Technical Support Document:

Chapter 5
Intended Round 4 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 (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. See CAA section 107(d)(1)(A)(i)-(iii).

In this action, EPA defines a nonattainment area as an area that, based on available information including (but not limited to) monitoring data and/or appropriate modeling analyses, 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. An attainment/unclassifiable area is defined as an area that, based on available information including (but not limited to) appropriate monitoring data and/or modeling analyses, EPA has determined meets the NAAQS and does not likely contribute to ambient air quality in a nearby area that does not meet the NAAQS. An unclassifiable area is defined as an area for which the available information does not allow EPA to determine whether the area meets the definition of a nonattainment area or the definition of an attainment/unclassifiable area.

EPA is under a December 31, 2020, deadline to designate all remaining undesignated areas as required by the U.S. District Court for the Northern District of California.[1] This deadline is the final of three deadlines established by the court for EPA to complete area designations for the 2010 SO_2 NAAQS. The remaining undesignated areas are: 1) those areas which, under the court order, did not meet the criteria that required designation in Round 2 and also were not required to be designated in Round 3 due to installation and operation of a new SO_2 monitoring network by January 2017 in the area meeting EPA's specifications referenced in EPA's SO_2 Data Requirements Rule (DRR)[2], and 2) those areas which EPA has not otherwise previously designated for the 2010 SO_2 NAAQS. EPA previously issued guidance on how to appropriately and sufficiently monitor ambient air quality in the "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (SO_2 NAAQS Designations Monitoring TAD).[3]

[1] *Sierra Club v. McCarthy*, No. 3-13-cv-3953 (SI) (N.D. Cal. Mar. 2, 2015).
[2] *See* 80 FR 51052 (August 21, 2015), codified at 40 CFR part 51 subpart BB.
[3] https://www.epa.gov/sites/production/files/2016-04/documents/so2monitoringtad.pdf

In previous final actions, EPA has issued designations for the 2010 SO_2 NAAQS for most areas of the country.[4] As mentioned, EPA is under a deadline of December 31, 2020, to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California. We are referring to the set of designations being finalized by the deadline of December 31, 2020, as "Round 4" or the final round of the designations process for the 2010 SO_2 NAAQS. After these Round 4 designations are completed, there will be no remaining undesignated areas for the 2010 SO_2 NAAQS.

This technical support document (TSD) addresses designations for all remaining undesignated areas in Missouri for the 2010 SO_2 NAAQS. Areas with monitored violations of the NAAQS are explicitly evaluated in this TSD. Undesignated areas in Missouri without monitored violations are referenced in this TSD for completeness but are covered in more detail in Chapter 2.

Missouri submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on July 19, 2011. The state submitted a revision to its recommendations for area designations based on technical evaluations using monitoring data and air quality modeling on April 30, 2020 to address more recent air quality monitoring data for monitors that were installed pursuant the DRR. The state previously submitted revisions to its recommendations for area designations on September 24, 2015 for Round 2 and December 8, 2016 for Round 3. In our intended designations, we have considered all the submissions from the state, except where a later submission indicates that it replaces an element of an earlier submission.

Table 1 identifies EPA's intended Round 4 designations and the areas in Missouri to which they would apply. It also lists Missouri's current recommendations. EPA intends to designate these areas by December 31, 2020, through an assessment and characterization of air quality based primarily on ambient monitoring data, including data from existing and new EPA-approved monitors that have collected data from January 2017 forward, pursuant to the DRR; however, other available evidence and supporting information, such as air dispersion modeling in certain situations, may also be considered.[5]

[4] Most areas of the U.S. were previously designated in actions published on August 5, 2013 (78 FR 47191), July 12, 2016 (81 FR 45039), December 13, 2016 (81 FR 89870), January 9, 2018 (83 FR 1098) and April 5, 2018 (83 FR 14597). EPA is not reopening these previous designation actions in this current Round 4 of designations under the 2010 SO_2 NAAQS, except where specifically discussed.

[5] Detailed SO_2 monitor information may be found in either the 2016 or 2017 ambient monitoring network plans, or associated addenda.

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

Area/ County	Missouri's Recommended Area Definition	Missouri's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
New Madrid County, MO	Area encompassing the property boundaries of these two facilities - The portion of New Madrid County bounded by the Mississippi River to the east and the lines connecting the following coordinates: Zone 16 Universal Transverse Mercator (UTM) coordinates (272016.6, 4042423.62), (268791.92, 4042564.43), (268957.29, 4045213.47), and (270362.07, 4045125.75)	Nonattainment	Area bounded by: • East: Missouri/ Kentucky and Missouri/Tennessee State lines. • North: County Highway 406 East to Levee Road, following Levee Road North to County Highway 406, then extending directly East to the Missouri/Kentucky State line. • West: County Highway 403 • South: County Highway 408 East to the intersection with County Highway 431, then extending directly East to the Missouri/Tennessee State line	Nonattainment
Remaining portion of New Madrid County, MO	Remainder of New Madrid County	Attainment/ Unclassifiable	Remainder of New Madrid County	Attainment/ Unclassifiable
Iron County, MO*	Iron County, MO	Attainment/ Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable

* EPA addresses this area in Chapter 2 with all other areas which EPA intends to designate "attainment/unclassifiable" or "unclassifiable."

Areas that EPA previously designated in Round 1 (*see* 78 FR 47191), Round 2 (*see* 81 FR 45039 and 81 FR 89870), and Round 3 (*see* 83 FR 1098 and 83 FR 14597) are not affected by the designations in Round 4 unless otherwise noted.

2. General Approach and Schedule

An updated designations guidance document was issued by EPA through a September 5, 2019, memorandum from Peter Tsirigotis, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Regional Air Division Directors, U.S. EPA Regions 1-10.[6] To better reflect the Round 4 designations process, this memorandum supplements, where necessary, prior designations guidance documents on area designations for the 2010 primary SO_2 NAAQS issued on March 24, 2011, March 20, 2015, and July 22, 2016. This memorandum identifies factors that EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The document also contains the factors that EPA intends to evaluate in determining the boundaries for all remaining areas in the country. These factors include: 1) air quality characterization via ambient monitoring and/or dispersion modeling results; 2) emissions-related data; 3) meteorology; 4) geography and topography; and 5) jurisdictional boundaries.

In EPA's September 2019 memorandum, we note that Round 4 area designations will be based primarily on ambient monitoring data, including data from existing and new EPA-approved monitors that have collected data at least from January 2017 forward, pursuant to the DRR. In addition, EPA may evaluate air dispersion modeling submitted by state air agencies for two specific circumstances. First, states may submit air dispersion modeling to support the geographic extent of a nonattainment boundary. Second, states may submit air dispersion modeling to demonstrate that new permanent and federally enforceable SO_2 emissions limits provide for attainment of the NAAQS and represent a more accurate characterization of current air quality at the time of designation than does monitoring of past air quality.

This TSD is organized such that there is a section for each area in Missouri for which air quality monitoring data indicate a violation of the 2010 SO_2 NAAQS. When modeling information is available, it is evaluated in the context of that section. EPA does not plan to revise this intended designations TSD after consideration of state and public comment on our intended designation. A separate final 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.

[6] https://www.epa.gov/sites/production/files/2019-09/documents/round_4_so2_designations_memo_09-05-2019_final.pdf

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 2010 SO_2 NAAQS.
3) Intended designated nonattainment area –an area that, based on available information including (but not limited to) monitoring data and/or appropriate modeling analyses, EPA intends to determine 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) Intended designated attainment/unclassifiable area – an area that, based on available information including (but not limited to) appropriate monitoring data and/or appropriate modeling analyses, EPA intends to determine meets the 2010 SO_2 NAAQS and does not likely contribute to ambient air quality in a nearby area that does not meet the NAAQS.
5) Intended designated unclassifiable area – an area for which the available information does not allow EPA to determine whether the area meets the definition of a nonattainment area or the definition of an attainment/unclassifiable area.
6) Modeled violation – a modeled design value impact above the 2010 SO_2 NAAQS demonstrated by air dispersion modeling.
7) Recommended attainment area – an area that a state, territory, or tribe has recommended that EPA designate as attainment.
8) Recommended nonattainment area – an area that a state, territory, or tribe has recommended that EPA designate as nonattainment.
9) Recommended unclassifiable area – an area that a state, territory, or tribe has recommended that EPA designate as unclassifiable.
10) Recommended attainment/unclassifiable (or unclassifiable/attainment) area – an area that a state, territory, or tribe has recommended that EPA designate as attainment/unclassifiable (or 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 EPA.

3. Technical Analysis for the New Madrid County, Missouri Area

3.1. Introduction

EPA must designate the New Madrid County, Missouri area by December 31, 2020, because the area has not been previously designated, and Missouri installed and began operating new EPA-approved monitors pursuant to the DRR. This section presents all the available air quality information for the portion of New Madrid County that includes the following SO_2 sources around which the DRR required the state to characterize air quality:

- The Associated Electric Cooperative Inc. (AECI) New Madrid facility operates two coal-fired boilers for the generation of electric power. AECI New Madrid emits more than 2,000 tons of SO_2 annually. Specifically, AECI New Madrid emitted 16,774 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 monitoring.

- The Magnitude 7 Metals (M7M) facility is a primary aluminum reduction plant that uses electrolysis to form aluminum. The facility emits more than 2,000 tons of SO_2 annually. Specifically, the facility emitted 5,323 tons of SO_2 in 2014. This source meets the DRR criteria and is on the SO_2 DRR Source list, and Missouri has chosen to characterize it via monitoring.

As seen in Figure 1 and Figure 2 below, the AECI New Madrid and M7M facilities sit adjacent from one another and are located in southeast Missouri along the Mississippi River. They are approximately 200 km to the south of St. Louis, Missouri and approximately 3 km to the east of the nearest city, Marston, Missouri. The locations of the three SO_2 monitors are provided in Figure 2. Site #1 is located just to the north of the M7M facility on the property of AECI New Madrid. Site #2 is also located on AECI New Madrid's property to the southeast of the M7M fenceline. Site #3 is located at the M7M entrance on the west side of the facility. These three monitors were sited to characterize the air quality in the area around both sources in the New Madrid County area which Missouri selected to characterize via monitoring under the DRR.

