Missouri State Implementation Plan Revision

Nonattainment Area Plan for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard

Jefferson County Sulfur Dioxide Nonattainment Area

Missouri Air Conservation Commission

Adoption Hearing

May 28, 2015

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Project # 2010-SO2-3B (Jefferson)

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ACRONYMS & ABBREVIATIONS LIST

AERMET	AERMOD Meteorological Preprocessor
AERMOD	AMS/EPA Regulatory Model
AMS	American Meteorological Society
AOC	Administrative Order on Consent
ASOS	Automated Surface Observing Station
BAS	Basic Operating Permit
BPIP PRIME	Building Profile Input Program with Plume Rise Model Enhancements
CAAA	Clean Air Act Amendments of 1990
CEMS	Continuous Emission Monitoring System
CFR	Code of Federal Regulations
CSR	Code of State Regulations
CCVR	Cloud Cover Measurements
department	Missouri Department of Natural Resources
EGU	Electric Generating Unit
EPA	United States Environmental Protection Agency
FR	Federal Register
GEP	Good Engineering Practice (stack height)
km	kilometers
m	meters
MACT	Maximum Achievable Control Technology
$\mu g/m^3$	micrograms per cubic meter
MoEIS	Missouri Emissions Inventory System
MTSP	Mark Twain State Park
NAA	Nonattainment Area

NAAQS	National Ambient Air Quality Standard
NAD83	North American Datum of 1983
NED	National Elevation Data
NWS	National Weather Service
P70	Part 70 Operating Permit
PM	Particulate Matter (PM_{10} and $PM_{2.5}$)
ppb	parts per billion
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
RACM	Reasonably Available Control Measures
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
tpy	tons per year
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

EXECUTIVE SUMMARY

On June 22, 2010, the U.S. Environmental Protection Agency (EPA) established a new 1-hour sulfur dioxide (SO_2) primary National Ambient Air Quality Standard (NAAQS) of 75 parts per billion (ppb), based on the three-year average of the annual 99th percentile of 1-hour daily maximum concentrations (75 FR 35520; June 22, 2010). This new SO_2 standard replaces the previous 24-hour and annual primary SO_2 NAAQS promulgated in 1971 (36 FR 8187; April 30, 1971). Once EPA establishes or revises a NAAQS, EPA must designate as "nonattainment" those areas that violate or contribute to violations of the NAAQS pursuant to section 107(d) of the federal Clean Air Act Amendments of 1990 (CAAA).

On August 5, 2013, the EPA designated a portion of Jefferson County, Missouri as nonattainment for the 2010 SO_2 primary NAAQS, effective October 4, 2013, based on air quality data from 2007-2009 that indicated a violation of the NAAQS for the area containing the Doe Run Herculaneum primary lead smelter among other sources (78 FR 47191; August 5, 2013). This final rule is codified in 40 CFR §81.326 *Missouri*.

Per section 191(a) of the CAAA, Missouri is required to submit to the EPA a nonattainment area (NAA) State Implementation Plan (SIP) revision for SO_2 that demonstrates the NAA will reach attainment of the 2010 SO_2 primary NAAQS as expeditiously as practicable, but no later than five years from the date of the nonattainment designation.

The main purpose of this SIP revision is to address CAAA section 172(c) plan requirements as applicable to this nonattainment area. This SIP revision demonstrates attainment for the Jefferson County SO_2 Nonattainment Area using air dispersion modeling that includes the continuation and modification of existing control strategies as well as new emission limits and other requirements. Examples of required controls include the permanent shutdown of operations at the Doe Run primary lead smelter in Herculaneum (December 2013) and strengthened stack emission limitations for three Ameren Missouri Energy Center facilities.

The emission limits identified for this SIP revision will initially be permanent and enforceable through a 2015 Consent Agreement between the Missouri Department of Natural Resources (department) and Ameren Missouri.

This SIP revision also addresses CAAA required elements, including a reasonably available control measures (RACM) analysis, a reasonably available control technology (RACT) analysis, reasonable further progress (RFP) requirements and contingency requirements. Multiple modeling scenarios were evaluated in the determination that the area will demonstrate NAAQS compliance.

1. INTRODUCTION

The federal CAAA require the EPA to establish NAAQS for SO_2 and five other criteria air pollutants impacting public health and the environment. The other criteria pollutants are ozone, particulate matter (including PM_{10} and $PM_{2.5}$), lead, nitrogen dioxide, and carbon monoxide. The CAAA also requires EPA to periodically review the standards and the latest scientific information to ensure they provide adequate health and environmental protection, and to update those standards as necessary.

On June 22, 2010, EPA established a new 1-hour SO_2 NAAQS of 75 ppb, based on the three-year average of the annual 99th percentile of 1-hour daily maximum concentrations (75 FR 35520; June 22, 2010). This new SO_2 standard replaces the previous 24-hour and annual primary SO_2 NAAQS promulgated in 1971 (36 FR 8187; April 30, 1971). Once EPA establishes or revises a NAAQS, EPA must designate as "nonattainment" those areas that violate or contribute to violations of the NAAQS pursuant to section 107(d) of the CAAA.

On August 5, 2013, the EPA designated a portion of Jefferson County, Missouri as nonattainment for the 2010 SO_2 primary NAAQS, effective October 4, 2013, based on air quality data from 2007-2009 that indicated a violation of the NAAQS for the area containing the Doe Run Herculaneum primary lead smelter among other sources (78 FR 47191; August 5, 2013). This final rule is codified in 40 CFR §81.326 *Missouri*. The Jefferson County SO_2 nonattainment area includes a number of SO_2 emitting sources within its geographical boundaries. Specifically, the largest of these modeled sources include The Doe Run Resources Corporation d/b/a The Doe Run Company (hereafter, Doe Run) primary lead smelter in Herculaneum, Ameren Missouri - Rush Island Energy Center, River Cement Company d/b/a Buzzi Unicem USA – Selma Plant in Festus, and Ardagh Glass Inc. [formerly Saint-Gobain Containers Inc.] in Pevely. Additionally, large modeled SO_2 sources located outside the boundaries of the Jefferson County SO_2 Nonattainment Area include Ameren Missouri's – Labadie Energy Center and Meramec Energy Center.

Per section 191(a) of the CAAA, Missouri is required to submit to the EPA a nonattainment area SIP revision for sulfur dioxide and to demonstrate the nonattainment area will reach attainment of the 2010 SO_2 primary NAAQS as expeditiously as practicable, but no later than five years from the date of the nonattainment designation.

Clean Air Act Requirements

Section 110 of the CAAA specifies general SIP requirements and Part D of the CAAA includes requirements for nonattainment areas. The department's June 27, 2013 Missouri SO_2 Infrastructure SIP submittal addresses the continued maintenance, or section 110 Infrastructure requirements, of the 2010 SO_2 primary NAAQS for all other portions of the state not designated as nonattainment. This document addresses CAAA Part D requirements for the Jefferson County SO_2 Nonattainment area. A separate document, developed concurrent to this one, will address the Part D SIP requirements for the State's only other SO_2 nonattainment area, called the Jackson County SO_2 Nonattainment area which includes a portion of Jackson County, Missouri where a violating SO_2 monitor currently operates.

The general Part D nonattainment SIP provisions are delineated in section 172 of the CAAA. Section 172(c) specifies SIPs submitted to satisfy Part D requirements shall, among other things, provide for attainment of the applicable NAAQS via federally enforceable measures and limitations, include Reasonably Available Control Measures (RACM) [which includes Reasonably Available Control Technology (RACT)], provide for Reasonable Further Progress (RFP), include an emissions inventory, require permits for construction and operation of major new or modified stationary sources, contain contingency measures, and satisfy the applicable provisions of section 110(a)(2) of the CAAA related to the general implementation of a new or revised NAAQS. The following sections of this document address the section 172(c) requirements as specified:

Section 2 (monitoring and ambient air quality data)
Section 3 (emissions inventory)
- Addresses section 172(c)(3) inventory

Section 6 (nonattainment area plan control strategy)
- Addresses section 172(c)(6) enforceable emission limitations, control measures along with schedules and timetables for compliance

Section 7 (RACM & RFP)
- Addresses section 172(c)(1) RACM/RACT
- Addresses section 172(c)(2) reasonable further progress

Section 8 (contingency measures, new source review & conformity)
- Addresses section 172(c)(9) contingency measures and section 172(c)(5) permitting requirements for new & modified major sources

Section 9 (public participation)

In addition to the above, section 172(c)(4) requires the SIP to identify and quantify the emissions of pollutants allowed from the construction and operation of major new or modified stationary sources per section 173(a)(1)(B). The SIP must demonstrate the emissions quantified in this regard will be consistent with the achievement of reasonable further progress and will not interfere with attainment of the sulfur dioxide NAAQS by the required attainment date. Section 172(c)(5) requires permits for the construction and operation of new or modified major stationary sources in the nonattainment area be in accordance with section 173.

Missouri administers a New Source Review (NSR) permitting program for new or modified major sources of sulfur dioxide per Missouri's approved permit program. Among other requirements, permits issued in Missouri require a demonstration that emissions from the new or modified source will not cause or contribute to a NAAQS violation, including the 2010 1-hour SO_2 NAAQS.

Missouri has SIP-approved regulations restricting particulate emissions from stationary sources and restricting fugitive dust emissions. These regulations assist in reducing sulfur dioxide emissions.

This plan conforms to the CAAA requirements and utilizes existing EPA guidance for sulfur dioxide SIPs. More information on EPA's guidance for sulfur dioxide SIPs developed under the 2010 SO_2 NAAQS are found at: http://www.epa.gov/airquality/sulfurdioxide/implement.html.

The combined modeling scenarios in section 5 of this NAA plan successfully demonstrate attainment of the 2010 SO_2 NAAQS based on implementation of required control measures described in section 6. Each of the required limitations and control measures (existing, modified and new) are required to reduce emission rates sufficiently to demonstrate 2010 SO_2 NAAQS compliance. The emission rate reductions are expected to result in monitored values of 75 ppb [equivalent to 196.725 micrograms per cubic meter ($\mu g/m^3$)] or less.

1.1. BACKGROUND

Sulfur dioxide (SO_2) is one of a group of highly reactive gasses known collectively as "oxides of sulfur." SO_2 is linked with a number of adverse effects on the respiratory system. In order to reduce ambient air concentrations, SO_2 emission sources are typically restricted by emission limits, control devices or other special conditions in a permanent and enforceable document, such as an air permit, regulation or a legally binding agreement such as a consent judgment or an administrative order on consent (AOC). The total of all SO_2 emission limits and special conditions prescribed by state regulation, construction permits and/or legally binding agreements is established to ensure 2010 SO_2 NAAQS compliance. The corresponding ambient air concentrations are determined by ambient air quality monitors. This data is the primary basis for the strategy developed for this plan.

1.1.A. Health Effects

Current scientific evidence links short-term exposures to SO_2, ranging from 5 minutes to 24 hours, with an array of adverse respiratory affects including bronchoconstriction and increased asthma symptoms. These effects are particularly important for asthmatics at elevated ventilation rates (e.g., while exercising or playing.)

Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

EPA's NAAQS for SO_2 is designed to protect against exposure to the entire group of sulfur oxides (SOx). SO_2 is the component of greatest concern and is used as the indicator for the larger group of gaseous sulfur oxides (SOx). Other gaseous sulfur oxides (e.g. SO_3) are found in the atmosphere at concentrations much lower than SO_2.

Emissions that lead to high concentrations of SO_2 generally also lead to the formation of other SOx. Control measures that reduce SO_2 can generally be expected to reduce people's exposures to all gaseous SOx. This may have the important co-benefit of reducing the formation of fine sulfate particles, which pose significant public health threats.

SOx can react with other compounds in the atmosphere to form small particles. These particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. EPA's NAAQS for particulate matter (PM_{10} and $PM_{2.5}$) are designed to provide protection against these health effects.

1.1.B. Sources

Nationally, the EPA estimates the largest sources of SO_2 emissions are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%). Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore and the burning of fossil fuels containing sulfur in locomotives, large ships and other non-road equipment applications.

Since the introduction of lower sulfur distillate fuels beginning in 2004 initially for mobile source applications, SO_2 air pollution is ever more characterized mainly by single, discrete stationary sources of SO_2, primarily pertaining to the combustion of fossil fuels. Because of its physical and chemical properties, SO_2 is not a typical criteria pollutant. Unlike the gaseous and fine particulate criteria pollutants, areas of maximum SO_2 concentrations tend to be relatively localized and the concentrations do not transport long distances. Consequently, SO_2 settles out of the air over a relatively short distance and has a relatively high concentration gradient. In other words, there is a sharp decrease in SO_2 concentrations as the distance from a large SO_2 source(s) increases.

For SO_2 point sources, there are thirteen small sources located inside the NAA boundary with each emitting less than 5 tons per year (tpy). These sources include hospitals, cremation centers, and various small businesses. Also located inside the NAA boundary are four larger sources, each with baseline emissions greater than 100 tpy. These four include one Electric Generating Unit (EGU), one retired primary lead smelter, and two manufacturing facilities. Five interactive sources outside the NAA were included in the modeling analysis, each emitting greater than 100 tpy. These sources include two EGU's, one brewery operation, and two manufacturing facilities. Three sources in Illinois were also included in the modeling analysis, each emitting greater than 1,000 tpy.

1.1.C. Regulatory History

Pursuant to the requirements of the CAAA, the EPA first promulgated a NAAQS for SO_2 on April 30, 1971. Specifically, EPA initially promulgated a 24-hour primary SO_2 standard of 140 parts per billion (ppb) [not to be exceeded more than once per year] and an annual average primary SO_2 standard of 30 ppb (to protect health) [annual arithmetic average]. EPA also initially promulgated a 3-hour average secondary SO_2 standard of 500 ppb (to protect public welfare). On May 22, 1996, EPA completed a review of the primary SO_2 NAAQS and chose not to revise the standards. Historically, there have been no areas designated as nonattainment per these standards in the entire State of Missouri.

