UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

DEC 0 2 2016

MEMORANDUM

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

SUBJECT: Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program

FROM: Richard A. Wayland, Division Director Richard A. Wayland
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TO: Regional Air Division Directors, Regions 1 – 10

The Environmental Protection Agency (EPA) is providing the attached *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program* to the state and local air agencies, as well as the public, for consideration, review and comment. This guidance document reflects the EPA's recommendations for how air agencies may conduct air quality modeling and related technical analyses to satisfy compliance demonstration requirements for ozone and secondary $PM_{2.5}$ for permit-related assessments under the Prevention of Significant Deterioration (PSD) program.

This document does not substitute for provisions or regulations of the Clean Air Act (CAA), nor is it a regulation itself. As the term "guidance" suggests, it provides recommendations on how to implement the modeling requirements. Thus, it does not impose binding, enforceable requirements on any party, nor does it assure that the EPA will approve all instances of its application, as the guidance may not apply to a particular situation based upon the circumstances. Final decisions by the EPA regarding a particular PSD demonstration will only be made based on the statute and applicable regulations, and will only be made following a final submission by air agencies and after notice and opportunity for public review and comment.

OVERVIEW

This guidance document provides a detailed framework that permit applicants may choose to use, in consultation with the appropriate permitting authority, to estimate single source impacts on secondary pollutants under the first tier (or Tier 1) approach put forth in the 2015 proposed revisions to the EPA's *Guideline on Air Quality Models* (published as Appendix W to 40 CFR part 51). For Tier 1 assessments, it is generally expected that applicants would use existing empirical relationships between precursors and secondary impacts based on modeling systems appropriate for this purpose as detailed in relevant EPA guidance.

In the preamble of the Appendix W proposed rulemaking, the EPA briefly discussed plans to develop one such Tier 1 demonstration tool for ozone and $PM_{2.5}$ precursors called Modeled Emission Rates for Precursors (MERPs). The MERPs may be used to describe an emission rate of a precursor that is expected to result in a change in ambient ozone (O_3) or fine particulate matter ($PM_{2.5}$) that would be less than a specific air quality concentration threshold for O_3 or $PM_{2.5}$ that a permitting authority chooses to use to determine whether an impact causes or contributes to a violation of the National Ambient Air Quality Standards (NAAQS) for O_3 or $PM_{2.5}$. We had initially planned to establish generally-applicable MERPs through a future rulemaking. However, after further consideration, we believe it is preferable for permit applicants and permitting authorities to consider site-specific conditions when deriving MERPs and to obtain experience with the development and application of locally and regionally appropriate values in the permitting process. Thus, we are providing this draft guidance document for consideration and use by permitting applicants and permit authorities on a case-by-case basis under the PSD program in assessing the effects of precursors of O_3 or $PM_{2.5}$ for purposes of that program.

If approved by the permitting authority as a Tier 1 demonstration tool for a $PM_{2.5}$ PSD source in a $PM_{2.5}$ attainment or unclassifiable area, a finding that projected increases in the $PM_{2.5}$ precursor emissions of nitrogen oxides (NO_x) and sulfur dioxide (SO_2) from a proposed construction are below the respective MERPs could be part of a sufficient demonstration that the construction will not cause or contribute to violation of the appropriate NAAQS. Similarly for the O_3 NAAQS, an appropriate Tier 1 demonstration may include a finding that the projected increases in O_3 precursor emissions of NO_x and VOC are below the respective MERPs. Where project sources emit multiple precursors, the sum of precursor impacts would need to be considered for a sufficient demonstration of compliance. Further, where project sources emit both primary $PM_{2.5}$ and precursors of secondary $PM_{2.5}$, we expect that applicants will need to combine the primary and secondary impacts to determine total $PM_{2.5}$ impacts as part of the PSD compliance demonstration.

This document also presents the EPA's modeling of hypothetical single source impacts on O_3 and secondary $PM_{2.5}$ to illustrate how this framework can be implemented by stakeholders. The relationships presented here, in some cases, may provide relevant technical information to assist or inform an applicant in providing a Tier 1 demonstration and also as a template for permit applicants and/or state or local air agencies to develop information relevant to a specific area or source type. Based on EPA modeling conducted to inform these illustrative MERPs, it is clear that such values will vary across the nation reflecting different sensitivities of an area's air quality level to precursor emissions, thereby providing an appropriate basis for evaluating the impacts of these precursors to O_3 and $PM_{2.5}$ formation because they reflect the regional or local atmospheric conditions for particular situations.

REVIEW AND COMMENT

The EPA is requesting that comments on the draft guidance by provided by Friday, February 3, 2017. For convenience, the draft guidance document is available electronically on the EPA's SCRAM website at https://www3.epa.gov/ttn/scram/guidance/guide/EPA454_R_16_006.pdf. Comments should be electronically submitted to Mr. George Bridgers of the EPA's Air Quality

Modeling Group at *bridgers.george@epa.gov*. In preparing the final version of the guidance, we will take into consideration comments received on the draft guidance.

If there are any questions regarding the draft guidance, please contact George Bridgers of EPA's Air Quality Modeling Group at (919) 541-5563 or *bridgers.george@epa.gov*.

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Attachment

Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program

EPA-454/R-16-006
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Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
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Contents

1 Background

EPA has proposed revisions to the *Guideline on Air Quality Models* (published as Appendix W to 40 CFR Part 51) to establish a recommended two-tiered approach for addressing single-source impacts on ozone (O_3) or secondary particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) (U.S. Environmental Protection Agency, 2015a). The first tier (or Tier 1) involves use of appropriate and technically credible relationships between emissions and ambient impacts developed from existing modeling studies deemed sufficient for evaluating a project source's impacts. The second tier (or Tier 2) involves more sophisticated case-specific application of chemical transport modeling (e.g., with an Eulerian grid or Lagrangian model). This guidance document is intended to provide a detailed framework that applicants may choose to apply, in consultation with the appropriate permitting authority, to estimate single-source impacts on secondary pollutants under the first tier approach put forth in the 2015 proposed revisions to the *Guideline* (i.e., Sections 5.3.2.b and 5.4.2.b). This guidance document does not require the use, nor does it require acceptance of the use, of this framework or any result using this framework by a permit applicant or a permitting authority. Permit applicants and permitting authorities retain the discretion to use other methods to complete a first tier assessment under Sections 5.3.2.b and 5.4.2.b. of Appendix W. This document is not a final agency action, and does not create any binding requirements on EPA, permitting authorities, permit applicants, or the public.

For Tier 1 assessments, EPA generally expects that applicants would use existing empirical relationships between precursors and secondary impacts based on modeling systems appropriate for this purpose. The use of existing credible technical information that appropriately characterize the emissions to air quality relationships will need to be determined on a case-by-case basis. Examples of existing relevant technical information that may be used by a permit applicant, in consultation with the appropriate permitting authority, include air quality modeling conducted for the relevant geographic area reflecting emissions changes for similar source types as part of a State Implementation Plan (SIP) demonstration, other permit action, or similar policy assessment as well air quality modeling of hypothetical industrial sources with similar source characteristics and emission rates of precursors that are located in similar atmospheric environments and for time periods that are conducive to the formation of O_3 or secondary $PM_{2.5}$. The applicant should describe how the existing modeling reflects the formation of O_3 or $PM_{2.5}$ in that particular area. Where the existing technical information is based on chemical and physical conditions less similar to the project source and key receptors, a more conservative estimate of impacts using demonstration tools may be necessary. Information that could be used to describe the comparability of two different geographic areas include average and peak temperatures, humidity, terrain, rural or urban nature of the area, nearby regional sources of pollutants (e.g., biogenics, other industry), and ambient concentrations of relevant pollutants where available.

In the preamble of the Appendix W NPRM, EPA briefly discussed plans to develop a new demonstration tool for ozone and $PM_{2.5}$ precursors called Modeled Emission Rates for

Precursors (MERPs). MERPs can be viewed as a type of Tier 1 demonstration tool under the Prevention of Significant Deterioration (PSD) permitting program that provides a simple way to relate maximum downwind impacts with a critical air quality threshold. EPA had initially planned to establish generally-applicable MERPs through a future rulemaking. However, after further consideration, EPA believes it is preferable for permit applicants and permitting authorities to consider site-specific conditions when deriving MERPs and to obtain experience with the development and application of locally and regionally appropriate values in the permitting process. Thus, instead of deriving generally-applicable MERP values, the EPA is providing this guidance document for consideration and use by permitting authorities and permit applicants on a case-by-case basis.

This guidance is relevant for the PSD program and only addresses assessing the effects of precursors of $PM_{2.5}$ and O3 for purposes of that program. The term Modeled Emissions Rate for Precursors (MERP) may be used to describe an emission rate of a precursor that is expected to result in a change in ambient ozone or $PM_{2.5}$ that would be less than a specific air quality concentration threshold for ozone or $PM_{2.5}$ that a permitting authority chooses to use to determine whether an impact causes or contributes to a violation of the NAAQS for ozone or $PM_{2.5}$. EPA contemplates that MERPs would relate a specific precursor of ozone and/or $PM_{2.5}$ and would not provide a single demonstration for all NAAQS pollutants. For example, for PSD, separate MERPs could be developed to relate volatile organic compounds (VOCs) to O_3, nitrogen oxides (NO_x) to O_3, sulfur dioxide (SO_2) to secondary $PM_{2.5}$, and NO_X to secondary $PM_{2.5}$.

If approved by the permitting authority as a Tier 1 demonstration tool for a $PM_{2.5}$ PSD source in a $PM_{2.5}$ attainment or unclassifiable area, a finding that projected increases in the $PM_{2.5}$ precursor emissions of NOx and SO_2 from a proposed construction are below the respective MERPs could be part of a sufficient demonstration that the construction will not cause or contribute to violation of the appropriate NAAQS (hereinafter “demonstration of compliance” or “compliance demonstration”). Similarly, for the O_3 NAAQS, an appropriate Tier 1 demonstration may include a finding that the projected increases in O_3 precursor emissions of NO_X and VOC are below the respective MERPs. Where project sources emit multiple precursors, the impacts should be estimated in a relative sense in comparison to the critical air quality threshold such that the sum of precursor impacts would need to be lower than the critical air quality threshold for a sufficient demonstration of compliance. Examples of combining precursor impacts are provided in section 7 of this document. Further, where project sources emit both primary $PM_{2.5}$ and precursors of secondary $PM_{2.5}$, EPA expects that applicants will need to combine the primary and secondary impacts to determine total $PM_{2.5}$ impacts as part of the PSD compliance demonstration.

The purpose of this document is to provide a framework for permitting authorities and permit applicants on how air quality modeling can be used to develop relationships between precursors and maximum downwind impacts for the purposes of establishing MERPs as a Tier 1 demonstration tool. We also present hypothetical single source impacts on O_3 and secondary $PM_{2.5}$ to illustrate how this framework can be implemented by stakeholders. The relationships

presented here in some cases may provide relevant technical information to assist or inform an applicant in providing a first tier demonstration and also as a template for stakeholders and/or state or local agencies to develop information relevant to a specific area or source type. Based on the EPA modeling conducted to inform these illustrative MERPs, it is clear that such values will vary across the nation reflecting different sensitivities of an area's air quality level to precursor emissions thereby providing an appropriate basis for evaluating the impacts of these precursors to $PM_{2.5}$ and ozone formation because they reflect the regional or local atmospheric conditions for particular situations.

2 Ozone and secondary $PM_{2.5}$ formation in the atmosphere

A conceptual understanding of an area's emissions sources and which precursor emissions limit the formation of secondary pollutants such as O_3 and $PM_{2.5}$ is useful for interpreting modeled and ambient impacts due to changes in emissions to that area. The formation regime favoring a particular precursor may vary day to day and by hour of the day. It is important to understand how the atmosphere will respond to changes in emissions to make informed decisions about changes in emissions from a source might have on ambient pollutant concentrations. Typically, reductions in emissions of primary pollutants or precursors to secondary pollutants result in some level of reduction in ambient pollutant concentrations.

Secondary $PM_{2.5}$ and O_3 are closely related to each other in that they share common sources of emissions and are formed in the atmosphere from chemical reactions with similar precursors (U.S. Environmental Protection Agency, 2005). Air pollutants formed through chemical reactions in the atmosphere are referred to as secondary pollutants. For example, ground-level ozone is predominantly a secondary pollutant formed through photochemical reactions driven by emissions of NO_x and VOCs in the presence of sunlight. Ozone formation is a complicated nonlinear process that depends on meteorological conditions in addition to VOC and NO_x concentrations (Seinfeld and Pandis, 2012). Warm temperatures, clear skies (abundant levels of solar radiation), and stagnant air masses (low wind speeds) increase ozone formation potential (Seinfeld and Pandis, 2012).

Ozone formation may be limited by either NO_X or VOC emissions depending on the meteorological conditions and the relative mix of these pollutants. When ozone concentrations increase (decrease) as a result of increases (decreases) in NO_X emissions, the ozone formation regime is termed "NO_X limited". Alternatively, the ozone formation regime is termed "VOC limited" when ambient ozone concentrations are very sensitive to changes in ambient VOC. The VOC-limited regime is sometimes referred to as "radical-limited" or "oxidant-limited" because reactions involving VOCs produce peroxy radicals that can lead to ozone formation by converting NO to NO_2 in the presence of sunlight. In a NO_X-limited regime, ozone decreases with decreasing NO_X and has very little response to changes in VOC. The NOx-limited formation regime is more common in rural areas of the U.S. where high levels of biogenic VOC exist and relatively few man-made, or anthropogenic, NOx emissions occur. Ozone decreases with decreasing VOC in a VOC-limited formation regime. The ozone formation regime for many

urban areas in the U.S. is VOC-limited during daytime hours due to large NO_X emissions from mobile and industrial sources and relatively smaller amount of biogenic and anthropogenic VOC emissions.

In the case of $PM_{2.5}$, or fine PM, total mass is often categorized into two groups: primary (i.e. emitted directly as $PM_{2.5}$ from sources) and secondary (i.e., $PM_{2.5}$ formed in the atmosphere by precursor emissions from sources). The ratio of primary to secondary $PM_{2.5}$ varies by location and season. In the U.S., $PM_{2.5}$ is dominated by a variety of chemical components: ammonium, sulfate, nitrate, organic carbon (OC), elemental carbon (EC), crustal elements, sea-spray constituents, and oxidized metals. $PM_{2.5}$ EC, crustal elements, and sea spray are directly emitted into the atmosphere from primary sources. $PM_{2.5}$ OC is directly emitted from primary sources but is also formed secondarily in the atmosphere by reactions involving VOCs. $PM_{2.5}$ sulfate, nitrate, and ammonium are predominantly the result of chemical reactions of the oxidized products of SO_2 and NO_X emissions and direct ammonia (NH_3) emissions (Seinfeld and Pandis, 2012).

Sulfur dioxide emissions are oxidized in the atmosphere and form sulfuric acid, which has a very low vapor pressure and tends to exist in the particulate phase. Particulate sulfuric acid reacts with ammonia to form ammonium bisulfate and ammonium sulfate. Aqueous phase reactions are also an important pathway for particulate sulfate formation. SO_2 dissolves into cloud and fog droplets and is oxidized to sulfate via reaction pathways involving hydrogen peroxide, ozone, and other oxidants. Since sulfate is essentially non-volatile under atmospheric conditions, sulfate formed in clouds persists as particulate sulfate after the cloud evaporates. Sulfur dioxide emissions reductions lead to reductions in particulate sulfate. The process is not completely linear, especially when aqueous phase production is significant, and so changes in SO_2 emissions may not result in the same proportion of change in $PM_{2.5}$ sulfate concentration.

Emissions of NOx are chemically transformed to nitric acid (HNO_3) through gas-phase and heterogeneous reactions. Nitric acid may condense onto particles to form particulate nitrate depending on the conditions. Condensation of nitric acid onto particles is favored by low temperature, high relative humidity, and relatively less acidic conditions associated with high levels of ammonia and particulate cations. Nitric acid formation may be oxidant or NOx-limited, and $PM_{2.5}$ ammonium nitrate formation may be limited by the availability of either nitric acid or ammonia or by meteorological conditions. When $PM_{2.5}$ ammonium nitrate is limited by the availability of ammonia, the formation regime is termed “ammonia-limited”, and the formation regime is termed “nitric acid-limited” when the opposite situation exists (Stockwell et al., 2000). In general, a decrease in NO_X emissions will result in a decrease in $PM_{2.5}$ nitrate concentration (Pun et al., 2007). Since $PM_{2.5}$ ammonium nitrate formation is preferred under low temperature and high relative humidity conditions and in the presence of ammonia, ammonium nitrate concentrations tend to be greater during colder months and in areas with significant ammonia emissions. NO_X emissions changes during warm temperatures may result less change in ambient $PM_{2.5}$ compared to cold months due to nitric acid staying in the gas rather than particle phase due to higher temperatures. Additionally, NO_X emissions changes in places with very little or no ambient ammonia will cause little change in ambient $PM_{2.5}$ ammonium nitrate.

3 Photochemical model application for single source secondary impacts

Publicly available and fully documented Eulerian photochemical grid models such as the Comprehensive Air Quality Model with Extensions (CAMx) (ENVIRON, 2014) and the Community Multiscale Air Quality (CMAQ) (Byun and Schere, 2006) model treat emissions, chemical transformation, transport, and deposition using time and space variant meteorology. These modeling systems simulate primarily emitted species and secondarily formed pollutants such as ozone and $PM_{2.5}$ (Chen et al., 2014; Civerolo et al., 2010; Russell, 2008; Tesche et al., 2006). Even though single source emissions are injected into a grid volume, photochemical transport models have been shown to adequately capture single source impacts when compared with downwind in-plume measurements (Baker and Kelly, 2014; Zhou et al., 2012). Where set up appropriately for the purposes of assessing the contribution of single sources to primary and secondarily formed pollutants, photochemical grid models could be used with a variety of approaches to estimate these impacts. These approaches generally fall into the categories of source sensitivity (how air quality changes due to changes in emissions) and source apportionment (what air quality impacts are related to certain emissions).

The simplest source sensitivity approach, commonly referred to as a brute-force change to emissions, would be to simulate two sets of conditions, one with all emission sources and a subsequent simulation with all emissions sources and the post-construction characteristics of the new or modifying project source being the only difference from the original baseline simulation (Cohan and Napelenok, 2011). The difference between these model simulations provides an estimate of the air quality change related to the change in emissions from the project source. In addition to the brute force approach, some photochemical models have been "instrumented" with techniques that allow tracking or account for ambient contributions from the emissions of a particular sector or source. These instrumented techniques provide a source sensitivity approach within the model to differentiate the impacts of single sources on changes in model predicted air quality. One sensitivity approach is the decoupled direct method (DDM), which tracks the sensitivity of an emissions source through all chemical and physical processes in the modeling system (Dunker et al., 2002). Sensitivity coefficients relating source emissions to air quality are estimated during the model simulation and output at the resolution of the host model. Unlike the brute force approach, a second simulation is not necessary when using DDM, although additional resources are required as part of the baseline simulation when DDM is also applied. Furthermore, some photochemical models have been instrumented with source apportionment capabilities, which tracks emissions from specific sources through chemical transformation, transport, and deposition processes to estimate a contribution to predicted air quality at downwind receptors (Kwok et al., 2015; Kwok et al., 2013).

Source apportionment has been used to differentiate the contribution from single sources on model predicted ozone and $PM_{2.5}$ (Baker and Foley, 2011; Baker and Kelly, 2014). DDM has also been used to estimate O_3 and $PM_{2.5}$ impacts from specific sources (Baker and Kelly, 2014; Bergin et al., 2008; Kelly et al., 2015) as well as the simpler brute-force sensitivity approach

(Baker and Kelly, 2014; Bergin et al., 2008; Kelly et al., 2015; Zhou et al., 2012). Limited comparison of single source impacts between models (Baker et al., 2013) and approaches to differentiate single source impacts (Baker and Kelly, 2014; Baker et al., 2013) show generally similar downwind spatial gradients and impacts. Near-source in-plume aircraft based measurement field studies provide an approach for evaluating model estimates of (near-source) downwind transport and chemical impacts from single stationary point sources (ENVIRON, 2012). Photochemical grid model source apportionment and source sensitivity simulation of single-source downwind impacts compare well against field study primary and secondary ambient measurements made in Tennessee and Texas (Baker and Kelly, 2014; ENVIRON, 2012). This work indicates photochemical grid models using source apportionment or source sensitivity approaches provide meaningful estimates of single source impacts.

4 Single source precursor emissions and downwind O_3 and secondary $PM_{2.5}$ impacts

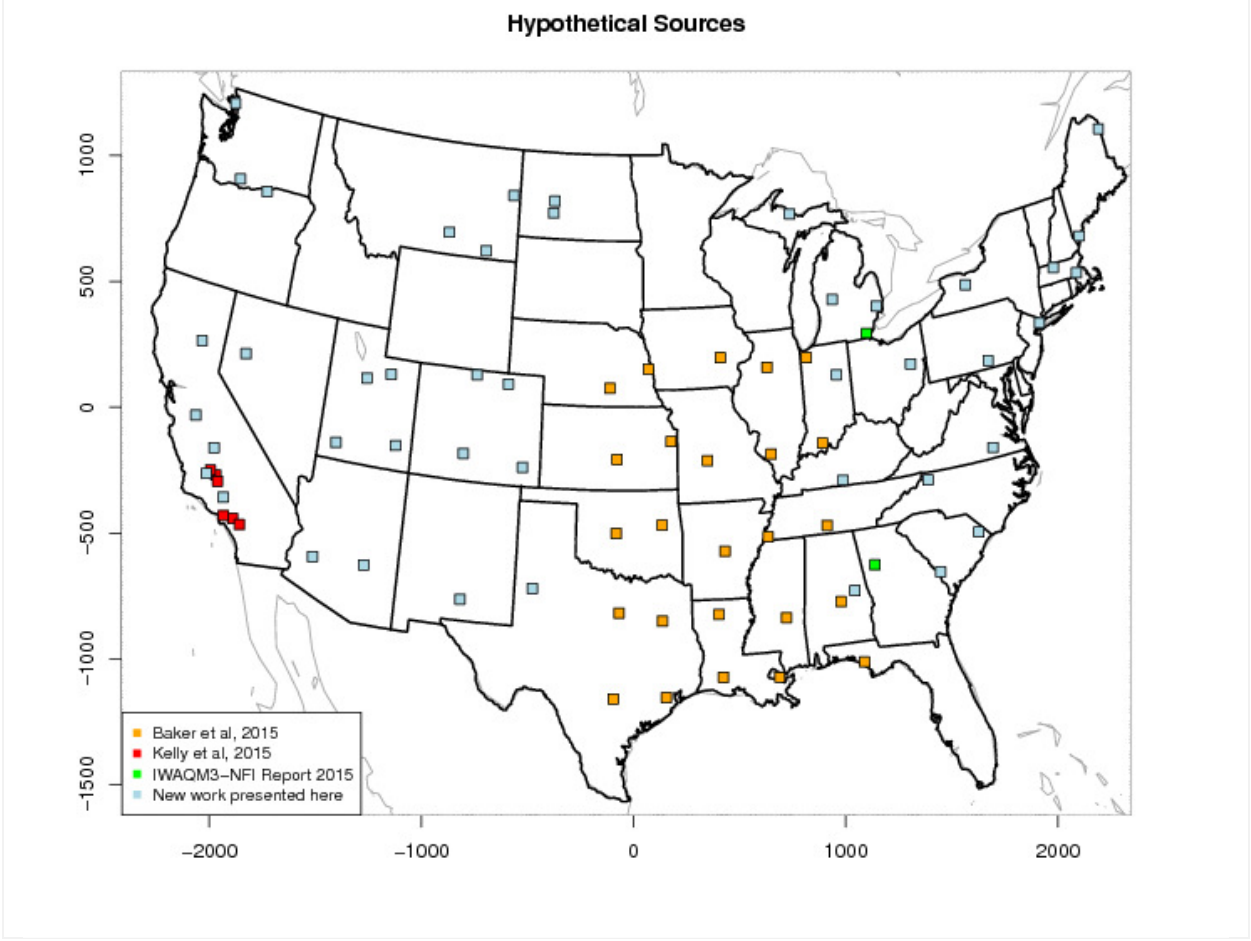
This section presents hypothetical single source impacts on downwind O_3 and secondary $PM_{2.5}$. Hypothetical sources included here are detailed in Table 4-1 and shown in Figure 4-1. As shown, these source types are located throughout the continental U.S. and reflect different release heights and multiple emissions rates. For the broader regions (i.e., eastern, central, and western US), the details on the specific locations modeled are provided in Appendix Table A-1 (ozone), A-2 (daily $PM_{2.5}$), and A-3 (annual $PM_{2.5}$).

Source release type “L” refers to low-level sources modeled with surface level emissions releases: stack height of 1 m, stack diameter of 5 m, exit temperature of 311 K, exit velocity of 27 m/s, and flow rate of 537 m^3/s. Source release type “H” refers to high elevation sources modeled with elevated emissions releases: stack height of 90 m, stack diameter of 5 m, exit temperature of 311 K, exit velocity of 27 m/s, and flow rate of 537 m^3/s. Hypothetical sources included in this assessment type is then modeled at multiple emission rates: 100, 300, 500, 1000, and 3000 tpy.

Table 4-1. List of hypothetical sources included in the EPA's modeling assessment.

				NAAQS & Precursors Modeled		
Geographic Region	# hypothetical sources within the region	Release Type	Emission Rate (tpy)	8-hr O3	Daily PM2.5	Annual PM2.5
EUS	19	H	3000	NOX, VOC	NOX, SO2	NOX, SO2
(eastern US)	19	H	1000	NOX, VOC	NOX, SO2	NOX, SO2
	19	H	500	NOX, VOC	NOX, SO2	NOX, SO2
	19	L	500	NOX, VOC	NOX, SO2	NOX, SO2
CUS	25	H	3000	NOX, VOC	NOX, SO2	NOX, SO2
(central US)	25	H	1000	NOX, VOC	NOX, SO2	NOX, SO2
	25	L	1000	NOX, VOC	NOX, SO2	NOX, SO2
	25	L	500	NOX, VOC	NOX, SO2	NOX, SO2
WUS	26	H	3000	NOX, VOC	NOX, SO2	NOX, SO2
(western US)	26	H	1000	NOX, VOC	NOX, SO2	NOX, SO2
	26	H	500	NOX, VOC	NOX, SO2	NOX, SO2
	26	L	500	NOX, VOC	NOX, SO2	NOX, SO2
Atlanta	1	L	300	NOX, VOC	NOX, SO2	NOX, SO2
	1	L	100	NOX, VOC	NOX, SO2	NOX, SO2
Detroit	1	L	300	NOX, VOC	NOX, SO2	NOX, SO2
	1	L	100	NOX, VOC	NOX, SO2	NOX, SO2
S. Bakersfield	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	
Bakersfield	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	
Shafter	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	
LA	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	
Riverside	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	
Pomona	1	H	100	NOX, VOC	NOX, SO2	
	1	L	100	NOX, VOC	NOX, SO2	
	1	H	500	NOX, VOC	NOX, SO2	
	1	L	500	NOX, VOC	NOX, SO2	
	1	H	2000	NOX, VOC	NOX, SO2	
	1	L	2000	NOX, VOC	NOX, SO2	

Figure 4-1. Hypothetical sources modeled for downwind secondary air quality impacts included in this assessment.



The single source impacts detailed in this section are collected from various photochemical grid model based assessments of hypothetical sources and report downwind O_3 and secondary $PM_{2.5}$ impacts and EPA modeling results that are being presented here for the first time. The resulting relationships are based on photochemical modeling studies that estimated single source impacts in California (Kelly et al., 2015), the Detroit and Atlanta urban areas (U.S. Environmental Protection Agency, 2016), and at rural and suburban locations in the central and eastern United States (Baker et al., 2015a). Additional photochemical modeling was conducted by EPA consistent with the approach described in Baker et al., 2015 for hypothetical sources in the western, central, and eastern U.S. to provide broader geographic coverage across the nation.

