Ohio Environmental Protection Agency

State Of Ohio 2010 Revised Sulfur Dioxide National Ambient Air Quality Standard Recommended Source Area Designation: General James M. Gavin and Kyger Creek Station Power Plants

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CHAPTER ONE:

General Discussion

History
The United States Environmental Protection Agency (U.S. EPA) promulgated the revised National Ambient Air Quality Standard (NAAQS) for sulfur dioxide (SO_2) on June 2, 2010. U.S. EPA replaced the 24-hour and annual standards with a new short-term one-hour standard of 75 parts per billion (ppb). The new one-hour SO_2 standard was published on June 22, 2010 (75 FR 35520) and became effective on August 23, 2010. The standard is based on the three-year average of the annual 99th percentile of one-hour daily maximum concentrations.

On August 15, 2013, U.S. EPA published (78 FR 47191) the initial SO_2 nonattainment area designations for the one-hour SO_2 standard across the country (effective October 4, 2013). On March 2, 2015, the U.S. District Court for the Northern District of California accepted as an enforceable order an agreement between the U.S. EPA and Sierra Club and the Natural Resources Defense Council to resolve litigation concerning the deadline for completing designations. The court's order directs U.S. EPA to complete designations in three steps: the first by July 2, 2016; the second by December 31, 2017 and the third by December 31, 2020. As part of the first round of designations, U.S. EPA has identified areas with newly monitored violations of the standard, or areas that contain stationary sources that emitted more than 16,000 tons of SO_2 in 2012 or emitted more than 2,600 tons of SO_2 and had an emission rate of at least 0.45 lbs SO_2/MMBtu in 2012. The U.S. EPA has identified two facilities in Ohio as meeting one or more of the emissions thresholds: the General James M. Gavin Plant and the W.H. Zimmer Generating Station. Ohio EPA must submit designation recommendations to U.S. EPA by September 18, 2015.

Requirements
Pursuant to section 107(d) of the Clean Air Act (CAA), U.S. EPA must initially designate areas as either "unclassifiable", "attainment", or "nonattainment" for the 2010 one-hour SO_2 standard. Since the original 2011 state submittals of designation recommendations and pursuant to the March 2, 2015 court order,

new information may be relevant for future designations. CAA Section 107(d) does not require states to submit updated recommendations. However, U.S. EPA will consider such information. For the round of designations to be completed by July 2, 2016, U.S. EPA requests that states submit updated recommendations and supporting information for consideration by September 18, 2015. If U.S. EPA intends to modify any state's designation recommendation, original or updated, the state will be notified no later than 120 days prior to promulgating the final designations. For the designations due to be promulgated on or before July 2, 2016, this notification will occur no later than March 2, 2016. Although not required by statute, U.S. EPA will provide a 30-day public comment period immediately following issuance of the 120-day letters.

Section 107(d)(1) of the CAA defines an area as "nonattainment" if it is violating the NAAQS or if it is contributing to a violation in a nearby area. The first step in making designation decisions is to identify areas for which monitoring or appropriate modeling information indicate a violation of the NAAQS. U.S. EPA may designate an area as attainment if it is clear that that it meets the SO_2 NAAQS and does not contribute to a violation in a nearby area.

U.S. EPA's *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO$_2$) Primary National Ambient Air Quality Standard (NAAQS); Final Rule* (80 FR 51051)*,* herein referred to as the Data Requirements Rule, references the December 2013 *Draft SO$_2$ NAAQS Designations Modeling Technical Assistance Document*. This document indicates that the purpose of the modeling is to assess actual, current air quality and that those recommendations could include modeling the source area as attaining the standard. Areas designated as unclassifiable or attainment may be subject to additional and continued analysis to assess attainment over time.