Figure 1. Map of the New Madrid County, Missouri Area Addressing the AECI New Madrid and M7M DRR sources.

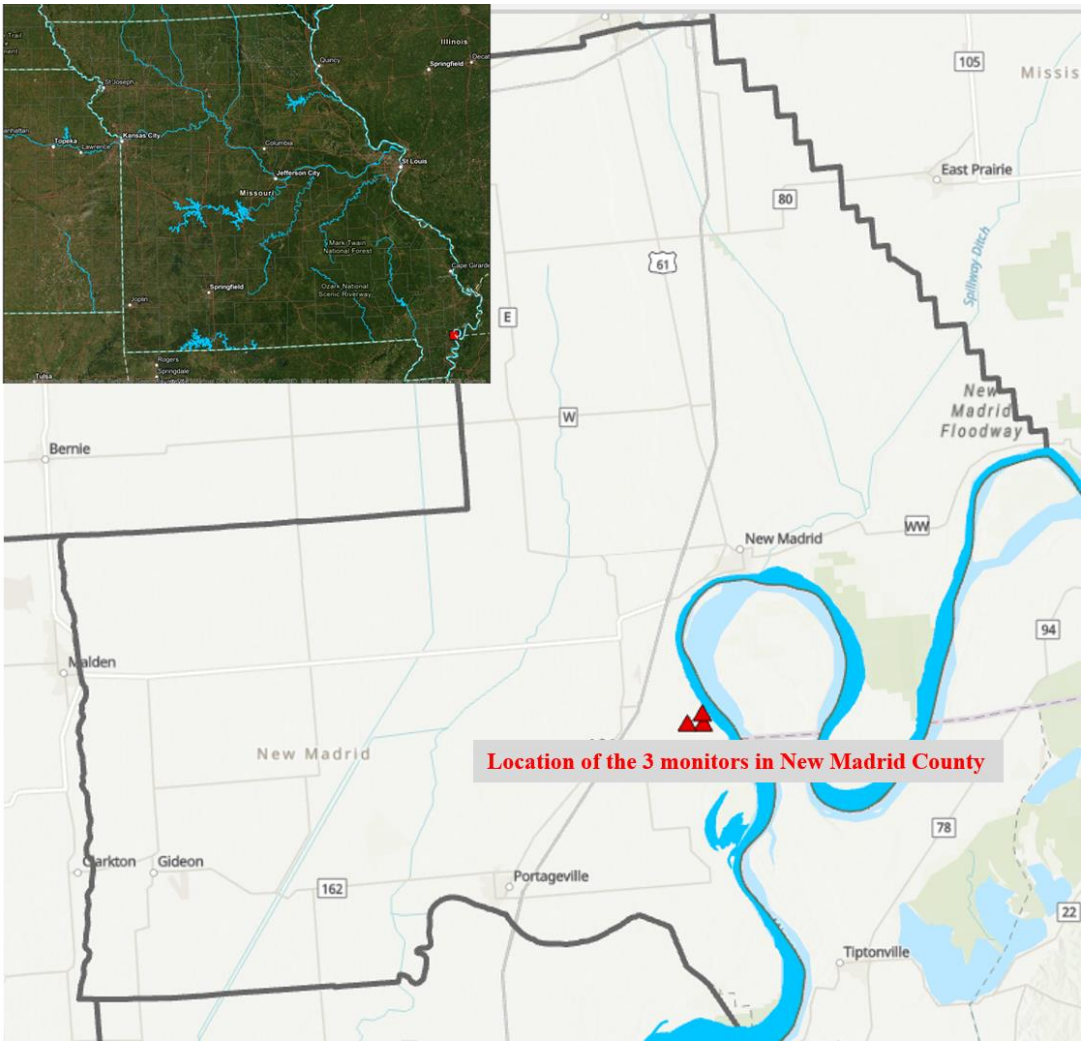
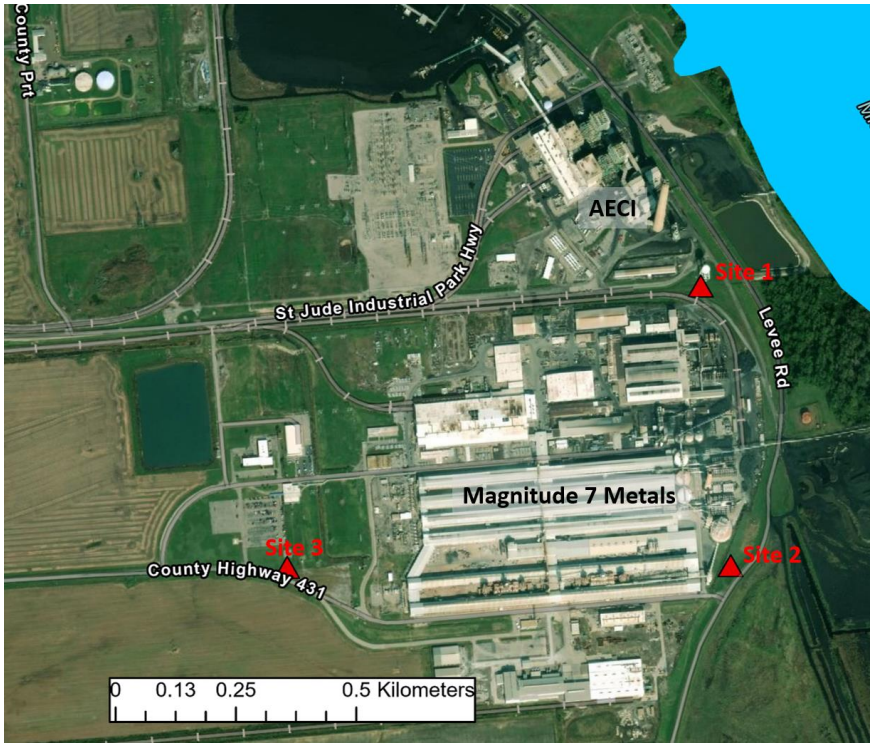


Figure 2. Map of the AECI New Madrid and M7M DRR sources and SO_2 monitor locations.



In its April 30, 2020 recommendation letter, Missouri recommended that a portion of New Madrid County be designated as nonattainment for the 2010 SO_2 NAAQS, based on monitored air quality from 2017-2019. Specifically, the state's recommended boundaries consist of:

- the portion of New Madrid County bounded by the Mississippi River to the east and lines connecting the following: Zone 16 Universal Transverse Mercator (UTM) coordinates (272016.6, 4042423.62) (268791.92, 4042564.43) (268957.29, 4045213.47) and (270362.07, 4045125.75).

EPA agrees with Missouri's recommendation as to the designation category, and intends to designate a portion of New Madrid County, Missouri, as described below, as nonattainment for the 2010 SO_2 NAAQS based upon currently available monitoring information for the 2017-2019 period. Our intended nonattainment area boundaries are different than the state's recommended boundaries and are described below.

3.2. Air Quality Monitoring Data for the New Madrid County, Missouri Area

EPA considered design values for air quality monitors in the New Madrid County area by assessing the most recent 3 consecutive years (i.e., 2017-2019) of quality-assured, certified ambient air quality data in the EPA Air Quality System (AQS) using data from Federal Reference Method and Federal Equivalent Method monitors that are sited and operated in

accordance with 40 CFR parts 50 and 58.[7] Procedures for using monitored air quality data to determine whether a violation has occurred are given in 40 CFR part 50 Appendix T, as revised in the 2010 SO_2 NAAQS rulemaking. The 2010 1-hour SO_2 NAAQS is met when the design value is 75 ppb or less. Whenever several monitors are located in an area, the design value for the area is determined by the monitor with the highest valid design value. The presence of one or more violating monitors (i.e., monitors with design values greater than 75 ppb) in a geographic area forms the basis for designating that area as nonattainment. The remaining factors, described in the next section, are then used as the technical basis for determining the spatial extent of the designated nonattainment area surrounding the violating monitors. Table 2 contains the 2017-2019 design values for the area of analysis.

Table 2. 2010 SO_2 NAAQS Design Values for the New Madrid County Area

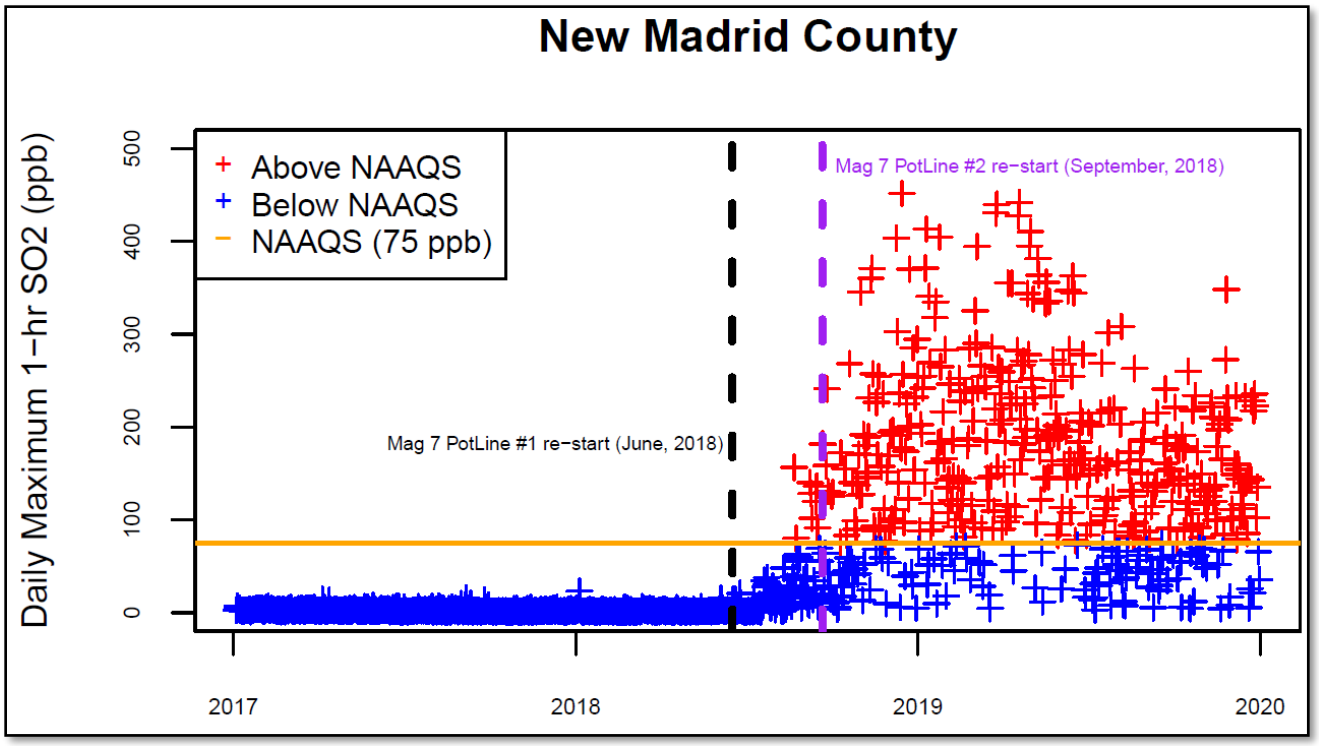
AQS Site ID	Monitor Location	2017 99th Percentile (ppb)	2018 99th Percentile (ppb)	2019 99th Percentile (ppb)	2017-2019 Design Value (ppb)
29-143-9001	SITE #1 AECI WATER TOWER: 391 St Jude Industrial Park, New Madrid, MO 63869	13	236	356	**202**
29-143-9002	SITE #2 EAST GRAVEYARD: 391 St Jude Industrial Park, New Madrid, MO 63869	5	370	428	**268**
29-143-9003	SITE #3 WEST ENTRANCE: 391 St Jude Industrial Park, New Madrid, MO 63569	7	43	91	**47**

