Technical Support Document:

Chapter 22
Final Round 3 Area Designations for the 2010 1-Hour SO$_2$ Primary National Ambient Air Quality Standard for Missouri

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). Our Notice of Availability (NOA)[1] and our Technical Support Document[2] for our intended designations for the round of designations we are required to complete by December 31, 2017, provided background on the relevant CAA definitions and the history of the designations for this NAAQS. Chapter 1 of this TSD for the final designations explains the definitions we applying in the final designations. The TSD for the intended Round 3 area designations also described Missouri's recommended designations, assessed the available relevant monitoring, modeling, and any other information, and provided our intended designations.

This TSD for the final Round 3 area designations for Missouri addresses any change by Missouri to Missouri's recommended designations since we communicated our intended designations for areas in Missouri. It also provides our assessment of additional relevant information that was submitted too close to the signature of the NOA to have been considered in our intended designations, or that has been submitted by Missouri or other parties since the publication of the NOA. This TSD does not repeat information contained in the TSD for our intended designations except as needed to explain our assessment of the newer information and to make clear the final action we are taking and its basis, but that information is incorporated as part of our final designations. If our assessment of the information already considered in our TSD for our intended designations has changed based on new information and we are finalizing a designation based on such change in our assessment, this TSD also explains that change. For areas of Missouri not explicitly addressed in this chapter, we are finalizing the designations described in our 120-day letters and the TSD for the intended Round 3 area designations. All the final designations are listed in Table 1 below.

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[1] EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard: Notification of Availability and Public Comment Period, September 5, 2017 (82 FR 41903).

[2] Technical Support Document: Intended Round 3 Area Designations for the 2010 1-Hour SO$_2$ Primary National Ambient Air Quality Standard, August 2017. https://www.epa.gov/sulfur-dioxide-designations/initial-technical-support-documents-area-designations-round-3.

For the areas in Missouri that are part of the Round 3 designations process, Table 1 identifies the EPA's final designations and the counties or portions of counties to which they apply. It also lists Missouri's current recommendations. Missouri has not changed its recommendation for any of its Round 3 areas but did submit new modeling information for the Greene County area. The EPA's final designations for these areas are based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1. Summary of the EPA's Final Designations and the Designation Recommendations by Missouri

Area/ County	Missouri's Recommended Area Definition	Missouri's Recommended Designation	EPA's Intended Designation	EPA's Final Area Definition[+]	EPA's Final Designation[3]
Henry County	Henry County	Attainment	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable
St Louis County	Within St. Louis County: The portion of St. Louis County bounded by county and state lines to the South, West and East, and US50 and I-55 to the North and West.	Attainment	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable
Jasper County	Jasper County	Attainment	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable
Barton County	Barton County	Attainment	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable

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[3] Refer to Chapter 1 of Technical Support Document: Final Round 3 Area Designations for the 2010 1-Hour SO$_2$ Primary National Ambient Air Quality Standard for definitions of the designation categories and the terminology change from Unclassifiable/Attainment to Attainment/Unclassifiable.

Area/ County	Missouri's Recommended Area Definition	Missouri's Recommended Designation	EPA's Intended Designation	EPA's Final Area Definition[+]	EPA's Final Designation[3]
Randolph County	Randolph County	Attainment	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable
Greene County	Greene County	Attainment	Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable
Remaining Undesignated Areas To Be Designated in this Action[*]	Entire counties or remainder of counties, as separately designated areas	Unclassifiable	Unclassifiable /Attainment	Same as State's Recommendation	Attainment/ Unclassifiable

+Our final designated areas include all tribal lands within these counties. The EPA is not determining the boundaries of any area of Indian country in this document, including any area of Indian country located in a larger designation area. The inclusion of any Indian country in the designation area is not a determination that the state has regulatory authority under the Clean Air Act for such Indian country.

*Except for areas that are associated with sources for which Missouri elected to install and timely began operation of a new SO_2 monitoring network meeting EPA specifications referenced in the EPA's SO_2 DRR (*see* Table 2), the EPA is designating the remaining undesignated areas as "attainment/unclassifiable." These areas are identified more specifically in Table 19 in section 8.1 of Chapter 22 of the TSD for the intended designations.

Areas for which Missouri elected to install and began operation of a new, approved SO_2 monitoring network and which are not being addressed in this round are listed in Table 2. The EPA is required to designate these areas, pursuant to a court ordered schedule, by December 31, 2020. Table 2 also lists the SO_2 emissions sources around which each new, approved monitoring network has been established.

Table 2 – Undesignated Areas for Which Missouri Installed New Monitors (and Associated Source or Sources)

Area	Source(s)
Iron County	Doe Run Buick Resource Recycling
New Madrid County	AECI New Madrid Power Plant – Marston Noranda Aluminum Inc. – New Madrid

2. Technical Analysis of New Information for the Greene County Area

2.1. Introduction

The EPA must designate the Greene County area by December 31, 2017, because the area has not been previously designated and Missouri 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 Greene County.

In Missouri's prior recommendation for this area, the state had recommended attainment based on a modeling assessment. However, Missouri subsequently identified a problem with the emissions data for John Twitty Energy Center. Missouri conducted a new modeling analysis with new emission rates and submitted this modeling analysis as part of their October 23, 2017 response letter to our intended unclassifiable designation. Missouri also provided an additional modeling analysis to the EPA on November 13, 2017.