Ohio EPA's Approach

This submittal is Ohio's recommendation for the designation of the area surrounding the General James M. Gavin Power Plant located in Gallia County, Ohio. This facility was identified by U.S. EPA as meeting the criteria established in the March 2, 2015 court order. In accordance with U.S. EPA's final rule, and a March 20, 2015 memorandum *Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard,* the starting point for the area designations would be the county boundary associated with a violation or around the SO_2 source(s) in question, unless additional information is provided to U.S. EPA demonstrating a different boundary is appropriate. U.S. EPA's SO$_2$ Designation Guidance states that U.S. EPA generally believes that in the absence of other relevant information, it is appropriate to use county boundaries to define nonattainment areas, but they recognize that the five-factor analysis and other information may support designating only a portion of a

county as nonattainment. U.S. EPA states that modeling could be used to address several of these factors simultaneously. Ohio used the five-factor analysis approach and conducted additional modeling analysis as a part of this submittal. While using this approach, the SO_2 Designation Guidance states this analysis should show that: 1) violations are not occurring in nearby portions that are excluded from the designation area; and 2) the excluded portions do not contain emission sources that contribute to the monitored or modeled violations, if observed.

The following summarizes the major factors included in Ohio's analysis for the designation recommendation for the area surrounding the General James M. Gavin Power Plant. Specifically, Ohio has used the five factor analysis approach, including refined dispersion modeling, as recommended in the SO_2 Designation Guidance, to support the boundary recommendation. Ohio understands, based on the both the December 2013 Draft SO_2 NAAQS Designations Modeling Technical Assistance Document and the March 20, 2015 memorandum, that dispersion modeling accounts simultaneously for multiple elements of the five-factor analysis. As such, Ohio believes that the modeling analysis presented in Appendix A and summarized in this document should carry significant weight in the designation process. Where appropriate, Ohio is providing additional supporting information with respect to the five-factor designation approach.

Factor 1:   Dispersion Modeling and Air Quality Data

Ohio conducted a refined dispersion modeling analysis following the guidance issued by U.S. EPA in the December 2013 Draft SO_2 NAAQS Designations Modeling Technical Assistance Document, the March 20 memorandum, and the proposed Data Requirements Rule. The modeling analysis was based on 2012 to 2014 actual emissions from the General James M. Gavin Power Plant and representative meteorological data from the same period. In addition to the General James M. Gavin Power Plant, Ohio simultaneously modeled actual emissions from Kyger Creek Station[1] located to the south-west of the General James M. Gavin Power plant approximately 2.5 kilometers distant, over the same period. The methodology and results of the analysis are provided in Appendix A. Evaluation of model performance against air quality monitoring data is provided in Appendix C. Ohio also examined air quality monitoring data for relevant monitors near the General James M. Gavin source area.

Factor 2:   Emissions Data

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[1] Ohio EPA intends this submittal to fulfill the future requirements for monitoring or modeling of Kyger Creek Power State per U.S,. EPA's final Data Requirements Rule.

Emissions of SO_2 for 2014 were determined from Ohio EPA's Fee Emission Reports (FERs) which are the basis for Ohio's 2014 NEI submittal. Emissions data for nearby sources in West Virginia were provided by the West Virginia Department of Environmental Protection. Tables identified in this analysis show stationary sources with reported SO_2 emissions in tons per year (TPY) at the facility level within each county relevant to the area around the General James M. Gavin facility. U.S. EPA's Designations Modeling Technical Assistance Document suggests sources greater than the thresholds established under the Data Requirements Rule located within 50 kilometers of the General James M. Gavin facility should be considered in the analysis of emissions data. Further, U.S. EPA Region 5 indicated to the Region 5 states that sources retired prior to the promulgation of a designation for a particular area do not need to be modeled. (Appendix D) This is consistent with the language of the Data Requirements Rule. Therefore, Ohio will consider the reduction in SO_2 emissions due to retirements as part of its recommended designation, if applicable. In addition to the emissions from sources meeting the above criteria, the impact of the General James M. Gavin Power Plant and Kyger Creek Station are directly modeled as a part of Ohio's designation recommendation analysis. Emissions data for both facilities were provided to Ohio EPA by American Electric Power.

Factor 3: Meteorology

The meteorology review looks at wind data gathered at stations in and near Ohio by the National Weather Service (NWS). Information presented under this factor is indicative of annual average winds. These data may also suggest that emissions originating from some directions may be more prone to contribute than emissions in other directions.

Ohio is located in what is meteorologically termed the Mid-Latitudes. For pollutant dispersion, the most important meteorological parameter is wind speed and wind direction. In this region, surface weather systems predominantly travel from west to east, guided by either the sub-tropical or polar jet streams. The resulting surface transport winds associated with these systems will generally have a western component with additional southern components in the summer and northern components in the winter, although, on any given day, winds can blow from any direction. Discussions regarding this factor will show representative wind roses for the source area and SO_2 sources surrounding the General James M. Gavin facility.

