SO_2 SIP

Appendix A

Modeling Protocol

A-1: Modeling Protocol (Nov. 10, 2015)

A-2: Modeling Protocol Addendum (Apr. 13, 2017)

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A-1: Modeling Protocol (Nov. 10, 2015)

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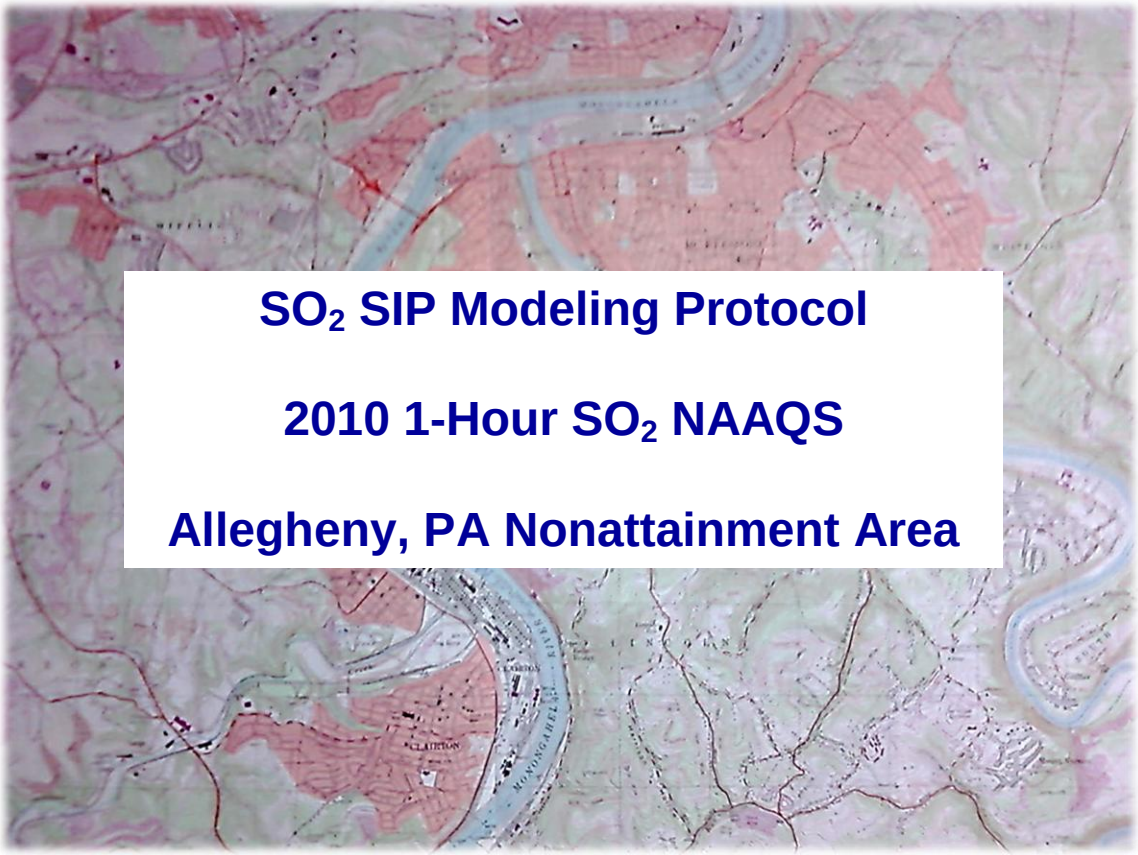

SO_2 SIP Modeling Protocol

2010 1-Hour SO_2 NAAQS

Allegheny, PA Nonattainment Area

Allegheny County Health Department
Air Quality Program

November 10, 2015

FINAL

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1 OVERVIEW

Modeling is a tool used to simulate observed conditions. For air-quality analyses, "air-dispersion modeling," as described by the U.S. Environmental Protection Agency (EPA), "uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source. Based on emissions and meteorological inputs, a dispersion model can be used to predict concentrations at selected downwind receptor locations."[1] Thus, an atmospheric model incorporates the three components of the air-pollution system, namely, the sources, dispersion, and receptors of atmospheric pollutants.

An air quality modeling *protocol* is a plan prepared to help assure that the most scientifically grounded estimates of future air-quality levels from atmospheric models are realized. Such a plan is used to demonstrate attainment of air-quality goals. For Allegheny County, a particular condition of concern addressed in this modeling protocol is the sulfur dioxide (SO_2) nonattainment area in the southeastern portion of the county. In particular, the Liberty monitoring site measured violations of the June 2010 1-hour SO_2 National Ambient Air Quality Standard (NAAQS). A violation of the SO2 NAAQS occurs when the 99th percentile daily maximum 1-hour SO_2 concentration averaged over three consecutive years exceeds 75 ppb (196 µg/m^3). The Liberty monitoring site experiences much high SO_2 concentrations than surrounding sites due to the influence of local sources within 5-10 km of the site.

As discussed in more detail herein, the EPA-recommended (Appendix W)[2] air quality model for estimating the near-source (< 50 km) impacts of primary emitted pollutants is the American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD) (U.S. EPA, 2005; Cimorelli et al., 2005). AERMOD has been demonstrated to perform adequately for many applications based on the results obtained from comprehensive field study results and when compared to the performance of the previous "workhorse" model of the EPA, the Industrial Source Complex Short Term, Version 3 (ISCST3) model (Perry et al., 2005). AERMOD along with additional models and techniques will be used to show that the emission control strategy proposed by Allegheny County will lead to attainment of the 1-hour National Ambient Air Quality Standard (NAAQS) for SO_2 by the due date of October 2018.

This section explains the requirement to prepare an attainment demonstration for the southeast Allegheny County SO_2 nonattainment area. Stakeholders, including contractors, associated with the SO_2 State Implementation Plan (SIP) workgroup and modeling protocol are also identified.

1.1 1-Hour SO_2 NAAQS and Nonattainment Designations

EPA tightened the NAAQS for SO_2 in 2010, establishing for the first time a 1-hour standard for SO_2 and setting that standard at 75 ppb (196 µg/m³). According to EPA's technical support document (TSD) for area designations in Pennsylvania (U.S. EPA, 2013a):

> "On June 2, 2010, EPA revised the primary SO_2 NAAQS (75 FR 35520), by establishing a new 1-hour standard at a level of 75 parts per billion (ppb) which is met at an ambient air quality monitoring site when the 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations does not exceed 75 ppb, as determined in accordance with Appendix T of 40 CFR part 50. 40 CFR 50.17(a)-(b). EPA has determined that this is the level necessary to provide protection of public health with an adequate margin of safety, especially for children, the elderly and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO_2. The Agency is revoking the two prior primary standards of 140 ppb evaluated over 24-hours, and 30 ppb evaluated over an entire year because these standards will not add additional public health protection given a 1-hour standard at 75 ppb…."

[1] http://www.epa.gov/scram001/dispersionindex.htm
[2] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

Initial designations for SO_2 nonattainment areas were based on areas with certified ambient air monitoring data collected during the calendar year (CY) 2010 through CY 2012 period for which the design value exceeded the 75 ppb NAAQS (please see Section 2.2). The extent of these select nonattainment areas was based on several factors, including monitored air quality, emissions and emissions-related data, meteorology, geography/topography, and jurisdictional boundaries. After considering these factors, EPA's TSD for area designations goes on to explain:

> "… EPA finds that the portions of Allegheny County that are nonattainment for the 2010 SO_2 NAAQS include the following: City of Clairton, City of Duquesne, City of McKeesport, Borough of Braddock, Borough of Dravosburg, Borough of East McKeesport, Borough of East Pittsburgh, Borough of Elizabeth, Borough of Glassport, Borough of Jefferson Hills, Borough of Liberty, Borough of Lincoln, Borough of North Braddock, Borough of Pleasant Hills, Borough of Port Vue, Borough of Versailles, Borough of Wall, Borough of West Elizabeth, Borough of West Mifflin, Elizabeth Township, Forward Township, and North Versailles Township. …"
>
> … "Available emissions, meteorological data, and geographical data suggest that the sources in the cities, boroughs and townships as identified … contribute to SO_2 NAAQS violations in Allegheny County." (U.S. EPA, 2013a)

The jurisdictions named by EPA and the area comprised by these jurisdictions are shown in Figure 1-1 below. This area, identified as the Allegheny, PA nonattainment area, is characterized by complex terrain as can be seen in the cutout.

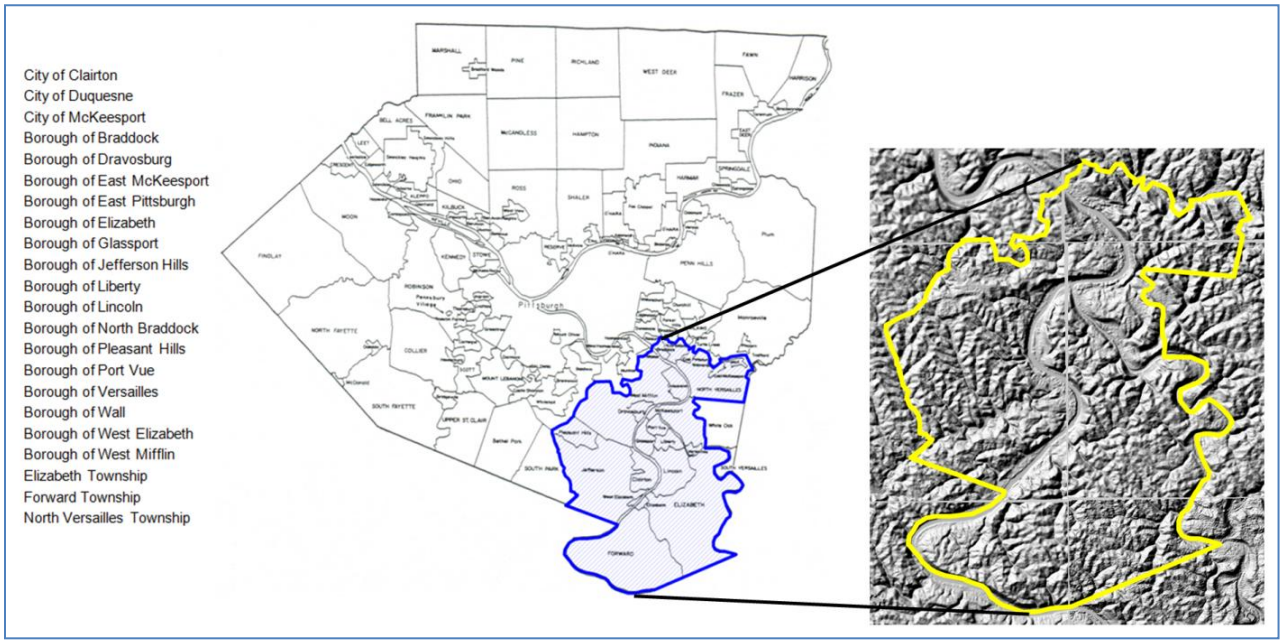

Figure 1-1. EPA's Designated SO_2 Nonattainment Area with Terrain Features

1.2 Stakeholders

ACHD is responsible for preparing and implementing a SIP that demonstrates attainment of the new hourly SO_2 NAAQS in the Allegheny, PA nonattainment area. A final attainment demonstration for this area will be provided to the PA DEP, on behalf of ACHD, for submittal to U.S. EPA Region III office as part of the Pennsylvania SIP.

ACHD staff, the SO_2 SIP Workgroup, and contractors have participated in the development of the SO_2 modeling procedures that are documented in this modeling protocol. The workgroup includes persons

from air quality agencies, local industry, environmental advocacy groups, environmental consulting companies, universities, and the general public. Table 1-1 lists members of the Allegheny County SO_2 SIP Workgroup and key personnel involved in the SO_2 modeling.

Table 1-1. Participants of the SO_2 SIP Workgroup

Participants	Affiliation	Website
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Joseph Minott Chelsea Perkins Ryan Knapick Aaron Jacobs-Smith	Clean Air Council, Philadelphia, PA	http://www.cleanair.org/
Cassie Steenblok	Clean Water Action (CWA), Pittsburgh, PA	http://www.cleanwateraction.org/pa
Larry Simmons	Energy & Environmental Management, Inc. (E^2M), Harrison City, PA	
Sue Seppi Joe Osborne	Group Against Smog and Pollution (GASP), Pittsburgh, PA	http://gasp-pgh.org
Philip R.S. Johnson	The Heinz Endowments Pittsburgh, PA	http://www.heinz.org/
John K. Irvine	Koppers Pittsburgh, PA	http://www.koppers.com/
John Shimshock	NRG Energy Inc., Canonsburg, PA	http://www.nrgenergy.com/
Steve Hepler	PA DEP - SW Regional Office, Pittsburgh, PA	http://www.portal.state.pa.us/portal/server.pt/community/southwest_regional_office/13775
Andrew Fleck Sean Nolan Daniel Roble John LaRosa	PA DEP - Headquarters, Harrisburg, PA	http://www.depweb.state.pa.us/portal/server.pt/community/air/6000
Valessa Souter-Kline	PennFuture Pittsburgh Office	http://www.pennfuture.org/
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Tim Leon-Guerrero Jessica Fry Ruth Knapp	U.S. EPA Region III Philadelphia, PA	http://www.epa.gov/aboutepa/region3.html

Participants	Affiliation	Website
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Contractors (ACHD)		
Ralph Morris Bart Brashers	Ramboll Environ Novato, CA	http://www.ramboll-environ.com/

2 PROBLEM STATEMENT

This section explains the nature of the SO_2 attainment challenge and provides a description of the southeastern Allegheny County nonattainment area (labeled "Allegheny, PA" by EPA in their TSD for area designations in Pennsylvania (U.S. EPA, 2013a)). Monitored SO_2 data results are also given.

2.1 Geographic/Meteorological Situation

The nonattainment area is made up of complex river valley terrain, roughly 11 miles wide by nearly 15 miles long. It includes a 23-mile winding portion of the Monongahela River, some of which serves as the southern border to the area, and a stretch of the Youghiogheny River that also functions as a small portion of the eastern border of the area. The area includes rural land, densely populated residential areas, and industrial facilities.

The base of the river valley lies at about 720 feet in elevation above mean sea level (MSL), while adjacent hilltops are over 1,100 feet MSL in elevation. Large temperature differences can be seen between hilltop and valley floor observations (e.g., 2 to 7°F) during clear, low-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180° in wind direction from the prevailing wind pattern with 3-4 mph downslope flows. Also, strong nighttime inversions can lead to poor dispersion scenarios on several days of the year (Sullivan, 1996).

The following wind rose in Figure 2-1 indicates that prevailing winds are from the southwest in the Liberty Borough area above the river valley.

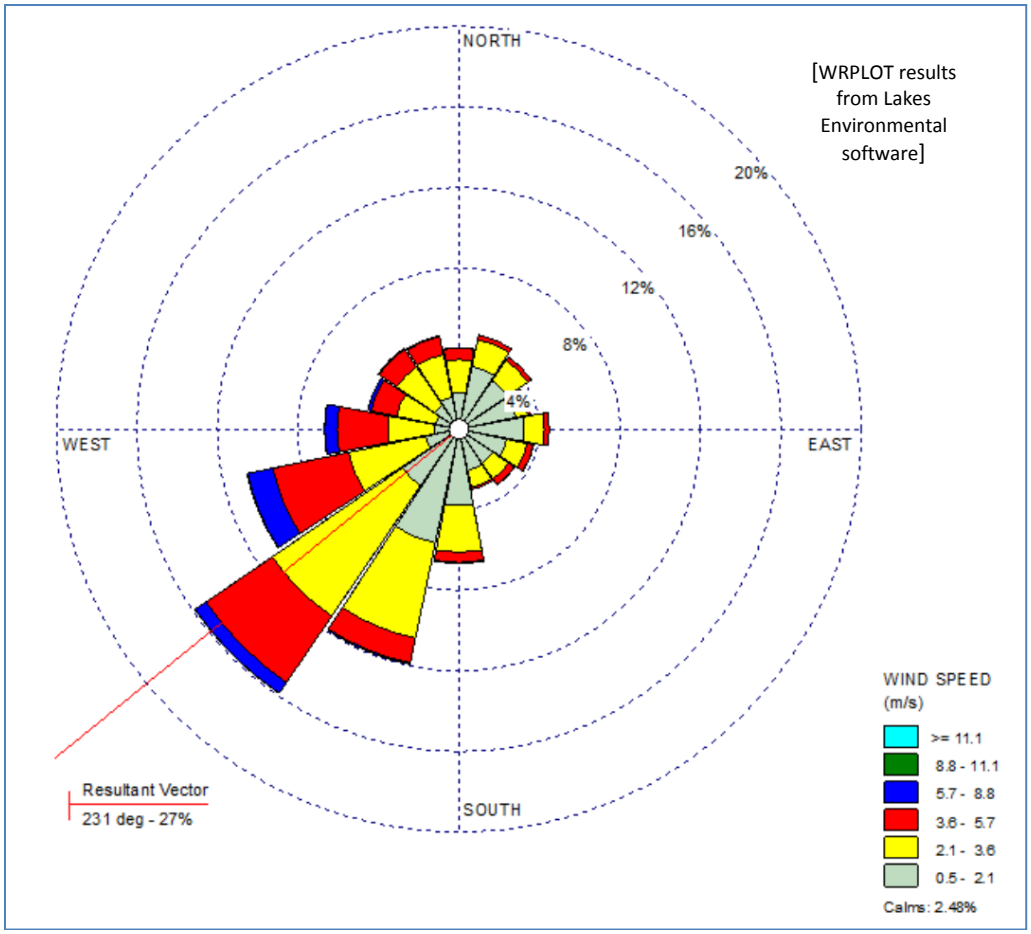
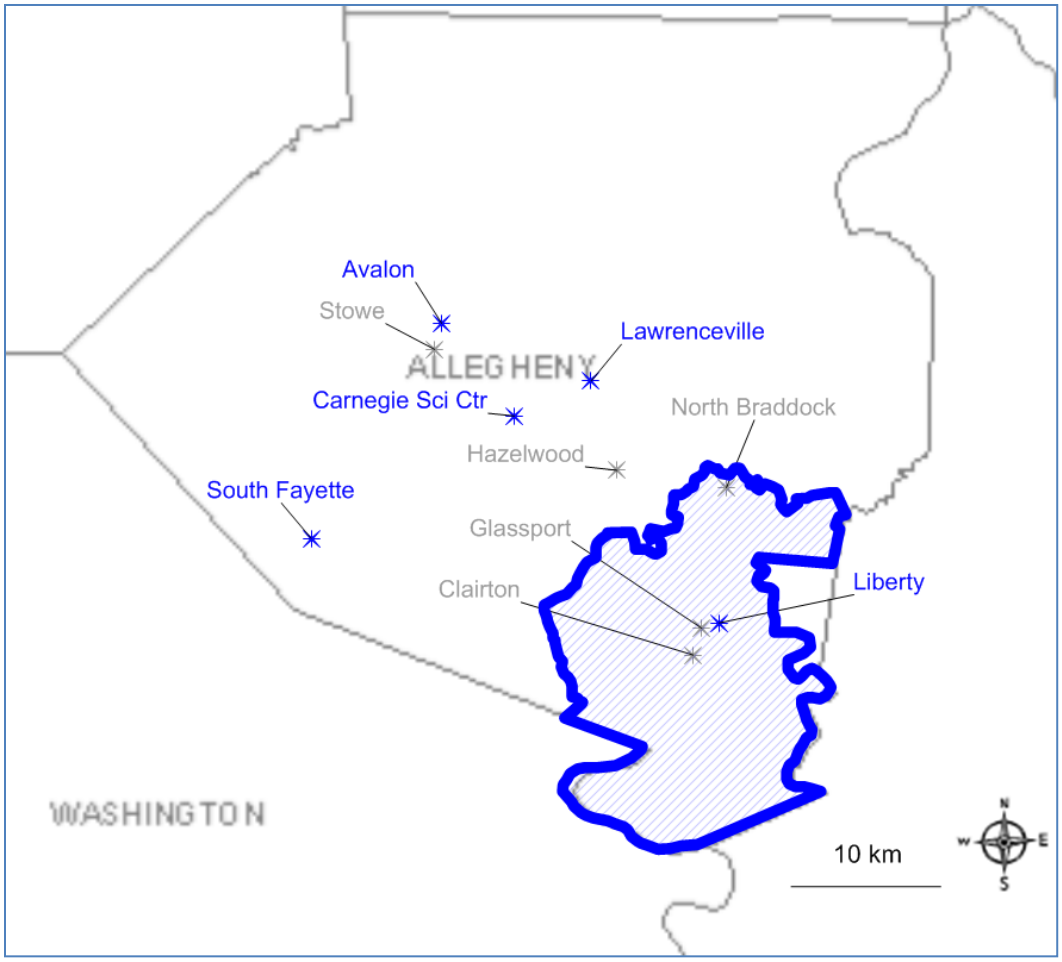


Figure 2-1. 2010-2014 Wind Rose for Liberty

2.2 Air Quality Monitoring Data

There are several current and former SO_2 monitoring locations in Allegheny County that are applicable to the SIP, shown in Figure 2-2 below. Sites outside of the nonattainment area can be used for background concentrations for the modeling demonstration. Former sites can also be examined for historical trends and as part of a conceptual model for the area. Former sites were discontinued due to site issues or to redundancy within the monitoring network.



Former sites are shown in gray

North Braddock was restarted in 2014

Lawrenceville began in 2010

Figure 2-2. Current (blue) and Former (gray) SO_2 Monitor Sites in Allegheny County

Long-term design values (3-year averages of the 4th-highest daily maximums) for Allegheny County sites over a 10-year timeframe are given are shown in Figure 2-3 on the following page.

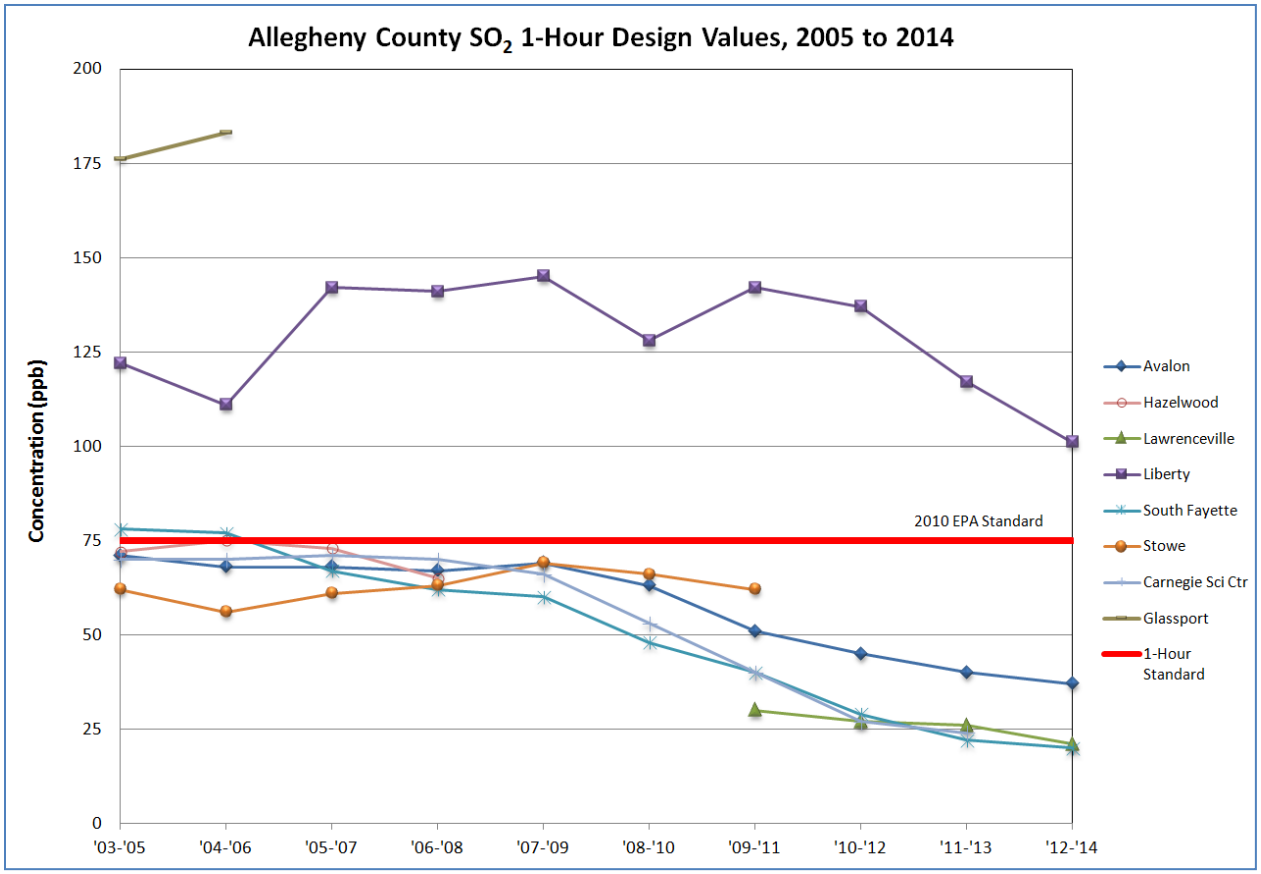


Figure 2-3. SO_2 Design Values 2005-2014, Allegheny County Sites

Recent monitored data shows that the only the Liberty monitor is in violation of the new 1-hour SO_2 standard of 75 ppb. The remaining monitors can be considered for background concentrations for the purposes of this attainment demonstration. (Note: North Braddock officially restarted on Jan. 1, 2014.)

Design values for the SO_2 sites in Figure 2-3 are also given in tabular form in Appendix B, along with other averaging periods. Note that demonstration of attainment for the 3-hour, 24-hour and annual NAAQS should also be demonstrated with the modeling.

Historical data back to 1996 for former sites are also shown in Appendix B, along with additional monitor data in the tri-state area analyzed for background purposes (see Section 4.6). Quality assurance data will also be included for data used in the final SIP submittal.

2.3 Local Emissions and Meteorology

The U. S. Steel Clairton Plant is the largest source within 2 km of the Liberty monitor and is adjacent to the Monongahela River where the river valley has a northwest to southeast orientation. As shown in the historical wind roses in Figure 2-4, the surface winds at the Liberty monitor on top of the ridge are primarily from the southwest representing synoptic transport, whereas down in the river valley near the U. S. Steel source the winds also include southeast and northwest components due to channeling within the river valley.

More recently, wind observations from the Clairton SODAR[3] operating near the U. S. Steel facility have become available that collected wind observations at 8 vertical levels above the ground: 30, 50, 70, 90, 110, 130, 150 and 170 m AGL. Good quality upper level wind observations started becoming available from the SODAR starting in late January 2014. Figure 2-5 displays wind roses from six levels of the SODAR during February through July 2014. The wind rose for the lowest level (30 m AGL) exhibits similarities with the surface wind rose near Glassport in Figure 2-4 that includes southeast and northwest winds due to channeling of the river valley whose ridge tops are ~110 m above the river. The SODAR wind roses for the upper vertical levels are similar to the surface wind rose at the Liberty monitoring site that lies on top of the ridge (Figure 2-1).

The highest hourly SO_2 observations at the Liberty monitor occur at night during strong inversion conditions that restrict dispersion conditions. The changes in the winds going from the floor of the river valley, where local sources exist, to the ridge tops, where the Liberty nonattainment monitor resides, emphasizes the importance in characterizing the river valley complex terrain meteorological conditions for accurately simulating transport and dispersion of pollutants in the Allegheny nonattainment area.

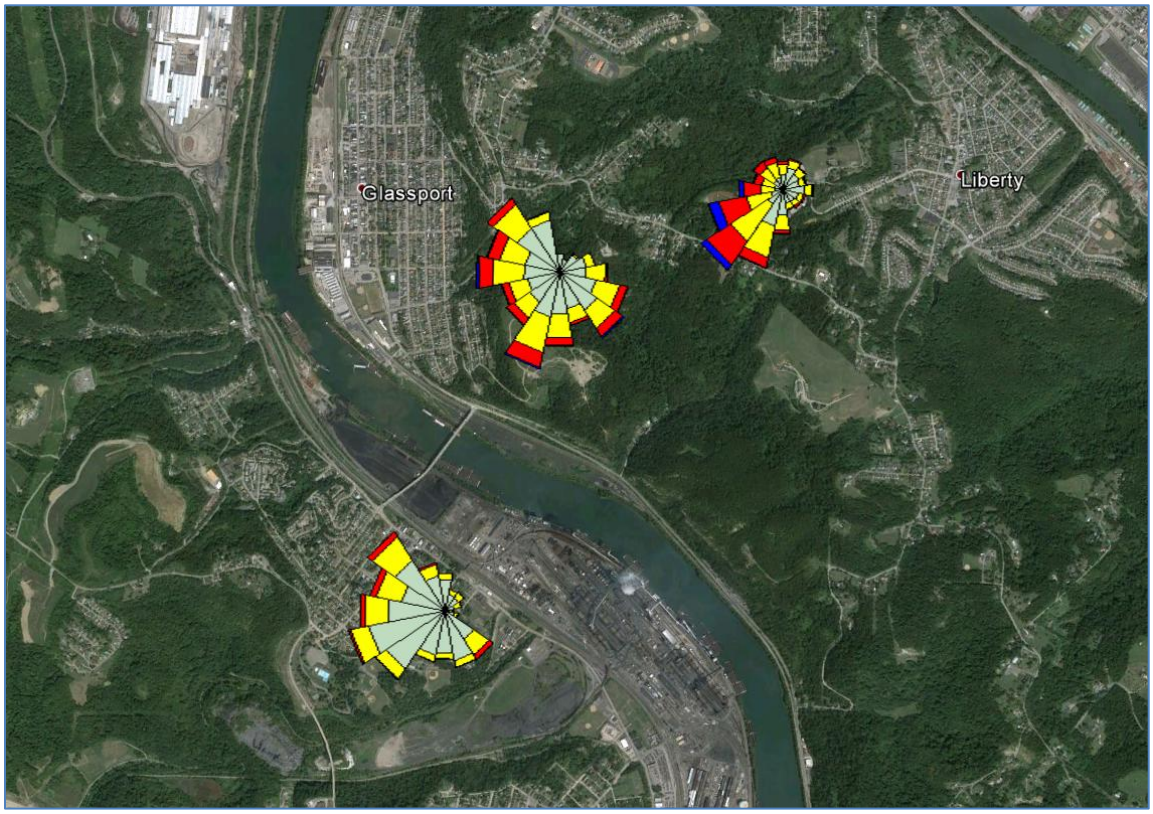


Figure 2-4. Historical Surface Wind Roses near the Liberty Monitor in the Allegheny County SO_2 Nonattainment Area (1996-2000)

[3] REMTECH Sonic Detection And Ranging (SODAR) PA0 system

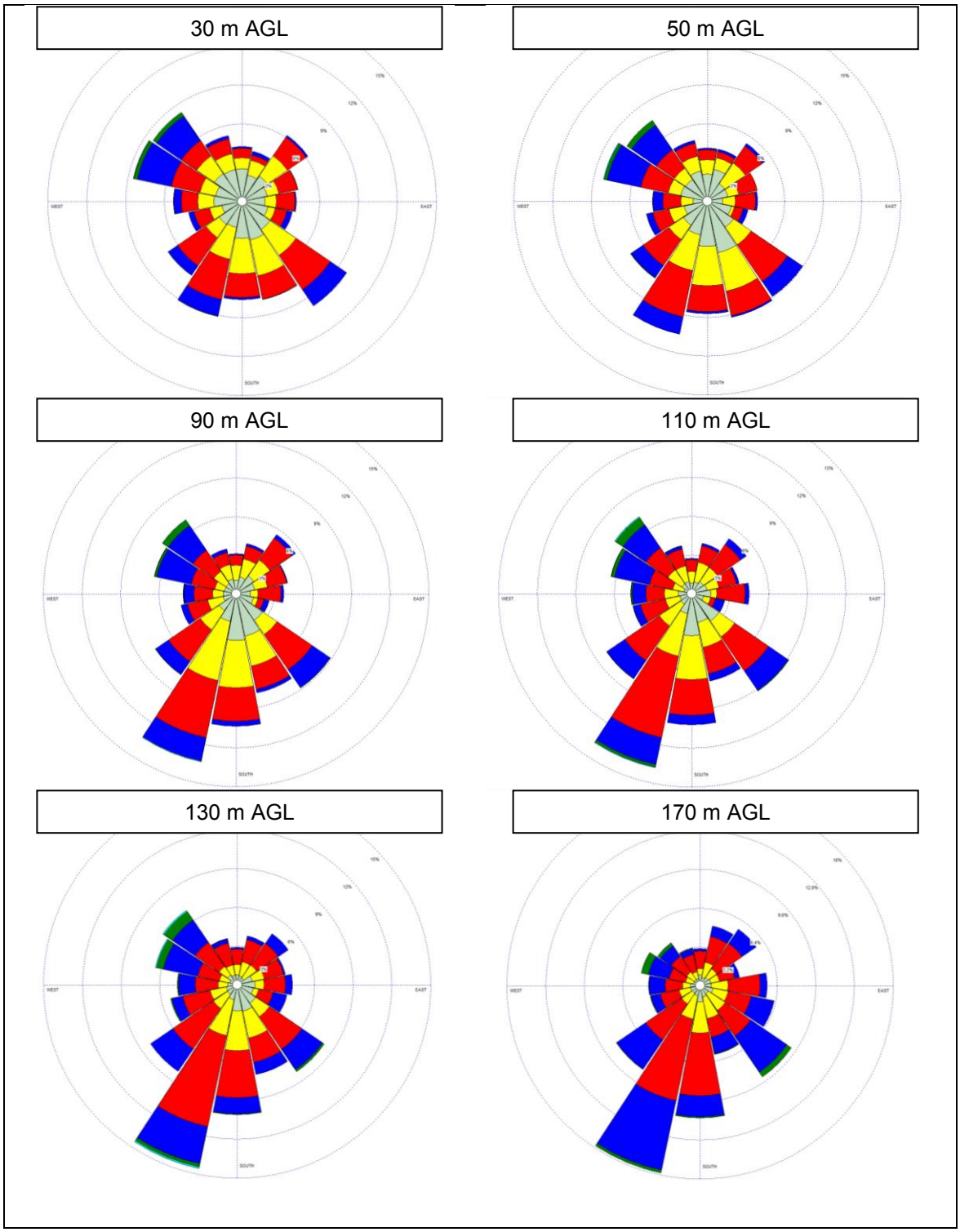


Figure 2-5. February-July 2014 Wind Roses at Six Vertical Levels from the Clairton SODAR.

Color scale: grey = 0.5-2.1; yellow = 2.1-3.6; red = 3.6-5.7; blue = 5.7-8.8; green = 8.8-11.1 m/s

Note: Data recovery from the SODAR was about 61% for year 2014.

3 SELECTION CRITERIA

This section outlines the models and the years to be modeled for the Allegheny, PA SO_2 attainment demonstration modeling effort. EPA issued *Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions* in April 2014 (U.S. EPA, 2014) and the proposed revision to Appendix W (*Guideline on Air Quality Models*) in July 2015 (U.S. EPA, 2015c). The following sections are written to conform to this guidance.

3.1 Model Selection and Options

The attainment demonstration will utilize EPA-preferred models and modeling techniques as adequate for the modeling simulation. AERMOD is the preferred model for near-field regulatory modeling. However, "Appendix W has flexibility to consider alternative models on a case-by-case basis when an adequate demonstration can be made that the alternative model performs better than, or is more appropriate than, the preferred model for a particular application" (EPA, 2014, pp. 13-14).

There are overall general issues to consider for this complex meteorology and terrain. As modeling proceeds, considerations will include, as appropriate:

- Alternative models and modeling scenarios
- Best representative meteorology for area
- Control strategies: Liberty Borough and North Braddock areas may need different controls. Separate scenarios may need to be modeled and with different options.

Model selection beyond the main use of the most-recent version of AERMOD (currently, v. 15181 released in July 2015) will likely involve consideration of various models/strategies such as:

- Proper characterization of sources
- Combination of AERMOD with other preferred models (possibly requiring acceptable alternative model justification)
- Use of CALPUFF, SCICHEM, or other models (requiring acceptable alternative model justification)

Model inputs entail the following decisions:

- Emissions: Maximum allowable or federally enforceable permit limits or appropriate maximum short-term potential rates for point and nonpoint sources.
- Sources: Sources to be identified. These may be only those within nonattainment area; however, some nearby sources beyond the area with significant impacts may be included.
- Background: How to best represent emissions outside area (e.g., distant sources may be accounted for by background).
- Meteorology: The best data set to represent conditions throughout area will be used (e.g., 5 years of Liberty onsite merged with PIT for upper air and additional surface parameters and missing hour substitution, or 3 years of "synthetic" site-specific MMIF derived from a prognostic meteorological model).
- Receptors: Placement and spacing (e.g., 100 m surrounding major sources, 200 m throughout).

3.1.1 Air Dispersion Model

The primary model used in the attainment demonstration is expected to be AERMOD. As indicated earlier, AERMOD is the recommended model for complex terrain and short- and long- term SO2 impacts within 50 km of a location of concern. The AERMOD modeling system (latest version v. 15181) includes

several components as described in Appendix A of the April 2014 EPA SO_2 SIP guidance document. Besides AERMOD itself, the current regulatory components include:

- AERMAP (v. 11103), the terrain processor for AERMOD, and
- AERMET (v. 15181), the meteorological data processor for AERMOD.

The non-regulatory components of AERMOD that will be employed in this modeling demonstration are:

- AERSURFACE (v. 13016), the surface characteristics processor for AERMET,
- BPIPPRIME (v. 04274), the building input processor for AERMOD, and
- AERMINUTE (v. 14237), a preprocessor to AERMET that calculates hourly averaged winds from 1-minute Automated Surface Observing System (ASOS) winds.

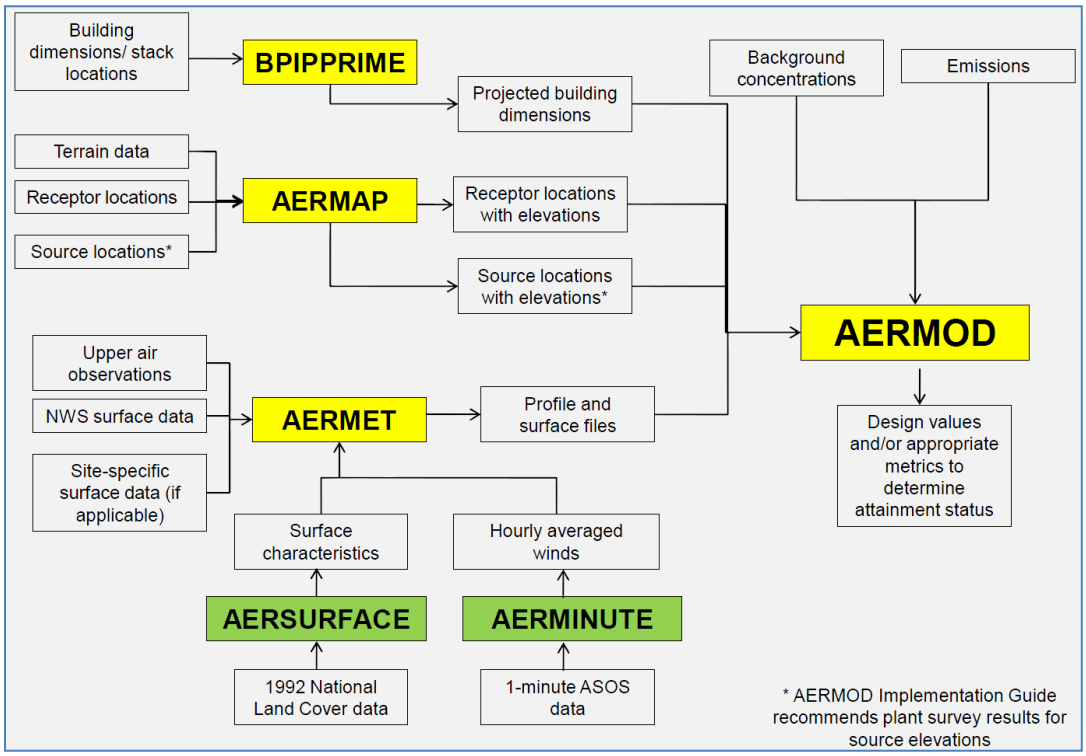


Figure 3-1. EPA's AERMOD Modeling System

In accordance with the April 2014 EPA guidance document, a design value baseline case will be established first by providing the following as input to AERMOD:

- Current allowable emissions
- Background concentrations
- Meteorology
- Receptors

Based on the fact that ambient monitoring results were used to establish the county's nonattainment area, model runs will also be completed using actual emissions in an attempt to demonstrate that the model performs adequately (i.e., compare model results with ambient monitoring data). Once adequate model performance has been demonstrated, additional model runs that incorporate various suggested emission control strategies will be completed until no predicted violations occur.

Facilities potentially affecting the Allegheny, PA nonattainment area are listed in Appendix D. Details of model input from these facilities, whether as point, volume, area, etc. sources and as a direct source or part of background, will be identified in the final SIP submittal.

Regarding the ability of AERMOD to produce realistic results, AERMOD operates with an improved understanding of the planetary boundary layer (PBL) (besides addressing surface releases, building downwash, plume interaction with terrain, and urban dispersion). But, although AERMOD has been shown to be a substantial improvement over previous models for complex terrain situations, the very nature of such terrain can present significant obstacles to the production of realistic results, even from AERMOD. So, a more refined characterization of the boundary layer using wind and turbulence data that accurately represents the changing airflow with altitude in the complex river valley of the Allegheny, PA nonattainment area would be another step toward properly simulating pollution dispersion there.

Recent studies have demonstrated that the provision of accurate, representative meteorological data to AERMOD from prognostic models such as the Weather Research and Forecasting (WRF) model (UCAR/NCAR, 2013) can improve AERMOD's output. AERMOD can be run for the nonattainment area in Allegheny County with WRF input versus routine meteorological input. The concentrations and isopleths pattern results can then be compared with measurements to assess the better-performing combination of input. If the WRF-AERMOD run yields better results, such combination would be used in the ACHD SIP to demonstrate future attainment of the new SO_2 NAAQS. The next section expands on this concept.

3.1.2 Meteorological Model Option

Section 8.3.c of EPA's Guideline on Air Quality Models (U.S. EPA, 2005) states in part that data representativeness for input to AERMOD "means utilizing data of an appropriate type for constructing realistic boundary layer profiles. Of paramount importance is the requirement that all meteorological data used as input to AERMOD must be both laterally and vertically representative of the transport and dispersion within the analysis domain."

AERMOD typically utilizes meteorological data from individual surface and upper-air locations and similarity parameterizations to estimate meteorological profiles. The measurements are frequently taken from National Weather Service (NWS) stations; however, there are significant limitations of NWS data for modeling purposes. The limitations include the fact that the surface data is a single-point measurement at a location that is often too far removed from the location of interest and at a single elevation, generally about 10 m above ground level; older NWS wind monitors (like cup/propeller anemometers and wind vanes, although sonic equipment is more likely today) have a relatively high starting threshold of approximately 1 m/s or greater; and, turbulence data are not available from NWS sites (Touma et al., 2007). Measurements made at a local air quality monitoring station are expected to be better, since they are from the area of concern and typically have threshold velocities of about 0.5 m/s, perhaps a bit less. However, local measurements are still usually made from isolated points at a solitary altitude with no turbulence data. In complicated terrain, a more thorough characterization would benefit the modeling effort.

One potential, relatively quick and simple, way to prepare accurate, representative surface meteorological data as input to AERMOD is to use prognostic model data such as output from the WRF model. The WRF model is a fully compressible and nonhydrostatic grid-based model that can be applied on scales from meters to thousands of kilometers. The WRF model was used via the Mesoscale Model Interface (MMIF) program (Brashers & Emery, 2015) to produce input to the Comprehensive Air Quality Model, with Extensions (CAMx) model (ENVIRON, 2013) for ACHD's recent $PM_{2.5}$ SIP with good results (ACHD, 2013 and Morris et al., 2012).

Discussion of the use and value of WRF model output to the present modeling demonstration can be found in Section 4.3 and Appendices F and I.

3.2 Modeled Years

The most recent consecutive calendar years will be initially selected for meteorology for the baseline modeling and model performance evaluation using AERMOD. (At the time of this protocol, the most recent complete years are 2010-2014.) Earlier years (2007, 2008, etc.) may be considered if there is low capture for meteorological data completeness or if the initial years are found to be inadequate or anomalous for meteorology.

Note that if Liberty is considered to be site-specific (or "onsite") for the nonattainment area, and airport data is not substituted, only 1 year of data is required in AERMOD. Since quality-assured data is readily available for many consecutive years at Liberty, a more robust 5-year period will be used.

If prognostic data is selected, 3 or more years (as available) would be chosen for the baseline years, consistent with proposed Appendix W recommendations (U.S. EPA, 2015c).[4] Prognostic data would be compared to concurrent measured data (as available) for appropriateness.

The baseline emissions would be constant for each of the years modeled. Future year 2018 will be used for the projected case emissions for the attainment demonstration. The model runs will be re-run for the timeframe, and future control design values will be calculated for the 5-year (or other) timeframe.

3.3 Alternative Model Testing

Alternative model testing and comparison with AERMOD will be performed to determine whether better model performance that better reproduces the high SO_2 events at Liberty can be obtained using an alternative air quality model. One concern is that the AERMOD steady-state Gaussian plume model uses a single wind for each hour to define the transport of the plumes from the local sources to the Liberty monitoring site. As seen in the SODAR upper-level wind data from February to July 2014 (see Figure 2-5) and the surface wind rose at Liberty (Figure 2-1), the surface winds at the locations of the local sources at the bottom of the river valley are different than the upper-level winds and winds at Liberty. Thus, a non-steady state air quality model that makes use of three-dimensional wind fields may have a better opportunity to simulate the high hourly SO_2 occurrences at Liberty. CALPUFF and SCICHEM non-steady-state Gaussian puff models will be tested using the March 2014 period during which high hourly SO_2 events occurred at Liberty and valid SODAR upper-level wind data are available. A high resolution (444 m) WRF meteorological model simulation will be performed for March 2014 and the AERMOD, CALPUFF, and SCICHEM air quality models will be run for the local sources using various combinations of meteorological inputs based on surface and upper-air meteorological observations and the WRF data and the results compared with the SO_2 observations and each other. Appendix I provides more detail on the March 2014 high resolution WRF modeling and air quality model evaluation and comparison.

[4] 40 CFR Part 51 (Appendix W), EPA's Guideline on Air Quality Models, specifies that if NWS airport data is used for meteorology, 5 years should be modeled. If onsite data is used, 1 year can be modeled. If prognostic data is used, 3 years should be modeled.

4 MODELING PROCEDURES

ACHD will prepare and run an appropriate air dispersion model (or combination of models) that adequately simulates the impacts of SO_2 within the Allegheny, PA SO_2 nonattainment area. The impact of sources on the violating air quality monitor at the Liberty site as well as all other ambient air locations will be determined. At this time we are assuming that the AERMOD model would be the primary air quality model for the attainment demonstration, which may be augmented by alternative air quality models as appropriate as part of the weight of evidence.

This section delineates the procedures for pre-processing, model simulations, and post-processing required for the SO_2 nonattainment area modeling demonstration.

4.1 Terrain and Modeling Domains

The domain for AERMAP should be appropriate to account for terrain throughout the nonattainment area (refer to AERMAP user's guide). Initial setting will be a 30 x 30 km rectangular domain surrounding the nonattainment area.

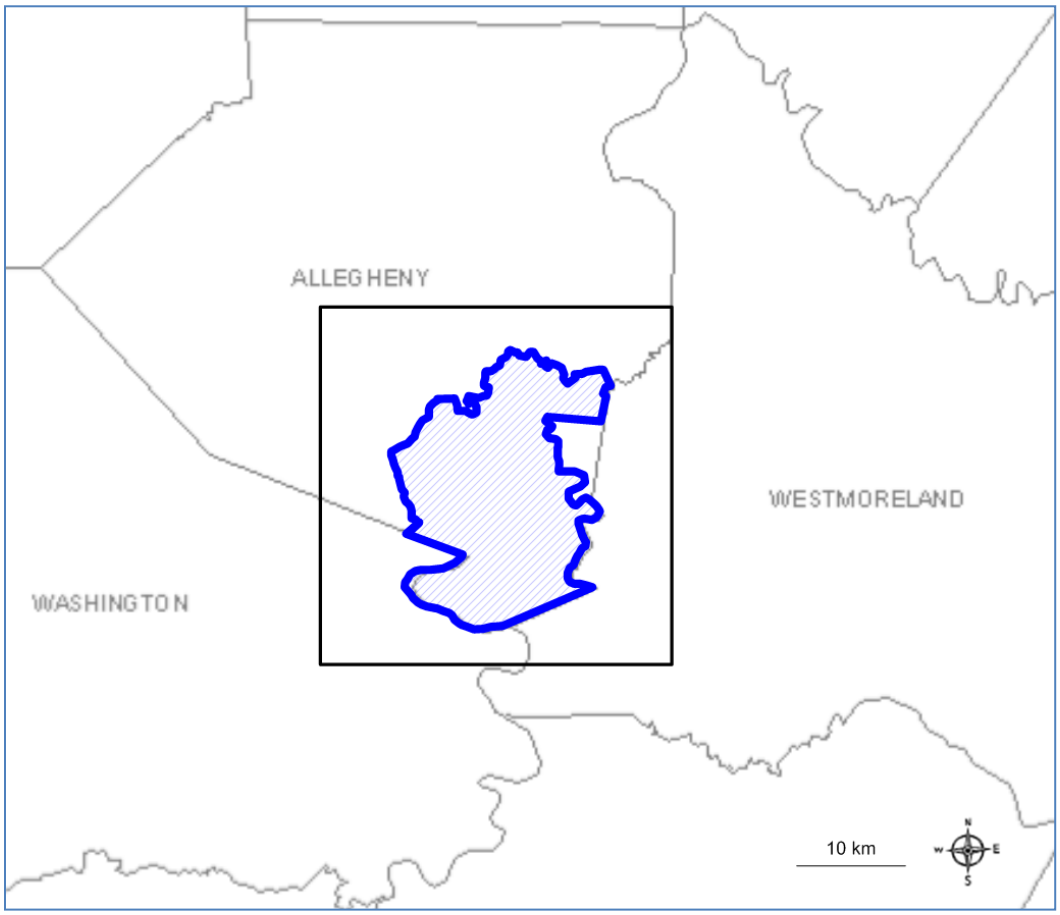


Figure 4-1. Domain for AERMAP

The AERMAP domain is based on terrain influence on the area. Terrain is similar throughout Allegheny County; with higher elevations further to the east/southeast in Westmoreland and Fayette counties. The 30 x 30 km setting should be sufficient to encompass elevations outside of the nonattainment area and

the resulting critical hill heights generated by AERMAP. The domain should be further tested for domain size if any critical hill heights are not representative adjacent hills.

For the full modeling of the area, AERMOD is preferred for near-field transport of 50 km or less (U.S. EPA, 2008, 2015c). Since the nonattainment area is an irregular polygon, concentric circles were used to determine the extent of the area to be modeled. A circle was first drawn (about 28 km diameter, shown by the dotted line in Figure 4-2 below) to encompass the full nonattainment area. A larger circle was then drawn to extend the area by an additional radius of 22 km in order to accommodate a maximum transport through the nonattainment area of 50 km for any source to be modeled.

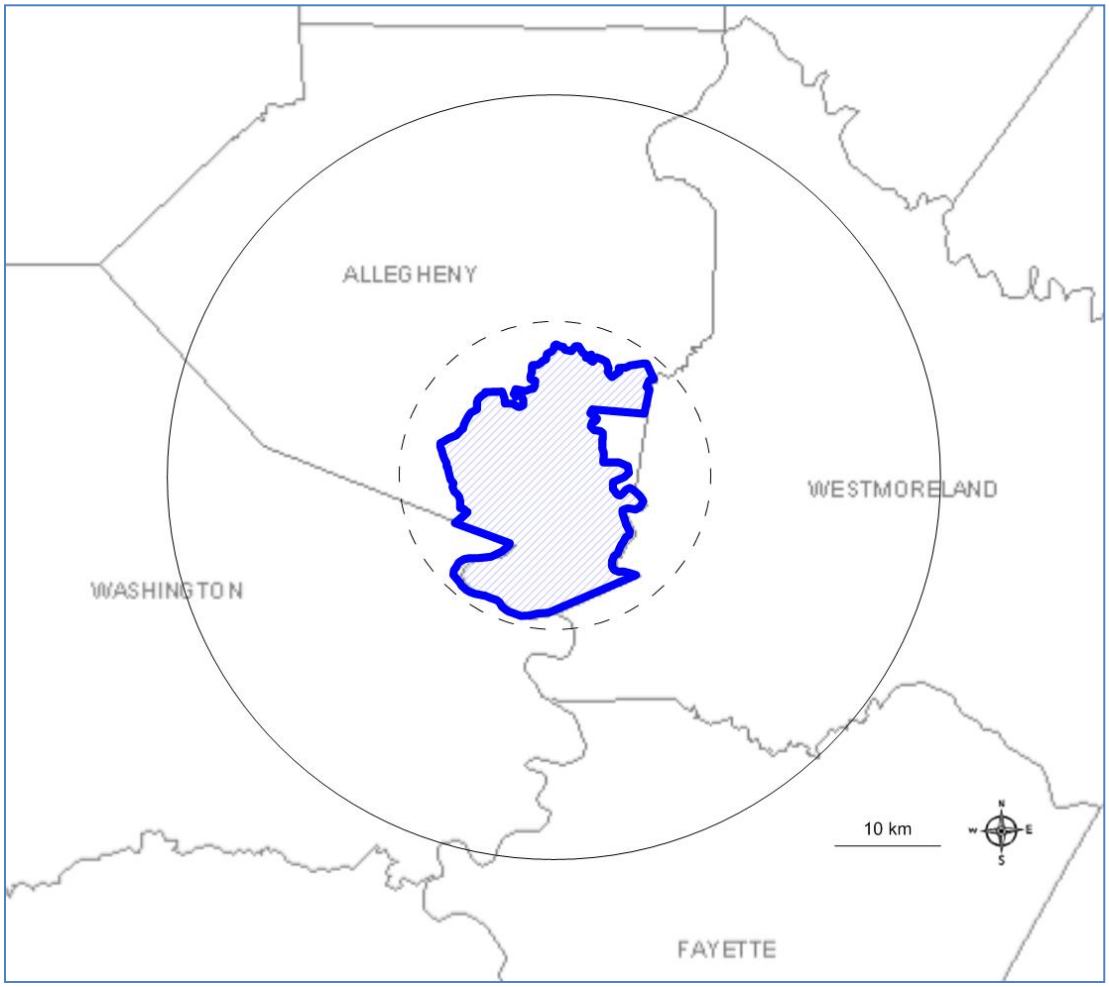


Figure 4-2. Modeling Domain

Not all sources in the domain will be modeled, dependent on emissions thresholds and background monitor representation (see Sections 4.5 through 4.7).

4.2 Geophysical Data

Terrain and land use processing will include the most recent data available for use in the AERMOD system. This includes:

- USGS NED terrain data, 1/3 (10 m) or 1 (30 m) arc-second resolution (for AERMAP)
- USGS NLCD land cover data, 1992 or more recent, as available (for AERSURFACE)

Note that if MMIF meteorological output is selected, AERSURFACE would not be used since MMIF generates surface characteristics specific to each grid cell.

A contour map of 1 arc-second terrain data for Allegheny County is shown in Figure 4-3, while a NLCD land cover map for Allegheny County is shown in Figure 4-4.

Figure 4-3. NED Terrain Data for Allegheny County (1 arc-second)

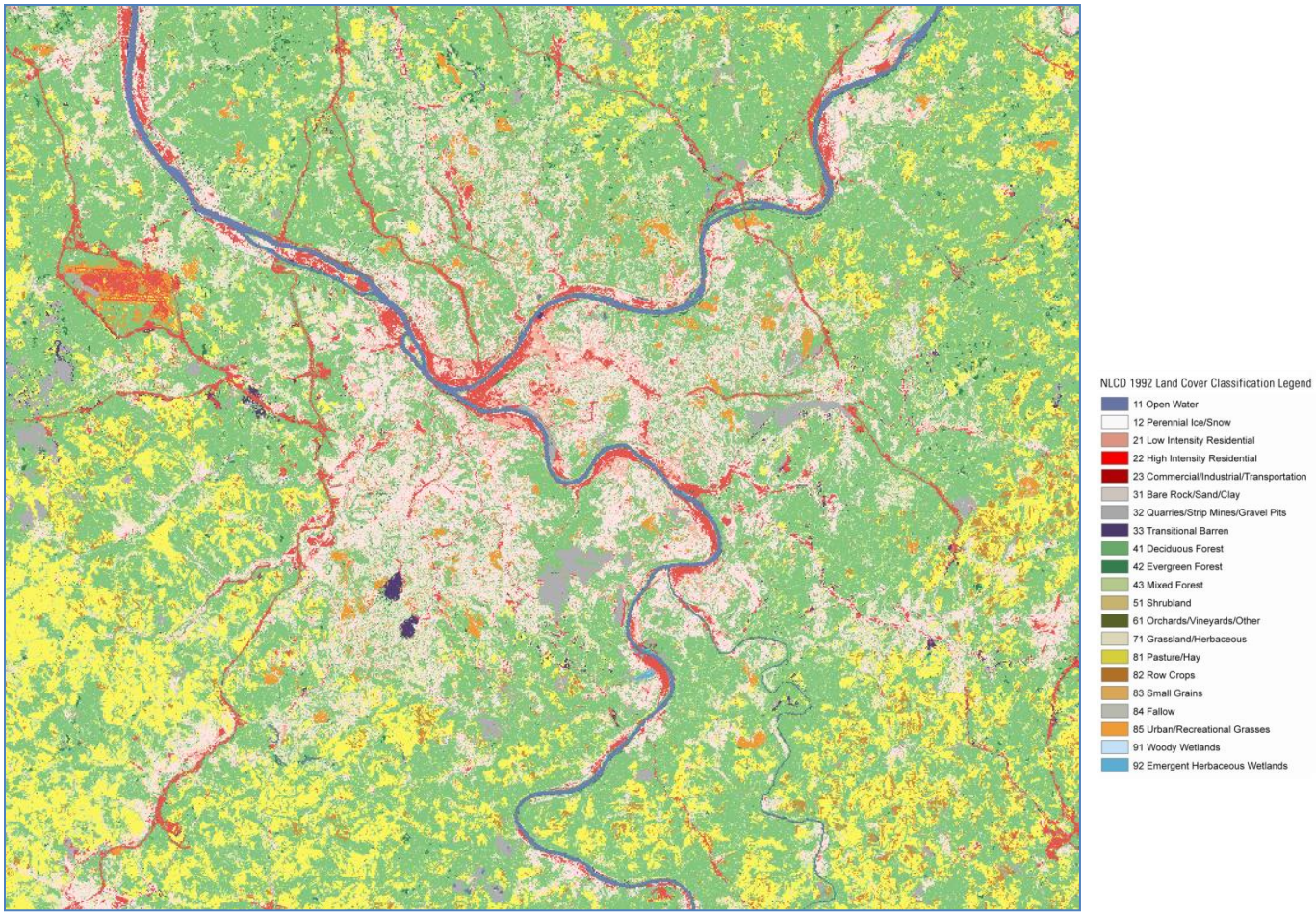


Figure 4-4. NLCD 1992 Land Cover for Allegheny County

4.3 Meteorological Inputs

Meteorological inputs would be processed differently depending on the type of data selected (surface onsite or prognostic). Both types of inputs will be generated and tested for appropriateness for the model.

AERMET processing will be used for all processing of meteorological inputs for AERMOD.

4.3.1 Surface-Based Onsite

Meteorological data will be based on local surface and airport upper-air meteorological observations. Liberty surface meteorological data will be used as onsite surface data, merged with Pittsburgh International Airport (PIT, WBAN: 94823) additional surface parameters and upper-air data. At a distance of about 23 miles to the northwest, the PIT balloon-borne radiosonde launch site provides the nearest representative upper-air data for the Liberty-Clairton area. The Guideline on Air Quality Models (U.S. EPA, 2005, 2015c), will be followed for AERMET processing procedures.

Meteorological inputs for each year include:

- Upper air data: NOAA RAOB FSL format, all mandatory and significant levels, 0Z and 12Z
- Surface data: NCDC PIT ISHD surface format

- Onsite: Liberty horizontal wind speed, wind direction (including standard deviation sigma theta for years available), and outdoor temperature
- Surface characteristics: generated by AERSURFACE

Onsite data should contain at least 90% valid hours per quarter and per year. The threshold for calms processing should be based on instrument type (a default 0.5 m/s will be used). Due to UTC to LST time adjustment (5 hours difference), extra hours should be included for each year of NCDC and NOAA airport data. If meeting the 90% completeness requirement by quarter, small gaps in the onsite data may be filled in according to the Meteorological Monitoring Guidance for Regulatory Modeling Applications (U.S. EPA, 2000).

PIT surface data will be used for additional surface parameters for the AERMET sfc file, including cloud cover, pressure, and other parameters. Airport wind data will not be substituted for any missing hours in the onsite data. All hourly airport data is available from the National Climatic Data Center (NCDC[5]). Photographs of key meteorological sites can be found in Appendix C.

AERMET Stage 1 and 2 will quality check and merge the input data. For surface characteristics used in Stage 3 of AERMET, the AERSURFACE preprocessor will be used for surface data (both onsite and PIT). AERSURFACE will be processed as follows:

- Study radius: 1 km
- Sectors: 12
- Temporal resolution: monthly, reassigned
- Seasonal months:
  - Dec.-Feb.: late autumn after frost and harvest, or winter with continuous snow on ground
  - Mar.-May: transitional spring
  - Jun.-Aug.: midsummer with lush vegetation
  - Sep.-Nov.: autumn with unharvested cropland
- Surface moisture: average

Precipitation measurements at available precipitation stations will be used for estimations of snow cover. Months with more than half of the days with continuous snow will be assigned as winter with continuous snow on ground. Future versions of AERSURFACE may incorporate a gust factor that may also be used to determine surface characteristics.

The BETA option to adjust surface friction velocity (u*) may be tested for better performance during low wind speed stable conditions (U.S. EPA, 2015b). (Note: since this is a non-default option currently, use of the BETA option may require alternative modeling justification.)

4.3.2 MMIF-Based Onsite

Meteorological data will be based on 3-dimensional prognostic data generated by the WRF model, extracted by the MMIF tool at various levels and resolutions.

For MMIF, meteorological inputs for each year would include:

- Upper air data: MMIF-generated site-specific (user-specific levels and number of soundings)
- Surface data: not used with MMIF
- Onsite data: MMIF-generated site-specific (EPA-recommended levels)
- Surface characteristics: generated by MMIF for specific WRF grid cell

[5] http://www.ncdc.noaa.gov/oa/ncdc.html

WRF/MMIF is based on meso-scale prognostic data and produces data above 90% completeness. The revised Appendix W (U.S. EPA, 2015c) specifies that AERMET be used for the processing of the MMIF data.

The MMIF data includes parameters not generally available with NWS or local surface data, including mixing height, low-level temperature difference (delta_T), and solar radiation. All parameters from MMIF will be used for AERMET processing unless found to be inappropriate. Since onsite data is multi-level, it's possible that some levels may be more appropriate than others.

As described in detail in Section 3 and Appendix F, WRF/MMIF model results will be used for at least one year as input to AERMET/AERMOD to determine if such input produces more valid results than the typical practice of using surface-based meteorological data as input. If selected as representative, MMIF-generated data would be used for AERMET onsite, upper air, and surface characteristics inputs. (Note that final use of MMIF may require alternative modeling justification.)

Although 12 km WRF resolution may be adequate, higher resolution grids such as 4 km or 1.3 km (or finer), along with surface nudging from available meteorological stations, may be more appropriate for the three-dimensional processing. MMIF data would be analyzed from different domains to determine the optimal configuration.

4.4 Source Types

Types of sources will be assigned by the following:

- Stacks, towers: point sources
  - Building parameters will also be included for point sources with downwash
- Ambient-temperature process fugitives: area or volume sources
- Coke oven (buoyant) battery fugitives: buoyant line sources

If included for any specific source inventory, road and mobile source emissions will be based on EPA haul roads methodologies (U.S. EPA, 2012). Otherwise, area, non-road, and mobile sources will be considered to be background.

Intermittent sources will be tested at varying levels of operation to ensure that these sources are not affecting attainment in the area. If an intermittent source is not contributing to nonattainment levels (or if it can be simply "screened out" – see the following Section 4.5), it may be excluded from the model.

The characterization of coke oven fugitives includes extreme heat and buoyancy affecting low-level emissions. For buoyant line sources, BLP (v. 99176) was formerly the preferred model, developed for aluminum reduction plant line modeling. The BLP code has now been incorporated into AERMOD v. 15181.

The current AERMOD version does not allow for different line sources (i.e., different BLP input parameters) within the same model run. Therefore, the combination of separate model runs will be required, based on a post-processor developed for the demonstration.

4.5 Source Screening

Sources included in the modeling will be based on emissions and location within or near the area. The focus of the modeling will be on the largest emitters within or directly adjacent to the nonattainment area, but smaller sources within the area and distant sources outside of the area will be screened for impacts in the nonattainment area. The extent of the screening will be based on the recommended limit for AERMOD transport of 50 km (see Section 4.1 above). Initial screening will be based on the AERSCREEN model, with refined screening based on AERMOD.

For sources within the nonattainment area, sources reporting 0.1 or more tons/year of SO_2 will be screened using AERSCREEN and AERMOD to determine the off-property maximum impact level. The most recent available emissions inventories (2011-2014) will be used for emissions, unless recent years do not represent normal operating conditions (in which case, a previous year of more normal operation will be used). If the maximum 1-hour SO_2 impact is above the significant impact level (SIL) of 3 ppb, based on interim SO_2 PSD/NSR guidance (U.S. EPA, 2010c) and the SIP Submissions guidance (U.S EPA, 2014), the source will be included in the attainment modeling at allowable levels.

For sources outside the area not accounted for by background by geographical location (or "nearby sources"), sources reporting 5 or more tons/year of SO_2 within the modeling domain (see Section 4.1) will be screening using AERSCREEN and AERMOD for the maximum impact in the nonattainment area. If the maximum 1-hour impact on the nonattainment area is above the SIL of 3 ppb, the source should be included in the attainment modeling at maximum allowable levels unless refined analyses show that impacts are less than background.

If additional refined analyses show that a nearby source, with screened impacts above the SIL, is contributing less than background levels anywhere in the area and without a significant concentration gradient, this source may also be considered for exclusion from the modeling. This method avoids double-counting of impacts that might occur by the inclusion of both the nearby source and background values.

Sources outside of the area that are already accounted for by the use of background monitored concentrations will be excluded from the modeling (see the following Sections 4-6 and 4-7).

4.6 Background Concentrations

Background concentrations from monitors are added to modeled results in order to account for emissions that are not explicitly modeled. Background can be calculated using different options as prescribed in EPA guidance (U.S. EPA, 2010a-b, 2011a-b, 2013c, 2014) including the following:

- "First tier" approach: based on the highest monitored background design value over the last 3-years, added to modeled design values
- Temporally-varying approach: based on the 99th percentile monitored concentrations, varying by hour of day and by season (or month), averaged over the most recent 3 years, added to modeled design values by hour

The temporally varying approach will be used for the background calculations. For a more accurate spatial representation of background concentrations, a sector-varying approach may also be used in conjunction with the temporal approach, based on current options available in AERMOD (U.S. EPA, 2015a). The temporally-varying values would be used from different monitors depending on the hourly wind sectors in single surface-level onsite wind supplied as input to the model. (Note: currently, only a limited number of sectors can be used in AERMOD; this may be modified with future versions.) In the case of missing wind data or calm periods, a default background monitor will be selected. Figure 4-5 shows available background monitors in the tri-state region (PA/OH/WV) and the 6 spatial vectors that would be used for background concentrations.

Note that if multi-level meteorology is used, with different wind directions possible at each level, a combination of the temporally-varying background values from each of the 6 sectors would be selected.

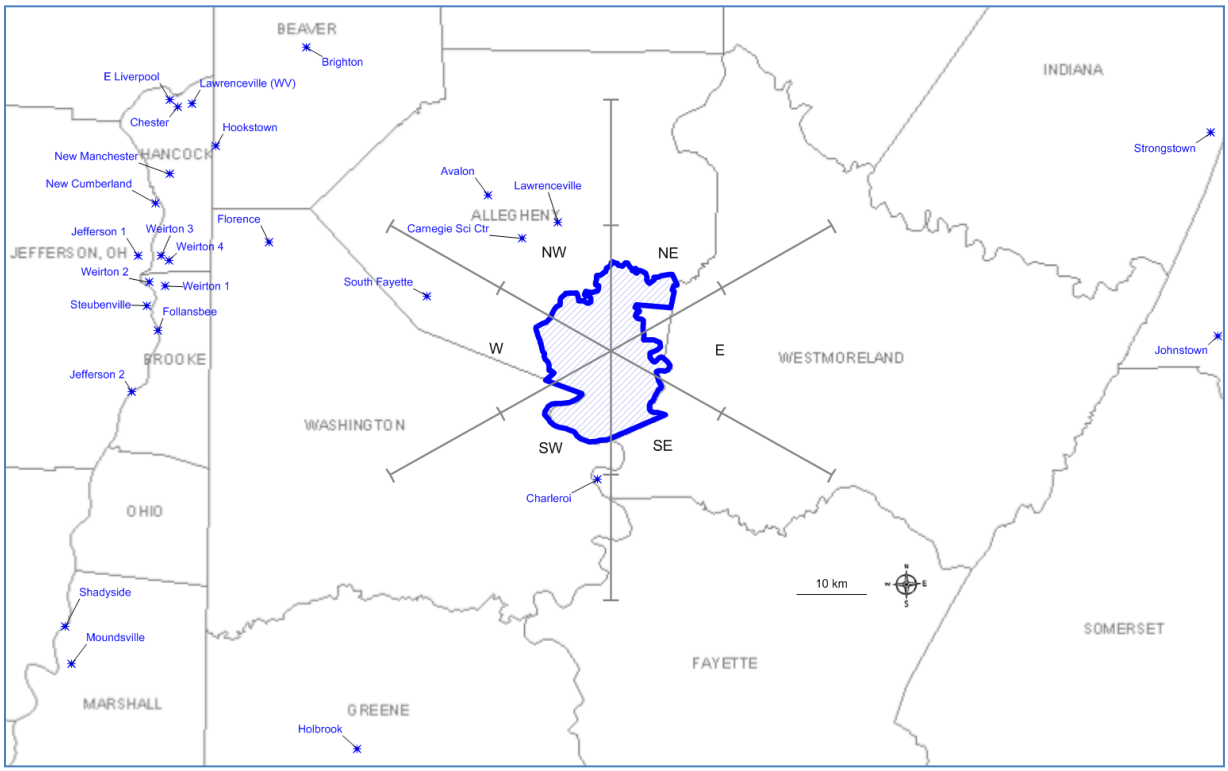


Figure 4-5. Background Monitors and Sectors

W Sector: For winds from the W, the South Fayette monitor is representative. South Fayette is a high-elevation suburban/rural monitor in Allegheny County and is generally considered a background site for most pollutants in the county. South Fayette will also be used as the default background monitor for missing wind sectors. Florence may also be examined as a more distant site to the west.

NW Sector: For winds from the NW, Carnegie Science Center and Lawrenceville can represent background from the Pittsburgh area. However, Carnegie Science Center did not operate in 2014. Therefore, for complete data over the most recent 3-year period (2012-2014), Lawrenceville should be used for the NW sector. Avalon should not be used for background due to industrial influences.

Several PA, OH, and WV monitors lie further to the W and NW. These monitors are less representative of background concentrations than the Allegheny County sites due to distance and/or industrial influences (see Appendix B for design values for these sites).

SW/SE Sectors: Charleroi lies directly to the south of the nonattainment area. However, 2014 data indicates that there are source-oriented influences at this monitor. Therefore, South Fayette is the most appropriate for sectors to the south. Holbrook to the SW may also be considered for use, but it may be more rural and distant to adequately represent background for the area. Additionally, Moundsville, WV and Shadyside, OH should not be used for background due to industrial influences.

NE/E Sectors: For winds from the NE/E, Strongstown and Johnstown may not be appropriate due to distance and/or industrial influences. For these winds, South Fayette will be used as the default background monitor, representative of general background levels throughout the area.

The resulting inputs for AERMOD (with single surface-level onsite data) would be temporally, seasonally, and spatially-specific 99th-percentile concentrations for each hour and wind sector based on the representative monitors. If multi-level meteorology is used, a combination of the temporally and seasonally-varying background values from the same representative monitors would be selected for each hour. This could be either the maximum or average of each hour from the background sites.

Figure 4-6 below shows a graph of South Fayette background data for 2012-2014 according to the temporally-varying method. The hourly 99th-percentiles averages are shown by season. The actual design value (DV) for 2012-2014, as well as the hourly averages, is also shown for comparison.

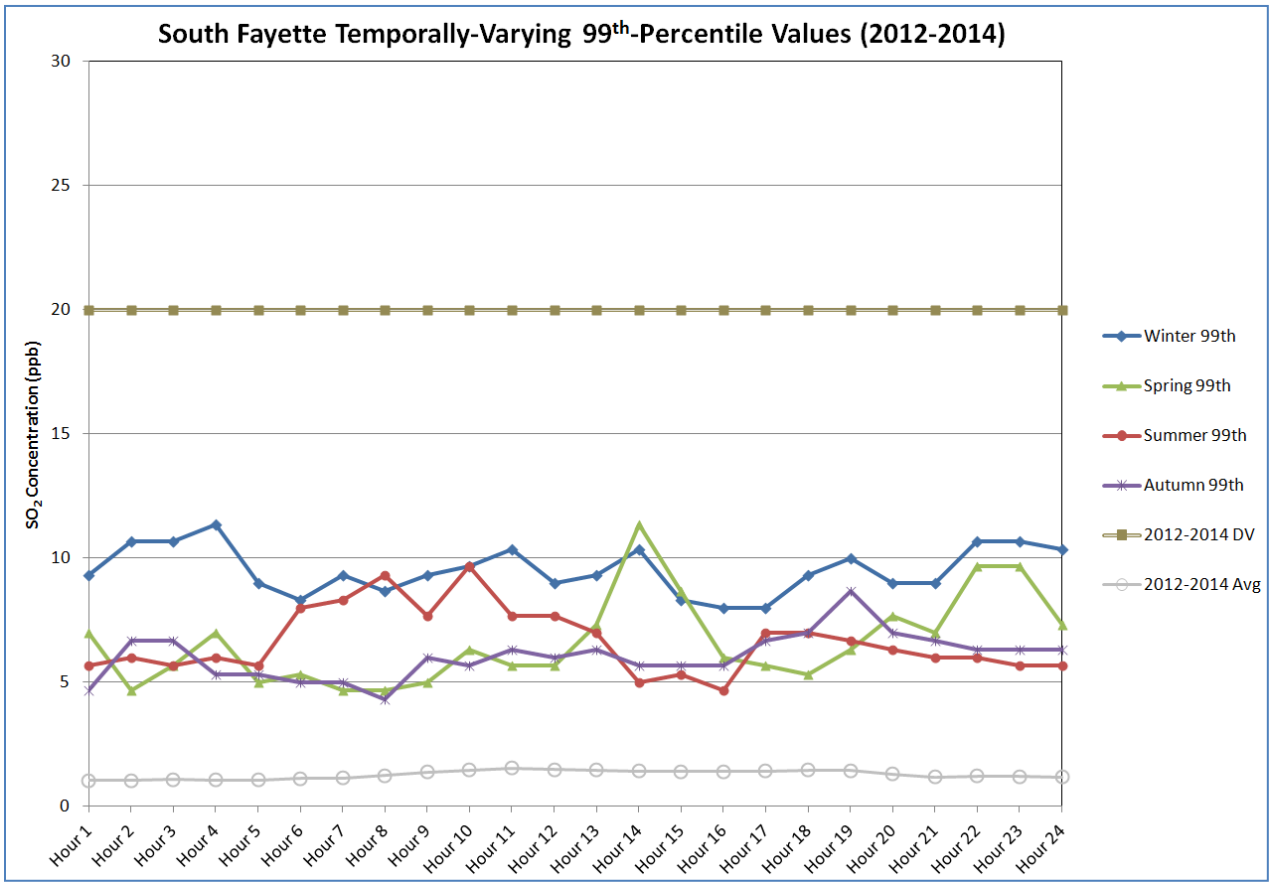


Figure 4-6. Temporally-Varying Background Concentrations, South Fayette, 2012-2014

The data shown in Figure 4-6 represents the 2nd-highest hourly value by season, averaged over the most recent 3-year period for South Fayette. The background value for South Fayette would then be a constant set of 24 hourly values for each season. (E.g., if South Fayette is used as background for hour 13 during a winter month, 10 ppb (26 µg/m³) would be added to the modeled concentrations at each receptor.)

Seasons are defined as follows:

Winter: Dec.-Feb.; Spring: Mar.-May; Summer: Jun.-Aug.; Autumn: Sept.-Oct.

4.7 Sources for Modeling

A list of SO_2 sources in Allegheny County and surrounding counties is given in Appendix D. Initial screening for sources will be based on reported actual emissions from the most recently compiled ACHD and PA DEP emissions inventories (2012-2014), unless the most recent year is not representative of normal operating conditions (see Section 4.5). Sources outside the modeling domain or already accounted for by background monitors will not be considered for modeling.

Combining the modeling domain from Figure 4-2 and the background monitors from Figure 4-5, a map of sources to be considered for modeling can be derived. This map is shown in Figure 4-7 below, with facilities shown as red symbols.

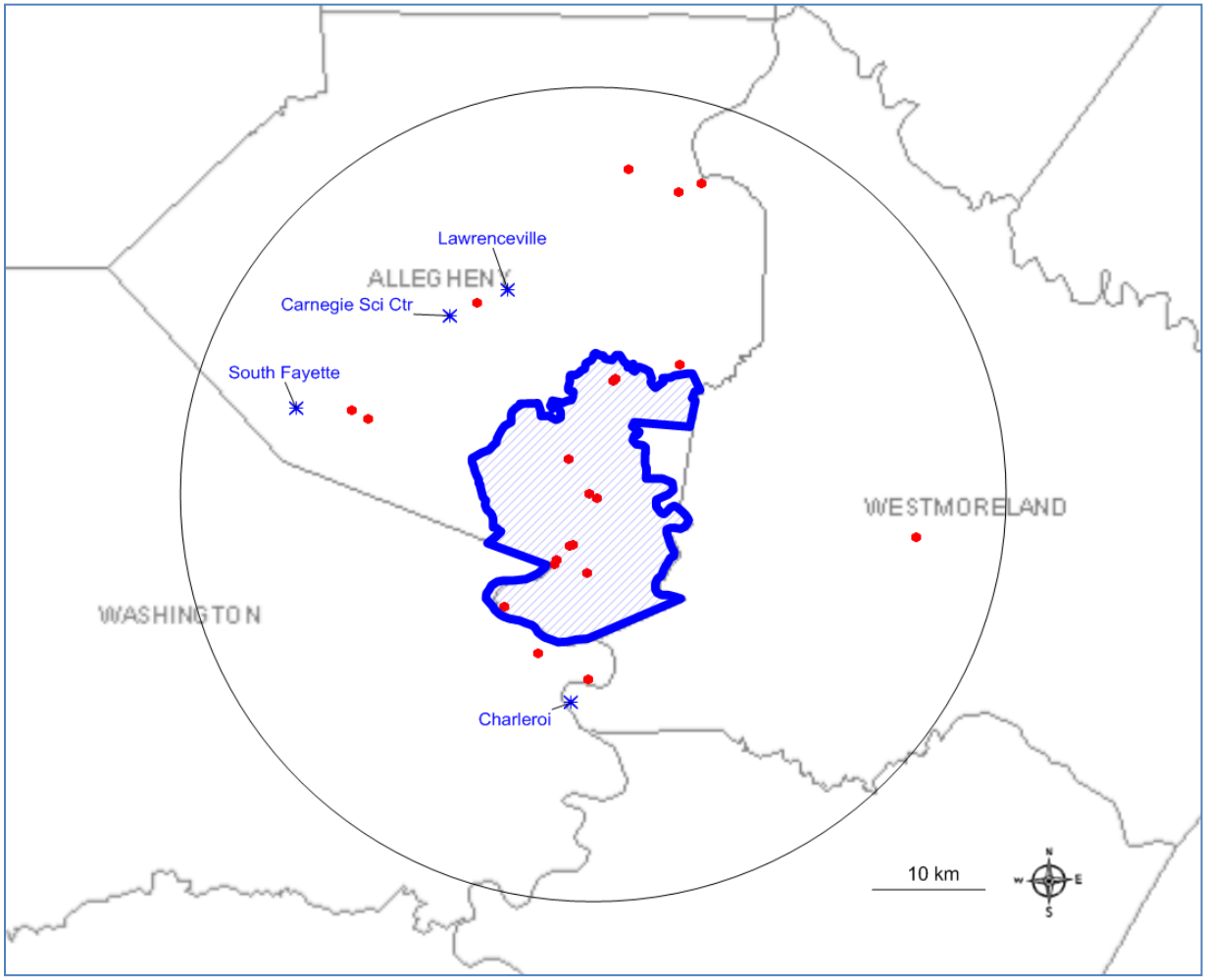


Figure 4-7. Sources within Modeling Domain for Modeling Consideration

Figure 4-7 shows that there are few sources within the nonattainment area above the threshold of 0.1 tons/year actual SO_2 emissions. There are also few sources above the threshold of 5 tons/year outside the nonattainment area that are not already accounted for by background monitors. The background monitors will account for the majority of emissions outside the nonattainment area.

4.8 Receptor Grids

Discrete Cartesian receptor grids will be based on EPA guidance (U.S. EPA, 2011b, 2013c, 2014). Initial settings will place discrete receptors at 200 m spacing throughout the nonattainment area in order to provide adequate assessment of impacts throughout the complex terrain of the area. Additional receptors will be placed at finer spacing (100 m) out to 1 to 2 km surrounding the largest facilities in the area, along with fenceline receptors at 50 m spacing.

On-property receptors for modeled facilities will be excluded from the receptor grid. For U. S. Steel, all property owned by U. S. Steel Corporation will be excluded from the receptor grid. If neighboring facilities are potentially impacting one another at exceedance levels, additional runs may be performed to determine source culpability.

4.9 AERMOD Configuration

This section summarizes the configuration to be used in the SO_2 attainment demonstration modeling. The latest version of AERMOD (currently v.15181) will be used in the modeling.

AERMOD will be run using the following specifications:

- Generate concentration values (CONC)
- Pollutant ID: sulfur dioxide (SO2) and 1-hour SO_2 NAAQS processing
- Stack-tip downwash (default)
- Default calms and missing data processing routines
- No wet or dry depletion/deposition
- Default rural dispersion for the area in general (urban mode may be selected for specific sources with large fugitive heat releases, as applicable)
- Elevated terrain effects (default)
- No flagpole receptors
- Building parameters for stacks potentially affected by downwash
- BETA option selected if MMIF meteorological inputs used (required for AERMOD v. 15181)
- Bulk Richardson low-level delta_T and solar radiation for stable boundary layer (MMIF only)
- Meteorological data with temp substitutions (MMIF only)
- Averaging period: 1 hour (for attainment purposes, but the secondary 3-hour and former 24-hour and annual averaging periods will also be examined)

AERMOD will generate 4th-highest daily maximum impacts for each receptor throughout the area for comparison to the 1-hour NAAQS. Output options can be varied to examine specific receptors and/or time periods. Sources may also be assigned into source groups to examine specific contributions. For control strategy purposes, individual sources may be run to examine the extent and level of impacts.

Use of the exponential decay (half-life) option may be considered based on monitored $PM_{2.5}$ speciation values at the Liberty monitor that are indicative of chemical transformation in the NAA. Liberty sulfate concentrations are regularly higher than other monitors in SWPA. This excess can be due to the transformation of SO_2 to intermediate sulfur compounds and sulfates under extreme high-temperature and moist conditions for certain SO_2 plumes in the NAA.

BETA options such as ADJ_U* (AERMET) and LowWind 1/2/3 (AERMOD) for low wind speed conditions may be tested for model performance. If these options (or other BETA options) are selected for the final model runs, alternative modeling justification may be required.

Post-processing would be needed to combine impacts from separate model runs if multiple buoyant line sources and/or MMIF meteorological inputs are used in the model. Hourly impacts would need to be combined from each run (matched in time) for each receptor before calculating the 99th-percentile for any year.

4.10 Design Value Calculations for Attainment

This section provides a summary of how the modeling results will be used to demonstrate attainment of the SO_2 NAAQS in the nonattainment area. It is expected that at least three simulations will be investigated:

- Base Case representing current emission conditions
- 2018 "Base Case" representing projected emissions, shut-downs, and "on-the-books" controls
- 2018 "Control Case" that includes additional or revised controls

Iterative model runs will be used to determine the appropriate controls needed to demonstrate attainment of the area. If attainment of the Liberty monitor is achieved, but other areas show nonattainment, additional analyses may be required. This may include supplemental model runs designed to ascertain the sensitivity of the model results to variations in model inputs (which are based on measurement uncertainties in emission rates, meteorological inputs, etc.). The results from these types of model sensitivity runs will help to determine if differences in maximum predicted impacts across the model domain are truly different or are within the expected range of impacts (i.e., the impact at any receptor is one of many potential impacts, each of which are dependent on the model inputs, overlaps of distributions would suggest no differences across those receptors). AERMOD's MAXDCONT and/or EVENT options may be used to examine source contributions to NAAQS violations.

If all possible modeling analyses (including alternative models/options) do not produce sufficient results, there may be no applicable model for the scenario. In this case, additional deployment of monitors may be needed as part of the attainment plan (see Section 9.2.4 of the Revised Guideline on Air Quality Models).

The procedures for demonstrating attainment of the SO_2 NAAQS are given in EPA's Nonattainment Area SIP Submissions guidance (U.S. EPA, 2014). AERMOD will provide predictions of SO_2 impacts at each receptor that includes contributions from all modeled sources and background. Based on the form of the 2010 SO_2 NAAQS, the design value will be calculated as the average of the 99th percentile (4th-high) of the annual distribution of daily maximum 1-hr concentrations averaged across the modeled years.

The following steps will be followed:

1. At each receptor, for each hour of the modeled period, calculate a total concentration across all sources including background concentrations.

2. From the total concentrations calculated in step 1, obtain the 1-hr maximum concentration at each receptor for each modeled day.

3. From the output of step 2, for each year modeled, calculate the 99th-percentile (4th-highest) daily maximum 1-hr concentration at each receptor. If modeling 5 years of meteorological data, this results in five 99th-percentile concentrations at each receptor.

4. Average the 99th-percentile (or 4th-highest) concentrations across the modeled years to obtain a design value at each receptor.

5. Modeled source contributions to a NAAQS violation can be determined by analyzing the hourly concentrations from individual source groups (if modeled as such) corresponding to the same hour as the 4th-daily maximum 1-hr concentration from each year.

For comparison to the secondary and former SO_2 NAAQS standards, the 2nd-high 3-hour, 2nd-high 24-hour, and annual averages for each modeled year will also be generated to ensure compliance with these standards.

5 EVALUATION OF RESULTS

This section describes a range of model testing methodologies potentially available to adequately evaluate the performance of the air quality modeling system for any of the given years modeled.

5.1 Context for the Model Performance Evaluation

When designing a model performance evaluation, it is important to understand how the modeling results will ultimately be used. The nonattainment area modeling will be based on the AERMOD model. The model performance evaluation for the baseline period will include analyses of AERMOD predictions for any of the years modeled against available measurements at monitors throughout modeling domains. Performance will be assessed in two ways: (1) on how accurately the model predicts observed concentrations; and (2) on how accurately the model predicts responses of predicted air quality to changes in inputs.

If AERMOD shows poor performance, the use of an alternative model (or combination of models) may be considered for modeling. If an alternative model can be shown to perform better than AERMOD, and the use of such model can be properly justified according to EPA guidelines (U.S. EPA, 2015c), an alternative model may be pursued for use in the attainment demonstration.

5.2 Multi-Layered Model Testing Process

Previous EPA modeling guidance (U.S. EPA, 2007) affirms the recommendations of numerous modeling scientists over the past decade (see, for example, Dennis et al., 1990; Seigneur et al., 2000; Russell and Dennis, 2000; Arnold et al., 2003; Boylan et al., 2003; Tonnesen et al., 2003) that a comprehensive, multi-layered approach to model performance testing should be performed, consisting of the four components: operational, diagnostic, mechanistic (or scientific) and probabilistic evaluation. For SO_2 modeling, this multi-layered framework may be viewed conceptually as follows:

> Operational Evaluation: Tests the ability of the model to estimate SO_2 concentrations. This evaluation examines whether the measurements are properly represented by the model predictions but does not necessarily ensure that the model is getting “the right answer for the right reason”;
>
> Diagnostic Evaluation: For SO_2, this step tests the ability of the model to get the right answer for the right reason;
>
> Mechanistic Evaluation: Tests the ability of the model to predict the response of SO_2 to changes in variables such as emissions and meteorology; and
>
> Probabilistic Evaluation: Takes into account the uncertainties associated with the model predictions and observations of SO_2.

Within the constraints of the schedule and resources, the model evaluation effort will attempt to include elements of each of these components. The operational evaluation will be the focus of the performance evaluation; where feasible and appropriate, diagnostic and mechanistic tests (e.g., use of probing tools, urban vs. rural performance analyses, etc.), traditional sensitivity simulations to explore uncertainty, and comparison of the model performance of this study with those from other groups will also be considered.

Table 5-1 lists a standard set of statistical performance measures that can be used to evaluate models. These performance measures can be calculated, as appropriate, using model performance evaluation software.

Table 5-1. Core Statistical Measures for Air Quality Model Evaluation

Statistical Measure	Mathematical Expression	Notes
Accuracy of paired peak (***A_p***)	$\frac{P - O_{peak}}{O_{peak}}$	P_{peak} = paired (in both time and space) peak prediction
Coefficient of determination (***r^2***)	$\frac{\left[\sum_{i=1}^{N}(P_i - \overline{P})(O_i - \overline{O})\right]^2}{\sum_{i=1}^{N}(P_i - \overline{P})^2 \sum_{i=1}^{N}(O_i - \overline{O})^2}$	P_i = prediction at time and location *i*; O_i = observation at time and location *i*; $\overline{P}$ = arithmetic average of P_i, i=1,2,…,N; $\overline{O}$ = arithmetic average of O_i, i=1,2,…,N
Normalized Mean Error (***NME***)	$\frac{\sum_{i=1}^{N}\lvert P_i - O_i\rvert}{\sum_{i=1}^{N} O_i}$	Reported as %
Root Mean Square Error (***RMSE***)	$\left[\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2\right]^{1/2}$	Reported as %
Fractional Gross Error (***F_E***)	$\frac{2}{N}\sum_{i=1}^{N}\left\lvert\frac{P_i - O_i}{P_i + O_i}\right\rvert$	Reported as %
Mean Absolute Gross Error (***MAGE***)	$\frac{1}{N}\sum_{i=1}^{N}\lvert P_i - O_i\rvert$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Gross Error (***MNGE***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{\lvert P_i - O_i\rvert}{O_i}$	Reported as %
Mean Bias (***MB***)	$\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Bias (***MNB***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{(P_i - O_i)}{O_i}$	Reported as %
Mean Fractionalized Bias (Fractional Bias, ***MFB***)	$\frac{2}{N}\sum_{i=1}^{N}\left(\frac{P_i - O_i}{P_i + O_i}\right)$	Reported as %
Normalized Mean Bias (***NMB***)	$\frac{\sum_{i=1}^{N}(P_i - O_i)}{\sum_{i=1}^{N} O_i}$	Reported as %
Bias Factor (***BF***)	$\frac{1}{N}\sum_{i=1}^{N}\left(\frac{P_i}{O_i}\right)$	Reported as BF:1 or 1:BF or in fractional notation (BF/1 or 1/BF).

The AERMOD operational evaluation will utilize numerous graphical displays to facilitate quantitative and qualitative comparisons between predictions and measurements. Together with the statistical metrics listed in Table 5-1, the graphical procedures are intended to help determine whether the base case simulation is performing well enough to make reliable future year SO_2 projections. The core graphical displays to be considered for use include the following:

- Time series plots at monitoring locations;
- Concentration scatter plots stratified by location, time;
- Bias and error stratified by concentration, time;
- Histogram plots of the statistical metrics, stratified by time; and
- Quantile-Quantile (Q-Q) plots.

These graphical displays can be generated for annual cycles as well as for monthly and seasonal periods. Emphasis will also be placed on peak concentrations for model performance, since the SO_2 1-hour NAAQS is based on daily maximum values.

Additionally, the Cox-Tikvart method will be used to examine performance for different model cases/options (U.S. EPA, 1992; Cox and Tikvart, 1990). This includes calculation of a composite performance measure (CPM) based on statistics from different averaging periods (1-hr, 3-hr, 24-hour).

Ideally, the operational evaluation described above will confirm that the modeling system is performing consistent with its scientific formulation, technical implementation, and at a level that is at least as reliable as other current state-of-science methods. Should unforeseen model performance problems arise in the baseline simulation, it may be necessary to draw into the evaluation supplemental diagnostic tools to aid in model testing. These diagnostic techniques are loosely referred to as “probing tools”. The actual need for their use, if any, can only be determined once the initial operational evaluation is completed. Should such diagnostic methods actually be needed, their usage would require additional resources.

If WRF is used at 4 km or 1.3 km (or finer) resolution to generate MMIF meteorological input, performance evaluation can be similar to that used in the 2006 NAAQS $PM_{2.5}$ SIP (ACHD, 2013).

5.3 Conceptual Model

As an additional, more qualitative measure of performance, modeled results will be compared to the conceptual model for the area, given in Appendix H.

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APPENDICES

APPENDIX A – Maps of Affected Areas

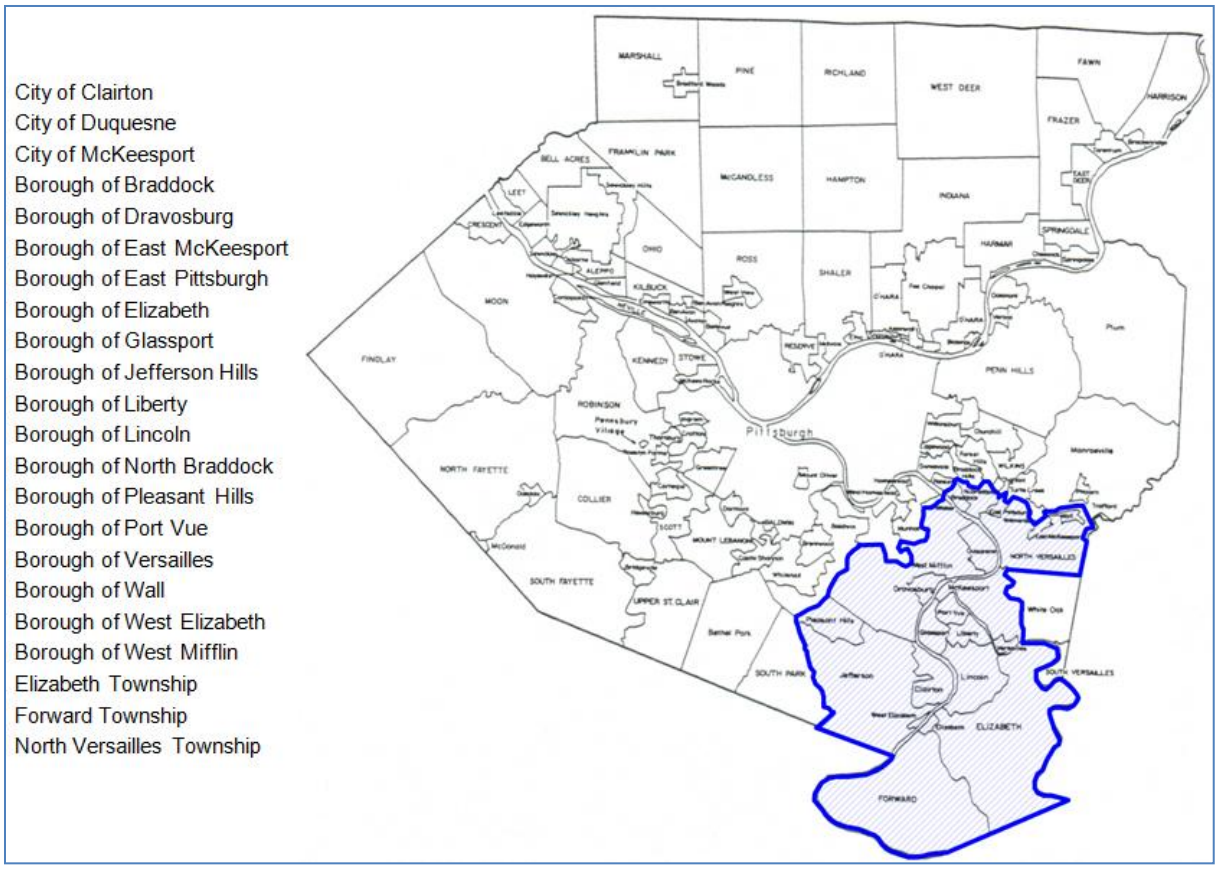


Figure A-1. EPA's Designated SO_2 Nonattainment Area.

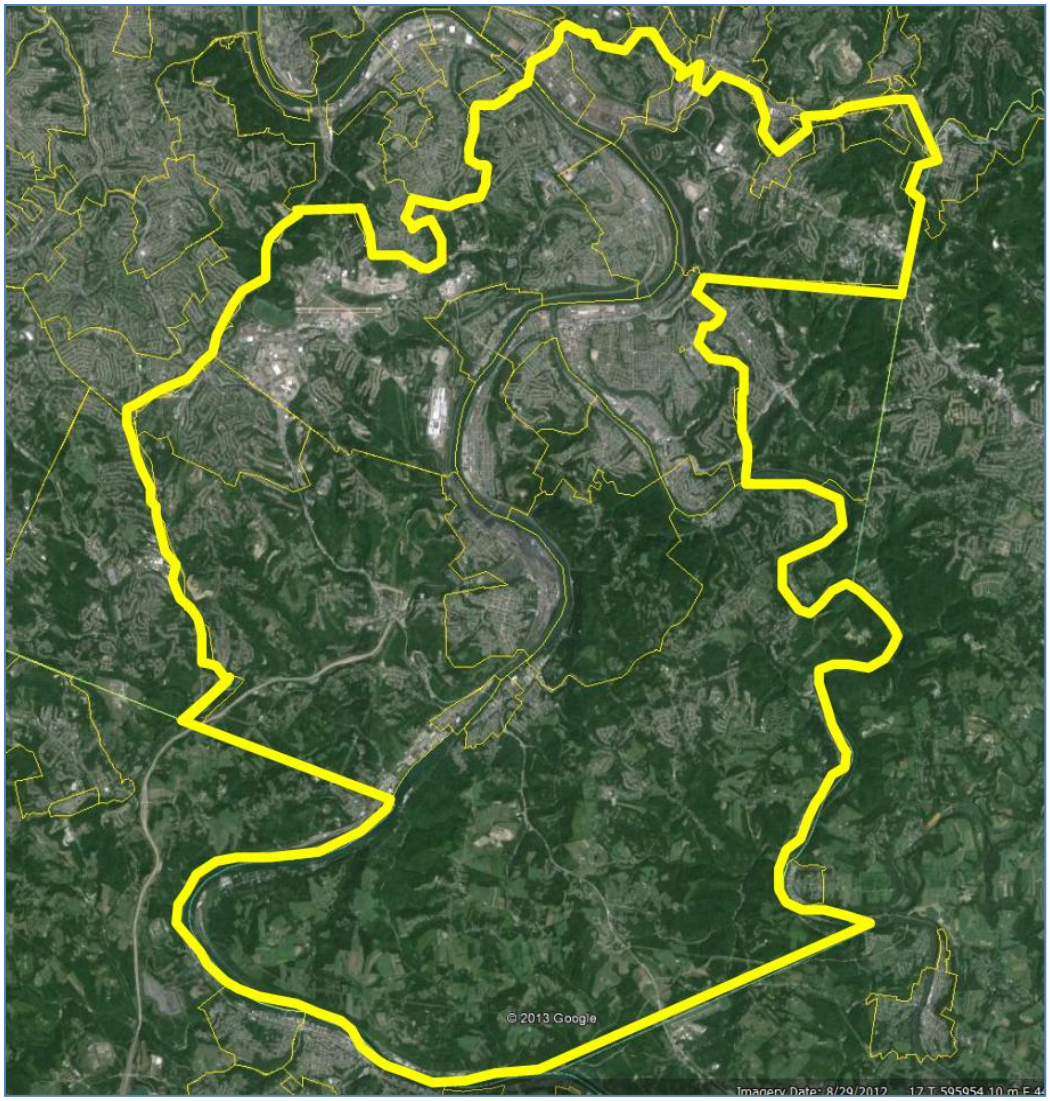


Figure A-2. SO_2 Nonattainment Area – Aerial Close-Up (with Municipal Borders).

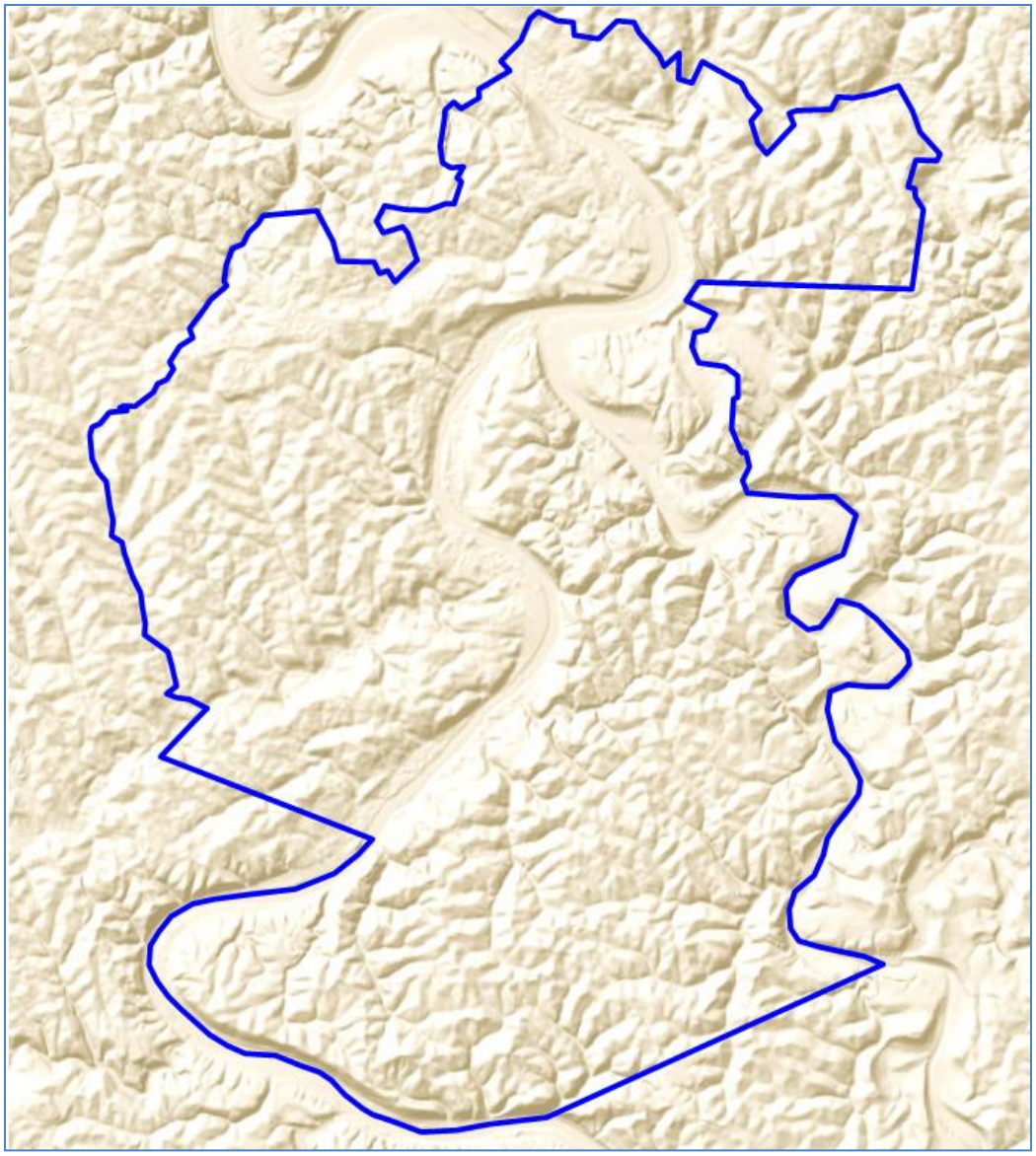
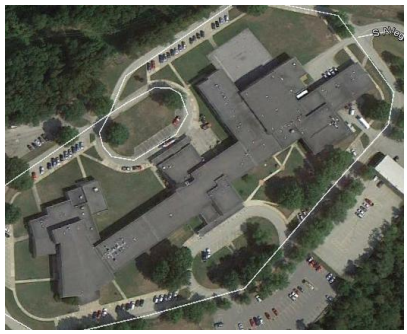


Figure A-3. SO_2 Nonattainment Area – Relief Close-Up.