On June 22, 2010, EPA revised the primary SO_2 standards by establishing a new 1-hour standard of 75 ppb [three-year average of the 99th percentile of the yearly distribution of 1-hour daily maximum SO_2 concentrations]. EPA also revoked the two existing primary SO_2 standards (24-hour and annual primary SO2 standards) recognizing that the revised 1-hour standard of 75 ppb will have the effect of generally maintaining 24-hour and annual SO_2 concentrations that are below the levels of the associated primary SO_2 standards, respectively.

On April 3, 2012, EPA took final action to retain the current secondary standard for SO_2 of 500 ppb averaged over three hours, not to be exceeded more than once per year.

Based on ambient monitoring data from 2007-2009, areas in a portion of Jackson County (Kansas City area) and a portion of Jefferson County (Herculaneum area) were in violation of the 2010 1-hour SO_2 NAAQS. Based on the violations recorded at the respective monitors, both areas were designated nonattainment under the 2010 sulfur dioxide standard effective October 4, 2013. As previously stated, this nonattainment area plan addresses only the Jefferson County SO_2 Nonattainment Area. Information on Missouri's 2010 1-hour SO_2 NAAQS area boundary designation recommendations may be found at the Air Program's NAAQS boundary designations webpage: http://dnr.mo.gov/env/apcp/naaqsboundarydesignations.htm#SO2

1.1.D. Description of Nonattainment Area & Topography

EPA designated a portion of Jefferson County, not the entire county, as the Jefferson County 2010 1-hour SO_2 nonattainment area on August 5, 2013, effective October 4, 2013 (78 FR 47191). Appendices B and C of this NAA plan provide a listing of the 2011 and 2018 SO_2 emissions inventory (point, nonpoint, & mobile). Appendix F of this NAA plan includes the modeled inventory of sources included in this Jefferson County SO_2 nonattainment area plan. The final SO_2 standard designations were based upon air quality monitoring data from calendar years 2007-2009.

The 2010 1-hour SO_2 Designation and Boundary Recommendation, codified in 40 CFR §81.326 "*Missouri – 2010 Sulfur Dioxide NAAQS (Primary)*", lists the specific Universal Transverse Mercator (UTM) coordinates comprising the Jefferson County nonattainment area-

Jefferson County (part) SO_2 Nonattainment Area

Jefferson County, MO [1] Jefferson County (part)
..... 10–4–13 Nonattainment.

That portion within Jefferson County described by connecting the following four sets of UTM coordinates moving in a clockwise manner:

(Herculaneum USGS Quadrangle)

718360.283 4250477.056

729301.869 4250718.415

729704.134 4236840.30

718762.547 4236558.715

(Festus USGS Quadrangle)

718762.547 4236558.715

729704.134 4236840.30

730066.171 4223042.637

719124.585 4222680.6

(Selma USGS Quadrangle)

729704.134 4236840.30

730428.209 4236840.3

741047.984 4223283.996

730066.171 4223042.637

(Valmeyer USGS Quadrangle)

729301.869 4250718.415

731474.096 4250798.868

730428.209 4236840.3

729704.134 4236840.30

[1] *Excludes Indian country located in each area, if any, unless otherwise specified.*

To date, EPA has not yet finalized designations for the remainder of the state under the 2010 1-hour SO_2 NAAQS.

In addition to these considerations, topographical characteristics influence wind speed and direction. Micrometeorological effects are influenced by predominant wind patterns in river basins or valleys. The topography of Jefferson County includes the eastern boundary along the Mississippi River, including the low-lying floodplain. The terrain rises significantly in areas with bluffs along the valley, and smaller feeder streams following along cuts in the higher elevation to meet the river. This irregular terrain can induce meteorological effects on both wind speed and direction, with aerodynamic wakes, density-driven downslope flows, channeling, and flow acceleration over the crest of terrain features possible. Compared to more uniform, flat terrain, Jefferson County can experience significant meteorological variability in horizontal and vertical wind profiles on spatial scales of a few hundred meters.

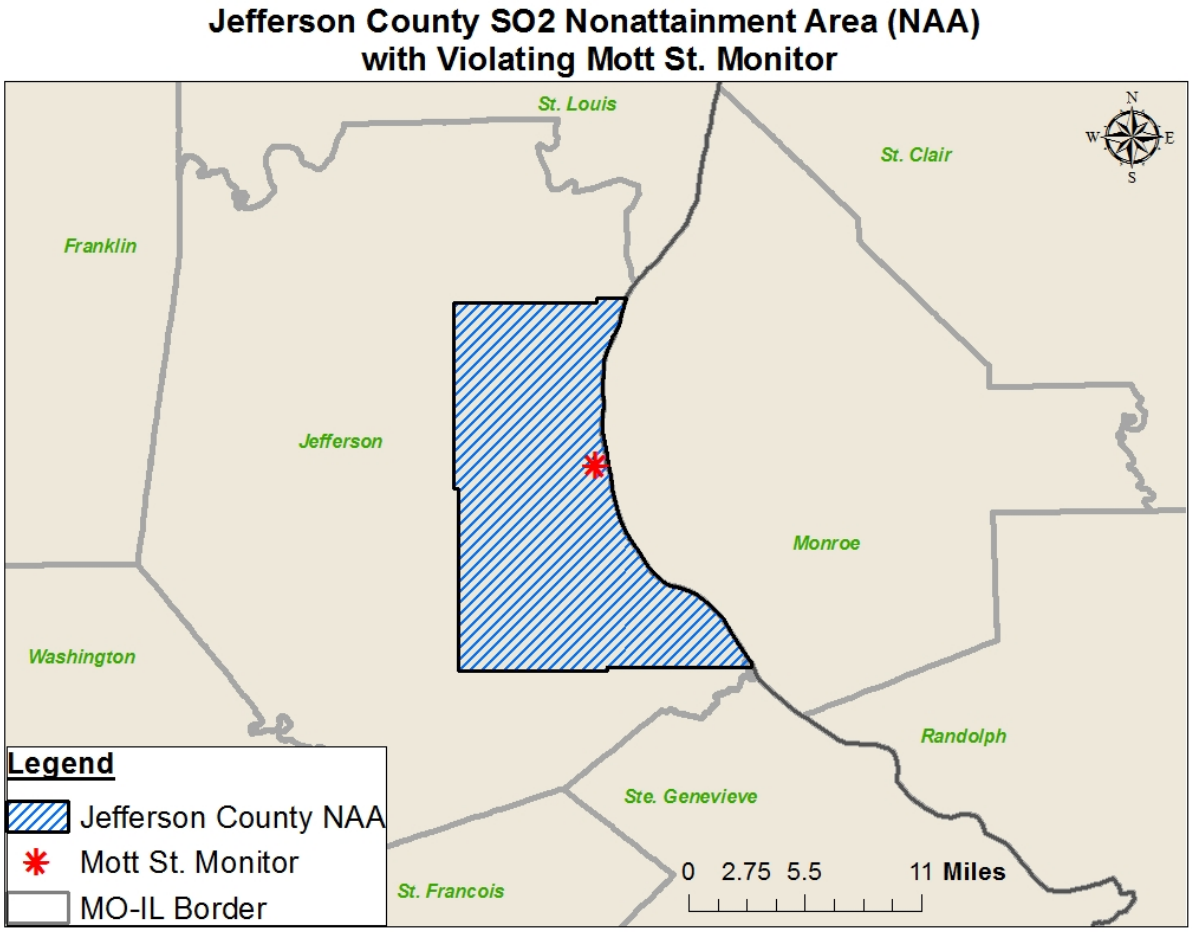

Figure 1 – Jefferson County 2010 1-hour SO_2 Nonattainment Area Boundary

2. MONITORING & AMBIENT AIR QUALITY DATA

The ambient air monitoring networks were established under the CAAA to protect and assess air quality. One of the main purposes of collecting air samples is to assess compliance with and progress made towards meeting ambient air quality standards. The department summarizes its statewide monitoring network, and any changes to it, in its annual air quality monitoring network plan in accordance with 40 CFR 58 Part B. Missouri's 2014 air quality monitoring network plan was approved by the EPA in a letter dated October 23, 2014 and is available at: http://dnr.mo.gov/env/apcp/docs/2014monitoringnetworkplan.pdf

Also, visit EPA Region 7's Air Quality Monitoring Network plan site for more information or to review Missouri's previous approved network plans: http://www.epa.gov/region07/air/quality/quality.htm#mo_air

2.1. AIR QUALITY MONITORING NETWORK

The department maintains a monitoring network satisfying all EPA requirements for NAAQS criteria pollutants, including SO_2. As documented in the 2013 SO_2 Infrastructure SIP, there is an

active network of state operated air quality monitoring sites, located throughout Missouri, tasked with collecting data on SO_2 in the ambient air. Monitoring is conducted pursuant to a department-approved Quality Assurance Project Plan (QAPP). Statewide SO_2 monitoring locations are shown in Figure 2.

Prior to the June 22, 2010 promulgation of the 1-hour SO_2 primary NAAQS, all of Missouri maintained compliance with the previous primary and secondary SO_2 NAAQS based on the statewide SO_2 monitoring network operating at the time. In fact, monitored values of the previous primary SO_2 NAAQS (both 3-hour and 24-hour averaging periods) were historically recorded well below the standard which enabled the Air Program to discontinue operation [prior to 2007] of several SO_2 monitoring sites where violations were not an issue. Further, in 2010, five additional SO_2 monitoring sites that were not recording violations of the 2010 1-hour SO_2 NAAQS were temporarily discontinued primarily due to state budgetary concerns. Of these five SO_2 monitoring sites, the Mark Twain State Park (MTSP) site in Monroe County resumed SO_2 monitoring on July 1, 2012. The highest SO_2 concentration recorded at the MTSP monitoring site in all of calendar year 2014 was 13 parts per billion (ppb). The MTSP monitoring site is generally considered a good benchmark for background concentrations for the state due to its remote location.

After promulgation of the 2010 1-hour SO_2 standard, a portion of Jefferson County was one of two areas in Missouri designated as nonattainment in August 2013. This designation was based on monitoring data from the existing SO_2 monitoring network for calendar years 2007 through 2009, as well as later data from calendar years 2010 through 2012. Monitoring network data is also needed to analyze the performance of the refined dispersion model used to demonstrate NAAQS compliance and track progress toward attainment.

Missouri has operated an air monitor for both SO_2 and lead in Herculaneum since 2001. The state operated monitor was moved in 2004 to Main Street and later moved in 2011 to the current Mott Street location. EPA approved the relocation of the SO_2 and lead monitor in Herculaneum (from Main Street to the current Mott Street monitor location). Specifically, in a December 12, 2011 EPA letter to the department regarding the approval of the 2011 Missouri Ambient Air Quality Monitoring Plan, "EPA has determined that MDNR (department) relocated the monitor in accordance with the regulations in 40 CFR 58.14(c)(6) based on logistical problems beyond the State's control since the State was required to vacate the property by the landowner, and because the site met all siting criteria."

In addition to Missouri operated monitors, the Doe Run Company has operated air quality monitors in the Herculaneum area since at least 1997. The violating Herculaneum Mott Street SO_2 monitor (i.e. Herculaneum Mott Street monitor) location was selected to characterize source specific [SO_2 and lead] emissions from the Doe Run Herculaneum primary lead smelter.

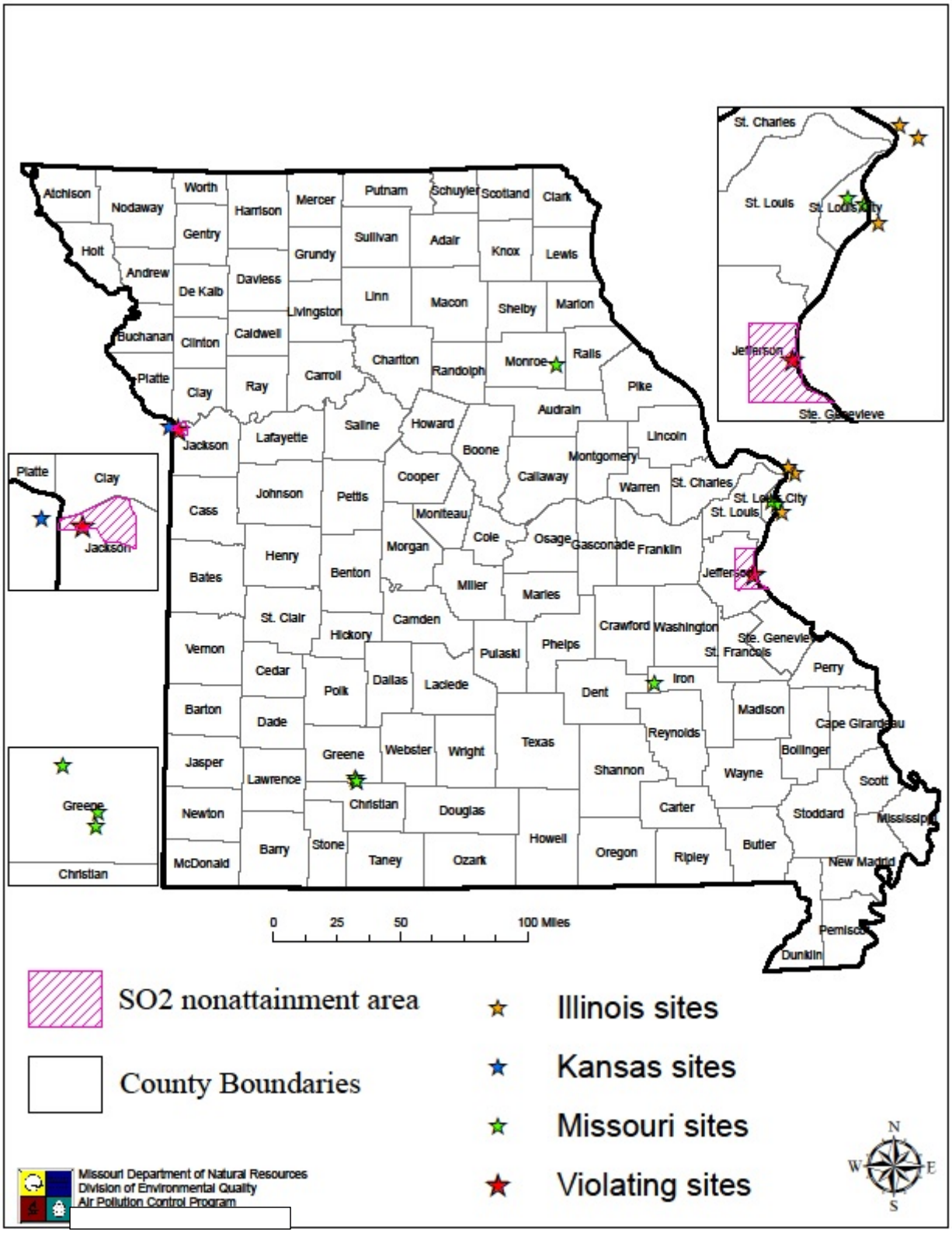

Figure 2 – Monitoring Sites - SO_2 Ambient Monitoring Network Showing Monitors in MO, KS, IL

2.2. MONITORING DATA

Monitored data recorded at the Herculaneum Main Street and Mott Street ambient monitors include values such that the fourth high (99th percentile of the daily 1-hour maximum) annual SO_2 concentrations were recorded as high as 400 ppb in calendar year 2004. Further, the three-year design value (2007-2009) for the Herculaneum Main Street monitor at 350 ppb was the highest design value in the continental United States for that period. The Herculaneum SO_2 monitor's three-year design values for 2010-2012 [216 ppb] and 2011-2013 [192 ppb], respectively, are also noncompliant with the 2010 1-hour SO_2 NAAQS.