Data collected at three monitors indicate that the Water Tower monitor (Site #1) and the East Graveyard (Site #2) are in violation of the NAAQS, with 2017-2019 design values of 202 and 268 ppb, respectively. As indicated in Table 2 and shown in Figure 3, monitored SO_2 concentrations increased with the onset of M7M restarting operations in June 2018.[8] The West Entrance monitor (Site #3) is currently attaining (47 ppb design value), however the latest year's (2019) 99th percentile value of 91 ppb is greater than the 75 ppb level of the NAAQS. Therefore, a portion of the area must be designated nonattainment because of the violating monitors.

[7] SO_2 air quality data are available from EPA's website at https://www.epa.gov/outdoor-air-quality-data. SO_2 air quality design values are available at https://www.epa.gov/air-trends/air-quality-design-values.

[8] M7M acquired the aluminum plant from its predecessor owner, Noranda Aluminum, in 2016. While the plant was idled in 2016, M7M restarted the plant operations in June of 2018.

Figure 3. Maximum Daily 1-hr SO_2 concentrations for 2017-2019 across the three monitors in New Madrid County.



3.3. Air Quality Modeling Analysis for the New Madrid County, Missouri Area Addressing AECI New Madrid and M7M

In its April 30, 2020 recommendation letter, Missouri provided an air quality modeling analysis for the area surrounding AECI New Madrid and M7M to support a nonattainment area boundary.

This assessment and characterization were 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, EPA does not agree with the state's jurisdictional boundary for the nonattainment area around the AECI New Madrid and M7M facilities, and intends to expand the boundary of the of the intended nonattainment area. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

As was shown in Figure 1 and Figure 2, the area that the state has assessed via air quality modeling is located in eastern New Madrid County, encompassing the area around the AECI New Madrid and M7M facilities.

The discussion and analysis that follows below will reference the "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and the factors for evaluation contained in EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.[9]

For this area, EPA received and considered a modeling assessment from the state and did not have any modeling from other parties. The state's modeling assessment submitted on April 30, 2020 to EPA contained six modeling scenarios, with a particular focus on a final modeling scenario that the state used to inform its boundary recommendations.

3.3.1. Modeling Analysis Provided by the State

3.3.1.1.Model Selection and Modeling Components

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 19191, the most recent version at the time the modeling was submitted to EPA. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

3.3.1.2.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" 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 area 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 section 7.2.1.1(b) 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 section 7.2.1.1(b)(i) classifies urban areas based on industrial, commercial, and residential land use over

[9] https://www.epa.gov/sites/production/files/2016-04/documents/so2modelingtad.pdf.

50% within a 3 km radius of the source. The population density (section 7.2.1.1(b)(ii)) 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. EPA agrees with the state for this component of the state's modeling.

3.3.1.3.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 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. For the New Madrid County area, the state evaluated six other sources of SO_2 within 25 km of AECI New Madrid and M7M. None of these six sources emitted more than 1 ton per year of SO_2 during the 2017-2019 timeframe and were therefore not included in the modeling demonstration. The state determined that this 25 km distance 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. No other sources beyond 25 km were determined by the state to have the potential to cause significant concentration gradients within the area of analysis.

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

- Modeled receptors were placed in New Madrid County outward up to 6 km from the M7M facility. The state deemed this 6 km extent sufficient to encompass all violations associated with the actual operations of AECI New Madrid and M7M. Receptors located over water (i.e. the Mississippi River) or in other states were not included in the modeling analysis. The state used grid spacing of 50 meters along the fencelines of AECI New Madrid and M7M and 100 meter spacing throughout the rest of the modeling domain.

The receptor network contained 4,517 receptors, and the network covered the southeastern portion of New Madrid County, Missouri to the Mississippi River.

Figures 4 and 5, included in the state's recommendation, show the state's chosen area of analysis surrounding the AECI New Madrid and M7M facilities, as well as the receptor grid for the area of analysis.

Because two monitors, which are the two ambient monitors showing violations of the NAAQS, are located on the AECI New Madrid facility's property, the state placed receptors within the AECI New Madrid property, while excluding receptors on M7M's property. Therefore, the state's modeling contains an evaluation of M7M's impact on AECI New Madrid property, but

does not contain the relative impacts that AECI New Madrid would have on M7M's property. In addition, the state removed receptors from the Mississippi River on the basis that it would be unfeasible to place an air quality monitor on the River. The state also excluded receptors over previously designated land in the bordering states of Kentucky and Tennessee, which are located within 1 to 6 km of AECI New Madrid and M7M.[10]

[10] *See* 83 FR 1098 (January 9, 2018).

Figure 4. Area of Analysis for the New Madrid County Area. Image courtesy of MoDNR.

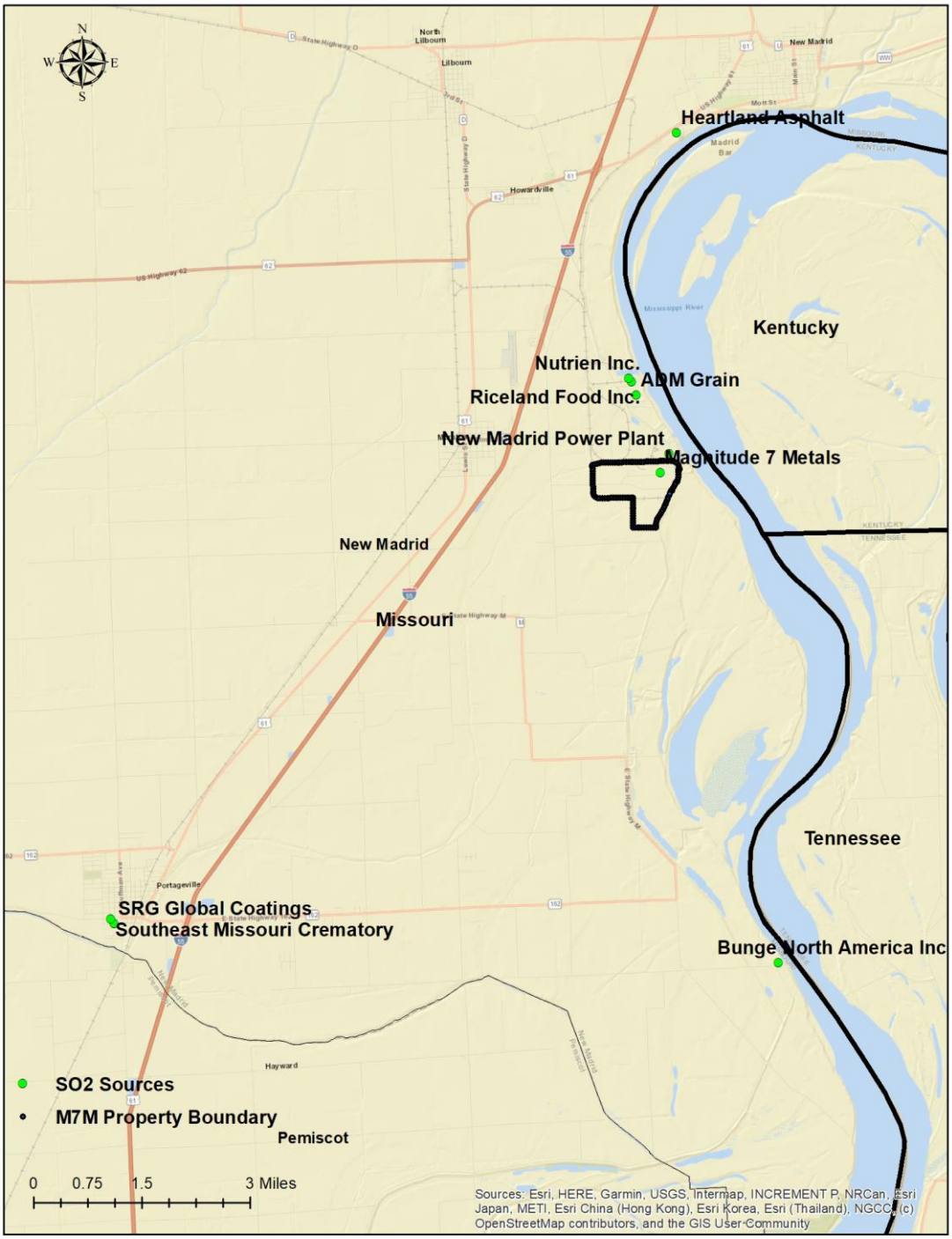
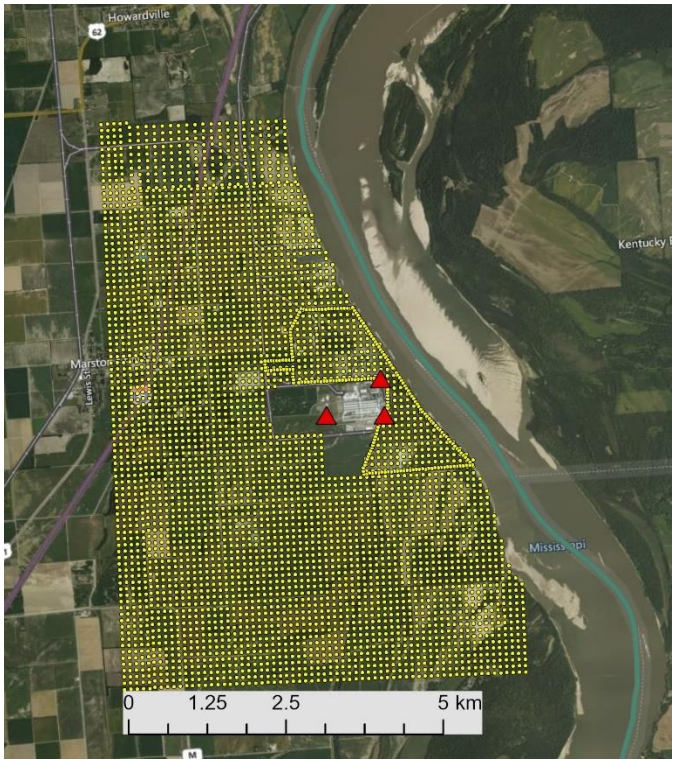