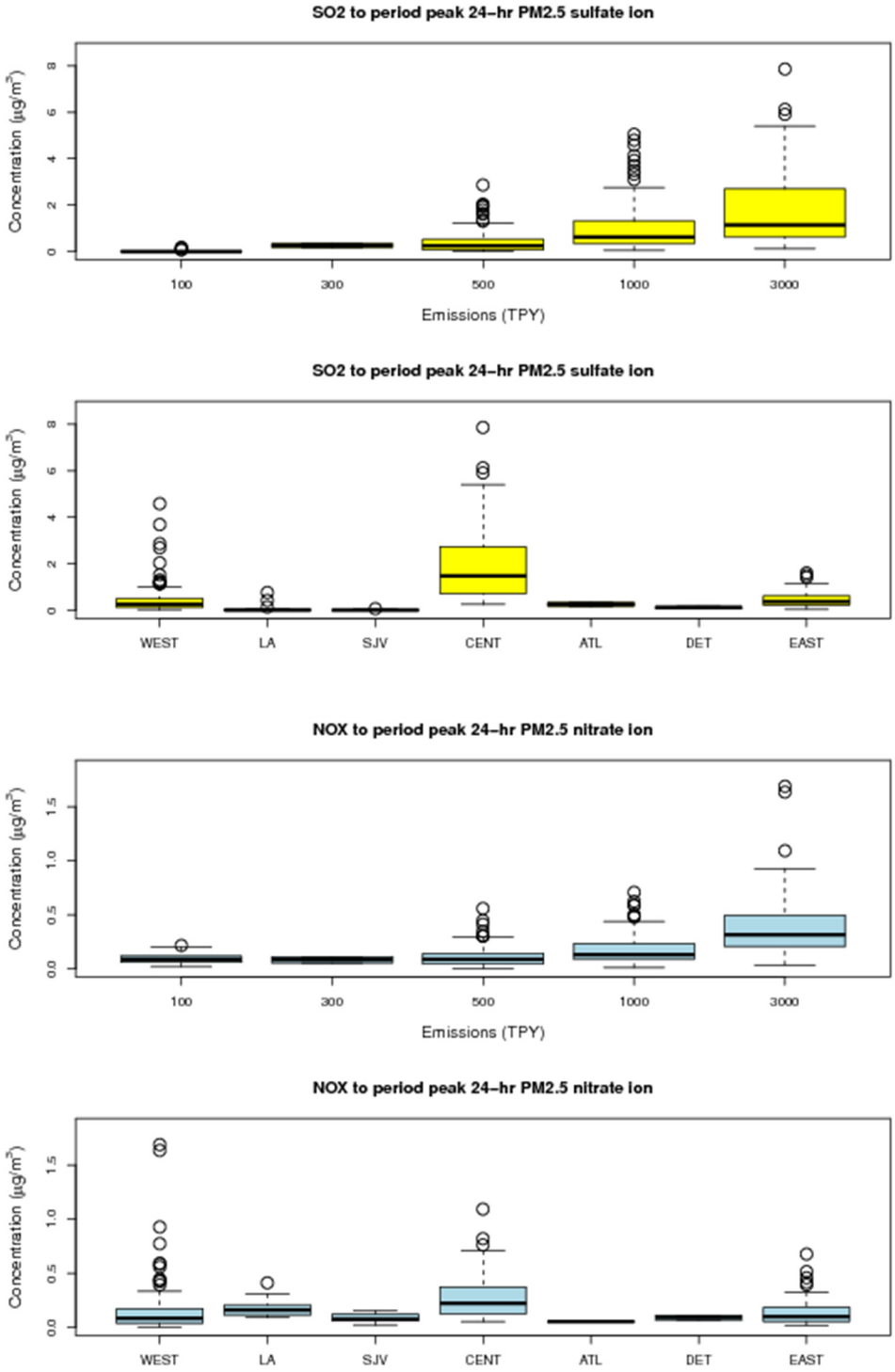
The relationships shown here for these hypothetical sources are not intended to provide an exhaustive representation of all combinations of source type, chemical, and physical source environments but rather provide insightful information about secondary pollutant impacts from single sources in different parts of the U.S. The maximum impacts for daily $PM_{2.5}$, annual $PM_{2.5}$ and daily maximum 8-hr average O_3 are shown in the following sub-sections for the

hypothetical sources modeled for an entire year (Baker et al., 2015b; U.S. Environmental Protection Agency, 2016).

4.1 Annual and Daily $PM_{2.5}$

The maximum daily average $PM_{2.5}$ sulfate ion from SO_2 emissions and maximum daily average $PM_{2.5}$ nitrate ion from NO_X emissions are shown in Figure 4-2 by emission rate and area. Downwind maximum $PM_{2.5}$ impacts generally increase as rates of precursor emissions increase. However, differences in chemical (e.g. NO_X/VOC ratio, ammonia concentrations) and physical (e.g. terrain and meteorology) regimes among these hypothetical sources result in differences in downwind impacts even for similar types of sources. Differences in maximum impacts can also be seen between the different areas and studies. Atlanta and Detroit both include a single hypothetical source modeled at 4 km horizontal grid resolution. The California sources were also modeled at 4 km but only include a sub-set of an entire year meaning the maximum impact from those hypothetical sources may not be realized as part of that study design. The western, central, and eastern U.S. sources were modeled at 12 km horizontal grid resolution for the entire year of 2011. Therefore, it is possible that the maximum impacts from each of these hypothetical sources may not have been realized using this specific year of meteorology and that another year with more conducive meteorology for secondary formation of O_3 and/or $PM_{2.5}$ might be more appropriate.

Figure 4-2. Maximum daily average secondary $PM_{2.5}$ sulfate ion impacts from SO_2 emissions and $PM_{2.5}$ nitrate ion impacts from NO_X emissions. Note: These impacts are from multiple modeling studies estimating downwind impact from hypothetical sources.



The distance from the source of maximum daily average secondary $PM_{2.5}$ impact is shown in Figure 4-3. Peak impacts tend to be in proximity to the source and become less common as distance from the source increases. Figure 4-4 shows maximum annual average impacts from SO_2 emissions on modeled $PM_{2.5}$ sulfate ion and NOX emissions on modeled $PM_{2.5}$ nitrate ion. Downwind impacts tend to increase as emissions of precursors increase. Also, impacts vary from area to area. Here, for the annual form of the NAAQS, the episodic California sources are not included since an entire year was not modeled as part of that project source.

Figure 4-3. Maximum daily average secondary $PM_{2.5}$ sulfate ion impacts from SO_2 emissions (left panels) and $PM_{2.5}$ nitrate ion impacts from NO_X emissions (right panels) shown by distance from the source.

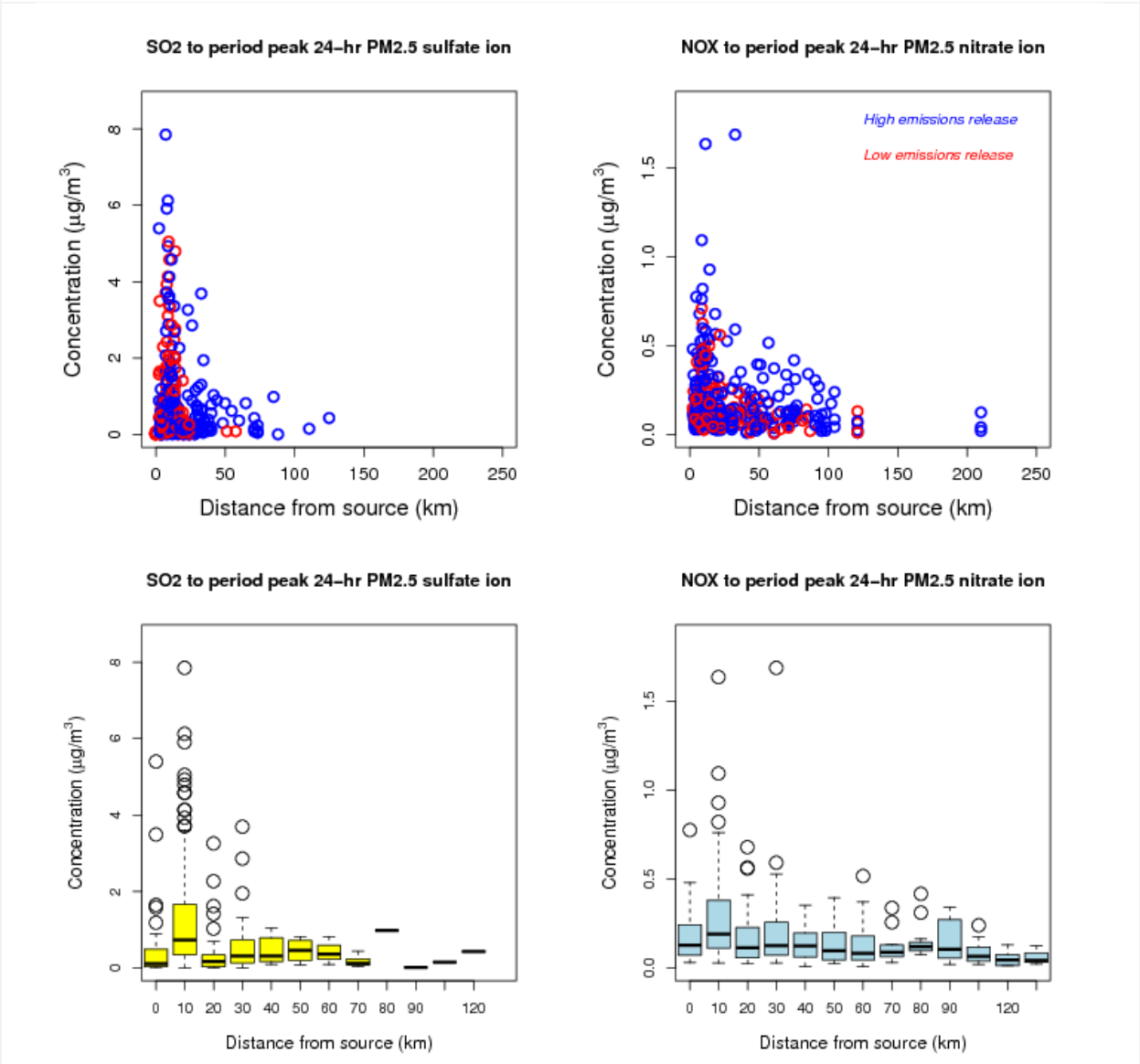
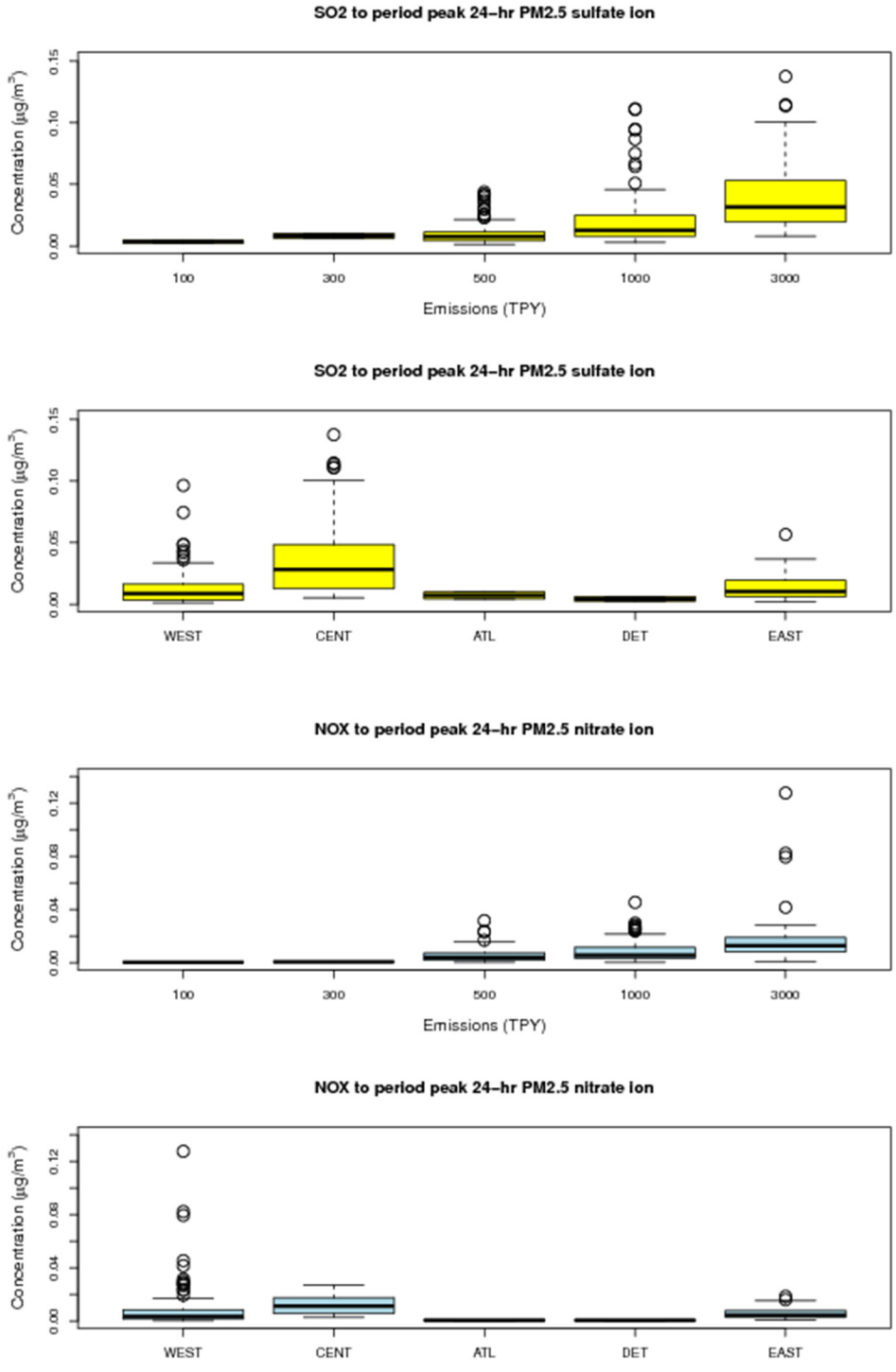


Figure 4-4. Maximum annual average secondary $PM_{2.5}$ sulfate ion impacts from SO_2 emissions and $PM_{2.5}$ nitrate ion impacts from NO_X emissions. Note: These impacts are from multiple modeling studies estimating downwind impact from hypothetical sources.



4.2 8-hour Ozone

Maximum 8-hr O_3 impacts are shown in Figure 4-5 compared to single source precursor emission rates. These relationships are based on photochemical modeling studies that estimated single source impacts on downwind $PM_{2.5}$ in California (Kelly et al., 2015), the Detroit and Atlanta urban areas (U.S. Environmental Protection Agency, 2016), and at rural and suburban locations in the central and eastern United States (Baker et al., 2015a). Additional modeling was conducted consistent with the approach described in Baker et al., 2015 for hypothetical sources in the western and eastern U.S. to provide broader geographic coverage of the U.S. Downwind maximum 8-hr O_3 impacts generally increase as rates of precursor emissions increase. However, differences in chemical (e.g. NO_X/VOC ratio, radical concentrations) and physical (e.g. terrain and meteorology) regimes among these hypothetical sources result in differences in downwind impacts even for similar types of sources.

Each of the hypothetical source impacts modeled as part of EPA's assessment used a typical industrial assumption for speciation of VOC emissions. To better understand the influence of VOC speciation, as a sensitivity analysis, EPA modeled a set of hypothetical sources with near-surface releases in the western and eastern U.S. with an alternative VOC emissions speciation that assumed 100% of the VOC emissions were emitted as formaldehyde to provide a more reactive profile than typically used. Figure 4-6 shows a comparison of the downwind maximum daily 8-hr average O_3 impacts of the typical hypothetical near-surface release sources in the western and eastern U.S. with impacts where these same sources with formaldehyde-only VOC emissions. For both sets of emissions scenarios, a total of 500 tpy of VOC was emitted, the only difference being the VOC speciation. The formaldehyde-only simulations for these sources generally resulted in higher downwind O_3 impacts than the simulations of hypothetical sources with typical speciation of VOC emissions. The increases in impacts are typically between 1.5 and 2 times higher.

Since VOC reactivity can be important, some areas may want to develop separate VOC to O_3 relationships using typical VOC profiles and also VOC profiles that may be more reflective of certain types of sources that exist in that area or are anticipated to operate in that area in the future.

Figure 4-5. Maximum 8-hr ozone impacts from NO_X emissions and from VOC emissions.
Note: These impacts are from multiple modeling studies estimating downwind impact from hypothetical sources.

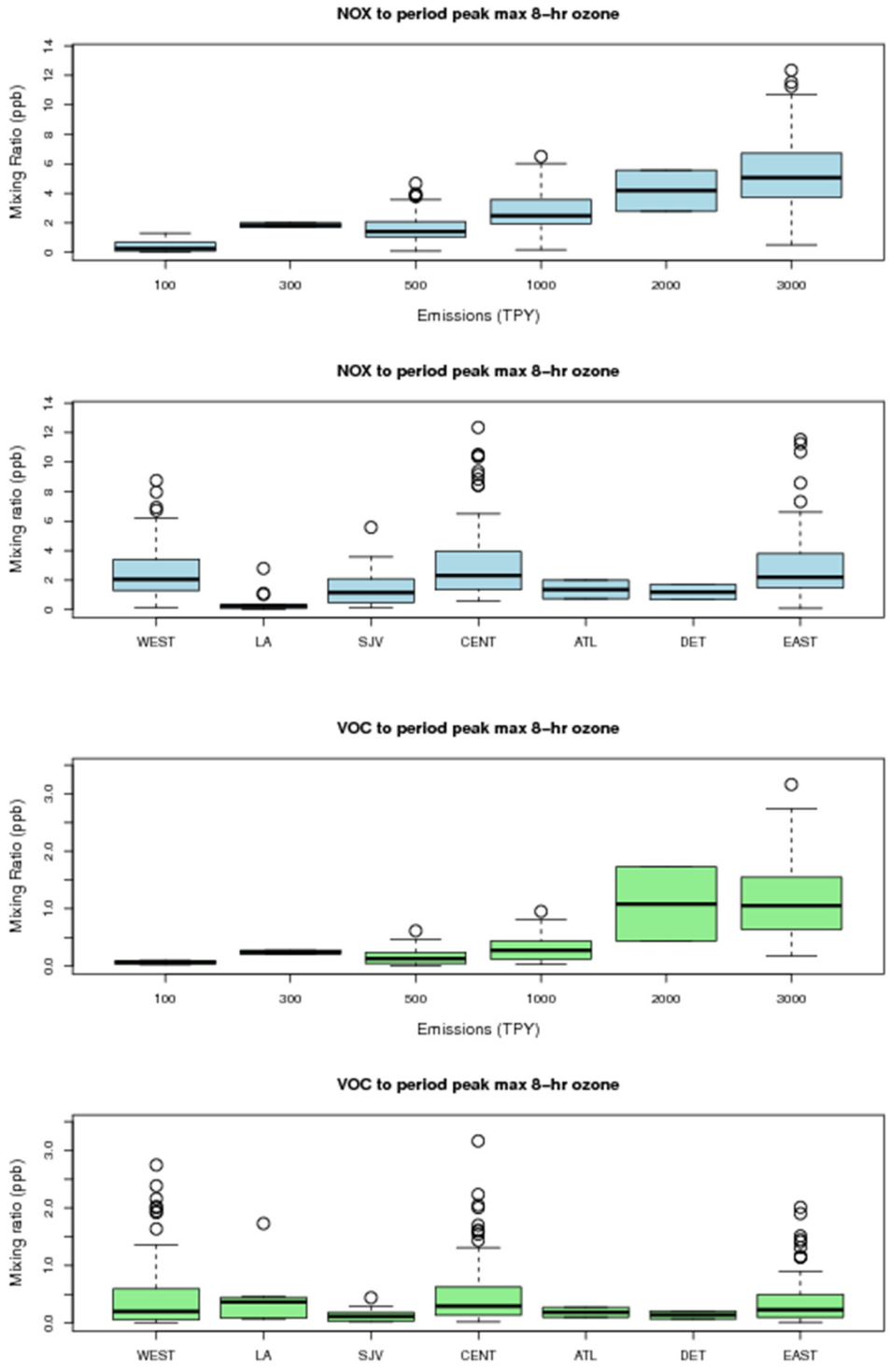
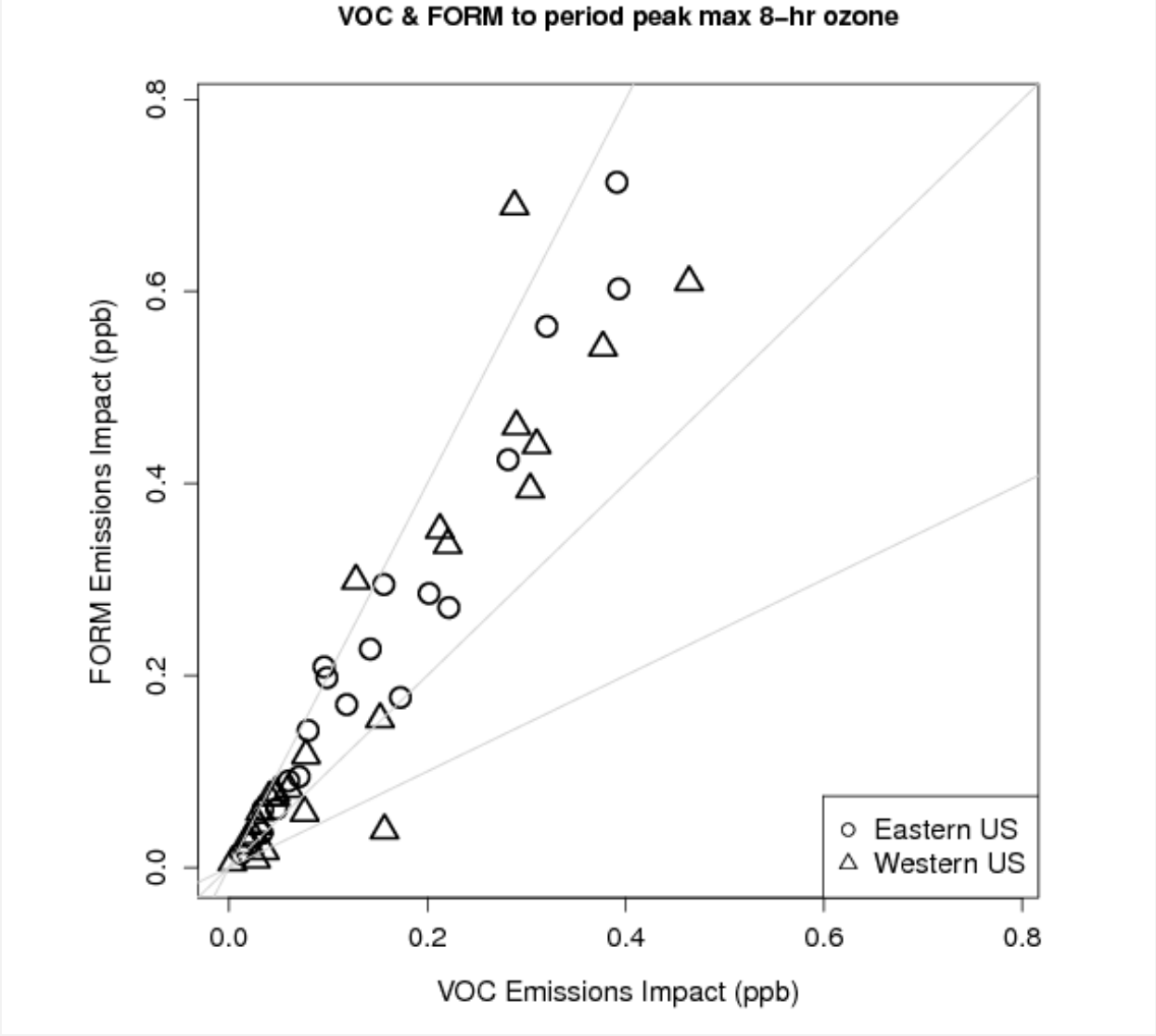
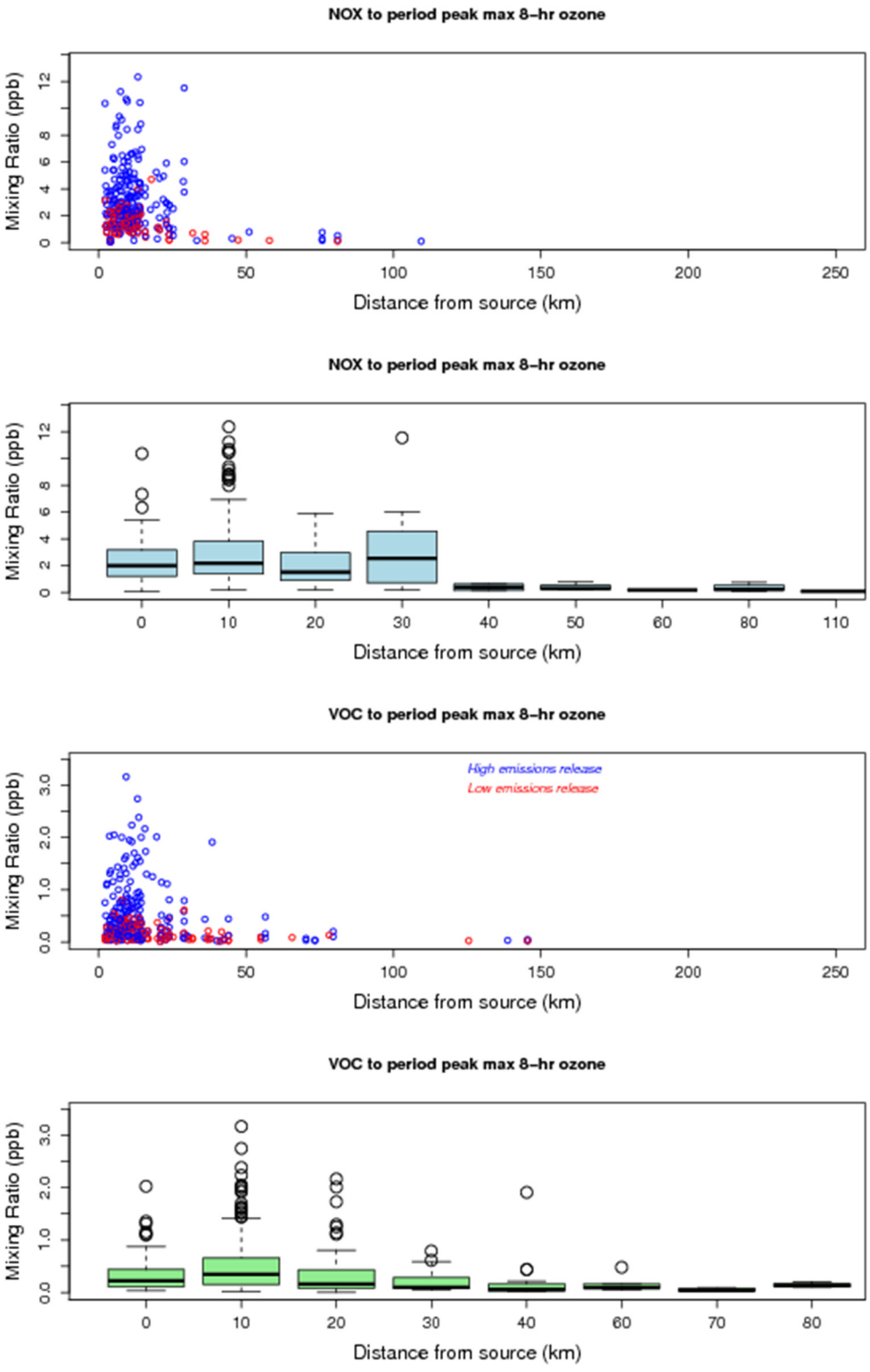


Figure 4-6. Maximum 8-hr ozone impacts from 500 tpy of near-surface VOC emissions using a typical industrial VOC speciation profile and assuming all VOC emissions are formaldehyde.
Note: these impacts are for the eastern and western U.S. hypothetical sources presented here and do not include information from any other studies.



The distance from the source of the maximum daily 8-hr average O_3 impacts are shown in Figure 4-7. Similar to maximum daily $PM_{2.5}$ impacts, maximum daily 8-hr average O_3 impacts tend to be in close proximity to the source and are less frequent as distance from the source increases. This is particularly notable where distance from the source exceeds 50 km.

Figure 4-7. Maximum 8-hr ozone impacts from NO_X emissions and from VOC emissions by distance from the source. Note: These impacts are from multiple modeling studies estimating downwind impact from hypothetical sources.



5 Framework for Developing MERPs as a Tier 1 Demonstration Tool

A Tier 1 demonstration tool as described in the 2015 proposed revision to the *Guideline* consists of technically credible air quality modeling done to relate precursor emissions and peak secondary pollutant impacts from specific or hypothetical sources. Permit applicants should provide a narrative explanation describing how project source post-construction emissions relate to the information provided as part of the Tier 1 demonstration tool. It should be made clear how the chemical and physical environments modeled as part of an existing set of information included in the Tier 1 demonstration tool are relevant to the geographic area of the source and key receptors. With appropriate supporting information, permitting authorities may derive and use MERP values as a particular type of Tier 1 demonstration tool. Such values should be based on existing air quality modeling that would be technically credible under the 2015 proposed revision to the *Guideline*. Properly-supported MERPs may provide a simple way to relate maximum downwind impacts with an air quality concentration threshold that is used to determine if such an impact causes or contributes to a violation of the appropriate NAAQS. In the discussion that follows, we will refer to the latter threshold as the "critical air quality threshold."

To derive a MERP value, the model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a critical air quality threshold using the following equation:

MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source / Modeled air quality impact from hypothetical source)

For $PM_{2.5}$, the modeled air quality impact of an increase in precursor emissions from the hypothetical source is expressed in units of $\mu g/m^{3\cdot}$. For O_3, the modeled air quality impact is expressed in ppb or ppm. As discussed in Section 4, these modeled impacts would reflect the maximum downwind impacts for $PM_{2.5}$ and O3. The critical air quality threshold is separately defined (as discussed below) and expressed as a concentration for $PM_{2.5}$ (in $\mu g/m^{3)}$ or O_3 (in ppb or ppm). Consistent with the modeled emissions rates that are input to the air quality model to predict a change in pollutant concentration, MERPs are expressed as an annual emissions rate in tons per year.