Based on the recorded monitor values, SO_2 NAAQS violations at the Herculaneum Mott Street monitor are predominantly attributable to the Doe Run Herculaneum primary lead smelter. In December 2013, the Doe Run Herculaneum primary lead smelter ceased operations, and since then monitored SO_2 values recorded at the Herculaneum Mott Street monitor are dramatically lower. Specifically, for the all of calendar year 2014 at the Mott Street monitor, the highest concentration recorded was 23 parts per billion (ppb) while the fourth highest concentration (99th percentile) recorded was 18 ppb. For comparison, the fourth highest concentration (99th percentile) recorded at the Mott Street monitor for calendar year 2013 was 143 ppb and for calendar year 2012 was 268 ppb. Based on these recorded SO_2 monitored values, the monitored exceedances recorded at the violating Mott Street monitor through 2013 are clearly dependent on smelting operations at the primary lead smelter which are now permanently shutdown.

If 2015 monitored SO_2 values continue to be similar to 2014 monitored values, the three-year design value for the Mott Street monitor is expected to be below 75 ppb [per the 2010 1-hour SO_2 NAAQS] by the end of 2015.

Figure 3 displays the fourth high (99th percentile of the daily 1-hour maximum) annual SO_2 concentrations recorded at the Herculaneum Main Street and Mott Street monitors, as well as the corresponding three-year design values based on quality assured data through September 30, 2014 and preliminary data through the development date of this SIP revision submittal. A summary of current preliminary SO_2 monitoring data recorded in 2015 (updated twice monthly) is available at http://dnr.mo.gov/env/apcp/docs/so2monitoringdata.pdf

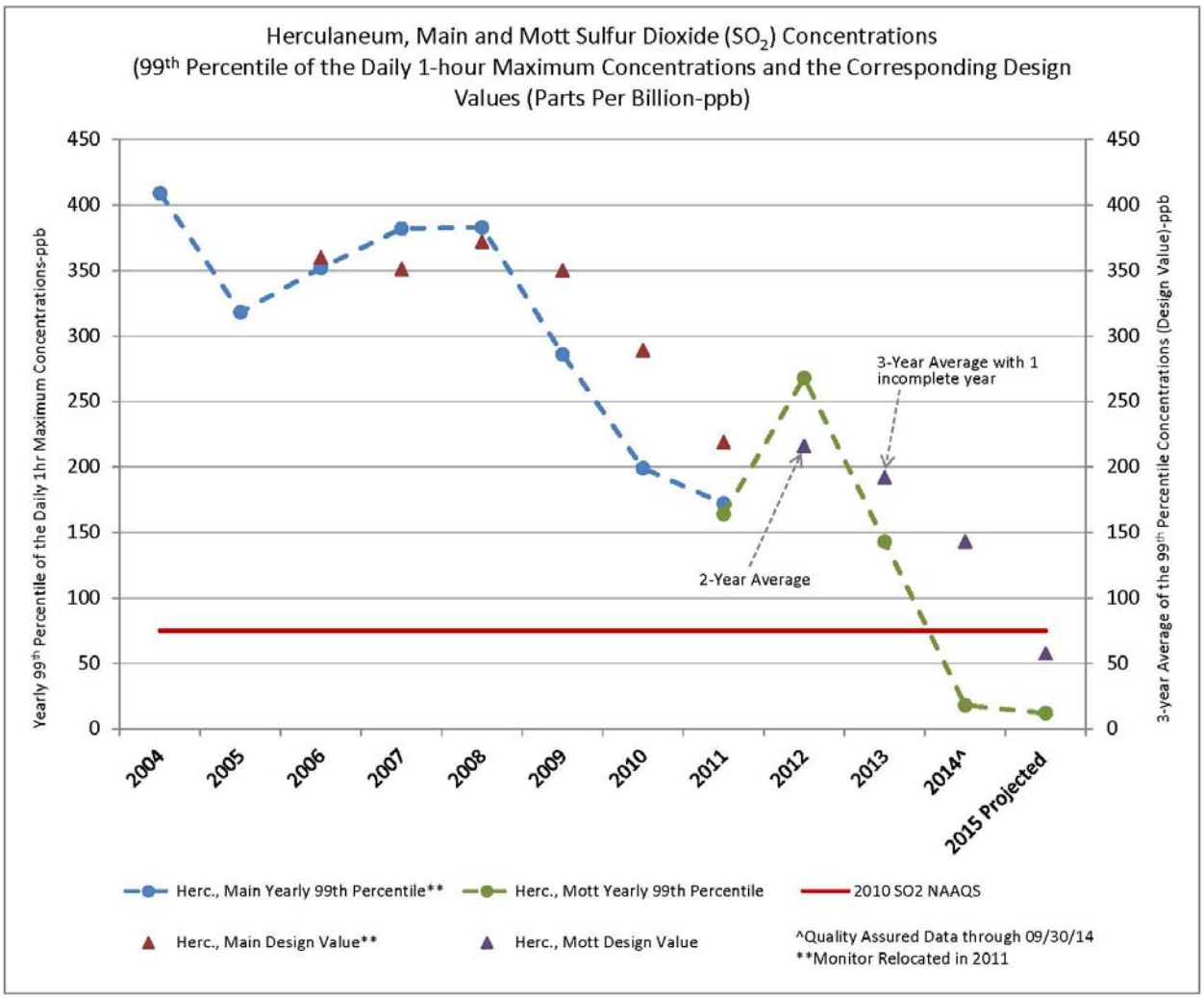

Figure 3 – Herculaneum SO_2 Monitoring Data & Design Values

3. EMISSIONS INVENTORY

The department's Air Pollution Control Program creates air emission inventories for criteria pollutants and hazardous air pollutants to meet federal reporting requirements under EPA's Air Emissions Reporting Rule, and to provide data that supports the functions of the Air Program, including SIP inventory needs. The SO_2 emissions inventory includes anthropogenic emissions from point source facilities like industrial plants, mobile source emissions from diesel powered vehicles, and nonpoint sources of emissions where many small sources are estimated at the county level (household fuel combustion emissions are combined). Point source facility emissions are reported directly by permitted sources in Missouri, while nonpoint and mobile source emissions are estimated using EPA guidelines and state-specific data.

Nonpoint sources of SO_2 include the small emitting sources that are not inventoried by collecting site specific data; their emissions are estimated based on activity surrogates at the county level. For Jefferson county including portions outside the nonattainment area, the most recently available nonpoint inventory in 2011 shows that residential fuel combustion, diesel fuel

distribution, open burning, wildfires, and all other emissions of SO_2 total to 50.525 tons. Mobile sources of SO_2 emissions are piston-driven engines using sulfur containing fuel, and the county total, including areas outside the nonattainment area, is 26.567 tpy of SO_2. The nonpoint and mobile emissions combined [Table 1] are less than 0.2% when compared to point source facility emissions, and they are not modeled as explicit point sources in the modeling demonstration for this SIP revision. Nonpoint and mobile source SO_2 emissions are included as part of the background concentration discussed in section 4.3.

Table 1 - Jefferson County (entire county) 2011 SO2 Emissions Summary

Emission Category	2011 SO_2 Emissions (tpy)	Percent of Total Point Source Emissions
Point Source Total	43712.9619	100%
Nonpoint Total	50.52526777	0.12%
Mobile Source Total	26.56717874	0.06%

SO_2 emissions in the Jefferson County SO_2 nonattainment area are driven by point sources, the large stationary industrial sources related to electric generation and other industrial sources using coal and other sulfur containing fuels. These sources are required to obtain construction and/or operating permits from the Air Pollution Control Program, and these permits are subject to the Missouri Emission Inventory Reporting Rule, 10 CSR 10-6.110. The rule requires that sources characterize their total annual actual facility emissions by describing the equipment generating the emissions, emission estimation methods, emission control devices, and release parameters. At a point source facility, emissions are generated by many types of equipment and processes, including but not limited to electric generating units, boilers, and other fossil fuel combustion equipment; emissions are characterized for modeling using their release parameters as stack, vent, or fugitive emissions. These data elements are used in SIPs to characterize current emissions and evaluate future scenarios that may include amended emission limits.

Point source emission data is collected via online submission or paper forms depending on facility choice. Over 90% of facilities choose the online submission of data, though all data, whether received electronically or hard copy, is entered to our emissions database called the Missouri Emissions Inventory System (MoEIS). MoEIS performs the initial quality assurance steps by ensuring minimum data fields are included and data is within acceptable ranges. Additional quality assurance is performed including, but not limited to the following: year-to-year variance, industry-type comparisons, and external data source verification. Corrections are made to emissions data with the acknowledgement of the facility representative.

The emission inventory for SO_2 in the Jefferson County SO_2 nonattainment area includes 16 point source facilities that reported over 0.01 tons of SO_2 in any emissions year to date. Additional emissions inventory information, for 2011 and 2018, representing baseline and attainment year inventories, is presented in Appendices B and C, respectively.

The sources with a Part 70 (P70) operating permit type characterize their emissions annually by providing updated emission totals based on each year's activity, therefore their emissions vary year-to-year. The sources with a Basic (BAS) operating permit type characterize their emissions by detailing year-specific data only when new permitted equipment starts up or if total emissions change by 5 tons or more from a previous year. Basic permit facilities may show the same emission total if they were not required to fully detail their emissions for each year – they roll forward the emission total.

Two required elements of nonattainment plans are a baseline and attainment year emission inventories. The 2011 baseline emission inventory is included in Appendix B. The baseline emissions inventory was taken from the 2011 National Emissions Inventory (NEI) database. The Air Program developed a comprehensive statewide emissions inventory for 2011, as described above and as required by the EPA's Air Emissions Reporting Requirements (AERR) rule published December 17, 2008, and submitted the inventory to the National Emissions Inventory (NEI) through the EPA's Emission Inventory System (EIS). The inventory includes point, nonpoint, onroad mobile, and nonroad mobile source emissions. The supporting documentation and sources of information used to develop the 2011 NEI can be found in the associated technical support document and appendices.

October 4, 2018 is the attainment date for the 2010 SO2 standard; therefore, 2018 was selected as the future year and the projected inventory is being submitted to U.S. EPA with this document to fulfill the projected year emissions inventory requirements under the 2010 SO2 standard. The 2018 attainment year inventory for this plan submittal is included in Appendix C. Emissions for non-point, area and mobile sources are presented at the county level and are not adjusted for the partial county nonattainment area. The emissions inventory was taken from the 2018 emissions modeling platform developed by the U.S. EPA. The point sources emissions inventory was modified to include the actual reductions of emissions from the Doe Run smelter, which was a decrease from 2011 reported emissions of approximately 20,000 tpy. The emissions in this inventory reflect what the expected actual emissions will be in the attainment year of 2018.

4. AIR DISPERSION MODELING

As outlined in the preamble of the final 1-hour SO_2 NAAQS rule, dispersion modeling is required to demonstrate compliance with the 1-hour SO_2 NAAQS in nonattainment areas. The U.S. Environmental Protection Agency (EPA) document entitled "Guidance for 1-hour SO_2 NAAQS SIP Submissions" recommends the use of the AERMOD modeling system, EPA's preferred near-field dispersion model, for the SO_2 analysis.

As currently formulated, EPA's guideline models yield concentration impacts in units of micrograms per cubic meter ($\mu g/m^3$) and do not yield results in the dimensionless levels of parts per volume of the NAAQS for gaseous air pollutants (i.e., O_3, NO_2, SO_2, and CO). In all modeling analyses and results contained as part of this nonattainment area plan, modeled concentrations are taken at ambient conditions of 25º Celsius. and 760 millimeters of Mercury

and were converted as: 1 ppb SO_2 = 2.623 µg/m³. [1] Based on this conversion, the 2010 1-hour SO_2 NAAQS of 75 ppb is equivalent to 196.725 µg/m³.

The AERMOD system was developed through a collaborative effort between the American Meteorological Society (AMS) and the EPA. AERMOD is a steady-state plume model that employs Gaussian and bi-Gaussian probability density functions to characterize the structure of the planetary boundary layer. AERMOD can predict the concentration distribution of pollutants from surface and elevated releases located within simple or complex terrain. The model allows for the input of multiple sources, terrain elevations, structure effects, various grid receptors, wet and dry depletion calculations, urban or rural terrain, and averaging periods ranging from one hour to one year.