The major geographic feature affecting winds in the area surrounding the General James M. Gavin facility is the hilly terrain and the Ohio River valley. This area has significant forested areas which modify the surface roughness lengths and can impact wind speed and wind direction. The Huntington airport

wind roses best illustrate the range of wind directions and wind speeds associated with this area.

A significant portion of this factor is accounted for by the dispersion modeling analysis conducted for this area. The AERSURFACE preprocessor component of the AERMOD model accounts for land use and its impact on surface roughness lengths, albedo, and Bowen ratio. The meteorological inputs to AERMOD itself are taken from measurements at the Huntington airport.

Factor 4:   Topography and Land Use/Land Cover

The topography and land use/land cover analysis looks at physical features and land use or land cover that might have an effect on the airshed and, therefore, the distribution of pollutants over an area. The General James M. Gavin Power Plant is located in the Ohio River valley, and therefore some portions of the area may experience inversions. However, the geographical and topographical features of the area are not likely to limit or impact the transport of SO_2 in a significant manner. Furthermore, the topography of the region is accounted for in the dispersion modeling analysis via the AERMAP preprocessor, and the impact of land use is accounted for via the AERSURFACE preprocessor. As such, Ohio does not consider topography and land use to be a significant factor for this analysis beyond what is analyzed directly via the refined dispersion modeling analysis.

Factor 5:   Jurisdictional Boundaries

The analysis of jurisdictional boundaries looks at the planning and organizational structure of an area to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner. Core Based Statistical Areas (CBSAs), comprised of Metropolitan Statistical Areas (MSAs) and Combined Statistical Areas (CSAs), boundaries were considered for these recommendations.

CHAPTER TWO:

<u>Analysis</u>

<u>Discussion:</u>

Based on the five factor analysis below, Ohio is recommending Gallia County in its entirety and the portion of Meigs County including Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships be designated as attainment for the 2010 one-hour SO_2 standard. The following discussion and information is relevant to those townships in Meigs County listed above as well as the entirety of Gallia County.

As detailed under Factor 1, Ohio EPA modeled actual SO_2 emissions from the General James M. Gavin and Kyger Creek Power Plants, years 2012-2014. No exceedances of the standard were modeled inclusive of a conservative 10 ppb background concentration. Derivation of the background concentration is detailed in Appendix E of this submittal.