As illustrated in this section, separate MERPs can be developed for specific precursors and secondary pollutant impacts: SO_2 to $PM_{2.5}$, NO_X to $PM_{2.5}$, NO_X to O_3, and VOC to O_3. The following sub-sections provide examples of developing a suitable Tier 1 demonstration tool for each precursor and secondary pollutant. In this assessment, the maximum downwind impact from each source is chosen over the length of the model simulation period and matched with the annual emission rate. The maximum impact is selected since a single year of meteorology (or less in some instances) is used to generate these relationships. Additional or alternative meteorological patterns may result in higher impacts in some areas. For the purposes of this example, the critical air quality thresholds are based on the draft Significant Impact Levels (SILs)

that EPA has derived in a separate exercise. Nothing in this guidance requires the use of such values. Consistent with EPA's draft guidance containing these SIL values, to the extent a permitting authority elects to use a SIL to quantify a level of impact that causes or contributes to a violation of the NAAQS or PSD increment(s), such values will need to be identified and justified on a case-by-case basis.

5.1 Annual and Daily $PM_{2.5}$

Based on the modeling results across all hypothetical sources presented in Section 4 and detailed in the Appendix of this document, Figure 5-1 shows NO_X to annual maximum daily average $PM_{2.5}$ nitrate ion and SO_2 to annual maximum daily average $PM_{2.5}$ sulfate ion MERPs that illustrate the range of potential values for these sources and time period. Neither $PM_{2.5}$ sulfate nor $PM_{2.5}$ nitrate are assumed to be neutralized by ammonium. For this illustrative example, consistent with EPA's draft SILs guidance, a critical air quality threshold of 1.2 $\mu g/m^3$ was used to estimate daily average $PM_{2.5}$ MERPs. The illustrative MERPs for NO_X to daily $PM_{2.5}$ range from 1,075 to just over 100,000, while the illustrative MERPs for SO_2 to daily $PM_{2.5}$ range from 210 to just over 27,000 for the hypothetical sources presented here based on the selected air quality threshold. The variation from source to source is related to different chemical and meteorological environments around the source that range in terms of conduciveness toward secondary $PM_{2.5}$ formation.

Figure 5-1. SO_2 (top panels) and NO_X (bottom panels) daily average $PM_{2.5}$ MERPs estimated from single source hypothetical emissions impacts on $PM_{2.5}$ nitrate ion and $PM_{2.5}$ sulfate ion respectively.

Note: Daily $PM_{2.5}$ MERPs derived here based on critical air quality threshold of 1.2 $\mu g/m^3$ and neither $PM_{2.5}$ sulfate nor nitrate is assumed to be neutralized by ammonia.

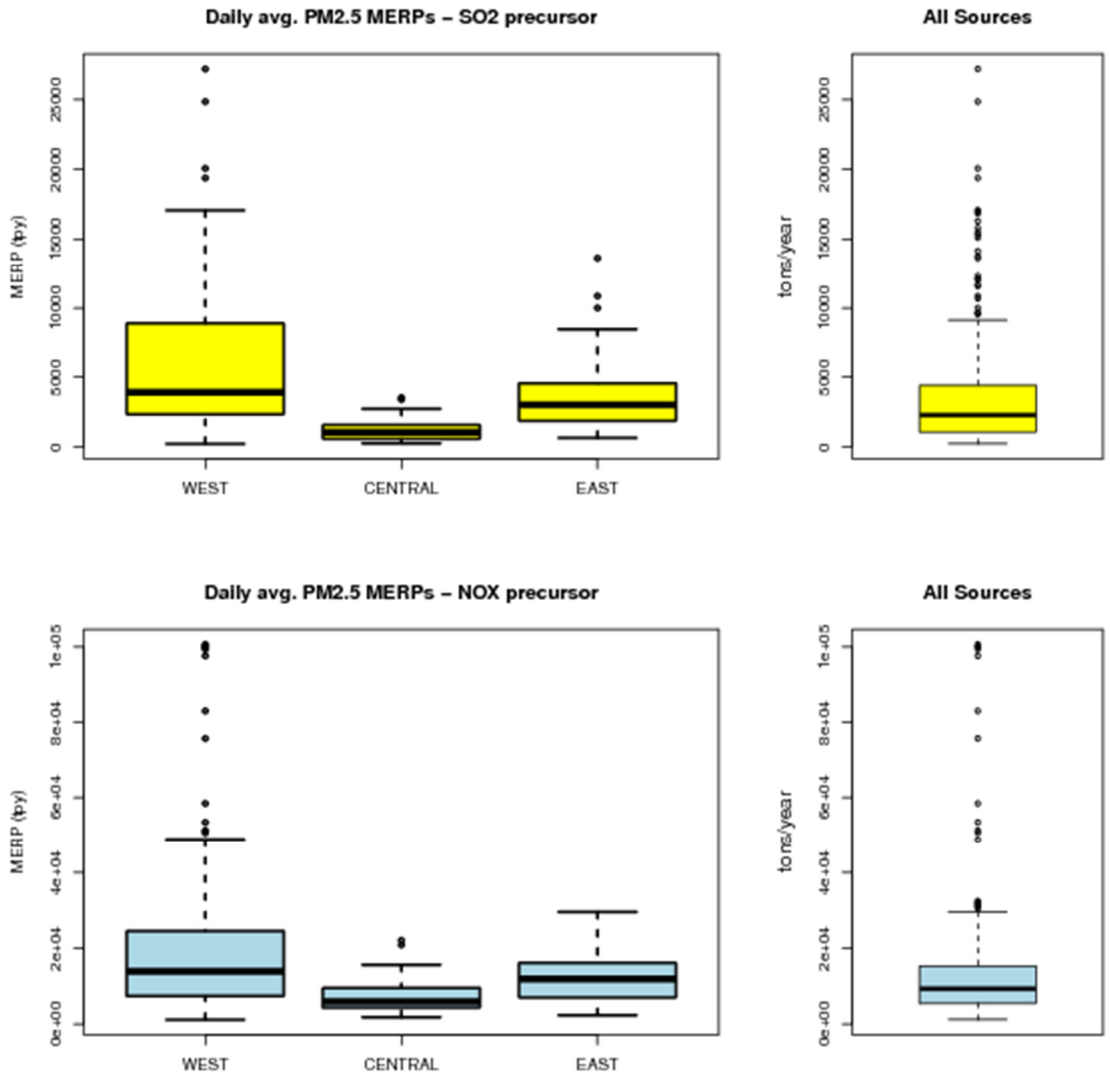
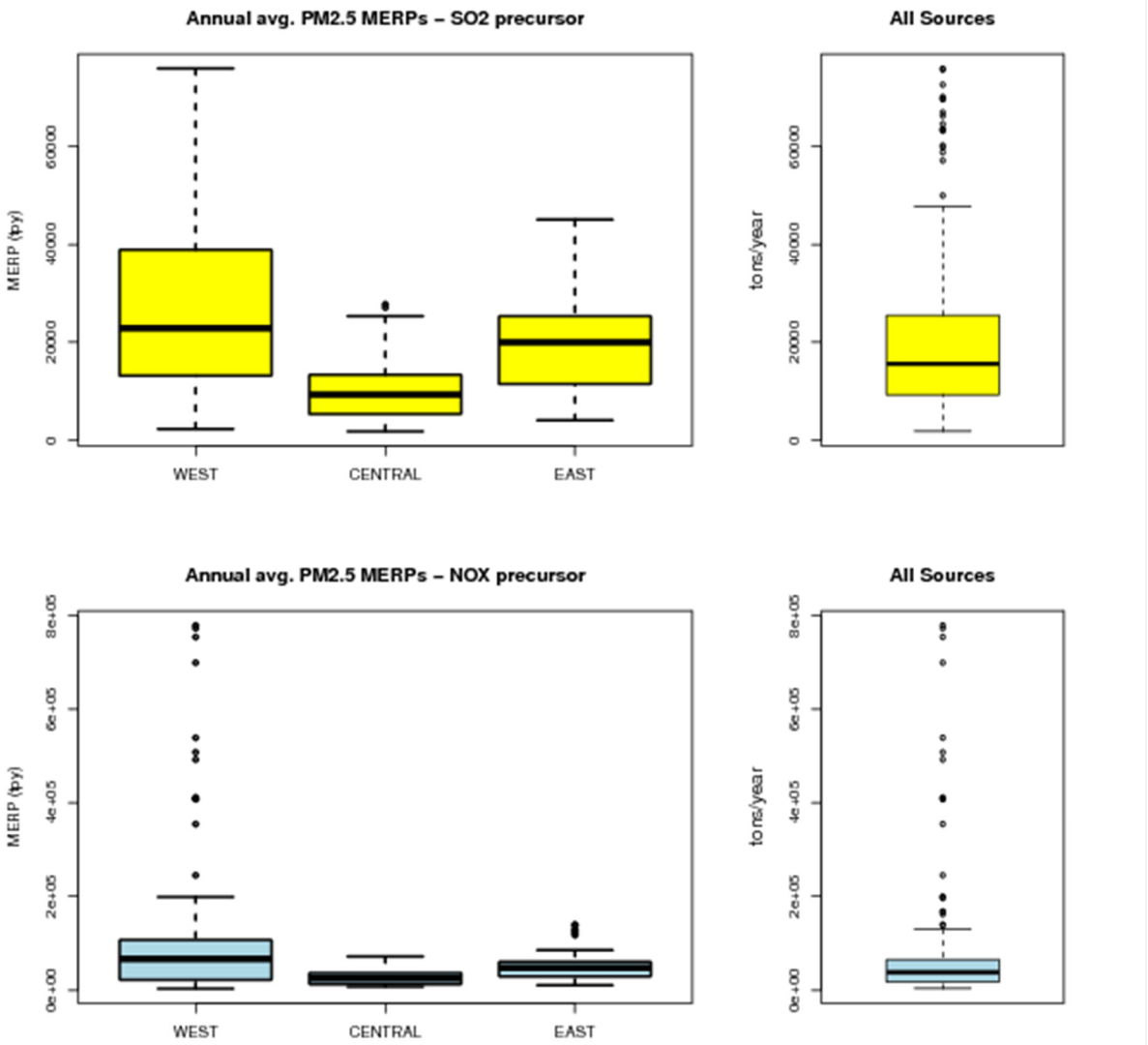


Figure 5-2. SO_2 (top panels) and NO_X (bottom panels) annual average $PM_{2.5}$ MERPS shown by geographic region.

Note: Annual $PM_{2.5}$ MERPs derived here based on critical air quality threshold of 0.2 µg/m^3 and neither $PM_{2.5}$ sulfate nor nitrate is assumed to be neutralized by ammonia.



Similarly, based on EPA's modeling results of hypothetical sources, Figure 5-2 shows NO_X to maximum annual average $PM_{2.5}$ nitrate ion and SO_2 to maximum annual average $PM_{2.5}$ sulfate ion MERPs to illustrate the range of potential values for these sources and this time period. As done for the daily $PM_{2.5}$ values, neither $PM_{2.5}$ sulfate nor $PM_{2.5}$ nitrate are assumed to be neutralized by ammonium. For this illustrative example, consistent with EPA's draft SILs guidance, a critical air quality threshold of 0.2 µg/m^3 was used to estimate annual average $PM_{2.5}$ MERPs. The illustrative MERPs for NO_X to annual $PM_{2.5}$ range from 3,184 tpy to just over 779,000 tpy, while the illustrative MERPs for SO_2 to annual $PM_{2.5}$ range from 1,795 tpy to just over 75,500 tpy for the hypothetical sources presented here based on the selected air quality

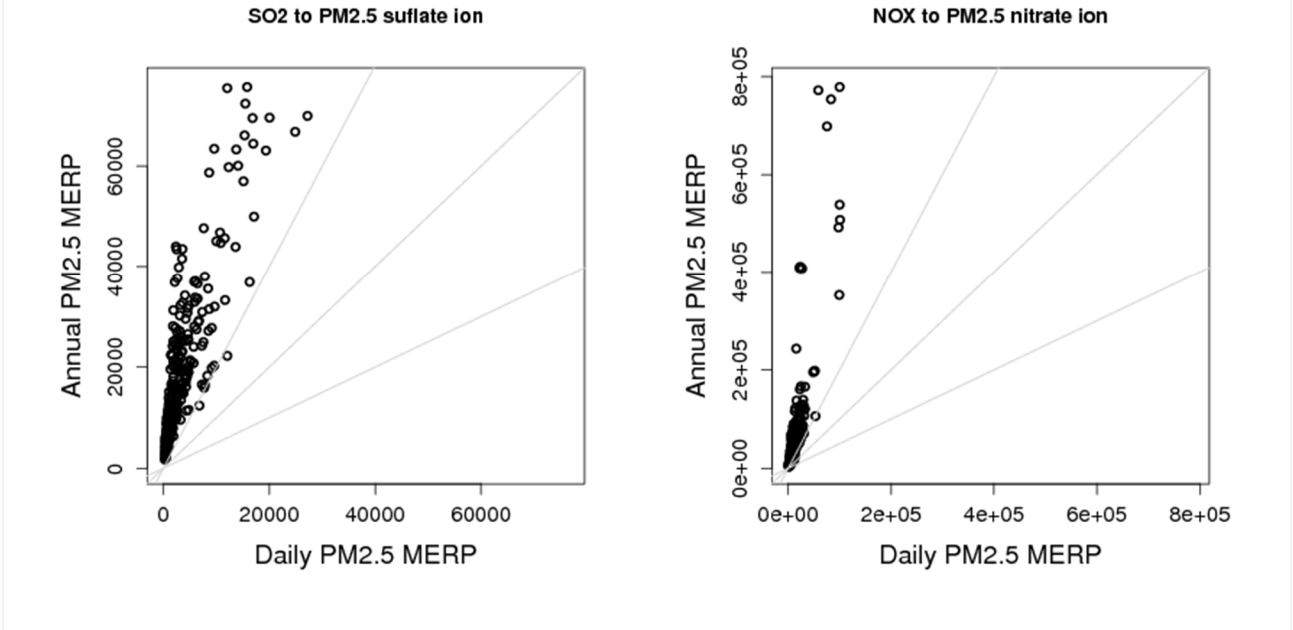
threshold. The variation from source to source is related to different chemical and meteorological environments around the source that range in terms of conduciveness toward secondary $PM_{2.5}$ formation.

As shown, the illustrative MERPs are generally lower for SO_2 than NO_X reflecting that SO_2 tends to form $PM_{2.5}$ more efficiently than NO_X. This is consistent with the conceptual model of secondary $PM_{2.5}$ formation in many parts of the United States reflecting that the $PM_{2.5}$ sulfate ion has a lower vapor pressure than $PM_{2.5}$ nitrate ion and tends to stay in the particulate phase in a greater range of meteorological conditions. The distribution of illustrative MERPs for both SO_2 and NO_X to daily $PM_{2.5}$ are shown to vary between regions of the United States. This is expected since the chemical (e.g., oxidants, neutralizing agents) and physical (e.g., terrain) environments vary regionally in the United States.

Figure 5-3 shows illustrative MERPs estimated for these sources for the daily and annual average forms of the $PM_{2.5}$ NAAQS. Given the critical air quality thresholds used as part of this illustrative exercise, annual $PM_{2.5}$ MERPs are consistently higher than for the daily $PM_{2.5}$ NAAQS for each hypothetical source modeled across all regions of the nation.

Figure 5-3. Illustrative $PM_{2.5}$ MERPs for SO_2 (left panel) and NO_X (right panel) estimated from single source hypothetical emissions impacts on $PM_{2.5}$ nitrate ion and $PM_{2.5}$ sulfate ion respectively.

Note: Daily average $PM_{2.5}$ MERPs are directly compared with annual average $PM_{2.5}$ MERPs. Neither $PM_{2.5}$ sulfate nor nitrate is assumed to be neutralized by ammonia.



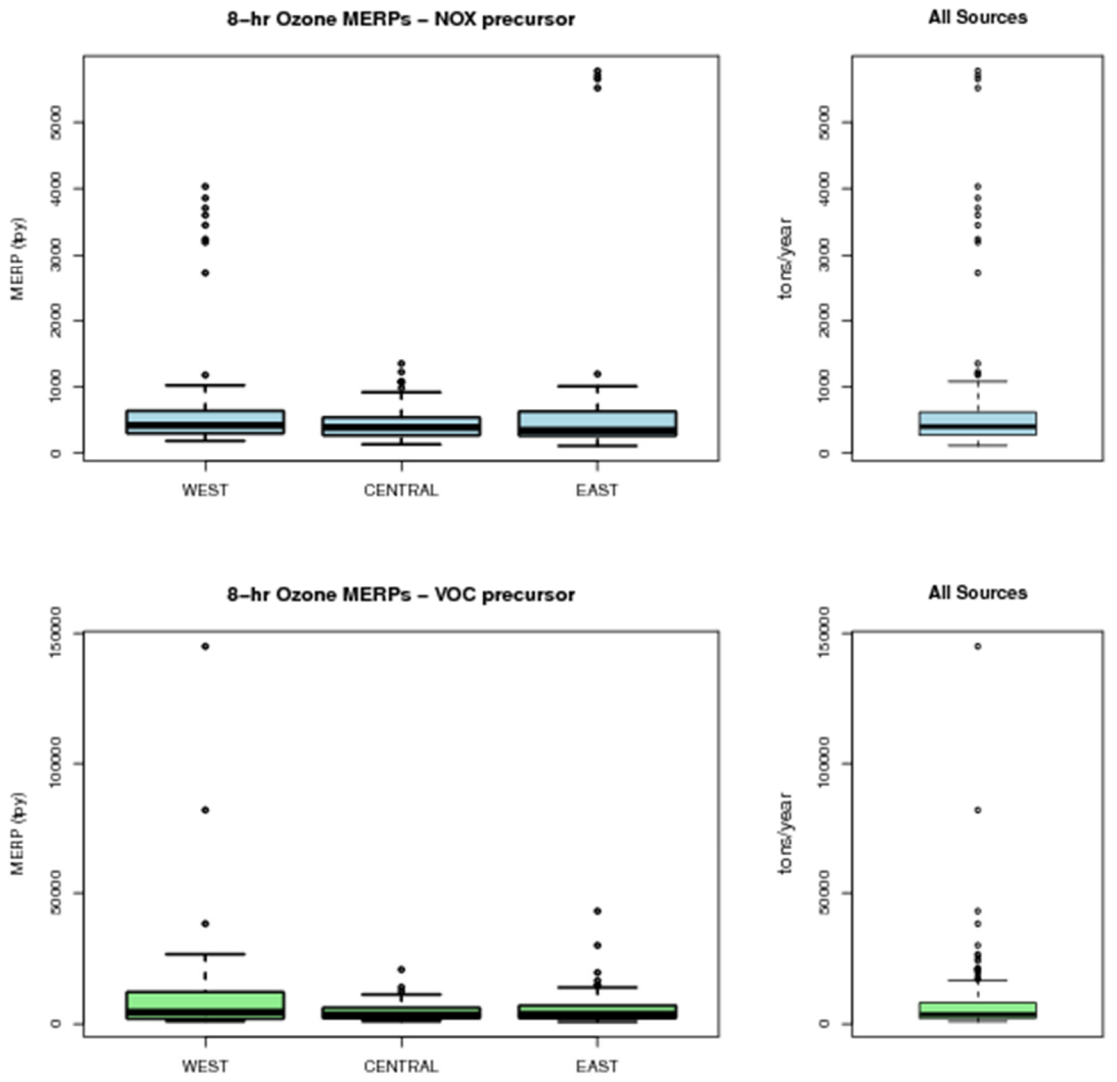
5.2 8-hour Ozone

Figure 5-4 shows illustrative MERPs for NO_X and VOC to daily maximum 8-hr average O_3 to illustrate the variability between regions/studies for the hypothetical sources included in this assessment. The modeled impacts reflect the highest annual 8-hr O_3 impacts from various hypothetical sources presented in this assessment (Baker et al., 2015b; Kelly et al., 2015; U.S. Environmental Protection Agency, 2016). Consistent with EPA's draft SILs guidance, a critical air quality threshold of 1.0 ppb is used for this illustrative example. The illustrative VOC MERPs are based on single source VOC impacts on downwind daily maximum 8-hr O_3, while the illustrative NO_X MERPs are based on single source NO_X impacts on downwind daily maximum 8-hr O_3. The illustrative MERPs for NO_X to daily maximum 8-hr O_3 range from 107 to 5,573, while the illustrative MERPs for VOC to daily maximum 8-hr O_3 range from 814 to approximately 145,000 for the hypothetical sources presented here based on the selected critical air quality threshold.

For this assessment, illustrative MERPs for NO_X tend to be lower than VOC which suggests most areas included in this assessment are NO_X limited rather than VOC limited in terms of O_3 formation regime. The distribution of illustrative MERPs for both NO_X and VOC are shown to vary between areas modeled as part of this assessment. Similar to $PM_{2.5}$, this is expected since the chemical (e.g., oxidants) and physical (e.g., terrain) environments vary regionally in the United States. The area-to-area availability of oxidants will determine whether O_3 production is NO_X or VOC limited which will be an important factor in how much an emissions source of NO_X or VOC will contribute to O_3 production.

Figure 5-4. NO_X (top panels) and VOC (bottom panels) MERPS estimated from single source hypothetical emissions impacts on daily maximum 8-hr O_3.

Note: 8-hr O3 MERPs derived here based on critical air quality threshold of 1.0 ppb



6 Recommended Method for Developing MERPs as a Tier 1 Demonstration Tool

Given the observed spatial variability in illustrative MERPs for each precursor for $PM_{2.5}$ and O_3, stakeholders choosing to develop their own Tier 1 demonstration tool will need to conduct sufficient air quality modeling, as described below in Section 6.1. Therefore, the air quality modeling should be consistent with the type of modeling system, model inputs, model application and estimation approach for O3 and secondary $PM_{2.5}$ recommended in the 2015 proposed revision to the *Guideline* (U.S. Environmental Protection Agency, 2015a) and the EPA's Single-Source Modeling guidance (U.S. Environmental Protection Agency, 2015b). The chosen modeling system should be applied with a design scope similar to that shown in this document where multiple hypothetical single sources with varying emission rates and stack release parameters are simulated for a period that includes meteorology conducive to the formation of O_3 and/or secondary $PM_{2.5}$. A modeling protocol should be developed and shared with the EPA Regional office that details the planned approach for developing MERPs based on photochemical modeling to ensure a sound technical basis for development of a suitable Tier 1 demonstration tool. As part of the protocol, the permit applicant should include a narrative that provides a technical justification that the existing information is relevant for their project source scenario.

There is no minimum number of hypothetical sources to include in developing a MERPs Tier 1 demonstration tool, but the benefit of including more hypothetical sources is that more information is available for future sources to use in predicting secondary pollutant impacts from their post-construction emissions. Permitting authorities or permit applicants should examine the existing recent (e.g., last 5 to 10 years) permit applications in that area to determine what types of emission rates and stack characteristics (e.g., surface and elevated release) should be reflected in the hypothetical project sources included in the model simulations. These model simulations should include a credible representation of current or post-construction conditions in the area of the project source and key receptors.

6.1 Developing Area Specific MERPs

Pre-existing modeling conducted for an area by a source, a governmental agency, or some other entity that is deemed sufficient may be adequate for air agencies to conduct local demonstrations leading to the development of area-specific MERPs.

8-hr Ozone: The general framework for such developmental efforts for O_3 should include the following steps:

1) Define the geographic area(s)
2) Conduct a series of source sensitivity simulations with appropriate air quality models to develop a database of modeled O_3 impacts associated with emissions of O_3 precursors (e.g., VOC and NO_X) from typical industrial point sources within the area of interest.

3) Extract the highest daily 8-hr average modeled impact anywhere in the domain from the model simulation.
4) Calculate the MERP estimate(s) using the equation provided in Section 5 of this document.
5) Conduct quality assurance of the resulting MERP estimate(s) and evaluate the interpretation and appropriateness given the nature of O_3 precursor emissions sources and chemical formation in the area of interest. This evaluation will likely require emissions inventory data and observed ambient data for O_3 and precursors.

If there are questions about what steps are appropriate in a given instance or how to apply the steps described above, air agencies should contact their Regional Office modeling contact for further technical consultation.

Daily $PM_{2.5}$: The general framework for such developmental efforts for daily $PM_{2.5}$ should include the following steps:

1) Define the geographic area(s)
2) Conduct a series of source sensitivity simulations with appropriate air quality models to develop a database of modeled $PM_{2.5}$ impacts associated with emissions of $PM_{2.5}$ precursors (e.g., SO_2 and NO_X) from typical industrial point sources within the area of interest.
3) Extract the highest daily 24-hr average modeled impact anywhere in the domain from the model simulation.
4) Calculate the MERP estimate(s) using the equation provided in Section 5 of this document.
5) Conduct quality assurance of the resulting MERP estimate(s) and evaluate the interpretation and appropriateness given the nature of $PM_{2.5}$ precursor emissions sources and chemical formation in the area of interest. This evaluation will likely require emissions inventory data and observed ambient data for $PM_{2.5}$ and precursors.

If there are questions about what steps are appropriate in a given instance and how to apply the steps described above, air agencies should contact their Regional Office modeling contact for further technical consultation.

Annual $PM_{2.5}$: The general framework for such developmental efforts for annual $PM_{2.5}$ should include the following steps:

1) Define the geographic area(s)
2) Conduct a series of source sensitivity simulations with appropriate air quality models to develop a database of modeled $PM_{2.5}$ impacts associated with emissions of $PM_{2.5}$ precursors (e.g., SO_2 and NO_X) from typical industrial point sources within the area of interest.
3) Extract the highest annual average modeled impact anywhere in the domain from the model simulation.

4) Calculate the MERP estimate(s) using the equation provided in Section 5 of this document.
5) Conduct quality assurance of the resulting MERP estimate(s) and evaluate the interpretation and appropriateness given the nature of $PM_{2.5}$ precursor emissions sources and chemical formation in the area of interest. This evaluation will likely require emissions inventory data and observed ambient data for $PM_{2.5}$ and precursors.

If there are questions about what steps are appropriate in a given instance or how to apply the steps described above, air agencies should contact their Regional Office modeling contact for further technical consultation.

7 Illustrative MERP Tier 1 Demonstrations Based on EPA Modeling for Example PSD Permit Scenarios

In this section, several example PSD permit application scenarios are presented to illustrate how modeled emissions and secondary pollutant impacts from EPA's modeling of hypothetical sources (described in Section 4) could be used to derive a MERP Tier 1 demonstration tool (as described in section 5) for a given location. Most of these examples assume the proposed new or modifying sources (hereinafter "project sources") do not emit any primary $PM_{2.5}$ to demonstrate how to account for multiple precursor contributions to secondary $PM_{2.5}$ formation. One scenario (i.e., scenario D) reflects a situation where a project source emits both primary $PM_{2.5}$ and precursors to secondary $PM_{2.5}$. In those situations, applicants should consult the appropriate sections of the *Guideline* (U.S. Environmental Protection Agency, 2015a) and related guidance (U.S. Environmental Protection Agency, 2015b)**.** As illustrated in these examples, MERPs for each precursor may be based on either the most conservative (lowest) value across a region/area or the source-specific value derived from a more similar hypothetical source modeled by a permit applicant, permitting authority or EPA.

For each area, Table 7.1 shows an example of the most conservative (i.e., lowest) illustrative MERP for each precursor and NAAQS across all sources, areas, and studies. These illustrative values in Table 7.1 are based on the EPA modeling of hypothetical sources described in section 4 and the critical air quality thresholds presented in Section 5. For reference at the individual source level, the maximum predicted downwind impacts for each of the hypothetical sources modeled with annual simulations are provided in Appendix A.

Table 7.1 Most Conservative (Lowest) Illustrative MERP Values (tons per year) by Precursor, Pollutant and Region. Note: illustrative MERP values are derived based on EPA modeling (as described in section 4) and critical air quality thresholds (as described in Section 5).

Precursor	Area	8-hr O3	Daily PM	Annual PM
NOx	Central US	126	1,820	7,427
NOx	Eastern US	107	2,467	10,037
NOx	Western US	184	1,155	3,184
SO2	Central US		256	1,795
SO2	Eastern US		675	4,013
SO2	Western US		225	2,289
VOC	Central US	948		
VOC	Eastern US	814		
VOC	Western US	1,049		

Scenario A: VOC and NO_X precursor assessment for $PM_{2.5}$ and additive O_3 impacts

In this scenario, a facility with a proposed increase in emissions of 0 TPY of primary $PM_{2.5}$, 130 TPY of VOC, 72 TPY of NO_X, and 0 TPY of SO_2 located in the upper midwest region. Only VOC and NO_X emissions are above the level of the SER and therefore require a PSD compliance demonstration.

O_3 analysis: The NO_X and VOC emissions from the project source are well below the lowest (most conservative) O_3 MERP value shown in Table 7-1 of any source modeled by EPA in the central or any other region in the continental U.S. In this case, air quality impacts of O_3 from this source would be expected to be below the critical air quality threshold.

However, the NO_X and VOC precursor contributions to 8-hr daily maximum O_3 are considered together to determine if the source's air quality impact would exceed the critical air quality threshold. In such a case, the proposed emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed. A value less than 100% indicates that the critical air quality threshold will not be exceeded when considering the combined impacts of these precursors on 8-hr daily maximum O_3.