The AERMOD modeling system was used to determine compliance with the 1-hour SO_2 NAAQS. AERMOD is the preferred model for determining pollutant impacts from industrial source complexes where emissions are released from a variety of source types. The most recent version (version 14134) of the AERMOD dispersion model, as well as the preprocessors, was used to perform the air quality analyses necessary to ultimately demonstrate attainment in the designated nonattainment area. AERMOD was used as a tool to determine if a proposed control strategy results in NAAQS compliance. Staff executed AERMOD and its corresponding preprocessors in a disk operating system (dos) windows interface.

The regulatory default options within the modeling system were set through the use of the MODELOPT keyword contained within the control pathway of the air quality model. Staff included terrain elevation data and stack-tip downwash calculations. Urban/rural site determinations were made for the nonattainment area to account for differences in boundary layer concentrations and to employ the 4-hour half-life option for urban SO_2 sources. The Jefferson county nonattainment area was determined to exhibit rural site characteristics for modeling purposes.

4.1. MODELING DATABASE DEVELOPMENT

Refined air quality analyses include SO_2 sources contained within the modeling domain that are determined to have an impact within the nonattainment area boundaries that are not included as part of the established background concentration. Sources located within 50 km of the NAA boundary were evaluated based on the level of their potential and actual emissions and their proximity to the boundary. Department staff developed ambient air quality inputs based upon the criteria outlined in 40 CFR Part 51 Appendix W, "Guideline on Air Quality Models." The following paragraphs outline the procedures that were used to ensure that consistent and comprehensive air quality reviews were conducted. The complete modeled source inventory is included in Appendix F. The modeled source inventory is based on emission year 2012, which was the most recent complete year at the start of modeling analyses.

[1] http://www.epa.gov/region1/communities/pdf/CapeWind/CapeWindModelingReview.pdf

4.1.A. Site Specific Data Collection

Detailed information characterizing sources deemed as having the potential to impact the nonattainment area was collected from the facilities on an individual basis to be verified. This information includes but is not limited to the following:

1. Facility wide SO_2 equipment list,
2. Potential to Emit (PTE) and reported actual emission rates for each piece of equipment identified in item #1, including information regarding varying load scenarios, if applicable,
3. A description of equipment usage in order to identify sources that fall into the intermittent source category,
4. Identification of federally enforceable limits contained within construction permits, operating permits, consent decrees or other state and federal rules,
5. Release parameters and source locations for each process unit or stack,
6. Property boundary, and
7. Building locations and heights.

4.1.B. Source Emission Rates

As mentioned previously, the emission rates utilized in the air quality model reflect current permanent and enforceable or recent actual emissions for each SO_2 source included in the model. EGUs are one of the major source categories of SO_2 emitters, which have different peak concentration impact levels depending on the percent load assumed in the modeled emission rates. After preliminary analysis of base load impacts at varying loads, staff determined 100% load would account for the maximum impact for all sources.

In some modeling scenarios contained in this demonstration, actual varying emissions are used to approximate current compliance status. Actual varying emissions are obtained through Continuous Emission Monitoring Systems (CEMS) data and evaluated against hourly meteorological data to simulate actual conditions. The use of allowable values cannot be overlooked as it is also evaluated in establishing certain emission levels to protect against violations, particularly when an ambient air quality monitor is not available to assess air quality. In this case, the monitor acts as a surrogate to establish SO_2 limits in conjunction with the requirement for additional monitors to ensure NAAQS compliance.

4.2. EMISSION RELEASE PARAMETERS

In order to accurately predict the dispersion of pollutants within the atmosphere, the air quality model must have information that describes how the emissions are released into the atmosphere. The document entitled "User's Guide for the AMS/EPA Regulatory Model AERMOD" outlines the source classification system that is used by the AERMOD modeling system in order to characterize emission releases within the input file.

For the SO_2 modeling demonstration, the majority of the emissions releases are stack driven releases with parameters based upon information provided by the facility or obtained from information contained within the Missouri Emissions Inventory System (MoEIS).

When stack data was unavailable, the release point was characterized as a volume source within the model input file. Each volume source release is limited to the size of openings from which emissions escape, such as doorways. If no release characteristics are available, default parameters for volume sources are assigned.

The following sections discuss the information used to assign release parameters.

4.2.A. Point Source Release (Stack Driven)

Point source emissions are vented through stacks or isolated vents. Any stack that vents horizontally, is equipped with a rain cap, or that does not provide an exit velocity, is modeled with a reduced exit velocity of 0.001 meters per second to account for the restriction of vertical flow. In order to assign the point source release parameters, the facility must provide information regarding the location and the nature of the release as follows:

1. Stack height,
2. Stack exit temperature,
3. Stack exit velocity, and
4. Stack diameter.

4.2.B. Volume Source Release (Non-stack Driven)

Any emission release point that is not routed through a stack is classified as a volume source release. Additionally, any emission release vented inside an enclosed structure, without a stack, is characterized as a volume source with release parameters equivalent to the size of the openings that allow for the escape of fugitive emissions.

In order to assign the volume source release parameters, the facility must provide information regarding the location and the nature of the release. The type of release plays an important role in the calculation of the initial lateral and vertical dimensions that are used in the air quality model. At a minimum, the facility must provide the following data:

1. Description of the release,
2. Release height (center of the volume),
3. X-dimension, and
4. Y-dimension.

The information described above was established for each release point/opening from which emissions may escape. If volume source data was unavailable, default release parameters were assumed based on the type of source being modeled.

4.3. MODEL DOMAIN & RECEPTOR GRID

The modeling domain is centered on the nonattainment area boundary. The modeling domain extends a sufficient distance, up to 50 kilometers (km), in an effort to define the impact from any source that may cause or contribute to a violation of the 1-hour SO_2 NAAQS within the nonattainment area. The AERMOD model is a near-field model that does not reliably extend beyond 50 km, which was then used as the absolute maximum distance within which to evaluate interactive sources.

The receptor grid developed for use in the air quality model has a fine resolution to identify the area of maximum impact from fugitive and point source releases and to encompass the full extent of any NAAQS violations that occur. For the nonattainment area, receptors are placed at 100-meter intervals along the perimeter with receptors within the nonattainment boundary also spaced at 100-meter intervals.

When determining compliance with the NAAQS, the EPA requires that, at a minimum, all nearby sources be modeled. All SO_2 emission sources located within the NAA boundary were explicitly modeled. Sources outside the NAA boundary were evaluated based on proximity to the NAA as well as the magnitude of potential and actual SO_2 emissions to determine whether they had the potential to impact receptors within the NAA. The Air Program evaluated all sources of SO2 emissions identified in the MOEIS emission reporting system up to 50 km from the border of the NAA. A 100 ton per year emissions threshold was used to determine inclusion in the model. Sources with either actual or potential emissions greater than this emissions threshold, depending on proximity to the boundary, were included in the model inventory. Sources that could be included as part of the background concentration were not explicitly included in the modeling analysis.

The data needed to execute the air quality analysis originated from the MoEIS emission reporting system for the State of Missouri. Since the model domain extends beyond the eastern state boundary, an interactive source inventory was obtained from the Illinois Environmental Protection Agency, and this data was incorporated into the air quality analysis.

When an interactive source was shown to contribute to a violation at the monitor, the department discussed possible control options with each such interactive source and modeled one or more control scenarios that would mitigate this interactive contribution on peak SO_2 concentrations.

4.4. TERRAIN ELEVATIONS

In addition to assigning receptor locations, the receptor options within the AERMOD system allow the user to input information regarding the terrain surrounding the facility. AERMOD is capable of calculating air pollutant concentrations for terrain that can be classified as simple, flat, complex or mountainous land. In order to calculate concentrations in complex or mountainous terrain situations, AERMOD must have information about the surrounding terrain and its features. To aid in the definition of the terrain features, EPA developed a pre-processor, AERMAP (version 11103) to search terrain data for base elevations and features that may influence the dispersion of pollutants within the modeling domain. Outstanding features are assigned an elevation that is referred to as the hill height scale; a value that must be included in the AERMOD input file.

National Elevation Data (NED) in the GeoTIFF format from the United States Geological Survey (USGS) Seamless Data Server was processed through the AERMAP program in order to obtain the base elevation for each receptor and source within the modeling domain. In addition, the hill height scale for each receptor was extracted as required by the AERMOD system in order to determine terrain influences within the modeling domain.

All source, receptor, and terrain elevation data were converted to UTM Zone 15 in the North American Datum of 1983 (NAD83) geodetic datum.

4.5. DETERMINATION OF SURFACE CHARACTERISTICS & AIRPORT SELECTION

To accurately calculate the boundary layer parameters in AERMET, the meteorological model must have information about the land use that surrounds the meteorological site: surface roughness, albedo and Bowen ratio. In order to provide a consistent method for determining surface characteristics, the EPA developed a mathematical tool, AERSURFACE, to determine surface roughness, Bowen ratio, and albedo values for input into AERMET. The department executed AERSURFACE (version 13016) using the default values described below:

Bowen ratio

- Ten kilometer by ten kilometer domain centered on the site.

Albedo

- Ten kilometer by ten kilometer domain centered on the site.

Surface roughness length

- Default upwind distance of one kilometer centered on the site.
- Twelve, 30 degree meteorological sectors.

Because these surface characteristics influence the similarity profiles that are utilized by the dispersion model, AERMOD, the user must determine if the surface characteristics at the meteorological site accurately represent the conditions that are present at the facility site. In order to determine if the differences in surface conditions significantly impact the AERMOD predictions, a direct comparison between the meteorological site and the facility site was necessary.

The department developed surface characteristics for multiple airports across the state for each moisture condition: average, dry and wet conditions. The results from the AERSURFACE analysis for each airport were summarized in an excel template. This template enables the user to input facility/area surface characteristics from AERSURFACE for comparison to each airport based upon characteristics of surface roughness, albedo, Bowen ratio, land use classifications, proximity and aerial photography.

4.6. METEOROLOGICAL DATA

The meteorological data utilized in the air quality model was selected based upon the spatial and temporal characteristics of the nonattainment area. Ultimately, site selection considered the proximity of the collection site to the area of interest, the complexity of the terrain in the area surrounding the monitor, the exposure of the meteorological sensor, and temporal variations in the local climate.

Because AERMOD does not accept raw meteorological data, it must be processed through AERMET (version 14134), the meteorological data pre-processor for the AERMOD modeling system. AERMET extracts and processes meteorological data in order to calculate the boundary layer parameters that are ultimately necessary for the calculation of pollutant concentrations within the atmosphere.

Most National Weather Service (NWS) stations record 1-minute Automated Surface Observing System (ASOS) wind data. The 1-minute ASOS data was obtained from the National Climatic Data Center in the TD-6405 data format that includes the 2-minute average wind speed and direction for each minute within an hour. The use of 1-minute ASOS data more accurately depicts the average hourly wind flow than single instantaneous readings of wind speed and direction that are used in other air quality modeling analyses. The 1-minute ASOS data is processed through AERMINUTE (v14237) in order to be input into the AERMET processor. For the Jefferson County nonattainment area, 1-minute ASOS data is not necessary as only onsite data is being used and it includes sub-hourly readings.

It is important to note that the Bowen ratio characteristics applied in Stage 3 AERMET processing are determined based upon the precipitation totals from the meteorological record for the time period being processed. For example, if the meteorological period reported above-average precipitation totals for 2010, the Bowen ratio values for wet surface moisture are chosen for Stage 3 processing in AERMET for 2010.

Because micrometeorological flows can influence the dispersion of pollutants, site-specific meteorological data is preferred when available. The Herculaneum site-specific data collection effort satisfies the minimum monitoring requirements described in the EPA document entitled "Meteorological Monitoring Guidance for Regulatory Modeling Applications".

For the Jefferson County NAA, staff selected available onsite data as the representative meteorological dataset. This site-specific (onsite) data is collected from the Doe Run Herculaneum primary lead smelter near the violating monitor. Since one year or more of site-specific data is available, these data are used for the NAA plan's air quality analysis as they are considered more representative of the entire area compared to a more distant NWS site. Data substitution from a NWS site was not necessary for the measured data collected at the Doe Run Company's Herculaneum site, as the site collects more than the minimum required parameters and the data completeness was above 90% for the selected years. This determination is based on a thorough comparison study and sensitivity analysis that compared all nearby available meteorological stations and processing options.

> "The AERMOD dispersion model was designed to accept a wide range of site-specific meteorological measurements, including profiles of wind, temperature and turbulence

> data. However, the algorithm for estimating the heat flux under stable conditions requires a cloud cover measurement, which is not typically available from site-specific monitoring programs. For applications of AERMOD in remote settings, the non-representativeness of cloud cover measurements from the nearest airport may present an obstacle to the application of AERMOD. Concerns have also been raised regarding the representativeness of cloud cover measurements from Automated Surface Observing System (ASOS) installations due to limitations in the vertical range of the ceilometer (EPA, 1997). An alternative scheme for estimating heat flux under stable conditions based on the use of a low-level ΔT measurement together with a single wind speed measurement, referred to as the Bulk Richardson Number Scheme, has been implemented in the AERMET meteorological processor."

EPA released a report that presents results of a technical review and modification of the implementation of the Bulk Richardson Number Scheme in AERMET, and results of an evaluation of the AERMOD model performance using the modified scheme as compared to the use of cloud cover data.[2]

As mentioned in excerpt above, like most onsite stations, the Herculaneum meteorological station does not record cloud cover measurements (CCVR). However, CCVR measurements from offsite (NWS ASOS) stations are not always representative of the defined modeling area. As mentioned previously, substitutive surface station data was not included in processing. In instances where only onsite data without CCVR data is used, AERMET implements an alternative scheme for estimating heat flux under stable conditions based on the use of a low-level ΔT (change in temperature) measurement with a single wind speed measurement, described as the Bulk Richardson Number Scheme above. The Bulk Richardson Number scheme requires at least recorded solar radiation and temperature difference in order to calculate cloud cover. Cloud cover is used to determine stability class which plays a significant role in predicted dispersion.