APPENDIX B – Monitor Sites and Data

There are two SO_2 monitoring sites within the Allegheny, PA nonattainment area:

Liberty: Located on a plateau near the center of the nonattainment area at an elevation of 1069 ft. (MSL). Recent data shows that Liberty is not attaining the new hourly standard. Liberty also contains meteorological sensors and H_2S, benzene, and PM monitors. [AQS: 42-003-0064]



N. Braddock: Located within the Monongahela River valley near the northern edge of the nonattainment area at an elevation of 870 ft. (MSL). Operated historically until 2000; restarted on Jan. 1, 2014. North Braddock also contains PM monitors. [AQS: 42-003-1301]

Additional monitored data from other Allegheny County and surrounding sites will be used for background calculations.

Below is a table of the SO_2 1-hour design values for all Allegheny County sites over the timeframe 2003-2014. The 1-hour design value is the 3-year average of the annual 99th-percentile daily maximum 1-hour values (for a complete year of data, the 99th-percentile is the 4th-highest daily 1-hour maximum).

Table B-1. 1-Hour Design Values of SO_2 Sites, 2003 to 2014 Timeframe (ppb)

Site	'01-'03	'02-'04	'03-'05	'04-'06	'05-'07	'06-'08	'07-'09	'08-'10	'09-'11	'10-'12	'11-'13	'12-'14
Avalon	86	78	71	68	68	67	69	63	51	45	40	37
Hazelwood	73	67	72	75	73	65						
Lawrenceville									30	27	26	21
Liberty	126	126	122	111	142	141	145	128	142	137	117	101
South Fayette	83	87	78	77	67	62	60	48	40	29	22	20
Stowe	75	68	62	56	61	63	69	66	62			
Carnegie Sci Ctr	77	75	70	70	71	70	66	53	40	27	24	25
Glassport	146	152	176	183								
1-Hour Standard	75	75	75	75	75	75	75	75	75	75	75	75

Notes:

- *Only 3-year periods with at least 2 years of data are shown.*
- *Lawrenceville began in 2010.*
- *Glassport was discontinued due to siting issues – it showed 24-hour and annual averages similar to that of Liberty.*
- *Stowe was discontinued in 2011 due to redundancy in the network, as Avalon was shown to be the more statistically significant monitor (see 2010 network assessment (ACHD, 2010)).*
- *Hazelwood was discontinued in 2007. This site was influenced by LTV in Hazelwood, which shut down in 1998.*

Below is a table of the 99th-percentile SO_2 1-hour values for all Allegheny County sites over the timeframe 2001-2014. For a complete year of data, the 99th-percentile is the 4th-highest daily 1-hour maximum.

Table B-2. Annual 99th-Percentiles of the Daily Maximum 1-Hour Values of SO_2 Sites, 2001 to 2014 Timeframe (ppb)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Avalon	95	97	66	71	76	57	70	75	61	53	40	42	39	30
Hazelwood	88	75	57	69	90	67	62							
Lawrenceville										29	31	22	24	17
Liberty	98	127	153	99	114	120	192	111	131	141	153	117	81	105
South Fayette	90	96	63	103	68	59	74	52	53	39	28	20	19	21
Stowe	78	87	61	56	68	44	72	74	60	63				
Carnegie Sci Ctr	76	82	73	70	66	73	75	62	61	35	23	22	28	
Glassport	116	157	164	136	229									
North Braddock														89
1-Hour Standard	75	75	75	75	75	75	75	75	75	75	75	75	75	75

Figure B-1 shows the number of exceedance days for Allegheny County sites over the timeframe 2006-2014.

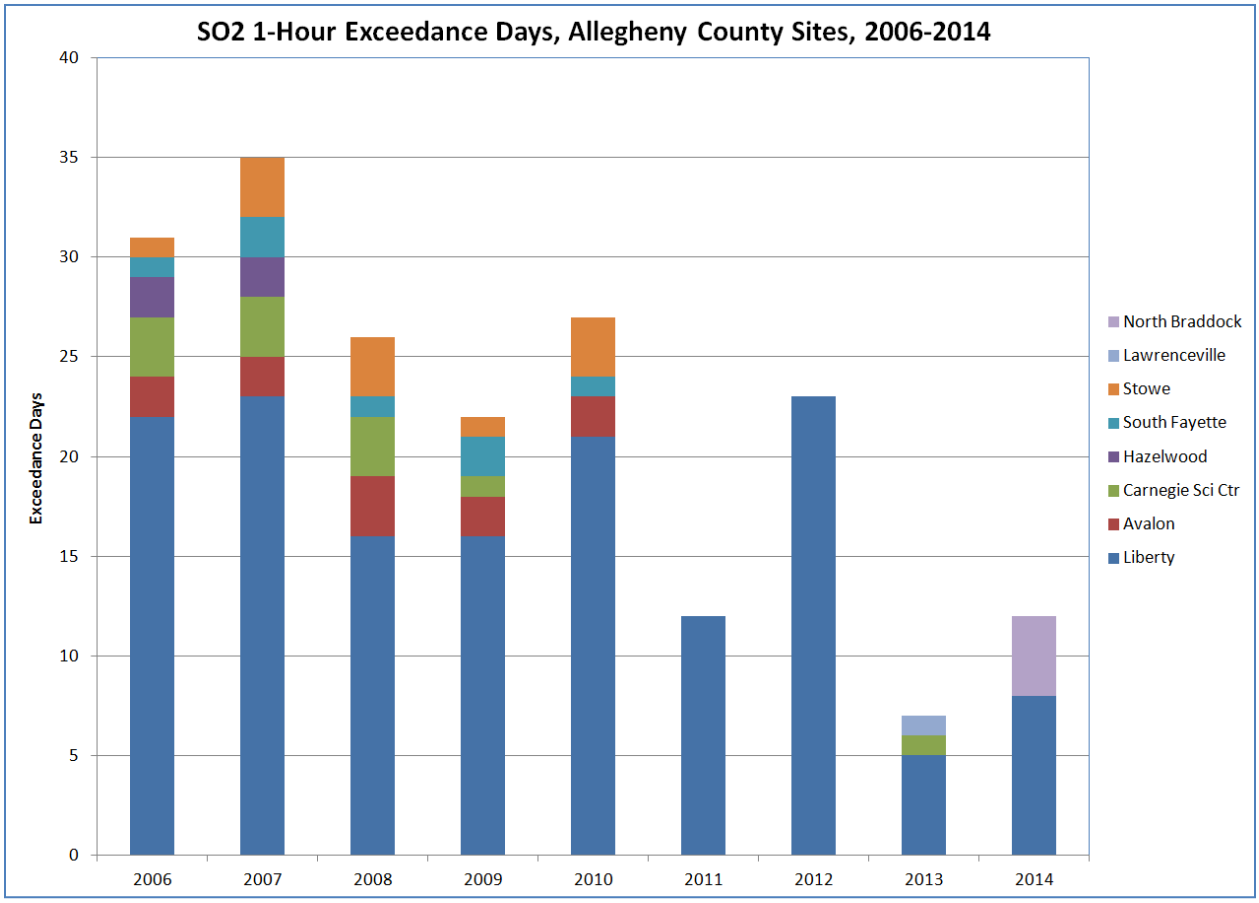


Figure B-1. Number of Exceedance Days of the 2010 1-Hour SO_2 NAAQS, Allegheny County Sites, 2006 to 2014 Timeframe

Note: Glassport was discontinued at the end of 2005.

Below is a table of the SO_2 3-hour design values for Allegheny County sites over the timeframe 2001-2014. The 3-hour design value is the 2nd-highest 3-hour average.

Table B-3. 3-Hour Design Values (2nd-High) of SO_2 Sites, 2001 to 2014 Timeframe (ppb)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Avalon	83	75	65	59	55	54	64	56	54	47	38	32	33	32
Hazelwood	75	55	53	52	72	59	49							
Lawrenceville										27	26	15	23	20
Liberty	124	89	115	90	89	98	188	96	152	99	331	116	77	77
South Fayette	58	130	61	70	55	49	60	60	50	57	32	24	19	24
Stowe	67	71	52	45	61	47	64	47	48	54				
Carnegie Sci Ctr	78	76	67	57	61	68	55	57	54	33	23	18	26	
Glassport	108	141	143	120	203									
North Braddock														71
3-Hour Standard	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Below is a table of the SO_2 24-hour design values for Allegheny County sites over the timeframe 2001-2014. The 24-hour design value is the 2nd-highest 24-hour average.

Table B-4. 24-Hour Design Values (2nd-High) of SO_2 Sites, 2001 to 2014 Timeframe (ppb)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Avalon	40	44	24	23	24	16	28	19	20	17	13	9	9	9
Hazelwood	32	26	26	20	22	19	23							
Lawrenceville										11	11	7	7	6
Liberty	53	39	44	37	41	49	64	34	55	26	70	35	24	26
South Fayette	33	40	31	22	20	25	24	18	20	17	11	9	7	8
Stowe	23	31	29	21	24	19	28	15	17	19				
Carnegie Sci Ctr	33	24	28	25	22	20	20	19	18	21	10	8	10	
Glassport	48	49	65	51	67									
North Braddock														19
24-Hour Standard	140	140	140	140	140	140	140	140	140	140	140	140	140	140

Below is a table of the SO_2 annual design values for Allegheny County sites over the timeframe 2001-2014. The annual design value is the arithmetic annual average.

Table B-5. Annual Design Values (Average) of SO_2 Sites, 2001 to 2014 Timeframe (ppb)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Avalon	10	9	8	6	7	5	5	5	4	2	2	2	2	2
Hazelwood	9	8	7	6	7	6	6							
Lawrenceville										2	2	2	2	1
Liberty	10	11	10	10	9	10	10	8	8	7	7	7	4	4
South Fayette	9	9	8	7	7	6	6	5	4	2	1	1	1	1
Stowe	7	7	7	6	7	6	6	4	3	3				
Carnegie Sci Ctr	8	10	10	7	8	7	5	5	4	6	3	3	3	
Glassport	15	13	12	11	13									
North Braddock														3
Annual Standard	30	30	30	30	30	30	30	30	30	30	30	30	30	30

Below is a table of the SO_2 1-hour design values for all sites in the nonattainment area over the 10-year timeframe of 1996-2005. South Fayette design values are also given for comparison.

Table B-6. Historical 1-Hour SO_2 Design Values, Sites in Nonattainment Area (with South Fayette also shown), 1996 to 2005 Timeframe (ppb)

	'94-'96	'95-'97	'96-'98	'97-'99	'98-'00	'99-'01	'00-'02	'01-'03	'02-'04	'03-'05
Glassport	221	189	165	121	124	122	132	146	152	176
Liberty	182	162	129	112	110	103	109	126	126	122
North Braddock	99	87	94	95	98	98				
Clairton	97	85	88	92	75	74				
South Fayette	104	90	96	96	92	89	96	83	87	78
1-Hour Standard	75	75	75	75	75	75	75	75	75	75

Notes:
- *Only 3-year periods with at least 2 years of data are shown.*
- *North Braddock and Clairton were discontinued at the end of 2000.*
- *South Fayette is shown in gray for comparison to background.*

Below is a table of the SO_2 1-hour design values for sites examined for background concentrations in the tri-state PA/OH/WV region over the timeframe 2004-2014.

Table B-7. Background Sites 1-Hour Design Values, 2004-2014 (ppb)

Site	St	Site ID	'02-'04	'03-'05	'04-'06	'05-'07	'06-'08	'07-'09	'08-'10	'09-'11	'10-'12	'11-'13	'12-'14
Shadyside	OH	39-013-3002	150	159	148	142	114	97	80	61	51	41	37
Steubenville	OH	39-081-0017			198	176	146	129	116	109	111	81	53
East Liverpool	OH	39-029-0022	157	150	135	121	115	117	90	62	32	24	23
Jefferson1	OH	39-081-0018								55	46	48	42
Jefferson2	OH	39-081-0020								43	36	35	28
Avalon	PA	42-003-0002	78	71	68	68	67	69	63	51	45	40	37
Lawrenceville	PA	42-003-0008								30	27	26	21
Carnegie Sci Ctr	PA	42-003-0010	75	70	70	71	70	66	53	40	27	24	25
South Fayette	PA	42-003-0067	87	78	77	67	62	60	48	40	29	22	20
Hookstown	PA	42-007-0002	143	145	130	140	128	128	101	80	57	40	31
Brighton	PA	42-007-0005	221	209	227	210	182	170	167	158	149	109	77
Johnstown	PA	42-021-0011	86	91	92	86	79	70	66	54	49	43	48
Holbrook*	PA	42-059-0002	84	79	73	84	87	82	54	32	20	17	17
Strongstown	PA	42-063-0004				111	99	87	90	82	81	72	81
Charleroi	PA	42-125-0005	90	86	79	80	80	88	67	49	21	20	26
Florence	PA	42-125-5001	108	106	102	90	78	72	60	53	33	24	17
Follansbee	WV	54-009-0005	162	177	158	150	143	127	127	119	115	88	51
Weirton1	WV	54-009-0007	157	153	157	165	161	129	103	83	79	59	45
Weirton2	WV	54-009-0011	148	155	144	155	158	157	148			138	76
New Manchester	WV	54-029-0005	224	204	159	164	166	167	126	86	47	29	29
New Cumberland	WV	54-029-0007	165	159	144	132	141	131	103	66	40	31	29
Chester	WV	54-029-0008	157	136	123	115	120	126	99	69	35	28	26
Weirton3	WV	54-029-0009	132	143	133	137	146	145	121	88	59	44	31
Lawrenceville	WV	54-029-0015	147	138	130	121	120	114	99	68	43	34	34
Weirton4	WV	54-029-1004	151	151	142	136	141	127	97	70	53	45	33
Moundsville	WV	54-051-1002	155	162	160	155	140	112	92	80	78	59	47
1-Hour Standard			75	75	75	75	75	75	75	75	75	75	75

** Note: Holbrook was formerly a seasonal monitor.*

APPENDIX C – Meteorological Sites

Liberty

PIT

Figure C-1. Photographs for Key Meteorological Sites

Liberty: South Allegheny High School rooftop, ACHD site

PIT (left): airport surface observations site
PIT (right): forecasting office in Moon Township, where sounding balloon is launched

APPENDIX D – SO_2 Facilities in Allegheny County and Surrounding Counties

Below are facilities lying within the modeling domain that are potentially impacting the Allegheny, PA nonattainment area (NAA). The modeling domain includes portions of Allegheny, Fayette, Washington, and Westmoreland Counties. Annual actual SO_2 emissions levels are shown for 2011-2014, as compiled by ACHD and PA DEP.

2011-2012 actual SO_2 emissions will be used for the initial screening of sources to be modeled (AERSCREEN), with 2012-2014 used for refined screening (AERMOD). For sources within the nonattainment area, only sources with 0.1 tons/year or greater emissions will be considered. For sources outside the nonattainment area, only those with 5.0 tons/year or greater emissions will be considered.

Sources accounted for by background monitors or lying outside the modeling domain will not be modeled. See Section 4 for more details on the modeling methodology.

Table D-1. Sources to be Considered for Modeling

Name	UTMe (km)	UTMn (km)	2011 SO_2 (tons)	2012 SO_2 (tons)	2013 SO_2 (tons)	2014 SO_2 (tons)	Comments
Allegheny County							
ALLEGHENY ENERGY/SPRINGDALE	604.297	4489.008	1.281	6.649	7.490	8.160	>5 tons
BAY VALLEY FOODS LLC/PGH	585.596	4478.778	313.170	268.222	208.803	12.757	>5 tons
CHAMBERS DEV CO INC/MONROEVILLE	602.466	4473.453	5.886	5.500	2.240	2.090	>5 tons
CLAIRTON SLAG INC/WEST ELIZABETH	593.583	4458.072	0.539	0.707	0.828	n/a	Within NAA
EASTMAN CHEM RESINS INC/ JEFFERSON SITE	593.298	4457.925	0.390	0.440	0.150	0.180	Within NAA
GUARDIAN IND CORP/JEFFERSON HILLS	592.252	4456.696	73.263	82.677	70.354	108.868	Within NAA
HARSCO METALS BRI LLC/BRADDOCK	597.171	4472.265	6.653	7.857	n/a	n/a	Within NAA
KELLY RUN SANI/MSW LDFL	594.725	4455.651	2.548	2.687	1.981	2.398	Within NAA
KOPPERS INC/CLAIRTON	594.987	4462.365	0.440	0.205	0.058	0.061	Within NAA
LANE CONSTR/BRIDGEVILLE	575.100	4469.554	9.771	5.172	0.371	0.590	>5 tons
NRG ENERGY INC/CHESWICK	602.380	4488.221	9290.308	1910.843	1686.312	4445.422	>5 tons
REDLAND BRICK INC/HARMAR	598.193	4490.183	42.073	28.216	15.800	30.790	>5 tons
UNIVERSAL STAINLESS & ALLOY PROD/BRIDGEVILLE	576.492	4468.783	14.246	14.906	9.757	7.446	>5 tons
U. S. STEEL/IRVIN PLANT	593.240	4465.419	418.689	635.112	507.965	715.847	Within NAA
U. S. STEEL/CLAIRTON PLANT	595.579	4462.034	1467.514	1737.962	1638.749	1475.273	Within NAA
U. S. STEEL/EDGAR THOMSON PLANT	596.974	4472.031	1279.002	1430.722	1453.872	1284.000	Within NAA
Washington County							
ALLEGHENY ENERGY/MITCHELL	587.810	4452.755	864.420	1569.720	1535.697	n/a	>5 tons
FLEXSYS AMER LTD/MONONGAHELA	590.709	4448.745	7.930	5.271	5.382	5.353	>5 tons
NRG ENERGY INC/ELRAMA	592.058	4456.364	428.080	249.000	n/a	n/a	>5 tons
WORLD KITCHEN/CHARLEROI	593.637	4444.424	81.300	69.800	77.100	77.306	>5 tons
Westmoreland County							
GREENBURG THERMAL LLC GREENSBURG	622.241	4458.681	19.158	19.012	13.530	n/a	>5 tons
ARCELORMITTAL MONESSEN LLC/MONESSEN COKE	594.866	4446.468	0.100	0.072	0.072	549.347	>5 tons

Notes:

- The Bellefield Boiler plant switched from coal to natural gas in 2009 and is < 5 tons/year.
- The Bay Valley Plant switched entirely to natural gas in 2014.
- NRG Cheswick flue gas desulfurization (FGD) system began in mid-2011.
- The Arcelormittal coke plant was idled in 2011 and restarted in 2014.
- The Mitchell and Elrama power plants are currently deactivated.
- There are no sources 5 tons or greater in Fayette County.
- Harsco (Braddock Recovery) and Clairton Slag are no longer inventoried by ACHD.

APPENDIX E – Calculation of Allowable Emissions Limits

SO_2 allowable emissions limits will be taken from operating and installation permits as available from ACHD or PA DEP. Limits may also exist in consent decrees/agreements or as emission reduction credits.

For ACHD sources/processes that are not limited by permit or agreement, calculations will be based on ACHD Article XXI limits. Article XXI calculations by process are given below.

SO_2 Allowables – Article XXI

A = Article XXI Allowable Emission Rate

E = Rated Maximum Heat Capacity

Conversions: $1 \frac{lb}{hr} = 0.126 \frac{g}{s} = 4.38 \frac{tons}{yr}$

Ideal Gas Law: if P constant, then $\frac{V_1}{V_2} = \frac{T_1}{T_2}$

Natural Gas Boiler [§2104.03.a.1]

For natural gas-only and propane-only sources, the allowable is simply the potential to emit:

$$\frac{E\ (mmBtu)}{hr} \left| \frac{0.6\ lb}{mmcf} \right| \frac{1\ mmcf}{1020\ mmBtu} = A \frac{lb}{hr}$$

Where:

$\frac{0.6\ lb}{mmcf}$ = Emission Factor for Natural Gas, taken from AP-42

$\frac{1\ mmcf}{1020\ mmBtu}$ = Average Gross Heating Value of Natural Gas, taken from AP-42

Small Boiler [§2104.03.a.2.A]

$$\frac{E\ \text{mmBtu}}{\text{hr}} \cdot \frac{1\ \text{lb}}{\text{mmBtu}} = A\ \frac{\text{lb}}{\text{hr}}$$

Medium Boiler [§2104.03.a.2.B]

$$1.7 \left[E\ \frac{\text{mmBtu}}{\text{hr}} \right]^{-0.14} = A\ \frac{\text{lb}}{\text{hr}}$$

Large Boiler [§2104.03.a.3.C]

$$\frac{E\ \text{mmBtu}}{\text{hr}} \cdot \frac{0.6\ \text{lb}}{\text{mmBtu}} = A\ \frac{\text{lb}}{\text{hr}}$$

Power Generation Boiler [§2104.03.a.4.D]

$$\frac{E\ \text{mmBtu}}{\text{hr}} \cdot \frac{2.8\ \text{lb}}{\text{mmBtu}} = A\ \frac{\text{lb}}{\text{hr}}$$

Process Emissions [§2104.03.c]

For processes, the allowable is the potential-to-emit of all materials and equipment contributing to the selected process. This may represent any combination of natural gas boiler and/or process calculations:

Example: Process 1

$$\frac{X\ (\text{tons of steel})}{\text{hr}} \cdot \frac{0.5\ \text{lb}}{\text{tons of steel}} = A_1\ \frac{\text{lb}}{\text{hr}}$$

Where:

$$\frac{X\ (\text{tons of steel})}{\text{hr}} = \text{Maximum Production Rate of the Process}$$

$$\frac{0.5\ \text{lb}}{\text{tons of steel}} = SO_2\ \text{Emission Factor for Process}$$

And:

$$4 \left[\frac{E\ (\text{mmBtu})}{\text{hr}} \cdot \frac{0.6\ \text{lb}}{\text{mmcf}} \cdot \frac{1\ \text{mmcf}}{1020\ \text{mmBtu}} \right] = A_2 \frac{\text{lb}}{\text{hr}}$$

Where:

4 = number of natural gas-only boilers supplying heat for the process

Total allowable for process:

$$A_1 + A_2 = A \frac{\text{lb}}{\text{hr}}$$

Example: Process 2

If the summation of the potential-to-emit values for the entire process is greater than 500 ppm (by volume) in the effluent gas, then 500 ppm is used as the allowable rate. Assuming ideal gas conditions:

$$\frac{500}{1\,000\,000} \cdot \frac{V\ (\text{cf})}{\text{min}} \cdot \frac{60\ \text{min}}{\text{hr}} \cdot \frac{64\ \text{lb}}{\text{lb-mole}} \cdot \frac{P}{R\,T} = A \frac{\text{lb}}{\text{hr}}$$

Where:

V = maximum volumetric flow rate of dry standard effluent gas, cf/min

$\frac{64\ \text{lb}}{\text{lb-mole}}$ = molecular weight of sulfur dioxide

T = standard temperature, °Rankine

R = ideal gas constant = $0.7302 \frac{\text{cf - atm}}{\text{lb-mole °R}}$

P = standard pressure, atm

Incinerator Emissions [§2104.03.d]

Incinerators, like processes, are assigned either the potential-to-emit or 500 ppm, whichever the lesser. The potential is calculated similarly to A_1 of Process 1 above: a maximum throughput rate multiplied by an emission factor. If greater than 500 ppm, then 500 ppm is the allowable, calculated like above.

Coke Ovens and Coke Oven Gas [§2105.21.h]

US Steel is required to not exceed 40 grains of H_2S per hundred dry standard cubic feet in coke oven gas (COG) used at its plants. Likewise, Shenango may not exceed 34 grains of H_2S in its coke oven gas. When calculating SO_2, it is assumed for all equipment that all H_2S is converted to SO_2 stoichiometrically at a 1:1 ratio, with a corresponding molecular weight ratio of 34:64. Example: for a US Steel boiler firing coke oven gas,

$$\frac{40 \text{ grains } H_2S}{100 \text{ dscf}} \cdot \frac{64 \text{ (Mol.Wt.) } SO_2}{34 \text{ (Mol.Wt.) } H_2S} \cdot \frac{\text{Max. COG (dscf)}}{\text{hr}} \cdot \frac{1 \text{ lb}}{7000 \text{ grains}} = A \frac{\text{lb}}{\text{hr}}$$

Hospital/Medical/Infectious Waste Incinerator Emissions [§2105.32.f]

Hospital/medical/infectious waste incinerators (HMIWIs) are required to meet 55 ppm sulfur dioxide emissions in the discharge. This is calculated using the same procedure as the 500 ppm calculation above.

APPENDIX F – Providing Representative Meteorological Data to AERMOD

As discussed in Section 1, AERMOD will be the primary model used in the attainment demonstration. AERMOD is the recommended model for complex terrain and short- and long- term SO_2 impacts within 50 km of a location of concern. AERMOD has been demonstrated to perform rather well when compared with field study results. Furthermore, as with dispersion models in general, AERMOD produces more reasonable output with better input data.

Regarding better input, Section 3 introduces the proposal to evaluate the use of the WRF model to generate an alternative meteorological data set as input to AERMOD. Potential advantages of using output from WRF as input to AERMOD include that WRF can yield complete grid-averaged planetary boundary layer data at 4 km (and finer) grid scale resolutions with profiles of temperature and wind (where wind values are not limited by equipment thresholds) and sub-grid scale turbulence formulation. Dispersion is modeled well using turbulence data at source level as inputs.[1, 2]

To circumvent the problem of grid-scale representations versus the site-specific data requirements for AERMOD, grid-scale output that encompasses the area of primary SO_2 emissions can be provided as if it were a specific meteorological site for input to AERMOD. Thus, a simulated point measurement could be used for input to AERMOD by employing output from WRF as representing a single location near the United States Steel (U. S. Steel) Clairton Plant, the largest source of SO_2 in the nonattainment area closest to the Liberty monitor. (Liberty is the monitor where measured violations of the new SO_2 NAAQS have occurred.)

Note from Figure 1-1 in Section 1 that if a representative single meteorological site were positioned in the river valley at approximately the middle of the nonattainment area and thus near the Liberty monitor, this position would also be adequately representative of weather conditions at another potentially significant SO_2 source in the nonattainment area, that of the U. S. Steel Edgar Thomson Plant located in the river valley at the northern end of the area. The U. S. Steel Irvin Plant (another substantial SO_2 emitter), located above the valley and only 1.5 miles to the north-northwest of the northern end of the Clairton Plant, would also be well represented. Figure F-1 shows the location of all three U. S. Steel operations along with two other large SO_2 emitters – NRG Energy's Elrama power plant and Allegheny Energy's Mitchell power plant – adjacent to the nonattainment area. Included in the figure are the present monitoring sites. The North Braddock SO_2 monitor resumed sampling in 2014, after being discontinued for many years. The Liberty Borough monitor has been in operation since the 1970s.

Wind direction accuracy is critical to properly simulate air-quality reality. So, if input that faithfully mimics river-valley channeling, out-of-valley flow, and prevailing winds can be developed for AERMOD, then more reliable results can be expected.

As noted above, the ACHD's recent $PM_{2.5}$ SIP included a modeling demonstration that used WRF via MMIF to produce input to the CAMx model. Figure F-2 shows the Liberty Borough area 4 km grid cells from the MMIF program; the cells cover both valley and elevated terrain. Figure F-3 displays stacked wind direction frequencies roughly representing the MMIF 4 km western grid cell (shown in Figure F-2) compared with typical wind roses from historic Liberty-Clairton area monitors located above and within the river valley. The WRF/MMIF results clearly depict valley versus above-valley flow.

Just as the MMIF program converted WRF multi-level single-site prognostic output fields to usable parameters and formats required for CAMx, similarly output can be derived and delivered to AERMOD directly or through AERMET, the meteorological preprocessor for AERMOD.

Furthermore, an accurate "dilution velocity," a measure of "the dilution capability of the boundary layer,"[1] is another key to getting the modeling right. And, here is where turbulence is accounted for in the modeling, because dilution velocity is expressed as the product of vertical and horizontal turbulent velocity divided by the horizontal wind speed. WRF results include turbulence data that can improve AERMOD output realism.

Recent studies have lent support to the possible use of prognostic meteorological model data as input to AERMOD in a regulatory application.[3-8] The expectation is that if certain critical conditions can be adequately addressed, input to AERMOD from models such as WRF can perhaps yield superior results. These conditions include the effectiveness of WRF output to properly represent surface roughness, urban scale peculiarities, vertical temperature profiles especially with respect to nighttime stable layers at low altitude, and other circumstances.[4] For instance, because of the existence of sources such as fugitive emissions from coking operations that are influenced by a potential "heat island" effect, building cavities, and surface roughness elements, special attention needs to be given to the structure of the "urban" boundary layer and how a prognostic model like WRF will accurately represent such a layer.

The appropriateness of using WRF output in AERMOD will be tested by comparing the AERMOD with WRF (via MMIF) output with reality in the nonattainment area. Such reality would be apparent from monitoring results in the area and the pattern of the SO_2 impact (seen in isopleths of the modeling results). Testing will be done by running WRF-AERMOD and comparing the output not only to measured values but also to output from the routine running of AERMOD with local (Liberty Borough) surface data and Pittsburgh NWS upper air data and with just Pittsburgh NWS surface and upper-air data.[6, 9] (Pittsburgh NWS data are collected approximately 20 miles to the northwest of the nonattainment area.) Output from runs using the LowWind BETA options with Liberty data will also be compared. If WRF-AERMOD results produce a significantly superior rendering of SO_2 impact in the nonattainment area, then such use of WRF-AERMOD for modeling by the ACHD should be acceptable.

Superior results can be expected, since a recent study by the Tennessee Valley Authority (TVA)[6] found that for daily SO_2 concentrations, AERMOD incorporating WRF output "estimated values much closer to observed" than AERMOD with NWS data. Furthermore, the WRF tool developed by TVA "had several advantages over NWS as it was able to directly output more land use and boundary layer parameters needed by AERMOD than NWS, it had a more representative upper air profile, it contained no missing data, and it was able to provide comprehensive data at the precise location of the source."

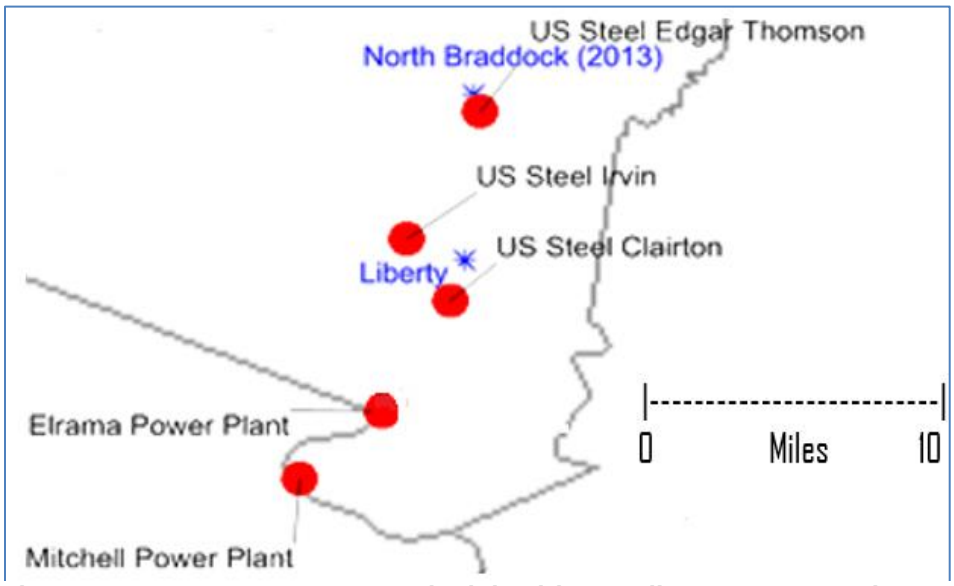


Figure F-1. Largest SO_2 Sources (red dots) in or Adjacent to Nonattainment Area and SO_2 Monitors (blue asterisks)

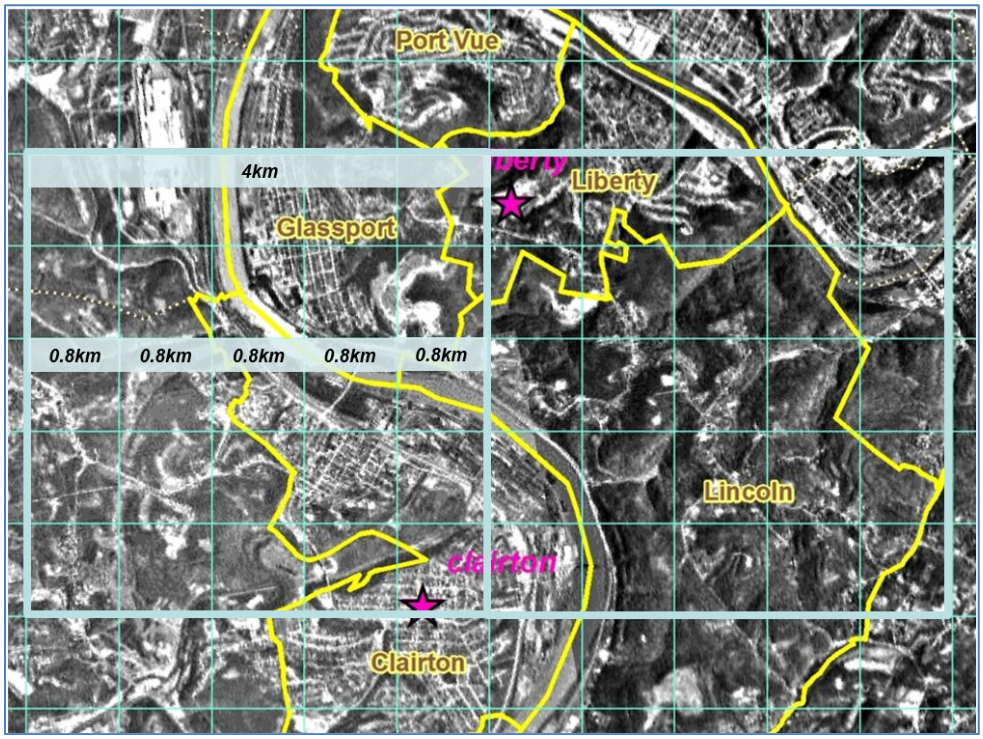


Figure F-2. WRF MMIF Cells from $PM_{2.5}$ Modeling

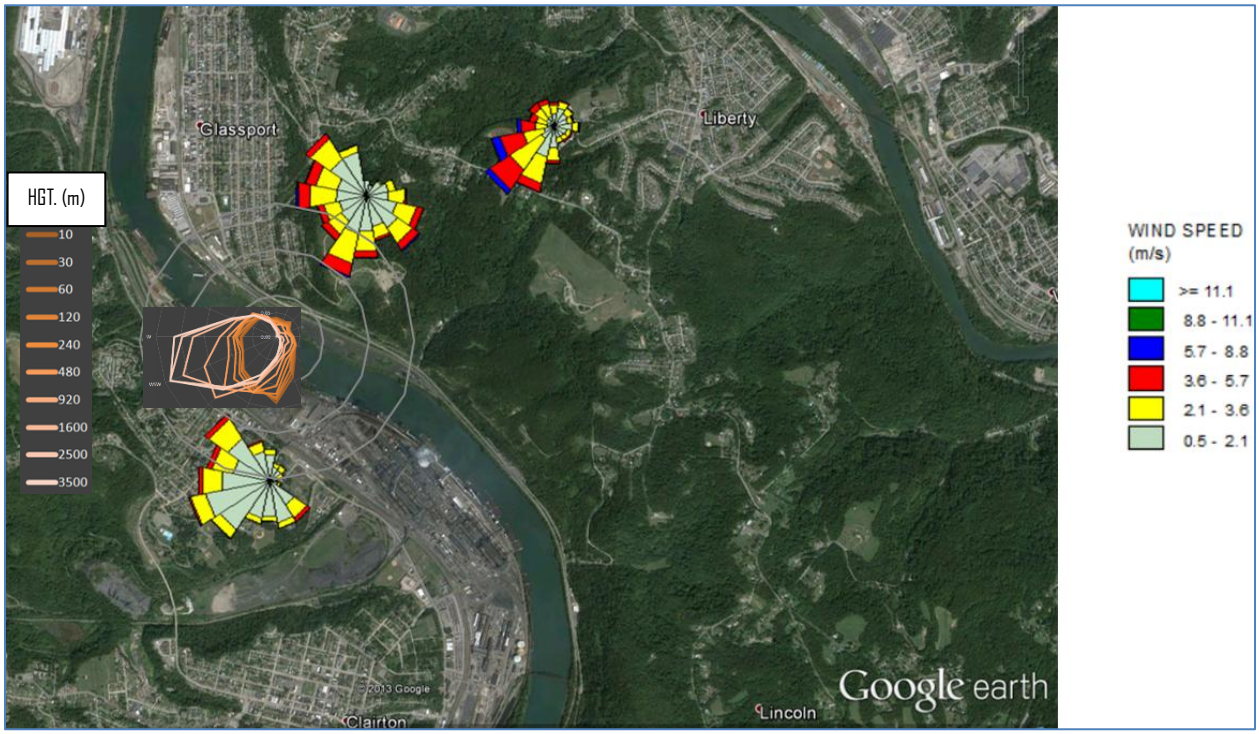


Figure F-3. Historic Wind Roses (1996-2000) with MMIF 2011 Stacked Wind Direction Frequencies Roughly Derived from Western 4 km Cell in Figure F-3

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APPENDIX G – Alternative Model Settings

Should CALPUFF be selected as an alternative model for the attainment demonstration, the following inputs are recommended in this appendix. These inputs may be similar to inputs for other models such as SCICHEM. More discussion of the alternative model testing and comparisons with AERMOD is provided in Appendix I.

The use of CALPUFF should meet alternative model justification for use in a near-field application (as described in EPA's clarification memo (U.S. EPA, 2008); the use of alternative models is also described in EPA's Guideline on Air Quality Models (U.S. EPA, 2005, 2015c)).

Below are the versions of CALPUFF and pre/postprocessors approved for regulatory use:

- CALPUFF v5.8.4
- CALMET v5.8.4
- CALPOST v6.221

Domain Settings

Common domain settings can be shared for CALPUFF, CALMET, and most associated preprocessor programs. These include:

- Projection: Universal Transverse Mercator (UTM)
- Zone: 17, Northern
- Datum: North American 1983
- Continent/Region: North America/Continental US (CONUS), NAR-C
- Base Time Zone: Eastern U.S. (GMT -05:00)
- Grid Type: Cartesian, referenced to lower left corner (same as AERMAP domain)
- Computational Grid Spacing: 100 m for near-field impacts

Geophysical Preprocessing

Geophysical preprocessing for CALMET includes the programs TERREL, CTGCOMP, CTGPROC, and MAKEGEO. The following settings should be used for these:

- Coastline: none
- Terrain Files: USGS30 7.5' DEMs
- Discrete Receptors: same as AERMOD
- Land Use Files: USGS NLCD 1992 land use (by state)

The use of 7.5' DEM terrain and NLCD 1992 land use data provide data points at every 30 meters within the domain.

Meteorological Preprocessing

Meteorological preprocessing for CALMET includes SMERGE, READ62, PXTRACT, and PMERGE. The following inputs should be used for these preprocessors:

- Surface Data: TD-3505, ISHWO, or SAMSON
- Upper Air Data: TD-6201, original FSL, or 3D.DAT
- Prognostic Data: WRF (use CALWRF to generate 3D.DAT)
- Precipitation Data: TD-3240
- Top Pressure: must equal or exceed top of vertical domain

Data for prognostic meteorology would be extracted from WRF results using the CALWRF preprocessor. WRF is a next-generation mesoscale numerical weather prediction system designed to serve both

operational forecasting and atmospheric research. WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of kilometers.

Meteorological Processing

CALMET would be initially used for the meteorological simulation according to recommended EPA-FLM settings (see Table G-1 below). For more specific processing, changes from EPA-FLM settings, for terrain influence (TERRAD), relative weights of surface and aloft fields and observations (R1/R2, if onsite stations are included), and radii of influence (RMAX1/RMAX2) may be considered.

Emissions Inputs

Emissions inputs would be similar to those used in AERMOD, with the exception of coke batteries, which would be modeled as buoyant line sources (BLP) in CALPUFF. Anthropogenic heat flux may also be added for large heat-releasing sources.

Table G-1. Recommended EPA-FLM CALMET Settings

Variable	Description	Default	EPA-FLM
Input/Output File Names			
GEODAT	Input filename of geophysical data	GEO.DAT	User defined
SRFDAT	Input filename of hourly meteorological data	SURF.DAT	User defined
CLDDAT	Input filename of gridded cloud data	CLOUD.DAT	
PRCDAT	Input filename of hourly precipitation data	PRECIP.DAT	User defined
WTDAT	Input filename of gridded fields of terrain weighting factors	WT.DAT	
METLST	Output filename of list file	CALMET.LST	User defined
METDAT	Output filename of generated gridded met fields	CALMET.DAT	User defined
PACDAT	Output filename of generated gridded met files (MESEOPUFF II)	PACOUT.DAT	
LCFILES	Convert names to upper or lower case	User defined	T
NUSTA	Number of upper air stations	User defined	User defined (>0)
NOWSTA	Number of over water met stations	User defined	User defined
NM3D	Number of MM4/MM5/3D.DAT files	User defined	User defined (>0)
NIGF	Number of coarse grid CAL MET fields initial guess fields	User defined	0
UPDAT	Input filenames of upper air data	UPn.DAT (n=1,2,3 ...)	user defined
SEADAT	Input filename of over water stations	SEAn.DAT (n=1,2,3 ...)	User defined
M3DDAT	Input filename of MM4/MM5/3D.DAT	MMSOn.DAT	User defined
IGFDAT	Input filename of IGF-CALMET files	IGFn.DAT (n=1,2,3 ...)	
DIAOAT	Input filename of preprocess sfc/UA data	DIAG.DAT	
PRGDAT	Input filename of prognostic gridded wind fields	PROG.DAT	
TSTPRT	Output filename of intermediate winds, and misc...etc	TEST.PRT	
TSTOUT	Output filename of final wind fields	TEST.OUT	
TSTKIN	Output filename of wind fields after kinematic winds	TEST.KIN	
TSTFRD	Output filename of winds after Froude Number effects	TEST.FRD	
TSTSLP	Output filename winds after slope effects	TEST.SLP	
DCSTGD	Output filename of distance land internal variables	DCST.GRD	

Variable	Description	Default	EPA-FLM
General Run/Control Parameters			
IBYR	Beginning year	User defined	User defined
IBMO	Beginning month	User defined	User defined
IBDY	Beginning day	User defined	User defined
IBHR	Beginning hour	User defined	User defined
IBTZ	Base time zone	User defined	User defined
IRLG	Length of run (hours)	User defined	User defined
IRTYPE	Output type to create	1	1
LCALGRD	Require fields for CALGRID	T	T
ITEST	Flag to stop run after setup phase	2	2
MREG	Conformity to regulatory values	User defined	1
Map and Grid Settings			
PMAP	Map projection	UTM	LCC
FEAST	False Easting at projection origin (km)	0.0	0.0
FNORTH	False northing at projection origin (km)	0.0	0.0
IUTMZN	UTM zone	User defined	-999
UTMHEM	Hemisphere of UTM projection	N	N
RLATO	Latitude of projection origin (decimal degrees-N)	User defined	User defined
RLONO	Longitude of projection origin (decimal degrees-W)	User defined	User defined
XLAT1	Matching latitude for projection (decimal degrees-N)	User defined	User defined
XLAT2	Matching latitude of projection (decimal degrees-N)	User defined	User defined
DATUM	Datum-region of output coordinates	WGS-84	User defined
NX	Number of east to west or X grid cells	User defined	User defined
NY	Number of north to south or Y grid cells	User defined	User defined
DGRIDKM	Grid spacing in kilometers (km)	User defined	User defined (km)
XORIGKM	Southwest corner of grid cell (1,1), X-coordinate (km)	User defined	User defined
YORIGKM	Southwest corner of grid cell (1,1), Y-coordinate (km)	User defined	User defined
NZ	Number of vertical layers	User defined	10
ZFACE	Cell face heights in arbitrary vertical grid (ZFACE (NZ+1)) (m)	User defined	0,20,40,80,160,320, 640,1200,2000,3000,4000
Output Options			
LSAVE	Save met fields in unformatted file	T	T
IFORMO	Type of unformatted output file	1	1
LPRINT	Print met fields	F	F
IPRINF	Print interval in hours	1	1
IUVOUT	Layers of U, V wind components to print (IUVOUT (NZ))	NZ*0	10*0
IWOUT	Levels of W wind component to print (IWOUT (NZ))	NZ*0	10*0
TOUT	Levels of 3-D temps to print (ITOUT (NZ))	NZ*0	10*0
STABILITY	Print PGT Stability	0	0
USTAR	Print friction velocity	0	0
MONIN	Print Monin-Obukhov	0	0
MIXHT	Print mixing height	0	0

Variable	Description	Default	EPA-FLM
WSTAR	Print convective velocity scale	0	0
PRECIP	Print precipitation rate	0	0
SENSHEAT	Print sensible heat flux	0	0
CONVZI	Print convective mixing height (Zic)	0	0
LOB	Print met data and internal variables	F	F
NN1	Test and debug print options: first time step	1	1
NN2	Test and debug print options: last time step	1	1
LOBCST	Test and debug print options: distance to land internal variables	F	F
IOUTO	Test and debug print options: control variables for writing winds	0	0
NZPRN2	Test and debug print options: number of levels starting at sfc	1	0
IPRO	Test and debug print options: interpolated winds	0	0
IPR1	Test and debug print options: terrain adjusted surface wind	0	0
IPR2	Test and debug print options: smoothed wind and diverge fields	0	0
IPR3	Test and debug print options: final wind speed and direction	0	0
IPR4	Test and debug print options: final divergence	0	0
IPR5	Test and debug print options: winds after Kinematic effects	0	0
IPR6	Test and debug print options: winds after Froude No adjustment	0	0
IPR7	Test and debug print options: winds after slope flow	0	0
IPR8	Test and debug print options: final winds	0	0
Meteorological Options			
NOOBS	No observation mode	0	0
NSSTA	Number of surface stations	User defined	User defined (>0)
NPSTA	Number of precipitation stations	User defined	User defined (>0)
ICLOUD	Gridded cloud fields	0	0
IFORMS	Surface met data file format	2	2
IFORMP	Precipitation data file format	2	2
IFORMC	Cloud data format	2	2
Wind Field Options/Parameters			
IWFCOD	Wind model options	1	1
IFRADJ	Compute Froude number adjustment effects	1	1
IKINE	Compute Kinematic effects	0	0
IOBR	Use O'Brien procedures for adjust vertical velocity	0	0
ISLOPE	Compute slope effects	1	1
IEXTRP	Extrapolate sfc wind obs to upper levels	-4	-4
ICALM	Extrapolate sfc winds even if calm	0	0
BIAS	Surface/upper weighting factors (BIAS (NZ))	NZ*0	10*0
RMIN2	Minimum distance for extrapolation of winds	4	-1
IPROG	Use prognostic model winds as input to diagnostic wind model	0	14
ISTEPPG	Timestep (hours) of prognostic model data	1	1
IGFMET	Use coarse CALMET fields as initial guess	0	0

Variable	Description	Default	EPA-FLM
LVARY	Use varying radius of influence	F	F
RMAX1	Maximum radius of influence in surface layer (km)	User defined	100
RMAX2	Maximum radius of influence over land aloft (km)	User defined	200
RMAX3	Maximum radius of influence over water (km)	User defined	200
RMIN	Minimum radius of influence in wind field interpolation (km)	0.1	0.1
TERRAD	Radius of influence of terrain features (km)	User defined	15
R1	Relative weight at surface of 1st guess fields and obs (km)	User defined	50
R2	Relative weight aloft of 1st guess fields and obs (km)	User defined	100
RPROG	Weighting factors of prognostic wind field data (km)	User defined	0
DIVLIM	Maximum acceptable divergence	5.0E-06	5.0E-06
NITER	Maximum number of iterations in divergence minimum	50	50
NSMTH	Number of passes in smoothing (NSMITH (NZ))	2, (nxnz-1)*4	2, 9*4
NINTR2	Maximum number of stations for interpolation (NINTR2(NZ))	99	10*99
CRITFN	Critical Froude Number	1	1
ALPHA	Empirical factor controlling influence of kinematic effects	0.1	0.1
FEXTR2	Multiplicative scaling factor for extrap of sfc obs to upper layers (FEXTRS(NX))	NZ*0	10*0
NBAR	Number of barriers to interpolation of wind fields	0	0
KBAR	Level (1 to NZ) up to which barriers apply	NZ	10
XBBAR (NBAR>O)	X coordinate of beginning of each barrier (km)	User defined	0
YBBAR (NBAR>O)	Y coordinate of beginning of each barrier (km)	User defined	0
XEBAR (NBAR>O)	X coordinate of ending of each barrier (km)	User defined	0
YEBAR (NBAR>O)	Y coordinate of ending of each barrier (km)	User defined	0
IDIOPT1	Compute surface temperature	0	0
ISURFT	Sfc met station to use for sfc temp	User defined	User defined
IDIOPT2	Domain-averaged temp lapse rate	0	0
IUPT (IDIOPT2=0)	UA station to use for the domain-scale lapse rate	User defined	User defined
ZUPT (IDIOPT2=0)	Depth through which domain-scale lapse rate is computed (m)	200	200
IDIOPT3	Domain-averaged wirid component	0	0
UPWIND (IDIOPT3=0)	UA station to use for domain-scale winds	-1	1
ZUPWIND (IDIOPT3=0)	Bottom and top of layer thru which domain winds computed (m)	1, 1000	1, 1000
IDIOPT4	Read observed surface. wind components	0	0
IDIOPT5	Read observed upper wind components	0	0
LLBREZE	Use lake breeze module	F	F
NBOX	Number of lake breeze regions	User defined	0
XG1	X grid line 1 defining the region of interest	User defined	0
XG2	X grid line 2 defining the region of interest	User defined	0
YG1	y grid line 1 defining the region of interest	User defined	0
YG2	Y grid line 2 defining the region of interest	User defined	0
XBCST	X point defining the coastline (km)	User defined	0

Variable	Description	Default	EPA-FLM
YBCST	Y point defining the coastline (km)	User defined	0
XECST	X point defining the coastline (km)	User defined	0
YECST	Y point defining the coastline (km)	User defined	0
NLB	Number of stations in the region (sfc +upper air)	User defined	1
METBXID	Station ID's in the region (METBXID (NLB))	User defined	0
Mixing Ht, Precip, Temp Parameters			
CONSTB	Mix ht constant: neutral, mechanical equation	1.41	1.41
CONSTE	Mix ht constant: convective equation	0.15	0.15
CONSTN	Mix ht constant: stable equation	2400	2400
CONSTW	Mix ht equation: over water	0.16	0.16
FCORIOL	Absolute value of Coriolis parameter	1.0E-04	1.0E-04
IAVEZI	Spatial averaging of Mix ht: conduct spatial averaging	1	1
MNMDAV	Spatial averaging of Mix ht: Max,search radius(# of grid cells)	1	1
HAFANG	Spatial avg'n of Mix ht: 0.5-angle of upwind cone for avg (deg)	30	30
ILEVZI	Spatial averaging of Mix ht:. Layer of winds used in upwind	1	1
IMIXH	Zic Mix Ht Options: Method to compute Mix ht	1	-1
THRESHL	Zic Mix Ht Options: Threshold buoyancy flux reqrd to sustain over land (W /m3)	0.05	0.0
THRESHW	Zic Mix Ht Options: Threshold buoyancy flux reqrd sustain over water (W/m3)	0.05	0.05
ITWPROG	Zic Mix Ht Options: Overwater lapse rates used in Zic growth	0	0
ILUOC3D	Zic Mix Ht Options: Land use category in 3D.DAT	16	16
DPTMIN	Min potential temp lapse rate in stable layer above Zic (deg-K/m)	0.001	0.001
DZZI	Depth of computing capping lapse rate (m)	200	200
ZIMIN	Minimum over land mixing height (m)	50	50
ZIMAX	Maximum over land mixing height (m)	3000	3000
ZIMINW	Minimum over water mixing height (m)	50	50
ZIMAXW	Maximum over water mixing height (m)	3000	3000
ICOARE	Over water surface fluxes methods and parameters	10	0
DSELF	Coastal/shallow water length scale (km)	0	0
IWARM	COARE warm layer computation	0	0
ICOOL	COARE cool skin layer computation	0	0
ITPROG	3D temp from obs or from prognostic data	0	0
IRAD	Temp interpolation type	1	1
TRADKM	Radius of influence of temp interpolation (km)	500	500
NUMTS	Max number of stations to include in interpolation	5	5
IAVET	Conduct spatial averaging of temp	1	1
TGDEFB	Default temp gradient below mix ht over water (deg-K/m)	-0.0098	-0.0098
TGDEFA	Default temp gradient above mix ht over water (deg-K/m)	-0.0045	-0.0045
JWAT1	Beginning land use categories for temp interpolation over water	User defined -999	55
JWAT2	Ending land use categories for temp interpolation over water	User defined -999	55
NFLAGP	Method of precipitation interpolation	2	2

Variable	Description	Default	EPA-FLM
SIGMAP	Radius of influence for precipitation (km)	100	100
CUTP	Minimum precipitation rate cutoff (mm/hr)	0.01	0.01
Surface Station Parameters			
CSNAM	Station name	User defined	User defined
IDSSTA	Station identification number	User defined	User defined
XSSTA	X-coordinate (km)	User defined	User defined
YSSTA	Y-coordinate (km)	User defined	User defined
XSTZ	Time zone	User defined	User defined
ZANEM	Anemometer height (m)	User defined	User defined
Upper Air Station Parameters			
CUNAM	Station name	User defined	
IDUSTA	Station identification number	User defined	
XUSTA	X-coordinate (km)	User defined	
YUSTA	Y-coordinate (km)	User defined	
UUTZ	Time zone	User defined	
Precipitation Station Parameters			
CPNAM	Station name	User defined	User defined
IDPSTA	Station identification number	User defined	User defined
XPSTA	X-coordinate (km)	User defined	User defined
YPSTA	Y-coordinate (km)	User defined	User defined

APPENDIX H – Conceptual Model

Air quality modeling is typically employed as a critical part of the State Implementation Plan. As stated earlier, modeling is a tool used to simulate observed conditions and incorporates the three components of the air-pollution system--the sources, dispersion, and receptors of atmospheric pollutants. This appendix establishes the setting and general conditions within which the modeling must perform in the Allegheny, PA nonattainment area. Ultimately, this appendix provides an answer to the key question, "What would good modeling results look like?"

The "Big Picture"

One of the major sources affecting the nonattainment area is the U. S. Steel Clairton Plant. The plant is located roughly within two miles south-southwest of the Liberty Borough monitoring site, and SO_2 concentrations measured at Liberty are strongly influenced by this plant – the largest coking operations in the nation. Note that the prevailing winds in this area of the county are generally from the south through west taking coking emissions toward the Liberty station. See Liberty surface wind rose and maps below.

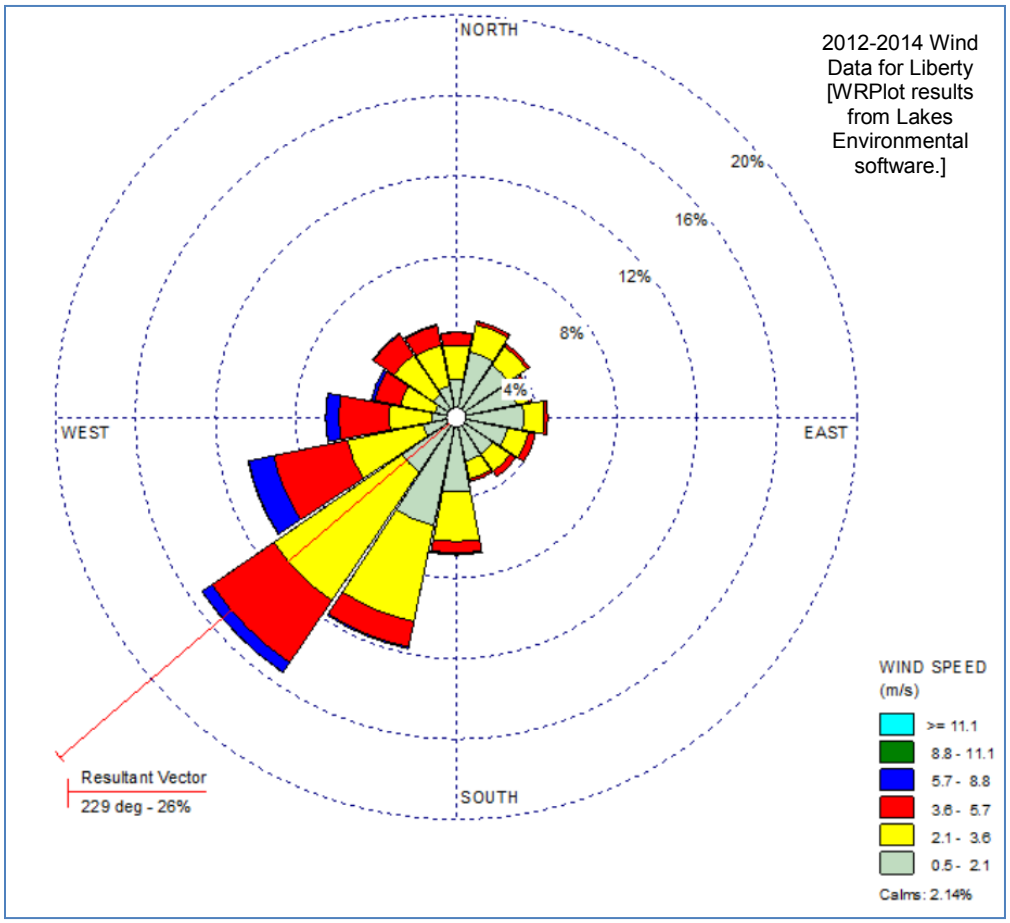

Figure H-1. 2012-2014 Wind Rose for Liberty

To better locate the sources of SO_2 on the Liberty Borough monitor, provided below is a look at "rose" data by 22.5° sectors for 2012-2014. This graph is then superimposed on the site of the Liberty Borough monitor. Pollution roses are also provided for historical data at Liberty Borough and former sites in Glassport, Clairton, North Braddock, and Braddock Cemetery.

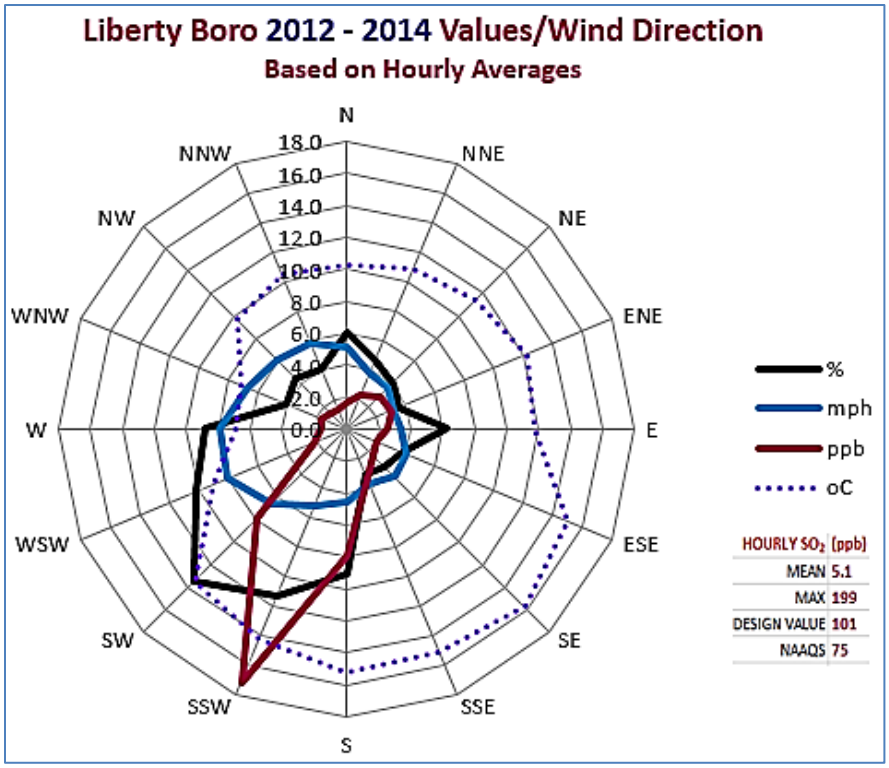

Figure H-2. Pollution and Meteorology Rose for Liberty, 2012 - 2014

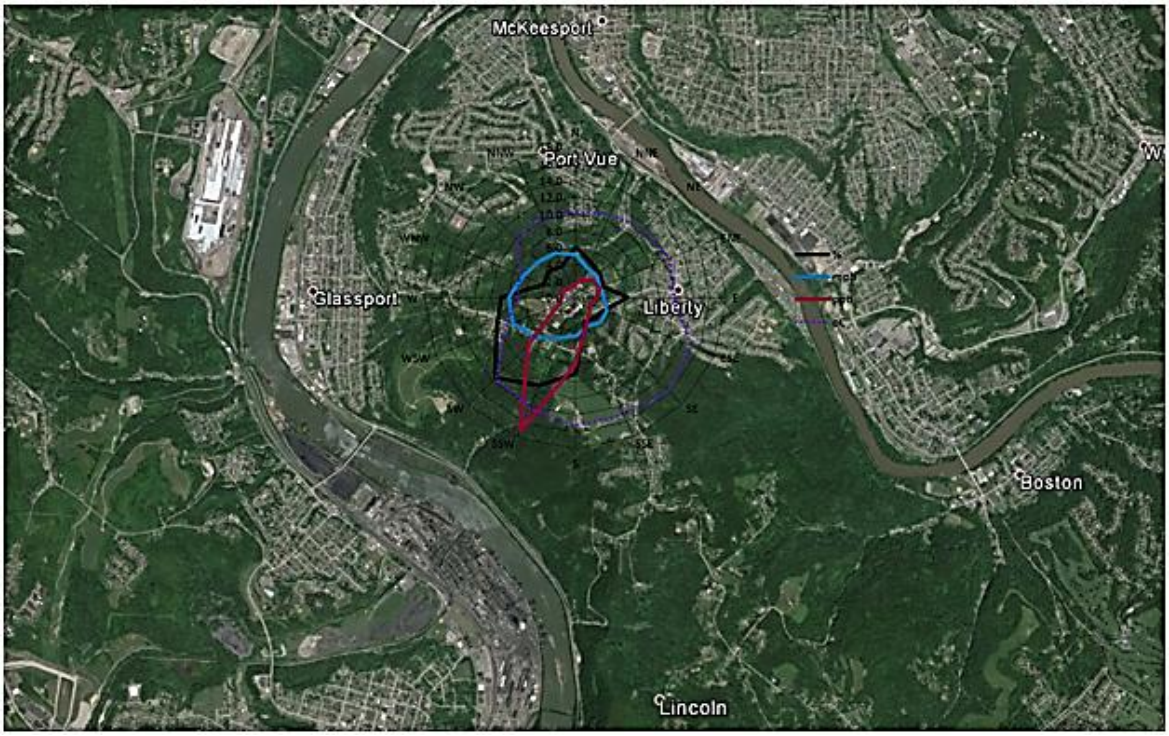

Figure H-3. Pollution and Meteorology Rose for Liberty with Aerial Map Overlay, 2012-2014

Figure H-4. Pollution Roses, Historical Data, Liberty/Glassport/Clairton, 1996-2000

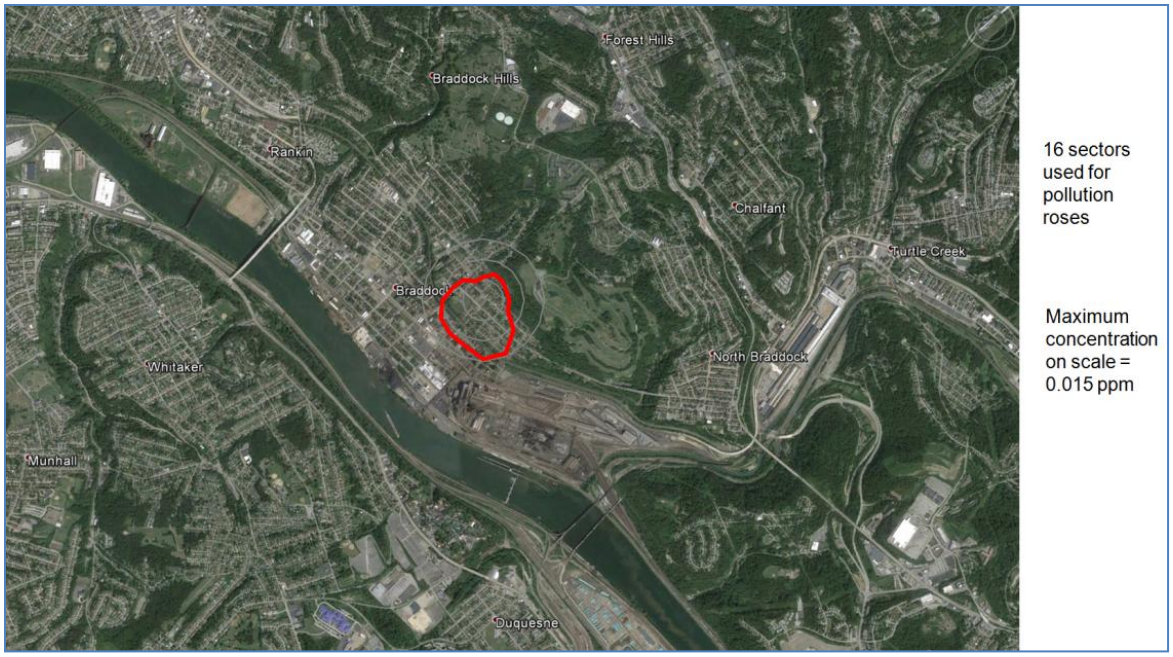

Figure H-5. Pollution Rose, Historical Data, North Braddock, 1996-2000

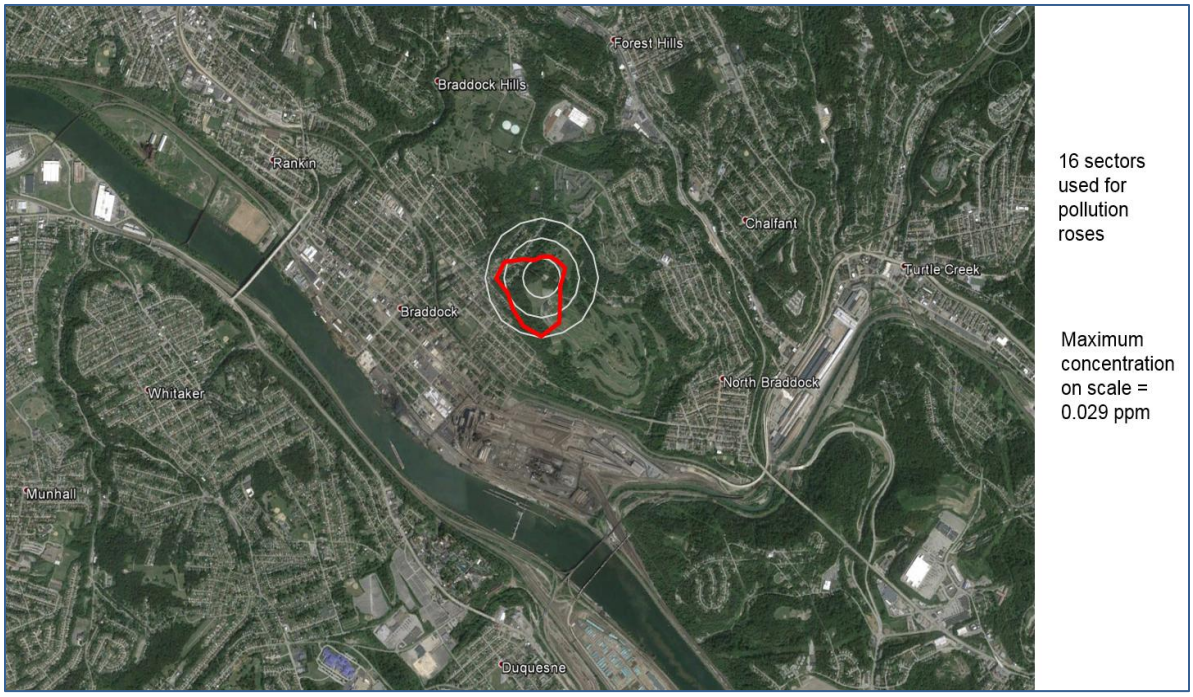

Figure H-6. Pollution Rose, Historical Data, Braddock Cemetery, 1982-1984

Based on the pollution rose data, the largest sources in the area have been and continue to be the largest contributors to SO_2 impacts in the nonattainment area. (Note that source modifications/shut downs should be taken into consideration when examining historical results.)

There are additional significant SO_2 sources in the vicinity of the nonattainment area. Locations of sources greater than about 100 tpy and, in most cases, even greater than 250 tpy SO_2 within 50 km of the Liberty monitor are shown in the following figure. The annual emissions are based on 2011 actual conditions, except for Bellefield Boiler (which switched its fuel to natural gas) and the Arcelormittal Monessen coke plant (which was idle in 2011). Both of these sources have the potential to emit at least 100 tpy of SO_2. In addition, Guardian Industries has the potential to emit about 140 tpy of SO_2, although their actual emissions in 2011 were 73 tons.

SO_2 monitoring sites are also presented in the figure. Note that North Braddock only began sampling in 2014, while Lawrenceville began in 2010.

Industries and monitors within the oval are within the nonattainment area. (Note that Guardian is inside, while NRG Elrama is outside the area.)

Note that a relief close-up of the SO_2 nonattainment area and a topographic view of the area can be found in Appendix A. The relief map shows terrain conditions that require the use of a model or modeling strategy that will handle complex terrain, such as the American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD).

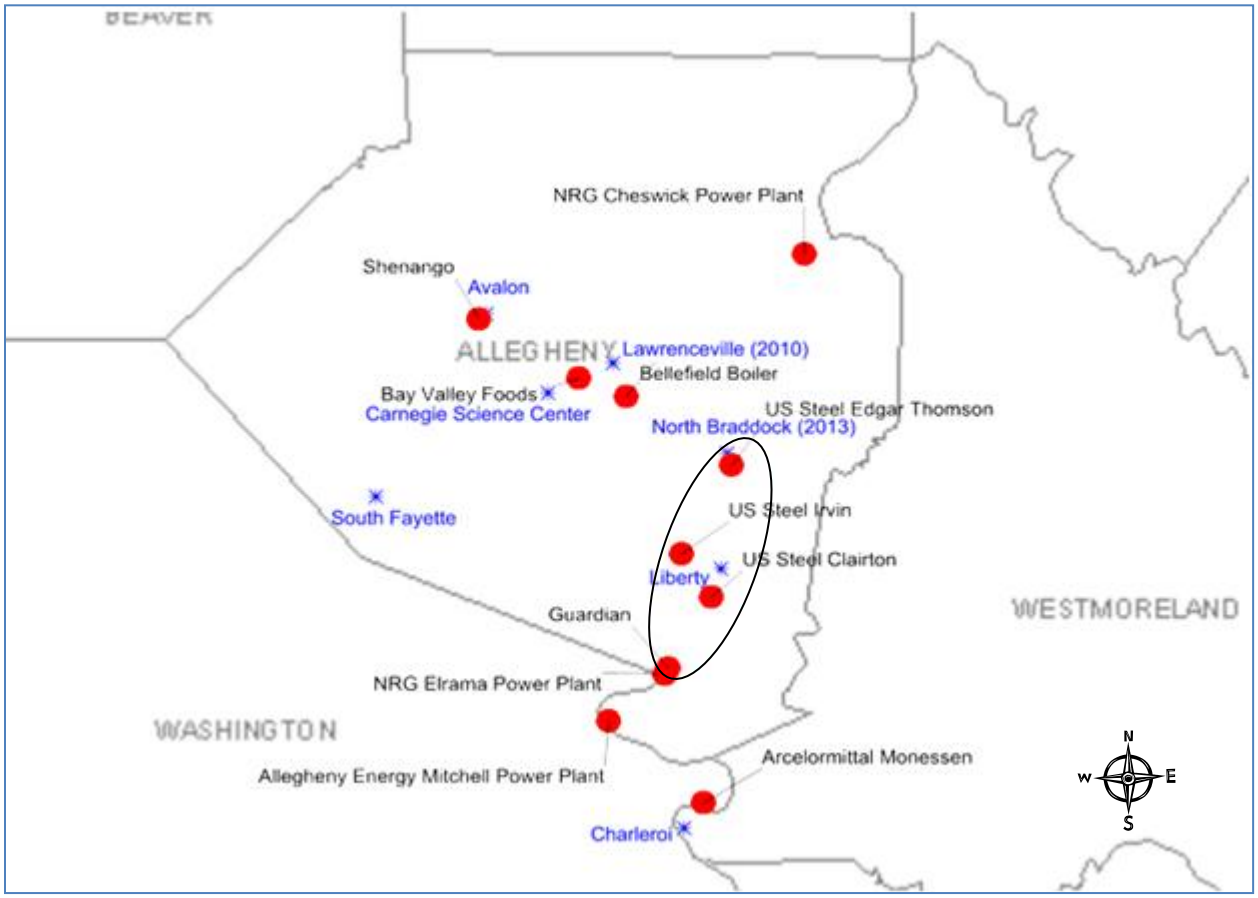

Figure H-7. Map of Largest SO_2 Sources with Allegheny County Monitors

Worst-Case Conditions

A good modeling effort and thorough analysis of air-pollution impact in complex terrain must address the general conditions that produce the highest concentrations downwind of a source of nonreactive, neutrally buoyant air-pollutant releases in such terrain. These conditions include:

1. Large emission rate. It should make sense that the greater the amount of pollutants exiting a stack, the greater the pollutant impact will be on the ambient air.
2. Low plume rise. Plume rise is a function of exit gas temperature and volumetric flow, et al. The more limited the rise of contaminants the closer they are to ground-level receptors, producing bigger effects.
3. Overlapping plumes. Under the right conditions, numerous collocated sources can “pile on” the pollution downwind.
4. Stack-tip downwash. With insufficient exit gas velocities, pollutants can be caught in the low-pressure region generated behind the top portion of the stack from which the pollutants are released. Generally, as long as exit gas velocities are greater than 1.5 times the wind speed at stack height, then stack-tip downwash will likely be avoided.
5. Building-induced downwash. Building configurations, heights, orientation, et al. can redirect airflow in such a way to cause contaminants released on or near a building to be dragged down toward the ground, instead of dispersing above and beyond the building.

6. Building cavity. As with building-induced downwash, building dimensions and orientation, et al. can redirect airflow in such a way to cause contaminants released on or near a building to become trapped in an entrainment region set-up adjacent to a leeward building face.
7. Proximity to source(s). Unless a nearby receptor is significantly lower than a tall emission unit, generally, the closer a receptor is to the source the greater the source's impact. Typically, source-receptor distances of within a couple of kilometers see the highest concentrations.
8. Terrain-induced downwash and channeling. Downslope flow from air moving downward in the lee of elevated terrain and other conditions can carry pollutants down with them. In addition, confinement of pollution within valley walls can channel emissions and increase their concentration.
9. High terrain. Plume conditions may not be sufficient to keep contaminants from impacting or grazing a hillside, thus substantially increasing ground-level concentrations.
10. Short ground cover. Turbulence is important to mixing the atmosphere. Taller ground features like trees or buildings can help to stir the air to reduce pollution build-up. Shorter features tend to produce less mixing and higher concentrations.
11. Stable/stagnant atmosphere. Atmospheric conditions that limit pollution dispersal are a function of temperature inversions et al. that produce relatively limited atmospheric volume into which air pollutants can spread. Oftentimes these conditions occur shortly after sunset and last through about midmorning. Increasing solar radiation throughout the day helps to produce thermals that contribute to mixing of the atmosphere, although these thermals can also contribute to local high pollution levels during "looping" plume impact at the surface and "fumigation" events.
12. Steady wind direction from source(s) to receptor(s) and throughout the vertical (boundary layer) with wind speeds no greater than about 2 m/s. Light, steady winds blowing consistently from sources to receptors can produce some of the highest concentrations in an area.

Successful Modeling

So, what would "good" modeling results for hourly SO_2 impacts in this nonattainment area look like? The general "rule of thumb" for air pollutant impact in complex terrain has been that the "highest, closest location" would be expected to experience the greatest concentrations from an elevated release of a buoyant, nonreactive emission. In the nonattainment situation ACHD is evaluating, any terrain at least 1100 ft MSL can be considered "high," while distances within about 2 km can be deemed "close."

Considering the two largest SO_2 sources within the nonattainment area – the Clairton Plant and the Edgar Thomson Plant – the highest, closest location to the Clairton Plant is the Lincoln hilltop across the Monongahela River to the northeast of the plant. The highest, closest location to the Edgar Thomson Plant is the area around the WRRK (formerly WLOA) communications tower just north of Edgar Thomson and in between the Braddock Cemetery and the Grand View Golf Club. In both the Clairton Plant and Edgar Thomson Plant cases, the assumption is that the emissions are released at a high elevation and have sufficient momentum and buoyancy to escape any building, stack, or terrain induced downwash or cavity effects. (Note that concentrations may be high near the source of the SO_2 release if the emissions are trapped within a building cavity, for instance.)

Overall, the pattern of impact across the nonattainment area would match what would happen in reality with nearby hills showing high concentrations and low-lying and more-distant locations displaying lower concentrations. Close in receptors and locations where emission plumes overlap substantially will also exhibit high concentrations.

Good modeling results would produce predicted values that match observed values in time and space. Thus, historical SO_2 concentrations at Liberty Borough or other sites in the modeling domain should be simulated well for model output to be considered reliable.

"Simulated well" needs to be quantified. Modeled results that do not under-predict or over-predict, along with producing a pattern within the nonattainment area that matches a demonstrably realistic pattern, should be considered a good simulation.

To demonstrate a realistic pattern, the following may be examined:

Previous SO_2 and PM_{10} modeling
Special studies in the Mon Valley (e.g., 1976 wind tunnel modeling study, see below)
Historical SO_2 monitoring data
Current other pollutant monitored data

Historical Monitored Data

Table H-1 below shows SO_2 5-year design values from present and past sites that may be used to evaluate model performance.

Table H-1. Historical Site 5-Year Design Values, 1996-2000, in ppb

Site	5-Year Avg 99th-Percentiles 1996-2000	5-Year Avg 99th-Percentiles 2001-2005
Glassport	149	160
Liberty	119	118
N. Braddock	95	--
Clairton	82	--

Recognizing source modifications/shutdowns, modeled impacts should show “ballpark” impacts similar to the historical data – i.e., Glassport should show higher impacts than Liberty, and Liberty should show higher impacts than Clairton.

Additionally, a 3-year special study for SO_2 was conducted in 1982-1984 that included 2 additional sites in the current NAA: Braddock Cemetery (near the radio tower) and West Mifflin (near Bettis). Design values from these sites and others in the Mon Valley are shown in Table H-2 below.

Table H-2. Historical Special Study 3-Year Design Values, 1982-1984, in ppb

Site	3-Year Avg 99th-Percentiles 1982-1984
Glassport	267
Liberty	211
West Mifflin	182
N. Braddock	115
Braddock Cemetery	164

Similar to above, direct comparison of current conditions to historical conditions cannot easily be made. However, the general results are similar to the 1996-2000 data, indicating that hilltops near the largest sources can show higher impacts than lower elevation or secondary locations.

PM_{10} Monitored Data

Examination of PM_{10} 1-hour monitored data can provide additional information for impacts in the area. Below are the most recent 1-hour 99th-percentile PM_{10} values for Lincoln, Liberty, Glassport (High St.), and N. Braddock, in the same format as the SO_2 NAAQS design values. (Note: Glassport High St. is different from the former SO_2 site.)

Table H-3. PM_{10} 1-Hour 99th-Percentiles, 2012-2014, in µg/m³

Site	3-Year Avg 99th-Percentiles 2012-2014
Lincoln	198
Liberty	159
Glassport (High St)	159
N Braddock	170

While PM_{10} and SO_2 sources are not identical by emission rate and release point, PM_{10} and SO_2 sources are both direct pollutants that are emitted from the same types of sources in the Mon Valley. Elevated levels of PM can often accompany elevated SO_2 levels during poor dispersion conditions.

Lincoln is similar to the historical Glassport SO_2 site (Wall St.) as a high-elevation impact site, showing higher concentrations than Liberty. The Glassport PM_{10} site (High St). is similar to Liberty, about 1 hillside away Lincoln and Glassport Wall St. North Braddock shows short-term values closer to Liberty than Lincoln.

Looking at the NAA as a whole, the most useful information taken from the historical SO_2 and current PM_{10} monitored data are the concurrent concentration ratios for one area to another. Modeled impacts for this demonstration should show impacts within expected ranges based on monitored data in order to determine under or overestimation.

Limitations to Modeling

In addition to limitations regarding the inherent ability of a chosen model to produce realistic, reliable results, getting the modeling "right" is complicated by several factors, including accuracy involving:

Source characterization: emissions, exit gas temperature and volumetric flow, and exact location, configuration, and timing of operations

Scale and characterization of surface features (topography and obstructions to flow) (AERSURFACE, AERMAP, et al. limitations)

Sizing ("density") of receptor grid. Is 100 m x 100 m grid sufficient? Probably, at least for initial runs

Characterizing meteorology across the modeling domain

Careful effort will be needed to mitigate these limitations.

One particular challenge regarding source characterization is properly representing coke oven emissions, especially their volumetric flow and subsequent plume rise. Concepts, procedures, and results reported in *Ambient Air Concentration Estimates from Coke Oven Emissions at the U.S. Steel Clairton* by David Layland and Jerome Mersch of EPA's Office of Air Quality Planning and Standards, March 1985, will be examined relative to this important issue.

Anticipated Pattern of Modeling Results

Following is a map roughly showing the expected worst-case maximum concentration locations within 2 km of the U. S. Steel Clairton Plant and adjacent SO_2 sources. These locations were determined based on:

Plume overlap (see item #3 in Worst-Case Conditions above)
Local source effects (see items #4 through #7 in Worst-Case Conditions above)
Terrain at least 1100 ft MSL (see item #9 in Worst-Case Conditions above)

The topographic map shows conditions near the center of the nonattainment area. Locations at 1100 ft MSL and higher are highlighted in pink. Areas within approximately 2 km of the northern portion of the Clairton Plant are within the yellow border. Locations within and near the plant that will likely experience high concentrations from building cavity and other source effects and plume overlaps are indicated by the blue elongated oval.

Dependable modeling of coke-works sources will likely show maximum or 4th-highest 1-hour SO_2 concentration results at locations roughly within both the yellow border and pink shading and within the blue oval. The actual pattern displayed by modeling will be based on various factors with one of the significant factors being grid spacing, that is, where receptor points occur within the modeling domain.

Figure H-8. Map of Terrain Surrounding U. S. Steel Clairton Plant

More detailed analysis is provided in the following figures. Expected maximum locations and possible maximum (or secondary maximum) locations within the nonattainment area are shown first for in and around Liberty-Clairton followed by locations in and around North Braddock.

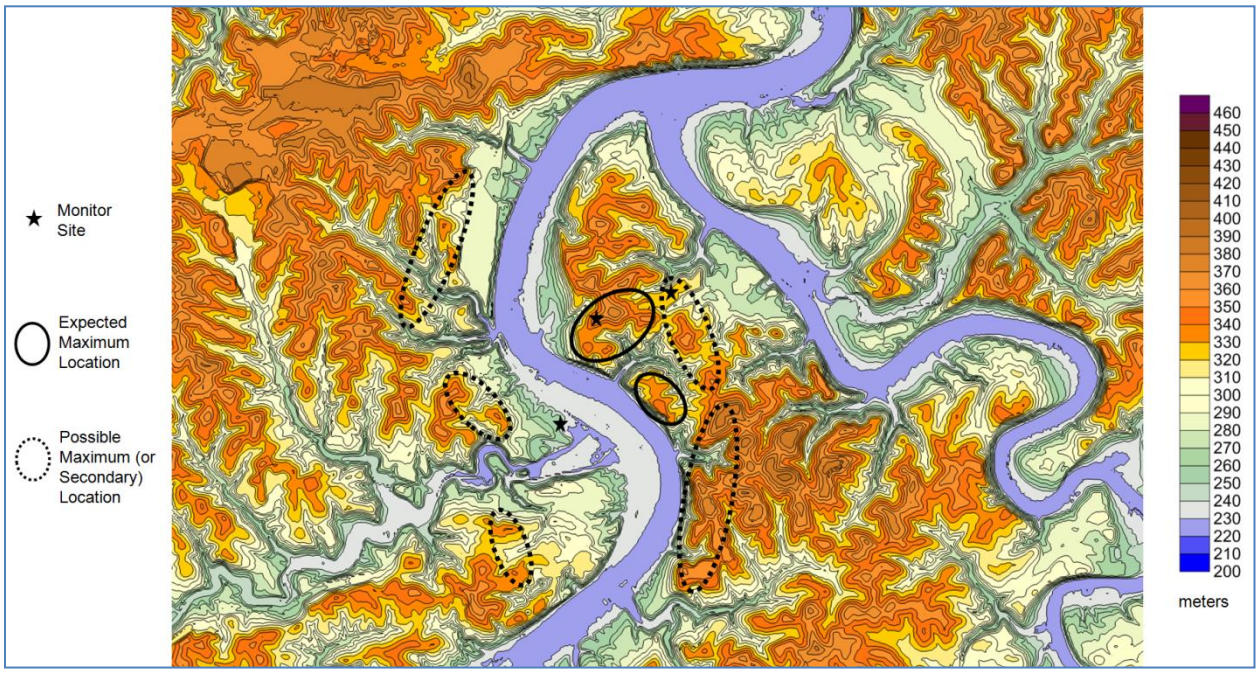

Figure H-9. Map of Terrain and Expected Maximum Locations Liberty/Glassport/Clairton and Vicinity

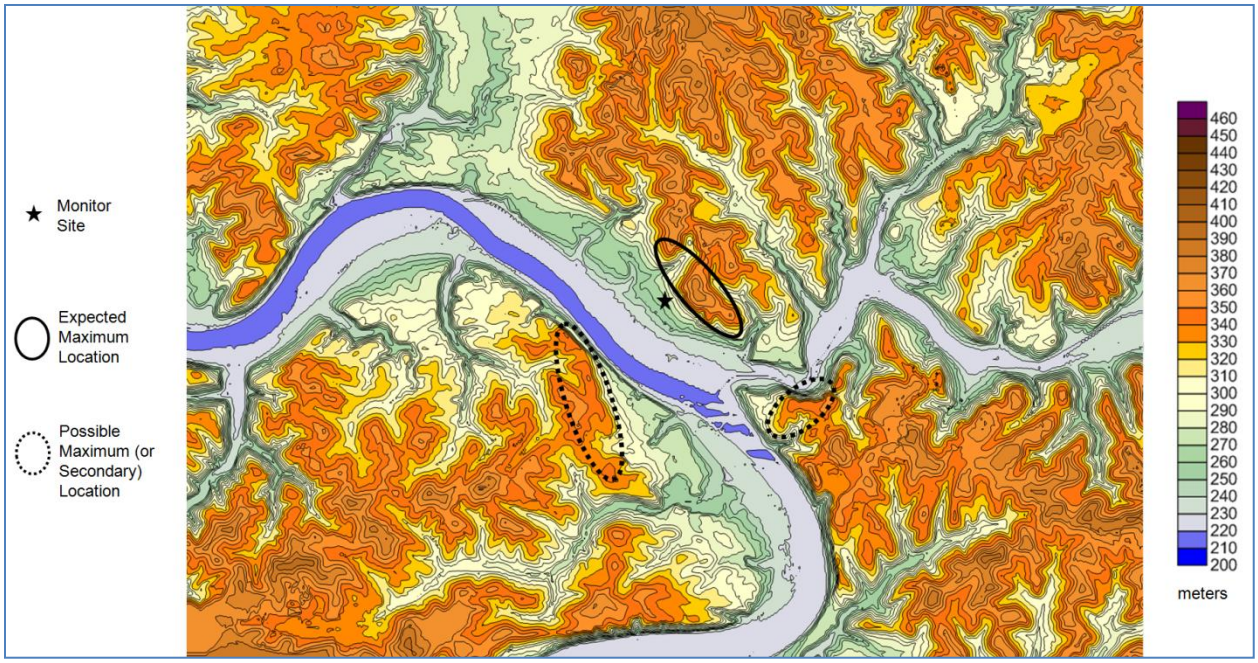

Figure H-10. Map of Terrain and Expected Maximum Locations in Braddock and Vicinity

Previous Studies

Finally, the *Wind Tunnel Modeling Study of the Dispersion of Sulfur Dioxide in Southern Allegheny County, Pennsylvania* prepared for the U.S. EPA Region III by G.R. Ludwig and G.T. Skinner of the Calspan Corporation, Buffalo, NY, and released in 1976 (EPA 903/9-75-019) provides a helpful perspective of SO_2 impact in the Mon Valley.

Following are several isopleth maps (from pages 109 through 114 of the study report) showing the impact of the Clairton operation (of the 1970s) alone and then the coke plant with the Elrama and Mitchell stack emission effects. Winds are out of the southwest (225º). (Numerous similar maps are available in the report, including maps with winds from 145º, 180º, and 331º.)

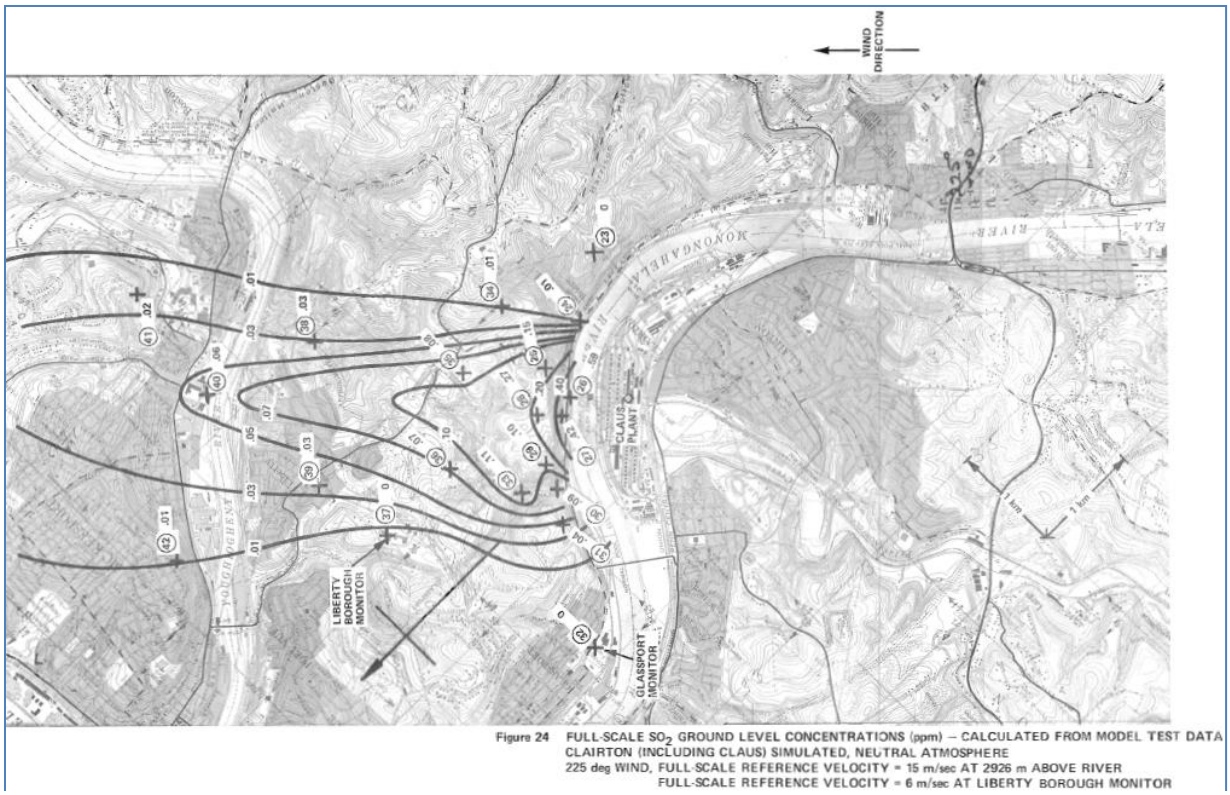

Figure H-11. Wind Tunnel Study Results – Neutral with ~Moderate Winds (see source details in figure)

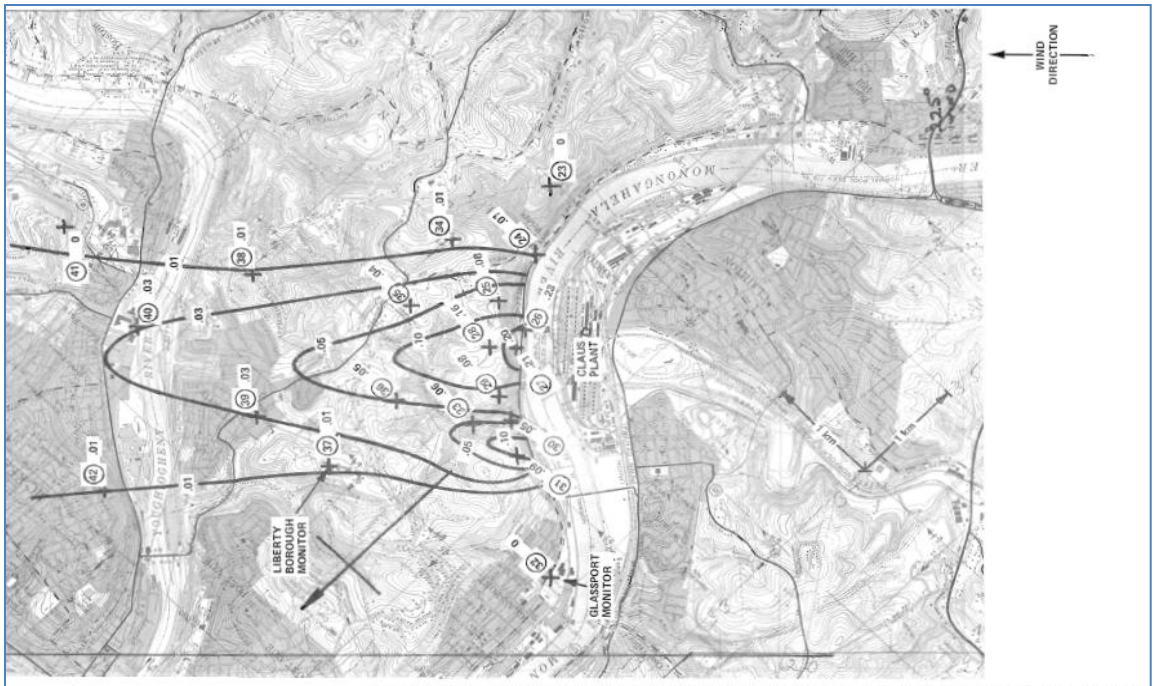

Figure 25 FULL-SCALE SO_2 GROUND LEVEL CONCENTRATIONS (ppm) – CALCULATED FROM MODEL TEST DATA
CLAIRTON (INCLUDING CLAUS) SIMULATED, NEUTRAL ATMOSPHERE
225 deg WIND, FULL-SCALE REFERENCE VELOCITY = 22 m/sec AT 2926 m ABOVE RIVER
FULL-SCALE REFERENCE VELOCITY = 8.8 m/sec AT LIBERTY BOROUGH MONITOR

Figure H-12. Wind Tunnel Study Results – Neutral with Fast Winds (see source details in figure)

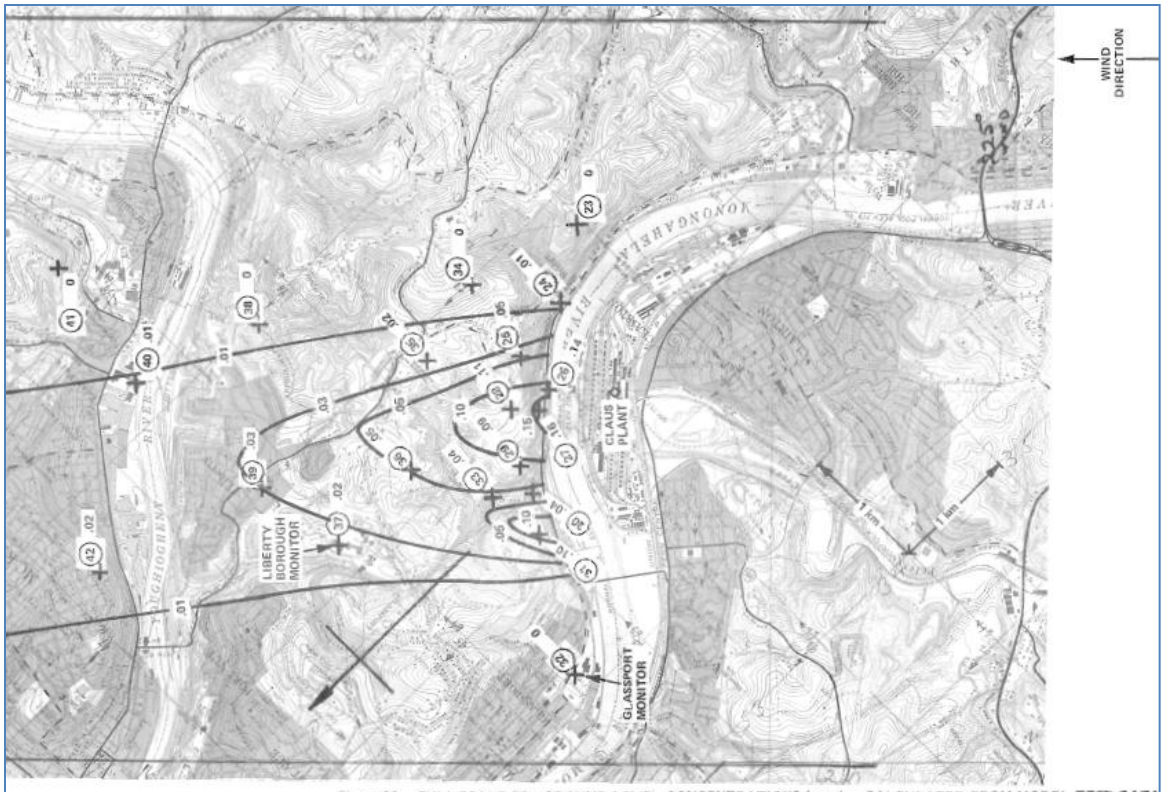

Figure 26 FULL-SCALE SO_2 GROUND LEVEL CONCENTRATIONS (ppm) – CALCULATED FROM MODEL TEST DATA
CLAIRTON (INCLUDING CLAUS) SIMULATED, WITH INVERSION
225 deg WIND, FULL-SCALE REFERENCE VELOCITY = 15 m/sec AT 2926 m ABOVE RIVER
FULL-SCALE REFERENCE VELOCITY = 9 m/sec AT LIBERTY BOROUGH MONITOR

Figure H-13. Wind Tunnel Study Results – Inversion with Fast Winds (see source details in figure)

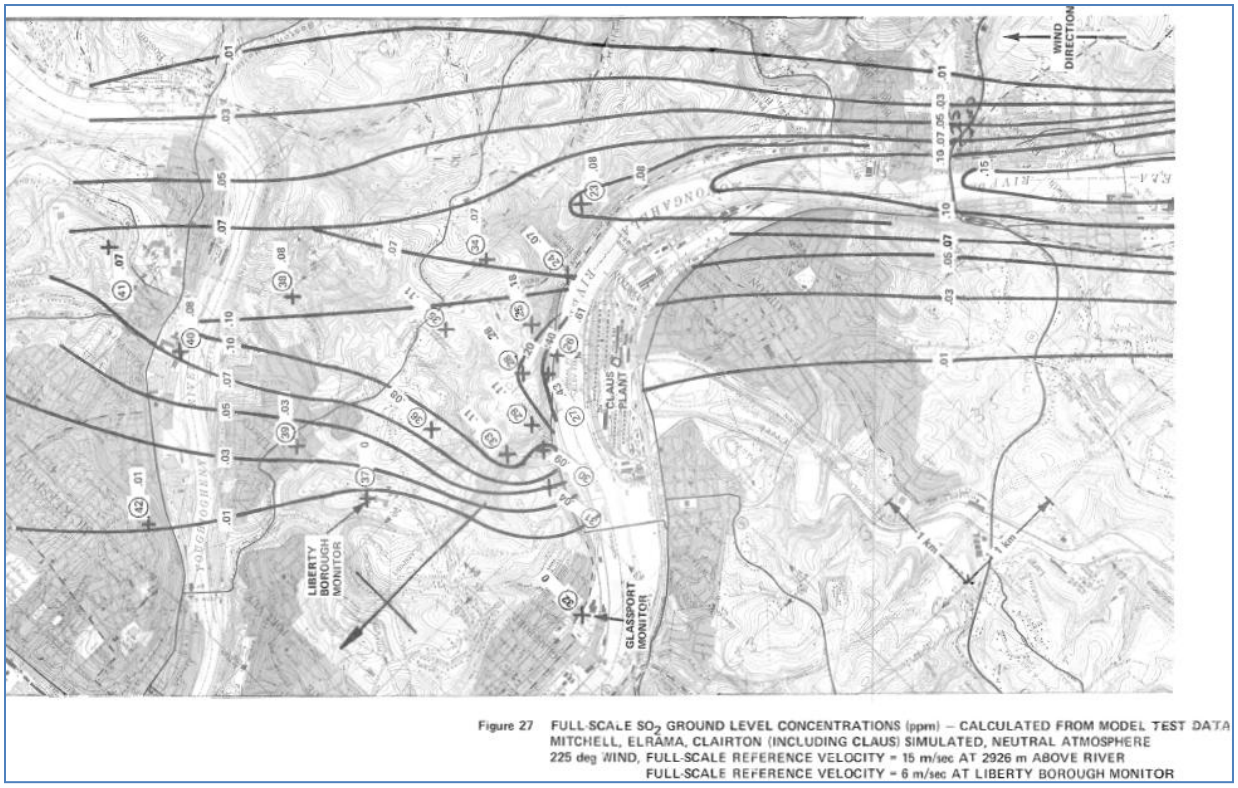

Figure H-14. Wind Tunnel Study Results – Neutral with ~Moderate Winds (see source details in figure)

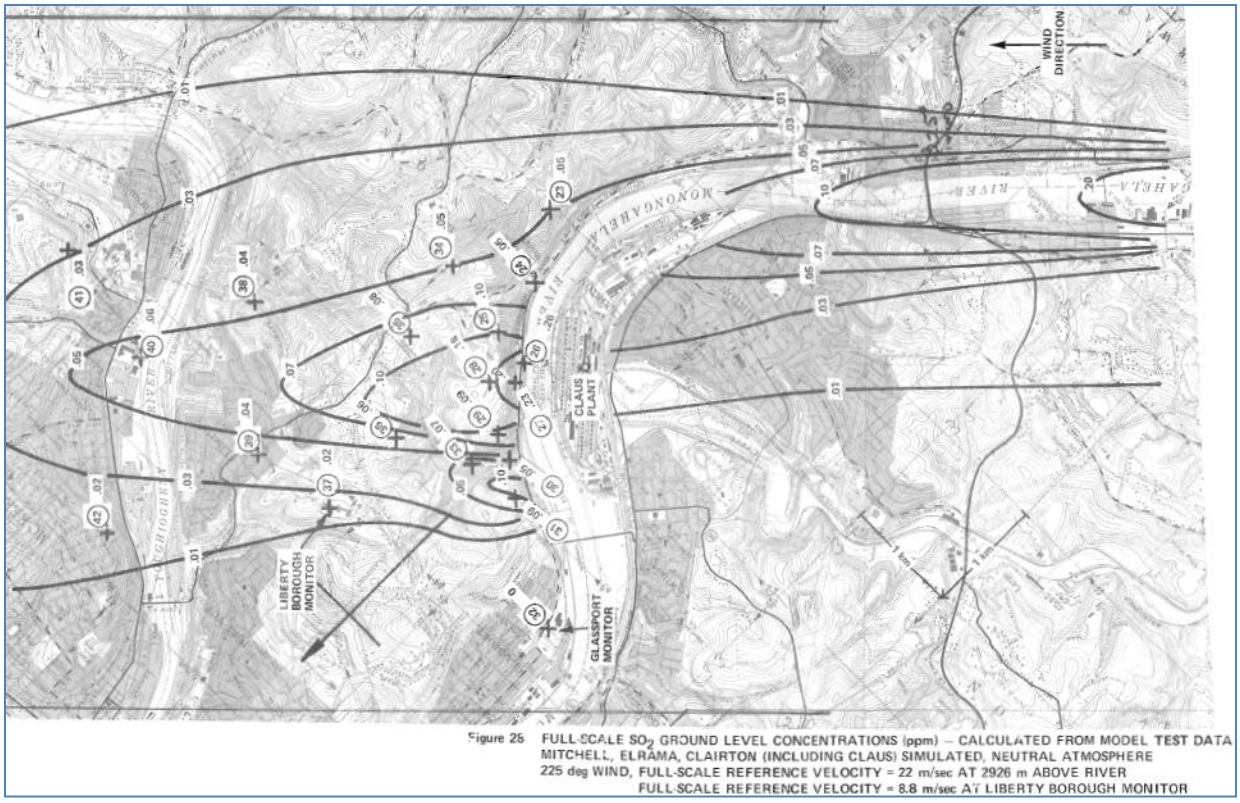

Figure H-15. Wind Tunnel Study Results – Neutral with Fast Winds (see source details in figure)

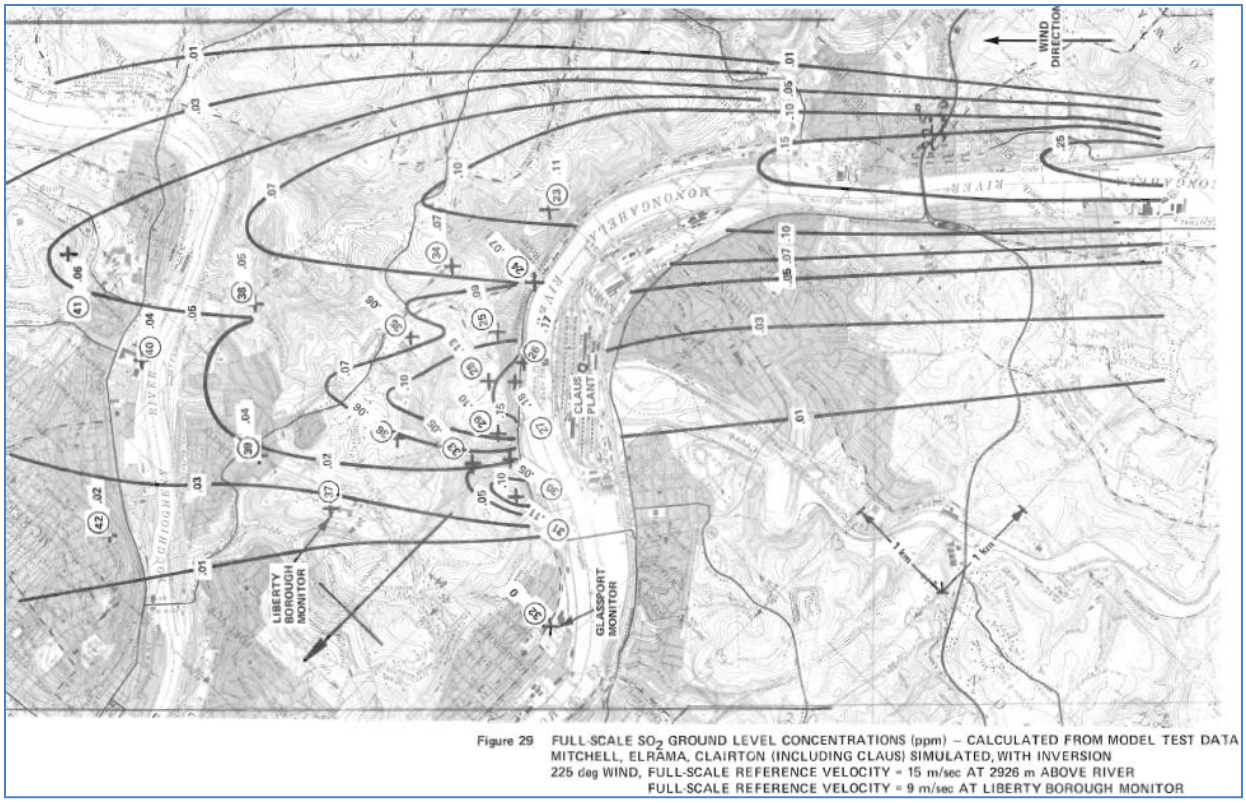

Figure H-16. Wind Tunnel Study Results –Inversion with Fast Winds (see source details in figure)

Note the near-field locations of maximum concentrations and the following observations made in the study report:

> "The results indicate that the river valley and bluffs do have an effect on the dispersion patterns. The largest effects were observed on the plumes from the Clairton Coke Works. For South and South-West wind directions, the plumes from the Coke Works appear to be deflected down into the river valley at the base of the bluffs. Concentration levels comparable to or higher than those observed near the top of the bluffs were obtained at the base. …
>
> The effect of the inversion used in these model tests was inconsistent. The inversion appeared to hold down the plumes from Elrama and Mitchell, increasing the far-field SO_2 levels over those observed with neutral flow for comparable wind velocities at the Liberty Borough School. This is the expected result. However, with the Clairton Coke Works as the source of the emissions, the far field SO_2 levels sometimes decreased with the inversion (225° wind direction), sometimes remained almost unchanged (180° wind direction) and sometimes the whole isopleths pattern changed shape (331° wind direction). The inconsistent effects of the inversion on the plumes from the Clairton Coke Works are probably a result of flow disturbances caused by the steep bluffs" (pages 60-61).