2.2. Summary of Information Reviewed in the TSD for the Intended Round 3 Area Designations

In the 120-day letter notification to the governor of Missouri, and further explained in Chapter 22 of the TSD for the intended Round 3 area designations, the EPA proposed a designation of unclassifiable based on all available information, including modeling information and all relevant monitoring information.

Table 3 below identifies all the modeling assessments evaluated for the 120-day letters and discussed in the TSD for the intended Round 3 area designations. Additional details can be found in the TSD for the Intended Round 3 Area Designations, Chapter 22.

Table 3 –Modeling Assessments Evaluated in the TSD for the Intended Designation for the Greene County Area

Organization Submitting Assessment	Date of the Assessment	Identifier used in the TSD for the Intended Round 3 Area Designations, Chapter 22	Distinguishing or Otherwise Key Features
Missouri	December 8th 2016	December 2016 Greene County Modeling	None

The state submitted modeling to the EPA on December 8, 2016, demonstrating the entirety of Greene County, Missouri, was meeting the NAAQS. However, in April 2017, the state informed the EPA that the CEMS data for John Twitty Energy Center used in the modeling were

potentially under-reported due to moisture in a probe. Thus, the EPA was unable to rely upon Missouri's December 8, 2016, modeling analysis to inform our intended designation. Because the EPA was unable to rely upon the modeling the state submitted and there was no other reliable information available to characterize air quality in the area, we were also unable to determine whether there was a predicted violation of the NAAQS in Greene County and whether emission sources within Greene County contributed to predicted violations in nearby counties. Therefore, our intended designation was unclassifiable.

2.3.   Assessment of New Air Quality Monitoring Data for the Greene County Area

The state indicated that it does not have existing SO_2 monitoring data in Greene County that would represent maximum impacts from the John Twitty Energy Center. The state has historically operated two monitors in Greene County, AQS site 29-077-0026 South Charleston and AQS site 29-077-0037 James-River South, both of which have a 2014-2016 design value of 17 parts per billion (ppb). Because the state indicated in its original DRR submittal that these monitors were not in an area of expected maximum impact from the John Twitty facility, data from these monitors has not determined our final designation for the Greene County area. We also do not have certified data for any additional complete calendar years at any of these sites, and we have no new monitoring information of any other type that the EPA has determined would warrant revising our prior analysis of available monitoring data.

The EPA agrees with Missouri that there are no monitoring sites representing maximum impacts from the John Twitty Energy Center within Greene County.

2.4.   Assessment of New Air Quality Modeling Analysis for the Greene County Area Addressing John Twitty Energy Center

2.4.1. Introduction

This section 2.4 presents all the newly available air quality modeling information for Greene County, Missouri, with a focus on the area around John Twitty Energy Center. (This portion of Greene County will often be referred to as "the John Twitty Energy Center area" or "the Greene County area" within this section 2.4.) This area contains the following SO_2 source around which Missouri was required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tons per year:

The John Twitty Energy Center facility emits 2,000 tons or more annually. Specifically, John Twitty emitted 3,021 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Missouri has chosen to characterize it via modeling.

On October 23, 2017, and November 13, 2017, Missouri submitted a total of three new modeling analyses for air quality in the area surrounding the John Twitty facility. Missouri continues to recommend that an area that includes the area surrounding the John Twitty facility, specifically all of Greene County, be designated as attainment based in part on its assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area. This new assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. Missouri's analysis supports a different designation than the EPA's intended designation for this area. The EPA expressed an intent to designate the area as unclassifiable, whereas Missouri's analysis supports a designation as attainment.

The area that the state has assessed via air quality modeling includes Greene County and also includes portions of Dade, Polk, Dallas, Webster, Christian, Stone, and Lawrence counties in Missouri.

As seen in Figure 1 below, the John Twitty facility is located in the south central portion of Greene County approximately 11 km southwest of downtown Springfield, Missouri.

Also included in the figure is another nearby emitter of SO_2, specifically the James River Power Plant.[4] James River and three smaller-emitting sources, Timken SMO LLC, Euticals Inc., and Noble Hill Landfill Renewable Energy Center, are also located within Greene County and were therefore included in the modeling analysis. James River is east-southeast of John Twitty, approximately 12 km away. The EPA notes that Timken SMO LLC did not meet the criteria to be required to report emissions to the EPA NEI database and therefore did not report emissions to the NEI in 2014.

The state's recommended area for the attainment designation continues to be all of Greene County, Missouri. The EPA's final designation boundary for Greene County area is not shown in this figure, but is shown in a figure in the section below that summarizes our final designation.

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[4] All other SO_2 emitters of 1 tpy or more based on information in the Missouri MOEIS inventory database for calendar year 2013, 2014, or 2015 are shown in Figure 1.