Beginning with version 13350, AERMET includes a non-default or beta option, that uses a modified Bulk Richardson number approach under the adjusted u* (surface friction velocity) beta option. This beta option may be useful in low wind speed/stable conditions. Non-default (beta) options require additional justification for use in regulatory applications; only default options were used in this analysis. Another change beginning with AERMET version 13350 is the ability to disable the substitution of missing CCVR and temperature values by interpolating small (1-2 hours) gaps in measurements. Since CCVR measurements are not recorded at Herculaneum and data completeness is satisfactory, this disabling option does not have significant effect on processing so was not employed. While performing sensitivity analyses, staff tested multiple processing options with none causing significant changes in the results. Therefore, no further analysis was done to support the use of these varying process methods.

The selected representative upper air station for the Jefferson County NAA is the Logan County Airport in Illinois. The meteorological station at Doe Run collects wind parameters, speed and direction, at three heights: 2 meters (m), 10m, and 40m. In the processing of the onsite

[2] EPA Final Report: "Implementation and Evaluation of Bulk Richardson Number Scheme in AERMOD." http://www.epa.gov/ttn/scram/7thconf/aermod/bulkri_eval.pdf

meteorological data, staff determined the wind direction and wind speed measured at 2m, being at a much lower height, was not representative of the overall conditions. Due to surface friction effects on wind speed and direction at the 2m level, the measurements taken at this level are commonly regarded as not representative of overall wind conditions. The 2m level wind measurements would only be useful in evaluating local micro scale anomalies. Therefore, the final meteorological inputs exclude the wind speed and direction readings taken at 2m. As mentioned previously, the Doe Run Herculaneum meteorological station collects sub-hourly data, specifically four observations per hour, or every fifteen minutes.

In following with the form of the 1-hour standard's design value calculation and the proposed modeling guidance laid out for the next rounds, the Air Program used the only complete three-year period of available onsite meteorological data, 2008-2010, for all nonattainment area plan modeling purposes. Excerpts of all meteorological data files used in the modeling analyses are included in Appendix G.

4.7. BUILDING DOWNWASH

Building downwash is calculated using the Building Profile Input Program (BPIP) with plume rise model enhancements (PRIME), version 04274. Information required to execute BPIP PRIME includes the heights and locations of structures, which may contribute to building downwash, and the stack locations in relation to these structures. Based upon the facility configuration, the department determined if a stack is subjected to wake effects from a surrounding structure(s). If structure wake effects are evident, flags were set to indicate which stacks are affected by building wake zones. For stacks influenced by a structure, BPIP PRIME calculates the building heights and widths to be included in the dispersion model so that building downwash effects are considered.

Staff evaluated building parameter information on a case by case basis. Aerial photography was used to quality assure the locational data for BPIP PRIME program input.

4.8. GOOD ENGINEERING PRACTICE STACK HEIGHT

Good engineering practice (GEP) stack height refers to the height at which emission releases from isolated stacks or vents will not cause excessive ground level concentrations in the immediate vicinity of a source due to building downwash effects, or complex terrain. Section 123 of the CAAA limits the modeling stack height to GEP when performing air quality analyses in an effort to prevent facilities from installing excessively tall stacks to meet ambient air quality and increment standards.

When performing air quality analyses, the EPA has outlined three differing techniques for determining GEP stack height:

1. Stacks less than the 65 meter de minimis level; do not have to undergo a GEP determination,

2. GEP is calculated using mathematical formulas that consider nearby building dimensions and building/stack configurations, or

3. GEP is calculated using fluid model studies.

For sources with available site specific data, the department modeled all stacks at the lesser of their actual stack height, or GEP stack height as determined by the BPIP PRIME preprocessor. Building downwash influences obtained from the BPIP PRIME output are included in the model input file for the air quality dispersion model as deemed necessary on a case-by-case basis. Any stack that was built prior to December 31, 1970 was modeled based upon the actual stack height per 40 CFR §52.21(h). Prohibited dispersion techniques as outlined in Section 123 of the CAAA were not allowed nor considered in the ambient air quality impact analysis.

In certain modeling scenarios that include actual emissions, the actual stack height was used to act as a surrogate for monitoring data. This approach is outlined in the EPA's SO2 modeling technical assistance document (TAD).

4.9. BACKGROUND CONCENTRATION

According to 40 CFR Part 51, Appendix W, background concentrations must be considered when determining compliance with the NAAQS. To account for natural source impacts, sources that are not explicitly modeled and unidentified sources, 2010-2012 monitoring data was used to establish background concentrations that were incorporated into the modeled results. To account for nearby sources, staff reviewed existing inventory data in the vicinity of the violating monitor. The following paragraphs outline the procedures used to determine how background concentrations were determined.

4.9.A. Monitor Analysis

EPA guidance notes that ambient air quality data should generally be used to account for background concentrations. Staff used 1-hour design value data for the latest 3-year period (2010-2012) to develop background concentrations and to perform a thorough background analysis using monitored values. Monitored background values are based on the design value of the nearest representative air quality monitor that is the least influenced by nearby SO_2 sources.

Background concentrations include impacts attributable to natural sources, nearby sources (excluding the major sources and interactive sources), and unidentified sources. This derived background concentration includes all sources of SO_2 not already included in the model runs. Emissions from any nearby interactive point source facilities are included in the interactive source model run for each area, and as such, are not included in the background concentration.

In general, the background value was calculated similarly to design values at air quality monitors, in order to be comparable to the SO_2 NAAQS. A nearby monitoring site near but outside the immediate area of source impact, that has SO_2 concentrations and wind direction measurements for the most recent certified three-year period, was selected for further analysis. A threshold concentration of 5 parts per billion was chosen to limit the monitored value sample size (and associated back trajectories) in the Jefferson County NAA. Statistical analysis, including an Excel pivot table and chart, was used to visualize the frequency of the measured concentrations from certain wind directions. This is helpful in targeting a sector with the least amount of monitored days above the threshold concentration, which can most likely be attributed to major source(s). Using the Linux-based Hybrid Single-Particle Lagrangian Integrated

Trajectory (HYSPLIT) model script, back trajectories were plotted to show where certain air parcels originated on days that monitored concentrations are above the threshold concentration. Impacts from sources are evident with groupings of trajectories. A sector with little to no source influence was chosen for further analysis. Considering measured concentrations from the chosen sector, the fourth highest value was chosen as representative of the area's background concentration.

Due to the limited number of SO_2 air quality monitoring sites located within Missouri [Figure 2 of this NAA plan], staff visually reviewed the regional surface characteristics within five kilometers (km) of the area to determine the monitoring station that best represents the observed land use in and around the nonattainment area. The MTSP monitoring site in Monroe County, generally considered a good benchmark for background concentrations for the state, was not chosen for the nonattainment area due to the availability of other SO_2 monitoring sites with more representative background characteristics to the nonattainment area being evaluated.

Since an urban monitor site was selected for background purposes for the nonattainment area, staff determined which meteorological corridors are not influenced by explicitly modeled sources. The meteorological corridors are defined according to ten degree wind direction sectors. Staff reviewed the 1-hour profile for each meteorological corridor in order to determine a representative background value. Statistical measures were employed in the determination of the background concentration.

4.9.B. Jefferson County Nonattainment Area Background Analysis

A background concentration must be included that represents the contribution from natural sources and from sources that are not explicitly modeled. The most recent air quality design value (i.e., the three-year average of the 99th percentile of the daily maximum 1-hour concentrations) of a representative monitoring site should be used for the background concentration based on recorded monitor violations of the 1-hour SO_2 standard.

The St. Louis metropolitan area includes six SO_2 monitoring sites. Missouri SO_2 monitoring sites in the St. Louis area include one in Jefferson County and two in the City of St. Louis. Illinois SO_2 monitoring sites in the area include one in St. Clair County and two in Madison County. The Herculaneum - Mott Street monitor located in Jefferson County is not representative of SO_2 background concentrations because there are direct source influences from nearby sources, namely the smelter. In addition, the Mott Street monitor is in violation of the 1-hour SO_2 standard which makes it inappropriate for background analysis consideration. The East St. Louis air quality monitor located in St. Clair County, Illinois (near the Jefferson County SO_2 NAA) was chosen as the representative background monitor for the area based on proximity to the sources being modeled, similarity of surrounding sources, and limited potential impacts from surrounding SO_2 sources.

Table 2 - Background Monitor Information

Specific Background Monitor Information	
Monitor Name	East St. Louis
AQS Site ID	17-163-0010
County	St. Clair
Latitude	+38.61203448
Longitude	-90.16047663
Area Represented	St Louis, IL-MO

This monitor is less impacted by primary SO_2 sources in the St. Louis metropolitan area compared to other nearby monitors, and therefore is more representative of background concentrations. The East St. Louis monitor records hourly SO_2 concentrations as well as hourly wind directional data. Hourly SO_2 concentration data and wind directional data from the East St. Louis site were obtained for the most recent certified three-year period, 2010-2012. Monitored values above 5 ppb, and 10 ppb were selected to run back trajectories using the HYSPLIT model. 24-Hour back trajectories, with a starting height of 10 meters (to be consistent with monitor height), were plotted for the selected high monitored days. A sector with little to no source influence was chosen to represent background concentrations. The sector with the least source influence was chosen as 40-110 degrees. Due North is assumed as zero degrees concerning wind direction. As included in Table 3, the fourth high monitored value (highlighted) chosen in the representative sector was 9 ppb. Therefore, an SO_2 concentration of 9 ppb or 23.607 $\mu g/m^3$ is used as the modeled background concentration for all Jefferson County SO_2 NAA plan purposes.

Table 3 - Wind and Monitor Data for Chosen Sector (40-110) Used to Derive the Fourth High Value to be the Representative Background Concentration for the Area

Date	Time	SO2Conc	WD		Date	Time	SO2Conc	WD
20100207	14:00	19	71		20110725	11:00	6	83
20100112	15:00	10	97		20100112	13:00	5	47
20101214	12:00	10	83		20100411	13:00	5	58
20100514	15:00	9	40		20101005	18:00	5	88
20110125	16:00	9	51		20101116	9:00	5	104
20110825	21:00	9	79		20101215	9:00	5	109
20110329	13:00	8	60		20101215	8:00	5	101
20110329	12:00	8	49		20110125	19:00	5	104
20110725	8:00	8	100		20110125	18:00	5	56
20100925	10:00	7	55		20110329	11:00	5	47
20120411	8:00	7	44		20110601	16:00	5	87
20121216	15:00	7	74		20110704	21:00	5	101
20100925	11:00	6	72		20110704	20:00	5	56
20101116	10:00	6	106		20120315	8:00	5	86

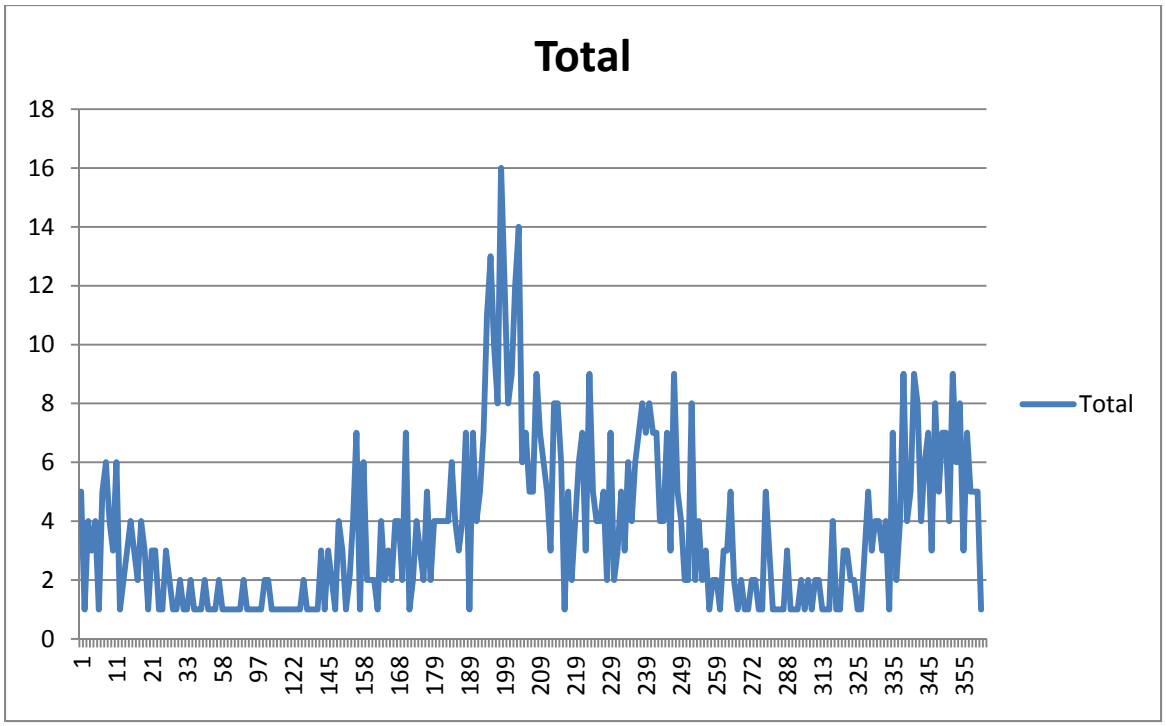

Figure 4 - Chart showing number of hits per degrees in Wind Direction, to depict areas of source influence