Example calculation for additive secondary impacts on 8-hr daily maximum O_3:

(72 tpy NO_X from source/107 tpy NO_X 8-hr daily maximum O_3 MERP) + (130 tpy VOC from source/814 TPY VOC 8-hr daily maximum O_3 MERP) = .67 + .16 = .83 * 100 = 83%

$PM_{2.5}$ analysis: The NO_X emissions of 72 tpy from the hypothetical project source are also well below the lowest (most conservative) $PM_{2.5}$ MERP value for the daily and annual NAAQS shown in Table 7-1 of any source modeled by EPA across the continental US. In this case, air quality impacts of $PM_{2.5}$ from this source are expected to be below the critical air quality threshold.

Scenario B: NO_X and SO_2 precursor assessment for comparable source O_3 impacts and additive

secondary $PM_{2.5}$ impacts

In this scenario, a facility with a proposed increase in emissions of 0 TPY of primary $PM_{2.5}$, 0 TPY of VOC, 310 TPY of NO_X, and 75 TPY of SO_2 located in the southeast region. Only NO_X and SO_2 emissions are above the level of the SER and therefore require a PSD compliance demonstration.

O_3 analysis: The NO_X emissions of 310 tpy are larger than the lowest (most conservative) NO_X MERP for 8-hr O_3 in the eastern and other regions of the U.S. such that air quality impacts of O3 from this source would be expected to exceed the critical air quality threshold. A comparable hypothetical source is identified that may be representative of this source (e.g., EUS region, source 19 with elevated emissions release as shown in Appendix A) and has source derived NO_X MERPs for 8-hr O_3 ranging from 327 to 462 TPY, which are both larger than the project source's post-construction emissions. The general formula for estimating MERPs is provided in section 5. Here, the equation is used with the modeled emissions rates and air quality impact information from source 19 of the EUS region with an elevated release (as detailed in Appendix Table A-1). Since multiple hypothetical sources were modeled at this location with an elevated release the source with the lowest MERP was selected for comparison with the project source, i.e.,

*MERP for source 19 EUS region elevated release (tpy) = 1.0 ppb * (500 tpy / 1.52 ppb) = 329 tpy*

In this case, based on modeling results for a more similar hypothetical source from Appendix A, the project source emissions are less than the calculated NO_X to 8-hr O_3 MERP such that air quality impacts of O_3 from this source would be expected to be less than the critical air quality threshold.

$PM_{2.5}$ analysis: Both the NO_X and SO_2 emissions are well below the lowest (most conservative) daily and annual $PM_{2.5}$ MERP values of any source modeled in the eastern or any other region in the continental U.S. However, the NO_X and SO_2 precursor contributions to both daily average $PM_{2.5}$ are considered together to determine if the source's air quality impact of $PM_{2.5}$ would exceed the critical air quality threshold. In this case, the proposed emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed. A value less than 100% indicates that the critical air quality threshold would not be exceeded when considering the combined impacts of these precursors on daily and/or annual $PM_{2.5}$.

Example calculation for additive secondary impacts on daily $PM_{2.5}$:

(310 tpy NO_X from source/1155 tpy NO_X daily $PM_{2.5}$ MERP) + (75 tpy SO_2 from source/225 TPY SO_2 daily $PM_{2.5}$ MERP) = .27 + .33 = .60 * 100 = 60%

Example calculation for additive secondary impacts on annual $PM_{2.5}$:

(310 tpy NO_X from source/3184 tpy NO_X annual $PM_{2.5}$ MERP) + (75 tpy SO_2 from source/2289 TPY SO_2 annual $PM_{2.5}$ MERP) = .097 + .033 = .13 * 100 = 13%

Scenario C: NO_X and SO_2 precursor assessment for comparable source O_3 and $PM_{2.5}$ impacts

In this scenario, a facility with a proposed increase in emissions of 0 TPY of primary $PM_{2.5}$, 22 TPY of VOC, 920 TPY of NO_X, and 259 TPY of SO_2 located in the western region. Only NO_X and SO_2 emissions are above the level of the SER and therefore require a PSD compliance demonstration.

O_3 analysis: The NO_X emissions of 920 tpy are larger than the lowest (most conservative) NO_X MERP for 8-hr O_3 in the western and other regions of the U.S. such that air quality impacts of O3 from this source would be expected to exceed the critical air quality threshold. A comparable hypothetical source is identified that may be representative of this source (e.g., WUS region, source 16 elevated release as shown in Appendix A) had a range of NO_X MERPs for 8-hr O_3 of 761 to 1,020 TPY, which are all larger than the source emissions modification. The general formula for estimating MERPs is provided in section 5. Here, the equation is used with the modeled emissions rates and air quality impact information from source 19 of the EUS region with an elevated release (as detailed in Appendix Table A-1). Since multiple hypothetical sources were modeled at this location with an elevated release the source with the lowest MERP was selected for comparison with the project source, i.e.,

*MERP for source 16 WUS region elev. release (tpy) = 1.0 ppb * (1000 tpy / 1.31 ppb) = 763 tpy*

In this case, based on modeling results for a more similar hypothetical source from Appendix A, the project source emissions are still greater than the calculated NO_X to 8-hr O_3 MERP such that air quality impacts of O3 from this source are expected to exceed the critical air quality threshold.

$PM_{2.5}$ analysis: The NO_X emissions of 920 are marginally below the lowest (most conservative) daily and annual $PM_{2.5}$ MERP value of any source modeled in the continental U.S., while the SO_2 emissions of 259 tpy are comparable to the lowest daily $PM_{2.5}$ MERP value of any source modeled in the western U.S. region. A hypothetical source considered more similar (e.g., WUS region, source 16 elevated release as shown in Appendix A) has a lowest NO_X MERP for daily $PM_{2.5}$ of 16,667 TPY and SO_2 MERP for daily $PM_{2.5}$ of 5,556 TPY, which are both much larger than the increase in emissions of the project such that the source's impact on $PM_{2.5}$ would be expected to be less than the critical air quality threshold.

Scenario D: NO_X and SO_2 precursor assessment for additive secondary $PM_{2.5}$ impacts along with direct $PM_{2.5}$

In this scenario, a facility with a proposed increase in emissions of 250 TPY of primary $PM_{2.5}$, 0 TPY of VOC, 310 TPY of NO_X, and 75 TPY of SO_2 located in the southeast region. Only NO_X and SO_2 emissions are above the level of the SER and therefore require a PSD compliance demonstration. This scenario is similar to Scenario B above, except that the primary $PM_{2.5}$

emissions must be accounted for in assessing $PM_{2.5}$ along with the secondary impacts of NO_X and SO_2 precursor emissions as part of the Tier 1 demonstration.

O_3 analysis: Please see Scenario B above.

$PM_{2.5}$ analysis: Similar to Scenario B, when considering NO_X and SO_2 contributions to daily average $PM_{2.5}$ together, the proposed emissions increased expressed as a percent of the lowest (most conservative) MERP and summed is less than 100% indicating the critical air quality threshold would be not be exceeded when considering the additive impacts of these precursors. However, in this example, the primary $PM_{2.5}$ impacts need to be added to the secondary impacts for an appropriate account of total $PM_{2.5}$ impacts for the comparison to the air quality threshold. The primary $PM_{2.5}$ impacts should be estimated using AERMOD or an approved alternative model as outlined in the *Guideline* (U.S. Environmental Protection Agency, 2015a) and consistent with EPA guidance for combining primary and secondary impacts of $PM_{2.5}$ for permit program assessments. In this scenario, a representative secondary impact for this source is added to the appropriately estimated primary $PM_{2.5}$ impacts. The highest impact at any receptor for primary $PM_{2.5}$ should be divided by the air quality threshold to estimate the percent contribution and determine if that primary contribution exceeds the 40% remaining after secondary impacts are accounted for using MERPs demonstration tool.

For example, a peak primary $PM_{2.5}$ impact from AERMOD is estimated to be 0.45 ug/m^3 for the scenario above. Compared with a 1.2 ug/m3 critical air quality threshold means that the primary impact is 35% of the critical air quality threshold. When this primary impact is summed with the secondary impacts of 60% the total is 95% which is below 100% suggesting this source impact is below the critical air quality threshold.

Alternatively, if the peak primary $PM_{2.5}$ impact from AERMOD is estimated to be 0.8 ug/m^3 for the above scenario then the percent primary contribution to the critical air quality threshold would be 62%. When summed with the secondary contribution of 60%, the total source impact exceeds 100% and therefore is greater than the critical air quality threshold.

7.1. Application of the EPA Assessment and Illustrative MERPs to Individual Permit Applications

In July 2015, EPA proposed revisions to the *Guideline* that recommend a two-tiered approach for addressing single-source impacts on O_3 or secondary $PM_{2.5}$ (U.S. Environmental Protection Agency, 2015a) with the first tier (or Tier 1) involving use of appropriate and technically credible relationships between emissions and ambient impacts developed from existing modeling studies deemed sufficient for evaluating a project source's impacts. To the extent the final revisions to the *Guideline* continue to reflect this two-tiered approach, this guidance document was developed by EPA to provide a framework that applicants might choose to apply, in consultation with the appropriate permitting authority, to develop and use MERPs in estimating single-source impacts on secondary pollutants under the proposed first tier approach (i.e.,

Sections 5.3.2.b and 5.4.2.b of the proposed *Guideline*). As illustrated in the examples above, use of MERPs for each precursor as a Tier 1 demonstration tool could be based on either the most conservative (lowest) value across a region/area or the source-specific value derived from a more similar hypothetical source modeled by a permit applicant, permitting authority or EPA.

Consistent with the proposed recommendations in EPA's *Guideline*, the appropriate tier for a given application should be selected in consultation with the appropriate reviewing authority (paragraph 3.0(b)) and be consistent with EPA guidance. If the two-tiered approach is included in the final *Guideline* revisions, permit applicants could choose to utilize the EPA analytical work reflected in this draft guidance as part of a Tier 1 demonstration for a specific PSD permit situation. To do so, one approach could be for the permit applicant to present to the appropriate permitting authority a technically credible justification that the emissions characteristics (e.g., stack height) of the specific source described in a permit application and the chemical and physical environment in the vicinity of that proposed source are adequately represented by the various hypothetical sources modeled by EPA, such that the most conservative (lowest) illustrative MERP values in a region or across the US, as shown in Table 7-1, may be appropriate to use for the Tier 1 demonstration in an individual permit application. Another possible approach would be for the permit applicant to show the appropriate permitting authority that the project source is more similar to certain hypothetical sources modeled as part of the EPA's assessment presented in Chapter 5. If that is the case, then the detailed results presented in Appendix A may better represent the O_3 or $PM_{2.5}$ impacts of the project source or specific location. If either of these approaches is contemplated, EPA recommends that the permit applicant consult with the appropriate permit reviewing authority in developing a modeling protocol and that both parties confirm, at that time, the appropriateness of using these modeling results for any particular permitting situation. As part of the protocol, the permit applicant should include a narrative that provides a technical justification that the existing information is relevant for the project source scenario.

8 Acknowledgements

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APPENDIX A. Relationship between hypothetical sources and maximum downwind impacts

The following table presents the maximum impacts for sources modeled with annual simulations. The highest 8-hr O_3 impacts are shown in Table A-1, daily $PM_{2.5}$ in Table A-2, and annual average $PM_{2.5}$ in Table A-3. These sources are described in more detail elsewhere (Baker et al., 2015b; U.S. Environmental Protection Agency, 2016). Emissions are shown in tons per year (tpy) and release heights relate to surface release (L) or elevated release (H). Source type "L" refers to sources modeled with surface level emissions releases: stack height of 1 m, stack diameter of 5 m, exit temperature of 311 K, exit velocity of 27 m/s, and flow rate of 537 m^3/s. Source type "H" refers to sources modeled with elevated emissions releases: stack height of 90 m, stack diameter of 5 m, exit temperature of 311 K, exit velocity of 27 m/s, and flow rate of 537 m^3/s. The source number are shown by location in the map below (Figures A-1, A-2, and A-3). With respect to the areas, CUS=central U.S., WUS=western U.S., and EUS=eastern U.S. Impacts shown are the maximum daily $PM_{2.5}$ impacts, maximum annual $PM_{2.5}$ impacts, and maximum daily 8-hr maximum impacts over annual simulations.

Figure A-1. Hypothetical source locations for the eastern U.S. (EUS) domain.

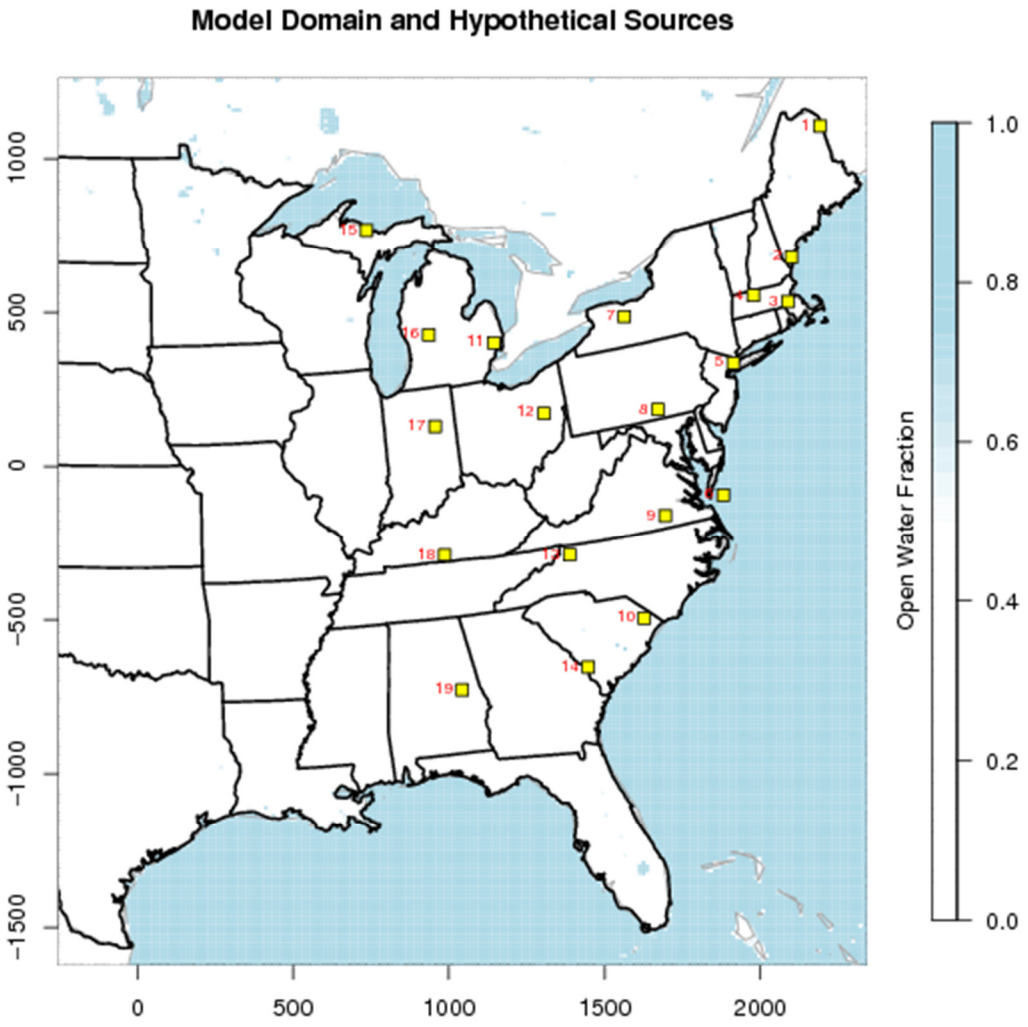

Figure A-2. Hypothetical source locations for the central U.S. (CUS) domain.

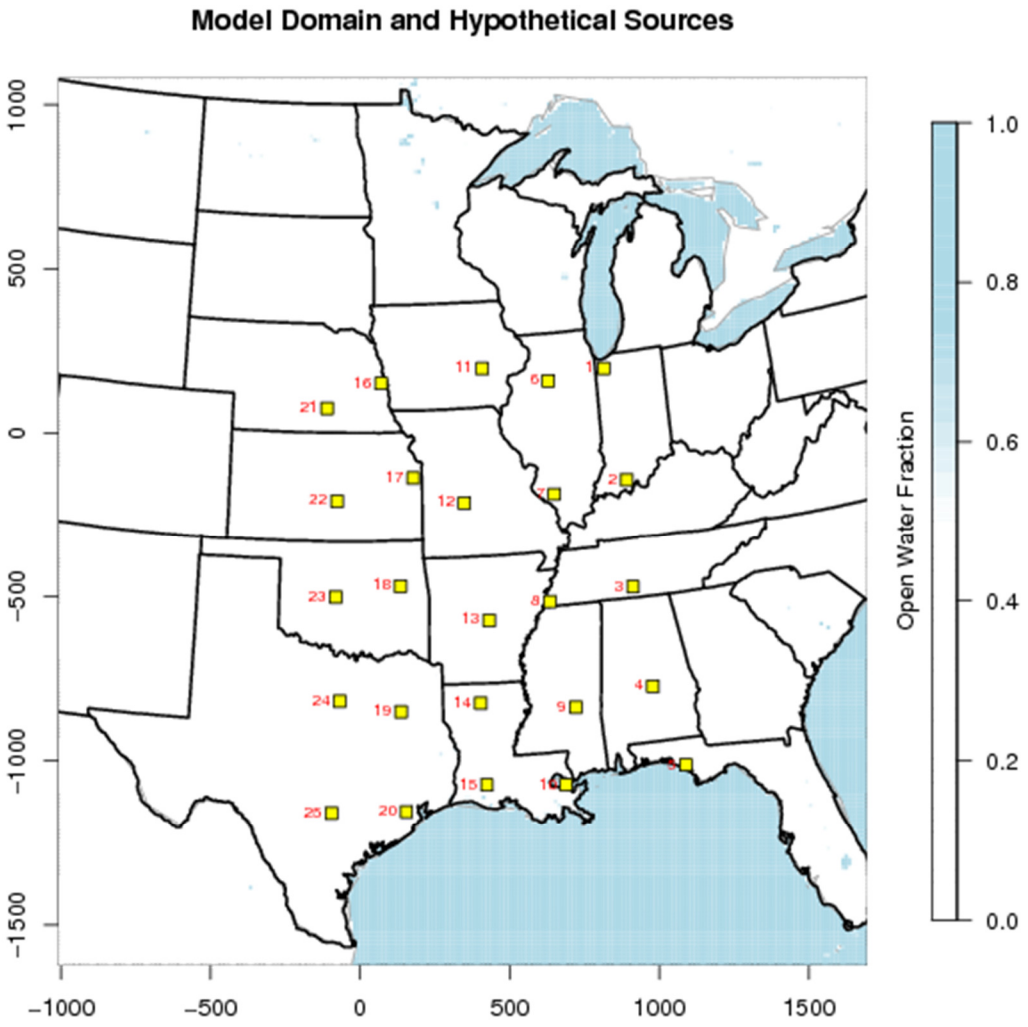

Figure A-3. Hypothetical source locations for the western U.S. (WUS) domain.

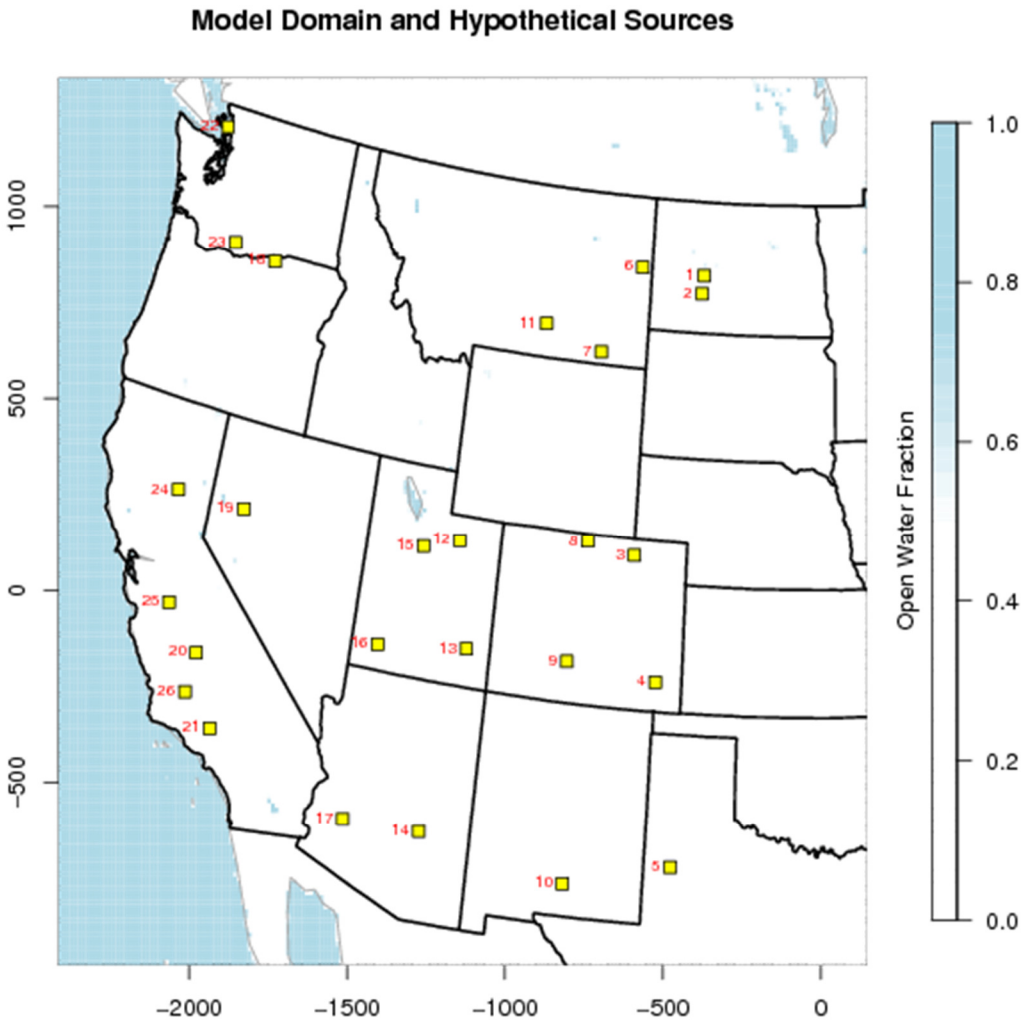

Table A-1. Highest daily maximum 8-hr O_3 impacts from NO_X and VOC sources from multiple hypothetical source model simulations. Source locations are shown in Figures A1-A3.

Precursor	Area	Emissions (tpy)	Height	Source	FIPS	State	County	Max Impact (ppb)
NOx	CUS	500	H	1	18127	Indiana	Porter	1.15
NOx	CUS	500	H	2	18037	Indiana	Dubois	2.11
NOx	CUS	500	H	3	47055	Tennessee	Giles	3.21
NOx	CUS	500	H	4	1001	Alabama	Autauga	2.41
NOx	CUS	500	H	5	12005	Florida	Bay	1.04
NOx	CUS	500	H	6	17155	Illinois	Putnam	1.34
NOx	CUS	500	H	7	17145	Illinois	Perry	3.88
NOx	CUS	500	H	8	47157	Tennessee	Shelby	0.70
NOx	CUS	500	H	9	28129	Mississippi	Smith	2.60
NOx	CUS	500	H	10	22071	Louisiana	Orleans	1.33
NOx	CUS	500	H	11	19095	Iowa	Iowa	1.37
NOx	CUS	500	H	12	29029	Missouri	Camden	2.12
NOx	CUS	500	H	13	5119	Arkansas	Pulaski	0.97
NOx	CUS	500	H	14	22061	Louisiana	Lincoln	1.91
NOx	CUS	500	H	15	22001	Louisiana	Acadia	2.51
NOx	CUS	500	H	16	31055	Nebraska	Douglas	1.43
NOx	CUS	500	H	17	20091	Kansas	Johnson	1.19
NOx	CUS	500	H	18	40101	Oklahoma	Muskogee	1.43
NOx	CUS	500	H	19	48213	Texas	Henderson	1.93
NOx	CUS	500	H	20	48201	Texas	Harris	0.78
NOx	CUS	500	H	21	31001	Nebraska	Adams	1.27
NOx	CUS	500	H	22	20155	Kansas	Reno	1.33
NOx	CUS	500	H	23	40017	Oklahoma	Canadian	0.57
NOx	CUS	500	H	24	48367	Texas	Parker	1.30
NOx	CUS	500	H	25	48187	Texas	Guadalupe	0.72
NOx	CUS	500	L	1	18127	Indiana	Porter	1.18
NOx	CUS	500	L	2	18037	Indiana	Dubois	2.14
NOx	CUS	500	L	3	47055	Tennessee	Giles	3.07
NOx	CUS	500	L	4	1001	Alabama	Autauga	2.43
NOx	CUS	500	L	5	12005	Florida	Bay	1.13
NOx	CUS	500	L	6	17155	Illinois	Putnam	1.40
NOx	CUS	500	L	7	17145	Illinois	Perry	3.97
NOx	CUS	500	L	8	47157	Tennessee	Shelby	0.69
NOx	CUS	500	L	9	28129	Mississippi	Smith	2.63
NOx	CUS	500	L	10	22071	Louisiana	Orleans	1.36
NOx	CUS	500	L	11	19095	Iowa	Iowa	1.39
NOx	CUS	500	L	12	29029	Missouri	Camden	2.29
NOx	CUS	500	L	13	5119	Arkansas	Pulaski	0.95
NOx	CUS	500	L	14	22061	Louisiana	Lincoln	1.97
NOx	CUS	500	L	15	22001	Louisiana	Acadia	2.53
NOx	CUS	500	L	16	31055	Nebraska	Douglas	1.50
NOx	CUS	500	L	17	20091	Kansas	Johnson	1.20
NOx	CUS	500	L	18	40101	Oklahoma	Muskogee	1.46
NOx	CUS	500	L	19	48213	Texas	Henderson	2.00
NOx	CUS	500	L	20	48201	Texas	Harris	0.79
NOx	CUS	500	L	21	31001	Nebraska	Adams	1.25
NOx	CUS	500	L	22	20155	Kansas	Reno	1.35

NOx	CUS	500	L	23	40017	Oklahoma	Canadian	0.58
NOx	CUS	500	L	24	48367	Texas	Parker	1.29
NOx	CUS	500	L	25	48187	Texas	Guadalupe	0.73
NOx	CUS	1000	H	1	18127	Indiana	Porter	2.04
NOx	CUS	1000	H	2	18037	Indiana	Dubois	3.76
NOx	CUS	1000	H	3	47055	Tennessee	Giles	5.39
NOx	CUS	1000	H	4	1001	Alabama	Autauga	4.20
NOx	CUS	1000	H	5	12005	Florida	Bay	1.94
NOx	CUS	1000	H	6	17155	Illinois	Putnam	2.40
NOx	CUS	1000	H	7	17145	Illinois	Perry	6.49
NOx	CUS	1000	H	8	47157	Tennessee	Shelby	1.29
NOx	CUS	1000	H	9	28129	Mississippi	Smith	4.43
NOx	CUS	1000	H	10	22071	Louisiana	Orleans	2.48
NOx	CUS	1000	H	11	19095	Iowa	Iowa	2.45
NOx	CUS	1000	H	12	29029	Missouri	Camden	3.82
NOx	CUS	1000	H	13	5119	Arkansas	Pulaski	1.85
NOx	CUS	1000	H	14	22061	Louisiana	Lincoln	3.57
NOx	CUS	1000	H	15	22001	Louisiana	Acadia	4.58
NOx	CUS	1000	H	16	31055	Nebraska	Douglas	2.64
NOx	CUS	1000	H	17	20091	Kansas	Johnson	2.25
NOx	CUS	1000	H	18	40101	Oklahoma	Muskogee	2.61
NOx	CUS	1000	H	19	48213	Texas	Henderson	3.46
NOx	CUS	1000	H	20	48201	Texas	Harris	1.35
NOx	CUS	1000	H	21	31001	Nebraska	Adams	1.88
NOx	CUS	1000	H	22	20155	Kansas	Reno	2.40
NOx	CUS	1000	H	23	40017	Oklahoma	Canadian	1.09
NOx	CUS	1000	H	24	48367	Texas	Parker	2.31
NOx	CUS	1000	H	25	48187	Texas	Guadalupe	1.34
NOx	CUS	3000	H	1	18127	Indiana	Porter	2.81
NOx	CUS	3000	H	2	18037	Indiana	Dubois	8.83
NOx	CUS	3000	H	3	47055	Tennessee	Giles	10.36
NOx	CUS	3000	H	4	1001	Alabama	Autauga	9.38
NOx	CUS	3000	H	5	12005	Florida	Bay	4.55
NOx	CUS	3000	H	6	17155	Illinois	Putnam	5.14
NOx	CUS	3000	H	7	17145	Illinois	Perry	12.34
NOx	CUS	3000	H	8	47157	Tennessee	Shelby	2.23
NOx	CUS	3000	H	9	28129	Mississippi	Smith	10.42
NOx	CUS	3000	H	10	22071	Louisiana	Orleans	6.02
NOx	CUS	3000	H	11	19095	Iowa	Iowa	4.43
NOx	CUS	3000	H	12	29029	Missouri	Camden	9.14
NOx	CUS	3000	H	13	5119	Arkansas	Pulaski	4.77
NOx	CUS	3000	H	14	22061	Louisiana	Lincoln	8.41
NOx	CUS	3000	H	15	22001	Louisiana	Acadia	10.52
NOx	CUS	3000	H	16	31055	Nebraska	Douglas	6.22
NOx	CUS	3000	H	17	20091	Kansas	Johnson	5.68
NOx	CUS	3000	H	18	40101	Oklahoma	Muskogee	6.35
NOx	CUS	3000	H	19	48213	Texas	Henderson	8.42
NOx	CUS	3000	H	20	48201	Texas	Harris	2.81
NOx	CUS	3000	H	21	31001	Nebraska	Adams	2.46
NOx	CUS	3000	H	22	20155	Kansas	Reno	4.69
NOx	CUS	3000	H	23	40017	Oklahoma	Canadian	2.79
NOx	CUS	3000	H	24	48367	Texas	Parker	5.14
NOx	CUS	3000	H	25	48187	Texas	Guadalupe	3.06
NOx	EUS	500	H	1	23003	Maine	Aroostook	2.09