Figure 1. Map of the Greene County Area Addressing the John Twitty Energy Center
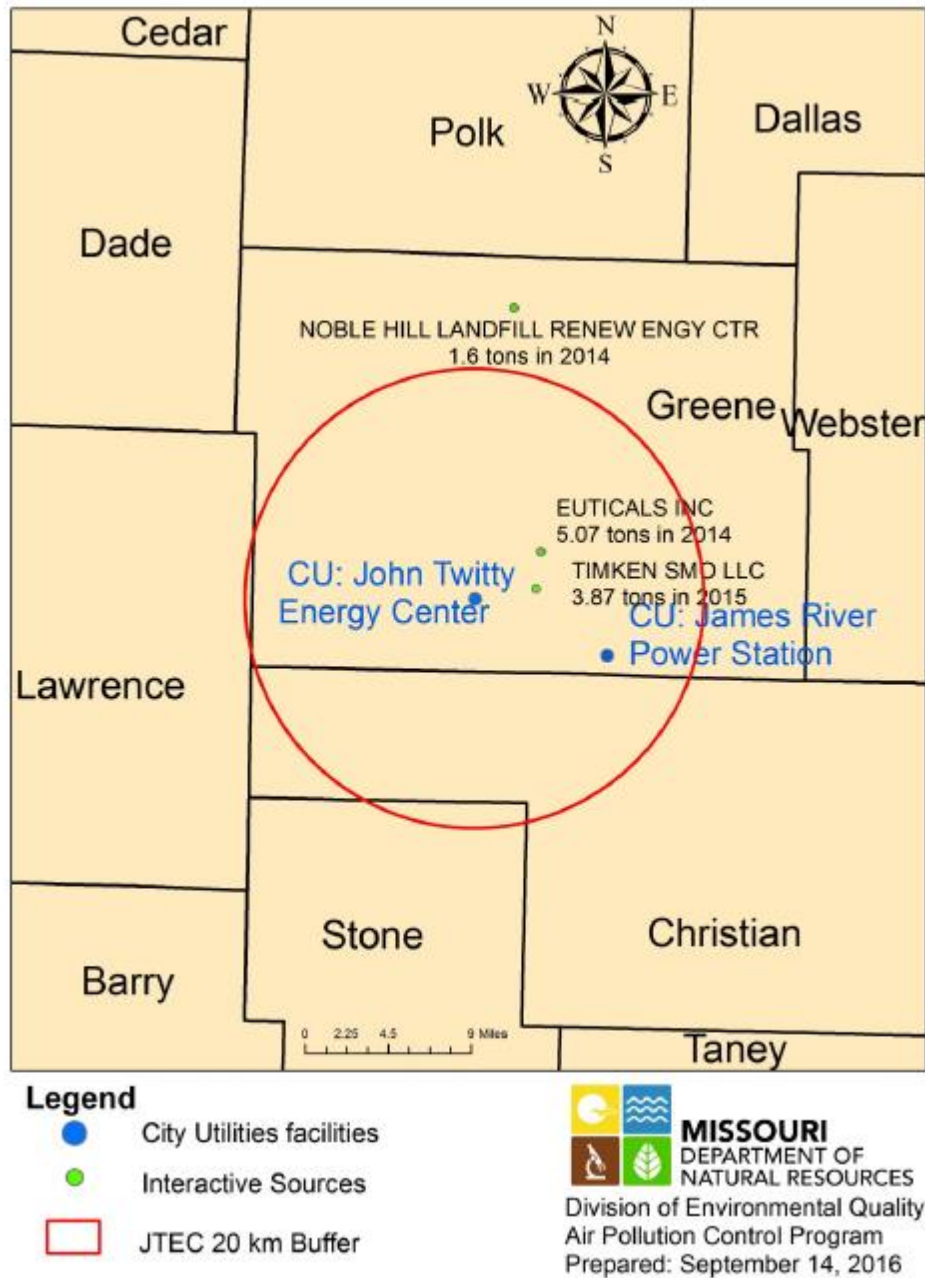
The discussion and analysis that follows below will reference the Modeling TAD cited in Chapter 1 of this TSD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance cited in Chapter 1 of this TSD, as appropriate.

For this area, the EPA received three different modeling assessments, beyond those identified above in Table 3 that were reviewed in our TSD for our intended designations, after the issuance of 120-day letters, including three assessments from the state and no assessments from other parties. To avoid confusion in referring to these assessments, the following Table 4 lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

Table 4 –New Modeling Assessments for the Greene County Area

Organization Submitting Assessment	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
Missouri	October 23, 2017	120-day response Coal Delivery	Original response from state – contained errors
Missouri	November 13, 2017	120-day response Corrected CAMD	Uses latest CAMD data including substitute data
Missouri	November 13, 2017	120-day response Corrected Coal Delivery	Corrected stack parameter and emission errors.

2.4.2. Modeling Analysis Provided by the State

2.4.2.1.Differences Among and Relevance of the Modeling Assessments

Missouri, in its response to our 120-day letter, submitted new dispersion modeling for the Greene County area. The main differences between the original Missouri 2016 dispersion modeling and each of these three new dispersion modeling analyses are the emission inputs for the John Twitty Energy Center. In the original 2016 modeling, Missouri used CEM data as reported to CAMD at the time of Missouri's original submittal. In April 2017, Missouri informed the EPA that the facility emissions were potentially underreported due to a CEM probe issue and the 2015 CEMs data were invalidated for one of the John Twitty emission units.

The first new Missouri modeling analysis (120-day response Coal Delivery), submitted on October 23, 2017, with the state's initial response to the 120-day letter, utilized an alternative approach to estimate hourly emissions based on the reported heat input and coal deliveries with sulfur content measurements. The EPA reviewed this modeling data and overall methodology and identified modeled emission rates that may not reflect actual emissions that occurred during certain periods. To address these EPA concerns, Missouri submitted two additional modeling runs on November 13, 2017: (1) 120-day response corrected CAMD modeling – which used the CAMD data as currently reported by CAMD in the modeling including substitute data associated with the probe error not available to the state when it did its original modeling; and (2) 120-day response Corrected Coal Delivery – which is identical to the 120-day response Coal Delivery modeling that used coal delivery information to inform the emissions except for certain corrections including certain corrected stack parameters and a correction for a period where coal delivery-based emissions inputs were transposed/substituted between the two John Twitty units.