Furthermore:

> "… The concentration data indicated the presence of considerable downwash near the face of the bluffs in the area near the Clairton Coke Works and to a lesser extent near the Mitchell Power Plant.…" (page 63).

To elaborate on the wind-tunnel work, based on a report titled *Review of Meteorology at the Clairton Area: Strengthening Dispersion Modeling for State Implementation Plans* prepared by David Sullivan,

CCM, in 1996, the river valleys lay at 718 ft MSL while adjacent hilltops can be greater than 1250 ft MSL. Large temperature differences can be observed between the hilltop and valley floor (e.g. 2°-7° F) during clear, light-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180° in wind direction with 3-4 mph downslope flows. And, strong nighttime inversions can lead to poor dispersion scenarios on several days of the year.

APPENDIX I – Alternative Model Testing and Evaluation

As briefly discussed in Section 3.3, alternative air quality models will be tested and compared against SO_2 observations and AERMOD modeling results for the March 2014 test period. The March 2014 period was selected for alternative model testing and evaluation due to the presence of several high SO_2 events at the Liberty monitor as well as valid SODAR upper-level wind observations from the Clairton SODAR site next to the U. S. Steel Clairton facility.

Although the intent is to use the EPA-preferred AERMOD steady-state Gaussian plume model with 5 years of meteorological inputs as the primary modeling tool for the Allegheny County 1-hour SO_2 attainment demonstration modeling, there is concern that AERMOD may not be able to accurately reproduce the transport and dispersion conditions within the complex river valley system. In particular, AERMOD uses a single wind direction for each hour that may not properly characterize transport and dispersion conditions from the local sources to the Liberty monitoring site. This issue was discussed in Section 2.3. The availability of reliable SODAR upper-level wind observations starting in late January 2014 offers a potentially valuable source of wind observations to assist in SO_2 modeling in the Allegheny County nonattainment area. For these reasons, the use of non-steady-state dispersion models will be investigated that can account for three dimensional transport and dispersion of local source SO_2 emissions within the river valley to the Liberty monitor on the plateau will be investigated as a sensitivity analysis. The alternative air quality modeling results may be used as part of the weight of evidence to support the AERMOD attainment demonstration modeling. If the alternative models are performing better than AERMOD, they can be used to verify the AERMOD control strategy response to make sure that the straight line wind limitation of AERMOD is not providing an incorrect SO_2 ambient concentration response to the control strategy.

The initial alternative model evaluation and AERMOD comparison study will use the March 2014 monthly modeling period. A high resolution WRF meteorological model simulation will be performed in order to obtain highly resolved three-dimensional hourly wind fields for the Allegheny nonattainment area. WRF will be run for the month of March 2014 using a 36/12/4/1.333/0.444 km nested grid structure with the 444 m horizontal grid resolution focused on the Allegheny, PA nonattainment area with a domain something like shown in Figure I-1.

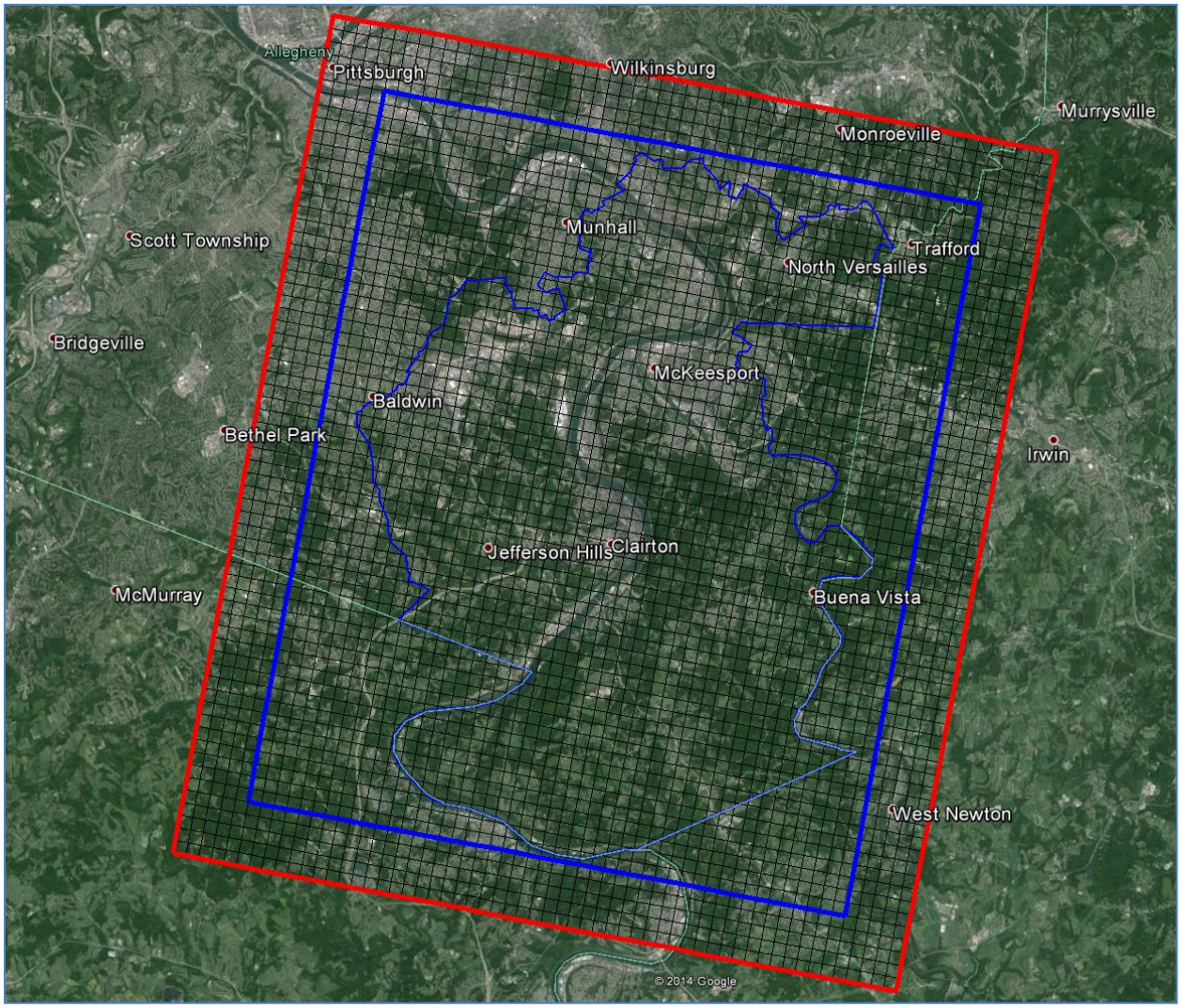

Figure I-1. Potential High-Resolution 444 m Horizontal Resolution WRF Domain

Table I-1 lists the various dispersion models and configurations that will be tested for the March 2014 period. The first option is running AERMOD in default regulatory mode using AERMET meteorological model with onsite surface meteorological data from Liberty and upper air observations from the Pittsburgh airport and the same procedures for developing the 5-year database as discussed in Section 3. The next two AERMOD dispersion modeling approaches would use the high resolution WRF results as meteorological input to AERMOD. The Mesoscale Model InterFace (MMIF[6]) tool will be used to process the March 2014 WRF 444 m output for AERMOD two ways: 1) using MMIF to directly generate the AERMOD meteorological inputs; and 2) using MMIF to generate surface and upper air data from the WRF data and then running that data through AERMET to generate AERMOD meteorological inputs. The sensitivity of the WRF grid cell used for the AERMOD single wind input can be investigated (e.g., U. S. Steel or Liberty monitor).

Sensitivity test modeling will then be conducted using the CALPUFF and SCICHEM non-steady-state Gaussian puff models. These models are able to simulate transport and dispersion using three-dimensional wind field inputs. Such wind fields would be generated using observation data alone, WRF data alone and combined observed and WRF meteorological data. Potentially two versions of CALPUFF

[6] http://www.epa.gov/ttn/scram/dispersion_related.htm#mmif

will be used, V5.8.4 (regulatory) and V6.4 (more recent) versions. The latest version of SCICHEM will be used, which is currently SCICHEM 3.0 (beta2). With CALPUFF V6.4 alternative chemical mechanisms could also be analyzed. Additional sensitivity tests may be conducted using options to take advantage of enhanced puff splitting or other options within the complex terrain wind fields.

The final model in Table 3-1 is the Comprehensive Air-quality Model with extensions (CAMx V6.1) photochemical grid model. CAMx could make maximum use of the three-dimensional wind fields from the WRF 444 m high resolution run. But CAMx also requires much more effort and resource to set up than the other puff/plume models. So whether CAMx is applied will depend on the performance of the other models and resource availability. It should be noted that the CAMx using the hybrid Plume-in-Grid (PiG) feature did simulate the impacts of local sources better in the Allegheny $PM_{2.5}$ SIP and EPA's testing of 6 dispersion models using tracer test field experiment data found CAMx usually performed better than the other models (EPA, 2012b[7]).

Table I-1. Potential Dispersion Model Options for Model Evaluation and Comparison Using March 2014.

Dispersion Model	Met. Model	Met Data	Comment
AERMOD	AERMET	Liberty SFC PIT UPR	AERMOD in regulatory default mode
AERMOD	--	WRF/MMIF in AERMOD mode	WRF 444 m SFC and UPR data processed to generate AERMOD-ready met inputs
AERMOD	AERMET	WRF/MMIF in AERMET mode	WRF 444 m SFC and UPR data processed to generate AEREMET inputs
CALPUFF V5.8.4	CALMET	SFC, UPR	Regulatory default w/o WRF data
CALPUFF V5.8.4	CALMET	SFC, UPR, WRF	Regulatory default w/ WRF data
CALPUFF V5.8.4	MMIF	WRF	Used just WRF met data
CALPUFF V6.4	TBD	TBD	CALPUFF V6.4 sensitivity tests based on V5.8 results (e.g., met and chemistry)
SCICHEM 3.0 (β2)	SCICHEM	SFC, UPR	SCICHEM using met observations
SCICHEM 3.0 (β2)	MMIF	WRF	SCICHEM using WRF data
CAMx V6.1	WRFCAMx	WRF	

[7] http://www.epa.gov/ttn/scram/reports/EPA-454_R-12-003.pdf

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A-2: Modeling Protocol Addendum (Apr. 13, 2017)

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This addendum addresses changes or updates to the modeling methodology since the final model protocol (November 2015).

Model Version

Two versions of AERMOD were released since the protocol: versions 16216 and 16216r. Corresponding with version 16216, an updated version of the preprocessor AERMET (version 16216) was also released. These versions incorporated bug fixes and model updates.

AERMOD was selected as the most appropriate model for the SIP demonstration. Final modeled results are based on the most recent versions of AERMOD (16216r) and AERMET (16216).

The most notable changes with AERMOD 16216 are the inclusion of the low wind option ADJ_U* and the use of prognostic meteorological data (MMIF) as regulatory default options according the final modeling guideline (40 CFR Part 51 Appendix W), released on Dec. 20, 2016.

In an effort not to duplicate work for this SIP, some model tests and evaluations were made using previous versions of AERMOD/AERMET, including versions 14134 and 15181. ACHD determined that the different model versions led to nearly equivalent results, with some minor differences in meteorological variables or impacts. These differences do not change the overall evaluation or modeling approach.

AERMOD Options/Configuration

Several AERMOD options were tested for use in the modeling demonstration. (These are described in more detail in the model configuration appendix.) ADJ_U* was selected as an appropriate option for meteorological processing with AERMET and MMIF input data. The use of ADJ_U* and MMIF data do not require the BETA switch in the control pathways for AERMET or AERMOD (versions 16216 and later).

Additionally, some flagpole receptors were included in the demonstration for elevated receptors that were not accounted for in terrain processing by AERMAP. This applies to receptors located on the Clairton-Glassport Bridge.

MMIF Meteorological Data

MMIF meteorological data was selected for the demonstration. (At the time of the meteorological data simulation, WRF version 3.6.1 was used with MMIF version 3.3rc2.) The model guidance included recommendations for some settings for MMIF, allowing user selection for other settings.

Note: The recommended AERMET-ready mode was selected for the MMIF processing. As such, MMIF data are used for onsite, upper air, and surface characteristic inputs, processed through AERMET to generate AERMOD-ready meteorological files.

<u>MMIF Vertical Layers</u>

The MMIF guidance recommends the following vertical layers (in meters) for MMIF with MID structure (structure assigns the method for which MMIF interpolates data between layers):

25 50 75 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 5000

However, it was found by ACHD and Ramboll Environ that the use of these layers leads to overprediction of wind speed at the 10 m level. (Both 2 m and 10 m levels are automatically produced with MMIF as

reference low levels for temperature and wind speed.) The overprediction is caused by the way that MMIF interpolates the wind field data based on the supplied layers and the layers inherent in WRF.

As a solution to this 10 m issue, ACHD and Ramboll Environ instead used additional low-level layers and with TOP structure:

20 30 40 60 80 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 5000

These specified layers with TOP structure allow for the re-diagnosis and proper calculation of wind speed at the 10 m level. The additional layers also allow for more low-level data overall, important for in-valley characterization for the SO_2 NAA.

MMIF Upper Levels

Based on comparisons to measured SODAR and multi-level tower data, wind speed at upper levels (above 50 m) were found to contain a high bias. This is based on airport/plateau wind speeds built into the WRF and not translating into lower wind speeds to represent localized in-valley flow. (See more in the MMIF evaluation appendix.)

To eliminate this bias, only surface wind speeds up to the 50 m layer were used from the supplied MMIF ONSITE data. This technique forces AERMOD, which extrapolates hourly data based on any/all supplied measurements, to more realistically calculate the upper levels wind speeds. This may also be a more AERMET-like approach for wind speed, putting more emphasis on AERMET than WRF for vertical profiles.

Mixing Heights

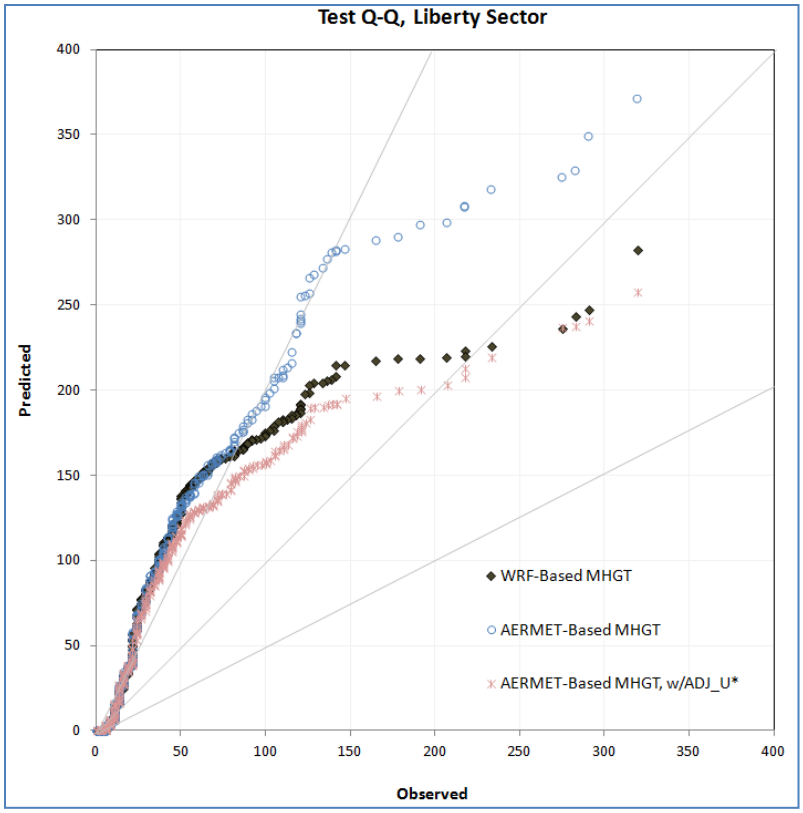
The user has three different options for mixing heights supplied by MMIF:

WRF (no recalculation of mixing heights)
MMIF (MMIF-recalculated mixing heights)
AERMET (allow AERMET to calculate mixing heights)

The use of WRF mixing heights was initially deemed to be the most appropriate, as AERMET-based mixing heights led to very low heights during stable nighttime conditions. (A minimum height of 1 m was generated for many hours.) While mixing height can be interpreted as measurement of stability rather than an actual height of a well-mixed layer, ACHD favored the more realistic measurement of mixing heights based on the WRF.

Upon the release of AERMOD/AERMET 16216, with ADJ_U* as a regulatory default option, additional testing was performed for different MMIF mixing height options. ADJ_U* can affect several interdependent variables in the boundary layer parameters file (.sfc), including mixing height (MHGT), unless mixing heights are supplied in the onsite input data.

Below is a test quantile-quantile (Q-Q) plot of resulting modeled impacts from MMIF with WRF-based mixing heights, AERMET-based mixing heights, and AERMET-based mixing heights w/ADJ_U*.



From the above Q-Q plot, the use of AERMET-based mixing heights (with very low heights for some hours), can lead to overestimation of impacts. However, the use of ADJ_U* with AERMET-based mixing heights leads to impacts closer to (and slightly better than) the use of WRF-based mixing heights. (Impacts closer to the diagonal 1:1 line are better modeled results compared to observed.)

The use of AERMET-based mixing heights is likely a better complement to AERMOD in general, more consistent with the overall methodology for the AERMOD modeling system. However, the ADJ_U* option is likely needed to compensate for some unrealistic parameters generated by AERMET from the MMIF input data.

Therefore, AERMET was selected as method for mixing heights, with ADJ_U* selected as a stable boundary layer option for Stage 3 of AERMET processing. Note: turbulence parameters are not included with MMIF data.

<u>Upper Air Levels</u>

The user can select the number of upper air soundings (FSL interval) with the MMIF data. Airports typically have only two upper air soundings for any day (00Z and 12Z). For this demonstration, four upper air soundings were selected, at every 6 hours.

Background Data

The protocol describes the background methodology using the temporally-varying approach, along with the examination of possible background sites in the tri-state PA/WV/OH area.

With the use of MMIF, background is likely best calculated from multiple monitor site data. The MMIF data can include different wind directions at different levels for the same hour, and each MMIF cell contains data specific to its respective location. While the sector-varying option is available in AERMOD

to use specified data when winds are from directions, there is no one direction for any hour that would be completely appropriate. For example, an hourly background value from the SW might be theoretically appropriate based on airport hourly data from the SW, but the wind directions could be in opposite directions (and varying by level) at one of the MMIF locations.

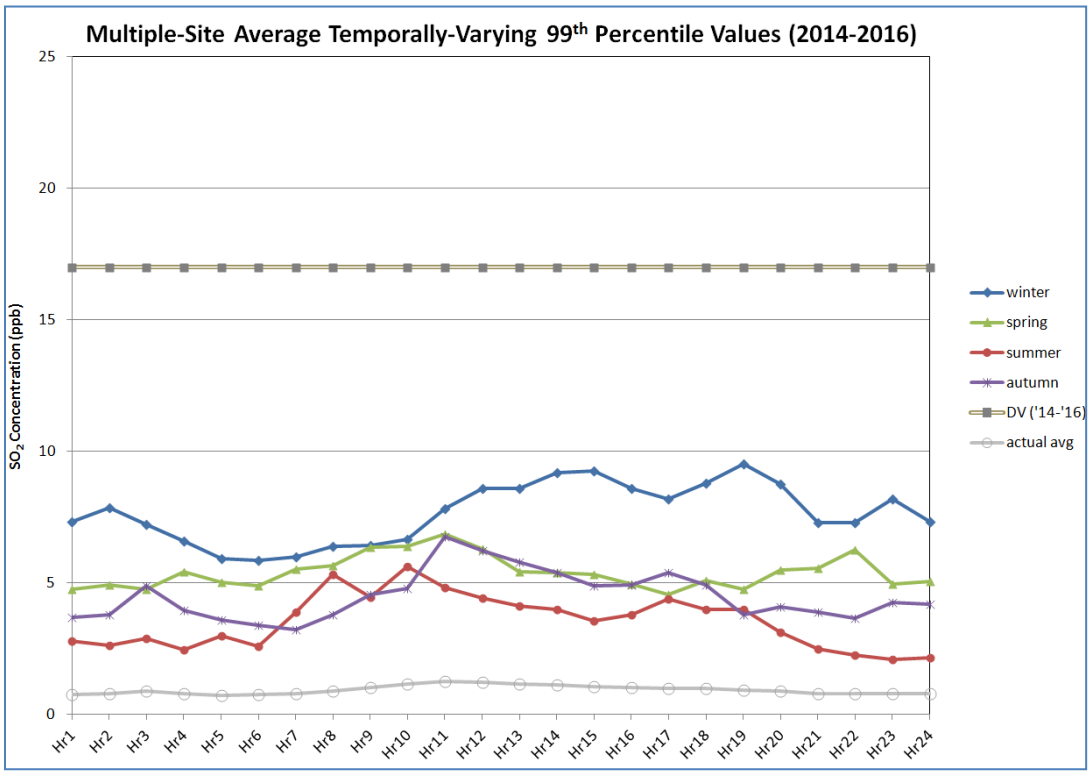
Therefore, in order to account for all background sites surrounding the NAA, at all elevations and during all wind directions, a multi-site average was calculated from temporally-varying data by season and averaged over a 3-year basis. This incorporates all available background data in the tri-state region without source influence and with 75% data recovery (by season).

At the time of this document, 2014-2016 is the most recent timeframe of monitored data. Since Jan. 7, 2016, the Avalon site has shown concentrations indicative of general/urban background. (Note: 2016 data have not yet been certified in AQS.)

Below is a table of the sites used in the background.

Site	Sector	Characteristics	Completeness
South Fayette	W	High elevation, general background	All seasons/years
Florence	W	Rural, background/transport	All seasons/years
Holbrook	SW	Rural, long-range transport	Shutdown in Oct. 2016
Lawrenceville	NW	Urban background	Offline in summer 2015
Avalon	NW	Urban background (after 2015)	2016 only

Below is a chart of the resulting multi-site temporally-varying data used for background.



Background data were run as a separate model run and then added via post-processing to the total cumulative impacts. Since wind speeds can also vary for the different MMIF cells, the KPIT airport was used as met data for the background run in order to determine calms for the area.

On-Property Receptors

The model stated that all U. S. Steel properties would be excluded from receptor placement. This was revised to exclude receptors only from within the contiguous fenceline of the U. S. Steel Mon Valley Works' plants. Note that the Mon Valley Works is an integrated steel facility, contiguous by railroad and gas pipeline, with one plant manager. Because of geographical separation, the Clairton, Irvin, and Edgar Thomson plants were run separately in the model.

Future Cases

It was outlined in the protocol that a base case, future "base case", and future control case would be run, with the future "base case" including shutdowns and on-the-books controls. The future base case included shutdowns within and outside of the NAA, but it was not sufficient for attainment. It has been excluded from the analysis, with focus only on base case and future control case.

Nearby Sources

Sources outside the NAA that were not accounted for by background (and included in the model) were modeled at rates according to Table 8.1 of Appendix W (maximum allowable emission limits, at temporally representative level when actually operating, for all hours of each time period under consideration).

Buoyant Line Sources

With the release of AERMOD version 15181, a new model source type BUOYLINE was created for buoyant line sources, based on algorithms ported from the BLP model. It was anticipated that BUOYLINE would be used for buoyant fugitive sources in the NAA.

However, after subsequent testing of the buoyant line feature (in both versions 15181 and 16216 of AERMOD), ACHD has deemed it to be inadequate for sources in the NAA. Reasons for this include:

- Impacts from buoyant line sources are likely overpredicting
- Maximum impacts from buoyant line sources occur in incorrect locations
- Theoretical enhanced plume rise for inline (parallel) wind directions is not evident in resultant plume impacts
- While more than one physical line can be modeled as a BUOYLINE, all lines must be modeled at the same average buoyancy properties (temperature, flow, dimensions)
- AERMOD results in fatal errors for many line configurations (including several small lines)
- DEBUG output is not available for buoyant line sources for more thorough review of data
- Buoyant line sources in the NAA are likely better modeled as smaller segments, instead of a large line plume in complex terrain

ACHD performed additional tests on the buoyant sources to test adequacy as point or volume sources. Point source treatment showed modeled overprediction, and volume source treatment also showed overprediction at actual release height (with no temperature-based flux).

Due to the extreme heat island effect from the buoyant fugitive sources in the NAA, it was assumed that varying-height volumes would be appropriate based on calculated plume rises from the BLP model. This technique would allow for plume rise based on heat from the sources under specific hourly atmospheric conditions. This method was used for previous SIPs by ACHD and other agencies, as well as by EPA for coke oven risk assessment modeling in 2003.

While this method uses the BLP model, which has now been removed as a preferred model (due the BLP incorporation in AERMOD), this technique uses the identical algorithms contained in AERMOD 16216r. Since the model evaluation of AERMOD/BLP shows equivalent results from both models, it should be assumed that the model is producing equivalent plume rises. If the plume rises could be extracted from AERMOD in the same manner as BLP, ACHD would utilize AERMOD for these same plume rises. Therefore, ACHD is considering this method to be a source characterization technique for the best-available modeled simulation of buoyant fugitive sources and not an alternative modeling approach.

The steps needed to use BLP plume rises for AERMOD volume sources are as follows:

1. Modify the BLP code so that plume rises are explicitly generated as hourly output data. Changes to the BLP code did not alter the line source algorithms, only adding the output of plume rise data as a model option.

2. Reformat the MMIF meteorological data corresponding to the facility with buoyant line sources into PCRAMMET ASCII format, used by BLP. This follows the procedure outlined in the AERMOD/BLP technical support document. For this SIP, only the Clairton battery fugitives were characterized as buoyant line volumes.
    a. Convert stability conditions (based on Monin-Obukov and surface roughness) into Pasquill-Gifford stability categories. This conversion was based on the AERMOD subroutine LTOPG (LSTAB).
    b. Convert wind directions to flow vectors (wind flowing toward).
    c. For mixing height, use the maximum of the convective and mechanical heights for each hour as both the urban and rural mixing height for BLP.
    d. Since BLP cannot accept missing data, fill any missing hours using interpolation, persistence, and professional judgment.

3. Run the modified BLP code (named BLPRISE by ACHD) for the buoyant line sources. The BLP inputs include line dimensions, flow, and buoyancy parameter F'. Post-processing of the BLP output is not required, since only the plume rises are utilized after this step.

4. Using the generated plume rises for each BLP line, calculate hourly release heights as plume rises plus building height. Equidistant line volume sources were created to represent segments of the line, and each volume source was then assigned the calculated hourly release heights by buoyant line. An HOUREMIS file was used for the height-varying data for the buoyant volume sources.

Note: several transitional plume rises and distances are created with each hour of plume rise data in BLP. Final plume rise can occur very close to the line or a few kilometers from the line, depending on stability and wind conditions. Terrain could be theoretically impacted during transitional plume rises before final plume rise is reached. (BLP was designed as a flat terrain model.) However, after further examination of the transitional plume rises in relation to the sources and terrain for this demonstration, the use of final plume rise is appropriate. Low plume rises generally reach final plume rise over a short distance (near property fenceline), and elevated plume rises quickly reach heights above terrain over short transitional distances.

Changes to the BLP code are included on the following pages, highlighted in yellow. The code was modified only to generate output that was not automatically created by BLP (version 99176).

