Technical Support Document:

Chapter 32
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Ohio

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (the EPA, we, or us) must designate areas as either "nonattainment," "attainment," or "unclassifiable" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS) (2010 SO_2 NAAQS). The CAA defines a nonattainment area as an area that does not meet the NAAQS or that contributes to a nearby area that does not meet the NAAQS. An attainment area is defined by the CAA as any area that meets the NAAQS and does not contribute to a nearby area that does not meet the NAAQS. Unclassifiable areas are defined by the CAA as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS. In this action, the EPA has defined a nonattainment area as an area that the EPA has determined violates the 2010 SO_2 NAAQS or contributes to a violation in a nearby area, based on the most recent 3 years of air quality monitoring data, appropriate dispersion modeling analysis, and any other relevant information. An unclassifiable/attainment area is defined by the EPA as an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS[1]. An unclassifiable area is defined by EPA as an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

This technical support document (TSD) addresses designations for nearly all remaining undesignated areas in Ohio for the 2010 SO_2 NAAQS. In previous final actions, the EPA has

[1] The term "attainment area" is not used in this document because the EPA uses that term only to refer to a previous nonattainment area that has been redesignated to attainment as a result of the EPA's approval of a state-submitted maintenance plan.

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issued designations for the 2010 SO_2 NAAQS for selected areas of the country.[2] The EPA is under a December 31, 2017, deadline to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California.[3] We are referring to the set of designations being finalized by the December 31, 2017, deadline as "Round 3" of the designations process for the 2010 SO_2 NAAQS. After the Round 3 designations are completed, the only remaining undesignated areas will be those where a state has timely installed and begun operating a new SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 Data Requirements Rule (DRR). (80 FR 51052) The EPA is required to designate those remaining undesignated areas by December 31, 2020.

Ohio submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on June 3, 2011. This initial recommendation was based on 2008-2010 air quality data and state emissions data from 2008. Ohio recommended several areas for nonattainment designation, based on monitored violations. Ohio recommended fourteen counties as unclassifiable because although they had monitored air quality data showing no violations, the SO_2 emissions affecting these counties had not been modeled, in accordance with EPA guidance at the time. For 32 counties which had no SO_2 monitors but contained SO_2 sources which Ohio considered as potentially necessitating evaluation by modeling, Ohio recommended unclassifiable designations. Finally, Ohio recommended an attainment designation for 36 counties which had total SO_2 emissions of less than 100 tpy. The state submitted a supplement and two revisions on June 29, 2011, April 12, 2012, and January 18, 2013, respectively. The supplement merely provided additional responses to public comments; the two revisions provided revised designation recommendations and revised nonattainment area boundary recommendations for areas which no longer contained monitored violations based on 2009-2011 and 2010-2012 data. The EPA based its Round 1 nonattainment designations in part on these submittals. To address the DRR, Ohio submitted a new statewide Round 3 recommendation on January 13, 2017. The state also provided additional analysis and recommendations regarding Cuyahoga County on June 28, 2017. Ohio's January 2017 submittal recommended unclassifiable/attainment designations for all undesignated counties except the Meigs and Gallia County Round 2 unclassifiable area, for which Ohio placed a network of new SO_2 monitors. Ohio did not recommend any new nonattainment areas. Finally, Ohio's June 28, 2017, submittal evaluated air quality in Cuyahoga County, analyzed causes of violations monitored in the 2014 to 2016 period, and provided modeling in support of the state's view that new limitations being imposed on a source in this county will provide for the area to be attaining the standard. In our intended designations, we have considered all the submissions from the state, except where a recommendation in a later submission regarding a particular area indicates that it replaces an earlier recommendation for that area we have considered the recommendation in the later submission.

For the areas in Ohio that are part of the Round 3 designations process, Table 1-1 identifies the EPA's intended designations and the counties or portions of counties to which they would apply. It also lists Ohio's current recommendations. The EPA's final designation for these areas will be

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[2] A total of 94 areas throughout the U.S. were previously designated in actions published on August 5, 2013, (78 FR 47191), July 12, 2016, (81 FR 45039), and December 13, 2016, (81 FR 89870).
[3] *Sierra Club v. McCarthy*, No. 3-13-cv-3953 (SI) (N.D. Cal. Mar. 2, 2015).

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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 1-1. Summary of the EPA's Intended Designations and the Designation Recommendations by Ohio

County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Adams	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Coshocton	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Cuyahoga	Entire County	Attainment	The portions of the Cities of Cleveland, Newburgh Heights, and Cuyahoga Heights that are south of I-490, west of I-77, and east of the Cuyahoga River.	Nonattainment
			Remainder of County	Unclassifiable/ Attainment
Hamilton	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Jefferson (p)	Partial County[a]	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Lorain	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Lucas	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Ottawa, Sandusky	Entire Counties	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Seneca	Entire County	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment
Remaining Areas in State[b]	All full or partial counties not yet designated	Unclassifiable/ Attainment	Same as State's	Unclassifiable/ Attainment

[a]All townships except Cross Creek, Steubenville, Warren, and Wells Townships and Steubenville City

[b] The EPA intends to designate the remaining undesignated counties (or portions of counties) in Ohio as separate "unclassifiable/attainment" areas as these areas were not required to be characterized by the state under the DRR and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the areas may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These areas that we intend to designate as unclassifiable/attainment (those to which this row of this table is applicable) are identified more specifically in Section 12 of this Ohio chapter of this TSD.

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Ohio has elected to install and begin operation of a new, approved SO_2 monitoring network under the DRR for one area, near the General J.M. Gavin and Kyger Creek power plants. However, this area has already been designated as unclassifiable in Round 2, published July 12, 2016. This area was defined to include all of Gallia County and six townships in Meigs County, Ohio. The remaining portion of Meigs County will be designated in this current round of designations.

Ohio has not elected to install and begin operation of a new, approved SO_2 monitoring network for any other area. Therefore, the EPA intends in Round 3 to designate all currently undesignated portions of Ohio.

Areas that the EPA previously designated unclassifiable in Round 1 (*see* 78 FR 47191) and Round 2 (*see* 81 FR 45039 and 81 FR 89870) are not affected by the designations in Round 3 unless otherwise noted.

2. General Approach and Schedule

Updated designations guidance documents were issued by the EPA through a July 22, 2016, memorandum and 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 I-X. These memoranda supersede earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and identify factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The documents also contain the factors that the EPA intends to evaluate in determining the boundaries for designated areas. 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.

To assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling for sources that emit SO_2, the EPA released its most recent version of a draft document titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) in August 2016.[4]

Readers of this chapter of this TSD should refer to the additional general information for the EPA's Round 3 area designations in Chapter 1 (Background and History of the Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard) and Chapter 2 (Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for States with Sources Not Required to be Characterized).

As specified by the March 2, 2015, court order, the EPA is required to designate by December 31, 2017, all "remaining undesignated areas in which, by January 1, 2017, states have not

[2] https://www.epa.gov/sites/production/files/2016-06/documents/so2modelingtad.pdf. In addition to this TAD on modeling, the EPA also has released a technical assistance document addressing SO_2 monitoring network design, to advise states that have elected to install and begin operation of a new SO_2 monitoring network. See Draft SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, February 2016, https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf.

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installed and begun operating a new SO_2 monitoring network meeting EPA specifications referenced in EPA's" SO_2 DRR. (80 FR 51052) The EPA will therefore designate by December 31, 2017, areas of the country that are not, pursuant to the DRR, timely operating EPA-approved and valid monitoring networks. The areas to be designated by December 31, 2017, include the areas associated with the sources in Ohio meeting DRR emissions criteria that the state has chosen to be characterized using air dispersion modeling, the areas associated with four sources in Ohio for which the state has imposed emissions limitations on sources to restrict their SO_2 emissions to less than 2,000 tpy, sources that met the DRR requirements by demonstrating shutdown of the source (none of which are in Ohio), and other areas not specifically required to be characterized by the state under the DRR.

Because many of the intended designations have been informed by available modeling analyses, this preliminary TSD is structured based on the availability of such modeling information. There is a section for each county for which modeling information is available. Section 5 addresses a county for which recent air quality monitoring data indicate a NAAQS violation. Section 12 addresses the remaining undesignated counties in the state, for which no air quality modeling information is available. Some of these counties contain sources which met the DRR emissions criteria but took federally enforceable limits below 2,000 tpy, see Section 16 of Chapter 2 to this TSD.
The EPA does not plan to revise this TSD after consideration of state and public comment on our intended designation. A separate TSD will be prepared as necessary to document how we have addressed such comments in the final designations.

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

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 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) 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.
3) Designated Nonattainment Area – an area that, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined either: (1) does not meet the 2010 SO_2 NAAQS, or (2) contributes to ambient air quality in a nearby area that does not meet the NAAQS.
4) Designated Unclassifiable/Attainment Area – an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be

meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.[5]

5) Designated Unclassifiable Area – an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.
6) Modeled Violation – a violation of the SO_2 NAAQS demonstrated by air dispersion modeling.
7) Recommended Attainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as attainment.
8) Recommended Nonattainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as nonattainment.
9) Recommended Unclassifiable Area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended Unclassifiable/Attainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating Monitor – an ambient air monitor meeting 40 CFR parts 50, 53, and 58 requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.
12) We, our, and us – these refer to the EPA.
13) Ohio's 2017 Recommendations – refers to the document entitled "State of Ohio 2010 Revised Sulfur Dioxide National Ambient Air Quality Standard Recommended Area Designations Round 3," prepared by the Ohio Environmental Protection Agency Division of Air Pollution Control, January 2017, and its associated appendices.

[5] The term "designated attainment area" is not used in this document because the EPA uses that term only to refer to a previous nonattainment area that has been redesignated to attainment as a result of the EPA's approval of a state-submitted maintenance plan.

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3. Technical Analysis for Adams County

3.1. Introduction

The EPA must designate Adams County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Adams County. There are two DRR sources in Adams County, located 18 km from each other. Ohio modeled these sources together to address the DRR characterization requirements. The discussion in this section will consider the modeling analysis for these sources in determining the intended designation. Adams County, Ohio, borders the state of Kentucky. The modeling domain included portions of Mason and Lewis Counties in Kentucky, and the modeling analysis included one Kentucky source in Mason County, located 13 km from the nearest Adams County DRR source. This section only addresses the EPA's intended designation for Adams County, Ohio.

3.2. Air Quality Monitoring Data for Adams County

This factor considers the SO_2 air quality monitoring data in the Adams County area. The state submittal included monitoring data from the nearest air quality monitor to the Stuart and Killen plants, Air Quality System (AQS) monitor 39-001-0001. This monitor is located at Adams County Hospital in West Union, Ohio, and is 12 km north-northwest of Killen and 22 km northeast of Stuart. Thus, the monitor is well removed from the locations expected to record maximum concentrations in the area. The data indicate that SO_2 concentrations at this monitor are clearly below the 2010 SO_2 NAAQS: 26 ppb for 2012-2014, 20 ppb for 2013-2015, and 24 ppb for 2014-2016. The state intended all available data collected at this monitor to support and corroborate air dispersion modeling results; the discussion of these modeled results follows immediately below. The EPA confirmed that there are no additional monitors in Ohio or Kentucky that could better inform the intended designation action for Adams County. The next nearest monitors to Adams County are 50-70 km from Stuart and Killen, east and west along the Ohio River. These monitors also do not show a violation of the 2010 SO_2 NAAQS in Adams County and its surroundings, but again the monitors do not reflect the expected peak ambient impacts caused by the Stuart and Killen plants.

Figure 3-1, provided by the state, shows the locations of the Ohio monitor sites in Adams County and Scioto County to the east.

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Figure 3-1. SO_2 Monitor Locations in Adams and Scioto Counties

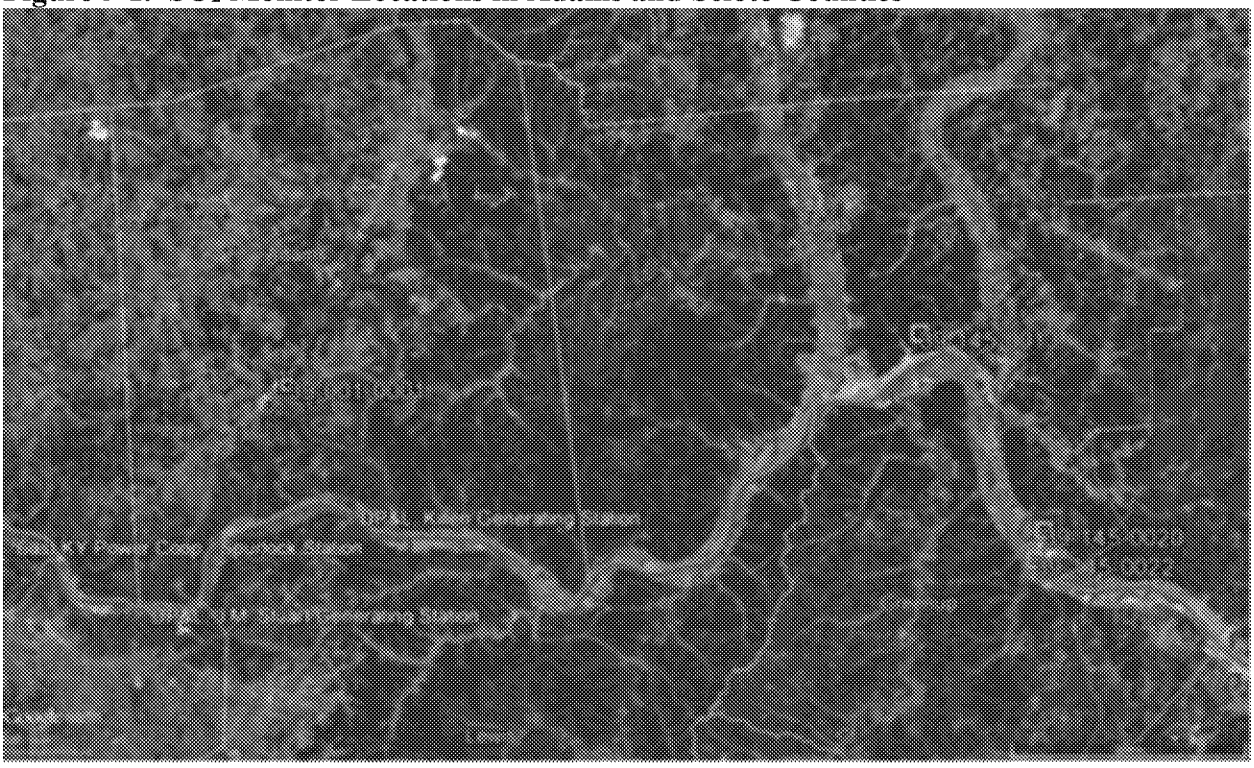

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Table 3-1 shows recent monitoring data for nearby sites located in Ohio and Kentucky.

Table 3-1: Air Quality Data near Adams County

County	Site ID	Approximate Distance to Stuart/Killen Area (km)	3-Year Design Value (ppb)		
			2012-2014	2013-2015	2014-2016
Adams	39-001-0001	13-23	26	20	24
Scioto	39-145-0013	48-67	9	11	10
Scioto	39-145-0020	60-75	27	26	28
Scioto	39-145-0022	60-75	19	19	23
Greenup, KY	21-089-0007	67-83	14	14	12
Boyd, KY	21-019-0017	77-93	16	16	12

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3.3. Air Quality Modeling Analysis for Adams County Addressing the Stuart and Killen Power Plants

3.3.1. Introduction

This section presents all the available air quality modeling information for a portion of Adams County that includes the Dayton Power and Light J. M. Stuart (Stuart) and Dayton Power and Light Killen (Killen) plants. (This portion of Adams County will often be referred to as "the Stuart/Killen area" within this section). Stuart and Killen are the SO_2 sources around which Ohio is required by the DRR to characterize SO_2 air quality.

- The Stuart facility emitted 10,768 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Ohio has chosen to characterize it via modeling.
- The Killen facility emitted 13,095 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Ohio has chosen to characterize it via modeling.
- The H. L. Spurlock Power Station (Spurlock) facility, located in Mason County, Kentucky, emitted 4,689 tons of SO_2 in 2014. This facility is 13 km from Stuart and 29 km from Killen, but Ohio included it in the Adams County modeling analysis. Spurlock is also listed under the DRR, and Kentucky evaluated Spurlock via modeling and included both Stuart and Killen in its analysis. For more information on Kentucky's analysis, see the Kentucky specific TSD chapter, Chapter 15.

Because we have air quality modeling results in which these sources are modeled together, the area around this group of sources is being addressed in this section with consideration given to the impacts of all these sources in the Stuart/Killen area.

In its submission, Ohio recommended that an area that includes the area surrounding the Stuart and Killen facilities, specifically the entirety of Adams County, be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from these facilities. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in southern Ohio, in the southwestern corner of Adams County, which is bounded by the Ohio River. As seen in Figure 3-2 below, provided by the state, the Stuart and Killen facilities are both located on the Ohio River. Also included in the figure are other nearby emitters of SO_2 and the wind rose from the modeled meteorology. The other sources in Ohio each emitted less than 5 tons in 2014. With the exception of Spurlock Station (4,689 tpy) and Carmeuse Lime and Stone (254 tpy), the other facilities in Kentucky within 50 km of Stuart emitted less than 15 tons each in 2014. Ohio

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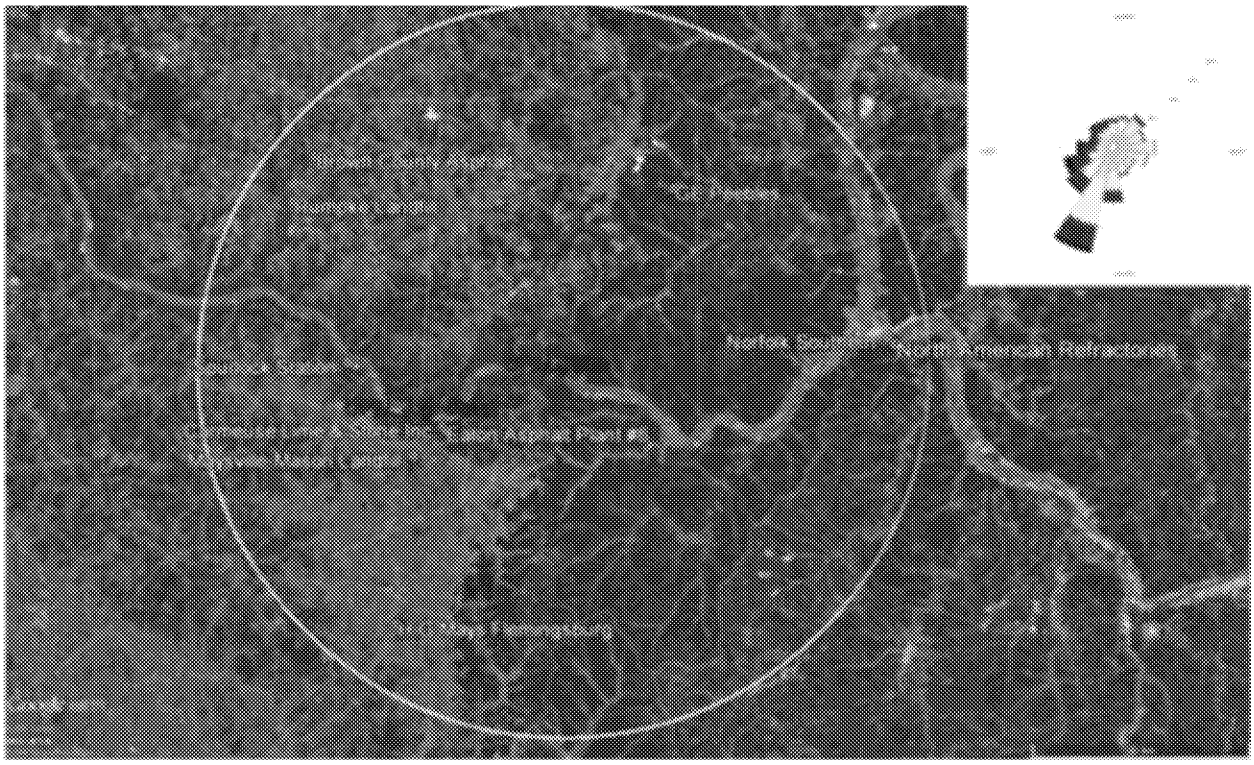
considered Spurlock and Carmeuse Lime and Stone, and determined that only Spurlock merited inclusion in the modeled domain, as detailed in the sections below.

Figure 3-2. Map and Wind Rose for the Stuart/Killen Area of Analysis in Adams County



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The EPA received a modeling assessment for this area from Ohio, which was the only analysis that the EPA received for this area. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

3.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data

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- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 15181 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Stuart/Killen area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Stuart/Killen area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

3.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the state used mapping software to determine that the predominant land use surrounding each power plant was made up of more than 50% rural categories; therefore, the state determined that it was most appropriate to run the model in rural mode. The EPA has also reviewed available satellite imagery, showing the rural nature of this area, and concurs with the state's determination that the modeling domain is appropriately represented in the model as rural.

3.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. The state determined that 50 km was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. For assessing the Stuart/Killen area, the state has included one other emitter of SO_2 within 50 km of Stuart and Killen, determining that the other sources within the 50 km radius were unlikely to cause a concentration gradient within the area of analysis due to

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their emission level and distance, and are adequately characterized by background. No sources beyond 50 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. Based on the information Ohio provided, the EPA concurs with the state's determination that only one other source within 50 km should be explicitly modeled in the analysis.

The receptor grid spacing for the area of analysis chosen by the state is as follows:
- 50 meters along the fencelines of Stuart and Killen
- 100-meter spacing to 3 km
- 250-meter spacing to 5 km
- 500-meter spacing to 7 km
- 1000-meter spacing to 10 km
- 5000-meter spacing to 50 km
- A receptor was also placed at the Adams County monitor location.

The receptor network, centered on the Stuart and Killen facilities along the southern border of Adams County, contained 89,253 receptors, more than in any other Ohio analysis. The network covered the entirety of Adams County and also included neighboring counties in Ohio and Kentucky.

Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, with the exceptions of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Ohio did not exclude receptors on the Ohio River. Potentially inconsistent with the Modeling TAD, Ohio's final submitted modeling run omitted receptors on the properties of both Stuart and Killen, but in earlier sensitivity runs the state confirmed that neither facility causes violations on the other facility's property. Additionally, with respect to the exclusion of receptors inside the Stuart and Killen fence lines, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside the Stuart and Killen fence lines would not have shown SO_2 violations attributable to one another. Therefore, despite the potential inconsistency with the Modeling TAD, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

The EPA has assessed Ohio's receptor grid for the Adams County area of analysis and confirms that Ohio used receptor grid placements and exclusions adequate for purposes of determining whether this area is attaining the SO_2 standard.

Figures 3-3 and 3-4 show the state's area of analysis surrounding Stuart and Killen, and the receptor grid for the area of analysis.

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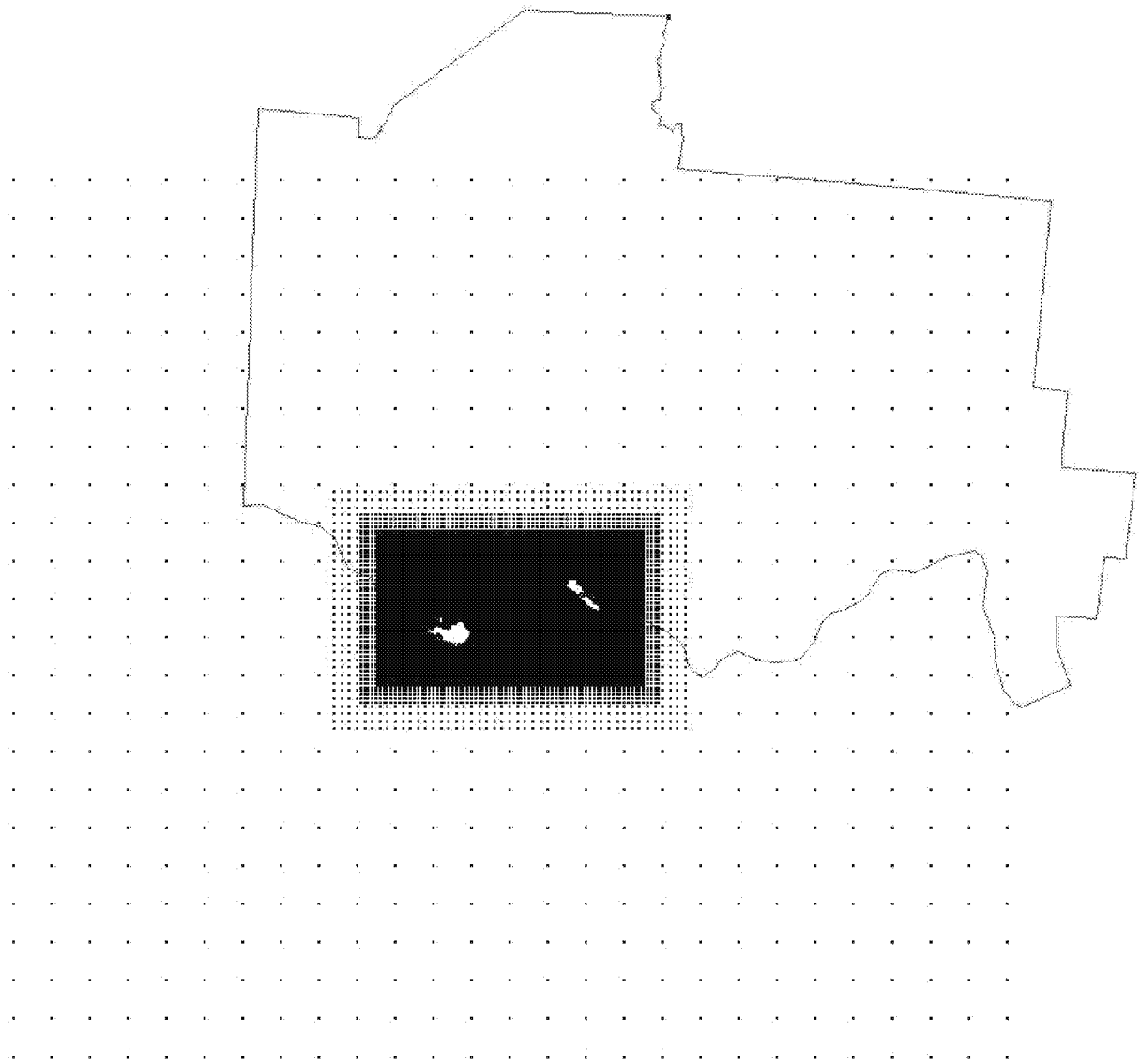
Figure 3-3: Area of Analysis for the Stuart/Killen Area of Adams County

Figure 3-4: Receptor Grid for the Stuart/Killen Area



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3.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

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Ohio modeled emissions from the Stuart, Killen, and Spurlock plants in this analysis. The Spurlock plant is 29 km northwest of the Stuart/Killen area. Ohio included Spurlock in the analysis because as a DRR source, Spurlock has the potential to cause a significant concentration gradient near the maximum modeled concentration near Stuart and Killen. Table 3-2 presents the annual SO_2 emissions from these facilities, based on data from the EPA's Clean Air Markets Division (CAMD) database.

Table 3-2. SO_2 Emissions from Facilities in the Stuart/Killen Area

Facility Name	Distance from Stuart (km)	SO_2 Emissions (tpy)				
		2012	2013	2014	2015	2016
DP&L J. M. Stuart Station	--	8,864	11,542	10,852	9,421	9,004
DP&L Killen Station	19.5	5,362	7,885	13,095	5,683	10,127
Spurlock Station	13	5,131	4,469	4,689	2,961	4,703
Carmeuse Lime Maysville	4.7			254		

The other facilities within 50 km of Stuart and Killen were considered not to have a significant concentration gradient that would affect the maximum concentration in the area of analysis, based on their distance from Stuart and Killen and their emissions. These facilities were not included in the modeling and are accounted for by the background concentration.

Ohio did not have detailed source information and thus did not model Carmeuse Lime and Stone, located in Maysville, Kentucky (Carmeuse Lime Maysville). However, because this source is located close to Stuart, and close to the final modeled design value location, the EPA requested further information about its potential impacts on the modeled design value. Carmeuse Lime Maysville emitted 254 tons in 2014 and is located 4.7 km south of Stuart. Ohio explained that they had previously modeled a similar, but larger, Carmeuse facility in Ohio (Carmeuse Lime Maple Grove; see section 10 of this TSD), which had approximately 14 times the SO_2 emissions of the Maysville facility. By extrapolating from that analysis, Ohio concluded that the Maysville facility would not have caused or contributed to modeled concentrations over the standard either in its own vicinity or in Adams County, had it been included in the Adams County modeling analysis. The Adams County design value was located 1.9 km north of Stuart and 6 km from Carmeuse Lime Maysville, while the maximum modeled concentration for Carmeuse Lime Maple Grove was located only 850 m from the facility. Therefore, it is likely that if Carmeuse Lime Maysville had been explicitly modeled, its maximum impact would have occurred well within the Kentucky border, several kilometers from the Adams County modeled design value receptor. Extrapolating the impacts of Carmeuse Lime-Mayville, (using the assumption that the two Carmeuse Lime facilities are fairly similar in SO_2 source characteristics such as stack height, velocity, and temperature, given that they are both lime kiln operations) an estimate of maximum SO_2 impact from Carmeuse Lime Maysville was derived from the ratio of Carmeuse Lime Maple Grove's annual modeled emissions to its modeled yearly maximum, multiplied by Carmeuse Lime Maysville's annual emission rate. This value ranged from 7.8 to 8.7 $\mu g/m^3$ for the three modeled years. Even if an average of these three values were added to the Adams County

modeled design value, i.e., even if Ohio were to disregard the substantial diminution of concentrations that would be expected from 850 meters from the plant (where maximum impacts from Carmeuse Lime Maysville are expected and 6 km away (where peak impacts from Stuart were modeled), the net design value would still be below the NAAQS. Therefore, the EPA concurs with Ohio's determination that Carmeuse Lime Maysville would not have caused or contributed to a violation of the NAAQS in the modeling analysis for Stuart and Killen had it been explicitly modeled, that Carmeuse Lime Maysville is not expected to cause significant concentration gradients near Stuart or Killen that merited the source being explicitly included in the modeling, and its impacts are appropriately characterized by the background concentration. As described in section 3.3.9, Ohio's background concentrations were considered to be conservative (i.e. prone to overstate actual background concentrations). Monitored concentrations at the background monitor which represent winds coming from the direction of Carmeuse Lime Maysville (south) would also include impacts from Stuart. The background concentrations which were added to the three concentrations included in the Adams County design value were 7, 10, and 8 ppb (18, 26, and 21 $\mu g/m^3$); more than twice the estimated contribution from Carmeuse Lime Maysville.

The state characterized Stuart, Killen, and Spurlock in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash. The EPA concurs with these determinations of source characterization.

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3.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, a state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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 included Stuart, Killen, and Spurlock in its analysis. The state considered other emitters of SO_2 within 50 km in the area of analysis, but determined that the impacts of these facilities were appropriately characterized through background concentrations. The state has chosen to model Stuart, Killen, and Spurlock using actual SO_2 emissions between 2012 and 2014. For Stuart and Killen, Ohio modeled actual hourly emissions submitted to Ohio by Dayton Power and Light. Most invalid or missing data was filled by interpolation between valid hours. For invalid data periods longer than 8 hours, data representing average CEMS values associated with different levels of power output was used to provide substitute hourly emissions values. This data was input into the model as hourly variable emissions. For Spurlock, the actual hourly emissions data were obtained from CAMD. This data was input into the model as hourly variable emissions. The EPA has confirmed that the total of the modeled emissions correspond with the totals of reported emissions for these plants. Table 3-2 above summarizes emissions from facilities in this area.

The EPA concurs with these emissions data.

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3.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Stuart/Killen area, the state selected the surface meteorology from Huntington Tri-State Airport in Huntington, West Virginia, 88-100 km to the east of Stuart and Killen, and coincident upper air observations from Wilmington Airborne Airpark, located in Wilmington, Ohio, 87 km north of Stuart and Killen, as best representative of meteorological conditions within the area of analysis. At the time Ohio conducted its analysis, 2012 to 2014 data were the most recent available data.

The state used AERSURFACE 13016 using data from the Huntington Tri-State Airport to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions. Figure 3-2 above, included in the state's recommendation, shows the location of this NWS station relative to the area of analysis (see the lower right corner).

As part of its recommendation, the state provided the 3-year surface wind rose for the Huntington Tri-State Airport in West Virginia. In Figure 3-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The winds at this station show a strong south-southwest component. The lightest winds most frequently blow from either the south-southwest or the west.

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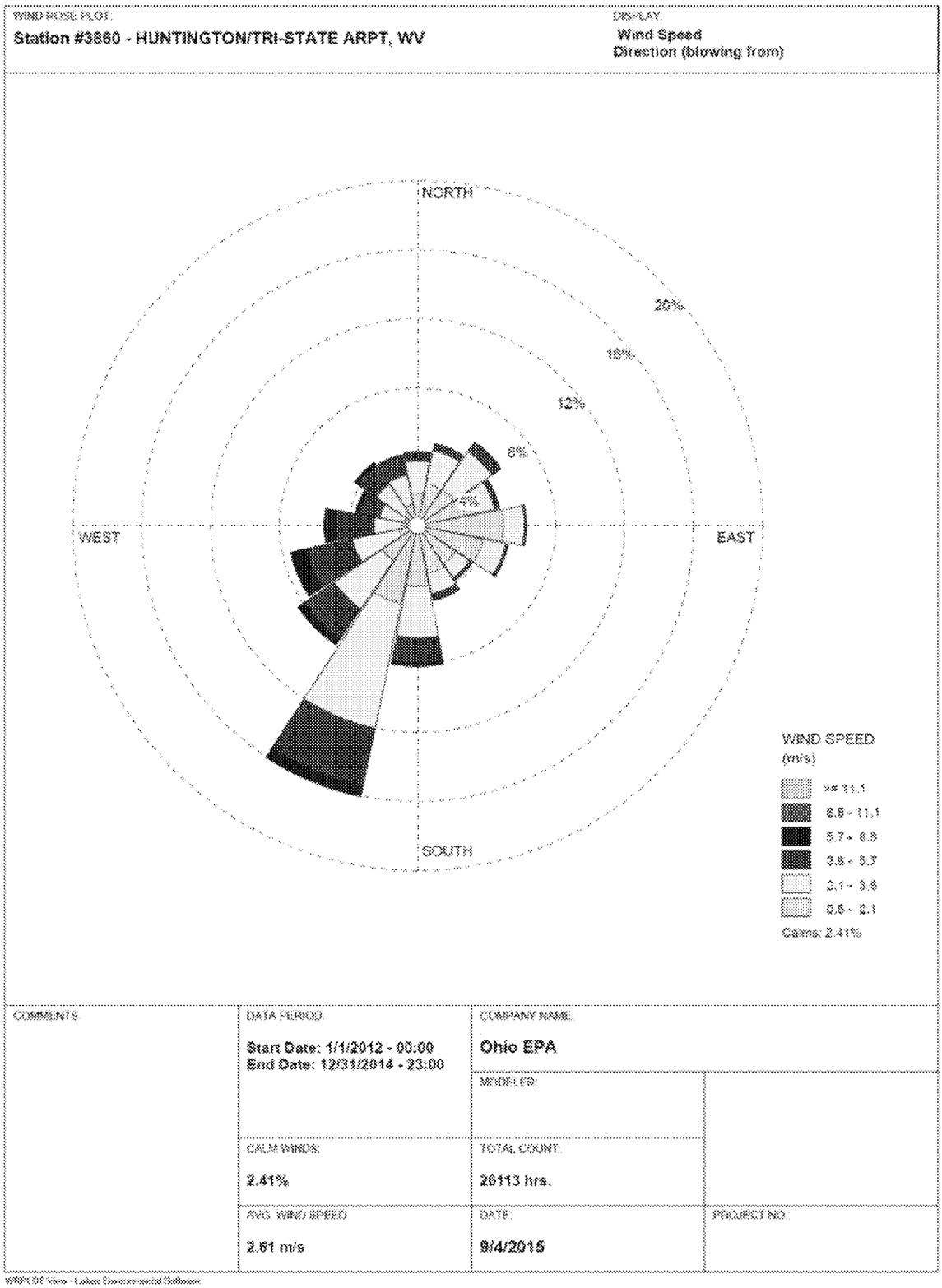
Figure 3-5: Huntington Tri-State Airport, WV, Cumulative Annual Wind Rose for Years 2012-2014



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and EPA's AERMOD Implementation Guide in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to process surface characteristics data.

In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Huntington Tri-State airport and processed with the AERMINUTE 14337 preprocessor. 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 than standard hourly data. This allowed 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with Ohio's selections of meteorological data.

3.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is hilly and forested near the Ohio River. To account for these terrain changes, the AERMAP 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from USGS Digital Elevation Data. The EPA concurs with Ohio's consideration of local terrain.

3.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, Ohio chose to use a seasonal/hourly variable background, taken from the Adams County monitor, 39-001-0001, for the years 2012-2014. Ohio calculated a 3-year average for each hour of data, including only non-zero values, divided the dataset into seasons, and used the 99th percentile value for each hour of the season. Because of the locations of the nearby sources in the area,

Ohio did not attempt to filter the background data to eliminate potential impacts from Stuart and Killen. Therefore, Ohio asserted that the background values are conservative (prone to overestimate background concentrations), as they would include impacts from Stuart and Killen. The background concentrations varied from 3 to 17 ppb, corresponding to 8 to 45 $\mu g/m^3$, with an average value of 7 ppb, or 18 $\mu g/m^3$.[6] The EPA concurs with Ohio's approach to calculating background for this area of analysis.

[6] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 $\mu g/m^3$.

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3.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Stuart/Killen area of analysis are summarized below in Table 3-3.

Table 3-3: Summary of AERMOD Modeling Input Parameters for the Stuart/Killen Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	16
Modeled Structures	31
Modeled Fencelines	2
Total receptors	89,253
Emissions Type	Actual
Emissions Years	2012- 2014
Meteorology Years	2012- 2014
NWS Station for Surface Meteorology	Huntington Tri-State Airport, WV (KHTS, Station # 3860)
NWS Station Upper Air Meteorology	Wilmington Airborne Airpark, OH (KILN, Station # 13841)
NWS Station for Calculating Surface Characteristics	Huntington Tri-State Airport, WV
Methodology for Calculating Background SO_2 Concentration	"Tier 2" Season/hourly variable from Adams County monitor, 39-001-0001, no wind directions eliminated.
Calculated Background SO_2 Concentration	3-17 ppb

The results presented below in Table 3-4 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

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Table 3-4. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Stuart/Killen Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012- 2014	265750	4281650	186.3	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 186.3 $\mu g/m^3$, equivalent to 71 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 3-6 below was included as part of the state's recommendation, and indicates that the highest predicted 99th percentile daily maximum 1-hour value occurred 1.9 km north of Stuart, near the northern fenceline of the Stuart facility. The state's receptor grid is also shown in the figure. The EPA examined the modeled results near the maximum receptor and property line, and determined that the maximum value was an isolated hot spot off facility property. Concentrations modeled in that dense area of the receptor grid were decreasing toward the fenceline. Therefore, the EPA finds that the maximum modeled concentration represents a correct characterization of ambient air quality and that it likely would not have changed if receptors would have been included within the facilities' fencelines.

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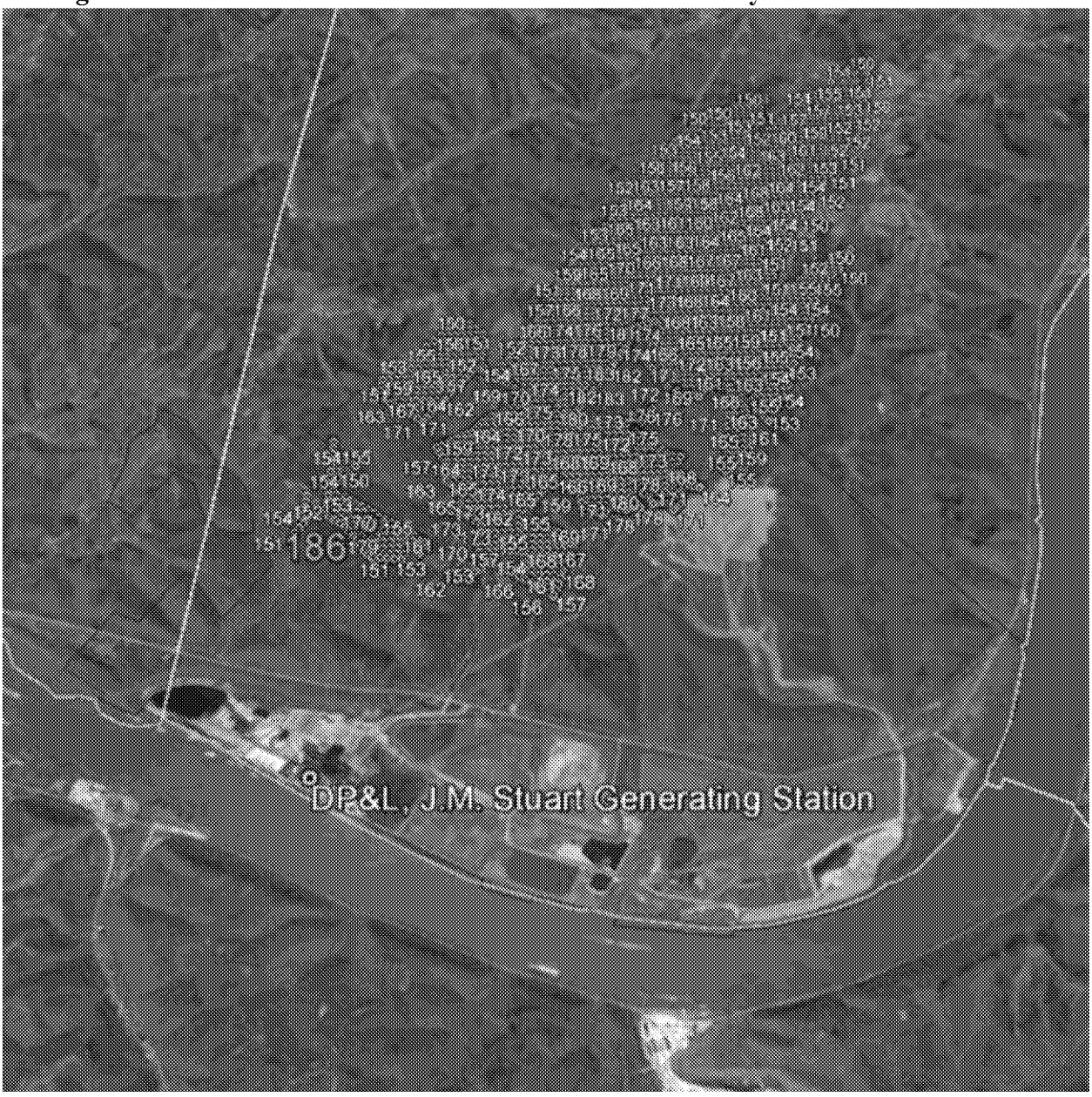
Figure 3-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Stuart/Killen Area of Analysis



Ohio's 2017 Recommendations, Appendix Y

The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors.

3.3.11. The EPA's Assessment of the Modeling Information Provided by the State

The EPA finds that Ohio's modeling analysis for the Stuart/Killen area is adequate to support the state's SO_2 designation recommendation. The analysis generally followed the Modeling TAD, except as otherwise noted in Section 3.3.4 regarding receptor placement. The state's modeling demonstrates attainment of the 1-hour SO_2 NAAQS at all modeled receptors and does not indicate any contribution to any nearby nonattainment areas. Specifically, there are no existing nonattainment areas or remaining undesignated areas within 100 km. The state has modeled nearly the entirety of Adams County, including the portions of the county that would be expected to observe the highest concentrations.

3.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Adams County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

3.5. Jurisdictional Boundaries in Adams County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Adams County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Ohio recommended that the entirety of Adams County be designated unclassifiable/attainment. The EPA concurs with the use of county boundaries as the basis for defining the designated area.

3.6. The EPA's Assessment of the Available Information for Adams County

The EPA believes that Ohio has provided adequate support with modeling data for its recommendation to designate Adams County as unclassifiable/attainment. The EPA finds that Adams County is meeting the 1-hour SO_2 NAAQS and does not contribute to any nearby nonattainment area. Monitoring data were available to EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality.