In addition to the issues with the CEMS data for John Twitty, Missouri also discovered a unit conversion error in the state's original modeling (Missouri December 2016 modeling) for the contributing sources in Greene County. Missouri corrected this error for all three new modeling analyses submitted in response to our 120-day letter. The new Missouri modeling will be described further below.

2.4.2.2. 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

In all of its new modeling analyses, the state used AERMOD version 16216r and AERMET version 16216, which were the most recent versions at the time of its 120-day response submittals to the EPA, and remain the most recent versions as of the date of the final designations. A discussion of the state's approach to the individual components is provided in the discussion that follows, as appropriate. The Missouri December 2016 modeling analyzed by the EPA for the intended designations used AERMOD version 15181, which was the most recent version available at the time Missouri was performing modeling for their December 2016 submittal.

2.4.2.3.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the "urban" or "rural" determination of a source 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 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.

The Guideline on Air Quality Models, Appendix W (January 2017) section 7.2.1 instructs users to define the urban or rural classification of the area considering land use and population density. The land use procedure in Appendix W 7.2.1.1(b) classifies urban areas based on industrial, commercial, and residential land use over 50% within a 3 km radius of the source. The population density threshold of the 3 km radius surrounding each facility is compared to the urban threshold of 750 people per square kilometer. Both the land use and population density guidelines in Appendix W were used to assess the urban characteristics of the area and it was determined to be rural.

For the reasons above and those stated in the TSD for the intended designations, the EPA agrees with the state for this component of the state's modeling. The rationale and the EPA's assessment of this component did not change from the prior state submittal and intended designation TSD.

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

The Modeling 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 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 source of SO$_2$ emissions subject to the DRR in this area is described in the introduction to this section. For the Greene County area, the state included four other emitters of SO$_2$ within 50 kilometers (km) of John Twitty in any direction. The state determined that this 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. In addition to John Twitty, the other emitters of SO$_2$ included in the area of analysis are James River, Timken SMO LLC, Euticals Inc., and Noble Hill Landfill Renewable Energy Center. No other sources beyond 50 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis.

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

- Center to 1 kilometer (km), receptors placed at 100m intervals
- 1km to 3.5km, receptors placed at 250m intervals
- 3.5km to 10km, receptors placed at 500m intervals
- 10km to 30km, receptors placed at 1000m intervals

The receptor network contained 7,555 receptors, and the network covered all of Greene County and also included portions of Dade, Polk, Dallas, Webster, Christian, Stone, and Lawrence counties in Missouri.

Figure 2, included in the state's recommendation, shows the state's chosen area of analysis surrounding the John Twitty facility, as well as the receptor grid for the area of analysis.

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. The state did not exclude receptors over water or in other areas as described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. The state excluded receptors within the facility fenceline. The EPA reviewed aerial and street view imagery for this fenceline and believes it is acceptable to exclude these receptors. The fence appears to be a mix of partial chain-link and partial barb wire, depending on the location on the fenceline.

Figure 2: Receptor Grid for the John Twitty Area
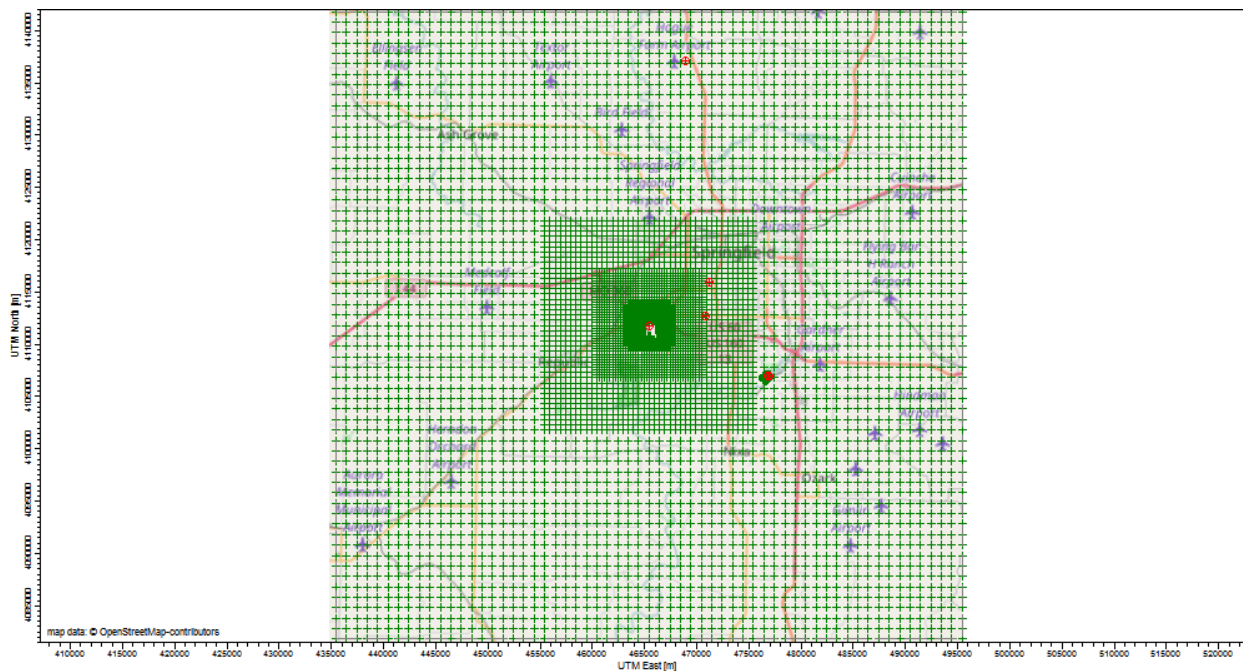
The EPA concludes that the receptors used in the Missouri submittal are appropriate for characterizing the air quality around the John Twitty Energy Center. Missouri included ambient receptors extending out 30 km and it did not exclude any receptors over water or on other facilities' property. The rationale and the EPA's assessment of this component did not change from the prior state submittal and intended designation TSD.