Following the BLP code are Model Clearinghouse memorandums that involved the review of the BLP-based method for buoyant volume sources used for the Clairton Plant and other sources in EPA Region III over the period of 1991 through 1994. These memorandums include: 91-III-12, 93-III-06, and 94-III-02, as downloaded from EPA's Model Clearinghouse Information Storage and Retrieval System (MCISRS) (https://cfpub.epa.gov/oarweb/MCHISRS/).

```
C***********************************************************************BLP00005
C                                                                       BLP00006
C                          BLP (DATED 99176)                            BLP00010
C                                                                       BLP00060
C             *** SEE BLP MODEL CHANGE BULLETIN MCB#3 ***               BLP00061
C                                                                       BLP00062
C    ON THE SUPPORT CENTER FOR REGULATORY AIR MODELS BULLETIN BOARD     BLP00063
C                                                                       BLP00064
C                              919-541-5742                             BLP00065
C                                                                       BLP00066
C***********************************************************************BLP00070
C                                                                       BLP00080
C      BLP -- MULTIPLE BUOYANT LINE AND POINT SOURCE                    BLP00090
C      DISPERSION MODEL                                                 BLP00100
C                                                                       BLP00110
C                                                                       BLP00120
C                                                                       BLP00130
C      DEVELOPED BY:                                                    BLP00140
C                                                                       BLP00150
C      JOE SCIRE AND LLOYD SCHULMAN                                     BLP00160
C      ENVIRONMENTAL RESEARCH AND TECHNOLOGY                            BLP00170
C      696 VIRGINIA ROAD                                                BLP00180
C      CONCORD, MASSACHUSETTS  01742                                    BLP00190
C                                                                       IBM
C                                                                       BLP00200
C***********************************************************************BLP00210
C
C      MODIFIED BY:
C
C      ROGER W. BRODE
C      PACIFIC ENVIRONMENTAL SERVICES, INC.
C      5001 S. MIAMI BLVD, SUITE 300
C      P.O. BOX 12077
C      RESEARCH TRIANGLE PARK, NC  27709
C
C      June 25, 1999
C
C      Modified to read meteorological data from an ASCII data file,
C      rather than an unformatted data file, using the default ASCII
C      format for ISCST3 generated by PCRAMMET and MPRM.  Also modified
C      to get filenames from the command line using the Lahey LF90
C      GETCL function (based on the ISCST3 model code), and to write
C      the model run date and time to the main output file.  Version
C      date used for output is now defined once in BLOCK DATA as
C      CHARACTER*5 VERSN.  Also modified for Y2K compliance using a
C      date window of 1950 to 2049.
C
C*********************************************************************
C
C
C      ADDITIONAL MODIFICATION BY:
C
C      Jason Maranche, Allegheny County Health Department (ACHD)
C
C      November 2013
C
C      Modified by ACHD in order to generate plume rise output
C      for use in AERMOD.  Original algorithms developed by
C      Larry Simmons of E2M for ACHD PM10 SIP workgroup in 1994.
C
C      Code changes indicated by 'ACHDXXXX' at line number.
C
C
C*********************************************************************
C                                                                       BLP00220
C                                                                       BLP00220
      CHARACTER*4 TITLE(20)                                             BLP00230
      REAL L,LEFF,LD,LELEV                                              BLP00240
      LOGICAL RINPUT,LSHEAR,RDOWNW,RUTMS                                BLP00250
      LOGICAL LMETIN,LMETOT,LTRANS                                      BLP00260
      LOGICAL RCOMPR                                                    BLP00270
```

```
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10),
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,
     1 LTRANS
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS
      COMMON/RINTP/XDIST(7),DH(7)
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR
      COMMON/METD24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24),
     1 DTHTA(2),PEXP(6),IDELS,IDSURF,IYSURF,IDUPER,IYUPER,TERAN(6),
     2 IRU,IHRMAX,LMETIN,LMETOT,IDAYS(366)
      COMMON/PBLDAT/TWOPBL,PBL1P6
      COMMON/OUTPT/IPCL(11),IPCP(51)
      COMMON/PARM/CRIT,TER1,DECFAC,XBACKG,CONST2,CONST3,MAXIT
C     COMMON/QA/VERSON,LEVEL
      DATA PI/3.1415927/
CPES  Begin PES Code Changes

C     Declare ILEN_FLD Parameter, which controls length of filenames.
C     Also declare variables for input and output filenames, version date
C     and model run time and date.
      INTEGER, PARAMETER :: ILEN_FLD = 80
      CHARACTER (LEN=ILEN_FLD) :: INPFIL, OUTFIL, METFIL, CNCFIL
      COMMON/IOFILE/ INPFIL, OUTFIL, METFIL, CNCFIL
      CHARACTER RUNDAT*8, RUNTIM*8, VERSN*5
      COMMON/DATETIME/ RUNDAT, RUNTIM, VERSN

C     Get Date and Time using system-specific functions     ---   CALL DATIME
      CALL DATIME (RUNDAT, RUNTIM)

C     Retrieve Input and Output File Names From Command Line,
C                                                           ---   CALL GETCOM
      CALL GETCOM ('  BLP   ',ILEN_FLD,INPFIL,OUTFIL,CNCFIL,METFIL)

C     Open Input and Output Files                           ---   CALL FILOPN
      CALL FILOPN (ILEN_FLD,INPFIL,OUTFIL,CNCFIL,METFIL)

      WRITE (6,1234) VERSN, RUNDAT, RUNTIM
 1234 FORMAT ('1',21X,'BLP              (DATED ',A5,')',71X,A8/123X,A8/)

CPES  End PES Code Changes
C
C     READ INPUTS
C
      CALL INPUT(RINPUT,RDOWNW,TITLE,RUTMS,RCOMPR)
      IF(.NOT.RINPUT)CALL RECEPT(RUTMS)
C
C     WRITE HEADERS FOR PLUME RISE HEIGHTS AND DISTANCES
      IF(.NOT.LMETOT)THEN
      WRITE(6,2222)
2222  FORMAT(1X,'PLUME RISE HEIGHTS AND DISTANCES OUTPUT'//
     1 3X,'YR',1X,'JDAY',2X,'HR',5X,'DH1',5X,'DH2',5X,'DH3',5X,'DH4',
     2 5X,'DH5',5X,'DH6',5X,'DH7',5X,'XF1',5X,'XF2',5X,'XF3',5X,'XF4',
     3 5X,'XF5',5X,'XF6',5X,'XF7',7X,'XFB',5X,'XFS')
      END IF
C
C
C     WRITE RUN INFORMATION TO RECORD #1 OF OUTPUT FILE (20)
C
      CALL OUTITL(TITLE,NREC,NPTS,NLINES,IPCL,IPCP,IYR,IDAYS,RCOMPR)
      IF(NLINES.LT.1)GO TO 21
      DO 20 I=1,NLINES
20    DEL(I)=XLEND(I)-XLBEG(I)
21    CONTINUE
      IF(NPTS.LE.0)GO TO 520
C
C     IF THE POINT SOURCE DOWNWASH OPTION IS REQUESTED,
C     DEFINE THE RECTANGLE OF INFLUENCE (IN SCS COORDINATES)
```

```
C     FOR THE DOWNWASH CALCULATIONS                                     BLP00750
C                                                                       BLP00760
      IF(.NOT.RDOWNW)GO TO 520                                          BLP00770
      THREHB=3.*HB                                                      BLP00780
      TWOHB=2.*HB                                                       BLP00790
      HALFWB=WB/2.                                                      BLP00800
      XAMIN=-TWOHB                                                      BLP00810
      XAMAX=L+TWOHB                                                     BLP00820
      YAMIN=-HALFWB-TWOHB                                               BLP00830
      YAMAX=(NLINES-1)*(DX+WB)+HALFWB+TWOHB                             BLP00840
C     FOR THOSE POINTS WITHIN THE REGION OF BUILDING DOWNWASH           BLP00850
C     EFFECTS AND WITH STACK HEIGHTS < 3*HB, SET                        BLP00860
C     IDOWNW (POINT #) = 1                                              BLP00870
      DO 505 I=1,NPTS                                                   BLP00880
      IF(PHS(I).GE.THREHB)GO TO 505                                     BLP00890
      IF(XPSCS(I).LT.XAMIN.OR.XPSCS(I).GT.XAMAX)GO TO 505               BLP00900
      IF(YPSCS(I).LT.YAMIN.OR.YPSCS(I).GT.YAMAX)GO TO 505               BLP00910
      IDOWNW(I)=1                                                       BLP00920
505   CONTINUE                                                          BLP00930
520   CONTINUE                                                          BLP00940
      IF(LMETIN)GO TO 1212                                              BLP00950
C     READ STATION CODES AND YEAR OF METEOROLOGICAL DATA                BLP00960
CPES  Begin PES Code Changes

      READ(2,*)IDS,IYS,IDU,IYU

CPES  End PES Code Changes
      IF(IDS.EQ.IDSURF.AND.IYS.EQ.IYSURF.AND.IDU.EQ.IDUPER.AND.         BLP00980
     1 IYU.EQ.IYUPER)GO TO 1212                                         BLP00990
      WRITE(6,1211)IDSURF,IYSURF,IDS,IYS,IDUPER,IYUPER,IDU,IYU          BLP01000
1211  FORMAT('1','REQUESTED STATION ID OR YEAR DOES NOT MATCH ',        BLP01010
     1 'THAT READ FROM THE MET. DATA FILE -- RUN TERMINATED'/           BLP01020
     2 '0',2X,'REQUESTED SURFACE DATA: ID = ',I5,3X,'YEAR = ',I4/       BLP01030
     3 10X,'MET. DATA READS: ID = ',I5,3X,'YEAR = ',I4/                 BLP01040
     4 '0','REQUESTED UPPER AIR DATA: ID = ',I5,3X,'YEAR = ',I4/        BLP01050
     5 10X,'MET. DATA FILE READS: ID = ',I5,3X,'YEAR = ',I4)            BLP01060
C     CALL WAUDIT
      STOP                                                              BLP01070
1212  CONTINUE                                                          BLP01080
C     CALCULATE DISTANCE (FROM XFB) TO FINAL NEUTRAL PLUME RISE         BLP01090
C     ASSUMING PLUMES INTERACT BEFORE REACHING TERMINAL RISE            BLP01100
      FBRG=N*FPRIME/PI                                                  BLP01110
      IF(FBRG.GT.55.)GO TO 10                                           BLP01120
C     THE CONSTANT 49 = 3.5*14.                                         BLP01130
      XFINAL=49.*FBRG**0.625                                            BLP01140
      GO TO 15                                                          BLP01150
10    XFINAL=3.5*CONST3*FBRG**0.4                                       BLP01160
15    CONTINUE                                                          BLP01170
      XMATCH=XFINAL                                                     BLP01180
C                                                                       BLP01190
C     ENTER MAIN LOOP                                                   BLP01200
C                                                                       BLP01210
      ISTART=1                                                          BLP01220
      DO 135 I=1,366                                                    BLP01230
      II=367-I                                                          BLP01240
      IF(IDAYS(II).NE.1)GO TO 135                                       BLP01250
      LASTDY=II                                                         BLP01260
      GO TO 137                                                         BLP01270
135   CONTINUE                                                          BLP01280
      WRITE(6,136)                                                      BLP01290
136   FORMAT(///'0','EXECUTION TERMINATING -- NO ELEMENTS OF ',         BLP01300
     1 'IDAYS ARRAY ARE EQUAL TO ONE')                                  BLP01310
C     CALL WAUDIT
      STOP                                                              BLP01320
137   CONTINUE                                                          BLP01330
      IF(LMETIN)LASTDY=1                                                BLP01340
      WRITE(6,1401)                                                     BLP01350
1401  FORMAT('1')                                                       BLP01360
      DO 1002 IDAY=ISTART,LASTDY                                        BLP01370
CPES  Begin PES Code Changes
```

```
C     READ METEOROLOGICAL DATA AND RETURN JULIAN DAY (JDAY) FROM DATA FILE

      CALL MET(JDAY)

C     Check for Proper Date Sequence
      IF (IDAY .NE. JDAY) THEN
         WRITE(*,*) 'MET DATA SEQUENCE ERROR AT JDAY = ',JDAY
         WRITE(6,*) 'MET DATA SEQUENCE ERROR AT JDAY = ',JDAY
         STOP
      END IF

CPES  End PES Code Changes
      IF(IDAYS(IDAY).NE.1)GO TO 1002                                    BLP01410
C                                                                       BLP01420
      DO 1000 IHR=1,IHRMAX                                              BLP01430
C                                                                       BLP01440
      IHOUR=IHR                                                         BLP01450
      ISTAB=KST(IHR)                                                    BLP01460
      TER1=1.-TERAN(ISTAB)                                              BLP01470
      P=PEXP(ISTAB)                                                     BLP01480
      TDEGK=TEMP(IHR)                                                   BLP01490
      IF(ISTAB.GT.4)S=9.80616*DTHTA(ISTAB-4)/TDEGK                      BLP01500
      WS=SPEED(IHR)                                                     BLP01510
      WD=RANDWD(IHR)                                                    BLP01520
C     CONVERT WD (FROM PREPROCESSOR) TO WD IN THE REGULAR               BLP01530
C     METEOROLOGICAL SENSE (I.E., 0=NORTH WIND,90=EAST WIND,            BLP01540
C     180=SOUTH WIND,270=WEST WIND)                                     BLP01550
      WD1=WD+180.                                                       BLP01560
      WD1=AMOD(WD1,360.)                                                BLP01570
      THETA=360.-(WD1+TCOR)                                             BLP01580
      IF(THETA.LT.0.0)THETA=360.+THETA                                  BLP01590
      THETA=AMOD(THETA,360.)                                            BLP01600
      DPBL=HMIX(IHR)                                                    BLP01610
      TWOPBL=2.*DPBL                                                    BLP01620
      PBL1P6=1.6*DPBL                                                   BLP01630
      CALL COORD(THETA)                                                 BLP01640
      CALL CONTRB(RCOMPR)                                               BLP01650
1000  CONTINUE                                                          BLP01660
1002  CONTINUE                                                          BLP01670
      WRITE(6,1005)JDAY                                                 BLP01680
1005  FORMAT(/////'0',30X,'LAST DAY PROCESSED = ',I3)                   BLP01690
C
C     CALL WAUDIT
      STOP                                                              BLP01700
      END                                                               BLP01710
CPES  Begin PES Code Changes

      SUBROUTINE GETCOM (MODEL,LENGTH,INPFIL,OUTFIL,CNCFIL,METFIL)
C*********************************************************************
C
C        ADAPTED FROM PCCODE Module of ISC2 Short Term Model - ISCST2
C
C        PURPOSE: Controls Retrieving Input and Output File Names From
C                 the Command Line for PCs
C
C        PROGRAMMER: Roger Brode
C
C        DATE:    March 2, 1992
C
C        MODIFIED:   To use ILEN_FLD (passed in as LENGTH) to define
C                    the length of the INPFIL and OUTFIL variables,
C                    and to specify length of the command line as
C                    a PARAMETER, initially set to 150.  Also set up
C                    conditional compilation statements (commented out)
C                    to facilitate compilation by DEC Visual Fortran.
C                    R.W. Brode, PES, Inc. - 12/2/98
C
C        MODIFIED:   Jayant Hardikar, PES, Inc.
C                    - Length of command line for Lahey version changed
C                      from 80 to 120 characters - 4/19/93
C                    - Adapted for DEPMET/PMERGE - 7/29/94
```

```
C
C        INPUTS:  Command Line
C
C        OUTPUTS: Input Runstream File Name
C                 Output Print File Name
C
C        CALLED FROM:   MAIN
C*********************************************************************
C
C     Variable Declarations
      IMPLICIT NONE

      INTEGER LENGTH
      CHARACTER (LEN=LENGTH) :: INPFIL, OUTFIL, CNCFIL, METFIL
      CHARACTER (LEN=8)      :: MODEL
C     Declare the COMLIN Variable to Hold Contents of Command Line for Lahey
      INTEGER , PARAMETER :: LENCL = 150
      CHARACTER (LEN=LENCL) :: COMLIN
      INTEGER LOCB(LENCL), LOCE(LENCL), I, IFCNT
      LOGICAL INFLD

      COMLIN = ' '
      METFIL = ' '

C*************************************************************LAHEY START
C     Use Lahey Function GETCL To Retrieve Contents of Command Line.
C     Retrieve Input and Output File Names From the COMLIN Variable.
      CALL GETCL(COMLIN)
      INFLD = .FALSE.
      IFCNT = 0
      DO I = 1, LENCL
         IF (.NOT.INFLD .AND. COMLIN(I:I) .NE. ' ') THEN
            INFLD = .TRUE.
            IFCNT = IFCNT + 1
            LOCB(IFCNT) = I
         ELSE IF (INFLD .AND. COMLIN(I:I) .EQ. ' ') THEN
            INFLD = .FALSE.
            LOCE(IFCNT) = I - 1
         END IF
      END DO
      IF (IFCNT .LT. 3 .OR. IFCNT .GT. 4) THEN
C        Error on Command Line.  Write Error Message and STOP
         WRITE(*,660) MODEL
         STOP
      END IF
      INPFIL = COMLIN(LOCB(1):LOCE(1))
      OUTFIL = COMLIN(LOCB(2):LOCE(2))
      CNCFIL = COMLIN(LOCB(3):LOCE(3))
C     Check for Optional Argument for Preprocessed Met Data File
      IF (IFCNT .EQ. 4) THEN
         METFIL = COMLIN(LOCB(4):LOCE(4))
      END IF

C*************************************************************LAHEY STOP

  660 FORMAT (' COMMAND LINE ERROR: ',A8,' input_file output_file',
     &        ' concen_file [metdata_file]')

      RETURN
      END


      SUBROUTINE DATIME ( DCALL, TCALL )
C*********************************************************************
C                 DATIME Module
C
C        PURPOSE: Obtain the system date and time
C
C        PROGRAMMER: Jim Paumier, PES, Inc.
C
C        DATE:    April 15, 1994
```

```
C
C        MODIFIED:   Uses Fortran 90 DATE_AND_TIME routine.
C                    R.W. Brode, PES, 8/14/98
C
C        INPUTS:  none
C
C        OUTPUTS: Date and time in character format
C
C        CALLED FROM:  RUNTIME
C***********************************************************************
C
C     Variable Declarations
      IMPLICIT NONE

      CHARACTER DCALL*8, TCALL*8
      CHARACTER CDATE*8, CTIME*10, CZONE*5
      INTEGER  :: IDATETIME(8)
      INTEGER  :: IPTYR, IPTMON, IPTDAY, IPTHR, IPTMIN, IPTSEC

      DCALL = ' '
      TCALL = ' '

C     Call date and time routine
      CALL DATE_AND_TIME (CDATE, CTIME, CZONE, IDATETIME)

C     Convert year to two digits and store array variables
      IPTYR  = IDATETIME(1) - 100 * INT(IDATETIME(1)/100)
      IPTMON = IDATETIME(2)
      IPTDAY = IDATETIME(3)
      IPTHR  = IDATETIME(5)
      IPTMIN = IDATETIME(6)
      IPTSEC = IDATETIME(7)

C     Write Date and Time to Character Variables, DCALL & TCALL
      WRITE(DCALL, '(2(I2.2,"/"),I2.2)' ) IPTMON, IPTDAY, IPTYR
      WRITE(TCALL, '(2(I2.2,":"),I2.2)' ) IPTHR, IPTMIN, IPTSEC

      RETURN
      END

      SUBROUTINE FILOPN (LENGTH,INPFIL,OUTFIL,CNCFIL,METFIL)
C***********************************************************************
C                 FILOPN Module
C
C        PURPOSE: Opens Input and Output Files
C
C        PROGRAMMER: Roger Brode, PES, Inc.
C
C        DATE:    December 6, 1994
C
C        INPUTS:  Input filename, INPFIL
C                 Output filename, OUTFIL
C                 Concentration filename, CNCFIL
C                 Met Data filename, METFIL
C
C        OUTPUTS: Openned files
C
C        CALLED FROM:  MAIN
C
C        ERROR HANDLING:   Checks errors opening files
C***********************************************************************
C
C     Variable Declarations
      IMPLICIT NONE

      INTEGER LENGTH
      CHARACTER (LEN=LENGTH) :: INPFIL, OUTFIL, CNCFIL, METFIL
      CHARACTER DUMMY*8

      SAVE
```

```
C     OPEN Input Runstream File, Unit = 5
      DUMMY = 'RUN-STRM'
      OPEN (UNIT=5,FILE=INPFIL,ERR=99,STATUS='OLD')

C     OPEN Print Output File, Unit = 6
      DUMMY = 'OUTPUT'
CLF90 The CARRIAGECONTROL specifier in the following statement is a
CLF90 non-standard Lahey language extension (also supported by DEC VF),
CLF90 and may need to be removed for portability of the code.
      OPEN (UNIT=6,FILE=OUTFIL,CARRIAGECONTROL='FORTRAN',
     &      ERR=99,STATUS='UNKNOWN')

C     OPEN Output Concentration Data File, Unit = 20
      DUMMY = 'CONCDATA'
      OPEN (UNIT=20,FILE=CNCFIL,FORM='UNFORMATTED',ERR=99,
     &      STATUS='UNKNOWN')

      IF (METFIL .NE. ' ') THEN
C        OPEN Meteorological Data File, Unit = 2
         DUMMY = 'METDATA'
         OPEN (UNIT=2,FILE=METFIL,ERR=99,STATUS='OLD')
      END IF

      GO TO 1000

C     WRITE Error Message:  Error Opening File
 99   WRITE(*,*) 'Error Opening File: ', DUMMY
      STOP

 1000 CONTINUE

      RETURN
      END

CPES  End PES Code Changes
C
      SUBROUTINE INPUT(RINPUT,RDOWNW,TITLE,RUTMS,RCOMPR)                BLP01720
C                                                                       BLP01730
C                                                                       BLP01740
      REAL*8 RXBEG,RYBEG,RXEND,RYEND,XBASE,YBASE,XCOORD,YCOORD          BLP01750
      REAL*8 XLBEG,XLEND,YLBEG,YLEND                                    BLP01760
      REAL*8 ANGRD,SINT,COST,XB1,XE1,YB1,YE1,EX,EY                      BLP01770
      REAL*8 YLBS,YLES                                                  BLP01780
      REAL YLBEG1(10),YLEND1(10)                                        BLP01790
      REAL L,LELEV                                                      BLP01800
      REAL DIAM(50)                                                     BLP01810
      LOGICAL RINPUT,LINPUT,LUTMS,LPART,LSHEAR,RDOWNW,LDOWNW,LFALSE     BLP01820
      LOGICAL LMETOT,LMETIN,LTRANS,RUTMS                                BLP01830
      LOGICAL LCOMPR,RCOMPR                                             BLP01840
      CHARACTER*4 TITLE(20)
      CHARACTER*4 ALPYES,ALP1,ALP2,ALP3,ALP4,ALP5,ALP6
C                                                                       BLP01850
C     COMMON BLOCKS                                                     BLP01860
C                                                                       BLP01870
      COMMON/SOURCE/NLINES,XLBEG1(10),XLEND1(10),DEL(10),YSCS(10),      BLP01880
     1 QT(10),HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),          BLP01890
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),     BLP01900
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      BLP01910
      COMMON/RCEPT/RXBEG1,RYBEG1,RXEND1,RYEND1,RDX,RDY,XRSCS(100),      BLP01920
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                 BLP01930
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,   BLP01940
     1 LTRANS                                                           BLP01950
      COMMON/OUTPT/IPCL(11),IPCP(51)                                    BLP01960
      COMMON/PARM/CRIT,TER1,DECFAC,XBACKG,CONST2,CONST3,MAXIT           BLP01970
      COMMON/METD24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24),     BLP01980
     1 DTHTA(2),PEXP(6),IDELS,IDSURF,IYSURF,IDUPER,IYUPER,TERAN(6),     BLP01990
     2 IRU,IHRMAX,LMETIN,LMETOT,IDAYS(366)                              BLP02000
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP02010
C     COMMON/QA/VERSON,LEVEL                                            BLP02020
CPES  Begin PES Code Changes
```

```
      CHARACTER RUNDAT*8, RUNTIM*8, VERSN*5
      COMMON/DATETIME/ RUNDAT, RUNTIM, VERSN

CPES  End PES Code Changes
C                                                                       BLP02030
C     NAMELIST STATEMENTS                                               BLP02040
C                                                                       BLP02050
      NAMELIST/GEN/NLINES,NPTS,NREC,LINPUT,LUTMS,LPART,LDOWNW,LSHEAR,   BLP02060
     1 LTRANS,TCOR,LCOMPR                                               BLP02070
      NAMELIST/RISE/L,HB,WB,WM,FPRIME,DX                                BLP02080
      NAMELIST/METIN/ZMEAS,DTHTA,PEXP,IDSURF,IYSURF,IDUPER,IYUPER,      BLP02090
     1 IDELS,IRU,IDAYS,LMETIN,LMETOT                                    BLP02100
      NAMELIST/CALC/CRIT,TERAN,DECFAC,XBACKG,CONST2,CONST3,MAXIT        BLP02110
      NAMELIST/OUTPUT/IPCL,IPCP                                         BLP02120
      NAMELIST/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY                    BLP02130
C                                                                       BLP02140
      DATA LINPUT/.FALSE./,LUTMS/.FALSE./,LPART/.FALSE./                BLP02150
      DATA LDOWNW/.TRUE./,LFALSE/.FALSE./,LCOMPR/.FALSE./               BLP02160
      DATA ALPYES/'YES'/,ALP1/'NO'/                                     BLP02170
      DATA ALP2/'NO'/,ALP3/'NO'/,ALP4/'NO'/,ALP5/'NO'/,ALP6/'NO'/       BLP02180
      DATA RAD/0.017453293/                                             BLP02190
      DATA MAXL/10/,MAXP/50/,MAXR/100/                                  BLP02200
      DATA TEN6/1.E6/                                                   BLP02210
C                                                                       BLP02220
C     READ TITLE CARD                                                   BLP02230
C                                                                       BLP02240
      READ(5,7)TITLE                                                    BLP02250
7     FORMAT(20A4)                                                      BLP02260
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM
1400  FORMAT('1',11X,'BLP -- MULTIPLE BUOYANT LINE AND POINT ',
     1'SOURCE DISPERSION MODEL     SCRAM VERSION (DATED ',A5,')',17X,A8,
     2/,123X,A8 / ' ',13('**********'))

CPES  End PES Code Changes
      WRITE(6,8)TITLE                                                   BLP02310
8     FORMAT(/'0',20A4)                                                 BLP02320
C                                                                       BLP02330
C     READ NUMBER OF SOURCES AND FORMAT OF INPUTS (GEN NAMELIST)        BLP02340
C                                                                       BLP02350
      READ(5,GEN)                                                       BLP02360
      WRITE(6,GEN)                                                      BLP02370
      N=NLINES                                                          BLP02380
      RINPUT=LINPUT                                                     BLP02390
      RUTMS=LUTMS                                                       BLP02400
      RCOMPR=LCOMPR                                                     BLP02410
      IF(NLINES.LE.0)LDOWNW=LFALSE                                      BLP02420
      RDOWNW=LDOWNW                                                     BLP02430
      IF(NLINES.GT.MAXL)GO TO 700                                       BLP02440
      IF(NPTS.GT.MAXP)GO TO 702                                         BLP02450
      IF(NREC.GT.MAXR)GO TO 704                                         BLP02460
C                                                                       BLP02470
C     READ PARAMETERS USED IN LINE SOURCE PLUME RISE                    BLP02480
C     CALCULATIONS (RISE NAMELIST)                                      BLP02490
C                                                                       BLP02500
      IF(NLINES.LT.1)GO TO 49                                           BLP02510
      READ(5,RISE)                                                      BLP02520
      WRITE(6,RISE)                                                     BLP02530
C                                                                       BLP02540
C     READ RECEPTOR INFORMATION (RCEPT NAMELIST)                        BLP02550
C                                                                       BLP02560
C     IF LINPUT (RINPUT) = .TRUE., INPUT COORDINATES OF EACH RECEPTOR   BLP02570
C     OTHERWISE, INPUT RECEPTOR GRID BOUDARIES AND SPACING AND A        BLP02580
C     RECTANGULAR RECEPTOR GRID WILL BE GENERATED (UP TO 100 RECEPTORS) BLP02590
49    CONTINUE                                                          BLP02600
      IF(RINPUT)GO TO 25                                                BLP02610
      READ(5,RCEPT)                                                     BLP02620
      WRITE(6,RCEPT)                                                    BLP02630
      XBASE=0.0                                                         BLP02640
      YBASE=0.0                                                         BLP02650
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      IF(.NOT.LUTMS)GO TO 61                                            BLP02660
      XBASE=RXBEG                                                       BLP02670
      YBASE=RYBEG                                                       BLP02680
61    CONTINUE                                                          BLP02690
      RXBEG1=RXBEG-XBASE                                                BLP02700
      RYBEG1=RYBEG-YBASE                                                BLP02710
      RXEND1=RXEND-XBASE                                                BLP02720
      RYEND1=RYEND-YBASE                                                BLP02730
25    CONTINUE                                                          BLP02740
C                                                                       BLP02750
C     READ MET. DATA PARAMETERS (METIN NAMELIST)                        BLP02760
C                                                                       BLP02770
      READ(5,METIN)                                                     BLP02780
      WRITE(6,METIN)                                                    BLP02790
      IF(IYSURF.EQ.IYUPER)GO TO 55                                      BLP02800
      WRITE(6,56)IYSURF,IYUPER                                          BLP02810
56    FORMAT('1','RUN TERMINATED -- YEAR REQUESTED FOR SURFACE AND ',   BLP02820
     1 'UPPER AIR MET. DATA DO NOT MATCH'/'0','IYSURF = ',I4,           BLP02830
     2 5X,'IYUPER = ',I4)                                               BLP02840
C     CALL WAUDIT
      STOP                                                              BLP02850
55    CONTINUE                                                          BLP02860
      IYR=IYSURF                                                        BLP02870
      IF(LMETIN)IDAYS(1)=1                                              BLP02880
      IF(MOD(IYSURF,4).NE.0)IDAYS(366)=0                                BLP02890
C                                                                       BLP02900
C     READ DECAY RATE, TERRAIN CORRECTION FACTOR, CONVERGENCE           BLP02910
C     CRITERION, ITERATION LIMIT (CALC NAMELIST)                        BLP02920
C                                                                       BLP02930
      READ(5,CALC)                                                      BLP02940
      WRITE(6,CALC)                                                     BLP02950
C                                                                       BLP02960
C     READ WHICH SOURCES (IF ANY) TO HAVE PARTIAL                       BLP02970
C     CONCENTRATION OUTPUT (OUTPUT NAMELIST)                            BLP02980
C                                                                       BLP02990
      IF(.NOT.LPART)GO TO 118                                           BLP03000
      READ(5,OUTPUT)                                                    BLP03010
      WRITE(6,OUTPUT)                                                   BLP03020
118   CONTINUE                                                          BLP03030
C                                                                       BLP03040
C     READ COORDINATES OF USER SPECIFIED RECEPTORS                      BLP03050
C                                                                       BLP03060
      IF(.NOT.RINPUT)GO TO 40                                           BLP03070
      IF(LUTMS)GO TO 36                                                 BLP03080
C     READ RECEPTOR COORDINATES IN SCS UNITS                            BLP03090
      DO 27 I=1,NREC                                                    BLP03100
27    READ(5,28)XRSCS(I),YRSCS(I),RELEV(I)                              BLP03110
28    FORMAT(3F10.1)                                                    BLP03120
      XBASE=0.0                                                         BLP03130
      YBASE=0.0                                                         BLP03140
      GO TO 40                                                          BLP03150
C     READ RECEPTOR COORDINATES IN UTM UNITS                            BLP03160
36    READ(5,28)XBASE,YBASE,RELEV(1)                                    BLP03170
      XRSCS(1)=0.0                                                      BLP03180
      YRSCS(1)=0.0                                                      BLP03190
      IF(NREC.LE.1)GO TO 40                                             BLP03200
      DO 37 I=2,NREC                                                    BLP03210
      READ(5,28)XCOORD,YCOORD,RELEV(I)                                  BLP03220
      XRSCS(I)=XCOORD-XBASE                                             BLP03230
      YRSCS(I)=YCOORD-YBASE                                             BLP03240
37    CONTINUE                                                          BLP03250
40    CONTINUE                                                          BLP03260
C                                                                       BLP03270
C     READ LINE SOURCE PARAMETERS USED IN DISPERSION CALCULATIONS       BLP03280
C                                                                       BLP03290
      IF(NLINES.LT.1)GO TO 59                                           BLP03300
      DO 46 I=1,NLINES                                                  BLP03310
      READ(5,48)XLBEG,YLBEG,XLEND,YLEND,HS(I),QT(I),LELEV(I)            BLP03320
48    FORMAT(4F10.1,2F10.4,F10.1)                                       BLP03330
C     NEGATIVE EMISSIONS CANNOT BE USED WHEN ARRAY COMPRESSION          BLP03340
C     OPTION IS USED                                                    BLP03350
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      IF(.NOT.RCOMPR.OR.QT(I).GE.0.0)GO TO 936                          BLP03360
      WRITE(6,934)I,QT(I)                                               BLP03370
934   FORMAT(//'0','EXECUTION TERMINATING -- NEGATIVE EMISSIONS ',      BLP03380
     1 'CANNOT BE USED WHEN ARRAY COMPRESSION OPTION (LCOMPR) IS ',     BLP03390
     2 'USED'/'0','LINE SOURCE: ',I2,3X,'EMISSION RATE = ',F12.2)       BLP03400
C     CALL WAUDIT
      STOP                                                              BLP03410
936   CONTINUE                                                          BLP03420
C     CHANGE EMISSION RATE TO MICROGRAMS/SECOND                         BLP03430
      QT(I)=QT(I)*TEN6                                                  BLP03440
      IF(XLBEG.GT.XLEND)GO TO 706                                       BLP03450
C     VERIFY LINE SOURCE COORDINATES ARE                                BLP03460
C     INPUT CORRECTLY - SCS COORDINATE SYSTEM                           BLP03470
      IF(LUTMS)GO TO 946                                                BLP03480
      IF(I.NE.1)GO TO 940                                               BLP03490
      YLBS=YLBEG                                                        BLP03500
      YLES=YLEND                                                        BLP03510
C     SCS COORDINATES OF BEGINNING OF FIRST LINE SOURCE                 BLP03520
C     SHOULD BE (0.0,0.0)                                               BLP03530
      IF(XLBEG.EQ.0.0.AND.YLBEG.EQ.0.0)GO TO 940                        BLP03540
      WRITE(6,708)XLBEG,YLBEG                                           BLP03550
708   FORMAT('1','THE ORIGIN OF THE SCS COORDINATE SYSTEM MUST BE ',    BLP03560
     1 'LOCATED AT THE BEGINNING OF '/3X,'LINE SOURCE NO. 1 -- I.E.,',  BLP03570
     2 '(XLBEG,YLBEG) FOR LINE NO. 1 MUST BE (0.0,0.0)'/'0','VALUES ',  BLP03580
     3 'OF (XLBEG,YLBEG) INPUT BY USER ARE (',F10.1,',',F10.1,')')      BLP03590
C     CALL WAUDIT
      STOP                                                              BLP03600
940   CONTINUE                                                          BLP03610
C     X-AXIS IN THE SCS COORDINATE SYSTEM MUST BE PARALLEL TO           BLP03620
C     THE LINE SOURCES                                                  BLP03630
      IF(YLBEG.EQ.YLEND)GO TO 941                                       BLP03640
      WRITE(6,709)I,YLBEG,YLEND                                         BLP03650
709   FORMAT('1','IN SCS COORDINATE SYSTEM, THE X-AXIS IS ALIGNED ',    BLP03660
     1 'PARALLEL TO THE LINE SOURCES -- I.E., THE Y COORDINATES '/3X,   BLP03670
     2 'OF THE BEGINNING AND END OF EACH LINE SOURCE MUST BE THE SAME'/ BLP03680
     3 '0','VALUES INPUT BY THE USER FOR LINE ',I2,' ARE YLBEG = ',     BLP03690
     4 F10.1,3X,'YLEND = ',F10.1)                                       BLP03700
C     CALL WAUDIT
      STOP                                                              BLP03710
941   CONTINUE                                                          BLP03720
      IF(I.EQ.1)GO TO 946                                               BLP03730
      IF(YLBEG.GT.YLBS.AND.YLEND.GT.YLES)GO TO 942                      BLP03740
      IM1=I-1                                                           BLP03750
      WRITE(6,710)IM1,YLBS,YLES,I,YLBEG,YLEND                           BLP03760
710   FORMAT('1','IN SCS COORDINATE SYSTEM, LINE SOURCES MUST BE ',     BLP03770
     1 'INPUT IN ORDER OF INCREASING Y -- I.E., YLBEG (YLEND) OF LINE ',BLP03780
     2 'NO. N'/3X,'MUST BE GREATER THAN YLBEG (YLEND) OF LINE NO. (N-1)'BLP03790
     3 /'0','VALUES INPUT BY THE USER FOR LINE ',I2,' ARE YLBEG = ',    BLP03800
     4 F10.1,3X,'YLEND = ',F10.1/29X,'LINE ',I2,3X,'YLBEG = ',F10.1,3X, BLP03810
     5 'YLEND = ',F10.1)                                                BLP03820
C     CALL WAUDIT
      STOP                                                              BLP03830
942   CONTINUE                                                          BLP03840
      YLBS=YLBEG                                                        BLP03850
      YLES=YLEND                                                        BLP03860
946   CONTINUE                                                          BLP03870
      XLBEG1(I)=XLBEG-XBASE                                             BLP03880
      YLBEG1(I)=YLBEG-YBASE                                             BLP03890
      XLEND1(I)=XLEND-XBASE                                             BLP03900
      YLEND1(I)=YLEND-YBASE                                             BLP03910
      YSCS(I)=YLBEG1(I)                                                 BLP03920
46    CONTINUE                                                          BLP03930
59    CONTINUE                                                          BLP03940
C                                                                       BLP03950
C     READ POINT SOURCE INFORMATION                                     BLP03960
C                                                                       BLP03970
      IF(NPTS.LT.1)GO TO 22                                             BLP03980
      DO 15 I=1,NPTS                                                    BLP03990
      READ(5,14)XCOORD,YCOORD,PHS(I),PQ(I),D,W,TSTACK(I),PELEV(I)       BLP04000
14    FORMAT(2F10.1,5F10.4,F10.1)                                       BLP04010
C     NEGATIVE EMISSIONS CANNOT BE USED WHEN ARRAY COMPRESSION          BLP04020
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C     OPTION IS USED                                                    BLP04030
      IF(.NOT.RCOMPR.OR.PQ(I).GE.0.0)GO TO 1936                         BLP04040
      WRITE(6,1934)I,PQ(I)                                              BLP04050
1934  FORMAT(//'0','EXECUTION TERMINATING -- NEGATIVE EMISSIONS ',      BLP04060
     1 'CANNOT BE USED WHEN ARRAY COMPRESSION OPTION (LCOMPR) IS ',     BLP04070
     2 'USED'/'0','POINT SOURCE: ',I2,3X,'EMISSION RATE = ',F12.2)      BLP04080
C     CALL WAUDIT
      STOP                                                              BLP04090
1936  CONTINUE                                                          BLP04100
C     CHANGE EMISSION RATE TO MICROGRAMS/SECOND                         BLP04110
      PQ(I)=PQ(I)*TEN6                                                  BLP04120
      XPSCS(I)=XCOORD-XBASE                                             BLP04130
      YPSCS(I)=YCOORD-YBASE                                             BLP04140
C     CONSTANT 2.45154 = G/4. (9.80616/4.)                              BLP04150
      APTS(I)=2.45154*D*D*W/TSTACK(I)                                   BLP04160
C     WHEN MULTIPLIED BY THE AMBIENT TEMPERATURE, BPTS GIVES 3. * FM    BLP04170
C     CONSTANT 0.75 = 3./(2.*2.)                                        BLP04180
      BPTS(I)=0.75*W*W*D*D/TSTACK(I)                                    BLP04190
      VEXIT(I)=W                                                        BLP04200
      DIAM(I)=D                                                         BLP04210
15    CONTINUE                                                          BLP04220
22    CONTINUE                                                          BLP04230
C                                                                       BLP04240
C     WRITE INPUT PARAMETERS                                            BLP04250
C                                                                       BLP04260
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM

CPES  End PES Code Changes
      WRITE(6,8)TITLE                                                   BLP04280
      NDYS=0                                                            BLP04290
      DO 135 I=1,366                                                    BLP04300
135   NDYS=NDYS+IDAYS(I)                                                BLP04310
      WRITE(6,136)NDYS,IDAYS                                            BLP04320
136   FORMAT(//'0','TOTAL NUMBER OF DAYS INCLUDED IN THIS RUN: ',I3//   BLP04330
     1 1X,'(0=NOT INCLUDED,1=INCLUDED)'//                               BLP04340
     2 3('0',10(10I1,3X)/),'0',6(10I1,3X),6I1)                          BLP04350
      NT=NPTS+NLINES                                                    BLP04360
      WRITE(6,112)NT,NLINES,NPTS                                        BLP04370
112   FORMAT(//'0','TOTAL NUMBER OF SOURCES: ',I3//12X,'LINE SOURCES: ',BLP04380
     1 I3/11X,'POINT SOURCES: ',I3)                                     BLP04390
      IF(LPART)ALP1=ALPYES                                              BLP04400
      WRITE(6,113)ALP1                                                  BLP04410
113   FORMAT(/'0','PARTIAL CONCENTRATIONS REQUESTED FOR ANY LINE OR ',  BLP04420
     1 'POINT SOURCES ? ',A3)                                           BLP04430
      IF(LDOWNW)ALP2=ALPYES                                             BLP04440
      WRITE(6,1110)ALP2                                                 BLP04450
1110  FORMAT('0','POINT SOURCE BUILDING DOWNWASH OPTION REQUESTED ? ',  BLP04460
     1 A3)                                                              BLP04470
      IF(LSHEAR)ALP3=ALPYES                                             BLP04480
      WRITE(6,1111)ALP3                                                 BLP04490
1111  FORMAT('0','VERTICAL WIND SHEAR (IN PLUME RISE) REQUESTED ? ',A3) BLP04500
      IF(LTRANS)ALP5=ALPYES                                             BLP04510
      WRITE(6,1212)ALP5                                                 BLP04520
1212  FORMAT('0','TRANSITIONAL POINT SOURCE PLUME RISE REQUESTED ? ',A3)BLP04530
      IF(LMETOT)ALP4=ALPYES                                             BLP04540
      WRITE(6,1112)ALP4                                                 BLP04550
1112  FORMAT('0','OUTPUT OF METEOROLOGICAL DATA REQUESTED ? ',A3)       BLP04560
      IF(RCOMPR)ALP6=ALPYES                                             BLP04570
      WRITE(6,1113)ALP6                                                 BLP04580
1113  FORMAT('0','OPTION TO COMPRESS OUTPUT CONCENTRATION ARRAYS ',     BLP04590
     1 'REQUESTED ? ',A3)                                               BLP04600
C                                                                       BLP04610
C     WRITE THE LINE SOURCE PLUME RISE PARAMETERS                       BLP04620
C                                                                       BLP04630
      IF(NLINES.LT.1)GO TO 122                                          BLP04640
      DXM=DX+WB                                                         BLP04650
      WRITE(6,50)HB,WB,L,DX,DXM,WM,FPRIME                               BLP04660
50    FORMAT(//'0','PARAMETERS USED IN THE LINE SOURCE PLUME RISE ',    BLP04670
     1 'CALCULATIONS'/                                                  BLP04680
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     1 '0','BUILDING DIMENSIONS:  HEIGHT = ',F7.2,1X,'(M)'/              BLP04690
     2 24X,'WIDTH = ',F7.2,1X,'(M)'/                                     BLP04700
     3 23X,'LENGTH = ',F7.2,1X,'(M)'/                                    BLP04710
     4 '0',9X,'BUILDING SEPARATION = ',F7.2,1X,'(M)'/                    BLP04720
     5 '0',6X,'LINE SOURCE SEPARATION = ',F7.2,1X,'(M)'/                 BLP04730
     6 '0',11X,'LINE SOURCE WIDTH = ',F7.2,1X,'(M)'/                     BLP04740
     7 '0','BUOYANCY FLUX PER LINE (FPRIME) = ',F7.1,1X,'(M**4/S**3)')  BLP04750
122   CONTINUE                                                          BLP04760
C                                                                       BLP04770
C     WRITE THE METEOROLOGICAL PARAMETERS                               BLP04780
C                                                                       BLP04790
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM

CPES  End PES Code Changes
      WRITE(6,1120)                                                     BLP04810
1120  FORMAT(/'0','METEOROLOGICAL PARAMETERS')                          BLP04820
      WRITE(6,1121)ZMEAS,PEXP,DTHTA                                     BLP04830
1121  FORMAT(/'0','MEAN WIND SPEED MEASUREMENT HEIGHT = ',F4.1,' (M)'/  BLP04840
     1 '0','WIND SPEED POWER LAW EXPONENTS (STABILITIES 1-6) =  ',      BLP04850
     2 6(F4.2,2X)/'0','VERTICAL POTENTIAL TEMPERATURE GRADIENT =  ',    BLP04860
     3 F5.3,1X,'DEG K/M  (STABILITY 5)',5X,F5.3,1X,'DEG K/M  ',         BLP04870
     4 '(STABILITY 6)')                                                 BLP04880
      IF(LMETIN)WRITE(6,1122)                                           BLP04890
1122  FORMAT('0','METEOROLOGICAL DATA -- FORMATTED USER INPUT')         BLP04900
      IF(.NOT.LMETIN)WRITE(6,1123)IDELS,IRU,IDSURF,IYSURF,IDUPER,IYUPER BLP04910
1123  FORMAT('0','METEOROLOGICAL DATA -- PREPROCESSOR FORMAT'/          BLP04920
     1 '0','STABILITY CLASS VARIATION RESTRICTED TO ',I1,' CLASSES/',   BLP04930
     2 'HOUR'/'0',1X,'MIXING HEIGHTS USED: ',I1,2X,'(1=RURAL,2=URBAN)'/ BLP04940
     3 '   SURFACE STATION ID: ',I5,5X,'YEAR: ',I2/                     BLP04950
     4 1X,'UPPER AIR STATION ID: ',I5,5X,'YEAR: ',I2)                   BLP04960
C                                                                       BLP04970
C     WRITE THE COMPUTATIONAL PARAMETERS                                BLP04980
C                                                                       BLP04990
      WRITE(6,1130)CRIT,MAXIT                                           BLP05000
1130  FORMAT(///'0','COMPUTATIONAL PARAMETERS'//'0','CONVERGENCE ',     BLP05010
     1 'THRESHOLD FOR LINE SOURCE CALCULATIONS = ',F6.3,1X,             BLP05020
     2 /                                                                BLP05030
     3 '0','MAXIMUM NUMBER OF ITERATIONS IN LINE SOURCE CALCULATIONS = 'BLP05040
     4,I2)                                                              BLP05050
      IF(.NOT.LSHEAR)WRITE(6,1131)CONST2                                BLP05060
1131  FORMAT('0','STABLE POINT SOURCE PLUME RISE CONSTANT (CONST2) = ', BLP05070
     1 F4.2)                                                            BLP05080
      WRITE(6,11131)CONST3                                              BLP05090
11131 FORMAT('0','FINAL NEUTRAL PLUME RISE CONSTANT (CONST3) = ',       BLP05100
     1 F5.2)                                                            BLP05110
      WRITE(6,1132)XBACKG,DECFAC,TERAN                                  BLP05120
1132  FORMAT('0','BACKGROUND CONCENTRATION = ',F8.2,1X,'(MICROGRAMS/',  BLP05130
     1 'M**3)'/'0','POLLUTANT DECAY FACTOR = ',E12.5,1X,' (1/SEC)'/     BLP05140
     2 '0','TERRAIN ADJUSTMENT FACTORS (STABILITIES 1-6) =  ',          BLP05150
     3 6(F4.2,2X))                                                      BLP05160
C                                                                       BLP05170
C     WRITE THE RECEPTOR INFORMATION                                    BLP05180
C                                                                       BLP05190
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM

CPES  End PES Code Changes
      IF(RINPUT)GO TO 85                                                BLP05210
      WRITE(6,114)                                                      BLP05220
114   FORMAT(/'0','RECEPTOR LOCATIONS GENERATED FROM USER DEFINED ',    BLP05230
     1 'RECEPTOR RECTANGLE')                                            BLP05240
      WRITE(6,70)RXBEG,RYEND,RXEND,RYEND,RXBEG,RYBEG,RXEND,RYBEG,RDX,RDYBLP05250
70    FORMAT(//'0',10X,'RECEPTOR NETWORK DEFINED BY THE FOLLOWING ',    BLP05260
     1 'RECTANGLE'/                                                     BLP05270
     2 '0',10X,'(',F10.1,',',F10.1,')',5X,'(',F10.1,',',F10.1,')'/      BLP05280
     3 '0',10X,'(',F10.1,',',F10.1,')',5X,'(',F10.1,',',F10.1,')'/      BLP05290
     4 '0',10X,'X GRID SPACING = ',F7.2/                                BLP05300
     5 '0',10X,'Y GRID SPACING = ',F7.2)                                BLP05310
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      GO TO 99                                                          BLP05320
85    WRITE(6,115)NREC                                                  BLP05330
115   FORMAT(/'0','ALL RECEPTOR LOCATIONS SPECIFIED BY THE USER -- ',   BLP05340
     1 'TOTAL NUMBER OF RECEPTOR: ',I3)                                 BLP05350
      WRITE(6,89)NREC                                                   BLP05360
89    FORMAT(//'0',10X,'RECEPTOR NETWORK (USER INPUT)'/                 BLP05370
     1 '0','NUMBER OF RECEPTORS: ',I4///1X,'RECEPTOR NUMBER',10X,       BLP05380
     2 'X',14X,'Y',10X,'ELEVATION'/25X,'(M)',12X,'(M)',12X,'(M)'/)      BLP05390
      DO 92 I=1,NREC                                                    BLP05400
      XCOORD=XRSCS(I)+XBASE                                             BLP05410
      YCOORD=YRSCS(I)+YBASE                                             BLP05420
92    WRITE(6,93)I,XCOORD,YCOORD,RELEV(I)                               BLP05430
93    FORMAT(7X,I3,11X,F10.1,5X,F10.1,2X,F10.1)                         BLP05440
99    CONTINUE                                                          BLP05450
      IF(.NOT.LUTMS)WRITE(6,116)TCOR                                    BLP05460
116   FORMAT('0','SOURCE AND RECEPTOR LOCATIONS SPECIFIED IN SCS ',     BLP05470
     1 'COORDINATES -- TCOR = ',F6.2,' DEGREES')                        BLP05480
      IF(LUTMS)WRITE(6,117)                                             BLP05490
117   FORMAT('0','SOURCE AND RECEPTOR LOCATIONS SPECIFIED IN UTM ',     BLP05500
     1 'COORDINATES')                                                   BLP05510
C                                                                       BLP05520
C     WRITE THE LINE SOURCE  PARAMETERS                                 BLP05530
C                                                                       BLP05540
      IF(NLINES.LT.1)GO TO 1133                                         BLP05550
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM

CPES  End PES Code Changes
      WRITE(6,60)NLINES                                                 BLP05570
60    FORMAT(/'0','LINE SOURCE PARAMETERS'///'0','NUMBER OF LINES: ',I4 BLP05580
     1 //1X,'LINE NUMBER',4X,'X START',6X,'Y START',9X,'X END',9X,      BLP05590
     2 'Y END',11X,'Q',10X,'HEIGHT',5X,'ELEVATION'/                     BLP05600
     3 18X,'(M)',10X,'(M)',12X,'(M)',11X,'(M)',8X,'(GM/SEC)',9X,        BLP05610
     4 '(M)',9X,'(M)')                                                  BLP05620
      DO 65 I=1,NLINES                                                  BLP05630
      XLBEG=XLBEG1(I)+XBASE                                             BLP05640
      YLBEG=YLBEG1(I)+YBASE                                             BLP05650
      XLEND=XLEND1(I)+XBASE                                             BLP05660
      YLEND=YLEND1(I)+YBASE                                             BLP05670
      QGMS=QT(I)/TEN6                                                   BLP05680
65    WRITE(6,62)I,XLBEG,YLBEG,XLEND,YLEND,QGMS,HS(I),LELEV(I)          BLP05690
62    FORMAT(4X,I3,7X,4(F10.1,4X),2X,F7.2,6X,F7.2,1X,F10.1)             BLP05700
      WRITE(6,212)                                                      BLP05710
212   FORMAT(//'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING ',          BLP05720
     1 'LINE SOURCES ARE AVAILABLE: '/'0','(0=NOT AVAILABLE; ',         BLP05730
     2 '1=AVAILABLE)'/'0','LINE SOURCE NUMBER',5X,'AVAILABILITY')       BLP05740
      DO 219 I=1,NLINES                                                 BLP05750
      WRITE(6,215)I,IPCL(I)                                             BLP05760
215   FORMAT('0',7X,I2,19X,I1)                                          BLP05770
219   CONTINUE                                                          BLP05780
      WRITE(6,216)NLINES,IPCL(11)                                       BLP05790
216   FORMAT('0',5X,'1 - ',I2,17X,I1)                                   BLP05800
1133  CONTINUE                                                          BLP05810
C                                                                       BLP05820
C     WRITE THE POINT SOURCE PARAMETERS                                 BLP05830
C                                                                       BLP05840
      IF(NPTS.LT.1)GO TO 127                                            BLP05850
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM

CPES  End PES Code Changes
      WRITE(6,160)NPTS                                                  BLP05870
160   FORMAT(/'0','POINT SOURCE PARAMETERS'///'0','NUMBER OF POINTS: ', BLP05880
     1 I4//1X,'POINT NUMBER',8X,'X',14X,'Y',11X,'Q',10X,'HEIGHT',4X,    BLP05890
     2 'DIAM.',4X,'EXIT VEL.',4X,'STACK TEMP.',3X,'ELEVATION'/          BLP05900
     3 20X,'(M)',12X,'(M)',6X,'(GM/SEC)',9X,'(M)',6X,'(M)',7X,          BLP05910
     4 '(M/S)',8X,'(DEG K)',8X,'(M)')                                   BLP05920
      DO 132 I=1,NPTS                                                   BLP05930
      XCOORD=XPSCS(I)+XBASE                                             BLP05940
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      YCOORD=YPSCS(I)+YBASE                                             BLP05950
      QGMS=PQ(I)/TEN6                                                   BLP05960
132   WRITE(6,133)I,XCOORD,YCOORD,QGMS,PHS(I),DIAM(I),VEXIT(I),         BLP05970
     1 TSTACK(I),PELEV(I)                                               BLP05980
133   FORMAT(5X,I3,8X,F10.1,5X,F10.1,4X,F7.2,6X,F7.2,2X,F7.2,4X,F7.2,   BLP05990
     1 8X,F6.1,2X,F10.1)                                                BLP06000
      WRITE(6,222)                                                      BLP06010
222   FORMAT(//'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING ',          BLP06020
     1 'POINT SOURCES ARE AVAILABLE: '/'0','(0=NOT AVAILABLE; ',        BLP06030
     2 '1=AVAILABLE)'/'0','POINT SOURCE NUMBER',5X,'AVAILABILITY')      BLP06040
      DO 239 I=1,NPTS                                                   BLP06050
      WRITE(6,235)I,IPCP(I)                                             BLP06060
235   FORMAT('0',8X,I2,19X,I1)                                          BLP06070
239   CONTINUE                                                          BLP06080
      WRITE(6,236)NPTS,IPCP(51)                                         BLP06090
236   FORMAT('0',6X,'1 - ',I2,17X,I1)                                   BLP06100
127   CONTINUE                                                          BLP06110
C                                                                       BLP06120
C     CALCULATE SCS COORDINATES FROM UTM COORDINATES                    BLP06130
C                                                                       BLP06140
      IF(.NOT.LUTMS)RETURN                                              BLP06150
      IF(NLINES.LE.0)RETURN                                             BLP06160
      XOR=XLBEG1(1)                                                     BLP06170
      YOR=YLBEG1(1)                                                     BLP06180
      DDX=XLEND1(1)-XOR                                                 BLP06190
      DDY=YLEND1(1)-YOR                                                 BLP06200
      ANGRAD=ATAN2(DDY,DDX)                                             BLP06210
      ANGRD=ANGRAD                                                      BLP06220
      TCOR=90.+ANGRAD/RAD                                               BLP06230
      SINT=DSIN(ANGRD)                                                  BLP06240
      COST=DCOS(ANGRD)                                                  BLP06250
      WRITE(6,189)                                                      BLP06260
189   FORMAT('1')                                                       BLP06270
C                                                                       BLP06280
C     TRANSLATE ORIGIN AND ROTATE COORDINATES                           BLP06290
C                                                                       BLP06300
C     LINE SOURCE COORDINATES                                           BLP06310
      DO 260 I=1,NLINES                                                 BLP06320
      XLBEG1(I)=XLBEG1(I)-XOR                                           BLP06330
      XLEND1(I)=XLEND1(I)-XOR                                           BLP06340
      YLBEG1(I)=YLBEG1(I)-YOR                                           BLP06350
      YLEND1(I)=YLEND1(I)-YOR                                           BLP06360
      XB1=XLBEG1(I)                                                     BLP06370
      XE1=XLEND1(I)                                                     BLP06380
      YB1=YLBEG1(I)                                                     BLP06390
      YE1=YLEND1(I)                                                     BLP06400
      YB1=-XB1*SINT+YB1*COST                                            BLP06410
      YLBEG1(I)=YB1                                                     BLP06420
      XB1=(XB1+YB1*SINT)/COST                                           BLP06430
      XLBEG1(I)=XB1                                                     BLP06440
      YE1=-XE1*SINT+YE1*COST                                            BLP06450
      YSCS(I)=YE1                                                       BLP06460
      YLEND1(I)=YE1                                                     BLP06470
      XE1=(XE1+YE1*SINT)/COST                                           BLP06480
      XLEND1(I)=XE1                                                     BLP06490
260   CONTINUE                                                          BLP06500
      DO 266 I=1,NLINES                                                 BLP06510
C     VERIFY LINE SOURCE COORDINATES ARE                                BLP06520
C     INPUT CORRECTLY - UTM COORDINATES                                 BLP06530
      IF(I.NE.1)GO TO 242                                               BLP06540
      YLBSAV=YLBEG1(I)                                                  BLP06550
      YLESAV=YLEND1(I)                                                  BLP06560
      GO TO 266                                                         BLP06570
242   CONTINUE                                                          BLP06580
      IF(YLBEG1(I).GT.YLBSAV.AND.YLEND1(I).GT.YLESAV)GO TO 243          BLP06590
      IM1=I-1                                                           BLP06600
      WRITE(6,217)IM1,YLBSAV,YLESAV,I,YLBEG1(I),YLEND1(I)               BLP06610
217   FORMAT('1','LINE SOURCE COORDINATES INPUT IN INCORRECT ',         BLP06620
     1 'ORDER -- WHEN USING UTM COORDINATES '/3X,                       BLP06630
     2 'LINE SOURCE COORDINATES MUST BE INPUT SUCH THAT WHEN ',         BLP06640
     3 'COORDINATES ARE CONVERTED TO SCS COORDINATES '/3X,              BLP06650
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     4 'YLBEG (YLEND) OF LINE NO. N MUST BE GREATER THAN ',            BLP06660
     5 'YLBEG (YLEND) OF LINE NO. (N-1)'/'0','CURRENT SCS VALUES ',    BLP06670
     6 'FOR ',2('LINE ',I2,' ARE YLBEG = ',F10.1,3X,'YLEND = ',        BLP06680
     7 F10.1/24X))                                                     BLP06690
C     CALL WAUDIT
      STOP                                                             BLP06700
243   CONTINUE                                                         BLP06710
      YLBSAV=YLBEG1(I)                                                 BLP06720
      YLESAV=YLEND1(I)                                                 BLP06730
266   CONTINUE                                                         BLP06740
C     POINT SOURCE COORDINATES                                         BLP06750
      IF(NPTS.LT.1)GO TO 275                                           BLP06760
      DO 270 I=1,NPTS                                                  BLP06770
      XPSCS(I)=XPSCS(I)-XOR                                            BLP06780
      YPSCS(I)=YPSCS(I)-YOR                                            BLP06790
      EX=XPSCS(I)                                                      BLP06800
      EY=YPSCS(I)                                                      BLP06810
      EY=-EX*SINT+EY*COST                                              BLP06820
      YPSCS(I)=EY                                                      BLP06830
      EX=(EX+EY*SINT)/COST                                             BLP06840
      XPSCS(I)=EX                                                      BLP06850
270   CONTINUE                                                         BLP06860
275   CONTINUE                                                         BLP06870
C     TRANSLATE BUT DO NOT ROTATE RECEPTOR RECTANGLE COORDINATES       BLP06880
      IF(LINPUT)GO TO 290                                              BLP06890
      RXBEG1=RXBEG1-XOR                                                BLP06900
      RXEND1=RXEND1-XOR                                                BLP06910
      RYBEG1=RYBEG1-YOR                                                BLP06920
      RYEND1=RYEND1-YOR                                                BLP06930
      GO TO 299                                                        BLP06940
290   DO 295 I=1,NREC                                                  BLP06950
      XRSCS(I)=XRSCS(I)-XOR                                            BLP06960
      YRSCS(I)=YRSCS(I)-YOR                                            BLP06970
      EX=XRSCS(I)                                                      BLP06980
      EY=YRSCS(I)                                                      BLP06990
      EY=-EX*SINT+EY*COST                                              BLP07000
      YRSCS(I)=EY                                                      BLP07010
      EX=(EX+EY*SINT)/COST                                             BLP07020
      XRSCS(I)=EX                                                      BLP07030
295   CONTINUE                                                         BLP07040
299   CONTINUE                                                         BLP07050
      RETURN                                                           BLP07060
700   WRITE(6,701)NLINES,MAXL                                          BLP07070
701   FORMAT('1','NUMBER OF LINE SOURCES INPUT EXCEEDS MAXIMUM NUMBER ',BLP07080
     1 'ALLOWED'/'0','NUMBER OF LINE SOURCES INPUT (NLINES): ',I5/     BLP07090
     2 '0','MAXIMUM NUMBER OF LINE SOURCES ALLOWED: ',I5)              BLP07100
C     CALL WAUDIT
      STOP                                                             BLP07110
702   WRITE(6,703)NPTS,MAXP                                            BLP07120
703   FORMAT('1','NUMBER OF POINT SOURCES INPUT EXCEEDS MAXIMUM ',     BLP07130
     1 'NUMBER ALLOWED'/'0','NUMBER OF POINT SOURCES INPUT (NPTS): ',I5/BLP07140
     2 '0','MAXIMUM NUMBER OF POINT SOURCES ALLOWED: ',I5)             BLP07150
C     CALL WAUDIT
      STOP                                                             BLP07160
704   WRITE(6,705)NREC,MAXR                                            BLP07170
705   FORMAT('1','NUMBER OF RECEPTORS INPUT EXCEEDS MAXIMUM NUMBER ',  BLP07180
     1 'ALLOWED'/'0','NUMBER OF RECEPTORS INPUT (NREC): ',I5/          BLP07190
     2 '0','MAXIMUM NUMBER OF RECEPTORS ALLOWED: ',I5)                 BLP07200
C     CALL WAUDIT
      STOP                                                             BLP07210
706   WRITE(6,707)XLBEG,XLEND                                          BLP07220
707   FORMAT('1','ENTER COORDINATES OF THE LINE SOURCE ENDPOINTS FROM ',BLP07230
     1 'WEST TO EAST -- '/1X,'I.E., XLBEG MUST BE LESS THAN OR EQUAL ', BLP07240
     2 'TO XLEND'/'0','XLBEG INPUT AS ',F10.1/'0','XLEND INPUT AS ',   BLP07250
     3 F10.1)                                                          BLP07260
C     CALL WAUDIT
      STOP                                                             BLP07270
      END                                                              BLP07280
C
C
      SUBROUTINE RECEPT(LUTMS)                                         BLP07290
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C                                                                       BLP07300
C                                                                       BLP07310
      REAL*8 EX,EY,SINT,COST,ANGRAD                                     BLP07320
      REAL LELEV                                                        BLP07330
      LOGICAL LUTMS                                                     BLP07340
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), BLP07350
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),                 BLP07360
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),     BLP07370
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      BLP07380
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),          BLP07390
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                 BLP07400
C     COMMON/QA/VERSON,LEVEL                                            BLP07410
CPES  Begin PES Code Changes

      CHARACTER RUNDAT*8, RUNTIM*8, VERSN*5
      COMMON/DATETIME/ RUNDAT, RUNTIM, VERSN

CPES  End PES Code Changes
      DATA RAD/57.29578/                                                BLP07420
      IF(NLINES.LE.0)GO TO 151                                          BLP07430
      YLMAX=YSCS(1)                                                     BLP07440
      YLMIN=YSCS(NLINES)                                                BLP07450
      XLMAX=XLEND(1)                                                    BLP07460
      XLMIN=XLBEG(1)                                                    BLP07470
      DO 5 I=1,NLINES                                                   BLP07480
      XLMIN=AMIN1(XLMIN,XLBEG(I))                                       BLP07490
      XLMAX=AMAX1(XLMAX,XLEND(I))                                       BLP07500
      YLMIN=AMIN1(YLMIN,YSCS(I))                                        BLP07510
      YLMAX=AMAX1(YLMAX,YSCS(I))                                        BLP07520
5     CONTINUE                                                          BLP07530
C     DEFINE THE SOURCE RECTANGLE                                       BLP07540
      WRITE(6,105)XLMIN,YLMAX,XLMAX,YLMAX,XLMIN,YLMIN,XLMAX,YLMIN       BLP07550
105   FORMAT('0','THE SOURCE RECTANGLE IS DEFINED BY THE FOLLOWING ',   BLP07560
     1 'POINTS (IN SCS COORDINATES):'                                   BLP07570
     2 /'0','(',F10.2,',',F10.2,')',10X,'(',F10.2,',',F10.2,')'         BLP07580
     3 /'0','(',F10.2,',',F10.2,')',10X,'(',F10.2,',',F10.2,')')        BLP07590
      GO TO 161                                                         BLP07600
C     IF THERE ARE NO LINE SOURCES, SOURCE RECTANGLE IS                 BLP07610
C     UNDEFINED -- ASSIGN VALUES TO XLMIN,XLMAX,YLMIN,YLMAX             BLP07620
C     SUCH THAT NO RESTRICTION IS PLACED ON THE LOCATIONS OF            BLP07630
C     RECEPTORS                                                         BLP07640
151   CONTINUE                                                          BLP07650
      XLMIN=1.E10                                                       BLP07660
      XLMAX=-1.E10                                                      BLP07670
      YLMIN=1.E10                                                       BLP07680
      YLMAX=-1.E10                                                      BLP07690
161   CONTINUE                                                          BLP07700
      IF(.NOT.LUTMS)GO TO 550                                           BLP07710
      ANGRAD=(TCOR-90.)/RAD                                             BLP07720
      SINT=DSIN(ANGRAD)                                                 BLP07730
      COST=DCOS(ANGRAD)                                                 BLP07740
550   CONTINUE                                                          BLP07750
      NRINX=(RXEND-RXBEG)/RDX+1.01                                      BLP07760
      NRINY=(RYEND-RYBEG)/RDY+1.01                                      BLP07770
C     NTHTOT IS THE NUMBER OF RECEPTORS BEFORE ELIMINATING              BLP07780
C     THOSE IN THE SOURCE RECTANGLE                                     BLP07790
      NTHTOT=NRINX*NRINY                                                BLP07800
      NREC=0                                                            BLP07810
      DO 10 I=1,NRINX                                                   BLP07820
      DO 10 J=1,NRINY                                                   BLP07830
      RXSAVE=RXBEG+(I-1)*RDX                                            BLP07840
      RYSAVE=RYBEG+(J-1)*RDY                                            BLP07850
      IF(.NOT.LUTMS)GO TO 560                                           BLP07860
      EX=RXSAVE                                                         BLP07870
      EY=RYSAVE                                                         BLP07880
      EY=-EX*SINT+EY*COST                                               BLP07890
      RYSAVE=EY                                                         BLP07900
      EX=(EX+EY*SINT)/COST                                              BLP07910
      RXSAVE=EX                                                         BLP07920
560   CONTINUE                                                          BLP07930
C     IF A RECEPTOR IS OUTSIDE THE SOURCE RECTANGLE, RECORD ITS         BLP07940
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C     X AND Y COORDINATES, OTHERWISE, IGNORE IT                         BLP07950
      IF(RYSAVE.GT.YLMAX.OR.RYSAVE.LT.YLMIN)GO TO 9                     BLP07960
      IF(RXSAVE.GT.XLMAX.OR.RXSAVE.LT.XLMIN)GO TO 9                     BLP07970
      GO TO 10                                                          BLP07980
9     NREC=NREC+1                                                       BLP07990
      IF(NREC.GT.100)GO TO 200                                          BLP08000
      XRSCS(NREC)=RXSAVE                                                BLP08010
      YRSCS(NREC)=RYSAVE                                                BLP08020
10    CONTINUE                                                          BLP08030
CPES  Begin PES Code Changes

      WRITE(6,1400) VERSN, RUNDAT, RUNTIM
1400  FORMAT('1',11X,'BLP -- MULTIPLE BUOYANT LINE AND POINT ',
     1'SOURCE DISPERSION MODEL     SCRAM VERSION (DATED ',A5,')',17X,A8,
     2/,123X,A8 / ' ',13('**********'))

CPES  End PES Code Changes
      WRITE(6,26)                                                       BLP08080
26    FORMAT(//'0','RECEPTOR NO.',11X,'LOCATION',19X,'RECEPTOR NO.',11X,BLP08090
     1 'LOCATION'/16X,'X',16X,'Y',32X,'X',16X,'Y')                      BLP08100
      IH=NREC/2                                                         BLP08110
      DO 30 I=1,IH                                                      BLP08120
      IP=IH+I                                                           BLP08130
      WRITE(6,29)I,XRSCS(I),YRSCS(I),IP,XRSCS(IP),YRSCS(IP)             BLP08140
29    FORMAT(3X,I3,10X,F6.0,10X,F6.0,13X,I3,10X,F6.0,10X,F6.0)          BLP08150
30    CONTINUE                                                          BLP08160
      IEVEN=MOD(NREC,2)                                                 BLP08170
      IF(IEVEN.NE.0)WRITE(6,33)NREC,XRSCS(NREC),YRSCS(NREC)             BLP08180
33    FORMAT(51X,I3,10X,F6.0,10X,F6.0)                                  BLP08190
      WRITE(6,35)NTHTOT,NREC                                            BLP08200
35    FORMAT(////1X,'NUMBER OF POSSIBLE RECEPTOR LOCATIONS = ',I5/      BLP08210
     1 '0','NUMBER OF ACTUAL RECEPTOR LOCATIONS = ',I5)                 BLP08220
      WRITE(6,37)                                                       BLP08230
37    FORMAT(/'0','GENERATED RECEPTOR LOCATIONS IN SCS COORDINATES')    BLP08240
      RETURN                                                            BLP08250
200   WRITE(6,205)RXBEG,RYBEG,RXEND,RYEND,RDX,RDY                       BLP08260
205   FORMAT('0','TOO MANY RECEPTOR LOCATIONS REQUESTED.'/'0',          BLP08270
     1 'RECEPTORS AT: (',E13.6,',',E13.6,')',2X,'TO  (',E13.6,',',      BLP08280
     2 E13.6,')',10X,'WITH (DX,DY) = (',E13.6,',',E13.6,')')            BLP08290
C     CALL WAUDIT
      STOP                                                              BLP08300
      END                                                               BLP08310
C
      SUBROUTINE OUTITL(TITLE,NREC,NPTS,NLINES,IPCL,IPCP,IYR,IDAYS,     BLP08320
     1 RCOMPR)                                                          BLP08330
C                                                                       BLP08340
C                                                                       BLP08350
      CHARACTER*4 TITLE(20)                                             BLP08360
      INTEGER IPCL(11),IPCP(51)                                         BLP08370
      DIMENSION IDAYS(366)                                              BLP08380
      LOGICAL RCOMPR                                                    BLP08390
C                                                                       BLP08400
C     THIS SUBROUTINE WRITES THE TITLE CARD AND OTHER RUN               BLP08410
C     INFORMATION TO RECORD #1 OF THE OUTPUT FILE (UNIT 20)             BLP08420
C                                                                       BLP08430
C     THOUSANDS PLACE OF NNREC IS CODED TO INDICATE IF ARRAY            BLP08440
C     COMPRESSION OPTION IS USED                                        BLP08450
C     IF NNREC > 1000, OUTPUT ARRAYS ARE COMPRESSED                     BLP08460
C     IF NNREC < 1000, OUTPUT ARRAYS ARE NOT COMPRESSED                 BLP08470
      NNREC=NREC                                                        BLP08480
      IF(RCOMPR)NNREC=NNREC+1000                                        BLP08490
      WRITE(20)TITLE,NNREC,NPTS,NLINES,IPCL,IPCP,IYR,IDAYS              BLP08500
      RETURN                                                            BLP08510
      END                                                               BLP08520
C
CPES  Begin PES Code Changes

      SUBROUTINE MET(JDAY)

C     The routine has been modified to read meteorological data from
C     an ASCII-formatted file rather than an unformatted file.  It also
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C     returns the Julian day (JDAY) determined from the date in the file.
C     Simple error checks for proper date sequence have also been added.
C     Modified by R.Brode, PES, Inc. - 6/25/99

CPES  End PES Code Changes
C                                                                       BLP08540
C                                                                       BLP08550
      LOGICAL LMETIN,LMETOT                                             BLP08560
CPES  Beging PES Code Changes

      DIMENSION HLH(2,24)

CPES  End PES Code Changes
      COMMON/METD24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24),     BLP08600
     1 DTHTA(2),PEXP(6),IDELS,IDSURF,IYSURF,IDUPER,IYUPER,TERAN(6),     BLP08610
     2 IRU,IHRMAX,LMETIN,LMETOT,IDAYS(366)                              BLP08620
      COMMON/QA/VERSON,LEVEL                                            BLP08630
CPES  Beging PES Code Changes

      CHARACTER RUNDAT*8, RUNTIM*8, VERSN*5
      COMMON/DATETIME/ RUNDAT, RUNTIM, VERSN

CPES  End PES Code Changes
      DATA KSTOLD/5/                                                    BLP08640
C                                                                       BLP08650
C     READ PROCESSED UNFORMATTED METEOROLOGICAL DATA                    BLP08660
C                                                                       BLP08670
      IF(LMETIN)GO TO 185                                               BLP08680
CPES  Begin PES Code Changes

      DO I = 1, 24
C        Read Hourly Records from Formatted ASCII File
         READ(2,9500,END=999,ERR=99) IYR, IMO, IDAY, IHR,
     &        RANDWD(I), SPEED(I), TEMP(I), KST(I),
     &        HLH(1,I), HLH(2,I)
9500     FORMAT(4I2,2F9.4,F6.1,I2,2F7.1)
         IF (I .NE. IHR) THEN
            WRITE(*,*) 'MET DATA SEQUENCE ERROR AT ',IYR,IMO,IDAY,IHR
            WRITE(6,*) 'MET DATA SEQUENCE ERROR AT ',IYR,IMO,IDAY,IHR
            STOP
         END IF

         CYCLE

99       CONTINUE

         WRITE(*,*) 'ERROR READING MET DATA FILE AT ',IYR,IMO,IDAY,IHR
         WRITE(6,*) 'ERROR READING MET DATA FILE AT ',IYR,IMO,IDAY,IHR
         STOP

999      CONTINUE

         WRITE(*,*) 'PREMATURE END OF FILE REACHED FOR MET DATA'
         WRITE(6,*) 'PREMATURE END OF FILE REACHED FOR MET DATA'
         STOP

      END DO

C     Convert Year to 4-Digit Value (IYEAR) Using Date Windowing
      IF (IYR .GE. 50 .AND. IYR .LE. 99) THEN
         IYEAR = 1900 + IYR
      ELSE IF (IYR .LT. 50) THEN
         IYEAR = 2000 + IYR
      ELSE
C        Input IYR must be 4-digit:  Save to IYEAR and convert to 2-digit
         IYEAR = IYR
         IYR   = IYEAR - 100 * (IYEAR/100)
      END IF

C     Calculate Julian Day Using 4-Digit Year
      CALL JULIAN(IYEAR,IMO,IDAY,JDAY)
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C     Write Status Message to the Screen
      WRITE(*,909) JDAY, IYEAR
 909  FORMAT('+','Now Processing Data For Day No. ',I4,' of ',I4)

CPES  End PES Code Changes
C     IRU=1 FOR RURAL MIXING HEIGHTS, IRU=2 FOR URBAN MIXING HEIGHTS    BLP08800
      DO 5 I=1,24                                                       BLP08810
      HMIX(I)=HLH(IRU,I)                                                BLP08820
5     CONTINUE                                                          BLP08830
C                                                                       BLP08840
C     ALLOW ONLY STABILITIES 1 TO 6 AND                                 BLP08850
C     RESTRICT STABILITY VARIATION TO 'IDELS' CLASSES/HOUR              BLP08860
C                                                                       BLP08870
      DO 75 I=1,24                                                      BLP08880
      ISTAB=KST(I)                                                      BLP08890
      ISTAB=MIN0(ISTAB,6)                                               BLP08900
      IDSTAB=ISTAB-KSTOLD                                               BLP08910
      IF(IABS(IDSTAB).GT.IDELS)ISTAB=KSTOLD+ISIGN(IDELS,IDSTAB)         BLP08920
      KSTOLD=ISTAB                                                      BLP08930
      KST(I)=ISTAB                                                      BLP08940
C     IF AMBIENT TEMPERATURE IS MISSING, ASSUME T=293.0 DEG. K          BLP08950
      IF(TEMP(I).LE.0.0)TEMP(I)=293.                                    BLP08960
75    CONTINUE                                                          BLP08970
C                                                                       BLP08980
C     IF LMETOT = .TRUE., WRITE HOURLY METEOROLOGY                      BLP08990
C                                                                       BLP09000
      IF(.NOT.LMETOT)RETURN                                             BLP09010
C
CPES  Begin PES Code Changes

      IF(IDAYS(JDAY).NE.1)RETURN
      WRITE(6,12)IYR,IMO,JDAY,(NH,NH=1,24),KST,SPEED,TEMP,RANDWD,
     1 (HLH(1,N),N=1,24),(HLH(2,N2),N2=1,24)                            BLP09040
12    FORMAT('0','IYR = ',I2,3X,'IMO = ',I2,3X,'JDAY = ',I4/
     1 4X,'HR=',3X,I4,23I5/                                             BLP09060
     1 4X,'ISTAB=',I4,23I5/4X,'WS=  ',24F5.1/4X,'TEMP=',24F5.0/         BLP09070
C
C     FORMAT CHANGED FROM 12F TO 24F TO WRITE RURAL AND URBAN HEIGHTS   ACHD9080
C     ON SAME LINE WITH NO CR/LF                                        ACHD9081
     2 4X,'WD-R=',24F5.0/4X,'H-RURAL=',24F6.0/                          ACHD9082
     3 4X,'H-URBAN=',24F6.0//                                           ACHD9083
C     HEADERS ADDED TO ANNOTATE PLUME RISE HEIGHTS AND DISTANCES        ACHD9084
     4 3X,'YR',1X,'JDAY',2X,'HR',5X,'DH1',5X,'DH2',5X,'DH3',5X,'DH4',   ACHD9085
     5 5X,'DH5',5X,'DH6',5X,'DH7',5X,'XF1',5X,'XF2',5X,'XF3',5X,'XF4',  ACHD9086
     6 5X,'XF5',5X,'XF6',5X,'XF7',7X,'XFB',5X,'XFS')                    ACHD9087
C
CPES  End PES Code Changes
      RETURN                                                            BLP09100
185   CONTINUE                                                          BLP09110
C                                                                       BLP09120
C     READ UP TO 24 HOURS OF FORMATTED METEOROLOGICAL DATA              BLP09130
C     FROM UNIT 5                                                       BLP09140
C                                                                       BLP09150
      READ(5,110)IHRMAX                                                 BLP09160
110   FORMAT(I2)                                                        BLP09170
      IF(IHRMAX.LE.24.AND.IHRMAX.GE.1)GO TO 161                         BLP09180
      WRITE(6,159)IHRMAX                                                BLP09190
159   FORMAT(/////10X,'EXECUTION TERMINATING -- IHRMAX MUST ',          BLP09200
     1 'BE SPECIFIED BY THE USER TO BE '/'0',9X,'BETWEEN ',             BLP09210
     2 '1 AND 24 WHEN THE FORMATTED METEOROLOGICAL USER INPUT '/        BLP09220
     3 '0',9X,'OPTION IS REQUESTED  --  (IHRMAX = ',                    BLP09230
     4 I5,')')                                                          BLP09240
C     CALL WAUDIT
      STOP                                                              BLP09250
161   CONTINUE                                                          BLP09260
CPES  Begin PES Code Changes

C     Set Julian Day = 1 for User Input Formatted Met Data
      JDAY = 1
```

```
      WRITE(6,1400) VERSN, RUNDAT, RUNTIM
1400  FORMAT('1',11X,'BLP -- MULTIPLE BUOYANT LINE AND POINT ',
     1'SOURCE DISPERSION MODEL     SCRAM VERSION (DATED ',A5,')',17X,A8,
     2/,123X,A8 / ' ',13('**********'))

CPES  End PES Code Changes
      WRITE(6,171)                                                      BLP09310
171   FORMAT(/'0',20X,'USER INPUT FORMATTED METEOROLOGICAL DATA'//      BLP09320
     1 '0',5X,'HOUR',3X,'STABILITY',3X,'WIND SPEED',3X,'WIND ',         BLP09330
     2 'DIRECTION',3X,'TEMPERATURE',3X,'MIXING HEIGHT'/                 BLP09340
     3 15X,'CLASS',8X,'(M/S)',8X,'(DEGREES)',6X,'(DEG. K)',9X,          BLP09350
     4 '(M)')                                                           BLP09360
      DO 100 I=1,IHRMAX                                                 BLP09370
      READ(5,112)KST(I),SPEED(I),RANDWD(I),TEMP(I),HMIX(I)              BLP09380
112   FORMAT(I1,9X,F10.2,F10.2,F10.2,F10.2)                             BLP09390
      IF(KST(I).GT.6)KST(I)=6                                           BLP09400
      WRITE(6,114)I,KST(I),SPEED(I),RANDWD(I),TEMP(I),HMIX(I)           BLP09410
114   FORMAT('0',6X,I2,8X,I1,9X,F5.2,10X,F5.1,11X,F5.1,9X,F5.0)         BLP09420
100   CONTINUE                                                          BLP09430
      RETURN                                                            BLP09440
      END                                                               BLP09450
CPES  Begin PES Code Changes

      SUBROUTINE JULIAN(INYR,INMN,INDY,JDY)
C*********************************************************************
C        Based on JULIAN Module of ISC3 Short Term Model
C
C        PURPOSE:    CONVERT YR/MN/DY DATE TO JULIAN DAY (1-366),
C                    INCLUDES TEST FOR 100 AND 400 YEAR CORRECTIONS
C
C        PROGRAMMER: Roger Brode
C
C        DATE:       June 24, 1999
C
C        INPUTS:     YEAR,  INYR (4 DIGIT)
C                    MONTH, INMN
C                    DAY,   INDY
C
C        OUTPUT:     JULIAN DAY,  JDY (1-366)
C
C        CALLED FROM:   MET
C
C        ERROR HANDLING:   Checks for Invalid Month or Day
C*********************************************************************

C     Variable Declarations
      IMPLICIT NONE

      SAVE
      INTEGER :: NDAY(12), IDYMAX(12)
      INTEGER :: INYR, INMN, INDY, JDY

C     Variable Initializations
      DATA NDAY/0,31,59,90,120,151,181,212,243,273,304,334/
      DATA IDYMAX/31,29,31,30,31,30,31,31,30,31,30,31/
      JDY = 0

C     Check for Invalid Month or Day
      IF (INMN.LT.1 .OR. INMN.GT.12) THEN
         WRITE(*,*) 'Invalid Month in Met Data File for IMO = ',INMN
         WRITE(6,*) 'Invalid Month in Met Data File for IMO = ',INMN
         STOP
      ELSE IF (INDY .GT. IDYMAX(INMN)) THEN
         WRITE(*,*) 'Invalid Day in Met Data File for IMO = ',INMN,
     &              ' and IDY = ',INDY
         WRITE(6,*) 'Invalid Day in Met Data File for IMO = ',INMN,
     &              ' and IDY = ',INDY
         STOP
      END IF

C     Determine JULIAN Day Number; For Non-Leap Year First
```

```
      IF ((MOD(INYR,4) .NE. 0) .OR.
     &    (MOD(INYR,100) .EQ. 0 .AND. MOD(INYR,400) .NE. 0)) THEN
C        Not a Leap Year
         IF (INMN.NE.2 .OR. (INMN.EQ.2 .AND. INDY.LE.28)) THEN
            JDY = INDY + NDAY(INMN)
         ELSE
            WRITE(*,*) 'Invalid Date; 2/29 in Non-Leap Year for IYR = ',
     &                 INYR
            WRITE(6,*) 'Invalid Date; 2/29 in Non-Leap Year for IYR = ',
     &                 INYR
            STOP
         END IF
      ELSE
C        Leap Year
         JDY = INDY + NDAY(INMN)
         IF (INMN .GT. 2)  JDY = JDY + 1
      END IF

 999  CONTINUE

      RETURN
      END

CPES  End PES Code Changes
C
      SUBROUTINE COORD(THETA)                                           BLP09460
C                                                                       BLP09470
C                                                                       BLP09480
      DIMENSION XSCS(10,129)                                            BLP09490
      REAL LELEV                                                        BLP09500
      REAL TCHK(4)/90.,180.,270.,360./                                  BLP09510
      INTEGER IL(4)/4*1/,ISEG(4)/1,129,129,1/                           BLP09520
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), BLP09530
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),                 BLP09540
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),     BLP09550
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      BLP09560
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),          BLP09570
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                 BLP09580
      EQUIVALENCE (XRCS(1,1),XSCS(1,1))                                 BLP09590
      DATA RAD/57.29578/                                                BLP09600
      TRAD=THETA/RAD                                                    BLP09610
      COST=COS(TRAD)                                                    BLP09620
      SINT=SIN(TRAD)                                                    BLP09630
      IF(NLINES.LT.1)GO TO 250                                          BLP09640
C                                                                       BLP09650
C     CALCULATE SOURCE COORDINATES FOR EACH SOURCE LINE SEGMENT         BLP09660
C                                                                       BLP09670
      DO 25 I=1,NLINES                                                  BLP09680
      DXX=DEL(I)/128.                                                   BLP09690
      XSCS(I,1)=XLBEG(I)                                                BLP09700
      DO 25 J=2,129                                                     BLP09710
      XSCS(I,J)=XSCS(I,J-1)+DXX                                         BLP09720
25    CONTINUE                                                          BLP09730
      IL(3)=NLINES                                                      BLP09740
      IL(4)=NLINES                                                      BLP09750
C                                                                       BLP09760
C     CALCULATE XN, YN (ORIGINS OF TRANSLATED COORDINATE SYSTEM         BLP09770
C     IN TERMS OF THE SCS COORDINATES                                   BLP09780
C                                                                       BLP09790
      DO 5 I=1,4                                                        BLP09800
      IF(THETA.GE.TCHK(I))GO TO 5                                       BLP09810
      ISAVE=I                                                           BLP09820
      ILINE=IL(I)                                                       BLP09830
      ISEGN=ISEG(I)                                                     BLP09840
      XN=XSCS(ILINE,ISEGN)                                              BLP09850
      YN=YSCS(ILINE)                                                    BLP09860
      GO TO 6                                                           BLP09870
5     CONTINUE                                                          BLP09880
6     CONTINUE                                                          BLP09890
C                                                                       BLP09900
C     TRANSLATE COORDINATES                                             BLP09910
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C                                                                       BLP09920
C     TRANSLATE LINE SOURCE SEGMENT COORDINATES                         BLP09930
      DO 10 I=1,NLINES                                                  BLP09940
      DO 10 J=1,129                                                     BLP09950
      XRCS(I,J)=XSCS(I,J)-XN                                            BLP09960
      YRCS(I,J)=YSCS(I)-YN                                              BLP09970
10    CONTINUE                                                          BLP09980
C     TRANSLATE POINT SOURCE COORDINATES                                BLP09990
      DO 11 I=1,NPTS                                                    BLP10000
      XPRCS(I)=XPSCS(I)-XN                                              BLP10010
      YPRCS(I)=YPSCS(I)-YN                                              BLP10020
11    CONTINUE                                                          BLP10030
C     TRANSLATE RECEPTOR COORDINATES                                    BLP10040
      DO 12 I=1,NREC                                                    BLP10050
      XRRCS(I)=XRSCS(I)-XN                                              BLP10060
      YRRCS(I)=YRSCS(I)-YN                                              BLP10070
12    CONTINUE                                                          BLP10080
C                                                                       BLP10090
C     ROTATE COORDINATE SYSTEM                                          BLP10100
C                                                                       BLP10110
C     ROTATE LINE SOURCE SEGMENT COORDINATES                            BLP10120
      DO 20 I=1,NLINES                                                  BLP10130
      DO 20 J=1,129                                                     BLP10140
      XSAVE=XRCS(I,J)                                                   BLP10150
      YSAVE=YRCS(I,J)                                                   BLP10160
      XRCS(I,J)=XSAVE*COST+YSAVE*SINT                                   BLP10170
      YRCS(I,J)=YSAVE*COST-XSAVE*SINT                                   BLP10180
20    CONTINUE                                                          BLP10190
      IF(NPTS.LT.1)GO TO 260                                            BLP10200
C     ROTATE POINT SOURCE COORDINATES                                   BLP10210
      DO 21 I=1,NPTS                                                    BLP10220
      XSAVE=XPRCS(I)                                                    BLP10230
      YSAVE=YPRCS(I)                                                    BLP10240
      XPRCS(I)=XSAVE*COST+YSAVE*SINT                                    BLP10250
      YPRCS(I)=YSAVE*COST-XSAVE*SINT                                    BLP10260
21    CONTINUE                                                          BLP10270
260   CONTINUE                                                          BLP10280
C     ROTATE RECEPTOR COORDINATES                                       BLP10290
      DO 22 I=1,NREC                                                    BLP10300
      XSAVE=XRRCS(I)                                                    BLP10310
      YSAVE=YRRCS(I)                                                    BLP10320
      XRRCS(I)=XSAVE*COST+YSAVE*SINT                                    BLP10330
      YRRCS(I)=YSAVE*COST-XSAVE*SINT                                    BLP10340
22    CONTINUE                                                          BLP10350
      RETURN                                                            BLP10360
250   CONTINUE                                                          BLP10370
C                                                                       BLP10380
C     WITH NO LINE SOURCES, JUST ROTATE THE POINT SOURCE AND            BLP10390
C     RECEPTOR COORDINATES                                              BLP10400
C                                                                       BLP10410
      IF(NPTS.LT.1)GO TO 360                                            BLP10420
C     ROTATE POINT SOURCE COORDINATES                                   BLP10430
      DO 321 I=1,NPTS                                                   BLP10440
      XSAVE=XPSCS(I)                                                    BLP10450
      YSAVE=YPSCS(I)                                                    BLP10460
      XPRCS(I)=XSAVE*COST+YSAVE*SINT                                    BLP10470
      YPRCS(I)=YSAVE*COST-XSAVE*SINT                                    BLP10480
321   CONTINUE                                                          BLP10490
360   CONTINUE                                                          BLP10500
C     ROTATE RECEPTOR COORDINATES                                       BLP10510
      DO 322 I=1,NREC                                                   BLP10520
      XSAVE=XRSCS(I)                                                    BLP10530
      YSAVE=YRSCS(I)                                                    BLP10540
      XRRCS(I)=XSAVE*COST+YSAVE*SINT                                    BLP10550
      YRRCS(I)=YSAVE*COST-XSAVE*SINT                                    BLP10560
322   CONTINUE                                                          BLP10570
      RETURN                                                            BLP10580
      END                                                               BLP10590
C
      SUBROUTINE CONTRB(RCOMPR)                                         BLP10600
C                                                                       BLP10610
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C                                                                       BLP10620
      REAL CHI(100),PARTCH(100),CHIL(100),FTSAVE(129)                   BLP10630
      REAL L,LEFF,LD,LELEV                                              BLP10640
      INTEGER NSEGA(7)/3,5,9,17,33,65,129/                              BLP10650
      LOGICAL LSHEAR,LTRANS,RCOMPR                                      BLP10660
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                             BLP10670
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), BLP10680
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),                 BLP10690
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),     BLP10700
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      BLP10710
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),          BLP10720
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                 BLP10730
      COMMON/RINTP/XDIST(7),DH(7)                                       BLP10740
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP10750
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,   BLP10760
     1 LTRANS                                                           BLP10770
      COMMON/PBLDAT/TWOPBL,PBL1P6                                       BLP10780
      COMMON/OUTPT/IPCL(11),IPCP(51)                                    BLP10790
      COMMON/PARM/CRIT,TER1,DECFAC,XBACKG,CONST2,CONST3,MAXIT           BLP10800
      DATA PI/3.1415927/,SRT2DP/0.7978846/,IWPBL/0/,JITCT/0/            BLP10810
      DO 5 I=1,NREC                                                     BLP10820
      CHIL(I)=0.0                                                       BLP10830
5     CHI(I)=0.0                                                        BLP10840
      IF(NLINES.LT.1)GO TO 2000                                         BLP10850
      ITHETA=THETA+0.5                                                  BLP10860
      WSST=WS*(HB/ZMEAS)**P                                             BLP10870
C     SET EFFECTIVE WIND SPEED USED IN PLUME RISE                       BLP10880
C     CALCULATIONS, U, TO STACK HEIGHT WIND SPEED, WSST --              BLP10890
C     IF USING WIND SHEAR OPTION IN PLUME RISE, U WILL BE               BLP10900
C     CALCULATED IN SUBROUTINE WSC                                      BLP10910
      U=WSST                                                            BLP10920
      IF(LSHEAR)CALL WSC(ISTAB,WSST,U,S,P)                              BLP10930
      CALL LENG(THETA,U)                                                BLP10940
C                                                                       BLP10950
C     CALCULATE DISTANCE TO FINAL RISE                                  BLP10960
C                                                                       BLP10970
      IF(ISTAB.LE.4)GO TO 6                                             BLP10980
C     CALCULATE DISTANCE TO FINAL RISE FOR STABLE CONDITIONS            BLP10990
      UNSRT=16.*U*U/S-XFB*XFB/3.                                        BLP11000
      IF(UNSRT.LE.0.0)GO TO 105                                         BLP11010
      XFS=0.5*(XFB+SQRT(UNSRT))                                         BLP11020
      GO TO 106                                                         BLP11030
105   XFS=(12.*XFB*U*U/S)**0.3333333                                    BLP11040
106   CONTINUE                                                          BLP11050
      XFSXX=U*PI/SQRT(S)                                                BLP11060
      XFS=AMIN1(XFS,XFSXX)                                              BLP11070
      IF(XFS.GT.XFB)GO TO 7                                             BLP11080
      DO 18 I=2,7                                                       BLP11090
18    XDIST(I)=XFS                                                      BLP11100
      GO TO 10                                                          BLP11110
6     XFS=XFB+XFINAL                                                    BLP11120
7     CONTINUE                                                          BLP11130
C     FIND 5 INTERMEDIATE DOWNWIND DISTANCES (IN ADDITION TO XFB)       BLP11140
C     AT WHICH PLUME RISE WILL BE CALCULATED                            BLP11150
      DO 9 I=2,7                                                        BLP11160
      RI=FLOAT(I)                                                       BLP11170
      XDIST(I)=XFS-(XFS-XFB)*(7.-RI)/5.                                 BLP11180
9     CONTINUE                                                          BLP11190
10    CONTINUE                                                          BLP11200
      CALL RISE(U,ISTAB,S)                                              BLP11210
C
C     WRITE PLUME RISE HEIGHTS AND DISTANCES OF FULL BUOYANCY (XFB),    ACHD1211
C     FINAL RISE (XFS), AND INTERMEDIATE HEIGHTS & DISTANCES            ACHD1212
      WRITE(6,5555) IYR,JDAY,IHOUR,DH,XDIST,XFB,XFS                     ACHD1213
5555  FORMAT(1X,I4,2X,I3,2X,I2,14(F8.2),2X,2(F8.2))                     ACHD1214
C
C                                                                       BLP11220
C     CALCULATE PARTIAL CONCENTRATIONS DUE TO THE LINE SOURCES          BLP11230
C                                                                       BLP11240
C     LOOP OVER LINES                                                   BLP11250
C                                                                       BLP11260
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      DO 1000 LNUM=1,NLINES                                             BLP11270
      DLMIN=DEL(LNUM)/128.                                              BLP11280
      ZB=LELEV(LNUM)                                                    BLP11290
      ZLINE=HS(LNUM)                                                    BLP11300
      WSST=WS*(ZLINE/ZMEAS)**P                                          BLP11310
      CUQ=QT(LNUM)/((NSEGA(1)-1)*WSST)                                  BLP11320
C     SRT2DP = SQRT(2./PI)                                              BLP11330
      SZ0=R0*SRT2DP                                                     BLP11340
      ZV=1000.*XVZ(SZ0,ISTAB)                                           BLP11350
      SY0=SZ0/2.                                                        BLP11360
      YV=1000.*XVY(SY0,ISTAB)                                           BLP11370
      XB=XRCS(LNUM,1)                                                   BLP11380
      YB=YRCS(LNUM,1)                                                   BLP11390
      XE=XRCS(LNUM,129)                                                 BLP11400
      YE=YRCS(LNUM,129)                                                 BLP11410
      XMAXL=AMAX1(XB,XE)                                                BLP11420
      XMINL=AMIN1(XB,XE)                                                BLP11430
      YMAXL=AMAX1(YB,YE)                                                BLP11440
      YMINL=AMIN1(YB,YE)                                                BLP11450
      DXEL=XE-XB                                                        BLP11460
      DYEL=YE-YB                                                        BLP11470
C                                                                       BLP11480
C     LOOP OVER RECEPTORS                                               BLP11490
C                                                                       BLP11500
      DO 500 I=1,NREC                                                   BLP11510
      SUM=0.0                                                           BLP11520
      PARTCH(I)=0.0                                                     BLP11530
      NSEG=0                                                            BLP11540
      NCONTR=0                                                          BLP11550
      XRECEP=XRRCS(I)                                                   BLP11560
      THT=RELEV(I)-ZB                                                   BLP11570
C                                                                       BLP11580
C     IF RECEPTOR IS UPWIND OF THE LINE, CHI = 0.0                      BLP11590
C                                                                       BLP11600
      IF(XRECEP.LE.XMINL)GO TO 500                                      BLP11610
      YRECEP=YRRCS(I)                                                   BLP11620
C     IWOSIG KEEPS TRACK OF WHETHER ANY LINE SEGMENT IS WITHIN          BLP11630
C     ONE SIGMA Y OF THE CURRENT RECEPTOR (0=NO,1=YES)                  BLP11640
      IWOSIG=0                                                          BLP11650
C     DEFINE REGION OF INFLUENCE                                        BLP11660
C     MAX DISTANCE FROM ANY SOURCE SEGMENT TO CURRENT RECEPTOR          BLP11670
C     IS EQUAL TO (XRECEP-XMINL)                                        BLP11680
      XRMXKM=(XRECEP-XMINL)/1000.                                       BLP11690
      CALL SIGMAY(XRMXKM,ISTAB,SYC)                                     BLP11700
      YLOW=YMINL-4.*SYC                                                 BLP11710
      YHIGH=YMAXL+4.*SYC                                                BLP11720
      IF(YRECEP.LT.YLOW.OR.YRECEP.GT.YHIGH)GO TO 500                    BLP11730
      YLOW=YLOW+DLMIN                                                   BLP11740
      YHIGH=YHIGH-DLMIN                                                 BLP11750
      IF(YRECEP.LT.YLOW.OR.YRECEP.GT.YHIGH)GO TO 500                    BLP11760
C     CHECK IF RECEPTOR IS DIRECTLY DOWNWIND OF                         BLP11770
C     THE LINE (IDW=0=NO,IDW=1=YES)                                     BLP11780
      IDW=1                                                             BLP11790
      IF(YRECEP.LT.YMINL.OR.YRECEP.GT.YMAXL)IDW=0                       BLP11800
C     CHECK IF RECEPTOR IS ON THE DOWNWIND SIDE OF THE LINE             BLP11810
      IF(XRECEP.GE.XMAXL)GO TO 477                                      BLP11820
      IF(MOD(ITHETA,90).EQ.0)GO TO 477                                  BLP11830
      EM=DYEL/DXEL                                                      BLP11840
      B=YE-EM*XE                                                        BLP11850
      IF(XRECEP.LT.(YRECEP-B)/EM)NCONTR=999                             BLP11860
477   CONTINUE                                                          BLP11870
      NSEG0=NSEGA(1)                                                    BLP11880
      NNEW=NSEG0                                                        BLP11890
      ITER=0                                                            BLP11900
      INDL=1                                                            BLP11910
      IDELTA=128/(NSEG0-1)                                              BLP11920
498   CONTINUE                                                          BLP11930
      NSEG=NSEG+NNEW                                                    BLP11940
C                                                                       BLP11950
C     LOOP OVER LINE SEGMENTS                                           BLP11960
C                                                                       BLP11970
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      DO 499 ISEG=1,NNEW                                                BLP11980
      FTSAVE(INDL)=0.0                                                  BLP11990
C     IF CURRENT RECEPTOR IS UPWIND OF A SOURCE SEGMENT, THEN           BLP12000
C     THIS SOURCE SEGMENT DOES NOT CONTRIBUTE                           BLP12010
      IF(XRCS(LNUM,INDL).GE.XRECEP)GO TO 495                            BLP12020
      DOWNX=XRECEP-XRCS(LNUM,INDL)                                      BLP12030
      CROSSY=YRECEP-YRCS(LNUM,INDL)                                     BLP12040
      VIRTXZ=DOWNX+ZV                                                   BLP12050
      VIRTXY=DOWNX+YV                                                   BLP12060
      VXYKM=VIRTXY/1000.                                                BLP12070
      VXZKM=VIRTXZ/1000.                                                BLP12080
      CALL DBTSIG(VXZKM,VXYKM,ISTAB,SIGY,SIGZ)                          BLP12090
C                                                                       BLP12100
C     IF CROSSWIND DISTANCE > 4 * SIGY, THEN THIS SOURCE SEGMENT        BLP12110
C     DOES NOT CONTRIBUTE                                               BLP12120
      IF(4.*SIGY.LT.ABS(CROSSY))GO TO 495                               BLP12130
      IF(ABS(CROSSY).LT.SIGY)IWOSIG=1                                   BLP12140
      CALL ZRISE(LNUM,INDL,I,Z)                                         BLP12150
C                                                                       BLP12160
C     INCLUDE TERRAIN CORRECTION IN DETERMINING THE PLUME HEIGHT        BLP12170
C                                                                       BLP12180
      HNT=Z+ZLINE                                                       BLP12190
C     TER1=(1.-TERAN(ISTAB)); THT=RELEV(I)-LELEV(LNUM)                  BLP12200
      TERRAN=TER1*AMIN1(HNT,THT)                                        BLP12210
      H=HNT-TERRAN                                                      BLP12220
      IF(H.GT.DPBL.AND.ISTAB.LE.4)GO TO 495                             BLP12230
C                                                                       BLP12240
C     SOLVE THE GAUSSIAN POINT SOURCE EQUATION                          BLP12250
C                                                                       BLP12260
      CALL GAUSS(CROSSY,SIGY,SIGZ,H,FT)                                 BLP12270
C     INCLUDE DECAY IN DETERMINING CHI                                  BLP12280
      DELTAT=DOWNX/WSST                                                 BLP12290
      FT=FT*(1.-DELTAT*DECFAC)                                          BLP12300
      FTSAVE(INDL)=FT                                                   BLP12310
      NCONTR=NCONTR+1                                                   BLP12320
495   INDL=INDL+IDELTA                                                  BLP12330
499   CONTINUE                                                          BLP12340
C                                                                       BLP12350
C     FIRST TIME THROUGH LOOP, CALCULATE THE FIRST CHI ESTIMATE         BLP12360
C                                                                       BLP12370
      IF(NNEW.NE.NSEG0)GO TO 714                                        BLP12380
      INDL=1                                                            BLP12390
      NSEGM1=NSEG0-1                                                    BLP12400
      SUM=(FTSAVE(1)+FTSAVE(129))/2.                                    BLP12410
      DO 712 ISEG2=2,NSEGM1                                             BLP12420
      INDL=INDL+IDELTA                                                  BLP12430
      SUM=SUM+FTSAVE(INDL)                                              BLP12440
712   CONTINUE                                                          BLP12450
C     IF RECEPTOR IS WITHIN REGION OF INFLUENCE BUT NOT DIRECTLY        BLP12460
C     DOWNWIND OF ANY PART OF THE LINE, AND SUM=0.0, CHI=0.0            BLP12470
      IF(SUM.LE.0.0.AND.IDW.NE.1)GO TO 500                              BLP12480
C                                                                       BLP12490
C     CALCULATE THE REFINED CHI ESTIMATE                                BLP12500
C                                                                       BLP12510
713   CONTINUE                                                          BLP12520
      ITER=ITER+1                                                       BLP12530
      IDIV=MIN0(ITER,2)                                                 BLP12540
      IDELTA=IDELTA/IDIV                                                BLP12550
      INDL=1+IDELTA/2                                                   BLP12560
C     INDL IS THE SUBCRIPT OF THE FIRST NEW LINE SEGMENT                BLP12570
C     (SAVE AS INDLSV)                                                  BLP12580
      INDLSV=INDL                                                       BLP12590
      NNEW=NSEGM1**ITER+0.1                                             BLP12600
C     IF MORE THAN 129 LINE SEGMENTS (I.E., 64 NEW SEGMENTS)            BLP12610
C     ARE REQUIRED, CONTINUE TO INCREASE THE NUMBER OF                  BLP12620
C     SEGMENTS BUT ONLY OVER THE SECTION OF THE LINE                    BLP12630
C     WHICH IS CONTRIBUTING                                             BLP12640
      IF(NNEW.GT.64)GO TO 759                                           BLP12650
      GO TO 498                                                         BLP12660
714   CONTINUE                                                          BLP12670
C     SUBSCRIPT OF THE FIRST NEW LINE SEGMENT IS INDLSV                 BLP12680
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C     SUBSCRIPT OF THE LAST NEW LINE SEGMENT IS INDLLN                  BLP12690
      INDLLN=129-IDELTA/2                                               BLP12700
C     SUM THE FIRST AND LAST NEW LINE SEGMENTS                          BLP12710
      SUM2=FTSAVE(INDLSV)+FTSAVE(INDLLN)                                BLP12720
C     IF THERE ARE ONLY 2 NEW LINE SEGMENTS, SKIP THIS LOOP             BLP12730
      IF(NNEW.LE.2)GO TO 717                                            BLP12740
      INDL=INDLSV                                                       BLP12750
      I2=NNEW-1                                                         BLP12760
C                                                                       BLP12770
C     FIND THE SUM OF ALL THE NEW LINE SEGMENTS                         BLP12780
C                                                                       BLP12790
      DO 715 ISEG3=2,I2                                                 BLP12800
      INDL=INDL+IDELTA                                                  BLP12810
      SUM2=SUM2+FTSAVE(INDL)                                            BLP12820
715   CONTINUE                                                          BLP12830
717   CONTINUE                                                          BLP12840
C                                                                       BLP12850
C     COMPARE THE NEW ESTIMATE WITH THE PREVIOUS ESTIMATE               BLP12860
C                                                                       BLP12870
      SUM2=SUM/2.+SUM2/(2.**ITER)                                       BLP12880
C     AT LEAST ONE LINE SEGMENT MUST BE WITHIN ONE SIGMA Y OF           BLP12890
C     THE LINE (IF THE RECEPTOR IS DIRECTLY DOWNWIND OF ANY PART        BLP12900
C     OF THE LINE)                                                      BLP12910
      IF(IDW.EQ.1.AND.IWOSIG.NE.1)GO TO 758                             BLP12920
      DIFF=ABS(SUM2-SUM)                                                BLP12930
      IF(DIFF*CUQ.LT.0.1)GO TO 720                                      BLP12940
      CORR=DIFF/SUM2                                                    BLP12950
      IF(CORR.LT.CRIT)GO TO 720                                         BLP12960
758   CONTINUE                                                          BLP12970
      SUM=SUM2                                                          BLP12980
      GO TO 713                                                         BLP12990
C     IF 129 SOURCE SEGMENTS NOT SUFFICIENT, CONTINUE                   BLP13000
C     TO INCREASE NUMBER OF SEGMENTS, BUT ONLY OVER THE                 BLP13010
C     SECTION OF LINE WHICH IS CONTRIBUTING                             BLP13020
759   CONTINUE                                                          BLP13030
      CALL SORT(FTSAVE,IBMIN,IBMAX,IWPBL)                               BLP13040
      IF(IWPBL.NE.999)GO TO 4949                                        BLP13050
      IWPBL=0                                                           BLP13060
      PARTCH(I)=0.0                                                     BLP13070
      GO TO 500                                                         BLP13080
4949  CONTINUE                                                          BLP13090
      IBMAX1=IBMAX-1                                                    BLP13100
      IH=0                                                              BLP13110
      IGMAX=1                                                           BLP13120
939   CONTINUE                                                          BLP13130
      SUM2=0.0                                                          BLP13140
      XGMAX1=IGMAX+1                                                    BLP13150
      DO 940 IG=IBMIN,IBMAX1                                            BLP13160
C     XCLN = X COORDINATE (RCS) OF CURRENT (NEWEST) LINE SEGMENT        BLP13170
C     YCLN = Y COORDINATE (RCS) OF CURRENT (NEWEST) LINE SEGMENT        BLP13180
      XSEG1=XRCS(LNUM,IG)                                               BLP13190
      XDIFF=XRCS(LNUM,IG+1)-XSEG1                                       BLP13200
      YSEG1=YRCS(LNUM,IG)                                               BLP13210
      YDIFF=YRCS(LNUM,IG+1)-YSEG1                                       BLP13220
      DO 940 IGSUB=1,IGMAX                                              BLP13230
      WEIGHT=FLOAT(IGSUB)/XGMAX1                                        BLP13240
      XCLN=XSEG1+WEIGHT*XDIFF                                           BLP13250
      YCLN=YSEG1+WEIGHT*YDIFF                                           BLP13260
      DOWNX=XRECEP-XCLN                                                 BLP13270
      CROSSY=YRECEP-YCLN                                                BLP13280
      VIRTXZ=DOWNX+ZV                                                   BLP13290
      VIRTXY=DOWNX+YV                                                   BLP13300
      VXYKM=VIRTXY/1000.                                                BLP13310
      VXZKM=VIRTXZ/1000.                                                BLP13320
      CALL DBTSIG(VXZKM,VXYKM,ISTAB,SIGY,SIGZ)                          BLP13330
      CALL ZRISE(LNUM,IG,I,Z)                                           BLP13340
C     INCLUDE TERRAIN CORRECTION IN DETERMINING THE PLUME HEIGHT        BLP13350
      HNT=Z+ZLINE                                                       BLP13360
C     TER1=(1.-TERAN(ISTAB)); THT=RELEV(I)-LELEV(LNUM)                  BLP13370
      TERRAN=TER1*AMIN1(HNT,THT)                                        BLP13380
      H=HNT-TERRAN                                                      BLP13390
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      CALL GAUSS(CROSSY,SIGY,SIGZ,H,FT)                                 BLP13400
C     INCLUDE DECAY IN DETERMINING CHI                                  BLP13410
      DELTAT=DOWNX/WSST                                                 BLP13420
      FT=FT*(1.-DELTAT*DECFAC)                                          BLP13430
      SUM2=SUM2+FT                                                      BLP13440
      NCONTR=NCONTR+1                                                   BLP13450
940   CONTINUE                                                          BLP13460
C     COMPARE THE NEW ESTIMATE WITH THE PREVIOUS ESTIMATE               BLP13470
      SUM2=SUM/2.+SUM2/(2.**ITER)                                       BLP13480
      DIFF=ABS(SUM2-SUM)                                                BLP13490
      IF(DIFF*CUQ.LT.0.1)GO TO 720                                      BLP13500
      CORR=DIFF/SUM2                                                    BLP13510
      IF(CORR.LT.CRIT)GO TO 720                                         BLP13520
      SUM=SUM2                                                          BLP13530
      ITER=ITER+1                                                       BLP13540
      IF(ITER.GE.MAXIT)GO TO 599                                        BLP13550
      IH=IH+1                                                           BLP13560
      IGMAX=2**IH                                                       BLP13570
      GO TO 939                                                         BLP13580
720   CONTINUE                                                          BLP13590
      SUM=SUM2                                                          BLP13600
C     TEST TO MAKE SURE AT LEAST TWO LINE SEGMENTS CONTRIBUTED          BLP13610
C     TO THE CHI ESTIMATE                                               BLP13620
C     (UNLESS RECEPTOR IS ON THE UPWIND SIDE OF THE LINE WITH           BLP13630
C     SOME SOURCE SEGMENTS DOWNWIND AND SOME SOURCE SEGMENTS            BLP13640
C     UPWIND -- IN THAT CASE JUST USE THE TEST FOR CONVERGENCE)         BLP13650
      IF(NCONTR.LT.2)GO TO 713                                          BLP13660
C     CALCULATE CONCENTRATION (IN MICROGRAMS)                           BLP13670
C     USE STACK HEIGHT WIND SPEED FOR DILUTION                          BLP13680
      PARTCH(I)=CUQ*SUM                                                 BLP13690
      CHIL(I)=CHIL(I)+PARTCH(I)                                         BLP13700
      GO TO 500                                                         BLP13710
599   WRITE(6,600)MAXIT,I,LNUM,CORR,CRIT,ITER,IHOUR,JDAY,IYR            BLP13720
600   FORMAT(//'0','TOO MANY ITERATIONS IN LINE SOURCE CALCULATIONS',   BLP13730
     1 ' -- MAXIT = ',I2/1X,'RECEPTOR ',I3,                             BLP13740
     1 ' PROBABLY TOO CLOSE TO LINE ',I2/                               BLP13750
     2 1X,'CORR = ',F6.2/1X,'CRIT = ',F6.2/1X,'ITER = ',I3/             BLP13760
     3 1X,'(IHOUR,JDAY,IYR) = ','(',I2,',',I3,',',I2,')')               BLP13770
      JITCT=JITCT+1                                                     BLP13780
      IF(JITCT.GT.100)GO TO 6491                                        BLP13790
      SUM=SUM2                                                          BLP13800
      PARTCH(I)=CUQ*SUM                                                 BLP13810
      CHIL(I)=CHIL(I)+PARTCH(I)                                         BLP13820
      GO TO 500                                                         BLP13830
6491  WRITE(6,6492)                                                     BLP13840
6492  FORMAT(//'0','TOO MANY EXCEEDENCES OF LINE SOURCE ',              BLP13850
     1 'ITERATION MAXIMUM -- EXECUTION TERMINATING')                    BLP13860
C     CALL WAUDIT
      STOP                                                              BLP13870
500   CONTINUE                                                          BLP13880
      IF(IPCL(LNUM).EQ.1)CALL OUTPUT(LNUM,PARTCH,NREC,RCOMPR)           BLP13890
1000  CONTINUE                                                          BLP13900
      IF(IPCL(11).EQ.1)CALL OUTPUT(11,CHIL,NREC,RCOMPR)                 BLP13910
C                                                                       BLP13920
C     CALCULATE PARTIAL CONCENTRATIONS DUE TO THE POINT SOURCES         BLP13930
C                                                                       BLP13940
C     LOOP OVER POINTS                                                  BLP13950
C                                                                       BLP13960
2000  IF(NPTS.LT.1)GO TO 9999                                           BLP13970
      IF(ISTAB.GT.4)SQRTS=SQRT(S)                                       BLP13980
      DO 2100 NUMPT=1,NPTS                                              BLP13990
      ZB=PELEV(NUMPT)                                                   BLP14000
      XSTACK=XPRCS(NUMPT)                                               BLP14010
      YSTACK=YPRCS(NUMPT)                                               BLP14020
      ZSTACK=PHS(NUMPT)                                                 BLP14030
      WSST=WS*(ZSTACK/ZMEAS)**P                                         BLP14040
      CUQ=PQ(NUMPT)/WSST                                                BLP14050
      BUOYFX=APTS(NUMPT)*(TSTACK(NUMPT)-TDEGK)                          BLP14060
      IF(ISTAB.GT.4)GO TO 7150                                          BLP14070
C     CALCULATE DISTANCE TO FINAL RISE                                  BLP14080
      IF(BUOYFX.GT.55.)GO TO 7010                                       BLP14090
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C     THE CONSTANT 49. = 3.5*14.                                        BLP14100
      XSMT=49.*BUOYFX**0.625                                            BLP14110
      GO TO 7015                                                        BLP14120
7010  XSMT=3.5*CONST3*BUOYFX**0.4                                       BLP14130
      GO TO 7015                                                        BLP14140
7150  XSMT=3.14159*WSST/SQRTS                                           BLP14150
7015  CONTINUE                                                          BLP14160
C                                                                       BLP14170
C     IF THE POINT SOURCE BUILDING DOWNWASH OPTION IS REQUESTED,        BLP14180
C     DETERMINE THE EFFECTS (IF ANY) OF BUILDING DOWNWASH               BLP14190
C                                                                       BLP14200
      ZV=0.0                                                            BLP14210
      YV=0.0                                                            BLP14220
      IF(IDOWNW(NUMPT).NE.1)GO TO 512                                   BLP14230
C     CALCULATE THE MOMENTUM RISE AT A DOWNWIND DISTANCE OF 2.*HB       BLP14240
C     FM3 = 3.*FM (I.E., 3.*VERTICAL MOMENTUM FLUX TERM)                BLP14250
      FM3=BPTS(NUMPT)*TDEGK                                             BLP14260
      BETAM=0.3333333+WSST/VEXIT(NUMPT)                                 BLP14270
      IF(ISTAB.GT.4)GO TO 509                                           BLP14280
      EFFHT=ZSTACK+(FM3*TWOHB/(BETAM*BETAM*WSST*WSST))**0.3333333       BLP14290
      GO TO 511                                                         BLP14300
509   EFFHT=ZSTACK+(FM3*SIN(SQRTS*TWOHB/WSST)/                          BLP14310
     1 (BETAM*BETAM*WSST*SQRTS))**0.3333333                             BLP14320
511   CONTINUE                                                          BLP14330
      RATIO=EFFHT/HB                                                    BLP14340
      RATIO=AMAX1(RATIO,1.0)                                            BLP14350
C     IF RATIO GE 3.0, SIGY AND SIGZ ARE NOT MODIFIED                   BLP14360
C     IF RATIO LT 3.0 AND GT 1.2, ONLY SIGZ IS MODIFIED                 BLP14370
C     IF RATIO LE 1.2, BOTH SIGY AND SIGZ ARE MODIFIED                  BLP14380
      IF(RATIO.GE.3.0)GO TO 512                                         BLP14390
      R0Z=HB*(1.5-RATIO/2.)                                             BLP14400
      SZ0=SRT2DP*R0Z                                                    BLP14410
      ZV=1000.*XVZ(SZ0,ISTAB)                                           BLP14420
      A=5.0*R0Z                                                         BLP14430
      B=8.3333333*R0Z*R0Z                                               BLP14440
      IF(RATIO.GT.1.2)GO TO 512                                         BLP14450
      R0Y=HB*(6.-5.*RATIO)/2.                                           BLP14460
      SY0=SRT2DP*R0Y                                                    BLP14470
      YV=1000.*XVY(SY0,ISTAB)                                           BLP14480
512   CONTINUE                                                          BLP14490
C                                                                       BLP14500
C     LOOP OVER RECEPTORS                                               BLP14510
C                                                                       BLP14520
      DO 2050 I=1,NREC                                                  BLP14530
      PARTCH(I)=0.0                                                     BLP14540
      DOWNX=XRRCS(I)-XSTACK                                             BLP14550
      IF(DOWNX.LE.0.0)GO TO 2050                                        BLP14560
      CROSSY=YRRCS(I)-YSTACK                                            BLP14570
      VIRTXZ=DOWNX+ZV                                                   BLP14580
      VIRTXY=DOWNX+YV                                                   BLP14590
      VXZKM=VIRTXZ/1000.                                                BLP14600
      VXYKM=VIRTXY/1000.                                                BLP14610
      CALL DBTSIG(VXZKM,VXYKM,ISTAB,SIGY,SIGZ)                          BLP14620
      IF(4.*SIGY.LT.ABS(CROSSY))GO TO 2050                              BLP14630
      IF(IDOWNW(NUMPT).NE.1)GO TO 1517                                  BLP14640
      ZSAVE=9999.                                                       BLP14650
C                                                                       BLP14660
C     IF THE SHEAR AND DOWNWASH OPTIONS ARE BOTH REQUESTED,             BLP14670
C     USE THE MINIMUM OF Z(SHEAR) AND Z(DOWNWASH)                       BLP14680
C                                                                       BLP14690
      IF(LSHEAR)CALL PTRISE(BUOYFX,ZSTACK,XSMT,DOWNX,WSST,ZSAVE,LSHEAR, BLP14700
     1 LTRANS)                                                          BLP14710
      IF(ISTAB.GT.4)GO TO 1515                                          BLP14720
1514  CONTINUE                                                          BLP14730
      EXR=AMIN1(DOWNX,XSMT)                                             BLP14740
      IF(.NOT.LTRANS)EXR=XSMT                                           BLP14750
      IF(.NOT.LTRANS.AND.ISTAB.GE.5)EXR=2.*WSST/SQRT(S)                 BLP14760
      C=-4.16666667*BUOYFX*EXR*EXR/WSST**3                              BLP14770
      GO TO 1516                                                        BLP14780
1515  IF(DOWNX.LT.2.*WSST/SQRT(S))GO TO 1514                            BLP14790
      C=-16.666667*BUOYFX/(WSST*S)                                      BLP14800
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1516  CONTINUE                                                          BLP14810
      CALL CUBIC(A,B,C,Z)                                               BLP14820
      Z=AMIN1(Z,ZSAVE)                                                  BLP14830
      GO TO 1518                                                        BLP14840
1517  CONTINUE                                                          BLP14850
      CALL PTRISE(BUOYFX,ZSTACK,XSMT,DOWNX,WSST,Z,LSHEAR,LTRANS)        BLP14860
1518  CONTINUE                                                          BLP14870
      HNT=Z+ZSTACK                                                      BLP14880
      THT=RELEV(I)-ZB                                                   BLP14890
C     TER1=(1.-TERAN(ISTAB))                                            BLP14900
      TERRAN=TER1*AMIN1(HNT,THT)                                        BLP14910
      H=HNT-TERRAN                                                      BLP14920
      IF(H.GT.DPBL.AND.ISTAB.LE.4)GO TO 2050                            BLP14930
      CALL GAUSS(CROSSY,SIGY,SIGZ,H,FT)                                 BLP14940
C     INCLUDE DECAY IN DETERMINING CHI                                  BLP14950
      DELTAT=DOWNX/WSST                                                 BLP14960
      FT=FT*(1.-DELTAT*DECFAC)                                          BLP14970
      PARTCH(I)=CUQ*FT                                                  BLP14980
      CHI(I)=CHI(I)+PARTCH(I)                                           BLP14990
2050  CONTINUE                                                          BLP15000
      ICODE=100+NUMPT                                                   BLP15010
      IF(IPCP(NUMPT).EQ.1)CALL OUTPUT(ICODE,PARTCH,NREC,RCOMPR)         BLP15020
2100  CONTINUE                                                          BLP15030
      IF(IPCP(51).EQ.1)CALL OUTPUT(151,CHI,NREC,RCOMPR)                 BLP15040
9999  CONTINUE                                                          BLP15050
      DO 9050 I=1,NREC                                                  BLP15060
      CHI(I)=CHI(I)+CHIL(I)+XBACKG                                      BLP15070
9050  CONTINUE                                                          BLP15080
      CALL OUTPUT(999,CHI,NREC,RCOMPR)                                  BLP15090
      RETURN                                                            BLP15100
      END                                                               BLP15110
C
      SUBROUTINE GAUSS(CROSSY,SIGY,SIGZ,H,FT)                           BLP15120
C                                                                       BLP15130
C                                                                       BLP15140
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP15150
      COMMON/PBLDAT/TWOPBL,PBL1P6                                       BLP15160
      DATA TMIN/0.0512/,TMAX/9.21/                                      BLP15170
      TD1=3.1415927*SIGY*SIGZ                                           BLP15180
      YPSIG=CROSSY/SIGY                                                 BLP15190
      EXPYP=0.5*YPSIG*YPSIG                                             BLP15200
C     PREVENT UNDERFLOWS                                                BLP15210
      IF(EXPYP.GT.50.)GO TO 495                                         BLP15220
      F=EXP(-EXPYP)                                                     BLP15230
      GO TO 496                                                         BLP15240
495   F=0.0                                                             BLP15250
      GO TO 443                                                         BLP15260
496   CONTINUE                                                          BLP15270
C     IF MIXING HEIGHT (DPBL) GE 5000 M OR FOR STABLE CONDITIONS,       BLP15280
C     NEGLECT THE REFLECTION TERMS                                      BLP15290
      IF(ISTAB.GE.5.OR.DPBL.GT.5000.)GO TO 451                          BLP15300
C     IF SIGZ GT 1.6*DPBL, ASSUME A UNIFORM VERTICAL DISTRIBUTION       BLP15310
      IF(SIGZ.GT.PBL1P6)GO TO 460                                       BLP15320
C     CALCULATE MULTIPLE EDDY REFLECTIONS TERMS                         BLP15330
C     USING A FOURIER SERIES METHOD -- SEE ERT MEMO CS 093              BLP15340
      F1=1                                                              BLP15350
      T=(SIGZ/DPBL)**2                                                  BLP15360
      H2=H/DPBL                                                         BLP15370
      IF(T.GE.0.6)GO TO 500                                             BLP15380
      ARG=2.*(1.-H2)/T                                                  BLP15390
      IF(ARG.GE.TMAX)GO TO 400                                          BLP15400
      IF(ARG.LT.TMIN)F1=F1+1.-ARG                                       BLP15410
      IF(ARG.GE.TMIN)F1=F1+EXP(-ARG)                                    BLP15420
      ARG=2.*(1.+H2)/T                                                  BLP15430
      IF(ARG.GE.TMAX)GO TO 400                                          BLP15440
      F1=F1+EXP(-ARG)                                                   BLP15450
      ARG=4.*(2.-H2)/T                                                  BLP15460
      IF(ARG.GE.TMAX)GO TO 400                                          BLP15470
      F1=F1+EXP(-ARG)                                                   BLP15480
      ARG=4.*(2.+H2)/T                                                  BLP15490
      IF(ARG.LT.TMAX)F1=F1+EXP(-ARG)                                    BLP15500
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400   ARG=-0.5*H2*H2/T                                                BLP15510
      IF(ARG.LT.-90.)F1=0.0                                           BLP15520
C     CONSTANT 0.797885 = SQRT(2./PI)                                 BLP15530
      IF(ARG.GE.-90.)F1=0.797885*F1*EXP(ARG)/SIGZ                     BLP15540
      IF(F1.LT.1.E-30)F1=0.0                                          BLP15550
      GO TO 1500                                                      BLP15560
C     CONSTANT 4.934802 = PI*PI/2.                                    BLP15570
500   ARG=4.934802*T                                                  BLP15580
      IF(ARG.GE.TMAX)GO TO 900                                        BLP15590
      F1=F1+2.*EXP(-ARG)*COS(3.141593*H2)                             BLP15600
C     CONSTANT 19.739209 = 2.*PI*PI                                   BLP15610
      ARG=19.739209*T                                                 BLP15620
      IF(ARG.LT.TMAX)F1=F1+2.*EXP(-ARG)*COS(6.283185*H2)              BLP15630
900   F1=F1/DPBL                                                      BLP15640
      IF(F1.LT.1.E-30)F1=0.0                                          BLP15650
1500  CONTINUE                                                        BLP15660
C     THE CONSTANT 1.25331414 = SQRT(PI/2.)                           BLP15670
      F1=1.25331414*SIGZ*F1                                           BLP15680
      GO TO 445                                                       BLP15690
451   CONTINUE                                                        BLP15700
      HPSIG=H/SIGZ                                                    BLP15710
      EXPHP=0.5*HPSIG*HPSIG                                           BLP15720
      IF(EXPHP.GT.50)GO TO 443                                        BLP15730
      F1=EXP(-EXPHP)                                                  BLP15740
      GO TO 445                                                       BLP15750
443   F1=0.0                                                          BLP15760
445   CONTINUE                                                        BLP15770
C     FIND PRODUCT OF EXPONENTIAL TERMS DIVIDED BY (PI*SIGY*SIGZ)     BLP15780
      FT=F*F1/TD1                                                     BLP15790
      GO TO 470                                                       BLP15800
460   CONTINUE                                                        BLP15810
C     VERTICAL DISTRIBUTION ASSUMED UNIFORM                           BLP15820
C     THE CONSTANT 2.5066283 = SQRT(2.*PI)                            BLP15830
      FT=F/(2.5066283*SIGY*DPBL)                                      BLP15840
470   RETURN                                                          BLP15850
      END                                                             BLP15860
C
      SUBROUTINE SORT(FTSAVE,IBMIN,IBMAX,IWPBL)                       BLP15870
C                                                                     BLP15880
C                                                                     BLP15890
      REAL FTSAVE(129)                                                BLP15900
      ISAFE=0                                                         BLP15910
      IB=0                                                            BLP15920
      IF(FTSAVE(129).NE.0.0)IB=129                                    BLP15930
      IF(FTSAVE(1).NE.0.0)IB=1                                        BLP15940
      IF(IB.NE.0)GO TO 970                                            BLP15950
      DO 950 ILEVEL=1,7                                               BLP15960
      NEACHL=2**(ILEVEL-1)                                            BLP15970
      INCR=2**(8-ILEVEL)                                              BLP15980
      INDEX=1+INCR/2                                                  BLP15990
      DO 945 NC=1,NEACHL                                              BLP16000
      IF(FTSAVE(INDEX).EQ.0.0)GO TO 944                               BLP16010
      IB=INDEX                                                        BLP16020
      GO TO 970                                                       BLP16030
944   INDEX=INDEX+INCR                                                BLP16040
945   CONTINUE                                                        BLP16050
950   CONTINUE                                                        BLP16060
      IF(IB.NE.0)GO TO 970                                            BLP16070
      IWPBL=999                                                       BLP16080
      RETURN                                                          BLP16090
970   IBMIN=IB-1                                                      BLP16100
      IBMAX=IB+1                                                      BLP16110
      IBMIN=AMAX0(IBMIN,1)                                            BLP16120
      IBMAX=AMIN0(IBMAX,129)                                          BLP16130
975   CONTINUE                                                        BLP16140
      INCRM=0                                                         BLP16150
      INCRP=0                                                         BLP16160
      IF(FTSAVE(IBMIN).NE.0.0)INCRM=1                                 BLP16170
      IF(IBMIN.EQ.1)INCRM=0                                           BLP16180
      IF(FTSAVE(IBMAX).NE.0.0)INCRP=1                                 BLP16190
      IF(IBMAX.EQ.129)INCRP=0                                         BLP16200
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      IBMIN=IBMIN-INCRM                                                 BLP16210
      IBMAX=IBMAX+INCRP                                                 BLP16220
      IF(INCRM.EQ.0.AND.INCRP.EQ.0)GO TO 980                            BLP16230
      ISAFE=ISAFE+1                                                     BLP16240
      IF(ISAFE.GT.129)GO TO 980                                         BLP16250
      GO TO 975                                                         BLP16260
980   CONTINUE                                                          BLP16270
      RETURN                                                            BLP16280
      END                                                               BLP16290
C
      SUBROUTINE OUTPUT(ICODE,CHIS,NREC,RCOMPR)                         BLP16300
C                                                                       BLP16310
C                                                                       BLP16320
      REAL CHIS(NREC)                                                   BLP16330
      LOGICAL RCOMPR                                                    BLP16340
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP16350
C                                                                       BLP16360
C     THIS SUBROUTINE OUTPUTS ALL CHI ARRAYS TO TAPE (OR DISK)          BLP16370
C                                                                       BLP16380
C     ICODE IDENTIFIES THE CHI ARRAY TO FOLLOW:                         BLP16390
C                                                                       BLP16400
C     ICODE = 1 TO 10 IMPLIES THE CHI ARRAY IS THE PARTIAL              BLP16410
C     CONTRIBUTION OF LINE NUMBER "ICODE" AT EACH RECEPTOR              BLP16420
C                                                                       BLP16430
C     ICODE = 11 IMPLIES THE CHI ARRAY IS THE PARTIAL                   BLP16440
C     CONTRIBUTION OF ALL THE LINES AT EACH RECEPTOR                    BLP16450
C                                                                       BLP16460
C     ICODE = 101 TO 150 IMPLIES THE CHI ARRAY IS THE PARTIAL           BLP16470
C     CONTRIBUTION OF POINT SOURCE NUMBER "ICODE - 100" AT              BLP16480
C     EACH RECEPTOR                                                     BLP16490
C                                                                       BLP16500
C     ICODE = 151 IMPLIES THE CHI ARRAY IS THE PARTIAL                  BLP16510
C     CONTRIBUTION OF ALL THE POINT SOURCES AT EACH RECEPTOR            BLP16520
C                                                                       BLP16530
C     ICODE = 999 IMPLIES THE CHI ARRAY IS THE TOTAL                    BLP16540
C     CONCENTRATION SUMMED OVER ALL THE POINT AND LINE SOURCES AT       BLP16550
C     EACH RECEPTOR                                                     BLP16560
      IDAYHR=JDAY*100+IHOUR                                             BLP16570
C     ROUND THE WS (NEAREST TENTHS OF M/S) AND                          BLP16580
C     THE DPBL (NEAREST METER)                                          BLP16590
      IWS=(WS+0.05)*10                                                  BLP16600
      IDPBL=DPBL+0.5                                                    BLP16610
      IWD=WD                                                            BLP16620
      ICD=IWS*10000+ISTAB*1000+ICODE                                    BLP16630
      IMET2=IWD*10000+IDPBL                                             BLP16640
      IF(RCOMPR)GO TO 10                                                BLP16650
      WRITE(20)IDAYHR,ICD,IMET2,CHIS                                    BLP16660
      RETURN                                                            BLP16670
10    CONTINUE                                                          BLP16680
      CALL COMPRS(IDAYHR,ICD,IMET2,NREC,CHIS)                           BLP16690
      RETURN                                                            BLP16700
      END                                                               BLP16710
C
      SUBROUTINE PTRISE(BUOYFX,ZSTACK,XSMT,DOWNX,WSST,Z,LSHEAR,LTRANS)  BLP16720
C                                                                       BLP16730
C                                                                       BLP16740
      LOGICAL LSHEAR,LTRANS                                             BLP16750
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP16760
      COMMON/PARM/CRIT,TER1,DECFAC,XBACKG,CONST2,CONST3,MAXIT           BLP16770
C                                                                       BLP16780
C     THIS SUBROUTINE CALCULATES POINT SOURCE PLUME RISE                BLP16790
C     WITH AN OPTIONAL VERTICAL WIND SPEED SHEAR CORRECTION FOR         BLP16800
C     BOTH NEUTRAL AND STABLE PLUME RISE                                BLP16810
C                                                                       BLP16820
C     A VALUE OF 0.6 IS ASSUMED FOR THE ENTRAINMENT                     BLP16830
C     PARAMETER (BETA)                                                  BLP16840
C                                                                       BLP16850
      X=DOWNX                                                           BLP16860
      IF(.NOT.LSHEAR)GO TO 145                                          BLP16870
C     CONSTANT 2.777778 = 1./(BETA*BETA) WITH BETA=0.6                  BLP16880
      CS=2.777778*BUOYFX                                                BLP16890
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      CS2=ZSTACK**P                                                     BLP16900
      EP=3.*(1.+P)                                                      BLP16910
      P3=3.+P                                                           BLP16920
      TP3=2.*P3                                                         BLP16930
145   CONTINUE                                                          BLP16940
      X=AMIN1(X,XSMT)                                                   BLP16950
      IF(.NOT.LTRANS)X=XSMT                                             BLP16960
      IF(ISTAB.GT.4)GO TO 150                                           BLP16970
      IF(.NOT.LSHEAR)GO TO 170                                          BLP16980
C                                                                       BLP16990
C     NEUTRAL-UNSTABLE PLUME RISE WITH SHEAR                            BLP17000
C                                                                       BLP17010
16    CONTINUE                                                          BLP17020
C     BETA (ENTRAINMENT PARAMETER) IS ASSUMED TO BE 0.6                 BLP17030
      A1=CS*X*X/WSST**3                                                 BLP17040
C     CONSTANT 0.8735805 = (2./3.)**(1./3.)                             BLP17050
      RMULT=0.8735805*(EP*EP*CS2**3/(TP3*A1**P))**(1./EP)               BLP17060
      RMULT=AMIN1(RMULT,1.0)                                            BLP17070
      Z=RMULT*(1.5*A1)**0.333333                                        BLP17080
      IF(ISTAB.LE.4)GO TO 39                                            BLP17090
      Z=AMIN1(Z,(6./CSV1)**0.333333)                                    BLP17100
      Z=AMIN1(Z,5.0*BUOYFX**0.25/S**0.375)                              BLP17110
39    CONTINUE                                                          BLP17120
      RETURN                                                            BLP17130
C                                                                       BLP17140
C     NEUTRAL-UNSTABLE PLUME RISE -- NO SHEAR                           BLP17150
C                                                                       BLP17160
170   CONTINUE                                                          BLP17170
      Z=1.6*(BUOYFX*X*X)**0.333333/WSST                                 BLP17180
      IF(ISTAB.GT.4)Z=AMIN1(Z,ZB)                                       BLP17190
      RETURN                                                            BLP17200
C                                                                       BLP17210
C     STABLE PLUME RISE -- NO SHEAR                                     BLP17220
C                                                                       BLP17230
175   CONTINUE                                                          BLP17240
      ZMTT=5.0*BUOYFX**0.25/S**0.375                                    BLP17250
C     CONST2 HAS A DEFAULT VALUE OF 2.6 (BRIGGS, 1975)                  BLP17260
      ZB=CONST2*(BUOYFX/(WSST*S))**0.333333                             BLP17270
      ZB=AMIN1(ZB,ZMTT)                                                 BLP17280
      IF(X.LT.XSMT)GO TO 170                                            BLP17290
      Z=ZB                                                              BLP17300
      RETURN                                                            BLP17310
C                                                                       BLP17320
C     STABLE PLUME RISE WITH SHEAR                                      BLP17330
C                                                                       BLP17340
150   CONTINUE                                                          BLP17350
      IF(.NOT.LSHEAR)GO TO 175                                          BLP17360
      XPFS=SQRT((TP3*CS2*CS/(WSST*S))**(EP/P3)*TP3*WSST**3/(EP*EP*CS2**3BLP17370
     1 *CS))                                                            BLP17380
      CSV1=WSST*S/CS                                                    BLP17390
      IF(X.LT.XPFS)GO TO 16                                             BLP17400
C     CONSTANT 0.5503212 = (1./6.)**(1./3.)                             BLP17410
      RMULT=0.5503212*CSV1**(P/(3.*P3))*(TP3*CS2)**(1./P3)              BLP17420
      RMULT=AMIN1(RMULT,1.0)                                            BLP17430
      Z=RMULT*(6./CSV1)**0.333333                                       BLP17440
      Z=AMIN1(Z,5.0*BUOYFX**0.25/S**0.375)                              BLP17450
      RETURN                                                            BLP17460
      END                                                               BLP17470
C
      SUBROUTINE CUBIC(A,B,C,Z)                                         BLP17480
C                                                                       BLP17490
C                                                                       BLP17500
C                                                                       BLP17510
C     SOLVES FOR ONE ROOT OF THE CUBIC EQUATION:                        BLP17520
C     Z**3 + A*Z**2 + B*Z + C = 0                                       BLP17530
C                                                                       BLP17540
      IMPLICIT  DOUBLE PRECISION (A-H,O-Z)                              XXX17545
      REAL A,B,C,Z                                                      XXX17547
      DATA ONE/1.0/                                                     BLP17550
      A3=A/3.                                                           BLP17560
      AP=B-A*A3                                                         BLP17570
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      BP=2.*A3**3-A3*B+C                                                BLP17580
      AP3=AP/3.                                                         BLP17590
      BP2=BP/2.                                                         BLP17600
      TROOT=BP2*BP2+AP3*AP3*AP3                                         BLP17610
      IF(TROOT.LE.0.0)GO TO 50                                          BLP17620
      TR=SQRT(TROOT)                                                    BLP17630
      APP=(-BP2+TR)**0.333333                                           BLP17640
      BSV=-BP2-TR                                                       BLP17650
      IF(BSV .EQ. 0) GO TO 45                                           XXX17655
      SGN=SIGN(ONE,BSV)                                                 BLP17660
      BPP=SGN*(ABS(BSV))**0.333333                                      BLP17670
      Z=APP+BPP-A3                                                      BLP17680
      RETURN                                                            BLP17690
   45 CONTINUE                                                          XXX17691
C     BSV (& BPP) = 0.0                                                 XXX17692
      Z=APP-A3                                                          XXX17693
      RETURN                                                            XXX17694
50    CM=2.*SQRT(-AP3)                                                  BLP17700
      ALPHA=ACOS(BP/(AP3*CM))/3.                                        BLP17710
      Z=CM*COS(ALPHA)-A3                                                BLP17720
      RETURN                                                            BLP17730
      END                                                               BLP17740
C
      SUBROUTINE WSC(ISTAB,UM,U,S,P)                                    BLP17750
C                                                                       BLP17760
C                                                                       BLP17770
      REAL L                                                            BLP17780
      LOGICAL LSHEAR,LTRANS                                             BLP17790
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,   BLP17800
     1 LTRANS                                                           BLP17810
C     CALCULATES AN EFFECTIVE U USING THE LINE SOURCE PLUME             BLP17820
C     RISE EQUATION (LINE SOURCE TERM ONLY)                             BLP17830
C     MATCHED AT X = XF (FINAL RISE)                                    BLP17840
      IF(ISTAB.GT.4)GO TO 50                                            BLP17850
C                                                                       BLP17860
C     NEUTRAL (OR UNSTABLE) CONDITIONS                                  BLP17870
C                                                                       BLP17880
      P3=3.*P                                                           BLP17890
      EP=2.+P3                                                          BLP17900
      EPI=1./EP                                                         BLP17910
C     CONSTANT 2.4=4.*BETA WITH BETA=0.6                                BLP17920
      T1=(EP*EP*N*FPRIME*HB**P3/(2.4*(2.+P)*L*UM**3))**EPI              BLP17930
      Z=T1*XMATCH**(2.*EPI)                                             BLP17940
C     CONSTANT 1.2 = 2.*BETA WITH BETA=0.6                              BLP17950
      U=(N*FPRIME/(1.2*L)*(XMATCH/Z)**2)**0.333333                      BLP17960
      U=AMAX1(U,UM)                                                     BLP17970
      RETURN                                                            BLP17980
50    CONTINUE                                                          BLP17990
C                                                                       BLP18000
C     STABLE CONDITIONS                                                 BLP18010
C                                                                       BLP18020
      P2=2.+P                                                           BLP18030
C     CONSTANT 0.6 = BETA                                               BLP18040
      Z=(P2*HB**P*N*FPRIME/(0.6*L*UM*S))**(1./P2)                       BLP18050
C     CONSTANT 3.3333333 = 2./BETA WITH BETA=0.6                        BLP18060
      U=3.3333333*N*FPRIME/(L*S*Z*Z)                                    BLP18070
      U=AMAX1(U,UM)                                                     BLP18080
      RETURN                                                            BLP18090
      END                                                               BLP18100
C
      SUBROUTINE LENG(THETA,U)                                          BLP18110
C                                                                       BLP18120
C                                                                       BLP18130
      REAL L,LEFF,LD,LEFF1,LEFFV                                        BLP18140
      LOGICAL LSHEAR,LTRANS                                             BLP18150
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,   BLP18160
     1 LTRANS                                                           BLP18170
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                             BLP18180
      DATA RAD/0.0174533/                                               BLP18190
C                                                                       BLP18200
C     THIS SUBROUTINE CALCULATES XFB,LEFF,LD,R0                         BLP18210
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C                                                                       BLP18220
C     FPRIME IS THE BUOYANCY FLUX OF ONE LINE; FP IS THE EFFECTIVE      BLP18230
C     BUOYANCY FLUX OF N LINES                                          BLP18240
      FP=N*FPRIME                                                       BLP18250
      TRAD=THETA*RAD                                                    BLP18260
      SINT=ABS(SIN(TRAD))                                               BLP18270
      COST=ABS(COS(TRAD))                                               BLP18280
C     CALCULATE DISTANCE OF FULL BUOYANCY (XFB)                         BLP18290
      DXM=DX+WB                                                         BLP18300
      XFB=L*COST+(N-1)*DXM*SINT                                         BLP18310
C     CALCULATE EFFECTIVE LINE SOURCE LENGTH (LEFF) AND                 BLP18320
C     EFFECTIVE DOWNWASH LINE LENGTH (LD)                               BLP18330
      LEFF1=L*SINT                                                      BLP18340
      IF(N.EQ.1)GO TO 112                                               BLP18350
C     CONSTANT 0.8333333 = 1./(2.*BETA) WITH BETA=0.6                   BLP18360
      ZI=0.8333333*DXM                                                  BLP18370
C     CONSTANT 2.2619467 = 2.*PI*BETA*BETA WITH BETA=0.6                BLP18380
C     CONSTANT 1.5915494 = 3./(PI*BETA) WITH BETA=0.6                   BLP18390
      T1=(2.2619467*U**3/FPRIME)*ZI*ZI*(ZI+1.5915494*WM)                BLP18400
      XI=(T1*L)**0.333333                                               BLP18410
      IF(XI.LE.L)GO TO 55                                               BLP18420
      XI=L/2.+SQRT(12.*T1-3.*L*L)/6.                                    BLP18430
C     CONSTANT 1.2 = 2.*BETA WITH BETA=0.6                              BLP18440
C     CONSTANT 0.6283185 = PI*BETA/3. WITH BETA=0.6                     BLP18450
      LEFFV=FP*(L*L/3.+XI*(XI-L))/(1.2*U**3*ZI*ZI)-0.6283185*ZI         BLP18460
      GO TO 110                                                         BLP18470
55    CONTINUE                                                          BLP18480
C     CONSTANT 3.6 = 6.*BETA WITH BETA=0.6                              BLP18490
C     CONSTANT 0.6283185 = PI*BETA/3. WITH BETA=0.6                     BLP18500
      LEFFV=FP/(3.6*L*ZI*ZI)*(XI/U)**3-0.6283185*ZI                     BLP18510
110   LEFF=LEFF1+LEFFV*COST                                             BLP18520
      LD=LEFF*SINT                                                      BLP18530
C     CALCULATE DOWNWASHED EDGE RADIUS                                  BLP18540
      R0=AMIN1(HB,LD)/AVFACT                                            BLP18550
      RETURN                                                            BLP18560
C     IF N = 1, NO INTERACTION AT ANY X, I.E.,                          BLP18570
C     LEFFV = WM; FP = FPRIME; XFB = L * COST + WM * SINT               BLP18580
112   LEFFV=WM                                                          BLP18590
      FP=FPRIME                                                         BLP18600
      XFB=XFB+WM*SINT                                                   BLP18610
      GO TO 110                                                         BLP18620
      END                                                               BLP18630
C
      SUBROUTINE RISE(U,ISTAB,S)                                        BLP18640
C                                                                       BLP18650
C                                                                       BLP18660
      REAL L,LEFF,LD                                                    BLP18670
      LOGICAL LSHEAR,LTRANS                                             BLP18680
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,   BLP18690
     1 LTRANS                                                           BLP18700
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                             BLP18710
      COMMON/RINTP/XDIST(7),DH(7)                                       BLP18720
C                                                                       BLP18730
C     THIS SUBROUTINE CALCULATES LINE SOURCE PLUME RISE                 BLP18740
C     USING AN OPTIONAL VERTICAL WIND SHEAR CORRECTED 'EFFECTIVE' WIND  BLP18750
C     SPEED FOR BOTH NEUTRAL AND STABLE CONDITIONS                      BLP18760
C                                                                       BLP18770
C     CONSTANT 1.5915494 = 3./(PI*BETA) WITH BETA=0.6                   BLP18780
C     CONSTANT 5.0 = 3./BETA WITH BETA=0.6                              BLP18790
      A=1.5915494*LEFF+5.*R0                                            BLP18800
C     CONSTANT 5.3051648 = 6./(PI*BETA*BETA) WITH BETA=0.6              BLP18810
C     CONSTANT 8.3333333 = 3./(BETA*BETA) WITH BETA=0.6                 BLP18820
      B=R0*(5.3051648*LD+8.333333*R0)                                   BLP18830
      DO 1000 I=2,7                                                     BLP18840
      X=XDIST(I)                                                        BLP18850
      IF(ISTAB.LE.4)GO TO 90                                            BLP18860
C     WITH STABLE CONDITIONS, USE NEUTRAL RISE EQUATION                 BLP18870
C     FOR TRANSITIONAL RISE CALCULATIONS, BUT CALCULATE                 BLP18880
C     FINAL RISE BASED ON THE FINAL STABLE RISE EQUATION                BLP18890
      IF(X.LT.XFS)GO TO 90                                              BLP18900
C     CALCULATE FINAL (STABLE) PLUME RISE                               BLP18910
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C     CONSTANT 5.3051648 = 6./(PI*BETA*BETA) WITH BETA=0.6              BLP18920
92    C=-5.3051648*FP/(U*S)                                             BLP18930
      GO TO 8                                                           BLP18940
90    CONTINUE                                                          BLP18950
      IF(X.LE.XFB)GO TO 80                                              BLP18960
7     CONTINUE                                                          BLP18970
C     CONSTANT 1.3262912 = 3./(2.*PI*BETA*BETA) WITH BETA=0.6           BLP18980
      C=-1.3262912*FP*(XFB*XFB/3.+X*X-XFB*X)/U**3                       BLP18990
8     CONTINUE                                                          BLP19000
      CALL CUBIC(A,B,C,Z)                                               BLP19010
12    CONTINUE                                                          BLP19020
      DH(I)=Z                                                           BLP19030
      GO TO 1000                                                        BLP19040
C     CONSTANT 0.4420971 = 1./(2.*PI*BETA*BETA) WITH BETA=0.6           BLP19050
80    C=-0.4420971*(FP/XFB)*(X/U)**3                                    BLP19060
      GO TO 8                                                           BLP19070
1000  CONTINUE                                                          BLP19080
      RETURN                                                            BLP19090
      END                                                               BLP19100
C
      SUBROUTINE ZRISE(IL,IS,IR,Z)                                      BLP19110
C                                                                       BLP19120
C                                                                       BLP19130
      REAL LEFF,LD,LELEV                                                BLP19140
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),          BLP19150
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                 BLP19160
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), BLP19170
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),                 BLP19180
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),     BLP19190
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      BLP19200
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                             BLP19210
      COMMON/RINTP/XDIST(7),DH(7)                                       BLP19220
C                                                                       BLP19230
C     Z1 IS THE PLUME HEIGHT OF THE HIGHEST PLUME SEGMENT AT X = XFB    BLP19240
C     (EXCEPT IN THE SPECIAL CASE OF STABLE CONDITIONS WITH             BLP19250
C     THE DISTANCE TO FINAL RISE (XFS) LESS THAN XFB -- IN              BLP19260
C     THAT CASE, Z1 IS THE HEIGHT OF THE HIGHEST PLUME ELEMENT          BLP19270
C     AT X=XFS)                                                         BLP19280
C     XI IS THE DISTANCE OF THE CURRENT LINE SEGMENT TO XFB             BLP19290
C                                                                       BLP19300
      Z1=DH(2)                                                          BLP19310
      XI=XFB-XRCS(IL,IS)                                                BLP19320
      XI=AMAX1(XI,0.0)                                                  BLP19330
      XI=AMIN1(XI,XFB)                                                  BLP19340
      ZXFB=Z1*(1.-(XFB-XI)/XFB)                                         BLP19350
C     Z2 IS THE PLUME HEIGHT OF THE HIGHEST SEGMENT AT X                BLP19360
      CALL INTRSE(XRRCS(IR),Z2)                                         BLP19370
      DELTAZ=Z2-Z1                                                      BLP19380
      Z=ZXFB+DELTAZ                                                     BLP19390
      RETURN                                                            BLP19400
      END                                                               BLP19410
C
      SUBROUTINE INTRSE(X,Z)                                            BLP19420
C                                                                       BLP19430
C                                                                       BLP19440
      REAL LEFF,LD                                                      BLP19450
      COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                             BLP19460
      COMMON/RINTP/XDIST(7),DH(7)                                       BLP19470
C                                                                       BLP19480
C     THIS SUBROUTINE INTERPOLATES THE PLUME RISE OF THE TOP (HIGHEST)  BLP19490
C     PLUME ELEMENT AT ANY DISTANCE X USING THE CALCULATED              BLP19500
C     PLUME RISE AT SEVEN POINTS (XDIST(1-7))                           BLP19510
C                                                                       BLP19520
      IF (X.GT.XDIST(7))GO TO 55                                        BLP19530
      DO 10 I=2,6                                                       BLP19540
      IF(X.GT.XDIST(I))GO TO 10                                         BLP19550
      INDEX=I                                                           BLP19560
      GO TO 11                                                          BLP19570
10    CONTINUE                                                          BLP19580
      INDEX=5                                                           BLP19590
11    CONTINUE                                                          BLP19600
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      INDEX1=INDEX-1                                                    BLP19610
      Z=DH(INDEX)-(DH(INDEX)-DH(INDEX1))*(XDIST(INDEX)-X)/              BLP19620
     1 (XDIST(INDEX)-XDIST(INDEX1))                                     BLP19630
      RETURN                                                            BLP19640
55    CONTINUE                                                          BLP19650
C     PLUME REACHES FINAL RISE                                          BLP19660
      Z=DH(7)                                                           BLP19670
      RETURN                                                            BLP19680
      END                                                               BLP19690
C
      SUBROUTINE DBTSIG (X,XY,KST,SY,SZ)                                BLP19700
C                                                                       BLP19710
C                                                                       BLP19720
      DIMENSION XA(7),XB(2),XD(5),XE(8),XF(9),AA(8),BA(8),AB(3),BB(3),  BLP19730
     1 AD(6),BD(6),AE(9),BE(9),AF(10),BF(10)                            BLP19740
      DATA XA/.5,.4,.3,.25,.2,.15,.1/                                   BLP19750
      DATA XB/.4,.2/                                                    BLP19760
      DATA XD /30.,10.,3.,1.,.3/                                        BLP19770
      DATA XE /40.,20.,10.,4.,2.,1.,.3,.1/                              BLP19780
      DATA XF /60.,30.,15.,7.,3.,2.,1.,.7,.2/                           BLP19790
      DATA AA /453.85,346.75,258.89,217.41,179.52,170.22,158.08,122.8/  BLP19800
      DATA BA /2.1166,1.7283,1.4094,1.2644,1.1262,1.0932,1.0542,.9447/  BLP19810
      DATA AB /109.30,98.483,90.673/                                    BLP19820
      DATA BB /1.0971,0.98332,0.93198/                                  BLP19830
      DATA AD /44.053,36.650,33.504,32.093,32.093,34.459/               BLP19840
      DATA BD /0.51179,0.56589,0.60486,0.64403,0.81066,0.86974/         BLP19850
      DATA AE /47.618,35.420,26.970,24.703,22.534,21.628,21.628,23.331, BLP19860
     1 24.26/                                                           BLP19870
      DATA BE /0.29592,0.37615,0.46713,0.50527,0.57154,0.63077,0.75660, BLP19880
     1 0.81956,0.8366/                                                  BLP19890
      DATA AF /34.219,27.074,22.651,17.836,16.187,14.823,13.953,13.953, BLP19900
     1 14.457,15.209/                                                   BLP19910
      DATA BF /0.21716,0.27436,0.32681,0.41507,0.46490,0.54503,0.63227, BLP19920
     1 0.68465,0.78407,0.81558/                                         BLP19930
      GO TO (10,20,30,40,50,60),KST                                     BLP19940
C        STABILITY A (10)                                               BLP19950
   10 TH = (24.167 - 2.5334*ALOG(XY))/57.2958                           BLP19960
      IF (X.GT.3.11) GO TO 69                                           BLP19970
      DO 11 ID = 1,7                                                    BLP19980
      IF(X.GE.XA(ID)) GO TO 12                                          BLP19990
   11 CONTINUE                                                          BLP20000
      ID = 8                                                            BLP20010
   12 SZ = AA(ID) * X ** BA(ID)                                         BLP20020
      GO TO 71                                                          BLP20030
C        STABILITY B (20)                                               BLP20040
   20 TH = (18.333 - 1.8096*ALOG(XY))/57.2958                           BLP20050
      IF(X.GT.35.) GO TO 69                                             BLP20060
      DO 21 ID = 1,2                                                    BLP20070
      IF (X.GE.XB(ID)) GO TO 22                                         BLP20080
   21 CONTINUE                                                          BLP20090
      ID = 3                                                            BLP20100
   22 SZ = AB(ID) * X ** BB(ID)                                         BLP20110
      GO TO 70                                                          BLP20120
C        STABILITY C (30)                                               BLP20130
   30 TH = (12.5 - 1.0857*ALOG(XY))/57.2958                             BLP20140
      SZ = 61.141 *X ** 0.91465                                         BLP20150
      GO TO 70                                                          BLP20160
C        STABILITY D (40)                                               BLP20170
   40 TH = (8.3333-0.72382*ALOG(XY))/57.2958                            BLP20180
      DO 41 ID = 1,5                                                    BLP20190
      IF (X.GE.XD(ID)) GO TO 42                                         BLP20200
   41 CONTINUE                                                          BLP20210
      ID = 6                                                            BLP20220
   42 SZ = AD(ID) * X ** BD(ID)                                         BLP20230
      GO TO 70                                                          BLP20240
C        STABILITY E (50)                                               BLP20250
   50 TH = (6.25 - 0.54287*ALOG(XY))/57.2958                            BLP20260
      DO 51 ID = 1,8                                                    BLP20270
      IF (X.GE.XE(ID)) GO TO 52                                         BLP20280
   51 CONTINUE                                                          BLP20290
      ID = 9                                                            BLP20300
```

```
   52 SZ = AE(ID) * X ** BE(ID)                                          BLP20310
      GO TO 70                                                           BLP20320
C        STABILITY F (60)                                                BLP20330
   60 TH = (4.1667 - 0.36191*ALOG(XY))/57.2958                           BLP20340
      DO 61 ID = 1,9                                                     BLP20350
      IF (X.GE.XF(ID)) GO TO 62                                          BLP20360
   61 CONTINUE                                                           BLP20370
      ID = 10                                                            BLP20380
   62 SZ = AF(ID) * X ** BF(ID)                                          BLP20390
      GO TO 70                                                           BLP20400
   69 SZ = 5000.                                                         BLP20410
      GO TO 71                                                           BLP20420
   70 IF (SZ.GT.5000.) SZ = 5000.                                        BLP20430
   71 SY = 1000. * XY * SIN(TH)/(2.15 * COS(TH))                         BLP20440
      RETURN                                                             BLP20450
      END                                                                BLP20460
C
      SUBROUTINE SIGMAY(XKM,KST,SY)                                      BLP20470
C                                                                        BLP20480
C                                                                        BLP20490
C                                                                        BLP20500
C     THIS SUBROUTINE CALCULATES SIGMA Y                                 BLP20510
C                                                                        BLP20520
      GO TO (10,20,30,40,50,60),KST                                      BLP20530
10    TH=(24.167-2.5334*ALOG(XKM))/57.2958                               BLP20540
      GO TO 70                                                           BLP20550
20    TH=(18.333-1.8096*ALOG(XKM))/57.2958                               BLP20560
      GO TO 70                                                           BLP20570
30    TH=(12.5-1.0857*ALOG(XKM))/57.2958                                 BLP20580
      GO TO 70                                                           BLP20590
40    TH=(8.3333-0.72385*ALOG(XKM))/57.2958                              BLP20600
      GO TO 70                                                           BLP20610
50    TH=(6.25-0.54287*ALOG(XKM))/57.2958                                BLP20620
      GO TO 70                                                           BLP20630
60    TH=(4.1667-0.36191*ALOG(XKM))/57.2958                              BLP20640
70    SY=1000.*XKM*SIN(TH)/(2.15*COS(TH))                                BLP20650
      RETURN                                                             BLP20660
      END                                                                BLP20670
C
      FUNCTION XVZ (SZO,KST)                                             BLP20680
C                                                                        BLP20690
C                                                                        BLP20700
      DIMENSION SA(7),SB(2),SD(5),SE(8),SF(9),AA(8),AB(3),AD(6),AE(9),   BLP20710
     * AF(10),CA(8),CB(3),CD(6),CE(9),CF(10)                             BLP20720
      DATA SA /13.95,21.40,29.3,37.67,47.44,71.16,104.65/                BLP20730
      DATA SB /20.23,40./                                                BLP20740
      DATA SD /12.09,32.09,65.12,134.9,251.2/                            BLP20750
      DATA SE /3.534,8.698,21.628,33.489,49.767,79.07,109.3,141.86/      BLP20760
      DATA SF /4.093,10.93,13.953,21.627,26.976,40.,54.89,68.84,83.25/   BLP20770
      DATA AA /122.8,158.08,170.22,179.52,217.41,258.89,346.75,453.85/   BLP20780
      DATA AB /90.673,98.483,109.3/                                      BLP20790
      DATA AD /34.459,32.093,32.093,33.504,36.650,44.053/                BLP20800
      DATA AE /24.26,23.331,21.628,21.628,22.534,24.703,26.97,35.42,     BLP20810
     * 47.618/                                                           BLP20820
      DATA AF /15.209,14.457,13.953,13.953,14.823,16.187,17.836,22.651,  BLP20830
     * 27.074,34.219/                                                    BLP20840
      DATA CA /1.0585,.9486,.9147,.8879,.7909,.7095,.5786,.4725/         BLP20850
      DATA CB /1.073,1.017,.9115/                                        BLP20860
      DATA CD /1.1498,1.2336,1.5527,1.6533,1.7671,1.9539/                BLP20870
      DATA CE /1.1953,1.2202,1.3217,1.5854,1.7497,1.9791,2.1407,2.6585,  BLP20880
     * 3.3793/                                                           BLP20890
      DATA CF /1.2261,1.2754,1.4606,1.5816,1.8348,2.151,2.4092,3.0599,   BLP20900
     * 3.6448,4.6049/                                                    BLP20910
      GO TO (10,20,30,40,50,60),KST                                      BLP20920
C        STABILITY A(10)                                                 BLP20930
10    DO 11 ID = 1,7                                                     BLP20940
      IF(SZO.LE.SA(ID)) GO TO 12                                         BLP20950
11    CONTINUE                                                           BLP20960
      ID = 8                                                             BLP20970
12    XVZ =(SZO/AA(ID))**CA(ID)                                          BLP20980
      RETURN                                                             BLP20990
```

```
C        STABILITY B (20)                                              BLP21000
20    DO 21 ID = 1,2                                                   BLP21010
      IF (SZO.LE.SB(ID)) GO TO 22                                      BLP21020
21    CONTINUE                                                         BLP21030
      ID = 3                                                           BLP21040
22    XVZ = (SZO/AB(ID))**CB(ID)                                       BLP21050
      RETURN                                                           BLP21060
C        STABILITY C (30)                                              BLP21070
30    XVZ = (SZO/61.141)**1.0933                                       BLP21080
      RETURN                                                           BLP21090
C        STABILITY D (40)                                              BLP21100
40    DO 41 ID = 1,5                                                   BLP21110
      IF(SZO.LE.SD(ID)) GO TO 42                                       BLP21120
41    CONTINUE                                                         BLP21130
      ID = 6                                                           BLP21140
42    XVZ = (SZO/AD(ID))**CD(ID)                                       BLP21150
      RETURN                                                           BLP21160
C        STABILITY E (50)                                              BLP21170
50    DO 51 ID = 1,8                                                   BLP21180
      IF (SZO.LE.SE(ID)) GO TO 52                                      BLP21190
51    CONTINUE                                                         BLP21200
      ID = 9                                                           BLP21210
52    XVZ = (SZO/AE(ID))**CE(ID)                                       BLP21220
      RETURN                                                           BLP21230
C        STABILITY F(60)                                               BLP21240
60    DO 61 ID = 1,9                                                   BLP21250
      IF(SZO.LE.SF(ID)) GO TO 62                                       BLP21260
61    CONTINUE                                                         BLP21270
      ID = 10                                                          BLP21280
62    XVZ = (SZO/AF(ID))**CF(ID)                                       BLP21290
      RETURN                                                           BLP21300
      END                                                              BLP21310
C
      FUNCTION XVY (SYO,KST)                                           BLP21320
C                                                                      BLP21330
C                                                                      BLP21340
      GO TO (1,2,3,4,5,6),KST                                          BLP21350
1     XVY = (SYO/213.)**1.1148                                         BLP21360
      RETURN                                                           BLP21370
2     XVY = (SYO/155.)**1.097                                          BLP21380
      RETURN                                                           BLP21390
3     XVY = (SYO/103.)**1.092                                          BLP21400
      RETURN                                                           BLP21410
4     XVY = (SYO/68.)**1.076                                           BLP21420
      RETURN                                                           BLP21430
5     XVY = (SYO/50.)**1.086                                           BLP21440
      RETURN                                                           BLP21450
6     XVY = (SYO/33.5)**1.083                                          BLP21460
      RETURN                                                           BLP21470
      END                                                              BLP21480
C
      BLOCK DATA                                                       BLP21490
C                                                                      BLP21500
C                                                                      BLP21510
      REAL L,LELEV                                                     BLP21520
      LOGICAL LSHEAR,LMETIN,LMETOT,LTRANS                              BLP21530
      COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AVFACT,TWOHB,N,LSHEAR,  BLP21540
     1 LTRANS                                                          BLP21550
      COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR BLP21560
      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), BLP21570
     1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),                BLP21580
     2 NPTS,XPSCS(50),YPSCS(50),PQ(50),PHS(50),XPRCS(50),YPRCS(50),    BLP21590
     3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)     BLP21600
      COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),         BLP21610
     1 YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NREC                BLP21620
      COMMON/RINTP/XDIST(7),DH(7)                                      BLP21630
      COMMON/OUTPT/IPCL(11),IPCP(51)                                   BLP21640
      COMMON/PARM/CRIT,TER1,DECFAC,XBACKG,CONST2,CONST3,MAXIT          BLP21650
      COMMON/METD24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24),    BLP21660
     1 DTHTA(2),PEXP(6),IDELS,IDSURF,IYSURF,IDUPER,IYUPER,TERAN(6),    BLP21670
     2 IRU,IHRMAX,LMETIN,LMETOT,IDAYS(366)                             BLP21680
```

```
CPES  Begin PES Code Changes

      CHARACTER RUNDAT*8, RUNTIM*8, VERSN*5
      COMMON/DATETIME/ RUNDAT, RUNTIM, VERSN
      DATA RUNDAT/' '/, RUNTIM/' '/, VERSN/'99176'/

CPES  End PES Code Changes
      DATA AVFACT/1.0/                                                  BLP21690
      DATA NLINES/0/,NPTS/0/,NREC/0/,TCOR/90.0/                         BLP21700
      DATA ZMEAS/7.0/,DTHTA/0.02,0.035/,IDELS/5/,IDAYS/366*0/           BLP21710
      DATA IRU/1/,IHRMAX/24/                                            BLP21720
      DATA LSHEAR/.TRUE./,LMETIN/.FALSE./,LMETOT/.FALSE./,LTRANS/.TRUE./BLP21730
      DATA PEXP/0.10,0.15,0.20,0.25,0.30,0.30/                          BLP21740
      DATA IYSURF/0/,IYUPER/0/                                          BLP21750
      DATA CRIT/0.02/,DECFAC/0.0/,XBACKG/0.0/,CONST2/2.6/,CONST3/34.49/,BLP21760
     1 TERAN/0.5,0.5,0.5,0.5,0.30,0.30/,MAXIT/14/                       BLP21770
      DATA IPCL/11*0/,IPCP/51*0/                                        BLP21780
      DATA RXBEG/0.0/,RYBEG/0.0/,RXEND/0.0/,RYEND/0.0/,RDX/0.0/,RDY/0.0/BLP21790
      DATA XRSCS/100*0.0/,YRSCS/100*0.0/,RELEV/100*0.0/                 BLP21800
      DATA XLBEG/10*0.0/,XLEND/10*0.0/,YSCS/10*0.0/,                    BLP21810
     1 HS/10*0.0/,QT/10*0.0/,LELEV/10*0.0/                              BLP21820
      DATA XPSCS/50*0.0/,YPSCS/50*0.0/,PHS/50*0.0/,PQ/50*0.0/,          BLP21830
     1 APTS/50*0.0/,TSTACK/50*0.0/,PELEV/50*0.0/,IDOWNW/50*0/           BLP21840
      END                                                               BLP21850
C
      SUBROUTINE COMPRS(IDAYHR,ICD,IMET2,NREC,CHIS)                     BLP21860
C                                                                       BLP21870
C                                                                       BLP21880
      REAL CHIS(NREC),CHIOUT(100)                                       BLP21890
C                                                                       BLP21900
C     ARRAY COMPRESSION TECHNIQUE USES NEGATIVE NUMBERS TO FLAG ZEROES  BLP21910
C     FOR EXAMPLE, CHIS=12.5, 12.2, 0.0, 0.0, 0.0, 10.1, 0.0, 15.1,     BLP21920
C     16.7, 0.0, 0.0, 0.0, 0.0, 0.0 IS STORED AS:                       BLP21930
C     CHIOUT=12.5, 12.2, -3., 10.1, -1., 15.1, 16.7, -5.                BLP21940
C     WHERE -3 REPLACES THREE ZEROES, -1 REPLACES ONE ZERO, ETC.        BLP21950
C                                                                       BLP21960
      NZERO=0                                                           BLP21970
      II=0                                                              BLP21980
      DO 100 I=1,NREC                                                   BLP21990
      IF(CHIS(I).NE.0.0)GO TO 50                                        BLP22000
      NZERO=NZERO+1                                                     BLP22010
      GO TO 100                                                         BLP22020
50    CONTINUE                                                          BLP22030
      IF(NZERO.EQ.0)GO TO 70                                            BLP22040
      II=II+1                                                           BLP22050
      CHIOUT(II)=-NZERO                                                 BLP22060
      NZERO=0                                                           BLP22070
70    CONTINUE                                                          BLP22080
      II=II+1                                                           BLP22090
      CHIOUT(II)=CHIS(I)                                                BLP22100
100   CONTINUE                                                          BLP22110
      IF(NZERO.EQ.0)GO TO 105                                           BLP22120
      II=II+1                                                           BLP22130
      CHIOUT(II)=-NZERO                                                 BLP22140
105   CONTINUE                                                          BLP22150
      WRITE(20)II                                                       BLP22160
      CALL OUT(IDAYHR,ICD,IMET2,II,CHIOUT)                              BLP22170
      RETURN                                                            BLP22180
      END                                                               BLP22190
C
      SUBROUTINE OUT(IDAYHR,ICD,IMET2,II,CHIOUT)                        BLP22200
C                                                                       BLP22210
C                                                                       BLP22220
      REAL CHIOUT(II)                                                   BLP22230
      WRITE(20)IDAYHR,ICD,IMET2,CHIOUT                                  BLP22240
      RETURN                                                            BLP22250
      END                                                               BLP22260
```

Model Clearinghouse Information Storage and Retrieval System
Record Details

Allegheny Co. PM-10 SIP - Aug 91

Record No: 91-III -12 **Last Update: / /**

EPA Region:	3	*Fiscal Year:*	1991
States:	PA		
Record Type:	Informal		
Pollutants:	PM-10	*Sources:*	Steel Facility
Models:	ISCST,BLP,SHORTZ	*Urban/Rural:*	Urban
Terrain:	Both High & Low	*Regulations:*	SIP
Guideline:	Both	*Database:*	Offsite
Oral/Written:	Oral	*Involvement:*	Review and Comment
Subjects:	Emissions Characterization Mixed Terrain Modeling Plume Rise		
Comments:			

8/20/91

Process fugitives from the Clairton Coke ovens dominate the PM-10 picture in the area. A big problem is that the coke oven emissions are hot and some plume rise is expected; however there is no accepted method for estimating that rise. (R-III has talked to G. Briggs with no clear solution to that problem.) Also, most of the receptors outside of plant property are on complex terrain. The local agency does not have the expertise to address this complicated problem and R-III is providing advice on what EPA will accept in the SIP. (The SIP will not make the 11/15/91 deadline but will come in sometime in the next 18 months, to avoid a FIP.)

Issue: R-III proposes 4 alternative technical solutions to the problem.

1. Assume, conservatively, no plume rise and model with ISCST as a surface-based volume source with terrain following. (May be too conservative.)
2. Use lidar or photography to determine plume rise and model with SHORTZ. (May be too expensive.)

3. Use technique developed by Layland and Mersch in 1985, involving SHORTZ and plume rise calculated from BLP (technique was never published and may suffer from credibility.)
4. Use BLP directly since the source looks somewhat like a pot line from an aluminum mill. (C/H is skeptical.)

C/H Comment: Write up the 4 options with technical support for each and send to the C/H.

Model Clearinghouse Information Storage and Retrieval System
Record Details

USX-June 93
Record No: 93-III -06 **Last Update: / /**

EPA Region:	3	*Fiscal Year:*	1993
States:	PA		
Record Type:	Oral		
Pollutants:	PM-10	*Sources:*	Steel Facility
Models:	IGM	*Urban/Rural:*	Urban
Terrain:	Both High & Low	*Regulations:*	SIP
Guideline:	Non Guideline	*Database:*	Offsite
Oral/Written:	Oral	*Involvement:*	Review and Comment
Subjects:	Plume Rise		
Comments:			

6/9/93

Previously the Region had agreed with Allegheny County that BLP could be used for plume rise calculations as input into IGM\ISC2. To do this the County wants to alter a few lines of code in IGM.

Issue: R-III does not believe that this minor change should make IGM a new non-guideline model. The Region has reviewed the code changes and sees no problem.

C/H Comment: Defer to Region III judgment. United Engineers and Constructors should be made aware of the changes.

Model Clearinghouse Information Storage and Retrieval System
Record Details

OH/WV PM-10 SIP-Dec 93

Record No: 94-III -02 **Last Update: 01/15/1997**

EPA Region:	3	*Fiscal Year:*	1994
States:	OH-WV		
Record Type:	Informal		
Pollutants:	PM-10	*Sources:*	Steel Facility,Mixed/Multiple Sources
Models:	BLP,IGM	*Urban/Rural:*	Rural
Terrain:	Both High & Low	*Regulations:*	SIP
Guideline:	Both	*Database:*	Onsites
Oral/Written:	Oral	*Involvement:*	Review and Comment
Subjects:	Emissions Characterization Plume Rise		
Comments:			

RECORD OF COMMUNICATION

_x__TELEPHONE CALL ___MEETING ___CONFERENCE CALL ___OTHER

INFORMATION COPIES TO: Gary John Becky Tom C.

TO: D. Wilson
FROM: R. Calby, R. Robinson, J. Summerhays
DATE: 12/9/93
TIME:
SUBJ: OH/WV PM-10 SIP (Steubenville/Follansbee)

SUMMARY OF COMMUNICATION:

Recall that the SIP demonstration was determined to be inadequate because of inappropriate mixed terrain modeling for Wheeling-Pitt on the WV side. (Actually there are some Wheeling-Pitt facilities on the OH side also.) Region V has been looking at

how to do the modeling.

Issue: Wheeling-Pitt has suggested that they be allowed to use BLP plume rise for the coke ovens, to apply to volume sources for input to IGM, such as is being done at the Clairton Coke works in PA. They want to extend the argument to use the BLP plume rise for the BOF furnaces as well.

Discussion: Region V has always used non buoyant volume sources for these types of facilities. It was agreed that such a treatment would be conservative. Two types of problems were identified with the Wheeling-Pitt proposal. First: Neither the coke ovens or the BOF shop are really buoyant line sources, in the sense that aluminum reduction plants are. In fact it seems that the coke ovens are significantly different from the classic aluminum plant where there is a row of "pot lines" on the floor of a long building; emissions are out the roof monitors of such buildings. The BOF building may be somewhat like that but the emissions are more concentrated at one point on the roof monitor, directly above the furnace. The second problem is that, even if the BLP approach can be justified, there is no way of knowing that ISC/RTDM (IGM) will work correctly with the BLP plume rise. Our experience has been that one cannot arbitrarily take modules from one model and place them in another, and expect the performance of the model to improve.