NOx	EUS	500	H	2	23031	Maine	York	0.81
NOx	EUS	500	H	3	25021	Massachusetts	Norfolk	0.72
NOx	EUS	500	H	4	25011	Massachusetts	Franklin	1.97
NOx	EUS	500	H	5	36005	New York	Bronx	0.09
NOx	EUS	500	H	7	36051	New York	Livingston	1.09
NOx	EUS	500	H	8	42001	Pennsylvania	Adams	1.66
NOx	EUS	500	H	9	51053	Virginia	Dinwiddie	2.01
NOx	EUS	500	H	10	45051	South Carolina	Horry	2.06
NOx	EUS	500	H	11	26099	Michigan	Macomb	0.94
NOx	EUS	500	H	12	39157	Ohio	Tuscarawas	1.35
NOx	EUS	500	H	13	37009	North Carolina	Ashe	1.87
NOx	EUS	500	H	14	45005	South Carolina	Allendale	2.88
NOx	EUS	500	H	15	26103	Michigan	Marquette	0.52
NOx	EUS	500	H	16	26117	Michigan	Montcalm	2.16
NOx	EUS	500	H	17	18053	Indiana	Grant	1.78
NOx	EUS	500	H	18	21009	Kentucky	Barren	2.95
NOx	EUS	500	H	19	1123	Alabama	Tallapoosa	1.53
NOx	EUS	500	L	1	23003	Maine	Aroostook	2.18
NOx	EUS	500	L	2	23031	Maine	York	0.79
NOx	EUS	500	L	3	25021	Massachusetts	Norfolk	0.74
NOx	EUS	500	L	4	25011	Massachusetts	Franklin	1.95
NOx	EUS	500	L	5	36005	New York	Bronx	0.09
NOx	EUS	500	L	7	36051	New York	Livingston	1.07
NOx	EUS	500	L	8	42001	Pennsylvania	Adams	1.67
NOx	EUS	500	L	9	51053	Virginia	Dinwiddie	2.00
NOx	EUS	500	L	10	45051	South Carolina	Horry	2.11
NOx	EUS	500	L	11	26099	Michigan	Macomb	0.94
NOx	EUS	500	L	12	39157	Ohio	Tuscarawas	1.36
NOx	EUS	500	L	13	37009	North Carolina	Ashe	1.81
NOx	EUS	500	L	14	45005	South Carolina	Allendale	2.94
NOx	EUS	500	L	15	26103	Michigan	Marquette	0.70
NOx	EUS	500	L	16	26117	Michigan	Montcalm	2.20
NOx	EUS	500	L	17	18053	Indiana	Grant	1.80
NOx	EUS	500	L	18	21009	Kentucky	Barren	2.91
NOx	EUS	500	L	19	1123	Alabama	Tallapoosa	1.87
NOx	EUS	1000	H	1	23003	Maine	Aroostook	2.89
NOx	EUS	1000	H	2	23031	Maine	York	1.42
NOx	EUS	1000	H	3	25021	Massachusetts	Norfolk	1.35
NOx	EUS	1000	H	4	25011	Massachusetts	Franklin	3.42
NOx	EUS	1000	H	5	36005	New York	Bronx	0.18
NOx	EUS	1000	H	7	36051	New York	Livingston	1.98
NOx	EUS	1000	H	8	42001	Pennsylvania	Adams	2.98
NOx	EUS	1000	H	9	51053	Virginia	Dinwiddie	3.41
NOx	EUS	1000	H	10	45051	South Carolina	Horry	3.66
NOx	EUS	1000	H	11	26099	Michigan	Macomb	1.70
NOx	EUS	1000	H	12	39157	Ohio	Tuscarawas	2.44
NOx	EUS	1000	H	13	37009	North Carolina	Ashe	3.14
NOx	EUS	1000	H	14	45005	South Carolina	Allendale	4.99
NOx	EUS	1000	H	15	26103	Michigan	Marquette	0.99
NOx	EUS	1000	H	16	26117	Michigan	Montcalm	3.83
NOx	EUS	1000	H	17	18053	Indiana	Grant	3.17
NOx	EUS	1000	H	18	21009	Kentucky	Barren	5.03
NOx	EUS	1000	H	19	1123	Alabama	Tallapoosa	3.06
NOx	EUS	3000	H	1	23003	Maine	Aroostook	4.74

NOx	EUS	3000	H	2	23031	Maine	York	3.49
NOx	EUS	3000	H	3	25021	Massachusetts	Norfolk	3.12
NOx	EUS	3000	H	4	25011	Massachusetts	Franklin	6.06
NOx	EUS	3000	H	5	36005	New York	Bronx	0.52
NOx	EUS	3000	H	7	36051	New York	Livingston	4.23
NOx	EUS	3000	H	8	42001	Pennsylvania	Adams	6.61
NOx	EUS	3000	H	9	51053	Virginia	Dinwiddie	6.59
NOx	EUS	3000	H	10	45051	South Carolina	Horry	8.58
NOx	EUS	3000	H	11	26099	Michigan	Macomb	3.43
NOx	EUS	3000	H	12	39157	Ohio	Tuscarawas	4.99
NOx	EUS	3000	H	13	37009	North Carolina	Ashe	6.34
NOx	EUS	3000	H	14	45005	South Carolina	Allendale	11.24
NOx	EUS	3000	H	15	26103	Michigan	Marquette	2.52
NOx	EUS	3000	H	16	26117	Michigan	Montcalm	7.31
NOx	EUS	3000	H	17	18053	Indiana	Grant	4.69
NOx	EUS	3000	H	18	21009	Kentucky	Barren	10.69
NOx	EUS	3000	H	19	1123	Alabama	Tallapoosa	6.49
NOx	WUS	500	H	1	38057	North Dakota	Mercer	0.15
NOx	WUS	500	H	2	38059	North Dakota	Morton	2.72
NOx	WUS	500	H	3	8123	Colorado	Weld	1.73
NOx	WUS	500	H	4	8011	Colorado	Bent	2.08
NOx	WUS	500	H	5	48445	Texas	Terry	1.17
NOx	WUS	500	H	6	30083	Montana	Richland	1.94
NOx	WUS	500	H	7	30075	Montana	Powder River	1.70
NOx	WUS	500	H	8	8069	Colorado	Larimer	0.59
NOx	WUS	500	H	9	8109	Colorado	Saguache	1.93
NOx	WUS	500	H	10	35035	New Mexico	Otero	1.16
NOx	WUS	500	H	11	30111	Montana	Yellowstone	1.39
NOx	WUS	500	H	12	49013	Utah	Duchesne	1.23
NOx	WUS	500	H	13	49037	Utah	San Juan	1.19
NOx	WUS	500	H	14	4007	Arizona	Gila	1.18
NOx	WUS	500	H	15	49049	Utah	Utah	1.40
NOx	WUS	500	H	16	49021	Utah	Iron	0.82
NOx	WUS	500	H	17	4012	Arizona	La Paz	2.33
NOx	WUS	500	H	18	41049	Oregon	Morrow	1.94
NOx	WUS	500	H	19	32001	Nevada	Churchill	2.25
NOx	WUS	500	H	20	6107	California	Tulare	1.32
NOx	WUS	500	H	21	6037	California	Los Angeles	0.84
NOx	WUS	500	H	22	53057	Washington	Skagit	0.14
NOx	WUS	500	H	23	53039	Washington	Klickitat	2.32
NOx	WUS	500	H	24	6063	California	Plumas	1.34
NOx	WUS	500	H	25	6047	California	Merced	1.22
NOx	WUS	500	H	26	6029	California	Kern	1.51
NOx	WUS	500	L	1	38057	North Dakota	Mercer	0.18
NOx	WUS	500	L	2	38059	North Dakota	Morton	2.71
NOx	WUS	500	L	3	8123	Colorado	Weld	1.77
NOx	WUS	500	L	4	8011	Colorado	Bent	2.13
NOx	WUS	500	L	5	48445	Texas	Terry	1.20
NOx	WUS	500	L	6	30083	Montana	Richland	1.89
NOx	WUS	500	L	7	30075	Montana	Powder River	1.51
NOx	WUS	500	L	8	8069	Colorado	Larimer	0.61
NOx	WUS	500	L	9	8109	Colorado	Saguache	1.95
NOx	WUS	500	L	10	35035	New Mexico	Otero	1.21
NOx	WUS	500	L	11	30111	Montana	Yellowstone	1.41

NOx	WUS	500	L	12	49013	Utah	Duchesne	1.28
NOx	WUS	500	L	13	49037	Utah	San Juan	1.43
NOx	WUS	500	L	14	4007	Arizona	Gila	1.23
NOx	WUS	500	L	15	49049	Utah	Utah	1.95
NOx	WUS	500	L	16	49021	Utah	Iron	0.69
NOx	WUS	500	L	17	4012	Arizona	La Paz	2.34
NOx	WUS	500	L	18	41049	Oregon	Morrow	1.94
NOx	WUS	500	L	19	32001	Nevada	Churchill	2.29
NOx	WUS	500	L	20	6107	California	Tulare	1.31
NOx	WUS	500	L	21	6037	California	Los Angeles	0.84
NOx	WUS	500	L	22	53057	Washington	Skagit	0.16
NOx	WUS	500	L	23	53039	Washington	Klickitat	2.52
NOx	WUS	500	L	24	6063	California	Plumas	1.33
NOx	WUS	500	L	25	6047	California	Merced	1.15
NOx	WUS	500	L	26	6029	California	Kern	1.46
NOx	WUS	1000	H	1	38057	North Dakota	Mercer	0.29
NOx	WUS	1000	H	2	38059	North Dakota	Morton	4.53
NOx	WUS	1000	H	3	8123	Colorado	Weld	2.95
NOx	WUS	1000	H	4	8011	Colorado	Bent	3.57
NOx	WUS	1000	H	5	48445	Texas	Terry	2.04
NOx	WUS	1000	H	6	30083	Montana	Richland	3.44
NOx	WUS	1000	H	7	30075	Montana	Powder River	2.96
NOx	WUS	1000	H	8	8069	Colorado	Larimer	1.06
NOx	WUS	1000	H	9	8109	Colorado	Saguache	3.38
NOx	WUS	1000	H	10	35035	New Mexico	Otero	1.94
NOx	WUS	1000	H	11	30111	Montana	Yellowstone	2.39
NOx	WUS	1000	H	12	49013	Utah	Duchesne	2.04
NOx	WUS	1000	H	13	49037	Utah	San Juan	2.41
NOx	WUS	1000	H	14	4007	Arizona	Gila	2.17
NOx	WUS	1000	H	15	49049	Utah	Utah	2.15
NOx	WUS	1000	H	16	49021	Utah	Iron	1.31
NOx	WUS	1000	H	17	4012	Arizona	La Paz	4.10
NOx	WUS	1000	H	18	41049	Oregon	Morrow	2.71
NOx	WUS	1000	H	19	32001	Nevada	Churchill	3.81
NOx	WUS	1000	H	20	6107	California	Tulare	2.31
NOx	WUS	1000	H	21	6037	California	Los Angeles	1.46
NOx	WUS	1000	H	22	53057	Washington	Skagit	0.27
NOx	WUS	1000	H	23	53039	Washington	Klickitat	4.19
NOx	WUS	1000	H	24	6063	California	Plumas	2.36
NOx	WUS	1000	H	25	6047	California	Merced	1.57
NOx	WUS	1000	H	26	6029	California	Kern	2.55
NOx	WUS	3000	H	1	38057	North Dakota	Mercer	0.78
NOx	WUS	3000	H	2	38059	North Dakota	Morton	5.39
NOx	WUS	3000	H	3	8123	Colorado	Weld	5.40
NOx	WUS	3000	H	4	8011	Colorado	Bent	6.21
NOx	WUS	3000	H	5	48445	Texas	Terry	4.29
NOx	WUS	3000	H	6	30083	Montana	Richland	4.74
NOx	WUS	3000	H	7	30075	Montana	Powder River	5.90
NOx	WUS	3000	H	8	8069	Colorado	Larimer	2.54
NOx	WUS	3000	H	9	8109	Colorado	Saguache	6.72
NOx	WUS	3000	H	10	35035	New Mexico	Otero	3.87
NOx	WUS	3000	H	11	30111	Montana	Yellowstone	4.44
NOx	WUS	3000	H	12	49013	Utah	Duchesne	3.75
NOx	WUS	3000	H	13	49037	Utah	San Juan	5.24

NOx	WUS	3000	H	14	4007	Arizona	Gila	4.20
NOx	WUS	3000	H	15	49049	Utah	Utah	5.25
NOx	WUS	3000	H	16	49021	Utah	Iron	2.94
NOx	WUS	3000	H	17	4012	Arizona	La Paz	8.75
NOx	WUS	3000	H	18	41049	Oregon	Morrow	4.73
NOx	WUS	3000	H	19	32001	Nevada	Churchill	6.92
NOx	WUS	3000	H	20	6107	California	Tulare	3.75
NOx	WUS	3000	H	21	6037	California	Los Angeles	3.31
NOx	WUS	3000	H	22	53057	Washington	Skagit	0.74
NOx	WUS	3000	H	23	53039	Washington	Klickitat	7.95
NOx	WUS	3000	H	24	6063	California	Plumas	4.93
NOx	WUS	3000	H	25	6047	California	Merced	3.21
NOx	WUS	3000	H	26	6029	California	Kern	4.05
VOC	CUS	500	L	1	18127	Indiana	Porter	0.42
VOC	CUS	500	L	2	18037	Indiana	Dubois	0.10
VOC	CUS	500	L	3	47055	Tennessee	Giles	0.04
VOC	CUS	500	L	4	1001	Alabama	Autauga	0.08
VOC	CUS	500	L	5	12005	Florida	Bay	0.28
VOC	CUS	500	L	6	17155	Illinois	Putnam	0.13
VOC	CUS	500	L	7	17145	Illinois	Perry	0.11
VOC	CUS	500	L	8	47157	Tennessee	Shelby	0.30
VOC	CUS	500	L	9	28129	Mississippi	Smith	0.02
VOC	CUS	500	L	10	22071	Louisiana	Orleans	0.22
VOC	CUS	500	L	11	19095	Iowa	Iowa	0.14
VOC	CUS	500	L	12	29029	Missouri	Camden	0.05
VOC	CUS	500	L	13	5119	Arkansas	Pulaski	0.21
VOC	CUS	500	L	14	22061	Louisiana	Lincoln	0.04
VOC	CUS	500	L	15	22001	Louisiana	Acadia	0.12
VOC	CUS	500	L	16	31055	Nebraska	Douglas	0.23
VOC	CUS	500	L	17	20091	Kansas	Johnson	0.08
VOC	CUS	500	L	18	40101	Oklahoma	Muskogee	0.14
VOC	CUS	500	L	19	48213	Texas	Henderson	0.05
VOC	CUS	500	L	20	48201	Texas	Harris	0.14
VOC	CUS	500	L	21	31001	Nebraska	Adams	0.35
VOC	CUS	500	L	22	20155	Kansas	Reno	0.09
VOC	CUS	500	L	23	40017	Oklahoma	Canadian	0.07
VOC	CUS	500	L	24	48367	Texas	Parker	0.17
VOC	CUS	500	L	25	48187	Texas	Guadalupe	0.16
VOC	CUS	1000	H	1	18127	Indiana	Porter	0.78
VOC	CUS	1000	H	2	18037	Indiana	Dubois	0.20
VOC	CUS	1000	H	3	47055	Tennessee	Giles	0.10
VOC	CUS	1000	H	4	1001	Alabama	Autauga	0.12
VOC	CUS	1000	H	5	12005	Florida	Bay	0.49
VOC	CUS	1000	H	6	17155	Illinois	Putnam	0.29
VOC	CUS	1000	H	7	17145	Illinois	Perry	0.22
VOC	CUS	1000	H	8	47157	Tennessee	Shelby	0.64
VOC	CUS	1000	H	9	28129	Mississippi	Smith	0.07
VOC	CUS	1000	H	10	22071	Louisiana	Orleans	0.43
VOC	CUS	1000	H	11	19095	Iowa	Iowa	0.37
VOC	CUS	1000	H	12	29029	Missouri	Camden	0.09
VOC	CUS	1000	H	13	5119	Arkansas	Pulaski	0.46
VOC	CUS	1000	H	14	22061	Louisiana	Lincoln	0.09
VOC	CUS	1000	H	15	22001	Louisiana	Acadia	0.22
VOC	CUS	1000	H	16	31055	Nebraska	Douglas	0.59

VOC	CUS	1000	H	17	20091	Kansas	Johnson	0.16
VOC	CUS	1000	H	18	40101	Oklahoma	Muskogee	0.28
VOC	CUS	1000	H	19	48213	Texas	Henderson	0.15
VOC	CUS	1000	H	20	48201	Texas	Harris	0.29
VOC	CUS	1000	H	21	31001	Nebraska	Adams	0.69
VOC	CUS	1000	H	22	20155	Kansas	Reno	0.18
VOC	CUS	1000	H	23	40017	Oklahoma	Canadian	0.14
VOC	CUS	1000	H	24	48367	Texas	Parker	0.33
VOC	CUS	1000	H	25	48187	Texas	Guadalupe	0.34
VOC	CUS	1000	L	1	18127	Indiana	Porter	0.81
VOC	CUS	1000	L	2	18037	Indiana	Dubois	0.20
VOC	CUS	1000	L	3	47055	Tennessee	Giles	0.09
VOC	CUS	1000	L	4	1001	Alabama	Autauga	0.16
VOC	CUS	1000	L	5	12005	Florida	Bay	0.55
VOC	CUS	1000	L	6	17155	Illinois	Putnam	0.31
VOC	CUS	1000	L	7	17145	Illinois	Perry	0.36
VOC	CUS	1000	L	8	47157	Tennessee	Shelby	0.65
VOC	CUS	1000	L	9	28129	Mississippi	Smith	0.11
VOC	CUS	1000	L	10	22071	Louisiana	Orleans	0.47
VOC	CUS	1000	L	11	19095	Iowa	Iowa	0.42
VOC	CUS	1000	L	12	29029	Missouri	Camden	0.09
VOC	CUS	1000	L	13	5119	Arkansas	Pulaski	0.44
VOC	CUS	1000	L	14	22061	Louisiana	Lincoln	0.09
VOC	CUS	1000	L	15	22001	Louisiana	Acadia	0.26
VOC	CUS	1000	L	16	31055	Nebraska	Douglas	0.54
VOC	CUS	1000	L	17	20091	Kansas	Johnson	0.17
VOC	CUS	1000	L	18	40101	Oklahoma	Muskogee	0.29
VOC	CUS	1000	L	19	48213	Texas	Henderson	0.10
VOC	CUS	1000	L	20	48201	Texas	Harris	0.27
VOC	CUS	1000	L	21	31001	Nebraska	Adams	0.77
VOC	CUS	1000	L	22	20155	Kansas	Reno	0.19
VOC	CUS	1000	L	23	40017	Oklahoma	Canadian	0.15
VOC	CUS	1000	L	24	48367	Texas	Parker	0.33
VOC	CUS	1000	L	25	48187	Texas	Guadalupe	0.36
VOC	CUS	3000	H	1	18127	Indiana	Porter	2.00
VOC	CUS	3000	H	2	18037	Indiana	Dubois	0.89
VOC	CUS	3000	H	3	47055	Tennessee	Giles	0.75
VOC	CUS	3000	H	4	1001	Alabama	Autauga	0.66
VOC	CUS	3000	H	5	12005	Florida	Bay	1.29
VOC	CUS	3000	H	6	17155	Illinois	Putnam	1.70
VOC	CUS	3000	H	7	17145	Illinois	Perry	1.61
VOC	CUS	3000	H	8	47157	Tennessee	Shelby	2.24
VOC	CUS	3000	H	9	28129	Mississippi	Smith	0.61
VOC	CUS	3000	H	10	22071	Louisiana	Orleans	1.43
VOC	CUS	3000	H	11	19095	Iowa	Iowa	1.55
VOC	CUS	3000	H	12	29029	Missouri	Camden	0.35
VOC	CUS	3000	H	13	5119	Arkansas	Pulaski	1.59
VOC	CUS	3000	H	14	22061	Louisiana	Lincoln	0.29
VOC	CUS	3000	H	15	22001	Louisiana	Acadia	1.02
VOC	CUS	3000	H	16	31055	Nebraska	Douglas	2.05
VOC	CUS	3000	H	17	20091	Kansas	Johnson	0.58
VOC	CUS	3000	H	18	40101	Oklahoma	Muskogee	0.84
VOC	CUS	3000	H	19	48213	Texas	Henderson	0.51
VOC	CUS	3000	H	20	48201	Texas	Harris	1.09

VOC	CUS	3000	H	21	31001	Nebraska	Adams	3.16
VOC	CUS	3000	H	22	20155	Kansas	Reno	0.76
VOC	CUS	3000	H	23	40017	Oklahoma	Canadian	0.44
VOC	CUS	3000	H	24	48367	Texas	Parker	1.31
VOC	CUS	3000	H	25	48187	Texas	Guadalupe	1.29
VOC	EUS	500	H	1	23003	Maine	Aroostook	0.12
VOC	EUS	500	H	2	23031	Maine	York	0.22
VOC	EUS	500	H	3	25021	Massachusetts	Norfolk	0.14
VOC	EUS	500	H	4	25011	Massachusetts	Franklin	0.10
VOC	EUS	500	H	5	36005	New York	Bronx	0.08
VOC	EUS	500	H	7	36051	New York	Livingston	0.10
VOC	EUS	500	H	8	42001	Pennsylvania	Adams	0.16
VOC	EUS	500	H	9	51053	Virginia	Dinwiddie	0.07
VOC	EUS	500	H	10	45051	South Carolina	Horry	0.03
VOC	EUS	500	H	11	26099	Michigan	Macomb	0.28
VOC	EUS	500	H	12	39157	Ohio	Tuscarawas	0.17
VOC	EUS	500	H	13	37009	North Carolina	Ashe	0.03
VOC	EUS	500	H	14	45005	South Carolina	Allendale	0.01
VOC	EUS	500	H	15	26103	Michigan	Marquette	0.32
VOC	EUS	500	H	16	26117	Michigan	Montcalm	0.20
VOC	EUS	500	H	17	18053	Indiana	Grant	0.39
VOC	EUS	500	H	18	21009	Kentucky	Barren	0.06
VOC	EUS	500	H	19	1123	Alabama	Tallapoosa	0.05
VOC	EUS	500	L	1	23003	Maine	Aroostook	0.14
VOC	EUS	500	L	2	23031	Maine	York	0.23
VOC	EUS	500	L	3	25021	Massachusetts	Norfolk	0.14
VOC	EUS	500	L	4	25011	Massachusetts	Franklin	0.11
VOC	EUS	500	L	5	36005	New York	Bronx	0.09
VOC	EUS	500	L	7	36051	New York	Livingston	0.13
VOC	EUS	500	L	8	42001	Pennsylvania	Adams	0.16
VOC	EUS	500	L	9	51053	Virginia	Dinwiddie	0.06
VOC	EUS	500	L	10	45051	South Carolina	Horry	0.03
VOC	EUS	500	L	11	26099	Michigan	Macomb	0.25
VOC	EUS	500	L	12	39157	Ohio	Tuscarawas	0.18
VOC	EUS	500	L	13	37009	North Carolina	Ashe	0.06
VOC	EUS	500	L	14	45005	South Carolina	Allendale	0.02
VOC	EUS	500	L	15	26103	Michigan	Marquette	0.32
VOC	EUS	500	L	16	26117	Michigan	Montcalm	0.22
VOC	EUS	500	L	17	18053	Indiana	Grant	0.43
VOC	EUS	500	L	18	21009	Kentucky	Barren	0.06
VOC	EUS	500	L	19	1123	Alabama	Tallapoosa	0.06
VOC	EUS	1000	H	1	23003	Maine	Aroostook	0.26
VOC	EUS	1000	H	2	23031	Maine	York	0.44
VOC	EUS	1000	H	3	25021	Massachusetts	Norfolk	0.28
VOC	EUS	1000	H	4	25011	Massachusetts	Franklin	0.17
VOC	EUS	1000	H	5	36005	New York	Bronx	0.16
VOC	EUS	1000	H	7	36051	New York	Livingston	0.20
VOC	EUS	1000	H	8	42001	Pennsylvania	Adams	0.30
VOC	EUS	1000	H	9	51053	Virginia	Dinwiddie	0.16
VOC	EUS	1000	H	10	45051	South Carolina	Horry	0.07
VOC	EUS	1000	H	11	26099	Michigan	Macomb	0.51
VOC	EUS	1000	H	12	39157	Ohio	Tuscarawas	0.37
VOC	EUS	1000	H	13	37009	North Carolina	Ashe	0.08
VOC	EUS	1000	H	14	45005	South Carolina	Allendale	0.06

VOC	EUS	1000	H	15	26103	Michigan	Marquette	0.60
VOC	EUS	1000	H	16	26117	Michigan	Montcalm	0.49
VOC	EUS	1000	H	17	18053	Indiana	Grant	0.75
VOC	EUS	1000	H	18	21009	Kentucky	Barren	0.13
VOC	EUS	1000	H	19	1123	Alabama	Tallapoosa	0.10
VOC	EUS	3000	H	1	23003	Maine	Aroostook	1.45
VOC	EUS	3000	H	2	23031	Maine	York	1.31
VOC	EUS	3000	H	3	25021	Massachusetts	Norfolk	0.80
VOC	EUS	3000	H	4	25011	Massachusetts	Franklin	0.47
VOC	EUS	3000	H	5	36005	New York	Bronx	0.48
VOC	EUS	3000	H	7	36051	New York	Livingston	1.16
VOC	EUS	3000	H	8	42001	Pennsylvania	Adams	0.76
VOC	EUS	3000	H	9	51053	Virginia	Dinwiddie	0.81
VOC	EUS	3000	H	10	45051	South Carolina	Horry	0.34
VOC	EUS	3000	H	11	26099	Michigan	Macomb	1.14
VOC	EUS	3000	H	12	39157	Ohio	Tuscarawas	1.15
VOC	EUS	3000	H	13	37009	North Carolina	Ashe	0.36
VOC	EUS	3000	H	14	45005	South Carolina	Allendale	0.43
VOC	EUS	3000	H	15	26103	Michigan	Marquette	1.41
VOC	EUS	3000	H	16	26117	Michigan	Montcalm	1.52
VOC	EUS	3000	H	17	18053	Indiana	Grant	2.01
VOC	EUS	3000	H	18	21009	Kentucky	Barren	0.90
VOC	EUS	3000	H	19	1123	Alabama	Tallapoosa	0.55
VOC	WUS	500	H	1	38057	North Dakota	Mercer	0.21
VOC	WUS	500	H	2	38059	North Dakota	Morton	0.29
VOC	WUS	500	H	3	8123	Colorado	Weld	0.08
VOC	WUS	500	H	4	8011	Colorado	Bent	0.05
VOC	WUS	500	H	5	48445	Texas	Terry	0.03
VOC	WUS	500	H	6	30083	Montana	Richland	0.15
VOC	WUS	500	H	7	30075	Montana	Powder River	0.08
VOC	WUS	500	H	8	8069	Colorado	Larimer	0.02
VOC	WUS	500	H	9	8109	Colorado	Saguache	0.04
VOC	WUS	500	H	10	35035	New Mexico	Otero	0.00
VOC	WUS	500	H	11	30111	Montana	Yellowstone	0.13
VOC	WUS	500	H	12	49013	Utah	Duchesne	0.05
VOC	WUS	500	H	13	49037	Utah	San Juan	0.03
VOC	WUS	500	H	14	4007	Arizona	Gila	0.02
VOC	WUS	500	H	15	49049	Utah	Utah	0.29
VOC	WUS	500	H	16	49021	Utah	Iron	0.04
VOC	WUS	500	H	17	4012	Arizona	La Paz	0.02
VOC	WUS	500	H	18	41049	Oregon	Morrow	0.46
VOC	WUS	500	H	19	32001	Nevada	Churchill	0.16
VOC	WUS	500	H	20	6107	California	Tulare	0.31
VOC	WUS	500	H	21	6037	California	Los Angeles	0.06
VOC	WUS	500	H	22	53057	Washington	Skagit	0.22
VOC	WUS	500	H	23	53039	Washington	Klickitat	0.03
VOC	WUS	500	H	24	6063	California	Plumas	0.03
VOC	WUS	500	H	25	6047	California	Merced	0.30
VOC	WUS	500	H	26	6029	California	Kern	0.38
VOC	WUS	500	L	1	38057	North Dakota	Mercer	0.21
VOC	WUS	500	L	2	38059	North Dakota	Morton	0.35
VOC	WUS	500	L	3	8123	Colorado	Weld	0.08
VOC	WUS	500	L	4	8011	Colorado	Bent	0.06
VOC	WUS	500	L	5	48445	Texas	Terry	0.03