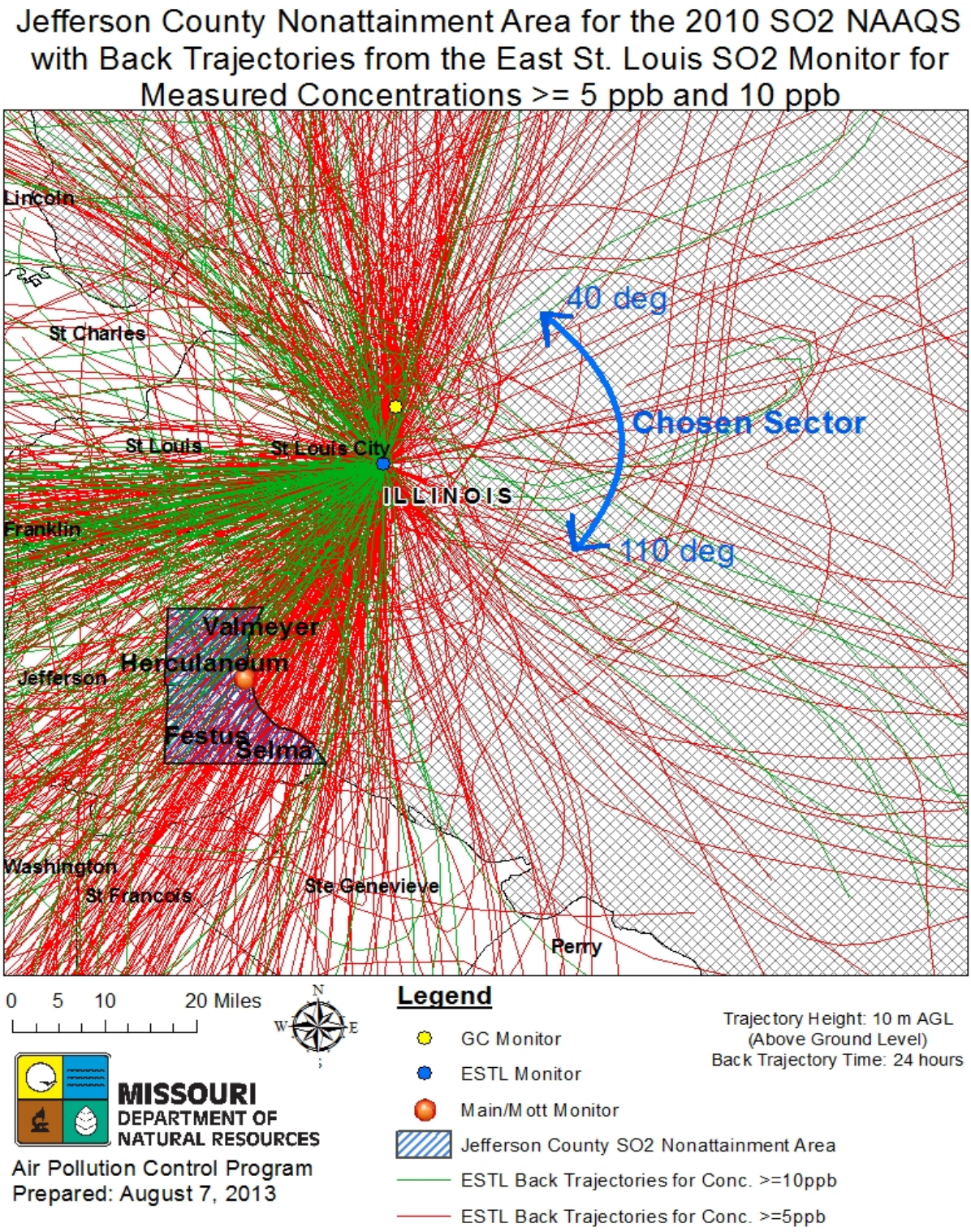

Figure 5 - Plotted Back Trajectories depict areas of source influence and the chosen background sector

5. MODELING SCENARIOS

Several iterations of modeling scenarios were performed in order to determine practicable strategies that demonstrate compliance. As laid out in the introduction, the main control strategy for the nonattainment area has already been implemented so our innovative approach to the area involves multiple different scenarios to support the nonattainment area plan. Each supporting scenario is described in detail in the following sections. All modeling scenarios include the established background concentration for the area. Excerpts of input and associated output files are included in Appendices D and E.

5.1. NONATTAINMENT AREA PLAN SCENARIO

The main scenario described below employs a 100 m spacing receptor grid that encompasses the perimeter as well as the entire nonattainment area. This scenario uses the same 2008-2010 Herculaneum onsite meteorological data as all other scenarios described below. The receptor grid was broken into four subsectors to minimize model runtime. The four subsectors are shown below.

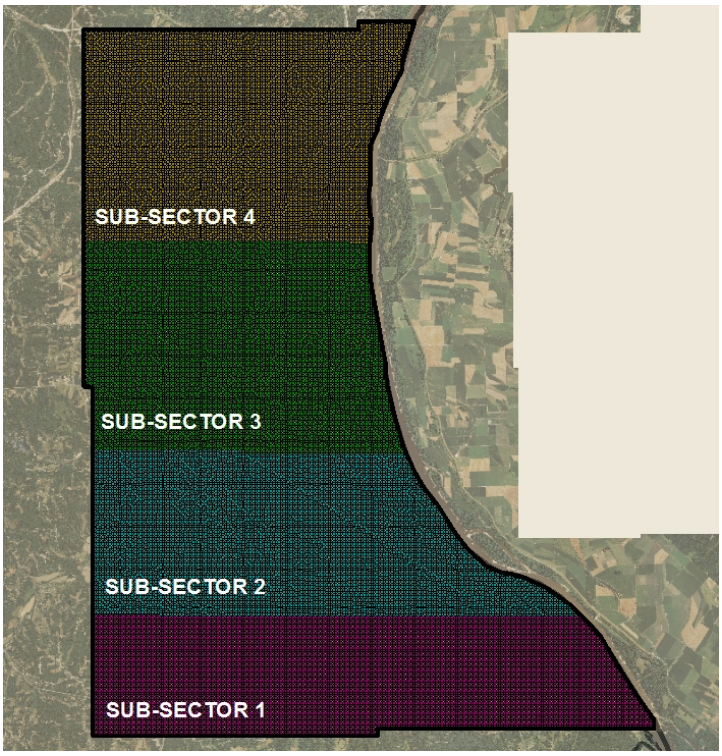

Figure 6 – Jefferson County NAA Modeling Subsectors

5.1.A. Main Scenario to Demonstrate Attainment

This modeling scenario includes all nonattainment area sources at their current, permanent and enforceable (or allowable/potential-to-emit) emissions with outside interactive sources at their most recent actual emission rates. This scenario demonstrates the entire nonattainment area is already in compliance. For the three largest nearby Electric Generating Units (EGU's), the hourly emissions recorded by CEMS as reported to EPA's Clean Air Markets Division (CAMD) were utilized in this scenario. No other sources in the model inventory currently record hourly emissions information. The Ameren facilities are included at actual hourly emissions, and they are also being addressed by new emission limitations and select monitoring requirements through the 2015 Consent Agreement.

Excerpt from the SO_2 NAAQS Designations Modeling TAD, latest draft released Dec. 2013: (http://www.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf, p. 27)

"*7.4 Use of Older Meteorological Data*

In some instances, representative meteorological data from the most recent three years may not be available, especially if the most representative data is older site-specific data. In such cases, it may be feasible to use older meteorological data (either site specific or NWS) that has been used in past regulatory applications for the area containing the threshold exceeding source, if these datasets are still considered representative of the most recent three years of meteorological conditions. If older datasets are used, the dates of the datasets would need to be adjusted to match the dates of most recent three years when using hourly emissions for any sources. This would most likely consist of changing the years of the meteorological datasets to match the most recent three years of emissions. Months, days, and hours could remain unchanged. In the event that the meteorological data covers leap years and the emissions data do not cover leap years, then February 29 can just be deleted from the adjusted meteorological datasets. If the emissions data covers leap years but the meteorological data does not, then February 28 or March 1 could be repeated with a new date of February 29. When no sources are represented by hourly emissions, but by AERMOD emissions factors only, then the meteorological data dates would not necessarily need to be adjusted because the AERMOD emission factors do not necessarily have to be concurrent with the meteorological data for proper model execution. In any event, the use of older meteorological data with recent emissions should be used with care, especially for those emissions that are meteorological dependent, such as demand in hot or cold weather for EGUs."

As mentioned in the above excerpt, the use of older onsite meteorological data can be paired with the most recent emissions data to be most representative of the area. This was chosen as the best way to characterize the area, given the Herculaneum onsite meteorological data currently available is from partial 2007 through partial 2011. Of the available onsite data set, the only full 3-year period, 2008 to 2010, was selected to mimic a design value calculation. While this 3-year period of meteorological data is still representative of the current meteorological conditions, the same cannot be said of that 3-year period of emissions data. For example, Ameren Meramec reported 20,826 tons of SO_2 in 2008, and 5,962 tons of SO_2 in 2013. Table 5 below details this trend. This is a considerable decrease that should be accounted for in the modeling demonstration. Therefore, the approach pairing older onsite meteorological data with recent emissions data, as laid out in the SO_2 modeling Technical Assistance Document (TAD), was deemed to be an appropriate method for this area. This main scenario including all sources

inside the NAA at potentials, all interactive sources outside the NAA boundary at current actual emissions, while the three Ameren facilities were modeled using their most recent 3 years of hourly CEMS data, 2011-2013, paired with the 3 full years of onsite Herculaneum meteorological data, 2008-2010. This scenario demonstrates the entire area is currently in compliance with the 1-hour SO_2 standard. The highest modeled impacts in the entire nonattainment area yielded by this scenario for the four subsectors are included in Table 4 below in both $\mu g/m^3$ and ppb. These concentrations also include the established background concentration of 9 ppb. Excerpts of input and output files for this scenario are included in Appendix D.

Table 4 - Main NAA Plan Compliant Scenario Results by Subsector

Subsector	**Highest Modeled Impact**	
#	**$\mu g/m^3$**	**ppb**
1	187.65	71.54
2	181.54	69.21
3	113.06	43.10
4	165.99	63.28

Table 5 - Ameren Missouri Meramec Energy Center's SO_2 Emissions Trend

Ameren Missouri Meramec Energy Center's Emissions Trend	
Emission Year	**SO_2 Emissions (Tons per year)**
2008	20,826
2009	16,856
2010	17,075
2011	15,281
2012	9,532
2013	5,962

5.1.B. Monitor Centric Runs

To determine the emission limits in Table 6, the department performed air dispersion modeling focused on a 1.25 km x 1.25 km area grid with 50 m spacing [Figure 7]. Since AERMOD is a steady state model, a single receptor at the monitor (or one receptor run) would be considered under-conservative; therefore a tight grid around the monitor was used to approximate the monitor itself while being more conservative in nature.

The department used allowable emissions for sources within the NAA boundary with actual emissions for nearby sources located in Missouri and in Illinois but located outside the NAA boundary. The department performed multiple iterations and scenarios to arrive at an overall control strategy that includes reduced emission rates for Ameren Missouri's Rush Island, Labadie, and Meramec Energy Centers, as the largest contributing sources. These iterations kept emission rates for all other sources fixed until no model-predicted exceedances of the SO_2 NAAQS were shown within the modeled 1.6 square kilometer (km^2) area around the Mott Street monitor. The emission limits in Table 6 reflect the department's modeled hourly emission rates adjusted to 24-hour block average limits as laid out in EPA's NAA guidance. Tables 7-9 include the critical modeled values that were used as a basis for the longer averaging time limits included in Table 6.

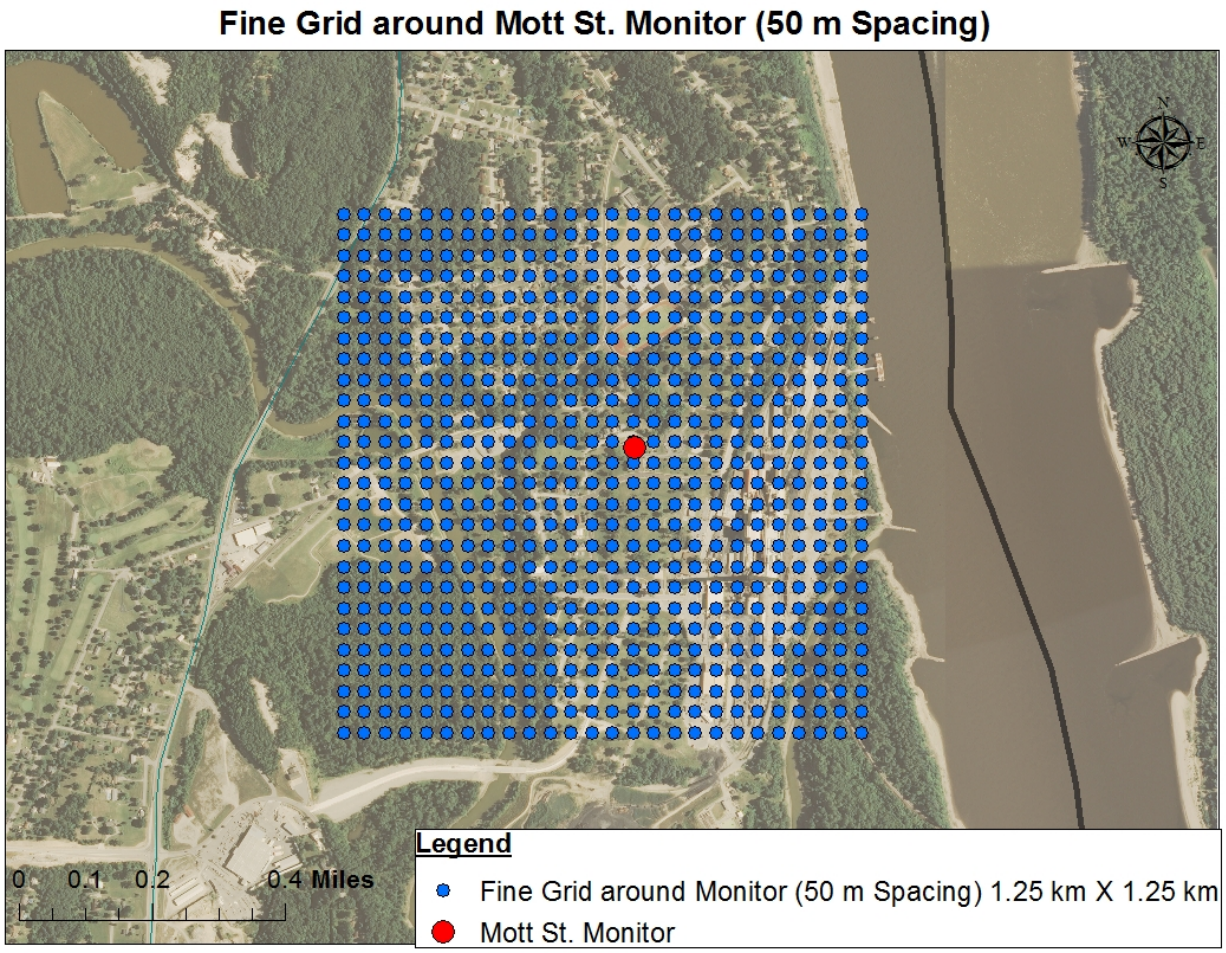

Figure 7 – Fine Grid around Mott Street Monitor – All Receptors Modeling Compliance

5.1.B.i. Monitor Centric Run to Support Limits

The fine resolution grid [Figure 7] focused around the Mott St. Monitor was used to verify that allowable emission limits for the Ameren facilities contained in the 2015 Consent Agreement [Appendix J] demonstrate compliance at and immediately surrounding the monitor. With all nonattainment sources included at allowable emissions, outside interactive sources at actual emissions, and the three Ameren Missouri facilities included at the emission limits contained in the 2015 Consent Agreement, the maximum impact within the monitor centric grid is 191.74 $\mu g/m^3$ or73.1 ppb, which is compliant. It's important to remember this concentration also includes the established background value. This compliant scenario shows that the emission limits established for the three plants indeed demonstrate compliance around the monitor.