Figure 5. Receptor Grid for the New Madrid County Area. Receptors are shown as yellow dots and monitor locations as red triangles.



EPA finds that the modeled receptor grid is sufficient to address modeled impacts in New Madrid County, except for the exclusion of receptors over the Mississippi River. The state excluded over water receptors following the recommendations of the SO_2 Modeling TAD. EPA's September 2019 memorandum states that the SO_2 Modeling TAD can be used as a helpful tool for evaluating the extent of monitored and modeled NAAQS violations, but other circumstances specific to a particular area should be considered. With monitored violations located within 0.25 km of the Mississippi River, the EPA believes receptors need to be placed on the portion of the Mississippi River that resides in New Madrid County to fully evaluate potential impacts in the county.

3.3.1.4.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.

As previously mentioned, the state explicitly modeled AECI New Madrid and M7M and no other sources for the New Madrid area of analysis. The AECI New Madrid units were modeled using actual stack heights and actual hourly emissions. The two units at AECI New Madrid emit from a single 243-meter stack.

M7M was modeled using estimates of actual emissions for the known SO_2 emission points. SO_2 emissions at M7M are due to three emission source types. The first type of source are three on-site carbon bake furnaces. The carbon bakes furnaces produce block anodes, with the sulfur in the raw coke and pitch material producing emissions of SO_2 during the baking process. M7M carbon bake #1 is not currently operating, although permitted to, and has not operated during the 2017-2019 timeframes. Carbon bake #2 and carbon bake #3 have been operating since operations restarted in August of 2018. Emissions from carbon bake #3 are routed to an individual 23-meter stack, and this 23-meter actual stack height was used in the modeling.

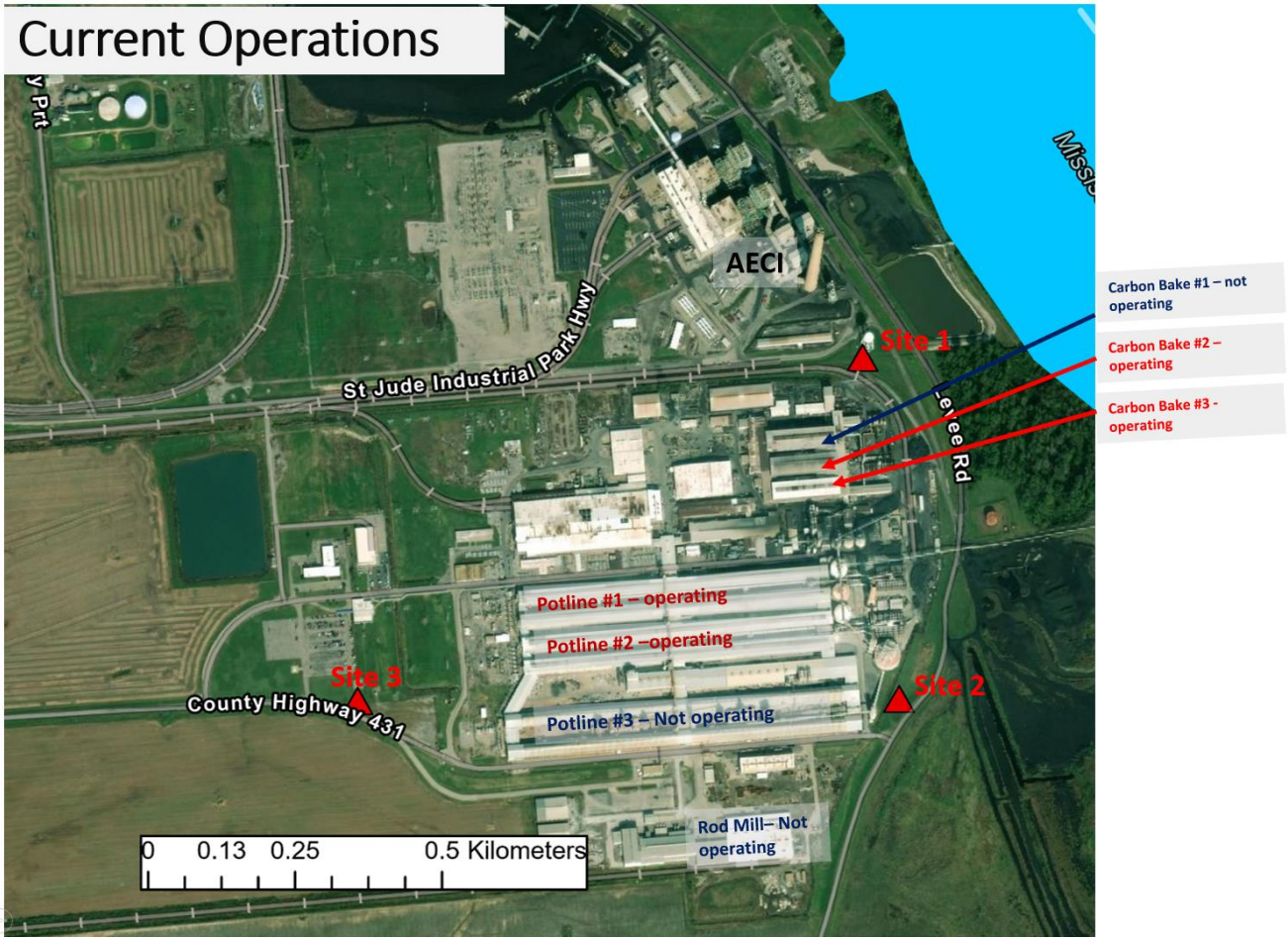
Carbon bake #2 emissions are routed to four fluoride scrubbers that can ultimately emit to 64 individual hinged rain capped stacks that are designed to open when operating. Each of the four scrubbers have a group of 16 individual stacks and each group of stacks are 4.5 meters apart. Each stack is approximately 0.3 meter in diameter and 15 meters in height. The 16 stacks above each fluoride scrubber are 0.152 meters apart.

To best represent the actual operations of carbon bake #2 in its boundary recommendation analysis, the state performed modeling scenarios that included modeling carbon bake #2 as operating with 64 stacks, 48 stacks, 32 stacks, and one single stack. The state modeled the hinged rain cap stacks using the capped stack option (i.e., POINTCAP) in AERMOD, based on pictures of the hinged cap not completely opening during operation. The modeled stack parameters of exit temperature and velocity were based on actual stack tests performed at the facility in January and February of 2019. The state ultimately modeled the 64 stacks of carbon bake #2 emissions as 32 individual capped stacks, concluding that this modeled scenario was able to best match the maximum monitored SO_2 concentrations at monitoring Site #1. The state further justified modeling carbon bake #2 as 32 individual stacks based on information, provided by the M7M facility, that typically only two of the four carbon bake #2 scrubbers are in operation at the same time.

The second and third emission source types at M7M are from the pots that produce the aluminum through electrolysis. The pots are located in rectangular buildings known as potlines. Sulfur present in some of the aluminum oxide as well as sulfur still present in the carbon anode and cathode blocks oxidizes in the pots to form emissions of SO_2. The M7M facility has three potlines. Potlines #1 and #2 have been in operation since M7M restarted in the summer of 2018. Potline #3 is not currently operating, although permitted to, and has not operated in the 2017-2019 timeframe. Emissions from Potlines #1 and #2 are captured and routed to a 90-meter stack. The state modeled this actual stack height for Potlines #1 and #2. Emissions from the potlines that are not captured and routed to the stack are allowed to vent through the top of the potline building. These rooftop fugitive emissions were represented and modeled using EPA's buoyant line source (BLP) algorithm within AERMOD. Each potline building includes two buoyant line sources in the modeling analysis, which match the actual set-up for these buildings at the facility.

To provide a visual context to emission points modeled, Figure 6 shows the locations of the emission sources (i.e, carbon bakes, potlines, AECI New Madrid stack) for the New Madrid County area of analysis.

Figure 6. Location of SO_2 emission points at the AECI New Madrid (black label) and M7M facilities. Currently operating emission points at M7M are indicated with red text and non-operating sources are indicated by blue text. Monitor sites are denoted by red triangles.



For the M7M facility, the state adequately characterized the source's building layout and location. Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. The state designed modeling scenarios based on actual emissions estimates from the carbon bake process and the potlines. EPA understands and agrees with the state that the carbon bakes at M7M are difficult to characterize within the AERMOD modeling system. Ideally, the hinged rain caps on the carbon bake #2 stacks would open completely and be characterized as an unobstructed vertical point source in the modeling demonstration, though this capped or unobstructed stack characterization will likely not be a main cause of any over or under model prediction at the Site #1 monitor as the impacts of this characterization will be minor compared to the overall modeled impacts from the carbon bake stack emissions. As previously mentioned, the state modeled the 64 stacks associated with carbon bake #2 as 32 individual stacks, and the results of this characterization will be further analyzed in Section 4.3.1.11.