VOC	WUS	500	L	6	30083	Montana	Richland	0.16
VOC	WUS	500	L	7	30075	Montana	Powder River	0.05
VOC	WUS	500	L	8	8069	Colorado	Larimer	0.02
VOC	WUS	500	L	9	8109	Colorado	Saguache	0.04
VOC	WUS	500	L	10	35035	New Mexico	Otero	0.01
VOC	WUS	500	L	11	30111	Montana	Yellowstone	0.16
VOC	WUS	500	L	12	49013	Utah	Duchesne	0.06
VOC	WUS	500	L	13	49037	Utah	San Juan	0.03
VOC	WUS	500	L	14	4007	Arizona	Gila	0.02
VOC	WUS	500	L	15	49049	Utah	Utah	0.46
VOC	WUS	500	L	16	49021	Utah	Iron	0.05
VOC	WUS	500	L	17	4012	Arizona	La Paz	0.02
VOC	WUS	500	L	18	41049	Oregon	Morrow	0.46
VOC	WUS	500	L	19	32001	Nevada	Churchill	0.11
VOC	WUS	500	L	20	6107	California	Tulare	0.29
VOC	WUS	500	L	21	6037	California	Los Angeles	0.06
VOC	WUS	500	L	22	53057	Washington	Skagit	0.19
VOC	WUS	500	L	23	53039	Washington	Klickitat	0.04
VOC	WUS	500	L	24	6063	California	Plumas	0.03
VOC	WUS	500	L	25	6047	California	Merced	0.32
VOC	WUS	500	L	26	6029	California	Kern	0.35
VOC	WUS	1000	H	1	38057	North Dakota	Mercer	0.41
VOC	WUS	1000	H	2	38059	North Dakota	Morton	0.59
VOC	WUS	1000	H	3	8123	Colorado	Weld	0.19
VOC	WUS	1000	H	4	8011	Colorado	Bent	0.12
VOC	WUS	1000	H	5	48445	Texas	Terry	0.06
VOC	WUS	1000	H	6	30083	Montana	Richland	0.34
VOC	WUS	1000	H	7	30075	Montana	Powder River	0.35
VOC	WUS	1000	H	8	8069	Colorado	Larimer	0.04
VOC	WUS	1000	H	9	8109	Colorado	Saguache	0.10
VOC	WUS	1000	H	10	35035	New Mexico	Otero	0.03
VOC	WUS	1000	H	11	30111	Montana	Yellowstone	0.29
VOC	WUS	1000	H	12	49013	Utah	Duchesne	0.18
VOC	WUS	1000	H	13	49037	Utah	San Juan	0.11
VOC	WUS	1000	H	14	4007	Arizona	Gila	0.05
VOC	WUS	1000	H	15	49049	Utah	Utah	0.60
VOC	WUS	1000	H	16	49021	Utah	Iron	0.11
VOC	WUS	1000	H	17	4012	Arizona	La Paz	0.06
VOC	WUS	1000	H	18	41049	Oregon	Morrow	0.95
VOC	WUS	1000	H	19	32001	Nevada	Churchill	0.40
VOC	WUS	1000	H	20	6107	California	Tulare	0.66
VOC	WUS	1000	H	21	6037	California	Los Angeles	0.12
VOC	WUS	1000	H	22	53057	Washington	Skagit	0.43
VOC	WUS	1000	H	23	53039	Washington	Klickitat	0.13
VOC	WUS	1000	H	24	6063	California	Plumas	0.06
VOC	WUS	1000	H	25	6047	California	Merced	0.78
VOC	WUS	1000	H	26	6029	California	Kern	0.75
VOC	WUS	3000	H	1	38057	North Dakota	Mercer	1.11
VOC	WUS	3000	H	2	38059	North Dakota	Morton	1.63
VOC	WUS	3000	H	3	8123	Colorado	Weld	0.87
VOC	WUS	3000	H	4	8011	Colorado	Bent	0.84
VOC	WUS	3000	H	5	48445	Texas	Terry	0.22
VOC	WUS	3000	H	6	30083	Montana	Richland	2.17
VOC	WUS	3000	H	7	30075	Montana	Powder River	1.25

VOC	WUS	3000	H	8	8069	Colorado	Larimer	0.18
VOC	WUS	3000	H	9	8109	Colorado	Saguache	0.64
VOC	WUS	3000	H	10	35035	New Mexico	Otero	0.41
VOC	WUS	3000	H	11	30111	Montana	Yellowstone	1.36
VOC	WUS	3000	H	12	49013	Utah	Duchesne	1.12
VOC	WUS	3000	H	13	49037	Utah	San Juan	0.55
VOC	WUS	3000	H	14	4007	Arizona	Gila	0.50
VOC	WUS	3000	H	15	49049	Utah	Utah	1.95
VOC	WUS	3000	H	16	49021	Utah	Iron	0.69
VOC	WUS	3000	H	17	4012	Arizona	La Paz	0.66
VOC	WUS	3000	H	18	41049	Oregon	Morrow	2.38
VOC	WUS	3000	H	19	32001	Nevada	Churchill	2.03
VOC	WUS	3000	H	20	6107	California	Tulare	1.92
VOC	WUS	3000	H	21	6037	California	Los Angeles	0.68
VOC	WUS	3000	H	22	53057	Washington	Skagit	1.21
VOC	WUS	3000	H	23	53039	Washington	Klickitat	1.00
VOC	WUS	3000	H	24	6063	California	Plumas	0.93
VOC	WUS	3000	H	25	6047	California	Merced	2.74
VOC	WUS	3000	H	26	6029	California	Kern	2.01

Table A-2. Highest daily 24-hr $PM_{2.5}$ impacts from NO_X and SO_2 sources from multiple hypothetical source model simulations. Source locations are shown in Figures A1-A3.

Precursor	Area	Emissions (tpy)	Height	Source	FIPS	State	County	Max. Value (ug/m3)
NOx	CUS	500	L	1	18127	Indiana	Porter	0.26
NOx	CUS	500	L	2	18037	Indiana	Dubois	0.18
NOx	CUS	500	L	3	47055	Tennessee	Giles	0.15
NOx	CUS	500	L	4	1001	Alabama	Autauga	0.21
NOx	CUS	500	L	6	17155	Illinois	Putnam	0.10
NOx	CUS	500	L	7	17145	Illinois	Perry	0.14
NOx	CUS	500	L	8	47157	Tennessee	Shelby	0.06
NOx	CUS	500	L	9	28129	Mississippi	Smith	0.27
NOx	CUS	500	L	10	22071	Louisiana	Orleans	0.29
NOx	CUS	500	L	11	19095	Iowa	Iowa	0.12
NOx	CUS	500	L	12	29029	Missouri	Camden	0.11
NOx	CUS	500	L	13	5119	Arkansas	Pulaski	0.14
NOx	CUS	500	L	14	22061	Louisiana	Lincoln	0.11
NOx	CUS	500	L	15	22001	Louisiana	Acadia	0.20
NOx	CUS	500	L	16	31055	Nebraska	Douglas	0.21
NOx	CUS	500	L	17	20091	Kansas	Johnson	0.13
NOx	CUS	500	L	18	40101	Oklahoma	Muskogee	0.12
NOx	CUS	500	L	19	48213	Texas	Henderson	0.12
NOx	CUS	500	L	20	48201	Texas	Harris	0.13
NOx	CUS	500	L	21	31001	Nebraska	Adams	0.35
NOx	CUS	500	L	22	20155	Kansas	Reno	0.08
NOx	CUS	500	L	23	40017	Oklahoma	Canadian	0.06
NOx	CUS	500	L	24	48367	Texas	Parker	0.21
NOx	CUS	500	L	25	48187	Texas	Guadalupe	0.11
NOx	CUS	1000	H	1	18127	Indiana	Porter	0.19
NOx	CUS	1000	H	2	18037	Indiana	Dubois	0.13
NOx	CUS	1000	H	3	47055	Tennessee	Giles	0.12
NOx	CUS	1000	H	4	1001	Alabama	Autauga	0.24
NOx	CUS	1000	H	6	17155	Illinois	Putnam	0.11
NOx	CUS	1000	H	7	17145	Illinois	Perry	0.19
NOx	CUS	1000	H	8	47157	Tennessee	Shelby	0.10
NOx	CUS	1000	H	9	28129	Mississippi	Smith	0.14
NOx	CUS	1000	H	10	22071	Louisiana	Orleans	0.33
NOx	CUS	1000	H	11	19095	Iowa	Iowa	0.13
NOx	CUS	1000	H	12	29029	Missouri	Camden	0.09
NOx	CUS	1000	H	13	5119	Arkansas	Pulaski	0.24
NOx	CUS	1000	H	14	22061	Louisiana	Lincoln	0.11
NOx	CUS	1000	H	15	22001	Louisiana	Acadia	0.17
NOx	CUS	1000	H	16	31055	Nebraska	Douglas	0.15
NOx	CUS	1000	H	17	20091	Kansas	Johnson	0.10
NOx	CUS	1000	H	18	40101	Oklahoma	Muskogee	0.15
NOx	CUS	1000	H	19	48213	Texas	Henderson	0.08
NOx	CUS	1000	H	20	48201	Texas	Harris	0.09
NOx	CUS	1000	H	21	31001	Nebraska	Adams	0.21
NOx	CUS	1000	H	22	20155	Kansas	Reno	0.11
NOx	CUS	1000	H	23	40017	Oklahoma	Canadian	0.05
NOx	CUS	1000	H	24	48367	Texas	Parker	0.16

NOx	CUS	1000	H	25	48187	Texas	Guadalupe	0.12
NOx	CUS	1000	L	1	18127	Indiana	Porter	0.44
NOx	CUS	1000	L	2	18037	Indiana	Dubois	0.49
NOx	CUS	1000	L	3	47055	Tennessee	Giles	0.30
NOx	CUS	1000	L	4	1001	Alabama	Autauga	0.38
NOx	CUS	1000	L	6	17155	Illinois	Putnam	0.20
NOx	CUS	1000	L	7	17145	Illinois	Perry	0.27
NOx	CUS	1000	L	8	47157	Tennessee	Shelby	0.13
NOx	CUS	1000	L	9	28129	Mississippi	Smith	0.50
NOx	CUS	1000	L	10	22071	Louisiana	Orleans	0.71
NOx	CUS	1000	L	11	19095	Iowa	Iowa	0.22
NOx	CUS	1000	L	12	29029	Missouri	Camden	0.22
NOx	CUS	1000	L	13	5119	Arkansas	Pulaski	0.32
NOx	CUS	1000	L	14	22061	Louisiana	Lincoln	0.22
NOx	CUS	1000	L	15	22001	Louisiana	Acadia	0.40
NOx	CUS	1000	L	16	31055	Nebraska	Douglas	0.41
NOx	CUS	1000	L	17	20091	Kansas	Johnson	0.26
NOx	CUS	1000	L	18	40101	Oklahoma	Muskogee	0.28
NOx	CUS	1000	L	19	48213	Texas	Henderson	0.23
NOx	CUS	1000	L	20	48201	Texas	Harris	0.24
NOx	CUS	1000	L	21	31001	Nebraska	Adams	0.62
NOx	CUS	1000	L	22	20155	Kansas	Reno	0.16
NOx	CUS	1000	L	23	40017	Oklahoma	Canadian	0.10
NOx	CUS	1000	L	24	48367	Texas	Parker	0.48
NOx	CUS	1000	L	25	48187	Texas	Guadalupe	0.24
NOx	CUS	3000	H	1	18127	Indiana	Porter	0.53
NOx	CUS	3000	H	2	18037	Indiana	Dubois	0.53
NOx	CUS	3000	H	3	47055	Tennessee	Giles	0.48
NOx	CUS	3000	H	4	1001	Alabama	Autauga	0.68
NOx	CUS	3000	H	6	17155	Illinois	Putnam	0.32
NOx	CUS	3000	H	7	17145	Illinois	Perry	0.54
NOx	CUS	3000	H	8	47157	Tennessee	Shelby	0.34
NOx	CUS	3000	H	9	28129	Mississippi	Smith	0.54
NOx	CUS	3000	H	10	22071	Louisiana	Orleans	1.09
NOx	CUS	3000	H	11	19095	Iowa	Iowa	0.35
NOx	CUS	3000	H	12	29029	Missouri	Camden	0.37
NOx	CUS	3000	H	13	5119	Arkansas	Pulaski	0.76
NOx	CUS	3000	H	14	22061	Louisiana	Lincoln	0.37
NOx	CUS	3000	H	15	22001	Louisiana	Acadia	0.56
NOx	CUS	3000	H	16	31055	Nebraska	Douglas	0.46
NOx	CUS	3000	H	17	20091	Kansas	Johnson	0.32
NOx	CUS	3000	H	18	40101	Oklahoma	Muskogee	0.53
NOx	CUS	3000	H	19	48213	Texas	Henderson	0.26
NOx	CUS	3000	H	20	48201	Texas	Harris	0.33
NOx	CUS	3000	H	21	31001	Nebraska	Adams	0.82
NOx	CUS	3000	H	22	20155	Kansas	Reno	0.30
NOx	CUS	3000	H	23	40017	Oklahoma	Canadian	0.17
NOx	CUS	3000	H	24	48367	Texas	Parker	0.60
NOx	CUS	3000	H	25	48187	Texas	Guadalupe	0.41
NOx	EUS	500	H	1	23003	Maine	Aroostook	0.06
NOx	EUS	500	H	2	23031	Maine	York	0.04
NOx	EUS	500	H	3	25021	Massachusetts	Norfolk	0.03
NOx	EUS	500	H	4	25011	Massachusetts	Franklin	0.03
NOx	EUS	500	H	6	0	NONE	NONE	0.10

NOx	EUS	500	H	7	36051	New York	Livingston	0.11
NOx	EUS	500	H	8	42001	Pennsylvania	Adams	0.05
NOx	EUS	500	H	9	51053	Virginia	Dinwiddie	0.09
NOx	EUS	500	H	10	45051	South Carolina	Horry	0.07
NOx	EUS	500	H	11	26099	Michigan	Macomb	0.06
NOx	EUS	500	H	12	39157	Ohio	Tuscarawas	0.04
NOx	EUS	500	H	13	37009	North Carolina	Ashe	0.04
NOx	EUS	500	H	14	45005	South Carolina	Allendale	0.03
NOx	EUS	500	H	15	26103	Michigan	Marquette	0.02
NOx	EUS	500	H	16	26117	Michigan	Montcalm	0.05
NOx	EUS	500	H	17	18053	Indiana	Grant	0.07
NOx	EUS	500	H	18	21009	Kentucky	Barren	0.05
NOx	EUS	500	H	19	1123	Alabama	Tallapoosa	0.05
NOx	EUS	500	L	1	23003	Maine	Aroostook	0.12
NOx	EUS	500	L	2	23031	Maine	York	0.07
NOx	EUS	500	L	3	25021	Massachusetts	Norfolk	0.05
NOx	EUS	500	L	4	25011	Massachusetts	Franklin	0.05
NOx	EUS	500	L	6	0	NONE	NONE	0.17
NOx	EUS	500	L	7	36051	New York	Livingston	0.26
NOx	EUS	500	L	8	42001	Pennsylvania	Adams	0.10
NOx	EUS	500	L	9	51053	Virginia	Dinwiddie	0.13
NOx	EUS	500	L	10	45051	South Carolina	Horry	0.19
NOx	EUS	500	L	11	26099	Michigan	Macomb	0.13
NOx	EUS	500	L	12	39157	Ohio	Tuscarawas	0.09
NOx	EUS	500	L	13	37009	North Carolina	Ashe	0.05
NOx	EUS	500	L	14	45005	South Carolina	Allendale	0.08
NOx	EUS	500	L	15	26103	Michigan	Marquette	0.04
NOx	EUS	500	L	16	26117	Michigan	Montcalm	0.20
NOx	EUS	500	L	17	18053	Indiana	Grant	0.11
NOx	EUS	500	L	18	21009	Kentucky	Barren	0.11
NOx	EUS	500	L	19	1123	Alabama	Tallapoosa	0.09
NOx	EUS	1000	H	1	23003	Maine	Aroostook	0.10
NOx	EUS	1000	H	2	23031	Maine	York	0.07
NOx	EUS	1000	H	3	25021	Massachusetts	Norfolk	0.05
NOx	EUS	1000	H	4	25011	Massachusetts	Franklin	0.06
NOx	EUS	1000	H	6	0	NONE	NONE	0.18
NOx	EUS	1000	H	7	36051	New York	Livingston	0.23
NOx	EUS	1000	H	8	42001	Pennsylvania	Adams	0.09
NOx	EUS	1000	H	9	51053	Virginia	Dinwiddie	0.18
NOx	EUS	1000	H	10	45051	South Carolina	Horry	0.13
NOx	EUS	1000	H	11	26099	Michigan	Macomb	0.12
NOx	EUS	1000	H	12	39157	Ohio	Tuscarawas	0.08
NOx	EUS	1000	H	13	37009	North Carolina	Ashe	0.08
NOx	EUS	1000	H	14	45005	South Carolina	Allendale	0.05
NOx	EUS	1000	H	15	26103	Michigan	Marquette	0.04
NOx	EUS	1000	H	16	26117	Michigan	Montcalm	0.10
NOx	EUS	1000	H	17	18053	Indiana	Grant	0.14
NOx	EUS	1000	H	18	21009	Kentucky	Barren	0.09
NOx	EUS	1000	H	19	1123	Alabama	Tallapoosa	0.09
NOx	EUS	3000	H	1	23003	Maine	Aroostook	0.24
NOx	EUS	3000	H	2	23031	Maine	York	0.21
NOx	EUS	3000	H	3	25021	Massachusetts	Norfolk	0.14
NOx	EUS	3000	H	4	25011	Massachusetts	Franklin	0.15
NOx	EUS	3000	H	6	0	NONE	NONE	0.46

NOx	EUS	3000	H	7	36051	New York	Livingston	0.68
NOx	EUS	3000	H	8	42001	Pennsylvania	Adams	0.27
NOx	EUS	3000	H	9	51053	Virginia	Dinwiddie	0.52
NOx	EUS	3000	H	10	45051	South Carolina	Horry	0.39
NOx	EUS	3000	H	11	26099	Michigan	Macomb	0.33
NOx	EUS	3000	H	12	39157	Ohio	Tuscarawas	0.23
NOx	EUS	3000	H	13	37009	North Carolina	Ashe	0.22
NOx	EUS	3000	H	14	45005	South Carolina	Allendale	0.16
NOx	EUS	3000	H	15	26103	Michigan	Marquette	0.12
NOx	EUS	3000	H	16	26117	Michigan	Montcalm	0.26
NOx	EUS	3000	H	17	18053	Indiana	Grant	0.42
NOx	EUS	3000	H	18	21009	Kentucky	Barren	0.20
NOx	EUS	3000	H	19	1123	Alabama	Tallapoosa	0.21
NOx	WUS	500	H	1	38057	North Dakota	Mercer	0.09
NOx	WUS	500	H	2	38059	North Dakota	Morton	0.04
NOx	WUS	500	H	3	8123	Colorado	Weld	0.06
NOx	WUS	500	H	4	8011	Colorado	Bent	0.06
NOx	WUS	500	H	6	30083	Montana	Richland	0.08
NOx	WUS	500	H	7	30075	Montana	Powder River	0.05
NOx	WUS	500	H	8	8069	Colorado	Larimer	0.02
NOx	WUS	500	H	9	8109	Colorado	Saguache	0.04
NOx	WUS	500	H	10	35035	New Mexico	Otero	0.01
NOx	WUS	500	H	11	30111	Montana	Yellowstone	0.07
NOx	WUS	500	H	12	49013	Utah	Duchesne	0.03
NOx	WUS	500	H	13	49037	Utah	San Juan	0.01
NOx	WUS	500	H	14	4007	Arizona	Gila	0.01
NOx	WUS	500	H	15	49049	Utah	Utah	0.08
NOx	WUS	500	H	16	49021	Utah	Iron	0.03
NOx	WUS	500	H	17	4012	Arizona	La Paz	0.03
NOx	WUS	500	H	18	41049	Oregon	Morrow	0.15
NOx	WUS	500	H	19	32001	Nevada	Churchill	0.03
NOx	WUS	500	H	20	6107	California	Tulare	0.31
NOx	WUS	500	H	21	6037	California	Los Angeles	0.02
NOx	WUS	500	H	22	53057	Washington	Skagit	0.05
NOx	WUS	500	H	23	53039	Washington	Klickitat	0.03
NOx	WUS	500	H	24	6063	California	Plumas	0.02
NOx	WUS	500	H	25	6047	California	Merced	0.30
NOx	WUS	500	H	26	6029	California	Kern	0.17
NOx	WUS	500	L	1	38057	North Dakota	Mercer	0.11
NOx	WUS	500	L	2	38059	North Dakota	Morton	0.07
NOx	WUS	500	L	3	8123	Colorado	Weld	0.10
NOx	WUS	500	L	4	8011	Colorado	Bent	0.08
NOx	WUS	500	L	6	30083	Montana	Richland	0.09
NOx	WUS	500	L	7	30075	Montana	Powder River	0.09
NOx	WUS	500	L	8	8069	Colorado	Larimer	0.02
NOx	WUS	500	L	9	8109	Colorado	Saguache	0.04
NOx	WUS	500	L	10	35035	New Mexico	Otero	0.01
NOx	WUS	500	L	11	30111	Montana	Yellowstone	0.09
NOx	WUS	500	L	12	49013	Utah	Duchesne	0.03
NOx	WUS	500	L	13	49037	Utah	San Juan	0.01
NOx	WUS	500	L	14	4007	Arizona	Gila	0.01
NOx	WUS	500	L	15	49049	Utah	Utah	0.09

NOx	WUS	500	L	16	49021	Utah	Iron	0.04
NOx	WUS	500	L	17	4012	Arizona	La Paz	0.04
NOx	WUS	500	L	18	41049	Oregon	Morrow	0.20
NOx	WUS	500	L	19	32001	Nevada	Churchill	0.04
NOx	WUS	500	L	20	6107	California	Tulare	0.45
NOx	WUS	500	L	21	6037	California	Los Angeles	0.03
NOx	WUS	500	L	22	53057	Washington	Skagit	0.07
NOx	WUS	500	L	23	53039	Washington	Klickitat	0.04
NOx	WUS	500	L	24	6063	California	Plumas	0.03
NOx	WUS	500	L	25	6047	California	Merced	0.56
NOx	WUS	500	L	26	6029	California	Kern	0.17
NOx	WUS	1000	H	1	38057	North Dakota	Mercer	0.17
NOx	WUS	1000	H	2	38059	North Dakota	Morton	0.08
NOx	WUS	1000	H	3	8123	Colorado	Weld	0.12
NOx	WUS	1000	H	4	8011	Colorado	Bent	0.12
NOx	WUS	1000	H	6	30083	Montana	Richland	0.16
NOx	WUS	1000	H	7	30075	Montana	Powder River	0.09
NOx	WUS	1000	H	8	8069	Colorado	Larimer	0.04
NOx	WUS	1000	H	9	8109	Colorado	Saguache	0.08
NOx	WUS	1000	H	10	35035	New Mexico	Otero	0.01
NOx	WUS	1000	H	11	30111	Montana	Yellowstone	0.12
NOx	WUS	1000	H	12	49013	Utah	Duchesne	0.06
NOx	WUS	1000	H	13	49037	Utah	San Juan	0.01
NOx	WUS	1000	H	14	4007	Arizona	Gila	0.02
NOx	WUS	1000	H	15	49049	Utah	Utah	0.16
NOx	WUS	1000	H	16	49021	Utah	Iron	0.05
NOx	WUS	1000	H	17	4012	Arizona	La Paz	0.05
NOx	WUS	1000	H	18	41049	Oregon	Morrow	0.30
NOx	WUS	1000	H	19	32001	Nevada	Churchill	0.05
NOx	WUS	1000	H	20	6107	California	Tulare	0.59
NOx	WUS	1000	H	21	6037	California	Los Angeles	0.04
NOx	WUS	1000	H	22	53057	Washington	Skagit	0.11
NOx	WUS	1000	H	23	53039	Washington	Klickitat	0.06
NOx	WUS	1000	H	24	6063	California	Plumas	0.04
NOx	WUS	1000	H	25	6047	California	Merced	0.59
NOx	WUS	1000	H	26	6029	California	Kern	0.34
NOx	WUS	3000	H	1	38057	North Dakota	Mercer	0.44
NOx	WUS	3000	H	2	38059	North Dakota	Morton	0.24
NOx	WUS	3000	H	3	8123	Colorado	Weld	0.31
NOx	WUS	3000	H	4	8011	Colorado	Bent	0.34
NOx	WUS	3000	H	6	30083	Montana	Richland	0.39
NOx	WUS	3000	H	7	30075	Montana	Powder River	0.21
NOx	WUS	3000	H	8	8069	Colorado	Larimer	0.11
NOx	WUS	3000	H	9	8109	Colorado	Saguache	0.26
NOx	WUS	3000	H	10	35035	New Mexico	Otero	0.04
NOx	WUS	3000	H	11	30111	Montana	Yellowstone	0.28
NOx	WUS	3000	H	12	49013	Utah	Duchesne	0.16
NOx	WUS	3000	H	13	49037	Utah	San Juan	0.04
NOx	WUS	3000	H	14	4007	Arizona	Gila	0.07
NOx	WUS	3000	H	15	49049	Utah	Utah	0.42
NOx	WUS	3000	H	16	49021	Utah	Iron	0.11
NOx	WUS	3000	H	17	4012	Arizona	La Paz	0.13

NOx	WUS	3000	H	18	41049	Oregon	Morrow	0.77
NOx	WUS	3000	H	19	32001	Nevada	Churchill	0.15
NOx	WUS	3000	H	20	6107	California	Tulare	1.64
NOx	WUS	3000	H	21	6037	California	Los Angeles	0.12
NOx	WUS	3000	H	22	53057	Washington	Skagit	0.31
NOx	WUS	3000	H	23	53039	Washington	Klickitat	0.20
NOx	WUS	3000	H	24	6063	California	Plumas	0.13
NOx	WUS	3000	H	25	6047	California	Merced	1.69
NOx	WUS	3000	H	26	6029	California	Kern	0.93
SO2	CUS	500	L	1	18127	Indiana	Porter	1.79
SO2	CUS	500	L	2	18037	Indiana	Dubois	0.26
SO2	CUS	500	L	3	47055	Tennessee	Giles	0.44
SO2	CUS	500	L	4	1001	Alabama	Autauga	1.30
SO2	CUS	500	L	6	17155	Illinois	Putnam	0.54
SO2	CUS	500	L	7	17145	Illinois	Perry	0.85
SO2	CUS	500	L	8	47157	Tennessee	Shelby	0.72
SO2	CUS	500	L	9	28129	Mississippi	Smith	1.99
SO2	CUS	500	L	10	22071	Louisiana	Orleans	0.88
SO2	CUS	500	L	11	19095	Iowa	Iowa	1.37
SO2	CUS	500	L	12	29029	Missouri	Camden	1.06
SO2	CUS	500	L	13	5119	Arkansas	Pulaski	1.62
SO2	CUS	500	L	14	22061	Louisiana	Lincoln	0.59
SO2	CUS	500	L	15	22001	Louisiana	Acadia	1.93
SO2	CUS	500	L	16	31055	Nebraska	Douglas	0.98
SO2	CUS	500	L	17	20091	Kansas	Johnson	0.65
SO2	CUS	500	L	18	40101	Oklahoma	Muskogee	1.21
SO2	CUS	500	L	19	48213	Texas	Henderson	0.37
SO2	CUS	500	L	20	48201	Texas	Harris	1.65
SO2	CUS	500	L	21	31001	Nebraska	Adams	1.96
SO2	CUS	500	L	22	20155	Kansas	Reno	0.46
SO2	CUS	500	L	23	40017	Oklahoma	Canadian	0.69
SO2	CUS	500	L	24	48367	Texas	Parker	0.55
SO2	CUS	500	L	25	48187	Texas	Guadalupe	0.57
SO2	CUS	1000	H	1	18127	Indiana	Porter	1.13
SO2	CUS	1000	H	2	18037	Indiana	Dubois	0.34
SO2	CUS	1000	H	3	47055	Tennessee	Giles	0.89
SO2	CUS	1000	H	4	1001	Alabama	Autauga	1.62
SO2	CUS	1000	H	6	17155	Illinois	Putnam	0.35
SO2	CUS	1000	H	7	17145	Illinois	Perry	0.72
SO2	CUS	1000	H	8	47157	Tennessee	Shelby	0.62
SO2	CUS	1000	H	9	28129	Mississippi	Smith	0.49
SO2	CUS	1000	H	10	22071	Louisiana	Orleans	1.12
SO2	CUS	1000	H	11	19095	Iowa	Iowa	0.76
SO2	CUS	1000	H	12	29029	Missouri	Camden	0.65
SO2	CUS	1000	H	13	5119	Arkansas	Pulaski	1.13
SO2	CUS	1000	H	14	22061	Louisiana	Lincoln	0.78
SO2	CUS	1000	H	15	22001	Louisiana	Acadia	1.14
SO2	CUS	1000	H	16	31055	Nebraska	Douglas	0.56
SO2	CUS	1000	H	17	20091	Kansas	Johnson	0.45
SO2	CUS	1000	H	18	40101	Oklahoma	Muskogee	0.69
SO2	CUS	1000	H	19	48213	Texas	Henderson	0.52
SO2	CUS	1000	H	20	48201	Texas	Harris	0.89
SO2	CUS	1000	H	21	31001	Nebraska	Adams	0.65
SO2	CUS	1000	H	22	20155	Kansas	Reno	0.53