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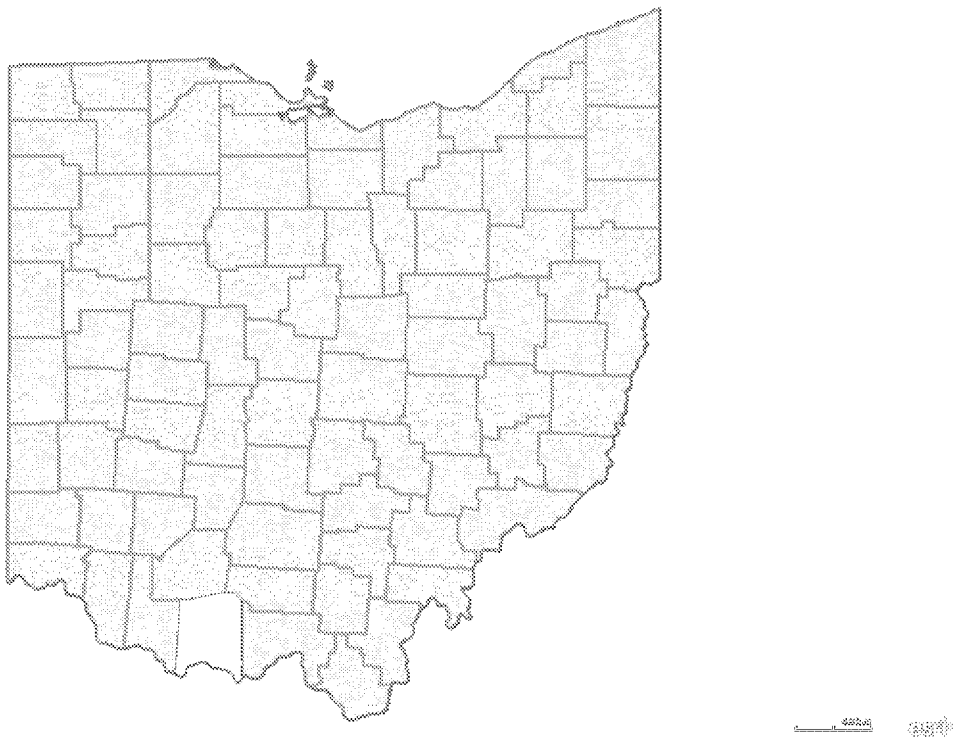
The EPA believes that our intended unclassifiable/attainment area, the entirety of Adams County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

3.7. Summary of Our Intended Designation for Adams County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state's recommendation and intends to designate Adams County as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Adams County.

Figure 3-7 shows the boundary of this intended designated area.

Figure 3-7: Boundary of the Intended Adams County Unclassifiable/Attainment Area



At this time, our intended designations for Ohio only apply to this area and the other areas presented in this technical support document.

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4. Technical Analysis for Coshocton County

4.1. Introduction

The EPA must designate Coshocton County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Coshocton County.

4.2. Air Quality Monitoring Data for Coshocton County

This factor considers the SO_2 air quality monitoring data in the area of Coshocton County. The state included monitoring data from Air Quality System monitor 39-157-0006. This monitor was located in Tuscarawas County, 9 km northwest of the Coshocton County line and 41 km northwest of the large SO_2 sources in Coshocton County. The Tuscarawas County monitor only has data until 2012, at which time the design value was 45 ppb. This monitor is not considered to be located in the area of maximum concentration from SO_2 sources in Coshocton County, but is included as the nearest SO_2 monitor to Coshocton County. The EPA confirmed that there is no additional relevant data in AQS that could inform this intended designation action.

4.3. Air Quality Modeling Analysis for Coshocton County

4.3.1. Introduction

This section presents all the available air quality modeling information for a portion of Coshocton County that includes the American Electric Power Conesville Power Plant (Conesville). (This portion of Coshocton County will often be referred to as "the Conesville area" within this section). Conesville emitted 7,370 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Ohio has chosen to characterize it via modeling.

In its submission, Ohio recommended that an area that includes the area surrounding the Conesville plant, specifically the entirety of Coshocton County, be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in central Ohio approximately 98 km east-northeast of Columbus, Ohio. The Conesville plant is located on the

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Muskingum River, near the town of Conesville. The local area is mostly wooded with some agricultural land.

Figure 4-1, provided by the state, below shows the Conesville area of analysis. The Conesville plant is located near the southern border of Coshocton County. Also included in the figure are other nearby emitters of SO_2 within 25 km of Conesville, which are RockTenn CP, LLC (13 tpy), McWane Ductile-Ohio (1 tpy), CE Acquisition Company LLC (10 tpy), Shelly Materials Plant #66 (2 tpy) in Coshocton County; and Appalachian Power Co., Dresden Plant (8 tpy) in Muskingum County. Two higher-emitting facilities are located within 50 km of Conesville: The Belden Brick Company (902 tpy) in Tuscarawas County and AMG Vanadium, Inc. (631 tpy) in Guernsey County. Ohio determined that, given the prevailing winds, emissions from The Belden Brick Company (902 tpy), located 41 km northeast of Conesville in Tuscarawas County, are sufficiently rarely upwind of Conesville and it is sufficiently distant to be unlikely to contribute to the maximum concentrations in the Conesville area. The next largest facility, AMG Vanadium, Inc., is located 35 km southeast of Conesville. Ohio also determined that this source was sufficiently distant to be unlikely to have a concentration gradient which would affect the maximum concentrations near Conesville. Ohio determined that the remaining sources in the surrounding area were also unlikely to cause a concentration gradient that would affect the maximum concentration, given their lower emissions levels and distance from Conesville. Their impacts are represented by the fixed background value that Ohio chose to represent this rural area. The EPA concurs with Ohio's choice of sources to include for this analysis.

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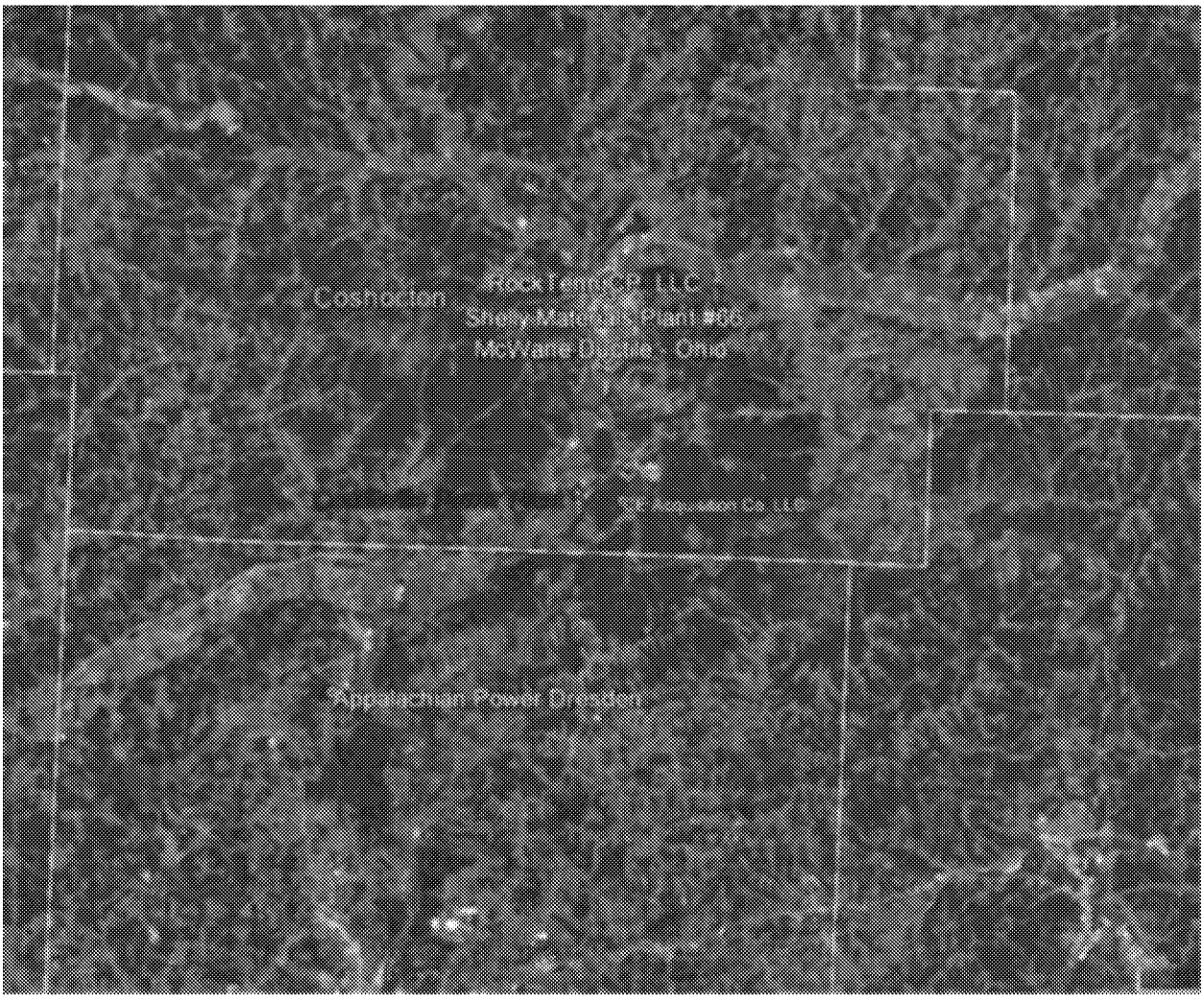
Figure 4-1. Map of the Conesville Area of Analysis and Sources Within 25 Kilometers



Ohio's 2017 Recommendations, Appendix Q

The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. For this area, the EPA received and considered one modeling assessment, submitted by Ohio.

4.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Conesville area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Conesville area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

4.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the state used mapping software to determine that the predominant land use surrounding the Conesville plant was made up of rural categories; therefore, the state determined that it was most appropriate to run the model in rural mode. The EPA has also reviewed available satellite imagery, showing the rural nature of this area, and concurs with the state's determination that the modeling domain is appropriately represented in the model as rural.

4.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

For the Conesville area of Coshocton County, the state determined that 25 km was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact

on SO_2 air quality from other sources in nearby areas. Five SO_2 sources were located within 25 km of Conesville; in 2014 these facilities' combined SO_2 emissions were 34 tpy. None of these facilities were included in Ohio's Conesville modeling. As previously mentioned, these smaller sources were not expected to cause concentration gradients or have more than a negligible impact on the maximum modeled concentration, and were therefore accounted for by the background concentration. Ohio also considered other emitters of SO_2 within 50 km of Conesville. Ohio determined that any additional sources within the 50 km radius were unlikely to cause a significant concentration gradient that would affect the maximum concentration within the area of analysis due to their distance and/or emission level, and their impacts are adequately characterized by background. No sources beyond 50 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA concurs with the modeled domain size. Ohio's modeled results show the maximum concentration well below the NAAQS, within 3 km of Conesville.

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

- Every 50 meters along the Conesville fenceline
- 50-meter spacing to 3 km
- 100-meter spacing to 5 km
- 250-meter spacing to 6 km
- 500-meter spacing to 9 km
- 1000-meter spacing to 13 km
- 5000-meter spacing to 25 km.

The receptor network contained 32,548 receptors, and the network covered portions of Coshocton, Muskingum, and Guernsey Counties. Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility. The state opted to apply a regular grid of receptors without excluding the Muskingum River. Potentially inconsistent with the TAD, the state did not place receptors within the fenceline of Conesville, and the state did not address whether access to plant property was precluded. However, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside the Conesville fence line would not have shown SO_2 violations Therefore, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

The EPA has assessed Ohio's receptor grid for the Coshocton County area of analysis and confirms that Ohio used receptor grid placements and exclusions adequate for purposes of determining whether this area is attaining the SO_2 standard.

Figure 4-2, included in the state's recommendation, shows the state's receptor grid for the area of analysis.

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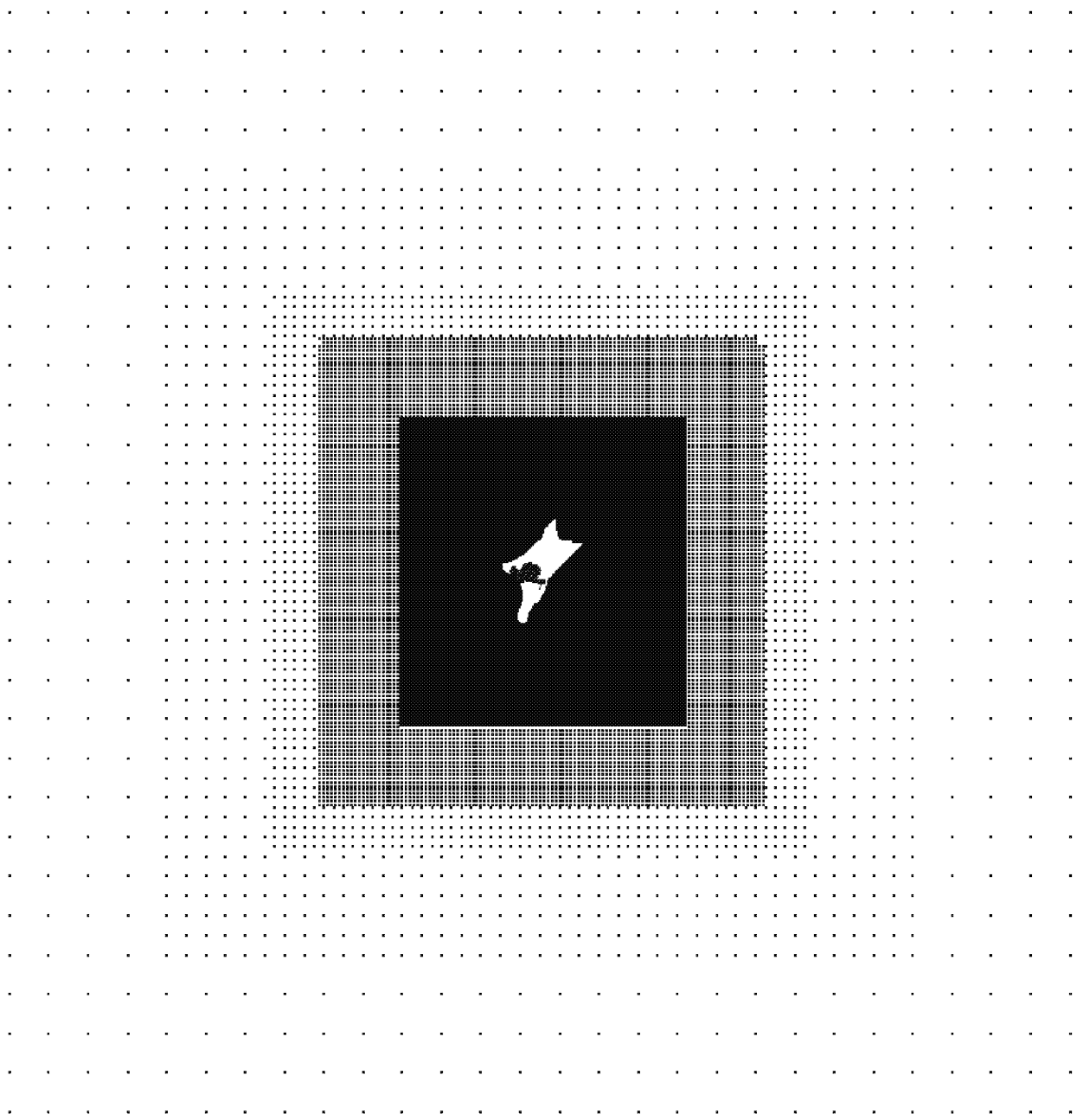
Figure 4-2: Receptor Grid for the Conesville Area of Analysis



Ohio's 2017 Recommendations, Appendix Q

4.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building

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downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

The state characterized Conesville in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash. The EPA concurs with Ohio's source characterization.

4.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, a state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

Ohio chose to model Conesville with actual 2013-2015 emissions. Hourly emissions data were obtained from American Electric Power, using CAMD reported data, with some missing or invalid data replaced by interpolation between valid data points. The EPA has ensured that the sum of the hourly modeled emissions is comparable to the annual emissions reported in CAMD. Therefore, the EPA concurs with the emissions used in the Conesville model analysis. Table 4-1 below shows actual emissions for sources in the area.

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Table 4-1. Annual Actual SO_2 Emissions from Facilities in the Conesville Area

Facility Name	Distance from Conesville (km)	Annual Actual SO_2 Emissions (tpy)			
		2012	2013	2014	2015
Conesville Power Plant	--	12,321.5	6,525.2	7,370.3	4,998.3
RockTenn CP, LLC	10	13	13.7	13.4	10.3
McWane Ductile - Ohio	7.1	1.1	1.1	1.2	1.2
CE Acquisition Company LLC	3.6	-	2.0	9.7	9.1
Shelly Materials Plant #66	14	-	-	1.8	-
Appalachian Power Co, Dresden Plant	16	-	-	7.7	-
Total Emissions		12,335.6	6,542	7,404.1	5,018.9

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4.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Conesville area, the state selected the surface meteorology from John Glenn Columbus International Airport, located in Columbus, Ohio, located 88 km west-southwest of Conesville, and coincident upper air observations from the Greater Pittsburgh International Airport, located in Pittsburgh, Pennsylvania, 140 km east-northeast of Conesville, as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE 13016 with data from the John Glenn Columbus International Airport (KCMH) to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions.

In figure 4-3 below, included in the state's recommendation, the location of the surface NWS station is shown relative to the area of analysis, at the far left of the map.

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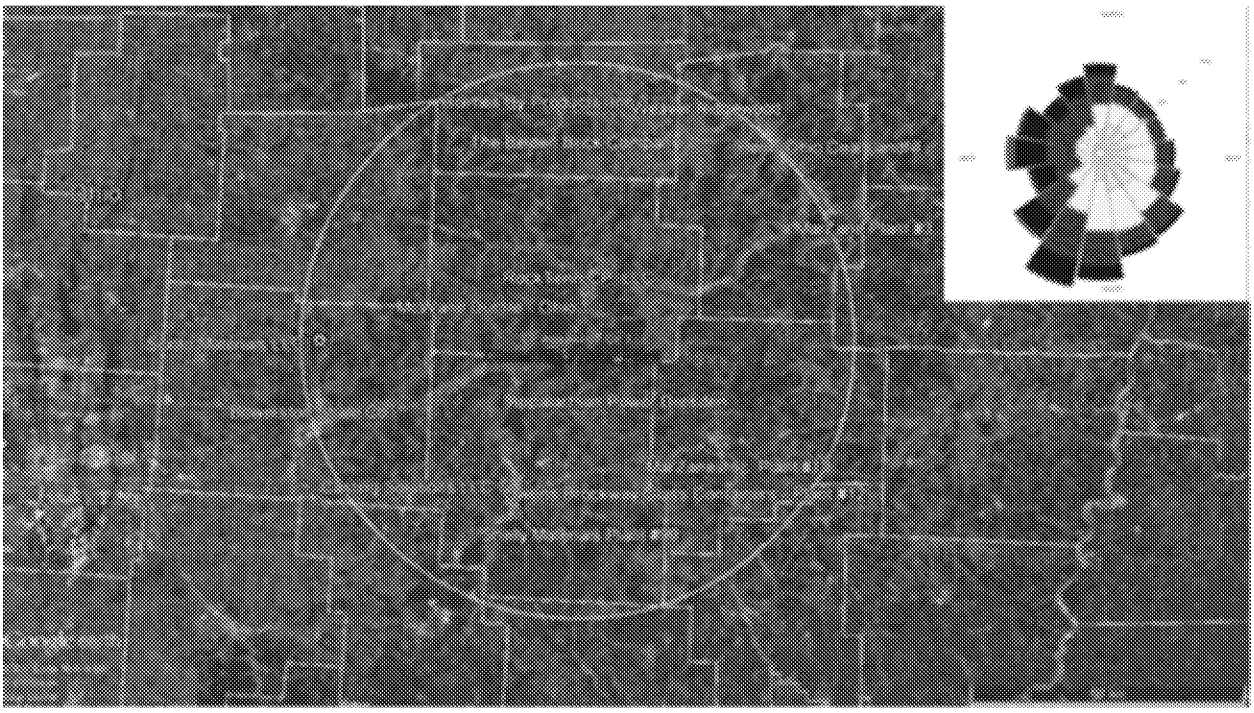
Figure 4-3. Conesville Area of Analysis and the Columbus NWS Station Wind Rose



Ohio's 2017 Recommendations, Appendix Q

As part of its recommendation, the state provided the 3-year surface wind rose for John Glenn Columbus International Airport. In Figure 4-4, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Winds in this area do not show a strong directional bias, although the south and southwestern components seem to generally dominate, and higher speed winds tend to come more often from the west and southwest than other directions.

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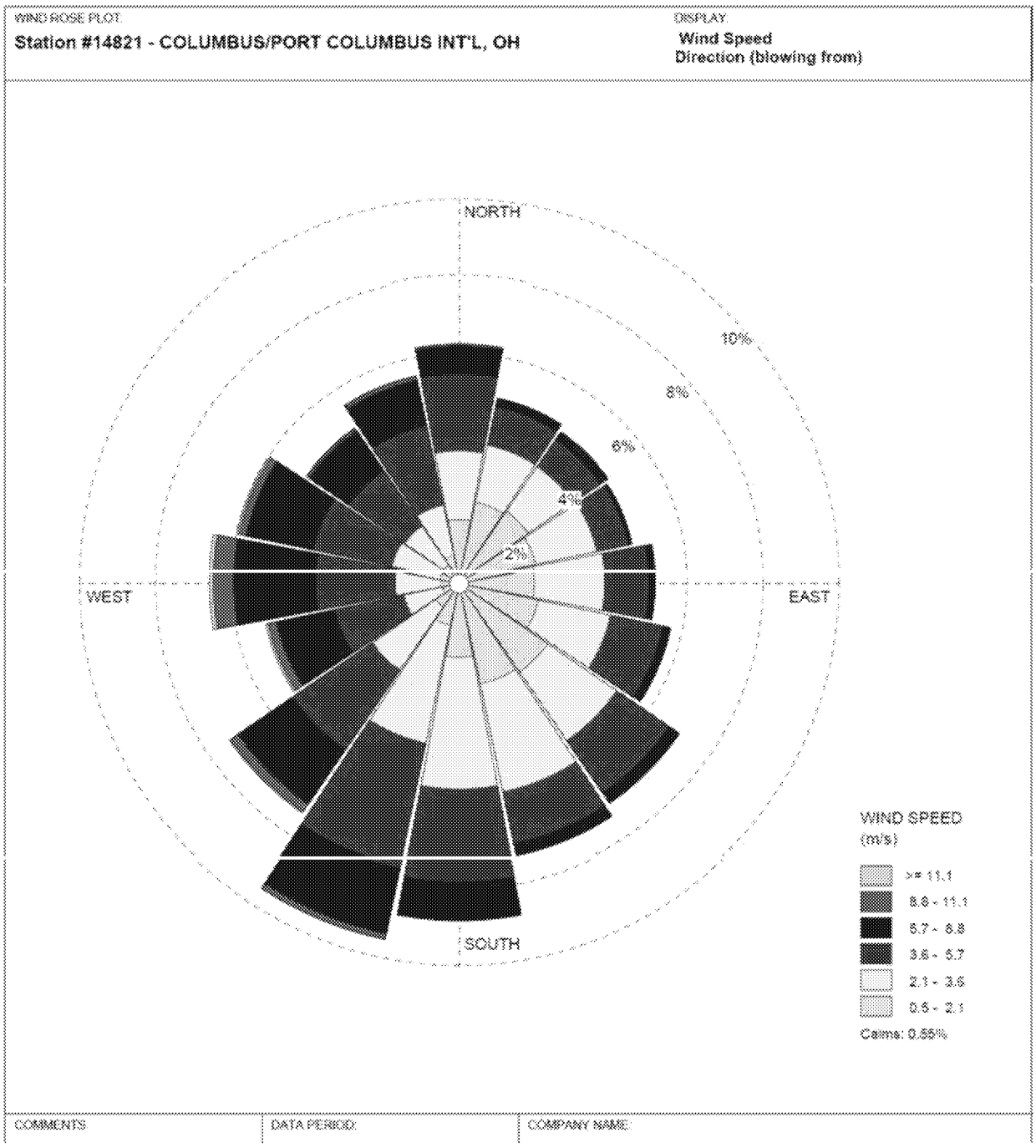
Figure 4-4: John Glenn Columbus International Airport Cumulative Wind Rose for 2013 – 2015.



Ohio's 2017 Recommendations, Appendix Q

Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 15181 processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration from John Glenn Columbus International Airport was processed with the AERMINUTE preprocessor. 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 than standard hourly data. This allowed 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological data that Ohio used.

4.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as generally flat to gently rolling with no features significant to this modeling analysis. The AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations from USGS Digital Elevation Data for all the receptors. The EPA concurs with the terrain information that Ohio used.

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4.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, Ohio chose to use a fixed background concentration of 8 ppb. This value was taken from a 2011 Lake Michigan Air Directors Consortium (LADCO) modeling protocol addressing two rural areas in Wisconsin and Iowa. As the Conesville area is predominantly rural, with the Conesville plant representing 99% of the 2014 emissions within 25 km, and there are no air quality monitors representative of local background, Ohio determined that the LADCO rural value was reasonable and appropriate. The single background value for this area of analysis, 8 ppb (21 $\mu g/m^3$)[7] was incorporated into the final AERMOD results. The EPA concurs that this background value, determined by LADCO to be representative of background concentrations in typical Midwestern rural areas, is for conditions similar to the conditions near Conesville and is representative of background concentrations in the Conesville area of analysis.

[7] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 $\mu g/m^3$.

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4.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Conesville area of analysis are summarized below in Table 4-2.

Table 4-2: Summary of AERMOD Modeling Input Parameters for the Conesville Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	65
Modeled Fencelines	1
Total receptors	32,548
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	John Glenn Columbus International Airport (KCMH)
NWS Station Upper Air Meteorology	Greater Pittsburgh International Airport (KPIT)
NWS Station for Calculating Surface Characteristics	John Glenn Columbus International Airport (KCMH)
Methodology for Calculating Background SO_2 Concentration	Fixed background concentration representing a rural Midwestern area developed by LADCO
Calculated Background SO_2 Concentration	8 ppb

The results presented below in Table 4-3 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

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Table 4-3. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Conesville Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 17		99th Percentile Daily Maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled Concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	425350	4451300	72.6	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 72.6 $\mu g/m^3$, equivalent to 27.7 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 4-5 below was included as part of the state's recommendation, and indicates that this maximum predicted value occurred 2.5 km north of Conesville.

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Figure 4-5: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Conesville Area

Ohio's 2017 Recommendations, Appendix Q

The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the modeled area.

4.3.11. The EPA's Assessment of the Modeling Information Provided by the State

The EPA believes that the Conesville modeling analysis is adequate to support the state's SO_2 designation recommendation. The analysis generally followed the TAD and showed attainment of the 1-hour SO_2 NAAQS at all modeled receptors. Additionally, the analysis does not indicate any contribution to any nearby nonattainment areas or remaining undesignated areas. Specifically, there are no existing nonattainment areas or remaining undesignated areas within 50 km. Since Ohio modeled most of Coshocton County, and modeled the portions of Coshocton County that would be expected to observe the highest concentrations in the area, this modeling indicates that the entirety of Coshocton County is attaining the standard.

4.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Coshocton County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

4.5. Jurisdictional Boundaries for Coshocton County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Coshocton County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Ohio recommended that the entirety of Coshocton County be designated unclassifiable/attainment. The EPA concurs with the use of county boundaries as the basis for defining the designated area.

4.6. The EPA's Assessment of the Available Information for Coshocton County

After careful review of the modeling assessment, the EPA intends to designate Coshocton County as unclassifiable/attainment. Ohio's dispersion modeling of the Coshocton County area showed no modeled violations of the standard and did not indicate that Conesville contributes to any nearby nonattainment area. The EPA finds the state's modeling to be acceptable as a basis for this designation.

The EPA believes that our intended unclassifiable/attainment area will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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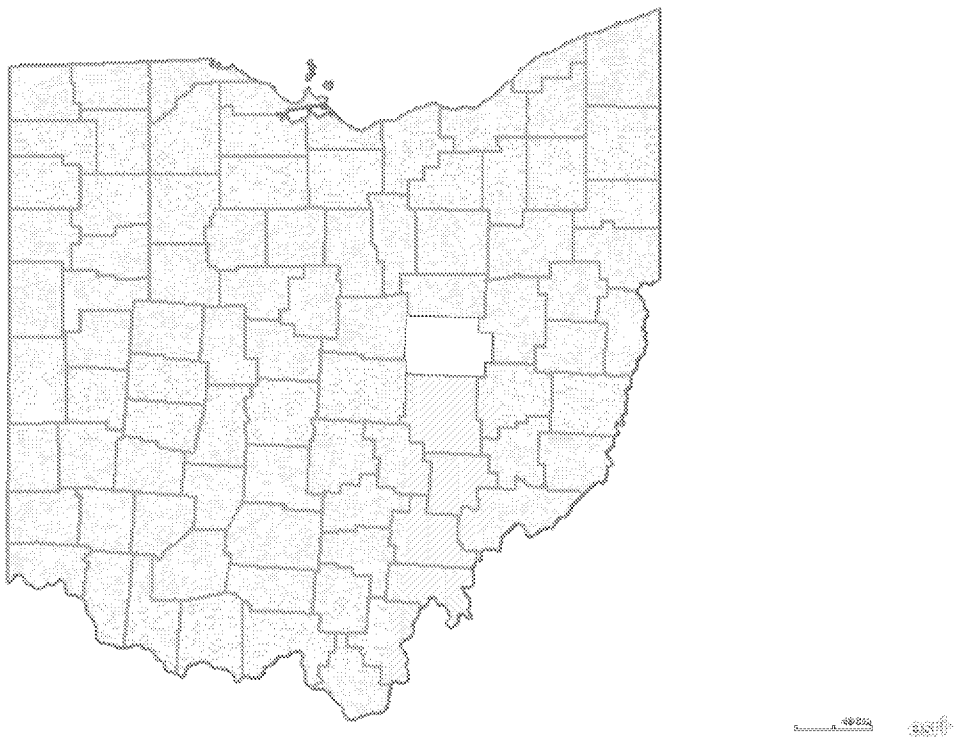
4.7. Summary of Our Intended Designation for Coshocton County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate Coshocton County as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Coshocton County.

Figure 4-6 shows the boundary of this intended designated area.

Figure 4-6. Boundary of the Intended Coshocton County Area



At this time, our intended designations for Ohio only apply to this area and the other areas presented in this technical support document.

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5. Technical Analysis for Cuyahoga County

5.1. Introduction

The EPA must designate Cuyahoga County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in the county.

In its January 18, 2017, submittal, Ohio recommended that Cuyahoga County be designated attainment, based in part on a review of 2013 to 2015 air quality monitoring data at four sites in the county. Subsequently, the EPA and Ohio reviewed 2014 to 2016 monitoring data, which showed a violation at the monitor in Newburgh Heights, site number 39-035-0065.

Ohio then conducted a review of the causes of this violation, which it described in a supplemental submittal of June 28, 2017. Ohio noted that the primary distinction between 2013 to 2015 air quality (with a design value at the Newburgh Heights monitor of 55 ppb) and 2014 to 2016 air quality (with a design value of 168 ppb) was the occurrence of unusually high concentrations, with daily maximum concentrations ranging from 342 ppb to 447 ppb, occurring on a small set of days in the second half of February 2016. This monitor is near to a modest sized (84 tpy) source called Charter Steel, and Ohio determined that the likely predominant cause of these high concentrations was unusually high fugitive SO_2 emissions from that source during that period. As Ohio explained, the source has an electric arc furnace and related steelmaking equipment, in which fugitive emissions from the steel vessel are ordinarily captured with high efficiency by a high volume capture system, but disturbances to interior air flow evidently disrupted this capture and led to significant fugitive emissions. In particular, Ohio found that a sizable opening at the plant was open during much of February 2016 due to a malfunctioning door. Ohio was unable to determine the precise quantity of emissions that went uncaptured and were emitted as fugitive emissions out this door. Nevertheless, Ohio conducted modeling assuming that five percent of the emissions of this facility were emitted as fugitive emissions, assuming that the remaining 95 percent of the emissions were captured and vented out of the associated baghouse. This modeling estimated concentrations with a magnitude similar to the monitored values. This modeling suggests that Ohio has a plausible explanation of why such elevated concentrations occurred in February 2016, and suggests that the modeling reasonably captures the effect on concentrations that can be expected by mitigating the fugitive emissions.

Next, Ohio undertook efforts to identify and require steps that would mitigate this cause of elevated concentrations. Ohio determined that Charter Steel needed a replacement door that would be less prone to being stuck open. On June 12, 2017, Ohio issued a draft permit setting limits on the time that this door can be in the open position. Ordinary operations are to keep the door slightly open, to a level below five feet above grade, to help provide make-up air for the fugitive emissions capture system, and to open the door fully for short periods for purposes of bringing in metal scrap and related materials for charging into the furnace. However, the draft permit would prohibit the door from being open more than five feet for more than five minutes at

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a time. The draft permit also would establish SO_2 emission limits for these operations. The permit is expected to be effective and federally enforceable upon issuance.

Finally, Ohio provided modeling that analyzed air quality that can be expected once it has completed final issuance of the permit that it has issued in draft form, reflecting the emission limits and requirements for door operation that are contained in the draft permit. Ohio submitted this modeling on June 28, 2017, in conjunction with an updated recommendation that the EPA designate Cuyahoga County as attainment for the SO_2 standard. This modeling indicates that the area will attain the standard with emissions from Charter Steel at these allowable levels.

The EPA has reviewed this material and concurs that compliance with the limitations Ohio has proposed will result in the area meeting the SO_2 standard in the area. Nevertheless, these limitations have not yet been issued in final form and thus are not presently federally enforceable or effective. Furthermore, in absence of issuance of a suitable final and effective permit and compliance with its terms, demonstrated to assure that the area will thereupon begin meeting the air quality standard, the EPA considers the monitoring data to be the best indicator of current air quality, and the most recent available air quality data indicate that the area is violating the standard. Accordingly, the EPA intends to designate a portion of the county as nonattainment. On the other hand, if Ohio issues a final and effective permit, compliance is required and Ohio certifies that compliance has occurred by the end of the period for state responses to 120-day letters, consistent with either the attainment analysis that Ohio has already provided or a suitably adjusted analysis, as appropriate, the EPA anticipates promulgating a final designation of unclassifiable/attainment for this area.

The information in Ohio's June 28, 2017, submittal supports Ohio's view that the violations monitored in Newburgh Heights are primarily attributable to the characteristics of the ground-level release of emissions after malfunctions at Charter Steel, which is located approximately 0.3 kilometers south of the monitor. This information, in conjunction with information from other monitoring sites between 2 and 5 km away which have recorded design values below the standard, suggests that the violating area and the area of contributing sources is relatively localized. Two sources are located in this portion of the Cleveland area: Charter Steel, which in 2014 emitted 84 tons of SO_2, and ArcelorMittal, which in 2014 emitted 981 tons of SO_2. While the evidence from Ohio suggests that the violations in Newburgh Heights are predominantly attributable to emissions from Charter Steel, the proximity and relatively substantial emissions of ArcelorMittal suggests that this source as well warrants inclusion in the intended nonattainment area as a nearby potential contributor to violations. Therefore, the EPA has defined an intended nonattainment area that includes the violating monitor and these two sources, which the EPA believes encompasses the full area that is violating and the nearby sources that are contributing to the violations. Specifically, the EPA intends to designate a nonattainment area that includes the portions of the Cities of Cleveland, Newburgh Heights, and Cuyahoga Heights that are south of I-490, west of I-77, and east of the Cuyahoga River.

The EPA intends to designate the remainder of the county as unclassifiable/attainment. As noted above, the EPA's general approach is to promulgate a designation of "unclassifiable/attainment" in areas that were not required to be characterized under 40 CFR 51.1203(c) or (d) and where the EPA does not have available information including (but not limited to) appropriate modeling

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analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. One source in Cuyahoga County, Medical Center, was listed as a DRR source. This source became subject to a limit requiring its emissions to be below 1 ton per year. As a result, neither this source nor any other source in the area incurred a requirement for modeling or monitoring air quality characterization under the DRR. The discussion below describes a limited area that contributes to the violations that have been observed near Charter Steel. The EPA believes that the remainder of the county warrants being designated unclassifiable/attainment. If in its final action the EPA determines that the Newburgh Heights area warrants being designated unclassifiable/attainment, the EPA anticipates that for administrative convenience it would designate the entire county as a single unclassifiable/attainment area.

5.2. Air Quality Monitoring Data

This factor considers available SO_2 air quality monitoring data. Based on ambient air quality data collected between 2014 and 2016, Cuyahoga County shows a violation of the 2010 SO_2 NAAQS at one of its monitors. The 2014 - 2016 design value for the Cleveland area is 168 ppb. The violating monitor is located in Newburgh Heights, in an industrialized portion of southern Cleveland and adjacent suburbs. Table 5-1 provides summary information for this and the other ambient air quality monitors within the county.[8]

Table 5-1: Air Quality Monitoring Data for Cuyahoga County

Air Quality System (AQS) Monitor ID	Monitor Location	2013 – 2015 SO_2 Design Value (ppb)	2014 – 2016 SO_2 Design Value (ppb)
39-035-0038	2547 St. Tikhon, Cleveland	62	59
39-035-0045	4950 Broadway, Cleveland	22	23
39-035-0060	E. 14th & Orange, Cleveland	61	51
39-035-0065	4600 Harvard, Newburgh Heights	55	168

* Monitor in **bold** has the highest 2014 - 2016 design value in the area.

[8] The 2014 - 2016 design values for this and other SO_2 monitors are available in a data file posted at https://www.epa.gov/air-trends/air-quality-design-values.

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Table 5-2 shows the 99th percentile of daily maximum concentrations for each year from 2013 to 2016 for each of the Cuyahoga County monitors.

Table 5-2: Year-by-Year Air Quality Monitoring Data for Cuyahoga County

Air Quality Systems (AQS) Monitor ID	Monitor Location	Annual 99th Percentile Among Daily Maximum Concentrations (ppb)			
		2013	2014	2015	2016
39-035-0038	2547 St. Tikhon, Cleveland	63	65	59	53
39-035-0045	4950 Broadway, Cleveland	18	17	32	19
39-035-0060	E. 14th & Orange, Cleveland	66	53	63	38
39-035-0065	4600 Harvard, Newburgh Heights	30	80	55*	370

*Monitoring for this year did not meet completeness criteria at this monitor. Nevertheless, the three-year design value is valid.

Table 5-2 highlights two significant features of the monitoring data in Cuyahoga County. First, the Newburgh Heights monitor did not meet completeness criteria for 2015. This incompleteness is the result of the first quarter of 2015 having 61 days of valid daily maximum values, representing 68 percent of the days in the quarter, slightly below the 75 percent completeness criterion. Even if days with less than 18 hours of values but at least 1 hourly value are included, only 66 days in the first quarter of 2015, 73 percent of the days, have data.

Appendix T to 40 CFR 50 provides procedures for determining whether a data set that is short of 75 percent complete is nevertheless sufficiently complete to provide a valid design value. For a site in which the design value is above the standard, Appendix T prescribes a test to evaluate whether more complete data might yield a design value below the standard. Specifically, in this case, Appendix T prescribes a test in which one substitutes low values in place of the missing days in the quarter, calculates the resulting "test design value" (for 2015, based on the 99th percentile among a slightly higher number of days), and examines whether the "test design value" is also above the standard. In this case at the Newburgh Heights monitor, even with such data substitution, the 99th percentile value would still be based on the fourth highest maximum daily concentration in 2015, which would still be 55 ppb, so that the "test design value" would still be 168 ppb. That is, if the missing data had not been missing, the site would have had a violating design value regardless of what values had been recorded on the pertinent days. Therefore, under Appendix T, the data are deemed to provide a valid design value.

A second feature of the data shown in Table 5-2 is the relative stability of the data, i.e. the relative consistency of maximum concentrations from year to year. The only value that is starkly different from other values in the table is the value at the Newburgh Heights site in 2016. The high 99th percentile value in 2016 at this site is the result of five days in mid to late February with maximum daily concentrations between 342 ppb and 447 ppb, which are the only days in 2016 other than January 30 (with a maximum value of 95 ppb) that recorded a concentration above the level of the standard.

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A third feature of the data shown in Table 5-2 is the prospects for future three-year design values at the Newburgh Heights monitor to show attainment. Since the 99th percentile daily maximum value in 2016 at this site is over three times the standard, any three-year period that includes 2016 will have a design value above the standard. Therefore, besides the 2014 to 2016 period, the 2015 to 2017 and the 2016 to 2018 period will also necessarily have design values above the standard.

As part of its submittal, Ohio provided extensive analysis of air quality for purposes of evaluating the origins of high concentrations observed at the Newburgh Heights monitor in 2016. Ohio noted that concentrations above the standard at this monitor in 2016 occurred exclusively in late January 2016 and on a handful of occasions in February 2016, with the maximum daily values in February ranging from 342 ppb to 408 ppb; the highest value at other times in 2016 at this site was 31 ppb. Ohio examined the meteorology for these episodes in February 2016 and found that the times of high concentrations had generally south to southwest winds, i.e., winds that would carry emissions from Charter Steel toward the Newburgh Heights monitor, a distance of 300 m north of Charter Steel.

Ohio also noted unusual conditions at Charter Steel during this time. The facility has a sizable opening, called the West End Door, through which the company brings in scrap metal and other materials for charging into its electric arc furnace. As a result of high winds during this period, the door of this opening was stuck in the open position, resulting in unusual air flow within the building during the winter month of February 2016. Charter Steel's emissions are generated as fugitive emissions, at the surface of the steel within the furnace vessel. Ordinarily a high volume capture system is highly efficient at capturing these emissions, but Ohio hypothesized that the open door disrupted this capture, resulting in a substantial fraction of the emissions escaping out this door.

Ohio tested this hypothesis by modeling a fraction of the emissions from Charter Steel as fugitive emissions. Ordinarily the capture system is estimated to capture all but 0.05 percent of emissions from the vessel. Ohio modeled a scenario in which a substantial fraction of the emissions was fugitive and was emitted (as a volume source) out the West End Door. This modeling suggested that fugitive emissions of 5 percent of the facility's emissions could reasonably result in concentrations at the Newburgh Heights monitoring location similar to those monitored in February 2016. Aside from the distribution of emissions among stack and fugitive sources, the elements of this modeling analysis are similar to the elements of the allowable emissions modeling discussed below. Based on this analysis, the EPA concurs that elevated concentrations monitored at Newburgh Heights in February 2016 are likely attributable in significant part to the open door at Charter Steel and the resulting significant fraction of emissions being emitted out that door as fugitive emissions.

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5.3. Air Quality Modeling Analysis for Cuyahoga County

5.3.1. Introduction

This section presents all the available air quality modeling information for air quality within Cuyahoga County. The only source in Cuyahoga County listed on the DRR source list, Medical Center, became subject to a federally enforceable and effective emission limit of 1 tpy, so modeling was not required for this source. No other source in Cuyahoga County was subject to a requirement under the DRR for air quality characterization.

Nevertheless, on June 28, 2017, Ohio submitted modeling addressing the area near the Newburgh Heights monitoring site, most notably assessing the impacts of Charter Steel. This portion of Cuyahoga County will be referred to as "the Newburgh Heights area" within this section. This submittal included two modeling runs: modeling to evaluate Ohio's hypothesis that high fugitive emissions from Charter Steel (resulting from a large building door being open) was a critical factor in the high concentrations observed at the Newburgh Heights monitoring site in February 2016, and modeling to evaluate whether new emission limits and new requirements for improved door operation would provide for attainment.

As discussed below, the primary basis for the EPA's intended designation for the Newburgh Heights area is data from the Newburgh Heights monitoring site. However, while Ohio has not yet issued the permit that it cites as a basis for designating the area attainment, the EPA also evaluated the possibility of basing the EPA's final designation primarily on Ohio's modeling of allowable emissions, presuming that the permit that underlies Ohio's modeling has been issued in final, federally enforceable form and presuming compliance by then. An evaluation of Ohio's modeling is provided below, for purposes of providing a full analysis of information relevant to the designation of this portion of Cuyahoga County. This review addresses both the modeling evaluating causes of high concentrations at Newburgh Heights and the modeling with potential future emission limits, with an emphasis on the modeling demonstrating attainment.

The pertinent modeling that Ohio submitted is premised on issuance in final form of a permit that Ohio issued in draft form on June 12, 2017. Insofar as this permit has not yet been issued in final form, selected aspects of this modeling cannot yet be considered to reflect enforceable requirements, with the result that the modeling in these respects cannot yet be considered consistent with the recommendations of the Modeling TAD. On the other hand, the EPA expects these aspects of the modeling to become appropriate once the permit for Charter Steel is issued in final form. The discussion below notes those facets of the modeling that the EPA expects to become appropriate only after the permit for Charter Steel is issued in final form.

Figure 5-1 below, provided by the state, shows the location of Charter Steel, ArcelorMittal, other sources in and near Cleveland, and multiple monitoring sites in the area. Ohio has recommended that this and other parts of Cuyahoga County be designated attainment. The EPA's intended nonattainment designation boundary is shown in Figure 5-7 below.