Factor 1:   Dispersion Modeling and Air Quality Data

Ohio EPA modeled actual emissions from the General James M. Gavin Power Plant and Kyger Creek Station for years 2012-2014, inclusive of a 10 ppb background. The full details of the modeling analysis are presented in Appendix A of this submittal.   Appendix F includes the modeling protocol, and an evaluation of model performance is presented in Appendix C. For this analysis, the maximum modeled 3-year design value, years 2012-2014, was 162.16913 $\mu g/m^3$ (188.32660 $\mu g/m^3$, including background). Note that Ohio ensured that the maximum combined impacts were captured by the finest receptor grid included in the modeling domain, as described in Appendix A of this submittal. An area meets the standard of 75 ppb if a concentration of 196.2 $\mu g/m^3$ or lower is modeled, inclusive of background. Thus, no exceedance of the standard was modeled.   The results of this analysis are shown in Figure 1.   Note that for clarity, only design values of 150 $\mu g/m^3$ or greater, inclusive of background, are displayed.
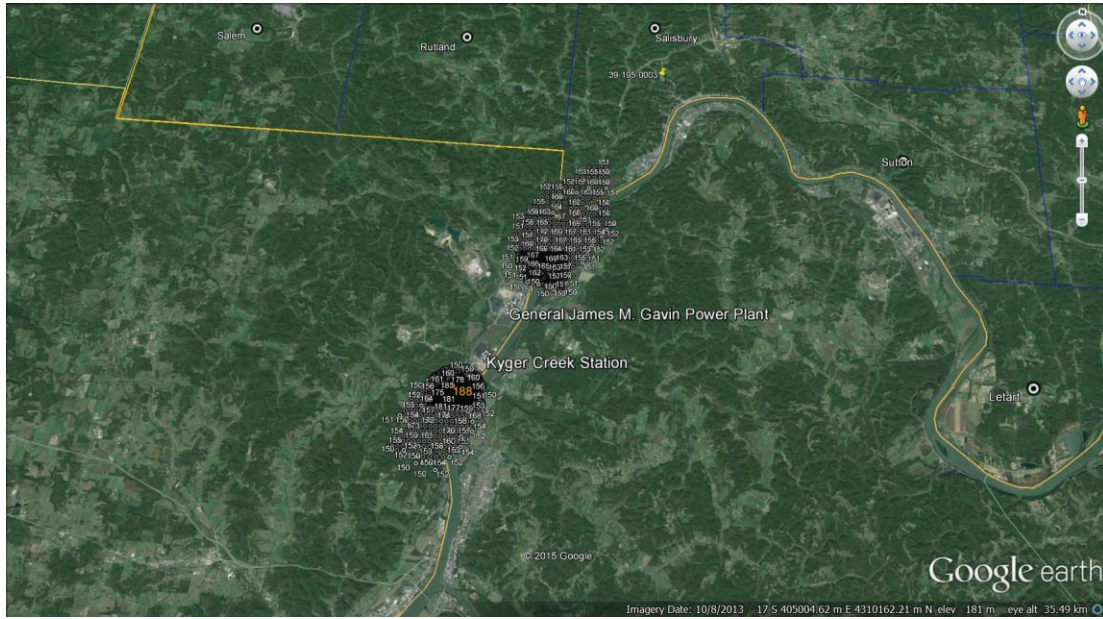
Figure 1: Maximum SO2 impacts, General James M. Gavin and Kyger Creek facilities, 2012-2014. Concentrations are shown in $\mu g/m^3$ including background.

The maximum 3-year design value was modeled approximately 1,200 meters from the fenceline of Kyger Creek Station and approximately 1,800 meters from the largest SO_2 source at Kyger Creek. The spatial distribution of modeled concentrations greater than or equal to 150 $\mu g/m^3$ were located in a 5 to 9 kilometer radius of the primary emissions sources, as detailed in Appendix A. As shown in Figure 1, the distribution of highest impacts is clearly and strongly influenced by the Ohio River valley. It should be noted that Ohio's modeling analysis was conducted over a 50 x 50 kilometer modeling domain to encompass relevant jurisdictional boundaries.

In addition to the modeling analysis, Ohio examined monitor data from the five SO_2 monitors located around Gallia County and the General James M. Gavin source area. The monitor data, years 2012-2014, is summarized in Table 1.

2012-2014 Monitored SO2 Design Values: General James M. Gavin Source Area			
Monitor ID	**County**	**2012-2014 DV (ppb)**	**Distance from Gavin Plant (km)**
39-105-0003*	Meigs	30	13
39-087-0012	Lawrence	17	67
39-145-0013	Scioto	9	72
39-145-0020	Scioto	27	71
39-145-0022	Scioto	19	73

Table 1: SO$_2$ design values, Gallia County and General James M. Gavin source area. *Background derived from monitor 39-105-0003.