FOLLOWUP ANTICIPATED:
Agreed that D. Wilson would discuss the problem with T. Casey

MODEL CLEARINGHOUSE RECORDS INFORMATION:
SOURCE NAME: Wheeling Pitt
LOCATION: WV/OH
SOURCE TYPE: Steel Plant
POLLUTANTS: PM-10
REGULATION(S) INVOLVED: SIP
MET. DATA BASES (ON/OFF-SITE): On
MODEL(S) USED: IGM BLP

RECORD OF COMMUNICATION

_x__TELEPHONE CALL ___MEETING ___CONFERENCE CALL ___OTHER

INFORMATION COPIES TO: John Joe

TO: T. Casey
FROM: D. Wilson
DATE: 12/13/93
TIME:
SUBJ: OH/WV PM-10 SIP

SUMMARY OF COMMUNICATION:
Relayed the issues in the 12/9/93 telecon with R-V. R-III believes they have gotten the OK from us in the past to use BLP plume rise in IGM for Clairton. Basis was Layland used it in 1985 and Briggs endorses it. (A check with the C/H files indicates that the C/H did not agree with R-III usage of BLP plume rise. Indeed we asked them to send in the proposal to us as a written request.) R-III is aware of the Wheeling Pitt proposal, but has not offered an opinion to the State. They have also talked with R-V. They did not think it should be used for BOF furnaces. However, they seemed to be unaware of the nature of aluminum mills.

FOLLOWUP ANTICIPATED:
Discuss the precedent of Clairton with SRAB

MODEL CLEARINGHOUSE RECORDS INFORMATION:
SOURCE NAME: Wheeling Pitt
LOCATION: WV/OH
SOURCE TYPE: Steel
POLLUTANTS: PM-10
REGULATION(S) INVOLVED: SIP
MET. DATA BASES (ON/OFF-SITE): On
MODEL(S) USED: IGM BLP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

SUBJECT: Application of BLP Plume Rise to Volume Sources

DATE: DRAFT 3/10/94

FROM: Marcia L. Spink, Chief
Air & Radiation Programs Branch. (3AT10)

TO, Joseph A. Tikvart, Chief
Source-Receptor Analysis Branch (MD-14)

In response to your recent request, this memorandum describes the methodology employed by the Allegheny County Bureau of Environmental Quality to incorporate plume rise considerations into its modeling of battery fugitives at the Clairton Coke works. The purpose of this memorandum is to provide background information to help OAQPS make informed decisions or recommendations regarding any future applications of this technique. Region III has approved this methodology for the specific case of Allegheny County's attainment demonstration for the Liberty Borough (Clairton) PM-10 nonattainment area.

Coke oven batteries are much like long loaves of bread, in which each slice is an oven. Batteries are typically on the order of six to fifteen meters tall and 50 to 300 meters long. The ovens are charged with coal through ports on the top of each oven. The coal is heated in the absence of air for twelve to 24 hours to produce coke. The oven doors (the crusts on left and right sides of each slice of bread) are then removed and the hot coke is pushed into a waiting quench car. The coke is then carried to the quench tower where it is cooled with water. Each oven is charged and pushed individually. Charging, pushing, leaking doors and topside seals all cause buoyant, fugitive emissions from battery. (See Figure 1, AP-42, 1986.).

None of the Guideline models provides techniques that are wholly satisfactory to characterize the dispersion of emissions from buoyant volume sources. ISC and SHORTZ/LONGZ provide for the initial dispersion of volume sources, but in both cases the emissions are modeled as terrain-following. This causes an overestimation of ground-level concentrations from buoyant sources under low wind speed conditions. BLP is only listed. in Appendix A of the Guideline for the modeling of emissions from

aluminum reduction facilities and has no provisions for complex terrain.

As you will recall, Allegheny County's modeling employs the BLP model to calculate plume rise and the plume rise is input into IGM on an hour-by-hour basis through the use of pseudo-stacks. (See attachments for more details.) This approach has the following advantages:

(1) effective release height is estimated using the methods of Schulman and Scire (1980):

(2) IGM, a model demonstrated to be equivalent to certain Guideline techniques, is used without alteration to accomplish concentration estimates; and.

(3) this approach can accommodate both simple and complex terrain.

Allegheny County's approach has the disadvantage that BLP has only been evaluated for modeling certain aluminum reduction plants. Care should be taken that we do not apply this technique to sources that differ too markedly from those under which BLP has been evaluated.

Attached please find relevant sections of Allegheny County's SIP submittal that describe its implementation of this technique. Also attached is an August 19, 1991 memo from Gary Briggs providing his views on the application of Schulman and Scire rise to Clairton's coke oven batteries. Please note that Gary concurs with the application of Schulman-Scire rise under low wind speed conditions only and that the parametric equations that Gary offers are "food for thought" and not meant to be used without further graphical or statistical analysis.

In summary, the use of a second model to calculate plume rise is unusual, but potentially approvable for general use on buoyant volume sources for the following reasons: (1) OAQPS set the precedent in 1985 by using a similar approach to model USX Clairton in support of section 112 standards for by-product coke ovens; 2) IGM, a model determined by EPA to be generically equivalent certain to Guideline models, was the model used to produce concentration estimates -- BLP was only used to develop input for IGM within the latitude generally afforded analysts in characterizing source inputs for Guideline models; and 3) there is no approach generally available to account for the buoyancy of volume sources.

If you have any questions or comments regarding this matter, please call me at (215) 597-9075 or Todd Ellsworth at (215) 597-2906, or your staff may call Tom Casey at (2].5) 597-2746.

cc: G. Briggs (MD-80)
R. Robinson (AE-17.J)

ATTACHMENTS WERE NOT ABLE TO BE SCANNED--SEE PAPER FILE]

RECORD OF COMMUNICATION

_x_TELEPHONE CALL _ MEETING CONFERENCE CALL _ OTHER

INFORMATION COPIES TO: Gary, John, Joe

TO: T. Casey
FROM: D. Wilson, D. Doll
DATE: 3/21/94
TIME:
SUBJ: Draft Reg. III Memo: BLP Plume Rise to Coke Ovens (OH/WV PM-10 SIP; Clairton Works)

SUMMARY OF COMMUNICATION:
Discussed comments/clarifications concerning draft Region III memo. from Marcia Spink to Joe Tikvart. Memo provides info on application of BLP plume rise to coke ovens at U.S. Steel Clairton Works with subsequent input to IGM. Procedure done by Allegheny city. Bureau of Enviro Qual and approved by Reg. III for Liberty Borough PM-10 nonattainment area. WV wants to apply same procedure to Wheeling-Pitt for Stuebenville/Follensbee PM-10 SIP. Procedure would apply to coke ovens and extended to BOF and blast furnaces. Issue: Can the procedure be supported for use at Clairton and, if so, can it supported for use at Wheeling-Pitt and extended to other furnaces there?

The procedure applied for Clairton first treats the Coke oven battery as a buoyant line source in BLP. Effective plume height is calculated for every hour and all wind speeds and stability categories. Downwash effects are accounted for in the BLP plume rise calculations. The coke oven battery is then characterized in IGM as a series of point sources ("pseudo-stacks") using effective plume height for every hour from the BLP. No plume rise or downwash effects are calculated in the subsequent IGM runs. Tom Casey noted that one of the motivations for using this technique is to better characterize plume impaction in complex terrain using IGM.

It was noted that in Region III communications with Gary Briggs, Gary would likely support the use of the BLP plume rise for low wind speed conditions but not for high wind speed cases.

It was also noted that the Layland-Mersch 1985 protocol for modeling toxic emissions from Clairton was for LONGZ model, i.e. not for a short term model. Also in that protocol there was a comparison of modeled and monitored data.

During the discussion, it became clearer that this is primarily a source characterization issue and no changes or modifications to

any models are planned. It was noted that it has been the C/H practice not to "second-guess" the Regions' determinations of source characterization.

The C/H inquired whether any comparisons of model predictions with monitored data exists for the Clairton Works using this technique. Tom Casey indicated some qualitative comparisons exist and will provide them to the C/H.

The C/H also noted that the possibility of extending the use of this technique to other similar sources (i.e., blast furnaces) could have wider implications with the other Regions. Thus, the C/H plans to review this approach with Region V and possibly other Regions in concerning the usage of this technique to other similar sources.

FOLLOW UP ANTICIPATED:

T. Casey to provide qualitative comparisons of model predictions with monitored data for the Clairton Works.

C/H to discuss issue with J. Irwin, J. Tikvart on C/H position on using this technique for Wheeling-Pitt and other similar sources.

C/H to discuss issue with Reg. V and possibly other Regions.

C/H to send draft response to Region III following internal and Regional Office discussions.

MODEL CLEARINGHOUSE RECORDS INFORMATION:
SOURCE NAME: Wheeling-Pitt
LOCATION: WV/OH
SOURCE TYPE: Steel Plant
POLLUTANTS: PM- 10
REGULATION(S) INVOLVED: SIP
MET. DATA BASES (ON/OFF-SITE): ON
MODEL(S) USED: BLP/IGM

From: Dennis Doll (DDOLL)
To: DWILSON
Date: Friday, March 25, 1994 3:49 pm
Subject: Discussion w/Reg V

Dean:

Randy Robinson and John Summerhays called to discuss Tom Casey memo. In summary, John Summerhays does not totally agree with the presumption of buoyant plume rise associated with all emission sources on a coke oven battery. They discussed this w/ an engineer in Reg. V that deals with steel plants. The engineer's view is that plume rise from door leaks and top leaks is not significant. Also, plume characteristics from pushing operations can vary substantially although John can accept the notion of some plume rise from pushing operations. Also, some coke oven batteries have substantial control devices (e.g., hoods over the ovens where push emissions are directed to a control device or a shed encompassing the whole oven). The batteries at Wheeling-Pitt apparently have some control devices installed.

Thus, John does not totally agree with the concept Tom Casey is presenting. I suggested, and they agreed, that we have a conference call w/Tom Casey and Reg. V to discuss in general the aspects and concerns of using this approach. I mentioned that I'll discuss this with you and get back to them next week.

APPLICATION OF BLP PLUME RISE TO COKE OVEN MODELING
(USX CLAIRTON AND WHEELING-PITT STEEL PLANTS)

PURPOSE

Review SRAB position on application of BLP plume rise to modeling of coke ovens and/or similar sources.

* Review SRAB position on use of technique for USX Clairton and Wheeling-Pitt steel plants.

* Identify next steps in responding to draft Reg. III memo which describes application of BLP plume rise to volume sources.

BACKGROUND

* Reg. III assisted Allegheny city. in developing methodology to use BLP plume rise in modeling USX Clairton Coke Oven emissions for Liberty Bor. PM-10 nonattainment area

* Methodology:

- Coke ovens represented as buoyant line source in BLP for plume rise calc.

- Plume rise calc. every hour. Downwash effects included

- Coke Ovens represented as point sources ("pseudo-stacks") in IGM incorporating plume rise from BLP.

- No plume rise calc. in IGM.

- Similar to Layland/Mersch; however LONGZ used there.

Stuebenville/Follansbee PM-10 SIP disapproved because of, among other issues, inadequate modeling of Wheeling-Pitt steel plant in Follansbee. WV considering using "Clairton" modeling methodology for Wheeling-Pitt coke ovens. Considering extending to BOF and blast furnaces. Reg. III/Reg. V issue.

* Region III draft memo describes modeling methodology for Clairton coke ovens:

Approved for Liberty Bor. PM-10 SIP

- Supported this methodology to accommodate plume rise and complex terrain impacts.

- Noted that Gary Briggs would likely support use of BLP plume rise for low wind speeds but not likely for high wind speeds.

Contends use of second model to calc. plume rise "potentially approvable" for general use on buoyant volume sources because:

- no precedent set with Layland/Mersch report
- no IGM equivalent to Guideline models - BLP used only to develop input to IGM "within latitude afforded analysts in characterizing source input."
- no viable approach for accommodating buoyant volume sources

- No modeled/monitored data comparisons provided but are being developed by Allegheny Co.

C/H discussion of modeling methodology with Region V (Robinson, Summerhays):

Do not agree with treatment of all coke oven emission sources (i.e., door leaks, topside, pushing, charging) with buoyant plume rise. Asserts modeling may overstate plume rise of emissions.

- In theory, can accept some plume rise for pushing operations .
  - Reg. V engineer does not observe substantial plume rise from door leaks

- Extension to other sources (e.g. furnaces) a concern.
- Most similar sources in Reg. V used ISC modeling (e.g., volume sources, no plume rise).

ISSUES

Methodology similar although not the same as Layland/Mersch:

- L/M used LONGZ for annual. avg.

- Reg. III/Allegheny Co. approach used for ann. avg. and short - term.

- L/M shows good agreement with ann. avg. within 2 km.

- No comparisons of Reg. III/Alleg. Co. approach with monitored data for short-term although to be provided. Apparently no other model evaluation info available.

* Extension of modeling methodology to Wheeling-Pitt and other similar sources:

  - Wider implications for other Regions. Technique would need review by other Regions.

  C/H not likely to concur with technique as " generally approvable for general use on buoyant volume sources" suggested in Reg. III memo.

  Reg. III has approved technique for Liberty Bor. PM-10 SIP. Does C/H concur? If not, implications for Reg. III/Allegheny Co. and Wheeling-Pitt?

  Reg. III: position on Wheeling-Pitt unknown although precedent would suggest approval by Reg. III for coke ovens. Extension to other sources unknown.

* Reg. V not likely to support use of technique at Wheeling-Pitt as applied to Clairton.

OPTIONS FOR FOLLOW-UP

Conference call with Regs. III, V, C/H on draft memo and methodology applied to Clairton. Discuss implications/options for modeling Wheeling-Pitt.

Following call, provide draft response from SRAB to Reg. III.

Solicit comments from other Regions on draft Reg. III memo and draft SRAB response.

RECORD OF COMMUNICATION
_X_TELEPHONE CALL _ MEETING CONFERENCE CALL OTHER

INFORMATION COPIES TO: Joe, John I., Gary, John S., Tom C.

TO: T. Casey, J. Summerhays
FROM: D. Wilson, D. Doll
DATE: 4/12/94
TIME :
SUBJ.: OH/WV PM-10 SIP (Steubenville/Follansbee); Allegheny Co., Liberty Borough PM-10 SIP.

SUMMARY OF COMMUNICATION:

SUMMARY: The C/H reviewed the sequence of events following receipt of the draft Reg. III memo on the modeling done for the USX Clairton coke oven batteries for the Liberty Borough PM-10 SIP. Subsequently, C/H opinions were noted on the modeling done at Clairton and how this impacts the modeling at Wheeling-Pitt for the Stuebenville/Follansbee PM-10 SIP. This information was then discussed with Regs. III & V.

ISSUE: For Clairton, the C/H suggested that there is no need to exchange drafts of the Reg. III memo and C/H responses. At this point, the modeling for Clairton is part of a SIP approved by the Region. The C/H noted that when the SIP arrives for review, the C/H would not question the source characterization done for Clairton. The C/H suggested to Reg. III that the Technical Support Doc for the SIP note as fully as possible the unique modeling characteristics for Clairton (e.g., previous studies, modeled/monitored data comparison, complex terrain, etc.). Region III agreed with this approach.

For Wheeling-Pitt, the C/H suggested that Regs. III & V, WV and OH jointly develop the technical approach for characterizing the coke oven batteries, and possibly the BOF and blast furnaces for modeling. The C/H noted that while Clairton can probably be considered unique, Wheeling-Pitt would likely set a precedent for modeling coke oven batteries and furnaces nationwide. Although the C/H would not question the technical approach for characterizing the Wheeling-Pitt coke oven batteries and furnaces, the C/H would be concerned with how this approach would affect previous and future model applications/emission limitations for coke oven batteries and furnaces in other Regions (i.e., consistency issue). Therefore, once the technical approach is developed for Wheeling-Pitt, the C/H plans to communicate this approach to the appropriate Regions for comment on how this would affect their particular situations from a consistency standpoint but not on the technical aspects of the

source characterization. It's possible that the source characterization approach developed for Wheeling-Pitt may need to be revisited at that time because of consistency concerns expressed by the Regions.

FOLLOW UP ANTICIPATED:
Regions III, V, OH and WV will coordinate developing a source characterization approach for Wheeling-Pitt coke oven batteries and possibly the BOF and blast furnaces. The C/H will be informed of the approach developed. The C/H Will then coordinate a review of this approach with other appropriate Regional Offices. The purpose of this review will be to identify any concerns because of possible inconsistencies with source characterizations of coke oven batteries, BOF and blast furnaces at steel facilities in their Regions.

MODEL CLEARINGHOUSE RECORDS INFORMATION:

SOURCE NAME: Wheeling-Pitt/Clairton
LOCATION: WV/OH/ PA
SOURCE TYPE: Steel Plant
POLLUTANTS: PM-10
REGULATION(S) INVOLVED: SIP

MET DATA BASES (ON/OFF-SITE): On
MODEL (S) USED: IGM BLP

SO_2 SIP

Appendix B

Monitored Data

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Monitored Data

This appendix includes monitored data for sites in the NAA (Liberty and North Braddock) as well as other sites in the tri-state area (PA/WV/OH) that have been used for the overall SIP analysis (including background and historical data).

The following pages include:

- EPA 2015 design value spreadsheet data for nationwide NAAs

  (Downloaded from: https://www.epa.gov/air-trends/air-quality-design-values)

- EPA AQS design value report (AMP 480) for sites in the NAA, 2007-2016

- EPA AQS quicklook report (AMP 450) for sites in the NAA, 2007-2016

- EPA AQS design value report (AMP 480) for sites in the tri-state area, 2000-2016

  (Note: some 2016 data not fully uploaded to AQS for tri-state sites)

Table 1c. Design Values in Areas Previously Designated Nonattainment for Sulfur Dioxide 1-Hour NAAQS
AQS Data Query: 6/21/2016 Last Updated: 6/30/2016

Designated Area	State	EPA Region(s)	Designation Status[1]	2013-2015 Design Value (ppb)[2,3]	Meets NAAQS?
Nonaattinamnet Areas Designated Based on Monitoring Data					
Hayden, AZ	AZ	9	Nonattainment	246	No
Miami, AZ	AZ	9	Nonattainment	199	No
Hillsborough County, FL	FL	4	Nonattainment	66	Yes
Nassau County, FL	FL	4	Nonattainment	58	Yes
Lemont, IL	IL	5	Nonattainment	36	Yes
Pekin, IL	IL	5	Nonattainment	167	No
Indianapolis, IN	IN	5	Nonattainment	79	No
Morgan County, IN	IN	5	Nonattainment	70	Yes
Southwest Indiana, IN	IN	5	Nonattainment	133	No
Terre Haute, IN	IN	5	Nonattainment	109	No
Muscatine, IA	IA	7	Nonattainment	158	No
Campbell-Clermont Counties, KY-OH	KY-OH	4,5	Nonattainment	50	Yes
Jefferson County, KY	KY	4	Nonattainment		Incomplete
St. Bernard Parish, LA	LA	6	Nonattainment	114	No
Detroit, MI	MI	5	Nonattainment	64	Yes
Jackson County, MO	MO	7	Nonattainment	141	No
Jefferson County, MO	MO	7	Nonattainment	66	Yes
Billings, MT	MT	8	Nonattainment	63	Yes
Central New Hampshire, NH	NH	1	Nonattainment	20	Yes
Lake County, OH	OH	5	Nonattainment	93	No
Muskingum River, OH	OH	5	Nonattainment	121	No
Steubenville, OH-WV	OH-WV	3,5	Nonattainment	47	Yes
Allegheny, PA	PA	3	Nonattainment	99	No
Beaver, PA	PA	3	Nonattainment	39	Yes
Indiana, PA	PA	3	Nonattainment		Incomplete
Warren, PA	PA	3	Nonattainment	118	No
Sullivan County, TN	TN	4	Nonattainment		Incomplete
Marshall, WV	WV	3	Nonattainment	41	Yes
Rhinelander, WI	WI	5	Nonattainment	157	No
Nonaattinamnet Areas Designated Based on Modeling Data[4]					
Alton Township, IL	IL	5	Nonattainment		
Williams County, IL	IL	5	Nonattainment		
St Clair Count, MI	MI	5	Nonattainment		
Anne Arundel and Baltimore County, MD	MD	3	Nonattainment		

Notes:

1. Area designation status as of June 30, 2016

2. The level of the 1-hour NAAQS for sulfur dioxide is 75 parts per billion (ppb) calculated as the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations

3. The design values shown here are computed for the latest design value period from data collected using Federal Reference Methods or Federal Equivalent Methods reported by States, Tribes, and local agencies to EPA's Air Quality System (AQS) as of 6/30/2016. Concentrations flagged by States, Tribes, and local agencies as exceptional events (e.g., high winds, wildfires, volcanic eruptions) and concurred by the associated EPA Regional Office are not included in the calculation of these design values.

4. For areas designated nonattinment based on modeling, the detrmination of whether they are meeting the NAAQS is based on modeling data rather than monitoring data.

Disclaimer: The information listed in this report and in these tables is intended for informational use only and does not constitute a regulatory determination by EPA as whether an area has attained a NAAQS. The information set forth in this report has no regulatory effect. To have regulatory effect, a final EPA determination as to whether an area has attained a NAAQS or attained a NAAQS as of its applicable attainment date can be accomplished only after rulemaking that provides an opportunity for notice and comment. No such determination for regulatory purposes exists in the absence of such rulemaking. This report does not constitute a proposed or final rulemaking.

Table 3c. Design Value History for Previously Designated Nonattainment Areas (including Maintenance Areas) for Sulfur Dioxide 1-Hour NAAQS for 2006 through 2015

AQS Data Query: 6/21/2016 Last Updated: 6/30/2016

Designated Area	State	EPA Region	2004-2006 Design Value (ppb)[2,3]	2005-2007 Design Value (ppb)[2,3]	2006-2008 Design Value (ppb)[2,3]	2007-2009 Design Value (ppb)[2,3]	2008-2010 Design Value (ppb)[2,3]	2009-2011 Design Value (ppb)[2,3]	2010-2012 Design Value (ppb)[2,3]	2011-2013 Design Value (ppb)[2,3]	2012-2014 Design Value (ppb)[2,3]	2013-2015 Design Value (ppb)[2,3]
Hayden, AZ	AZ	9	276	286	273	284	282	259	285	266	282	246
Miami, AZ	AZ	9	120	132	141	132	121	111	107	105	122	199
Hillsborough County, FL	FL	4	117	119	115	118	110	103	105	93	79	66
Nassau County, FL	FL	4	122	119		84	129	129	122	70	57	58
Muscatine, IA	IA	7	135	165						217	194	158
Lemont, IL	IL	5	82	104	104	110	100	98	96	90	66	36
Pekin, IL	IL	5	234	222	238	232	235	211	215	204	210	167
Morgan County, IN	IN	5		130	113	110	98	100	94	81	79	70
Southwest Indiana, IN	IN	5	144	151	179	190	203	175	157	143	155	133
Terre Haute, IN	IN	5	125	125	125	137	149	150	145	123	117	109
Indianapolis, IN	IN	5	115	117	109	92	86	80	86	78	92	79
Jefferson County, KY	KY	4	96	106	111	117	112	112	123			
Campbell-Clermont Counties, KY-OH	KY-OH	4,5					70	89	98	88	72	50
St. Bernard Parish, LA	LA	6				331	297	287	255	233	159	114
Detroit, MI	MI	5	128	122	114	97	96	90	90	77	72	64
Jackson County, MO	MO	7	151	156	169	171	164	159	157	162	150	141
Jefferson County, MO	MO	7									143	66
Billings, MT	MT	8	84				84	79	78	64	70	63
Central New Hampshire, NH	NH	1	151	157	167	192	212	221	157	89	23	20
Muskingum River, OH	OH	5			262	216	195	180	161	147	138	121
Lake County, OH	OH	5	54	53	43	40	37	157	149	142	118	93
Steubenville, OH-WV	OH-WV	3,5	198	176	161	157	148	119	115	88	76	48
Allegheny, PA	PA	3	111	142	141	145	128	142	137	117	101	99
Beaver, PA	PA	3	227	210	182	170	167	158	180			39
Indiana, PA	PA	3		111	99	87	90	82	78	68		
Warren, PA	PA	3	226	214	178	137	123	105	107	112	120	118
Sullivan County, TN	TN	4	208	171	169	160	191	196	198			
Rhinelander, WI	WI	5	155	179	196	196	175	151	161	158	163	157
Marshall, WV	WV	3	160	155	140	112	92	80	78	59	47	41

Notes:

1. Area designation status as of June 30, 2016.

2. The level of the 1-hour NAAQS for sulfur dioxide is 75 parts per billion (ppb) calculated as the 3-year average

3. The design values shown here are computed for the latest design value period from data collected using Federal Reference Methods or Federal Equivalent Methods reported by States, Tribes, and local agencies to EPA's Air Quality System (AQS) as of 6/30/2016. Concentrations flagged by States, Tribes, and local agencies as exceptional events (e.g., high winds, wildfires, volcanic eruptions) and concurred by the associated EPA Regional Office are not included in the calculation of these design values.

Disclaimer: The information listed in this report and in these tables is intended for informational use only and does not constitute a regulatory determination by EPA as whether an area has attained a NAAQS. The information set forth in this report has no regulatory effect. To have regulatory effect, a final EPA determination as to whether an area has attained a NAAQS or attained a NAAQS as of its applicable attainment date can be accomplished only after rulemaking that provides an opportunity for notice and comment. No such determination for regulatory purposes exists in the absence of such rulemaking. This report does not constitute a proposed or final rulemaking.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: IYY

DESIGN VALUE REPORT

Report Request ID: 1519962 Report Code: AMP480 Feb. 7, 2017

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	42	003	0064								
	42	003	1301								

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	42401		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
WORKFILE DELIMITER	,
USER SITE METADATA	STREET ADDRESS
MERGE PDF FILES	YES
QUARTERLY DATA IN WORKFILE	NO
AGENCY ROLE	PQAO

DATE CRITERIA

Start Date	End Date
2007	2016

APPLICABLE STANDARDS

Standard Description
SO2 1-hour 2010

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: **Feb. 7, 2017**

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	192		4	120		4	114		142	Y

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Feb. 7, 2017

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2008

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	111		4	192		4	120		141	Y

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Feb. 7, 2017

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	131		4	111		4	192		145	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2010

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	141	N	4	131		4	111		128	Y

Notes:
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2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2011

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	153		4	141	N	4	131		142	Y

Notes:
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Feb. 7, 2017

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2012
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	117	S	4	153		4	141	N	137	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2013

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	81	S	4	117	S	4	153		117	Y

Notes:
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2014

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	105	Y	4	81	S	4	117	S	101	Y
42-003-1301	600 Anderson St, Braddock,	4	89	Y							89	N

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	112	S	4	105	Y	4	81	S	99	Y
42-003-1301	600 Anderson St, Braddock,	4	52	S	4	89	Y				71	N

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0064	2743 Washington Blvd, McKee	4	64		4	112	S	4	105	Y	94	Y
42-003-1301	600 Anderson St, Braddock,	4	51		4	52	S	4	89	Y	64	Y

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the state's certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: IYY

QUICKLOOK CRITERIA PARAMETERS

Report Request ID: 1519959 Report Code: AMP450 Feb. 7, 2017

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	42	003	0064	42401	1						
	42	003	1301	42401	2						

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
QUICK LOOK			

SELECTED OPTIONS

Option Type	Option Value
WORKFILE DELIMITER	,
MERGE PDF FILES	YES
EVENTS PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
AGENCY ROLE	PQAO

SORT ORDER

Order	Column
1	PARAMETER_CODE
2	STATE_CODE
3	COUNTY_CODE
4	SITE_ID
5	POC
6	DATES
7	EDT_ID

DATE CRITERIA

Start Date	End Date
2007	2016

APPLICABLE STANDARDS

Standard Description
CO 1-hour 1971
CO 8-hour 1971
Lead 3-Month 2009
Lead 3-Month PM10 Surrogate 2009
NO2 1-hour
NO2 Annual 1971
Ozone 1-hour Daily 2005
Ozone 8-hour 2015
PM10 24-hour 2006
PM25 24-hour 2012
PM25 Annual 2012
SO2 1-hour 2010
SO2 24-hour 1971
SO2 3-hour 1971
SO2 Annual 1971

Feb. 7, 2017

EXCEPTIONAL DATA TYPES

EDT	DESCRIPTION
0	NO EVENTS
1	EVENTS EXCLUDED
2	EVENTS INCLUDED
5	EVENTS WITH CONCURRENCE EXCLUDED

Note: The * indicates that the mean does not satisfy summary criteria.

Feb. 7, 2017

Sulfur dioxide (42401) Pennsylvania Parts per billion (008)

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	OBS	COMP QTRS	1ST MAX 1-HR	2ND MAX 1-HR	99TH PCTL 1-HR	1ST MAX 24-HR	2ND MAX 24-HR	Days >24HR STD	ARITH MEAN AN-STD	CERT and EVAL	EDT
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2007	039	8616	4	264.0	224.0	192.0	65.0	64.1	0	9.48		0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2008	039	8668	4	156.0	153.0	111.0	37.2	33.8	0	8.28		0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2009	039	8590	4	193.0	179.0	131.0	67.3	54.5	0	7.68		0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2010	039	8208	4	215.0	207.0	141.0	26.1	25.9	0	7.15	N	0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2011	039	8718	4	450.0	188.0	153.0	134.2	70.4	0	6.66		0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport,	2012	039	8765	4	199.0	161.0	117.0	39.0	35.0	0	6.76	S	0

Note: The * indicates that the mean does not satisfy summary criteria.

Feb. 7, 2017

Sulfur dioxide (42401) Pennsylvania Parts per billion (008)

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	OBS	COMP QTRS	1ST MAX 1-HR	2ND MAX 1-HR	99TH PCTL 1-HR	1ST MAX 24-HR	2ND MAX 24-HR	Days >24HR STD	ARITH MEAN AN-STD	CERT and EVAL	EDT
					PA 15133 (Liberty)													
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2013	039	8450	4	99.0	96.0	81.0	29.0	24.3	0	4.00	S	0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2014	000	8692	4	122.0	111.0	105.0	26.3	25.8	0	4.47	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2015	000	8521	4	244.0	173.0	112.0	46.8	35.5	0	4.61	S	0
42-003-0064	1	0021	Liberty	Allegheny	2743 Washington Blvd, McKeesport, PA 15133 (Liberty)	2016	600	8742	4	171.0	73.0	64.0	29.0	26.0	0	3.80		0
42-003-1301	2	0021	North Braddock	Allegheny	600 Anderson St, Braddock, PA 15104 (North Braddock)	2014	000	8708	4	126.0	117.0	89.0	25.0	19.1	0	2.87	Y	0
42-003-1301	2	0021	North	Allegheny	600	2015	000	8572	4	80.0	69.0	52.0	16.1	10.2	0	1.91	S	0

Note: The * indicates that the mean does not satisfy summary criteria.

Feb. 7, 2017

Sulfur dioxide (42401) Pennsylvania Parts per billion (008)

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	OBS	COMP QTRS	1ST MAX 1-HR	2ND MAX 1-HR	99TH PCTL 1-HR	1ST MAX 24-HR	2ND MAX 24-HR	Days >24HR STD	ARITH MEAN AN-STD	CERT and EVAL EDT
			Braddock		Anderson St, Braddock, PA 15104 (North Braddock)												
42-003-1301	2	0021	North Braddock	Allegheny	600 Anderson St, Braddock, PA 15104 (North Braddock)	2016	092	8750	4	69.0	64.0	51.0	18.9	12.4	0	1.77	0

Note: The * indicates that the mean does not satisfy summary criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
QUICK LOOK REPORT (AMP450 END)

Feb. 7, 2017

METHODS USED IN THIS REPORT

PARAMETER	METHOD CODE	COLLECTION METHOD	ANALYSIS METHOD
42401	000	MULTIPLE METHODS	MULTIPLE METHODS
42401	039	INSTRUMENTAL	ULTRA VIOLET STIMULATED FLUORESCNC
42401	092	AUTOMATED ANALYZER	ULTRAVIOLET FLUORESCENCE
42401	600	Instrumental	Ultraviolet Fluorescence API 100 EU

Note: The * indicates that the mean does
not satisfy summary criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
QUICK LOOK REPORT (AMP450 END)

Feb. 7, 2017

PQAOS USED IN THIS REPORT

PQAO	AGENCY DESCRIPTION
0021	Allegheny County,PA Health Department

Note: The * indicates that the mean does
not satisfy summary criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
QUICK LOOK REPORT (AMP450 END)

Feb. 7, 2017

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the state's certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Note: The * indicates that the mean does not satisfy summary criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: IYY

DESIGN VALUE REPORT

Report Request ID: 1521774 Report Code: AMP480 Feb. 10, 2017

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	42										
	39										
	54										

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	42401		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
WORKFILE DELIMITER	,
USER SITE METADATA	STREET ADDRESS
MERGE PDF FILES	YES
QUARTERLY DATA IN WORKFILE	NO
AGENCY ROLE	PQAO

DATE CRITERIA

Start Date	End Date
2000	2016

APPLICABLE STANDARDS

Standard Description
SO2 1-hour 2010

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: **Feb. 10, 2017**

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	77	Y	4	115	Y	4	85	Y	92	Y
39-003-0002	2650 BIBLE RD.	4	34	Y	4	28	Y	4	36	Y	33	Y
39-007-1001	770 LAKE RD.	4	50		4	86	Y	4	68	Y	68	Y
39-013-3002	EAST 40 ST.	4	204	Y	0	147 *	Y				176	N
39-017-0004	SCHULER AND BENDER	4	90		4	69	Y	4	78	Y	79	Y
39-017-1004	HOOK FIELD AIRPORT	4	75		4	72	Y	4	58	Y	68	Y
39-023-0003	5400 SPANGLER	4	45		4	39	Y	4	39	Y	41	Y
39-025-0021	3079 ANGEL DR.	4	97	Y	4	68	Y	4	87	Y	84	Y
39-029-0016	500 MARYLAND AVE. E. LIVERP	1	406 *	Y	2	196 *	Y	3	141 *		248	N
39-029-2001	EAST LIVERPOOL CITY HALL 12				2	187 *	Y	4	155	Y	171	N
39-035-0038	2547 ST TIKHON	4	102	Y	4	130	Y	3	88 *	Y	107	Y
39-035-0045	4950 BROADWAY AVE.	4	48	Y	4	100	Y	4	50	Y	66	Y
39-035-0060	E. 14TH & ORANGE	4	75	Y	4	94	Y	4	95	Y	88	Y
39-035-0065	4600 HARVARD AVE.	4	83	Y	4	123	Y	4	81	Y	96	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891	4	75	Y	4	178	Y	4	131	Y	128	Y
39-049-0004	1313 CHESAPEAKE	1	37 *	Y	4	44	Y	4	56	Y	46	N
39-049-0034	KORBEL AVE.	3	44 *	Y	4	37	Y	4	52	Y	44	Y
39-061-0010	6950 RIPPLE RD.	4	157	Y	4	114	Y	4	122	Y	131	Y
39-061-0039	1275 SECTION RD.				2	95 *	Y	2	117 *	Y	106	N
39-061-2003	WYOMING & FORRER							1	74 *	Y	74	N

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-081-0016	227 NORTH 5TH ST.	4	188	Y	4	224	Y	2	160 *	Y	191	N
39-081-1001	501 COMMERICAL	4	163	Y	4	233	Y	4	235	Y	210	Y
39-085-0003	36010 LAKESHORE	4	45	Y	4	65	Y	4	58	Y	56	Y
39-085-3002	71 E HIGH	4	149	Y	4	201	Y	4	165	Y	172	Y
39-087-0006	2120 S. 8TH	4	66	Y	4	68	Y	4	52	Y	62	Y
39-093-0017	601 BROAD STREET, ELYRIA, O	0	60 *								60	N
39-093-0026	NEBRASKA AVE. AND ADAMS	4	49	Y	4	61	Y	4	49	Y	53	Y
39-093-1003	131 COURT STREET	2	59 *	Y	4	63	Y	4	53	Y	58	N
39-095-0008	3040 YORK ST.	3	55 *	Y	1	87 *	Y	4	47	Y	63	N
39-095-0024	348 S. ERIE	4	47	Y	4	55	Y	3	50 *	Y	51	N
39-099-0009	9 WEST FRONT STREET				4	81	Y	4	79	Y	80	N
39-099-0013	345 OAKHILL	4	89	Y							89	N
39-105-1001	MULBERRY AVE.	4	114	Y	4	125	Y	4	112	Y	117	Y
39-113-0025	451 WEST THIRD ST.,	4	37	Y	4	41	Y	4	47	Y	42	Y
39-115-0003	2600 ST. RT. 83	4	165	Y	4	208	Y	4	325	Y	233	Y
39-145-0013	4862 GALLIA	4	52	Y	4	68	Y	4	45	Y	55	Y
39-151-0016	515 25TH. ST.	4	126	Y	4	62	Y	4	71	Y	86	Y
39-153-0017	80 BRITTAIN	4	163	Y	4	158	Y	4	143	Y	155	Y
39-153-0022	177 S. BROADWAY	4	76	Y	4	107	Y	4	89	Y	91	Y
39-157-0003	100 N TUSCARAWAS	4	119	Y	4	119	Y	4	153	Y	130	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	3	136 *	Y	3	106 *	Y	4	133	Y	125	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	95		4	55		4	65		72	Y
42-003-0021	GLADSTONE HIGH SCHOOL	4	75	Y	4	70	Y	4	123	Y	89	Y
42-003-0031	1275 Bedford Ave, Pittsburg	3	89 *	Y	4	62	Y	4	85	Y	79	Y
42-003-0032	TASSO ST				2	73 *	Y	4	124	Y	99	N
42-003-0064	2743 Washington Blvd, McKee	4	102	Y	4	108	Y	4	119	Y	110	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	102	Y	4	75	Y	4	100	Y	92	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	203	Y	3	232 *	Y	4	323	Y	253	Y
42-003-1301	600 Anderson St, Braddock,	4	101	Y	4	94	Y	4	99	Y	98	Y
42-003-3003	EXTENSION TO WALL STREET IN	4	124	Y	4	125	Y	4	124	Y	124	Y
42-003-3004	GREENWAY ALLEY, CLAIRTON	4	61	Y	4	86	Y	4	77	Y	75	Y
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	161		4	164		4	182		169	Y
42-007-0004	HOLMES AVE							4	78		78	N
42-007-0005	1015 SEBRING ROAD	4	270	Y	4	310	Y	4	349	Y	310	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	83	Y	4	92	Y	4	87	Y	87	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	109	Y	4	99	Y	4	88	Y	99	Y
42-011-0100	700 BLOCK OF PENN STREET NE							4	83	Y	83	N
42-013-0801	2ND AVE & 7TH ST	4	62	Y	4	71	Y	4	59	Y	64	Y
42-017-0012	ROCKVIEW LANE	4	43	Y	4	37	Y	4	47	Y	42	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	88	Y	4	84	Y	4	110	Y	94	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-043-0401	651 Gibson Blvd., Harrisbur	4	62	Y	4	50	Y	4	56	Y	56	Y
42-045-0002	FRONT ST & NORRIS ST	4	69	Y	4	55	Y	4	64	Y	63	Y
42-045-0109	MARCUS HOOK ELEMENTARY SCHO	0	126 *		4	81		4	109		105	N
42-049-0003	10TH AND MARNE STREETS	4	96	Y	4	171	Y	4	151	Y	139	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	79 *		2	72 *		1	59 *		70	N
42-069-2006	GEORGE ST TROOP AND CITY OF	4	31	Y	4	35	Y	4	41	Y	36	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	52	Y	4	47	Y	4	69	Y	56	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	99	Y	4	107	Y	4	102	Y	103	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	54	Y	4	62	Y	4	53	Y	56	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	36	Y	4	46	Y	4	50	Y	44	Y
42-081-0403	600 RAILWAY STREET WILLIAM	4	39	Y	4	47	Y	4	46	Y	44	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	63	Y	2	73 *	Y	4	73	Y	70	N
42-089-0001	2.5 KM NE OF KUNKLETOWN				1	18 *		1	40 *		29	N
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	37	Y	4	36	Y	4	35	Y	36	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	38	Y	4	43	Y	4	48	Y	43	Y
42-095-0100	COAL ST & MILTON ST				3	51 *	Y	4	65	Y	58	N
42-095-8000	17TH AND SPRING GARDEN STRE	4	67	Y	1	96 *	Y				82	N
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	38	Y	4	34	Y	4	33	Y	35	Y
42-101-0004	1501 E. LYCOMING AVE.	4	44	Y	4	58	Y	4	53	Y	52	Y
42-101-0022	DEFENSE SUPPORT CENTER 20TH	2	56 *	Y	1	73 *	Y	4	53	Y	61	N

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Pollutant: Sulfur dioxide(42401)
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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-101-0024	GRANT-ASHTON ROADS PHILA NE				1	37 *	Y	4	48	Y	43	N
42-101-0027	S W CORNER BROAD AND BUTLER				2	51 *	Y	4	48	Y	50	N
42-101-0029	20TH AND RACE STREETS	3	60 *	Y	4	54	Y	4	55	Y	56	Y
42-101-0047	500 SOUTH BROAD STREET-PARK				2	84 *	Y	4	52	Y	68	N
42-101-0048	3000 LEWIS ST. (NEAR BATH S				2	53 *	Y	4	43	Y	48	N
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	4	45	Y	4	60	Y	4	50	Y	52	Y
42-107-0003	COAL & STADIUM STS. SHENAND	4	79		4	60		4	64		68	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	79	Y	4	109	Y	4	102	Y	97	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	207	Y	4	246	Y	4	250	Y	234	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	77	Y	4	81	Y	4	73	Y	77	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	81	Y	4	69	Y	4	94	Y	81	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	133		4	130		4	127		130	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	89	Y	4	95	Y	4	77	Y	87	Y
42-133-0008	HILL ST.	4	78	Y	4	83	Y	4	97	Y	86	Y

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Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	142	Y	4	226	Y	4	228	Y	199	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	224	Y	4	256	Y	4	244	Y	241	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	176	Y	4	191	Y	4	210	Y	192	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	49	Y	4	57	Y	4	60	Y	55	Y
54-025-0001	UNKNOWN							3	22 *	Y	22	N
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	198	Y	4	177	Y	4	208	Y	194	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	186	Y	4	191	Y	4	157	Y	178	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	134	Y	4	156	Y	4	134	Y	141	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	167	Y	4	187	Y	4	168	Y	174	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR	4	172	Y	4	180	Y	4	130	Y	161	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	162	Y	4	206	Y	4	164	Y	177	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE	4	161	Y	4	195	Y	4	175	Y	177	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	194	Y	4	193	Y	4	225	Y	204	Y
54-039-0004	WVAPCC OFC BLDG 1558 WASHIN	1	138 *	Y	3	113 *	Y	4	95	Y	115	N
54-039-0010	CHARLESTON - 209 MORRIS STR	3	81 *	Y							81	N
54-039-2002	PARK AVENUE NITRO WV				1	103 *	Y	3	86 *	Y	95	N
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	177	Y	4	284	Y	4	290	Y	250	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	186	Y	4	200	Y	4	209	Y	198	Y
54-061-0004	KNAPP HALL, WVU, MORGANTOWN	4	157	Y	4	141	Y	4	149	Y	149	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	159	Y	4	190	Y	4	190	Y	180	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2000

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2000			1999			1998			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-069-0007	NORTHERN PANHANDLE REGIONAL	4	141	Y	4	140	Y	4	163	Y	148	Y
54-099-0002	CENTENNIAL DRIVE KENOVA WVA	4	64	Y	4	64	Y	4	65	Y	64	Y
54-099-0003	SPRING BROOK DRIVE	4	123		4	129		3	300 *		184	N
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	112		4	127		3	123 *		121	N
54-099-0005	BIG SANDY ROAD	4	154		4	114		3	131 *		133	N
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	193	Y	4	329	Y	4	373	Y	298	Y

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Design Value Year: 2001
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	82		4	77	Y	4	115	Y	91	Y
39-003-0002	2650 BIBLE RD.	4	27		4	34	Y	4	28	Y	30	Y
39-007-1001	770 LAKE RD.	4	56		4	50		4	86	Y	64	Y
39-013-3002	EAST 40 ST.	4	214		4	204	Y	0	147 *	Y	188	N
39-017-0004	SCHULER AND BENDER	4	96		4	90		4	69	Y	85	Y
39-017-1004	HOOK FIELD AIRPORT	4	93		4	75		4	72	Y	80	Y
39-023-0003	5400 SPANGLER	4	44		4	45		4	39	Y	43	Y
39-025-0021	3079 ANGEL DR.	4	129		4	97	Y	4	68	Y	98	Y
39-029-0016	500 MARYLAND AVE. E. LIVERP				1	406 *	Y	2	196 *	Y	301	N
39-029-0022	500 MARYLAND	3	147 *								147	N
39-029-2001	EAST LIVERPOOL CITY HALL 12							2	187 *	Y	187	N
39-035-0038	2547 ST TIKHON	4	75		4	102	Y	4	130	Y	102	Y
39-035-0045	4950 BROADWAY AVE.	4	65		4	48	Y	4	100	Y	71	Y
39-035-0060	E. 14TH & ORANGE	4	73		4	75	Y	4	94	Y	81	Y
39-035-0065	4600 HARVARD AVE.	4	55		4	83	Y	4	123	Y	87	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891	4	101		4	75	Y	4	178	Y	118	Y
39-049-0004	1313 CHESAPEAKE				1	37 *	Y	4	44	Y	41	N
39-049-0034	KORBEL AVE.	4	41		3	44 *	Y	4	37	Y	41	Y
39-053-0002	S.R. 554	2	136 *								136	N
39-061-0010	6950 RIPPLE RD.	4	168		4	157	Y	4	114	Y	146	Y

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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2001
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-061-0039	1275 SECTION RD.							2	95 *	Y	95	N
39-081-0016	227 NORTH 5TH ST.	4	178		4	188	Y	4	224	Y	197	Y
39-081-1001	501 COMMERICAL	4	189		4	163	Y	4	233	Y	195	Y
39-085-0003	36010 LAKESHORE	4	51		4	45	Y	4	65	Y	54	Y
39-085-3002	71 E HIGH	4	139		4	149	Y	4	201	Y	163	Y
39-087-0006	2120 S. 8TH	4	65		4	66	Y	4	68	Y	66	Y
39-093-0017	601 BROAD STREET, ELYRIA, O	4	61		0	60 *					61	N
39-093-0026	NEBRASKA AVE. AND ADAMS	4	50		4	49	Y	4	61	Y	53	Y
39-093-1003	131 COURT STREET				2	59 *	Y	4	63	Y	61	N
39-095-0008	3040 YORK ST.	4	69		3	55 *	Y	1	87 *	Y	70	N
39-095-0024	348 S. ERIE	4	72		4	47	Y	4	55	Y	58	Y
39-099-0009	9 WEST FRONT STREET							4	81	Y	81	N
39-099-0013	345 OAKHILL	4	97		4	89	Y				93	N
39-105-1001	MULBERRY AVE.	4	126		4	114	Y	4	125	Y	122	Y
39-113-0025	451 WEST THIRD ST.,	4	34		4	37	Y	4	41	Y	37	Y
39-115-0003	2600 ST. RT. 83	4	209		4	165	Y	4	208	Y	194	Y
39-145-0013	4862 GALLIA	4	74		4	52	Y	4	68	Y	65	Y
39-151-0016	515 25TH. ST.	4	55		4	126	Y	4	62	Y	81	Y
39-153-0017	80 BRITTAIN	4	132		4	163	Y	4	158	Y	151	Y
39-153-0022	177 S. BROADWAY	4	84		4	76	Y	4	107	Y	89	Y

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Feb. 10, 2017

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2001
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State Name: Ohio

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-157-0003	100 N TUSCARAWAS	4	88		4	119	Y	4	119	Y	109	Y

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State Name: Pennsylvania

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	95		3	136 *	Y	3	106 *	Y	112	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	76		4	95		4	55		75	Y
42-003-0021	GLADSTONE HIGH SCHOOL	2	88 *		4	75	Y	4	70	Y	78	Y
42-003-0031	1275 Bedford Ave, Pittsburg				3	89 *	Y	4	62	Y	76	N
42-003-0032	TASSO ST							2	73 *	Y	73	N
42-003-0064	2743 Washington Blvd, McKee	4	98		4	102	Y	4	108	Y	103	Y
42-003-0067	3640 Old Oakdale Rd, McDona	3	90 *		4	102	Y	4	75	Y	89	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	3	78 *		4	203	Y	3	232 *	Y	171	Y
42-003-1301	600 Anderson St, Braddock,				4	101	Y	4	94	Y	98	N
42-003-3003	EXTENSION TO WALL STREET IN	3	116 *		4	124	Y	4	125	Y	122	Y
42-003-3004	GREENWAY ALLEY, CLAIRTON				4	61	Y	4	86	Y	74	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	147		4	161		4	164		157	Y
42-007-0005	1015 SEBRING ROAD	4	294		4	270	Y	4	310	Y	291	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	100		4	83	Y	4	92	Y	92	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	101		4	109	Y	4	99	Y	103	Y
42-013-0801	2ND AVE & 7TH ST	4	68		4	62	Y	4	71	Y	67	Y
42-017-0012	ROCKVIEW LANE	4	38		4	43	Y	4	37	Y	39	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	92		4	88	Y	4	84	Y	88	Y
42-043-0401	651 Gibson Blvd., Harrisbur	4	31		4	62	Y	4	50	Y	48	Y
42-045-0002	FRONT ST & NORRIS ST	4	52		4	69	Y	4	55	Y	59	Y

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Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

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State Name: Pennsylvania

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-045-0109	MARCUS HOOK ELEMENTARY SCHO				0	126 *		4	81		104	N
42-049-0003	10TH AND MARNE STREETS	4	124		4	96	Y	4	171	Y	130	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	72 *		2	79 *		2	72 *		74	N
42-069-2006	GEORGE ST TROOP AND CITY OF	4	39		4	31	Y	4	35	Y	35	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	39		4	52	Y	4	47	Y	46	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	138		4	99	Y	4	107	Y	115	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	45		4	54	Y	4	62	Y	54	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	49		4	36	Y	4	46	Y	44	Y
42-081-0100	899 CHERRY STREET	0	25 *								25	N
42-081-0403	600 RAILWAY STREET WILLIAM	3	40 *		4	39	Y	4	47	Y	42	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	66		4	63	Y	2	73 *	Y	67	N
42-089-0001	2.5 KM NE OF KUNKLETOWN							1	18 *		18	N
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	46		4	37	Y	4	36	Y	40	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	36		4	38	Y	4	43	Y	39	Y
42-095-0100	COAL ST & MILTON ST							3	51 *	Y	51	N
42-095-8000	17TH AND SPRING GARDEN STRE	4	67		4	67	Y	1	96 *	Y	77	N
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	33		4	38	Y	4	34	Y	35	Y
42-101-0004	1501 E. LYCOMING AVE.	4	48		4	44	Y	4	58	Y	50	Y
42-101-0022	DEFENSE SUPPORT CENTER 20TH	2	60 *		2	56 *	Y	1	73 *	Y	63	N
42-101-0024	GRANT-ASHTON ROADS PHILA NE							1	37 *	Y	37	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2001
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-101-0027	S W CORNER BROAD AND BUTLER							2	51 *	Y	51	N
42-101-0029	20TH AND RACE STREETS	4	67		3	60 *	Y	4	54	Y	60	Y
42-101-0047	500 SOUTH BROAD STREET-PARK							2	84 *	Y	84	N
42-101-0048	3000 LEWIS ST. (NEAR BATH S							2	53 *	Y	53	N
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	2	67 *		4	45	Y	4	60	Y	57	N
42-107-0003	COAL & STADIUM STS. SHENAND	4	51		4	79		4	60		63	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	100		4	79	Y	4	109	Y	96	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	241		4	207	Y	4	246	Y	231	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	123		4	77	Y	4	81	Y	94	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	94		4	81	Y	4	69	Y	81	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	125		4	133		4	130		129	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	72		4	89	Y	4	95	Y	85	Y
42-133-0008	HILL ST.	4	48		4	78	Y	4	83	Y	70	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2001
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	169		4	142	Y	4	226	Y	179	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	214		4	224	Y	4	256	Y	231	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	182		4	176	Y	4	191	Y	183	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	56		4	49	Y	4	57	Y	54	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	174		4	198	Y	4	177	Y	183	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	164		4	186	Y	4	191	Y	180	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	165		4	134	Y	4	156	Y	152	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	162		4	167	Y	4	187	Y	172	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR	4	125		4	172	Y	4	180	Y	159	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	159		4	162	Y	4	206	Y	176	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE	4	120		4	161	Y	4	195	Y	159	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	156		4	194	Y	4	193	Y	181	Y
54-039-0004	WVAPCC OFC BLDG 1558 WASHIN				1	138 *	Y	3	113 *	Y	126	N
54-039-0010	CHARLESTON - 209 MORRIS STR	4	104		3	81 *	Y				93	N
54-039-2002	PARK AVENUE NITRO WV							1	103 *	Y	103	N
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	191		4	177	Y	4	284	Y	217	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	197		4	186	Y	4	200	Y	194	Y
54-061-0004	KNAPP HALL, WVU, MORGANTOWN	3	135 *		4	157	Y	4	141	Y	144	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	176		4	159	Y	4	190	Y	175	Y
54-069-0007	NORTHERN PANHANDLE REGIONAL	4	132		4	141	Y	4	140	Y	138	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2001

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2001			2000			1999			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-099-0002	CENTENNIAL DRIVE KENOVA WVA	4	67		4	64	Y	4	64	Y	65	Y
54-099-0003	SPRING BROOK DRIVE	4	118		4	123		4	129		123	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	110		4	112		4	127		116	Y
54-099-0005	BIG SANDY ROAD	4	111		4	154		4	114		126	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	163		4	193	Y	4	329	Y	228	Y

Notes:
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Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2002
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	89	Y	4	82		4	77	Y	83	Y
39-003-0002	2650 BIBLE RD.	4	24	Y	4	27		4	34	Y	28	Y
39-007-1001	770 LAKE RD.	4	55	Y	4	56		4	50		54	Y
39-013-3002	EAST 40 ST.	4	164	Y	4	214		4	204	Y	194	Y
39-017-0004	SCHULER AND BENDER	4	86	Y	4	96		4	90		91	Y
39-017-1004	HOOK FIELD AIRPORT	4	70	Y	4	93		4	75		79	Y
39-023-0003	5400 SPANGLER	4	43	Y	4	44		4	45		44	Y
39-025-0021	3079 ANGEL DR.	4	69	Y	4	129		4	97	Y	98	Y
39-029-0016	500 MARYLAND AVE. E. LIVERP							1	406 *	Y	406	N
39-029-0022	500 MARYLAND	4	150	Y	3	147 *					149	N
39-035-0038	2547 ST TIKHON	4	53	Y	4	75		4	102	Y	77	Y
39-035-0045	4950 BROADWAY AVE.	4	51	Y	4	65		4	48	Y	55	Y
39-035-0060	E. 14TH & ORANGE	4	55	Y	4	73		4	75	Y	68	Y
39-035-0065	4600 HARVARD AVE.	4	55	Y	4	55		4	83	Y	64	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891	4	100	Y	4	101		4	75	Y	92	Y
39-049-0004	1313 CHESAPEAKE							1	37 *	Y	37	N
39-049-0034	KORBEL AVE.	4	37	Y	4	41		3	44 *	Y	41	Y
39-053-0002	S.R. 554	4	109	Y	2	136 *					123	N
39-061-0010	6950 RIPPLE RD.	4	157	Y	4	168		4	157	Y	161	Y
39-081-0016	227 NORTH 5TH ST.	4	132	Y	4	178		4	188	Y	166	Y

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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2002
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-081-1001	501 COMMERICAL	4	197	Y	4	189		4	163	Y	183	Y
39-085-0003	36010 LAKESHORE	4	49	Y	4	51		4	45	Y	48	Y
39-085-3002	71 E HIGH	4	146	Y	4	139		4	149	Y	145	Y
39-087-0006	2120 S. 8TH	4	62	Y	4	65		4	66	Y	64	Y
39-093-0017	601 BROAD STREET, ELYRIA, O	4	60	Y	4	61		0	60 *		60	N
39-093-0026	NEBRASKA AVE. AND ADAMS	4	48	Y	4	50		4	49	Y	49	Y
39-093-1003	131 COURT STREET							2	59 *	Y	59	N
39-095-0008	3040 YORK ST.	4	88	Y	4	69		3	55 *	Y	71	N
39-095-0024	348 S. ERIE	4	53	Y	4	72		4	47	Y	57	Y
39-099-0013	345 OAKHILL	4	59	Y	4	97		4	89	Y	82	Y
39-105-1001	MULBERRY AVE.	4	94	Y	4	126		4	114	Y	111	Y
39-113-0025	451 WEST THIRD ST.,	4	37	Y	4	34		4	37	Y	36	Y
39-115-0003	2600 ST. RT. 83	4	180	Y	4	209		4	165	Y	185	Y
39-145-0013	4862 GALLIA	4	50	Y	4	74		4	52	Y	59	Y
39-151-0016	515 25TH. ST.	4	52	Y	4	55		4	126	Y	78	Y
39-153-0017	80 BRITTAIN	4	145	Y	4	132		4	163	Y	147	Y
39-153-0022	177 S. BROADWAY	4	90	Y	4	84		4	76	Y	83	Y
39-157-0003	100 N TUSCARAWAS	4	152	Y	4	88		4	119	Y	120	Y

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State Name: Pennsylvania

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	97	Y	4	95		3	136 *	Y	109	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	82	Y	4	76		4	95		84	Y
42-003-0021	GLADSTONE HIGH SCHOOL	3	75 *	Y	2	88 *		4	75	Y	79	N
42-003-0031	1275 Bedford Ave, Pittsburg							3	89 *	Y	89	N
42-003-0064	2743 Washington Blvd, McKee	4	127	Y	4	98		4	102	Y	109	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	96	Y	3	90 *		4	102	Y	96	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	87	Y	3	78 *		4	203	Y	123	Y
42-003-1301	600 Anderson St, Braddock,							4	101	Y	101	N
42-003-3003	EXTENSION TO WALL STREET IN	3	157 *	Y	3	116 *		4	124	Y	132	N
42-003-3004	GREENWAY ALLEY, CLAIRTON							4	61	Y	61	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	152	Y	4	147		4	161		153	Y
42-007-0005	1015 SEBRING ROAD	4	283	Y	4	294		4	270	Y	282	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	87	Y	4	100		4	83	Y	90	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	100	Y	4	101		4	109	Y	103	Y
42-013-0801	2ND AVE & 7TH ST	4	51	Y	4	68		4	62	Y	60	Y
42-017-0012	ROCKVIEW LANE	4	45	Y	4	38		4	43	Y	42	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	82	Y	4	92		4	88	Y	87	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	3	49 *	Y							49	N
42-043-0401	651 Gibson Blvd., Harrisbur	4	55	Y	4	31		4	62	Y	49	Y
42-045-0002	FRONT ST & NORRIS ST	4	65	Y	4	52		4	69	Y	62	Y

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Pollutant: Sulfur dioxide(42401)
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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2002
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-045-0109	MARCUS HOOK ELEMENTARY SCHO							0	126 *		126	N
42-049-0003	10TH AND MARNE STREETS	4	88	Y	4	124		4	96	Y	103	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	93 *	Y	2	72 *		2	79 *		81	N
42-069-2006	GEORGE ST TROOP AND CITY OF	4	36	Y	4	39		4	31	Y	35	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	46	Y	4	39		4	52	Y	46	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	95	Y	4	138		4	99	Y	111	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	50	Y	4	45		4	54	Y	50	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	40	Y	4	49		4	36	Y	42	Y
42-081-0100	899 CHERRY STREET	4	34	N	0	25 *					30	N
42-081-0403	600 RAILWAY STREET WILLIAM				3	40 *		4	39	Y	40	N
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	58	Y	4	66		4	63	Y	62	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	37	Y	4	46		4	37	Y	40	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	45	Y	4	36		4	38	Y	40	Y
42-095-0100	COAL ST & MILTON ST											N
42-095-8000	17TH AND SPRING GARDEN STRE	4	64	Y	4	67		4	67	Y	66	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	30	Y	4	33		4	38	Y	34	Y
42-101-0004	1501 E. LYCOMING AVE.	4	49	Y	4	48		4	44	Y	47	Y
42-101-0022	DEFENSE SUPPORT CENTER 20TH				2	60 *		2	56 *	Y	58	N
42-101-0029	20TH AND RACE STREETS	4	58	Y	4	67		3	60 *	Y	62	Y
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	4	53	Y	2	67 *		4	45	Y	55	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2002
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-107-0003	COAL & STADIUM STS. SHENAND	4	84	Y	4	51		4	79		71	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	93	Y	4	100		4	79	Y	91	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	306	Y	4	241		4	207	Y	251	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	88	Y	4	123		4	77	Y	96	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	91	Y	4	94		4	81	Y	89	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	103	Y	4	125		4	133		120	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	61	Y	4	72		4	89	Y	74	Y
42-133-0008	HILL ST.	4	58	Y	4	48		4	78	Y	61	Y

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	145	Y	4	169		4	142	Y	152	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	157	Y	4	214		4	224	Y	198	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	129	Y	4	182		4	176	Y	162	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	42	Y	4	56		4	49	Y	49	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	207	Y	4	174		4	198	Y	193	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	139	Y	4	164		4	186	Y	163	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	167	Y	4	165		4	134	Y	155	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	101	Y	4	162		4	167	Y	143	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR	4	131	Y	4	125		4	172	Y	143	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	157	Y	4	159		4	162	Y	159	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE	4	80	Y	4	120		4	161	Y	120	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	127	Y	4	156		4	194	Y	159	Y
54-039-0004	WVAPCC OFC BLDG 1558 WASHIN							1	138 *	Y	138	N
54-039-0010	CHARLESTON - 209 MORRIS STR	4	87	Y	4	104		3	81 *	Y	91	N
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	137	Y	4	191		4	177	Y	168	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	282	Y	4	197		4	186	Y	222	Y
54-061-0004	KNAPP HALL, WVU, MORGANTOWN				3	135 *		4	157	Y	146	N
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	226	Y	4	176		4	159	Y	187	Y
54-069-0007	NORTHERN PANHANDLE REGIONAL	4	106	Y	4	132		4	141	Y	126	Y
54-099-0002	CENTENNIAL DRIVE KENOVA WVA	4	62	Y	4	67		4	64	Y	64	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2002

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2002			2001			2000			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-099-0003	SPRING BROOK DRIVE	4	83		4	118		4	123		108	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	82		4	110		4	112		101	Y
54-099-0005	BIG SANDY ROAD	4	93		4	111		4	154		119	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	125	Y	4	163		4	193	Y	160	Y

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2003
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	99	Y	4	89	Y	4	82		90	Y
39-003-0002	2650 BIBLE RD.	4	27	Y	4	24	Y	4	27		26	Y
39-007-1001	770 LAKE RD.	4	44	Y	4	55	Y	4	56		52	Y
39-013-3002	EAST 40 ST.	4	158	Y	4	164	Y	4	214		179	Y
39-017-0004	SCHULER AND BENDER	4	79	Y	4	86	Y	4	96		87	Y
39-017-1004	HOOK FIELD AIRPORT	4	70	Y	4	70	Y	4	93		78	Y
39-023-0003	5400 SPANGLER	4	47	Y	4	43	Y	4	44		45	Y
39-025-0021	3079 ANGEL DR.	4	103	Y	4	69	Y	4	129		100	Y
39-029-0022	500 MARYLAND	4	151	Y	4	150	Y	3	147 *		149	Y
39-035-0038	2547 ST TIKHON	4	85	Y	4	53	Y	4	75		71	Y
39-035-0045	4950 BROADWAY AVE.	4	68	Y	4	51	Y	4	65		61	Y
39-035-0060	E. 14TH & ORANGE	4	64	Y	4	55	Y	4	73		64	Y
39-035-0065	4600 HARVARD AVE.	4	55	Y	4	55	Y	4	55		55	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891	2	127 *	Y	4	100	Y	4	101		109	N
39-049-0034	KORBEL AVE.	4	43	Y	4	37	Y	4	41		40	Y
39-053-0002	S.R. 554	4	93	Y	4	109	Y	2	136 *		113	N
39-061-0010	6950 RIPPLE RD.	4	114	Y	4	157	Y	4	168		146	Y
39-081-0016	227 NORTH 5TH ST.	3	180 *	Y	4	132	Y	4	178		163	Y
39-081-0017	618 LOGAN ST.	0	121 *	Y							121	N
39-081-1001	501 COMMERICAL	4	198	Y	4	197	Y	4	189		195	Y

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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2003
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
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Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-085-0003	36010 LAKESHORE	4	56	Y	4	49	Y	4	51		52	Y
39-085-3002	71 E HIGH	4	149	Y	4	146	Y	4	139		145	Y
39-087-0006	2120 S. 8TH	4	40	Y	4	62	Y	4	65		56	Y
39-093-0017	601 BROAD STREET, ELYRIA, O	4	56	Y	4	60	Y	4	61		59	Y
39-093-0026	NEBRASKA AVE. AND ADAMS	1	34 *	Y	4	48	Y	4	50		44	N
39-095-0008	3040 YORK ST.	4	65	Y	4	88	Y	4	69		74	Y
39-095-0024	348 S. ERIE	4	54	Y	4	53	Y	4	72		60	Y
39-099-0013	345 OAKHILL	4	75	Y	4	59	Y	4	97		77	Y
39-105-1001	MULBERRY AVE.	4	93	Y	4	94	Y	4	126		104	Y
39-113-0025	451 WEST THIRD ST.,	4	35	Y	4	37	Y	4	34		35	Y
39-115-0003	2600 ST. RT. 83	4	267	Y	4	180	Y	4	209		219	Y
39-145-0013	4862 GALLIA	4	49	Y	4	50	Y	4	74		58	Y
39-151-0016	515 25TH. ST.	4	61	Y	4	52	Y	4	55		56	Y
39-153-0017	80 BRITTAIN	4	167	Y	4	145	Y	4	132		148	Y
39-153-0022	177 S. BROADWAY	4	85	Y	4	90	Y	4	84		86	Y
39-157-0003	100 N TUSCARAWAS	2	139 *	Y	4	152	Y	4	88		126	N
39-157-0006	527 CRESCENT DR.	1	66 *	Y							66	N

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State Name: Pennsylvania

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	66	Y	4	97	Y	4	95		86	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	73	Y	4	82	Y	4	76		77	Y
42-003-0021	GLADSTONE HIGH SCHOOL	3	57 *	Y	3	75 *	Y	2	88 *		73	N
42-003-0064	2743 Washington Blvd, McKee	4	153	Y	4	127	Y	4	98		126	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	63	Y	4	96	Y	3	90 *		83	N
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	61	Y	4	87	Y	3	78 *		75	N
42-003-3003	EXTENSION TO WALL STREET IN	4	164	Y	3	157 *	Y	3	116 *		146	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	152	Y	4	152	Y	4	147		150	Y
42-007-0005	1015 SEBRING ROAD	4	158	Y	4	283	Y	4	294		245	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	98	Y	4	87	Y	4	100		95	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	107	Y	4	100	Y	4	101		103	Y
42-013-0801	2ND AVE & 7TH ST	4	62	Y	4	51	Y	4	68		60	Y
42-017-0012	ROCKVIEW LANE	4	46	Y	4	45	Y	4	38		43	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	90	Y	4	82	Y	4	92		88	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	3	36 *	Y	3	49 *	Y				43	N
42-043-0401	651 Gibson Blvd., Harrisbur	4	72	Y	4	55	Y	4	31		53	Y
42-045-0002	FRONT ST & NORRIS ST	4	63	Y	4	65	Y	4	52		60	Y
42-049-0003	10TH AND MARNE STREETS	4	85	Y	4	88	Y	4	124		99	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	84 *	Y	2	93 *	Y	2	72 *		83	N
42-069-2006	GEORGE ST TROOP AND CITY OF	4	39	Y	4	36	Y	4	39		38	Y

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Design Value Year: 2003
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	51	Y	4	46	Y	4	39		45	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	94	Y	4	95	Y	4	138		109	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	69	Y	4	50	Y	4	45		55	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	42	Y	4	40	Y	4	49		44	Y
42-081-0100	899 CHERRY STREET	4	57	Y	4	34	N	0	25 *		39	N
42-081-0403	600 RAILWAY STREET WILLIAM							3	40 *		40	N
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	71	Y	4	58	Y	4	66		65	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	41	Y	4	37	Y	4	46		41	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	39	Y	4	45	Y	4	36		40	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	63	Y	4	64	Y	4	67		65	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	38	Y	4	30	Y	4	33		34	Y
42-101-0004	1501 E. LYCOMING AVE.	4	52	Y	4	49	Y	4	48		50	Y
42-101-0022	DEFENSE SUPPORT CENTER 20TH							2	60 *		60	N
42-101-0029	20TH AND RACE STREETS	4	63	Y	4	58	Y	4	67		63	Y
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	4	53	Y	4	53	Y	2	67 *		58	N
42-107-0003	COAL & STADIUM STS. SHENAND	4	54	Y	4	84	Y	4	51		63	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	78	Y	4	93	Y	4	100		90	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	262	Y	4	306	Y	4	241		270	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	95	Y	4	88	Y	4	123		102	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	85	Y	4	91	Y	4	94		90	Y

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State Name: Pennsylvania

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-125-5001	HILLMAN STATE PARK - KINGS	4	106	Y	4	103	Y	4	125		111	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	83	Y	4	61	Y	4	72		72	Y
42-133-0008	HILL ST.	4	52	Y	4	58	Y	4	48		53	Y

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Design Value Year: 2003
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	189	Y	4	145	Y	4	169		168	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	168	Y	4	157	Y	4	214		180	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	179	Y	4	129	Y	4	182		163	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	45	Y	4	42	Y	4	56		48	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	271	Y	4	207	Y	4	174		217	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	187	Y	4	139	Y	4	164		163	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	153	Y	4	167	Y	4	165		162	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	166	Y	4	101	Y	4	162		143	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR	4	153	Y	4	131	Y	4	125		136	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	147	Y	4	157	Y	4	159		154	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE	4	99	Y	4	80	Y	4	120		100	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	165	Y	4	127	Y	4	156		149	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	85	Y	4	87	Y	4	104		92	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	154	Y	4	137	Y	4	191		161	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	176	Y	4	282	Y	4	197		218	Y
54-061-0004	KNAPP HALL, WVU, MORGANTOWN							3	135 *		135	N
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	185	Y	4	226	Y	4	176		196	Y
54-069-0007	NORTHERN PANHANDLE REGIONAL	3	100 *	Y	4	106	Y	4	132		113	Y
54-099-0002	CENTENNIAL DRIVE KENOVA WVA	1	58 *	Y	4	62	Y	4	67		62	N
54-099-0003	SPRING BROOK DRIVE	4	77		4	83		4	118		93	Y

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2003			2002			2001			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	119		4	82		4	110		104	Y
54-099-0005	BIG SANDY ROAD	4	123		4	93		4	111		109	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	131	Y	4	125	Y	4	163		140	Y

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State Name: Ohio

		2004			2003			2002			3-Year	
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39-001-0001	210 N. WILSON DR.	4	102	Y	4	99	Y	4	89	Y	97	Y
39-003-0002	2650 BIBLE RD.	4	28	Y	4	27	Y	4	24	Y	26	Y
39-007-1001	770 LAKE RD.	4	36	Y	4	44	Y	4	55	Y	45	Y
39-013-3002	EAST 40 ST.	4	129	Y	4	158	Y	4	164	Y	150	Y
39-017-0004	SCHULER AND BENDER	4	96	Y	4	79	Y	4	86	Y	87	Y
39-017-1004	HOOK FIELD AIRPORT	4	77	Y	4	70	Y	4	70	Y	72	Y
39-023-0003	5400 SPANGLER	4	42	Y	4	47	Y	4	43	Y	44	Y
39-025-0021	3079 ANGEL DR.	4	106	Y	4	103	Y	4	69	Y	93	Y
39-029-0022	500 MARYLAND	4	170	Y	4	151	Y	4	150	Y	157	Y
39-035-0038	2547 ST TIKHON	4	76	Y	4	85	Y	4	53	Y	71	Y
39-035-0045	4950 BROADWAY AVE.	4	46	Y	4	68	Y	4	51	Y	55	Y
39-035-0060	E. 14TH & ORANGE	4	63	Y	4	64	Y	4	55	Y	61	Y
39-035-0065	4600 HARVARD AVE.	4	48	Y	4	55	Y	4	55	Y	53	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891				2	127 *	Y	4	100	Y	114	N
39-049-0034	KORBEL AVE.	4	53	Y	4	43	Y	4	37	Y	44	Y
39-053-0002	S.R. 554	4	104	Y	4	93	Y	4	109	Y	102	Y
39-061-0010	6950 RIPPLE RD.	4	158	Y	4	114	Y	4	157	Y	143	Y
39-081-0016	227 NORTH 5TH ST.				3	180 *	Y	4	132	Y	156	N
39-081-0017	618 LOGAN ST.	4	236	Y	0	121 *	Y				179	N
39-081-1001	501 COMMERICAL	0	73 *	Y	4	198	Y	4	197	Y	156	N

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39-085-3002	71 E HIGH	4	161	Y	4	149	Y	4	146	Y	152	Y
39-087-0006	2120 S. 8TH	4	55	Y	4	40	Y	4	62	Y	52	Y
39-093-0017	601 BROAD STREET, ELYRIA, O	3	63 *	Y	4	56	Y	4	60	Y	60	N
39-093-0026	NEBRASKA AVE. AND ADAMS				1	34 *	Y	4	48	Y	41	N
39-095-0008	3040 YORK ST.	4	85	Y	4	65	Y	4	88	Y	79	Y
39-095-0024	348 S. ERIE	4	58	Y	4	54	Y	4	53	Y	55	Y
39-099-0013	345 OAKHILL	4	55	Y	4	75	Y	4	59	Y	63	Y
39-105-1001	MULBERRY AVE.	4	100	Y	4	93	Y	4	94	Y	96	Y
39-113-0025	451 WEST THIRD ST.,	0	10 *	Y	4	35	Y	4	37	Y	27	N
39-115-0003	2600 ST. RT. 83	4	274	Y	4	267	Y	4	180	Y	240	Y
39-145-0013	4862 GALLIA	4	42	Y	4	49	Y	4	50	Y	47	Y
39-145-0020	2840 BACK RD.	0	39 *	N							39	N
39-145-0022	1740 GALLIA PIKE	0	38 *	N							38	N
39-151-0016	515 25TH. ST.	0	71 *	Y	4	61	Y	4	52	Y	61	N
39-153-0017	80 BRITTAIN	4	172	Y	4	167	Y	4	145	Y	161	Y
39-153-0022	177 S. BROADWAY	4	68	Y	4	85	Y	4	90	Y	81	Y
39-157-0003	100 N TUSCARAWAS				2	139 *	Y	4	152	Y	146	N
39-157-0006	527 CRESCENT DR.	4	86	Y	1	66 *	Y				76	N

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		2004			2003			2002			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	71	Y	4	66	Y	4	97	Y	78	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	70	Y	4	73	Y	4	82	Y	75	Y
42-003-0021	GLADSTONE HIGH SCHOOL	4	69	Y	3	57 *	Y	3	75 *	Y	67	N
42-003-0064	2743 Washington Blvd, McKee	4	99	Y	4	153	Y	4	127	Y	126	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	103	Y	4	63	Y	4	96	Y	87	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	56	Y	4	61	Y	4	87	Y	68	Y
42-003-3003	EXTENSION TO WALL STREET IN	4	136	Y	4	164	Y	3	157 *	Y	152	Y
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	124	Y	4	152	Y	4	152	Y	143	Y
42-007-0005	1015 SEBRING ROAD	4	222	Y	4	158	Y	4	283	Y	221	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	79	Y	4	98	Y	4	87	Y	88	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	105	Y	4	107	Y	4	100	Y	104	Y
42-013-0801	2ND AVE & 7TH ST	4	61	Y	4	62	Y	4	51	Y	58	Y
42-017-0012	ROCKVIEW LANE	4	34	Y	4	46	Y	4	45	Y	42	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	86	Y	4	90	Y	4	82	Y	86	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	33	Y	3	36 *	Y	3	49 *	Y	39	N
42-043-0401	651 Gibson Blvd., Harrisbur	4	64	Y	4	72	Y	4	55	Y	64	Y
42-045-0002	FRONT ST & NORRIS ST	4	49	Y	4	63	Y	4	65	Y	59	Y
42-049-0003	10TH AND MARNE STREETS	4	72	Y	4	85	Y	4	88	Y	82	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	75 *	Y	2	84 *	Y	2	93 *	Y	84	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	0	124 *	Y							124	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2004
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2004			2003			2002			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-069-2006	GEORGE ST TROOP AND CITY OF	4	34	Y	4	39	Y	4	36	Y	36	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	54	Y	4	51	Y	4	46	Y	50	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	91	Y	4	94	Y	4	95	Y	93	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	69	Y	4	69	Y	4	50	Y	63	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	39	Y	4	42	Y	4	40	Y	40	Y
42-081-0100	899 CHERRY STREET	4	38	Y	4	57	Y	4	34	N	43	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	52	Y	4	71	Y	4	58	Y	60	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	28	Y	4	41	Y	4	37	Y	35	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	42	Y	4	39	Y	4	45	Y	42	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	92	Y	4	63	Y	4	64	Y	73	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	34	Y	4	38	Y	4	30	Y	34	Y
42-101-0004	1501 E. LYCOMING AVE.	4	47	Y	4	52	Y	4	49	Y	49	Y
42-101-0029	20TH AND RACE STREETS	4	56	Y	4	63	Y	4	58	Y	59	Y
42-101-0055	24TH & RITNER STREETS	0	39 *	Y							39	N
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	4	51	Y	4	53	Y	4	53	Y	52	Y
42-107-0003	COAL & STADIUM STS. SHENAND	4	73	Y	4	54	Y	4	84	Y	70	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	49	Y	4	78	Y	4	93	Y	73	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	190	Y	4	262	Y	4	306	Y	253	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	88	Y	4	95	Y	4	88	Y	90	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	81	Y	4	85	Y	4	91	Y	86	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2004

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2004			2003			2002			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-125-5001	HILLMAN STATE PARK - KINGS	4	115	Y	4	106	Y	4	103	Y	108	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	68	Y	4	83	Y	4	61	Y	71	Y
42-133-0008	HILL ST.	4	108	Y	4	52	Y	4	58	Y	73	Y

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Design Value Year: 2004
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2004			2003			2002			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	153	Y	4	189	Y	4	145	Y	162	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	145	Y	4	168	Y	4	157	Y	157	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	135	Y	4	179	Y	4	129	Y	148	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	48	Y	4	45	Y	4	42	Y	45	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	193	Y	4	271	Y	4	207	Y	224	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	169	Y	4	187	Y	4	139	Y	165	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	150	Y	4	153	Y	4	167	Y	157	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	130	Y	4	166	Y	4	101	Y	132	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR				4	153	Y	4	131	Y	142	N
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	137	Y	4	147	Y	4	157	Y	147	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE	2	82 *	Y	4	99	Y	4	80	Y	87	N
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	160	Y	4	165	Y	4	127	Y	151	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	94	Y	4	85	Y	4	87	Y	89	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	175	Y	4	154	Y	4	137	Y	155	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	182	Y	4	176	Y	4	282	Y	213	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	209	Y	4	185	Y	4	226	Y	207	Y
54-069-0007	NORTHERN PANHANDLE REGIONAL				3	100 *	Y	4	106	Y	103	N
54-099-0002	CENTENNIAL DRIVE KENOVA WVA				1	58 *	Y	4	62	Y	60	N
54-099-0003	SPRING BROOK DRIVE	4	75		4	77		4	83		78	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	59		4	119		4	82		87	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2004

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2004			2003			2002			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-099-0005	BIG SANDY ROAD	4	52		4	123		4	93		89	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	171	Y	4	131	Y	4	125	Y	142	Y

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Design Value Year: 2005
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	121		4	102	Y	4	99	Y	107	Y
39-003-0002	2650 BIBLE RD.	4	27	Y	4	28	Y	4	27	Y	27	Y
39-007-1001	770 LAKE RD.	4	39		4	36	Y	4	44	Y	40	Y
39-013-3002	EAST 40 ST.	4	190		4	129	Y	4	158	Y	159	Y
39-017-0004	SCHULER AND BENDER	4	87		4	96	Y	4	79	Y	87	Y
39-017-1004	HOOK FIELD AIRPORT	4	80		4	77	Y	4	70	Y	76	Y
39-023-0003	5400 SPANGLER	4	50		4	42	Y	4	47	Y	46	Y
39-025-0021	3079 ANGEL DR.	3	71 *		4	106	Y	4	103	Y	93	Y
39-029-0022	500 MARYLAND	4	129		4	170	Y	4	151	Y	150	Y
39-035-0038	2547 ST TIKHON	4	88		4	76	Y	4	85	Y	83	Y
39-035-0045	4950 BROADWAY AVE.	4	66		4	46	Y	4	68	Y	60	Y
39-035-0060	E. 14TH & ORANGE	4	93		4	63	Y	4	64	Y	73	Y
39-035-0065	4600 HARVARD AVE.	4	55		4	48	Y	4	55	Y	53	Y
39-035-6001	CLEVELAND HEALTH MUSEUM 891							2	127 *	Y	127	N
39-049-0034	KORBEL AVE.	4	55	Y	4	53	Y	4	43	Y	50	Y
39-053-0002	S.R. 554	4	100		4	104	Y	4	93	Y	99	Y
39-061-0010	6950 RIPPLE RD.	4	164		4	158	Y	4	114	Y	145	Y
39-081-0016	227 NORTH 5TH ST.							3	180 *	Y	180	N
39-081-0017	618 LOGAN ST.	4	224		4	236	Y	0	121 *	Y	194	N
39-081-1001	501 COMMERICAL				0	73 *	Y	4	198	Y	136	N

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Design Value Year: 2005
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State Name: Ohio

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-085-0003	36010 LAKESHORE	4	74		4	42	Y	4	56	Y	57	Y
39-085-3002	71 E HIGH	4	193		4	161	Y	4	149	Y	168	Y
39-087-0006	2120 S. 8TH	4	55	Y	4	55	Y	4	40	Y	50	Y
39-093-0017	601 BROAD STREET, ELYRIA, O				3	63 *	Y	4	56	Y	60	N
39-093-0026	NEBRASKA AVE. AND ADAMS							1	34 *	Y	34	N
39-095-0008	3040 YORK ST.	4	67		4	85	Y	4	65	Y	72	Y
39-095-0024	348 S. ERIE	4	70		4	58	Y	4	54	Y	61	Y
39-099-0013	345 OAKHILL	4	71		4	55	Y	4	75	Y	67	Y
39-105-1001	MULBERRY AVE.	4	103		4	100	Y	4	93	Y	99	Y
39-113-0025	451 WEST THIRD ST.,				0	10 *	Y	4	35	Y	23	N
39-115-0003	2600 ST. RT. 83	4	281		4	274	Y	4	267	Y	274	Y
39-145-0013	4862 GALLIA	4	39	Y	4	42	Y	4	49	Y	43	Y
39-145-0020	2840 BACK RD.	4	65		0	39 *	N				52	N
39-145-0022	1740 GALLIA PIKE	4	69		0	38 *	N				53	N
39-151-0016	515 25TH. ST.				0	71 *	Y	4	61	Y	66	N
39-153-0017	80 BRITTAIN	4	140		4	172	Y	4	167	Y	160	Y
39-153-0022	177 S. BROADWAY	4	79		4	68	Y	4	85	Y	77	Y
39-157-0003	100 N TUSCARAWAS							2	139 *	Y	139	N
39-157-0006	527 CRESCENT DR.	4	77		4	86	Y	1	66 *	Y	76	N

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	76		4	71	Y	4	66	Y	71	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	66		4	70	Y	4	73	Y	70	Y
42-003-0021	GLADSTONE HIGH SCHOOL	4	90		4	69	Y	3	57 *	Y	72	N
42-003-0064	2743 Washington Blvd, McKee	4	114		4	99	Y	4	153	Y	122	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	68		4	103	Y	4	63	Y	78	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	68		4	56	Y	4	61	Y	62	Y
42-003-3003	EXTENSION TO WALL STREET IN	4	229		4	136	Y	4	164	Y	176	Y
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	158		4	124	Y	4	152	Y	145	Y
42-007-0005	1015 SEBRING ROAD	4	248		4	222	Y	4	158	Y	209	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	76		4	79	Y	4	98	Y	84	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	4	95		4	105	Y	4	107	Y	102	Y
42-013-0801	2ND AVE & 7TH ST	4	72		4	61	Y	4	62	Y	65	Y
42-017-0012	ROCKVIEW LANE	4	43	Y	4	34	Y	4	46	Y	41	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	97		4	86	Y	4	90	Y	91	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	39	Y	4	33	Y	3	36 *	Y	36	Y
42-043-0401	651 Gibson Blvd., Harrisbur	4	79		4	64	Y	4	72	Y	72	Y
42-045-0002	FRONT ST & NORRIS ST	4	54	Y	4	49	Y	4	63	Y	55	Y
42-049-0003	10TH AND MARNE STREETS	4	80		4	72	Y	4	85	Y	79	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	77 *		2	75 *	Y	2	84 *	Y	79	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	130		0	124 *	Y				127	N

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State Name: Pennsylvania

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-069-2006	GEORGE ST TROOP AND CITY OF	4	47	Y	4	34	Y	4	39	Y	40	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	78		4	54	Y	4	51	Y	61	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	108		4	91	Y	4	94	Y	98	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	63		4	69	Y	4	69	Y	67	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	42	Y	4	39	Y	4	42	Y	41	Y
42-081-0100	899 CHERRY STREET	4	47	Y	4	38	Y	4	57	Y	47	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	50		4	52	Y	4	71	Y	58	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	36	Y	4	28	Y	4	41	Y	35	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	49		4	42	Y	4	39	Y	43	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	90		4	92	Y	4	63	Y	82	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	37	Y	4	34	Y	4	38	Y	36	Y
42-101-0004	1501 E. LYCOMING AVE.	3	51 *	Y	4	47	Y	4	52	Y	50	Y
42-101-0029	20TH AND RACE STREETS	0	55 *	Y	4	56	Y	4	63	Y	58	N
42-101-0055	24TH & RITNER STREETS	4	42	Y	0	39 *	Y				41	N
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	2	56 *		4	51	Y	4	53	Y	53	N
42-107-0003	COAL & STADIUM STS. SHENAND	4	48	Y	4	73	Y	4	54	Y	58	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	59	Y	4	49	Y	4	78	Y	62	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	254		4	190	Y	4	262	Y	235	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	75		4	88	Y	4	95	Y	86	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	98		4	81	Y	4	85	Y	88	Y

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State Name: Pennsylvania

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-125-5001	HILLMAN STATE PARK - KINGS	4	97		4	115	Y	4	106	Y	106	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	94		4	68	Y	4	83	Y	82	Y
42-133-0008	HILL ST.	4	112		4	108	Y	4	52	Y	91	Y

Notes:
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Pollutant: Sulfur dioxide(42401)
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Design Value Year: 2005
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	189		4	153	Y	4	189	Y	177	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	147		4	145	Y	4	168	Y	153	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	152		4	135	Y	4	179	Y	155	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	44	Y	4	48	Y	4	45	Y	46	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	148		4	193	Y	4	271	Y	204	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	121		4	169	Y	4	187	Y	159	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	105		4	150	Y	4	153	Y	136	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	134		4	130	Y	4	166	Y	143	Y
54-029-0014	WEIRTON - SKYVIEW ELEMENTAR							4	153	Y	153	N
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	131		4	137	Y	4	147	Y	138	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE				2	82 *	Y	4	99	Y	91	N
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	129		4	160	Y	4	165	Y	151	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	78		4	94	Y	4	85	Y	86	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	157		4	175	Y	4	154	Y	162	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	140		4	182	Y	4	176	Y	166	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	4	167		4	209	Y	4	185	Y	187	Y
54-069-0007	NORTHERN PANHANDLE REGIONAL							3	100 *	Y	100	N
54-099-0002	CENTENNIAL DRIVE KENOVA WVA							1	58 *	Y	58	N
54-099-0003	SPRING BROOK DRIVE	4	75		4	75		4	77		76	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	56		4	59		4	119		78	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2005

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: West Virginia

		2005			2004			2003			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-099-0005	BIG SANDY ROAD	4	49	N	4	52		4	123		75	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	167		4	171	Y	4	131	Y	156	Y

Notes:
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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2006
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	70		4	121		4	102	Y	98	Y
39-003-0002	2650 BIBLE RD.	4	22	Y	4	27	Y	4	28	Y	26	Y
39-007-1001	770 LAKE RD.	4	40	Y	4	39		4	36	Y	38	Y
39-013-3002	EAST 40 ST.	4	124		4	190		4	129	Y	148	Y
39-017-0004	SCHULER AND BENDER	4	70	N	4	87		4	96	Y	84	Y
39-017-1004	HOOK FIELD AIRPORT	4	54		4	80		4	77	Y	70	Y
39-023-0003	5400 SPANGLER	4	39	Y	4	50		4	42	Y	44	Y
39-025-0021	3079 ANGEL DR.				3	71 *		4	106	Y	89	N
39-029-0022	500 MARYLAND	4	107		4	129		4	170	Y	135	Y
39-035-0038	2547 ST TIKHON	4	75		4	88		4	76	Y	80	Y
39-035-0045	4950 BROADWAY AVE.	4	65		4	66		4	46	Y	59	Y
39-035-0060	E. 14TH & ORANGE	4	75		4	93		4	63	Y	77	Y
39-035-0065	4600 HARVARD AVE.	4	125		4	55		4	48	Y	76	Y
39-049-0034	KORBEL AVE.	4	37	Y	4	55	Y	4	53	Y	48	Y
39-053-0002	S.R. 554	4	110		4	100		4	104	Y	105	Y
39-061-0010	6950 RIPPLE RD.	4	108		4	164		4	158	Y	143	Y
39-081-0017	618 LOGAN ST.	4	135		4	224		4	236	Y	198	Y
39-081-1001	501 COMMERICAL							0	73 *	Y	73	N
39-085-0003	36010 LAKESHORE	4	45	Y	4	74		4	42	Y	54	Y
39-085-3002	71 E HIGH	4	172		4	193		4	161	Y	175	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2006
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-087-0006	2120 S. 8TH	4	58		4	55	Y	4	55	Y	56	Y
39-093-0017	601 BROAD STREET, ELYRIA, O							3	63 *	Y	63	N
39-095-0008	3040 YORK ST.	4	63		4	67		4	85	Y	72	Y
39-095-0024	348 S. ERIE	4	44	Y	4	70		4	58	Y	57	Y
39-099-0013	345 OAKHILL	4	60		4	71		4	55	Y	62	Y
39-105-1001	MULBERRY AVE.	4	109		4	103		4	100	Y	104	Y
39-113-0025	451 WEST THIRD ST.,							0	10 *	Y	10	N
39-115-0003	2600 ST. RT. 83	0	78 *		4	281		4	274	Y	211	N
39-115-0004	S.R. 83	4	336								336	N
39-145-0013	4862 GALLIA	4	39	Y	4	39	Y	4	42	Y	40	Y
39-145-0020	2840 BACK RD.	4	49	N	4	65		0	39 *	N	51	N
39-145-0022	1740 GALLIA PIKE	4	45	N	4	69		0	38 *	N	50	N
39-151-0016	515 25TH. ST.							0	71 *	Y	71	N
39-153-0017	80 BRITTAIN	4	138		4	140		4	172	Y	150	Y
39-153-0022	177 S. BROADWAY	4	50	Y	4	79		4	68	Y	66	Y
39-157-0006	527 CRESCENT DR.	4	61		4	77		4	86	Y	75	Y

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Design Value Year: 2006
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	57		4	76		4	71	Y	68	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	73		4	66		4	70	Y	70	Y
42-003-0021	GLADSTONE HIGH SCHOOL	4	67		4	90		4	69	Y	75	Y
42-003-0064	2743 Washington Blvd, McKee	4	120		4	114		4	99	Y	111	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	59		4	68		4	103	Y	77	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	3	44 *		4	68		4	56	Y	56	N
42-003-3003	EXTENSION TO WALL STREET IN				4	229		4	136	Y	183	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	109		4	158		4	124	Y	130	Y
42-007-0005	1015 SEBRING ROAD	4	211		4	248		4	222	Y	227	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	62		4	76		4	79	Y	72	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR	1	83 *		4	95		4	105	Y	94	N
42-013-0801	2ND AVE & 7TH ST	4	48	Y	4	72		4	61	Y	60	Y
42-017-0012	ROCKVIEW LANE	4	35	Y	4	43	Y	4	34	Y	37	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	94		4	97		4	86	Y	92	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	27	Y	4	39	Y	4	33	Y	33	Y
42-043-0401	651 Gibson Blvd., Harrisbur	4	55		4	79		4	64	Y	66	Y
42-045-0002	FRONT ST & NORRIS ST	4	49	Y	4	54	Y	4	49	Y	51	Y
42-049-0003	10TH AND MARNE STREETS	4	44	Y	4	80		4	72	Y	65	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	67 *		2	77 *		2	75 *	Y	73	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	116		4	130		0	124 *	Y	123	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2006
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-069-2006	GEORGE ST TROOP AND CITY OF	4	42		4	47	Y	4	34	Y	41	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	55		4	78		4	54	Y	62	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	74		4	108		4	91	Y	91	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	54	Y	4	63		4	69	Y	62	Y
42-079-1101	CHILWICK & WASHINGTON STS	3	45 *	Y	4	42	Y	4	39	Y	42	N
42-081-0100	899 CHERRY STREET	4	58	Y	4	47	Y	4	38	Y	48	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	40	Y	4	50		4	52	Y	47	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	35	Y	4	36	Y	4	28	Y	33	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	48	Y	4	49		4	42	Y	46	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	256		4	90		4	92	Y	146	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	35	Y	4	37	Y	4	34	Y	35	Y
42-101-0004	1501 E. LYCOMING AVE.	4	40	Y	3	51 *	Y	4	47	Y	46	Y
42-101-0029	20TH AND RACE STREETS				0	55 *	Y	4	56	Y	56	N
42-101-0055	24TH & RITNER STREETS	4	43	Y	4	42	Y	0	39 *	Y	41	N
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	2	39 *	Y	2	56 *		4	51	Y	49	N
42-107-0003	COAL & STADIUM STS. SHENAND	4	70		4	48	Y	4	73	Y	64	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	63		4	59	Y	4	49	Y	57	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	235		4	254		4	190	Y	226	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	74		4	75		4	88	Y	79	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	78		4	98		4	81	Y	86	Y

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Pollutant: Sulfur dioxide(42401)
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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2006

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-125-5001	HILLMAN STATE PARK - KINGS	4	95		4	97		4	115	Y	102	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	75		4	94		4	68	Y	79	Y
42-133-0008	HILL ST.	4	93		4	112		4	108	Y	104	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2006
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2006			2005			2004			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	131		4	189		4	153	Y	158	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	179		4	147		4	145	Y	157	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	145		4	152		4	135	Y	144	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	38	Y	4	44	Y	4	48	Y	43	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	136		4	148		4	193	Y	159	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	142		4	121		4	169	Y	144	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	115		4	105		4	150	Y	123	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	134		4	134		4	130	Y	133	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	121		4	131		4	137	Y	130	Y
54-029-0016	WILLIAMS COUNTRY CLUB LODGE							2	82 *	Y	82	N
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	138		4	129		4	160	Y	142	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	90		4	78		4	94	Y	87	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	147		4	157		4	175	Y	160	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	181		4	140		4	182	Y	168	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN	3	158 *		4	167		4	209	Y	178	N
54-099-0003	SPRING BROOK DRIVE				4	75		4	75		75	N
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	70		4	56		4	59		62	Y
54-099-0005	BIG SANDY ROAD	4	63		4	49	N	4	52		55	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	97		4	167		4	171	Y	145	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	74		4	70		4	121		88	Y
39-003-0002	2650 BIBLE RD.	4	19		4	22	Y	4	27	Y	23	Y
39-007-1001	770 LAKE RD.	4	31		4	40	Y	4	39		37	Y
39-009-0004	7760 BLACKBURN ROAD	4	88								88	N
39-013-3002	EAST 40 ST.	3	113 *		4	124		4	190		142	Y
39-017-0004	SCHULER AND BENDER	4	59		4	70	N	4	87		72	Y
39-017-1004	HOOK FIELD AIRPORT	4	38		4	54		4	80		57	Y
39-023-0003	5400 SPANGLER	4	31		4	39	Y	4	50		40	Y
39-025-0021	3079 ANGEL DR.							3	71 *		71	N
39-029-0022	500 MARYLAND	4	128		4	107		4	129		121	Y
39-035-0038	2547 ST TIKHON	3	80 *		4	75		4	88		81	Y
39-035-0045	4950 BROADWAY AVE.	4	64		4	65		4	66		65	Y
39-035-0060	E. 14TH & ORANGE	4	85		4	75		4	93		84	Y
39-035-0065	4600 HARVARD AVE.	4	81		4	125		4	55		87	Y
39-049-0034	KORBEL AVE.	4	33		4	37	Y	4	55	Y	42	Y
39-053-0002	S.R. 554				4	110		4	100		105	N
39-061-0010	6950 RIPPLE RD.	4	99		4	108		4	164		124	Y
39-081-0017	618 LOGAN ST.	4	168		4	135		4	224		176	Y
39-085-0003	36010 LAKESHORE	4	41		4	45	Y	4	74		53	Y
39-085-3002	71 E HIGH	4	176		4	172		4	193		180	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-087-0006	2120 S. 8TH	4	47		4	58		4	55	Y	53	Y
39-095-0008	3040 YORK ST.	4	75		4	63		4	67		68	Y
39-095-0024	348 S. ERIE	4	46		4	44	Y	4	70		53	Y
39-099-0013	345 OAKHILL	4	58		4	60		4	71		63	Y
39-105-1001	MULBERRY AVE.	4	84		4	109		4	103		99	Y
39-115-0003	2600 ST. RT. 83				0	78 *		4	281		180	N
39-115-0004	S.R. 83	4	229		4	336					283	N
39-145-0013	4862 GALLIA	4	32		4	39	Y	4	39	Y	37	Y
39-145-0020	2840 BACK RD.	4	42		4	49	N	4	65		52	Y
39-145-0022	1740 GALLIA PIKE	3	43 *		4	45	N	4	69		52	N
39-153-0017	80 BRITTAIN	4	46		4	138		4	140		108	Y
39-153-0022	177 S. BROADWAY	4	57		4	50	Y	4	79		62	Y
39-157-0006	527 CRESCENT DR.	4	75		4	61		4	77		71	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	70		4	57		4	76		68	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	75		4	73		4	66		71	Y
42-003-0021	GLADSTONE HIGH SCHOOL	4	62		4	67		4	90		73	Y
42-003-0064	2743 Washington Blvd, McKee	4	192		4	120		4	114		142	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	74		4	59		4	68		67	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	3	72 *		3	44 *		4	68		61	N
42-003-3003	EXTENSION TO WALL STREET IN							4	229		229	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	153		4	109		4	158		140	Y
42-007-0005	1015 SEBRING ROAD	3	170 *		4	211		4	248		210	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	69		4	62		4	76		69	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR				1	83 *		4	95		89	N
42-011-0011	1059 Arnold Road	2	54 *								54	N
42-013-0801	2ND AVE & 7TH ST	4	56		4	48	Y	4	72		59	Y
42-017-0012	ROCKVIEW LANE	4	34		4	35	Y	4	43	Y	37	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	68		4	94		4	97		86	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	27		4	27	Y	4	39	Y	31	Y
42-043-0401	651 Gibson Blvd., Harrisbur	4	60		4	55		4	79		65	Y
42-045-0002	FRONT ST & NORRIS ST	3	51 *		4	49	Y	4	54	Y	51	Y
42-049-0003	10TH AND MARNE STREETS	4	38		4	44	Y	4	80		54	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	108 *		2	67 *		2	77 *		84	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	88		4	116		4	130		111	Y
42-069-2006	GEORGE ST TROOP AND CITY OF	4	33		4	42		4	47	Y	41	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	65		4	55		4	78		66	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	103		4	74		4	108		95	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	41		4	54	Y	4	63		53	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	40		3	45 *	Y	4	42	Y	42	N
42-081-0100	899 CHERRY STREET	4	46		4	58	Y	4	47	Y	50	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	4	46		4	40	Y	4	50		45	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	26		4	35	Y	4	36	Y	32	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	43		4	48	Y	4	49		47	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	215		4	256		4	90		187	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	29		4	35	Y	4	37	Y	34	Y
42-101-0004	1501 E. LYCOMING AVE.	4	38		4	40	Y	3	51 *	Y	43	Y
42-101-0029	20TH AND RACE STREETS							0	55 *	Y	55	N
42-101-0055	24TH & RITNER STREETS	4	35		4	43	Y	4	42	Y	40	Y
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE	3	50 *		2	39 *	Y	2	56 *		48	N
42-107-0003	COAL & STADIUM STS. SHENAND	4	48		4	70		4	48	Y	55	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	67		4	63		4	59	Y	63	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	153		4	235		4	254		214	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	90		4	74		4	75		80	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-125-0200	MCCARRELL AND FAYETTE STS	4	63		4	78		4	98		80	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	78		4	95		4	97		90	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	61		4	75		4	94		77	Y
42-133-0008	HILL ST.	4	107		4	93		4	112		104	Y

Notes:
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2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2007
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2007			2006			2005			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	131		4	131		4	189		150	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	168		4	179		4	147		165	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	169		4	145		4	152		155	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	43		4	38	Y	4	44	Y	42	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	208		4	136		4	148		164	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	134		4	142		4	121		132	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	126		4	115		4	105		115	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	142		4	134		4	134		137	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	112		4	121		4	131		121	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	140		4	138		4	129		136	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	96		4	90		4	78		88	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	161		4	147		4	157		155	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	193		4	181		4	140		171	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN				3	158	*	4	167		163	N
54-099-0003	SPRING BROOK DRIVE							4	75		75	N
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	47		4	70		4	56		58	Y
54-099-0005	BIG SANDY ROAD	4	46		4	63		4	49	N	53	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	128		4	97		4	167		131	Y

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Pollutant: Sulfur dioxide(42401)
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Design Value Year: 2008
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	59		4	74		4	70		68	Y
39-003-0002	2650 BIBLE RD.	4	20	Y	4	19		4	22	Y	20	Y
39-007-1001	770 LAKE RD.	4	36	Y	4	31		4	40	Y	36	Y
39-009-0004	7760 BLACKBURN ROAD	4	76		4	88					82	N
39-013-3002	EAST 40 ST.	4	105		3	113 *		4	124		114	Y
39-017-0004	SCHULER AND BENDER				4	59		4	70	N	65	N
39-017-1004	HOOK FIELD AIRPORT	4	32	Y	4	38		4	54		41	Y
39-023-0003	5400 SPANGLER	4	24	N	4	31		4	39	Y	31	Y
39-029-0022	500 MARYLAND	4	111		4	128		4	107		115	Y
39-035-0038	2547 ST TIKHON	4	81		3	80 *		4	75		79	Y
39-035-0045	4950 BROADWAY AVE.	4	43	Y	4	64		4	65		57	Y
39-035-0060	E. 14TH & ORANGE	4	70		4	85		4	75		77	Y
39-035-0065	4600 HARVARD AVE.	4	50		4	81		4	125		85	Y
39-049-0034	KORBEL AVE.	4	29	Y	4	33		4	37	Y	33	Y
39-053-0002	S.R. 554							4	110		110	N
39-061-0010	6950 RIPPLE RD.	4	83		4	99		4	108		97	Y
39-081-0017	618 LOGAN ST.	4	135		4	168		4	135		146	Y
39-085-0003	36010 LAKESHORE	4	42		4	41		4	45	Y	43	Y
39-085-3002	71 E HIGH	4	164		4	176		4	172		171	Y
39-087-0006	2120 S. 8TH	4	37	Y	4	47		4	58		47	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2008
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-095-0008	3040 YORK ST.				4	75		4	63		69	N
39-095-0024	348 S. ERIE				4	46		4	44	Y	45	N
39-099-0013	345 OAKHILL	4	60	Y	4	58		4	60		59	Y
39-105-1001	MULBERRY AVE.	4	78		4	84		4	109		90	Y
39-115-0003	2600 ST. RT. 83							0	78 *		78	N
39-115-0004	S.R. 83	4	220		4	229		4	336		262	Y
39-145-0013	4862 GALLIA	4	30		4	32		4	39	Y	34	Y
39-145-0020	2840 BACK RD.	4	34	Y	4	42		4	49	N	42	Y
39-145-0022	1740 GALLIA PIKE	4	39	Y	3	43 *		4	45	N	42	N
39-153-0017	80 BRITTAIN	4	34	Y	4	46		4	138		73	Y
39-153-0022	177 S. BROADWAY	4	37	Y	4	57		4	50	Y	48	Y
39-157-0006	527 CRESCENT DR.	4	64	Y	4	75		4	61		67	Y

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Design Value Year: 2008
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State Name: Pennsylvania