5.1.B.ii. Monitor Centric Run to Approximate Monitored Values

This monitor centric grid was also used in a scenario with all sources included at actual emissions, with hourly emissions where available, to approximate contributions to current monitored values. Although the meteorological data and emissions data is not the same time period as the most recent monitoring data for exact comparison, some rough conclusions can still be drawn. The maximum modeled design value around the monitor is 35.7 ppb (or 93.6 $\mu g/m^3$),

while recent monitoring data (although not yet quality assured) shows a preliminary 4th high value of 18 ppb. Therefore we can infer that there are, as expected, inherent conservative nuances associated with the modeling that slightly overestimates peak concentrations. Though this is a rough correlation, it can still be stated that the model is indeed conservative in nature. Further, a modeling scenario showing NAAQS compliance is a critical NAA plan evaluation tool characterized by a margin of safety due to the conservative nature of the model.

5.1.B.iii. Doe Run Herculaneum 2011 Actual Emissions Baseline Scenario with Monitor Centric Grid

This scenario includes only Doe Run Herculaneum primary lead smelter at 2011 reported actual emission rates and estimated fugitive emissions in order to approximate baseline conditions near the violating monitor when designations were finalized for the Jefferson County SO_2 NAA. Doe Run Herculaneum unit level process data was the starting point for approximating fugitive emissions. During the preparation of this NAA plan, the department determined that fugitive SO_2 emissions at the lead smelter were not properly characterized prior to the shutdown of the smelter in December 2013. Therefore, several modeling scenarios were evaluated to best characterize fugitive emissions during smelter operation. These modeled scenarios utilized actual SO_2 emissions data as well as onsite meteorological data to compare modeled concentrations with monitored concentrations. Fugitive emissions were estimated based on the effects on monitored data recorded before and after the shutdown of the Doe Run Herculaneum primary lead smelter in December 2013. The same receptor grid and meteorological data were used for this scenario as for the previous monitor centric scenarios.

As shown in the plotted concentration map below concentrations from fugitive sources significantly affect receptors near the source. The fugitive emissions used in this scenario were chosen because the concentration at the receptor nearest the monitor is very close to the monitored value for the same year. This map shows the wide variety of concentration gradients that can occur in a small area when such large fugitive emissions exist. The average concentration of the receptors immediately surrounding the monitor in this scenario is approximately 200 ppb as compared to the 172 and 164 ppb measured at the Main and Mott Street monitors, respectively, that year. Since the monitor was relocated in 2011, the comparison is slightly less reliable but general conclusions about the significance of fugitive emissions can still be drawn.

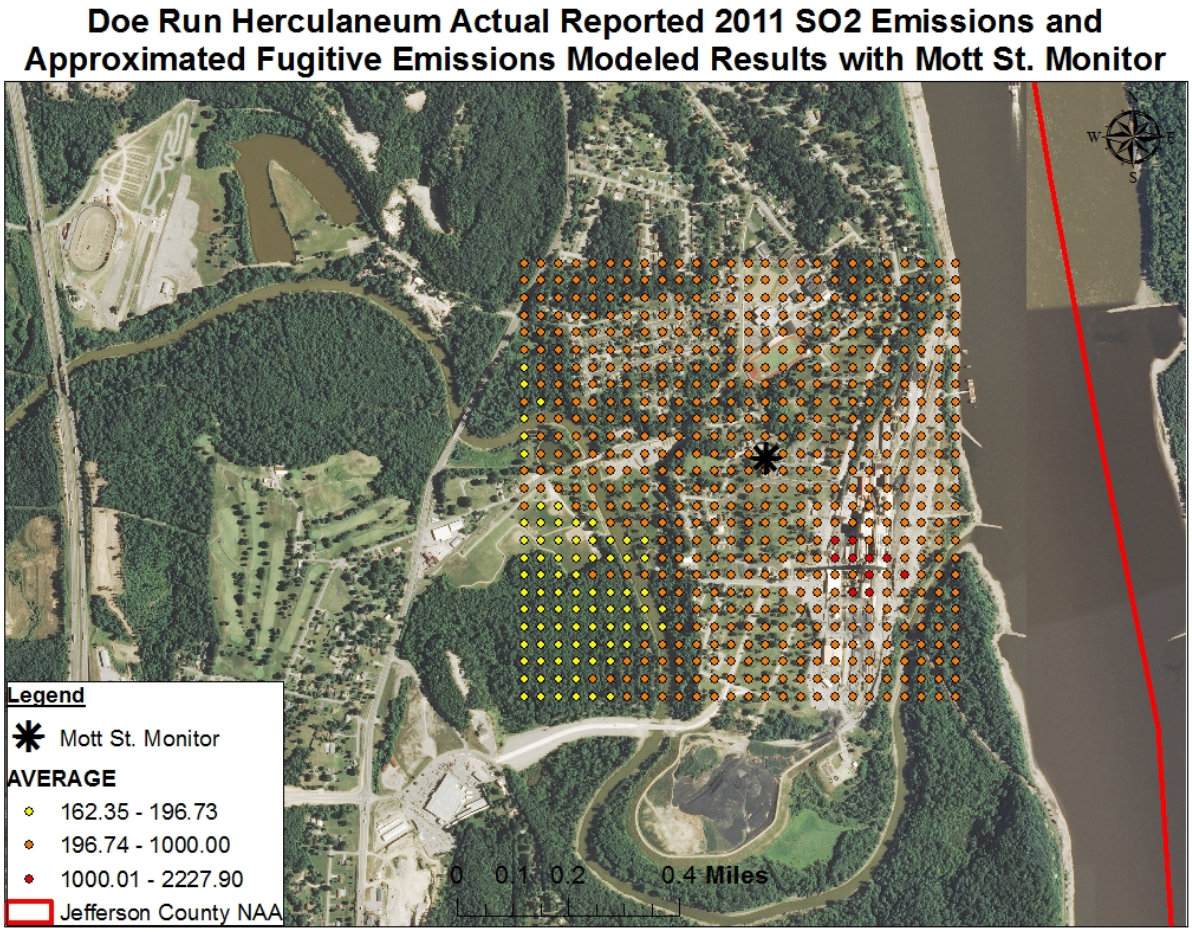

Figure 8 – Modeled Receptor Concentrations Doe Run Herculaneum Primary Lead Smelter

6. CONTROL STRATEGY

The NAA SIP should provide for attainment of the standard based on SO_2 emission reductions from control measures that are permanent and enforceable [section 110(a)(2)(A) of the CAAA]. Air agencies should consider all RACM/RACT. Section 172(c)(I) of the CAAA provides that such plan shall provide for the implementation of all RACM as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of RACT) and shall provide for attainment of the primary NAAQS that can be implemented in light of the attainment needs for the affected area. In addition to the modeled control strategy of this NAA plan, the EPA has promulgated other regulatory requirements that it expects will yield substantial reductions in SO_2 emissions that will also contribute to timely attainment of the 2010 SO_2 NAAQS. While beneficial, the specific timing and SO_2 impacts of these other federal regulatory requirements are difficult to quantify and are not modeled or relied upon as part of this NAA plan.

Pursuant to section 172(c) of the CAAA, control measures must be permanent and federally enforceable to be used in a SIP to demonstrate attainment. Federal enforceability is

demonstrated via a federally-approved SIP which may include a SIP-approved rule, construction permit and/or legally binding agreement such as a consent judgment or AOC.

As previously mentioned, required control measures include the completion (in December 2013) of the main control strategy since permanent shutdown of operations at the Doe Run Herculaneum primary lead smelter. Other required control measures include strengthened stack emission limitations for three Ameren Missouri Energy Center facilities [section 6.1] with a compliance date of January 1, 2017, as well as new SO_2 monitoring network requirements for the Ameren Missouri - Rush Island Energy Center, as detailed in the 2015 Consent Agreement [Appendix J].

6.1. CONSENT AGREEMENT MEASURES

The new control measures needed for this proposed SIP revision to demonstrate attainment for the 2010 SO_2 NAAQS in the Jefferson County nonattainment area are made enforceable by the 2015 Consent Agreement [Appendix J].

The 2015 Consent Agreement includes required strengthened emission limits for three Ameren Missouri Energy Centers, an associated implementation schedule, as well as monitoring network requirements for the Ameren Missouri - Rush Island Energy Center.

As laid out in the EPA's SO_2 NAA guidance[3], longer averaging times (up to 30 days) may be applied to new emission limitations. Staff followed the methods outlined in the guidance to establish longer averaging time limits for the three Ameren Missouri Energy Centers. Staff used recent hourly recorded emissions (CEMS) to determine variability on the desired averaging time basis and applied the resulting ratio to the modeled compliant value to arrive at the final longer averaging time emission limit. Summary tables for each source that detail the variability analysis performed to yield the longer averaging time limits are included below, in Tables 7, 8, and 9.

The 2015 Consent Agreement includes required SO_2 emission limits [Table 6] and allows for reevaluating these limits based on the collection of additional ambient monitoring data,

[3] EPA Guidance for 1-hour SO2 Nonattainment Area SIP Submissions, released April 23, 2014. http://www.epa.gov/oaqps001/sulfurdioxide/pdfs/20140423guidance.pdf

Table 6 - Ameren Missouri Energy Center Emission Limits

Source	Source ID	Emission Limit per Source Facility Wide Limit (Pounds SO_2 per Hour)	Averaging Time
Ameren Missouri — Labadie Energy Center	071003	40,837	24 hour block average
Ameren Missouri — Meramec Energy Center	1890010	7,371	24 hour block average
Ameren Missouri — Rush Island Energy Center	0990016	13,600	24 hour block average

Table 7 - Summary of Variability Analysis Performed for Ameren Rush Island

Plant-wide Total Rush Island Energy Center					
2010-2012					
Unit	**Modeled**	**1-hour**	**24-hour**	**Ratio**	**Block**
	lb/hour	**99th percentile**	**99th percentile**		**24-hour limit**
		lb/hour	**lb/hour**		**lb/hour**
Unit 1	7300	5073.6	4716	0.929513	6785.4
Unit 2	7300	5393.4	5034.4	0.933442	6814.1
Total	**14600**	**10467**	**9750.4**	**0.931478**	**13599.6**

Table 8 - Summary of Variability Analysis Performed for Ameren Labadie

Plantwide Total Labadie Energy Center					
2011-2013					
Unit	Modeled lb/hour	1-hour 99th percentile lb/hour	24-hour 99th percentile lb/hour	Ratio	Block 24-hour limit lb/hour
Unit 1	10800	4752.2	4445.6	0.93549	10103.3
Unit 2	10800	4992.7	4698.7	0.941119	10164.1
Unit 3	10800	4902.9	4688.1	0.956197	10326.9
Unit 4	10800	4924.1	4670.2	0.948434	10243.1
Total	**43200**	**19571.8**	**18502.6**	**0.94531**	**40837.4**

Table 9 - Summary of Variability Analysis Performed for Ameren Meramec

Plantwide Total Meramec Energy Center					
2011-2013					
Unit	**Modeled lb/hour**	**1-hour 99th percentile lb/hour**	**24-hour 99th percentile lb/hour**	**Ratio**	**Block 24-hour limit lb/hour**
Unit 1	1250.00	991.94	857.84	0.86	1081.01
Unit 2	1250.00	949.40	867.05	0.91	1141.58
Total U1-2	**2500.00**	**1941.34**	**1724.89**	**0.89**	**2222.59**
Unit 3	2600.00	1952.65	1812.89	0.93	2413.92
Unit 4	3000.00	2679.23	2441.92	0.91	2734.28
Total U3-4	**5600.00**	**4631.88**	**4254.81**	**0.92**	**5148.19**
Total	**8100.00**	**8514.55**	**7704.59**	**0.90**	**7370.78**

7. REASONABLY AVAILABLE CONTROL MEASURES & REASONABLE FURTHER PROGRESS

7.1. REASONABLY AVAILABLE CONTROL MEASURES (RACM)

Section 172(c)(1) requires SIP provisions to provide for implementation of Reasonably Available Control Measures (RACM) as expeditiously as possible (including such emissions reductions from existing sources obtained through implementation of Reasonably Available Control Technology (RACT) requirements) and provide for attainment of NAAQS.