The AQS monitoring data retrievals are included as Appendix H. With the exception of monitor 39-105-0003, located 13 kilometers to the Northeast of the General James M. Gavin Plant, these monitors are located approximately 70 kilometers to the Southwest of the General James M. Gavin facility and approximately 30 kilometers distant from the nearest border of Gallia County. The location of these monitors and the explicitly modeled sources are shown in Figure 2.
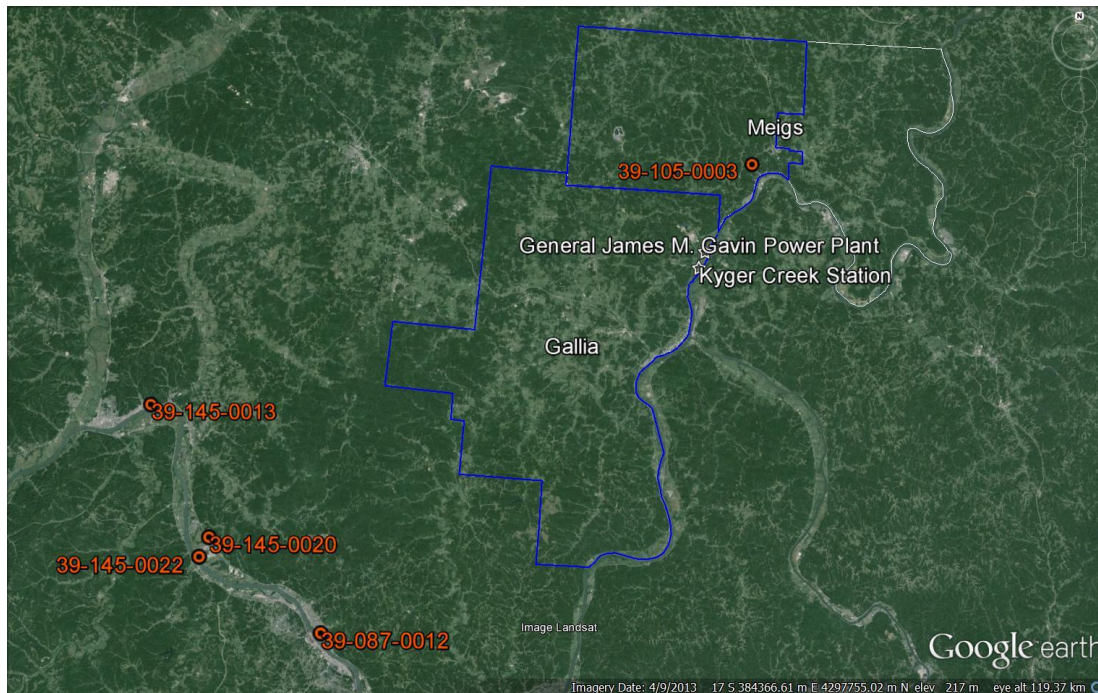

Figure 2: SO$_2$ monitors surrounding the General James M. Gavin source area.

Although these monitors are likely not impacted by emissions from the General James M. Gavin Plant and Kyger Creek Station, they are indicative of SO$_2$ concentrations that would be transported into Gallia County and the source area via the prevailing winds of the area, as described in Factor 3 of this analysis. As shown in Table 1, all monitors are well below the standard of 75 ppb. Further, with the exception of monitor 39-145-0013, these monitors are sited to specifically monitor significant SO$_2$ sources. Thus, it is anticipated that dispersion over the approximately 30 kilometers distance to Gallia County will reduce the concentration of SO$_2$ transported into Gallia County below what is conservatively accounted for by background, and certainly well below the 75 ppb standard. Ohio believes that, in addition to the modeling results and the absence of significant SO$_2$ sources (Factor 2), this provides strong evidence that the 75 ppb standard is attained throughout Gallia County.

Monitor 39-105-0003, located 13 kilometers to the Northeast of the General

James M. Gavin Plant in Meigs County, has a 2012-2014 SO_2 design value of 30 ppb. This monitor was sited specifically to monitor the impacts of emissions from both the General James M. Gavin Plant and Kyger Creek Station. Taking into account the meteorology of the area and the absence of other SO_2 sources not explicitly modeled, it is unlikely that SO_2 concentrations above the standard would occur to the North or West of this monitor. Further, modeling results indicate that the highest modeled concentrations are strongly oriented along the Ohio River valley (Figure 1), and that areas outside of the valley are not strongly impacted by emissions from the General James M. Gavin and Kyger Creek Station facilities. As such, Ohio is including the Western portion of Meigs County in its recommended designation of attainment.

Factor 2:   Emissions

In 2014, there were 65,681 TPY of actual SO_2 emissions from Ohio and West Virginia sources within 50 kilometers of the General James M. Gavin facility (inclusive) from sources that might potentially need to be modeled under the requirements of the Data Requirements Rule. 50,621 TPY of actual 2014 SO_2 emissions are within Gallia County itself. These sources are shown in Table 2.

State	County	Facility ID	Facility Name	2014 SO2 Emissions (TPY)	Distance from General J.M. Gavin (km)
OH	Gallia	0627010056	General James M. Gavin Power Plant	36,873	--
OH	Gallia	0627000003	Ohio Valley Electric Company, Kyger Creek Station	13,748	2.5
			Gallia Total	*50,621*	
WV	Mason	6760811	Appalachian Power Mountaineer Plant	4,411	16.7
WV	Mason	6760711	Appalachian Power Phillip Sporn Plant	10,649	17.2
			Mason Total	*15,060*	
			Grand Total	*65,681*	

Table 2: 2014 annual SO$_2$ emissions, General James M. Gavin Plant and nearby sources.