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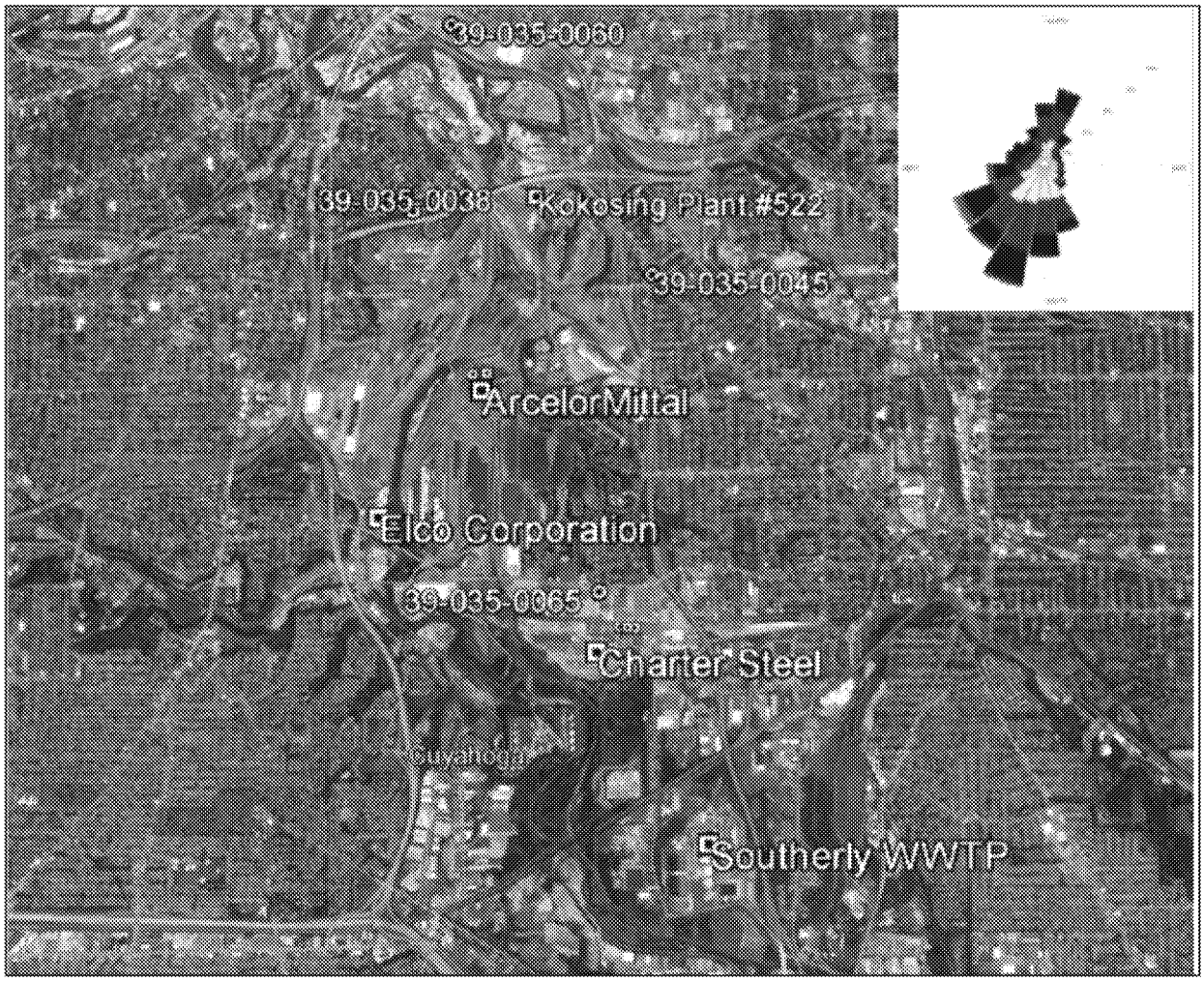
Figure 5-1. Map of the Newburgh Heights Area



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. The following sections discuss a modeling assessment that the EPA received from Ohio, which was the only analysis that the EPA received for this area.

5.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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

- BPIPPRM: 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 16216r in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows. AERMOD version 16216r is the current regulatory version of AERMOD. The modeling for the Newburgh Heights area did not use the adjusted surface friction velocity (ADJ_U*) parameter in AERMET, for consistency with other analyses of this area.

5.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Ohio evaluated land use in the area and determined that the area should be considered urban for modeling purposes. Ohio used the population of the Cleveland metropolitan area, 2.3 million, as an indicator of the degree of urban heat island. Given the industrialized nature of the immediate area, and the urban character of Cleveland and neighboring Newburgh Heights, the EPA concurs that this area warrants being modeled as an urban area.

5.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The state used a grid of receptors focused on impacts from Charter Steel. The grid included a total of 4,479 receptors. Receptors were placed every 50 m along the fenceline of Charter Steel extending out either to 400 m (north and east, the predominant wind directions) or to 300 m (west of the source). Receptors were placed at 100 m intervals out an additional 600 m. South of the source, receptors were placed every 100 m out to 400 m from the source. Beyond this grid, receptors were placed every 200 m out an additional 4 km in all directions. Figure 5-2 shows the state's receptor grid.

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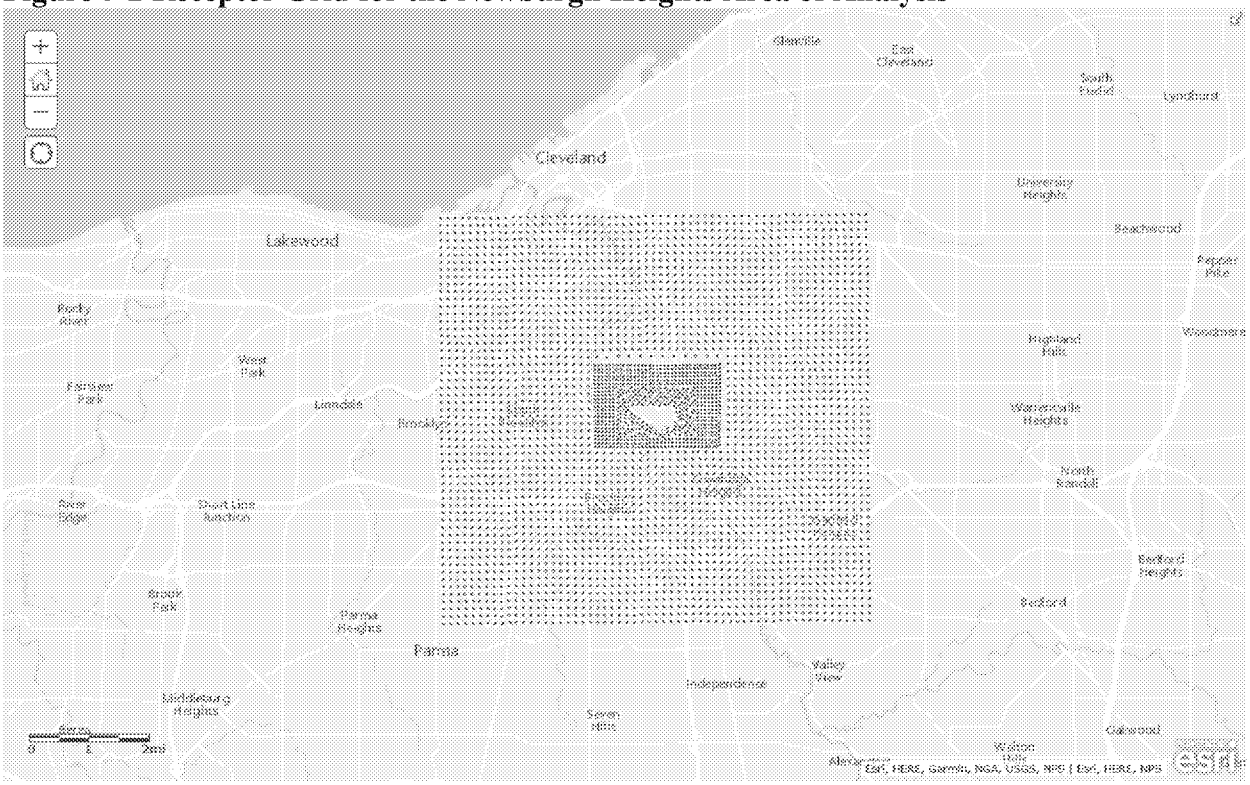
Figure 5-2 Receptor Grid for the Newburgh Heights Area of Analysis



This receptor grid is smaller than Ohio's other receptor grids. The maximum concentration is expected to be close to Charter Steel, because the emission release heights are low, the source is small, and the modeling only included one source. As discussed below, this receptor grid was adequate to include the area of maximum concentrations near Charter Steel. The EPA believes that this receptor grid was adequate to assess whether any portion of the area near Charter Steel is violating the standard.

Figure 5-3, included in the state's recommendation, show the state's chosen area of analysis surrounding Charter Steel along with nearby monitoring sites.

Figure 5-3: Newburgh Heights Area of Analysis

5.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions. As discussed below, the state modeled only Charter Steel in its analysis, as the impact of other sources in the area were determined by the state to be adequately represented as part of the background concentration.

The state characterized Charter Steel in accordance with the best practices outlined in the Modeling TAD. The primary releases from Charter Steel are from its two baghouse stacks, for both of which the actual height of 45.7 m is also the GEP height. The state modeled these GEP stack heights in conjunction with allowable emissions for the electric arc furnace emissions that are vented from these furnaces. The state modeled fugitive (uncaptured) emissions from the facility's operations as volume sources, using a 14 m release height for emissions escaping the roof vents and a 4 m release height for emissions escaping the west end door. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash.

5.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these

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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." Further discussion of the use of allowable emissions for characterizing air quality is provided in Section 5.4 of the Modeling TAD.

For Charter Steel, the state utilized this option to model future allowable SO_2 emissions. These allowable emission levels are summarized in Table 6-2.

Table 5-2. Charter Steel Future Allowable SO_2 Emissions

Facility Name	Future Allowable SO_2 Emissions (tpy)
Charter Steel	706

These allowable emissions are premised on issuance in final form of a permit that Ohio issued in draft form to Charter Steel on June 12, 2017. On July 18, 2017, the EPA provided comments to Ohio regarding this draft permit, including recommendations for improving the enforceability of the proposed limitations. At present, prior to issuance of a final, appropriate permit, the limitations cannot be considered enforceable, and so Ohio's analysis cannot presently be considered an appropriate reflection of current limitations for Charter Steel. Specifically, neither the limit on total emissions from the electric arc furnace nor the requirements for proper operation of the West End Door, which are necessary for minimizing fugitive emissions, can presently be considered enforceable. Nevertheless, the EPA anticipates that Ohio will issue a final permit to Charter Steel addressing the EPA's comments and making these limitations fully enforceable in the near future. Therefore, while the emission rates of Charter Steel and the distribution of these emissions between the stack emissions and fugitive emissions cannot presently be considered to reflect enforceable limitations in accordance with the Modeling TAD, the EPA anticipates that this situation will change, and that issuance of a final permit for Charter Steel with the limitations and fully addressing the EPA's comments would make Ohio's treatment of allowable emissions in the modeling from Charter Steel fully in accordance with the Modeling TAD.

Several Cuyahoga County facilities have reduced their SO_2 emissions in recent years. The Medical Center Company (MCCo), a local heating and energy supplier, was Cuyahoga County's only DRR source. Its 2014 SO_2 emissions were 2,403 tons. MCCo opted to replace its two coal-fired boilers with a natural gas boiler by January 13, 2017. The facility's new SO_2 emission limit is 1.18 tpy. Ohio has revised the federally enforceable permit-to-install for MCCo to reflect the new boiler, limits, and fuel. Ohio submitted this permit, which was effective on October 5, 2015, to the EPA.

Cleveland Electric Illuminating Co., (FirstEnergy Generation, LLC) Lake Shore Plant, a coal-fired power plant, permanently shut down on December 17, 2015. Its 2014 SO_2 emissions were

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665 tons. Ohio submitted a letter dated December 17, 2015, verifying this enforceable shutdown to the EPA.

Cleveland Thermal LLC, which emitted 1,063 tons in 2014, opted to retire its coal-fired boilers and all but two of its oil-fired boilers by January 13, 2017. Cleveland Thermal LLC has entered into a consent decree which mandates the new boiler configuration, limits, and allowable fuels. Ohio included a copy of this December 29, 2015, consent decree, in its January 13, 2017, submittal to the EPA.

The combination of the emission reductions at these three facilities brings Cuyahoga County's emissions below 2,000 tpy as a whole. Table 5-3 identifies the sources in Cuyahoga County that have taken an annual emissions limit of 2,000 tpy or below and sources that have shut down or ceased coal combustion through federally enforceable measures.

Table 5-3. Sources Taking an Emissions Limit or Shutting Down in Cuyahoga County

County	Facility	New PTE/Limit	Annual SO_2 Emissions (tpy)		
			2014	2015	2017 expected
Cuyahoga	The Medical Center Company	1.18 tpy	2,403	2,322	<1
Cuyahoga	Cleveland Thermal LLC	Shut coal boilers 01/13/2017	1,063	821	11
Cuyahoga	Cleveland Electric Illuminating Co., Lake Shore Plant	Shut down 12/17/2015	665	<1	0
County Total (includes other facilities)			**5,792**	**4,767**	**1,635**

Table 5-4 shows Charter Steel and other sources in Cuyahoga County along with their 2014 emission levels and their distance from Charter Steel. Aside from Charter Steel, this table only shows sources with 2014 emissions of over 100 tpy, and this table does not show Medical Center or other sources that have federally enforceable limits or fuel switches that result in allowable emissions below this emission level as described previously.

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Table 5-4. Significant Sources in Cuyahoga County in Relation to Charter Steel

Facility	Municipality	2014 Emissions (tpy)	Distance, Direction from Charter Steel
Charter Steel	Cuyahoga Heights	84	--
ArcelorMittal	Cleveland	981	2 km, N
DiGeronimo Aggregates	Cleveland	514	10 km, SE

The emissions of ArcelorMittal would ordinarily be directly modeled in an analysis of air quality in this area. However, this source emits under 1,000 tpy, and a monitor located just northeast of the plant (site number 39-035-0045) that is reasonably sited to record at least approximately the largest impacts from this facility shows concentrations well below the standard. The available evidence suggests that ArcelorMittal is not a primary contributor to violations in Cuyahoga County, whereas the evidence suggests that in 2014 to 2016, Charter Steel was a primary contributor to violations specifically at the Newburgh Heights monitor. When Charter Steel is causing high concentrations, the winds are typically from the southwest, such that emissions from ArcelorMittal are being blown away from rather than toward the peak impact areas of Charter Steel. While ArcelorMittal may sometimes contribute to elevated concentrations in Newburgh Heights, the concentration gradient of ArcelorMittal impacts on days exceeding the standard in Newburgh Heights is not likely to be significant, so that, according to criteria in Appendix W, Ohio reasonably did not model this source explicitly. As discussed in Section 5.3.9 below, Ohio's modeling represents the impact of ArcelorMittal (and other sources in Cuyahoga County) by means of a relatively high background concentration. Other sources, most notably DiGeronimo Aggregates, emit less and are more distant from the area and thus even less warrant being explicitly modeled. The EPA concludes that Ohio's analysis appropriately includes only the emissions of Charter Steel.

5.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the Newburgh Heights area of analysis, the state selected the surface meteorology from the NWS site at Cleveland's Hopkins International Airport (KCLE, NWS station number 14820), approximately 16 km west of the source, and coincident upper air observations from the Buffalo, New York Airport (KBUF, NWS station number 14733), approximately 291 km northeast of the source, as best representative of meteorological conditions within the area of analysis.

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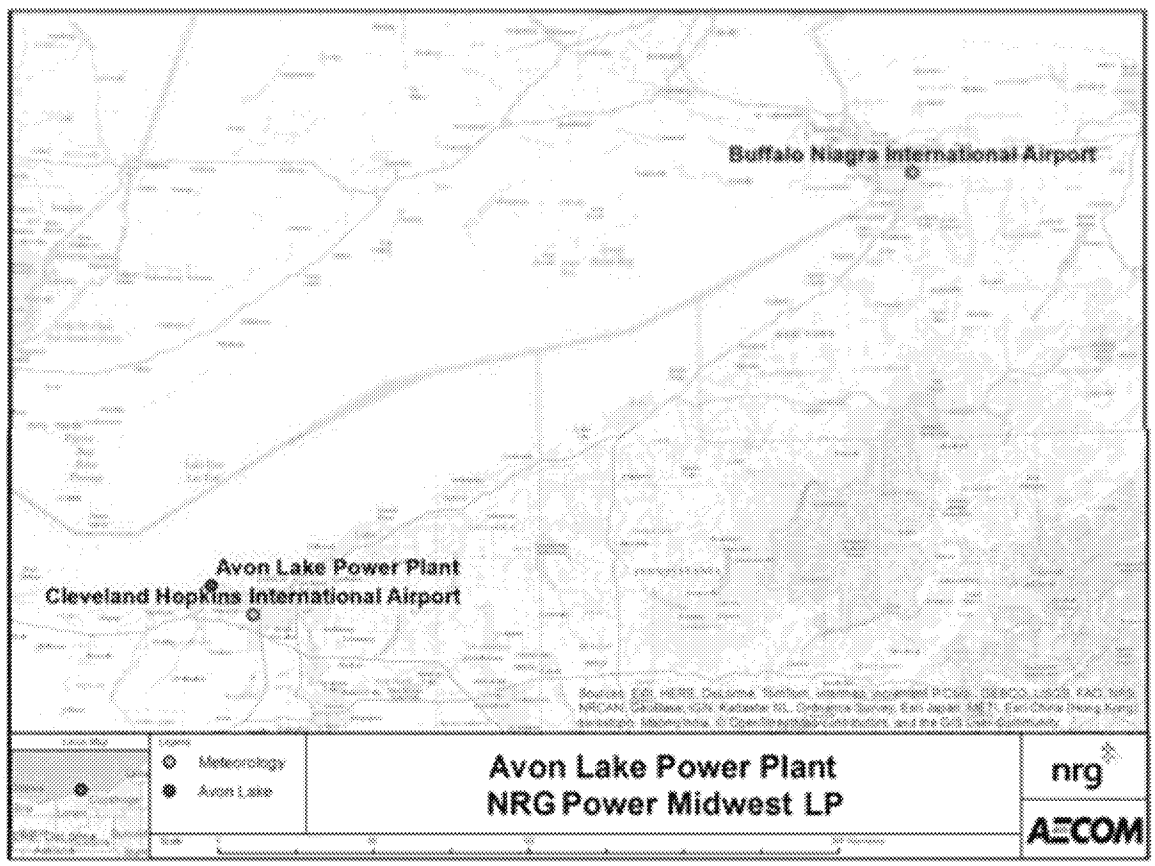
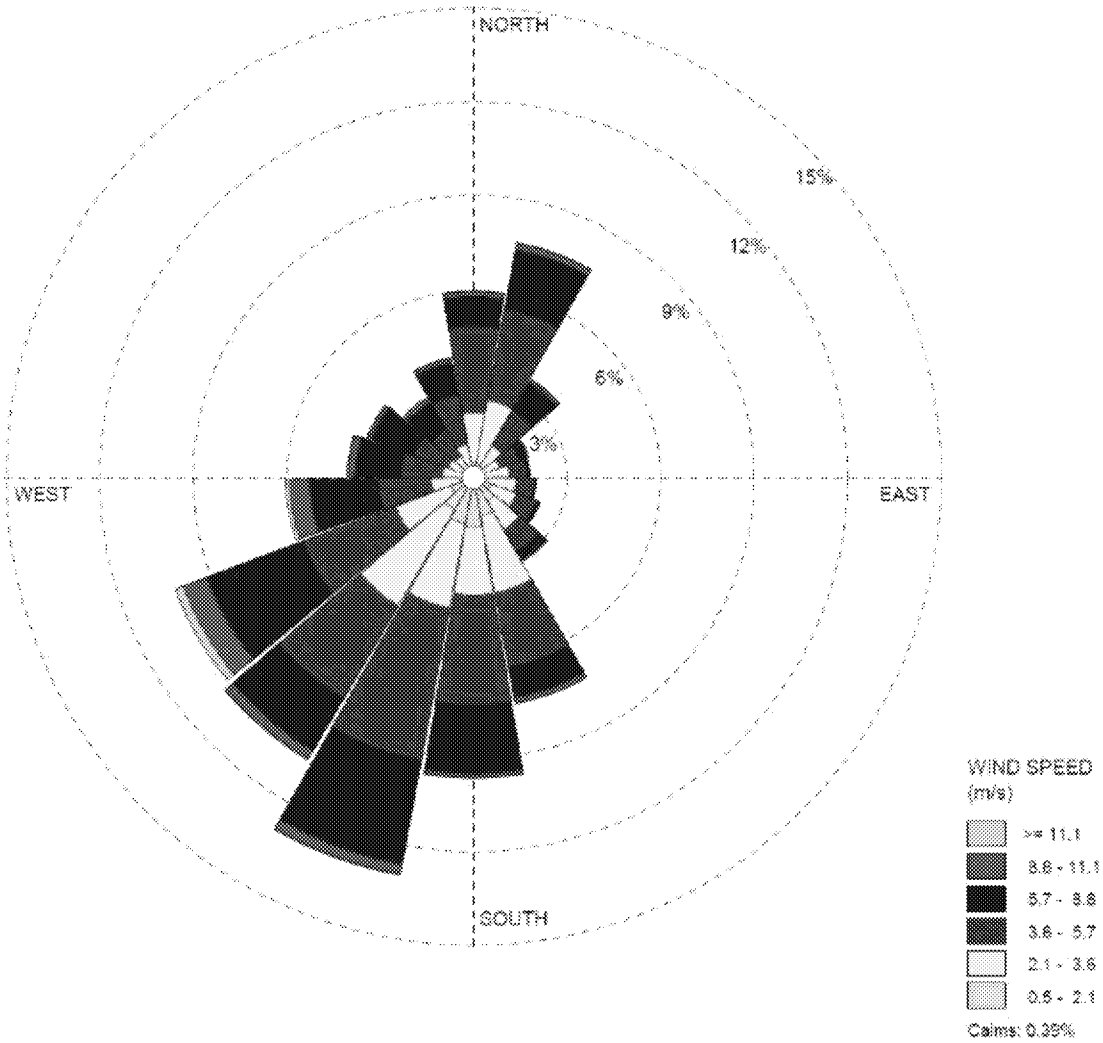
The state used AERSURFACE version 13016 to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions. The location of the surface NWS station is shown in the center of the figure below. (Although Ohio provided this figure for the Lorain County analysis, the Cleveland analysis uses the same meteorological data as the Lorain County analysis, so the same figure is helpful for illustrating the data used in both analyses. For reference, the Newburgh Heights monitor is approximately 33 km east of the Avon Lake source in Lorain County)

Figure 5-4. NWS station location for the Newburgh Heights Area of Analysis



As part of its recommendation, the state provided the 3-year surface wind rose for the Cleveland Airport. In Figure 5-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind rose shows a very strong southwest component. Winds are less frequent from the east than from the west and north.

Figure 5-5: Cleveland Airport Wind Rose for 2012-2014



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 16216 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Cincinnati Northern Kentucky Airport and was processed with the AERMINUTE preprocessor. These data

were subsequently input into AERMET to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and are less prone to over-report calm wind conditions than standard NWS hourly data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological data and surface characteristics components of Ohio's modeling assessment.

5.3.8. Modeling Parameter: Geography, Topography and Terrain

Charter Steel is in the Cuyahoga River Valley, an area with moderate terrain features. Nevertheless, the geographical and topographical features of the area are not considered to significantly influence air pollution transport or dispersion. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA concurs with Ohio's treatment of the local terrain.

5.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a tier 1 approach.

Since Ohio was modeling only the impact of Charter Steel, and the primary background source (not explicitly modeled) was ArcelorMittal in Cleveland, Ohio used a background concentration equal to the design value at the monitoring site just northeast of ArcelorMittal, site number 39-035-0045, located in Cleveland approximately 2 kilometers north of Charter Steel. Given this purpose of obtaining a conservative (prone to overstate) representation of impacts from ArcelorMittal (and other Cleveland sources) at the areas of maximum concentrations near Charter Steel, Ohio made no exclusions by wind direction. The EPA concurs with this approach. The background concentration for this area of analysis determined by this means was 23 ppb, which is equivalent to 60.2 $\mu g/m^3$.[9] While this is a higher background concentration than would normally be used if secondary sources were modeled directly, this background value is appropriate here given that the concentration is designed to include the impacts of ArcelorMittal and other sources that were not directly included in this modeling analysis.

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[9] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 $\mu g/m^3$.

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5.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Newburgh Heights area of analysis are summarized below in Table 5-5.

Table 5-5: Summary of AERMOD Modeling Input Parameters for the Newburgh Heights Area of Analysis

Input Parameter	Value
AERMOD Version	16216r (default)
Dispersion Characteristics	Urban (Population: 2.3 million)
Modeled Sources	1
Modeled Stacks	2 point and 4 volume sources
Modeled Structures	2
Modeled Fencelines	1
Total receptors	4,479
Emissions Type	Expected Allowable
Emissions Years	--
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Cleveland Airport (KCLE, 14820)
NWS Station Upper Air Meteorology	Buffalo, NY (KBUF, 14733)
NWS Station for Calculating Surface Characteristics	Cleveland Airport (14820)
Methodology for Calculating Background SO_2 Concentration	Tier 1 Site: 39-035-0045
Calculated Background SO_2 Concentration	23 ppb

The results presented below in Table 5-6 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 5-6. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Newburgh Heights Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 16		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	445,187	4,588,212	165.4	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 165.4 $\mu g/m^3$, equivalent to 63.2 ppb. This modeled concentration included the background concentration of SO_2, and is based on expected allowable emissions from Charter Steel. Figure 5-6 below was developed by the EPA from the state's modeling results, and indicates that the highest predicted design value occurred about 350 m east of the primary emission sources of Charter Steel, slightly southeast of the Newburgh Heights monitor. Figure 5-6 shows the modeled results throughout the domain. The modeling submitted by the state indicates that the emission limits proposed to be imposed on Charter Steel provide for the SO_2 standard to be attained throughout the modeled area. Figure 5-6 also shows the area included in Ohio's analysis (a square area extending near the north, west, and south edges of this figure) and the intended nonattainment area (an area bounded on I-77 on the east and mostly by the Cuyahoga River on the west), features discussed in other subsections.

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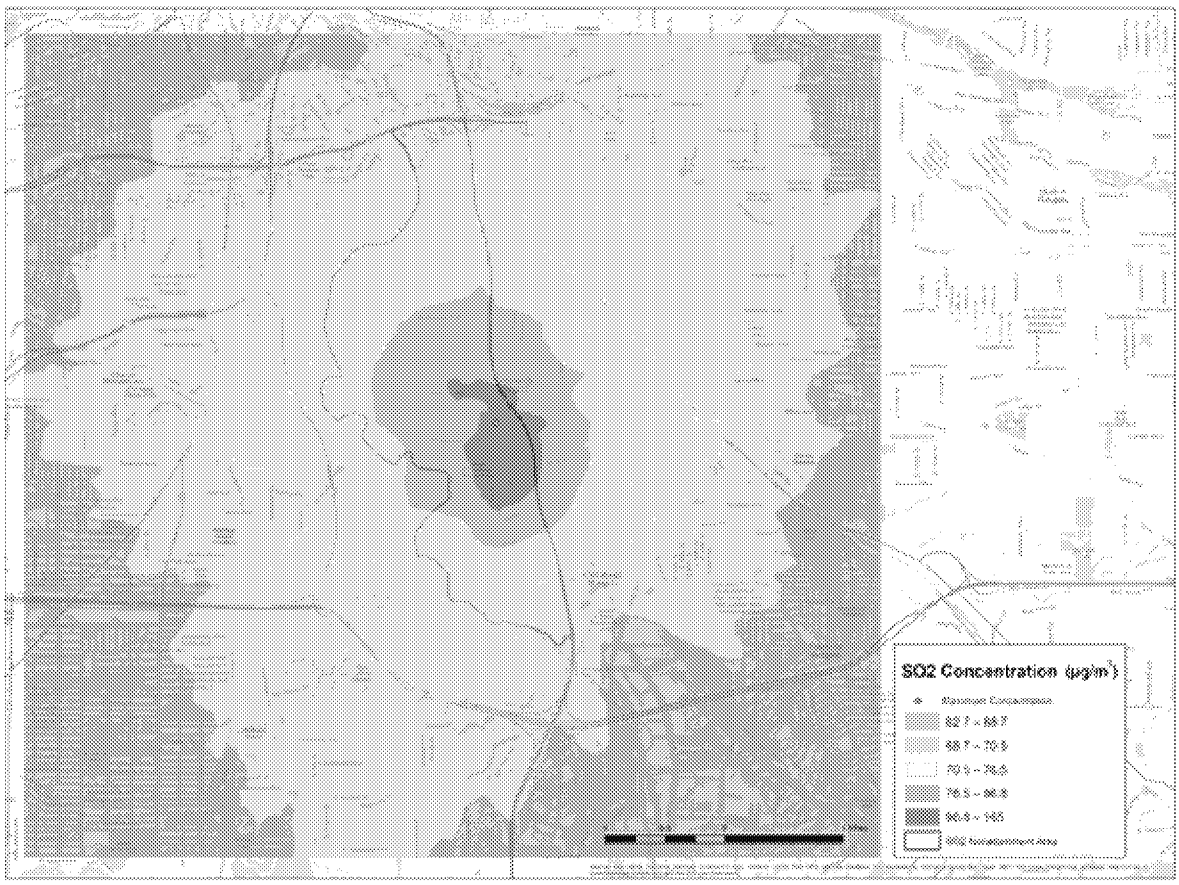
Figure 5-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Newburgh Heights Area of Analysis



5.3.11. The EPA's Assessment of the Modeling Information Provided by the State

Ohio's modeling for the Newburgh Heights area is premised on issuance of a permit that at present has only been issued in draft form. As a result, the emission rates do not presently reflect allowable emission levels, and draft requirements for improvements in operation of the facility's West End Door, which are necessary to assure that fugitive emissions out this door are lower than they were in 2016, are not presently federally enforceable and effective. To this extent, the modeling provided by Ohio cannot presently be considered consistent with the Modeling TAD. On the other hand, the EPA anticipates that Ohio will issue this permit in final form in the near future, and the EPA anticipates that the pertinent requirements will be fully enforceable at that time. Ohio proposed to require immediate compliance with the emission limits, once the permit is final. At that point, the modeling provided by Ohio would be fully consistent with the Modeling TAD, and indicates that the area would then currently be meeting the SO_2 NAAQS.

5.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Cuyahoga County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. Except to the extent that the allowable emissions that Ohio modeled have only been proposed and do not yet reflect final, enforceable limitations, the EPA believes that Ohio properly incorporated these factors into its analysis.

5.5. Jurisdictional Boundaries in Cuyahoga County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Cuyahoga County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Ohio recommended that the entirety of Cuyahoga County be designated unclassifiable/attainment, based on monitoring data for most of the county showing attainment and based on modeling showing that issuance of expected new enforceable measures (and their requirements for immediate compliance) will ensure that the area in which 2014 – 2016 monitoring data show a violation can then be considered to be attaining the standard. However, the modeled emission rates are not yet enforceable, which means that the premise of Ohio's recommendation (that expected limits will assure that the area is meeting the standard) is not presently in place. For this and other reasons discussed below, the EPA intends to designate a portion of Cuyahoga County as nonattainment. The next section, Section 5.6, discusses the EPA's assessment of the area that warrants this designation. The EPA finds that an appropriate area may be delineated using boundaries consisting of municipal borders, major roadways, and the Cuyahoga River. The EPA finds that these boundaries are well known and appropriate boundaries to use to define a nonattainment area. The EPA intends to designate the remainder of the county as unclassifiable/attainment, extending out to the Cuyahoga County boundaries.

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5.6. The EPA's Assessment of the Available Information for Cuyahoga County

Assessing air quality in the Newburgh Heights area requires weighing multiple types of information addressing two different time periods. Specifically, the EPA must weigh monitoring evidence, most significantly including monitoring data from the Newburgh Heights site showing a violation during the 2014 to 2016 period. In addition to weighing the overall design value at that site, indicating a violation of the SO_2 standard at that location, the EPA must also weigh Ohio's analysis of the causes of particular occasions of unusually high concentrations at this site. The EPA must further weigh modeling provided by Ohio designed to test the state's hypothesis that high concentrations at the Newburgh Heights site during 2016 may be attributed to Charter Steel having an unusually high fraction of fugitive emissions escaping through a large door that was stuck open during that period, modeling which may be considered to affirm the presence of violations during the 2014 to 2016 period. Finally, the EPA must weigh modeling including potential future emissions limitations in the latter part of 2017 at Charter Steel.

The Modeling TAD is a useful place to start in weighing these various types of analyses. As discussed above, this guidance offers two modeling options. The first option is to model actual emissions. Under this option, the EPA advises that states model three years of actual emissions, with the design and intent of using modeling to evaluate what three years of monitoring at an exhaustive network of sites would find. For example, if 2014 to 2016 are the most recent years of available modeling inputs, the modeling using these inputs would be intended to assess what concentrations would be observed if a monitoring network were measuring concentrations for 2014 to 2016 at this array of locations. The second option is based on current allowable emissions. Under this option, the modeling also uses the three most recent years of available meteorological data, but the modeling uses the current allowable emission rate, irrespective of whether emissions during the most recent three-year period might have been higher. This modeling may be considered to reflect worst case allowable current air quality.

In the case of the Newburgh Heights area, the available evidence unequivocally indicates that the area was violating the SO_2 standard in the 2014 to 2016 period. The Newburgh Heights monitoring data show a design value for this period that is well over the standard, and Ohio's modeling of 2016 conditions provides supporting evidence that high concentrations in the area are a plausible result of unusually high fugitive emissions from Charter Steel during that period.

Conversely, modeling of prospective allowable emission rates, anticipating issuance of enforceable limitations for Charter Steel, suggest that prospective worst case allowable air quality (upon issuance of and compliance with a suitable permit) for the period subsequent to 2014 to 2016 but potentially by the time the EPA promulgates final designations will be attaining the standard.

When designating areas, the EPA does not consider anticipated future emission reductions that are not yet federally effective and in force. The EPA believes that the currently available monitoring evidence of nonattainment represents the most reliable indicator of air quality in the Newburgh Heights area. The Modeling TAD offers two options for modeling air quality, including one option that considers actual air quality over the most recent three-year period and

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one option that considers more recent allowable air quality, but the Modeling TAD does not speak to how modeling of either type is to be weighed against monitored air quality. Nevertheless, the EPA interprets its Modeling TAD to provide that if a source is complying with emission limits that have been shown to assure that the area is attaining the standard, the area may be designated accordingly, even if the source has reduced emissions too recently to make possible the collection of three years of monitoring data reflecting the reduced emission conditions. The Modeling TAD offers this approach as an alternative to modeling actual emissions over the most recent available three-year period. This approach would also require that the state provide persuasive evidence that enforceable changes in circumstances have changed air quality sufficiently now to reflect the air quality modeled to occur with allowable emissions. The EPA believes that Ohio has provided adequate evidence that the high exceedances monitored in 2016 were attributable in substantial part to a malfunction at Charter Steel's West End Door and the consequential substantial fugitive emissions, and the EPA believes further that replacement of this door and restrictions on door operation (mitigating fugitive emissions) in combination with establishment of suitable emission limits will result in considerable improvement in air quality in accordance with Ohio's modeling of allowable emissions. Consequently, if Ohio issues a permit that imposes emission limits and door limitations that are suitably enforceable that mandate the conditions reflected in the already submitted modeling analysis (or, alternatively, that impose adjusted limitations that an adjusted modeling analysis shows will yield attainment), and if Ohio certifies that Charter Steel is complying with these limitations by the end of the period for state responses to the EPA's 120-day letter, the EPA anticipates designating this area as unclassifiable/attainment.

Ohio has not recommended any definition of boundaries for a Newburgh Heights area, separate from the remainder of Cuyahoga County. Given the existence of multiple other monitors in the county currently monitoring no violations, and given the evidence that a key factor underlying the monitored violations is unusually substantial emissions being released near ground level from Charter Steel, the area that is violating the standard appears likely to be relatively small. The area has two significant sources, namely Charter Steel and ArcelorMittal; no other sources appear to be nearby contributors to the violations. The other source in Cuyahoga County that is emitting over 100 tpy, DiGeronimo Aggregates, is 10 km away from Charter Steel, and its emissions (514 tpy in 2014) appear sufficiently low as to warrant being considered not to contribute to violations in the Newburgh Heights area. Therefore, an area that includes a modest buffer around Charter Steel and ArcelorMittal and the monitor is likely to be adequate as a definition of this nonattainment area. Using municipal boundaries, major roadways, and the Cuyahoga River as boundaries, the EPA believes that an adequately inclusive nonattainment area may be defined as the portions of the Cities of Cleveland, Newburgh Heights, and Cuyahoga Heights that are south of I-490, west of I-77, and east of the Cuyahoga River. This intended nonattainment area is shown above in Figure 5-6.

For the remainder of Cuyahoga County, several monitors are measuring design values below the standard, but, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. However, the EPA also has no evidence that any violations of the standard outside the Newburgh Heights area are occurring. The remainder of Cuyahoga County was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not

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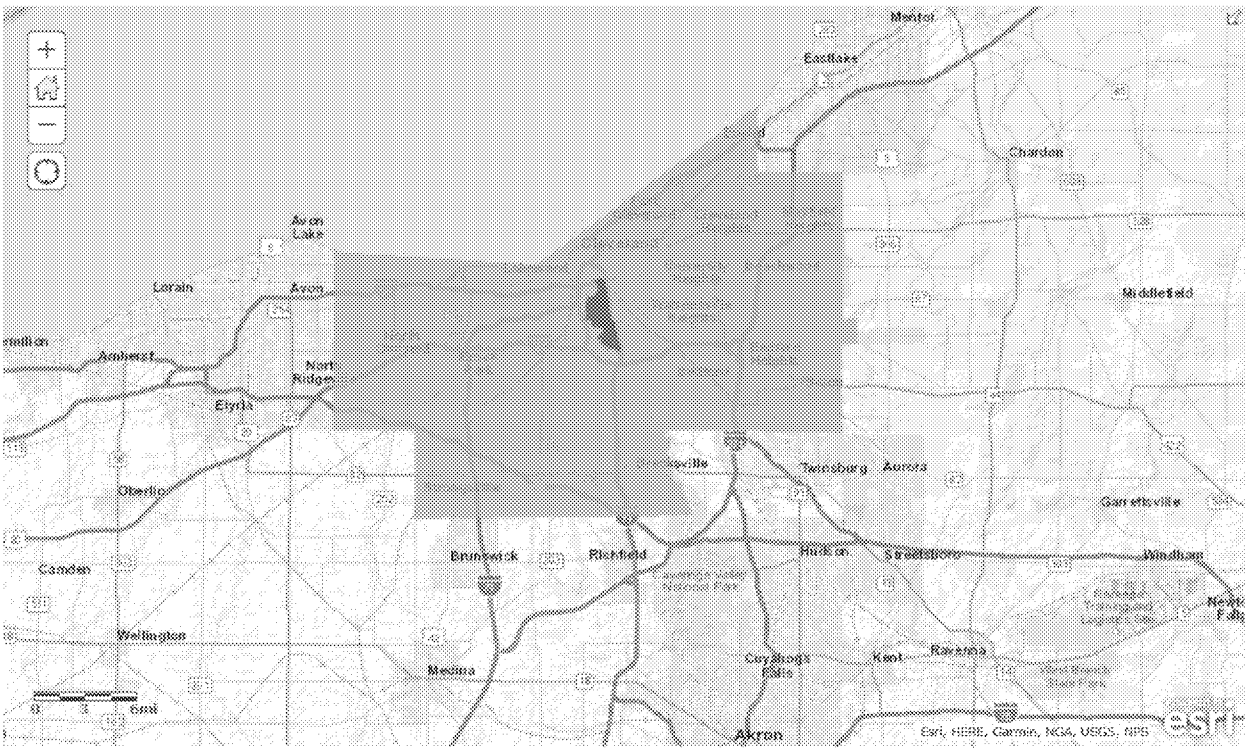
limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contributing to ambient air quality in a nearby area that does not meet the NAAQS. The remainder of the county therefore meets the definition of an "unclassifiable/attainment" area. Therefore, the EPA intends to designate the remainder of Cuyahoga County outside the intended nonattainment area as unclassifiable/attainment. Figure 5-7 shows a map of Cuyahoga County (marking the borders of the county), which, other than the Newburgh Heights area described above, the EPA intends to designate unclassifiable/attainment. (In this figure, the area in red represents our intended nonattainment area and the area in green represents our intended unclassifiable/attainment area.)

Figure 5-7. EPA's Intended Designation for Cuyahoga County



5.7. Summary of Our Intended Designation for Cuyahoga County

Based on the most recent 3 years of air quality monitoring data, appropriate dispersion modeling analysis, and any other relevant information, the EPA has determined a portion of Cuyahoga County violates the 2010 SO_2 NAAQS or contributes to a violation in a nearby area, and the EPA intends to designate a nonattainment area consisting of the portions of the Cities of Cleveland, Newburgh Heights, and Cuyahoga Heights that are south of I-490, west of I-77, and east of the Cuyahoga River. Nevertheless, if Ohio issues a final permit for Charter Steel requiring the conditions that Ohio has modeled as yielding attainment, and Ohio certifies that Charter Steel is required to comply and has complied with these requirements by the end of the state response period, the EPA anticipates designating this area as unclassifiable/attainment. The EPA intends to designate the remainder of Cuyahoga County as unclassifiable/attainment. The

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intended designations are shown in Figure 5-6 and 5-7 above. If the EPA concludes that a final designation of unclassifiable/attainment is warranted for all parts of Cuyahoga County, the EPA anticipates designating the full county as a single unclassifiable/attainment area for administrative convenience.

Ohio has recommended a designation of unclassifiable/attainment for Cuyahoga County. In considering your recommendation, we have taken into account all available information, including any current (2014-2016) air monitoring data, and any air dispersion modeling analyses provided by Ohio or by a third party. The air monitoring data show a portion of Cuyahoga County may be violating the 2010 primary SO_2 NAAQS, which would require a modification of the recommended designation. We invite Ohio to review the available information and further discuss this issue with the EPA in order to inform an appropriate final designation.

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6. Technical Analysis for Hamilton County

6.1. Introduction

The EPA must designate Hamilton County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Hamilton County. The Dynegy Miami Fort Station (Miami Fort) is a power plant located in southwestern Hamilton County, near Ohio's border with Indiana and Kentucky. Miami Fort reported 28,479 tons of SO_2 to CAMD in 2014, which exceeds the DRR threshold of 2,000 tpy; therefore, Ohio is required by the DRR to characterize SO_2 air quality around Miami Fort.

6.2. Air Quality Monitoring Data for Hamilton County

This factor considers the SO_2 air quality monitoring data in Hamilton County. In its January 2017 recommendations, the state included monitoring data from the five monitors listed in Table 6-1.

Table 6-1. Monitoring Data for the Hamilton County Area

County	AQS ID	Annual 99th Percentile Among Daily Maximum Concentrations (ppb)					Design Values (ppb)		
		2012	2013	2014	2015	2016	2012-2014	2013-2015	2014-2016
Hamilton	39-061-0010	63	68	71	54	18	67	64	48
Hamilton	39-061-0040	98	57	67	36	12	74	53	39
Butler	39-017-0019	62	26	27	44	43	38	32	38
Butler	39-017-0020	56	47	30	29	16	44	35	25
Butler	39-017-0021	--	25	32	31	20	--	29	28

Hamilton County monitor 39-061-0010 is located northwest of downtown Cincinnati, 15 km northeast of Miami Fort. Hamilton County monitor 39-061-0040 is located in Cincinnati, 26 km east of Miami Fort. The Butler County monitors are approximately 25 km north of Cincinnati and 53 km northeast of Miami Fort. Data collected at these monitors indicate that current SO_2 concentrations in Hamilton and Butler Counties are generally below the 2010 SO_2 NAAQS. However, these monitors are relatively distant from the likely maximum concentrations in Hamilton County, which are expected nearer to Miami Fort, and therefore the monitored concentrations may not be fully representative of worst-case air quality in Hamilton County.