Overall, EPA notes that there is uncertainty in the characterization M7M within the AERMOD modeling system, and thus there is uncertainty in knowing the geographic extent of the

violations. This uncertainty should be considered when interpreting the adequacy of the modeling results.

The state characterized the AECI New Madrid facility within the area of analysis in accordance with the best practices outlined in the Modeling TAD, except for not including receptors inside M7M's property line. 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.

3.3.1.5.Modeling Parameter: Emissions

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.

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, 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, EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

As previously noted, the state included the AECI New Madrid and M7M facilities and no other sources of SO_2 within 25 km in the area of 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 2017 and 2019 are summarized below.

For AECI New Madrid, the state provided annual actual SO_2 emissions between 2016 and 2018 in the April 30, 2020 recommendation. For M7M, there were no emissions reported for 2017 as the facility was not operating. Actual emissions from 2018 submitted to EPA's National Emissions Inventory (NEI) are summarized in Table 3. Actual annual emissions for 2019 for M7M were provided by the state staff upon EPA request. EPA retrieved AECI New Madrid annual emissions for 2019 as available in EPA's Clean Air Markets Division's Database.[11] A description of how the state obtained hourly emission rates is given below this table.

[11] https://ampd.epa.gov/ampd/

Table 3. Actual SO_2 Emissions Between 2017 – 2019 from Facilities in the New Madrid County Area

Facility Name	SO_2 Emissions (tpy)		
	2017	2018	2019
AECI New Madrid	13,548	14,866	13,252
Magnitude 7 Metals	0*	1,772	3,706
Total Emissions from All Modeled Facilities in the State's Area of Analysis	13,548	16,638	16,985

* Noranda Aluminum, now M7M, was idled in 2016. M7M restarted the plant operations in June of 2018.

For AECI New Madrid, the actual hourly emissions data were obtained from CEMS.

For M7M, the state modeled six different scenarios with unique emissions inputs for the carbon bake emission and potline sources. The six scenarios were designed to evaluate modeled emission rates for the carbon bakes and potlines to see if any of the emissions estimates were able to reproduce the maximum monitored SO_2 concentration seen at Site #1 and Site #2 A summary of the six modeling scenarios are provided in Table 4. The first five scenarios were used to evaluate three different approaches and data sources to estimate emissions for the carbon bakes and potlines. The sixth modeling run used the best performing datasets as indicated by the first five scenarios. This sixth and last modeling run was ultimately used to support the state's recommended boundary. To summarize:

1) The state evaluated M7M's annual emissions for 2018 reported to the state's emissions inventory questionnaire (EIQ). The air program divided these annual reported emissions from the EIQ by 3,672 hours (the total number of hours from August through December, which were the five months the facility was operating that year). This resulted in average hourly emission rates for all modeled emission points at M7M, which were held constant and modeled from August through December of 2018 in this scenario. Maximum modeled SO_2 concentrations were over-predicted by a factor of 4 at the Site #1 monitor and because of this overprediction the state chose not to rely on the EIQ submitted emissions estimates from 2018.

2) The state obtained monthly SO_2 mass balance compliance worksheets provided by the facility to obtain emissions inputs in the modeling for the carbon bakes and potline stack. These compliance worksheets estimate monthly SO_2 emissions from the carbon bake process by estimating the difference between the incoming and outgoing sulfur from the carbon bakes. The state used monthly worksheets from October, November, and December of 2018 to determine monthly varying average hourly emission rates and ran AERMOD from October through December of 2018 to compare modeled results to the Site #1 and Site #2 monitors. Comparisons of model-monitor performance showed an overprediction of the maximum monitored SO_2 concentrations, so the state chose not to rely on the SO_2 emissions from the monthly compliance worksheets.

3) The state obtained 12-month average SO_2 mass balance compliance worksheets provided by the facility. Similar to the monthly compliance worksheets, the 12-month compliance worksheets estimate a 12-month average of SO_2 emissions from the carbon bake process by estimating the

difference between the incoming and outgoing sulfur from the carbon bakes. The state evaluated various 12-month compliance worksheets (i.e., January 2019 – December 2019; September 2018 – August 2019, etc.) by inputting the 12-month emission total for each emission point divided by 8,760 hours (the number of operating hours during the 12-month period) to determine the average hourly emission rate for the facility during normal operations. Comparisons of model-monitor performance of the various 12-month emissions estimates were done to see which one might be most representative of M7M operations. The state asserted that the emissions estimate from the September 2018 – August 2019 compliance worksheet showed relatively good agreement between the maximum modeled and monitored SO_2 concentrations at monitor Site #1, so the state chose to rely on the SO_2 emissions from this 12-month compliance worksheet to determine its recommended boundary around the M7M and AECI New Madrid facilities.

Table 4. The Six Modeling Scenarios provided by MoDNR in their April 30, 2020 submission.

Model Scenario	Dataset used to estimate modeled hourly emissions	Time Period Modeled
1	Monthly emissions from mass balance compliance worksheets for October, November and December2018.	2018
2	2018 annual emissions from EIQ.	2018
3	12-month emissions from 12-month mass balance compliance worksheet covering the period of September 2018 through August 2019.	2018
4	12-month emissions from 12-month mass balance compliance worksheet covering the period of January 2019 through December 2019.	2019
5	12-month emissions from 12-month mass balance compliance worksheet covering the period of September 2018 through August 2019.	2019
6	12-month emissions from 12-month mass balance compliance worksheet covering the period of September 2018 through August 2019.	Entire 2017-2019 period

After evaluating the above data sources and emission estimation approaches by performing the various scenarios over varying timeframes less than the 2017-2019 three-year period, the state developed emissions inputs for a final modeling run (Scenario #6 in Table 4) for the 2017-2019 period that was used to determine its recommended boundary. The emissions inputs are as follows:

- 2017-2019 hourly CEMS at AECI New Madrid.

- Emissions estimates from the 12-month SO_2 compliance worksheet for September 2018 – August 2019. The 12-month emission total for each emission point was divided by 8,760 hours and then were applied to all hours between 2017-2019 at carbon bakes #1 and #2 and the potline stack that represents potlines #1 and #2.

- Fugitive emissions from the potlines were modeled as buoyant line sources on top of the two potline buildings in operation. Each potline building includes two of these buoyant line sources in the modeling analysis, which matches the actual set-up for these buildings at the facility.

Overall, EPA finds that state evaluated multiple sources of emissions information available for M7M and input this information into AERMOD to be compared with the monitoring data. EPA notes that the emissions estimates vary widely by the data source (i.e., EIQ, one-month compliance worksheet, 12-month compliance worksheet) which leads to uncertainty and low confidence in emissions estimates to accurately represent the M7M's facility operations. While the chosen dataset (12-month SO_2 estimate from September 2018 – August 2019) showed relatively good agreement to the maximum monitored concentration at the Site #1 monitor, other model performance metrics indicated the emissions estimates used in the state's final modeling scenario are not representative of the facility's operation. This will be discussed further in Section 4.3.1.11.

3.3.1.6. Modeling Parameter: Meteorology and Surface Characteristics

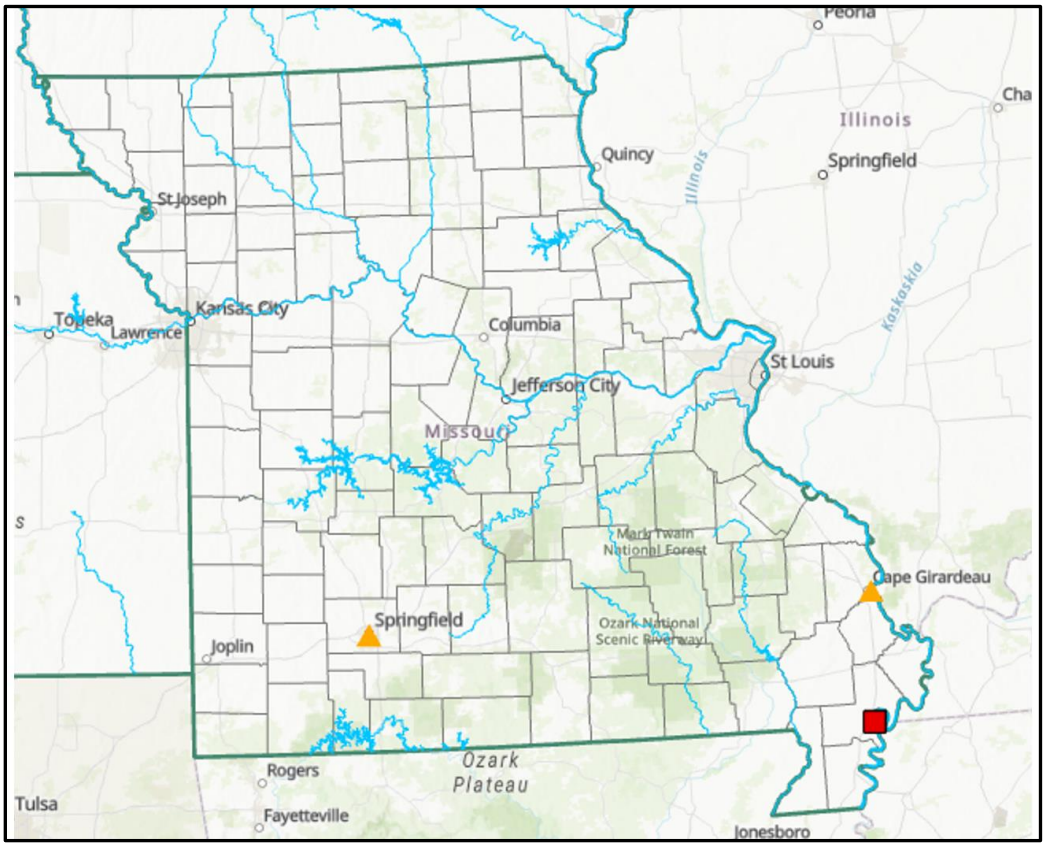
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data, for sources modeled with actual emissions) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. 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 New Madrid County area, the state selected the surface meteorology from the NWS station in Cape Girardeau, Missouri, located at [lat: 37.2255, lon: -89.5786], 79 km to the northeast of the source ,and coincident upper air observations from the NWS station in Springfield, Missouri, located at [lat: 37.24, lon: -93.39], 209 km to the west of the source as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from Cape Girardeau, Missouri NWS station to estimate the surface characteristics of the area of analysis. 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. The state also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo" and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer).