2.4.2.5.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 included John Twitty and all sources that emitted greater than 1 ton per year of SO_2 within 50 km of John Twitty Energy Center.

The state characterized these sources within the area of analysis 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 was used to assist in addressing building downwash.

The EPA concludes the state has identified and included in the modeling all emissions sources

that may contribute to ambient SO_2 concentrations, including all relevant sources located in Greene County. These sources in the modeling did not change from the Missouri December 2016 modeling, and the EPA's assessment of this component did not change from the intended designation TSD.

2.4.2.6.Modeling Parameter: Emissions

The 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 effective and enforceable.

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. Specifically, a state may use PTE rates for a facility that 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. 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 John Twitty and four other emitters of SO_2 within 50 km in the area of analysis. The state has chosen to model these facilities using actual emissions. The facilities in the state's modeling analyses and their associated annual actual SO_2 emissions between 2013 and 2015 are summarized below.

For the facilities, the state provided annual actual SO_2 emissions between 2013 and 2015. This information is summarized in Table 5. A description of how the state obtained hourly emission rates is given below this table.

Table 5. Actual SO₂ Emissions Between 2013 – 2015 from Facilities in the Greene County Area

Facility Name	SO₂ Emissions Tons/Year (tpy)		
	2013	**2014**	**2015**
John Twitty	2,584	3,021	1,661*
James River	1,846	1,793	440
Timken SMO LLC	0.06	0.13	3.87
Euticals Inc.	0.08	5.07	0.93
Noble Hill Landfill REC	1.60	1.60	1.40
Total Emissions from All Modeled Facilities in the State's Area of Analysis	4,432	4,821	2,107

*This value is taken from the state's original submittal, as the state did not submit replacement information with its new modeling analysis. The EPA notes that the state has used modeling reflecting 2,672 tpy in its 120-day response Corrected CAMD modeling submittal.

For John Twitty and James River the actual hourly emissions data used in the state's original modeling analysis were obtained from CEMS as reported to CAMD. For the remaining sources, the state apportioned the reported highest annual emissions of the 3 years over 8,760 hours and used that rate as representative for all 3 years in the modeling. Spreading annual emissions across all hours in a year may not be appropriate in many cases. However, in this case, given the low annual emissions reported and the lack of additional temporalization information, this method is acceptable. As already noted, the state has subsequently found and corrected a unit conversion error related to the modeled emission rate for the contributing sources.

In April 2017, the state informed the EPA via a phone call that the CEMS data that were used in the original modeling for the John Twitty facility were potentially under-reported due to moisture in a probe. We noted in our TSD for the intended designations that CAMD had published a value of 2,672 tpy for 2015 emissions from the John Twitty facility. These CAMD-published hourly data and the 2015 total emission value are based on a data substitution approach in which the maximum potential concentration of SO₂ in the stack (397 ppm) is paired with actual stack flow information to calculate a substitute hourly emission value for each hour in the period believed to be affected by the probe problem. Therefore, this CAMD-substituted data set represents hourly emissions values that are equal to or greater than the emissions that actually occurred. As part of Missouri's response to our intended designation, Missouri submitted a new modeling run (120-day response Corrected CAMD modeling) that used the CAMD-substituted data for periods in which emissions originally were under reported.

2.4.2.7. 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 Greene County area, the state selected the surface meteorology from the Springfield NWS station, located in Springfield, Missouri, located at 37.2397616, -93.3899533, 10 km to the north of the source, and coincident upper air observations from the same NWS station, as best representative of meteorological conditions.

The state used AERSURFACE version 13016 using data from the Springfield 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 1 km at a seasonal temporal resolution for dry, wet, and average conditions.

In Figure 3 below, generated by the EPA, the location of this NWS station is shown relative to the area of analysis.