SO2	CUS	1000	H	23	40017	Oklahoma	Canadian	0.47
SO2	CUS	1000	H	24	48367	Texas	Parker	0.82
SO2	CUS	1000	H	25	48187	Texas	Guadalupe	0.74
SO2	CUS	1000	L	1	18127	Indiana	Porter	3.93
SO2	CUS	1000	L	2	18037	Indiana	Dubois	0.80
SO2	CUS	1000	L	3	47055	Tennessee	Giles	1.58
SO2	CUS	1000	L	4	1001	Alabama	Autauga	3.70
SO2	CUS	1000	L	6	17155	Illinois	Putnam	1.33
SO2	CUS	1000	L	7	17145	Illinois	Perry	2.48
SO2	CUS	1000	L	8	47157	Tennessee	Shelby	1.60
SO2	CUS	1000	L	9	28129	Mississippi	Smith	4.79
SO2	CUS	1000	L	10	22071	Louisiana	Orleans	3.11
SO2	CUS	1000	L	11	19095	Iowa	Iowa	2.76
SO2	CUS	1000	L	12	29029	Missouri	Camden	2.42
SO2	CUS	1000	L	13	5119	Arkansas	Pulaski	4.14
SO2	CUS	1000	L	14	22061	Louisiana	Lincoln	1.76
SO2	CUS	1000	L	15	22001	Louisiana	Acadia	4.58
SO2	CUS	1000	L	16	31055	Nebraska	Douglas	2.29
SO2	CUS	1000	L	17	20091	Kansas	Johnson	1.66
SO2	CUS	1000	L	18	40101	Oklahoma	Muskogee	3.33
SO2	CUS	1000	L	19	48213	Texas	Henderson	1.06
SO2	CUS	1000	L	20	48201	Texas	Harris	3.49
SO2	CUS	1000	L	21	31001	Nebraska	Adams	5.05
SO2	CUS	1000	L	22	20155	Kansas	Reno	0.96
SO2	CUS	1000	L	23	40017	Oklahoma	Canadian	1.74
SO2	CUS	1000	L	24	48367	Texas	Parker	2.05
SO2	CUS	1000	L	25	48187	Texas	Guadalupe	1.41
SO2	CUS	3000	H	1	18127	Indiana	Porter	5.91
SO2	CUS	3000	H	2	18037	Indiana	Dubois	1.33
SO2	CUS	3000	H	3	47055	Tennessee	Giles	5.40
SO2	CUS	3000	H	4	1001	Alabama	Autauga	7.85
SO2	CUS	3000	H	6	17155	Illinois	Putnam	1.40
SO2	CUS	3000	H	7	17145	Illinois	Perry	3.36
SO2	CUS	3000	H	8	47157	Tennessee	Shelby	2.32
SO2	CUS	3000	H	9	28129	Mississippi	Smith	1.94
SO2	CUS	3000	H	10	22071	Louisiana	Orleans	6.12
SO2	CUS	3000	H	11	19095	Iowa	Iowa	3.26
SO2	CUS	3000	H	12	29029	Missouri	Camden	3.72
SO2	CUS	3000	H	13	5119	Arkansas	Pulaski	4.93
SO2	CUS	3000	H	14	22061	Louisiana	Lincoln	3.61
SO2	CUS	3000	H	15	22001	Louisiana	Acadia	4.13
SO2	CUS	3000	H	16	31055	Nebraska	Douglas	2.26
SO2	CUS	3000	H	17	20091	Kansas	Johnson	1.62
SO2	CUS	3000	H	18	40101	Oklahoma	Muskogee	3.39
SO2	CUS	3000	H	19	48213	Texas	Henderson	2.04
SO2	CUS	3000	H	20	48201	Texas	Harris	2.86
SO2	CUS	3000	H	21	31001	Nebraska	Adams	2.88
SO2	CUS	3000	H	22	20155	Kansas	Reno	2.07
SO2	CUS	3000	H	23	40017	Oklahoma	Canadian	1.87
SO2	CUS	3000	H	24	48367	Texas	Parker	3.55
SO2	CUS	3000	H	25	48187	Texas	Guadalupe	2.71
SO2	EUS	500	H	1	23003	Maine	Aroostook	0.39
SO2	EUS	500	H	2	23031	Maine	York	0.39
SO2	EUS	500	H	3	25021	Massachusetts	Norfolk	0.16

SO2	EUS	500	H	4	25011	Massachusetts	Franklin	0.19
SO2	EUS	500	H	6	0	NONE	NONE	0.42
SO2	EUS	500	H	7	36051	New York	Livingston	0.13
SO2	EUS	500	H	8	42001	Pennsylvania	Adams	0.10
SO2	EUS	500	H	9	51053	Virginia	Dinwiddie	0.27
SO2	EUS	500	H	10	45051	South Carolina	Horry	0.22
SO2	EUS	500	H	11	26099	Michigan	Macomb	0.24
SO2	EUS	500	H	12	39157	Ohio	Tuscarawas	0.08
SO2	EUS	500	H	13	37009	North Carolina	Ashe	0.22
SO2	EUS	500	H	14	45005	South Carolina	Allendale	0.14
SO2	EUS	500	H	15	26103	Michigan	Marquette	0.12
SO2	EUS	500	H	16	26117	Michigan	Montcalm	0.22
SO2	EUS	500	H	17	18053	Indiana	Grant	0.33
SO2	EUS	500	H	18	21009	Kentucky	Barren	0.06
SO2	EUS	500	H	19	1123	Alabama	Tallapoosa	0.23
SO2	EUS	500	L	1	23003	Maine	Aroostook	0.86
SO2	EUS	500	L	2	23031	Maine	York	0.63
SO2	EUS	500	L	3	25021	Massachusetts	Norfolk	0.19
SO2	EUS	500	L	4	25011	Massachusetts	Franklin	0.25
SO2	EUS	500	L	6	0	NONE	NONE	0.62
SO2	EUS	500	L	7	36051	New York	Livingston	0.32
SO2	EUS	500	L	8	42001	Pennsylvania	Adams	0.36
SO2	EUS	500	L	9	51053	Virginia	Dinwiddie	0.56
SO2	EUS	500	L	10	45051	South Carolina	Horry	0.63
SO2	EUS	500	L	11	26099	Michigan	Macomb	0.29
SO2	EUS	500	L	12	39157	Ohio	Tuscarawas	0.24
SO2	EUS	500	L	13	37009	North Carolina	Ashe	0.25
SO2	EUS	500	L	14	45005	South Carolina	Allendale	0.51
SO2	EUS	500	L	15	26103	Michigan	Marquette	0.37
SO2	EUS	500	L	16	26117	Michigan	Montcalm	0.53
SO2	EUS	500	L	17	18053	Indiana	Grant	0.96
SO2	EUS	500	L	18	21009	Kentucky	Barren	0.13
SO2	EUS	500	L	19	1123	Alabama	Tallapoosa	0.33
SO2	EUS	1000	H	1	23003	Maine	Aroostook	0.76
SO2	EUS	1000	H	2	23031	Maine	York	0.65
SO2	EUS	1000	H	3	25021	Massachusetts	Norfolk	0.31
SO2	EUS	1000	H	4	25011	Massachusetts	Franklin	0.34
SO2	EUS	1000	H	6	0	NONE	NONE	0.63
SO2	EUS	1000	H	7	36051	New York	Livingston	0.25
SO2	EUS	1000	H	8	42001	Pennsylvania	Adams	0.20
SO2	EUS	1000	H	9	51053	Virginia	Dinwiddie	0.47
SO2	EUS	1000	H	10	45051	South Carolina	Horry	0.35
SO2	EUS	1000	H	11	26099	Michigan	Macomb	0.40
SO2	EUS	1000	H	12	39157	Ohio	Tuscarawas	0.16
SO2	EUS	1000	H	13	37009	North Carolina	Ashe	0.39
SO2	EUS	1000	H	14	45005	South Carolina	Allendale	0.27
SO2	EUS	1000	H	15	26103	Michigan	Marquette	0.23
SO2	EUS	1000	H	16	26117	Michigan	Montcalm	0.39
SO2	EUS	1000	H	17	18053	Indiana	Grant	0.65
SO2	EUS	1000	H	18	21009	Kentucky	Barren	0.11
SO2	EUS	1000	H	19	1123	Alabama	Tallapoosa	0.40
SO2	EUS	3000	H	1	23003	Maine	Aroostook	1.51
SO2	EUS	3000	H	2	23031	Maine	York	1.41
SO2	EUS	3000	H	3	25021	Massachusetts	Norfolk	0.72

SO2	EUS	3000	H	4	25011	Massachusetts	Franklin	0.78
SO2	EUS	3000	H	6	0	NONE	NONE	1.16
SO2	EUS	3000	H	7	36051	New York	Livingston	0.62
SO2	EUS	3000	H	8	42001	Pennsylvania	Adams	0.56
SO2	EUS	3000	H	9	51053	Virginia	Dinwiddie	1.03
SO2	EUS	3000	H	10	45051	South Carolina	Horry	0.82
SO2	EUS	3000	H	11	26099	Michigan	Macomb	0.79
SO2	EUS	3000	H	12	39157	Ohio	Tuscarawas	0.43
SO2	EUS	3000	H	13	37009	North Carolina	Ashe	0.81
SO2	EUS	3000	H	14	45005	South Carolina	Allendale	0.63
SO2	EUS	3000	H	15	26103	Michigan	Marquette	0.63
SO2	EUS	3000	H	16	26117	Michigan	Montcalm	0.86
SO2	EUS	3000	H	17	18053	Indiana	Grant	1.62
SO2	EUS	3000	H	18	21009	Kentucky	Barren	0.26
SO2	EUS	3000	H	19	1123	Alabama	Tallapoosa	0.89
SO2	WUS	500	H	1	38057	North Dakota	Mercer	0.50
SO2	WUS	500	H	2	38059	North Dakota	Morton	0.18
SO2	WUS	500	H	3	8123	Colorado	Weld	0.24
SO2	WUS	500	H	4	8011	Colorado	Bent	0.18
SO2	WUS	500	H	6	30083	Montana	Richland	0.23
SO2	WUS	500	H	7	30075	Montana	Powder River	0.09
SO2	WUS	500	H	8	8069	Colorado	Larimer	0.07
SO2	WUS	500	H	9	8109	Colorado	Saguache	0.28
SO2	WUS	500	H	10	35035	New Mexico	Otero	0.04
SO2	WUS	500	H	11	30111	Montana	Yellowstone	0.10
SO2	WUS	500	H	12	49013	Utah	Duchesne	0.06
SO2	WUS	500	H	13	49037	Utah	San Juan	0.05
SO2	WUS	500	H	14	4007	Arizona	Gila	0.04
SO2	WUS	500	H	15	49049	Utah	Utah	0.07
SO2	WUS	500	H	16	49021	Utah	Iron	0.09
SO2	WUS	500	H	17	4012	Arizona	La Paz	0.26
SO2	WUS	500	H	18	41049	Oregon	Morrow	0.19
SO2	WUS	500	H	19	32001	Nevada	Churchill	0.35
SO2	WUS	500	H	20	6107	California	Tulare	0.76
SO2	WUS	500	H	21	6037	California	Los Angeles	0.04
SO2	WUS	500	H	22	53057	Washington	Skagit	0.08
SO2	WUS	500	H	23	53039	Washington	Klickitat	0.24
SO2	WUS	500	H	24	6063	California	Plumas	0.16
SO2	WUS	500	H	25	6047	California	Merced	0.66
SO2	WUS	500	H	26	6029	California	Kern	0.14
SO2	WUS	500	L	1	38057	North Dakota	Mercer	1.14
SO2	WUS	500	L	2	38059	North Dakota	Morton	0.55
SO2	WUS	500	L	3	8123	Colorado	Weld	0.40
SO2	WUS	500	L	4	8011	Colorado	Bent	0.26
SO2	WUS	500	L	6	30083	Montana	Richland	0.39
SO2	WUS	500	L	7	30075	Montana	Powder River	0.32
SO2	WUS	500	L	8	8069	Colorado	Larimer	0.17
SO2	WUS	500	L	9	8109	Colorado	Saguache	0.33
SO2	WUS	500	L	10	35035	New Mexico	Otero	0.04
SO2	WUS	500	L	11	30111	Montana	Yellowstone	0.20
SO2	WUS	500	L	12	49013	Utah	Duchesne	0.07
SO2	WUS	500	L	13	49037	Utah	San Juan	0.05

SO2	WUS	500	L	14	4007	Arizona	Gila	0.04
SO2	WUS	500	L	15	49049	Utah	Utah	0.08
SO2	WUS	500	L	16	49021	Utah	Iron	0.10
SO2	WUS	500	L	17	4012	Arizona	La Paz	0.32
SO2	WUS	500	L	18	41049	Oregon	Morrow	0.25
SO2	WUS	500	L	19	32001	Nevada	Churchill	0.48
SO2	WUS	500	L	20	6107	California	Tulare	2.86
SO2	WUS	500	L	21	6037	California	Los Angeles	0.08
SO2	WUS	500	L	22	53057	Washington	Skagit	0.18
SO2	WUS	500	L	23	53039	Washington	Klickitat	0.56
SO2	WUS	500	L	24	6063	California	Plumas	0.27
SO2	WUS	500	L	25	6047	California	Merced	2.04
SO2	WUS	500	L	26	6029	California	Kern	0.26
SO2	WUS	1000	H	1	38057	North Dakota	Mercer	0.98
SO2	WUS	1000	H	2	38059	North Dakota	Morton	0.34
SO2	WUS	1000	H	3	8123	Colorado	Weld	0.41
SO2	WUS	1000	H	4	8011	Colorado	Bent	0.30
SO2	WUS	1000	H	6	30083	Montana	Richland	0.36
SO2	WUS	1000	H	7	30075	Montana	Powder River	0.16
SO2	WUS	1000	H	8	8069	Colorado	Larimer	0.13
SO2	WUS	1000	H	9	8109	Colorado	Saguache	0.46
SO2	WUS	1000	H	10	35035	New Mexico	Otero	0.06
SO2	WUS	1000	H	11	30111	Montana	Yellowstone	0.18
SO2	WUS	1000	H	12	49013	Utah	Duchesne	0.10
SO2	WUS	1000	H	13	49037	Utah	San Juan	0.08
SO2	WUS	1000	H	14	4007	Arizona	Gila	0.08
SO2	WUS	1000	H	15	49049	Utah	Utah	0.13
SO2	WUS	1000	H	16	49021	Utah	Iron	0.15
SO2	WUS	1000	H	17	4012	Arizona	La Paz	0.48
SO2	WUS	1000	H	18	41049	Oregon	Morrow	0.35
SO2	WUS	1000	H	19	32001	Nevada	Churchill	0.58
SO2	WUS	1000	H	20	6107	California	Tulare	1.53
SO2	WUS	1000	H	21	6037	California	Los Angeles	0.07
SO2	WUS	1000	H	22	53057	Washington	Skagit	0.15
SO2	WUS	1000	H	23	53039	Washington	Klickitat	0.45
SO2	WUS	1000	H	24	6063	California	Plumas	0.28
SO2	WUS	1000	H	25	6047	California	Merced	1.31
SO2	WUS	1000	H	26	6029	California	Kern	0.25
SO2	WUS	3000	H	1	38057	North Dakota	Mercer	2.69
SO2	WUS	3000	H	2	38059	North Dakota	Morton	0.81
SO2	WUS	3000	H	3	8123	Colorado	Weld	0.77
SO2	WUS	3000	H	4	8011	Colorado	Bent	0.60
SO2	WUS	3000	H	6	30083	Montana	Richland	0.98
SO2	WUS	3000	H	7	30075	Montana	Powder River	0.43
SO2	WUS	3000	H	8	8069	Colorado	Larimer	0.30
SO2	WUS	3000	H	9	8109	Colorado	Saguache	1.24
SO2	WUS	3000	H	10	35035	New Mexico	Otero	0.13
SO2	WUS	3000	H	11	30111	Montana	Yellowstone	0.42
SO2	WUS	3000	H	12	49013	Utah	Duchesne	0.22
SO2	WUS	3000	H	13	49037	Utah	San Juan	0.19
SO2	WUS	3000	H	14	4007	Arizona	Gila	0.23
SO2	WUS	3000	H	15	49049	Utah	Utah	0.30

SO2	WUS	3000	H	16	49021	Utah	Iron	0.34
SO2	WUS	3000	H	17	4012	Arizona	La Paz	1.02
SO2	WUS	3000	H	18	41049	Oregon	Morrow	0.89
SO2	WUS	3000	H	19	32001	Nevada	Churchill	1.18
SO2	WUS	3000	H	20	6107	California	Tulare	4.58
SO2	WUS	3000	H	21	6037	California	Los Angeles	0.14
SO2	WUS	3000	H	22	53057	Washington	Skagit	0.43
SO2	WUS	3000	H	23	53039	Washington	Klickitat	1.15
SO2	WUS	3000	H	24	6063	California	Plumas	0.76
SO2	WUS	3000	H	25	6047	California	Merced	3.69
SO2	WUS	3000	H	26	6029	California	Kern	0.53

Table A-3. Highest annual average $PM_{2.5}$ impacts from NO_X and SO_2 sources from multiple hypothetical source model simulations. Source locations are shown in Figures A1-A3.

Precursor	Area	Emissions (tpy)	Height	Source	FIPS	State	County	Max Value (ug/m3)
NOx	CUS	500	L	1	18127	Indiana	Porter	0.011
NOx	CUS	500	L	2	18037	Indiana	Dubois	0.011
NOx	CUS	500	L	3	47055	Tennessee	Giles	0.012
NOx	CUS	500	L	4	1001	Alabama	Autauga	0.011
NOx	CUS	500	L	6	17155	Illinois	Putnam	0.007
NOx	CUS	500	L	7	17145	Illinois	Perry	0.011
NOx	CUS	500	L	8	47157	Tennessee	Shelby	0.003
NOx	CUS	500	L	9	28129	Mississippi	Smith	0.011
NOx	CUS	500	L	10	22071	Louisiana	Orleans	0.009
NOx	CUS	500	L	11	19095	Iowa	Iowa	0.010
NOx	CUS	500	L	12	29029	Missouri	Camden	0.007
NOx	CUS	500	L	13	5119	Arkansas	Pulaski	0.005
NOx	CUS	500	L	14	22061	Louisiana	Lincoln	0.005
NOx	CUS	500	L	15	22001	Louisiana	Acadia	0.013
NOx	CUS	500	L	16	31055	Nebraska	Douglas	0.007
NOx	CUS	500	L	17	20091	Kansas	Johnson	0.006
NOx	CUS	500	L	18	40101	Oklahoma	Muskogee	0.008
NOx	CUS	500	L	19	48213	Texas	Henderson	0.005
NOx	CUS	500	L	20	48201	Texas	Harris	0.009
NOx	CUS	500	L	21	31001	Nebraska	Adams	0.011
NOx	CUS	500	L	22	20155	Kansas	Reno	0.005
NOx	CUS	500	L	23	40017	Oklahoma	Canadian	0.004
NOx	CUS	500	L	24	48367	Texas	Parker	0.004
NOx	CUS	500	L	25	48187	Texas	Guadalupe	0.005
NOx	CUS	1000	H	1	18127	Indiana	Porter	0.008
NOx	CUS	1000	H	2	18037	Indiana	Dubois	0.007
NOx	CUS	1000	H	3	47055	Tennessee	Giles	0.006
NOx	CUS	1000	H	4	1001	Alabama	Autauga	0.005
NOx	CUS	1000	H	6	17155	Illinois	Putnam	0.005
NOx	CUS	1000	H	7	17145	Illinois	Perry	0.006
NOx	CUS	1000	H	8	47157	Tennessee	Shelby	0.003
NOx	CUS	1000	H	9	28129	Mississippi	Smith	0.005
NOx	CUS	1000	H	10	22071	Louisiana	Orleans	0.006
NOx	CUS	1000	H	11	19095	Iowa	Iowa	0.008
NOx	CUS	1000	H	12	29029	Missouri	Camden	0.006
NOx	CUS	1000	H	13	5119	Arkansas	Pulaski	0.005
NOx	CUS	1000	H	14	22061	Louisiana	Lincoln	0.003
NOx	CUS	1000	H	15	22001	Louisiana	Acadia	0.005
NOx	CUS	1000	H	16	31055	Nebraska	Douglas	0.006
NOx	CUS	1000	H	17	20091	Kansas	Johnson	0.004
NOx	CUS	1000	H	18	40101	Oklahoma	Muskogee	0.005
NOx	CUS	1000	H	19	48213	Texas	Henderson	0.003
NOx	CUS	1000	H	20	48201	Texas	Harris	0.004
NOx	CUS	1000	H	21	31001	Nebraska	Adams	0.008
NOx	CUS	1000	H	22	20155	Kansas	Reno	0.004
NOx	CUS	1000	H	23	40017	Oklahoma	Canadian	0.003
NOx	CUS	1000	H	24	48367	Texas	Parker	0.003

NOx	CUS	1000	H	25	48187	Texas	Guadalupe	0.003
NOx	CUS	1000	L	1	18127	Indiana	Porter	0.022
NOx	CUS	1000	L	2	18037	Indiana	Dubois	0.024
NOx	CUS	1000	L	3	47055	Tennessee	Giles	0.027
NOx	CUS	1000	L	4	1001	Alabama	Autauga	0.026
NOx	CUS	1000	L	6	17155	Illinois	Putnam	0.015
NOx	CUS	1000	L	7	17145	Illinois	Perry	0.024
NOx	CUS	1000	L	8	47157	Tennessee	Shelby	0.007
NOx	CUS	1000	L	9	28129	Mississippi	Smith	0.025
NOx	CUS	1000	L	10	22071	Louisiana	Orleans	0.020
NOx	CUS	1000	L	11	19095	Iowa	Iowa	0.019
NOx	CUS	1000	L	12	29029	Missouri	Camden	0.016
NOx	CUS	1000	L	13	5119	Arkansas	Pulaski	0.011
NOx	CUS	1000	L	14	22061	Louisiana	Lincoln	0.013
NOx	CUS	1000	L	15	22001	Louisiana	Acadia	0.027
NOx	CUS	1000	L	16	31055	Nebraska	Douglas	0.013
NOx	CUS	1000	L	17	20091	Kansas	Johnson	0.011
NOx	CUS	1000	L	18	40101	Oklahoma	Muskogee	0.016
NOx	CUS	1000	L	19	48213	Texas	Henderson	0.012
NOx	CUS	1000	L	20	48201	Texas	Harris	0.020
NOx	CUS	1000	L	21	31001	Nebraska	Adams	0.021
NOx	CUS	1000	L	22	20155	Kansas	Reno	0.010
NOx	CUS	1000	L	23	40017	Oklahoma	Canadian	0.008
NOx	CUS	1000	L	24	48367	Texas	Parker	0.010
NOx	CUS	1000	L	25	48187	Texas	Guadalupe	0.012
NOx	CUS	3000	H	1	18127	Indiana	Porter	0.025
NOx	CUS	3000	H	2	18037	Indiana	Dubois	0.026
NOx	CUS	3000	H	3	47055	Tennessee	Giles	0.024
NOx	CUS	3000	H	4	1001	Alabama	Autauga	0.023
NOx	CUS	3000	H	6	17155	Illinois	Putnam	0.017
NOx	CUS	3000	H	7	17145	Illinois	Perry	0.024
NOx	CUS	3000	H	8	47157	Tennessee	Shelby	0.012
NOx	CUS	3000	H	9	28129	Mississippi	Smith	0.021
NOx	CUS	3000	H	10	22071	Louisiana	Orleans	0.024
NOx	CUS	3000	H	11	19095	Iowa	Iowa	0.023
NOx	CUS	3000	H	12	29029	Missouri	Camden	0.019
NOx	CUS	3000	H	13	5119	Arkansas	Pulaski	0.017
NOx	CUS	3000	H	14	22061	Louisiana	Lincoln	0.014
NOx	CUS	3000	H	15	22001	Louisiana	Acadia	0.019
NOx	CUS	3000	H	16	31055	Nebraska	Douglas	0.018
NOx	CUS	3000	H	17	20091	Kansas	Johnson	0.013
NOx	CUS	3000	H	18	40101	Oklahoma	Muskogee	0.018
NOx	CUS	3000	H	19	48213	Texas	Henderson	0.012
NOx	CUS	3000	H	20	48201	Texas	Harris	0.015
NOx	CUS	3000	H	21	31001	Nebraska	Adams	0.025
NOx	CUS	3000	H	22	20155	Kansas	Reno	0.014
NOx	CUS	3000	H	23	40017	Oklahoma	Canadian	0.010
NOx	CUS	3000	H	24	48367	Texas	Parker	0.013
NOx	CUS	3000	H	25	48187	Texas	Guadalupe	0.014
NOx	EUS	500	H	1	23003	Maine	Aroostook	0.002
NOx	EUS	500	H	2	23031	Maine	York	0.002
NOx	EUS	500	H	3	25021	Massachusetts	Norfolk	0.001
NOx	EUS	500	H	4	25011	Massachusetts	Franklin	0.002
NOx	EUS	500	H	6	0	NONE	NONE	0.002

NOx	EUS	500	H	7	36051	New York	Livingston	0.003
NOx	EUS	500	H	8	42001	Pennsylvania	Adams	0.003
NOx	EUS	500	H	9	51053	Virginia	Dinwiddie	0.002
NOx	EUS	500	H	10	45051	South Carolina	Horry	0.002
NOx	EUS	500	H	11	26099	Michigan	Macomb	0.002
NOx	EUS	500	H	12	39157	Ohio	Tuscarawas	0.002
NOx	EUS	500	H	13	37009	North Carolina	Ashe	0.002
NOx	EUS	500	H	14	45005	South Carolina	Allendale	0.001
NOx	EUS	500	H	15	26103	Michigan	Marquette	0.001
NOx	EUS	500	H	16	26117	Michigan	Montcalm	0.003
NOx	EUS	500	H	17	18053	Indiana	Grant	0.004
NOx	EUS	500	H	18	21009	Kentucky	Barren	0.002
NOx	EUS	500	H	19	1123	Alabama	Tallapoosa	0.001
NOx	EUS	500	L	1	23003	Maine	Aroostook	0.007
NOx	EUS	500	L	2	23031	Maine	York	0.006
NOx	EUS	500	L	3	25021	Massachusetts	Norfolk	0.004
NOx	EUS	500	L	4	25011	Massachusetts	Franklin	0.007
NOx	EUS	500	L	6	0	NONE	NONE	0.006
NOx	EUS	500	L	7	36051	New York	Livingston	0.007
NOx	EUS	500	L	8	42001	Pennsylvania	Adams	0.010
NOx	EUS	500	L	9	51053	Virginia	Dinwiddie	0.005
NOx	EUS	500	L	10	45051	South Carolina	Horry	0.010
NOx	EUS	500	L	11	26099	Michigan	Macomb	0.007
NOx	EUS	500	L	12	39157	Ohio	Tuscarawas	0.006
NOx	EUS	500	L	13	37009	North Carolina	Ashe	0.004
NOx	EUS	500	L	14	45005	South Carolina	Allendale	0.006
NOx	EUS	500	L	15	26103	Michigan	Marquette	0.003
NOx	EUS	500	L	16	26117	Michigan	Montcalm	0.010
NOx	EUS	500	L	17	18053	Indiana	Grant	0.010
NOx	EUS	500	L	18	21009	Kentucky	Barren	0.007
NOx	EUS	500	L	19	1123	Alabama	Tallapoosa	0.003
NOx	EUS	1000	H	1	23003	Maine	Aroostook	0.004
NOx	EUS	1000	H	2	23031	Maine	York	0.004
NOx	EUS	1000	H	3	25021	Massachusetts	Norfolk	0.003
NOx	EUS	1000	H	4	25011	Massachusetts	Franklin	0.004
NOx	EUS	1000	H	6	0	NONE	NONE	0.003
NOx	EUS	1000	H	7	36051	New York	Livingston	0.006
NOx	EUS	1000	H	8	42001	Pennsylvania	Adams	0.006
NOx	EUS	1000	H	9	51053	Virginia	Dinwiddie	0.003
NOx	EUS	1000	H	10	45051	South Carolina	Horry	0.005
NOx	EUS	1000	H	11	26099	Michigan	Macomb	0.004
NOx	EUS	1000	H	12	39157	Ohio	Tuscarawas	0.003
NOx	EUS	1000	H	13	37009	North Carolina	Ashe	0.004
NOx	EUS	1000	H	14	45005	South Carolina	Allendale	0.003
NOx	EUS	1000	H	15	26103	Michigan	Marquette	0.002
NOx	EUS	1000	H	16	26117	Michigan	Montcalm	0.006
NOx	EUS	1000	H	17	18053	Indiana	Grant	0.007
NOx	EUS	1000	H	18	21009	Kentucky	Barren	0.004
NOx	EUS	1000	H	19	1123	Alabama	Tallapoosa	0.002
NOx	EUS	3000	H	1	23003	Maine	Aroostook	0.012
NOx	EUS	3000	H	2	23031	Maine	York	0.011
NOx	EUS	3000	H	3	25021	Massachusetts	Norfolk	0.007
NOx	EUS	3000	H	4	25011	Massachusetts	Franklin	0.010
NOx	EUS	3000	H	6	0	NONE	NONE	0.008