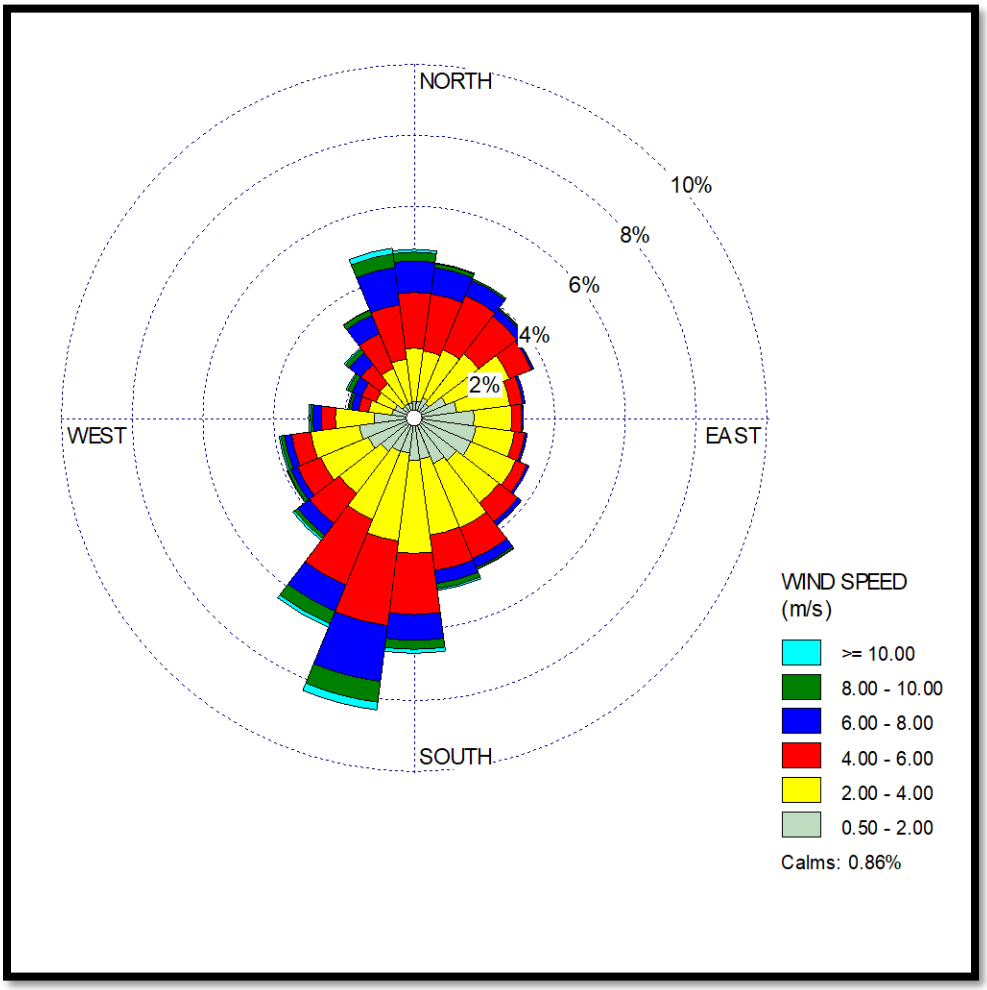
In the figure below, generated by EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 7. Area of Analysis and the NWS stations in the New Madrid County, Missouri Area. The locations of Cape Girardeau, Missouri (surface) and Springfield, Missouri (upper air) are denoted by orange triangles. The location of the New Madrid Area of Analysis is denoted by the red square.



The 3-year surface wind rose for the Cape Girardeau, Missouri NWS station is shown in Figure 8. In Figure 8, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The New Madrid County area of analysis experienced winds from all directions throughout the years modeled, with a south-southwest wind being the most predominate wind direction.

Figure 8: New Madrid County, Missouri Cumulative Annual Wind Rose for Years 2017 – 2019



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 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 Cape Girardeau, Missouri NWS station, which is the source of the surface meteorological data, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological

data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. Per the AERMET User's Guide, 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.

EPA concludes the processing of meteorological data follows EPA guidance and is representative of meteorological conditions around the AECI New Madrid and M7M facility for purposes of modeling to inform the nonattainment boundary. Our assessment is based on the description and analysis the state provided which indicate the surface and upper air sites chosen were the best available for the state to use. From the wind rose (Figure 8), EPA concludes hourly impacts will occur in all directions with predominant transport of emissions to the northeast based on higher frequency of south-southwest winds.

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

The terrain in the area of analysis is best described as relatively flat. To account for 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.

EPA agrees with MoDNR's treatment of terrain within AERMOD and finds it followed established guidance for terrain processing.

3.3.1.8.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 1 approach using the 3-year design value from 2016-2018 from the regional rural monitor located at Mark Twain State Park (AQS Site ID: 29-137-0001).[12] The background concentration for this area of analysis was determined by the state to be 13.1 micrograms per cubic meter ($\mu g/m^3$), equivalent to 5 ppb when expressed in two significant figures, and that value was incorporated into the final AERMOD results.

EPA concludes that a background value of 5 ppb from the rural Mark Twain State Park monitor is acceptable for the New Madrid County area since there are no other large SO_2 sources within 40 km of the explicitly modeled AECI New Madrid and M7M facilities.

[12] The most recent 3-year design value (2017-2019) at the Mark Twain State Park is 4 ppb.

3.3.1.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the New Madrid County area of analysis are summarized below in Table 5.

Table 5: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the New Madrid County Area

Input Parameter	Value
AERMOD Version	19191 (regulatory default)
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	35
Modeled Structures	82
Modeled Fencelines	2
Total receptors	4,517
Emissions Type	Actual
Emissions Years	2017-2019 CEMS for AECI New Madrid. A 12-month actual emissions estimate from a September 2018 – August 2019 compliance report for the M7M facility.
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Cape Girardeau, Missouri
NWS Station Upper Air Meteorology	Springfield, Missouri
NWS Station for Calculating Surface Characteristics	Cape Girardeau, Missouri
Methodology for Calculating Background SO_2 Concentration	Tier 1 based on design value, for 2016-2018, at Mark Twain State Park (AQS Site # 29-137-0001
Calculated Background SO_2 Concentration	5 ppb

The results presented below in Table 6 and Figure 9 show the geographic extent of the predicted modeled violations based on the input parameters.

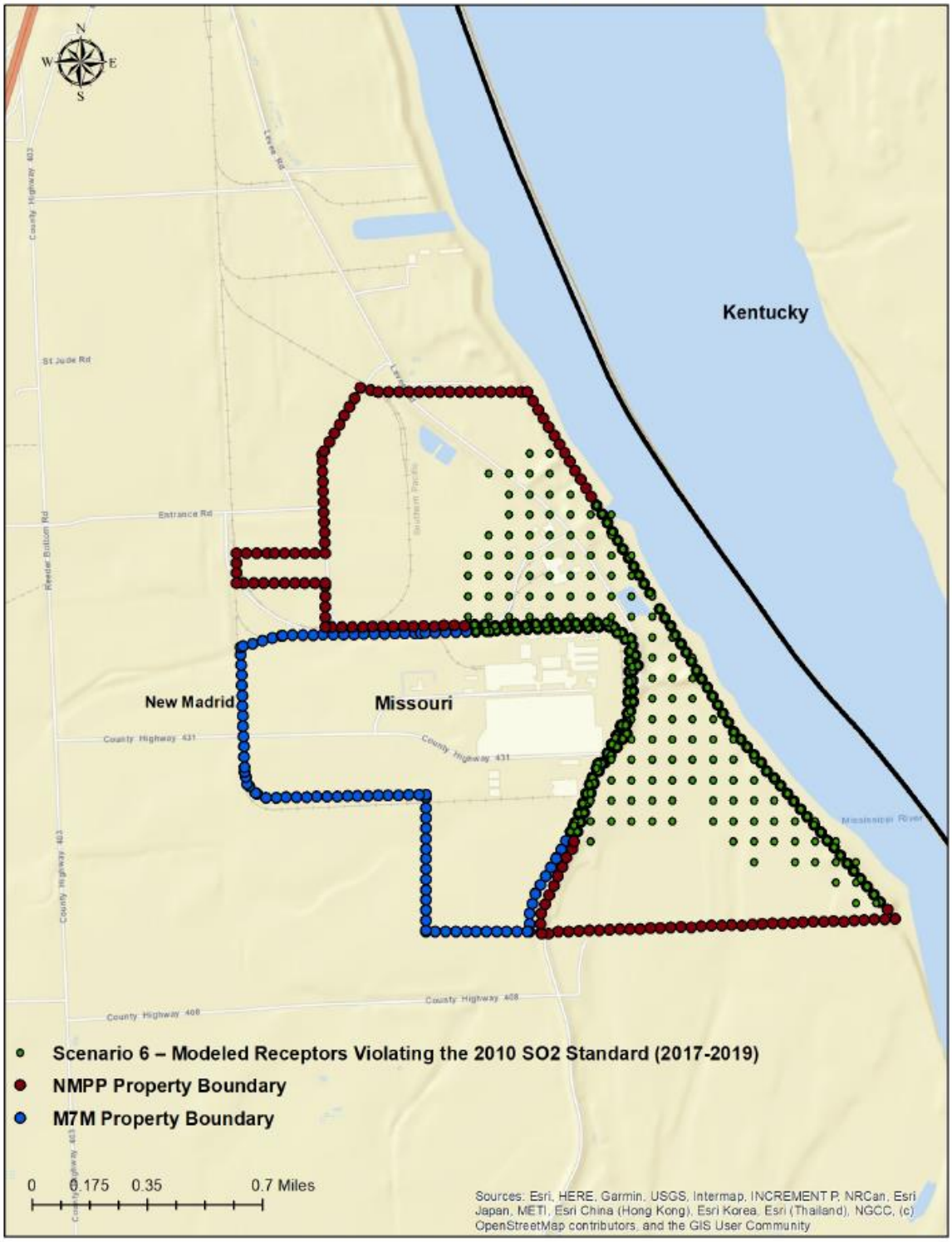
Table 6. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the New Madrid Area

Averaging Period	Data Period	Receptor Location [UTM zone 15]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM	UTM	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	807991.10	4046399.20	3,380.36	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

Figure 9 was included as part of the state's recommendation and indicates that the predicted modeled violations (green circles) are fully contained within the state's recommended nonattainment area boundary.