Figure 3. Area of Analysis and the NWS station in the Greene County Area
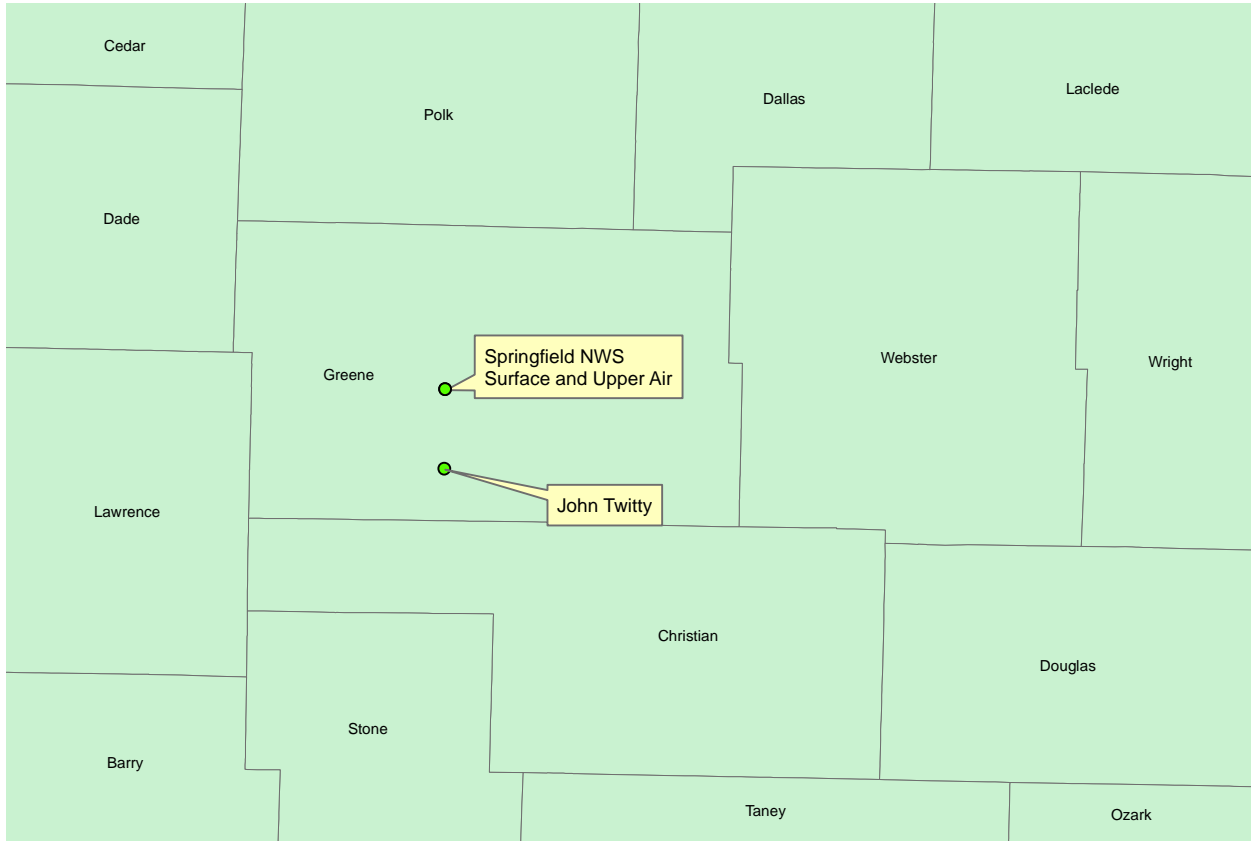
As part of its recommendation, the state provided the 3-year surface data, from which the EPA generated a wind rose for the Springfield NWS station. In Figure 4, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The predominant wind patterns are from the SSE.

Figure 4: Greene County Cumulative Annual Wind Rose for Years 2013 – 2015.
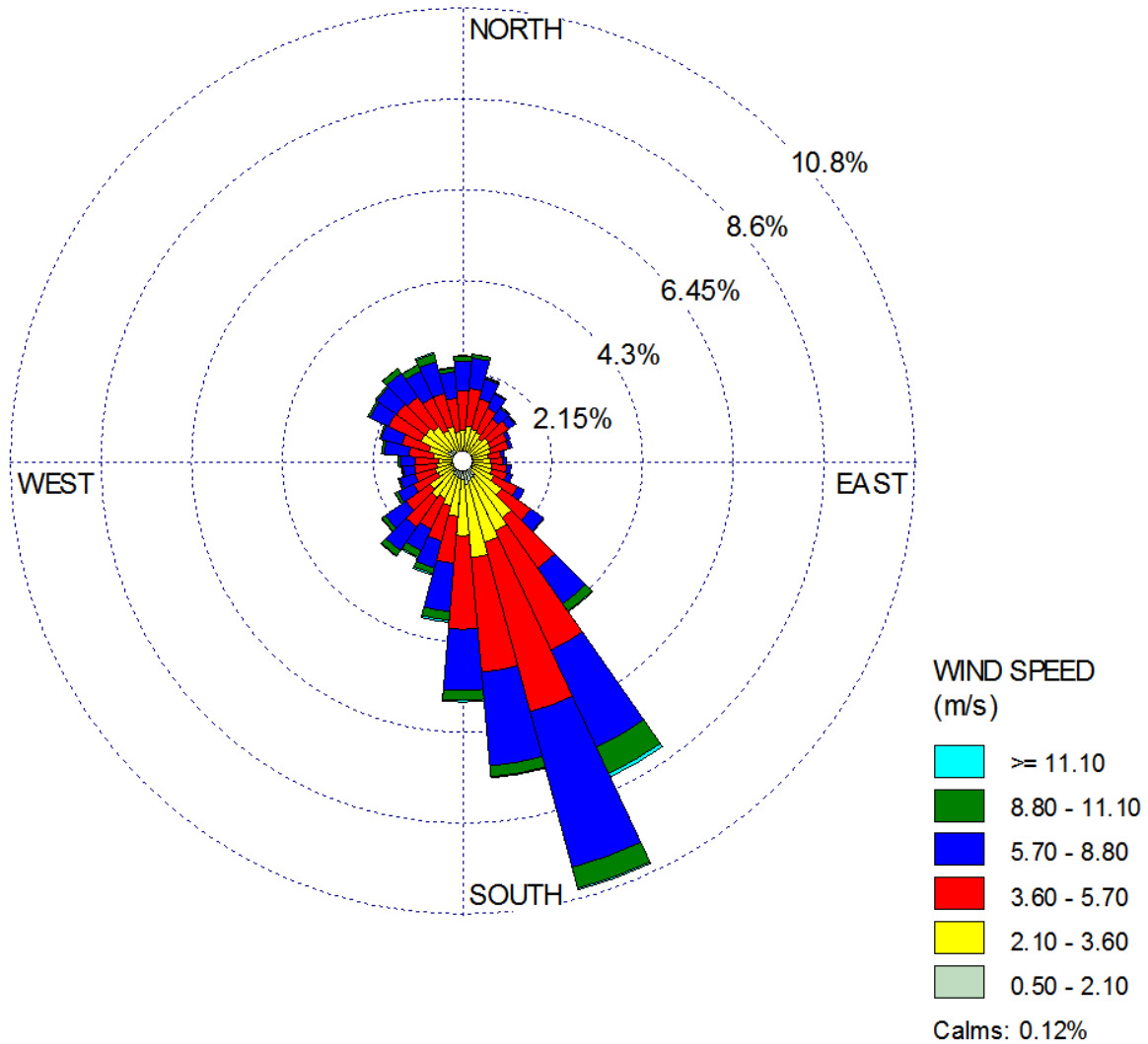
Meteorological data from the above surface and upper air NWS station were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data file created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the EPA SO$_2$ modeling TAD guidance, as outlined in the state's modeling protocol, in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Springfield NWS station to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, 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 concludes the processing of meteorological data follows the EPA guidance and is representative of meteorological conditions around John Twitty for purposes of designations modeling. The Springfield NWS station had a 99.95% data availability, with 0.12% calms identified. In addition, there are 12 incomplete or missing records from the total 26,282 hours available. From the wind rose, the EPA concludes hourly impacts will occur in all directions with predominant transport of emissions to the northwest based on higher frequency of southeasterly winds. The AERMET component of the modeling did change from the Missouri December 2016 modeling, as the state used AERMET version 16216 in this submittal, while all other inputs remained unchanged.