The SO2 nonattainment area SIP guidance also provides that to the extent that U.S. EPA has promulgated national and regional rules that will require significant SO2 emission reductions in the period after areas are designated as nonattainment, "expeditious attainment" may in many cases mean that attainment will be possible earlier than the attainment date. The SO2 nonattainment area SIP guidance references programs such as the Mercury and Air Toxics Standards (MATS) for EGUs and Maximum Achievable Control Technology (MACT) standards for industrial, commercial and institutional (ICI) boilers. U.S. EPA acknowledges that the control strategies sources may use to comply with these federal programs may also provide for significant SO2 emission reductions and additional control measures may not be necessary to meet the requirements under the SO2 standard.

Missouri performed a RACM analysis in compliance with the RACM Guidance. Only one major source that impacts nonattainment is located in the area; Doe Run Herculaneum. The primary source of SO2 emissions from this facility has permanently closed as of December 2013; therefore RACM is not necessary. Rush Island Energy Center was analyzed as part of the control strategy but, based on modeling results under current actual conditions, did not necessitate the addition of controls. Missouri has determined that existing controls and practices, combined with additional controls and practices per the 2015 Consent Agreement, constitute RACM.

As previously stated, the department has also promulgated state regulations controlling SO_2 emissions to the atmosphere, some of which pertain to specific installations. Affected SO_2 sources are currently limited by 10 CSR 10-6.260, which is scheduled to be replaced by proposed new state SO_2 rule, 10 CSR 10-6.261 with a projected rule effective date in late 2015. Upon promulgation, this new state SO_2 rule will be submitted to EPA as a SIP revision. Affected sources are currently meeting the 10 CSR 10-6.260 requirements and additional required limits per the 2015 Consent Agreement with Ameren Missouri further reduce SO_2 emissions as part of this NAA plan.

7.2. REASONABLE FURTHER PROGRESS (RFP)

Section 172(c)(2) of the CAAA requires areas designated as nonattainment for criteria pollutants to include a demonstration of Reasonable Further Progress (RFP) in nonattainment area plans. Further, Section 171(1) of the CAAA defines RFP as "such annual incremental reductions in emissions of the relevant air pollutant as are required by this part (part D) or may reasonably be

required by the EPA for the purpose of ensuring attainment of the applicable NAAQS by the applicable attainment date." EPA has explained that this definition is most appropriate for pollutants that are emitted by numerous and diverse sources, where the relationship between any individual source and the overall air quality is not explicitly quantified, and where the emission reductions necessary to attain the NAAQS are inventory-wide. EPA has exerted that the definition of RFP is generally less pertinent to pollutants like SO_2 that usually have a limited number of sources affecting areas of air quality which are relatively well defined, and emissions control measures for such sources result in swift and dramatic improvement in air quality. That is, for SO_2, there is usually a single "step" between pre-control nonattainment and post-control attainment. Therefore, for SO_2, with its discernible relationship between emissions and air quality, and significant and immediate air quality improvements, EPA explained in the General Preamble that RFP is best construed as "adherence to an ambitious compliance schedule" (74 FR 13547, April 16, 1992) and is appropriate for the implementation of the 2010 SO_2 NAAQS. Missouri has demonstrated an ambitious compliance schedule through the early implementation of the main control strategy – specifically, the December 2013 permanent shutdown of operations at the Doe Run Herculaneum primary lead smelter.

As stated in the April 23, 2014 SO_2 SIP submittal guidance, RFP is satisfied by the strict adherence to an ambitious compliance schedule which is expected to periodically yield significant emissions reductions. In addition to the major control strategy that ceased operations, in December 2013, at the Doe Run Herculaneum primary lead smelter, the Air Program is ensuring that affected sources implement appropriate control measures as expeditiously as practicable in order to ensure attainment of the standard by the October 2018 attainment date. The emission limitations included in the 2015 Consent Agreement were modeled to demonstrate attainment of the 2010 SO_2 NAAQS at the existing violating monitor. As indicated in section 6, the NAA SIP main control strategy has been completed, resulting in a positive ambient air impact as evidenced by data collected from the existing Mott Street SO_2 monitor. As noted in section 2.1, the Air Program's Herculaneum ambient air monitoring site used for monitoring maximum airborne SO_2 concentrations for NAAQS compliance has, since January 2014, trended significantly downward compared to historical levels. This trend demonstrates significant progress toward attainment of the SO_2 NAAQS.

As required by EPA's April 23, 2014 Guidance for 1-Hour SO2 Nonattainment Area SIP Submissions, the remaining emission control measures will be implemented by January 1, 2017 leading to demonstration of attainment with the 2010 SO_2 NAAQS by the 2018 deadline. Implementation of these control measures and resulting emissions reductions are required as expeditiously as practicable, but no later than January 2017. Also, contingency measure requirements tied to the SO_2 monitoring network requirements around the Rush Island Energy Center are included in the 2015 Consent Agreement and are discussed below in section 8.

8. OTHER NAA PLAN REQUIREMENTS

8.1. CONTINGENCY MEASURES

Section 172(c)(9) of the CAAA defines contingency measures as such measures in a SIP that are to be implemented in the event that an area fails to make RFP, or fails to attain the NAAQS by the applicable attainment date. Contingency measures are to become effective without further

action by the state or the EPA, where the area has failed to (1) achieve RFP or, (2) attain the NAAQS by the statutory attainment date for the affected area. These control measures are to consist of other available control measures that are not included in the control strategy for the NAA SIP for the affected area.

To address contingency measures, the EPA has explained that SO_2 presents special considerations. First, for some of the other criteria pollutants, the analytical tools for quantifying the relationship between reductions in precursor emissions and resulting air quality improvements remains subject to significant uncertainties, in contrast with procedures for directly-emitted pollutants such as SO_2. Second, emission estimates and attainment analyses for other criteria pollutants can be strongly influenced by overly optimistic assumptions about control efficiency and rates of compliance for many small sources. In contrast, the control efficiencies for SO_2 control measures are well understood and are far less prone to uncertainty. Since SO_2 control measures are by definition based on what is directly and quantifiably necessary to attain the 2010 SO_2 NAAQS, it would be unlikely for an area to implement the necessary emission controls yet fail to attain the NAAQS. Contingency measures for Missouri include a program to identify sources of violations of the SO_2 NAAQS through the 2015 Consent Agreement with Ameren Missouri to install ambient air quality monitors around the Rush Island Energy Center. The 2015 Consent Agreement allows adjustments for establishing more stringent emission limits in the event the monitors indicate an exceedance of the NAAQS. In addition, Missouri has an active enforcement program to address violations. Missouri will continue to operate a comprehensive program to identify sources of violations of the SO_2 NAAQS and to undertake an aggressive follow-up for compliance and enforcement, including expedited procedures for establishing enforceable consent agreements pending the adoption of revised SIPs. This is consistent with the approach for the implementation of contingency measures to address the 2010 SO_2 NAAQS as described in EPA's April 23, 2014 Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions.

8.2. NEW SOURCE REVIEW (NSR)

Part D of title I of the CAAA prescribes the procedures and conditions under which a new major stationary source or major modification may obtain a preconstruction permit in an area designated nonattainment for any criteria pollutant. The nonattainment NSR permitting requirements in section 172(c)(5) and 173 of the CAAA are among "the requirements of this part". Missouri already has a nonattainment NSR permitting program (10 CSR 10-6.060(7)). The program is applicable to any nonattainment area as designated under section 107 of the CAAA (10 CSR 10-6.020(2)(N)(10)). Therefore, this existing program applies to the construction and modification of major stationary sources of SO_2 that would locate in the Jefferson County SO_2 nonattainment area and any other/new 2010 1-hour SO_2 NAAQS nonattainment area.

Missouri's nonattainment NSR program ensures that the construction and modification of major stationary sources of SO_2 will not interfere with reasonable further progress toward the attainment of the 2010 SO_2 NAAQS. This is accomplished through applicable regulatory requirements that include, but are not limited to:

- The installation of Lowest Achievable Emissions Rate (LAER) control technology [10 CSR 10-6.060(7)(B)(8)];

- The acquisition of emissions reductions to offset new emissions of nonattainment pollutant(s) [10 CSR 10-6.060(7)(B)(3)];

- Documentation that all major sources owned and operated in the state by the same owner are in compliance with all applicable CAAA requirements [10 CSR 10-6.060(7)(B)(6)];

- A demonstration via an analysis of alternative sites, sizes, production processes, and environmental control techniques shows that the benefits of a proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification [10 CSR 10-6.060(7)(B)(9) and 10 CSR 10-6.020(2)(A)(42)]; and

- An opportunity for a public hearing and written comment on the proposed permit [10 CSR 10-6.060(7)(F)].

The nonattainment NSR requirements apply on a pollutant-specific basis with respect to each nonattainment pollutant for which a source has the potential to emit in amounts greater than the applicable major source threshold for the pollutant, i.e., in major amounts [40 CFR §51.165(a)(l)(iv)]. For new sources, in areas that are designated nonattainment for the 2010 SO_2 NAAQS, 100 tpy or more of SO_2 represents a major amount. Similarly, SO_2 nonattainment NSR requirements also apply to any existing major stationary source of SO_2 that proposes a major modification, i.e., a physical change or change in the method of operation that results in a significant net emissions increase (40 tpy or more) of SO_2 [40 CFR §51.165(a)(l)(x)(A)].

8.3. CONFORMITY

General conformity is required by CAAA section 176(c). This section of the CAAA requires that actions by federal agencies do not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or interim reductions and milestones. General conformity applies to any federal action (e.g., funding, licensing, permitting or approving), other than certain highway and transportation projects, if the action takes place in a nonattainment or maintenance area for any of the six criteria pollutants [ozone, PM, $N0_2$, carbon monoxide, lead or SO_2]. Projects that are Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) projects as defined in 40 CFR §93.101, are generally not subject to general conformity requirements and are instead subject to transportation conformity. However, per 40 CFR §93.101, general conformity requirements do apply to a federal highway and transit project that does not involve title 23 or title 49 funding but requires FHWA or FTA approval, such as is required for a connection to an Interstate highway or for a deviation from applicable design standards.

The EPA's General Conformity Rule (40 CFR §93.150 to 93.165) establishes the criteria and procedures for determining if a federal action conforms to the SIP. With respect to the 2010 SO_2 NAAQS, federal agencies are expected to continue to estimate emissions for conformity analyses in the same manner as they estimated emissions for conformity analyses under the previous NAAQS for SO_2. The EPA's General Conformity Rule includes the basic requirement that a

federal agency's general conformity analysis be based on the latest and most accurate emission estimation techniques available 40 CFR §93.159(b). When updated and improved emissions estimation techniques become available, the EPA expects the federal agency to use these techniques. For Missouri, the SIP addresses general conformity under the state rule 10 CSR 10-6.300 *Conformity of General Federal Actions to State Implementation Plans*.

Transportation conformity is required under CAAA section 176(c) to ensure that federally supported highway and transit project activities are consistent with ("conform to") the purpose of the SIP. Transportation conformity applies to areas that are designated nonattainment, and those areas redesignated to attainment after 1990 ("maintenance areas" with plans developed under CAAA section 175A) for transportation-related criteria pollutants. Due to the relatively small, and decreasing, amounts of sulfur in gasoline and on-road diesel fuel, the EPA' s transportation conformity rules provide that they do not apply to SO_2 unless either the EPA Regional Administrator or the director of the state air agency has found that transportation-related emissions of SO_2 as a precursor are a significant contributor to a PM2.5 nonattainment problem, or if the SIP has established an approved or adequate budget for such emissions as part of the RFP, attainment or maintenance strategy [40 CFR §93.102(b)(l), (2)(v)]. Missouri has not identified SO_2 as a significant contributor to a PM2.5 NAA problem and Missouri has not established an approved or adequate budget for SO_2. Therefore, transportation conformity rules continue to not apply to SO_2 for these nonattainment areas.

9. PUBLIC PARTICIPATION

In accordance with section 110(a)(2) of the CAAA, the department is required to hold a public hearing prior to adoption of this SIP revision and the subsequent submittal to the EPA. The department will notify the public and other interested parties of an upcoming public hearing and comment period thirty (30) days prior to holding such hearing for this SIP revision as follows:

- Notice of availability of the SO_2 Nonattainment Area plan and all Appendices for Jefferson County was posted on the Department of Natural Resources' Air Pollution Control Program website no later than March 30, 2015: http://www.dnr.mo.gov/env/apcp/stateplanrevisions.htm

- The public hearing to receive comments on this nonattainment area plan was held on April 30, 2015, at 9:00 am at the Lewis and Clark State Office Building, LaCharrette/Nightingale Conference Room, 1101 Riverside Drive, Jefferson City, MO 65101.

- Notification for the public hearing and solicitation for public comment for the nonattainment area plan for Jefferson County was posted no later than March 30, 2015, on the department website at http://dnr.mo.gov/env/apcp/public-notices.htm per standard procedure, notices are posted online at least 30 days prior to public hearing. The public comment period closed on May 7, 2015, seven (7) days after the public hearing.

Appendix I contains a copy of the notice of availability of this NAA plan and all Appendices, as well as a copy of the notification of public hearing and solicitation for public comment. The remaining public participation documents, including but not limited to the transcript from the

public hearing and the response to comments, are also included in Appendix I as part of this SIP submittal package sent to EPA.

10. CONCLUSION

The department hereby asserts that the State has met its CAAA section 191(a) obligation to submit a plan for the Jefferson County SO_2 Nonattainment Area SIP under the 2010 SO_2 NAAQS via this SIP submittal. Furthermore, this document demonstrates attainment of the 2010 SO_2 NAAQS though air dispersion modeling of an effective control strategy as well as complying with requirements of section 172(c) in regard to this standard for the Jefferson County SO_2 Nonattainment Area.