Figure 9: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the New Madrid County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration, among others. The modeling results also include the area in which a NAAQS violation was modeled, information that is relevant to the

selection of the boundaries of the area that will be designated. The modeled violations are attributed to the carbon bake emission sources and are located along the north and east fenceline of the M7M facility and extend up to 0.5 km beyond the M7M fenceline. Modeled violations occur up to the edge of the modeled receptor grid which ends at the bank of the Mississippi River.

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

The state considered different modeling scenarios that included different emissions inputs at M7M, in particular for the emissions at the two currently operating carbon bakes. The state based its modeling scenario that was used to inform its boundary recommendation on AERMOD's ability to match the maximum monitored concentrations, in particular the Site #1 monitor. Site #1 is located less than 0.1 km from the carbon bake #1 stacks. EPA further evaluated the state's chosen modeling scenario, utilizing quantile-quantile (q-q) plots to compare the model predictions to monitor concentrations. Figures 10 and 11 provide the q-q plots for Site #1 and Site #2, respectively. The plots use monitor and modeled data from a 12-month period (September 2018 through August 2019).

The q-q plot at Site #1 shows the model can replicate the maximum concentrations, and as previously mentioned, this formed the basis for state's chosen modeled emissions and source characterization at M7M. However, the q-q plots at Site #1 show that beyond the model replication of the maximum monitor concentration, the model severely underpredicts the lower, yet still exceeding, monitor concentrations. This model underprediction also occurs at Site #2.

This q-q model evaluation indicates a consistent model underprediction in the state's chosen modeling scenario at the two nearby monitors that are in violation of the NAAQS. The model underprediction is likely due to a combination of factors, with uncertainties in the modeled emissions and source characterization (i.e., what is the best way to represent the 64 short stacks of carbon bake #2) as primary concerns. The q-q plots show the difficulty of properly representing the M7M source characterization and operations within AERMOD. Because of these uncertainties at M7M, EPA is not able to rely solely on the overall final MoDNR modeling demonstration to inform the extent of the nonattainment boundary around the AECI and M7M facilities.

Figure 10: Model to monitor comparison (q-q) at monitoring Site #1.

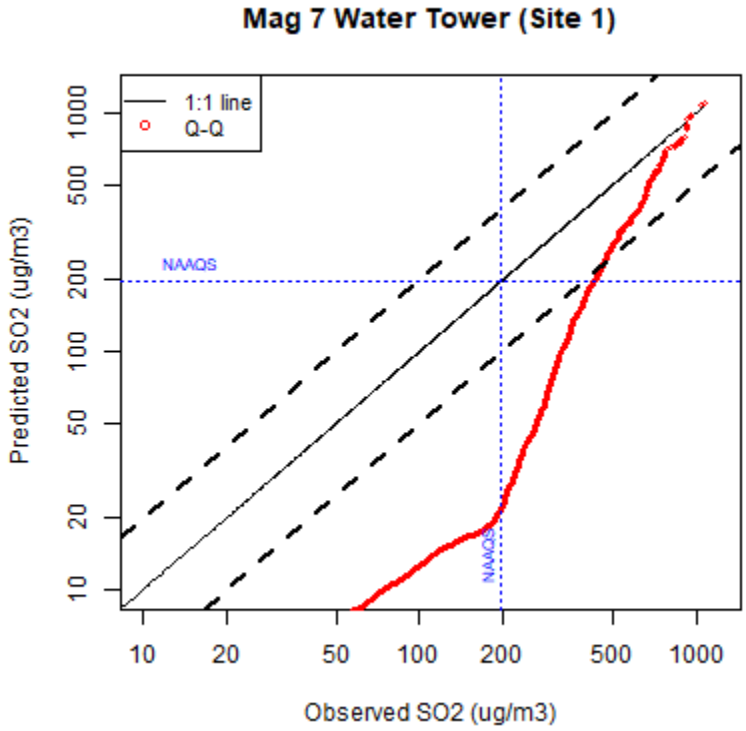
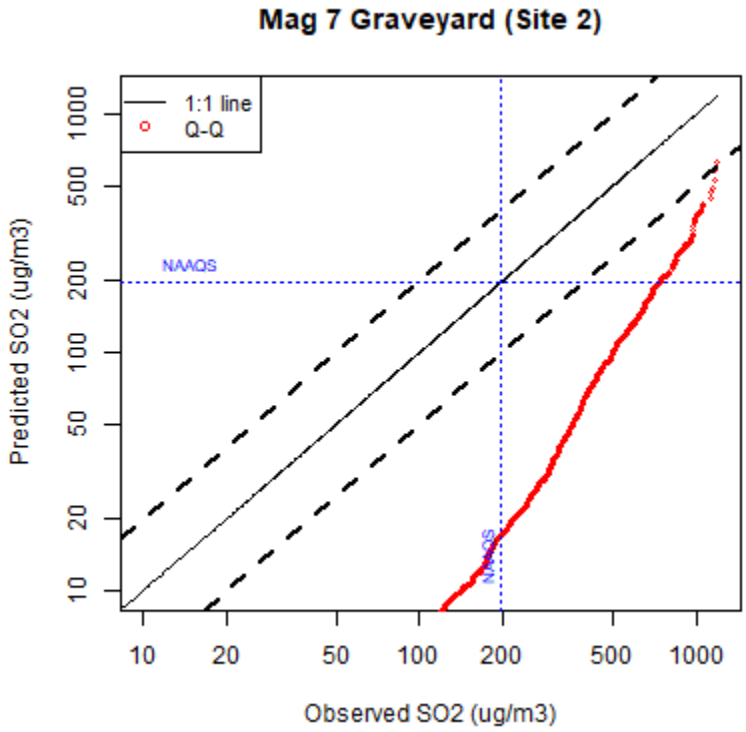


Figure 11: Model to monitor comparison (q-q) at monitoring Site #2.



3.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the New Madrid County, Missouri Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. 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. As mentioned in Section 3.1, M7M began operation in June of 2018, approximately half-way through the 2017-2019 three-year timeframe used to evaluate the monitoring data and compare to the NAAQS. It is reasonable to believe that if M7M was operating throughout the entire three-year period, that higher design values would have occurred at the monitors and the geographic extent of violations would be seen at greater distances.

Also, specific to the emissions-related factor, as discussed in previous sections, the M7M facility is difficult to characterize via AERMOD modeling. While EPA agrees with the state that the area around AECI New Madrid and M7M should be designated nonattainment, due to these identified emissions uncertainties, there remains uncertainty in determining the extent of violations in the area.

3.5. Jurisdictional Boundaries in the New Madrid County, Missouri Area

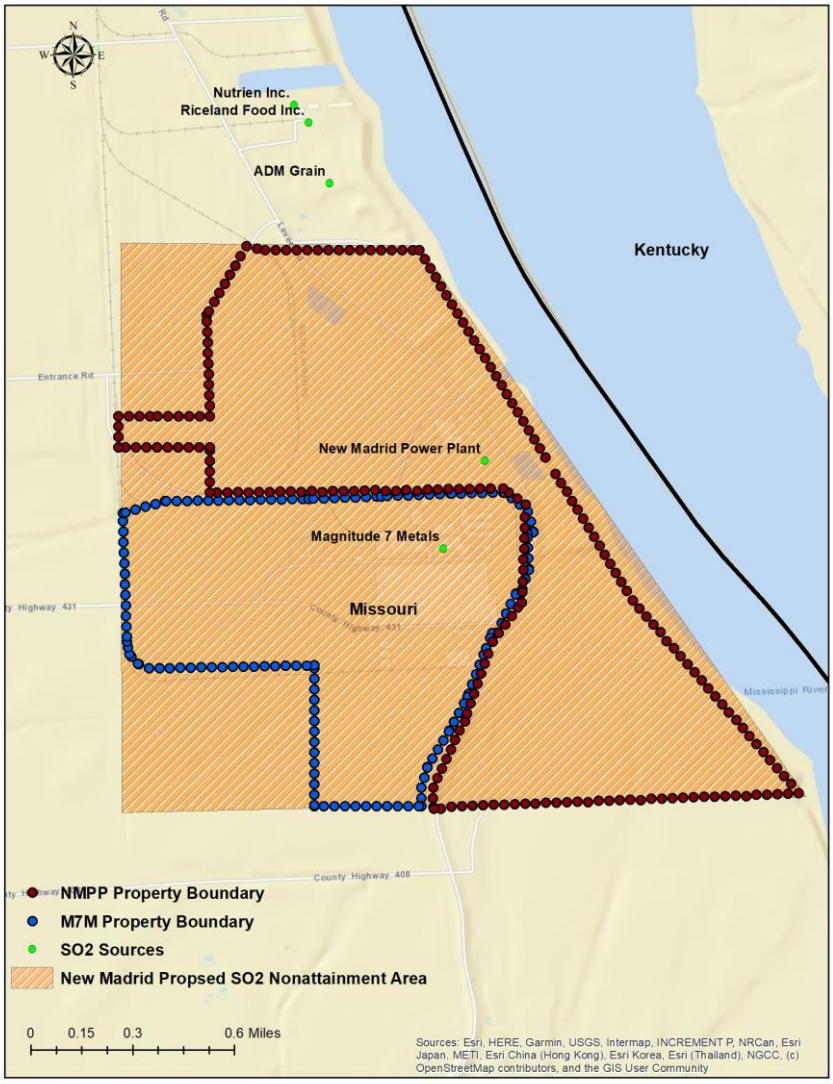
EPA considers existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area. Our goal is to base designations on clearly defined legal boundaries that align with existing administrative boundaries when reasonable. Existing jurisdictional boundaries used to define a nonattainment area must encompass the area that has been identified as meeting the nonattainment definition.