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6.3. Air Quality Modeling Analysis for the Miami Fort Area

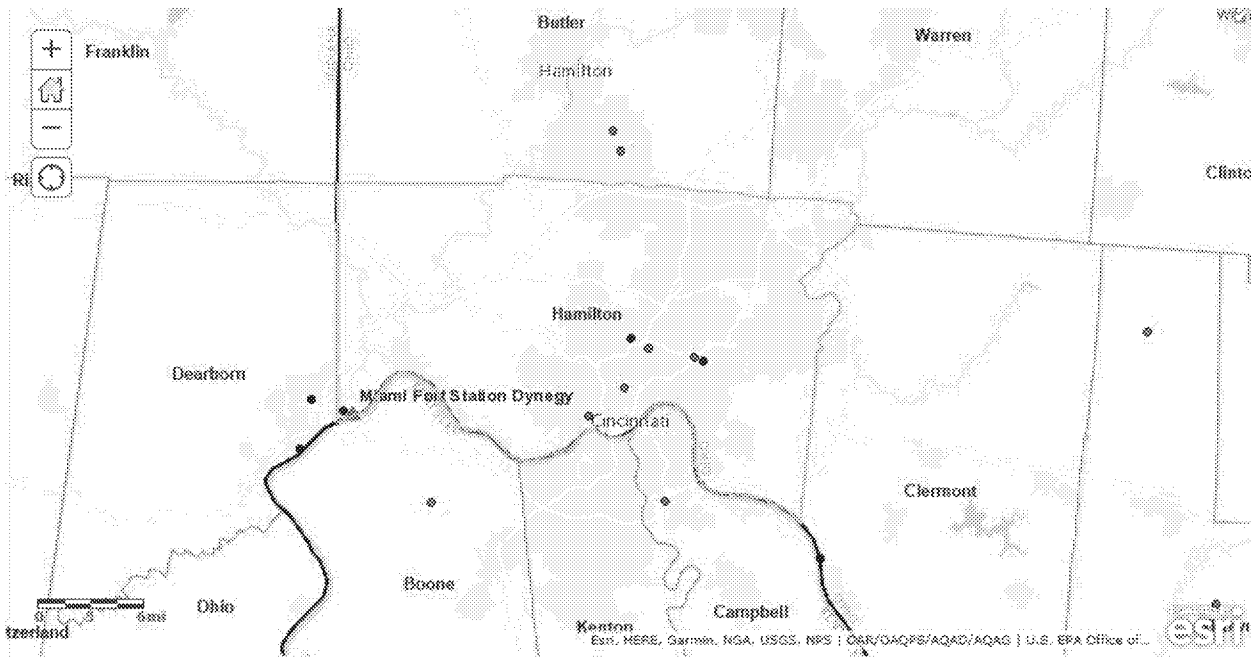
6.3.1. Introduction

This section presents the available air quality modeling information for a portion of Hamilton County that includes the Miami Fort facility. (This portion of Hamilton County will often be referred to as "the Miami Fort area" within this section). The area that the state has assessed via air quality modeling is located in the southwestern corner of Hamilton County, near the border between Ohio, Indiana, and Kentucky. The Ohio River runs through this area. The Miami Fort Station is located 25 km west of the city of Cincinnati.

In its submission, Ohio recommended that the entirety of Hamilton County be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area and intends to designate the area as unclassifiable/attainment.

Figure 6-1 below shows the location of the Miami Fort facility. Also included in the figure is the state's recommended area for designation: the entirety of Hamilton County. The EPA's intended unclassifiable/attainment designation boundary is the same as the state's recommended boundary for this area.

Figure 6-1. Map of Hamilton County



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. The following sections discuss a modeling assessment that the EPA received from Ohio, which was the only analysis that the EPA received for this area.

6.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Miami Fort area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Miami Fort area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

6.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. For the purpose of performing the modeling for the area of analysis, the state used mapping software to determine that the predominant land use surrounding the Miami Fort plant was made up of rural categories; therefore, the state determined that it was most appropriate to run the model in rural

mode. The EPA concurs with the state's determination that the modeling domain is appropriately represented in the model as rural. Miami Fort is 4.5 km from the town of Lawrenceburg, Indiana, and approximately 15 km from downtown Cincinnati, Ohio, but within the 3-kilometer radius around Miami Fort which is recommended in the Auer-Irwin method of determining whether an area is urban or rural for modeling, the land is clearly rural, made up of farmland, riverbanks, and wooded areas.

6.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The state considered other emitters of SO_2 within 50 km of Miami Fort. Several large sources merited consideration. DTE St. Bernard, which emitted 1,666 tons in 2014, is located 27 km east of Miami Fort in Hamilton County. In July 2015, the company indicated its intent to convert its coal boiler to natural gas at the end of 2015, which would reduce its SO_2 potential to emit to 56 tpy. Therefore, Ohio determined that this source would not have a concentration gradient near Miami Fort, and did not include DTE St. Bernard in the Miami Fort modeling analysis. The American Electric Power Tanners Creek Power Plant, which is located 6 km from Miami Fort in Dearborn County, Indiana, and emitted 18,109 tpy in 2014, reported to the Indiana Department of Environmental Management that it would shut down by May 31, 2015. Therefore, Ohio did not include this source in the modeling analysis. The EPA has confirmed these conversions and shutdowns have occurred and are enforceable, so the EPA concurs with the state's decision to exclude these facilities from the modeling analysis on the basis that their new allowable emissions are sufficiently low not to warrant being explicitly modeled.

The Duke Energy East Bend (East Bend) power plant, located 23 km south of Miami Fort in Boone County, Kentucky, emitted 2,103 tons in 2014. The Kentucky Utilities Company Ghent Station (Ghent Station) is located 45 km south of Miami Fort and emitted 14,851 tons in 2014. At these distances, Ohio believed the Kentucky facilities would not cause a significant concentration gradient that would affect the maximum concentration near Miami Fort. For this reason, the EPA concurs with the state's decision to exclude these facilities from the modeling for Miami Fort.

These two power plants are DRR sources, which Kentucky addressed through modeling. Kentucky included Miami Fort and Ghent Station in its analysis for East Bend. Kentucky's DRR modeling analysis for Ghent Station did not include Miami Fort. In the East Bend analysis, Kentucky modeled Miami Fort at its hourly varying actual emissions as reported to CAMD with a constant stack exit velocity and temperature. This analysis showed the area around East Bend is attaining the standard. Therefore, Miami Fort did not contribute to a modeled exceedance of the

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NAAQS in Kentucky's analyses. For more information on Kentucky's analysis see Chapter 15 of this TSD.

The EPA also considered potential impacts from two smaller facilities closer to Miami Fort. E.I. DuPont's Fort Hill facility is 1 km west of Miami Fort and in 2014 emitted 153 tons of SO_2. Anchor Glass, in neighboring Dearborn County, Indiana, is about 4 km west of Miami Fort and in 2014 emitted 155 tons of SO_2. Of interest here is their potential impact in the location of maximum concentrations, which as discussed below is approximately 1.4 km east of Miami Fort, i.e. about 2.4 km and 5.4 km, respectively east of these plants. Given the modest emission levels of these plants, especially compared to the average of over 10,000 tons of SO_2 per year from Miami Fort, and the distances involved, the concentration gradients from these sources at the area of maximum concentrations is likely to be low enough to warrant excluding these sources from explicit analysis and representing the impacts of these sources as part of the background concentration. In addition, even if this approach were to understate the impacts of these sources, the estimated concentrations in the area (as discussed in section 6.3.10 below) are sufficiently below the standard that such an understatement would be unlikely to affect whether the area would be found to be meeting the standard.

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

- 50-meter spacing along the Miami Fort fenceline and out to 2 km.
- 100-meter spacing to 5 km
- 250-meter spacing to 10 km
- 500-meter spacing to 15 km
- 1000-meter spacing to 50 km.

The receptor network contained 36,443 receptors, and the network covered portions of Ohio, Indiana, and Kentucky. Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property. Receptors were not placed within Miami Fort's physical fence line. Since as discussed below, maximum concentrations in the area were estimated to occur well beyond the Miami Fort fenceline, this exclusion may be presumed not to have influenced maximum concentration estimates in the area. The state did not omit receptors over the Ohio River. The EPA concurs with Ohio's receptor grid.

Figures 6-2 and 6-3, included in the state's recommendation, show the state's chosen area of analysis surrounding the Miami Fort facility and the receptor grid for the area of analysis.

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Figure 6-2: Miami Fort Area of Analysis

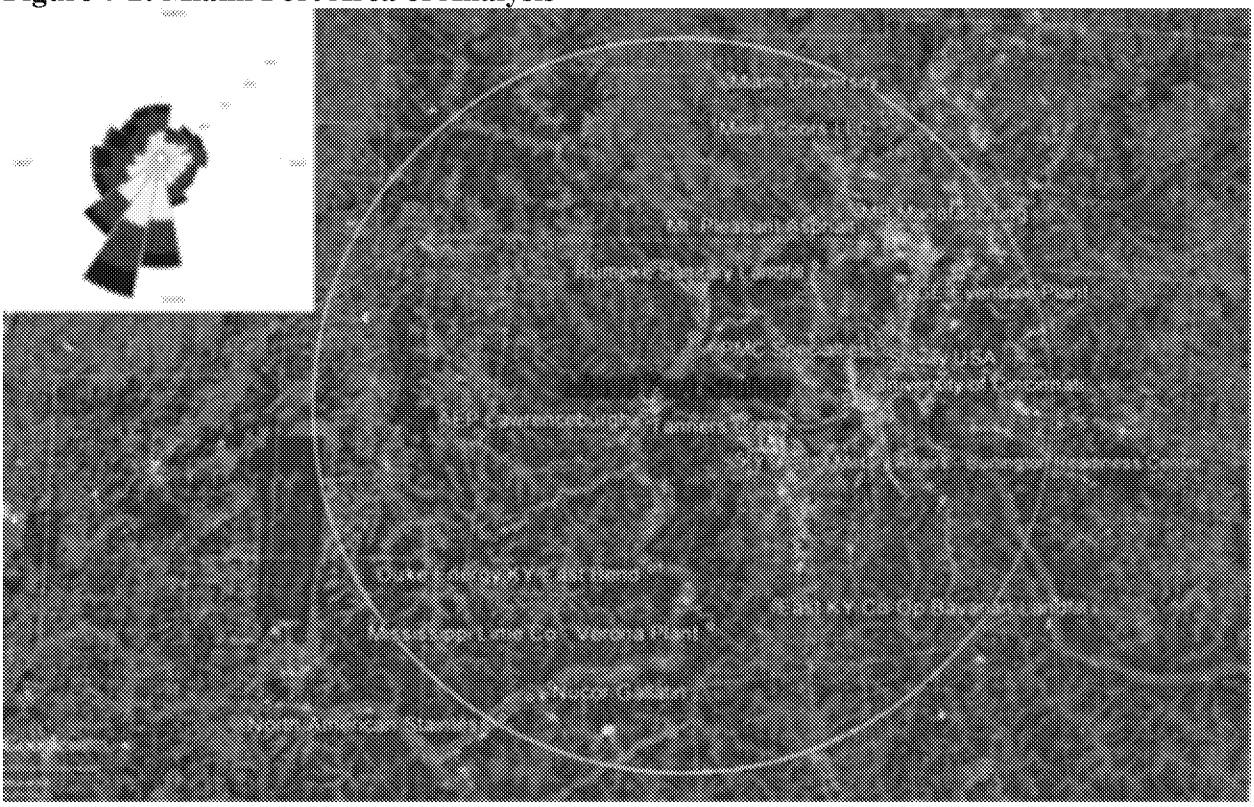

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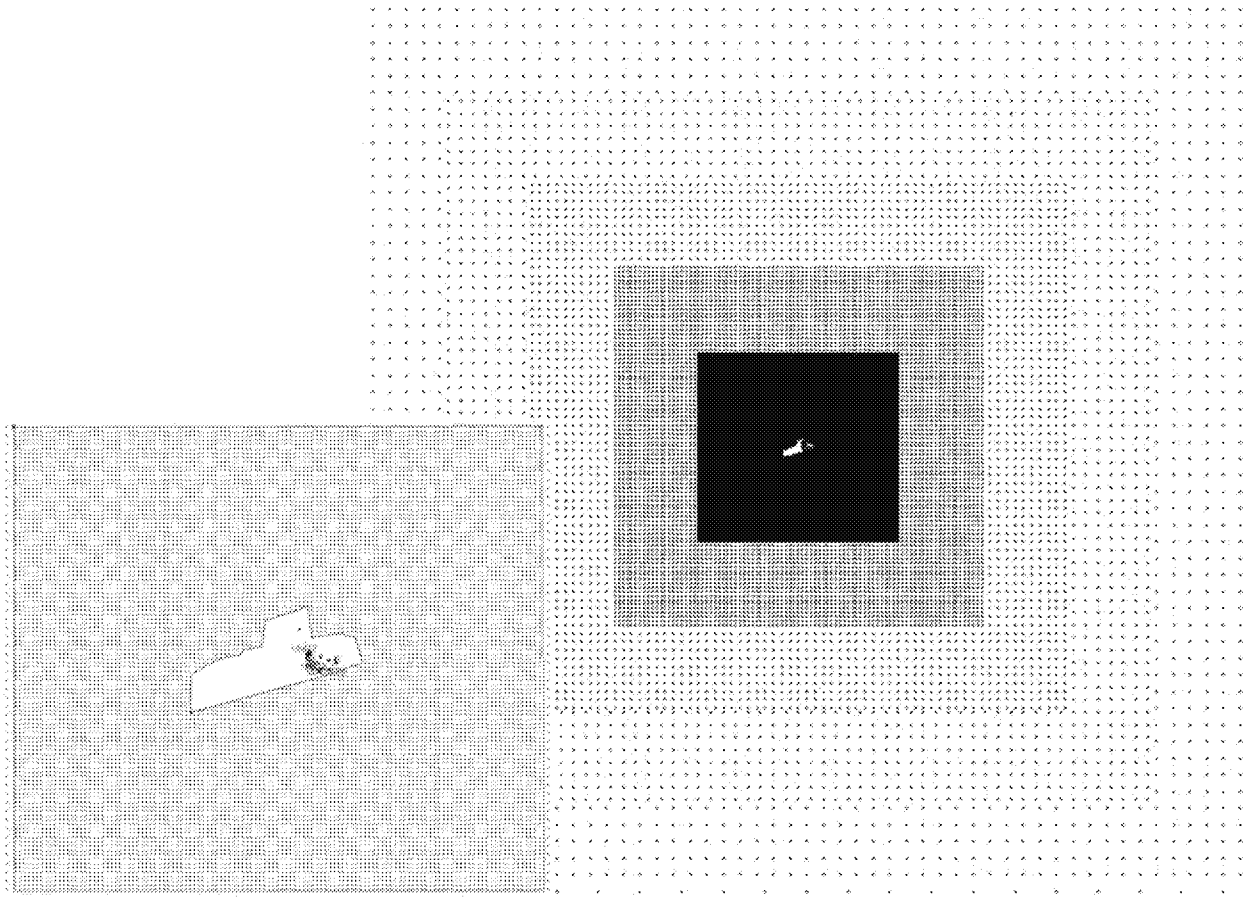
Figure 6-3: Receptor Grid for the Miami Fort Area of Analysis



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6.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions. The state modeled only Miami Fort in its analysis, as the other sources were determined to be too small and/or too distant to cause a significant concentration gradient that would affect the maximum concentration in the area of analysis.

The state characterized Miami Fort in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions for Miami Fort's coal-fired Units 7 and 8. Miami Fort had an additional coal-fired boiler, Unit 6, which ceased operation in June 2015, as a result of a federally enforceable closure, thereby effectively having zero allowable emissions. This unit was therefore not included in Ohio's modeling analysis. The state also adequately characterized the source's building layout

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and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash. As stated, the EPA finds Ohio's characterization of Miami Fort to be adequate for the modeling analysis.

6.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

For Units 7 and 8 at Miami Fort, the state modeled hourly varying actual SO_2 emissions between 2012 and 2014, Miami Fort's annual emission totals for these units are summarized in Table 6-2.

Table 6-2. Miami Fort Actual SO_2 Emissions for Units 7 and 8 for 2012-2014

Facility Name	SO_2 Emissions (tpy)		
	2012	2013	2014
Dynegy Miami Fort	10,580	11,836	9,539

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SO_2 emissions from Miami Fort Unit 6 were 15,791 tons in 2012, 19,558 tons in 2013, and 18,865 tons in 2014. However, as noted above, this unit shut down in June 2015, pursuant to a federally enforceable and effective requirement, based on rescission of the permit for this unit, and is no longer emitting. Thus, Ohio modeled zero allowable emissions for this unit, consistent with the Modeling TAD.

For Miami Fort Units 7 and 8, Ohio modeled actual hourly emissions submitted to Ohio by Dynegy from CEMS records with missing data filled using interpolation. The EPA has ensured that, for the modeled units, the sum of the hourly emissions is comparable to the annual emissions reported in CAMD and therefore concurs with the emissions used.

6.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the Miami Fort area of analysis, the state selected the surface meteorology from the Cincinnati Northern Kentucky Airport NWS station, approximately 14 km southeast of the source, and coincident upper air observations from the Wilmington Airborne Park in Wilmington, Ohio, 95 km northeast of the source, as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE 13016 to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions. The location of the surface NWS station (at center of figure) is shown in relation to the Miami Fort area of analysis in Figure 6-4 below, provided by the state.

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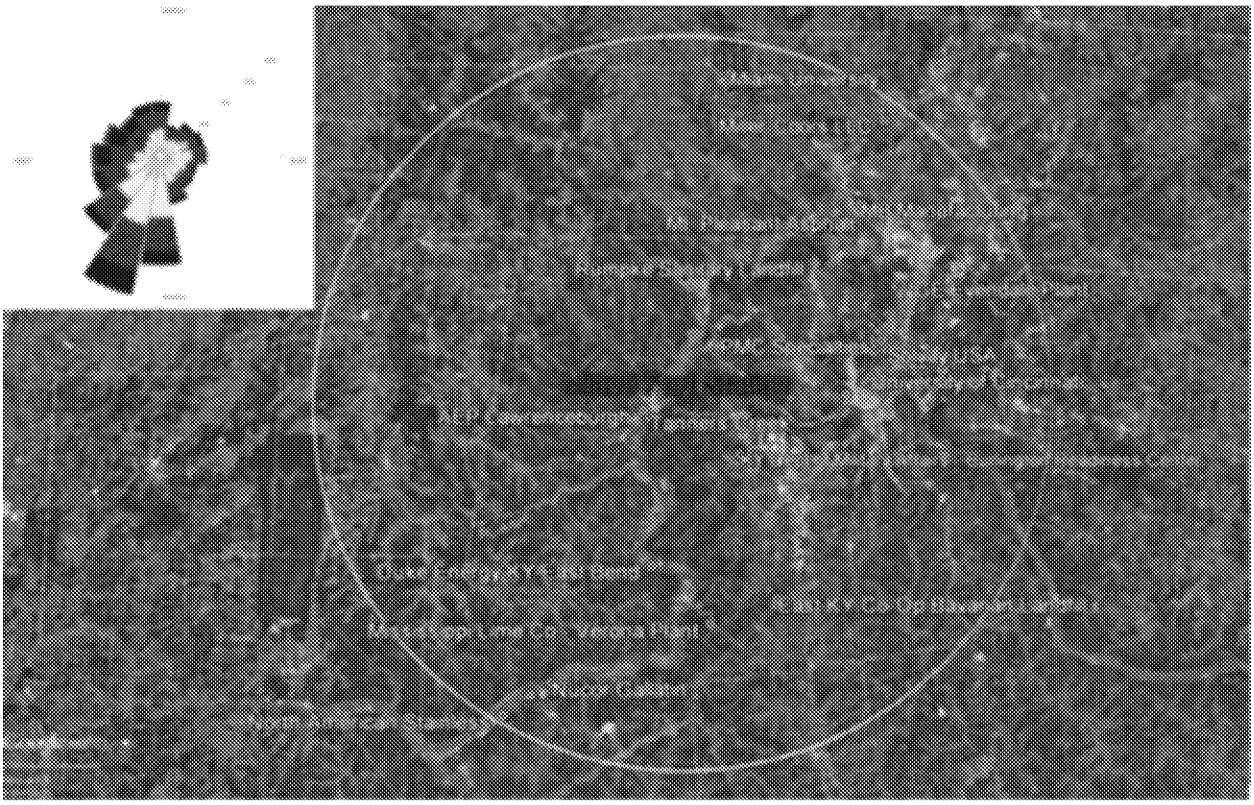
Figure 6-4. NWS station location for the Miami Fort Area of Analysis



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As part of its recommendation, the state provided the 3-year surface wind rose for Cincinnati Northern Kentucky Airport. In Figure 6-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind rose shows a very strong southwest component. Winds are less frequent from the east than from the west and north.

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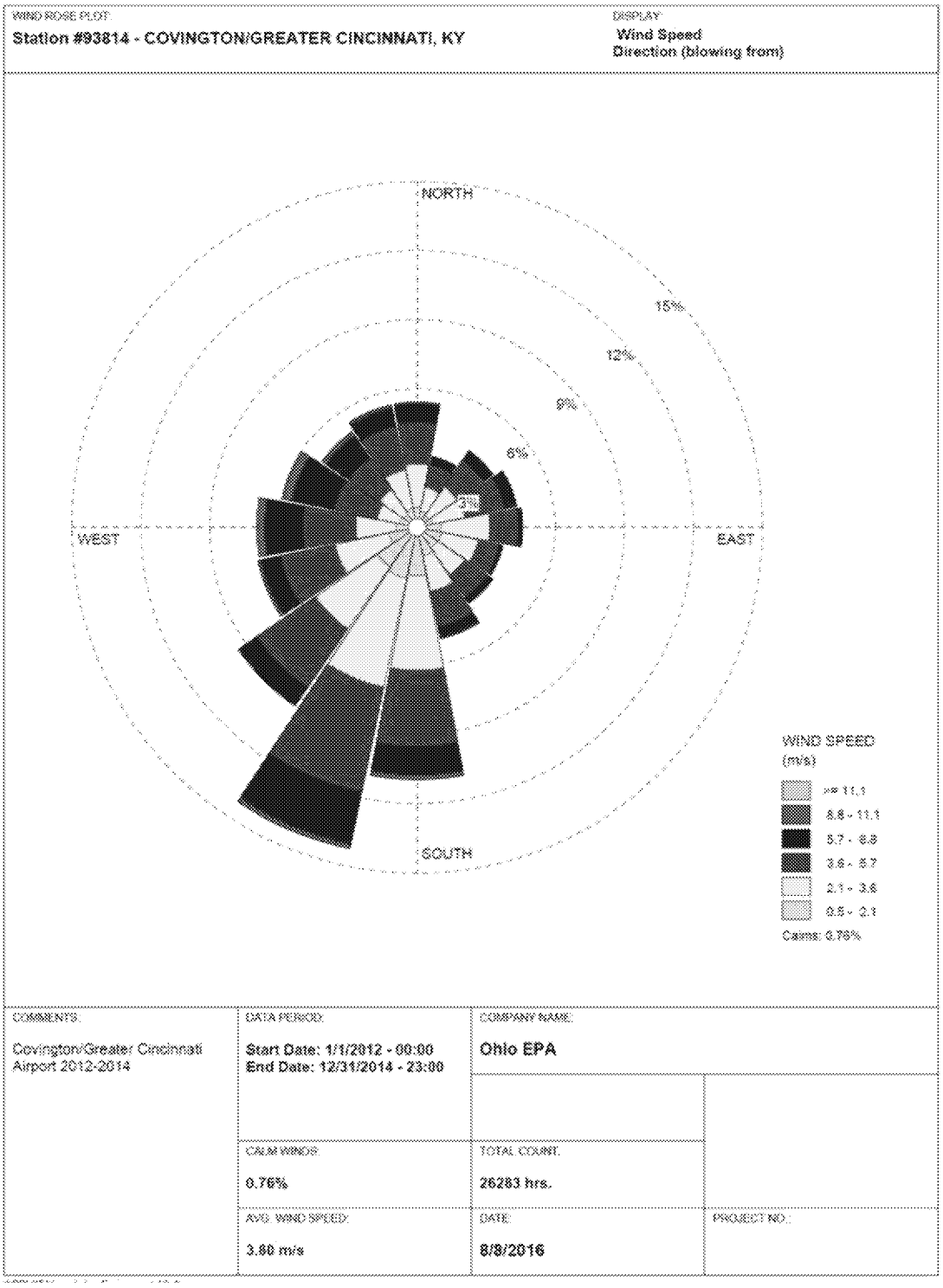
Figure 6-5: Cincinnati Northern Kentucky Airport Wind Rose for 2012-2014



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Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Cincinnati Northern Kentucky Airport and was processed with the AERMINUTE preprocessor. These data were subsequently input into AERMET to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and are less prone to over-report calm wind conditions than standard NWS hourly data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological and surface characteristics components of Ohio's modeling assessment.

6.3.8. Modeling Parameter: Geography, Topography and Terrain

Hamilton County borders the Ohio River. The Miami Fort facility is located on the Ohio River near the confluence of the Ohio and the Great Miami River, at the Indiana-Ohio-Kentucky border in the southwestern corner of Hamilton County. Miami Fort is 25 km west of downtown Cincinnati. The area near the Ohio River is hilly and forested. While the river valley can experience nighttime inversions and airflow into and out of the valley, the geographical and topographical features of the area are not considered to significantly influence air pollution transport or dispersion. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA concurs with Ohio's treatment of the local terrain.

6.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a tier 2 approach using the nearest monitor, 39-061-0010, located in Hamilton County

approximately 15 kilometers northeast of Miami Fort. Ohio did not attempt to exclude wind directions, due to the number of background sources surrounding Miami Fort. Therefore, it is likely that using this background data set may double-count Miami Fort's impacts. In order to limit the effect of this double counting, Ohio included monitored values of zero ppb in the three-year averages that were calculated for each hour before the data set was divided into seasons by hour of day. (It is considered more conservative to remove zero-values before averaging.) The EPA finds this approach to be reasonable. The background concentrations for this area of analysis were determined by the state to vary from 6 to 82.8 micrograms per cubic meter ($\mu g/m^3$), equivalent to 2.3 to 31.6 ppb[10], with an average value of 31.5 $\mu g/m^3$ (12 ppb).

6.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Miami Fort area of analysis are summarized below in Table 6-3.

Table 6-3: Summary of AERMOD Modeling Input Parameters for the Miami Fort Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	25
Modeled Fencelines	1
Total receptors	36,443
Emissions Type	Actual*
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Cincinnati Northern Kentucky (KCVG)
NWS Station Upper Air Meteorology	Wilmington Air Park, Ohio (KILN)

[10] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.

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Input Parameter	Value
NWS Station for Calculating Surface Characteristics	Cincinnati Northern Kentucky
Methodology for Calculating Background SO_2 Concentration	Tier 2, season/hour of day variable from AQS 39-061-0010.
Calculated Background SO_2 Concentration	2 – 32 ppb

*Except that Miami Fort Unit 6 emissions are addressed as having zero allowable emissions.

The results presented below in Table 6-4 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 6-4. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Miami Fort Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 16		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	691300	4331100	159.1	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 159.1 $\mu g/m^3$, equivalent to 60.7 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from Miami Fort, excluding Unit 6 which shut down in 2015. Figure 6-6 below was included as part of the state's recommendation, and indicates that the predicted value occurred just across the Ohio River in Boone County, Kentucky, about 1.4 km from the Miami Fort fenceline. Figure 6-6 shows the modeled results throughout the domain. The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated.

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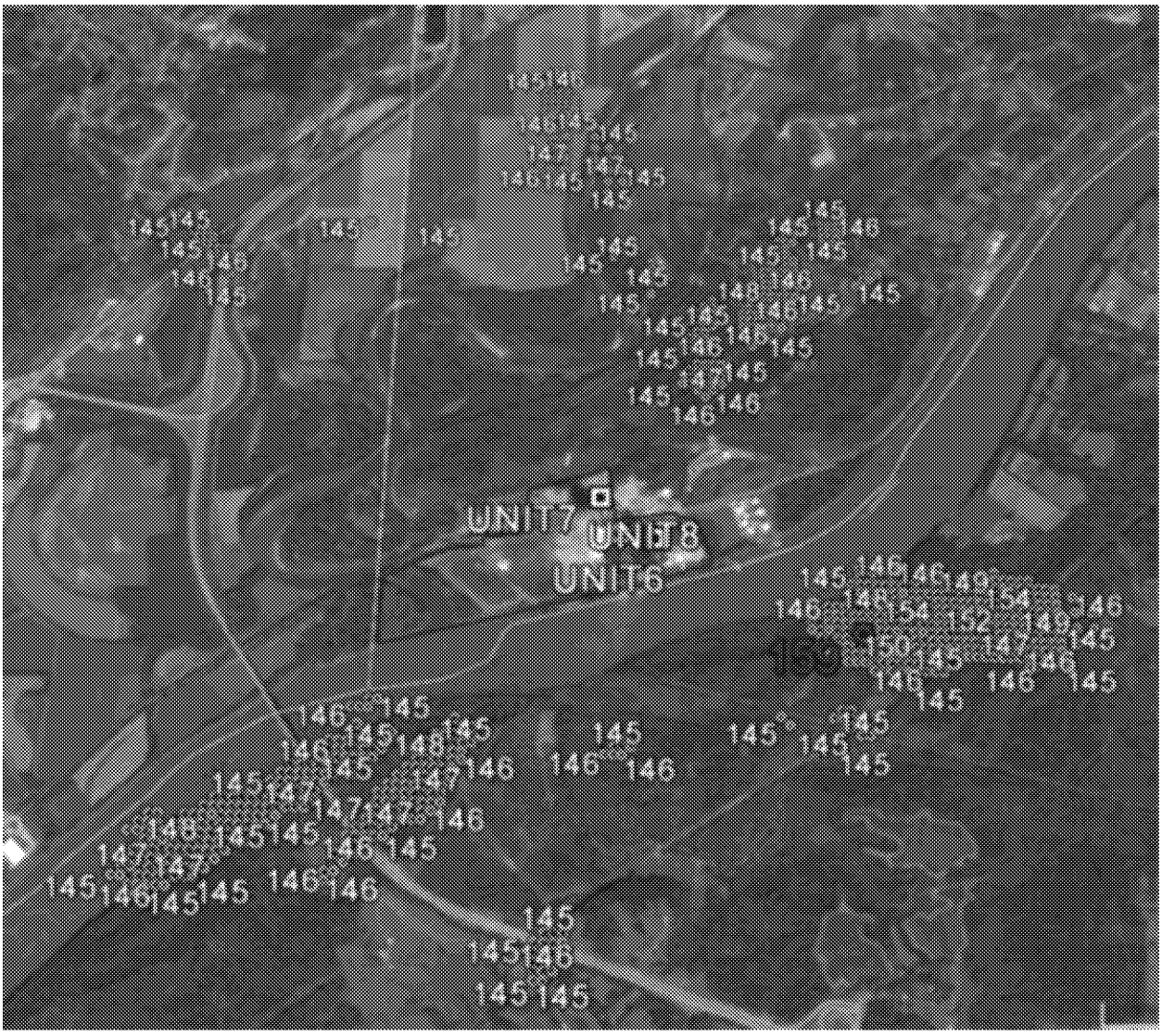
Figure 6-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Miami Fort Area of Analysis



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6.3.11. The EPA's Assessment of the Modeling Information Provided by the State

After reviewing Ohio's modeling analysis, the EPA considers its overall modeling assessment to be acceptable. Ohio modeled the Miami Fort facility using 2012-2014 actual emissions, for the two units still in operation, with AERMOD version 15181. Ohio selected nearby representative meteorological data sites and modeled a dense receptor grid around the facility. Ohio's model results indicate that the modeled area is not violating the 2010 SO_2 NAAQS and does not contribute to a nearby area that is violating the NAAQS.

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6.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Hamilton County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. The EPA believes that Ohio properly incorporated these factors into its analysis.

6.5. Jurisdictional Boundaries in Hamilton County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Hamilton County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA intends to designate the entirety of Hamilton County as unclassifiable/attainment. The EPA believes that our intended unclassifiable/attainment area bounded by Hamilton County's borders will have clearly defined legal boundaries, and we intend to find the county boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

6.6. The EPA's Assessment of the Available Information for Hamilton County

Ohio identified the highest concentrations near Miami Fort to be occurring in Boone County, Kentucky. Ohio's analysis indicated that the entire modeled area, including portions in Ohio, Kentucky, and Indiana, is attaining the standard. Ohio only made recommendations for designations of Ohio counties, and this chapter only assesses appropriate designations for areas in Ohio. Also, Kentucky provided a more complete assessment of air quality in its nearby areas. Nevertheless, Ohio's analysis suggests that relevant nearby portions of Kentucky and Indiana are attaining the standard as well.

After careful review of the modeling assessment, the EPA intends to designate Hamilton County as unclassifiable/attainment. Ohio's dispersion modeling of the Hamilton County area showed no modeled violations of the standard. There are no existing nonattainment areas or remaining undesignated areas within 100 km, so the EPA concludes the Miami Fort area does not contribute to any violations in nearby areas. While the local air quality monitors also showed no measured violations of the standard, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. The EPA finds the state's modeling to be acceptable as a basis for this designation.

6.7. Summary of Our Intended Designation for Hamilton County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state's recommendation and intends to designate Hamilton County as unclassifiable/attainment for the 2010 SO_2 NAAQS because,

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based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Hamilton County.

Figure 6-7 shows the boundary of this intended designation area.

Figure 6-7. Boundary of the Intended Hamilton County Unclassifiable/Attainment Area

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7. Technical Analysis for Jefferson County

7.1. Introduction

While the EPA designated portions of Jefferson County as nonattainment in rulemaking published August 5, 2013 (78 FR 47191), the EPA must designate the remaining portions of Jefferson County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in this portion of Jefferson County. This area contains the First Energy Sammis facility (Sammis), a coal fired power plant which emitted 10,263 tons of SO_2 in 2014. Ohio is required by the DRR to characterize SO_2 air quality around Sammis, because Sammis exceeded the DRR threshold of 2,000 tons per year. Ohio has chosen to characterize Sammis via modeling. The remaining portions of Jefferson County to be designated includes Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships in Jefferson County. Ohio recommended designating Belmont, Carroll, Columbiana, and Harrison Counties along with this portion of Jefferson County, as those four counties border Jefferson County and the combined SO_2 emissions of the counties (absent emissions from the Sammis facility) are well below the 2,000 tpy DRR threshold. However, most of the area in these counties was not included in the area that Ohio modeled. This chapter addresses Belmont, Carroll, Columbiana, and Harrison Counties together in section 12. The designation recommendation for Jefferson County and the DRR analysis for Sammis are addressed in the following paragraphs.

7.2. Air Quality Monitoring Data for Jefferson County

This factor considers available SO_2 air quality monitoring data in the Jefferson County area, which are shown in Table 7-1.

Table 7-1. Air Quality Monitoring Data (ppb) in the Jefferson County Area

County	Site ID	Annual 99th Percentile Among Daily Maximum Concentrations (ppb)				Design Values (ppb)	
		2013	2014	2015	2016	2013-2015	2014-2016
Jefferson	39-081-0017	37	30	29	27	32	29
Jefferson	39-081-0018	52	38	50	31	47	43
Jefferson	39-081-0020	33	24	23	20	27	23
Hancock (WV)	54-029-0005	29	34	39	37	34	37

The Jefferson County monitors 39-081-0018 and 39-081-0020 are located in the vicinity of the Cardinal Power Plant, approximately 29 km south of Sammis. Monitor 39-081-0017 is located in

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Steubenville, Ohio, approximately 18 km south of Sammis. Monitor 54-029-0005 is located in Hancock County, West Virginia, approximately 4.7 km to the east of Sammis. None of these monitors indicate current violations of the 2010 SO_2 NAAQS in Jefferson County. The monitor in Hancock County is likely to be close enough to the maximum impact area of Sammis (the modeling analysis suggests a maximum impact in Hancock County 2.6 km from Sammis) to provide important supporting evidence as to air quality near this plant. The other monitors are not near the area of maximum impact from Sammis. The EPA confirmed that there is no other additional relevant data in AQS that could inform the intended designation for Jefferson County.

7.3. Air Quality Modeling Analysis for Jefferson County

7.3.1. Introduction

This section presents the available air quality modeling information for the portion of Jefferson County that includes the Sammis facility. (This portion of Jefferson County will often be referred to as "the Sammis area" within this section). The area that the state has assessed via air quality modeling is located in eastern Ohio, along the Ohio River, where Ohio borders West Virginia and Pennsylvania.

In its 2017 recommendations, Ohio recommended that the area surrounding the Sammis facility, specifically the portion of Jefferson County containing Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships, be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for a portion of Jefferson County, and intends to designate the area as unclassifiable/attainment.

Figure 7-1 below, as provided by the state, shows the Sammis facility in Stratton, Ohio, near the West Virginia and Pennsylvania borders, and also depicts the location of the Greater Pittsburgh International Airport NWS station #94823 and its 2012-2014 wind rose.

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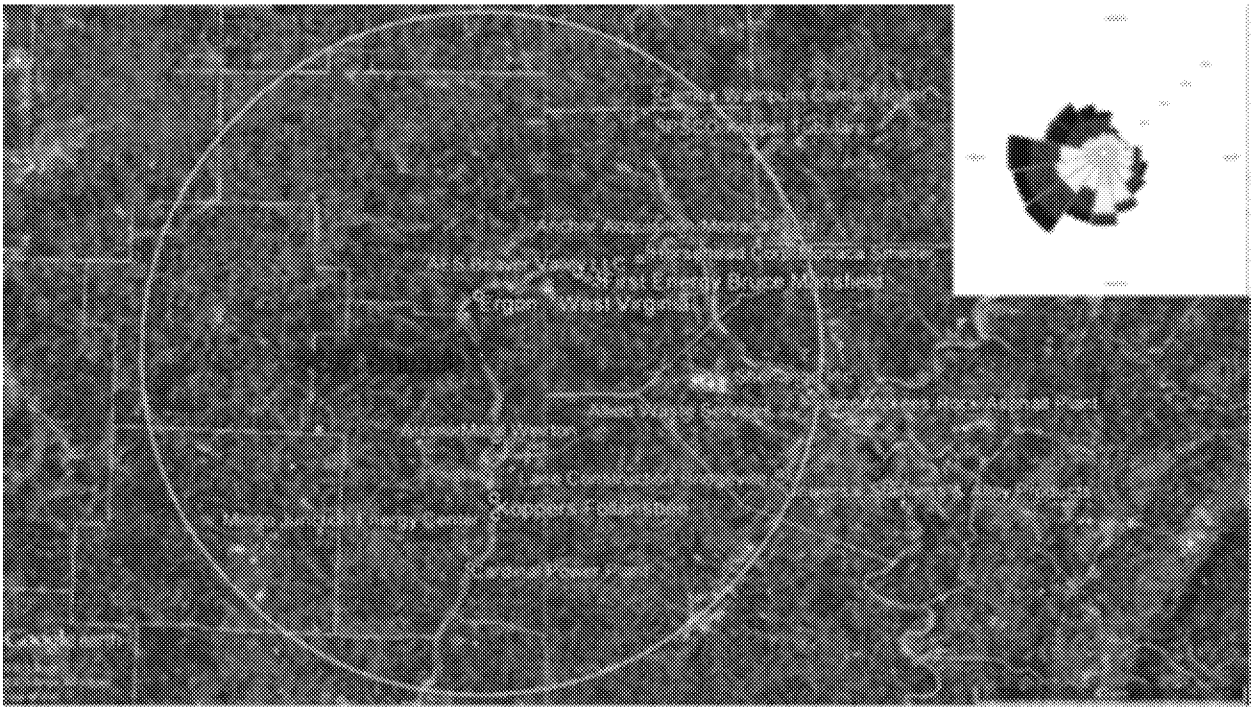
Figure 7-1. Map of the Jefferson County Area Addressing the Sammis Facility



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The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. The following sections discuss a modeling assessment that the EPA received from Ohio, which was the only analysis that the EPA received for this area.

7.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Sammis area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted friction velocity (ADJ_U*) parameter in AERMET. The Sammis area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

7.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the state used mapping software to determine that the predominant land use surrounding Sammis was made up of rural categories; therefore, the state determined that it was most appropriate to run the model in rural mode. The EPA has also reviewed available satellite imagery, showing the rural nature of this area, and concurs with the state's determination that the modeling domain is appropriately represented in the model as rural.

7.3.4. Modeling Parameter: Emission Sources

The SO_2 source subject to the DRR in this area, Sammis, is described in the introduction to this section. For the Jefferson County modeling analysis, the state considered other emitters of SO_2 located within 50 km of Sammis. Sources which were further than 25 km from Sammis, and/or emitted less than 20 tpy, were considered unlikely to cause a concentration gradient that would affect the maximum concentration within the area of analysis.

Several sources did merit consideration for their potential impacts on the Sammis area of analysis. The largest source in the general area, the First Energy Bruce Mansfield power plant, which emitted 19,784 tons of SO_2 in 2014, is located approximately 21 km to the northeast of Sammis, in Shippingport, Pennsylvania. The Jewel Acquisition/Midland facility is located approximately 18 km to the northeast of Sammis, and emitted 180 tons of SO_2 in 2014. At such distances, Ohio did not expect that these sources would cause a significant concentration gradient in the vicinity of the maximum concentrations in the Sammis area of analysis. Additionally, these two sources are commonly downwind of Sammis, in the sense that the representative wind data Ohio used in its modeling analysis indicate that winds come from the northeast much less often than from other directions. This suggests in turn that emissions from these facilities are less likely to affect the Sammis area frequently and thus are less prone to have impacts on maximum

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concentrations near Sammis. Ohio noted that Sammis' impacts at a 21 km distance northeast were approximately 17 $\mu g/m^3$, without background, which suggests there is minimal interaction between impacts of Sammis and impacts of Bruce Mansfield and Jewel Acquisition/Midland. In addition, Bruce Mansfield is in the Beaver County, Pennsylvania, nonattainment area, which in its 2013 promulgation, the EPA included an area of violation and contribution that included only selected portions of Beaver County and that did not extend into West Virginia or Ohio, based on the significant distances and thus diminished impact the Ohio and West Virginia sources would have on that area in Pennsylvania. Given that the maximum concentrations estimated near Sammis are to the southeast of the plant, reflecting winds that would be carrying emissions from Bruce Mansfield away from rather than toward Sammis, Bruce Mansfield is even less likely to cause significant concentration gradients in the Sammis area than vice versa.

The second largest neighboring source, the Cardinal Power Plant, emitted 10,660 tons in 2014 and is located 31 km to the south of Sammis. Ohio stated that this source is distant enough that it does not merit explicit modeling. Furthermore, as with Bruce Mansfield, maximum concentrations estimated near Sammis are to the southeast of the plant, reflecting winds that would be carrying emissions from Cardinal away from rather than toward Sammis. Given that Cardinal is sufficiently distant as to be unlikely to cause significant concentration gradients near Sammis, the EPA agrees that Cardinal did not merit inclusion in the Sammis analysis.

Several other sources with lower emissions and significant distance from Sammis are also not likely to cause concentration gradients near the maximum concentration area near Sammis. Ergon-West Virginia, Inc. is the closest facility to Sammis, located approximately 8.5 km to the north. Ergon-West Virginia emitted only 19 tons in 2014 and is not considered large enough or close enough to warrant inclusion in the Sammis modeling analysis. Similarly, Koppers Follansbee is 21 km to the south and emitted 100 tons of SO_2 in 2014. At this distance, this source does not warrant inclusion in the modeling analysis. An additional source outside Ohio's modeling domain, the Apex Environmental, LLC sanitary landfill in Amsterdam, Ohio, is located 26 km southwest of Sammis, near the southern border of Springfield Township, Jefferson County. It reported 206 tpy of SO_2 in 2014. The state asserts that the impacts of all these sources are suitably represented as part of the background concentration.

As further detailed in section 7.3.10, the monitor located nearest to Sammis adequately captures impacts from nearby sources to act as a background monitor for the area of analysis. The background monitor accounts for any possible impacts from nearby sources without explicitly modeling them. Because of this, the EPA concurs with Ohio's modeled source selection.

7.3.5. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

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

- 50-meter spacing along the Sammis fenceline, continuing to 3 km
- 100-meter spacing to 4 km
- 250-meter spacing to 7.5 km
- 500-meter spacing to 15 km
- 1,000-meter spacing to 25 km.

The receptor network contained 31,723 receptors, covering portions of Jefferson County, Ohio; Brooke and Hancock Counties, West Virginia; and Allegheny, Lawrence, Washington, and Beaver Counties, Pennsylvania.

Figures 7-2 and 7-3, included in the state's recommendation, show the state's chosen area of analysis surrounding Sammis, and the dense portion of the receptor grid for the area of analysis.

The state placed receptors for the purposes of this designation effort in most locations that would be considered ambient air relative to each modeled facility, including other facilities' property. Ohio did not exclude receptors based on monitoring feasibility. Ohio did not place receptors in the Steubenville, OH-WV nonattainment area because Ohio has separately analyzed concentrations in the Steubenville area (considering any impacts from these sources) as part of its nonattainment SIP and attainment demonstration. While the exclusion of these receptors is not consistent with the Modeling TAD, consistent with its finding in 2013 that the area of violation and contributing sources was limited to the previously defined nonattainment area, the EPA continues to believe that Sammis, which is 15 km in a most frequently downwind direction from the nonattainment area, does not contribute to violations which have been observed in the Steubenville area.