NOx	EUS	3000	H	7	36051	New York	Livingston	0.016
NOx	EUS	3000	H	8	42001	Pennsylvania	Adams	0.015
NOx	EUS	3000	H	9	51053	Virginia	Dinwiddie	0.009
NOx	EUS	3000	H	10	45051	South Carolina	Horry	0.012
NOx	EUS	3000	H	11	26099	Michigan	Macomb	0.011
NOx	EUS	3000	H	12	39157	Ohio	Tuscarawas	0.010
NOx	EUS	3000	H	13	37009	North Carolina	Ashe	0.010
NOx	EUS	3000	H	14	45005	South Carolina	Allendale	0.007
NOx	EUS	3000	H	15	26103	Michigan	Marquette	0.004
NOx	EUS	3000	H	16	26117	Michigan	Montcalm	0.015
NOx	EUS	3000	H	17	18053	Indiana	Grant	0.018
NOx	EUS	3000	H	18	21009	Kentucky	Barren	0.010
NOx	EUS	3000	H	19	1123	Alabama	Tallapoosa	0.004
NOx	WUS	500	H	1	38057	North Dakota	Mercer	0.003
NOx	WUS	500	H	2	38059	North Dakota	Morton	0.003
NOx	WUS	500	H	3	8123	Colorado	Weld	0.004
NOx	WUS	500	H	4	8011	Colorado	Bent	0.001
NOx	WUS	500	H	6	30083	Montana	Richland	0.002
NOx	WUS	500	H	7	30075	Montana	Powder River	0.001
NOx	WUS	500	H	8	8069	Colorado	Larimer	0.001
NOx	WUS	500	H	9	8109	Colorado	Saguache	0.001
NOx	WUS	500	H	10	35035	New Mexico	Otero	0.000
NOx	WUS	500	H	11	30111	Montana	Yellowstone	0.002
NOx	WUS	500	H	12	49013	Utah	Duchesne	0.001
NOx	WUS	500	H	13	49037	Utah	San Juan	0.000
NOx	WUS	500	H	14	4007	Arizona	Gila	0.001
NOx	WUS	500	H	15	49049	Utah	Utah	0.005
NOx	WUS	500	H	16	49021	Utah	Iron	0.001
NOx	WUS	500	H	17	4012	Arizona	La Paz	0.000
NOx	WUS	500	H	18	41049	Oregon	Morrow	0.008
NOx	WUS	500	H	19	32001	Nevada	Churchill	0.001
NOx	WUS	500	H	20	6107	California	Tulare	0.023
NOx	WUS	500	H	21	6037	California	Los Angeles	0.001
NOx	WUS	500	H	22	53057	Washington	Skagit	0.005
NOx	WUS	500	H	23	53039	Washington	Klickitat	0.001
NOx	WUS	500	H	24	6063	California	Plumas	0.001
NOx	WUS	500	H	25	6047	California	Merced	0.015
NOx	WUS	500	H	26	6029	California	Kern	0.014
NOx	WUS	500	L	1	38057	North Dakota	Mercer	0.008
NOx	WUS	500	L	2	38059	North Dakota	Morton	0.007
NOx	WUS	500	L	3	8123	Colorado	Weld	0.008
NOx	WUS	500	L	4	8011	Colorado	Bent	0.002
NOx	WUS	500	L	6	30083	Montana	Richland	0.005
NOx	WUS	500	L	7	30075	Montana	Powder River	0.003
NOx	WUS	500	L	8	8069	Colorado	Larimer	0.001
NOx	WUS	500	L	9	8109	Colorado	Saguache	0.002
NOx	WUS	500	L	10	35035	New Mexico	Otero	0.000
NOx	WUS	500	L	11	30111	Montana	Yellowstone	0.004
NOx	WUS	500	L	12	49013	Utah	Duchesne	0.001
NOx	WUS	500	L	13	49037	Utah	San Juan	0.000
NOx	WUS	500	L	14	4007	Arizona	Gila	0.001
NOx	WUS	500	L	15	49049	Utah	Utah	0.006

NOx	WUS	500	L	16	49021	Utah	Iron	0.001
NOx	WUS	500	L	17	4012	Arizona	La Paz	0.000
NOx	WUS	500	L	18	41049	Oregon	Morrow	0.013
NOx	WUS	500	L	19	32001	Nevada	Churchill	0.002
NOx	WUS	500	L	20	6107	California	Tulare	0.031
NOx	WUS	500	L	21	6037	California	Los Angeles	0.002
NOx	WUS	500	L	22	53057	Washington	Skagit	0.007
NOx	WUS	500	L	23	53039	Washington	Klickitat	0.002
NOx	WUS	500	L	24	6063	California	Plumas	0.002
NOx	WUS	500	L	25	6047	California	Merced	0.023
NOx	WUS	500	L	26	6029	California	Kern	0.017
NOx	WUS	1000	H	1	38057	North Dakota	Mercer	0.006
NOx	WUS	1000	H	2	38059	North Dakota	Morton	0.005
NOx	WUS	1000	H	3	8123	Colorado	Weld	0.008
NOx	WUS	1000	H	4	8011	Colorado	Bent	0.002
NOx	WUS	1000	H	6	30083	Montana	Richland	0.004
NOx	WUS	1000	H	7	30075	Montana	Powder River	0.002
NOx	WUS	1000	H	8	8069	Colorado	Larimer	0.002
NOx	WUS	1000	H	9	8109	Colorado	Saguache	0.002
NOx	WUS	1000	H	10	35035	New Mexico	Otero	0.000
NOx	WUS	1000	H	11	30111	Montana	Yellowstone	0.004
NOx	WUS	1000	H	12	49013	Utah	Duchesne	0.002
NOx	WUS	1000	H	13	49037	Utah	San Juan	0.000
NOx	WUS	1000	H	14	4007	Arizona	Gila	0.001
NOx	WUS	1000	H	15	49049	Utah	Utah	0.010
NOx	WUS	1000	H	16	49021	Utah	Iron	0.001
NOx	WUS	1000	H	17	4012	Arizona	La Paz	0.000
NOx	WUS	1000	H	18	41049	Oregon	Morrow	0.016
NOx	WUS	1000	H	19	32001	Nevada	Churchill	0.002
NOx	WUS	1000	H	20	6107	California	Tulare	0.045
NOx	WUS	1000	H	21	6037	California	Los Angeles	0.003
NOx	WUS	1000	H	22	53057	Washington	Skagit	0.009
NOx	WUS	1000	H	23	53039	Washington	Klickitat	0.003
NOx	WUS	1000	H	24	6063	California	Plumas	0.002
NOx	WUS	1000	H	25	6047	California	Merced	0.030
NOx	WUS	1000	H	26	6029	California	Kern	0.028
NOx	WUS	3000	H	1	38057	North Dakota	Mercer	0.016
NOx	WUS	3000	H	2	38059	North Dakota	Morton	0.013
NOx	WUS	3000	H	3	8123	Colorado	Weld	0.019
NOx	WUS	3000	H	4	8011	Colorado	Bent	0.007
NOx	WUS	3000	H	6	30083	Montana	Richland	0.009
NOx	WUS	3000	H	7	30075	Montana	Powder River	0.006
NOx	WUS	3000	H	8	8069	Colorado	Larimer	0.005
NOx	WUS	3000	H	9	8109	Colorado	Saguache	0.007
NOx	WUS	3000	H	10	35035	New Mexico	Otero	0.001
NOx	WUS	3000	H	11	30111	Montana	Yellowstone	0.009
NOx	WUS	3000	H	12	49013	Utah	Duchesne	0.005
NOx	WUS	3000	H	13	49037	Utah	San Juan	0.001
NOx	WUS	3000	H	14	4007	Arizona	Gila	0.003
NOx	WUS	3000	H	15	49049	Utah	Utah	0.028
NOx	WUS	3000	H	16	49021	Utah	Iron	0.004
NOx	WUS	3000	H	17	4012	Arizona	La Paz	0.001

NOx	WUS	3000	H	18	41049	Oregon	Morrow	0.042
NOx	WUS	3000	H	19	32001	Nevada	Churchill	0.006
NOx	WUS	3000	H	20	6107	California	Tulare	0.128
NOx	WUS	3000	H	21	6037	California	Los Angeles	0.008
NOx	WUS	3000	H	22	53057	Washington	Skagit	0.026
NOx	WUS	3000	H	23	53039	Washington	Klickitat	0.008
NOx	WUS	3000	H	24	6063	California	Plumas	0.007
NOx	WUS	3000	H	25	6047	California	Merced	0.082
NOx	WUS	3000	H	26	6029	California	Kern	0.080
SO2	CUS	500	L	1	18127	Indiana	Porter	0.026
SO2	CUS	500	L	2	18037	Indiana	Dubois	0.005
SO2	CUS	500	L	3	47055	Tennessee	Giles	0.009
SO2	CUS	500	L	4	1001	Alabama	Autauga	0.031
SO2	CUS	500	L	6	17155	Illinois	Putnam	0.008
SO2	CUS	500	L	7	17145	Illinois	Perry	0.010
SO2	CUS	500	L	8	47157	Tennessee	Shelby	0.009
SO2	CUS	500	L	9	28129	Mississippi	Smith	0.035
SO2	CUS	500	L	10	22071	Louisiana	Orleans	0.023
SO2	CUS	500	L	11	19095	Iowa	Iowa	0.029
SO2	CUS	500	L	12	29029	Missouri	Camden	0.011
SO2	CUS	500	L	13	5119	Arkansas	Pulaski	0.016
SO2	CUS	500	L	14	22061	Louisiana	Lincoln	0.009
SO2	CUS	500	L	15	22001	Louisiana	Acadia	0.041
SO2	CUS	500	L	16	31055	Nebraska	Douglas	0.016
SO2	CUS	500	L	17	20091	Kansas	Johnson	0.019
SO2	CUS	500	L	18	40101	Oklahoma	Muskogee	0.014
SO2	CUS	500	L	19	48213	Texas	Henderson	0.006
SO2	CUS	500	L	20	48201	Texas	Harris	0.040
SO2	CUS	500	L	21	31001	Nebraska	Adams	0.037
SO2	CUS	500	L	22	20155	Kansas	Reno	0.007
SO2	CUS	500	L	23	40017	Oklahoma	Canadian	0.011
SO2	CUS	500	L	24	48367	Texas	Parker	0.008
SO2	CUS	500	L	25	48187	Texas	Guadalupe	0.013
SO2	CUS	1000	H	1	18127	Indiana	Porter	0.019
SO2	CUS	1000	H	2	18037	Indiana	Dubois	0.008
SO2	CUS	1000	H	3	47055	Tennessee	Giles	0.010
SO2	CUS	1000	H	4	1001	Alabama	Autauga	0.021
SO2	CUS	1000	H	6	17155	Illinois	Putnam	0.009
SO2	CUS	1000	H	7	17145	Illinois	Perry	0.009
SO2	CUS	1000	H	8	47157	Tennessee	Shelby	0.008
SO2	CUS	1000	H	9	28129	Mississippi	Smith	0.018
SO2	CUS	1000	H	10	22071	Louisiana	Orleans	0.023
SO2	CUS	1000	H	11	19095	Iowa	Iowa	0.020
SO2	CUS	1000	H	12	29029	Missouri	Camden	0.012
SO2	CUS	1000	H	13	5119	Arkansas	Pulaski	0.013
SO2	CUS	1000	H	14	22061	Louisiana	Lincoln	0.012
SO2	CUS	1000	H	15	22001	Louisiana	Acadia	0.027
SO2	CUS	1000	H	16	31055	Nebraska	Douglas	0.013
SO2	CUS	1000	H	17	20091	Kansas	Johnson	0.010
SO2	CUS	1000	H	18	40101	Oklahoma	Muskogee	0.008
SO2	CUS	1000	H	19	48213	Texas	Henderson	0.007
SO2	CUS	1000	H	20	48201	Texas	Harris	0.022
SO2	CUS	1000	H	21	31001	Nebraska	Adams	0.022
SO2	CUS	1000	H	22	20155	Kansas	Reno	0.009

SO2	CUS	1000	H	23	40017	Oklahoma	Canadian	0.007
SO2	CUS	1000	H	24	48367	Texas	Parker	0.009
SO2	CUS	1000	H	25	48187	Texas	Guadalupe	0.014
SO2	CUS	1000	L	1	18127	Indiana	Porter	0.064
SO2	CUS	1000	L	2	18037	Indiana	Dubois	0.015
SO2	CUS	1000	L	3	47055	Tennessee	Giles	0.033
SO2	CUS	1000	L	4	1001	Alabama	Autauga	0.094
SO2	CUS	1000	L	6	17155	Illinois	Putnam	0.025
SO2	CUS	1000	L	7	17145	Illinois	Perry	0.029
SO2	CUS	1000	L	8	47157	Tennessee	Shelby	0.021
SO2	CUS	1000	L	9	28129	Mississippi	Smith	0.095
SO2	CUS	1000	L	10	22071	Louisiana	Orleans	0.075
SO2	CUS	1000	L	11	19095	Iowa	Iowa	0.067
SO2	CUS	1000	L	12	29029	Missouri	Camden	0.035
SO2	CUS	1000	L	13	5119	Arkansas	Pulaski	0.046
SO2	CUS	1000	L	14	22061	Louisiana	Lincoln	0.030
SO2	CUS	1000	L	15	22001	Louisiana	Acadia	0.111
SO2	CUS	1000	L	16	31055	Nebraska	Douglas	0.043
SO2	CUS	1000	L	17	20091	Kansas	Johnson	0.051
SO2	CUS	1000	L	18	40101	Oklahoma	Muskogee	0.040
SO2	CUS	1000	L	19	48213	Texas	Henderson	0.019
SO2	CUS	1000	L	20	48201	Texas	Harris	0.111
SO2	CUS	1000	L	21	31001	Nebraska	Adams	0.087
SO2	CUS	1000	L	22	20155	Kansas	Reno	0.019
SO2	CUS	1000	L	23	40017	Oklahoma	Canadian	0.030
SO2	CUS	1000	L	24	48367	Texas	Parker	0.026
SO2	CUS	1000	L	25	48187	Texas	Guadalupe	0.040
SO2	CUS	3000	H	1	18127	Indiana	Porter	0.088
SO2	CUS	3000	H	2	18037	Indiana	Dubois	0.047
SO2	CUS	3000	H	3	47055	Tennessee	Giles	0.060
SO2	CUS	3000	H	4	1001	Alabama	Autauga	0.114
SO2	CUS	3000	H	6	17155	Illinois	Putnam	0.047
SO2	CUS	3000	H	7	17145	Illinois	Perry	0.046
SO2	CUS	3000	H	8	47157	Tennessee	Shelby	0.036
SO2	CUS	3000	H	9	28129	Mississippi	Smith	0.094
SO2	CUS	3000	H	10	22071	Louisiana	Orleans	0.138
SO2	CUS	3000	H	11	19095	Iowa	Iowa	0.077
SO2	CUS	3000	H	12	29029	Missouri	Camden	0.063
SO2	CUS	3000	H	13	5119	Arkansas	Pulaski	0.064
SO2	CUS	3000	H	14	22061	Louisiana	Lincoln	0.065
SO2	CUS	3000	H	15	22001	Louisiana	Acadia	0.115
SO2	CUS	3000	H	16	31055	Nebraska	Douglas	0.059
SO2	CUS	3000	H	17	20091	Kansas	Johnson	0.050
SO2	CUS	3000	H	18	40101	Oklahoma	Muskogee	0.047
SO2	CUS	3000	H	19	48213	Texas	Henderson	0.039
SO2	CUS	3000	H	20	48201	Texas	Harris	0.100
SO2	CUS	3000	H	21	31001	Nebraska	Adams	0.080
SO2	CUS	3000	H	22	20155	Kansas	Reno	0.039
SO2	CUS	3000	H	23	40017	Oklahoma	Canadian	0.030
SO2	CUS	3000	H	24	48367	Texas	Parker	0.043
SO2	CUS	3000	H	25	48187	Texas	Guadalupe	0.067
SO2	EUS	500	H	1	23003	Maine	Aroostook	0.009
SO2	EUS	500	H	2	23031	Maine	York	0.014
SO2	EUS	500	H	3	25021	Massachusetts	Norfolk	0.006

SO2	EUS	500	H	4	25011	Massachusetts	Franklin	0.005
SO2	EUS	500	H	6	0	NONE	NONE	0.004
SO2	EUS	500	H	7	36051	New York	Livingston	0.003
SO2	EUS	500	H	8	42001	Pennsylvania	Adams	0.003
SO2	EUS	500	H	9	51053	Virginia	Dinwiddie	0.007
SO2	EUS	500	H	10	45051	South Carolina	Horry	0.006
SO2	EUS	500	H	11	26099	Michigan	Macomb	0.004
SO2	EUS	500	H	12	39157	Ohio	Tuscarawas	0.004
SO2	EUS	500	H	13	37009	North Carolina	Ashe	0.007
SO2	EUS	500	H	14	45005	South Carolina	Allendale	0.006
SO2	EUS	500	H	15	26103	Michigan	Marquette	0.005
SO2	EUS	500	H	16	26117	Michigan	Montcalm	0.004
SO2	EUS	500	H	17	18053	Indiana	Grant	0.005
SO2	EUS	500	H	18	21009	Kentucky	Barren	0.002
SO2	EUS	500	H	19	1123	Alabama	Tallapoosa	0.005
SO2	EUS	500	L	1	23003	Maine	Aroostook	0.021
SO2	EUS	500	L	2	23031	Maine	York	0.025
SO2	EUS	500	L	3	25021	Massachusetts	Norfolk	0.010
SO2	EUS	500	L	4	25011	Massachusetts	Franklin	0.009
SO2	EUS	500	L	6	0	NONE	NONE	0.013
SO2	EUS	500	L	7	36051	New York	Livingston	0.006
SO2	EUS	500	L	8	42001	Pennsylvania	Adams	0.009
SO2	EUS	500	L	9	51053	Virginia	Dinwiddie	0.014
SO2	EUS	500	L	10	45051	South Carolina	Horry	0.023
SO2	EUS	500	L	11	26099	Michigan	Macomb	0.008
SO2	EUS	500	L	12	39157	Ohio	Tuscarawas	0.009
SO2	EUS	500	L	13	37009	North Carolina	Ashe	0.010
SO2	EUS	500	L	14	45005	South Carolina	Allendale	0.016
SO2	EUS	500	L	15	26103	Michigan	Marquette	0.010
SO2	EUS	500	L	16	26117	Michigan	Montcalm	0.011
SO2	EUS	500	L	17	18053	Indiana	Grant	0.011
SO2	EUS	500	L	18	21009	Kentucky	Barren	0.004
SO2	EUS	500	L	19	1123	Alabama	Tallapoosa	0.010
SO2	EUS	1000	H	1	23003	Maine	Aroostook	0.016
SO2	EUS	1000	H	2	23031	Maine	York	0.025
SO2	EUS	1000	H	3	25021	Massachusetts	Norfolk	0.011
SO2	EUS	1000	H	4	25011	Massachusetts	Franklin	0.009
SO2	EUS	1000	H	6	0	NONE	NONE	0.008
SO2	EUS	1000	H	7	36051	New York	Livingston	0.006
SO2	EUS	1000	H	8	42001	Pennsylvania	Adams	0.006
SO2	EUS	1000	H	9	51053	Virginia	Dinwiddie	0.013
SO2	EUS	1000	H	10	45051	South Carolina	Horry	0.012
SO2	EUS	1000	H	11	26099	Michigan	Macomb	0.007
SO2	EUS	1000	H	12	39157	Ohio	Tuscarawas	0.008
SO2	EUS	1000	H	13	37009	North Carolina	Ashe	0.013
SO2	EUS	1000	H	14	45005	South Carolina	Allendale	0.011
SO2	EUS	1000	H	15	26103	Michigan	Marquette	0.010
SO2	EUS	1000	H	16	26117	Michigan	Montcalm	0.008
SO2	EUS	1000	H	17	18053	Indiana	Grant	0.009
SO2	EUS	1000	H	18	21009	Kentucky	Barren	0.004
SO2	EUS	1000	H	19	1123	Alabama	Tallapoosa	0.009
SO2	EUS	3000	H	1	23003	Maine	Aroostook	0.037
SO2	EUS	3000	H	2	23031	Maine	York	0.056
SO2	EUS	3000	H	3	25021	Massachusetts	Norfolk	0.028

SO2	EUS	3000	H	4	25011	Massachusetts	Franklin	0.023
SO2	EUS	3000	H	6	0	NONE	NONE	0.020
SO2	EUS	3000	H	7	36051	New York	Livingston	0.016
SO2	EUS	3000	H	8	42001	Pennsylvania	Adams	0.016
SO2	EUS	3000	H	9	51053	Virginia	Dinwiddie	0.031
SO2	EUS	3000	H	10	45051	South Carolina	Horry	0.030
SO2	EUS	3000	H	11	26099	Michigan	Macomb	0.019
SO2	EUS	3000	H	12	39157	Ohio	Tuscarawas	0.022
SO2	EUS	3000	H	13	37009	North Carolina	Ashe	0.033
SO2	EUS	3000	H	14	45005	South Carolina	Allendale	0.029
SO2	EUS	3000	H	15	26103	Michigan	Marquette	0.025
SO2	EUS	3000	H	16	26117	Michigan	Montcalm	0.020
SO2	EUS	3000	H	17	18053	Indiana	Grant	0.025
SO2	EUS	3000	H	18	21009	Kentucky	Barren	0.014
SO2	EUS	3000	H	19	1123	Alabama	Tallapoosa	0.024
SO2	WUS	500	H	1	38057	North Dakota	Mercer	0.013
SO2	WUS	500	H	2	38059	North Dakota	Morton	0.007
SO2	WUS	500	H	3	8123	Colorado	Weld	0.005
SO2	WUS	500	H	4	8011	Colorado	Bent	0.003
SO2	WUS	500	H	6	30083	Montana	Richland	0.004
SO2	WUS	500	H	7	30075	Montana	Powder River	0.003
SO2	WUS	500	H	8	8069	Colorado	Larimer	0.002
SO2	WUS	500	H	9	8109	Colorado	Saguache	0.003
SO2	WUS	500	H	10	35035	New Mexico	Otero	0.001
SO2	WUS	500	H	11	30111	Montana	Yellowstone	0.004
SO2	WUS	500	H	12	49013	Utah	Duchesne	0.003
SO2	WUS	500	H	13	49037	Utah	San Juan	0.002
SO2	WUS	500	H	14	4007	Arizona	Gila	0.001
SO2	WUS	500	H	15	49049	Utah	Utah	0.005
SO2	WUS	500	H	16	49021	Utah	Iron	0.003
SO2	WUS	500	H	17	4012	Arizona	La Paz	0.002
SO2	WUS	500	H	18	41049	Oregon	Morrow	0.007
SO2	WUS	500	H	19	32001	Nevada	Churchill	0.007
SO2	WUS	500	H	20	6107	California	Tulare	0.019
SO2	WUS	500	H	21	6037	California	Los Angeles	0.002
SO2	WUS	500	H	22	53057	Washington	Skagit	0.006
SO2	WUS	500	H	23	53039	Washington	Klickitat	0.009
SO2	WUS	500	H	24	6063	California	Plumas	0.007
SO2	WUS	500	H	25	6047	California	Merced	0.009
SO2	WUS	500	H	26	6029	California	Kern	0.009
SO2	WUS	500	L	1	38057	North Dakota	Mercer	0.044
SO2	WUS	500	L	2	38059	North Dakota	Morton	0.018
SO2	WUS	500	L	3	8123	Colorado	Weld	0.009
SO2	WUS	500	L	4	8011	Colorado	Bent	0.004
SO2	WUS	500	L	6	30083	Montana	Richland	0.008
SO2	WUS	500	L	7	30075	Montana	Powder River	0.006
SO2	WUS	500	L	8	8069	Colorado	Larimer	0.002
SO2	WUS	500	L	9	8109	Colorado	Saguache	0.004
SO2	WUS	500	L	10	35035	New Mexico	Otero	0.002
SO2	WUS	500	L	11	30111	Montana	Yellowstone	0.005
SO2	WUS	500	L	12	49013	Utah	Duchesne	0.004
SO2	WUS	500	L	13	49037	Utah	San Juan	0.002

SO2	WUS	500	L	14	4007	Arizona	Gila	0.002
SO2	WUS	500	L	15	49049	Utah	Utah	0.006
SO2	WUS	500	L	16	49021	Utah	Iron	0.004
SO2	WUS	500	L	17	4012	Arizona	La Paz	0.003
SO2	WUS	500	L	18	41049	Oregon	Morrow	0.008
SO2	WUS	500	L	19	32001	Nevada	Churchill	0.009
SO2	WUS	500	L	20	6107	California	Tulare	0.042
SO2	WUS	500	L	21	6037	California	Los Angeles	0.002
SO2	WUS	500	L	22	53057	Washington	Skagit	0.006
SO2	WUS	500	L	23	53039	Washington	Klickitat	0.009
SO2	WUS	500	L	24	6063	California	Plumas	0.011
SO2	WUS	500	L	25	6047	California	Merced	0.018
SO2	WUS	500	L	26	6029	California	Kern	0.009
SO2	WUS	1000	H	1	38057	North Dakota	Mercer	0.026
SO2	WUS	1000	H	2	38059	North Dakota	Morton	0.013
SO2	WUS	1000	H	3	8123	Colorado	Weld	0.010
SO2	WUS	1000	H	4	8011	Colorado	Bent	0.006
SO2	WUS	1000	H	6	30083	Montana	Richland	0.008
SO2	WUS	1000	H	7	30075	Montana	Powder River	0.006
SO2	WUS	1000	H	8	8069	Colorado	Larimer	0.003
SO2	WUS	1000	H	9	8109	Colorado	Saguache	0.005
SO2	WUS	1000	H	10	35035	New Mexico	Otero	0.003
SO2	WUS	1000	H	11	30111	Montana	Yellowstone	0.007
SO2	WUS	1000	H	12	49013	Utah	Duchesne	0.006
SO2	WUS	1000	H	13	49037	Utah	San Juan	0.003
SO2	WUS	1000	H	14	4007	Arizona	Gila	0.003
SO2	WUS	1000	H	15	49049	Utah	Utah	0.010
SO2	WUS	1000	H	16	49021	Utah	Iron	0.005
SO2	WUS	1000	H	17	4012	Arizona	La Paz	0.005
SO2	WUS	1000	H	18	41049	Oregon	Morrow	0.013
SO2	WUS	1000	H	19	32001	Nevada	Churchill	0.012
SO2	WUS	1000	H	20	6107	California	Tulare	0.036
SO2	WUS	1000	H	21	6037	California	Los Angeles	0.003
SO2	WUS	1000	H	22	53057	Washington	Skagit	0.012
SO2	WUS	1000	H	23	53039	Washington	Klickitat	0.016
SO2	WUS	1000	H	24	6063	California	Plumas	0.012
SO2	WUS	1000	H	25	6047	California	Merced	0.018
SO2	WUS	1000	H	26	6029	California	Kern	0.017
SO2	WUS	3000	H	1	38057	North Dakota	Mercer	0.075
SO2	WUS	3000	H	2	38059	North Dakota	Morton	0.031
SO2	WUS	3000	H	3	8123	Colorado	Weld	0.024
SO2	WUS	3000	H	4	8011	Colorado	Bent	0.016
SO2	WUS	3000	H	6	30083	Montana	Richland	0.018
SO2	WUS	3000	H	7	30075	Montana	Powder River	0.017
SO2	WUS	3000	H	8	8069	Colorado	Larimer	0.008
SO2	WUS	3000	H	9	8109	Colorado	Saguache	0.015
SO2	WUS	3000	H	10	35035	New Mexico	Otero	0.009
SO2	WUS	3000	H	11	30111	Montana	Yellowstone	0.019
SO2	WUS	3000	H	12	49013	Utah	Duchesne	0.016
SO2	WUS	3000	H	13	49037	Utah	San Juan	0.010
SO2	WUS	3000	H	14	4007	Arizona	Gila	0.009
SO2	WUS	3000	H	15	49049	Utah	Utah	0.027

SO2	WUS	3000	H	16	49021	Utah	Iron	0.013
SO2	WUS	3000	H	17	4012	Arizona	La Paz	0.014
SO2	WUS	3000	H	18	41049	Oregon	Morrow	0.034
SO2	WUS	3000	H	19	32001	Nevada	Churchill	0.030
SO2	WUS	3000	H	20	6107	California	Tulare	0.096
SO2	WUS	3000	H	21	6037	California	Los Angeles	0.009
SO2	WUS	3000	H	22	53057	Washington	Skagit	0.033
SO2	WUS	3000	H	23	53039	Washington	Klickitat	0.039
SO2	WUS	3000	H	24	6063	California	Plumas	0.032
SO2	WUS	3000	H	25	6047	California	Merced	0.048
SO2	WUS	3000	H	26	6029	California	Kern	0.049

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