A significant aspect of Ohio's recommended designation and selection of sources explicitly modeled is the cessation of operations at the Phillip Sporn Plant as of June 1, 2015. (Appendix I) This represents an emission reduction of approximately 16% from the area surrounding the General James M. Gavin facility. Per U.S. EPA Region 5, sources retired prior to the promulgation of a designation for a particular area do not need to be modeled (Appendix D). As such, the impacts of emissions from the Phillip Sporn Plant were not considered in this analysis. The distance between the remaining facilities and the area impacted by emissions from the General James M. Gavin Plant, as well as the meteorology of the area (Factor 3) were considered. The distance between Kyger Creek Station and the General James M. Gavin Plant, 2.5 km, necessitated that Kyger Creek Station emissions be explicitly modeled. Ohio EPA also determined that the relatively low emissions from the Mountaineer Plant, considering meteorology (discussed below) and its distance from the General James M. Gavin Plant (4,411 TPY, 16.7 km), would not necessitate they be explicitly modeled as they are unlikely to impact ambient SO_2 concentrations in the source area beyond what is accounted for in the background concentration. This conclusion is supported by the fact that emissions from the General James M. Gavin Plant and Kyger Creek Station, which were approximately 11 times higher than Mountaineer Power Plant in 2014, did not demonstrate modeled exceedances of the standard, and had maximum impacts relatively close to the facilities, as described in Factor 1. Further, Ohio EPA's model performance evaluation demonstrated that modeled impacts at the location of air quality monitor 30-105-0003, located approximately 13 kilometers distant and sited to monitor emissions from the General James M. Gavin and Kyger Creek Station facilities, had a maximum modeled design value of 46 ppb, including background. It is therefore unlikely that the relatively low emissions from Mountaineer Power Plant, located approximately 17 kilometers distant, would cause a significant concentration gradient beyond what is accounted for in background.