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Figure 7-2: Sammis Area of Analysis

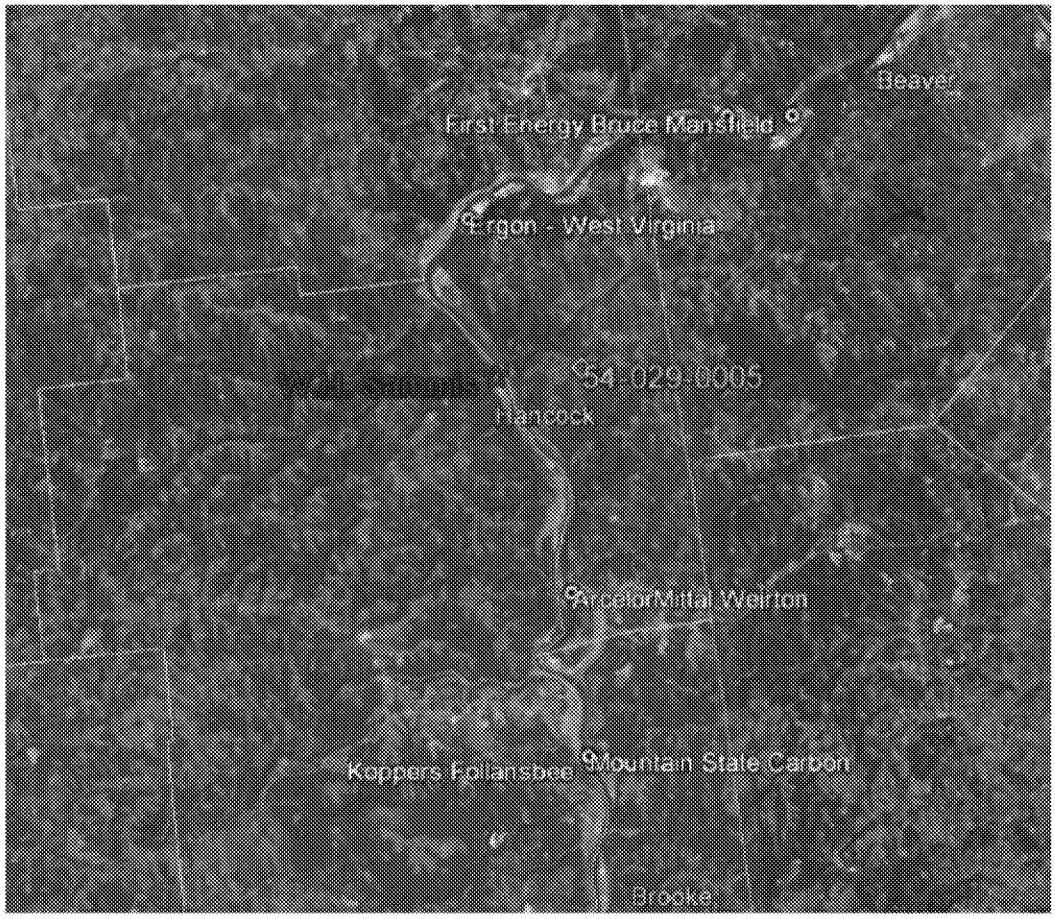

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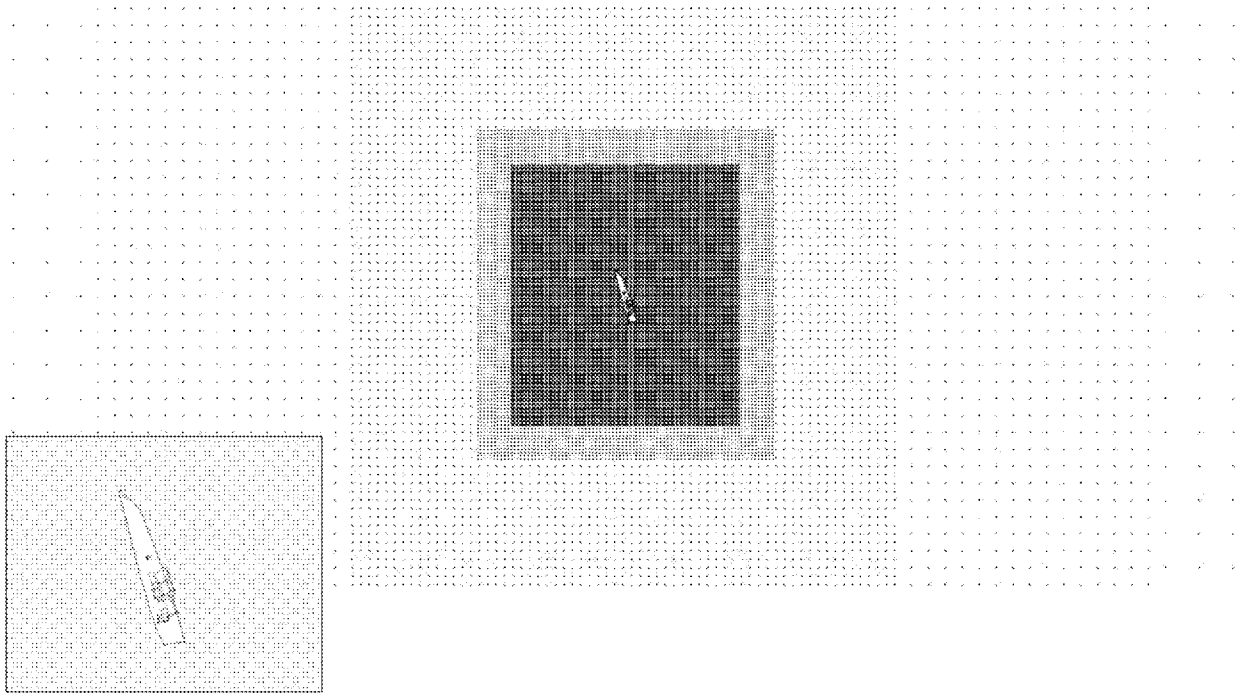
Figure 7-3: Receptor Grid for the Sammis Area of Analysis with Fenceline Inset



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The EPA concurs with Ohio's placement of receptors. There are clear fence lines surrounding the Sammis facility that effectively preclude the public from entering the facility, so the area within the fence line would not be considered ambient air. The state did not include receptors in the Steubenville, OH-WV nonattainment area, and the EPA concurs that Sammis is sufficiently distant, in a most frequently downwind direction, that contributes to violations in the Steubenville area is unnecessary. In addition, the modeled attainment demonstration for the Steubenville nonattainment area SIP, for reasons of distance and direction considered the impacts of Sammis only as part of the background concentration.

7.3.6. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

Ohio characterized Sammis in accordance with the practices outlined in the Modeling TAD, using actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash.

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7.3.7. Modeling Parameter: Emissions Data

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

For Sammis, the state modeled hourly varying actual SO_2 emissions between 2012 and 2014. Sammis' annual emission totals for 2012-2016 are summarized in Table 7-2.

Table 7-2. Sammis Actual SO_2 Emissions for 2012-2016

Facility Name	SO_2 Emissions (tpy)				
	2012	2013	2014	2015	2016
W.H. Sammis	3,949	8,495	10,263	7,674	5,713

Ohio modeled actual hourly emissions for Sammis based on CEMS data, with missing and invalid emissions data identified by FirstEnergy and replaced by interpolation. The EPA has ensured that the sum of the hourly emissions is comparable to the annual emissions reported in CAMD; therefore, the EPA concurs with Ohio's modeled emissions. As noted above, the EPA also concurs with Ohio's determination that only Sammis warrants explicit inclusion in the modeling analysis.

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7.3.8. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the Sammis area of analysis, the state selected both the surface meteorology and coincident upper air observations from the Greater Pittsburgh International Airport NWS station KPIT (#94823), in Pittsburgh, Pennsylvania, located approximately 35 km to the east of Sammis, as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Greater Pittsburgh International Airport NWS station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions.

In Figure 7-4 below, included in the state's recommendation, the location of the selected NWS station, the Greater Pittsburgh International Airport, KPIT (#94823), is shown to the east of Sammis, within the 50 km circle. The figure also depicts the 2012-2014 wind rose for the NWS station.

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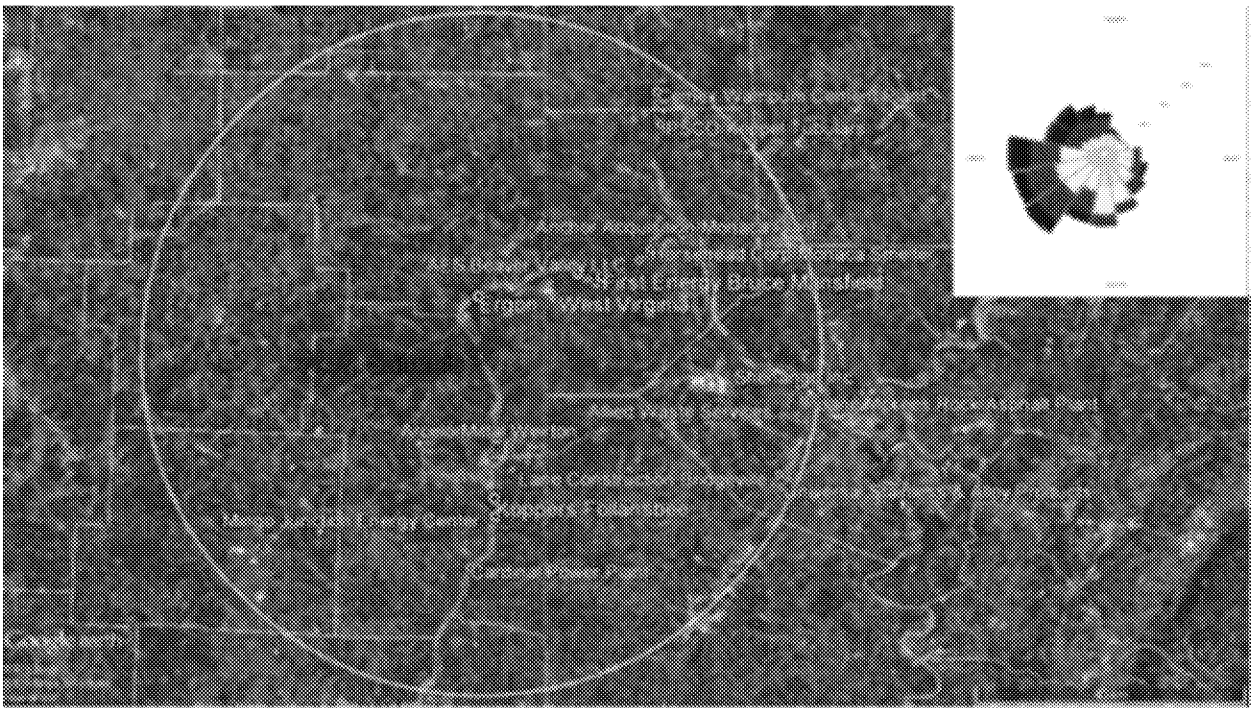
Figure 7-4. Area of Analysis and the NWS Station in the Sammis Area



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As part of its recommendation, the state provided the 3-year surface wind rose for surface station KPIT (#94823). In Figure 7-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The predominant winds measured at this station originate from the west and southwest. Winds from the northeast are infrequent, and relatively light.

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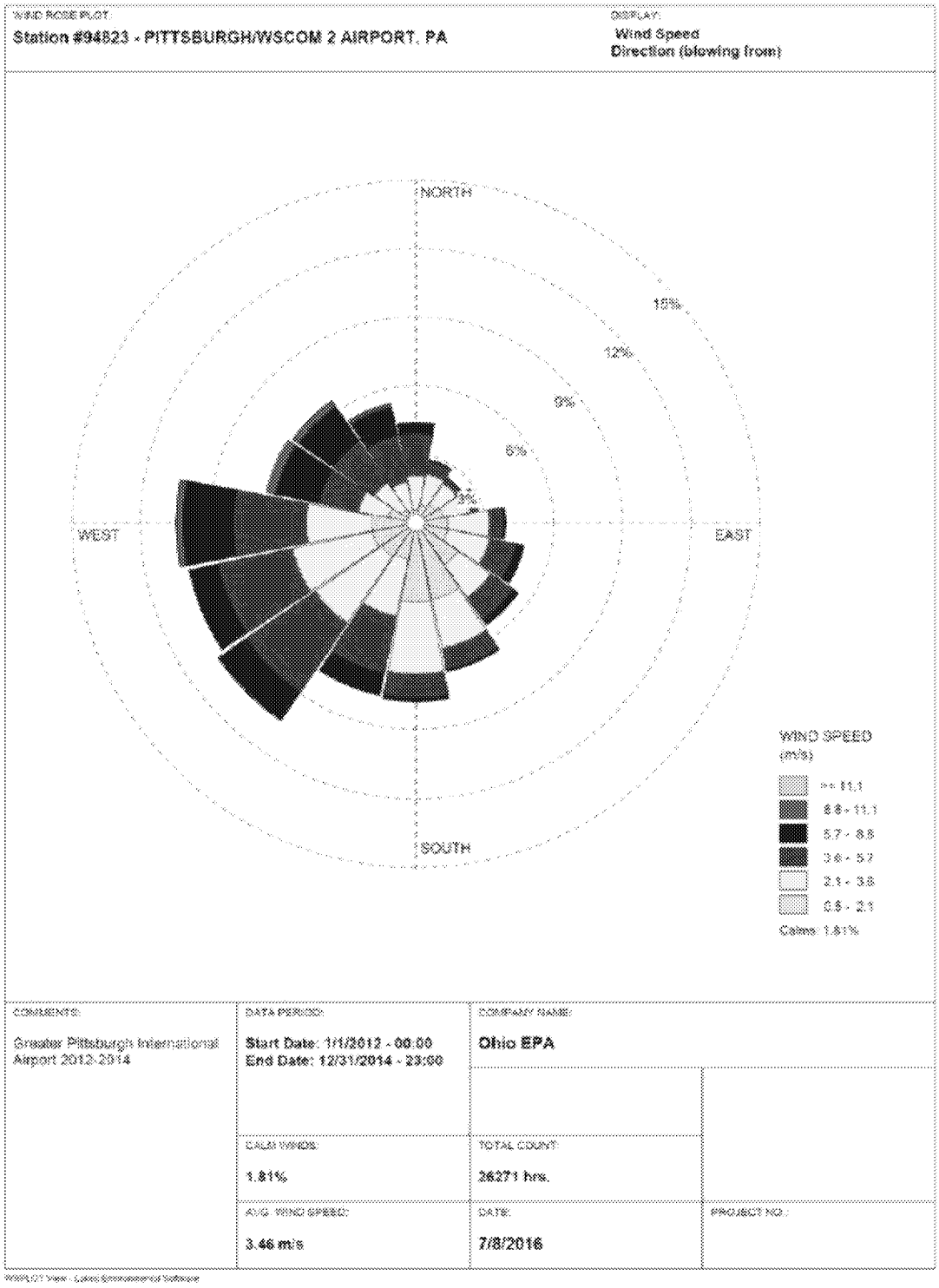
Figure 7-5: Pittsburgh Cumulative Annual Wind Rose for Years 2012 – 2014



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Meteorological data from the above surface and upper air NWS station was used in generating AERMOD-ready files with the AERMET version 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling for Sammis.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from surface station #94823 located at the Greater Pittsburgh International Airport (KPIT) and was processed with the AERMINUTE preprocessor. 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 are less prone to over-report calm wind conditions than standard NWS hourly data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological and surface characteristics components of Ohio's modeling assessment.

7.3.9. Modeling Parameter: Geography, Topography and Terrain

Jefferson County lies along the Ohio River. Terrain along the river is hilly and wooded. While the river valley can experience nighttime inversions and airflow into and out of the valley, the geographical and topographical features of the area are not considered to significantly influence air pollution transport or dispersion. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS Digital Elevation Data. The EPA concurs with Ohio's treatment of the local terrain.

7.3.10. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose the tier 2 approach, using data derived from AQS monitor 54-029-0005 located in Hancock County, West Virginia, approximately 4.7 km east of the Sammis facility. A 45° sector of wind directions (251° - 296°) was assumed to correspond to strong contributions from the Sammis facility to the monitor. Data from this sector was eliminated from the background

calculations to avoid double counting Sammis' emissions in the modeling analysis. The EPA concurs with this analysis. There are no additional nearby SO_2 sources within that wind sector whose contributions would be improperly removed. That is, the exclusion of this wind sector does not exclude the impacts of any of the sources in or near Jefferson County that are intended in this analysis to be represented by the background concentration. Figure 7-6 shows the variations in background concentration by season and hour of day which were incorporated into the modeling analysis.

Ohio chose to model only the Sammis facility in this analysis and to consider the other facilities within 50 km to be adequately represented by background data. The Steubenville area contains the largest group of nearby SO_2 sources. Ohio stated that their separate analysis of the Steubenville area in support of their nonattainment SIP addresses the impacts of Steubenville sources on neighboring areas. Their analysis, submitted separately to the EPA in 2015, indicates that the impacts from the Steubenville area peak at the fencelines of the local facilities (20 km from Sammis). The impacts from Steubenville sources at the edge of the attainment modeling domain, 15 km from Sammis, are approximately 22 $\mu g/m^3$. Given that Ohio modeled a maximum concentration near Sammis of 84.5 $\mu g/m^3$, much more than 22 $\mu g/m^3$ below the standard, the Steubenville sources would not likely contribute to a violation in the Sammis area of analysis or near Sammis' peak impacts.

The EPA is not relying on Ohio's prior analysis of the impacts of Steubenville area sources in the Sammis area. Instead, the EPA is relying on Ohio's selection of an appropriate monitoring site for determining impacts from sources in the Steubenville area as well as other sources that are not being explicitly modeled and the impacts of which are to be represented as part of the background concentration. The EPA considers the Hancock County monitor to provide a suitable estimation of impacts in the Sammis area, and the EPA believes that evaluation of concentrations at times other than when winds are blowing within a 45° sector of Sammis to provide a good means of determining the background impacts of sources in the Steubenville area and elsewhere on concentrations in the Sammis area. The EPA considers Ohio's information to be supplemental evidence that a more conservative estimate of impacts from Steubenville area sources is likely to lead to the same conclusion, that concentrations near Sammis, including impacts from Steubenville area sources, are unlikely to show violations of the SO_2 standard. Therefore, the EPA concurs with Ohio's decision to omit Steubenville sources from the Sammis modeling analysis and rely on the background concentration to reflect impacts from these sources.

The Hancock County monitor, being located east of Sammis, is more likely to overstate rather than understate impacts from sources to the northeast of Sammis such as the Bruce Mansfield power plant. These contributions are expected to be fairly small, given the 21 km distance between the two facilities. In addition, the wind rose corroborates the presumption that the AERMOD analysis would be unlikely to show frequent impacts from sources located to the northeast of Sammis. Therefore, the EPA concurs with Ohio's decision to omit the Bruce Mansfield plant from the Sammis modeling analysis and instead rely on the background concentration to reflect the impact from this source.

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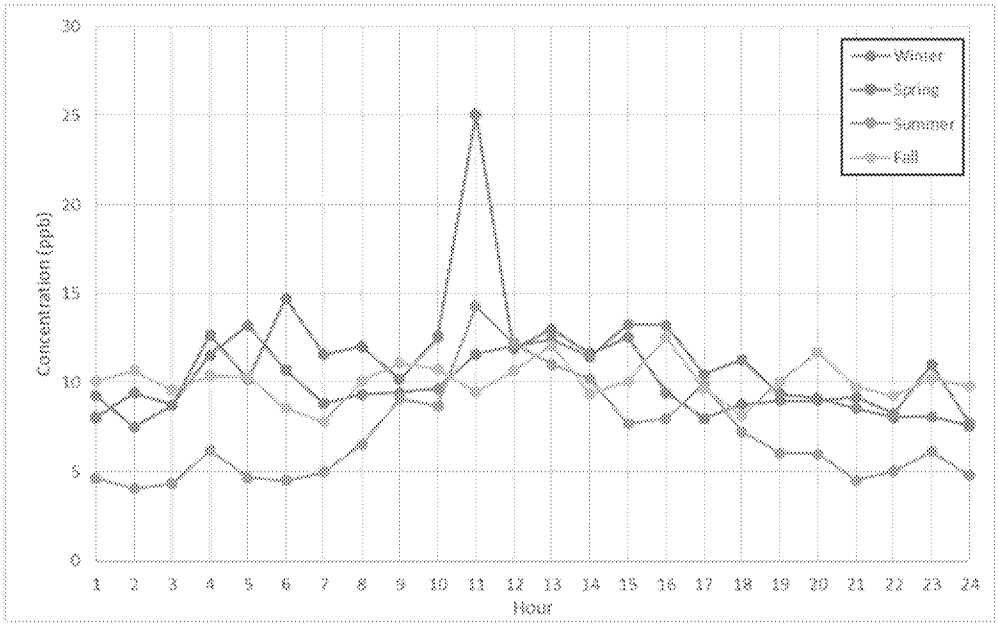
Figure 7-6. Hourly and Seasonally Variable SO_2 Background Data, Derived from Air Quality Monitor 54-029-0005 for the Sammis Area of Analysis



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7.3.11. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Jefferson County area of analysis are summarized below in Table 7-3.

Table 7-3: Summary of AERMOD Modeling Input Parameters for the Sammis Area

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1
Modeled Structures	20
Modeled Fencelines	1
Total receptors	31,723
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014

Input Parameter	Value
NWS Station for Surface Meteorology	Pittsburgh, Pennsylvania (KPIT, #94823)
NWS Station Upper Air Meteorology	Pittsburgh, Pennsylvania (KPIT, #94823)
NWS Station for Calculating Surface Characteristics	Pittsburgh, Pennsylvania (KPIT, #94823)
Methodology for Calculating Background SO_2 Concentration	Tier 2: season/hour of day, using data from site number 54-029-0005
Calculated Background SO_2 Concentration	4-25 ppb

The results presented below in Table 7-4 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 7-4. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Sammis Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	532850.00	4484500.00	84.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The highest predicted 99th percentile daily maximum 1-hour concentration within the modeling domain is 84.5 $\mu g/m^3$, equivalent to 32.3 ppb. This modeled concentration includes the background concentration. Figures 7-7 and 7-8 below, provided by the state, show the location of the high modeled values, including the maximum value, which was found in Hancock County, West Virginia, 2.6 km southeast of the Sammis facility. The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area.

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Figure 7-7: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Sammis Area of Analysis

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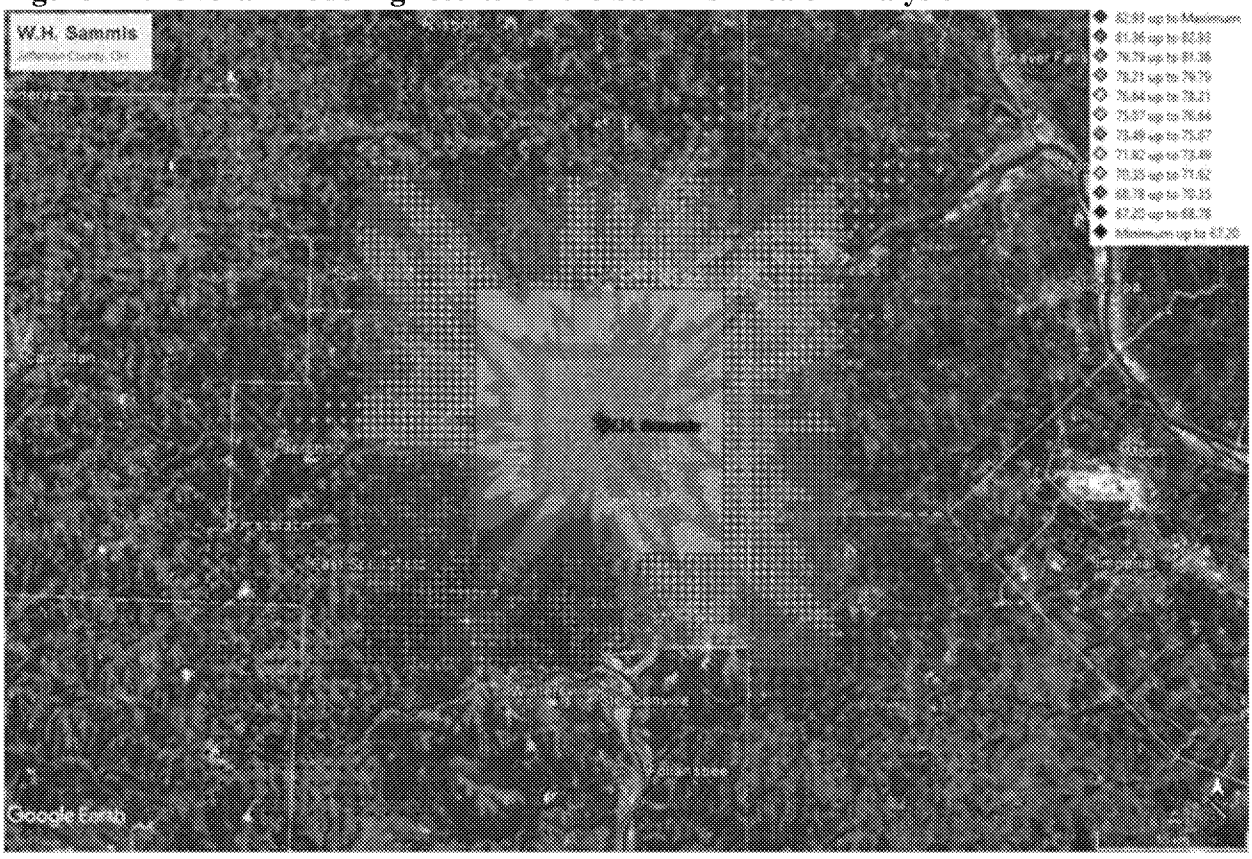
Figure 7-8. Overall modeling results for the Sammis Area of Analysis



7.3.12. The EPA's Assessment of the Modeling Information Provided by the State

After reviewing the state's modeling analysis, the EPA concurs with the modeling assessment. The state used AERMOD version 15181 to model impacts from actual hourly varying emissions from the local DRR source (Sammis). Sammis was the only facility explicitly modeled in this analysis. Due to factors such as distance, low emissions, and wind frequency, Ohio determined that surrounding SO_2 sources did not merit explicit modeling as they were unlikely to impact SO_2 concentrations in the Jefferson County area beyond that reflected in the background concentration. Instead, contributions from surrounding sources were addressed using the background concentrations. As noted in Section 7.2, Ohio's chosen background monitor was located reasonably near to the area with maximum impacts from Sammis as indicated by this modeling analysis, and so the monitor is suitably placed for assessing the pertinent impacts from distant sources potentially affecting the area of analysis. The state determined the background concentrations through a tier 2 approach utilizing an AQS monitor located approximately 4.7 km to the east of Sammis. The EPA supports Ohio's decision to exclude a 45° wind direction sector, to avoid double counting Sammis' impacts on the background concentrations. The receptor grid used in the modeling assessment contains 31,723 receptors and densely spaced grids around

areas of maximum impact. Ohio utilized 3 years of NWS meteorological data (2012-2014) and analyzed surface characteristics using AERSURFACE. The method the state used for selecting and preparing meteorological inputs followed the EPA's Modeling TAD. Ohio accounted for terrain in the modeling assessment by incorporating the AERMAP terrain processor. The maximum predicted 99th percentile daily maximum 1-hour concentration within the modeling domain is located 2.6 km from the facility at a level of 84.51 $\mu g/m^3$, or 32.3 ppb, including background, which indicates attainment of the 2010 SO_2 NAAQS in this area. The contours shown in Figure 7-8 indicate that Sammis' impacts are relatively low near the existing nonattainment area boundary, and that these impacts are declining with distance from Sammis. With northwest winds, when winds carry the emissions from Sammis toward the nonattainment area, the emissions from sources within the nonattainment area are being carried away from the impacts of Sammis. so that the relevant area where Sammis might add to the impacts of sources in the nonattainment area would be beyond (farther to the southeast of) the nonattainment area sources, where the impact of Sammis would be even less. For these reasons, the EPA continues to believe that Sammis does not contribute to the existing nonattainment portion of Jefferson County. Similarly, the results of Ohio's analysis also indicate that the impacts of Sammis (and more generally the undesignated portions of Jefferson County) are relatively low near the nonattainment area in Beaver County, Pennsylvania, so that this part of Jefferson County would not be considered to be contributing to this nonattainment area either. After examining the parameters and inputs of the modeling information provided by the state, the EPA supports Ohio's modeling approach for the Sammis facility.

7.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Jefferson County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

7.5. Jurisdictional Boundaries in Jefferson County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the undesignated portion of Jefferson County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

The EPA intends to designate the portion of Jefferson County containing Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships as unclassifiable/attainment. Township boundaries were selected because counties and townships in Ohio have well established jurisdictional boundaries. The EPA believes that our intended unclassifiable/attainment area will have clearly defined legal boundaries, and we

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intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

7.6. Other Information Relevant to the Designations for Jefferson County

The EPA intends to designate a portion of Jefferson County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundary for our intended area comprises Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships. This intended area includes townships which border the Steubenville OH-WV Nonattainment area (unshaded in Figure 7-9 below), and some townships which were not addressed by the Sammis modeling analysis, as they were located beyond the Sammis area modeling domain, closer to the Steubenville nonattainment area modeling domain.

Jefferson County includes no sources besides Sammis listed under the DRR as incurring requirements for air quality characterization. Of the currently undesignated portions of Jefferson County, Ohio has modeled the highest concentration area (as well as portions of West Virginia and Pennsylvania that might be expected to observe maximum impacts from sources in undesignated portions of Jefferson County). Thus, attainment near Sammis suggests that the remainder of the currently undesignated portions of Jefferson County are also attaining the standard.

The EPA believes that the Sammis DRR modeling analysis indicates that the remaining undesignated townships in Jefferson County are attaining the 2010 SO_2 NAAQS. There are no other SO_2 sources in the neighboring counties which are likely to cause an impact on the air quality in these townships. Therefore, the EPA is intending to designate all the remaining undesignated townships in Jefferson County as unclassifiable/attainment.

7.7. The EPA's Assessment of the Available Information for Jefferson County

Ohio's modeling analysis was performed in accordance with the Modeling TAD and indicates the area around Sammis has peak impacts below the 2010 SO_2 NAAQS and does not indicate contribution to nearby existing nonattainment areas. While this analysis excluded receptors from the Steubenville nonattainment area, the modeling results indicate that the maximum concentrations in the Sammis area occur much closer to Sammis, and that the impacts of Sammis are not causing violations near to or within the nonattainment area. Consistent with its finding in 2013 that the area of violation and contributing sources was limited to the previously defined nonattainment area, the EPA continues to believe that Sammis, which is 15 km in a most frequently downwind direction from the nonattainment area, does not contribute to violations which have been observed in the Steubenville area. Similarly, the EPA continues to believe that Sammis does not contribute to violations which have been observed in the Beaver County, Pennsylvania area, 21 km away. Included background concentrations adequately account for other sources near the area. The air quality monitors near Sammis and in other parts of Jefferson County, including those located within the existing nonattainment areas, are all currently showing concentrations below the 2010 SO_2 NAAQS. For these reasons and those explained above, the EPA intends to designate the as-yet-undesignated portion of Jefferson County as

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unclassifiable/attainment. This portion includes Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships.

7.8. Summary of Our Intended Designation for Jefferson County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state recommendation and intends to designate the currently undesignated portions of Jefferson County as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundary for our intended area comprises Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships. Figure 7-9 shows the boundary of this intended designated area, shaded. The unshaded area in Figure 7-9 is the existing Steubenville OH-WV nonattainment area. The EPA is intending to designate all the remaining undesignated townships in Jefferson County as unclassifiable/attainment.

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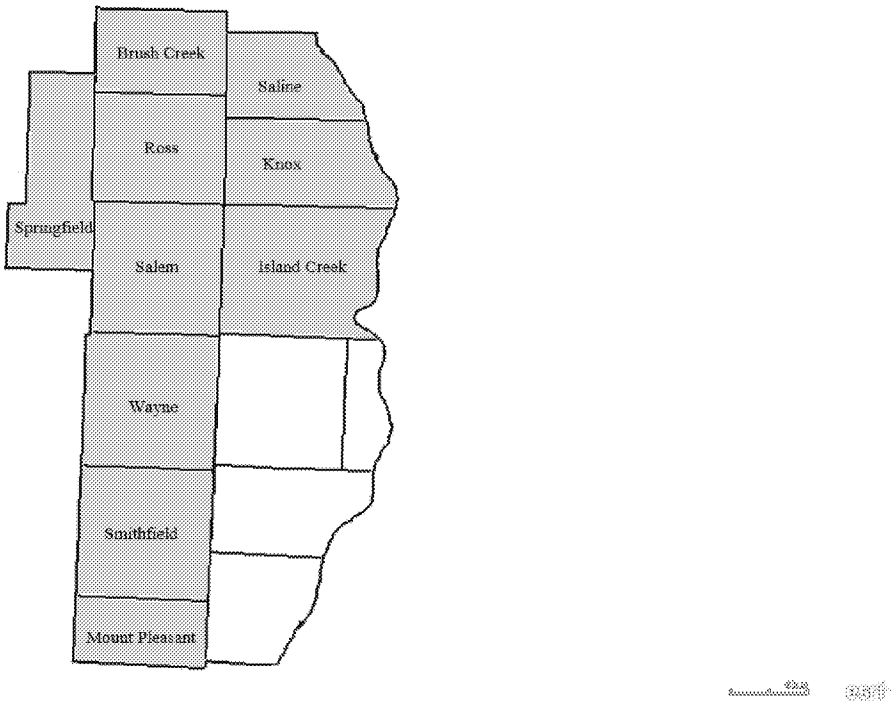
Figure 7-9. Boundary of the Intended Jefferson County Unclassifiable/Attainment Area



At this time, our intended designations for Ohio only apply to this area and the other areas presented in this technical support document.

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8. Technical Analysis for Lorain County

8.1. Introduction

The EPA must designate Lorain County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Lorain County. The NRG Power Midwest LP Avon Lake Power Plant (Avon Lake) is a power plant located in Lorain County, in northern Ohio near Lake Erie. Avon Lake emitted 34,935 tons of SO_2 in 2014, and therefore, Ohio is required by the DRR to characterize SO_2 air quality around it.

8.2. Air Quality Monitoring Data for Lorain County

There are no SO_2 air quality monitors in Lorain County. The nearest SO_2 monitors are in Cuyahoga County and Summit County, approximately 25 km east of the Lorain County borders. The Cuyahoga and Summit County monitors have not shown violations of the 2010 SO_2 NAAQS for 2013-2015, although one Cuyahoga County monitor recorded a violation for 2014-2016. Nevertheless, none of these monitors are located in the area of expected maximum concentration for Avon Lake, and so these monitors are not representative of whether the Lorain County area is attaining the standard.

8.3. Air Quality Modeling Analysis for Lorain County Addressing the Avon Lake Power Plant

8.3.1. Introduction

This section presents all the available air quality modeling information for a portion of Lorain County that includes the Avon Lake facility. (This portion of Lorain County will often be referred to as "the Avon Lake area" within this section). Avon Lake emitted 34,935 tons of SO_2 in 2014; therefore, it meets the DRR criteria and Ohio is required to characterize SO_2 air quality around it. As requested by the company, Ohio elected to issue a federally enforceable and effective new SO_2 emission limit and to demonstrate compliance with the 2010 SO_2 NAAQS through air quality modeling.

In its submission, Ohio recommended that an area that includes the area surrounding Avon Lake, specifically the entirety of Lorain County, be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the state's assessment,

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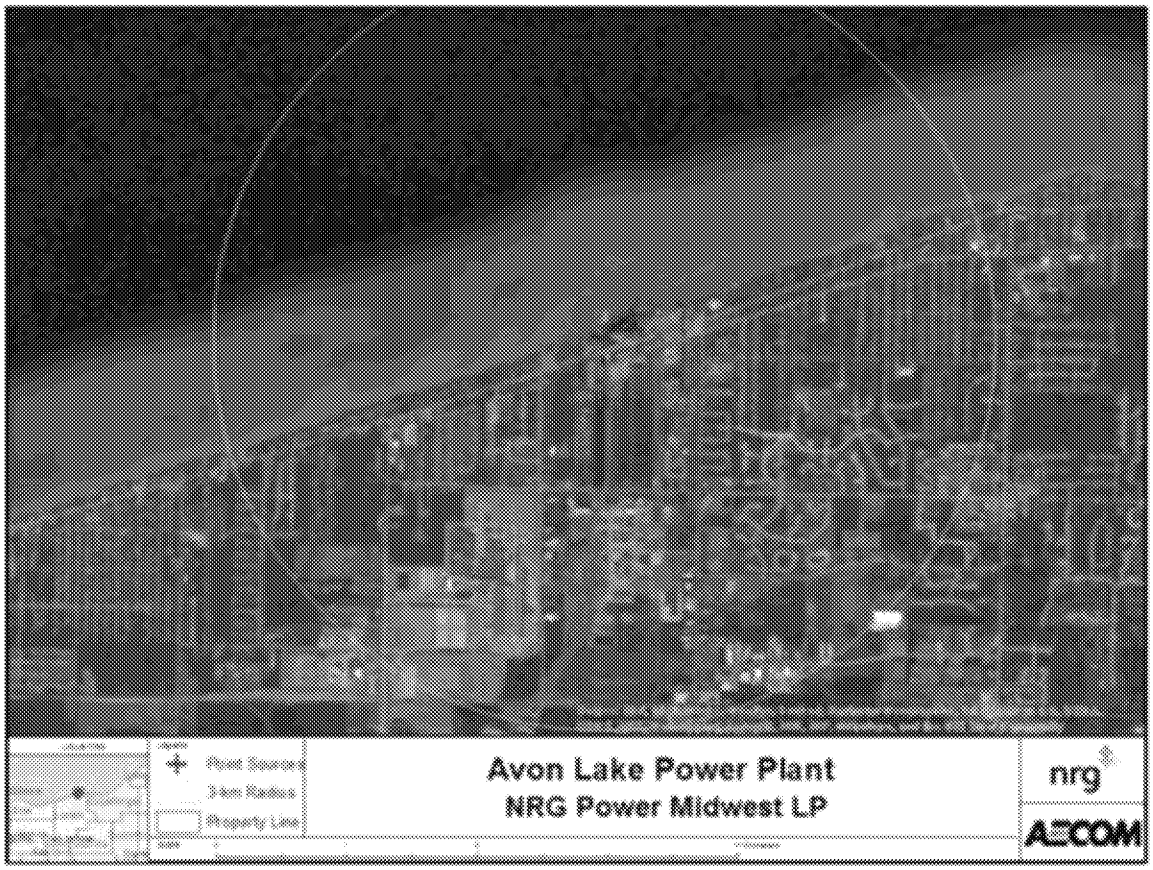
supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment.

The area that was assessed via air quality modeling is located in the northeast portion of Lorain County, near Lake Erie. Avon Lake's fenceline is marked in red in Figure 8-1 below, as provided in Ohio's January 2017 recommendation.[11]

Figure 8-1. Map of the Avon Lake Area of Lorain County (with 3 km radius shown).



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Ohio reviewed and submitted modeling conducted by a consultant on the behalf of Avon Lake. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. This was the only analysis that the EPA received for this area. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

[11] Several figures in this document are copied from the document prepared by a consultant titled, "1-hour SO_2 NAAQS Compliance Modeling per the Data Requirements Rule for NRG Power Midwest LP Avon Lake Generating Station Ohio EPA Facility ID 02-47-03-0013 Revised Report No. 3," October 2016. Figures footnoted for brevity as "Ohio's 2017 Recommendations, Appendix G" refer to this document.

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8.3.2. Modeling Analysis Performed by Avon Lake's Consultant and Submitted by Ohio

8.3.3. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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's modeling used AERMOD version 15181 in the regulatory default mode. A discussion of the approach to the individual components of the modeling system is provided in the corresponding discussion that follows. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Avon Lake area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Avon Lake area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

8.3.4. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the consultant used mapping software to determine that the land use within a 3 km radius of Avon Lake is more than 50% rural, and therefore the consultant determined that it was appropriate to run the model in rural mode. The 3-kilometer radius around Avon Lake, shown above in Figure 8-1, is roughly half Lake Erie and half residential with some light industry. The EPA concurs with the decision to model the Avon Lake area as rural.

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8.3.5. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

For Lorain County, no sources other than Avon Lake were determined by the state to have the potential to cause significant concentration gradients within the area of analysis that merited explicit inclusion in modeling. Oberlin College, approximately 27 km from Avon Lake, emitted 230 tpy in 2014, but permanently shut down both of its coal boilers in April of 2014. Republic Steel, approximately 9 km from Avon Lake, emitted 23 tpy in 2014. West Lorain Plant, which emitted 73 tpy in 2014, is approximately 20 km from Avon Lake. Kokosing Materials-Plant 503 emitted less than 3 tons in 2014. The other facilities in Lorain County emitted between 3 to 15 tons each and are all over 20 km from Avon Lake. Therefore, only Avon Lake was explicitly modeled, and any impacts from nearby sources are addressed by the background concentration. Figure 8-2, provided by the state, shows the location of Avon Lake and other facilities in Lorain County. The EPA agrees that these other sources have sufficiently low emissions at sufficient distance from the expected area of maximum concentrations that the impacts of these sources may reasonably be represented as part of the background concentration.

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Figure 8-2. Lorain County SO_2 Sources.

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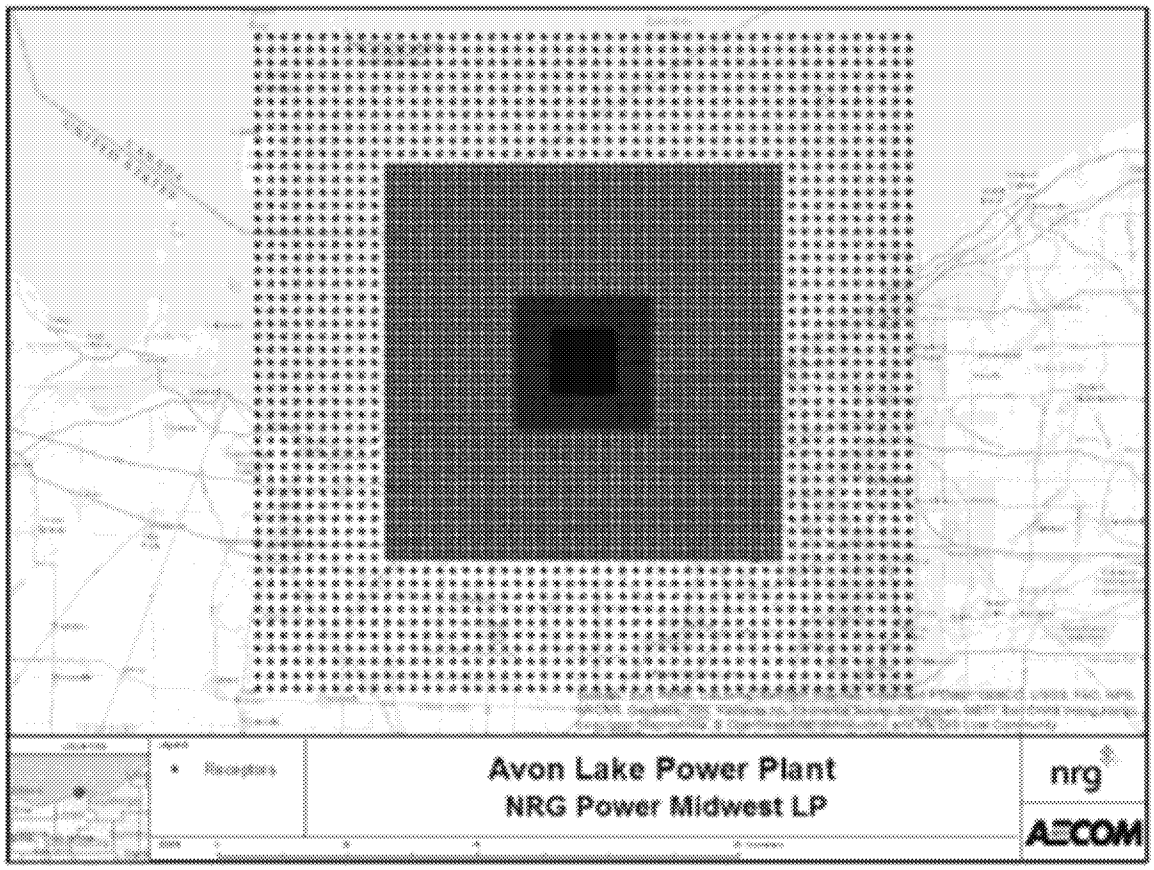
The receptor network for the Avon Lake modeling analysis contained 11,582 receptors, covering the northeastern portion of Lorain County. Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air to the modeled facility. The state opted to include receptors over Lake Erie. The state excluded receptors within the facility fenceline. Maximum concentrations were reported separately for both overwater and land-based receptors.

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

- Every 50 meters along the facility fenceline.
- 100-meter spacing to 3 km
- 200-meter spacing to 5 km
- 500-meter spacing to 10 km
- 1000-meter spacing to 30 km.

Figure 8-3, included with the state's recommendation, shows the receptor grid used for the Avon Lake analysis.

Figure 8-3: Receptor Grid for the Avon Lake Area



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8.3.6. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash, and following GEP policy when modeling allowable emissions.