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	75		4	70		4	57		67	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	62		4	75		4	73		70	Y
42-003-0021	GLADSTONE HIGH SCHOOL				4	62		4	67		65	N
42-003-0064	2743 Washington Blvd, McKee	4	111		4	192		4	120		141	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	52		4	74		4	59		62	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	74		3	72 *		3	44 *		63	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	122		4	153		4	109		128	Y
42-007-0005	1015 SEBRING ROAD	4	165		3	170 *		4	211		182	Y
42-007-0014	EIGHT STREET AND RIVER ALLE	4	60		4	69		4	62		64	Y
42-011-0009	UGI CO MONGANTOWN RD AND PR							1	83 *		83	N
42-011-0011	1059 Arnold Road	4	46		2	54 *					50	N
42-013-0801	2ND AVE & 7TH ST	4	55		4	56		4	48	Y	53	Y
42-017-0012	ROCKVIEW LANE	4	26		4	34		4	35	Y	32	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	75		4	68		4	94		79	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	32		4	27		4	27	Y	29	Y
42-043-0401	651 Gibson Blvd., Harrisbur	4	62		4	60		4	55		59	Y
42-045-0002	FRONT ST & NORRIS ST	4	47		3	51 *		4	49	Y	49	Y
42-049-0003	10TH AND MARNE STREETS	4	38		4	38		4	44	Y	40	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	86 *		2	108 *		2	67 *		87	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	92		4	88		4	116		99	Y

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Pollutant: Sulfur dioxide(42401)
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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2008
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-069-2006	GEORGE ST TROOP AND CITY OF	4	29		4	33		4	42		35	Y
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO	4	69		4	65		4	55		63	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	60		4	103		4	74		79	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA	4	58		4	41		4	54	Y	51	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	36		4	40		3	45 *	Y	40	N
42-081-0100	899 CHERRY STREET	4	34		4	46		4	58	Y	46	Y
42-085-0100	PA518 (NEW CASTLE ROAD) & P	3	43 *		4	46		4	40	Y	43	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	25		4	26		4	35	Y	29	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F	4	31		4	43		4	48	Y	41	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	47		4	215		4	256		173	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	45		4	29		4	35	Y	36	Y
42-101-0004	1501 E. LYCOMING AVE.	4	33		4	38		4	40	Y	37	Y
42-101-0055	24TH & RITNER STREETS	3	32 *		4	35		4	43	Y	37	Y
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE				3	50 *		2	39 *	Y	45	N
42-107-0003	COAL & STADIUM STS. SHENAND				4	48		4	70		59	N
42-123-0003	345 E. FIFTH AVE. WARREN HI	4	42		4	67		4	63		57	Y
42-123-0004	OVERLOOK SITE - NEAR STONE	4	146		4	153		4	235		178	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	75		4	90		4	74		80	Y
42-125-0200	MCCARRELL AND FAYETTE STS	4	77		4	63		4	78		73	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	62		4	78		4	95		78	Y

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Pollutant: Sulfur dioxide(42401)
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Design Value Year: 2008

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-129-0008	DONOHOE ROAD - PENN DOT MAI	4	72		4	61		4	75		69	Y
42-133-0008	HILL ST.	4	96		4	107		4	93		99	Y

Notes:
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Pollutant: Sulfur dioxide(42401)
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Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2008
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2008			2007			2006			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	168		4	131		4	131		143	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	137		4	168		4	179		161	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	159		4	169		4	145		158	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	50		4	43		4	38	Y	44	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	154		4	208		4	136		166	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	147		4	134		4	142		141	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	120		4	126		4	115		120	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	163		4	142		4	134		146	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	127		4	112		4	121		120	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	144		4	140		4	138		141	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	76		4	96		4	90		87	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	113		4	161		4	147		140	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	130		4	193		4	181		168	Y
54-061-0005	WVU LAW SCHOOL, MORGANTOWN							3	158 *		158	N
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	49		4	47		4	70		55	Y
54-099-0005	BIG SANDY ROAD	4	31		4	46		4	63		47	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	149		4	128		4	97		125	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	80		4	59		4	74		71	Y
39-003-0002	2650 BIBLE RD.	2	23 *		4	20	Y	4	19		21	N
39-003-0009	2850 BIBLE ROAD	2	13 *								13	N
39-007-1001	770 LAKE RD.	4	34		4	36	Y	4	31		34	Y
39-009-0004	7760 BLACKBURN ROAD	4	58		4	76		4	88		74	Y
39-013-3002	EAST 40 ST.	4	74		4	105		3	113 *		97	Y
39-017-0004	SCHULER AND BENDER							4	59		59	N
39-017-1004	HOOK FIELD AIRPORT	4	30		4	32	Y	4	38		33	Y
39-023-0003	5400 SPANGLER	4	27		4	24	N	4	31		27	Y
39-029-0022	500 MARYLAND	4	113		4	111		4	128		117	Y
39-035-0038	2547 ST TIKHON	4	60		4	81		3	80 *		74	N
39-035-0045	4950 BROADWAY AVE.	4	50		4	43	Y	4	64		52	Y
39-035-0060	E. 14TH & ORANGE	2	83 *		4	70		4	85		79	N
39-035-0065	4600 HARVARD AVE.	4	25		4	50		4	81		52	Y
39-049-0034	KORBEL AVE.	2	36 *		4	29	Y	4	33		33	N
39-061-0010	6950 RIPPLE RD.	4	57		4	83		4	99		80	Y
39-081-0017	618 LOGAN ST.	4	85		4	135		4	168		129	Y
39-085-0003	36010 LAKESHORE	4	37		4	42		4	41		40	Y
39-085-0007	177 MAIN STREET	4	186								186	N
39-085-3002	71 E HIGH				4	164		4	176		170	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-087-0006	2120 S. 8TH	4	23		4	37	Y	4	47		36	Y
39-095-0008	3040 YORK ST.							4	75		75	N
39-095-0024	348 S. ERIE							4	46		46	N
39-099-0013	345 OAKHILL	4	54		4	60	Y	4	58		57	Y
39-103-0004	BALLASH ROAD	1	34 *								34	N
39-105-1001	MULBERRY AVE.	4	94		4	78		4	84		85	Y
39-115-0004	S.R. 83	4	198		4	220		4	229		216	Y
39-145-0013	4862 GALLIA	4	22		4	30		4	32		28	Y
39-145-0020	2840 BACK RD.	4	36		4	34	Y	4	42		37	Y
39-145-0022	1740 GALLIA PIKE	4	32		4	39	Y	3	43 *		38	N
39-153-0017	80 BRITTAIN	4	31		4	34	Y	4	46		37	Y
39-153-0022	177 S. BROADWAY	4	35		4	37	Y	4	57		43	Y
39-157-0006	527 CRESCENT DR.	4	64		4	64	Y	4	75		68	Y

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Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	61		4	75		4	70		69	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	61		4	62		4	75		66	Y
42-003-0021	GLADSTONE HIGH SCHOOL							4	62		62	N
42-003-0064	2743 Washington Blvd, McKee	4	131		4	111		4	192		145	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	53		4	52		4	74		60	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	4	60		4	74		3	72 *		69	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	109		4	122		4	153		128	Y
42-007-0005	1015 SEBRING ROAD	4	176		4	165		3	170 *		170	Y
42-007-0014	EIGHT STREET AND RIVER ALLE				4	60		4	69		65	N
42-011-0011	1059 Arnold Road	4	47		4	46		2	54 *		49	N
42-013-0801	2ND AVE & 7TH ST	4	51		4	55		4	56		54	Y
42-017-0012	ROCKVIEW LANE	4	32		4	26		4	34		31	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	68		4	75		4	68		70	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	29		4	32		4	27		29	Y
42-043-0401	651 Gibson Blvd., Harrisbur				4	62		4	60		61	N
42-045-0002	FRONT ST & NORRIS ST	4	32		4	47		3	51 *		43	Y
42-049-0003	10TH AND MARNE STREETS	4	36		4	38		4	38		37	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	51 *		2	86 *		2	108 *		82	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	82		4	92		4	88		87	Y
42-069-2006	GEORGE ST TROOP AND CITY OF				4	29		4	33		31	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO				4	69		4	65		67	N
42-073-0015	CROTON ST & JEFFERSON ST.	4	81		4	60		4	103		81	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA				4	58		4	41		50	N
42-079-1101	CHILWICK & WASHINGTON STS	4	26		4	36		4	40		34	Y
42-081-0100	899 CHERRY STREET				4	34		4	46		40	N
42-085-0100	PA518 (NEW CASTLE ROAD) & P				3	43 *		4	46		45	N
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	28		4	25		4	26		26	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F				4	31		4	43		37	N
42-095-8000	17TH AND SPRING GARDEN STRE	4	46		4	47		4	215		103	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	27		4	45		4	29		34	Y
42-101-0004	1501 E. LYCOMING AVE.	3	37 *		4	33		4	38		36	Y
42-101-0055	24TH & RITNER STREETS	4	32		3	32 *		4	35		33	Y
42-101-0136	AMTRAK, 5917 ELMWOOD AVENUE							3	50 *		50	N
42-107-0003	COAL & STADIUM STS. SHENAND							4	48		48	N
42-123-0003	345 E. FIFTH AVE. WARREN HI				4	42		4	67		55	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	113		4	146		4	153		137	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	100		4	75		4	90		88	Y
42-125-0200	MCCARRELL AND FAYETTE STS				4	77		4	63		70	N
42-125-5001	HILLMAN STATE PARK - KINGS	4	77		4	62		4	78		72	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI				4	72		4	61		67	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2009

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-133-0008	HILL ST.	4	89		4	96		4	107		97	Y

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Design Value Year: 2009
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2009			2008			2007			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	82		4	168		4	131		127	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	81		4	137		4	168		129	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	143		4	159		4	169		157	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	25		4	50		4	43		39	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	139		4	154		4	208		167	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	113		4	147		4	134		131	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	133		4	120		4	126		126	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	131		4	163		4	142		145	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	102		4	127		4	112		114	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	97		4	144		4	140		127	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	63		4	76		4	96		78	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	61		4	113		4	161		112	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	182		4	130		4	193		168	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	80		4	49		4	47		59	Y
54-099-0005	BIG SANDY ROAD	4	37		4	31		4	46		38	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	119		4	149		4	128		132	Y

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Design Value Year: 2010
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	43		4	80		4	59		61	Y
39-003-0002	2650 BIBLE RD.				2	23 *		4	20	Y	22	N
39-003-0009	2850 BIBLE ROAD	4	23		2	13 *					18	N
39-007-1001	770 LAKE RD.	4	20		4	34		4	36	Y	30	Y
39-009-0004	7760 BLACKBURN ROAD	4	71		4	58		4	76		68	Y
39-013-3002	EAST 40 ST.	4	62		4	74		4	105		80	Y
39-017-1004	HOOK FIELD AIRPORT	1	31 *		4	30		4	32	Y	31	N
39-023-0003	5400 SPANGLER	4	28		4	27		4	24	N	26	Y
39-029-0022	500 MARYLAND	4	47		4	113		4	111		90	Y
39-035-0038	2547 ST TIKHON	4	76		4	60		4	81		72	Y
39-035-0045	4950 BROADWAY AVE.	4	38		4	50		4	43	Y	44	Y
39-035-0060	E. 14TH & ORANGE	4	75		2	83 *		4	70		76	N
39-035-0065	4600 HARVARD AVE.	4	25		4	25		4	50		33	Y
39-049-0034	KORBEL AVE.				2	36 *		4	29	Y	33	N
39-061-0010	6950 RIPPLE RD.	3	66 *		4	57		4	83		69	N
39-081-0017	618 LOGAN ST.	4	127		4	85		4	135		116	Y
39-085-0003	36010 LAKESHORE	4	31		4	37		4	42		37	Y
39-085-0007	177 MAIN STREET	4	139		4	186					163	N
39-085-3002	71 E HIGH							4	164		164	N
39-087-0006	2120 S. 8TH	1	26 *		4	23		4	37	Y	29	N

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Design Value Year: 2010
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-087-0012	460 Commerce Drive	3	33 *								33	N
39-099-0013	345 OAKHILL	4	48		4	54		4	60	Y	54	Y
39-103-0004	BALLASH ROAD	2	32 *		1	34 *					33	N
39-105-1001	MULBERRY AVE.	4	94		4	94		4	78		89	Y
39-115-0004	S.R. 83	4	167		4	198		4	220		195	Y
39-145-0013	4862 GALLIA	4	24		4	22		4	30		25	Y
39-145-0020	2840 BACK RD.	4	52		4	36		4	34	Y	41	Y
39-145-0022	1740 GALLIA PIKE	4	50		4	32		4	39	Y	41	Y
39-153-0017	80 BRITTAIN	4	27		4	31		4	34	Y	31	Y
39-153-0022	177 S. BROADWAY	4	38		4	35		4	37	Y	37	Y
39-157-0006	527 CRESCENT DR.	4	58		4	64		4	64	Y	62	Y

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State Name: Pennsylvania

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	53	N	4	61		4	75		63	Y
42-003-0008	301 39th St, Pittsburgh, PA	3	29 *	N							29	N
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	35		4	61		4	62		53	Y
42-003-0064	2743 Washington Blvd, McKee	4	141	N	4	131		4	111		128	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	39	N	4	53		4	52		48	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC	3	63 *		4	60		4	74		66	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	72		4	109		4	122		101	Y
42-007-0005	1015 SEBRING ROAD	4	161		4	176		4	165		167	Y
42-007-0014	EIGHT STREET AND RIVER ALLE							4	60		60	N
42-011-0011	1059 Arnold Road	4	36		4	47		4	46		43	Y
42-013-0801	2ND AVE & 7TH ST	4	36		4	51		4	55		47	Y
42-017-0012	ROCKVIEW LANE	4	24		4	32		4	26		27	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	56		4	68		4	75		66	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	26		4	29		4	32		29	Y
42-043-0401	651 Gibson Blvd., Harrisbur							4	62		62	N
42-045-0002	FRONT ST & NORRIS ST	4	34		4	32		4	47		38	Y
42-049-0003	10TH AND MARNE STREETS	4	28		4	36		4	38		34	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	24 *		2	51 *		2	86 *		54	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	95		4	82		4	92		90	Y
42-069-2006	GEORGE ST TROOP AND CITY OF							4	29		29	N

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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Design Value Year: 2010
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-071-0007	ABRAHAM LINCOLN JR HIGH GRO							4	69		69	N
42-073-0015	CROTON ST & JEFFERSON ST.	4	53		4	81		4	60		65	Y
42-077-0004	STATE HOSPITAL REAR 1600 HA							4	58		58	N
42-079-1101	CHILWICK & WASHINGTON STS	4	17		4	26		4	36		26	Y
42-081-0100	899 CHERRY STREET							4	34		34	N
42-085-0100	PA518 (NEW CASTLE ROAD) & P							3	43 *		43	N
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	15		4	28		4	25		23	Y
42-095-0025	WASHINGTON & CAMBRIA STS. F							4	31		31	N
42-095-8000	17TH AND SPRING GARDEN STRE	4	57		4	46		4	47		50	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	18		4	27		4	45		30	Y
42-101-0004	1501 E. LYCOMING AVE.	4	18		3	37 *		4	33		29	Y
42-101-0055	24TH & RITNER STREETS	4	25		4	32		3	32 *		29	Y
42-123-0003	345 E. FIFTH AVE. WARREN HI							4	42		42	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	109		4	113		4	146		123	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	26		4	100		4	75		67	Y
42-125-0200	MCCARRELL AND FAYETTE STS							4	77		77	N
42-125-5001	HILLMAN STATE PARK - KINGS	4	42		4	77		4	62		60	Y
42-129-0008	DONOHOE ROAD - PENN DOT MAI							4	72		72	N
42-133-0008	HILL ST.	4	27		4	89		4	96		71	Y

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Design Value Year: 2010
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2010			2009			2008			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	131		4	82		4	168		127	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	92		4	81		4	137		103	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	143		4	143		4	159		148	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	31		4	25		4	50		35	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	85		4	139		4	154		126	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	50		4	113		4	147		103	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	44		4	133		4	120		99	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	68		4	131		4	163		121	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	68		4	102		4	127		99	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	51		4	97		4	144		97	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	51		4	63		4	76		63	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	101		4	61		4	113		92	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	24		4	182		4	130		112	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	4	44		4	80		4	49		58	Y
54-099-0005	BIG SANDY ROAD	4	41		4	37		4	31		36	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	84		4	119		4	149		117	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2011
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	30		4	43		4	80		51	Y
39-003-0002	2650 BIBLE RD.							2	23 *		23	N
39-003-0009	2850 BIBLE ROAD	4	14		4	23		2	13 *		17	N
39-007-1001	770 LAKE RD.	4	19		4	20		4	34		24	Y
39-009-0004	7760 BLACKBURN ROAD	3	58 *		4	71		4	58		62	N
39-013-3002	EAST 40 ST.	4	47		4	62		4	74		61	Y
39-017-0019	1300 OXFORD STATE ROAD	1	29 *								29	N
39-017-0020	3350 YANKEE ROAD	2	77 *								77	N
39-017-1004	HOOK FIELD AIRPORT				1	31 *		4	30		31	N
39-023-0003	5400 SPANGLER	4	22		4	28		4	27		26	Y
39-029-0022	500 MARYLAND	4	27		4	47		4	113		62	Y
39-035-0038	2547 ST TIKHON	4	78		4	76		4	60		71	Y
39-035-0045	4950 BROADWAY AVE.	4	38		4	38		4	50		42	Y
39-035-0060	E. 14TH & ORANGE	4	62		4	75		2	83 *		73	N
39-035-0065	4600 HARVARD AVE.	4	63		4	25		4	25		38	Y
39-049-0034	KORBEL AVE.							2	36 *		36	N
39-061-0010	6950 RIPPLE RD.	4	84		3	66 *		4	57		69	N
39-061-0040	250 WM. HOWARD TAFT	3	140 *								140	N
39-081-0017	618 LOGAN ST.	4	114		4	127		4	85		109	Y
39-081-0018	3487 COUNTY RD. 19	4	55								55	N

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State Name: Ohio

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-081-0020	1469 3rd ST.	4	43								43	N
39-085-0003	36010 LAKESHORE	4	32		4	31		4	37		33	Y
39-085-0007	177 MAIN STREET	4	145		4	139		4	186		157	Y
39-087-0006	2120 S. 8TH				1	26	*	4	23		25	N
39-087-0012	460 Commerce Drive	4	34		3	33	*				34	N
39-099-0013	345 OAKHILL	4	40		4	48		4	54		47	Y
39-103-0004	BALLASH ROAD				2	32	*	1	34	*	33	N
39-105-0003	117 MEMORIAL DRIVE	2	88	*							88	N
39-105-1001	MULBERRY AVE.	2	110	*	4	94		4	94		99	N
39-115-0004	S.R. 83	4	175		4	167		4	198		180	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	1	34	*							34	N
39-145-0013	4862 GALLIA	4	23		4	24		4	22		23	Y
39-145-0020	2840 BACK RD.	4	41		4	52		4	36		43	Y
39-145-0022	1740 GALLIA PIKE	4	43		4	50		4	32		42	Y
39-153-0017	80 BRITTAIN	4	24		4	27		4	31		27	Y
39-153-0022	177 S. BROADWAY	4	40		4	38		4	35		38	Y
39-157-0006	527 CRESCENT DR.	4	55		4	58		4	64		59	Y

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Design Value Year: 2011
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	40		4	53	N	4	61		51	Y
42-003-0008	301 39th St, Pittsburgh, PA	4	31		3	29 *	N				30	N
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	23		4	35		4	61		40	Y
42-003-0064	2743 Washington Blvd, McKee	4	153		4	141	N	4	131		142	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	28		4	39	N	4	53		40	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC				3	63 *		4	60		62	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	58		4	72		4	109		80	Y
42-007-0005	1015 SEBRING ROAD	4	136		4	161		4	176		158	Y
42-011-0011	1059 Arnold Road	4	26		4	36		4	47		36	Y
42-013-0801	2ND AVE & 7TH ST	4	32		4	36		4	51		40	Y
42-017-0012	ROCKVIEW LANE	4	22		4	24		4	32		26	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	39		4	56		4	68		54	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	4	20		4	26		4	29		25	Y
42-045-0002	FRONT ST & NORRIS ST	4	13		4	34		4	32		26	Y
42-049-0003	10TH AND MARNE STREETS	4	20		4	28		4	36		28	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	21 *		2	24 *		2	51 *		32	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	68		4	95		4	82		82	Y
42-073-0015	CROTON ST & JEFFERSON ST.	4	47		4	53		4	81		60	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	13		4	17		4	26		19	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	12		4	15		4	28		18	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2011
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-095-8000	17TH AND SPRING GARDEN STRE	4	30		4	57		4	46		44	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	10		4	18		4	27		18	Y
42-101-0004	1501 E. LYCOMING AVE.	4	13		4	18		3	37 *		23	Y
42-101-0055	24TH & RITNER STREETS	3	15 *		4	25		4	32		24	Y
42-101-1002	5200 PENNYPACK PARK PHILADE	3	8 *								8	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	94		4	109		4	113		105	Y
42-125-0005	CHARLER01 WASTE TREATMENT P	4	22		4	26		4	100		49	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	39		4	42		4	77		53	Y
42-133-0008	HILL ST.	4	34		4	27		4	89		50	Y

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2011			2010			2009			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	143		4	131		4	82		119	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	75		4	92		4	81		83	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	2	235 *		4	143		4	143		174	N
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	46								46	N
54-011-0006	HUNTINGTON - MARSHALL UNIVE	3	42 *		4	31		4	25		33	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	33		4	85		4	139		86	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	3	36 *		4	50		4	113		66	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	30		4	44		4	133		69	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	66		4	68		4	131		88	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	34		4	68		4	102		68	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	63		4	51		4	97		70	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	45		4	51		4	63		53	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	79		4	101		4	61		80	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	22		4	24		4	182		76	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF	3	26 *		4	44		4	80		50	N
54-099-0005	BIG SANDY ROAD	3	16 *		4	41		4	37		31	N
54-107-1002	VIENNA - NEALE ELEM SCHOOL	3	49 *		4	84		4	119		84	Y

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Design Value Year: 2012
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	29	Y	4	30		4	43		34	Y
39-003-0009	2850 BIBLE ROAD	4	12	Y	4	14		4	23		16	Y
39-007-1001	770 LAKE RD.	4	53	Y	4	19		4	20		31	Y
39-009-0004	7760 BLACKBURN ROAD				3	58 *		4	71		64	N
39-013-3002	EAST 40 ST.	4	44	Y	4	47		4	62		51	Y
39-017-0019	1300 OXFORD STATE ROAD	4	62	Y	1	29 *					46	N
39-017-0020	3350 YANKEE ROAD	4	56	Y	2	77 *					67	N
39-017-1004	HOOK FIELD AIRPORT							1	31 *		31	N
39-023-0003	5400 SPANGLER	4	18	Y	4	22		4	28		23	Y
39-029-0022	500 MARYLAND	4	22	Y	4	27		4	47		32	Y
39-035-0038	2547 ST TIKHON	4	83	Y	4	78		4	76		79	Y
39-035-0045	4950 BROADWAY AVE.	4	88	Y	4	38		4	38		55	Y
39-035-0060	E. 14TH & ORANGE	4	80	Y	4	62		4	75		72	Y
39-035-0065	4600 HARVARD AVE.	4	104	Y	4	63		4	25		64	Y
39-061-0010	6950 RIPPLE RD.	3	63 *	Y	4	84		3	66 *		71	N
39-061-0040	250 WM. HOWARD TAFT	3	98 *	Y	3	140 *					119	N
39-081-0017	618 LOGAN ST.	4	92	Y	4	114		4	127		111	Y
39-081-0018	3487 COUNTY RD. 19	4	37		4	55					46	N
39-081-0020	1469 3rd ST.	4	28		4	43					36	N
39-085-0003	36010 LAKESHORE	4	38	Y	4	32		4	31		34	Y

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		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-085-0007	177 MAIN STREET	4	163	Y	4	145		4	139		149	Y
39-087-0006	2120 S. 8TH							1	26 *		26	N
39-087-0012	460 Commerce Drive	4	13	Y	4	34		3	33 *		27	N
39-099-0013	345 OAKHILL	4	43	Y	4	40		4	48		44	Y
39-103-0004	BALLASH ROAD							2	32 *		32	N
39-105-0003	117 MEMORIAL DRIVE	4	26	Y	2	88 *					57	N
39-105-1001	MULBERRY AVE.				2	110 *		4	94		102	N
39-115-0004	S.R. 83	4	142	Y	4	175		4	167		161	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	2	26 *	Y	1	34 *					30	N
39-145-0013	4862 GALLIA	4	10	Y	4	23		4	24		19	Y
39-145-0020	2840 BACK RD.	4	23	Y	4	41		4	52		39	Y
39-145-0022	1740 GALLIA PIKE	4	17	Y	4	43		4	50		37	Y
39-153-0017	80 BRITTAIN	4	22	Y	4	24		4	27		24	Y
39-153-0022	177 S. BROADWAY	4	47	Y	4	40		4	38		42	Y
39-157-0006	527 CRESCENT DR.	3	45 *	Y	4	55		4	58		53	N

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State Name: Pennsylvania

		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	42	S	4	40		4	53	N	45	Y
42-003-0008	301 39th St, Pittsburgh, PA	4	22	S	4	31		3	29 *	N	27	N
42-003-0010	CARNEGIE SCIENCE CENTER - 1	3	22 *		4	23		4	35		27	Y
42-003-0064	2743 Washington Blvd, McKee	4	117	S	4	153		4	141	N	137	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	20	S	4	28		4	39	N	29	Y
42-003-0116	405 WHEELER AVE, MCKEES ROC							3	63 *		63	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	2	42 *		4	58		4	72		57	Y
42-007-0005	1015 SEBRING ROAD	2	244 *		4	136		4	161		180	Y
42-011-0011	1059 Arnold Road	2	6 *		4	26		4	36		23	N
42-013-0801	2ND AVE & 7TH ST	4	28		4	32		4	36		32	Y
42-017-0012	ROCKVIEW LANE	4	15		4	22		4	24		20	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	3	52 *		4	39		4	56		49	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	3	18 *		4	20		4	26		21	N
42-045-0002	FRONT ST & NORRIS ST	4	15		4	13		4	34		21	Y
42-049-0003	10TH AND MARNE STREETS	2	19 *		4	20		4	28		22	Y
42-059-0002	4.8 KM SE OF HOLBROOK	2	14 *		2	21 *		2	24 *		20	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	70		4	68		4	95		78	Y
42-073-0015	CROTON ST & JEFFERSON ST.	1	35 *		4	47		4	53		45	N
42-079-1101	CHILWICK & WASHINGTON STS	3	8 *		4	13		4	17		13	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	2	8 *		4	12		4	15		12	Y

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Design Value Year: 2012
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-095-8000	17TH AND SPRING GARDEN STRE	4	20		4	30		4	57		36	Y
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	9		4	10		4	18		12	Y
42-101-0004	1501 E. LYCOMING AVE.	4	7		4	13		4	18		13	Y
42-101-0055	24TH & RITNER STREETS	4	14		3	15 *		4	25		18	Y
42-101-1002	5200 PENNYPACK PARK PHILADE	4	8		3	8 *					8	N
42-123-0004	OVERLOOK SITE - NEAR STONE	2	118 *		4	94		4	109		107	Y
42-123-0005	2044 Pennsylvania Avenue Ea	0	45 *								45	N
42-125-0005	CHARLER01 WASTE TREATMENT P	3	16 *		4	22		4	26		21	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	18		4	39		4	42		33	Y
42-133-0008	HILL ST.	4	19		4	34		4	27		27	Y

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2012			2011			2010			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	71	Y	4	143		4	131		115	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	71	Y	4	75		4	92		79	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	117	Y	2	235 *		4	143		165	N
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	28	N	4	46					37	N
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	16	Y	3	42 *		4	31		30	Y
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	24	Y	4	33		4	85		47	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	34	Y	3	36 *		4	50		40	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	32	Y	4	30		4	44		35	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	44	Y	4	66		4	68		59	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	27	Y	4	34		4	68		43	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	45	Y	4	63		4	51		53	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	38	M	4	45		4	51		45	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	55	Y	4	79		4	101		78	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	16	Y	4	22		4	24		21	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF				3	26 *		4	44		35	N
54-099-0005	BIG SANDY ROAD				3	16 *		4	41		29	N
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	24	Y	3	49 *		4	84		52	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2013
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	24		4	29	Y	4	30		28	Y
39-003-0009	2850 BIBLE ROAD	4	7		4	12	Y	4	14		11	Y
39-007-1001	770 LAKE RD.	4	29		4	53	Y	4	19		34	Y
39-009-0004	7760 BLACKBURN ROAD							3	58 *		58	N
39-013-3002	EAST 40 ST.	4	33		4	44	Y	4	47		41	Y
39-017-0019	1300 OXFORD STATE ROAD	4	26		4	62	Y	1	29 *		39	N
39-017-0020	3350 YANKEE ROAD	4	47		4	56	Y	2	77 *		60	N
39-017-0021	1491 MADE INDUSTRIAL DR.	2	25 *								25	N
39-023-0003	5400 SPANGLER	4	17		4	18	Y	4	22		19	Y
39-029-0019	1250 GEORGE, COLUMBIANA POR	2	28 *								28	N
39-029-0022	500 MARYLAND	2	24 *		4	22	Y	4	27		24	N
39-035-0038	2547 ST TIKHON	4	63		4	83	Y	4	78		75	Y
39-035-0045	4950 BROADWAY AVE.	4	18		4	88	Y	4	38		48	Y
39-035-0060	E. 14TH & ORANGE	4	66		4	80	Y	4	62		69	Y
39-035-0065	4600 HARVARD AVE.	4	30		4	104	Y	4	63		66	Y
39-049-0034	KORBEL AVE.	4	13								13	N
39-061-0010	6950 RIPPLE RD.	4	68		3	63 *	Y	4	84		72	N
39-061-0040	250 WM. HOWARD TAFT	4	57		3	98 *	Y	3	140 *		98	Y
39-081-0017	618 LOGAN ST.	4	37		4	92	Y	4	114		81	Y
39-081-0018	3487 COUNTY RD. 19	4	52		4	37		4	55		48	Y

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Design Value Year: 2013
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-081-0020	1469 3rd ST.	4	33		4	28		4	43		35	Y
39-085-0003	36010 LAKESHORE	4	32		4	38	Y	4	32		34	Y
39-085-0007	177 MAIN STREET	4	119		4	163	Y	4	145		142	Y
39-087-0012	460 Commerce Drive	4	22		4	13	Y	4	34		23	Y
39-095-0008	3040 YORK ST.	4	29								29	N
39-099-0013	345 OAKHILL	4	27		4	43	Y	4	40		37	Y
39-105-0003	117 MEMORIAL DRIVE	4	33		4	26	Y	2	88 *		49	N
39-105-1001	MULBERRY AVE.							2	110 *		110	N
39-115-0004	S.R. 83	4	124		4	142	Y	4	175		147	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	4	16		2	26 *	Y	1	34 *		25	N
39-145-0013	4862 GALLIA	4	10		4	10	Y	4	23		14	Y
39-145-0020	2840 BACK RD.	4	14		4	23	Y	4	41		26	Y
39-145-0022	1740 GALLIA PIKE	4	11		4	17	Y	4	43		24	Y
39-153-0017	80 BRITTAIN	4	23		4	22	Y	4	24		23	Y
39-153-0022	177 S. BROADWAY	4	59		4	47	Y	4	40		49	Y
39-157-0006	527 CRESCENT DR.				3	45 *	Y	4	55		50	N

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Design Value Year: 2013
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-003-0002	520 Orchard Ave, Avalon, PA	4	39	S	4	42	S	4	40		40	Y
42-003-0008	301 39th St, Pittsburgh, PA	4	24	S	4	22	S	4	31		26	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1	4	28	Y	3	22 *		4	23		24	Y
42-003-0064	2743 Washington Blvd, McKee	4	81	S	4	117	S	4	153		117	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	19	S	4	20	S	4	28		22	Y
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	21	Y	2	42 *		4	58		40	Y
42-007-0005	1015 SEBRING ROAD	4	42	M	2	244 *		4	136		141	N
42-011-0011	1059 Arnold Road	3	20 *	M	2	6 *		4	26		17	N
42-013-0801	2ND AVE & 7TH ST	3	33 *	M	4	28		4	32		31	Y
42-017-0012	ROCKVIEW LANE	3	16 *	Y	4	15		4	22		18	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	3	32 *	M	3	52 *		4	39		41	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	2	18 *	M	3	18 *		4	20		19	N
42-045-0002	FRONT ST & NORRIS ST	4	15	M	4	15		4	13		14	Y
42-049-0003	10TH AND MARNE STREETS	4	12	Y	2	19 *		4	20		17	Y
42-059-0002	4.8 KM SE OF HOLBROOK	4	16	Y	2	14 *		2	21 *		17	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	66	Y	4	70		4	68		68	Y
42-073-0015	CROTON ST & JEFFERSON ST.	3	39 *	M	1	35 *		4	47		40	N
42-079-1101	CHILWICK & WASHINGTON STS	4	7	Y	3	8 *		4	13		9	Y
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	8	M	2	8 *		4	12		9	Y
42-095-8000	17TH AND SPRING GARDEN STRE	3	14 *	M	4	20		4	30		21	N

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NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2013
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	4	9	Y	4	9		4	10		9	Y
42-101-0004	1501 E. LYCOMING AVE.	4	8		4	7		4	13		9	Y
42-101-0048	3000 LEWIS ST. (NEAR BATH S	1	15 *								15	N
42-101-0055	24TH & RITNER STREETS	4	9		4	14		3	15 *		13	Y
42-101-1002	5200 PENNYPACK PARK PHILADE	3	5 *		4	8		3	8 *		7	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	123	M	2	118 *		4	94		112	Y
42-123-0005	2044 Pennsylvania Avenue Ea	1	49 *	N	0	45 *					47	N
42-125-0005	CHARLER01 WASTE TREATMENT P	4	21	M	3	16 *		4	22		20	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	16	Y	4	18		4	39		24	Y
42-133-0008	HILL ST.	3	19 *	M	4	19		4	34		24	Y

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Design Value Year: 2013
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2013			2012			2011			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	49		4	71	Y	4	143		88	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	31		4	71	Y	4	75		59	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	62		4	117	Y	2	235 *		138	N
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	21		4	28	N	4	46		32	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	2	19 *		4	16	Y	3	42 *		26	N
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	29		4	24	Y	4	33		29	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	23		4	34	Y	3	36 *		31	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	23		4	32	Y	4	30		28	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	22		4	44	Y	4	66		44	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	40		4	27	Y	4	34		34	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	26		4	45	Y	4	63		45	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	42		4	38	M	4	45		42	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	3	43 *		4	55	Y	4	79		59	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	14		4	16	Y	4	22		17	Y
54-099-0004	ROUTE 52 (ONE MILE SOUTH OF							3	26 *		26	N
54-099-0005	BIG SANDY ROAD							3	16 *		16	N
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	25		4	24	Y	3	49 *		33	Y

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Design Value Year: 2014
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	24	S	4	24		4	29	Y	26	Y
39-003-0009	2850 BIBLE ROAD	4	13	S	4	7		4	12	Y	11	Y
39-007-1001	770 LAKE RD.	4	17	S	4	29		4	53	Y	33	Y
39-013-3002	EAST 40 ST.	4	33	S	4	33		4	44	Y	37	Y
39-017-0019	1300 OXFORD STATE ROAD	4	27	S	4	26		4	62	Y	38	Y
39-017-0020	3350 YANKEE ROAD	4	30	S	4	47		4	56	Y	44	Y
39-017-0021	1491 MADE INDUSTRIAL DR.	4	32		2	25 *					29	N
39-023-0003	5400 SPANGLER	4	19	S	4	17		4	18	Y	18	Y
39-029-0019	1250 GEORGE, COLUMBIANA POR	4	23	S	2	28 *					26	N
39-029-0022	500 MARYLAND				2	24 *		4	22	Y	23	N
39-035-0038	2547 ST TIKHON	4	65	S	4	63		4	83	Y	70	Y
39-035-0045	4950 BROADWAY AVE.	4	17	S	4	18		4	88	Y	41	Y
39-035-0060	E. 14TH & ORANGE	4	53	S	4	66		4	80	Y	66	Y
39-035-0065	4600 HARVARD AVE.	4	80	S	4	30		4	104	Y	71	Y
39-049-0034	KORBEL AVE.	4	17	S	4	13					15	N
39-061-0010	6950 RIPPLE RD.	4	71	S	4	68		3	63 *	Y	67	Y
39-061-0040	250 WM. HOWARD TAFT	4	67	S	4	57		3	98 *	Y	74	Y
39-081-0017	618 LOGAN ST.	4	30	S	4	37		4	92	Y	53	Y
39-081-0018	3487 COUNTY RD. 19	4	38		4	52		4	37		42	Y
39-081-0020	1469 3rd ST.	4	24		4	33		4	28		28	Y

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State Name: Ohio

		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-085-0003	36010 LAKESHORE	4	33	S	4	32		4	38	Y	34	Y
39-085-0007	177 MAIN STREET	4	72	S	4	119		4	163	Y	118	Y
39-087-0012	460 Commerce Drive	4	17	S	4	22		4	13	Y	17	Y
39-095-0008	3040 YORK ST.	1	17 *	S	4	29					23	N
39-099-0013	345 OAKHILL	4	44	S	4	27		4	43	Y	38	Y
39-105-0003	117 MEMORIAL DRIVE	4	32	S	4	33		4	26	Y	30	Y
39-115-0004	S.R. 83	4	148	S	4	124		4	142	Y	138	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	4	26	S	4	16		2	26 *	Y	22	N
39-145-0013	4862 GALLIA	4	8	S	4	10		4	10	Y	9	Y
39-145-0020	2840 BACK RD.	4	45	S	4	14		4	23	Y	27	Y
39-145-0022	1740 GALLIA PIKE	4	29	S	4	11		4	17	Y	19	Y
39-153-0017	80 BRITTAIN	4	21	S	4	23		4	22	Y	22	Y
39-153-0022	177 S. BROADWAY	3	43 *	S	4	59		4	47	Y	50	N
39-157-0006	527 CRESCENT DR.							3	45 *	Y	45	N

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		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-001-0001	NARSTO SITE - ARENDTSVILLE	1	12 *	Y							12	N
42-003-0002	520 Orchard Ave, Avalon, PA	4	30	Y	4	39	S	4	42	S	37	Y
42-003-0008	301 39th St, Pittsburgh, PA	4	17	Y	4	24	S	4	22	S	21	Y
42-003-0010	CARNEGIE SCIENCE CENTER - 1				4	28	Y	3	22 *		25	N
42-003-0064	2743 Washington Blvd, McKee	4	105	Y	4	81	S	4	117	S	101	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	21	Y	4	19	S	4	20	S	20	Y
42-003-1301	600 Anderson St, Braddock,	4	89	Y							89	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	29	Y	4	21	Y	2	42 *		31	Y
42-007-0005	1015 SEBRING ROAD	4	40	Y	4	42	M	2	244 *		109	N
42-011-0011	1059 Arnold Road	4	10	Y	3	20 *	M	2	6 *		12	N
42-013-0801	2ND AVE & 7TH ST	3	44 *	Y	3	33 *	M	4	28		35	Y
42-017-0012	ROCKVIEW LANE	2	13 *	N	3	16 *	Y	4	15		15	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	54	Y	3	32 *	M	3	52 *		46	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	2	17 *	N	2	18 *	M	3	18 *		18	N
42-045-0002	FRONT ST & NORRIS ST	2	10 *	N	4	15	M	4	15		13	N
42-049-0003	10TH AND MARNE STREETS	3	12 *	Y	4	12	Y	2	19 *		14	Y
42-059-0002	4.8 KM SE OF HOLBROOK	4	20	Y	4	16	Y	2	14 *		17	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	3	71 *	Y	4	66	Y	4	70		69	N
42-073-0015	CROTON ST & JEFFERSON ST.	4	40	Y	3	39 *	M	1	35 *		38	N
42-079-1101	CHILWICK & WASHINGTON STS	4	9	N	4	7	Y	3	8 *		8	Y

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REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	5	Y	4	8	M	2	8 *		7	Y
42-095-8000	17TH AND SPRING GARDEN STRE	3	25 *	Y	3	14 *	M	4	20		20	N
42-099-0301	ROUTE 34 LITTLE BUFFALO STA	3	16 *	N	4	9	Y	4	9		11	N
42-101-0004	1501 E. LYCOMING AVE.	2	11 *	N	4	8		4	7		9	N
42-101-0048	3000 LEWIS ST. (NEAR BATH S	3	9 *	N	1	15 *					12	N
42-101-0055	24TH & RITNER STREETS	3	10 *	Y	4	9		4	14		11	Y
42-101-1002	5200 PENNYPACK PARK PHILADE				3	5 *		4	8		7	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	118	Y	4	123	M	2	118 *		120	Y
42-123-0005	2044 Pennsylvania Avenue Ea	2	83 *	Y	1	49 *	N	0	45 *		59	N
42-125-0005	CHARLER01 WASTE TREATMENT P	4	40	Y	4	21	M	3	16 *		26	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	18	Y	4	16	Y	4	18		17	Y
42-133-0008	HILL ST.	3	23 *	Y	3	19 *	M	4	19		20	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2014
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2014			2013			2012			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	33	Y	4	49		4	71	Y	51	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	32	Y	4	31		4	71	Y	45	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	48	Y	4	62		4	117	Y	76	Y
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	20		4	21		4	28	N	23	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	3	21 *	Y	2	19 *		4	16	Y	19	N
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	34	Y	4	29		4	24	Y	29	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	29	Y	4	23		4	34	Y	29	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	23	Y	4	23		4	32	Y	26	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	26	Y	4	22		4	44	Y	31	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	34	Y	4	40		4	27	Y	34	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS	4	28	Y	4	26		4	45	Y	33	Y
54-039-0010	CHARLESTON - 209 MORRIS STR	4	47	Y	4	42		4	38	M	42	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	43	Y	3	43 *		4	55	Y	47	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	15	Y	4	14		4	16	Y	15	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	31	Y	4	25		4	24	Y	27	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	12	Y	4	24	S	4	24		20	Y
39-003-0009	2850 BIBLE ROAD	4	10	Y	4	13	S	4	7		10	Y
39-007-1001	770 LAKE RD.	4	37	Y	4	17	S	4	29		28	Y
39-013-0006	2 BALL PARK RD.	2	14 *	Y							14	N
39-013-3002	EAST 40 ST.	2	46 *	N	4	33	S	4	33		37	N
39-017-0019	1300 OXFORD STATE ROAD	4	44	Y	4	27	S	4	26		32	Y
39-017-0020	3350 YANKEE ROAD	4	29	Y	4	30	S	4	47		35	Y
39-017-0021	1491 MADE INDUSTRIAL DR.	4	31	Y	4	32		2	25 *		29	N
39-023-0003	5400 SPANGLER	4	13	Y	4	19	S	4	17		16	Y
39-029-0019	1250 GEORGE, COLUMBIANA POR	4	15	Y	4	23	S	2	28 *		22	N
39-029-0022	500 MARYLAND							2	24 *		24	N
39-035-0038	2547 ST TIKHON	4	59	Y	4	65	S	4	63		62	Y
39-035-0045	4950 BROADWAY AVE.	4	32	Y	4	17	S	4	18		22	Y
39-035-0060	E. 14TH & ORANGE	4	63	Y	4	53	S	4	66		61	Y
39-035-0065	4600 HARVARD AVE.	3	55 *	Y	4	80	S	4	30		55	Y
39-049-0034	KORBEL AVE.	4	6	Y	4	17	S	4	13		12	Y
39-061-0010	6950 RIPPLE RD.	4	54	Y	4	71	S	4	68		64	Y
39-061-0040	250 WM. HOWARD TAFT	2	36 *	N	4	67	S	4	57		53	N
39-081-0017	618 LOGAN ST.	4	29	Y	4	30	S	4	37		32	Y
39-081-0018	3487 COUNTY RD. 19	4	50	Y	4	38		4	52		47	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-081-0020	1469 3rd ST.	4	23	Y	4	24		4	33		27	Y
39-085-0003	36010 LAKESHORE	4	36	Y	4	33	S	4	32		34	Y
39-085-0007	177 MAIN STREET	4	89	Y	4	72	S	4	119		93	Y
39-087-0012	460 Commerce Drive	4	16	Y	4	17	S	4	22		18	Y
39-095-0008	3040 YORK ST.	3	22 *	Y	1	17 *	S	4	29		23	N
39-099-0013	345 OAKHILL	4	32	Y	4	44	S	4	27		34	Y
39-105-0003	117 MEMORIAL DRIVE	4	47	Y	4	32	S	4	33		37	Y
39-115-0004	S.R. 83	4	91	Y	4	148	S	4	124		121	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	4	25	Y	4	26	S	4	16		22	Y
39-145-0013	4862 GALLIA	4	15	Y	4	8	S	4	10		11	Y
39-145-0020	2840 BACK RD.	4	20	Y	4	45	S	4	14		26	Y
39-145-0022	1740 GALLIA PIKE	4	17	Y	4	29	S	4	11		19	Y
39-153-0017	80 BRITTAIN	4	14	Y	4	21	S	4	23		19	Y
39-153-0022	177 S. BROADWAY				3	43 *	S	4	59		51	N
39-153-0025	199 S. BROADWAY AVE.	3	25 *	Y							25	N

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Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-001-0001	NARSTO SITE - ARENDTSVILLE	4	11		1	12 *	Y				12	N
42-003-0002	520 Orchard Ave, Avalon, PA	4	44	S	4	30	Y	4	39	S	38	Y
42-003-0008	301 39th St, Pittsburgh, PA	2	23 *	S	4	17	Y	4	24	S	21	N
42-003-0010	CARNEGIE SCIENCE CENTER - 1							4	28	Y	28	N
42-003-0064	2743 Washington Blvd, McKee	4	112	S	4	105	Y	4	81	S	99	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	19	S	4	21	Y	4	19	S	20	Y
42-003-1301	600 Anderson St, Braddock,	4	52	S	4	89	Y				71	N
42-007-0002	ROUTE 168 & TOMLINSON ROAD	4	24		4	29	Y	4	21	Y	25	Y
42-007-0005	1015 SEBRING ROAD	4	34		4	40	Y	4	42	M	39	Y
42-011-0011	1059 Arnold Road	4	10		4	10	Y	3	20 *	M	13	Y
42-013-0801	2ND AVE & 7TH ST	4	31		3	44 *	Y	3	33 *	M	36	Y
42-017-0012	ROCKVIEW LANE	4	8		2	13 *	N	3	16 *	Y	12	Y
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	4	34		4	54	Y	3	32 *	M	40	Y
42-027-0100	PENN STATE UNIVERSITY - ARB	3	20 *		2	17 *	N	2	18 *	M	18	N
42-045-0002	FRONT ST & NORRIS ST	4	9		2	10 *	N	4	15	M	11	N
42-049-0003	10TH AND MARNE STREETS	4	17		3	12 *	Y	4	12	Y	14	Y
42-059-0002	4.8 KM SE OF HOLBROOK	4	19		4	20	Y	4	16	Y	18	Y
42-063-0004	PA. DEPT. OF TRANSPORTATION	4	73		3	71 *	Y	4	66	Y	70	N
42-073-0015	CROTON ST & JEFFERSON ST.	4	29		4	40	Y	3	39 *	M	36	Y
42-079-1101	CHILWICK & WASHINGTON STS	4	10		4	9	N	4	7	Y	9	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-091-0013	STATE ARMORY - 1046 BELVOIR	4	6		4	5	Y	4	8	M	6	Y
42-095-8000	17TH AND SPRING GARDEN STRE	4	20		3	25 *	Y	3	14 *	M	20	N
42-099-0301	ROUTE 34 LITTLE BUFFALO STA				3	16 *	N	4	9	Y	13	N
42-101-0004	1501 E. LYCOMING AVE.				2	11 *	N	4	8		9	N
42-101-0048	3000 LEWIS ST. (NEAR BATH S	3	9 *		3	9 *	N	1	15 *		11	N
42-101-0055	24TH & RITNER STREETS	4	10		3	10 *	Y	4	9		10	Y
42-101-1002	5200 PENNYPACK PARK PHILADE							3	5 *		5	N
42-123-0004	OVERLOOK SITE - NEAR STONE	4	114		4	118	Y	4	123	M	118	Y
42-123-0005	2044 Pennsylvania Avenue Ea	4	51		2	83 *	Y	1	49 *	N	61	N
42-125-0005	CHARLER01 WASTE TREATMENT P	4	39		4	40	Y	4	21	M	33	Y
42-125-5001	HILLMAN STATE PARK - KINGS	4	17		4	18	Y	4	16	Y	17	Y
42-133-0008	HILL ST.	4	30		3	23 *	Y	3	19 *	M	24	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2015			2014			2013			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	49		4	33	Y	4	49		44	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	26		4	32	Y	4	31		30	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	35		4	48	Y	4	62		48	Y
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	27		4	20		4	21		23	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	4	15		3	21 *	Y	2	19 *		18	N
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	39		4	34	Y	4	29		34	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	3	27 *		4	29	Y	4	23		26	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	21		4	23	Y	4	23		22	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	19		4	26	Y	4	22		22	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	30		4	34	Y	4	40		35	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS				4	28	Y	4	26		27	N
54-039-0010	CHARLESTON - 209 MORRIS STR	4	34		4	47	Y	4	42		41	Y
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	38		4	43	Y	3	43 *		41	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	4	16		4	15	Y	4	14		15	Y
54-107-1002	VIENNA - NEALE ELEM SCHOOL	4	28		4	31	Y	4	25		28	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-001-0001	210 N. WILSON DR.	4	37		4	12	Y	4	24	S	24	Y
39-003-0009	2850 BIBLE ROAD	4	4		4	10	Y	4	13	S	9	Y
39-007-1001	770 LAKE RD.	4	7		4	37	Y	4	17	S	20	Y
39-013-0006	2 BALL PARK RD.	4	6		2	14 *	Y				10	N
39-013-3002	EAST 40 ST.				2	46 *	N	4	33	S	40	N
39-017-0019	1300 OXFORD STATE ROAD	4	43		4	44	Y	4	27	S	38	Y
39-017-0020	3350 YANKEE ROAD	4	16		4	29	Y	4	30	S	25	Y
39-017-0021	1491 MADE INDUSTRIAL DR.	4	20		4	31	Y	4	32		28	Y
39-023-0003	5400 SPANGLER	4	6		4	13	Y	4	19	S	13	Y
39-029-0019	1250 GEORGE, COLUMBIANA POR	4	14		4	15	Y	4	23	S	17	Y
39-035-0038	2547 ST TIKHON	4	53		4	59	Y	4	65	S	59	Y
39-035-0045	4950 BROADWAY AVE.	4	19		4	32	Y	4	17	S	23	Y
39-035-0060	E. 14TH & ORANGE	4	38		4	63	Y	4	53	S	51	Y
39-035-0065	4600 HARVARD AVE.	4	370		3	55 *	Y	4	80	S	168	Y
39-049-0034	KORBEL AVE.	4	4		4	6	Y	4	17	S	9	Y
39-061-0010	6950 RIPPLE RD.	4	18		4	54	Y	4	71	S	48	Y
39-061-0040	250 WM. HOWARD TAFT	4	12		2	36 *	N	4	67	S	39	N
39-081-0017	618 LOGAN ST.	4	27		4	29	Y	4	30	S	29	Y
39-081-0018	3487 COUNTY RD. 19	4	31		4	50	Y	4	38		40	Y
39-081-0020	1469 3rd ST.	4	20		4	23	Y	4	24		22	Y

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Ohio

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
39-085-0003	36010 LAKESHORE	4	10		4	36	Y	4	33	S	26	Y
39-085-0007	177 MAIN STREET	4	80		4	89	Y	4	72	S	80	Y
39-087-0012	460 Commerce Drive	4	7		4	16	Y	4	17	S	13	Y
39-095-0008	3040 YORK ST.	4	21		3	22 *	Y	1	17 *	S	20	N
39-099-0013	345 OAKHILL	4	13		4	32	Y	4	44	S	30	Y
39-105-0003	117 MEMORIAL DRIVE	2	41 *		4	47	Y	4	32	S	40	N
39-115-0004	S.R. 83	4	17		4	91	Y	4	148	S	85	Y
39-135-1001	6940 OXFORD GETTYSBURG RD.	4	16		4	25	Y	4	26	S	22	Y
39-145-0013	4862 GALLIA	4	6		4	15	Y	4	8	S	10	Y
39-145-0020	2840 BACK RD.	4	18		4	20	Y	4	45	S	28	Y
39-145-0022	1740 GALLIA PIKE	4	23		4	17	Y	4	29	S	23	Y
39-153-0017	80 BRITTAIN	4	8		4	14	Y	4	21	S	14	Y
39-153-0022	177 S. BROADWAY							3	43 *	S	43	N
39-153-0025	199 S. BROADWAY AVE.	4	10		3	25 *	Y				18	N

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Pollutant: Sulfur dioxide(42401)
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Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-001-0001	NARSTO SITE - ARENDTSVILLE	2	5 *		4	11		1	12 *	Y	9	N
42-003-0002	520 Orchard Ave, Avalon, PA	4	15		4	44	S	4	30	Y	30	Y
42-003-0008	301 39th St, Pittsburgh, PA	4	12		2	23 *	S	4	17	Y	17	N
42-003-0064	2743 Washington Blvd, McKee	4	64		4	112	S	4	105	Y	94	Y
42-003-0067	3640 Old Oakdale Rd, McDona	4	9		4	19	S	4	21	Y	16	Y
42-003-1301	600 Anderson St, Braddock,	4	51		4	52	S	4	89	Y	64	Y
42-007-0002	ROUTE 168 & TOMLINSON ROAD	2	21 *		4	24		4	29	Y	25	N
42-007-0005	1015 SEBRING ROAD	2	35 *		4	34		4	40	Y	36	N
42-011-0011	1059 Arnold Road	2	6 *		4	10		4	10	Y	9	N
42-013-0801	2ND AVE & 7TH ST	2	15 *		4	31		3	44 *	Y	30	N
42-017-0012	ROCKVIEW LANE	2	10 *		4	8		2	13 *	N	10	N
42-021-0011	MILLER AUTO SHOP 1 MESSENGE	2	43 *		4	34		4	54	Y	44	N
42-027-0100	PENN STATE UNIVERSITY - ARB	2	7 *		3	20 *		2	17 *	N	15	N
42-045-0002	FRONT ST & NORRIS ST	2	12 *		4	9		2	10 *	N	10	N
42-049-0003	10TH AND MARNE STREETS	2	7 *		4	17		3	12 *	Y	12	N
42-059-0002	4.8 KM SE OF HOLBROOK	2	8 *		4	19		4	20	Y	16	N
42-063-0004	PA. DEPT. OF TRANSPORTATION	2	45 *		4	73		3	71 *	Y	63	N
42-073-0015	CROTON ST & JEFFERSON ST.	2	38 *		4	29		4	40	Y	36	N
42-079-1101	CHILWICK & WASHINGTON STS	2	5 *		4	10		4	9	N	8	N
42-091-0013	STATE ARMORY - 1046 BELVOIR	2	8 *		4	6		4	5	Y	6	N

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Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Pennsylvania

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
42-095-8000	17TH AND SPRING GARDEN STRE	2	22 *		4	20		3	25 *	Y	22	N
42-099-0301	ROUTE 34 LITTLE BUFFALO STA							3	16 *	N	16	N
42-101-0004	1501 E. LYCOMING AVE.							2	11 *	N	11	N
42-101-0048	3000 LEWIS ST. (NEAR BATH S	3	18 *		3	9 *		3	9 *	N	12	N
42-101-0055	24TH & RITNER STREETS	3	8 *		4	10		3	10 *	Y	9	N
42-123-0004	OVERLOOK SITE - NEAR STONE	2	46 *		4	114		4	118	Y	93	N
42-123-0005	2044 Pennsylvania Avenue Ea	1	21 *		4	51		2	83 *	Y	52	N
42-125-0005	CHARLER01 WASTE TREATMENT P	2	28 *		4	39		4	40	Y	36	N
42-125-5001	HILLMAN STATE PARK - KINGS	2	16 *		4	17		4	18	Y	17	N
42-133-0008	HILL ST.	2	18 *		4	30		3	23 *	Y	24	N

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Sulfur dioxide(42401)
Standard Units: Parts per billion(008)
NAAQS Standard: SO2 1-hour 2010
Statistic: Annual 99th Percentile **Level:** 75

Design Value Year: 2016
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: West Virginia

		2016			2015			2014			3-Year	
Site ID	STREET ADDRESS	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Comp. Qrtrs	99th Percentile	Cert& Eval	Design Value	Valid Ind.
54-009-0005	FOLLANSBEE - MAHAN LANE	4	33		4	49		4	33	Y	38	Y
54-009-0007	MCKIMS RIDGE ROAD - CROSS C	4	39		4	26		4	32	Y	32	Y
54-009-0011	WEIRTON - MARLAND HEIGHTS E	4	49		4	35		4	48	Y	44	Y
54-009-6000	STATE TOUTE 2, BOX27A, BEEC	4	40		4	27		4	20		29	Y
54-011-0006	HUNTINGTON - MARSHALL UNIVE	3	4 *		4	15		3	21 *	Y	13	N
54-029-0005	NEW MANCHESTER - NEW MANCHE	4	37		4	39		4	34	Y	37	Y
54-029-0007	NEW CUMBERLAND - R D #1, CR	4	48		3	27 *		4	29	Y	35	Y
54-029-0008	CHESTER - ALLISON ELEMENTAR	4	23		4	21		4	23	Y	22	Y
54-029-0009	WEIRTON - SUMMIT CIRCLE	4	31		4	19		4	26	Y	25	Y
54-029-0015	LAWRENCEVILLE - COMMUNITY P	4	26		4	30		4	34	Y	30	Y
54-029-1004	WEIRTON - OAK ST AND OWINGS							4	28	Y	28	N
54-039-0010	CHARLESTON - 209 MORRIS STR				4	34		4	47	Y	41	N
54-039-0020	CHARLESTON - 1436 DIXIE STR	3	7 *								7	N
54-051-1002	MOUNDSVILLE - NG ARMORY, 15	4	8		4	38		4	43	Y	30	Y
54-061-0003	MORGANTOWN - AIRPORT US 119	3	14 *		4	16		4	15	Y	15	N
54-107-1002	VIENNA - NEALE ELEM SCHOOL	3	16 *		4	28		4	31	Y	25	N

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the state's certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Notes:
1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

SO_2 SIP

Appendix C

Meteorological Analysis

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ANALYSIS OF METEOROLOGY WHEN SO_2 WAS GREATER THAN 75 ppb/hr in 2011-2015

Anthony J. Sadar, ACHD, Air Quality Program, February 2017

Overview: To better prepare for demonstrating and maintaining compliance with the new federal 1-hour SO_2 national ambient air quality standard (NAAQS) of 75 ppb, weather conditions were analyzed during times in 2011 through 2015 when hourly SO_2 values in Allegheny County exceeded a level of 75 ppb. Concentration level and identification of the 55 days when the exceedance hours were recorded at the Liberty Borough monitor--located in about the middle of the EPA-designated SO_2 nonattainment area (NAA) (see Figure 1)--are given in Table 1. Total days per month and total hours per month when exceedances occurred are graphed in Figures 2a and 2b, respectively.

For the North Braddock monitor--located in the northern portion of the SO_2 NAA--a summary of the 5 days when exceedance hours were recorded during 2014 (when the SO_2 monitor was re-installed) and 2015 is given in Table 2.

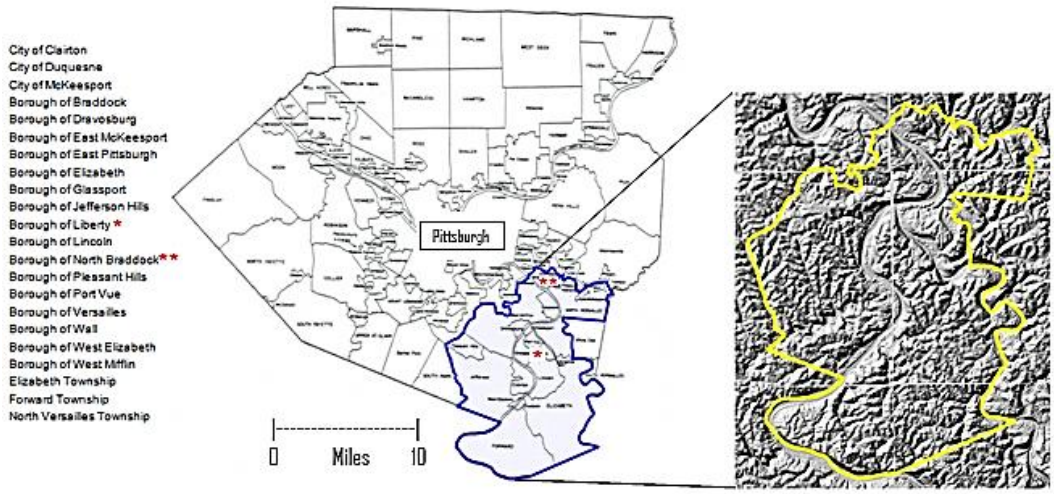


Figure 1. Allegheny County with nonattainment area communities and locations of Liberty Borough and North Braddock SO_2 monitoring sites identified. Insert shows topography.

As indicated by the 2011-2015 table and figure totals for Liberty Borough, hourly SO_2 exceedances are usually most frequent during November. Also, October and March were months of substantially increased exceedance frequency. For North Braddock, the 5 days during 2014 and 2015 with hourly exceedances occurred in January, February, November, and December. Overall, on an annual basis, the total number of exceedances has generally been decreasing from 2011 through 2015, although maximum concentrations at Liberty Borough can still be quite high.

Note that because of the relatively high frequency of exceedances and full five-year data set for Liberty Borough, the Liberty Borough exceedances will be the focus of this report. Documentation of the North Braddock exceedances are provided in Table 2 for informational purposes, but will not be analyzed further.

Meteorological Conditions that Typically Produce Exceedances: An investigation of the weather conditions that typically produce SO_2 levels greater than 75 ppb was conducted by focusing on times when the NAAQS limit was exceeded. The expectation is that hourly exceedances are very much wind direction dependent. In addition, atmospheric stability and other meteorological factors contribute to high hourly SO_2 levels. Furthermore, an analysis of synoptic map features can assist with understanding atmospheric influences on air quality.

The first column in Table 3 shows the meteorological conditions collected by the National Weather Service, Pittsburgh, PA (PIT NWS) and Allegheny County Airport (AGC), and ACHD equipment at Liberty Borough associated with each of the high-concentration events from Table 1. For the hourly exceedances, specific conditions evaluated included general surface weather in the eastern portion of the U.S., daily temperature departures from normal, hourly temperatures and winds, hourly precipitation amounts, and twice-daily radiosonde measurements (for inversion conditions).

A summary of weather conditions in Table 4 shows the typical circumstances that contributed to the exceedance hour(s) at Liberty Borough.

As the table suggests, SO_2 exceedances of the hourly NAAQS of 75 ppb were most likely in November. To a lesser extent, March and October had an elevated number of days and hours with exceedances.

The surface weather map features were rather varied, but generally revealed the influence of a high pressure system to the SSE of Western PA. As observed by the Liberty Borough monitor, most exceedances occurred with rather light winds from the S through SW, associated with the advection of warm air into the region.

Temperature departures on exceedance days, as recorded at PIT NWS, averaged 7 ^{o}F above normal. The departures ranged from -7 ^{o}F to +23 ^{o}F, with 82 % of days recording positive departures.

By far, no precipitation was measured during exceedance hours.

Finally, atmospheric stability conditions, as indicated by the presence of a morning and/or evening ground temperature inversion of any strength, were evaluated. During the hourly SO_2 exceedance events, morning inversions were generally in the moderate range, averaging 4.4 ^{o}C in strength and topping out at a mean of 225 m. Evening surface inversions were typically 0.8 ^{o}C, 88 m, and at 47 % occurrence. Because of the importance of inversion conditions to air quality, inversion conditions are discussed in more detail in the following section.

	2011	2012	2013	2014	2015	Avg. (Total)	Min/Max
January		78 (1)		122 (1)		**100 (2)**	**78/122**
February	80 (1)	104 (1)				**92 (2)**	**80/104**
March		99 (6)		92 (3)		**97 (9)**	**76/161**
April		97 (2)			87 (1)	**93 (3)**	**76/117**
May					163 (3)	**163 (3)**	**112/244**
June						**--**	**--**
July	91 (2)	124 (3)				**111 (5)**	**81/199**
August			81 (1)			**81 (1)**	**81/81**
September		97 (2)				**97 (2)**	**86/108**
October		110 (2)		97 (3)	115 (3)	**107 (8)**	**76/173**
November	156 (9)	81 (5)	81 (1)	89 (1)		**124 (16)**	**76/450**
December		79 (1)	94 (3)			**90 (4)**	**79/99**
Avg. (Total)	**139 (12)**	**97 (23)**	**89 (5)**	**98 (8)**	**132 (7)**	**110 (55)**	**--**
Min/Max	**76/450**	**76/199**	**81/99**	**79/122**	**76/244**	**2013-2015 Design Value**	**76/450**
4th High	**153**	**117**	**81**	**105**	**112**	**99**	**81/153**

Days when Exceedances Occurred

	2011	2012	2013	2014	2015
January		10		5	
February	16	27			
March		11,12,14, 15,17;28		7,22;31	
April		13;16			17
May					2,3;4
June					
July	17;20	17,23;24			
August			26		
September		14;16			
October		24;25		26,27;28	9,20;21
November	3,6,7,19, 20;24-27	11,15, 21,22;23	6	4	
December		14	1,19;20		

Table 1. Liberty Borough SO_2 daily maximum hourly exceedances of 75 ppb. Averages in ppb by month and year given along with number of exceedances in parenthesis. Minimum and maximum hourly values and days on which exceedances occurred also identified.

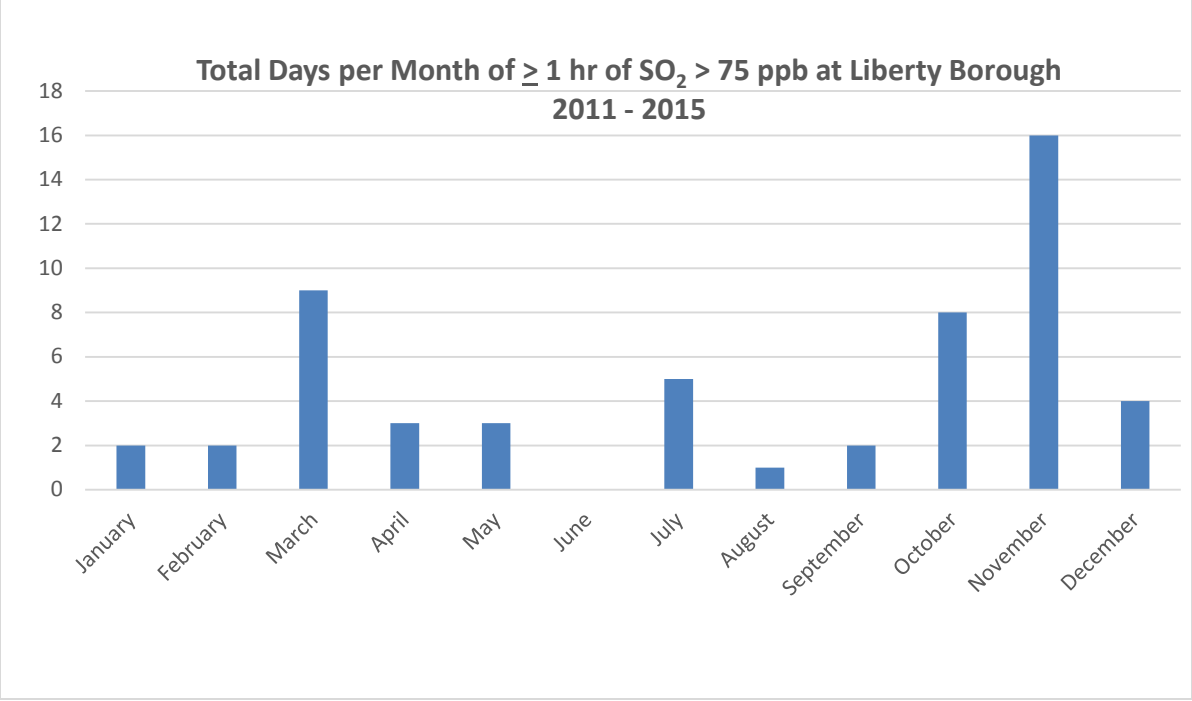


Figure 2a. Total days each month at Liberty Borough monitor during 2011 through 2015 when SO_2 was greater than 75 ppb for at least one hour.

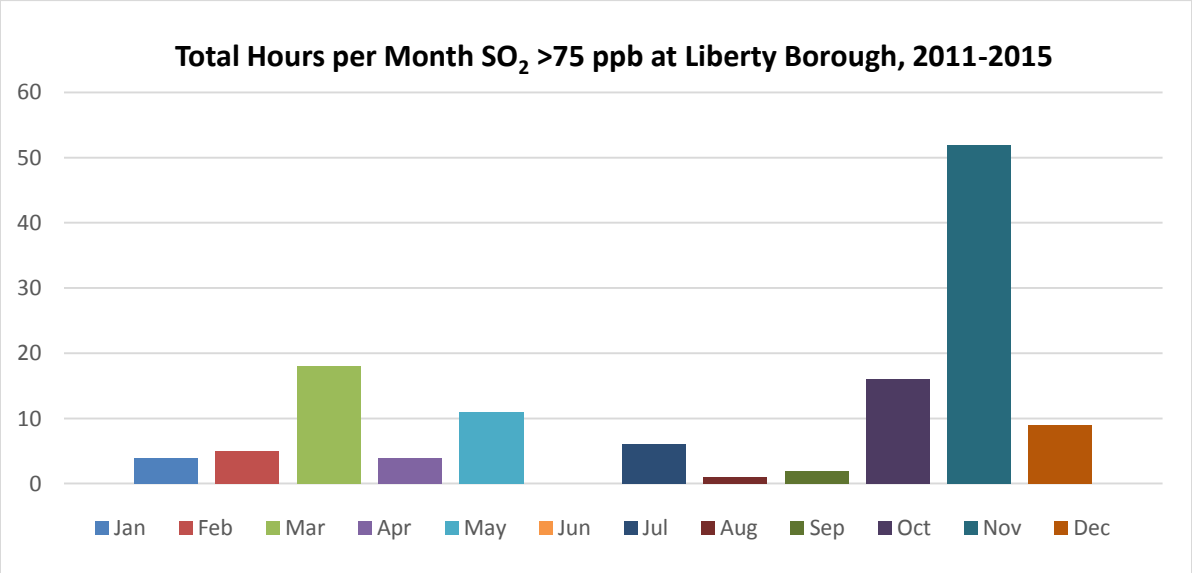


Figure 2b. Total hours each month at Liberty Borough monitor during 2011 through 2015 when SO_2 was greater than 75 ppb.

	2014	2015	Avg. (Total)	Min/Max
Jan. 14 & 17	108 (2)		**108 (2)**	**89/126**
Feb. 1	107 (1)		**107 (1)**	**107/107**
Nov. 11	117 (1)		**117 (1)**	**117/117**
Dec. 21		80 (1)	**80 (1)**	**80/80**
Avg. (Total)	**110 (4)**	**80 (1)**	**104 (5)**	**--**
Min/Max	**89/126**	**80/80**	**--**	**80/126**

Table 2. North Braddock SO_2 daily maximum hourly exceedances of 75 ppb. Averages in ppb by month and year given along with number of exceedances in parenthesis. Minimum and maximum hourly values and days on which exceedances occurred also identified. (Note that wind direction and wind speed data were not available until 2015 for the North Braddock site.)

Meteorological Variable/Event	Feb. 16, **2011**	July 17, 2011	July 20, 2011	Nov. 3, 2011	Nov. 6-7, 2011	Nov. 19-20, 2011	Nov. 24-27, 2011	Jan. 10, **2012**	Feb. 27, 2012	Mar. 11-12, 2012
Time of Exceedance	O	O	O	O & M	O & M	M,O; A	M,O;M	O	M	O
Surface Map Feature	High to SE	High to S	Low to SSE	High to S	High to SSE	Cold Frnt. from NW	High to S-SSE	Low to SW	Cold Frnt. fr. WNW	High to SE
PIT Temperature Departure (°F)	10 & 24	4 & 6	8 & 10	1 & 5	0 & 4	2 & 11	0, 9, 13 & 16	10 & 6	10	9 & 13
Liberty Borough Temp. (°F)	49	75	77	45 & 42	41 & 35	36 & 58	34 & 46	33	30	47
Liberty Borough W. D. (°)	SSW (203)	SSW (210)	SSW (203)	S (178) & SW (214)	E (99) & SSW (210)	SSW (201) & SW (218)	SW (214) & SSW (203)	SSW (204)	SSW (210)	S (172)
Liberty Borough W. S. (mph)	3.9	4.1	5.0	1.4 & 3.1	2.0 & 3.8	2.0 & 8.5	6.0 & 3.9	3.2	3.3	1.0
AGC Precip. at Exceed. Hr. (in.)	0	0	0	0	0	Trace & 0.03	0.01 & 0	0	0	0
00Z Sfc.Inversion: Strgth.,°C/hgt.,m	0.2/41	None	None	0.8/148	None	0.2/56, 0.4/111, & None	None, None, & 0.6/84	1.2/40	None	None
12Z Sfc.Inversion: Strgth.,°C/hgt.,m	1.8/319	None	2.2/313	3.8/411	8.2/251	4.0/175 & None	None, 5.2/575, & 1.4/195	6.1/126	4.8/369	5.2/127

Notes: Values are derived from PIT NWS, Liberty Borough, or Allegheny County Airport (AGC) data as indicated, and University of Wyoming for PIT NWS records of inversion strength and height from the daily 12Z (morning) and 00Z (evening) soundings. For time of exceedance: E/N = evening/night (~1900-2200 hr); O = overnight; M = morning; A = afternoon. Multiple values are listed for PIT Temperature Departure when exceedance(s) occurred overnight or on several days. Two Liberty Borough weather entries are given when more than one exceedance occurred in a column; and each single value indicates single hour or average of multiple hours for the same day or consecutive days. Surface inversions are provided when they relate to the exceedance hour(s).

Table 3a. Meteorology on days in 2011 - 2015 for Liberty Borough with SO_2 greater than 75 ppb.

Meteorological Variable/Event	Mar. 14-15, 2012	Mar.17, 2012	Mar.28, 2012	Apr. 13, 2012	Apr. 16, 2012	July 17, 2012	July 23-24, 2012	Sep. 14, 2012	Sep. 16, 2012	Oct. 24-25, 2012
Time of Exceedance	M & O	O	O	O	O	O	O & M	M	O	O & O
Surface Map Feature	Warm Frnt. Passage	Warm Frnt. Overhead	Warm Frnt. Passage	High to S	High to SE	High to SSW	Cold Frnt. to NNW	Low to NW	High to SE	Warm Frnt. in Area
PIT Temperature Departure (°F)	19 & 22	23 & 22	-4 & 16	0 & 2	17 & 20	9 & 9	1, 5, & 3	3	-4 & -2	17, 17, & 18
Liberty Borough Temp. (°F)	46 & 53	51	49	48	64	69	72 & 75	68	54	59 & 56
Liberty Borough W. D. (°)	SW (228) & SSW (213)	SSW (208)	SSW (204)	SSW (209)	SSW (208)	SW (219)	SW (214) & SSW (213)	SSW (208)	S (189)	SSW (210) & SSW (204)
Liberty Borough W. S. (mph)	2.0 & 2.5	2.5	5.0	1.4	5.1	3.0	3.9 & 5.1	5.5	3.0	3.5 & 1.1
AGC Precip. at Exceed. Hr. (in.)	0	0	0	0	0	0	0	0	0	0
00Z Inversion: Strgth., °C/hgt., m	None & 0.8/43	None	None	None	None	None	None & None	None	None	0.8/43 & 0.6/52
12Z Inversion: Strgth., °C/hgt., m	0.8/198 & 5.4/222	4.8/201	None	7.8/128	0.2/251	2.8/180	None & None	5.0/130	6.8/280	1.0/121 & 7.4/232

Notes: See notes at Table 3a.

Table 3b. Meteorology on days in 2011 - 2015 for Liberty Borough with SO_2 > 75 ppb (continued).

Meteorological Variable/Event	Nov.11, 2012	Nov.15, 2012	Nov. 21-23, 2012	Dec. 14, 2012	Aug. 26, **2013**	Nov. 6, 2013	Dec. 1, 2013	Dec. 19-20, 2013	Jan. 5, **2014**	Mar. 7, 2014
Time of Exceedance	M	O	E/N & O	E/N	M	M	O	O	M	E/N
Surface Map Feature	Low to SSW	High to W	High to S	High to SE	High to S	High to SSE	High to S	High to S	Cold Frnt. to NW	Cold Frnt. to NW
PIT Temperature Departure (°F)	13	-6 & -2	4, 4, & 2	3	5	11	-6 & -1	7 & 18	5	2
Liberty Borough Temp. (°F)	42	35	42 & 42	40	62	40	33	44	25	39
Liberty Borough W. D. (°)	SSW (204)	WSW (241)	SSW (205) & SSW (203)	SSW (201)	SSW (209)	SSW (202)	SW (214)	SSW (202)	SSW (212)	SSW (211)
Liberty Borough W. S. (mph)	1.7	0.8	1.9 & 3.0	2.4	4.1	2.4	3.4	4.5	3.0	3.2
AGC Precip. at Exceed. Hr. (in.)	0	0	0	0	0	0	0	0	0	0
00Z Inversion: Strgth., °C/hgt., m	1.4/87	0.6/100	1.2/43 & 1.0/69	1.8/82	None	None	1.4/158	1.2/311	1.4/74	0.4/43
12Z Inversion: Strgth., °C/hgt., m	6.8/325	3.3/162	10.9/194 & 1.8/32	5.8/289	3.2/233	6.2/375	2.2/333	0.8/128	5.9/183	None

Notes: See notes at Table 3a.

Table 3c. Meteorology on days in 2011 - 2015 for Liberty Borough with SO_2 > 75 ppb (continued).

Meteorological Variable/Event	Mar. 22, 2014	Mar.31, 2014	Oct. 26-28, 2014	Nov. 4, 2014	Apr. 17, **2015**	May 2-3, 2015	May 3-4, 2015	Oct. 9, 2015	Oct 20-21, 2015	**Avg. or Typical Value**
Time of Exceedance	O	O	O & O	O	M	M & O	O	O	E/N & M	**O**
Surface Map Feature	Cold Fmt. Imminent	High to SSE	Warm Fmt. Passage	High to S	High to S	High to SSW	High to SE	Cold Fmt. to NW	High to S	**High to SSE**
PIT Temperature Departure (^{o}F)	-7 & 3	-1 & 12	2, 4, & 17	-3 & 10	13	3 & 7	10	9 & 8	9 & 7	**+7**
Liberty Borough Temp. (^{o}F)	45	47	43 & 63	44	55	48 & 53	56	62	54 & 43	**49**
Liberty Borough W. D. (^{o})	SSW (204)	S (186)	SSW (210) & SSW (204)	SSW (209)	SSW (201)	SSW (203) & SSE (167)	SSW (196)	SSW (210)	SSW (199) & SSW (203)	**SSW (203)**
Liberty Borough W. S. (mph)	6.4	1.5	2.8 & 5.4	5.0	4.0	2.0 & 1.6	1.9	3.1	3.6 & 1.5	**3.3**
AGC Precip. at Exceed. Hr. (in.)	0	0	0	0	0	0	0	0	0	**0**
00Z Inversion: Strgth., ^{o}C/hgt., m	None	None	0.2/105 & 0.8/117	0.6/60	None	None & None	None	0.8/45	0.2/203	**0.8/88 (47%)**
12Z Inversion: Strgth., ^{o}C/hgt., m	None	1.0/41	7.2/173 & None	1.0/77	None	4.8/305 & 5.8/166	7.4/213	1.0/342	5.8/190	**4.4/225 (79%)**

Notes: See notes at Table 3a.

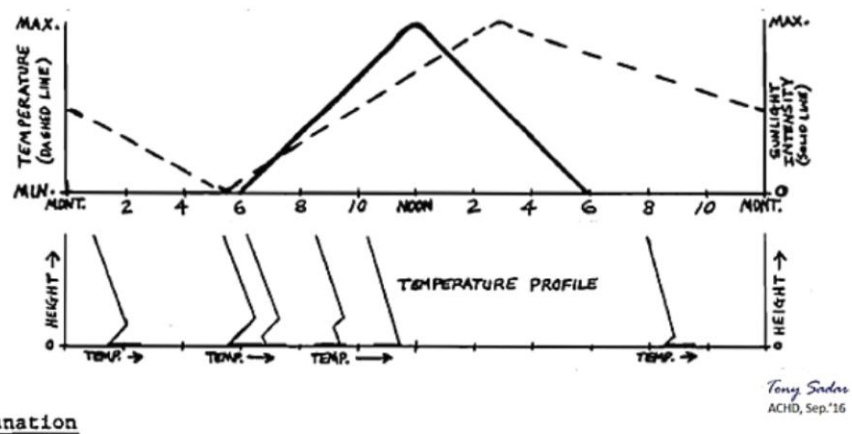
Table 3d. Meteorology on days in 2011 - 2015 for Liberty Borough with SO_2 > 75 ppb (continued).

Meteorological Variable/Event	Typical conditions when hourly SO_2 greater than 75 ppb at Liberty Borough
Months	November (March and October also rather favorable).
Time of Exceedance	Overnight (typically about 2200 through 0400).
Surface Map Feature(s)	Varied, but generally high pressure to SSE.
Temperature Departure	+7 ^{o}F, with range from -7 ^{o}F to +23 ^{o}F and 82 % of the departures positive.
Liberty Borough WD & WS	SSW (203) at 3.3 mph.
Precipitation	Only 2 exceedance hours recorded small amounts of precipitation.
Stability	Morning surface inversions 4.4 ^{o}C strength, 225 m depth, and 79% frequency, with evening surface inversions typically 0.8 ^{o}C, 88 m, and at 47 % occurrence.

Table 4. Typical conditions during exceedance hours in 2011 - 2015 for Liberty Borough.

General Morning Surface Inversion Conditions 2011 – 2015: The following tables (5a through 5e) provide an overview of dispersion conditions from 2011 through 2015, as measured at PIT NWS. Additional years and times of inversion statistics are provided and compared with measurements from a nearby meteorological tower in the attached supplementary report (Attachment 1).

Note that to help assure that an inversion was present throughout most of Allegheny County when an inversion was measured at the NWS, a surface inversion had to be at least 1 ^{o}C to be considered significant for a morning inversion and at least 0.4 ^{o}C for an evening inversion. Evening inversion conditions are less stringent because inversions typically begin to form shortly after sunset, so a smaller inversion is indicative of the beginning of a more significant inversion. See Figure 3 for the typical progression of surface inversion formation.



Explanation

6 AM	(Sunrise) Sunlight intensity at surface weak, temperature begins to increase from overnight minimum, ground inversion strongest.
7 AM	Sunlight intensity increases as sun rises in sky and ground is warmed which in turn warms air. Thus inversion "burns off" from ground up.
11 AM	Inversion completely "burned off" (i.e., isothermal or mean temperature profile).
12 Noon	Sunlight intensity maximum.
3 PM	Temperature maximum (because of time lag between ground heating and subsequent air heating).
6 PM	(Sunset) Sunlight intensity negligible, temperature decreasing, ground inversion soon to begin.
At Night	Temperature decreases, ground inversion strengthens.

Figure 3. Typical diurnal variation of temperature, sunlight intensity, and vertical temperature profile.

Year	Avg. Strength (°C)	Strength Std. Dev. (°C)	Avg. Top (m)	Top Std. Dev. (m)	Est. Break Time*** (EST)	Total Days of Inversion (%)
2011	3.7	2.1	246	118	9.5	134 (37)
2012	3.9	2.1	229	96	9.5	158 (43)
2013	3.4	1.8	244	113	9.5	127 (35)
2014	3.4	1.9	233	117	9.5	141 (39)
2015	3.9	2.1	250	139	10.0	166 (45)
'11-'15Avg.	**3.7**	**2.0**	**240**	**118**	**9.5**	**145 (40)**

*** For morning (12Z) surface inversions of at least 1.0°C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).
****** PIT NWS = Pittsburgh National Weather Service.
******* Estimated break time is to nearest half hour EST. Method for calculating break time was altered slightly beginning 2014; however, values are comparable with previous years.

Table 5a. 12Z Inversion statistics* for 2011-2015, derived from PIT NWS soundings.**

Month	2011	2012	2013	2014	2015	2011-2015
JAN	3.1	4.1	4.0	4.2	4.1	**4.0**
FEB	3.4	3.3	4.3	3.2	3.1	**3.4**
MAR	3.6	5.1	3.2	3.0	4.3	**4.0**
APR	3.6	4.0	3.1	3.6	3.7	**3.6**
MAY	2.9	3.8	2.6	3.5	4.0	**3.5**
JUN	3.0	3.0	2.7	3.3	2.5	**2.9**
JUL	3.1	3.0	2.6	2.7	3.6	**3.1**
AUG	3.3	4.3	3.1	3.6	3.3	**3.5**
SEP	3.0	4.3	4.7	3.8	4.0	**4.0**
OCT	6.1	3.7	3.9	3.1	3.9	**4.0**
NOV	5.0	4.5	3.3	3.3	4.8	**4.3**
DEC	4.3	3.6	2.4	3.6	4.9	**3.9**
Annual	**3.7**	**3.9**	**3.4**	**3.4**	**3.9**	**3.7**

*** For morning (12Z) surface inversions of at least 1.0°C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).

Table 5b. Average strength (°C)* for 2011-2015, derived from PIT NWS soundings.

Month	2011	2012	2013	2014	2015	2011-2015
JAN	206	265	220	314	322	267
FEB	278	257	301	226	237	258
MAR	381	220	235	197	327	271
APR	221	259	245	270	258	255
MAY	236	205	232	238	231	228
JUN	196	189	250	241	267	228
JUL	251	214	176	208	228	221
AUG	205	219	214	219	213	214
SEP	270	217	273	180	204	222
OCT	253	231	256	231	210	237
NOV	282	251	296	237	278	268
DEC	207	241	235	315	327	270
Annual	**246**	**229**	**244**	**233**	**250**	**240**

*** For morning (12Z) surface inversions of at least 1.0^{o}C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).

Table 5c. Average top (m)* for 2011-2015, derived from PIT NWS soundings.

Month	2011	2012	2013	2014	2015	2011-2015
JAN	5 (16)	9 (29)	8 (26)	7 (24)	7 (23)	**36 (24)**
FEB	10 (36)	10 (36)	6 (21)	8 (29)	8 (29)	**42 (30)**
MAR	7 (23)	11 (35)	6 (19)	8 (29)	11 (35)	**43 (28)**
APR	6 (20)	12 (40)	10 (33)	14 (47)	11 (37)	**53 (35)**
MAY	13 (43)	14 (45)	9 (29)	13 (42)	19 (61)	**68 (44)**
JUN	8 (28)	13 (43)	13 (43)	13 (43)	8 (27)	**55 (37)**
JUL	18 (60)	15 (48)	9 (29)	11 (37)	19 (61)	**72 (47)**
AUG	21 (68)	19 (61)	16 (53)	17 (55)	21 (68)	**94 (61)**
SEP	12 (40)	14 (47)	14 (47)	20 (67)	20 (67)	**80 (53)**
OCT	11 (35)	15 (48)	18 (60)	13 (42)	14 (45)	**71 (46)**
NOV	12 (40)	17 (57)	10 (33)	9 (30)	13 (43)	**61 (41)**
DEC	11 (35)	9 (29)	8 (27)	8 (26)	15 (48)	**51 (33)**
Annual	**134 (37)**	**158 (43)**	**127 (35)**	**141 (39)**	**166 (45)**	**726 (40)**

*** For morning (12Z) surface inversions of at least 1.0^{o}C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion). Percent based on available days of data is given in parenthesis.

Table 5d. Total days of inversions for 2011-2015, derived from PIT NWS soundings.*

Month	2011	2012	2013	2014	2015	2011-2015
JAN	10.5	10.5	11.0	11.0	11.5	11.0
FEB	9.5	9.5	11.5	11.0	10.0	10.0
MAR	11.0	10.0	9.5	9.5	10.0	10.0
APR	9.0	9.0	9.0	9.5	9.0	9.0
MAY	9.0	8.5	8.0	9.5	8.5	9.0
JUN	8.0	8.5	8.5	9.0	9.5	8.5
JUL	9.0	9.0	8.5	8.5	9.0	9.0
AUG	8.5	9.5	9.0	9.5	9.0	9.0
SEP	9.5	9.5	10.0	9.5	9.0	9.5
OCT	11.0	10.0	10.0	10.0	10.0	10.0
NOV	11.0	11.0	11.0	10.0	11.0	11.0
DEC	10.5	11.0	11.0	12.0	13.0	11.5
Annual	**9.5**	**9.5**	**9.5**	**9.5**	**10.0**	**9.5**

***** Estimated break time is to nearest half hour EST. Method for calculating break time was altered slightly beginning 2014; however, values are comparable with previous years.
**** For morning (12Z) surface inversions of at least 1.0^{o}C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).

Compilations and evaluations by A.J. Sadar, A. Holt, and Q. Lin, ACHD/AQP, 2014; A.J. Sadar, 2015-2016.

Table 5e. Estimated break time (EST)* for 2011-2015, derived from PIT NWS soundings.**

Based on morning surface inversion data for 2011–2015 in Table 5a, the years with the strongest inversions were 2012 and 2015. These were also the years with the highest frequency of inversions. The weakest measured inversions were in 2013 and 2014. So, the modeled years, 2012 through 2014, included one of the strongest inversion years with one of the highest frequencies (2012). Weaker, less frequent inversions occurred in 2013 and 2014.

Tables 5b through 5e show that overall November is the month with the worst surface inversion conditions. November has the strongest average strength (4.3^{o}C), highest top (268 m), and one of the longest break times (11 am EST); although, November is about average for total days of inversions (41%). Note that these inversion statistics lend confirmation to the finding that the highest number of SO_2 exceedances in 2011 through 2015 occurred at the Liberty Borough monitor in November (see Figures 2a and 2b).

<u>National Temperature and Precipitation Conditions 2011 – 2015</u>: The following graphics (Figures 4a and 4b) provide an overview of temperature and precipitation conditions from 2011 through 2015. As displayed, temperatures in southwest PA were above normal and much above normal in 2011 and 2012, respectively. Temperatures were near normal and below average in 2013 and 2014, respectively; while in 2015, temperatures were once again above average. So, conditions

from 2012 through 2014, the three years that were used in modeling, showed temperatures that were much above normal (2012), near normal (2013), and below average (2014).

The amount of precipitation falling in southwest PA was much above normal in 2011 and above normal in 2012 and 2013. Precipitation amounts were near average and above average in 2014 and 2015, respectively. So, conditions from 2012 through 2014, the three years that were used in modeling, showed precipitation to be above normal (2012 and 2013) and near average (2014).

Temperature and precipitation conditions can have mixed effects on ambient SO_2 concentrations, especially on an hourly basis. For instance, moisture in the atmosphere can convert SO_2 (gas) into a sulfate particle, thus removing the gas (although not the pollutant) from the air. Wind and inversion conditions likely play a more substantial role in hourly concentrations, as discussed above.

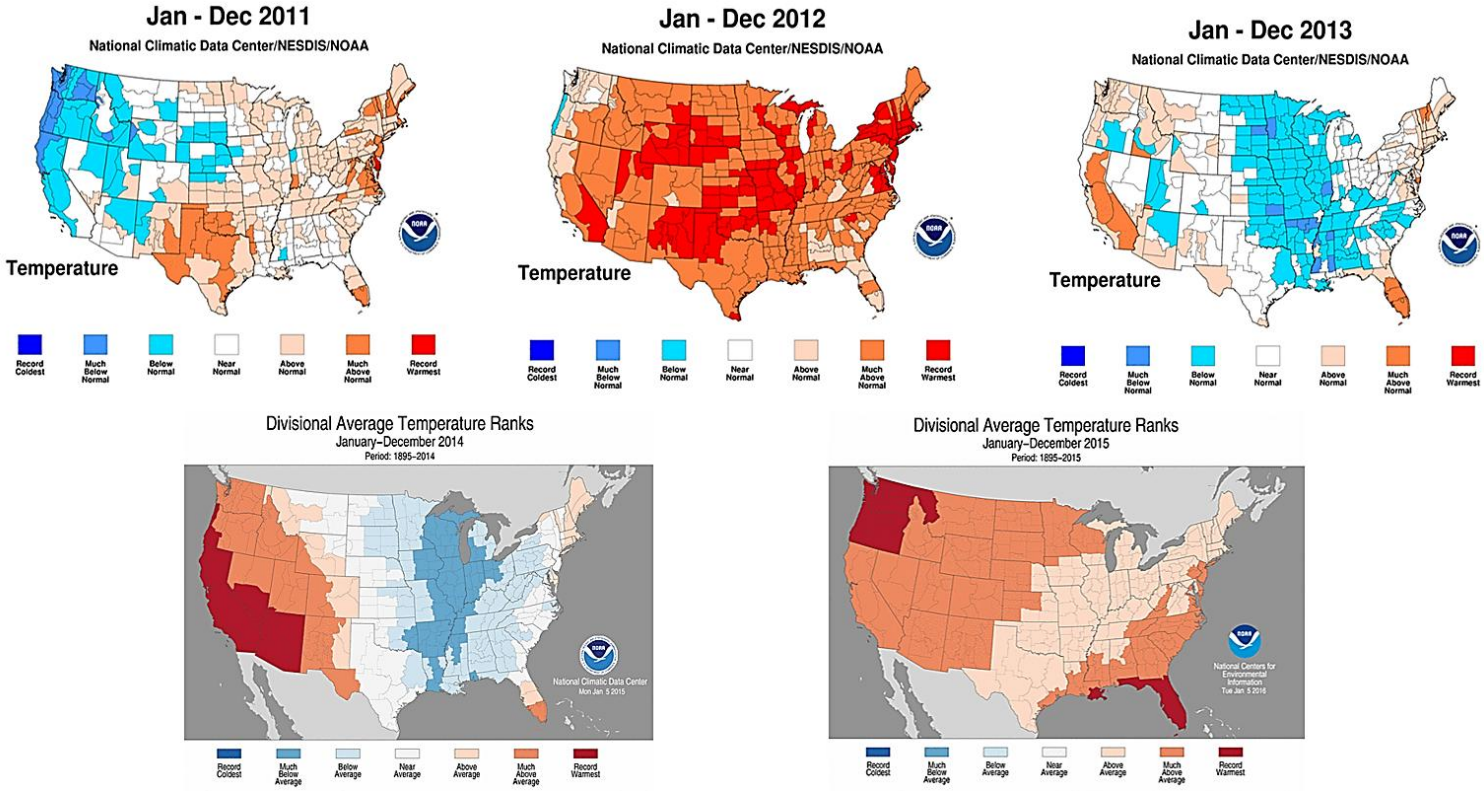


Figure 4a. Temperature conditions 2011-2015 (National Climatic Data Center).

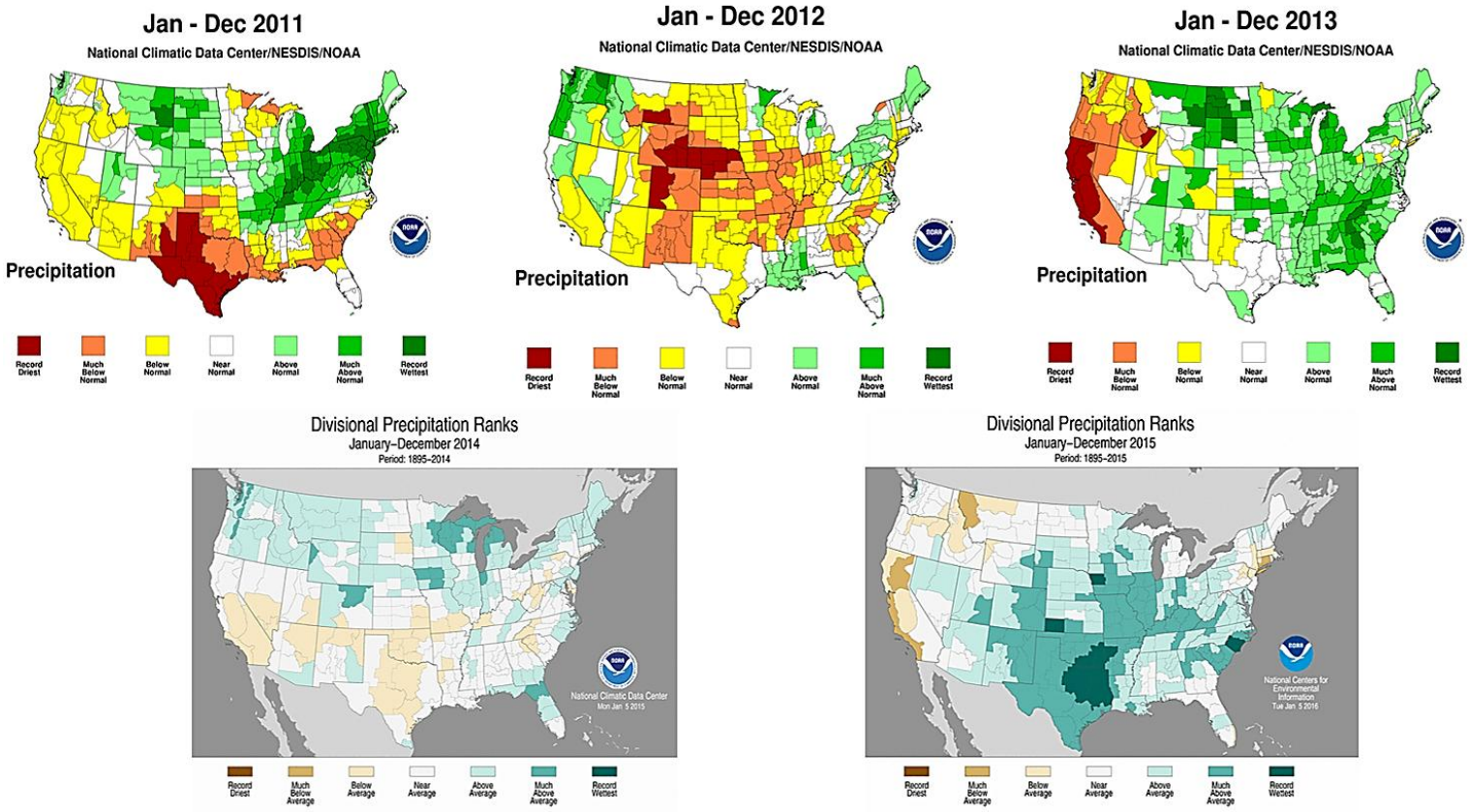


Figure 4b. Precipitation conditions 2011-2015 (National Climatic Data Center).

ATTACHMENT 1

Radiosonde Observation Representativeness for Air Dispersion Potential in Complex Terrain – Preliminary Findings

(This supplementary report is based on an American Meteorological Society 2017 Annual Meeting poster presentation by Anthony J. Sadar--with coauthor Jason Maranche--of ACHD.)

Abstract

Worst case dispersion conditions in the atmospheric boundary layer (ABL) usually involve times when temperature increases with height from the surface of the earth (i.e., a ground level "temperature inversion"). During such times, mixing of the atmosphere is suppressed, allowing contaminants released into the air to remain concentrated. Measurement of temperature inversion conditions is important to characterizing dispersion potential in the lower portions of the ABL, and a radiosonde is the instrument used to make such measurements.

Radiosonde observations are made twice a day throughout much of the world to help interpret weather conditions in the upper atmosphere. Across the contiguous U.S., there are about 70 radiosonde balloon launch sites where measurements are made. However, is the density of this network sufficient to represent air dispersion potential, including the presence of temperature inversions, at locations far removed from the launch sites, especially in complex terrain? Furthermore, are measurements that are typically made only twice daily at 12-hour intervals adequate to represent dispersion potential throughout the remaining 22 hours of the day?

To help answer these questions, five years of data -- both morning (12Z, or 7 a.m. EST) and evening (00Z, or 7 p.m. EST) observations -- were examined from upper-air measurements made at the Pittsburgh (PIT) National Weather Service in Moon Township, Pennsylvania. Moon Township is located in the far western suburbs of Allegheny County. The county is an area containing much complex terrain. The goal of the analysis was to determine the representativeness of the PIT radiosonde sounding data to all of Allegheny County, portions of which are as far away from the measurement site as 50 km.

Introduction

Air quality in southwestern Pennsylvania, as in most other areas of the U.S., is very much influenced by surface based temperature inversions. A temperature inversion is a condition in the atmosphere that yields little or no mixing of the air.

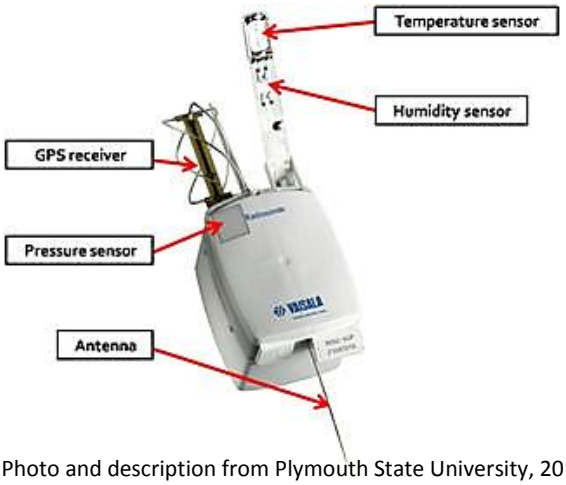
An atmospheric temperature inversion occurs when air temperature increases with increasing height. This situation is the inverse of the "normal" condition where a warm ground keeps low lying air warmer than air higher up and the warm air can rise, causing the atmosphere to mix.

A surface based (or ground level) temperature inversion forms when air next to the ground cools faster than air at higher altitude. So, warmer, lighter air is found above cooler, heavier air. In such a situation, air is stable and mixing within the surface air layer will be suppressed.

The dispersion of atmospheric contaminants is affected by the stability of the atmosphere. Typically, some of the worst-case conditions for the buildup of pollution concentrations occur under stable situations when surface based temperature inversions are present.

To collect temperature and various other conditions starting at the surface, the National Weather Service (NWS) launches a balloon with a measurement transmitter (see radiosonde photo) into the atmosphere twice a day—once in the morning and once in the evening—at about 70 locations across the contiguous U.S. (see map). There are similar scheduled launches at about 1000 locations outside the U.S. These twice daily radiosonde observations are used throughout much of the world to help interpret weather conditions in the upper atmosphere. In air pollution meteorology, such observations are critical to characterizing dispersion potential in the lower portions of the atmospheric boundary layer (ABL).

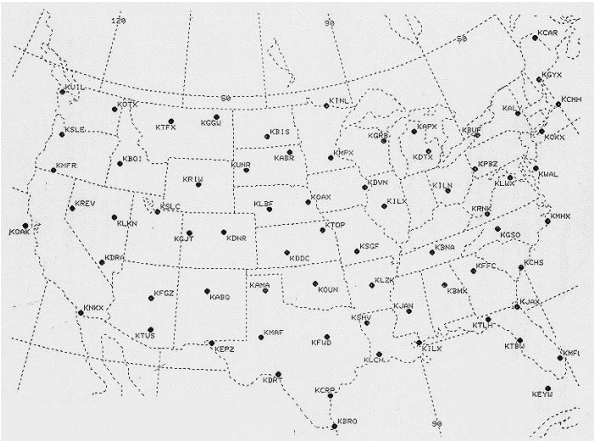
RADIOSONDE WITH BALLOON AND PARACHUTE



(Photo and description from Plymouth State University, 2014.)

(Photo from Radiosonde Museum of North America, 2013.)

Radiosonde Launch Sites in Contiguous U.S.



Source: http://web.gps.caltech.edu/~bordoni/ese132/docs/April2612.pdf

When radiosonde dat[illegible] above the surface is increasing with ascent, then a surface based temperature inversion exists.

The tables below show the strength and frequency of surface based temperature inversions estimated from Pittsburgh-area NWS balloon launches from 2009 through 2015. (To help assure that an inversion was present throughout most of Allegheny County when an inversion was measured at the NWS, which is at an elevation of about 1170 ft (nearly 360 m) MSL, a surface inversion had to be at least 1 ^{o}C to be considered significant for a morning inversion and at least 0.4 ^{o}C for an evening inversion. Evening inversion conditions are less stringent because inversions typically begin to form shortly after sunset, so a smaller inversion is indicative of the beginning of a more significant inversion.)

During this seven-year period, the strength of morning (12Z, or 7 a.m. EST) inversions (measured by degree of temperature increase with height) was 3.8^{o}C on average, topping out on average at nearly 240 meters above the ground.

The strength and frequency of evening (00Z, or 7 p.m. EST) surface based temperature inversions from 2009 through 2015 is shown next. During this seven-year period, the average strength of evening inversions was 1.1^{o}C, topping out on average at 116 meters above the ground.