Factor 3:   Meteorology

Please refer to the Factor 3 general discussion at the beginning of this document for general meteorological information applicable to Gallia County and the General James M. Gavin facility. Per relevant U.S. EPA guidance, dispersion modeling accounts for the majority of topographical and land use features that influence the meteorology of Gallia County. Of particular importance in Ohio's designation recommendation for this area are the annual trends and distribution of wind directions in this area, which are best represented by data from the National Weather Service station located at the Huntington Tri-State Airport in Wayne County, West Virginia. Wind roses from this station, years 2012 to 2014, are shown in Figure 3, below.
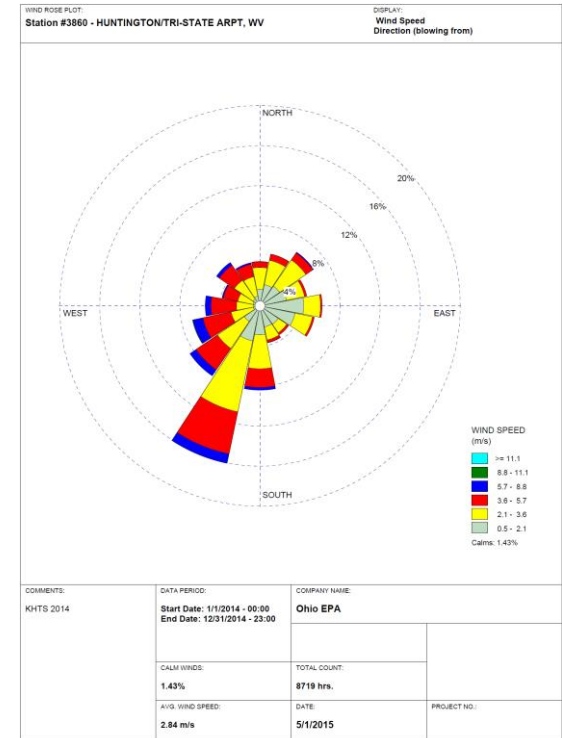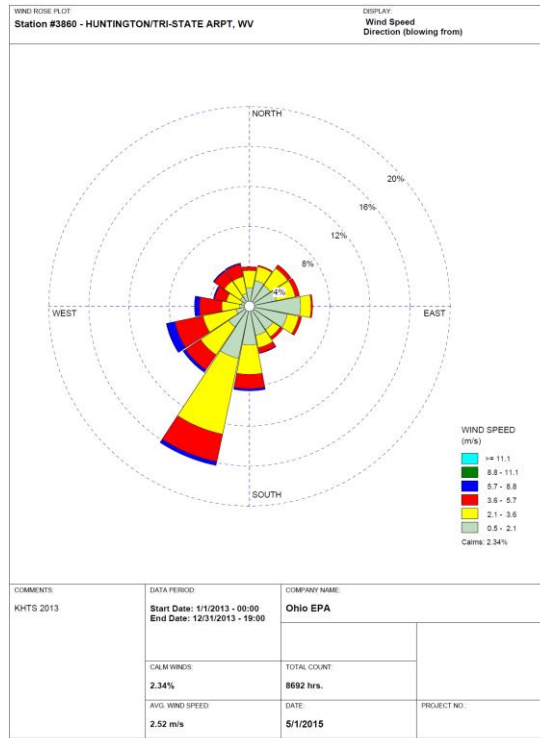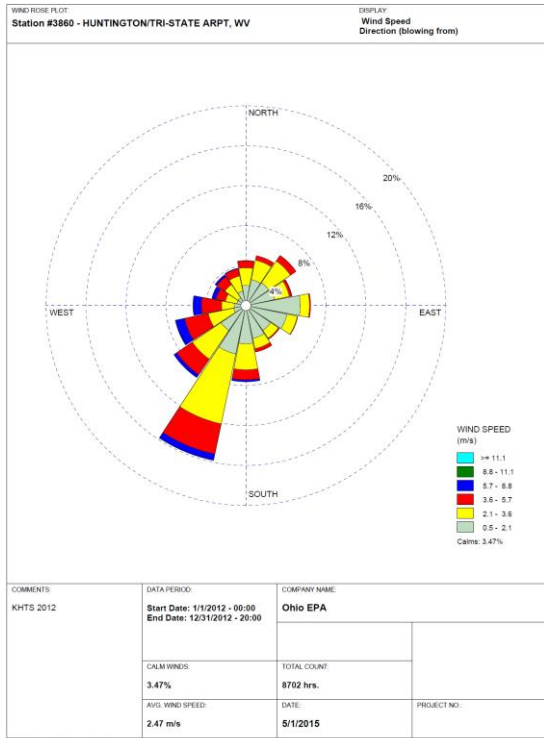
Figure 3: Huntington wind roses, 2012-2014.

The predominant wind directions were used, in part, to inform which facilities in Table 2, in addition to General James M. Gavin Power Plant and Kyger Creek Station, may potentially impact ambient SO_2 concentrations in Gallia County not accounted for by background and therefore necessitate inclusion in the dispersion modeling analysis. As shown in Figure 3, the predominant winds in the source area originate from the south and southwest. Figure 4 shows the location of all facilities in Table 2, as well as a composite wind rose, years 2012-2014, from the Huntington meteorological station.
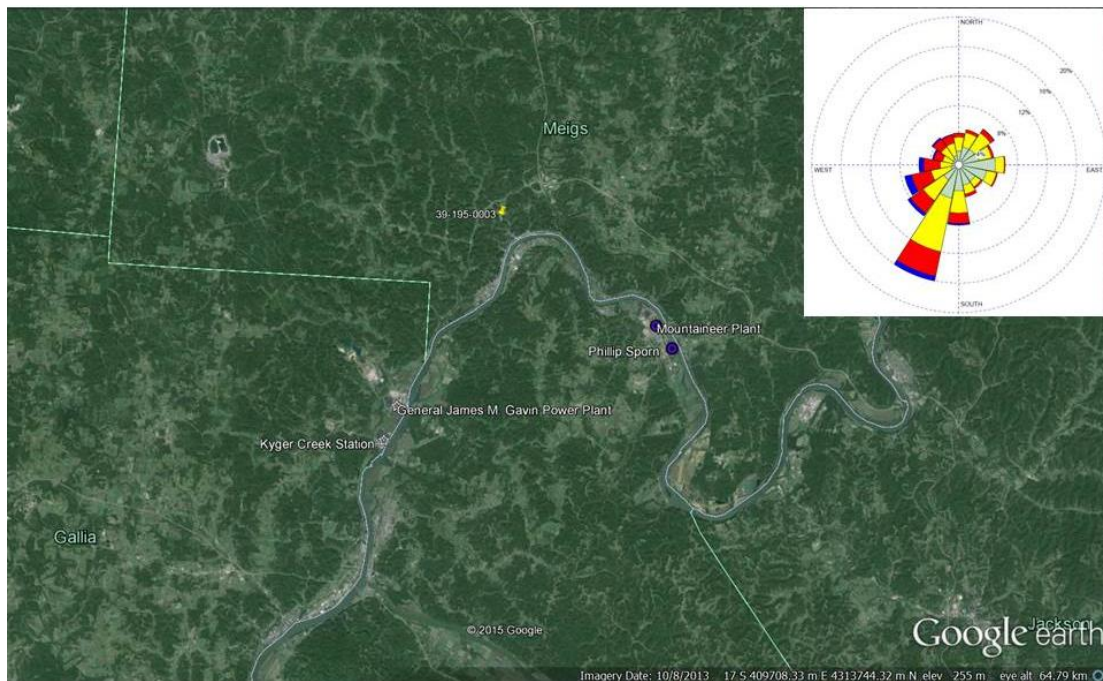