Only Avon Lake was modeled in this analysis. The state characterized this source in accordance with the best practices outlined in the Modeling TAD. The state followed the EPA's good engineering practices (GEP) policy in conjunction with modeling allowable emissions limits. The stack for Boiler 12/Unit 9 was built before 1971, so it meets the grandfather provisions and was therefore allowed to be modeled at its actual height. The stack for Boiler 10/Unit 7 was rebuilt in the 1970s. Its GEP height was calculated based on the controlling Boiler 12/Unit 9 building, and found to be greater than the actual Boiler 10/Unit 7 stack height. Therefore, Boiler 10/Unit 7 was also modeled at its actual height. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM, version 04274, was used

to assist in addressing GEP stack height and building downwash. The EPA concurs with this aspect of the state's analysis.

8.3.7. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

Avon Lake agreed to operating restrictions and new emission limits as part of this analysis and the state's designation recommendation process. The state performed a modeling analysis of Avon Lake to find emission limits which would provide for attainment of the 2010 SO_2 NAAQS. In accordance with the EPA's Modeling TAD, the state modeled Avon Lake with the most recent 3 years of meteorological data.

The state performed a load analysis to examine several different operating scenarios for Avon Lake. These include full load, mid load, minimum load, and startup conditions. Boiler 10 was assumed to operate only during the startup condition, as it currently only provides support steam for Boiler 12. Avon Lake's permit requires that Boiler 10 operate at no more than 10% of its annual heat capacity, in accordance with requirements for "limited use boilers." The state determined that the full load scenario had the largest ambient impact. Another analysis then determined the critical emission values which would provide for attainment during the full load operating scenario. This value was used to set Avon Lake's new allowable emission limits.

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Table 8-1. Emissions Used in Avon Lake Load Analysis

Emissions Data	Boiler	Load Analysis Based on the rated capacity of the boiler (MMBtu/hr) and a reference SO_2 emission rate of 1.0 lb/MMBtu			
		Full	Mid	Minimum	Startup for Boiler 12
SO_2 Emission Rate (lb/hr)	10	0	0	0	339.3
	12	6,040.00	4,595.26	3,150.52	3,020.00
SO_2 Emission Rate (g/s)	10	0	0	0	42.75
	12	761.03	578.99	396.96	380.51
Exit Velocity (m/s)	10	n/a	n/a	n/a	16.6
	12	22.6	17.5	13.1	13.1
Exit Temperature (K)	10	n/a	n/a	n/a	466.9
	12	420	407.5	401.5	401.5

Using the results of this analysis, Ohio set new limits for five SO_2 sources at Avon Lake: two coal-fired boilers (Boiler 10/B010 and Boiler 12/B012), one oil-fired combustion turbine (B013), and two package boilers which use natural gas or fuel oil (B015 and B016). Units B010, B012, B013, B015, and B016, combined, may not exceed 9,600 pounds per hour on a 1-hour average basis. Boilers 10 and 12 (B010 and B012), combined, may not exceed 1.59 pounds per million British Thermal Units (lb/MMBtu), on a rolling 30-day average. SO_2 emissions from B013, B015, and B016 at the Avon Lake facility have typically been very low (less than 0.3 tons per year between 2012 and 2014), so the modeling focused on B010 and B012, but all five units are included in the enforceable SO_2 emission limit. On November 23, 2016, Ohio issued a federally enforceable permit to Avon Lake, effective January 13, 2017, which requires the facility to comply with these limits. The permit, Permit Number P0121748, was provided as part of Ohio's submittal. Avon Lake's SO_2 emissions before and after the new limits are summarized in Table 8-1.

Table 8-2. SO_2 Emissions Before and After New PTE from Avon Lake

Source Name	Actual SO_2 Emissions (tpy)			Total SO_2 Emissions After Limits (all sources combined)
	2012	2013	2014	
B010 Boiler No. 10 (Unit 7)	1,262	1,562	1,822	42,048 tpy

Source Name	Actual SO_2 Emissions (tpy)			Total SO_2 Emissions After Limits (all sources combined)
	2012	2013	2014	
B012 Boiler No. 12 (Unit 9)	37,045	39,562	33,113	(9,600 lb/hr)
B013 Combustion Turbine CT-10	<0.1	0.3	0.1	
B015 Package Boiler 1	<0.1	<0.1	<0.1	
B016 Package Boiler 2	<0.1	<0.1	<0.1	

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Ohio's modeling used the 1-hour average emission limit (9,600 pounds per hour) in its analysis. If Ohio were relying solely on the 30-day average limit of 1.59 lb/MMBtu, the EPA would expect Ohio to model emissions at an adjusted rate that would reflect a comparably stringent 1-hour limit. However, because Ohio has established a 1-hour average mass emission limit, and the 30-day average emission rate limit may be considered a supplemental limit, the modeling of the 1-hour average limit is an appropriate test of whether the limit provides for attainment.

However, questions remain as to whether the modeling addresses worst-case conditions, so as to demonstrate that the limit provides for attainment even in the worst case distribution of emissions. The analysis does examine a range of routine operating scenarios, with the intent of evaluating which scenario is most likely to cause worst case air quality. However, given that the limit is expressed as a limit that extends across multiple units, a showing of attainment must include a showing that attainment can be expected under the full range of operational options that comply with this multi-unit limit. The scenarios modeled include operation of Boiler 12 at three loads with no operation of Boiler 10, but the only other scenario modeled has 30 percent of normal maximum load at Boiler 10, in combination with 50 percent load on Boiler 12. No scenario with full load on Boiler 10 is modeled, even though such a scenario appears fully feasible and permissible under the issued limit. For this reason, Ohio has not fully demonstrated that emissions in compliance with the limit will result in attainment of the standard. In addition, Ohio has not provided modeling of actual emissions in this area. Although total emissions in 2012, 2013, and 2014 in each case are less that the annual totals that correspond to 9,600 pounds per hour, numerous hours in these years and in 2015 have emissions well above this level, so that Ohio's analysis is also not necessarily indicative of actual air quality for these years.

8.3.8. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for Avon Lake, the state selected the surface meteorology from the NWS station at Cleveland Hopkins International Airport (KCLE), located approximately 20 km southeast of Avon Lake, and coincident upper air observations from the NWS station at Buffalo Niagara International Airport (KBUF), approximately 315 km northeast of Avon Lake, as best representative of meteorological conditions within the area of analysis.

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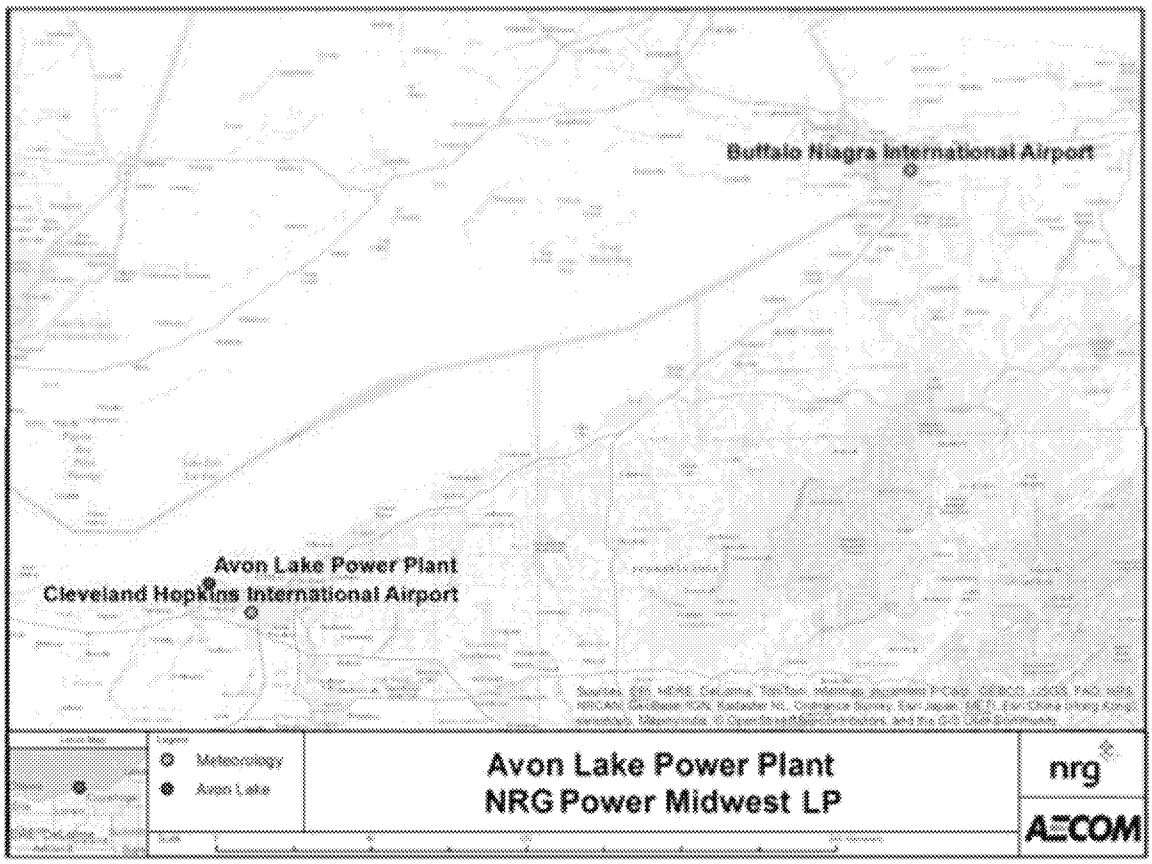
The consultant used AERSURFACE version 13016 to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance (and were determined from the most recent 30-year precipitation normal for the surface station), and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions.

In Figure 8-4, included in the analysis provided with the state's recommendation, the location of the surface and upper air NWS stations are shown relative to the area of analysis.

Figure 8-4. Location of Meteorological Stations Relative to Avon Lake



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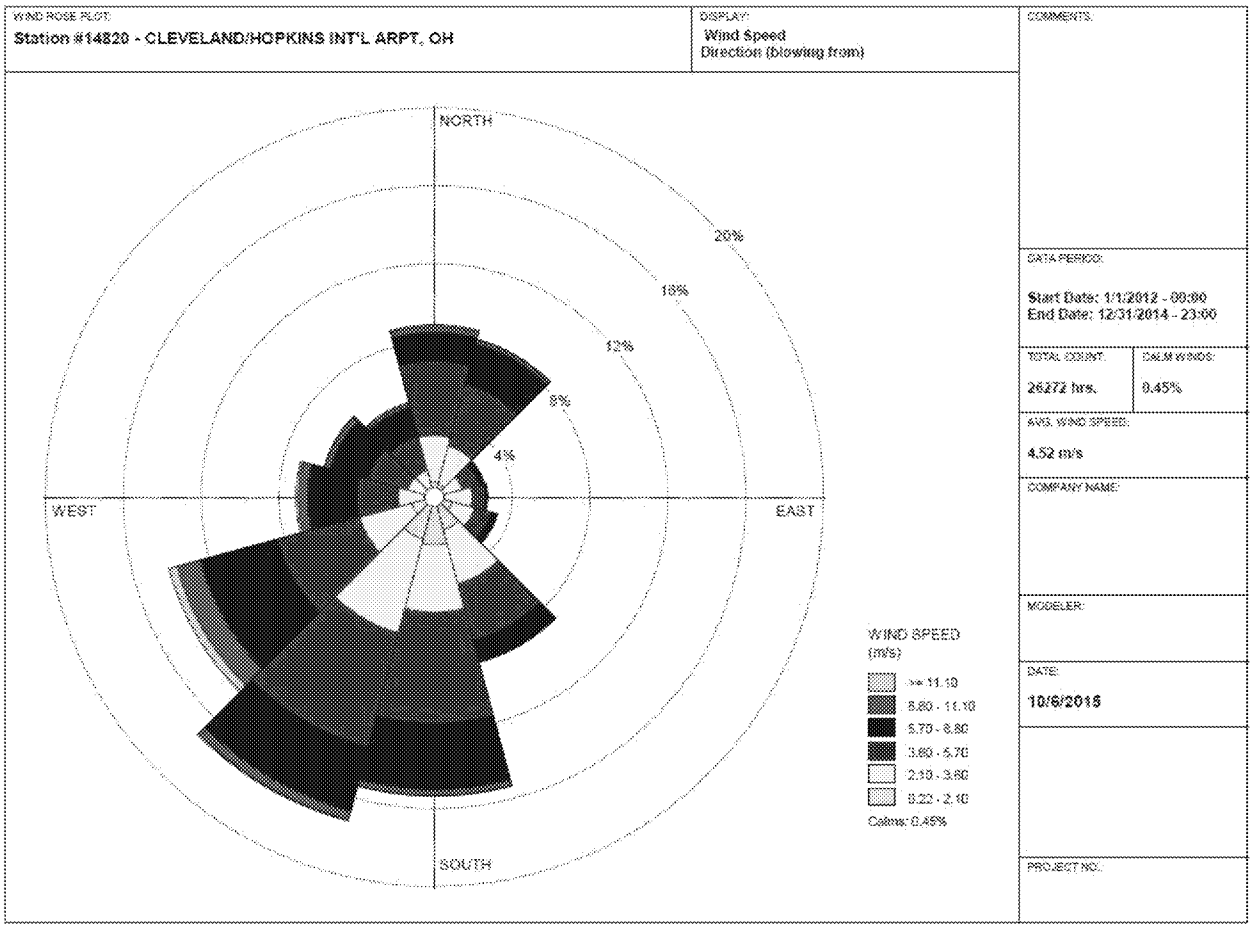
As part of its documentation, the state provided the 3-year 2012-2014 surface wind rose for Cleveland Hopkins International Airport. In Figure 8-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The meteorological data shows a dominant flow from the southwest, and significant flow from the northeast.

Figure 8-5: Cleveland Hopkins International Airport Cumulative Annual Wind Rose for Years 2012-2014



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Meteorological data from the above surface and upper air NWS 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. The state did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

The state used AERMINUTE version 14337 to process 1-minute data from Cleveland Hopkins International Airport. This data was subsequently processed with AERMET version 15181 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, compared to standard hourly NWS data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. Wind speeds lower than this value are treated as calms and not used for determining concentrations.

The EPA finds the state adequately selected and processed meteorological data for the area.

8.3.9. Modeling Parameter: Geography, Topography and Terrain

The terrain in the area of analysis is best described as mostly flat. Nevertheless, the AERMAP terrain program within AERMOD, version 11103, was used to specify terrain elevations for all the receptors, based on 30 meter USGS National Elevation Data. The EPA concurs with this treatment of local terrain data.

8.3.10. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose the tier 2 approach. The analysis of background concentrations for Avon Lake used ambient air monitoring data collected at the Eastlake site, site number 39-085-0003, for the period April 16, 2015, through June 30, 2016. This time period was chosen because this monitor could better represent Lorain background air quality after the nearby Eastlake power plant, which had been emitting between 20,000 and 50,000 tpy of SO_2, had shut down just previously. The Eastlake monitor is located on Lake Erie, 56 km east of Avon Lake. The city of Cleveland lies between Avon Lake and the Eastlake monitor site, but the set of small sources near Eastlake is similar to the set of small sources in Lorain County other than Avon Lake. Background concentrations from the dataset were developed using the procedure defined in the Modeling TAD. These background concentrations ranged from 2 to 11 ppb, corresponding to 5 to 29 $\mu g/m^3$.[12] The EPA concurs that these are appropriate representations of background concentrations for the area.

8.3.11. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Avon Lake area of analysis are summarized below in Table 8-2.

[12] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 $\mu g/m^3$.

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Table 8-3: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Avon Lake Area

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	6
Modeled Fencelines	1
Total receptors	11,582
Emissions Type	PTE
Emissions Years	PTE limits, effective 1/13/2017
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Cleveland Hopkins International Airport (KCLE)
NWS Station Upper Air Meteorology	Buffalo Niagara International Airport (KBUF)
NWS Station for Calculating Surface Characteristics	Cleveland Hopkins International Airport
Methodology for Calculating Background SO_2 Concentration	Tier 2, Season/hour of day, using data from site number 39-085-0003
Calculated Background SO_2 Concentration	2-11 ppb

The results presented below in Table 8-3 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

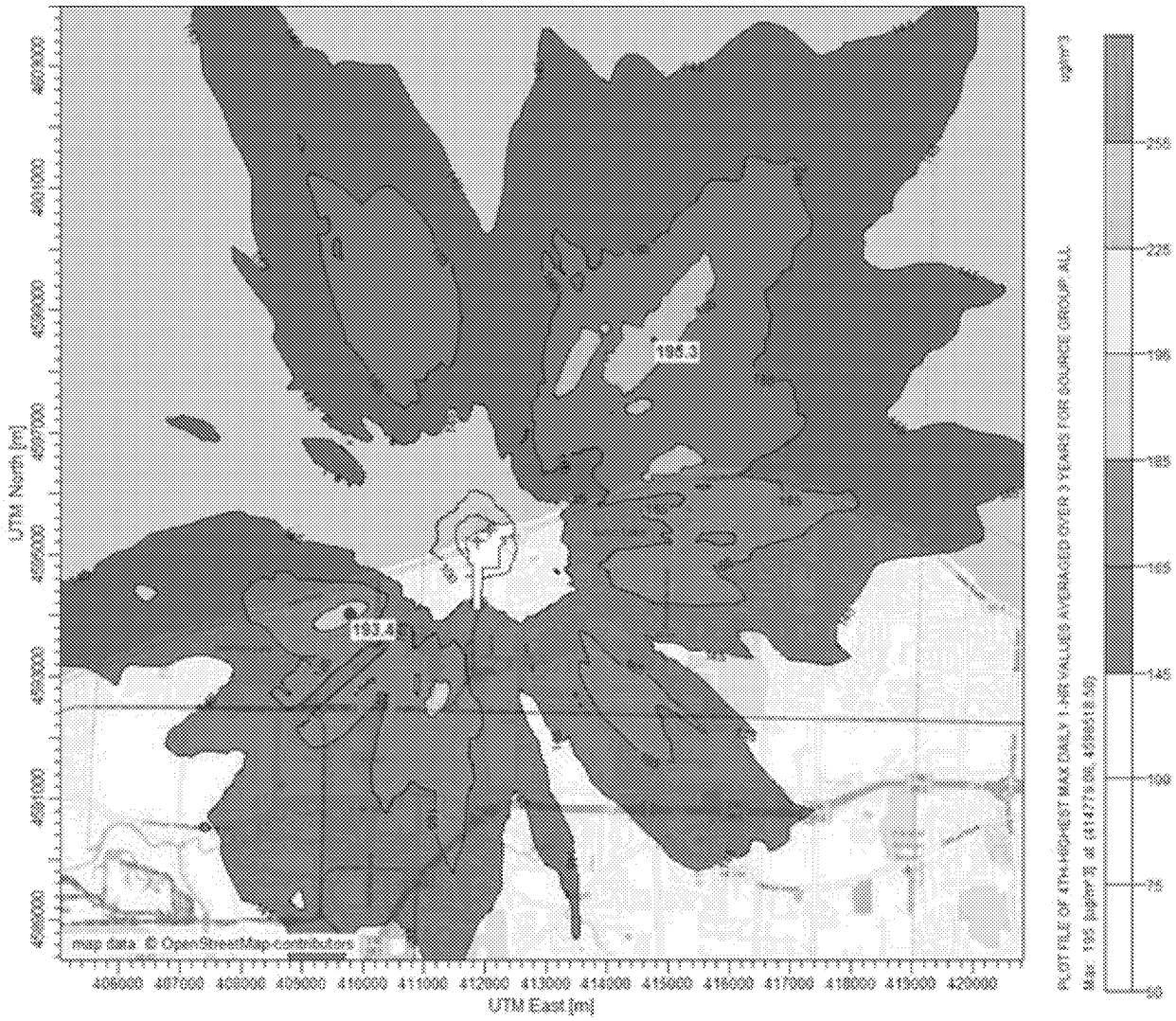
Table 8-4. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Avon Lake Area

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	409800	4594000	193.4	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The modeling results indicate that the highest predicted 99th percentile daily maximum 1-hour concentration within the on-land portion of the chosen modeling domain is 193.4 $\mu g/m^3$, equivalent to 73.8 ppb. This modeled concentration included a background concentration and is based on new PTE emission limits from the facility, as incorporated into a permit that Ohio provided with its submittal. The degree to which the modeling reflects allowable emissions is discussed below. Figure 8-6 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 2 km southwest of Avon Lake. In addition, modeling with receptors over Lake Erie, which under the recommendations of the Modeling TAD are optional, found a maximum concentration of 195.3 $\mu g/m^3$), equivalent to 74.6 ppb, 4.2 km northeast of the plant.

Figure 8-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Avon Lake Area of Analysis



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The modeling for Avon Lake indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area.

8.3.12. The EPA's Assessment of the Modeling Information Provided by the State

After reviewing the state's modeling analysis, the EPA considers the Avon Lake modeling assessment to be acceptable in most respects. The state used AERMOD version 15181 and modeled the Avon Lake facility using a nearby representative meteorological data site and a dense receptor grid around the facility, and appropriate background concentrations are used. The modeled results do not indicate a violation of the 2010 SO_2 NAAQS. In addition, while a violation is being monitored in neighboring Cuyahoga County, this monitor is 33 km away, the EPA has concluded that contributions to this monitored violation are quite localized (as discussed in Section 5 above), and the evidence from Ohio's modeling of Avon Lake supports the view that this source does not contribute to the violation monitored in Cuyahoga County, and other violations are even less nearby.

However, in one important respect, this analysis does not properly address whether allowable emissions provide for attainment. The limit is established as limiting the sum of emissions over multiple units, but Ohio does not provide adequate analysis of whether it has modeled the worst case distribution of these emissions. Therefore, the EPA is unable to determine whether compliance with the limits would necessarily result in attainment, and Ohio's analysis also does not provide a reliable indication of whether actual emissions are resulting in attainment.

8.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Lorain County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. Due to reasons explained above, the EPA is unable to determine whether compliance with the modeled limits would necessarily result in attainment, and Ohio's analysis also does not provide a reliable indication of whether actual emissions are resulting in attainment.

8.5. Jurisdictional Boundaries in Lorain County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Lorain County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA intends to designate the entirety of Lorain County as unclassifiable/attainment. The EPA believes that our intended unclassifiable/attainment area bounded by Lorain County's borders will have clearly defined legal boundaries, and we intend to find the county boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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8.6. The EPA's Assessment of the Available Information for Lorain County

After careful review of the modeling assessment, the EPA concludes that it cannot determine air quality near Avon Lake and intends to designate Lorain County as unclassifiable because Ohio did not demonstrate that its representation of emissions in the dispersion modeling of its DRR source area relied on the worst case distribution of allowable emissions. Thus, while Ohio's analysis showed that emissions of 9,600 pounds per hour from Boiler 12 would result in no modeled violations of the standard, the EPA cannot determine whether other permissible distributions of these allowable emissions would also have shown attainment.

No monitors are located in Lorain County, and the monitors in other Northeast Ohio counties are too distant to be representative of whether this area is meeting the NAAQS. As discussed in Section 5, although a monitor in neighboring Cuyahoga County monitored a violation for 2014 to 2016, the EPA finds that that violating area is relatively localized. For similar reasons as discussed in Section 5, including the fact that the primary emission source in Lorain County (Avon Lake) is 33 km from the violating monitor, the EPA does not consider any part of Lorain County to be contributing to the monitored violation in Cuyahoga County.

8.7. Summary of Our Intended Designation for Lorain County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the entirety of Lorain County as unclassifiable for the 2010 SO_2 NAAQS because on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS.
Figure 8-7 shows the boundary of this intended designated area.

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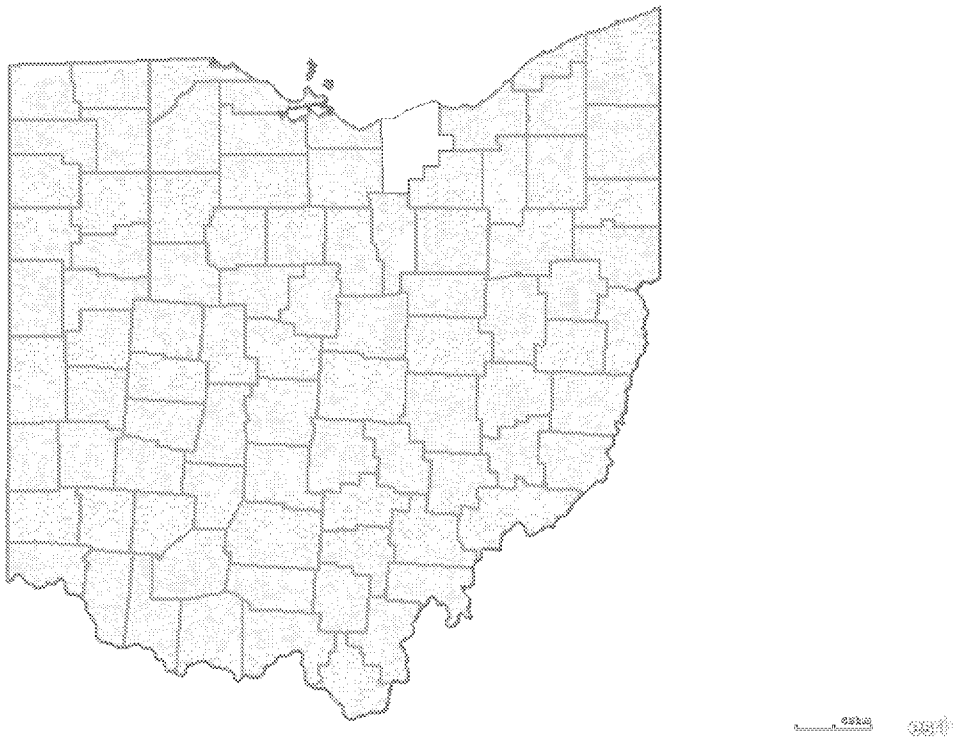
Figure 8-7. Boundary of the Intended Lorain County Unclassifiable Area



9. Technical Analysis for Lucas County

9.1. Introduction

The EPA must designate the Lucas County area by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Lucas County. This area contains the FirstEnergy Generation Bay Shore facility (Bay Shore), a coal fired power plant which emitted 2,002 tons of SO_2 in 2014. This area also includes the BP-Husky Refining facility, which emitted 1,618 tons of SO_2 in 2014 and which Ohio listed as necessitating further air quality characterization due to its proximity to Bay Shore. Ohio is required by the DRR to characterize SO_2 air quality around these facilities due to their listing under the DRR. Ohio has chosen to characterize these facilities by modeling. Ohio recommended designating Henry and Fulton Counties along with Lucas County, as those two counties border Lucas County and the combined SO_2 emissions of the two counties are well below 2,000 tpy. Because the modeling for Lucas County did not characterize air quality for the majority of Henry and Fulton Counties, this chapter addresses Henry and Fulton Counties together in Section 12.

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The designation recommendation for Lucas County and the DRR modeling for Bay Shore are addressed in the following paragraphs.

9.2. Air Quality Monitoring Data for Lucas County

This factor considers the SO_2 air quality monitoring data in Lucas County. The state included monitoring data for 2013-2015 from Air Quality System monitor 39-095-0008. This monitor is located in Toledo, in Lucas County, approximately 4.5 km southwest of the FirstEnergy Generation Bay Shore facility. The Ohio's modeling suggests that this monitor is not located in the area of maximum impacts from the pertinent facilities. Figure 9-1, provided by the state, shows the location of the monitor. Data collected at this monitor indicates that the highest concentration recorded during the years 2013- 2015 was 36 ppb. This monitor experienced several extended outages during each of the years, 2013-2015, so a full 3-year average could not be calculated. However, as the monitor is located in an industrial area of Toledo between several facilities, the fact that the maximum monitored concentration was only about half the SO_2 standard suggests that the area is likely attaining the standard. Table 9-1 provides summary statistics for the valid days of monitored data. The EPA confirmed that there is no additional relevant data in AQS that could inform the intended designation action.

Figure 9-1. Location of Toledo Air Quality Monitor.

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Table 9-1. Monitor 39-095-0008 Summary Statistics, 2013-2015

	Valid Days	99th Percentile (ppb)	Mean (ppb)	Median (ppb)	Mode (ppb)	MAX (ppb)
2013	342	30	6	3	1	36
2014	248	17	4	3	2	26
2015	289	19	4	3	2	30

9.3. Air Quality Modeling Analysis for Lucas County

9.3.1. Introduction

This section presents the available air quality modeling information for a portion of Lucas County that includes Bay Shore and BP-Husky. (This portion of Lucas County will often be referred to as "the Bay Shore area" within this section). The area that the state has assessed via air quality modeling is located near the cities of Toledo and Harbor View, in northern Ohio along the Maumee River and Lake Erie. This area contains two SO_2 sources around which Ohio is required by the DRR to characterize SO_2 air quality. Ohio listed the FirstEnergy Bay Shore Power Plant because this source emitted 2,002 tons of SO_2 in 2014. Ohio listed BP-Husky Refining LLC (BP-Husky), which emitted 1,618 tpy in 2014, "due to its close proximity to [Bay Shore]." Its collocated facility, Chemtrade Refinery Solutions (Chemtrade), which emitted 35 tpy in 2014, is not on the SO_2 DRR Source list. However, Ohio determined that this facility warranted inclusion in the modeling analysis, due to its proximity.

Figure 9-2, provided by the state, shows the Bay Shore and BP-Husky facilities near Lake Erie, approximately 10 km northeast of downtown Toledo. Also included in the figure are other nearby emitters of SO_2 within 50 km of Bay Shore.

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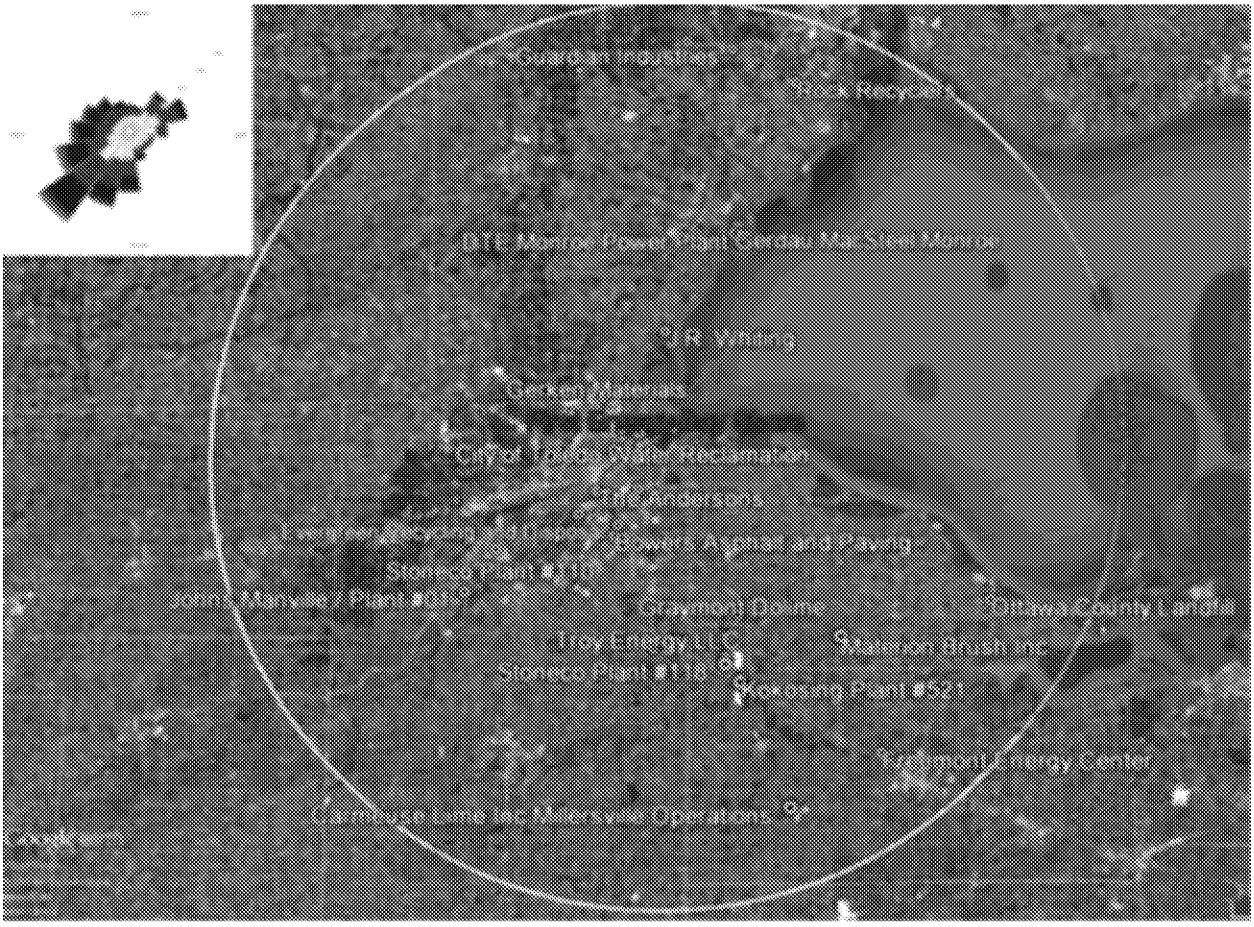
Figure 9-2. Map of the Bay Shore Area



Ohio's 2017 Recommendations, Appendix W

In its submission, Ohio recommended that the entirety of Lucas County be designated as unclassifiable/attainment based on an assessment and characterization of air quality impacts from these facilities and the other nearby sources that may have a potential impact in the area. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendations for the Lucas County area, and intends to designate the area as unclassifiable/attainment. The following sections discuss a modeling assessment that the EPA received from Ohio, which was the only analysis that the EPA received for this area.

9.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

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- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: 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 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Bay Shore area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted friction velocity (ADJ_U*) parameter in AERMET. The Bay Shore area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

9.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. Ohio conducted a land use analysis of the area surrounding the Bay Shore facility over a 3-kilometer radius. Their analysis, performed with and then without consideration of Lake Erie, indicated that rural dispersion coefficients should be utilized in the AERMOD model. The EPA concurs that rural dispersion is appropriate for the modeled area. While the Bay Shore plant is located near the city of Toledo, it is 9 km from the downtown area. Within the 3-kilometer radius of consideration around the source as recommended by the Auer-Irwin method of determining rural or urban characteristics for modeling, the area contains farmland, residential areas, a railyard, some light industrial areas, and Maumee Bay of Lake Erie.

9.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the

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extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.
The state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property. The state opted to apply a regular grid of receptors without excluding selected receptor locations over nearby water bodies such as Lake Erie. Ohio conducted additional analysis to determine impacts within the other plants' properties. The maximum concentration modeled by Ohio (as discussed in section 9.3.10 below) is well outside plant property, and so the EPA believes that exclusion of receptors on plant property did not influence whether maximum concentrations were found to attain the standard.

The facilities subject to the DRR in this area, Bay Shore and BP-Husky Refining, are described in the introduction to this section. For the Lucas County area, the state considered 20 other emitters of SO_2 within 50 km of the Bay Shore Facility. The state determined that this was the appropriate distance to adequately assess which sources might have a potential impact on SO_2 air quality in the Bay Shore area of analysis. The other facilities not included separately in the modeling in Lucas County each emitted less than 180 tpy in 2014 and are located at least 7 km from Bay Shore. Pilkington North America, located 14 km from Bay Shore in Wood County, emitted 406 tpy in 2014. The background air quality monitor is located such that it accounts for contributions from these more distant facilities. See Figure 9-1.

Several large facilities are located in Michigan, north of Toledo. Based on their distance from Toledo, and the fact that Toledo's winds come predominantly from the southwest, Ohio considered it unlikely that the Michigan facilities would cause a significant concentration gradient that would affect the maximum concentration in the Bay Shore area of analysis. The J. R. Whiting power plant, which is the closest Michigan facility at 11 km, emitted 6,439 tpy in 2014, but enforceably closed its coal units in April 2016.[13] The DTE Electric Company – Monroe Power Plant emitted 6,286 tpy in 2014. It is located 23 km from Bay Shore. Ohio determined that its contribution in the Bay Shore area of analysis would be adequately characterized by the background concentrations. Given the distance and magnitude of emissions from these various sources, and the resulting likelihood that the sources will not cause a significant concentration gradient near the maximum concentration area in Lucas County, the EPA concurs with Ohio's decision to include Bay Shore, BP-Husky, and Chemtrade in the analysis and to rely on background concentrations to represent the impacts of the other facilities.

The modeled receptor network contained 32,069 receptors, and the network covered Lucas County and portions of neighboring counties within a 50 km radius of Bay Shore Power Plant and BP-Husky.

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

- 50-meter spacing along the fencelines of both Bay Shore and BP-Husky

[13] Further information on the enforceability of this closure is provided in the TSD for the Round 2 designation of Monroe County, Michigan, available at https://www.epa.gov/sites/production/files/2016-07/documents/r5_mi_final_designation_tsd_06302016.pdf.

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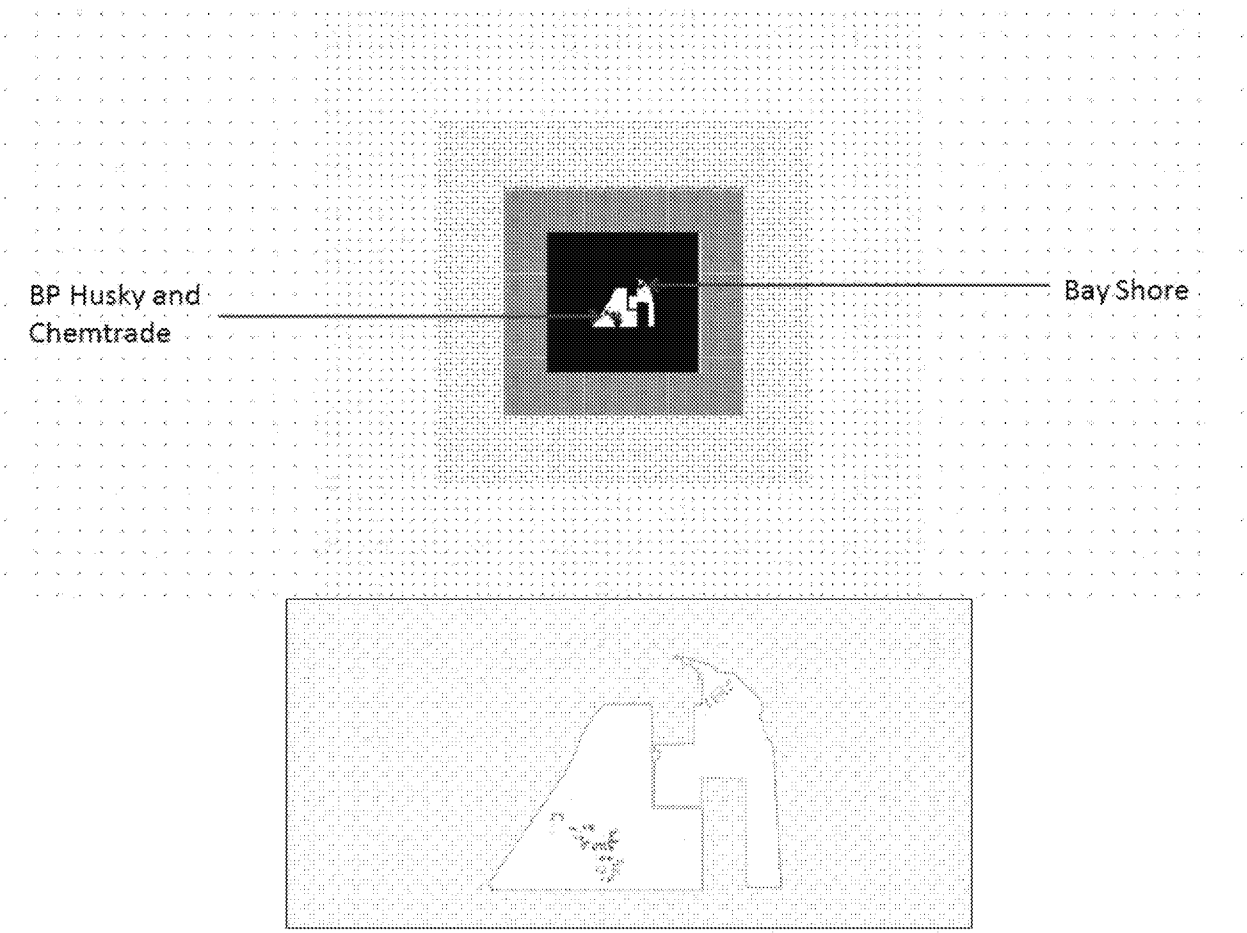
- 50-meter spacing to 2 km
- 100-meter spacing to 4 km
- 250-meter spacing to 7 km
- 500-meter spacing to 12 km
- 1,000-meter spacing to 25 km
- 2,500-meter spacing to 35 km
- 5,000-meter spacing to 50 km

A separate set of 195 receptors with 150-meter spacing was used to address impacts from Bay Shore, BP-Husky, and Chemtrade within each other's fenceline, treating each plant's property as ambient air with respect to the other facilities.

Figure 9-3, included in the state's recommendation, shows the receptor grid for the area of analysis. The EPA finds the state's receptor grid adequate for the area of analysis.

Figure 9-3: Receptor Grid for the Bay Shore Analysis



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9.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

The sources explicitly modeled in the Lucas County analysis were Bay Shore, BP-Husky, and Chemtrade. Bay Shore and BP-Husky were modeled because the facilities were listed as DRR sources. Chemtrade was included because it is collocated with BP-Husky.

The state characterized these sources in accordance with the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also characterized the source's building layout and location and the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash. The EPA concurs with Ohio's characterization of the modeled facilities.

9.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

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As previously noted, the state included Bay Shore Power Plant, BP-Husky Refining, and one other emitter of SO_2 in its analysis. The state has chosen to model these facilities using actual emissions. The facilities in the state's modeling analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below. This information is summarized in Table 9-2.

Table 9-2. Actual 2012-2014 SO_2 Emissions for Sources in the Bay Shore Analysis

Facility Name	SO_2 Emissions (tpy)		
	2012	2013	2014
Bay Shore	3,563	4,261	3,598
BP-Husky	1,618	1,618	1,618
Chemtrade Refinery Solutions	28.8	12.3	34.57
Total Emissions from All Modeled Facilities in the State's Area of Analysis	5,210	5,891	5,251

FirstEnergy Generation notified Ohio that it was permanently shutting down Bay Shore's coal-fired Boilers 2, 3, and 4 on December 17, 2015. Pursuant to this notification, this shutdown is permanent and enforceable. The units had been curtailed since September 2012. Ohio did not include emissions from the three boilers in the modeling assessment. Bay Shore's total SO_2 emissions dropped from approximately 11,000 tons in 2011 to 3,600 tons in 2014, due to the boilers' curtailment. Bay Shore's remaining unit, a pet-coke-fired circulating fluidized bed boiler, was included in the modeling analysis. FirstEnergy Generation submitted Bay Shore's actual hourly emissions data for this remaining boiler for 2012-2014 from its CEMS data, with missing or invalid hours filled using interpolation between valid hours. The BP-Husky facility does not collect hourly data for most of its SO_2-emitting sources. For most sources at this facility, a daily average actual emission rate was used. Therefore, Ohio modeled the same emission rate for the full three-year period. For Chemtrade, although Table 9-2 shows varying annual emission rates in the 2012 to 2014 period, the modeling used a conservative (highest annual) fixed emission rate at the 2014 emission level released from a single location with average flow and temperatures. The EPA concurs with Ohio's determinations of appropriate emission levels to model.

9.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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

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data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Bay Shore area of analysis, the state selected the surface meteorology from station #4848 located at the Toledo Executive Airport, Ohio, (KTDZ), and coincident upper air observations from the upper air station located at the Detroit/Pontiac, Michigan, Airport (KPTK, station #4830), as best representative of meteorological conditions within the area of analysis.