(A more in-depth explanation of temperature inversions, especially with respect to contaminant dispersal, can be found in Enz, et al., 2014.)

MORNING INVERSIONS* for **2009–2015** Derived from PIT NWS** Soundings

Year	**Avg. Strength** (^{o}C)	**Strength Std. Dev.** (^{o}C)	**Avg. Top** (m)	**Top Std. Dev.** (m)	**Est. Break Time*** ** (EST)	**Total Days of Inversion** (%)
2009	3.8	2.1	244	149	9.5	154 (44)
2010	4.1	2.3	226	115	9.5	171 (47)
2011	3.7	2.1	246	118	9.5	134 (37)
2012	3.9	2.1	229	96	9.5	158 (43)
2013	3.4	1.8	244	113	9.5	127 (35)
2014	3.4	1.9	233	117	9.5	141 (39)
2015	3.9	2.1	250	139	10.0	166 (45)
'09-'15 Avg.	**3.8**	**2.1**	**239**	**122**	**9.5**	**~150 (42)**

*** For morning (12Z) surface inversions of at least 1.0^{o}C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).

****** PIT NWS = Pittsburgh National Weather Service.

******* Estimated break time is to nearest half hour. Method for calculating break time was altered slightly beginning 2014; however, values are comparable with previous years.

Compilations and evaluations by A.J. Sadar, A. Holt, and Q. Lin, ACHD/AQP, January-April 2014; and, A.J. Sadar, January 2015 ff.

EVENING INVERSIONS* for **2009–2015** Derived from PIT NWS ** Soundings

Year	Avg. Strength (°C)	Strength Std. Dev. (°C)	Avg. Top (m)	Top Std. Dev. (m)	Total Days of Inversion (%)
2009	1.1	1.2	96	75	49 (14)
2010	1.2	1.1	140	154	53 (15)
2011	1.1	0.8	120	80	47 (13)
2012	0.9	0.6	90	57	45 (12)
2013	1.3	1.1	133	121	45 (12)
2014	1.3	1.1	120	95	41 (11)
2015	1.1	1.1	112	113	68 (19)
'09-'15 Avg.	**1.1**	**1.0**	**116**	**106**	**348 (14)**

*** For evening (00Z) surface inversions of at least 0.4°C in strength** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion).
****** PIT NWS = Pittsburgh National Weather Service.

Compilations and evaluations by A.J. Sadar, S. Vozar, C. Lopez, and V. Frankeny, May 2015 ff., et al.

Determining Representativeness

In valleys or low lying areas, inversions can form first and/or be more intense than at elevated locations. Therefore, an analysis of measurements of valley inversions versus measurements of inversions at higher elevations, such as at the PIT NWS, was initiated by ACHD.

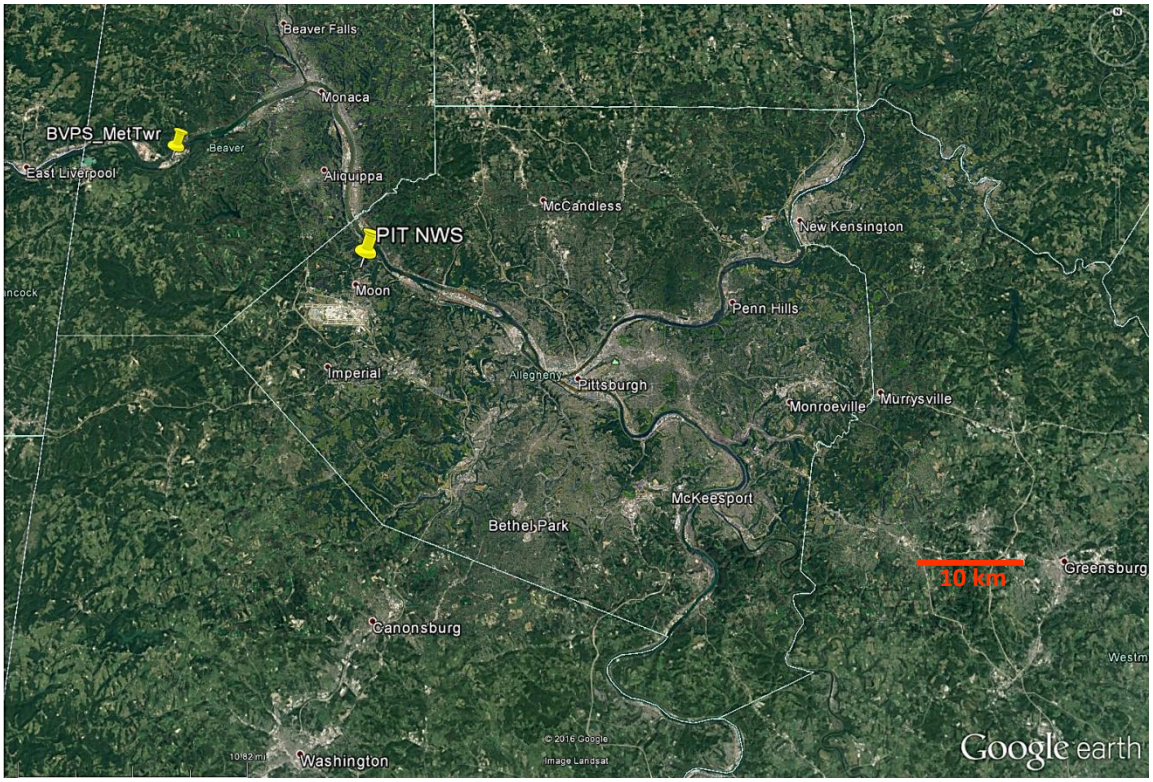
The key issues of concern are related to spatial and temporal representativeness of the inversion measurements made by a radiosonde, and can be described as follows:

1) Spatial Representativeness: whether sounding data collected at PIT properly represents dispersion potential of all of Allegheny County, parts of which are as far away from the radiosonde launch site as 50 km and much of which is below the elevation of the radiosonde release site; and,

2) Temporal Representativeness: whether measurements made typically only twice a day, at 12-hour intervals, are adequate to represent dispersion potential throughout the remaining 22 hours of the day.

<u>1) Spatial Representativeness</u>

Numerous river valleys exist in the county. As noted above, within valleys or low lying areas, inversions can form first and/or be more intense than at elevated locations. PIT NWS is at an elevation of nearly 360 m MSL. River levels can be as low as about 216 m MSL. The figure below presents a relief map of Allegheny County showing the location of PIT NWS and terrain within the county. Also shown is the location of the Beaver Valley Power Station (BVPS) meteorological tower from which in-valley data was compared with the PIT NWS readings. Note that the BVPS tower is 20.5 km WNW of PIT NWS launch site and at approximately 220 m MSL.



2) Temporal Representativeness

The actual times radiosondes are launched from PIT NWS for the 7 am EST and 7 pm EST reports are typically about 6:15 am EST and 6:15 pm EST, respectively. The ascent of the sensors takes about 45 min to complete. The resulting data represents the 12Z (7 am EST) and 00Z (7 pm EST) rather well; however, conditions can change quickly with advancing fronts, precipitation, wind shifts, et al.

BVPS tower measurements ending 6 am and 6 pm EST were compared with standard PIT radiosonde observations at 7 am and 7 pm EST. For this comparison, minimum surface inversion conditions were based on U.S. Nuclear Regulatory Commission criteria found in "Regulatory Guide 1.23: Meteorological Monitoring Programs for Nuclear Power Plants" (March 2007). Note that at 0.2^{o}C and 0.5^{o}C per 100 m, these minimum conditions are quite a bit more liberal than conditions given earlier (1°C for 12Z and 0.4^{o}C for 00Z) that were for assurance that surface inversion conditions existed throughout most of Allegheny County.

The following tables provide detailed comparisons of the PIT and BVPS sites.

Total 12Z Inversions: 2011-2015, DERIVED FROM PIT **NWS** SOUNDINGS* and **BVPS** TOWER DATA**

Month	2011 NWS	2011 BVPS	2011 (NWS-BVPS)	2012 NWS	2012 BVPS	2012 (NWS-BVPS)	2013 NWS	2013 BVPS	2013 (NWS-BVPS)	2014 NWS	2014 BVPS	2014 (NWS-BVPS)	2015 NWS	2015 BVPS	2015 (NWS-BVPS)	2011-2015 NWS	2011-2015 BVPS	5 Yr. (NWS-BVPS)
JAN	6 (19)	3 (10)	3	11 (35)	8 (26)	3	9 (29)	12 (39)	-3	8 (27)	8 (26)	0	9 (29)	5 (16)	4	43 (28)	36 (23)	7
FEB	10 (36)	9 (32)	1	13 (46)	11 (38)	2	6 (21)	6 (21)	0	11 (39)	10 (36)	1	11 (39)	5 (18)	6	51 (36)	41 (29)	10
MAR	10 (32)	11 (35)	-1	15 (48)	16 (52)	-1	6 (19)	7 (23)	-1	12 (43)	11 (35)	1	15 (48)	17 (55)	-2	58 (38)	62 (40)	-4
APR	10 (33)	9 (30)	1	14 (47)	17 (57)	-3	17 (57)	22 (73)	-5	14 (47)	17 (57)	-3	15 (50)	18 (60)	-3	70 (47)	83 (55)	-13
MAY	13 (43)	19 (61)	-6	14 (45)	21 (68)	-7	9 (29)	22 (71)	-13	15 (48)	18 (58)	-3	22 (71)	21 (68)	1	73 (47)	101(65)	-28
JUN	9 (31)	18 (27)	-9	14 (47)	20 (67)	-6	14 (47)	14 (47)	0	13 (43)	15 (50)	-2	16 (53)	19 (63)	-3	66 (44)	86 (57)	-20
JUL	22 (73)	24 (77)	-2	15 (48)	20 (65)	-5	11 (35)	18 (58)	-7	11 (37)	15 (48)	-4	21 (68)	18 (58)	3	80 (52)	95 (61)	-15
AUG	21 (68)	17 (55)	4	19 (61)	23 (74)	-4	19 (61)	17 (55)	2	17 (55)	17 (55)	0	25 (81)	23 (74)	2	101(65)	97 (63)	4
SEP	12 (40)	10 (33)	2	16 (53)	19 (63)	-3	15 (50)	16 (53)	-1	20 (67)	17 (57)	3	22 (73)	22 (73)	0	85 (57)	84 (56)	1
OCT	12 (39)	15 (48)	-3	15 (48)	19 (61)	-4	20 (65)	21 (68)	-1	13 (42)	9 (29)	4	18 (58)	14 (45)	4	78 (50)	78 (50)	0
NOV	15 (50)	14 (47)	1	18 (60)	18 (60)	0	14 (47)	12 (40)	2	10 (33)	6 (20)	4	18 (60)	16 (53)	2	75 (50)	66 (44)	9
DEC	11 (35)	10 (32)	1	11 (35)	15 (48)	-4	10 (33)	9 (29)	1	8 (26)	7 (23)	1	17 (55)	11 (35)	6	57 (37)	52 (34)	5
Annual	151(42)	159(44)	-8	175(48)	207(57)	-32	150(41)	176(48)	-26	152(42)	150(41)	2	209(57)	189(52)	20	837(46)	881(48)	-44

*** For 12Z (morning) surface inversions of at least 0.2°C in strength and 0.5°C per 100m** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion). Percent based on available days of data is given in parenthesis.

**** For 6 am EST low-level stable (inversion) conditions based on NRC Guide 1.23, Table 1** (shallow isothermal and/or unstable conditions may also be present below or within low-level inversion). Percent based on available days of data is given in parenthesis.

NWS data compilations/evaluations by A.J. Sadar, A. Holt, and Q. Lin, ACHD/AQP, January-April 2014; and, A.J. Sadar, Jan-Feb 2016.
NWS/BVPS data compilations/evaluations by A.J. Sadar and A. Holt, Jan 2017.

Total 00Z Inversions: 2011-2015, DERIVED FROM PIT **NWS** SOUNDINGS* and **BVPS** TOWER DATA**

Month	2011 NWS	2011 BVPS	2011 (NWS-BVPS)	2012 NWS	2012 BVPS	2012 (NWS-BVPS)	2013 NWS	2013 BVPS	2013 (NWS-BVPS)	2014 NWS	2014 BVPS	2014 (NWS-BVPS)	2015 NWS	2015 BVPS	2015 (NWS-BVPS)	2011-2015 NWS	2011-2015 BVPS	5-Yr. (NWS-BVPS)
JAN	5 (16)	3 (10)	2	4 (13)	7 (23)	-3	6 (19)	10 (32)	-4	7 (23)	5 (16)	2	6 (19)	6 (19)	0	28 (18)	31 (20)	-3
FEB	5 (18)	6 (21)	-1	2 (7)	7 (25)	-5	2 (7)	2 (7)	0	5 (18)	4 (14)	1	2 (7)	2 (7)	0	16 (11)	21 (15)	-5
MAR	2 (6)	4 (13)	-2	2 (6)	0 (0)	2	0 (0)	0 (0)	0	2 (6)	2 (6)	0	5 (16)	2 (6)	3	11 (7)	8 (5)	3
APR	1 (3)	1 (3)	0	1 (3)	0 (0)	1	1 (3)	1 (3)	0	0 (0)	0 (0)	0	3 (10)	1 (3)	2	6 (4)	3 (2)	3
MAY	1 (3)	3 (10)	-2	2 (6)	0 (0)	2	0 (0)	1 (3)	-1	4 (13)	1 (3)	3	0 (0)	1 (3)	-1	7 (5)	6 (4)	1
JUN	0 (0)	0 (0)	0	0 (0)	1 (3)	-1	1 (3)	1 (3)	0	6 (20)	2 (7)	4	6 (20)	1 (3)	5	13 (9)	5 (3)	8
JUL	3 (10)	2 (6)	1	0 (0)	0 (0)	0	3 (10)	1 (3)	2	1 (3)	1 (3)	0	3 (10)	3 (10)	0	10 (6)	7 (5)	3
AUG	2 (6)	1 (3)	1	1 (3)	1 (3)	0	0 (0)	1 (3)	-1	1 (3)	1 (3)	0	1 (3)	0 (0)	1	5 (3)	4 (3)	1
SEP	4 (13)	3 (10)	1	3 (10)	2 (7)	1	4 (13)	2 (7)	2	1 (3)	0 (0)	1	8 (27)	0 (0)	8	20 (13)	7 (5)	13
OCT	9 (29)	9 (29)	0	6 (19)	6 (19)	0	14 (45)	5 (16)	9	10 (32)	2 (6)	8	13 (42)	5 (16)	8	52 (34)	27 (17)	25
NOV	8 (27)	14 (47)	-6	13 (43)	20 (67)	-7	8 (27)	6 (20)	2	5 (17)	7 (23)	-2	13 (43)	16 (53)	-3	47 (31)	63 (42)	-16
DEC	7 (23)	11 (35)	-4	5 (16)	15 (48)	-10	11 (35)	8 (26)	3	6 (19)	8 (26)	-2	14 (45)	15 (48)	-1	43(28)	57 (37)	-14
Annual	47 (13)	57 (16)	-10	39 (11)	59 (16)	-20	50 (14)	38 (10)	12	48 (13)	33 (9)	15	74 (20)	52 (14)	22	258(14)	239(13)	19

*** For 00Z (evening) surface inversions of at least 0.2°C in strength and 0.5°C per 100m** (shallow isothermal and/or unstable conditions may also be present below or within ground inversion). Percent based on available days of data is given in parenthesis.

**** For 6 pm EST low-level stable (inversion) conditions based on NRC Guide 1.23, Table 1** (shallow isothermal and/or unstable conditions may also be present below or within low-level inversion). Percent based on available days of data is given in parenthesis.

NWS data compilations/evaluations by A.J. Sadar, A. Holt, and Q. Lin, ACHD/AQP, January-April 2014; and, A.J. Sadar, Jan-Feb 2016.
NWS/BVPS data compilations/evaluations by A.J. Sadar and A. Holt, Jan 2017.

Data analysis continues on this project; however, based on initial comparisons of 2011-2015 total days per month during which substantial low-level inversions occurred at two closely located measurement sites, we tentatively conclude:

- Low-level inversions, whether measured in (BVPS) or out of (NWS) the valley, are quite frequent in Allegheny County.
- Seasonally, there appears to be a tendency toward more measured low-level inversions in the valley during the late spring through mid-summer mornings and winter evenings. Early- to mid- fall apparently favors more out-of-valley evening inversions. However, these differences may be because of monthly sun angle variation with respect to in- and out-of-valley measurements and the small but important difference in times the observations were made.
- Annual differences show more low-level inversions in the valley in the morning with more inversions out of the valley in the evening. These differences may be because of the small but important difference in times the observations were made. And, curiously, the five-year duration reveals a shift from more morning and evening in-valley inversions early on to more out-of-valley inversions in later years.

For improved understanding of air-dispersion characteristics and consequences, it is important to model with upper-air data that properly represents--both spatially and temporally--all locations within the modeling domain.

Future studies are expected to include PIT observation comparisons with sodar and sodar/RASS data collected from a nearby valley location and additional instrumented tower data from regional sites.

Acknowledgements

Generous assistance with data assembly and analysis of this report came from staff and interns at ACHD, especially: Allason Holt, Shaun Vozar, Victoria Frankeny, Carlos Lopez, and Q. Lin. Additional data and assistance was provided by PA DEP and BVPS.

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SO_2 SIP

Appendix D

Emissions and Modeling Inventories

D-1: Base Case SIP Emissions Inventory (2011)

D-2: Future Case Projected Emissions Inventory (2018)

D-3: Modeling Inventories

D-4: Variability and Averaging Period Analysis

Emissions and Modeling Inventories

This appendix includes SO_2 emissions and modeling inventories used in the SIP demonstration, as well as emissions-related data and analysis used to determine variability for specific sources.

Emissions Inventories

Emissions inventories correspond with actual emissions for the SIP base case (2011) and projected future case (2018) by emission sector for the Allegheny, PA nonattainment area (NAA) only. Sectors include point, area, nonroad, and onroad (mobile).

For the 2011 SIP emissions inventory, data is taken from EPA's National Emissions Inventory (NEI) database for reported sources of SO_2.[1] For area, nonroad, and onroad emissions, emissions were compiled on a county-wide basis. Allegheny County emissions for these sectors were scaled down based on the population of the NAA (10.38% of Allegheny County).[2]

For the projected 2018 case, the point source emissions from 2011 were scaled down by derived future case emission ratios that are a result of the control strategy. (Note: this applies to the 2011 point inventory only; scaled emissions estimates for the same sources may differ for more recent inventories.)

For USS Mon Valley Works, the following ratios were used to project the future case actual emissions:

- For sources using downriver COG (produced at the Clairton plant), a ratio of 0.264 was used for the future case COG-based emissions. This applies to:
    - All Clairton Boilers
    - All Irvin sources using COG except for the 80" Hot Strip Mill
    - All Edgar Thomson and Harsco sources using COG
- For the Clairton SCOT Incinerator, a ratio of 0.637 was used for future case.
- For Clairton Traveling Hot Car fugitives, a ratio of 0.680 was used for future case.
- For the Clairton PEC Baghouses, a ratio of 0.486 was used for future case.

Additionally, C Battery sources (not operating in 2011) were added to the future case point source inventory.

For future case emissions for other sectors (area, nonroad, onroad), MARAMA Alpha 2 projections[3] were applied to the 2011 source categories, as developed from EPA projection factors.

The table on the next page shows before (2011) and after (2018) point source SO_2 totals by facility from the emissions inventories. Values are shown in tons/year (tpy).

[1] https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data
[2] http://www.census.gov/2010census/
[3] http://www.marama.org/technical-center/emissions-inventory/2011-inventory-and-projections

Facility Name	2011 SO2 (tpy)	2018 SO2 (tpy)
BASIC CARBIDE CORP/BUENA VISTA	0.001	0.001
BETTIS ATOMIC POWER LAB/W MIFFLIN	0.053	0.053
CLAIRTON SLAG INC/WEST ELIZABETH PAVING	0.539	0.539
CP IND INC/MCKEESPORT	0.006	0.006
EASTMAN CHEM RESINS INC/JEFFERSON SITE	0.390	0.390
GARDNER DENVER NASH LLC/ELIZABETH	0.001	0.001
GUARDIAN IND CORP/JEFFERSON HILLS	73.263	--
HARSCO METALS BRI LLC/BRADDOCK	6.653	3.201
KELLY RUN SANI/MSW LDFL	2.548	2.548
KINDER MORGAN LIQUIDS TERM LLC	0.014	0.014
KOPPERS INC/CLAIRTON PLT	0.440	0.440
LIBERTY PULTRUSIONS/WEST MIFFLIN	0.002	0.002
MARATHON ASHLAND PETRO FLOREFFE TERM	0.030	0.030
PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	0.004	0.004
PEOPLES NATURAL GAS CO/WALL COMP STA	0.005	0.011
SOUTH HILLS HEALTH SYS/JEFFERSON	0.033	0.033
TUBE CITY IMS/SCRAP METAL PROCESSOR	0.003	0.003
TYK AMER/LARGE	0.009	0.009
US STEEL CORP/CLAIRTON WORKS	1467.514	1204.831
US STEEL CORP/EDGAR THOMSON WORKS	1279.002	1120.999
US STEEL CORP/IRVIN PLT	418.689	343.400
VALLEY NATL GASES WV LLC/WEST MIFFLIN	0.001	0.001

Modeling Inventories

Modeling inventories correspond with sources and stack parameters that were used in the modeling demonstration. Smaller sources that are part of the emissions inventory for the NAA have been screened out from the modeling runs. Excess or emergency sources that are not applicable to the maximum allowable case have also been excluded from the attainment runs. Additionally, some larger sources outside of the NAA have been included in the modeling demonstration in order to properly account for all possible emissions affecting the NAA. (See details in Appendices A and E).

For testing and performance evaluations, actual emissions and stack flow rates for 2012-2014 were used. For the attainment demonstration, allowable or maximum potential emissions were used at maximum stack flow rates. The allowable/potential emissions for each source are constant for each modeled year (2012-2014).

Variability and Averaging Analysis

This analysis corresponds to the variability in sulfur content associated with coke oven gas (COG) fuel usage. Sources that use COG as a primary fuel were assigned longer-term averaging periods for their limits based on the variability of H_2S in the COG and calculated adjustment ratios. The longer-term averaging is presumed to lead to "comparable stringency" as described in the SO_2 SIP Guidance (2014).

D-1: Base Case SIP Emissions Inventory (2011)

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2011 Point Source Emissions Inventory (Annual Tons by Process) - Page 1

region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	12633011	64218913	95954012	89732514	2	S3	4200300007	BASIC CARBIDE CORP/BUENA VISTA	BLDG HEATER / B002 BLDG HEATER	10200603	339999	0.0005	TON
42003	12633011	64218813	95953912	138586714	1	S2	4200300007	BASIC CARBIDE CORP/BUENA VISTA	BOILER B001 / BOILER	10200603	339999	0.0002	TON
42003	6596811	98916013	95954812	138588314	31	S1	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #1-NATURAL GAS / BOILER #1-NATURAL GAS	10300602	541712	0.0012	TON
42003	6596811	98916113	95955312	138588414	32	S2	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #2-NATURAL GAS / BOILER #2-NATURAL GAS	10300602	541712	0.0033	TON
42003	6596811	98915813	95955412	138588114	1	S3	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #3-NATURAL GAS / BOILER# 3-NATURAL GAS	10300602	541712	0.0020	TON
42003	6596811	98916213	95955512	138588514	33	S4	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #4-NATURAL GAS / BOILER # 4-NATURAL GAS	10300602	541712	0.0031	TON
42003	6596811	98916713	95955812	138589014	104	S8	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	COMPUTING CTR EMERG GEN / COMPUTING CTR GEN #1	20100102	541712	0.0079	TON
42003	6596811	98916813	95955912	138589114	105	S9	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	COMPUTING CTR EMERG GEN / COMPUTING CTR GEN #2	20100102	541712	0.0082	TON
42003	6596811	98916613	95955612	138588914	103	S6	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	DIESEL GENERATOR TESTING / DIESEL GENERATOR TESTING	20100102	541712	0.0088	TON
42003	6596811	98915913	95955112	138588214	3	S12	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	ROADS & VEHICLES / VEHICLE EXHAUST EMISSIONS	27300320	541712	0.0071	TON
42003	6596811	98916313	95955212	138588614	35	S13	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	SMALL COMBUSTION EQUIP NG / SMALL COMBUSTION EQUIP NG	10300603	541712	0.0111	TON
42003	4714911	98925213	95959612	138597814	120	S3	4200300079	CLAIRTON SLAG INC/WEST ELIZABETH PAVING MATL PLT	DEDICATED VEHICLE EMISSIN / BULLDOZER, LOADERS ETC.	20300101	324121	0.5388	TON
42003	4715511	98926313	95960612	138599014	1	S4	4200300171	CP IND INC/MCKEESPORT	"A" FURNACE / "A" FURNACE	10200602	332312	0.0020	TON
42003	4715511	98926413	95960712	138599114	2	S5	4200300171	CP IND INC/MCKEESPORT	"B" FURNACE / "B" FURNACE	10200602	332312	0.0020	TON
42003	4715511	98926513	95960812	138599214	3	S6	4200300171	CP IND INC/MCKEESPORT	HOLCROFT FURNACE / HOLCROFT FURNACE	10200603	332312	0.0003	TON
42003	4715511	98926613	95960512	138599314	4	S3	4200300171	CP IND INC/MCKEESPORT	OTHER COMBUSTION / HEATING	10200602	332312	0.0010	TON
42003	4715511	98926813	95960512	138599514	6	S3	4200300171	CP IND INC/MCKEESPORT	SPIN FORGING / PIPE END FORMING	10200603	332312	0.0001	TON
42003	4715511	98926713	95960512	138599414	5	S3	4200300171	CP IND INC/MCKEESPORT	SURFACE COMBUSTION / ENCLOSED FURNACE	10200602	332312	0.0010	TON
42003	6596911	17368213	95964312	14068714	2	S32	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	#1 & #2 LTC UNIT / #1 LTC FCE., CB, NG	10200603	325211	0.0100	TON
42003	6596911	17368413	95964012	14329414	1	S28	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	#1 & #2 LTC UNIT / #2 LTC FCE. VA-POWER, NG	10200602	325211	0.0100	TON
42003	6596911	98931313	95965712	138604014	35	S45	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	BOILER #5 (TRANE) / BOILER #5, NAT. GAS	10200602	325211	0.0800	TON
42003	6596911	64207713	95965612	89121614	33	S44	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	BOILERS #3 & 4 / BOILERS #3 & 4, NAT. GAS	10200602	325211	0.0200	TON
42003	6596911	17368513	95964412	14328114	3	S33	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	C5 HOT OIL HEATER, NG / C-5 HOT OIL HEATER, NG	10200603	325211	0.0100	TON
42003	6596911	98929813	95963612	138602514	187	S23	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	C5 THERMAL OXIDIZER / THEMAL OXIDIZER THERMAL	10200602	325211	0.0100	TON
42003	6596911	98931713	95963312	138604414	104	S2	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	HYDRO UNIT / HEATER	10200602	325211	0.0100	TON
42003	6596911	17368813	95967612	14327614	8	S66	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	MISC. NATURAL GAS / MISC. NAT. GAS USAGE	10200602	325211	0.0100	TON
42003	6596911	17368613	95967212	14327814	6	S61	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	VEHICLE EXHAUST / DIESEL EXHAUST	27000320	325211	0.1900	TON
42003	6596911	17368713	95967212	14327714	7	S61	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	VEHICLE EXHAUST / GASOLINE EXHAUST	20300307	325211	0.0400	TON
42003	3006311	98938313	95968912	138611114	31	S3	4200300951	GARDNER DENVER NASH LLC/ELIZABETH	HIGH PRESSURE BOILER #1 / NATURAL GAS BURNING	10200603	333912	0.0004	TON
42003	3006311	98938413	95969012	138611214	32	S4	4200300951	GARDNER DENVER NASH LLC/ELIZABETH	HIGH PRESSURE BOILER #2 / NATURAL GAS BURNING	10200603	333912	0.0004	TON
42003	2989611	38222713	95973312	16751214	3	S3	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	CULLET PROCESSING / CULLET HEATING-NG	10200603	327211	0.0007	TON
42003	2989611	98948813	95973612	138621714	116	S6	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	FORK TRUCK, PROPANE / FORK TRUCK, PROPANE	20301001	327211	0.0002	TON
42003	2989611	98948213	95973212	138621114	108	S2	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	GLASS MELT FURNACE / METAL GLASS (ESP ONLY OPR	30501403	327211	12.2611	TON
42003	2989611	38222313	95973212	16751714	2	S2	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	GLASS MELT FURNACE / METAL GLASS DI/ESP	30501403	327211	37.7428	TON
42003	2989611	98948113	95973112	138621014	106	S1	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	GLASS MELT FURNACE / METAL GLASS NO DI/ESP	30501403	327211	2.7668	TON
42003	2989611	98948613	95973512	138621514	113	S5	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	GLASS/ROLL COATING / GLASS/ROLL COATING SO2	31301001	327211	19.9500	TON
42003	2989611	38222813	95973412	16750714	1	S4	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	RAW MATERIAL RECEIVING / BATCH WATER HEATER-NG	10200603	327211	0.0007	TON
42003	2989611	98949013	95973612	138621914	119	S6	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	SITE DEDICATED VEHICLES / DUMP/PAYLOADER EXHAUST	20200107	327211	0.5179	TON
42003	2989611	98949413	95973412	138622314	31	S4	4200300342	GUARDIAN IND CORP/JEFFERSON HILLS	SPACE/WATER HEATERS, NG / SPACE/WATER HEATERS, NG	10200603	327211	0.0224	TON
42003	3006211	98952613	95974312	138625514	111	S5	4200300913	HARSCO METALS BRI LLC/BRADDOCK	OFF-ROAD FRONTEND LOADER FUEL EMISSIONS.	27000320	332322	0.0030	TON
42003	3006211	38198913	95973912	17187314	1	S1	4200300913	HARSCO METALS BRI LLC/BRADDOCK	ROTARY DRYER / COMBUSTION DESULF	10300799	332322	4.6900	TON
42003	3006211	38199013	95974112	17187014	2	S3	4200300913	HARSCO METALS BRI LLC/BRADDOCK	ROTARY DRYER / COMBUSTION NO DESULF	10300799	332322	1.9600	TON
42003	8521011	509013	95976512	17234314	1	S3	4200300802	KELLY RUN SANI/MSW LDFL	DEDICATED DIESEL VEHICLES / DEDICATED DIESEL VEHICLES	20300101	562212	0.6400	TON
42003	8521011	98957413	95976312	138630314	103	S1	4200300802	KELLY RUN SANI/MSW LDFL	ENCLOSED GROUND FLARE #1 / GROUND FLARE #1	50100410	562212	1.9000	TON
42003	8521011	508913	95976612	17234414	3	S4	4200300802	KELLY RUN SANI/MSW LDFL	PORTABLE GENERATOR / GASOLINE ELEC. GENERATOR	20201702	562212	0.0020	TON
42003	8521011	98957613	95976412	138630514	107	S2	4200300802	KELLY RUN SANI/MSW LDFL	ROCK CRUSHING/SOIL SCREEN / SOIL SCREENING OPERATIONS	30502002	562212	0.0060	TON
42003	4716111	98961113	95977612	138634114	31	S1	4200300208	KINDER MORGAN LIQUIDS TERM LLC/PETROL LIQUID STORAGE	HOPKINS 800 HEATER / HOPKINS 800 - NAT'L GAS	10200603	493110	0.0110	TON
42003	4716111	28120713	95977912	13578214	1	S5	4200300208	KINDER MORGAN LIQUIDS TERM LLC/PETROL LIQUID STORAGE	THERMTECH VAPOR INCIN. / NAT'L GAS - THERMTECH	10200602	493110	0.0030	TON
42003	4714311	28141213	95979512	16978414	5	S1	4200300027	KOPPERS INC/CLAIRTON PLT	1T4 HOT OIL HEATER / 1T4 HOT OIL HEATER	10200603	325194	0.0014	TON
42003	4714311	28140413	95979512	16979214	2	S1	4200300027	KOPPERS INC/CLAIRTON PLT	2T2 HEATER - SEC. HEATER / 2T2 HEATER - SEC. HEATER	10200603	325194	0.0054	TON
42003	4714311	28139313	95979612	16980414	4	S2	4200300027	KOPPERS INC/CLAIRTON PLT	PRILL HOT OIL HEATER / HOT OIL HEATER	39990003	325194	0.0042	TON
42003	4714311	28141713	95979512	16977714	3	S1	4200300027	KOPPERS INC/CLAIRTON PLT	PRIMARY HEATER / PRIMARY HEATER	10200603	325194	0.0223	TON
42003	4714311	28139413	95979512	16980314	6	S1	4200300027	KOPPERS INC/CLAIRTON PLT	SEC. FLASH HEATER (TI) / SEC. FLASH HEATER (TI)	10100602	325194	0.0222	TON
42003	4714311	28139513	95979812	16980214	7	S4	4200300027	KOPPERS INC/CLAIRTON PLT	THERMAL OXIDIZER / THERMAL OXIDIZER	10200603	325194	0.0046	TON
42003	4714311	98965813	95980112	138638814	108	S7	4200300027	KOPPERS INC/CLAIRTON PLT	TRANSPORTATION / DIESEL VEHICLES	20300101	325194	0.3728	TON
42003	4714311	98965513	95980112	138638514	105	S7	4200300027	KOPPERS INC/CLAIRTON PLT	TRANSPORTATION / GASOLINE VEHICLES	20300301	325194	0.0073	TON
42003	4714811	28136613	95983312	16628614	1	S4	4200300075	LIBERTY PULTRUSIONS/WEST MIFFLIN	BOILER, NG / BOILER - NG	10200603	326130	0.0021	TON
42003	15621011	98975213	95984212	138648214	3	STK-3	4200300096	MARATHON ASHLAND PETRO FLOREFFE TERM/ASPHALT TERM	HOT OIL HEATER	10200603	324121	0.0222	TON
42003	15621011	98975113	95984112	138648114	1	STK-1	4200300096	MARATHON ASHLAND PETRO FLOREFFE TERM/ASPHALT TERM	VP BOILER MODEL 1365	10200602	324121	0.0080	TON
42003	2989411	98995113	95996712	138668414	5	S8	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	BOILER / BOILER	10200602	334514	0.0002	TON
42003	2989411	98994913	95996612	138668214	3	S7	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	COIL MFG. OVEN 3 UNITS NG / COIL MFG. OVEN 3 UNITS NG	39000699	334514	0.0007	TON
42003	2989411	98996113	95995912	138669414	108	S11	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	COIL PRESSING AREA / COIL PRESSING AREA	39000699	334514	0.0001	TON
42003	2989411	98995213	95996112	138668514	6	S14	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	GAS RADIANT SPACE HEATERS / SPACE HEATERS/BATH ROOMS	10500106	334514	0.0006	TON
42003	2989411	98994813	95996312	138668114	1	S3	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BAKE OVEN, NG / LARGE BAKE OVEN, NG	39000699	334514	0.0015	TON
42003	2989411	98996613	95996512	138669914	114	S6	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BURNOFF OVEN / LARGE BURNOFF OVEN	31307002	334514	0.0001	TON

2011 Point Source Emissions Inventory (Annual Tons by Process) - Page 2

region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	2989411	98995413	95996512	138668714	8	S6	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BURNOFF OVEN / LARGE BURNOFF OVEN	39000699	334514	0.0004	TON
42003	2989411	98996513	95996412	138669814	113	S5	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	SMALL BURNOFF OVEN / SMALL BURNOFF OVEN	31307002	334514	0.0001	TON
42003	2989411	98995013	95996012	138668314	4	S12	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	STEAM CLEANER JENNY / CLEANING OF MOTOR PARTS	39000699	334514	0.0002	TON
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	PEOPLES NATURAL GAS CO/WALL COMP STA	ENGINE #2-NG 4SRB RICE	20200202	221210	0.0051	TON
42003	3006711	99016613	96007712	138690014	31	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #1 / BOILER NO. 1 - NG	10300602	622110	0.0130	TON
42003	3006711	99016713	96007712	138690114	33	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #2 / BOILER NO. 2 - NG	10300602	622110	0.0140	TON
42003	3006711	99016813	96007712	138690214	35	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #3 / BOILER NO. 3 - NG	10300602	622110	0.0051	TON
42003	3006711	38197013	96007812	14105914	1	S2	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SPORTS MEDICINE BOILERS / BOILER NO. 1	10300602	622110	0.0003	TON
42003	3006711	38196513	96007812	14106814	2	S2	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SPORTS MEDICINE BOILERS / BOILER NO. 2	10300602	622110	0.0003	TON
42003	3006711	38196913	96007912	14106114	3	S3	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SURGERY CENTER BOILERS / BOILER NO. 1	10300602	622110	0.0002	TON
42003	3006711	99016913	96007912	138690314	37	S3	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SURGERY CENTER BOILERS / BOILER NO.2	10300602	622110	0.0002	TON
42003	2991211	38209113	96010612	17235614	1	S2	4200300774	TUBE CITY IMS/SCRAP METAL PROCESSOR	SPACE HEATERS (ALL) / SPACE HEATERS	10100602	423510	0.0012	TON
42003	2991211	38209513	96010612	17235214	2	S2	4200300774	TUBE CITY IMS/SCRAP METAL PROCESSOR	TORCH CUTTING OPERATIONS / TORCH CUTTING NAT'L GAS	30390003	423510	0.0020	TON
42003	3819411	99022813	96010812	138696214	3	S-1	4200300416	TYK AMER/LARGE	AFTERBURNERS 10-17	39000699	327120	0.0003	TON
42003	3819411	99022613	96010812	138696014	1	S-1	4200300416	TYK AMER/LARGE	BRICK CURING OVEN BURNERS 1-8	39000699	327120	0.0004	TON
42003	3819411	99023513	96010912	138697014	106	S-3	4200300416	TYK AMER/LARGE	BRICK PRESSES	30500304	327120	0.0073	TON
42003	3819411	99022713	96010912	138696114	2	S-3	4200300416	TYK AMER/LARGE	DRYING OVEN BURNERS	39000699	327120	0.0002	TON
42003	3819411	99022913	96011012	138696314	4	S-4	4200300416	TYK AMER/LARGE	SPACE HEATERS	10500106	327120	0.0012	TON
42003	8204511	99049713	96032512	138723614	104	S68	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 FUGITIVES / BATTERY #1, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5310113	96027112	16966114	1	S1	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 UNDERFIRING / BATTERY 1,UNDERFIRING COG	30300306	331110	59.7281	TON
42003	8204511	5310013	96027112	16966314	2	S1	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 UNDERFIRING / BATTERY 1,UNDERFIRING NG	30390003	331110	0.0023	TON
42003	8204511	99051213	96032912	138725114	134	S74	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13 FUGITIVES / BATTERY #13, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99047913	96032712	138721614	13	S7	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13, UNDERFIRING / BATTERY13,UNDERFIRING COG	30300306	331110	45.1247	TON
42003	8204511	99048013	96032712	138721714	14	S7	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13, UNDERFIRING / BATTERY13,UNDERFIRING NG	30390003	331110	0.0025	TON
42003	8204511	99051713	96033012	138725614	139	S75	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14 FUGITIVES / BATTERY #14, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99048113	96033512	138721814	15	S8	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14, UNDERFIRING / BATTERY14,UNDERFIRING COG	30300306	331110	45.5056	TON
42003	8204511	99048213	96033512	138721914	16	S8	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14, UNDERFIRING / BATTERY14,UNDERFIRING NG	30390003	331110	0.0029	TON
42003	8204511	99052213	96033112	138726114	144	S76	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15 FUGITIVES / BATTERY #15, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99048313	96034112	138722014	17	S9	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15, UNDERFIRING / BATTERY15,UNDERFIRING COG	30300306	331110	48.5524	TON
42003	8204511	99048413	96034112	138722114	18	S9	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15, UNDERFIRING / BATTERY15,UNDERFIRING NG	30390003	331110	0.0022	TON
42003	8204511	99052713	96033212	138726614	149	S77	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19 FUGITIVES / BATTERY #19, SOAKING	30300303	331110	3.3819	TON
42003	8204511	99048513	96027212	138722214	19	S10	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19, UNDERFIRING / BATTERY19,UNDERFIRING COG	30300306	331110	80.8325	TON
42003	8204511	99048613	96027212	138722314	20	S10	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19, UNDERFIRING / BATTERY19,UNDERFIRING NG	30390003	331110	0.0046	TON
42003	8204511	99050213	96032612	138724114	109	S69	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 FUGITIVES / BATTERY #2, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5305113	96028112	16811114	3	S2	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 UNDERFIRING / BATTERY 2,UNDERFIRING COG	30300306	331110	56.9743	TON
42003	8204511	5304513	96028112	16811814	4	S2	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 UNDERFIRING / BATTERY 2,UNDERFIRING NG	30390003	331110	0.0023	TON
42003	8204511	99053213	96033312	138727114	154	S78	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20 FUGITIVES / BATTERY #20, SOAKING	30300303	331110	3.3819	TON
42003	8204511	99048713	96027312	138722414	21	S11	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20, UNDERFIRING / BATTERY20,UNDERFIRING COG	30300306	331110	98.8499	TON
42003	8204511	99048813	96027312	138722514	22	S11	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20, UNDERFIRING / BATTERY20,UNDERFIRING NG	30390003	331110	0.0038	TON
42003	8204511	99050713	96032812	138724614	114	S70	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3 FUGITIVES / BATTERY #3, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5303113	96029212	16974514	5	S3	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3, UNDERFIRING / BATTERY 3,UNDERFIRING COG	30300306	331110	49.5706	TON
42003	8204511	5306513	96029212	16973014	6	S3	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3, UNDERFIRING / BATTERY 3,UNDERFIRING NG	30390003	331110	0.0021	TON
42003	8204511	99053713	96033412	138727614	159	S79	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B FUGITIVES / BATTERY #B, SOAKING	30300303	331110	4.3505	TON
42003	8204511	99048913	96027412	138722614	23	S12	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B, UNDERFIRING / BATTERY B,UNDERFIRING COG	30300306	331110	188.8860	TON
42003	8204511	99049013	96027412	138722714	24	S12	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B, UNDERFIRING / BATTERY B,UNDERFIRING NG	30390003	331110	0.0071	TON
42003	8204511	5307113	96027912	16972414	31	S18	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #1, STCK S31 / BOILER #1, COG, STACK S31	10200707	331110	197.7160	TON
42003	8204511	5306013	96027912	16974114	32	S18	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #1, STCK S31 / BOILER #1, NG, STACK S31	10200601	331110	0.1889	TON
42003	8204511	5306613	96028012	16972914	33	S19	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #2, STCK S32 / BOILER #2, COG, STACK S32	10200707	331110	105.1200	TON
42003	8204511	5306713	96028012	16972814	34	S19	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #2, STCK S32 / BOILER #2, NG, STACK S32	10200601	331110	0.0782	TON
42003	8204511	5306813	96028212	89176214	35	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R1, STACK S36 / BOILER R1, COG, STACK S36	10200707	331110	4.7986	TON
42003	8204511	5306913	96028212	138723014	36	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R2, STACK S36 / BOILER R2, COG, STACK S36	10200707	331110	1.5347	TON
42003	8204511	5306913	96028212	16972614	36	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R2, STACK S36 / BOILER R2, NG, STACK S36	10200601	331110	1.5347	TON
42003	8204511	99049313	96028312	138723214	37	S21	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER T1, STACK S38 / BOILER T1, COG, STACK S38	10200707	331110	14.7478	TON
42003	8204511	5308513	96028412	89175914	38	S22	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER T2, STACK S39 / BOILER T2, COG, STACK S39	10200707	331110	13.6395	TON
42003	8204511	99060013	96029512	138733914	235	S32	4200300032	US STEEL CORP/CLAIRTON PLT	FLARING / FLARING	30399999	331110	0.0365	TON
42003	8204511	99059413	96028712	138733314	229	S25	4200300032	US STEEL CORP/CLAIRTON PLT	MOTOR VEHICLE EXHAUST / HEAVY-DUTY VEHICLES	20300101	331110	3.1612	TON
42003	8204511	99049213	96032412	138722914	26	S67	4200300032	US STEEL CORP/CLAIRTON PLT	NH3 TANKER LOADING FLARE / NH3 TANKER LOADING FLARE	39999993	331110	0.0745	TON
42003	8204511	99054713	96030212	138728614	175	S41	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PEC FUGITIVES	30300303	331110	5.7785	TON
42003	8204511	99054513	96027612	138728414	173	S15	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PEC BAGHOUSE STACK	30300303	331110	52.0061	TON
42003	8204511	99055013	96033012	138728914	178	S75	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PRE PUSH	30300303	331110	0.5983	TON
42003	8204511	99054613	96029812	138728514	174	S36	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / TRAVELING HOT CAR	30300303	331110	38.8114	TON
42003	8204511	99054813	96030612	138728714	176	S46	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / UNCONTROLLED PUSHING	30300303	331110	0.2717	TON
42003	8204511	99055313	96030312	138729214	181	S42	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PEC FUGITIVES	30300303	331110	6.4016	TON
42003	8204511	99055113	96027712	138729014	179	S16	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PEC BAGHOUSE STACK	30300303	331110	57.6141	TON
42003	8204511	99055613	96033212	138729514	184	S77	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PRE PUSH	30300303	331110	0.6764	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	8204511	99055213	96029912	138729114	180	S37	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / TRAVELING HOT CAR	30300303	331110	43.7443	TON
42003	8204511	99055413	96030712	138729314	182	S47	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / UNCONTROLLED PUSHING	30300303	331110	1.6188	TON
42003	8204511	99054113	96030112	138728014	163	S39	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PEC FUGITIVES	30300303	331110	4.3426	TON
42003	8204511	99053913	96027512	138727814	161	S13	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PEC BAGHOUSE STACK	30300303	331110	39.0831	TON
42003	8204511	99054413	96032612	138728314	166	S69	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PRE PUSH	30300303	331110	0.4480	TON
42003	8204511	99054013	96029712	138727914	162	S34	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / TRAVELING HOT CAR	30300303	331110	30.7800	TON
42003	8204511	99054213	96030512	138728114	164	S44	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / UNCONTROLLED PUSHING	30300303	331110	0.0410	TON
42003	8204511	99055813	96030412	138729714	187	S43	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PEC FUGITIVES	30300303	331110	2.7282	TON
42003	8204511	99055713	96027812	138729614	185	S17	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PEC BAGHOUSE STACK	30300303	331110	51.8358	TON
42003	8204511	99056013	96033412	138729914	190	S79	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PRE PUSH	30300303	331110	0.3502	TON
42003	8204511	99056113	96030812	138730014	191	S49	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #1 / QUENCH TOWER #1	30300304	331110	2.2029	TON
42003	8204511	99056213	96030912	138730114	193	S51	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #5 / QUENCH TOWER #5	30300304	331110	2.9423	TON
42003	8204511	99056313	96031012	138730214	194	S52	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #7 / QUENCH TOWER #7	30300304	331110	3.3264	TON
42003	8204511	99056413	96031112	138730314	195	S53	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #B / QUENCH TOWER #B	30300304	331110	2.7653	TON
42003	8204511	99059813	96028512	138733714	233	S23	4200300032	US STEEL CORP/CLAIRTON PLT	SCOT HYDROGENATION UNIT / SCOT STACK	30399999	331110	60.9202	TON
42003	8204511	99059513	96034012	138733414	230	S85	4200300032	US STEEL CORP/CLAIRTON PLT	TUG BOAT EXHAUST / TUG BOAT EXHAUST	20300101	331110	1.9388	TON
42003	8204511	99049113	96032412	138722814	25	S67	4200300032	US STEEL CORP/CLAIRTON PLT	WWT SURGE TANK NH3 FLARE / WWT SURGE TANK NH3 FLARE	39990024	331110	0.0018	TON
42003	7409311	99043413	96024912	138717114	101	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 CASTHOUSE / BF #1 CASTHOUSE BAGHOUSE	30300825	331110	26.4864	TON
42003	7409311	99043513	96024912	138717214	102	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 CASTHOUSE / BF #1 CASTHOUSE ROOF MON.	30300825	331110	2.7024	TON
42003	7409311	10403313	96024912	13688814	5	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 FUME SUPPRESSION / BF #1 FUME SUPPRESSION	10200707	331110	4.6864	TON
42003	7409311	10403113	96023812	13689014	7	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 MISC. / BF #1 MISC. COG	39000702	331110	3.8622	TON
42003	7409311	10403013	96023812	13689114	8	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 MISC. / BF #1 MISC. NATURAL GAS	39000699	331110	0.0597	TON
42003	7409311	99043613	96024912	138717314	103	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 CASTHOUSE / BF #3 CASTHOUSE BAGHOUSE	30300825	331110	43.6585	TON
42003	7409311	99043713	96024912	138717414	104	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 CASTHOUSE / BF #3 CASTHOUSE ROOF MON.	30300825	331110	2.3462	TON
42003	7409311	99042513	96024912	138716214	14	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 FUME SUPPRESSION / BF #3 FUME SUPPRESSION	10200707	331110	4.0687	TON
42003	7409311	99042613	96026612	138716314	16	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 MISC. / BF #3 MISC., COG	39000702	331110	3.6141	TON
42003	7409311	99042713	96026612	138716414	17	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 MISC. / BF #3 MISC., NATURAL GAS	39000699	331110	0.0569	TON
42003	7409311	10404513	96023812	13638214	2	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF #1 STOVE COG	39000702	331110	1.2617	TON
42003	7409311	10404613	96023812	13638114	3	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF #1 STOVE NATURAL GAS	39000699	331110	0.1889	TON
42003	7409311	10404413	96023812	13638314	1	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF STOVE #1, BFG	39000701	331110	112.8670	TON
42003	7409311	99042313	96026612	138716014	11	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF #3 STOVE, COG	39000702	331110	8.5511	TON
42003	7409311	99042413	96026612	138716114	12	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF #3 STOVE, NATURAL GAS	39000699	331110	1.2053	TON
42003	7409311	99042213	96026612	138715914	10	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF STOVE #3, BFG	39000701	331110	207.0540	TON
42003	7409311	99042813	96026012	138716514	19	S3	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BFG FLARE / BFG FLARE	30390024	331110	38.8325	TON
42003	7409311	99042913	96024612	138716614	20	S17	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BOP PROCESS FUEL / BOP COMBUSTION, COG	10200707	331110	12.5122	TON
42003	7409311	99043013	96024612	138716714	21	S17	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BOP PROCESS FUEL / BOP COMBUSTION, NG	10200603	331110	0.0646	TON
42003	7409311	99043113	96025212	138716814	23	S22	4200300202	US STEEL CORP/EDGAR THOMSON PLT	CASTER/LMF PROCESS FUEL / CONTINUOUS CASTER, COG	39000702	331110	0.9078	TON
42003	7409311	99043213	96025212	138716914	24	S22	4200300202	US STEEL CORP/EDGAR THOMSON PLT	CASTER/LMF PROCESS FUEL / CONTINUOUS CASTER, NG	39000699	331110	0.0215	TON
42003	7409311	99043313	96026112	138717014	26	S30	4200300202	US STEEL CORP/EDGAR THOMSON PLT	PLANT WIDE MISC COMB, NG / PLANT WIDE MISC COMB, NG	10200603	331110	0.0301	TON
42003	7409311	10401813	96023912	13690314	31	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, BFG	10200704	331110	147.9550	TON
42003	7409311	10401713	96023912	13690414	32	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, COG	10200707	331110	84.3929	TON
42003	7409311	10401613	96023912	13690514	33	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, NG	10200601	331110	0.0506	TON
42003	7409311	10401413	96024012	13690814	35	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, BFG	10200704	331110	288.8840	TON
42003	7409311	10401313	96024012	13690914	36	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, COG	10200707	331110	46.0291	TON
42003	7409311	10404213	96024012	13687914	37	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, NG	10200601	331110	0.0400	TON
42003	7409311	10404113	96024112	13688014	39	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, BFG	10200704	331110	191.7850	TON
42003	7409311	10403413	96024112	13688714	40	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, COG	10200707	331110	44.7914	TON
42003	7409311	10403913	96024112	13688214	41	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, NG	10200601	331110	0.0352	TON
42003	7409411	99038213	96022812	138711914	16	S9	4200300203	US STEEL CORP/IRVIN PLT	#1 GALV. LINE PREHEAT NG / #1 GALV. LINE PREHEAT NG	30390003	331110	0.0409	TON
42003	7409411	99038313	96023012	138712014	17	S11	4200300203	US STEEL CORP/IRVIN PLT	#2 GALV LINE PREHEAT NG / #2 GALV LINE PREHEAT NG	30390003	331110	0.0294	TON
42003	7409411	10396113	96023312	13637814	1	S14	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 1 / 80 INCH MILL REHEAT #1 NG	39000699	331110	0.0844	TON
42003	7409411	10396213	96023312	13637714	2	S14	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 1 / 80 INCH MILL REHEAT 1 COG	39000702	331110	65.4141	TON
42003	7409411	10397013	96023412	13636814	4	S15	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 2 / 80 INCH MILL REHEAT #2 NG	39000699	331110	0.0849	TON
42003	7409411	10398913	96023412	13580014	5	S15	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 2 / 80 INCH MILL REHEAT 2 COG	39000702	331110	64.9983	TON
42003	7409411	10398013	96020812	13581214	7	S16	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 3 / 80 INCH MILL REHEAT #3 NG	39000699	331110	0.0786	TON
42003	7409411	10397913	96020812	13581314	8	S16	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 3 / 80 INCH MILL REHEAT 3 COG	39000702	331110	60.8857	TON
42003	7409411	99041613	96020912	138715314	10	S17	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 4 / 80 INCH MILL REHEAT #4 NG	39000699	331110	0.0863	TON
42003	7409411	99037913	96020912	138711614	11	S17	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 4 / 80 INCH MILL REHEAT 4 COG	39000702	331110	66.0101	TON
42003	7409411	99038013	96021012	138711714	13	S18	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 5 / 80 INCH MILL REHEAT #5 NG	39000699	331110	0.0783	TON
42003	7409411	99038113	96021012	138711814	14	S18	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 5 / 80 INCH MILL REHEAT 5 COG	39000702	331110	58.3964	TON
42003	7409411	10395713	96022912	13579314	31	S1	4200300203	US STEEL CORP/IRVIN PLT	BOILER #1 / BOILER #1, COG DESULF OP	10200707	331110	15.0281	TON
42003	7409411	10395613	96022912	13579514	32	S1	4200300203	US STEEL CORP/IRVIN PLT	BOILER #1 / BOILER #1, NATURAL GAS	10200602	331110	0.0253	TON
42003	7409411	10395413	96021212	13579814	34	S2	4200300203	US STEEL CORP/IRVIN PLT	BOILER #2 / BOILER #2, COG DESULF OP	10200707	331110	18.1781	TON
42003	7409411	10399013	96021212	13579914	35	S2	4200300203	US STEEL CORP/IRVIN PLT	BOILER #2 / BOILER #2, NATURAL GAS	10200602	331110	0.0306	TON
42003	7409411	10398813	96022212	13580114	37	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #3 / BOILER #3 COG DESULF OP	10200707	331110	4.9625	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	7409411	10398613	96022212	13580514	38	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #3 / BOILER #3, NATURAL GAS	10200602	331110	0.0086	TON
42003	7409411	99039513	96022212	138713214	41	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #4 / BOILER #4 NATURAL GAS	10200602	331110	0.0081	TON
42003	7409411	99039413	96022212	138713114	40	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #4 / BOILER #4, COG DESULF OP	10200707	331110	4.2959	TON
42003	7409411	99039013	96021312	138712714	32	S20	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / COG FLARES #1-#3	30390024	331110	7.7488	TON
42003	7409411	99039113	96021412	138712814	33	S21	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / PEACHTREE FLARE A	30390024	331110	0.0004	TON
42003	7409411	99039213	96021412	138712914	34	S21	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / PEACHTREE FLARE B	30390024	331110	22.1748	TON
42003	7409411	99038813	96023212	138712514	26	S13	4200300203	US STEEL CORP/IRVIN PLT	CONTINUOUS ANNEALING / CONTINUOUS ANNEALING NG	30390003	331110	0.0077	TON
42003	7409411	99038913	96023212	138712614	27	S13	4200300203	US STEEL CORP/IRVIN PLT	CONTINUOUS ANNEALING / CONTINUOUS ANNEALING, COG	30390004	331110	4.3572	TON
42003	7409411	99038513	96021112	138712214	19	S19	4200300203	US STEEL CORP/IRVIN PLT	HPH ANNEALING FURNACES / HPH ANNEAL COG 58 BASES	30390004	331110	16.8764	TON
42003	7409411	99038413	96021112	138712114	18	S19	4200300203	US STEEL CORP/IRVIN PLT	HPH ANNEALING FURNACES / HPH ANNEAL NG 58 BASES	30390003	331110	0.0297	TON
42003	7409411	99039313	96021812	138713014	38	S26	4200300203	US STEEL CORP/IRVIN PLT	MISCELLANEOUS NATURAL GAS / MISCELLANEOUS NATURAL GAS	10200603	331110	0.0794	TON
42003	7409411	99038613	96023112	138712314	21	S12	4200300203	US STEEL CORP/IRVIN PLT	OPEN COIL ANNEALING / FURNACE 1-9, 10-16 NG	30390003	331110	0.0172	TON
42003	7409411	99038713	96023112	138712414	22	S12	4200300203	US STEEL CORP/IRVIN PLT	OPEN COIL ANNEALING / OCA COG1-9, 10-14, 15, 16	30390004	331110	8.6726	TON
42003	15621911	99063113	96036512	138737014	1	S6	4200300359	VALLEY NATL GASES WV LLC/WEST MIFFLIN	WEIL MCLAIN 88 BOILER	10200603	325120	0.0007	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	12633011	64218913	95954012	89732514	2	S3	4200300007	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	339999	All Other Miscellaneous Manufacturing
42003	12633011	64218813	95953912	138586714	1	S2	4200300007	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	339999	All Other Miscellaneous Manufacturing
42003	6596811	98916013	95954812	138588314	31	S1	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916113	95955312	138588414	32	S2	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98915813	95955412	138588114	1	S3	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916213	95955512	138588514	33	S4	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916713	95955812	138589014	104	S8	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916813	95955912	138589114	105	S9	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916613	95955612	138588914	103	S6	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98915913	95955112	138588214	3	S12	4200300259	27300320	Off-highway LPG-fueled Engines /Industrial Fork Lift	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916313	95955212	138588614	35	S13	4200300259	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	4714911	98925213	95959612	138597814	120	S3	4200300079	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	324121	Asphalt Paving Mixture and Block Manufacturing
42003	4715511	98926313	95960612	138599014	1	S4	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926413	95960712	138599114	2	S5	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926513	95960812	138599214	3	S6	4200300171	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926613	95960512	138599314	4	S3	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926813	95960512	138599514	6	S3	4200300171	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926713	95960512	138599414	5	S3	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	6596911	17368213	95964312	14068714	2	S32	4200300265	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368413	95964012	14329414	1	S28	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98931313	95965712	138604014	35	S45	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	64207713	95965612	89121614	33	S44	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368513	95964412	14328114	3	S33	4200300265	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98929813	95963612	138602514	187	S23	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98931713	95963312	138604414	104	S2	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368813	95967612	14327614	8	S66	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368613	95967212	14327814	6	S61	4200300265	27000320	Off-highway Diesel Engines /Industrial Fork Lift	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368713	95967212	14327714	7	S61	4200300265	20300307	Int Comb /Comm-Inst /Gasoline /Reciprocating: Exhaust	325211	Plastics Material and Resin Manufacturing
42003	3006311	98938313	95968912	138611114	31	S3	4200300951	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	333912	Air and Gas Compressor Manufacturing
42003	3006311	98938413	95969012	138611214	32	S4	4200300951	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	333912	Air and Gas Compressor Manufacturing
42003	2989611	38222713	95973312	16751214	3	S3	4200300342	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	327211	Flat Glass Manufacturing
42003	2989611	98948813	95973612	138621714	116	S6	4200300342	20301001	Int Comb /Comm-Inst /Liquified Petroleum Gas /Propane: Reciprocating	327211	Flat Glass Manufacturing
42003	2989611	98948213	95973212	138621114	108	S2	4200300342	30501403	Glass Manuf /Flat Glass: Melting Furnace	327211	Flat Glass Manufacturing
42003	2989611	38222313	95973212	16751714	2	S2	4200300342	30501403	Glass Manuf /Flat Glass: Melting Furnace	327211	Flat Glass Manufacturing
42003	2989611	98948113	95973112	138621014	106	S1	4200300342	30501403	Glass Manuf /Flat Glass: Melting Furnace	327211	Flat Glass Manufacturing
42003	2989611	98948613	95973512	138621514	113	S5	4200300342	31301001	Electrical Equip /Light Bulb Manuf /Glass to Socket Base Lubrication with SO2	327211	Flat Glass Manufacturing
42003	2989611	38222813	95973412	16750714	1	S4	4200300342	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	327211	Flat Glass Manufacturing
42003	2989611	98949013	95973612	138621914	119	S6	4200300342	20200107	Int Comb /Industrial /Distillate Oil (Diesel) /Reciprocating: Exhaust	327211	Flat Glass Manufacturing
42003	2989611	98949413	95973412	138622314	31	S4	4200300342	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	327211	Flat Glass Manufacturing
42003	3006211	98952613	95974312	138625514	111	S5	4200300913	27000320	Off-highway Diesel Engines /Industrial Fork Lift	332322	Sheet Metal Work Manufacturing
42003	3006211	38198913	95973912	17187314	1	S1	4200300913	10300799	Ext Comb /Comm-Inst /Process Gas /Other Not Classified	332322	Sheet Metal Work Manufacturing
42003	3006211	38199013	95974112	17187014	2	S3	4200300913	10300799	Ext Comb /Comm-Inst /Process Gas /Other Not Classified	332322	Sheet Metal Work Manufacturing
42003	8521011	509013	95976512	17234314	1	S3	4200300802	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	562212	Solid Waste Landfill
42003	8521011	98957413	95976312	138630314	103	S1	4200300802	50100410	Waste Disp-Govt /Landfill Dump /Waste Gas Destruction: Waste Gas Flares	562212	Solid Waste Landfill
42003	8521011	508913	95976612	17234414	3	S4	4200300802	20201702	Int Comb /Industrial /Gasoline /Reciprocating Engine	562212	Solid Waste Landfill
42003	8521011	98957613	95976412	138630514	107	S2	4200300802	30502002	Stone Quarrying & Processing /Secondary Crushing/Screening	562212	Solid Waste Landfill
42003	4716111	98961113	95977612	138634114	31	S1	4200300208	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	493110	General Warehousing and Storage
42003	4716111	28120713	95977912	13578214	1	S5	4200300208	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	493110	General Warehousing and Storage
42003	4714311	28141213	95979512	16978414	5	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28140413	95979512	16979214	2	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139313	95979612	16980414	4	S2	4200300027	39990003	Misc Manuf Indus /Natural Gas: Process Heaters	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28141713	95979512	16977714	3	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139413	95979512	16980314	6	S1	4200300027	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139513	95979812	16980214	7	S4	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	98965813	95980112	138638814	108	S7	4200300027	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	98965513	95980112	138638514	105	S7	4200300027	20300301	Int Comb /Comm-Inst /Gasoline /Reciprocating	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714811	28136613	95983312	16628614	1	S4	4200300075	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
42003	15621011	98975213	95984212	138648214	3	STK-3	4200300096	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	324121	Asphalt Paving Mixture and Block Manufacturing
42003	15621011	98975113	95984112	138648114	1	STK-1	4200300096	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	324121	Asphalt Paving Mixture and Block Manufacturing
42003	2989411	98995113	95996712	138668414	5	S8	4200300332	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98994913	95996612	138668214	3	S7	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996113	95995912	138669414	108	S11	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995213	95996112	138668514	6	S14	4200300332	10500106	Ext Comb /Space Heater /Industrial /Natural Gas	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98994813	95996312	138668114	1	S3	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996613	95996512	138669914	114	S6	4200300332	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995413	95996512	138668714	8	S6	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996513	95996412	138669814	113	S5	4200300332	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995013	95996012	138668314	4	S12	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	20200202	Int Comb /Industrial /Natural Gas /Reciprocating	221210	Natural Gas Distribution
42003	3006711	99016613	96007712	138690014	31	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	99016713	96007712	138690114	33	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	3006711	99016813	96007712	138690214	35	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38197013	96007812	14105914	1	S2	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38196513	96007812	14106814	2	S2	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38196913	96007912	14106114	3	S3	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	99016913	96007912	138690314	37	S3	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	2991211	38209113	96010612	17235614	1	S2	4200300774	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential	423510	Metal Service Centers and Other Metal Merchant Wholesalers
42003	2991211	38209513	96010612	17235214	2	S2	4200300774	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	423510	Metal Service Centers and Other Metal Merchant Wholesalers
42003	3819411	99022813	96010812	138696214	3	S-1	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022613	96010812	138696014	1	S-1	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99023513	96010912	138697014	106	S-3	4200300416	30500304	Brick Manuf /Curing	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022713	96010912	138696114	2	S-3	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022913	96011012	138696314	4	S-4	4200300416	10500106	Ext Comb /Space Heater /Industrial /Natural Gas	327120	Clay Building Material and Refractories Manufacturing
42003	8204511	99049713	96032512	138723614	104	S68	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5310113	96027112	16966114	1	S1	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5310013	96027112	16966314	2	S1	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99051213	96032912	138725114	134	S74	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99047913	96032712	138721614	13	S7	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048013	96032712	138721714	14	S7	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99051713	96033012	138725614	139	S75	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048113	96033512	138721814	15	S8	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048213	96033512	138721914	16	S8	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99052213	96033112	138726114	144	S76	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048313	96034112	138722014	17	S9	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048413	96034112	138722114	18	S9	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99052713	96033212	138726614	149	S77	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048513	96027212	138722214	19	S10	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048613	96027212	138722314	20	S10	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99050213	96032612	138724114	109	S69	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5305113	96028112	16811114	3	S2	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5304513	96028112	16811814	4	S2	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053213	96033312	138727114	154	S78	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048713	96027312	138722414	21	S11	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048813	96027312	138722514	22	S11	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99050713	96032812	138724614	114	S70	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5303113	96029212	16974514	5	S3	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306513	96029212	16973014	6	S3	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053713	96033412	138727614	159	S79	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048913	96027412	138722614	23	S12	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049013	96027412	138722714	24	S12	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5307113	96027912	16972414	31	S18	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306013	96027912	16974114	32	S18	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306613	96028012	16972914	33	S19	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306713	96028012	16972814	34	S19	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306813	96028212	89176214	35	S20	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306913	96028212	138723014	36	S20	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306913	96028212	16972614	36	S20	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049313	96028312	138723214	37	S21	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5308513	96028412	89175914	38	S22	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99060013	96029512	138733914	235	S32	4200300032	30399999	Primary Metals /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059413	96028712	138733314	229	S25	4200300032	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049213	96032412	138722914	26	S67	4200300032	39999993	Misc Manuf / Indus Processes /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054713	96030212	138728614	175	S41	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054513	96027612	138728414	173	S15	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055013	96033012	138728914	178	S75	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054613	96029812	138728514	174	S36	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054813	96030612	138728714	176	S46	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055313	96030312	138729214	181	S42	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055113	96027712	138729014	179	S16	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055613	96033212	138729514	184	S77	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055213	96029912	138729114	180	S37	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055413	96030712	138729314	182	S47	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054113	96030112	138728014	163	S39	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053913	96027512	138727814	161	S13	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054413	96032612	138728314	166	S69	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054013	96029712	138727914	162	S34	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054213	96030512	138728114	164	S44	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055813	96030412	138729714	187	S43	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055713	96027812	138729614	185	S17	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056013	96033412	138729914	190	S79	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056113	96030812	138730014	191	S49	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056213	96030912	138730114	193	S51	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	8204511	99056313	96031012	138730214	194	S52	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056413	96031112	138730314	195	S53	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059813	96028512	138733714	233	S23	4200300032	30399999	Primary Metals /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059513	96034012	138733414	230	S85	4200300032	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049113	96032412	138722814	25	S67	4200300032	39990024	Misc Manuf Indus /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043413	96024912	138717114	101	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043513	96024912	138717214	102	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403313	96024912	13688814	5	S2	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403113	96023812	13689014	7	S1	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403013	96023812	13689114	8	S1	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043613	96024912	138717314	103	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043713	96024912	138717414	104	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042513	96024912	138716214	14	S2	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042613	96026612	138716314	16	S4	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042713	96026612	138716414	17	S4	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404513	96023812	13638214	2	S1	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404613	96023812	13638114	3	S1	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404413	96023812	13638314	1	S1	4200300202	39000701	In-Process Fuel Use /Process Gas /Coke Oven or Blast Furnace	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042313	96026612	138716014	11	S4	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042413	96026612	138716114	12	S4	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042213	96026612	138715914	10	S4	4200300202	39000701	In-Process Fuel Use /Process Gas /Coke Oven or Blast Furnace	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042813	96026012	138716514	19	S3	4200300202	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042913	96024612	138716614	20	S17	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043013	96024612	138716714	21	S17	4200300202	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043113	96025212	138716814	23	S22	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043213	96025212	138716914	24	S22	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043313	96026112	138717014	26	S30	4200300202	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401813	96023912	13690314	31	S10	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401713	96023912	13690414	32	S10	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401613	96023912	13690514	33	S10	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401413	96024012	13690814	35	S11	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401313	96024012	13690914	36	S11	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404213	96024012	13687914	37	S11	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404113	96024112	13688014	39	S12	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403413	96024112	13688714	40	S12	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403913	96024112	13688214	41	S12	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038213	96022812	138711914	16	S9	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038313	96023012	138712014	17	S11	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10396113	96023312	13637814	1	S14	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10396213	96023312	13637714	2	S14	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10397013	96023412	13636814	4	S15	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398913	96023412	13580014	5	S15	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398013	96020812	13581214	7	S16	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10397913	96020812	13581314	8	S16	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99041613	96020912	138715314	10	S17	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99037913	96020912	138711614	11	S17	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038013	96021012	138711714	13	S18	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038113	96021012	138711814	14	S18	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395713	96022912	13579314	31	S1	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395613	96022912	13579514	32	S1	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395413	96021212	13579814	34	S2	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10399013	96021212	13579914	35	S2	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398813	96022212	13580114	37	S3	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398613	96022212	13580514	38	S3	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039513	96022212	138713214	41	S3	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039413	96022212	138713114	40	S3	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039013	96021312	138712714	32	S20	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039113	96021412	138712814	33	S21	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039213	96021412	138712914	34	S21	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038813	96023212	138712514	26	S13	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038913	96023212	138712614	27	S13	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038513	96021112	138712214	19	S19	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038413	96021112	138712114	18	S19	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039313	96021812	138713014	38	S26	4200300203	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038613	96023112	138712314	21	S12	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038713	96023112	138712414	22	S12	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	15621911	99063113	96036512	138737014	1	S6	4200300359	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325120	Industrial Gas Manufacturing

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42003	PA	Allegheny	2102002000	2011PADEP	SO2	76.11903	TON
42003	PA	Allegheny	2102004000	2011PADEP	SO2	4.58394	TON
42003	PA	Allegheny	2102005000	2011PADEP	SO2	21.35664	TON
42003	PA	Allegheny	2102006000	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2102007000	2011PADEP	SO2	0.03959	TON
42003	PA	Allegheny	2102008000	2011PADEP	SO2	2.50142	TON
42003	PA	Allegheny	2102011000	2011PADEP	SO2	0.31546	TON
42003	PA	Allegheny	2103002000	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2103004000	2011PADEP	SO2	22.23604	TON
42003	PA	Allegheny	2103005000	2011PADEP	SO2	11.09311	TON
42003	PA	Allegheny	2103006000	2011PADEP	SO2	0.50594	TON
42003	PA	Allegheny	2103007000	2011PADEP	SO2	0.01668	TON
42003	PA	Allegheny	2103008000	2011PADEP	SO2	0.43981	TON
42003	PA	Allegheny	2103011000	2011PADEP	SO2	1.72838	TON
42003	PA	Allegheny	2104001000	2011EPA_NP_NoOvrlp	SO2	0.07864	TON
42003	PA	Allegheny	2104002000	2011EPA_NP_NoOvrlp	SO2	0.04091	TON
42003	PA	Allegheny	2104004000	2011EPA_NP_NoOvrlp	SO2	8.45581	TON
42003	PA	Allegheny	2104006000	2011EPA_NP_NoOvrlp	SO2	1.37106	TON
42003	PA	Allegheny	2104007000	2011EPA_NP_NoOvrlp	SO2	0.02071	TON
42003	PA	Allegheny	2104008100	2011EPA_NP_NoOvrlp	SO2	0.23791	TON
42003	PA	Allegheny	2104008210	2011EPA_NP_NoOvrlp	SO2	0.35913	TON
42003	PA	Allegheny	2104008220	2011EPA_NP_NoOvrlp	SO2	0.11516	TON
42003	PA	Allegheny	2104008230	2011EPA_NP_NoOvrlp	SO2	0.03841	TON
42003	PA	Allegheny	2104008310	2011EPA_NP_NoOvrlp	SO2	0.50936	TON
42003	PA	Allegheny	2104008320	2011EPA_NP_NoOvrlp	SO2	0.16332	TON
42003	PA	Allegheny	2104008330	2011EPA_NP_NoOvrlp	SO2	0.05440	TON
42003	PA	Allegheny	2104008400	2011EPA_NP_NoOvrlp	SO2	0.22554	TON
42003	PA	Allegheny	2104008510	2011EPA_NP_NoOvrlp	SO2	0.00000	TON
42003	PA	Allegheny	2104008610	2011EPA_NP_NoOvrlp	SO2	0.00000	TON
42003	PA	Allegheny	2104008700	2011EPA_NP_NoOvrlp	SO2	0.01768	TON
42003	PA	Allegheny	2104011000	2011EPA_NP_NoOvrlp	SO2	0.40943	TON
42003	PA	Allegheny	2280002100	Multiple	SO2	0.56940	TON
42003	PA	Allegheny	2280002200	Multiple	SO2	0.60214	TON

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom
42003	PA	Allegheny	2285002006	Multiple	SO2	1.97039	TON
42003	PA	Allegheny	2285002007	Multiple	SO2	0.09558	TON
42003	PA	Allegheny	2310000220	2011PADEP	SO2	0.00073	TON
42003	PA	Allegheny	2310000330	2011PADEP	SO2	0.00010	TON
42003	PA	Allegheny	2310000660	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310010200	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310011000	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021010	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021100	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021202	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021251	2011PADEP	SO2	0.00177	TON
42003	PA	Allegheny	2310021302	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021351	2011PADEP	SO2	0.00628	TON
42003	PA	Allegheny	2310021400	2011PADEP	SO2	0.07770	TON
42003	PA	Allegheny	2310021509	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310021603	2011PADEP	SO2	2.15383	TON
42003	PA	Allegheny	2310111700	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2310121700	2011PADEP	SO2	0.00000	TON
42003	PA	Allegheny	2801500000	2011EPA_NP_NoOvrlp	SO2	0.00037	TON
42003	PA	Allegheny	2810060100	2011EPA_NP_NoOvrlp	SO2	0.07831	TON
42003	PA	Allegheny	2811015000	2011EPA_EVENTFIRES	SO2	0.25616	TON

SCC	SCC Short Name	Emissions Category
2102002000	Stationary Fuel Comb /Industrial /Bituminous/Subbituminous Coal /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102004000	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2102005000	Stationary Fuel Comb /Industrial /Residual Oil /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2102007000	Stationary Fuel Comb /Industrial /Liquified Petroleum Gas /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102008000	Stationary Fuel Comb /Industrial /Wood /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102011000	Stationary Fuel Comb /Industrial /Kerosene /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103004000	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2103005000	Stationary Fuel Comb /Commercial/Institutional /Residual Oil /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquified Petroleum Gas /Total: All Combustor Types	Fuel Combustion (Industrial/Commercial)
2103008000	Stationary Fuel Comb /Commercial/Institutional /Wood /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103011000	Stationary Fuel Comb /Commercial/Institutional /Kerosene /Total: All Combustor Types	Fuel Combustion (Industrial/Commercial)
2104001000	Stationary Fuel Comb /Residential /Anthracite Coal /Total: All Combustor Types	Fuel Combustion (Residential)
2104002000	Stationary Fuel Comb /Residential /Bituminous/Subbituminous Coal /Total: All Combustor Types	Fuel Combustion (Residential)
2104004000	Stationary Fuel Comb /Residential /Distillate Oil /Total: All Combustor Types	Fuel Combustion (Residential)
2104006000	Stationary Fuel Comb /Residential /Natural Gas /Total: All Combustor Types	Fuel Combustion (Residential)
2104007000	Stationary Fuel Comb /Residential /Liquified Petroleum Gas /Total: All Combustor Types	Fuel Combustion (Residential)
2104008100	Stationary Fuel Comb /Residential /Wood /Fireplace: general	Fuel Combustion (Residential Wood)
2104008210	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; non-EPA certified	Fuel Combustion (Residential Wood)
2104008220	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; non-catalytic	Fuel Combustion (Residential Wood)
2104008230	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; catalytic	Fuel Combustion (Residential Wood)
2104008310	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, non-EPA certified	Fuel Combustion (Residential Wood)
2104008320	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, non-catalytic	Fuel Combustion (Residential Wood)
2104008330	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, catalytic	Fuel Combustion (Residential Wood)
2104008400	Stationary Fuel Comb /Residential /Wood /Woodstove: pellet-fired, general (freestanding or FP insert)	Fuel Combustion (Residential Wood)
2104008510	Stationary Fuel Comb /Residential /Wood /Furnace: Indoor, cordwood-fired, non-EPA certified	Fuel Combustion (Residential Wood)
2104008610	Stationary Fuel Comb /Residential /Wood /Hydronic heater: outdoor	Fuel Combustion (Residential Wood)
2104008700	Stationary Fuel Comb /Residential /Wood /Outdoor Wood Burning Equipment	Fuel Combustion (Residential Wood)
2104011000	Stationary Fuel Comb /Residential /Kerosene /Total: All Heater Types	Fuel Combustion (Residential)
2280002100	Marine Vessels, Commercial /Diesel /Port emissions	Marine/Railroad
2280002200	Marine Vessels, Commercial /Diesel /Underway emissions	Marine/Railroad
2285002006	Railroad Equipment /Diesel /Line Haul Locomotives: Class I Operations	Marine/Railroad
2285002007	Railroad Equipment /Diesel /Line Haul Locomotives: Class II / III Operations	Marine/Railroad
2310000220	Oil & Gas Expl & Prod /All Processes /Drill Rigs	Oil and Gas Exploration/Production
2310000330	Oil & Gas Expl & Prod /All Processes /Artificial Lift	Oil and Gas Exploration/Production
2310000660	Oil & Gas Expl & Prod /All Processes /Hydraulic Fracturing Engines	Oil and Gas Exploration/Production
2310010200	Oil & Gas Expl & Prod /Crude Petroleum /Oil Well Tanks - Flashing & Standing/Working/Breathing	Oil and Gas Exploration/Production
2310011000	On-Shore Oil Production /Total: All Processes	Oil and Gas Exploration/Production

SCC	SCC Short Name	Emissions Category
2310021010	On-Shore Gas Production /Storage Tanks: Condensate	Oil and Gas Exploration/Production
2310021100	On-Shore Gas Production /Gas Well Heaters	Oil and Gas Exploration/Production
2310021202	On-Shore Gas Production /Natural Gas Fired 4Cycle Lean Burn Compressor Engines 50 To 499 HP	Oil and Gas Exploration/Production
2310021251	On-Shore Gas Production /Lateral Compressors 4 Cycle Lean Burn	Oil and Gas Exploration/Production
2310021302	On-Shore Gas Production /Natural Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 HP	Oil and Gas Exploration/Production
2310021351	On-Shore Gas Production /Lateral Compressors 4 Cycle Rich Burn	Oil and Gas Exploration/Production
2310021400	On-Shore Gas Production /Gas Well Dehydrators	Oil and Gas Exploration/Production
2310021509	On-Shore Gas Production /Fugitives: All Processes	Oil and Gas Exploration/Production
2310021603	On-Shore Gas Production /Gas Well Venting - Blowdowns	Oil and Gas Exploration/Production
2310111700	On-Shore Oil Production /Oil Well Completion: All Processes	Oil and Gas Exploration/Production
2310121700	On-Shore Gas Production /Gas Well Completion: All Processes	Oil and Gas Exploration/Production
2801500000	Agric - Crops /Field Burning - whole field set on fire /Unspecified	Agriculture
2810060100	Cremation /Humans	Cremation
2811015000	Prescribed Forest Burning	Prescribed Fires

2011 Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 1

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category
42003	PA	Allegheny	2260001010	2011EPAMOBILE	SO2	0.00082	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Motorcycles: Off-road	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260001030	2011EPAMOBILE	SO2	0.00086	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /All Terrain Vehicles	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260001060	2011EPAMOBILE	SO2	0.00014	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002006	2011EPAMOBILE	SO2	0.00026	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002009	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002021	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002027	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002039	2011EPAMOBILE	SO2	0.00068	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260002054	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260003030	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260003040	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004015	2011EPAMOBILE	SO2	0.00011	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004016	2011EPAMOBILE	SO2	0.00030	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004020	2011EPAMOBILE	SO2	0.00146	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004021	2011EPAMOBILE	SO2	0.00336	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004025	2011EPAMOBILE	SO2	0.00202	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004026	2011EPAMOBILE	SO2	0.00295	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004030	2011EPAMOBILE	SO2	0.00130	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004031	2011EPAMOBILE	SO2	0.00275	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004035	2011EPAMOBILE	SO2	0.00062	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004036	2011EPAMOBILE	SO2	0.00086	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260004071	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260005035	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Agricultural Equipt /Sprayers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260006005	2011EPAMOBILE	SO2	0.00022	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Generator Sets	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260006010	2011EPAMOBILE	SO2	0.00144	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Pumps	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260006015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Air Compressors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260006035	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2260007005	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Logging Equipt /Chain Saws : 6 HP	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265001010	2011EPAMOBILE	SO2	0.00042	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Motorcycles: Off-road	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265001030	2011EPAMOBILE	SO2	0.00439	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /All Terrain Vehicles	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265001050	2011EPAMOBILE	SO2	0.00768	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Golf Carts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265001060	2011EPAMOBILE	SO2	0.00014	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002003	2011EPAMOBILE	SO2	0.00024	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Pavers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002006	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002009	2011EPAMOBILE	SO2	0.00043	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002015	2011EPAMOBILE	SO2	0.00042	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rollers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002021	2011EPAMOBILE	SO2	0.00083	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002024	2011EPAMOBILE	SO2	0.00035	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002027	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002030	2011EPAMOBILE	SO2	0.00073	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002033	2011EPAMOBILE	SO2	0.00025	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002039	2011EPAMOBILE	SO2	0.00152	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002042	2011EPAMOBILE	SO2	0.00073	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cement & Mortar Mixers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002045	2011EPAMOBILE	SO2	0.00006	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cranes	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002054	2011EPAMOBILE	SO2	0.00010	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002057	2011EPAMOBILE	SO2	0.00009	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002060	2011EPAMOBILE	SO2	0.00022	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002066	2011EPAMOBILE	SO2	0.00050	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002072	2011EPAMOBILE	SO2	0.00035	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002078	2011EPAMOBILE	SO2	0.00011	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Dumpers/Tenders	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265002081	2011EPAMOBILE	SO2	0.00008	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003010	2011EPAMOBILE	SO2	0.00060	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003020	2011EPAMOBILE	SO2	0.00188	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Forklifts	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003030	2011EPAMOBILE	SO2	0.00046	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003040	2011EPAMOBILE	SO2	0.00084	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003050	2011EPAMOBILE	SO2	0.00004	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003060	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265003070	2011EPAMOBILE	SO2	0.00018	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004010	2011EPAMOBILE	SO2	0.01784	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004011	2011EPAMOBILE	SO2	0.00836	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Commercial)	Off-Highway Equip (Gasoline)

2011 Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 2

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category
42003	PA	Allegheny	2265004015	2011EPAMOBILE	SO2	0.00150	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004016	2011EPAMOBILE	SO2	0.00429	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004025	2011EPAMOBILE	SO2	0.00010	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004026	2011EPAMOBILE	SO2	0.00020	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004030	2011EPAMOBILE	SO2	0.00019	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004031	2011EPAMOBILE	SO2	0.00828	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004035	2011EPAMOBILE	SO2	0.00203	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004036	2011EPAMOBILE	SO2	0.00282	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004040	2011EPAMOBILE	SO2	0.00366	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004041	2011EPAMOBILE	SO2	0.00095	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004046	2011EPAMOBILE	SO2	0.00110	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Front Mowers (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004051	2011EPAMOBILE	SO2	0.00049	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Shredders < 6 HP (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004055	2011EPAMOBILE	SO2	0.04904	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004056	2011EPAMOBILE	SO2	0.01292	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004066	2011EPAMOBILE	SO2	0.00218	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004071	2011EPAMOBILE	SO2	0.04148	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004075	2011EPAMOBILE	SO2	0.00173	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Residential)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265004076	2011EPAMOBILE	SO2	0.00128	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005010	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /2-Wheel Tractors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Tractors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005020	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Combines	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005025	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Balers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005030	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Mowers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005035	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Sprayers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005040	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Tillers : 6 HP	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005045	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Swathers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005055	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265005060	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006005	2011EPAMOBILE	SO2	0.04482	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Generator Sets	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006010	2011EPAMOBILE	SO2	0.01108	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pumps	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006015	2011EPAMOBILE	SO2	0.00594	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Air Compressors	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006025	2011EPAMOBILE	SO2	0.01278	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Welders	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006030	2011EPAMOBILE	SO2	0.01984	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pressure Washers	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265006035	2011EPAMOBILE	SO2	0.00094	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265007010	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Logging Equipt /Shredders : 6 HP	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265007015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2265010010	2011EPAMOBILE	SO2	0.00118	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Gasoline)
42003	PA	Allegheny	2267001060	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002003	2011EPAMOBILE	SO2	0.00005	TON	Off-highway LPG /Construction & Mining Equipt /Pavers	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002015	2011EPAMOBILE	SO2	0.00008	TON	Off-highway LPG /Construction & Mining Equipt /Rollers	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002021	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002024	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002030	2011EPAMOBILE	SO2	0.00015	TON	Off-highway LPG /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002033	2011EPAMOBILE	SO2	0.00005	TON	Off-highway LPG /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002039	2011EPAMOBILE	SO2	0.00013	TON	Off-highway LPG /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002045	2011EPAMOBILE	SO2	0.00005	TON	Off-highway LPG /Construction & Mining Equipt /Cranes	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002054	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002057	2011EPAMOBILE	SO2	0.00010	TON	Off-highway LPG /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002060	2011EPAMOBILE	SO2	0.00023	TON	Off-highway LPG /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002066	2011EPAMOBILE	SO2	0.00002	TON	Off-highway LPG /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002072	2011EPAMOBILE	SO2	0.00020	TON	Off-highway LPG /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Other)
42003	PA	Allegheny	2267002081	2011EPAMOBILE	SO2	0.00008	TON	Off-highway LPG /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003010	2011EPAMOBILE	SO2	0.00112	TON	Off-highway LPG /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003020	2011EPAMOBILE	SO2	0.09884	TON	Off-highway LPG /Industrial Equipt /Forklifts	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003030	2011EPAMOBILE	SO2	0.00074	TON	Off-highway LPG /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003040	2011EPAMOBILE	SO2	0.00023	TON	Off-highway LPG /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003050	2011EPAMOBILE	SO2	0.00006	TON	Off-highway LPG /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2267003070	2011EPAMOBILE	SO2	0.00044	TON	Off-highway LPG /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Other)
42003	PA	Allegheny	2267004066	2011EPAMOBILE	SO2	0.00078	TON	Off-highway LPG /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Other)
42003	PA	Allegheny	2267005055	2011EPAMOBILE	SO2	0.00000	TON	Off-highway LPG /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Other)

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fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category
42003	PA	Allegheny	2267005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway LPG /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006005	2011EPAMOBILE	SO2	0.00627	TON	Off-highway LPG /Commercial Equipt /Generator Sets	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006010	2011EPAMOBILE	SO2	0.00141	TON	Off-highway LPG /Commercial Equipt /Pumps	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006015	2011EPAMOBILE	SO2	0.00166	TON	Off-highway LPG /Commercial Equipt /Air Compressors	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006025	2011EPAMOBILE	SO2	0.00206	TON	Off-highway LPG /Commercial Equipt /Welders	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006030	2011EPAMOBILE	SO2	0.00003	TON	Off-highway LPG /Commercial Equipt /Pressure Washers	Off-Highway Equip (Other)
42003	PA	Allegheny	2267006035	2011EPAMOBILE	SO2	0.00003	TON	Off-highway LPG /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Other)
42003	PA	Allegheny	2268002081	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2268003020	2011EPAMOBILE	SO2	0.00649	TON	Off-highway CNG /Industrial Equipt /Forklifts	Off-Highway Equip (Other)
42003	PA	Allegheny	2268003030	2011EPAMOBILE	SO2	0.00001	TON	Off-highway CNG /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Other)
42003	PA	Allegheny	2268003040	2011EPAMOBILE	SO2	0.00001	TON	Off-highway CNG /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2268003060	2011EPAMOBILE	SO2	0.00002	TON	Off-highway CNG /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Other)
42003	PA	Allegheny	2268003070	2011EPAMOBILE	SO2	0.00003	TON	Off-highway CNG /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Other)
42003	PA	Allegheny	2268005055	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2268005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Other)
42003	PA	Allegheny	2268006005	2011EPAMOBILE	SO2	0.00162	TON	Off-highway CNG /Commercial Equipt /Generator Sets	Off-Highway Equip (Other)
42003	PA	Allegheny	2268006010	2011EPAMOBILE	SO2	0.00008	TON	Off-highway CNG /Commercial Equipt /Pumps	Off-Highway Equip (Other)
42003	PA	Allegheny	2268006015	2011EPAMOBILE	SO2	0.00011	TON	Off-highway CNG /Commercial Equipt /Air Compressors	Off-Highway Equip (Other)
42003	PA	Allegheny	2268006020	2011EPAMOBILE	SO2	0.00399	TON	Off-highway CNG /Commercial Equipt /Gas Compressors	Off-Highway Equip (Other)
42003	PA	Allegheny	2268010010	2011EPAMOBILE	SO2	0.00097	TON	Off-highway CNG /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Other)
42003	PA	Allegheny	2270001060	2011EPAMOBILE	SO2	0.00019	TON	Off-highway Diesel /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002003	2011EPAMOBILE	SO2	0.00714	TON	Off-highway Diesel /Construction & Mining Equipt /Pavers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002006	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Diesel /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002009	2011EPAMOBILE	SO2	0.00019	TON	Off-highway Diesel /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002015	2011EPAMOBILE	SO2	0.01798	TON	Off-highway Diesel /Construction & Mining Equipt /Rollers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002018	2011EPAMOBILE	SO2	0.01919	TON	Off-highway Diesel /Construction & Mining Equipt /Scrapers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002021	2011EPAMOBILE	SO2	0.00108	TON	Off-highway Diesel /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002024	2011EPAMOBILE	SO2	0.00067	TON	Off-highway Diesel /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002027	2011EPAMOBILE	SO2	0.00200	TON	Off-highway Diesel /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002030	2011EPAMOBILE	SO2	0.00855	TON	Off-highway Diesel /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002033	2011EPAMOBILE	SO2	0.00732	TON	Off-highway Diesel /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002036	2011EPAMOBILE	SO2	0.07188	TON	Off-highway Diesel /Construction & Mining Equipt /Excavators	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002039	2011EPAMOBILE	SO2	0.00061	TON	Off-highway Diesel /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002042	2011EPAMOBILE	SO2	0.00029	TON	Off-highway Diesel /Construction & Mining Equipt /Cement & Mortar Mixers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002045	2011EPAMOBILE	SO2	0.01646	TON	Off-highway Diesel /Construction & Mining Equipt /Cranes	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002048	2011EPAMOBILE	SO2	0.01781	TON	Off-highway Diesel /Construction & Mining Equipt /Graders	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002051	2011EPAMOBILE	SO2	0.06024	TON	Off-highway Diesel /Construction & Mining Equipt /Off-highway Trucks	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002054	2011EPAMOBILE	SO2	0.00292	TON	Off-highway Diesel /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002057	2011EPAMOBILE	SO2	0.02345	TON	Off-highway Diesel /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002060	2011EPAMOBILE	SO2	0.07845	TON	Off-highway Diesel /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002066	2011EPAMOBILE	SO2	0.04842	TON	Off-highway Diesel /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002069	2011EPAMOBILE	SO2	0.07154	TON	Off-highway Diesel /Construction & Mining Equipt /Crawler Tractor/Dozers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002072	2011EPAMOBILE	SO2	0.03319	TON	Off-highway Diesel /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002075	2011EPAMOBILE	SO2	0.00769	TON	Off-highway Diesel /Construction & Mining Equipt /Off-highway Tractors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002078	2011EPAMOBILE	SO2	0.00010	TON	Off-highway Diesel /Construction & Mining Equipt /Dumpers/Tenders	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270002081	2011EPAMOBILE	SO2	0.00741	TON	Off-highway Diesel /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003010	2011EPAMOBILE	SO2	0.00173	TON	Off-highway Diesel /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003020	2011EPAMOBILE	SO2	0.02488	TON	Off-highway Diesel /Industrial Equipt /Forklifts	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003030	2011EPAMOBILE	SO2	0.01087	TON	Off-highway Diesel /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003040	2011EPAMOBILE	SO2	0.01103	TON	Off-highway Diesel /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003050	2011EPAMOBILE	SO2	0.00042	TON	Off-highway Diesel /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003060	2011EPAMOBILE	SO2	0.04380	TON	Off-highway Diesel /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270003070	2011EPAMOBILE	SO2	0.01535	TON	Off-highway Diesel /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004031	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004036	2011EPAMOBILE	SO2	0.00029	TON	Off-highway Diesel /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004046	2011EPAMOBILE	SO2	0.00776	TON	Off-highway Diesel /Lawn & Garden Equipt /Front Mowers (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004056	2011EPAMOBILE	SO2	0.00160	TON	Off-highway Diesel /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004066	2011EPAMOBILE	SO2	0.01048	TON	Off-highway Diesel /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004071	2011EPAMOBILE	SO2	0.00125	TON	Off-highway Diesel /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270004076	2011EPAMOBILE	SO2	0.00003	TON	Off-highway Diesel /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)	Off-Highway Equip (Diesel)

2011 Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 4

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category
42003	PA	Allegheny	2270005010	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /2-Wheel Tractors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005015	2011EPAMOBILE	SO2	0.00321	TON	Off-highway Diesel /Agricultural Equipt /Agricultural Tractors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005020	2011EPAMOBILE	SO2	0.00029	TON	Off-highway Diesel /Agricultural Equipt /Combines	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005025	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Balers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005030	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Agricultural Mowers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005035	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Diesel /Agricultural Equipt /Sprayers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005040	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Tillers : 6 HP	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005045	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Diesel /Agricultural Equipt /Swathers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005055	2011EPAMOBILE	SO2	0.00006	TON	Off-highway Diesel /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270005060	2011EPAMOBILE	SO2	0.00005	TON	Off-highway Diesel /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006005	2011EPAMOBILE	SO2	0.03553	TON	Off-highway Diesel /Commercial Equipt /Generator Sets	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006010	2011EPAMOBILE	SO2	0.00839	TON	Off-highway Diesel /Commercial Equipt /Pumps	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006015	2011EPAMOBILE	SO2	0.02324	TON	Off-highway Diesel /Commercial Equipt /Air Compressors	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006025	2011EPAMOBILE	SO2	0.01183	TON	Off-highway Diesel /Commercial Equipt /Welders	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006030	2011EPAMOBILE	SO2	0.00113	TON	Off-highway Diesel /Commercial Equipt /Pressure Washers	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270006035	2011EPAMOBILE	SO2	0.00101	TON	Off-highway Diesel /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270007015	2011EPAMOBILE	SO2	0.00020	TON	Off-highway Diesel /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2270010010	2011EPAMOBILE	SO2	0.00416	TON	Off-highway Diesel /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Diesel)
42003	PA	Allegheny	2282005010	2011EPAMOBILE	SO2	0.00774	TON	Pleasure Craft /Gasoline 2-Stroke /Outboard	Marine
42003	PA	Allegheny	2282005015	2011EPAMOBILE	SO2	0.00330	TON	Pleasure Craft /Gasoline 2-Stroke /Personal Water Craft	Marine
42003	PA	Allegheny	2282010005	2011EPAMOBILE	SO2	0.00481	TON	Pleasure Craft /Gasoline 4-Stroke /Inboard/Sterndrive	Marine
42003	PA	Allegheny	2282020005	2011EPAMOBILE	SO2	0.00475	TON	Pleasure Craft /Diesel /Inboard/Sterndrive	Marine
42003	PA	Allegheny	2282020010	2011EPAMOBILE	SO2	0.00002	TON	Pleasure Craft /Diesel /Outboard	Marine
42003	PA	Allegheny	2285002015	2011EPAMOBILE	SO2	0.00091	TON	Railroad Equipt /Diesel /Railway Maintenance	Railroad
42003	PA	Allegheny	2285004015	2011EPAMOBILE	SO2	0.00004	TON	Railroad Equipt /Gasoline, 4-Stroke /Railway Maintenance	Railroad
42003	PA	Allegheny	2285006015	2011EPAMOBILE	SO2	0.00000	TON	Railroad Equipt /LPG /Railway Maintenance	Railroad

2011 Onroad Source Emissions Inventory (Annual Tons by Source Category)

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Vehicle Type
42003	PA	Allegheny	2201110080	2011EPAMOVES2014	SO2	0.03610	TON	Highway Veh - Gasoline - Motorcycles (MC) - All on and off-network processes except refueling	Motorcycle
42003	PA	Allegheny	2201210080	2011EPAMOVES2014	SO2	3.76873	TON	Highway Veh - Gasoline - Passenger Car - All on and off-network processes except refueling	Passenger Car
42003	PA	Allegheny	2201310080	2011EPAMOVES2014	SO2	2.63676	TON	Highway Veh - Gasoline - Passenger Truck - All on and off-network processes except refueling	Passenger Truck
42003	PA	Allegheny	2201320080	2011EPAMOVES2014	SO2	0.84631	TON	Highway Veh - Gasoline - Light Commercial Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201420080	2011EPAMOVES2014	SO2	0.00082	TON	Highway Veh - Gasoline - Transit Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2201430080	2011EPAMOVES2014	SO2	0.00111	TON	Highway Veh - Gasoline - School Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2201510080	2011EPAMOVES2014	SO2	0.00031	TON	Highway Veh - Gasoline - Refuse Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201520080	2011EPAMOVES2014	SO2	0.09410	TON	Highway Veh - Gasoline - Single Unit Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201530080	2011EPAMOVES2014	SO2	0.00392	TON	Highway Veh - Gasoline - Single Unit Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201540080	2011EPAMOVES2014	SO2	0.01180	TON	Highway Veh - Gasoline - Motor Home - All on and off-network processes except refueling	Motor Home
42003	PA	Allegheny	2201610080	2011EPAMOVES2014	SO2	0.00009	TON	Highway Veh - Gasoline - Combination Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202210080	2011EPAMOVES2014	SO2	0.00802	TON	Highway Veh - Diesel - Passenger Car - All on and off-network processes except refueling	Passenger Car
42003	PA	Allegheny	2202310080	2011EPAMOVES2014	SO2	0.02460	TON	Highway Veh - Diesel - Passenger Truck - All on and off-network processes except refueling	Passenger Truck
42003	PA	Allegheny	2202320080	2011EPAMOVES2014	SO2	0.02729	TON	Highway Veh - Diesel - Light Commercial Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202410080	2011EPAMOVES2014	SO2	0.00651	TON	Highway Veh - Diesel - Intercity Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202420080	2011EPAMOVES2014	SO2	0.02389	TON	Highway Veh - Diesel - Transit Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202430080	2011EPAMOVES2014	SO2	0.00748	TON	Highway Veh - Diesel - School Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202510080	2011EPAMOVES2014	SO2	0.00637	TON	Highway Veh - Diesel - Refuse Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202520080	2011EPAMOVES2014	SO2	0.10892	TON	Highway Veh - Diesel - Single Unit Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202530080	2011EPAMOVES2014	SO2	0.00434	TON	Highway Veh - Diesel - Single Unit Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202540080	2011EPAMOVES2014	SO2	0.00297	TON	Highway Veh - Diesel - Motor Home - All on and off-network processes except refueling	Motor Home
42003	PA	Allegheny	2202610080	2011EPAMOVES2014	SO2	0.30654	TON	Highway Veh - Diesel - Combination Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202620080	2011EPAMOVES2014	SO2	0.18314	TON	Highway Veh - Diesel - Combination Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2203420080	2011EPAMOVES2014	SO2	0.00198	TON	Highway Veh - CNG - Transit Bus - All on and off-network processes except refueling	Bus

D-2: Future Case Projected Emissions Inventory (2018)