Figure 4: SO_2 sources within 50 km of the General James M. Gavin Power Plant, with 2012-2014 composite wind rose.

Considering the predominant wind directions, Ohio does not conclude the emissions from the Mountaineer Plant, located 16.7 km to the east-northeast of the General James M. Gavin Plant, impact ambient SO_2 concentrations in Gallia County and the townships of Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio in Meigs County[2]. Further, the Phillip Sporn Plant is no longer operational as of June 1, 2015 and therefore is not considered in this analysis. Ohio does not conclude that emissions from these sources impact ambient SO_2 concentrations beyond the background level accounted for in the refined

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[2] Ohio EPA also anticipates emissions from the Mountaineer Plant will not cause violations in the remainder of Meigs County. However, the Mountaineer Plant will be analyzed separately under U.S. EPA's Data Requirements Rule in the future by the West Virginia Department of Environmental Quality.

dispersion modeling analysis. Wind direction data and proximity suggests that emissions from Kyger Creek Station would potentially impact ambient SO_2 concentrations, and therefore this source was explicitly modeled. Ohio concludes that, following the closure of the Phillip Sporn facility, the primary sources of SO_2 in the General James M. Gavin source area are the General James M. Gavin Plant and Kyger Creek Station, and that the impact of those facilities in Table 2 not explicitly modeled or shutdown prior to promulgation of a designation are represented adequately and conservatively by the background concentration included in the Factor 1 modeling analysis.

Factor 4:   Topography and Land Use/Land Cover

Please refer to the general discussion of Factor 4 at the beginning of this document. Ohio, consistent with U.S. EPA guidance, understands that the topography and land use characteristics influencing meteorology and the dispersion of SO_2 emissions from the General James M. Gavin and Kyger Creek facilities are adequately accounted for via the dispersion modeling analysis. Please refer to the Factor 1 section of this Chapter.

Factor 5:   Jurisdictional Boundaries

The Point Pleasant, WV Micropolitan Statistical Area includes Mason County, West Virginia and Gallia County, Ohio. Meigs County, Ohio is not part of any combined statistical area or group. The Ohio EPA Central Office and the Ohio EPA Southeast District Office are responsible for air quality planning within all areas of Gallia and Meigs County. Gallia and Meigs Counties are not currently nonattainment for the 2010 one-hour SO_2 standard. The dispersion modeling analysis conducted by Ohio was inclusive of the entirety of Gallia and Meigs Counties. In this submission, Ohio is recommending, based on a five-factor analysis, that the entirety of Gallia County and the Western half of Meigs County inclusive of Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships, be designated unclassifiable/attainment for the 2010 one-hour SO_2 standard. Counties and Townships in Ohio have well-established boundaries and administration, and Ohio believes they are a suitable administrative basis for this recommendation.

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