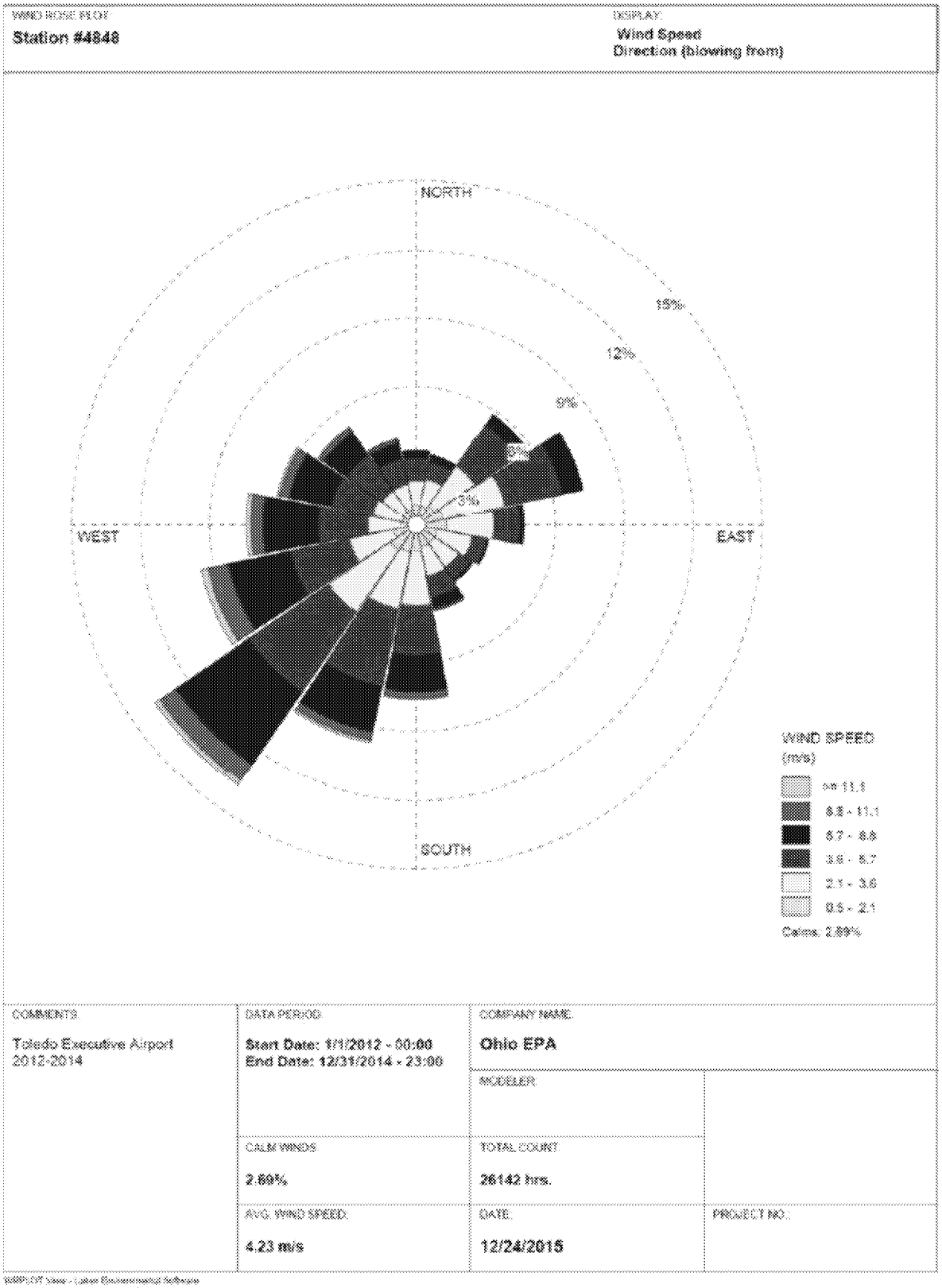
The state used AERSURFACE 13016 using data from the Toledo Executive Airport to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions.

The location of the NWS surface station is shown south of the Bay Shore facility at the lower edge of Figure 9-4 below, as provided by the state. The upper air station is located 108 km north of Bay Shore, and is not shown in the figure.

Figure 9-4. Bay Shore Area of Analysis and NWS Surface Station

As part of its recommendation, the state provided the 3-year surface wind rose for the Toledo surface station (KTDZ, #4848). In Figure 9-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The predominant winds in the source area originate from the southwest, with a significant contribution from northeasterly winds. Aside from the fact that BP-Husky is a listed source under the DRR, wind direction data and proximity suggests that emissions from BP-Husky would potentially impact ambient SO_2 concentrations, such that this source was necessary to model in the same analysis as any analysis of impacts from Bay Shore. Other sources southwest of Bay Shore are located such that the background monitor would be expected to reflect their impacts.

Figure 9-5: Toledo Cumulative Annual Wind Rose for Years 2012-2014



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Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling for Lucas County.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Toledo Executive Airport. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Toledo Executive Airport and was processed with the AERMINUTE preprocessor. These data were subsequently input into AERMET 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 than standard NWS hourly data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological and surface characteristics components of Ohio's modeling assessment.

9.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

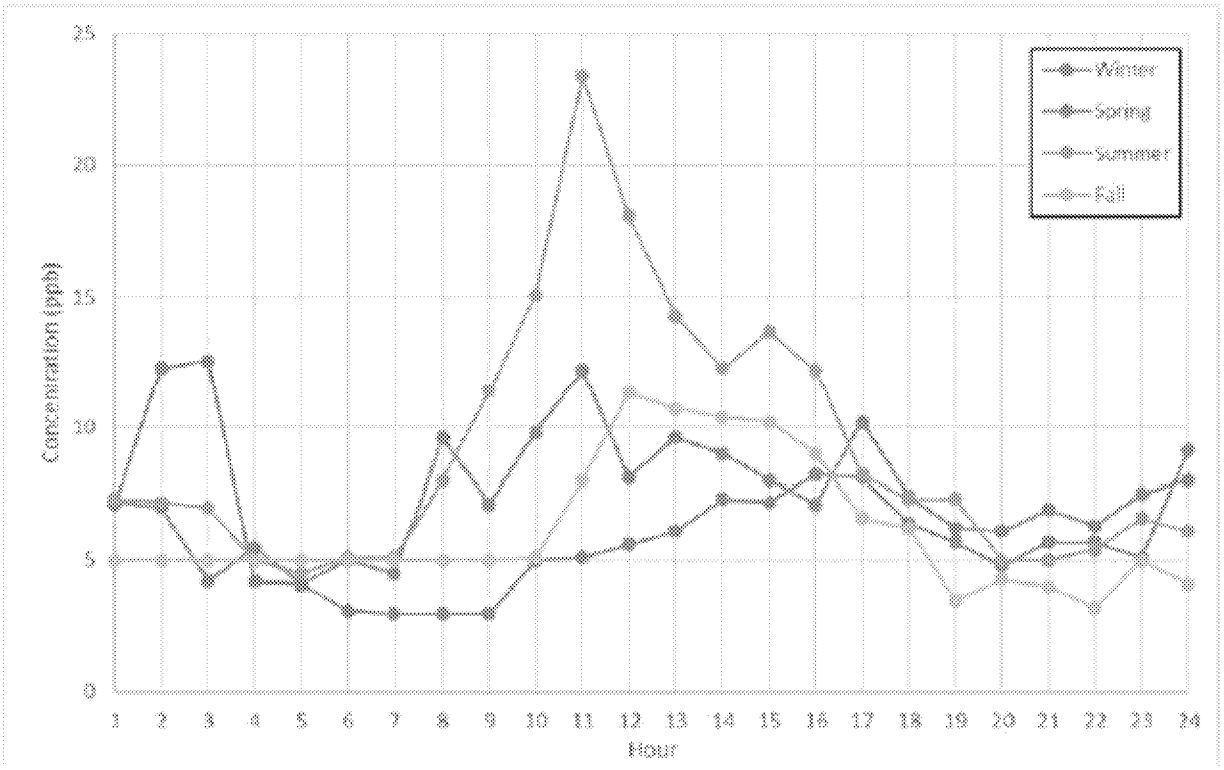
The terrain in the area of analysis is best described as flat to gently rolling. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA concurs with this approach to considering terrain in this area.

9.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose a tier 2 approach by season and hour of day to model background concentration. The

monitored background concentrations were derived from AQS monitor 39-095-0008, located 4.5 km southwest of the Bay Shore facility. Missing data at this monitor was discussed in section 9.2 of this TSD (see also Table 9-1). Despite these missing data, particularly in 2013, the EPA considers these data to be sufficiently complete to provide an adequate basis for assessing background concentrations in the Toledo area. A 45° sector of wind directions (22° - 67°) expected to lead to maximum impacts from Bay Shore and BP-Husky on the monitor was identified by finding the centerline heading between the monitor and the Bay Shore facility (44.5°). Data collected during times when the winds originated from that sector were eliminated from the background analysis to avoid double-counting emissions from the modeled sources. The EPA concurs with Ohio's approach and monitor selection and finds that data collected during other times is a suitable representation of background concentrations in Lucas County. Figure 9-6 below, provided by the state, shows the variability of the monitored background data by season and hour of day. The values range from 3 to 23.4 ppb, corresponding to a range from 8 to 61.3 μg/m^3, with an average value of approximately 8 ppb, or about 20 μg/m^3. [14]

Figure 9-6. Hourly and seasonal variable SO_2 background for the Bay Shore Analysis.



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[14] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 μg/m^3.

9.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Bay Shore area of analysis are summarized below in Table 9-3.

Table 9-3: Summary of AERMOD Modeling Input Parameters for the Bay Shore Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	30
Modeled Structures	88
Modeled Fencelines	2
Total receptors	32,069
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	#4848, Toledo Executive Airport (KTDZ)
NWS Station Upper Air Meteorology	Detroit/Pontiac, MI (KPTK, station #4830)
NWS Station for Calculating Surface Characteristics	#4848, Toledo Executive Airport (KTDZ)
Methodology for Calculating Background SO_2 Concentration	Tier 2, Varying by season and hour of day from Site: 39-095-0008
Calculated Background SO_2 Concentration	3-23.4 ppb

The modeling results presented below in Table 9-4 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 9-4. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Bay Shore Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	296750.00	4619350.00	175.3	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 175.3 $\mu g/m^3$, equivalent to 66.9 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the modeled facilities (excluding emissions from selected units that are permanently and enforceably shut down). Figure 9-7 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 1 km northwest of Bay Shore.

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Figure 9-7: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Bay Shore Area of Analysis

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The modeling submitted by the state does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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9.3.11. The EPA's Assessment of the Modeling Information Provided by the State

After reviewing Ohio's modeling analysis, the EPA considers their overall modeling assessment to be acceptable. Ohio used AERMOD version 15181 and explicitly modeled the Bay Shore facility and the BP-Husky Refining facility, both of which are subject to the DRR. The state also explicitly modeled the neighboring source Chemtrade, as the emissions from this source was deemed likely to cause a concentration gradient that would affect the maximum concentration in the modeled area due to its proximity. The local air quality monitor had experienced extended outages during recent years, but Ohio and the EPA still consider this data to be reasonably representative of local conditions based on the monitor's location in relationship to the modeled facilities and other local SO_2 emitters. The state chose a nearby representative meteorological data site and modeled a dense receptor grid around the facilities. Ohio's modeled results indicate that the area is not violating the 2010 SO_2 NAAQS and does not contribute to any nearby nonattainment areas.

9.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Lucas County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. The EPA believes that Ohio properly incorporated these factors into its analysis.

9.5. Jurisdictional Boundaries in Lucas County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Lucas County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA intends to designate the entirety of Lucas County as unclassifiable/attainment. The EPA believes that our intended unclassifiable/attainment area bounded by Lucas County's borders will have clearly defined legal boundaries, and we intend to find the county boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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9.6. The EPA's Assessment of the Available Information for Lucas County

After careful review of the modeling assessment, the EPA agrees with the state recommendation and intends to designate the entirety of Lucas County as unclassifiable/attainment because dispersion modeling of the area showed no modeled violations of the standard. Since no violations are identified nearby, Lucas County also does not contribute to any nearby violating areas. The local air quality monitor also showed no measured violations of the standard. These data were available to EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. The EPA finds the state's modeling to be acceptable as a basis for this designation

This section of the Ohio chapter specifically addresses Lucas County, because it contains two DRR sources for which the state characterized the area surrounding the sources through dispersion modeling. The state recommended designating Henry and Fulton Counties as unclassifiable/attainment along with Lucas County. These counties, which border Lucas County, do not contain any DRR sources, and Ohio's modeling for the Bay Shore area did not characterize air quality for the majority of these counties. The EPA's intended designations for Henry and Fulton Counties are addressed in section 12 of this chapter.

9.7. Summary of Our Intended Designation for Lucas County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the entirety of Lucas County as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Figure 9-8 shows the boundary of this intended designated area.

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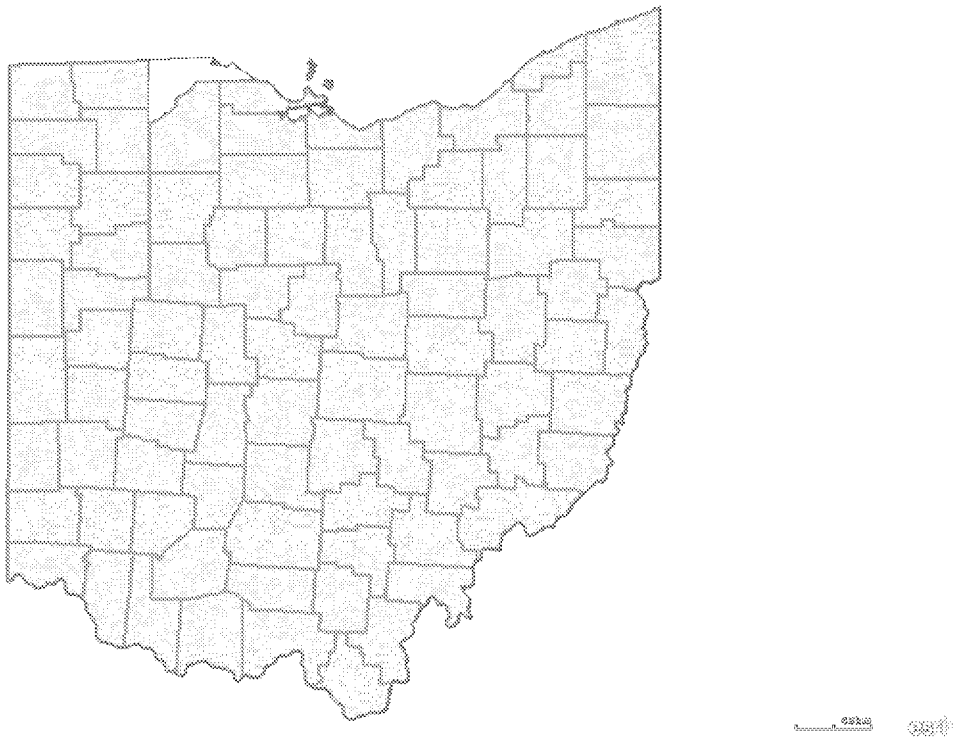
Figure 9-8. Boundary of the Intended Lucas County Unclassifiable/Attainment Area



10. Technical Analysis for Ottawa and Sandusky Counties

10.1. Introduction

The EPA must designate Ottawa and Sandusky Counties by December 31, 2017, because the counties have not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Ottawa or Sandusky Counties. Neither county contained a DRR source with emissions over 2,000 tpy, but Ohio committed to evaluate air quality near these two facilities, one in each county, in order to determine whether the sources represented a cluster of sources (with combined 2014 emissions exceeding 2,000 tpy) that merited listing as DRR sources. The two sources are Graymont Dolime (OH) Inc. (Graymont) in Genoa, Ottawa County, and Martin Marietta Magnesia Specialties Inc., (Martin Marietta) in Woodville, Sandusky County. Ohio used dispersion modeling to evaluate these facilities together as a cluster. This was the only such cluster which was identified in Ohio.

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10.2. Air Quality Monitoring Data for Ottawa and Sandusky Counties

There are no SO_2 monitors in Ottawa or Sandusky Counties. The nearest monitor is the Lucas County monitor, located in Toledo, approximately 24 km to the northwest of Graymont and Martin Marietta. This monitor had a design value of 23 ppb for 2013-2015. However, these data provide minimal evidence as to air quality in Ottawa or Sandusky County.

10.3. Air Quality Modeling Analysis for Ottawa and Sandusky Counties Area Addressing the Graymont/Martin Marietta Cluster

10.3.1. Introduction

This section presents all the available air quality modeling information for the portion of Sandusky and Ottawa Counties that includes Graymont in Genoa, Ottawa County, and Martin Marietta in Woodville, Sandusky County. (This portion of Ottawa and Sandusky Counties will often be referred to as "the Graymont/Martin Marietta Cluster area" within this section).

The Graymont facility emitted 810 tons in 2014 and is not on the SO_2 DRR source list. The Martin Marietta facility emitted 1809 tons in 2014 and is also not on the SO_2 DRR source list. However, since the two mineral processing facilities are located only 4.85 km from each other, and since together they emit over 2,000 tpy, Ohio performed a modeling analysis to evaluate whether these sources should be subject to the DRR. The area around this group of sources is being addressed in this section with consideration given to the impacts of these sources.

In its January 13, 2017, submission, Ohio recommended that an area that includes the area surrounding the Graymont/Martin Marietta Cluster area, specifically the entirety of Ottawa and Sandusky Counties, be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from these facilities and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in northern Ohio, about 20 km southeast of Toledo. Lake Erie lies 18 km to the northeast of the cluster area. The location of the two facilities is shown in Figure 10-1 below, provided by the state.

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Figure 10-1. Map of the Area of Analysis Containing Ottawa and Sandusky Counties

The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. The following sections discuss a modeling assessment that the EPA received from Ohio, which was the only analysis that the EPA received for this area.

10.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Graymont/Martin Marietta Cluster area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Graymont/Martin Marietta Cluster area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

10.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode for Graymont and Martin Marietta, since Ottawa and Sandusky Counties are primarily agricultural. The EPA concurs that the modeling domain is appropriately represented in the model as rural. A 3-kilometer radius around each facility contains only farmland and small residential areas.

10.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions evaluated in this analysis are described in the introduction to this section. The state did not include any other emitters of SO_2 in this analysis. No other sources were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. Since there are no other sources in these counties emitting 100 tpy or more of SO_2, the EPA agrees that an area of analysis that focuses on the impacts of these two sources is appropriate.

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The modeling domain extended approximately 3 km from the facilities on all sides. The receptor network contained 8,602 receptors, surrounding each facility and covering the area between them. Ohio used 50-meter spacing around the facilities' property lines, and 150 to 250-meter spacing beyond the facilities. While each facility's property is ambient air with respect to each other, an analysis of the individual facilities' impacts indicates that each facility's individual maximum impacts are near their own fencelines, and neither facility is causing high concentrations or exceedances at the edge of the other facility's property.

Receptor grids commonly extend farther from the applicable sources. However, in this case, Ohio used a relatively small receptor grid because it expected maximum concentrations to be near the respective sources. The results of Ohio's analysis, discussion in section 10.3.10 below, appear to support this approach. That is, the maximum concentrations were in fact estimated to be quite close to the respective facilities, and use of a larger receptor grid would not have yielded a higher concentration estimate and would not have altered the finding as to whether the area is attaining the standard.

Figures 10-2 and 10-3, provided by the state, show the Graymont/Martin Marietta Cluster area of analysis and the modeled receptor grid, respectively.

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Figure 10-2: Area of Analysis for Ottawa and Sandusky Counties

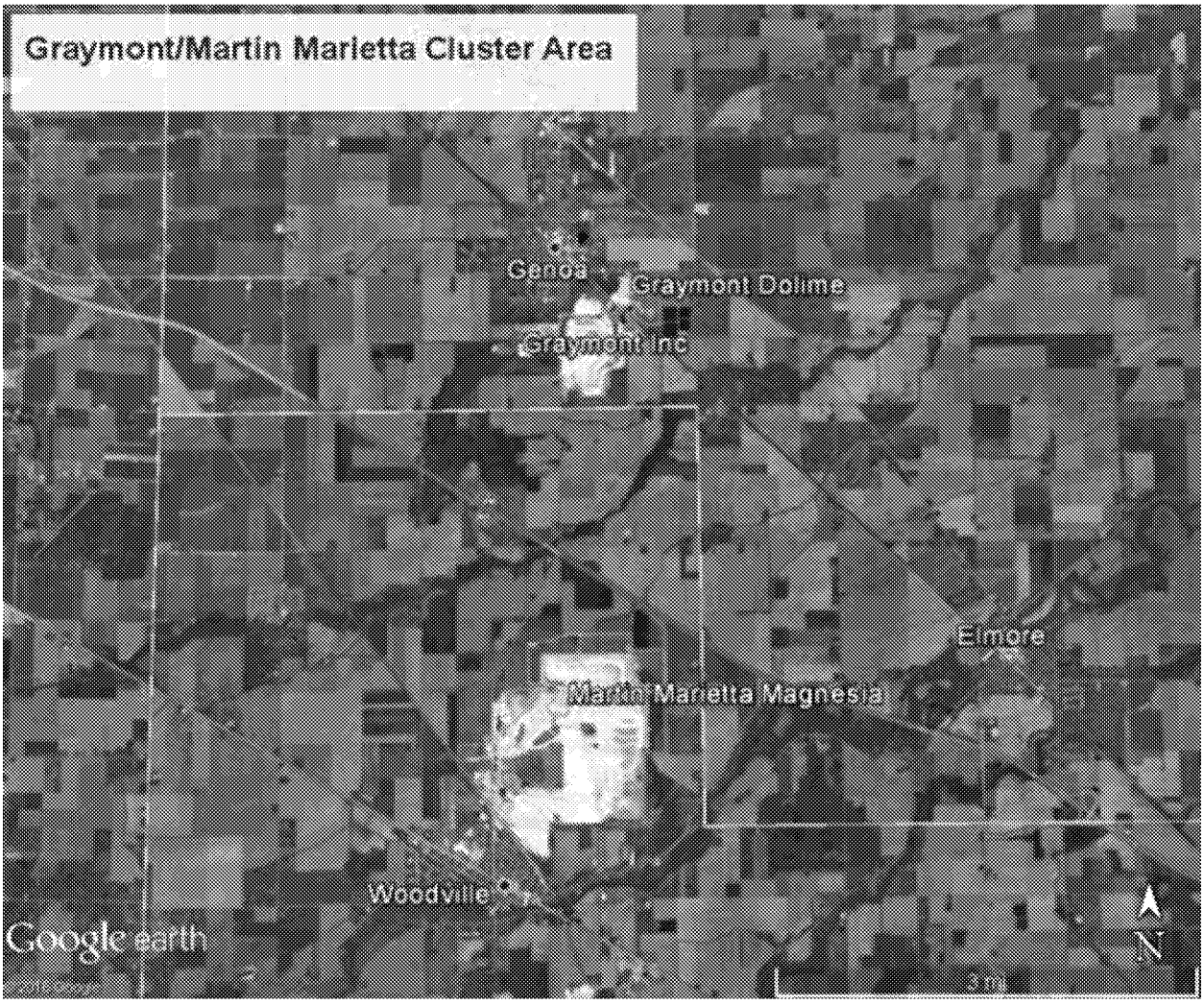
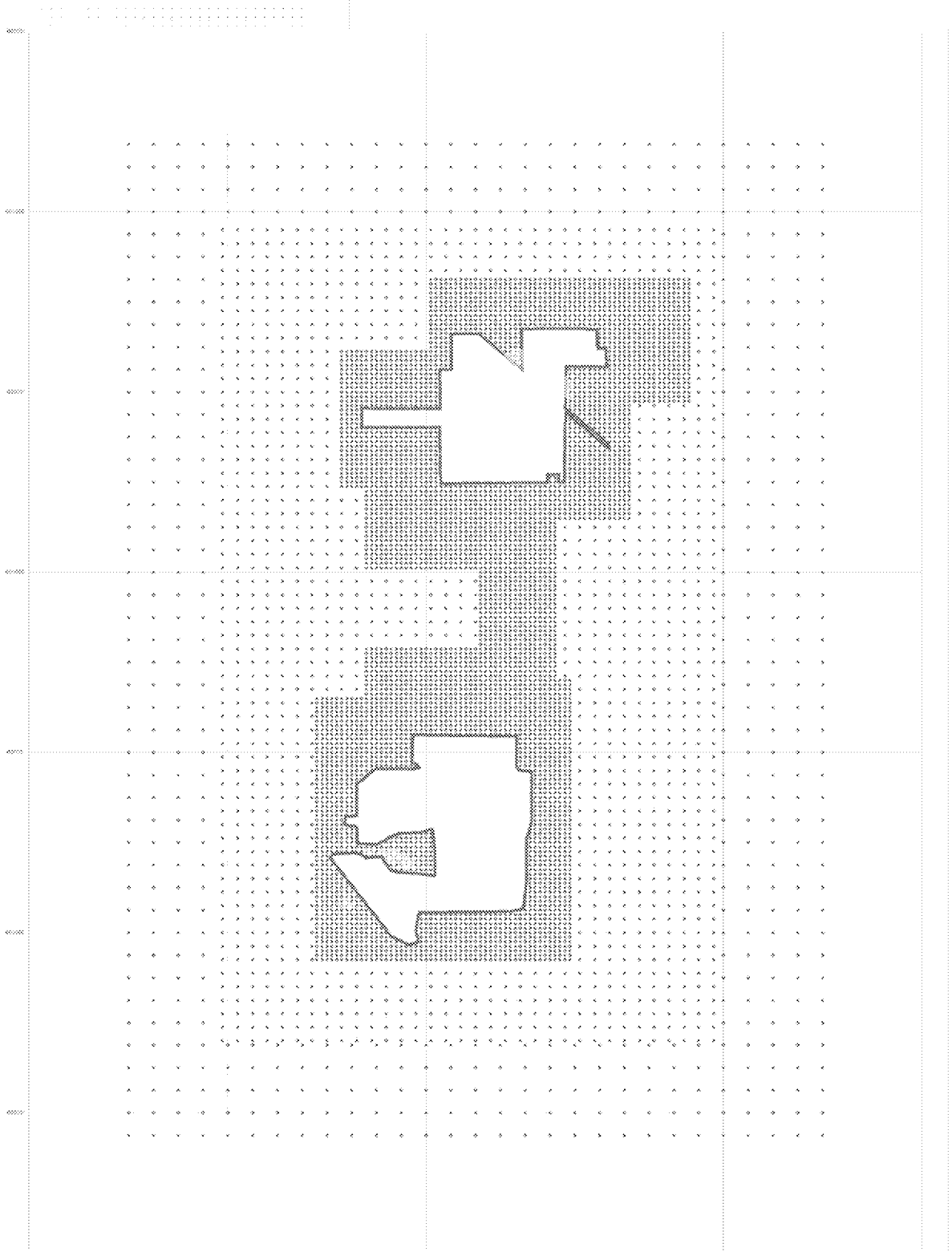


Figure 10-3: Receptor Grid for Ottawa and Sandusky Counties



10.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

The state characterized Graymont and Martin Marietta in accordance with the practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash. The EPA concurs with the source characterization in this analysis.

10.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

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The state chose to model Graymont and Martin Marietta using actual emissions. The facilities in the state's modeling analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below in Table 10-1.

Table 10-1. Actual SO_2 Emissions Between 2012 – 2014 for Ottawa and Sandusky Counties

Facility Name	SO_2 Emissions (tpy)		
	2012	2013	2014
Graymont Dolime	600	660	644
Martin Marietta Magnesia	1,149	1,425	1,578
Total Emissions	1,749	2,085	2,222

10.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the Graymont/Martin Marietta Cluster area of analysis, Ohio selected the surface meteorology from surface station #4848 located at the Toledo Executive Airport (KTDZ), and coincident upper air observations from the Detroit/Pontiac Airport (KPTK, #4830)) upper air station, located in White Lake, Michigan, Detroit/Pontiac Airport as best representative of meteorological conditions within the area of analysis. The state used AERSURFACE 13016 using data from the Toledo Executive Airport (KTDZ) to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions.

In Figure 10-4 below, provided by the state, shows the location of the NWS surface station,12-15 km northwest of the Graymont/Martin Marietta Cluster.

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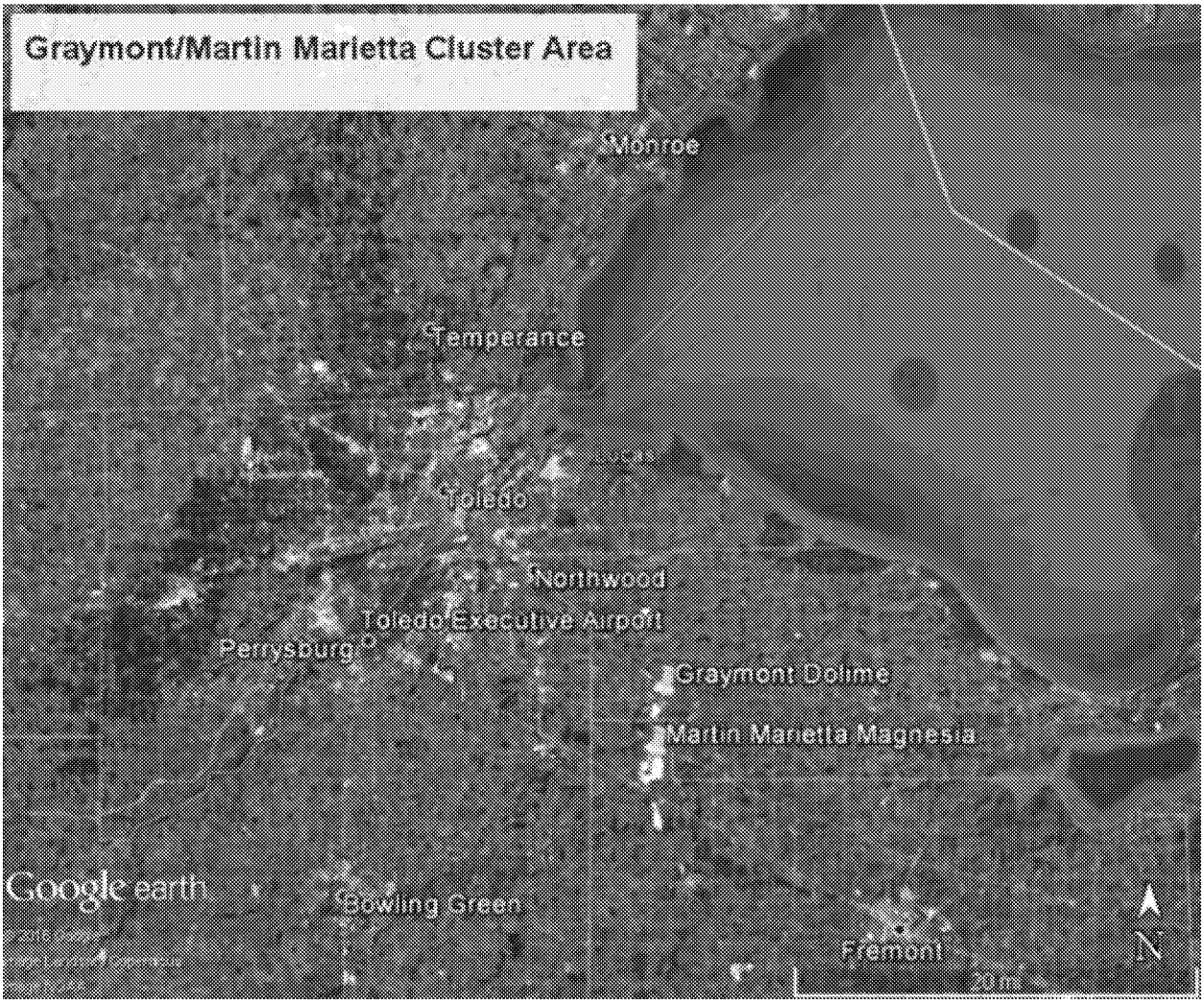
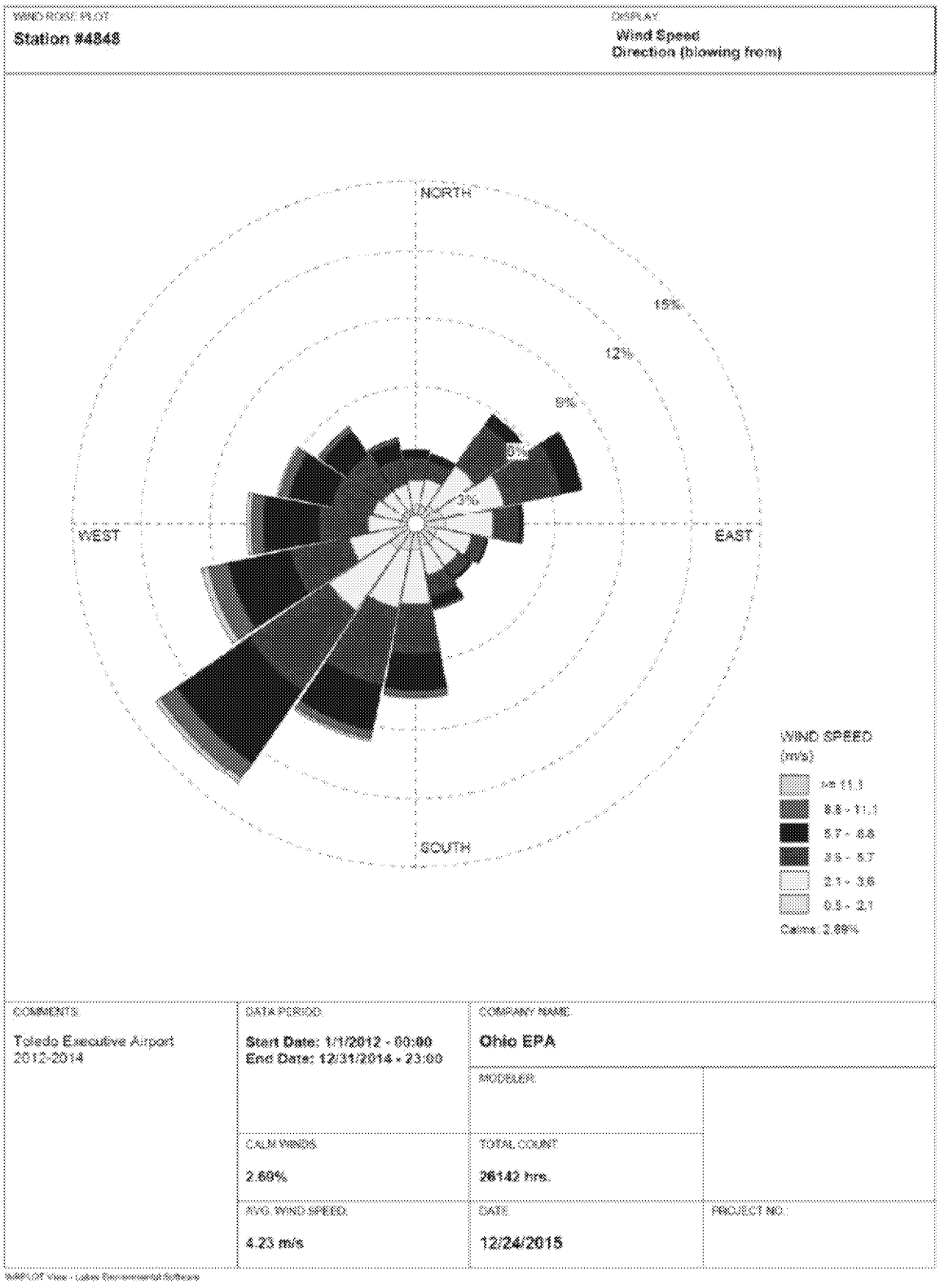
Figure 10-4. Area of Analysis and the NWS surface station in Ottawa and Sandusky Counties



As part of its recommendation, the state provided the 3-year surface wind rose for the Toledo NWS station (KTDZ). In Figure 10-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The predominant winds in the source area originate from the southwest, with a significant contribution from northeasterly winds.

Figure 10-5: Cumulative Annual Wind Rose for Toledo Executive Airport for Years 2012 – 2014



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) non-default regulatory option in its modeling.

In order to best represent actual wind conditions at the meteorological tower, surface wind data of 1-minute duration was processed by the AERMINUTE preprocessor, which creates hourly averaged wind data files for input into AERMET. These data were subsequently integrated into the AERMET processing to produce AERMOD-ready hourly surface meteorological data files. As a guard against excessively high concentrations that could theoretically be produced by AERMOD in very light wind conditions, the state set a minimum wind speed threshold of 0.5 meters per second. Using this threshold, no wind speeds lower than this value would be used for determining concentrations. The EPA concurs with the meteorological and surface characteristics components of Ohio's modeling assessment.

10.3.8. Modeling Parameter: Geography, Topography, and Terrain

The terrain in the area of analysis is best described as flat to gently rolling. 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 is from the USGS National Elevation Database. The EPA concurs with the state's treatment of local terrain.

10.3.9. Modeling Parameter: Background Concentrations of SO_2

The Graymont/Martin Marietta cluster area is predominantly rural, and there are no SO_2 sources with emissions greater than 100 tpy near the modeled cluster. The only air quality monitor near the area is in a heavily industrialized part of Toledo. While this monitor was appropriate for characterizing background sources near the Bay Shore Power Plant and BP-Husky (see section 9), which were located in the industrial area within a few kilometers of the monitor, Ohio determined that the Toledo monitor data would have too much local industrial impacts to accurately represent background for the rural Graymont/Martin Marietta area. Therefore, in lieu of using data from a nearby monitor to determine either a constant background concentration (a "tier 1" approach) or a background concentration that varies by hour and season (a "tier 2" approach), Ohio used a single background value of 8 ppb based on the upper limit of monitored regional background SO_2 concentrations for the Midwest determined by the Lake Michigan Air Directors Consortium (LADCO) in their July 25, 2011, document, "Modeling Protocol: Dispersion Modeling to Demonstrate Attainment of SO_2 Primary NAAQS." According to the Modeling TAD, "when no monitors are located in the vicinity of the sources being modeled, a "regional site" (i.e., one that is located away from the area of interest but is impacted by similar natural and distant man-made sources) may be used to determine background (Section 8.2.2c, Appendix W)."

This background concentration is lower than the background concentration Ohio used in its modeling for Carmeuse Lime Maple Grove in Seneca County, one county to the south of the Graymont/Martin Marietta Cluster area. In that analysis, Ohio used a single background value of 12 ppb to characterize background sources near Carmeuse Lime Maple Grove (see section 11). That area is also predominantly rural, but it was expected to be impacted by a moderate-sized source located to the southwest (and frequently upwind) of the DRR source. Ohio used screening modeling analyses along with the LADCO regional background value to determine that a 12 ppb (31 $\mu g/m^3$) [15] background value would be conservative yet appropriate for characterizing the SO_2 sources which were nearby but not explicitly modeled with Carmeuse Lime Maple Grove. No other sources in the area emit over 100 tons per year. Therefore, no sources are considered likely to affect the area of analysis in Ottawa and Sandusky Counties, and so Ohio determined that there was no need for further adjustment of the LADCO value. The EPA concurs with Ohio's justification for the use of the 8 ppb background value for characterizing background emissions in the Graymont/Martin Marietta Cluster area.

10.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the area of analysis for Ottawa and Sandusky Counties are summarized below in Table 10-2.

Table 10-2: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for Ottawa and Sandusky Counties

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	7
Modeled Structures	55
Modeled Fencelines	2
Total receptors	8,602
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Toledo Executive Airport (KTDZ)
NWS Station Upper Air Meteorology	Detroit/Pontiac Airport (KPTK)

[15] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 $\mu g/m^3$.

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Input Parameter	Value
NWS Station for Calculating Surface Characteristics	Toledo Executive Airport (KTDZ)
Methodology for Calculating Background SO_2 Concentration	LADCO Regional Midwest value
Calculated Background SO_2 Concentration	8 ppb (20.9 μg/m^3)

The results presented below in Table 10-3 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 10-3. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for Ottawa and Sandusky Counties

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration (μg/m^3)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	303967.5	4598248	188.0	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 μg/m^3 conversion factor.

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 188.0 μg/m^3, equivalent to 71.8 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the two modeled facilities. Figure 10-6 below, prepared by the EPA, indicates that the predicted maximum value occurred near the northern fenceline of the Graymont facility, with a smaller hotspot near the western fenceline of the Martin Marietta facility. The state's receptor grid is also shown in the figure.

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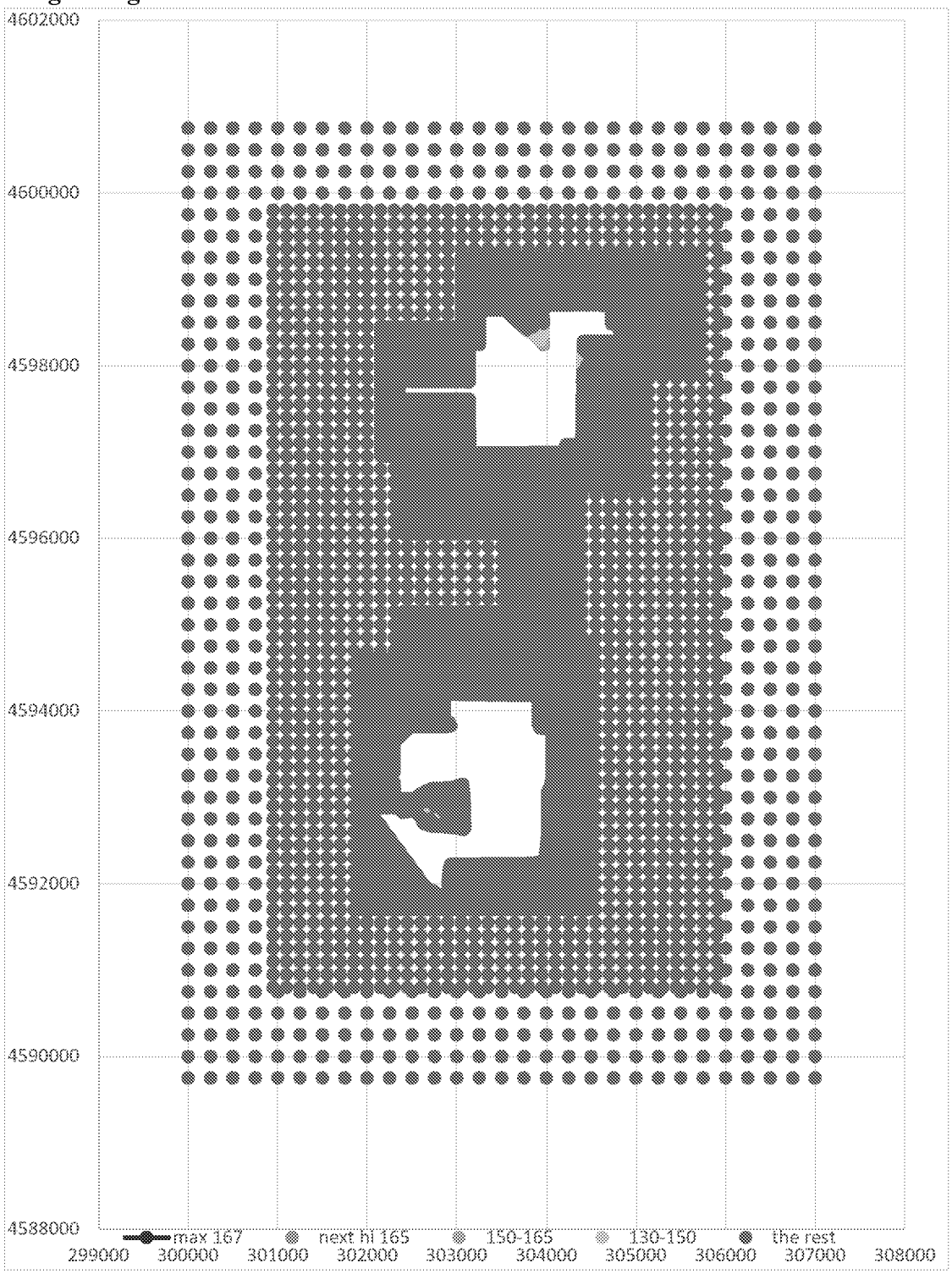
Figure 10-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Ottawa and Sandusky Counties Area of Analysis, Not Including Background



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is being attained at all receptors in this area.

10.3.11. The EPA's Assessment of the Modeling Information Provided by the State

After reviewing Ohio's modeling analysis, the EPA considers their overall modeling assessment to be acceptable. While the receptor grid is relatively small, the results of the analysis indicate that the receptor grid is adequate to address the maximum concentration areas near these sources. The state used AERMOD version 15181 in the regulatory default mode and modeled the Graymont and Martin Marietta facilities as a cluster, because they are located near each other and their combined 2014 emissions exceeded the DRR source threshold. The state chose a nearby representative meteorological data site and modeled a dense receptor grid around the facilities. The state used an appropriate background concentration based on a regional monitor that is located in an area where similar background concentrations would be expected. Ohio's modeled results indicate that the area is not violating the 2010 SO_2 NAAQS.

10.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Ottawa and Sandusky Counties

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. The EPA believes that Ohio properly incorporated these factors into its analysis.

10.5. Jurisdictional Boundaries in Ottawa and Sandusky Counties

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Ottawa and Sandusky Counties. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA intends to designate the entirety of Ottawa and Sandusky Counties as unclassifiable/attainment. The EPA believes that our intended unclassifiable/attainment area bounded by Ottawa and Sandusky Counties' borders will have clearly defined legal boundaries, and we intend to find the county boundaries to be a suitable basis for defining our intended unclassifiable/attainment areas.

10.6. The EPA's Assessment of the Available Information for Ottawa and Sandusky Counties

After careful review of the modeling assessment, the EPA intends to designate Ottawa and Sandusky Counties as unclassifiable/attainment because dispersion modeling of the source cluster in these counties showed no violations of the standard. The available monitoring data have limited value in informing the EPA's designation of this area. Additionally, there are no

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nonattainment areas or remaining undesignated areas within 50 km of the source cluster, so the EPA finds the cluster of sources are not contributing to any violations in nearby areas. The EPA finds the state's modeling to be acceptable as a basis for this designation.

10.7. Summary of Our Intended Designations for Ottawa and Sandusky Counties

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate Ottawa and Sandusky Counties as unclassifiable/attainment for the 2010 SO_2 NAAQS because based on the state's analysis, the EPA finds the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Ottawa and Sandusky Counties.