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

The terrain in the area of analysis is best described as 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 agrees with Missouri's treatment of terrain within AERMOD and finds it followed established guidance for terrain processing. The rationale and the EPA's assessment of this component did not change from the prior state submittal and intended designation TSD.

2.4.2.9.Modeling Parameter: Background Concentrations of SO₂

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 1 approach using the regional background for rural areas within the state that was based off an analysis of the East St. Louis monitor in Illinois. This was the same background methodology used by Missouri for rural areas in modeling submitted to the EPA for the SIP attainment demonstrations for areas that were designated nonattainment in Round 1 and in the modeling for the state's Round 2 designation recommendations. The background concentration for this area of analysis was determined by the state to be 23.6 micrograms per cubic meter ($\mu g/m^3$), equivalent to 9 ppb when expressed to three significant figures,[5] and that value was incorporated into the final AERMOD results. This value is similar to the Mark Twain State Park monitor (AQS Site ID: 29-137-0001) where the 3-year design value for 2013-2015 is 8 ppb.

The EPA concludes a background value of 9 ppb is acceptable for this area as no other SO_2 emitters above 1 tpy are near John Twitty that are not explicitly included in the modeling. The EPA again notes that 9 ppb is similar to the design value of the Mark Twain State Park monitor, which is also located in a rural area in Missouri. The rationale and the EPA's assessment of this component did not change from the prior state submittal and intended designation TSD.

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[5] 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 $\mu g/m^3$.

2.4.2.10.   Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Greene County area of analysis are summarized below in Table 6.

Table 6: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Greene County Area, for the 120-Day Response Corrected CAMD Analysis

Input Parameter	Value
AERMOD Version	16216r
Dispersion Characteristics	Rural
Modeled Sources	5
Modeled Stacks	12 stacks
Modeled Structures	29
Modeled Fencelines	1
Total receptors	7,555
Emissions Type	Corrected CAMD Actual hourly CEMS for John Twitty, highest actual annual for remaining
Emissions Years	2013-2015 for John Twitty and James River, year of highest annual for remaining sources
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Springfield, MO NWS
NWS Station Upper Air Meteorology	Springfield, MO NWS
NWS Station for Calculating Surface Characteristics	Springfield, MO NWS
Methodology for Calculating Background SO_2 Concentration	Tier 1 based on design value, for 2013-2015, East St. Louis, IL monitor – Rural representative analysis
Calculated Background SO_2 Concentration	9 ppb

The results presented below in Table 7 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters used in the 120-day response Corrected CAMD analysis.

Table 7. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO₂ Concentration Averaged Over 3 Years for the Area of Analysis for the Greene County Area, for the 120-Day Response Corrected CAMD Analysis

Averaging Period	Data Period	Receptor Location [UTM zone 15]		99th percentile daily maximum 1-hour SO₂ Concentration (μg/m³)	
		UTM-Easting	UTM-Northing	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	471433.00	4116306.00	112.4	196.4*

*Equivalent to the 2010 SO₂ NAAQS of 75 ppb using a 2.619 μg/m³ conversion factor

The state's new modeling using the Corrected CAMD hourly emissions data indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 112.4 μg/m³, equivalent to 42.9 ppb. This modeled concentration included the background concentration of SO₂ and is based on actual emissions from the facilities. Figure 5 below was created from the state's 120-day response Corrected CAMD modeling, and indicates that the highest predicted value occurred to the NE of the John Twitty facility, 7.4km away, but very near a contributing source, Euticals Inc. Springfield (077-0017). Nearer to the John Twitty fence line, the highest modeled concentrations occur approximately 2.1 km northwest from the stacks, similar to the prior modeling. The state's receptor grid is also partially shown in the figure.