The state's recommended nonattainment boundary for New Madrid County was designed from geographical coordinates. The state's recommended boundary is shown in Figure 12, and consists of:

- the Mississippi river on the east and the lines connecting the following coordinates: Zone 16 Universal Transverse Mercator (UTM) coordinates: (272016.6E, 4042423.62N), (268791.92E, 4042564.43N), (268957.29E, 4045213.47N), and (270362.07E, 4045125.75N).

The state's boundary encompasses a constructed polygon based on the property lines of AECI New Madrid and M7M. It extends approximately 1-km in the north-south direction and 1.5 km in the east-west direction.

Figure 12: The state's recommended nonattainment boundary for the New Madrid County Area of Analysis. Image courtesy of MoDNR.



3.6. Other Information Relevant to the Designation of the New Madrid County, Missouri Area

EPA did not receive additional information relevant to the designation of this area.

3.7. EPA's Assessment of the Available Information for the New Madrid County, Missouri Area

Two individual monitors in the New Madrid County area are violating the NAAQS based on the 2017-2019 design values. Missouri submitted air dispersion modeling to demonstrate the extent of the NAAQS violations and to establish a nonattainment boundary.

The state's recommended nonattainment boundary was based on the extent of modeled violations of the 1-hour SO_2 NAAQS. The state developed a modeling scenario that used available information that represented the actual operations at AECI New Madrid and M7M. Given the previously described uncertainties and difficulties in representing a facility like M7M in the AERMOD modeling framework, EPA is unable to rely solely on the extent of the modeled violations that was used by the state to establish its recommended nonattainment boundary.

While EPA agrees with the state that the likely primary cause of the monitored violations is due to low-height emissions releases (i.e., short carbon bake stacks and possibly some fugitive emissions), and that emissions from AECI New Madrid contribute to the violations, no reliable information is available to conclusively determine the full geographic extent of NAAQS exceedances in the area. In addition, M7M is currently not operating at its full permitted capability and the monitored design values being considered in the state's evaluation only considered M7M operations for the partial 3 years because M7M was not operating until June of 2018. Actual operations for the entire 3-year period would be more representative of the future and would likely result in a larger nonattainment boundary. Carbon Bake #1 and potline #3, while not operating during the modeled time period, have been in operation in the recent past (as recently as 2014) and, if they resume operation, additional SO_2 impacts would be seen in the area likely further increasing the nonattainment boundary.

When evaluating the maximum impacts from the taller stacks of the M7M potline (90 meters) and AECI New Madrid (243 meters) individually (i.e. separate from the shorter release points), these impacts, while below the level of the NAAQS when modeled with actual emissions, occur at the furthest edges or outside of the state recommended nonattainment boundary. Also, a viable strategy to mitigate the current low-level emission impacts from the carbon bakes is to potentially build a new, taller stack(s) to enhance atmospheric dispersion of pollutants. EPA finds the state recommended boundary is too small to fully incorporate the impacts from elevated stack emissions (current and any future new stack configurations) that need to be evaluated in a future attainment demonstration for the New Madrid County, Missouri area.

Lastly, as mentioned in Section 3.3.1.3, with the monitored violations located within 0.25 km of the Mississippi River, the EPA believes receptors need to be placed on the portion of the Mississippi River that resides in New Madrid County. The lack of model receptors outside the state's recommended boundary leads to uncertainty in identifying the actual extent of violations.

For these reasons, and with the additional consideration that the area has monitored 1-hour SO_2 concentrations greater than six times the level of the NAAQS in 2018 and 2019, we are unable to rely solely on the state's modeling as a basis to establish the geographic extent of EPA's intended nonattainment area boundary and, therefore, EPA's intended boundary expands on the state's recommended boundary.[13] EPA finds that extending the nonattainment boundary will

[13] EPA's assessment of the modeling for the New Madrid County area to inform our intended nonattainment boundary for 2010 SO_2 NAAQS designations does not imply that the modeling is appropriate for other purposes, such as NSR, interstate transport, or SIP demonstrations.

provide a more representative area of evaluation for SO_2 impacts from AECI New Madrid and M7M within New Madrid County.

EPA's nonattainment boundary includes the two principal SO_2 sources that contribute to SO_2 violations in New Madrid County. EPA's nonattainment boundary extends 2 km to 3 km to the north, west and south of the main emissions points at AECI New Madrid and M7M. Given that there is uncertainty in the geographic extent of the current NAAQS violations, EPA's boundary provides a high level of confidence that it encompasses the area of New Madrid County where violations of the NAAQS are likely to occur. EPA's intended nonattainment area, bounded by:

- East: Missouri/ Kentucky and Missouri/Tennessee State lines.
- North: County Highway 406 East to Levee Road, following Levee Road North to County Highway 406, then extending directly East to the Missouri/Kentucky State line.
- West: County Highway 403
- South: County Highway 408 East to the intersection with County Highway 431, then extending directly East to the Missouri/Tennessee State line

This area will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended nonattainment area.

EPA believes this intended nonattainment area captures the extent of NAAQS violations and the sources causing them, the M7M and AECI facilities. EPA has no evidence to suggest that violations are occurring in the remainder of the County or that there are sources outside the intended nonattainment area that are contributing to the violations in that area. Specifically, the remainder of New Madrid County does not contain any sources emitting greater than 0.5 tons per year of SO_2. For these reasons, EPA intends to designate the remainder of New Madrid County as attainment/unclassifiable.

3.8. Summary of EPA's Intended Designation for the New Madrid County, Missouri Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, EPA intends to designate a portion of New Madrid County, Missouri as nonattainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are defined as the area bounded by:

- East: Missouri/ Kentucky and Missouri/Tennessee State lines.
- North: County Highway 406 East to Levee Road, following Levee Road North to County Highway 406, then extending directly East to the Missouri/Kentucky State line.
- West: County Highway 403
- South: County Highway 408 East to the intersection with County Highway 431, then extending directly East to the Missouri/Tennessee State line

Additionally, EPA intends to designate the remainder of New Madrid County, Missouri as attainment/unclassifiable.

Figure 13 shows the boundary of this intended designated area and Figure 14 provides a more focused graphic of the intended nonattainment area around AECI New Madrid and M7M compared with the state's recommended boundary.

Figure 13. Boundary of the New Madrid County, Missouri Intended Nonattainment Area and Intended Attainment/Unclassifiable Area

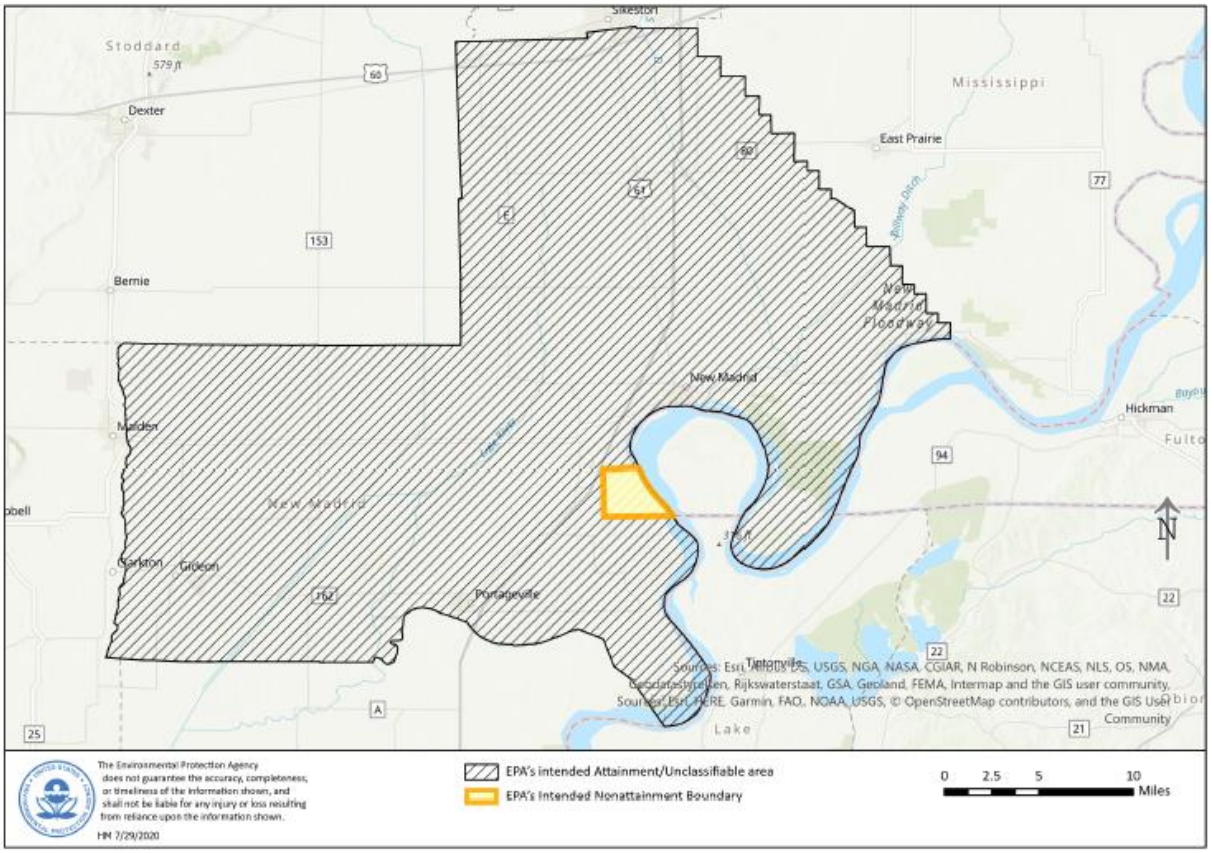


Figure 14. Boundary of the Intended New Madrid County, Missouri Nonattainment Area. EPA's intended nonattainment boundary is shown with the larger, orange polygon and the state's recommended nonattainment boundary is shown with the smaller, green polygon.