Figures 10-7 and 10-8 show the boundaries of these intended designated areas.

Figure 10-7. Boundary of the Intended Ottawa County Unclassifiable/Attainment Area

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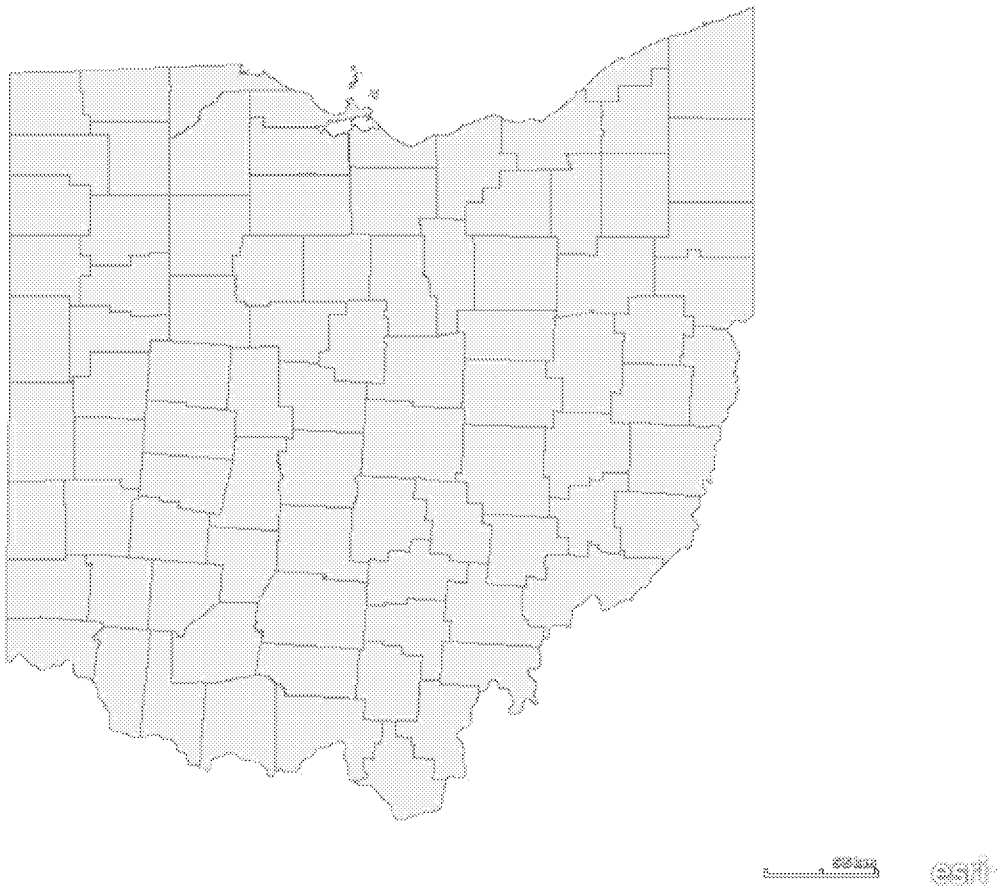
Figure 10-8. Boundary of the Intended Sandusky County Unclassifiable/Attainment Area



11. Technical Analysis for Seneca County

11.1. Introduction

The EPA must designate Seneca County by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Seneca County.

11.2. Air Quality Monitoring Data for Seneca County

There are no SO_2 monitors in Seneca County or in any nearby counties that would be indicative of air quality in these counties.

11.3. Air Quality Modeling Analysis for Seneca County Addressing Carmeuse Lime Maple Grove

11.3.1. Introduction

This section presents all the available air quality modeling information for a portion of Seneca County that includes Carmeuse Lime Maple Grove. (This portion of Seneca County will often be referred to as "the Carmeuse Lime area" within this section). Carmeuse Lime Maple Grove is a facility which produces quicklime and lime products. It emitted 4,438 tons of SO_2 in 2014; therefore, it meets the DRR criteria and Ohio is required by the DRR to characterize SO_2 air quality around it.

In its January 2017 submission, Ohio recommended that the area surrounding the Carmeuse Lime Maple Grove facility, specifically the entirety of Seneca County and the surrounding counties of Hancock, Ottawa, Sandusky, Wood, Wyandot, Crawford, Huron, and Erie, be designated as unclassifiable/attainment based on an assessment and characterization of air quality impacts from this facility and other nearby sources. This assessment and characterization was performed using AERMOD air dispersion modeling software, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the Seneca County area, and intends to designate the county as unclassifiable/attainment. The designations for Ottawa and Sandusky Counties were addressed in Section 10. The designations for Hancock, Wood, Wyandot, Crawford, Huron, and Erie Counties are addressed together in Section 12.

As seen in Figure 11-1 below, provided by the state, the Carmeuse Lime Maple Grove facility is located in Bettsville, Ohio, southeast of Toledo, southwest of Lake Erie. Also included in the figure are other nearby emitters of SO_2, notably the Sunny Farms Landfill in Seneca County southeast of Carmeuse Lime Maple Grove.

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Figure 11-1. Map of the Carmeuse Lime Area of Seneca County

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The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. For this area, the EPA received and considered a modeling assessment from Ohio. The following sections discuss a modeling assessment that the EPA received from Ohio, which is the only analysis that the EPA received for this area.

11.3.2. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. 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
- BPIPPRM: 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

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The state used AERMOD version 15181 in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Carmeuse Lime area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Carmeuse Lime area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

11.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the Seneca County area of analysis, the state determined that it was most appropriate to run the model in rural mode, as the area surrounding the source is agricultural. The EPA has confirmed this information by review of satellite imagery and concurs with this determination to model the Seneca County area as rural. A 3-kilometer radius around Carmeuse Lime Maple Grove contains only farmland, the facility itself, and a portion of the town of Bettsville.

11.3.4. Modeling Parameter: Emission Sources

The SO_2 source subject to the DRR in this area, Carmeuse Lime Maple Grove, is described in the introduction to this section. For the Seneca County modeling analysis, the state considered other emitters of SO_2 within 50 km of Carmeuse Lime Maple Grove. Sources which were further than 25 km from Carmeuse Lime Maple Grove, and/or emitted less than 20 tpy, were considered unlikely to cause a concentration gradient that would affect the maximum concentration within the area of analysis.

Several sources did merit consideration for their potential impacts on the Carmeuse Lime area of analysis. The largest neighboring sources, Martin Marietta Magnesia Specialties Inc. and Graymont Dolime, emitted 1,809.86 tons and 809.7 tons of SO_2 respectively in 2014. These two sources, located approximately 30 km to the northwest of Carmeuse Lime Maple Grove in Sandusky and Ottawa Counties, so that these sources would not be expected to cause significant concentration gradients near Carmeuse Lime Maple Grove and thus, under the applicable criteria in Appendix W, need not be included in the Carmeuse Lime Maple Grove modeling. In addition, these sources were modeled together in a separate cluster analysis. This analysis is detailed in Section 10 of this TSD. The maximum value from the cluster modeling was predicted to occur near the fencelines of those sources, with declining concentrations at further distances, such that the impacts and concentration gradients near the Carmeuse Lime area would be quite low. The

second largest neighboring source, the Sunny Farms Landfill, emitted 318.46 tons in 2014 and is located 22 km to the southwest of Carmeuse Lime Maple Grove. Although Ohio could have chosen not to model this facility simply based on the emissions and distance of this facility from Carmeuse Lime Maple Grove, Ohio performed a screening analysis of this source using AERSCREEN and SCREEN3 to evaluate further whether this source should be explicitly modeled. Ohio chose not to explicitly model this source, but adjusted the applicable background concentration in the Seneca County area to account for the potential impacts of Sunny Farms Landfill. (See section 11.3.9.) Fremont Energy Center, located 17 km to the north of the Carmeuse Lime Maple Grove facility, emitted 62.74 tons of SO_2 in 2014. The remaining sources within 20-50 km of Carmeuse Lime Maple Grove emit less than 20 tpy. Given the low emissions levels and the sources' distances from Carmeuse Lime Maple Grove, these sources (and Fremont Energy Center) are not expected to cause a significant concentration gradient near the maximum concentration in the Seneca County area of analysis and are therefore adequately accounted for through the background concentration. The EPA concurs that the impacts of these other sources are properly accounted for as part of the background concentration.

11.3.5. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

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

- 50-meter spacing along the fenceline of Carmeuse Lime Maple Grove
- 50-meter spacing to 1.5 km
- 100-meter spacing to 2.5 km
- 250-meter spacing to 5 km
- 500-meter spacing to 10 km
- 1,000-meter spacing to 25 km
- 2,500-meter spacing to 50 km

The receptor network contained 19,337 receptors, and the network covered all of Seneca and Sandusky Counties, the majority of Ottawa County, the eastern portion of Wood County, the northeastern portion of Hancock County, the northern portions of Wyandot and Crawford Counties, and the eastern portions of Huron and Erie Counties.

Figures 11-2 and 11-3, included in the state's recommendation, show the state's chosen area of analysis surrounding the Carmeuse Lime Maple Grove, as well as the receptor grid for the area of analysis.

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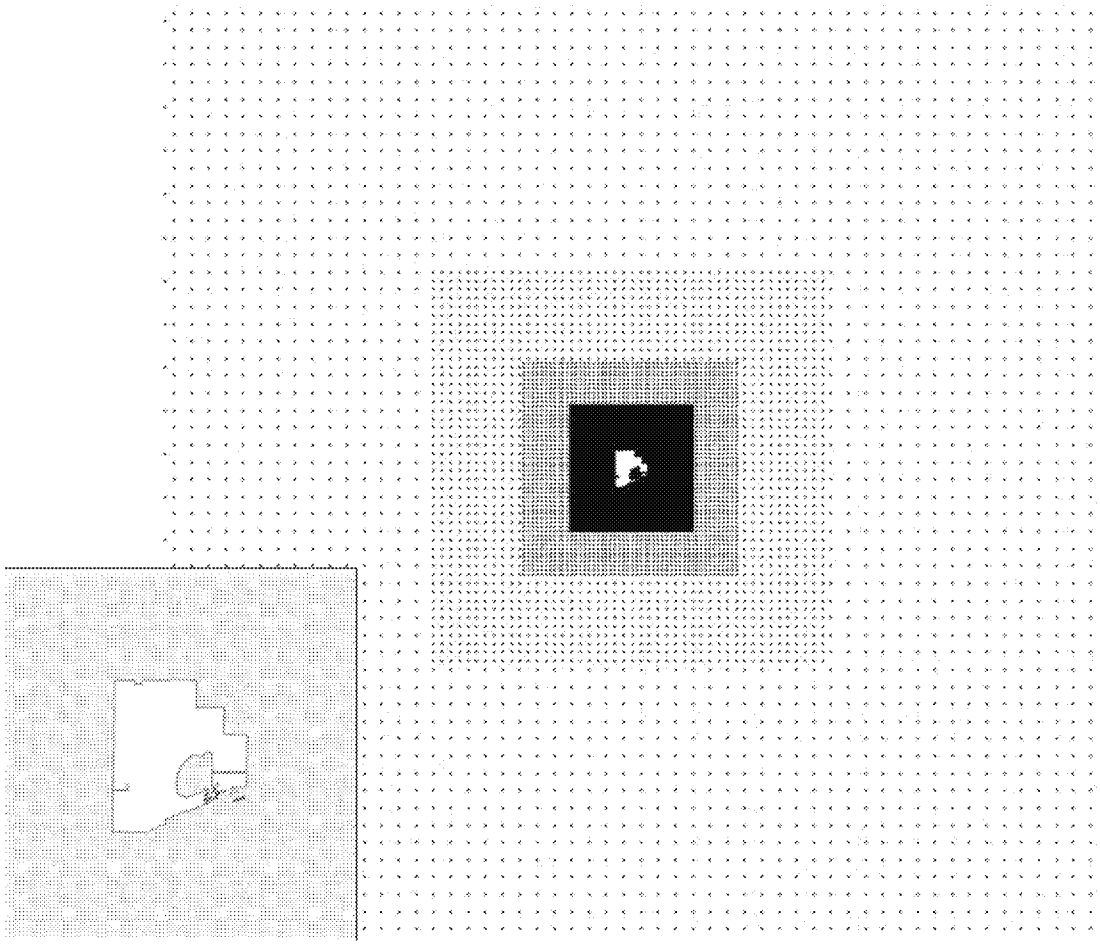
Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property. Aside from areas within the Carmeuse fenceline, there were no deletions of receptors because there were no areas where it would not be feasible to place a monitor. The state did not place receptors within the fence line of the Carmeuse Lime Maple Grove facility because access to that area is restricted from the public.

Figure 11-2: Area of Analysis for Seneca County

Ohio's 2017 Recommendations, Appendix P

Figure 11-3: Receptor Grid for Seneca County



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The EPA concurs with Ohio's placement of receptors. There are clear fences surrounding Carmeuse Lime Maple Grove's facility that restrict the public from entering the facility, so the area within the fence line would not be considered ambient air.

11.3.6. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash, and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

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Ohio characterized Carmeuse Lime Maple Grove in accordance with the practices outlined in the Modeling TAD, using actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash.

11.3.7. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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."

For Carmeuse Lime Maple Grove, the state modeled hourly varying actual SO_2 emissions between 2012 and 2014. Carmeuse Lime Maple Grove's annual emission totals are summarized in Table 11-1. A description of how the state obtained hourly emission rates is given below this table.

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Table 11-1. Actual SO_2 Emissions Between 2012 – 2014 from Carmeuse Lime Maple Grove

Facility Name	SO_2 Emissions (tpy)		
	2012	2013	2014
Carmeuse Lime Maple Grove	3,571.24	3,457.88	3,556.00

For Carmeuse Lime Maple Grove, the estimated actual hourly emissions data were obtained in consultation with the company from historic data for fuel firing rates and fuel sulfur for each hourly period. After comparing the sum of the total hourly emissions, the EPA found that the modeled emissions did not match the NEI reported annual emissions. The EPA consulted with Ohio, who explained that the modeled emissions are a more accurate representation of the facility's actual emissions because the emissions used in the dispersion modeling were based on calculations of fuel usage and fuel sulfur content. The emissions reported to the NEI were based on an emissions factor determined during a stack test from 2008. A review of the stack test information showed that the company used a higher sulfur fuel in 2008 than it did during the 3-year modeling period. Ohio determined that the fuel usage and fuel sulfur content emissions calculations were more representative of actual 2012-2014 operations of the Carmeuse Lime Maple Grove facility than the reported NEI emissions. The EPA concurs with the emissions data that Ohio used in the dispersion modeling assessment for the Carmeuse Lime Maple Grove facility.

11.3.8. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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, Federal Aviation Administration (FAA), and military stations.

For the Carmeuse Lime area of analysis, the state selected the surface meteorology from the NWS station at Toledo Executive Airport (KTDZ), located in Swanton, Ohio, northwest of Carmeuse Lime Maple Grove, and coincident upper air observations from Wilmington Airborne Park (KILN), located in Wilmington, Ohio, southwest of Carmeuse Lime Maple Grove, as representative of meteorological conditions within the area of analysis.

The state used AERSURFACE 13016 using data from Toledo Executive Airport to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface

roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions.

In Figure 11-4 below, generated by the state, the location of the surface NWS station is shown at the upper left.

Figure 11-4. Area of Analysis and the NWS station used for Seneca County

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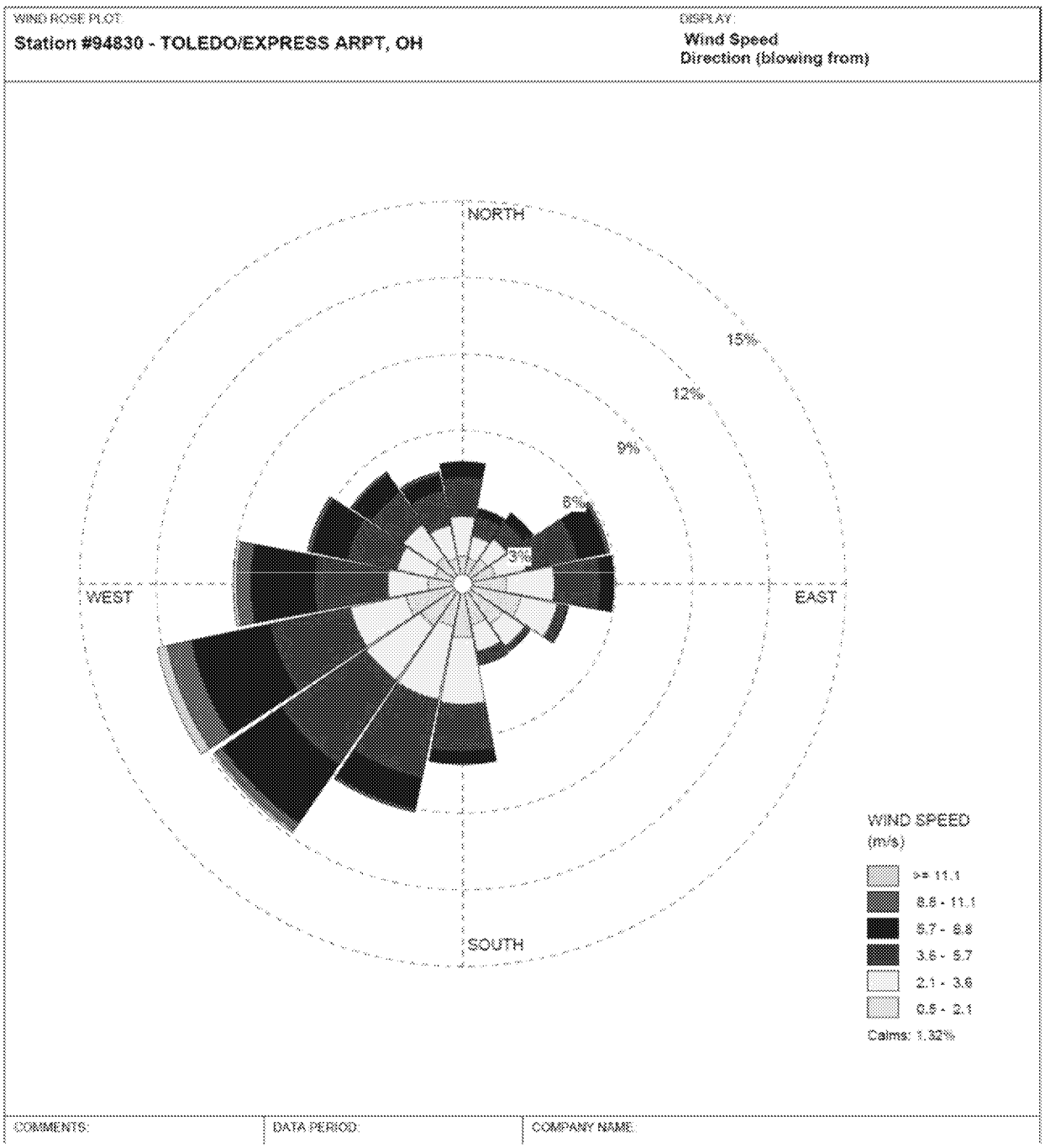
As part of its recommendation, the state provided the 3-year surface wind rose for Toledo Executive Airport. In Figure 11-5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The predominant winds in the source area originate from the southwest, with less frequent northeasterly winds.

Figure 11-5: Toledo, Ohio Cumulative Annual Wind Rose for Years 2012 – 2014



Toledo Express 2012-2014	Start Date: 1/1/2012 - 00:00 End Date: 12/31/2014 - 23:00	Ohio EPA	
	CALM WINDS: 1.32%	TOTAL COUNT: 26273 hrs.	
	AVG. WIND SPEED: 3.80 m/s	DATE: 5/31/2016	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Ohio's 2017 Recommendations, Appendix P

Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 15181 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 followed the methodology and settings presented in the SO_2 Modeling TAD and EPA's AERMOD Implementation Guide in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from surface station #94830 located at the Toledo Executive Airport (KTDZ) and was processed with the AERMINUTE preprocessor. 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 are less prone to over-report calm wind conditions than standard NWS hourly data. 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, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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. The EPA concurs with the meteorological and surface characteristics components of Ohio's modeling assessment.

11.3.9. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as flat to gently rolling. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA agrees with Ohio's terrain assessment in the modeling analysis.

11.3.10. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a different approach to estimate background since there were no nearby ambient air quality monitors which would provide a representative background value.

The nearest air quality monitor is located in an industrial area of Toledo, which is not representative of SO_2 emission conditions in rural Seneca County. Therefore, rather than pursuing the "tier 1" or "tier 2" approaches based on those monitoring data, Ohio began with a fixed background concentration based on the upper limit of monitored regional background SO_2 concentrations for the Midwest determined by the Lake Michigan Air Directors Consortium (LADCO) in their July 25, 2011, document, "Modeling Protocol: Dispersion Modeling to Demonstrate Attainment of SO_2 Primary NAAQS." Ohio used this value as background in its analysis of the Graymont/Martin Marietta Cluster in Ottawa and Sandusky Counties (see section 11).

Ohio was concerned about potential impacts from the Sunny Farms Landfill, a 318 tpy source in Seneca County 20 km southwest of the Carmeuse Lime Maple Grove facility. Although this facility had sufficiently low emissions at sufficient distance to warrant not modeling this source explicitly, Ohio sought to determine a background concentration higher than the regional site background concentration determined by LADCO in order to increase its confidence that the background value adequately incorporated the impacts of this facility. For this purpose, Ohio used the SCREEN3 model to estimate the impact of the Sunny Farms Landfill flare. The screening modeling results at the distance from the landfill to Carmeuse Lime Maple Grove (20 km) showed a range of 4 to 10 ppb, which represents maximum 1-hour concentrations during worst-case meteorological conditions and a range of flare emission conditions. Ohio judged that the lower end of this range, added to the LADCO typical Midwest regional background, would best represent background over the range of conditions for which this background value would

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be applied. Ohio then added the 4 ppb screening result (10 μg/m^3) [16] to the LADCO typical Midwest regional background value of 8 ppb (21 μg/m^3). This gave a final 12 ppb (31 μg/m^3) single background value which Ohio believed to be representative of Seneca County's primarily rural, agricultural land use and the low SO_2 emissions of local sources, but also reasonably accounts for possible impacts from the landfill upwind of Carmeuse Lime Maple Grove. This background value can be compared to the maximum "tier 2" value of 24 ppb (63 μg/m^3), which was applied in the Lucas County/Bay Shore analysis, using data from Toledo's industrial-area monitor (see section 9).

While this approach may be less reliable than explicitly modeling Sunny Farms Landfill's impact (and determining a background concentration that excludes these impacts, the 4 ppb enhancement of the background is likely to provide a conservative assessment of this source's impact (i.e., an overstatement of the likely impact) for the distant, modest emissions of this source. Therefore, the EPA believes that Ohio's approach to calculating the background concentration yielded an appropriate estimate of the background concentration in this area. Ohio also considered potential impacts from other smaller sources in the area, but these other SO_2 sources emitted less than one fifth of Sunny Farms Landfill's annual emissions. The two sources in neighboring counties with larger total emissions than Sunny Farms Landfill are 30 km away. For these reasons, the EPA agrees that these sources are adequately represented in Ohio's analysis by the calculated background concentration.

11.3.11. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Seneca County area of analysis are summarized below in Table 11-2.

[16] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1 ppb = approximately 2.619 μg/m^3.

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Table 11-2: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Seneca County Area

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1
Modeled Structures	23
Modeled Fencelines	1
Total receptors	19,337
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Toledo Executive Airport (KTDZ)
NWS Station Upper Air Meteorology	Wilmington (KILN)
NWS Station for Calculating Surface Characteristics	Toledo Executive Airport (KTDZ)
Methodology for Calculating Background SO_2 Concentration	LADCO Regional Midwest Value with additional local source component
Calculated Background SO_2 Concentration	31.4 $\mu g/m^3$, or 12 ppb

The results presented below in Table 11-3 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 11-3. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Carmeuse Lime Area of Analysis

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	315750.00	4566050.00	146.0	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb.

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 146.0 μg/m^3, equivalent to 55.7 ppb. This modeled concentration included a background concentration, and is based on actual emissions. Figure 11-6 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 360 meters to the east of the Carmeuse Lime Maple Grove fenceline. Figure 11-7, generated by the EPA, shows the overall modeling results. Even if a higher background concentration had been used, e.g. including the upper end of the range of results from screening runs for the Carmeuse Lime Maple Grove facility (a total of 18 ppb rather than 12 ppb, i.e. 47 μg/m^3 rather than 31 μg/m^3, the analysis would have shown a maximum modeled concentration of 162 μg/m^3 (61.9 ppb), below the standard.

Figure 11-6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Carmeuse Lime Area of Analysis

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The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not being violated in this area.

Figure 11-7. Overall Modeling Results for the Seneca County Area of Analysis

11.3.12. The EPA's Assessment of the Modeling Information Provided by the State

Ohio's modeling approach for the Seneca County area follows the EPA Modeling TAD. Ohio utilized AERMOD version 15181 using default regulatory options. The analysis relies upon varying hourly actual emissions calculations based on fuel usage and fuel sulfur content from the years 2012-2014 at Carmeuse Lime Maple Grove. The state used a fixed background concentration which was representative of rural Midwestern areas such as Seneca County, and which also accounted for emissions from the largest facility upwind of Carmeuse Lime Maple Grove. The receptor grid used in the modeling assessment contains 19,337 receptors and densely spaced grids around areas of maximum impact. Ohio utilized 3 years of meteorological data from nearby representative NWS surface and upper air stations. The method the state used for selecting meteorological inputs follows the EPA Modeling TAD. After reviewing the parameters and inputs of the modeling information provided by the state, the EPA concurs with the modeling approach.

11.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Seneca County

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

11.5. Jurisdictional Boundaries in Seneca County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Seneca County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA intends to designate Seneca County as unclassifiable/attainment. EPA agrees with Ohio's chosen jurisdictional boundaries. The EPA believes that our intended unclassifiable/attainment area will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

11.6. The EPA's Assessment of the Available Information for Seneca County

After careful review of the modeling assessment provided for the Carmeuse Lime Maple Grove area submitted by Ohio, the EPA agrees that Ohio has demonstrated that the area around Carmeuse Lime Maple Grove is not violating the 2010 SO_2 standard. There are no existing nonattainment areas or remaining undesignated areas within 50 km and thus there is no indication of contribution to any violations. Therefore, the EPA intends to designate Seneca County as unclassifiable/attainment.

11.7. Summary of Our Intended Designation for Seneca County and Its Neighboring Counties

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state recommendation and intends to designate Seneca County as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Figure 11-8 shows the boundary (shaded) and location of this intended area.

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Figure 11-8. Boundary of the Intended Seneca County Unclassifiable/Attainment Area

12. Technical Analysis for Remaining Areas in Ohio

12.1. Introduction

The state has not timely installed and begun operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in the EPA's SO_2 DRR for any sources of SO_2 emissions in the counties and portions of counties identified in Table 12-1. Accordingly, the EPA must designate these counties by December 31, 2017. At this time, there are no air quality modeling results available to the EPA for these counties and portions of counties. In addition, there is no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The EPA is designating the counties and portions of counties in Table 12-1 in the state as "unclassifiable/attainment" since these counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

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Although Ohio has begun a new monitoring network in an area previously designated as unclassifiable (the area including Gallia and part of Meigs County), Ohio has not begun timely operating an approved SO_2 monitoring network in any previously undesignated portion of the state. Therefore, the EPA must designate the remainder of the state in Round 3.

Of the 88 counties in Ohio, the EPA, in Rounds 1 and 2, designated all of 3 counties (Clermont, Gallia, and Lake Counties) and portions of four other counties (Jefferson, Meigs, Morgan, and Washington Counties). The discussion in Sections 3 to 11 above has addressed the remainder of one of these counties (Jefferson County) and all of nine additional counties. The purpose of this section is to address the remaining 72 full counties and the remainder of the 3 partially designated counties.

Five counties not discussed above contained sources listed under the DRR for which Ohio adopted emission limits in lieu of being subject to requirements for air quality characterization. The other 70 counties in Ohio contained no DRR sources and were therefore the state was not required to characterize air quality through modeling or monitoring for these areas.

For all of these 72 full counties and parts of 3 counties, listed in Table 12-1, the EPA is designating the area as "unclassifiable/attainment," since these counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Twelve of the 75 counties contain an air quality monitor. These monitoring data are discussed in section 12-2 below. All of these monitors had design values below the 2010 SO_2 NAAQS for the periods 2012-2014, 2013-2015, and 2014-2016, except Morgan County, in the portion of Morgan County that is already designated nonattainment.

Table 12-1. Counties and Partial Counties Not Addressed Above that the EPA Intends to Designate Unclassifiable/Attainment

County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Allen [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Ashland	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Ashtabula	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Athens	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Auglaize	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment

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County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Belmont [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Brown	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Butler	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Carroll	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Champaign	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Clark [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Clinton	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Columbiana [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Crawford	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Darke	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Defiance	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Delaware	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Erie	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Fairfield	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Fayette	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Franklin [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Fulton	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Geauga	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Greene	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Guernsey	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Hancock	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment

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County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Hardin	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Harrison	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Henry	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Highland	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Hocking	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Holmes	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Huron	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Jackson	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Knox	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Lawrence [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Licking	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Logan	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Madison	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Mahoning [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Marion	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Medina	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Meigs (p) [a]	Entire County except Bedford, Columbia, Rutland, Salem, Salisbury and Scipio Townships.	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment

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County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Mercer	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Miami	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Monroe	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Montgomery	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Morgan (p) [a]	Entire County except Center Township	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Morrow	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Muskingum	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Noble	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Paulding	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Perry	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Pickaway	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Pike	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Portage	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Preble [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Putnam	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Richland	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Ross	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Scioto [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Shelby	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Stark	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment

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County or Partial County (p)	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Summit	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Trumbull	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Tuscarawas [a]	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Union	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Van Wert	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Vinton	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Warren	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Washington	Entire County except for Waterford Township.	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Wayne	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Williams	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Wood	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment
Wyandot	Entire County	Unclassifiable/Attainment	Same as State's	Unclassifiable/Attainment

[a] There is an air quality monitor in this county.

Table 12-1 also summarizes Ohio's recommendations for these areas. Specifically, the state recommended that these counties and partial counties be designated as unclassifiable/attainment based on their level of emissions and local monitored data. The EPA reviewed the state's assessment, supporting documentation, and all available data. At this time, there are no air quality modeling results available to the EPA for these counties and portions of counties. In addition, with one exception, there is no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The exception is Morgan County, which is discussed in more detail in Section 12.2 below. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation and intends to designate these areas as unclassifiable/attainment. Figure 12-1 shows the locations of these areas within Ohio, along with the designations that have previously been promulgated.

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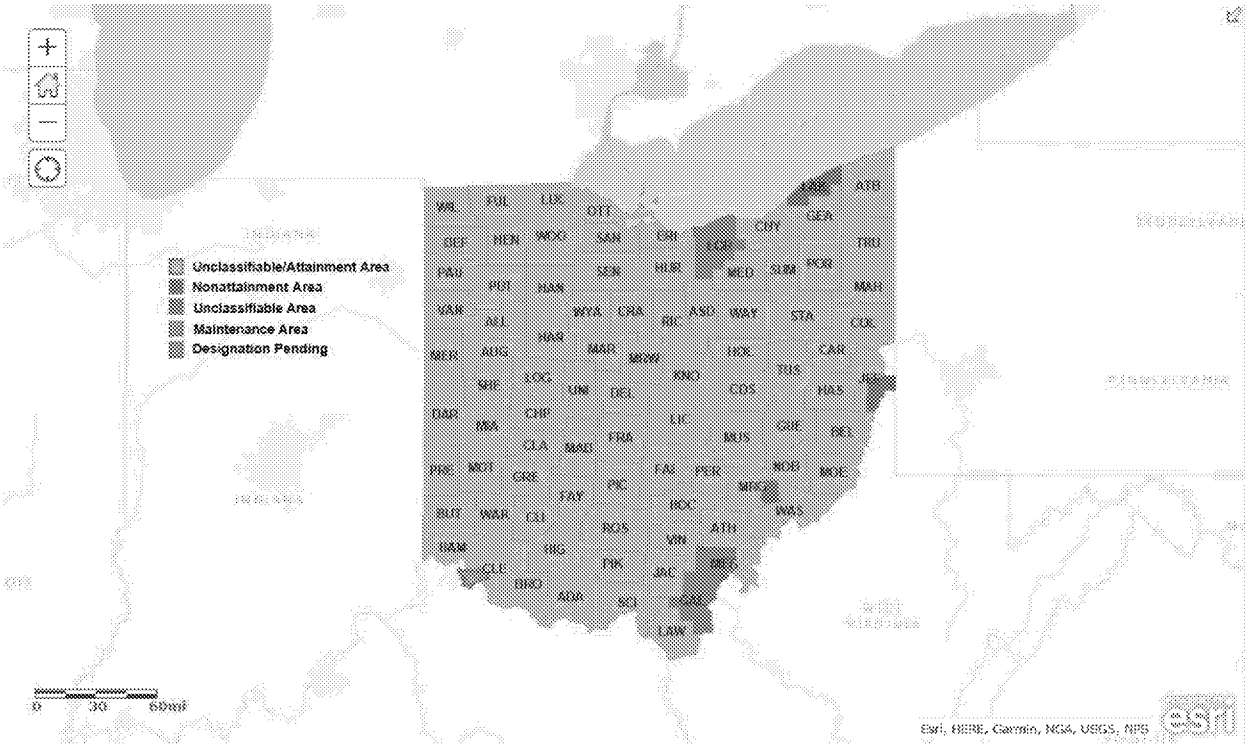
Figure 12-1. The EPA's Intended Designations for Counties in Ohio



12.2. Air Quality Monitoring Data

Twelve of the 75 counties or portions of counties discussed in this section contain air quality monitors (fifteen monitors in total). See Table 12-2 below. Fourteen of the fifteen monitors are not showing violations of the NAAQS. These data were available to EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of whether the area's actual air quality is meeting the NAAQS. The fifteenth monitor, in Morgan County, is in the Muskingum River nonattainment area, which the EPA designated on August 5, 2013 (78 FR 47191). In that action, the EPA determined the violating area and area of contributing sources associated with those monitored violations, which it defined to include specified portions of Morgan and Washington Counties. The EPA continues to believe that the remainder of Morgan County and other nearby area is neither violating the standard nor contributing to the violation in the area designated nonattainment.

Table 12-2. Air Quality Monitoring Data for Ohio

County	Monitor ID	3-Year Design Value (ppb)		
		2012-2014	2013-2015	2014-2016
Allen	39-003-0009	11	10	9
Belmont	39-013-3002	37	37*	40*
Clark	39-023-0003	18	16	13
Columbiana	39-029-0019	26*	22*	17
	39-029-0022	23*	24*	--**
Franklin	39-049-0034	15	12	9
Lawrence	39-087-0012	17	18	13
Mahoning	39-099-0013	38	34	30
Meigs	39-105-0003	30	37	40*
Morgan***	39-115-0004	138	121	85
Preble	39-135-1001	22*	22	22
Scioto	39-145-0013	9	11	10
	39-145-0020	27	26	28
	39-145-0022	19	19	23
Tuscarawas	39-157-0006	45*	--**	--**

*Not a valid design value
**No data for this period
***Monitor located in an existing nonattainment area

12.3. Areas of Special Interest

Six of the counties listed in Table 12-1, namely Ashtabula, Meigs, Ross, Summit, Washington, and Wayne Counties, warrant further discussion. In Ashtabula, Ross, and Wayne Counties, one or more sources was subject to the DRR but became subject to limits limiting emissions below 2,000 tons per year in lieu of being required to characterize air quality, and further discussion of the applicable limits is warranted. In Meigs County, a portion of the county near two Gallia County DRR sources is designated unclassifiable, and further discussion is warranted as to whether the remainder of the county should also be designated unclassifiable. In Summit and Washington Counties, no sources were listed as subject to DRR requirements, but clusters of sources warranted further evaluation of the potential for violations. The following subsections discuss each of these areas in turn.

12.3.1. Ashtabula County

The FirstEnergy Generation Corp. Ashtabula Plant (Ashtabula Plant), a power plant, is the only source in Ashtabula County which exceeded the DRR threshold of 2,000 tpy. The other sources in the county emitted less than 30 tpy in 2014 and 2015. The Ashtabula Plant emitted 3,560 tpy in 2014. On December 17, 2015, the Ashtabula Plant shut down pursuant to a federally

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enforceable requirement. Ohio provided a copy of FirstEnergy Generation Corporation's letter confirming the Ashtabula Plant's closure. Under Ohio Administrative Code (OAC) 3745-77-08 (H), the facility's Title V permit terminated based on this notification. The Ashtabula Plant's main coal-fired boiler shut down on April 16, 2015. There are no other DRR sources remaining in Ashtabula County, and the future total actual SO_2 emissions for the county are expected to be less than 50 tpy since the closure of the Ashtabula Plant, based on 2014-2015 data.

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12.3.2. Meigs County

In Round 2, in action published July 12, 2016, the EPA designated an area around two DRR sources, the General James M Gavin power plant (Gavin) and the Kyger Creek power plant (Kyger Creek), as unclassifiable. In that action, the EPA defined this area to include all of Gallia County and four townships in Meigs County, consistent with Ohio's recommended definition of this area. The Meigs County portion of this area includes the western half of this county and extends from about 3 to about 30 km from these sources, and does not include the eastern part of this county, which is generally more distant from the DRR sources.

Subsequently, Ohio initiated discussions of commencing operation of a new monitoring network near these sources, which the EPA approved and which Ohio began operation by January 1, 2017. This new network included two sites in Gallia County, Ohio, and one site in Mason County, West Virginia, supplementing an existing monitor in Meigs County, Ohio. The EPA is making no revisions to the designation for the area previously designated unclassifiable in this action. See Chapter 43 for discussion specific to the intended designations for West Virginia.

12.3.3. Ross County

Ross County contains only three facilities which reported actual SO_2 emissions over one ton in 2014 or 2015. The P. H. Glatfelter Company – Chillicothe Facility (Glatfelter), a paper mill, is the only source in Ross County which exceeded the DRR threshold of 2,000 tpy. The other two sources emitted less than 2 tpy in 2014 and 2015. Glatfelter emitted 18,444 tpy in 2014, but Glatfelter has chosen to convert its two coal boilers to natural gas, with number 2 fuel oil as a backup fuel, as of January 2017. Ohio submitted Glatfelter's revised federally enforceable permit-to-install, which became effective December 29, 2016. This permit requires Glatfelter's two boilers to use natural gas or fuel oil of up to 0.15 percent sulfur by weight, and reduces the total facility-wide allowable SO_2 emission limit to 1,800 tpy, effective January 13, 2017. Future actual emissions at Glatfelter, however, are expected to be less than 20 tpy. During periods that Glatfelter operates its two main boilers on natural gas without using backup fuel oil, its SO_2 emissions are expected to be well below its facility wide limit of 1,800 tpy. There are no other DRR sources remaining in Ross County, and the future total actual SO_2 emissions for Ross county are expected to be less than 1,804 tpy, based on 2015 data and Glatfelter's current SO_2 emission limits.

12.3.4. Summit County

Summit County contains five facilities which reported actual SO_2 emissions over one ton in 2014 or 2015. Summit County did not contain any DRR sources, but it did contain two facilities with 2014 emissions over 1,400 tpy, located within 5 km of each other in Akron. These facilities, Cargill, Incorporated-Salt Division (Cargill) and City of Akron Steam Generating (City of Akron Plant), as a cluster exceed 2,000 tpy. However, these sources have both permanently reduced their SO_2 emissions. Cargill shut down its four coal-fired boilers and one gas-fired boiler in late

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2014. Ohio submitted Cargill's revised federally enforceable permit-to-install, which became effective August 2, 2016. The remaining SO_2 emissions at the Cargill facility were less than one ton in 2014 and 2015. The City of Akron Plant shut down its coal-fired boiler in April 2015. Ohio submitted Akron Energy Systems' October 26, 2015 letter confirming the shutdown, and the facility's Title V permit, revised to reflect the boiler shutdown, which was effective on April 25, 2014. The remaining SO_2 emissions at the City of Akron facility were less than one ton in 2014 and 2015. One other facility in Summit County, Emerald Performance Materials, LLC, emitted 621 tpy in 2014, but less than one ton in 2015, operating a new gas-fired boiler instead of the existing coal-fired boiler. The coal-fired boiler has not been reported as permanently shut down. The other Summit County sources emitted less than 3 tpy in 2014 and 2015. Therefore, based on 2014-2015 data and the coal boiler shutdowns, the future total actual SO_2 emissions for Summit County are expected to be 624 tpy or less.

12.3.5. Washington County (part)

Part of Washington County (Waterford Township) is currently designated nonattainment for SO_2 (the Muskingum River Nonattainment Area). This nonattainment area contains the Globe Metallurgical facility and the Muskingum River power plant (now shut down). These sources are being addressed by Ohio's Nonattainment State Implementation Plan submittal and were therefore not addressed in Ohio's Round 3 designations submittal.

In the undesignated portion of Washington County, there are five facilities which reported actual SO_2 emissions over one ton in 2014 or 2015. See Table 12-3. None of these facilities required characterization under the DRR. The EPA evaluated these facilities and considered whether the sources could interact with the nonattainment portion of Washington County. All five facilities are at least 20 km from the nonattainment area. Three of the facilities emitted less than 5 tons in 2015, and are not considered likely to interact with the nonattainment portion of Washington County. The other two facilities had emissions over 1,000 tons in 2014 and 2015, and are discussed further below the table.

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Table 12-3. Actual SO_2 Emissions from Facilities in Washington County

Facility Name	Located in Nonattainment area (NA) or undesignated (U) portion of county?	SO_2 Emissions (tpy)	
		2014	2015
Kraton Polymers U.S. LLC	U	2,709	1,391
Orion Engineered Carbons, LLC	U	1,557	1,446
Eramet Marietta	U	5.4	4.6
Solvay Specialty Polymers USA, LLC	U	3.3	3.1
DTE Marietta	U	<1	1.0
Muskingum River Power Plant	NA		
Globe Metallurgical	NA		

Kraton Polymers U.S. LLC (Kraton Polymers) emitted over 2,000 tpy in 2014 but less than 2,000 tpy in 2015. In August 2015, Kraton Polymers shut down two coal-fired boilers. This reduced its expected actual SO_2 emissions to less than one ton. Ohio submitted Kraton Polymer's federally enforceable permit-to-install, which authorized the installation of two natural gas-fired boilers intended to replace the two coal boilers. This permit was issued January 15, 2013. Ohio also submitted a September 1, 2015, letter from Kraton Polymers, confirming the permanent boiler shutdowns as of August 31, 2015. Because of these shutdowns, Kraton Polymers was not listed as requiring characterization under the requirements of the DRR.

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The fifth source, Orion Engineered Carbons LLC (Orion), emitted 1,446 tpy in 2015. The EPA evaluated whether this source would contribute to violations in the nonattainment portion of Washington County, and determined that based on its distance from the nonattainment area, Orion would likely have minimal impact in that area. Therefore, the EPA continues to believe that Orion should not be included in and does not contribute to the Muskingum River nonattainment area.

12.3.6. Wayne County

Wayne County contains five facilities which reported actual SO_2 emissions over one ton in 2014 or 2015. Two facilities exceeded the DRR threshold of 2,000 tpy and were listed as subject to DRR requirements. These facilities are the Department of Public Utilities/City of Orrville power plant (Orrville) and Morton Salt, Inc. (Morton Salt). Orrville became subject to an enforceable emission limit of 1,475 tpy, which was placed in a federally enforceable permit, effective December 20, 2016, requiring compliance by January 13, 2017. Ohio submitted the permit with its January 2017 submittal. Morton Salt converted to burn natural gas and retired its two coal-fired boilers by January 13, 2017. Ohio submitted Morton Salt's federally enforceable permit to install, revised to reflect the natural gas conversion. The permit was effective on May 23, 2016. Based on the Orrville emission limit, the Morton Salt conversion, and other 2015 actual emissions data, the future total actual SO_2 emissions in Wayne County are expected to be less than 1,500 tpy.

12.4. Jurisdictional Boundaries

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for these counties. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The state has recommended designating these counties based on their county boundaries and in some cases, township boundaries. The EPA concurs with this decision.

12.5. The EPA's Assessment of the Available Information

These counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These counties therefore meet the definition of an "unclassifiable/attainment" area.

Our intended unclassifiable/attainment areas, generally bounded by county boundaries, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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12.6. Summary of Our Intended Designations for the Remainder of Ohio

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate each county in the rest of Ohio, unless otherwise noted, as a separate unclassifiable/attainment area for the 2010 SO_2 NAAQS.

Figure 12-1 above shows the location of these areas within Ohio as well as the boundaries of these intended unclassifiable/attainment areas.

For each of the counties listed in Table 12-1 the boundary of the unclassifiable/attainment area is the county boundary unless otherwise noted.

At this time, our intended designations for the state only apply to these areas and the other areas presented in this chapter. Following the completion of these Round 3 designations, there will be no remaining undesignated areas in Ohio.

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