Overall, the concentrations predicted in this run are higher than in the prior state submittal and the increases are mainly associated with the units-related correction to the contributing sources' modeled emission rates. Euticals Inc., nearby to where the maximum prediction occurs, is a small emitting source (about 1 lb/hr) with a low stack, 20 ft. Predicted concentrations around Euticals are well below the NAAQS. For Euticals, Inc., we note that the sum of the modeled hourly emission rates represents annual emissions that are much higher than what actually occurred in the years 2013 and 2015. Given this source is a very small emitter (6.08 tons total over 3 years), and was represented in the modeling with conservative emission rates for 2013 and 2015, and since all areas in the receptor grid still model well below the NAAQS, EPA believes that the modeling submitted by Missouri is acceptable to form the basis of our designation for this area.

Figure 5: Predicted 99th Percentile Daily Maximum 1-Hour SO₂ Concentrations Averaged Over 3 Years for the Area of Analysis for the Greene County Area, for the 120-Day Response Corrected CAMD Analysis

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

The state has submitted modeling demonstrating the entirety of Greene County, Missouri, is meeting the NAAQS and the EPA has determined that the 120-day response Corrected CAMD modeling conforms to the Modeling TAD. The state used corrected CEMS data for John Twitty that adequately represents at least the actual emissions for this facility during 2013-2015, and that may be higher than those actual emissions. This modeling analysis corrects the issue in prior modeling that included potentially under-reported emission due to moisture in a probe that was the basis for our intended unclassifiable designation, and corrects errors in unit conversions for other sources. Of the three new modeling analyses the state submitted in response to our intended designations, we believe the 120-day response Corrected CAMD modeling run is most representative of actual conditions, and is potentially more conservative (in the over-predicting sense) than actual conditions, and we are relying on this modeling run to inform our final

designation for Greene County. The 120-day response Coal Delivery and 120-day response Corrected Coal Delivery modeling runs (the latter of which corrects an error in the first) from the state rely on hourly emissions calculated from coal deliveries and sulfur content, and both also show attainment. However, the EPA was not able to verify the correlation between the coal that was shipped and the coal being combusted during any given hour. Therefore, we are not relying on these two model runs to inform our designation decision.

2.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Greene County Area

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 modeling adequately characterizes and accounts for the impacts of the meteorology, geography, and topography in Greene County.

2.6. Jurisdictional Boundaries in the Greene County Area

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

Missouri has recommended the entirety of Greene County be designated attainment based upon the state's modeling analysis demonstrating attainment within this county and surrounding areas. The rationale and the EPA's assessment of this component did not change from the prior state submittal and intended designation TSD.

2.7. Other Additional Information Relevant to the Designations for the Greene County Area

In the 120-day response Corrected CAMD modeling analysis, Missouri replaced the prior CEMS data at the John Twitty facility used in the Missouri December 2016 modeling, that may have been under-reported and in error based on moisture in a probe with substitute data that followed the EPA CAMD procedures. Missouri provided additional information in its 120-day comments to correct the prior modeling submitted and, after our evaluation of this new information the EPA is changing our assessment of the area's air quality in our final designation based on this new information.

No additional 3rd party modeling or analysis was received on our intended designation for this area.

2.8. The EPA's Assessment of the Available Information for the Greene County Area

The state has submitted modeling (120-day response Corrected CAMD) demonstrating the entirety of Greene County, Missouri, is meeting the NAAQS and the EPA finds that all aspects of the latest modeling generally conforms to the Modeling TAD. The latest modeling submittal, using revised CEM data, at least represents actual conditions in the Greene County area, and may indicate air quality conditions that are worse than actually exist. This modeling demonstrates attainment of the 1-hour SO_2 NAAQS in Greene County and nearby portions of adjacent counties. We conclude that Greene County does not violate the NAAQS and that Greene County does not contribute to air quality in a nearby area that violates the NAAQS. Consequently, this area meets the criteria to be designated attainment/unclassifiable.

The EPA believes that our final attainment/unclassifiable area, bounded by the Greene County lines, will have clearly defined legal boundaries, and we find these boundaries to be a suitable basis for defining our final attainment/unclassifiable area.

2.9. Summary of Our Final Designation for the Greene County Area

After careful evaluation of all available information, including the state's response to our intended designation, the EPA is designating Greene County as attainment/unclassifiable for the 2010 SO_2 NAAQS, because we are determining that Greene County does not violate the NAAQS and does not contribute to air quality in any nearby area that violates the NAAQS. Specifically, the boundaries are comprised of the entirety of Greene County, Missouri.

Figure 6 shows the boundary of this attainment/unclassifiable area.

Figure 6. Boundary of the Final Greene County Attainment/Unclassifiable Area

At this time, our final designations for the state only apply to this area and the other areas presented in chapter 22 of the technical support document for the intended designations. The EPA intends, in a separate action, to evaluate and designate all remaining undesignated areas in Missouri by December 31, 2020. These remaining undesignated areas are listed in Table 2.