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2018 Projected Point Source Emissions Inventory (Annual Tons by Process) - Page 1

region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	12633011	64218913	95954012	89732514	2	S3	4200300007	BASIC CARBIDE CORP/BUENA VISTA	BLDG HEATER / B002 BLDG HEATER	10200603	339999	0.0005	TON
42003	12633011	64218813	95953912	138586714	1	S2	4200300007	BASIC CARBIDE CORP/BUENA VISTA	BOILER B001 / BOILER	10200603	339999	0.0002	TON
42003	6596811	98916013	95954812	138588314	31	S1	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #1-NATURAL GAS / BOILER #1-NATURAL GAS	10300602	541712	0.0012	TON
42003	6596811	98916113	95955312	138588414	32	S2	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #2-NATURAL GAS / BOILER #2-NATURAL GAS	10300602	541712	0.0033	TON
42003	6596811	98915813	95955412	138588114	1	S3	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #3-NATURAL GAS / BOILER# 3-NATURAL GAS	10300602	541712	0.0020	TON
42003	6596811	98916213	95955512	138588514	33	S4	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	BOILER #4-NATURAL GAS / BOILER # 4-NATURAL GAS	10300602	541712	0.0031	TON
42003	6596811	98916713	95955812	138589014	104	S8	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	COMPUTING CTR EMERG GEN / COMPUTING CTR GEN #1	20100102	541712	0.0079	TON
42003	6596811	98916813	95955912	138589114	105	S9	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	COMPUTING CTR EMERG GEN / COMPUTING CTR GEN #2	20100102	541712	0.0082	TON
42003	6596811	98916613	95955612	138588914	103	S6	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	DIESEL GENERATOR TESTING / DIESEL GENERATOR TESTING	20100102	541712	0.0088	TON
42003	6596811	98915913	95955112	138588214	3	S12	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	ROADS & VEHICLES / VEHICLE EXHAUST EMISSIONS	27300320	541712	0.0071	TON
42003	6596811	98916313	95955212	138588614	35	S13	4200300259	BETTIS ATOMIC POWER LAB/W MIFFLIN	SMALL COMBUSTION EQUIP NG / SMALL COMBUSTION EQUIP NG	10300603	541712	0.0111	TON
42003	4714911	98925213	95959612	138597814	120	S3	4200300079	CLAIRTON SLAG INC/WEST ELIZABETH PAVING MATL PLT	DEDICATED VEHICLE EMISSIN / BULLDOZER, LOADERS ETC.	20300101	324121	0.5388	TON
42003	4715511	98926313	95960612	138599014	1	S4	4200300171	CP IND INC/MCKEESPORT	"A" FURNACE / "A" FURNACE	10200602	332312	0.0020	TON
42003	4715511	98926413	95960712	138599114	2	S5	4200300171	CP IND INC/MCKEESPORT	"B" FURNACE / "B" FURNACE	10200602	332312	0.0020	TON
42003	4715511	98926513	95960812	138599214	3	S6	4200300171	CP IND INC/MCKEESPORT	HOLCROFT FURNACE / HOLCROFT FURNACE	10200603	332312	0.0003	TON
42003	4715511	98926613	95960512	138599314	4	S3	4200300171	CP IND INC/MCKEESPORT	OTHER COMBUSTION / HEATING	10200602	332312	0.0010	TON
42003	4715511	98926813	95960512	138599514	6	S3	4200300171	CP IND INC/MCKEESPORT	SPIN FORGING / PIPE END FORMING	10200603	332312	0.0001	TON
42003	4715511	98926713	95960512	138599414	5	S3	4200300171	CP IND INC/MCKEESPORT	SURFACE COMBUSTION / ENCLOSED FURNACE	10200602	332312	0.0010	TON
42003	6596911	17368213	95964312	14068714	2	S32	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	#1 & #2 LTC UNIT / #1 LTC FCE., CB, NG	10200603	325211	0.0100	TON
42003	6596911	17368413	95964012	14329414	1	S28	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	#1 & #2 LTC UNIT / #2 LTC FCE. VA-POWER, NG	10200602	325211	0.0100	TON
42003	6596911	98931313	95965712	138604014	35	S45	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	BOILER #5 (TRANE) / BOILER #5, NAT. GAS	10200602	325211	0.0800	TON
42003	6596911	64207713	95965612	89121614	33	S44	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	BOILERS #3 & 4 / BOILERS #3 & 4, NAT. GAS	10200602	325211	0.0200	TON
42003	6596911	17368513	95964412	14328114	3	S33	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	C5 HOT OIL HEATER, NG / C-5 HOT OIL HEATER, NG	10200603	325211	0.0100	TON
42003	6596911	98929813	95963612	138602514	187	S23	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	C5 THERMAL OXIDIZER / THEMAL OXIDIZER THERMAL	10200602	325211	0.0100	TON
42003	6596911	98931713	95963312	138604414	104	S2	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	HYDRO UNIT / HEATER	10200602	325211	0.0100	TON
42003	6596911	17368813	95967612	14327614	8	S66	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	MISC. NATURAL GAS / MISC. NAT. GAS USAGE	10200602	325211	0.0100	TON
42003	6596911	17368613	95967212	14327814	6	S61	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	VEHICLE EXHAUST / DIESEL EXHAUST	27000320	325211	0.1900	TON
42003	6596911	17368713	95967212	14327714	7	S61	4200300265	EASTMAN CHEM RESINS INC/JEFFERSON SITE	VEHICLE EXHAUST / GASOLINE EXHAUST	20300307	325211	0.0400	TON
42003	3006311	98938313	95968912	138611114	31	S3	4200300951	GARDNER DENVER NASH LLC/ELIZABETH	HIGH PRESSURE BOILER #1 / NATURAL GAS BURNING	10200603	333912	0.0004	TON
42003	3006311	98938413	95969012	138611214	32	S4	4200300951	GARDNER DENVER NASH LLC/ELIZABETH	HIGH PRESSURE BOILER #2 / NATURAL GAS BURNING	10200603	333912	0.0004	TON
42003	3006211	98952613	95974312	138625514	111	S5	4200300913	HARSCO METALS BRI LLC/BRADDOCK	OFF-ROAD FRONTEND LOADER FUEL EMISSIONS.	27000320	332322	0.0030	TON
42003	3006211	38198913	95973912	17187314	1	S1	4200300913	HARSCO METALS BRI LLC/BRADDOCK	ROTARY DRYER / COMBUSTION DESULF	10300799	332322	1.2382	TON
42003	3006211	38199013	95974112	17187014	2	S3	4200300913	HARSCO METALS BRI LLC/BRADDOCK	ROTARY DRYER / COMBUSTION NO DESULF	10300799	332322	1.9600	TON
42003	8521011	509013	95976512	17234314	1	S3	4200300802	KELLY RUN SANI/MSW LDFL	DEDICATED DIESEL VEHICLES / DEDICATED DIESEL VEHICLES	20300101	562212	0.6400	TON
42003	8521011	98957413	95976312	138630314	103	S1	4200300802	KELLY RUN SANI/MSW LDFL	ENCLOSED GROUND FLARE #1 / GROUND FLARE #1	50100410	562212	1.9000	TON
42003	8521011	508913	95976612	17234414	3	S4	4200300802	KELLY RUN SANI/MSW LDFL	PORTABLE GENERATOR / GASOLINE ELEC. GENERATOR	20201702	562212	0.0020	TON
42003	8521011	98957613	95976412	138630514	107	S2	4200300802	KELLY RUN SANI/MSW LDFL	ROCK CRUSHING/SOIL SCREEN / SOIL SCREENING OPERATIONS	30502002	562212	0.0060	TON
42003	4716111	98961113	95977612	138634114	31	S1	4200300208	KINDER MORGAN LIQUIDS TERM LLC/PETROL LIQUID STORAGE	HOPKINS 800 HEATER / HOPKINS 800 - NAT'L GAS	10200603	493110	0.0110	TON
42003	4716111	28120713	95977912	13578214	1	S5	4200300208	KINDER MORGAN LIQUIDS TERM LLC/PETROL LIQUID STORAGE	THERMTECH VAPOR INCIN. / NAT'L GAS - THERMTECH	10200602	493110	0.0030	TON
42003	4714311	28141213	95979512	16978414	5	S1	4200300027	KOPPERS INC/CLAIRTON PLT	1T4 HOT OIL HEATER / 1T4 HOT OIL HEATER	10200603	325194	0.0014	TON
42003	4714311	28140413	95979512	16979214	2	S1	4200300027	KOPPERS INC/CLAIRTON PLT	2T2 HEATER - SEC. HEATER / 2T2 HEATER - SEC. HEATER	10200603	325194	0.0054	TON
42003	4714311	28139313	95979612	16980414	4	S2	4200300027	KOPPERS INC/CLAIRTON PLT	PRILL HOT OIL HEATER / HOT OIL HEATER	39990003	325194	0.0042	TON
42003	4714311	28141713	95979512	16977714	3	S1	4200300027	KOPPERS INC/CLAIRTON PLT	PRIMARY HEATER / PRIMARY HEATER	10200603	325194	0.0223	TON
42003	4714311	28139413	95979512	16980314	6	S1	4200300027	KOPPERS INC/CLAIRTON PLT	SEC. FLASH HEATER (TI) / SEC. FLASH HEATER (TI)	10100602	325194	0.0222	TON
42003	4714311	28139513	95979812	16980214	7	S4	4200300027	KOPPERS INC/CLAIRTON PLT	THERMAL OXIDIZER / THERMAL OXIDIZER	10200603	325194	0.0046	TON
42003	4714311	98965813	95980112	138638814	108	S7	4200300027	KOPPERS INC/CLAIRTON PLT	TRANSPORTATION / DIESEL VEHICLES	20300101	325194	0.3728	TON
42003	4714311	98965513	95980112	138638514	105	S7	4200300027	KOPPERS INC/CLAIRTON PLT	TRANSPORTATION / GASOLINE VEHICLES	20300301	325194	0.0073	TON
42003	4714811	28136613	95983312	16628614	1	S4	4200300075	LIBERTY PULTRUSIONS/WEST MIFFLIN	BOILER, NG / BOILER - NG	10200603	326130	0.0021	TON
42003	15621011	98975213	95984212	138648214	3	STK-3	4200300096	MARATHON ASHLAND PETRO FLOREFFE TERM/ASPHALT TERM	HOT OIL HEATER	10200603	324121	0.0222	TON
42003	15621011	98975113	95984112	138648114	1	STK-1	4200300096	MARATHON ASHLAND PETRO FLOREFFE TERM/ASPHALT TERM	VP BOILER MODEL 1365	10200602	324121	0.0080	TON
42003	2989411	98995113	95996712	138668414	5	S8	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	BOILER / BOILER	10200602	334514	0.0002	TON
42003	2989411	98994913	95996612	138668214	3	S7	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	COIL MFG. OVEN 3 UNITS NG / COIL MFG. OVEN 3 UNITS NG	39000699	334514	0.0007	TON
42003	2989411	98996113	95995912	138669414	108	S11	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	COIL PRESSING AREA / COIL PRESSING AREA	39000699	334514	0.0001	TON
42003	2989411	98995213	95996112	138668514	6	S14	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	GAS RADIANT SPACE HEATERS / SPACE HEATERS/BATH ROOMS	10500106	334514	0.0006	TON
42003	2989411	98994813	95996312	138668114	1	S3	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BAKE OVEN, NG / LARGE BAKE OVEN, NG	39000699	334514	0.0015	TON
42003	2989411	98996613	95996512	138669914	114	S6	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BURNOFF OVEN / LARGE BURNOFF OVEN	31307002	334514	0.0001	TON
42003	2989411	98995413	95996512	138668714	8	S6	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	LARGE BURNOFF OVEN / LARGE BURNOFF OVEN	39000699	334514	0.0004	TON
42003	2989411	98996513	95996412	138669814	113	S5	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	SMALL BURNOFF OVEN / SMALL BURNOFF OVEN	31307002	334514	0.0001	TON
42003	2989411	98995013	95996012	138668314	4	S12	4200300332	PA ELEC COIL LTD/MFG MTR COILS & REP MTRS	STEAM CLEANER JENNY / CLEANING OF MOTOR PARTS	39000699	334514	0.0002	TON
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	PEOPLES NATURAL GAS CO/WALL COMP STA	ENGINE #2-NG 4SRB RICE	20200202	221210	0.0051	TON
42003	3006711	99016613	96007712	138690014	31	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #1 / BOILER NO. 1 - NG	10300602	622110	0.0130	TON
42003	3006711	99016713	96007712	138690114	33	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #2 / BOILER NO. 2 - NG	10300602	622110	0.0140	TON
42003	3006711	99016813	96007712	138690214	35	S1	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	BOILER #3 / BOILER NO. 3 - NG	10300602	622110	0.0051	TON
42003	3006711	38197013	96007812	14105914	1	S2	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SPORTS MEDICINE BOILERS / BOILER NO. 1	10300602	622110	0.0003	TON
42003	3006711	38196513	96007812	14106814	2	S2	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SPORTS MEDICINE BOILERS / BOILER NO. 2	10300602	622110	0.0003	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	3006711	38196913	96007912	14106114	3	S3	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SURGERY CENTER BOILERS / BOILER NO. 1	10300602	622110	0.0002	TON
42003	3006711	99016913	96007912	138690314	37	S3	4200301019	SOUTH HILLS HEALTH SYS/JEFFERSON REG MED CTR	SURGERY CENTER BOILERS / BOILER NO.2	10300602	622110	0.0002	TON
42003	2991211	38209113	96010612	17235614	1	S2	4200300774	TUBE CITY IMS/SCRAP METAL PROCESSOR	SPACE HEATERS (ALL) / SPACE HEATERS	10100602	423510	0.0012	TON
42003	2991211	38209513	96010612	17235214	2	S2	4200300774	TUBE CITY IMS/SCRAP METAL PROCESSOR	TORCH CUTTING OPERATIONS / TORCH CUTTING NAT'L GAS	30390003	423510	0.0020	TON
42003	3819411	99022813	96010812	138696214	3	S-1	4200300416	TYK AMER/LARGE	AFTERBURNERS 10-17	39000699	327120	0.0003	TON
42003	3819411	99022613	96010812	138696014	1	S-1	4200300416	TYK AMER/LARGE	BRICK CURING OVEN BURNERS 1-8	39000699	327120	0.0004	TON
42003	3819411	99023513	96010912	138697014	106	S-3	4200300416	TYK AMER/LARGE	BRICK PRESSES	30500304	327120	0.0073	TON
42003	3819411	99022713	96010912	138696114	2	S-3	4200300416	TYK AMER/LARGE	DRYING OVEN BURNERS	39000699	327120	0.0002	TON
42003	3819411	99022913	96011012	138696314	4	S-4	4200300416	TYK AMER/LARGE	SPACE HEATERS	10500106	327120	0.0012	TON
42003	8204511	99049713	96032512	138723614	104	S68	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 FUGITIVES / BATTERY #1, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5310113	96027112	16966114	1	S1	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 UNDERFIRING / BATTERY 1,UNDERFIRING COG	30300306	331110	59.7281	TON
42003	8204511	5310013	96027112	16966314	2	S1	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 1 UNDERFIRING / BATTERY 1,UNDERFIRING NG	30390003	331110	0.0023	TON
42003	8204511	99051213	96032912	138725114	134	S74	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13 FUGITIVES / BATTERY #13, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99047913	96032712	138721614	13	S7	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13, UNDERFIRING / BATTERY13,UNDERFIRING COG	30300306	331110	45.1247	TON
42003	8204511	99048013	96032712	138721714	14	S7	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 13, UNDERFIRING / BATTERY13,UNDERFIRING NG	30390003	331110	0.0025	TON
42003	8204511	99051713	96033012	138725614	139	S75	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14 FUGITIVES / BATTERY #14, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99048113	96033512	138721814	15	S8	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14, UNDERFIRING / BATTERY14,UNDERFIRING COG	30300306	331110	45.5056	TON
42003	8204511	99048213	96033512	138721914	16	S8	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 14, UNDERFIRING / BATTERY14,UNDERFIRING NG	30390003	331110	0.0029	TON
42003	8204511	99052213	96033112	138726114	144	S76	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15 FUGITIVES / BATTERY #15, SOAKING	30300303	331110	0.6069	TON
42003	8204511	99048313	96034112	138722014	17	S9	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15, UNDERFIRING / BATTERY15,UNDERFIRING COG	30300306	331110	48.5524	TON
42003	8204511	99048413	96034112	138722114	18	S9	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 15, UNDERFIRING / BATTERY15,UNDERFIRING NG	30390003	331110	0.0022	TON
42003	8204511	99052713	96033212	138726614	149	S77	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19 FUGITIVES / BATTERY #19, SOAKING	30300303	331110	3.3819	TON
42003	8204511	99048513	96027212	138722214	19	S10	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19, UNDERFIRING / BATTERY19,UNDERFIRING COG	30300306	331110	80.8325	TON
42003	8204511	99048613	96027212	138722314	20	S10	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 19, UNDERFIRING / BATTERY19,UNDERFIRING NG	30390003	331110	0.0046	TON
42003	8204511	99050213	96032612	138724114	109	S69	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 FUGITIVES / BATTERY #2, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5305113	96028112	16811114	3	S2	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 UNDERFIRING / BATTERY 2,UNDERFIRING COG	30300306	331110	56.9743	TON
42003	8204511	5304513	96028112	16811814	4	S2	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 2 UNDERFIRING / BATTERY 2,UNDERFIRING NG	30390003	331110	0.0023	TON
42003	8204511	99053213	96033312	138727114	154	S78	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20 FUGITIVES / BATTERY #20, SOAKING	30300303	331110	3.3819	TON
42003	8204511	99048713	96027312	138722414	21	S11	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20, UNDERFIRING / BATTERY20,UNDERFIRING COG	30300306	331110	98.8499	TON
42003	8204511	99048813	96027312	138722514	22	S11	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 20, UNDERFIRING / BATTERY20,UNDERFIRING NG	30390003	331110	0.0038	TON
42003	8204511	99050713	96032812	138724614	114	S70	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3 FUGITIVES / BATTERY #3, SOAKING	30300303	331110	8.8884	TON
42003	8204511	5303113	96029212	16974514	5	S3	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3, UNDERFIRING / BATTERY 3,UNDERFIRING COG	30300306	331110	49.5706	TON
42003	8204511	5306513	96029212	16973014	6	S3	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY 3, UNDERFIRING / BATTERY 3,UNDERFIRING NG	30390003	331110	0.0021	TON
42003	8204511	99053713	96033412	138727614	159	S79	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B FUGITIVES / BATTERY #B, SOAKING	30300303	331110	4.3505	TON
42003	8204511	99048913	96027412	138722614	23	S12	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B, UNDERFIRING / BATTERY B,UNDERFIRING COG	30300306	331110	188.8860	TON
42003	8204511	99049013	96027412	138722714	24	S12	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY B, UNDERFIRING / BATTERY B,UNDERFIRING NG	30390003	331110	0.0071	TON
42003	8204511	5307113	96027912	16972414	31	S18	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #1, STCK S31 / BOILER #1, COG, STACK S31	10200707	331110	52.1970	TON
42003	8204511	5306013	96027912	16974114	32	S18	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #1, STCK S31 / BOILER #1, NG, STACK S31	10200601	331110	0.1889	TON
42003	8204511	5306613	96028012	16972914	33	S19	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #2, STCK S32 / BOILER #2, COG, STACK S32	10200707	331110	27.7517	TON
42003	8204511	5306713	96028012	16972814	34	S19	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER #2, STCK S32 / BOILER #2, NG, STACK S32	10200601	331110	0.0782	TON
42003	8204511	5306813	96028212	89176214	35	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R1, STACK S36 / BOILER R1, COG, STACK S36	10200707	331110	1.2668	TON
42003	8204511	5306913	96028212	138723014	36	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R2, STACK S36 / BOILER R2, COG, STACK S36	10200707	331110	0.4052	TON
42003	8204511	5306913	96028212	16972614	36	S20	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER R2, STACK S36 / BOILER R2, NG, STACK S36	10200601	331110	1.5347	TON
42003	8204511	99049313	96028312	138723214	37	S21	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER T1, STACK S38 / BOILER T1, COG, STACK S38	10200707	331110	3.8934	TON
42003	8204511	5308513	96028412	89175914	38	S22	4200300032	US STEEL CORP/CLAIRTON PLT	BOILER T2, STACK S39 / BOILER T2, COG, STACK S39	10200707	331110	3.6008	TON
42003	8204511	99060013	96029512	138733914	235	S32	4200300032	US STEEL CORP/CLAIRTON PLT	FLARING / FLARING	30399999	331110	0.0365	TON
42003	8204511	99059413	96028712	138733314	229	S25	4200300032	US STEEL CORP/CLAIRTON PLT	MOTOR VEHICLE EXHAUST / HEAVY-DUTY VEHICLES	20300101	331110	3.1612	TON
42003	8204511	99049213	96032412	138722914	26	S67	4200300032	US STEEL CORP/CLAIRTON PLT	NH3 TANKER LOADING FLARE / NH3 TANKER LOADING FLARE	39999993	331110	0.0745	TON
42003	8204511	99054713	96030212	138728614	175	S41	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PEC FUGITIVES	30300303	331110	5.7785	TON
42003	8204511	99054513	96027612	138728414	173	S15	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PEC BAGHOUSE STACK	30300303	331110	25.2750	TON
42003	8204511	99055013	96033012	138728914	178	S75	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / PRE PUSH	30300303	331110	0.5983	TON
42003	8204511	99054613	96029812	138728514	174	S36	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / TRAVELING HOT CAR	30300303	331110	26.3918	TON
42003	8204511	99054813	96030612	138728714	176	S46	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 13-15 / UNCONTROLLED PUSHING	30300303	331110	0.2717	TON
42003	8204511	99055313	96030312	138729214	181	S42	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PEC FUGITIVES	30300303	331110	6.4016	TON
42003	8204511	99055113	96027712	138729014	179	S16	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PEC BAGHOUSE STACK	30300303	331110	28.0005	TON
42003	8204511	99055613	96033212	138729514	184	S77	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / PRE PUSH	30300303	331110	0.6764	TON
42003	8204511	99055213	96029912	138729114	180	S37	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / TRAVELING HOT CAR	30300303	331110	29.7461	TON
42003	8204511	99055413	96030712	138729314	182	S47	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATT. 19-20 / UNCONTROLLED PUSHING	30300303	331110	1.6188	TON
42003	8204511	99054113	96030112	138728014	163	S39	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PEC FUGITIVES	30300303	331110	4.3426	TON
42003	8204511	99053913	96027512	138727814	161	S13	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PEC BAGHOUSE STACK	30300303	331110	18.9944	TON
42003	8204511	99054413	96032612	138728314	166	S69	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / PRE PUSH	30300303	331110	0.4480	TON
42003	8204511	99054013	96029712	138727914	162	S34	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / TRAVELING HOT CAR	30300303	331110	20.9304	TON
42003	8204511	99054213	96030512	138728114	164	S44	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERIES 1-3 / UNCONTROLLED PUSHING	30300303	331110	0.0410	TON
42003	8204511	99055813	96030412	138729714	187	S43	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PEC FUGITIVES	30300303	331110	2.7282	TON
42003	8204511	99055713	96027812	138729614	185	S17	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PEC BAGHOUSE STACK	30300303	331110	25.1922	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	8204511	99056013	96033412	138729914	190	S79	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY B / PRE PUSH	30300303	331110	0.3502	TON
42003	8204511	99056113	96030812	138730014	191	S49	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #1 / QUENCH TOWER #1	30300304	331110	2.2029	TON
42003	8204511	99056413	96031112	138730314	195	S53	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #B / QUENCH TOWER #B	30300304	331110	2.7653	TON
42003	8204511	99990007	96031145	138799907	263	CQ	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER C / QUENCH TOWER C	30300304	331110	7.8800	TON
42003	8204511	99990016	96031155	138799916	193A	5AQ	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #5A / QUENCH TOWER #5A	30300304	331110	0.0800	TON
42003	8204511	99990017	96031165	138799917	194A	7AQ	4200300032	US STEEL CORP/CLAIRTON PLT	QUENCH TOWER #7A / QUENCH TOWER #7A	30300304	331110	1.5700	TON
42003	8204511	99990013	96033416	138799939	255	C13	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY C FUGITIVES / BATTERY C, SOAKING	30300303	331110	2.3500	TON
42003	8204511	99990002	96033992	138799902	260	C2	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY C / PEC FUGITIVES	30300303	331114	2.2100	TON
42003	8204511	99990003	96033993	138799903	257	C3	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY C / PEC BAGHOUSE STACK	30300303	331115	9.6714	TON
42003	8204511	99990004	96033994	138799904	259	C4	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY C / PRE PUSH	30300303	331116	0.4000	TON
42003	8204511	99990005	96033995	138799905	258	C5	4200300032	US STEEL CORP/CLAIRTON PLT	PEC SYSTEM, BATTERY C / TRAVELING HOT CAR	30300303	331117	16.3064	TON
42003	8204511	99990008	96033418	138799908	10	C8	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY C, UNDERFIRING / BATTERY C,UNDERFIRING COG	30300306	331118	113.0100	TON
42003	8204511	99990009	96033418	138799909	10	C9	4200300032	US STEEL CORP/CLAIRTON PLT	BATTERY C, UNDERFIRING / BATTERY C,UNDERFIRING NG	30390003	331119	0.0100	TON
42003	8204511	99059813	96028512	138733714	233	S23	4200300032	US STEEL CORP/CLAIRTON PLT	SCOT HYDROGENATION UNIT / SCOT STACK	30399999	331110	38.8062	TON
42003	8204511	99059513	96034012	138733414	230	S85	4200300032	US STEEL CORP/CLAIRTON PLT	TUG BOAT EXHAUST / TUG BOAT EXHAUST	20300101	331110	1.9388	TON
42003	8204511	99049113	96032412	138722814	25	S67	4200300032	US STEEL CORP/CLAIRTON PLT	WWT SURGE TANK NH3 FLARE / WWT SURGE TANK NH3 FLARE	39990024	331110	0.0018	TON
42003	7409311	99043413	96024912	138717114	101	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 CASTHOUSE / BF #1 CASTHOUSE BAGHOUSE	30300825	331110	26.4864	TON
42003	7409311	99043513	96024912	138717214	102	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 CASTHOUSE / BF #1 CASTHOUSE ROOF MON.	30300825	331110	2.7024	TON
42003	7409311	10403313	96024912	13688814	5	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 FUME SUPPRESSION / BF #1 FUME SUPPRESSION	10200707	331110	1.2372	TON
42003	7409311	10403113	96023812	13689014	7	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 MISC. / BF #1 MISC. COG	39000702	331110	1.0196	TON
42003	7409311	10403013	96023812	13689114	8	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #1 MISC. / BF #1 MISC. NATURAL GAS	39000699	331110	0.0597	TON
42003	7409311	99043613	96024912	138717314	103	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 CASTHOUSE / BF #3 CASTHOUSE BAGHOUSE	30300825	331110	43.6585	TON
42003	7409311	99043713	96024912	138717414	104	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 CASTHOUSE / BF #3 CASTHOUSE ROOF MON.	30300825	331110	2.3462	TON
42003	7409311	99042513	96024912	138716214	14	S2	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 FUME SUPPRESSION / BF #3 FUME SUPPRESSION	10200707	331110	1.0741	TON
42003	7409311	99042613	96026612	138716314	16	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 MISC. / BF #3 MISC., COG	39000702	331110	0.9541	TON
42003	7409311	99042713	96026612	138716414	17	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF #3 MISC. / BF #3 MISC., NATURAL GAS	39000699	331110	0.0569	TON
42003	7409311	10404513	96023812	13638214	2	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF #1 STOVE COG	39000702	331110	0.3331	TON
42003	7409311	10404613	96023812	13638114	3	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF #1 STOVE NATURAL GAS	39000699	331110	0.1889	TON
42003	7409311	10404413	96023812	13638314	1	S1	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #1 / BF STOVE #1, BFG	39000701	331110	112.8670	TON
42003	7409311	99042313	96026612	138716014	11	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF #3 STOVE, COG	39000702	331110	2.2575	TON
42003	7409311	99042413	96026612	138716114	12	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF #3 STOVE, NATURAL GAS	39000699	331110	1.2053	TON
42003	7409311	99042213	96026612	138715914	10	S4	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BF STOVE #3 / BF STOVE #3, BFG	39000701	331110	207.0540	TON
42003	7409311	99042813	96026012	138716514	19	S3	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BFG FLARE / BFG FLARE	30390024	331110	38.8325	TON
42003	7409311	99042913	96024612	138716614	20	S17	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BOP PROCESS FUEL / BOP COMBUSTION, COG	10200707	331110	3.3032	TON
42003	7409311	99043013	96024612	138716714	21	S17	4200300202	US STEEL CORP/EDGAR THOMSON PLT	BOP PROCESS FUEL / BOP COMBUSTION, NG	10200603	331110	0.0646	TON
42003	7409311	99043113	96025212	138716814	23	S22	4200300202	US STEEL CORP/EDGAR THOMSON PLT	CASTER/LMF PROCESS FUEL / CONTINUOUS CASTER, COG	39000702	331110	0.2397	TON
42003	7409311	99043213	96025212	138716914	24	S22	4200300202	US STEEL CORP/EDGAR THOMSON PLT	CASTER/LMF PROCESS FUEL / CONTINUOUS CASTER, NG	39000699	331110	0.0215	TON
42003	7409311	99043313	96026112	138717014	26	S30	4200300202	US STEEL CORP/EDGAR THOMSON PLT	PLANT WIDE MISC COMB, NG / PLANT WIDE MISC COMB, NG	10200603	331110	0.0301	TON
42003	7409311	10401813	96023912	13690314	31	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, BFG	10200704	331110	147.9550	TON
42003	7409311	10401713	96023912	13690414	32	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, COG	10200707	331110	22.2797	TON
42003	7409311	10401613	96023912	13690514	33	S10	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #1 / RILEY BOILER #1, NG	10200601	331110	0.0506	TON
42003	7409311	10401413	96024012	13690814	35	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, BFG	10200704	331110	288.8840	TON
42003	7409311	10401313	96024012	13690914	36	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, COG	10200707	331110	12.1517	TON
42003	7409311	10404213	96024012	13687914	37	S11	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #2 / RILEY BOILER #2, NG	10200601	331110	0.0400	TON
42003	7409311	10404113	96024112	13688014	39	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, BFG	10200704	331110	191.7850	TON
42003	7409311	10403413	96024112	13688714	40	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, COG	10200707	331110	11.8249	TON
42003	7409311	10403913	96024112	13688214	41	S12	4200300202	US STEEL CORP/EDGAR THOMSON PLT	RILEY BOILER #3 / RILEY BOILER #3, NG	10200601	331110	0.0352	TON
42003	7409411	99038213	96022812	138711914	16	S9	4200300203	US STEEL CORP/IRVIN PLT	#1 GALV. LINE PREHEAT NG / #1 GALV. LINE PREHEAT NG	30390003	331110	0.0409	TON
42003	7409411	99038313	96023012	138712014	17	S11	4200300203	US STEEL CORP/IRVIN PLT	#2 GALV LINE PREHEAT NG / #2 GALV LINE PREHEAT NG	30390003	331110	0.0294	TON
42003	7409411	10396113	96023312	13637814	1	S14	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 1 / 80 INCH MILL REHEAT #1 NG	39000699	331110	0.0844	TON
42003	7409411	10396213	96023312	13637714	2	S14	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 1 / 80 INCH MILL REHEAT 1 COG	39000702	331110	65.4141	TON
42003	7409411	10397013	96023412	13636814	4	S15	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 2 / 80 INCH MILL REHEAT #2 NG	39000699	331110	0.0849	TON
42003	7409411	10398913	96023412	13580014	5	S15	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 2 / 80 INCH MILL REHEAT 2 COG	39000702	331110	64.9983	TON
42003	7409411	10398013	96020812	13581214	7	S16	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 3 / 80 INCH MILL REHEAT #3 NG	39000699	331110	0.0786	TON
42003	7409411	10397913	96020812	13581314	8	S16	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 3 / 80 INCH MILL REHEAT 3 COG	39000702	331110	60.8857	TON
42003	7409411	99041613	96020912	138715314	10	S17	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 4 / 80 INCH MILL REHEAT #4 NG	39000699	331110	0.0863	TON
42003	7409411	99037913	96020912	138711614	11	S17	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 4 / 80 INCH MILL REHEAT 4 COG	39000702	331110	66.0101	TON
42003	7409411	99038013	96021012	138711714	13	S18	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 5 / 80 INCH MILL REHEAT #5 NG	39000699	331110	0.0783	TON
42003	7409411	99038113	96021012	138711814	14	S18	4200300203	US STEEL CORP/IRVIN PLT	80 INCH MILL REHEAT FCE 5 / 80 INCH MILL REHEAT 5 COG	39000702	331110	58.3964	TON
42003	7409411	10395713	96022912	13579314	31	S1	4200300203	US STEEL CORP/IRVIN PLT	BOILER #1 / BOILER #1, COG DESULF OP	10200707	331110	3.9674	TON
42003	7409411	10395613	96022912	13579514	32	S1	4200300203	US STEEL CORP/IRVIN PLT	BOILER #1 / BOILER #1, NATURAL GAS	10200602	331110	0.0253	TON
42003	7409411	10395413	96021212	13579814	34	S2	4200300203	US STEEL CORP/IRVIN PLT	BOILER #2 / BOILER #2, COG DESULF OP	10200707	331110	4.7990	TON
42003	7409411	10399013	96021212	13579914	35	S2	4200300203	US STEEL CORP/IRVIN PLT	BOILER #2 / BOILER #2, NATURAL GAS	10200602	331110	0.0306	TON
42003	7409411	10398813	96022212	13580114	37	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #3 / BOILER #3 COG DESULF OP	10200707	331110	1.3101	TON
42003	7409411	10398613	96022212	13580514	38	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #3 / BOILER #3, NATURAL GAS	10200602	331110	0.0086	TON

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	facility_name	unit/process description	scc	naics	ann_value	unit
42003	7409411	99039513	96022212	138713214	41	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #4 / BOILER #4 NATURAL GAS	10200602	331110	0.0081	TON
42003	7409411	99039413	96022212	138713114	40	S3	4200300203	US STEEL CORP/IRVIN PLT	BOILER #4 / BOILER #4, COG DESULF OP	10200707	331110	1.1341	TON
42003	7409411	99039013	96021312	138712714	32	S20	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / COG FLARES #1-#3	30390024	331110	2.0457	TON
42003	7409411	99039113	96021412	138712814	33	S21	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / PEACHTREE FLARE A	30390024	331110	0.0004	TON
42003	7409411	99039213	96021412	138712914	34	S21	4200300203	US STEEL CORP/IRVIN PLT	COG FLARING / PEACHTREE FLARE B	30390024	331110	5.8541	TON
42003	7409411	99038813	96023212	138712514	26	S13	4200300203	US STEEL CORP/IRVIN PLT	CONTINUOUS ANNEALING / CONTINUOUS ANNEALING NG	30390003	331110	0.0077	TON
42003	7409411	99038913	96023212	138712614	27	S13	4200300203	US STEEL CORP/IRVIN PLT	CONTINUOUS ANNEALING / CONTINUOUS ANNEALING, COG	30390004	331110	1.1503	TON
42003	7409411	99038513	96021112	138712214	19	S19	4200300203	US STEEL CORP/IRVIN PLT	HPH ANNEALING FURNACES / HPH ANNEAL COG 58 BASES	30390004	331110	4.4554	TON
42003	7409411	99038413	96021112	138712114	18	S19	4200300203	US STEEL CORP/IRVIN PLT	HPH ANNEALING FURNACES / HPH ANNEAL NG 58 BASES	30390003	331110	0.0297	TON
42003	7409411	99039313	96021812	138713014	38	S26	4200300203	US STEEL CORP/IRVIN PLT	MISCELLANEOUS NATURAL GAS / MISCELLANEOUS NATURAL GAS	10200603	331110	0.0794	TON
42003	7409411	99038613	96023112	138712314	21	S12	4200300203	US STEEL CORP/IRVIN PLT	OPEN COIL ANNEALING / FURNACE 1-9, 10-16 NG	30390003	331110	0.0172	TON
42003	7409411	99038713	96023112	138712414	22	S12	4200300203	US STEEL CORP/IRVIN PLT	OPEN COIL ANNEALING / OCA COG1-9, 10-14, 15, 16	30390004	331110	2.2896	TON
42003	15621911	99063113	96036512	138737014	1	S6	4200300359	VALLEY NATL GASES WV LLC/WEST MIFFLIN	WEIL MCLAIN 88 BOILER	10200603	325120	0.0007	TON
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	PEOPLES NATURAL GAS CO/WALL COMP STA	ENGINE #2-NG 4SRB RICE	20200202	221210	0.0064	TON

2018 Projected Point Source Emissions Inventory (SCC and NAICS Descriptions) - Page 1

region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	12633011	64218913	95954012	89732514	2	S3	4200300007	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	339999	All Other Miscellaneous Manufacturing
42003	12633011	64218813	95953912	138586714	1	S2	4200300007	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	339999	All Other Miscellaneous Manufacturing
42003	6596811	98916013	95954812	138588314	31	S1	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916113	95955312	138588414	32	S2	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98915813	95955412	138588114	1	S3	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916213	95955512	138588514	33	S4	4200300259	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916713	95955812	138589014	104	S8	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916813	95955912	138589114	105	S9	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916613	95955612	138588914	103	S6	4200300259	20100102	Int Comb /Electric Gen /Distillate Oil (Diesel) /Reciprocating	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98915913	95955112	138588214	3	S12	4200300259	27300320	Off-highway LPG-fueled Engines /Industrial Fork Lift	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	6596811	98916313	95955212	138588614	35	S13	4200300259	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr	541712	R&D in the Physical, Engineering, and Life Sciences (except Biotechnology)
42003	4714911	98925213	95959612	138597814	120	S3	4200300079	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	324121	Asphalt Paving Mixture and Block Manufacturing
42003	4715511	98926313	95960612	138599014	1	S4	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926413	95960712	138599114	2	S5	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926513	95960812	138599214	3	S6	4200300171	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926613	95960512	138599314	4	S3	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926813	95960512	138599514	6	S3	4200300171	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	4715511	98926713	95960512	138599414	5	S3	4200300171	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	332312	Fabricated Structural Metal Manufacturing
42003	6596911	17368213	95964312	14068714	2	S32	4200300265	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368413	95964012	14329414	1	S28	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98931313	95965712	138604014	35	S45	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	64207713	95965612	89121614	33	S44	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368513	95964412	14328114	3	S33	4200300265	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98929813	95963612	138602514	187	S23	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	98931713	95963312	138604414	104	S2	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368813	95967612	14327614	8	S66	4200300265	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368613	95967212	14327814	6	S61	4200300265	27000320	Off-highway Diesel Engines /Industrial Fork Lift	325211	Plastics Material and Resin Manufacturing
42003	6596911	17368713	95967212	14327714	7	S61	4200300265	20300307	Int Comb /Comm-Inst /Gasoline /Reciprocating: Exhaust	325211	Plastics Material and Resin Manufacturing
42003	3006311	98938313	95968912	138611114	31	S3	4200300951	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	333912	Air and Gas Compressor Manufacturing
42003	3006311	98938413	95969012	138611214	32	S4	4200300951	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	333912	Air and Gas Compressor Manufacturing
42003	3006211	98952613	95974312	138625514	111	S5	4200300913	27000320	Off-highway Diesel Engines /Industrial Fork Lift	332322	Sheet Metal Work Manufacturing
42003	3006211	38198913	95973912	17187314	1	S1	4200300913	10300799	Ext Comb /Comm-Inst /Process Gas /Other Not Classified	332322	Sheet Metal Work Manufacturing
42003	3006211	38199013	95974112	17187014	2	S3	4200300913	10300799	Ext Comb /Comm-Inst /Process Gas /Other Not Classified	332322	Sheet Metal Work Manufacturing
42003	8521011	509013	95976512	17234314	1	S3	4200300802	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	562212	Solid Waste Landfill
42003	8521011	98957413	95976312	138630314	103	S1	4200300802	50100410	Waste Disp-Govt /Landfill Dump /Waste Gas Destruction: Waste Gas Flares	562212	Solid Waste Landfill
42003	8521011	508913	95976612	17234414	3	S4	4200300802	20201702	Int Comb /Industrial /Gasoline /Reciprocating Engine	562212	Solid Waste Landfill
42003	8521011	98957613	95976412	138630514	107	S2	4200300802	30502002	Stone Quarrying & Processing /Secondary Crushing/Screening	562212	Solid Waste Landfill
42003	4716111	98961113	95977612	138634114	31	S1	4200300208	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	493110	General Warehousing and Storage
42003	4716111	28120713	95977912	13578214	1	S5	4200300208	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	493110	General Warehousing and Storage
42003	4714311	28141213	95979512	16978414	5	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28140413	95979512	16979214	2	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139313	95979612	16980414	4	S2	4200300027	39990003	Misc Manuf Indus /Natural Gas: Process Heaters	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28141713	95979512	16977714	3	S1	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139413	95979512	16980314	6	S1	4200300027	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	28139513	95979812	16980214	7	S4	4200300027	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	98965813	95980112	138638814	108	S7	4200300027	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714311	98965513	95980112	138638514	105	S7	4200300027	20300301	Int Comb /Comm-Inst /Gasoline /Reciprocating	325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
42003	4714811	28136613	95983312	16628614	1	S4	4200300075	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
42003	15621011	98975213	95984212	138648214	3	STK-3	4200300096	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	324121	Asphalt Paving Mixture and Block Manufacturing
42003	15621011	98975113	95984112	138648114	1	STK-1	4200300096	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	324121	Asphalt Paving Mixture and Block Manufacturing
42003	2989411	98995113	95996712	138668414	5	S8	4200300332	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98994913	95996612	138668214	3	S7	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996113	95995912	138669414	108	S11	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995213	95996112	138668514	6	S14	4200300332	10500106	Ext Comb /Space Heater /Industrial /Natural Gas	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98994813	95996312	138668114	1	S3	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996613	95996512	138669914	114	S6	4200300332	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995413	95996512	138668714	8	S6	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98996513	95996412	138669814	113	S5	4200300332	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	2989411	98995013	95996012	138668314	4	S12	4200300332	39000699	In-Process Fuel Use /Natural Gas /General	334514	Totalizing Fluid Meter and Counting Device Manufacturing
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	20200202	Int Comb /Industrial /Natural Gas /Reciprocating	221210	Natural Gas Distribution
42003	3006711	99016613	96007712	138690014	31	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	99016713	96007712	138690114	33	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	99016813	96007712	138690214	35	S1	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38197013	96007812	14105914	1	S2	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38196513	96007812	14106814	2	S2	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	38196913	96007912	14106114	3	S3	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	3006711	99016913	96007912	138690314	37	S3	4200301019	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr	622110	General Medical and Surgical Hospitals
42003	2991211	38209113	96010612	17235614	1	S2	4200300774	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential	423510	Metal Service Centers and Other Metal Merchant Wholesalers
42003	2991211	38209513	96010612	17235214	2	S2	4200300774	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	423510	Metal Service Centers and Other Metal Merchant Wholesalers
42003	3819411	99022813	96010812	138696214	3	S-1	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022613	96010812	138696014	1	S-1	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	3819411	99023513	96010912	138697014	106	S-3	4200300416	30500304	Brick Manuf /Curing	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022713	96010912	138696114	2	S-3	4200300416	39000699	In-Process Fuel Use /Natural Gas /General	327120	Clay Building Material and Refractories Manufacturing
42003	3819411	99022913	96011012	138696314	4	S-4	4200300416	10500106	Ext Comb /Space Heater /Industrial /Natural Gas	327120	Clay Building Material and Refractories Manufacturing
42003	8204511	99049713	96032512	138723614	104	S68	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5310113	96027112	16966114	1	S1	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5310013	96027112	16966314	2	S1	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99051213	96032912	138725114	134	S74	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99047913	96032712	138721614	13	S7	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048013	96032712	138721714	14	S7	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99051713	96033012	138725614	139	S75	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048113	96033512	138721814	15	S8	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048213	96033512	138721914	16	S8	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99052213	96033112	138726114	144	S76	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048313	96034112	138722014	17	S9	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048413	96034112	138722114	18	S9	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99052713	96033212	138726614	149	S77	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048513	96027212	138722214	19	S10	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048613	96027212	138722314	20	S10	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99050213	96032612	138724114	109	S69	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5305113	96028112	16811114	3	S2	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5304513	96028112	16811814	4	S2	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053213	96033312	138727114	154	S78	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048713	96027312	138722414	21	S11	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048813	96027312	138722514	22	S11	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99050713	96032812	138724614	114	S70	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5303113	96029212	16974514	5	S3	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306513	96029212	16973014	6	S3	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053713	96033412	138727614	159	S79	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99048913	96027412	138722614	23	S12	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049013	96027412	138722714	24	S12	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5307113	96027912	16972414	31	S18	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306013	96027912	16974114	32	S18	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306613	96028012	16972914	33	S19	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306713	96028012	16972814	34	S19	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306813	96028212	89176214	35	S20	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306913	96028212	138723014	36	S20	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5306913	96028212	16972614	36	S20	4200300032	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049313	96028312	138723214	37	S21	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	5308513	96028412	89175914	38	S22	4200300032	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99060013	96029512	138733914	235	S32	4200300032	30399999	Primary Metals /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059413	96028712	138733314	229	S25	4200300032	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049213	96032412	138722914	26	S67	4200300032	39999993	Misc Manuf / Indus Processes /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054713	96030212	138728614	175	S41	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054513	96027612	138728414	173	S15	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055013	96033012	138728914	178	S75	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054613	96029812	138728514	174	S36	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054813	96030612	138728714	176	S46	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055313	96030312	138729214	181	S42	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055113	96027712	138729014	179	S16	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055613	96033212	138729514	184	S77	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055213	96029912	138729114	180	S37	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055413	96030712	138729314	182	S47	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054113	96030112	138728014	163	S39	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99053913	96027512	138727814	161	S13	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054413	96032612	138728314	166	S69	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054013	96029712	138727914	162	S34	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99054213	96030512	138728114	164	S44	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055813	96030412	138729714	187	S43	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99055713	96027812	138729614	185	S17	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056013	96033412	138729914	190	S79	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056113	96030812	138730014	191	S49	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99056413	96031112	138730314	195	S53	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990007	96031145	138799907	263	CQ	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990016	96031155	138799916	193A	5AQ	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990017	96031165	138799917	194A	7AQ	4200300032	30300304	By-product Coke Manuf /Quenching	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990013	96033416	138799939	255	C13	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990002	96033992	138799902	260	C2	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331114	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990003	96033993	138799903	257	C3	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331115	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990004	96033994	138799904	259	C4	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331116	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990005	96033995	138799905	258	C5	4200300032	30300303	By-product Coke Manuf /Oven Pushing	331117	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99990008	96033418	138799908	10	C8	4200300032	30300306	By-product Coke Manuf /Oven Underfiring	331118	Iron and Steel Mills and Ferroalloy Manufacturing

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region_cd	facility_id	unit_id	rel_point_id	process_id	agy_unit	agy_rel_point	agy_facility_id	scc	scc description (short name)	naics	naics description
42003	8204511	99990009	96033418	138799909	10	C9	4200300032	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331119	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059813	96028512	138733714	233	S23	4200300032	30399999	Primary Metals /Other Not Classified	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99059513	96034012	138733414	230	S85	4200300032	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	8204511	99049113	96032412	138722814	25	S67	4200300032	39990024	Misc Manuf Indus /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043413	96024912	138717114	101	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043513	96024912	138717214	102	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403313	96024912	13688814	5	S2	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403113	96023812	13689014	7	S1	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403013	96023812	13689114	8	S1	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043613	96024912	138717314	103	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043713	96024912	138717414	104	S2	4200300202	30300825	Iron Production /Cast House	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042513	96024912	138716214	14	S2	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042613	96026612	138716314	16	S4	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042713	96026612	138716414	17	S4	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404513	96023812	13638214	2	S1	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404613	96023812	13638114	3	S1	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404413	96023812	13638314	1	S1	4200300202	39000701	In-Process Fuel Use /Process Gas /Coke Oven or Blast Furnace	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042313	96026612	138716014	11	S4	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042413	96026612	138716114	12	S4	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042213	96026612	138715914	10	S4	4200300202	39000701	In-Process Fuel Use /Process Gas /Coke Oven or Blast Furnace	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042813	96026012	138716514	19	S3	4200300202	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99042913	96024612	138716614	20	S17	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043013	96024612	138716714	21	S17	4200300202	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043113	96025212	138716814	23	S22	4200300202	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043213	96025212	138716914	24	S22	4200300202	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	99043313	96026112	138717014	26	S30	4200300202	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401813	96023912	13690314	31	S10	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401713	96023912	13690414	32	S10	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401613	96023912	13690514	33	S10	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401413	96024012	13690814	35	S11	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10401313	96024012	13690914	36	S11	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404213	96024012	13687914	37	S11	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10404113	96024112	13688014	39	S12	4200300202	10200704	Ext Comb /Industrial /Process Gas /Blast Furnace Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403413	96024112	13688714	40	S12	4200300202	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409311	10403913	96024112	13688214	41	S12	4200300202	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038213	96022812	138711914	16	S9	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038313	96023012	138712014	17	S11	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10396113	96023312	13637814	1	S14	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10396213	96023312	13637714	2	S14	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10397013	96023412	13636814	4	S15	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398913	96023412	13580014	5	S15	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398013	96020812	13581214	7	S16	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10397913	96020812	13581314	8	S16	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99041613	96020912	138715314	10	S17	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99037913	96020912	138711614	11	S17	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038013	96021012	138711714	13	S18	4200300203	39000699	In-Process Fuel Use /Natural Gas /General	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038113	96021012	138711814	14	S18	4200300203	39000702	In-Process Fuel Use /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395713	96022912	13579314	31	S1	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395613	96022912	13579514	32	S1	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10395413	96021212	13579814	34	S2	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10399013	96021212	13579914	35	S2	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398813	96022212	13580114	37	S3	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	10398613	96022212	13580514	38	S3	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039513	96022212	138713214	41	S3	4200300203	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039413	96022212	138713114	40	S3	4200300203	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039013	96021312	138712714	32	S20	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039113	96021412	138712814	33	S21	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039213	96021412	138712914	34	S21	4200300203	30390024	Primary Metals /Fuel Fired Equipment /Process Gas: Flares	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038813	96023212	138712514	26	S13	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038913	96023212	138712614	27	S13	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038513	96021112	138712214	19	S19	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038413	96021112	138712114	18	S19	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99039313	96021812	138713014	38	S26	4200300203	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038613	96023112	138712314	21	S12	4200300203	30390003	Primary Metals /Fuel Fired Equipment /Natural Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	7409411	99038713	96023112	138712414	22	S12	4200300203	30390004	Primary Metals /Fuel Fired Equipment /Process Gas: Process Heaters	331110	Iron and Steel Mills and Ferroalloy Manufacturing
42003	15621911	99063113	96036512	138737014	1	S6	4200300359	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr	325120	Industrial Gas Manufacturing
42003	12633111	64225513	95997612	89734514	5	S2	4200301300	20200202	Int Comb /Industrial /Natural Gas /Reciprocating	221210	Natural Gas Distribution

2018 Projected Area Source Emissions Inventory (Annual Tons by Source Category) - Page 1

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	control_measures	projection_factor	cat
42003	PA	Allegheny	2102002000	2011PADEP	SO2	66.9315	TON	PROJECTION	0.8793	nonpt
42003	PA	Allegheny	2102004000	2011PADEP	SO2	4.4095	TON	PROJECTION&UNKNOWNMSR	1.0712	nonpt
42003	PA	Allegheny	2102005000	2011PADEP	SO2	3.8228	TON	PROJECTION&UNKNOWNMSR	1	nonpt
42003	PA	Allegheny	2102006000	2011PADEP	SO2	0.0000	TON	PROJECTION	0	nonpt
42003	PA	Allegheny	2102007000	2011PADEP	SO2	0.0461	TON	PROJECTION	1.1636	nonpt
42003	PA	Allegheny	2102008000	2011PADEP	SO2	2.9457	TON	PROJECTION	1.1776	nonpt
42003	PA	Allegheny	2102011000	2011PADEP	SO2	0.3379	TON	PROJECTION	1.0712	nonpt
42003	PA	Allegheny	2103002000	2011PADEP	SO2	0.0000	TON	PROJECTION	0	nonpt
42003	PA	Allegheny	2103004000	2011PADEP	SO2	19.3250	TON	PROJECTION&UNKNOWNMSR	0.9678	nonpt
42003	PA	Allegheny	2103005000	2011PADEP	SO2	1.9857	TON	PROJECTION&UNKNOWNMSR	1	nonpt
42003	PA	Allegheny	2103006000	2011PADEP	SO2	0.5363	TON	PROJECTION	1.0601	nonpt
42003	PA	Allegheny	2103007000	2011PADEP	SO2	0.0165	TON	PROJECTION	0.987	nonpt
42003	PA	Allegheny	2103008000	2011PADEP	SO2	0.6650	TON	PROJECTION	1.5121	nonpt
42003	PA	Allegheny	2103011000	2011PADEP	SO2	1.6727	TON	PROJECTION	0.9678	nonpt
42003	PA	Allegheny	2104001000	2011EPA_NP_NoOvrlp	SO2	0.0786	TON	PROJECTION	1	nonpt
42003	PA	Allegheny	2104002000	2011EPA_NP_NoOvrlp	SO2	0.0409	TON	PROJECTION	1	nonpt
42003	PA	Allegheny	2104004000	2011EPA_NP_NoOvrlp	SO2	7.5942	TON	PROJECTION	0.8981	nonpt
42003	PA	Allegheny	2104006000	2011EPA_NP_NoOvrlp	SO2	1.3532	TON	PROJECTION	0.987	nonpt
42003	PA	Allegheny	2104007000	2011EPA_NP_NoOvrlp	SO2	0.0178	TON	PROJECTION	0.8597	nonpt
42003	PA	Allegheny	2104008100	2011EPA_NP_NoOvrlp	SO2	0.2550	TON	PROJECTION	1.072	rwc
42003	PA	Allegheny	2104008210	2011EPA_NP_NoOvrlp	SO2	0.3221	TON	PROJECTION	0.897	rwc
42003	PA	Allegheny	2104008220	2011EPA_NP_NoOvrlp	SO2	0.1360	TON	PROJECTION	1.181	rwc
42003	PA	Allegheny	2104008230	2011EPA_NP_NoOvrlp	SO2	0.0454	TON	PROJECTION	1.181	rwc
42003	PA	Allegheny	2104008310	2011EPA_NP_NoOvrlp	SO2	0.4992	TON	PROJECTION	0.98	rwc
42003	PA	Allegheny	2104008320	2011EPA_NP_NoOvrlp	SO2	0.1929	TON	PROJECTION	1.181	rwc
42003	PA	Allegheny	2104008330	2011EPA_NP_NoOvrlp	SO2	0.0643	TON	PROJECTION	1.181	rwc
42003	PA	Allegheny	2104008400	2011EPA_NP_NoOvrlp	SO2	0.3710	TON	PROJECTION	1.645	rwc
42003	PA	Allegheny	2104008510	2011EPA_NP_NoOvrlp	SO2	0.0000	TON	PROJECTION	0	rwc
42003	PA	Allegheny	2104008610	2011EPA_NP_NoOvrlp	SO2	0.0000	TON	PROJECTION	0	rwc
42003	PA	Allegheny	2104008700	2011EPA_NP_NoOvrlp	SO2	0.0190	TON	PROJECTION	1.072	rwc
42003	PA	Allegheny	2104011000	2011EPA_NP_NoOvrlp	SO2	0.0895	TON	PROJECTION	0.2186	nonpt
42003	PA	Allegheny	2280002100	2011EPA_CMV	SO2	0.0727	TON	PROJECTION	0.1276	c1c2rail
42003	PA	Allegheny	2280002200	2011EPA_CMV	SO2	0.0000	TON	PROJECTION	0.1276	c1c2rail
42003	PA	Allegheny	2285002006	2011EPA_Rail	SO2	0.0001	TON	PROJECTION	0.0319	c1c2rail
42003	PA	Allegheny	2285002007	2011EPA_Rail	SO2	0.0000	TON	PROJECTION	0.0319	c1c2rail
42003	PA	Allegheny	2310000220	2011PADEP	SO2	0.0007	TON	PROJECTION&UNKNOWNMSR	1	oilgas
42003	PA	Allegheny	2310000330	2011PADEP	SO2	0.0001	TON	PROJECTION	1	oilgas
42003	PA	Allegheny	2310000660	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310010200	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310011000	2011PADEP	SO2	0.0000	TON	PROJECTION&UNKNOWNMSR	0	oilgas
42003	PA	Allegheny	2310021010	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	control_measures	projection_factor	cat
42003	PA	Allegheny	2310021100	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310021202	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310021251	2011PADEP	SO2	0.0039	TON	PROJECTION	2.2313	oilgas
42003	PA	Allegheny	2310021302	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310021351	2011PADEP	SO2	0.0140	TON	PROJECTION	2.2313	oilgas
42003	PA	Allegheny	2310021400	2011PADEP	SO2	0.1734	TON	PROJECTION	2.2313	oilgas
42003	PA	Allegheny	2310021509	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310021603	2011PADEP	SO2	4.8058	TON	PROJECTION	2.2313	oilgas
42003	PA	Allegheny	2310111700	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2310121700	2011PADEP	SO2	0.0000	TON	PROJECTION	0	oilgas
42003	PA	Allegheny	2801500000	2011EPA_NP_NoOvrlp	SO2	0.0004	TON	PROJECTION	1.0079	agburn
42003	PA	Allegheny	2810060100	2011EPA_NP_NoOvrlp	SO2	0.0759	TON	PROJECTION	0.9688	nonpt
42003	PA	Allegheny	2811015000	2011EPA_EVENTFIRES	SO2	0.2562	TON	N/A	1	fire

SCC	SCC Short Name	Emissions Category
2102002000	Stationary Fuel Comb /Industrial /Bituminous/Subbituminous Coal /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102004000	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2102005000	Stationary Fuel Comb /Industrial /Residual Oil /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2102007000	Stationary Fuel Comb /Industrial /Liquified Petroleum Gas /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102008000	Stationary Fuel Comb /Industrial /Wood /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2102011000	Stationary Fuel Comb /Industrial /Kerosene /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103004000	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2103005000	Stationary Fuel Comb /Commercial/Institutional /Residual Oil /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines	Fuel Combustion (Industrial/Commercial)
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquified Petroleum Gas /Total: All Combustor Types	Fuel Combustion (Industrial/Commercial)
2103008000	Stationary Fuel Comb /Commercial/Institutional /Wood /Total: All Boiler Types	Fuel Combustion (Industrial/Commercial)
2103011000	Stationary Fuel Comb /Commercial/Institutional /Kerosene /Total: All Combustor Types	Fuel Combustion (Industrial/Commercial)
2104001000	Stationary Fuel Comb /Residential /Anthracite Coal /Total: All Combustor Types	Fuel Combustion (Residential)
2104002000	Stationary Fuel Comb /Residential /Bituminous/Subbituminous Coal /Total: All Combustor Types	Fuel Combustion (Residential)
2104004000	Stationary Fuel Comb /Residential /Distillate Oil /Total: All Combustor Types	Fuel Combustion (Residential)
2104006000	Stationary Fuel Comb /Residential /Natural Gas /Total: All Combustor Types	Fuel Combustion (Residential)
2104007000	Stationary Fuel Comb /Residential /Liquified Petroleum Gas /Total: All Combustor Types	Fuel Combustion (Residential)
2104008100	Stationary Fuel Comb /Residential /Wood /Fireplace: general	Fuel Combustion (Residential Wood)
2104008210	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; non-EPA certified	Fuel Combustion (Residential Wood)
2104008220	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; non-catalytic	Fuel Combustion (Residential Wood)
2104008230	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; catalytic	Fuel Combustion (Residential Wood)
2104008310	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, non-EPA certified	Fuel Combustion (Residential Wood)
2104008320	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, non-catalytic	Fuel Combustion (Residential Wood)
2104008330	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, catalytic	Fuel Combustion (Residential Wood)
2104008400	Stationary Fuel Comb /Residential /Wood /Woodstove: pellet-fired, general (freestanding or FP insert)	Fuel Combustion (Residential Wood)
2104008510	Stationary Fuel Comb /Residential /Wood /Furnace: Indoor, cordwood-fired, non-EPA certified	Fuel Combustion (Residential Wood)
2104008610	Stationary Fuel Comb /Residential /Wood /Hydronic heater: outdoor	Fuel Combustion (Residential Wood)
2104008700	Stationary Fuel Comb /Residential /Wood /Outdoor Wood Burning Equipment	Fuel Combustion (Residential Wood)
2104011000	Stationary Fuel Comb /Residential /Kerosene /Total: All Heater Types	Fuel Combustion (Residential)
2280002100	Marine Vessels, Commercial /Diesel /Port emissions	Marine/Railroad
2280002200	Marine Vessels, Commercial /Diesel /Underway emissions	Marine/Railroad
2285002006	Railroad Equipment /Diesel /Line Haul Locomotives: Class I Operations	Marine/Railroad
2285002007	Railroad Equipment /Diesel /Line Haul Locomotives: Class II / III Operations	Marine/Railroad
2310000220	Oil & Gas Expl & Prod /All Processes /Drill Rigs	Oil and Gas Exploration/Production
2310000330	Oil & Gas Expl & Prod /All Processes /Artificial Lift	Oil and Gas Exploration/Production
2310000660	Oil & Gas Expl & Prod /All Processes /Hydraulic Fracturing Engines	Oil and Gas Exploration/Production
2310010200	Oil & Gas Expl & Prod /Crude Petroleum /Oil Well Tanks - Flashing & Standing/Working/Breathing	Oil and Gas Exploration/Production
2310011000	On-Shore Oil Production /Total: All Processes	Oil and Gas Exploration/Production

SCC	SCC Short Name	Emissions Category
2310021010	On-Shore Gas Production /Storage Tanks: Condensate	Oil and Gas Exploration/Production
2310021100	On-Shore Gas Production /Gas Well Heaters	Oil and Gas Exploration/Production
2310021202	On-Shore Gas Production /Natural Gas Fired 4Cycle Lean Burn Compressor Engines 50 To 499 HP	Oil and Gas Exploration/Production
2310021251	On-Shore Gas Production /Lateral Compressors 4 Cycle Lean Burn	Oil and Gas Exploration/Production
2310021302	On-Shore Gas Production /Natural Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 HP	Oil and Gas Exploration/Production
2310021351	On-Shore Gas Production /Lateral Compressors 4 Cycle Rich Burn	Oil and Gas Exploration/Production
2310021400	On-Shore Gas Production /Gas Well Dehydrators	Oil and Gas Exploration/Production
2310021509	On-Shore Gas Production /Fugitives: All Processes	Oil and Gas Exploration/Production
2310021603	On-Shore Gas Production /Gas Well Venting - Blowdowns	Oil and Gas Exploration/Production
2310111700	On-Shore Oil Production /Oil Well Completion: All Processes	Oil and Gas Exploration/Production
2310121700	On-Shore Gas Production /Gas Well Completion: All Processes	Oil and Gas Exploration/Production
2801500000	Agric - Crops /Field Burning - whole field set on fire /Unspecified	Agriculture
2810060100	Cremation /Humans	Cremation
2811015000	Prescribed Forest Burning	Prescribed Fires

2018 Projected Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 1

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category	Ann_proj_factor
42003	PA	Allegheny	2260001010	2011EPAMOBILE	SO2	0.00066	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Motorcycles: Off-road	Off-Highway Equip (Gasoline)	0.8077
42003	PA	Allegheny	2260001030	2011EPAMOBILE	SO2	0.00085	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /All Terrain Vehicles	Off-Highway Equip (Gasoline)	0.9943
42003	PA	Allegheny	2260001060	2011EPAMOBILE	SO2	0.00009	TON	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Gasoline)	0.6377
42003	PA	Allegheny	2260002006	2011EPAMOBILE	SO2	0.00016	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Gasoline)	0.6208
42003	PA	Allegheny	2260002009	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Gasoline)	0.6313
42003	PA	Allegheny	2260002021	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Gasoline)	0.6311
42003	PA	Allegheny	2260002027	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Gasoline)	0.6337
42003	PA	Allegheny	2260002039	2011EPAMOBILE	SO2	0.00043	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Gasoline)	0.6312
42003	PA	Allegheny	2260002054	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Gasoline)	0.6315
42003	PA	Allegheny	2260003030	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Gasoline)	0.273
42003	PA	Allegheny	2260003040	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Gasoline)	0.2677
42003	PA	Allegheny	2260004015	2011EPAMOBILE	SO2	0.00007	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)	Off-Highway Equip (Gasoline)	0.7004
42003	PA	Allegheny	2260004016	2011EPAMOBILE	SO2	0.00021	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)	Off-Highway Equip (Gasoline)	0.6972
42003	PA	Allegheny	2260004020	2011EPAMOBILE	SO2	0.00103	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Residential)	Off-Highway Equip (Gasoline)	0.7053
42003	PA	Allegheny	2260004021	2011EPAMOBILE	SO2	0.00234	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Commercial)	Off-Highway Equip (Gasoline)	0.6977
42003	PA	Allegheny	2260004025	2011EPAMOBILE	SO2	0.00141	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)	Off-Highway Equip (Gasoline)	0.6983
42003	PA	Allegheny	2260004026	2011EPAMOBILE	SO2	0.00203	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)	Off-Highway Equip (Gasoline)	0.6903
42003	PA	Allegheny	2260004030	2011EPAMOBILE	SO2	0.00091	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)	Off-Highway Equip (Gasoline)	0.697
42003	PA	Allegheny	2260004031	2011EPAMOBILE	SO2	0.00189	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Gasoline)	0.687
42003	PA	Allegheny	2260004035	2011EPAMOBILE	SO2	0.00045	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)	Off-Highway Equip (Gasoline)	0.7265
42003	PA	Allegheny	2260004036	2011EPAMOBILE	SO2	0.00062	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Gasoline)	0.7265
42003	PA	Allegheny	2260004071	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Gasoline)	0.6919
42003	PA	Allegheny	2260005035	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Agricultural Equipt /Sprayers	Off-Highway Equip (Gasoline)	0.6731
42003	PA	Allegheny	2260006005	2011EPAMOBILE	SO2	0.00016	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Generator Sets	Off-Highway Equip (Gasoline)	0.7351
42003	PA	Allegheny	2260006010	2011EPAMOBILE	SO2	0.00106	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Pumps	Off-Highway Equip (Gasoline)	0.7344
42003	PA	Allegheny	2260006015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Air Compressors	Off-Highway Equip (Gasoline)	0.7377
42003	PA	Allegheny	2260006035	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Gasoline)	0.7348
42003	PA	Allegheny	2260007005	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 2-Stroke /Logging Equipt /Chain Saws : 6 HP	Off-Highway Equip (Gasoline)	0.7448
42003	PA	Allegheny	2265001010	2011EPAMOBILE	SO2	0.00031	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Motorcycles: Off-road	Off-Highway Equip (Gasoline)	0.738
42003	PA	Allegheny	2265001030	2011EPAMOBILE	SO2	0.00326	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /All Terrain Vehicles	Off-Highway Equip (Gasoline)	0.7414
42003	PA	Allegheny	2265001050	2011EPAMOBILE	SO2	0.00497	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Golf Carts	Off-Highway Equip (Gasoline)	0.6474
42003	PA	Allegheny	2265001060	2011EPAMOBILE	SO2	0.00009	TON	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Gasoline)	0.612
42003	PA	Allegheny	2265002003	2011EPAMOBILE	SO2	0.00015	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Pavers	Off-Highway Equip (Gasoline)	0.6246
42003	PA	Allegheny	2265002006	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Gasoline)	0.6264
42003	PA	Allegheny	2265002009	2011EPAMOBILE	SO2	0.00028	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Gasoline)	0.6419
42003	PA	Allegheny	2265002015	2011EPAMOBILE	SO2	0.00026	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rollers	Off-Highway Equip (Gasoline)	0.6267
42003	PA	Allegheny	2265002021	2011EPAMOBILE	SO2	0.00052	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Gasoline)	0.6297
42003	PA	Allegheny	2265002024	2011EPAMOBILE	SO2	0.00022	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Gasoline)	0.6352
42003	PA	Allegheny	2265002027	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Gasoline)	0.6408
42003	PA	Allegheny	2265002030	2011EPAMOBILE	SO2	0.00046	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Gasoline)	0.6279
42003	PA	Allegheny	2265002033	2011EPAMOBILE	SO2	0.00016	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Gasoline)	0.6364
42003	PA	Allegheny	2265002039	2011EPAMOBILE	SO2	0.00096	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Gasoline)	0.6308
42003	PA	Allegheny	2265002042	2011EPAMOBILE	SO2	0.00046	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cement & Mortar Mixers	Off-Highway Equip (Gasoline)	0.6215
42003	PA	Allegheny	2265002045	2011EPAMOBILE	SO2	0.00004	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cranes	Off-Highway Equip (Gasoline)	0.5933
42003	PA	Allegheny	2265002054	2011EPAMOBILE	SO2	0.00006	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Gasoline)	0.6314
42003	PA	Allegheny	2265002057	2011EPAMOBILE	SO2	0.00005	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Gasoline)	0.5893
42003	PA	Allegheny	2265002060	2011EPAMOBILE	SO2	0.00013	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Gasoline)	0.5931
42003	PA	Allegheny	2265002066	2011EPAMOBILE	SO2	0.00032	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Gasoline)	0.6303
42003	PA	Allegheny	2265002072	2011EPAMOBILE	SO2	0.00021	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Gasoline)	0.6065
42003	PA	Allegheny	2265002078	2011EPAMOBILE	SO2	0.00007	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Dumpers/Tenders	Off-Highway Equip (Gasoline)	0.6135
42003	PA	Allegheny	2265002081	2011EPAMOBILE	SO2	0.00005	TON	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Gasoline)	0.5886
42003	PA	Allegheny	2265003010	2011EPAMOBILE	SO2	0.00017	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Gasoline)	0.2766
42003	PA	Allegheny	2265003020	2011EPAMOBILE	SO2	0.00048	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Forklifts	Off-Highway Equip (Gasoline)	0.2537
42003	PA	Allegheny	2265003030	2011EPAMOBILE	SO2	0.00012	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Gasoline)	0.2659
42003	PA	Allegheny	2265003040	2011EPAMOBILE	SO2	0.00023	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Gasoline)	0.2772
42003	PA	Allegheny	2265003050	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Gasoline)	0.2651
42003	PA	Allegheny	2265003060	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Gasoline)	0.2727
42003	PA	Allegheny	2265003070	2011EPAMOBILE	SO2	0.00005	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Gasoline)	0.2635
42003	PA	Allegheny	2265004010	2011EPAMOBILE	SO2	0.01260	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Residential)	Off-Highway Equip (Gasoline)	0.7063
42003	PA	Allegheny	2265004011	2011EPAMOBILE	SO2	0.00597	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Commercial)	Off-Highway Equip (Gasoline)	0.7137
42003	PA	Allegheny	2265004015	2011EPAMOBILE	SO2	0.00105	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)	Off-Highway Equip (Gasoline)	0.7032
42003	PA	Allegheny	2265004016	2011EPAMOBILE	SO2	0.00305	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)	Off-Highway Equip (Gasoline)	0.7103
42003	PA	Allegheny	2265004025	2011EPAMOBILE	SO2	0.00007	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)	Off-Highway Equip (Gasoline)	0.7075
42003	PA	Allegheny	2265004026	2011EPAMOBILE	SO2	0.00014	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)	Off-Highway Equip (Gasoline)	0.7025
42003	PA	Allegheny	2265004030	2011EPAMOBILE	SO2	0.00013	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)	Off-Highway Equip (Gasoline)	0.7059

2018 Projected Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 2

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category	Ann_proj_factor
42003	PA	Allegheny	2265004031	2011EPAMOBILE	SO2	0.00565	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Gasoline)	0.6825
42003	PA	Allegheny	2265004035	2011EPAMOBILE	SO2	0.00148	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)	Off-Highway Equip (Gasoline)	0.7266
42003	PA	Allegheny	2265004036	2011EPAMOBILE	SO2	0.00205	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Gasoline)	0.7266
42003	PA	Allegheny	2265004040	2011EPAMOBILE	SO2	0.00249	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Residential)	Off-Highway Equip (Gasoline)	0.6822
42003	PA	Allegheny	2265004041	2011EPAMOBILE	SO2	0.00066	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Commercial)	Off-Highway Equip (Gasoline)	0.6903
42003	PA	Allegheny	2265004046	2011EPAMOBILE	SO2	0.00073	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Front Mowers (Commercial)	Off-Highway Equip (Gasoline)	0.6687
42003	PA	Allegheny	2265004051	2011EPAMOBILE	SO2	0.00035	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Shredders < 6 HP (Commercial)	Off-Highway Equip (Gasoline)	0.7096
42003	PA	Allegheny	2265004055	2011EPAMOBILE	SO2	0.03337	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Residential)	Off-Highway Equip (Gasoline)	0.6806
42003	PA	Allegheny	2265004056	2011EPAMOBILE	SO2	0.00891	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)	Off-Highway Equip (Gasoline)	0.69
42003	PA	Allegheny	2265004066	2011EPAMOBILE	SO2	0.00147	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Gasoline)	0.6754
42003	PA	Allegheny	2265004071	2011EPAMOBILE	SO2	0.02883	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Gasoline)	0.6951
42003	PA	Allegheny	2265004075	2011EPAMOBILE	SO2	0.00119	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Residential)	Off-Highway Equip (Gasoline)	0.6861
42003	PA	Allegheny	2265004076	2011EPAMOBILE	SO2	0.00088	TON	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)	Off-Highway Equip (Gasoline)	0.6859
42003	PA	Allegheny	2265005010	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /2-Wheel Tractors	Off-Highway Equip (Gasoline)	0.6759
42003	PA	Allegheny	2265005015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Tractors	Off-Highway Equip (Gasoline)	0.6433
42003	PA	Allegheny	2265005020	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Combines	Off-Highway Equip (Gasoline)	0.6105
42003	PA	Allegheny	2265005025	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Balers	Off-Highway Equip (Gasoline)	0.6411
42003	PA	Allegheny	2265005030	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Mowers	Off-Highway Equip (Gasoline)	0.6614
42003	PA	Allegheny	2265005035	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Sprayers	Off-Highway Equip (Gasoline)	0.6585
42003	PA	Allegheny	2265005040	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Tillers : 6 HP	Off-Highway Equip (Gasoline)	0.6414
42003	PA	Allegheny	2265005045	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Swathers	Off-Highway Equip (Gasoline)	0.6417
42003	PA	Allegheny	2265005055	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Gasoline)	0.6458
42003	PA	Allegheny	2265005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Gasoline)	0.6435
42003	PA	Allegheny	2265006005	2011EPAMOBILE	SO2	0.03247	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Generator Sets	Off-Highway Equip (Gasoline)	0.7244
42003	PA	Allegheny	2265006010	2011EPAMOBILE	SO2	0.00818	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pumps	Off-Highway Equip (Gasoline)	0.7384
42003	PA	Allegheny	2265006015	2011EPAMOBILE	SO2	0.00432	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Air Compressors	Off-Highway Equip (Gasoline)	0.7282
42003	PA	Allegheny	2265006025	2011EPAMOBILE	SO2	0.00932	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Welders	Off-Highway Equip (Gasoline)	0.7288
42003	PA	Allegheny	2265006030	2011EPAMOBILE	SO2	0.01469	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pressure Washers	Off-Highway Equip (Gasoline)	0.7405
42003	PA	Allegheny	2265006035	2011EPAMOBILE	SO2	0.00069	TON	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Gasoline)	0.7378
42003	PA	Allegheny	2265007010	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Gasoline, 4-Stroke /Logging Equipt /Shredders : 6 HP	Off-Highway Equip (Gasoline)	0.7196
42003	PA	Allegheny	2265007015	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Gasoline, 4-Stroke /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder	Off-Highway Equip (Gasoline)	0.7595
42003	PA	Allegheny	2265010010	2011EPAMOBILE	SO2	0.00074	TON	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Gasoline)	0.6268
42003	PA	Allegheny	2267001060	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Other)	0.9984
42003	PA	Allegheny	2267002003	2011EPAMOBILE	SO2	0.00005	TON	Off-highway LPG /Construction & Mining Equipt /Pavers	Off-Highway Equip (Other)	1.0555
42003	PA	Allegheny	2267002015	2011EPAMOBILE	SO2	0.00008	TON	Off-highway LPG /Construction & Mining Equipt /Rollers	Off-Highway Equip (Other)	1.0738
42003	PA	Allegheny	2267002021	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Other)	1.0476
42003	PA	Allegheny	2267002024	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Other)	1.0589
42003	PA	Allegheny	2267002030	2011EPAMOBILE	SO2	0.00016	TON	Off-highway LPG /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Other)	1.0533
42003	PA	Allegheny	2267002033	2011EPAMOBILE	SO2	0.00006	TON	Off-highway LPG /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Other)	1.063
42003	PA	Allegheny	2267002039	2011EPAMOBILE	SO2	0.00015	TON	Off-highway LPG /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Other)	1.0925
42003	PA	Allegheny	2267002045	2011EPAMOBILE	SO2	0.00006	TON	Off-highway LPG /Construction & Mining Equipt /Cranes	Off-Highway Equip (Other)	1.0447
42003	PA	Allegheny	2267002054	2011EPAMOBILE	SO2	0.00001	TON	Off-highway LPG /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Other)	1.0447
42003	PA	Allegheny	2267002057	2011EPAMOBILE	SO2	0.00010	TON	Off-highway LPG /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Other)	1.048
42003	PA	Allegheny	2267002060	2011EPAMOBILE	SO2	0.00024	TON	Off-highway LPG /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Other)	1.0564
42003	PA	Allegheny	2267002066	2011EPAMOBILE	SO2	0.00003	TON	Off-highway LPG /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Other)	1.0665
42003	PA	Allegheny	2267002072	2011EPAMOBILE	SO2	0.00021	TON	Off-highway LPG /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Other)	1.0486
42003	PA	Allegheny	2267002081	2011EPAMOBILE	SO2	0.00009	TON	Off-highway LPG /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Other)	1.0461
42003	PA	Allegheny	2267003010	2011EPAMOBILE	SO2	0.00122	TON	Off-highway LPG /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Other)	1.0887
42003	PA	Allegheny	2267003020	2011EPAMOBILE	SO2	0.10824	TON	Off-highway LPG /Industrial Equipt /Forklifts	Off-Highway Equip (Other)	1.0951
42003	PA	Allegheny	2267003030	2011EPAMOBILE	SO2	0.00083	TON	Off-highway LPG /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Other)	1.1175
42003	PA	Allegheny	2267003040	2011EPAMOBILE	SO2	0.00025	TON	Off-highway LPG /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Other)	1.1058
42003	PA	Allegheny	2267003050	2011EPAMOBILE	SO2	0.00007	TON	Off-highway LPG /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Other)	1.0832
42003	PA	Allegheny	2267003070	2011EPAMOBILE	SO2	0.00050	TON	Off-highway LPG /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Other)	1.1318
42003	PA	Allegheny	2267004066	2011EPAMOBILE	SO2	0.00083	TON	Off-highway LPG /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Other)	1.0646
42003	PA	Allegheny	2267005055	2011EPAMOBILE	SO2	0.00000	TON	Off-highway LPG /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Other)	0.8868
42003	PA	Allegheny	2267005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway LPG /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Other)	0.8565
42003	PA	Allegheny	2267006005	2011EPAMOBILE	SO2	0.00761	TON	Off-highway LPG /Commercial Equipt /Generator Sets	Off-Highway Equip (Other)	1.2133
42003	PA	Allegheny	2267006010	2011EPAMOBILE	SO2	0.00169	TON	Off-highway LPG /Commercial Equipt /Pumps	Off-Highway Equip (Other)	1.2054
42003	PA	Allegheny	2267006015	2011EPAMOBILE	SO2	0.00199	TON	Off-highway LPG /Commercial Equipt /Air Compressors	Off-Highway Equip (Other)	1.2027
42003	PA	Allegheny	2267006025	2011EPAMOBILE	SO2	0.00248	TON	Off-highway LPG /Commercial Equipt /Welders	Off-Highway Equip (Other)	1.2031
42003	PA	Allegheny	2267006030	2011EPAMOBILE	SO2	0.00003	TON	Off-highway LPG /Commercial Equipt /Pressure Washers	Off-Highway Equip (Other)	1.2008
42003	PA	Allegheny	2267006035	2011EPAMOBILE	SO2	0.00003	TON	Off-highway LPG /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Other)	1.2137
42003	PA	Allegheny	2268002081	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Other)	1.1062
42003	PA	Allegheny	2268003020	2011EPAMOBILE	SO2	0.00741	TON	Off-highway CNG /Industrial Equipt /Forklifts	Off-Highway Equip (Other)	1.1412
42003	PA	Allegheny	2268003030	2011EPAMOBILE	SO2	0.00001	TON	Off-highway CNG /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Other)	1.1417

2018 Projected Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 3

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category	Ann_proj_factor
42003	PA	Allegheny	2268003040	2011EPAMOBILE	SO2	0.00001	TON	Off-highway CNG /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Other)	1.1436
42003	PA	Allegheny	2268003060	2011EPAMOBILE	SO2	0.00002	TON	Off-highway CNG /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Other)	1.148
42003	PA	Allegheny	2268003070	2011EPAMOBILE	SO2	0.00003	TON	Off-highway CNG /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Other)	1.1616
42003	PA	Allegheny	2268005055	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Other)	1
42003	PA	Allegheny	2268005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway CNG /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Other)	1
42003	PA	Allegheny	2268006005	2011EPAMOBILE	SO2	0.00188	TON	Off-highway CNG /Commercial Equipt /Generator Sets	Off-Highway Equip (Other)	1.1579
42003	PA	Allegheny	2268006010	2011EPAMOBILE	SO2	0.00009	TON	Off-highway CNG /Commercial Equipt /Pumps	Off-Highway Equip (Other)	1.1549
42003	PA	Allegheny	2268006015	2011EPAMOBILE	SO2	0.00013	TON	Off-highway CNG /Commercial Equipt /Air Compressors	Off-Highway Equip (Other)	1.156
42003	PA	Allegheny	2268006020	2011EPAMOBILE	SO2	0.00476	TON	Off-highway CNG /Commercial Equipt /Gas Compressors	Off-Highway Equip (Other)	1.1929
42003	PA	Allegheny	2268010010	2011EPAMOBILE	SO2	0.00101	TON	Off-highway CNG /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Other)	1.0348
42003	PA	Allegheny	2270001060	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Diesel /Recreational Equipt /Specialty Vehicles/Carts	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002003	2011EPAMOBILE	SO2	0.00071	TON	Off-highway Diesel /Construction & Mining Equipt /Pavers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002006	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Construction & Mining Equipt /Tampers/Rammers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002009	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Diesel /Construction & Mining Equipt /Plate Compactors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002015	2011EPAMOBILE	SO2	0.00180	TON	Off-highway Diesel /Construction & Mining Equipt /Rollers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002018	2011EPAMOBILE	SO2	0.00192	TON	Off-highway Diesel /Construction & Mining Equipt /Scrapers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002021	2011EPAMOBILE	SO2	0.00011	TON	Off-highway Diesel /Construction & Mining Equipt /Paving Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002024	2011EPAMOBILE	SO2	0.00007	TON	Off-highway Diesel /Construction & Mining Equipt /Surfacing Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002027	2011EPAMOBILE	SO2	0.00020	TON	Off-highway Diesel /Construction & Mining Equipt /Signal Boards/Light Plants	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002030	2011EPAMOBILE	SO2	0.00086	TON	Off-highway Diesel /Construction & Mining Equipt /Trenchers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002033	2011EPAMOBILE	SO2	0.00073	TON	Off-highway Diesel /Construction & Mining Equipt /Bore/Drill Rigs	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002036	2011EPAMOBILE	SO2	0.00719	TON	Off-highway Diesel /Construction & Mining Equipt /Excavators	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002039	2011EPAMOBILE	SO2	0.00006	TON	Off-highway Diesel /Construction & Mining Equipt /Concrete/Industrial Saws	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002042	2011EPAMOBILE	SO2	0.00003	TON	Off-highway Diesel /Construction & Mining Equipt /Cement & Mortar Mixers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002045	2011EPAMOBILE	SO2	0.00165	TON	Off-highway Diesel /Construction & Mining Equipt /Cranes	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002048	2011EPAMOBILE	SO2	0.00178	TON	Off-highway Diesel /Construction & Mining Equipt /Graders	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002051	2011EPAMOBILE	SO2	0.00602	TON	Off-highway Diesel /Construction & Mining Equipt /Off-highway Trucks	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002054	2011EPAMOBILE	SO2	0.00029	TON	Off-highway Diesel /Construction & Mining Equipt /Crushing/Processing Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002057	2011EPAMOBILE	SO2	0.00234	TON	Off-highway Diesel /Construction & Mining Equipt /Rough Terrain Forklifts	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002060	2011EPAMOBILE	SO2	0.00784	TON	Off-highway Diesel /Construction & Mining Equipt /Rubber Tire Loaders	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002066	2011EPAMOBILE	SO2	0.00484	TON	Off-highway Diesel /Construction & Mining Equipt /Tractors/Loaders/Backhoes	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002069	2011EPAMOBILE	SO2	0.00715	TON	Off-highway Diesel /Construction & Mining Equipt /Crawler Tractor/Dozers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002072	2011EPAMOBILE	SO2	0.00332	TON	Off-highway Diesel /Construction & Mining Equipt /Skid Steer Loaders	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002075	2011EPAMOBILE	SO2	0.00077	TON	Off-highway Diesel /Construction & Mining Equipt /Off-highway Tractors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002078	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Diesel /Construction & Mining Equipt /Dumpers/Tenders	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270002081	2011EPAMOBILE	SO2	0.00074	TON	Off-highway Diesel /Construction & Mining Equipt /Other Construction Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003010	2011EPAMOBILE	SO2	0.00017	TON	Off-highway Diesel /Industrial Equipt /Aerial Lifts	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003020	2011EPAMOBILE	SO2	0.00249	TON	Off-highway Diesel /Industrial Equipt /Forklifts	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003030	2011EPAMOBILE	SO2	0.00109	TON	Off-highway Diesel /Industrial Equipt /Sweepers/Scrubbers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003040	2011EPAMOBILE	SO2	0.00110	TON	Off-highway Diesel /Industrial Equipt /Other General Industrial Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003050	2011EPAMOBILE	SO2	0.00004	TON	Off-highway Diesel /Industrial Equipt /Other Material H&ling Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003060	2011EPAMOBILE	SO2	0.00438	TON	Off-highway Diesel /Industrial Equipt /AC\Refrigeration	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270003070	2011EPAMOBILE	SO2	0.00154	TON	Off-highway Diesel /Industrial Equipt /Terminal Tractors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004031	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004036	2011EPAMOBILE	SO2	0.00003	TON	Off-highway Diesel /Lawn & Garden Equipt /Snowblowers (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004046	2011EPAMOBILE	SO2	0.00078	TON	Off-highway Diesel /Lawn & Garden Equipt /Front Mowers (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004056	2011EPAMOBILE	SO2	0.00016	TON	Off-highway Diesel /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004066	2011EPAMOBILE	SO2	0.00105	TON	Off-highway Diesel /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004071	2011EPAMOBILE	SO2	0.00012	TON	Off-highway Diesel /Lawn & Garden Equipt /Turf Equipt (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270004076	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005010	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /2-Wheel Tractors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005015	2011EPAMOBILE	SO2	0.00032	TON	Off-highway Diesel /Agricultural Equipt /Agricultural Tractors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005020	2011EPAMOBILE	SO2	0.00003	TON	Off-highway Diesel /Agricultural Equipt /Combines	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005025	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Balers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005030	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Agricultural Mowers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005035	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Sprayers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005040	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Tillers : 6 HP	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005045	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Swathers	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005055	2011EPAMOBILE	SO2	0.00001	TON	Off-highway Diesel /Agricultural Equipt /Other Agricultural Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270005060	2011EPAMOBILE	SO2	0.00000	TON	Off-highway Diesel /Agricultural Equipt /Irrigation Sets	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270006005	2011EPAMOBILE	SO2	0.00355	TON	Off-highway Diesel /Commercial Equipt /Generator Sets	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270006010	2011EPAMOBILE	SO2	0.00084	TON	Off-highway Diesel /Commercial Equipt /Pumps	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270006015	2011EPAMOBILE	SO2	0.00232	TON	Off-highway Diesel /Commercial Equipt /Air Compressors	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270006025	2011EPAMOBILE	SO2	0.00118	TON	Off-highway Diesel /Commercial Equipt /Welders	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270006030	2011EPAMOBILE	SO2	0.00011	TON	Off-highway Diesel /Commercial Equipt /Pressure Washers	Off-Highway Equip (Diesel)	0.1

2018 Projected Nonroad Source Emissions Inventory (Annual Tons by Source Category) - Page 4

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Emissions Category	Ann_proj_factor
42003	PA	Allegheny	2270006035	2011EPAMOBILE	SO2	0.00010	TON	Off-highway Diesel /Commercial Equipt /Hydro-power Units	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270007015	2011EPAMOBILE	SO2	0.00002	TON	Off-highway Diesel /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2270010010	2011EPAMOBILE	SO2	0.00042	TON	Off-highway Diesel /Industrial Equipt /Other Oil Field Equipt	Off-Highway Equip (Diesel)	0.1
42003	PA	Allegheny	2282005010	2011EPAMOBILE	SO2	0.00472	TON	Pleasure Craft /Gasoline 2-Stroke /Outboard	Marine	0.6098
42003	PA	Allegheny	2282005015	2011EPAMOBILE	SO2	0.00198	TON	Pleasure Craft /Gasoline 2-Stroke /Personal Water Craft	Marine	0.5997
42003	PA	Allegheny	2282010005	2011EPAMOBILE	SO2	0.00283	TON	Pleasure Craft /Gasoline 4-Stroke /Inboard/Sterndrive	Marine	0.5877
42003	PA	Allegheny	2282020005	2011EPAMOBILE	SO2	0.00078	TON	Pleasure Craft /Diesel /Inboard/Sterndrive	Marine	0.1652
42003	PA	Allegheny	2282020010	2011EPAMOBILE	SO2	0.00000	TON	Pleasure Craft /Diesel /Outboard	Marine	0.1655
42003	PA	Allegheny	2285002015	2011EPAMOBILE	SO2	0.00009	TON	Railroad Equipt /Diesel /Railway Maintenance	Railroad	0.1
42003	PA	Allegheny	2285004015	2011EPAMOBILE	SO2	0.00003	TON	Railroad Equipt /Gasoline, 4-Stroke /Railway Maintenance	Railroad	0.6638
42003	PA	Allegheny	2285006015	2011EPAMOBILE	SO2	0.00000	TON	Railroad Equipt /LPG /Railway Maintenance	Railroad	1.0497

2018 Projected Onroad Source Emissions Inventory (Annual Tons by Source Category)

fips_code	st_usps_cd	county_name	scc	data_set_short_name	pollutant_cd	NAA_emissions	uom	SCC Short Name	Vehicle Type
42003	PA	Allegheny	2201110080	2011EPAMOVES2014	SO2	0.01200	TON	Highway Veh - Gasoline - Motorcycles (MC) - All on and off-network processes except refueling	Motorcycle
42003	PA	Allegheny	2201210080	2011EPAMOVES2014	SO2	1.08395	TON	Highway Veh - Gasoline - Passenger Car - All on and off-network processes except refueling	Passenger Car
42003	PA	Allegheny	2201310080	2011EPAMOVES2014	SO2	0.68405	TON	Highway Veh - Gasoline - Passenger Truck - All on and off-network processes except refueling	Passenger Truck
42003	PA	Allegheny	2201320080	2011EPAMOVES2014	SO2	0.22164	TON	Highway Veh - Gasoline - Light Commercial Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201420080	2011EPAMOVES2014	SO2	0.00029	TON	Highway Veh - Gasoline - Transit Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2201430080	2011EPAMOVES2014	SO2	0.00039	TON	Highway Veh - Gasoline - School Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2201510080	2011EPAMOVES2014	SO2	0.00011	TON	Highway Veh - Gasoline - Refuse Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201520080	2011EPAMOVES2014	SO2	0.03287	TON	Highway Veh - Gasoline - Single Unit Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201530080	2011EPAMOVES2014	SO2	0.00139	TON	Highway Veh - Gasoline - Single Unit Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2201540080	2011EPAMOVES2014	SO2	0.00415	TON	Highway Veh - Gasoline - Motor Home - All on and off-network processes except refueling	Motor Home
42003	PA	Allegheny	2201610080	2011EPAMOVES2014	SO2	0.00002	TON	Highway Veh - Gasoline - Combination Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202210080	2011EPAMOVES2014	SO2	0.01950	TON	Highway Veh - Diesel - Passenger Car - All on and off-network processes except refueling	Passenger Car
42003	PA	Allegheny	2202310080	2011EPAMOVES2014	SO2	0.06849	TON	Highway Veh - Diesel - Passenger Truck - All on and off-network processes except refueling	Passenger Truck
42003	PA	Allegheny	2202320080	2011EPAMOVES2014	SO2	0.07436	TON	Highway Veh - Diesel - Light Commercial Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202410080	2011EPAMOVES2014	SO2	0.00787	TON	Highway Veh - Diesel - Intercity Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202420080	2011EPAMOVES2014	SO2	0.02855	TON	Highway Veh - Diesel - Transit Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202430080	2011EPAMOVES2014	SO2	0.00902	TON	Highway Veh - Diesel - School Bus - All on and off-network processes except refueling	Bus
42003	PA	Allegheny	2202510080	2011EPAMOVES2014	SO2	0.00755	TON	Highway Veh - Diesel - Refuse Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202520080	2011EPAMOVES2014	SO2	0.12865	TON	Highway Veh - Diesel - Single Unit Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202530080	2011EPAMOVES2014	SO2	0.00514	TON	Highway Veh - Diesel - Single Unit Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202540080	2011EPAMOVES2014	SO2	0.00355	TON	Highway Veh - Diesel - Motor Home - All on and off-network processes except refueling	Motor Home
42003	PA	Allegheny	2202610080	2011EPAMOVES2014	SO2	0.35390	TON	Highway Veh - Diesel - Combination Short-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2202620080	2011EPAMOVES2014	SO2	0.21244	TON	Highway Veh - Diesel - Combination Long-haul Truck - All on and off-network processes except refueling	Commercial Truck
42003	PA	Allegheny	2203420080	2011EPAMOVES2014	SO2	0.00404	TON	Highway Veh - CNG - Transit Bus - All on and off-network processes except refueling	Bus

D-3: Modeling Inventories

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Modeling Inventory, Point Sources, Actuals 2012-2014 (for Performance Testing) - Page 1

POINT SOURCE	ID	UTMx	UTMy	ELEV	HEIGHT	TEMP	VEL	DIAM	BLDG	2012 ACTUAL g/s	2013 ACTUAL g/s	2014 ACTUAL g/s	COMMENT
US STEEL CLAIRTON Quench Tower 1	CLQNCH1	595964.00	4461731.00	231	30.48	358.49	3.54	6.80	YES	0.054	0.054	0.051	
US STEEL CLAIRTON Quench Tower 5	CLQNCH5	595472.00	4462078.00	231	30.48	358.49	3.54	7.10	YES	0.089	0.088	0.030	
US STEEL CLAIRTON Quench Tower 7	CLQNCH7	595430.00	4462047.00	231	37.18	362.77	2.99	8.81	YES	0.059	0.057	0.010	
US STEEL CLAIRTON Quench Tower B	CLQNCHB	595460.00	4462374.00	231	41.15	368.55	4.30	9.51	YES	0.225	0.199	0.284	
US STEEL CLAIRTON Quench Tower C	CLQNCHC	595622.00	4462186.00	231	50.00	378.00	3.66	12.67	YES	0.057	0.545	0.705	Began near end of 2012
US STEEL CLAIRTON Quench Tower 5A	CLQNCH5A	595223.00	4462366.00	231	50.00	378.00	3.66	12.67	YES	--	--	0.002	Began in 2014
US STEEL CLAIRTON Quench Tower 7A	CLQNCH7A	595188.00	4462316.00	231	50.00	378.00	3.66	12.67	YES	--	--	0.040	Began in 2014
US STEEL CLAIRTON PEC Baghouse 1-3 (seg a)	CLPEC1a	595865.75	4461872.18	231	24.99	324.83	8.84	1.22	YES	0.381	0.366	0.336	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 1-3 (seg b)	CLPEC1b	595861.10	4461877.19	231	24.99	324.83	8.84	1.22	YES	0.381	0.366	0.336	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 1-3 (seg c)	CLPEC1c	595856.39	4461882.39	231	24.99	324.83	8.84	1.22	YES	0.381	0.366	0.336	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg a)	CLPEC13a	595324.70	4462210.47	231	24.99	324.83	16.95	0.91	YES	0.469	0.453	0.450	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg b)	CLPEC13b	595320.28	4462215.54	231	24.99	324.83	16.95	0.91	YES	0.469	0.453	0.450	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg c)	CLPEC13c	595315.94	4462220.42	231	24.99	324.83	16.95	0.91	YES	0.469	0.453	0.450	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg a)	CLPEC19a	595319.97	4462206.37	231	24.99	304.83	15.60	0.91	YES	0.580	0.562	0.541	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg b)	CLPEC19b	595315.54	4462211.35	231	24.99	304.83	15.60	0.91	YES	0.580	0.562	0.541	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg c)	CLPEC19c	595311.02	4462216.53	231	24.99	304.83	15.60	0.91	YES	0.580	0.562	0.541	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg a)	CLPECBa	595439.48	4462426.08	231	15.54	324.83	13.78	1.22	YES	0.514	0.496	0.489	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg b)	CLPECBb	595430.87	4462433.71	231	15.54	324.83	13.78	1.22	YES	0.514	0.496	0.489	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg c)	CLPECBc	595420.91	4462441.34	231	15.54	324.83	13.78	1.22	YES	0.514	0.496	0.489	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse C	CLPECC	595678.00	4462007.00	231	30.00	328.20	15.10	2.49	YES	0.117	0.510	0.520	Began near end of 2012
US STEEL CLAIRTON Battery 1 Underfiring	CLCOMB1	595871.00	4461845.00	231	68.58	526.49	7.59	2.44	YES	1.697	0.935	0.970	
US STEEL CLAIRTON Battery 2 Underfiring	CLCOMB2	595866.00	4461852.00	231	68.58	534.27	7.71	2.44	YES	1.628	0.905	0.942	
US STEEL CLAIRTON Battery 3 Underfiring	CLCOMB3	595742.00	4461989.00	231	68.58	539.27	7.38	2.44	YES	1.460	1.158	1.159	
US STEEL CLAIRTON Battery 13 Underfiring	CLCOMB13	595389.00	4462164.00	231	68.58	535.38	4.48	3.05	YES	1.719	1.231	0.482	
US STEEL CLAIRTON Battery 14 Underfiring	CLCOMB14	595380.00	4462174.00	231	68.58	536.49	4.30	3.05	YES	1.963	1.401	0.923	
US STEEL CLAIRTON Battery 15 Underfiring	CLCOMB15	595253.00	4462318.00	231	68.58	541.49	4.48	3.05	YES	2.010	1.118	0.301	
US STEEL CLAIRTON Battery 19 Underfiring	CLCOMB19	595273.00	4462117.00	231	76.20	519.27	3.72	4.72	YES	3.060	2.166	1.462	
US STEEL CLAIRTON Battery 20 Underfiring	CLCOMB20	595258.00	4462134.00	231	76.20	542.05	4.27	4.72	YES	2.993	2.474	1.946	
US STEEL CLAIRTON B Battery Underfiring	CLCOMBB	595477.00	4462406.00	231	96.01	515.38	5.06	4.95	YES	5.439	2.846	2.941	
US STEEL CLAIRTON C Battery Underfiring	CLCOMBC	595768.00	4462126.00	231	98.14	503.20	5.81	3.66	YES	8.996	2.689	3.254	Began near end of 2012
US STEEL CLAIRTON Boiler 1	CLBLR1	595004.00	4462714.00	231	57.91	457.60	29.56	2.67	YES	7.848	7.200	7.279	
US STEEL CLAIRTON Boiler 2	CLBLR2	594989.00	4462717.00	231	57.91	437.05	21.94	2.13	YES	3.391	5.188	3.652	
US STEEL CLAIRTON Boiler R1	CLBLRR1	594892.00	4462604.00	231	50.29	524.27	7.47	2.59	YES	0.256	0.242	0.179	
US STEEL CLAIRTON Boiler R2	CLBLRR2	594892.00	4462604.00	231	50.29	524.27	7.47	2.59	YES	0.230	0.284	0.322	
US STEEL CLAIRTON Boiler T1	CLBLRT1	594845.00	4462563.00	231	26.52	544.27	9.05	1.46	YES	0.428	0.545	0.545	
US STEEL CLAIRTON Boiler T2	CLBLRT2	594837.00	4462569.00	231	26.52	543.16	9.05	1.46	YES	0.444	0.573	0.461	
US STEEL CLAIRTON SCOT Incinerator	CLSCOT	595575.00	4462036.00	231	45.72	638.16	17.43	1.17	YES	2.963	3.348	2.700	
US STEEL CLAIRTON Misc. Flaring	CLFLARE	595580.00	4462050.00	231	8.26	1273.00	20.00	0.63	N/A	0.004	0.012	0.015	Center of plant; WWTF used for height
US STEEL EDGAR THOMSON Riley Boiler 1	ETRB1	597057.00	4471990.00	225	49.17	672.04	7.86	4.22	YES	6.715	8.496	6.106	
US STEEL EDGAR THOMSON Riley Boiler 2	ETRB2	597042.00	4471996.00	225	49.17	672.04	7.86	4.22	YES	10.146	9.078	7.074	
US STEEL EDGAR THOMSON Riley Boiler 3	ETRB3	597027.00	4472001.00	225	49.17	672.04	7.86	4.22	YES	7.392	8.752	6.137	
US STEEL EDGAR THOMSON Blast Furnace 1 Stoves	ETBF1STV	597180.00	4472051.00	225	79.42	464.82	7.97	3.28	YES	5.645	5.363	4.779	
US STEEL EDGAR THOMSON Blast Furnace 3 Stoves	ETBF3STV	597014.00	4472084.00	225	57.05	522.59	9.84	2.59	YES	4.020	3.923	2.535	
US STEEL EDGAR THOMSON Casthouse Baghouse (4 comps)	ETCASTB	597131.00	4471997.00	225	27.43	394.26	10.00	3.60	YES	5.244	4.419	5.551	4 compartments aggregated to 1 stack
US STEEL EDGAR THOMSON BFG Flare	ETBFGF	597166.00	4471984.00	225	66.00	1273.00	20.00	0.92	YES	0.521	0.548	3.413	
US STEEL IRVIN Boiler #1	IRBLR1	593149.00	4465476.00	287	19.50	635.38	10.23	1.10	YES	0.616	0.608	0.589	
US STEEL IRVIN Boiler #2	IRBLR2	593171.00	4465165.00	287	21.94	537.05	8.00	1.28	YES	0.854	0.560	0.670	
US STEEL IRVIN Boilers #3-4	IRBLR3	593419.00	4465596.00	287	22.86	644.26	9.70	1.42	YES	0.429	0.427	0.424	Boilers 3 and 4 exhaust to same stack
US STEEL IRVIN 80" Mill Reheat Furnace 1	IR80IN1	593177.00	4465871.00	287	20.00	710.38	29.43	1.98	YES	1.728	1.291	1.251	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 2	IR80IN2	593178.00	4465884.00	287	20.00	710.38	29.43	1.98	YES	1.745	1.352	1.251	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 3	IR80IN3	593179.00	4465896.00	287	20.00	710.38	29.43	1.98	YES	1.693	1.299	1.245	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 4	IR80IN4	593180.00	4465909.00	287	20.00	710.38	29.43	1.98	YES	2.430	1.943	1.943	
US STEEL IRVIN 80" Mill Reheat Furnace 5	IR80IN5	593181.00	4465923.00	287	20.00	710.38	29.43	1.98	YES	2.496	1.843	1.921	
US STEEL IRVIN 80" Mill Reheat Waste Stack 6	IR80INW	593243.00	4465922.00	287	28.34	710.38	29.43	1.82	YES	2.579	1.969	1.871	Excess exhaust from furnaces 1-3
US STEEL IRVIN #1 Galv Line Preheat	IRGALV1	593352.00	4465406.00	287	25.30	944.26	9.48	1.42	YES	0.001	0.001	0.001	
US STEEL IRVIN #2 Galv Line Preheat	IRGALV2	593350.00	4465386.00	287	26.82	944.26	2.66	1.37	YES	0.001	0.001	0.001	
US STEEL IRVIN HPH Annealing Furnaces (seg a)	IRHPH_a	593328.56	4465585.48	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg b)	IRHPH_b	593325.15	4465553.51	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)

Modeling Inventory, Point Sources, Actuals 2012-2014 (for Performance Testing) - Page 2

POINT SOURCE	ID	UTMx	UTMy	ELEV	HEIGHT	TEMP	VEL	DIAM	BLDG	2012 ACTUAL g/s	2013 ACTUAL g/s	2014 ACTUAL g/s	COMMENT
US STEEL IRVIN HPH Annealing Furnaces (seg c)	IRHPH_c	593321.76	4465521.64	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg d)	IRHPH_d	593318.44	4465489.75	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg e)	IRHPH_e	593315.27	4465457.80	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg f)	IRHPH_f	593311.57	4465425.87	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg g)	IRHPH_g	593308.19	4465393.98	287	21.33	527.60	10.00	0.76	YES	0.118	0.090	0.094	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN Open Coil Annealing	IROCA	593335.00	4465243.00	287	21.33	310.94	10.52	2.96	YES	0.521	0.425	0.482	16 furnaces total
US STEEL IRVIN Continuous Annealing	IRCONTA	593341.00	4464903.00	287	36.57	513.72	10.52	1.07	YES	0.269	0.203	0.153	
US STEEL IRVIN Peach Tree Flare A&B	IRPTF	592868.00	4464808.00	333	18.28	1273.00	20.00	0.63	N/A	1.252	1.306	7.231	Intermittent
US STEEL IRVIN COG Flares 1-3	IRCOGF	593237.00	4464601.00	287	8.99	1273.00	20.00	0.63	N/A	0.831	0.753	0.902	Intermittent
ALLEGHENY ENERGY MITCHELL Boiler 33	MITCHELL	587839.00	4452707.00	228	114.29	320.38	19.20	6.10	YES	45.158	44.180	0.000	Deactivated in Oct 2013
ALLEGHENY ENERGY MITCHELL Boiler B&W Oil	MITCHBW	587838.00	4452754.00	228	58.82	463.70	7.92	4.27	YES	0.000	0.000	0.000	Deactivated in Oct 2013
ALLEGHENY ENERGY MITCHELL Aux Boiler	MITCHAUX	587756.00	4452812.00	228	45.72	469.20	6.98	1.06	YES	0.000	0.000	0.000	Deactivated in Oct 2013
NRG ELRAMA Boilers 1-4	ELRAMA	592059.00	4456413.00	229	119.48	324.83	15.07	7.92	YES	7.163	0.000	0.000	Deactivated in Oct 2012
BAY VALLEY Boilers 1-2	BAYVLY1	585581.00	4478787.00	222	76.22	472.00	6.40	3.05	YES	4.320	3.587	0.362	Coal is primary fuel in 2012-2013
BAY VALLEY Boilers 3-4,8	BAYVLY3	585592.00	4478798.00	222	76.22	394.00	3.35	3.05	YES	3.396	2.420	0.005	Coal is primary fuel in 2012-2013
GUARDIAN Melt Furnaces (no DI)	GUARDM	592123.00	4456544.00	231	24.99	535.22	25.51	2.70	YES	0.231	0.003	0.065	Shutdown in Aug 2015
GUARDIAN Melt Furnaces (w/DI and ESP)	GUARDMDI	592157.00	4456511.00	231	30.48	554.67	22.10	1.98	YES	1.740	1.800	2.863	Shutdown in Aug 2015
HARSCO (BRADDOCK REC) Rotary Dryer	HARSCO	597415.00	4471857.00	228	12.19	366.50	16.76	0.91	YES	0.226	[use 2012]	[use 2012]	No longer inventoried (minor source)
KELLY RUN Landfill Ground Flare	KELLYRN	594649.00	4456398.00	355	10.67	1160.93	0.79	2.03	N/A	0.057	0.057	0.069	
NRG CHESWICK Main Boiler	CHESWICK	602375.00	4488256.00	231	168.40	328.72	17.01	8.15	YES	54.971	48.512	127.888	CEMS hourly available
NRG CHESWICK Aux Boiler	CHESAUX	602451.00	4488203.00	231	69.82	629.83	28.42	1.21	YES	0.001	0.001	0.001	
FLEXSYS Boilers	FLEXSYSB	590756.00	4448729.00	231	14.93	461.89	2.00	8.23	YES	0.001	0.001	0.001	
FLEXSYS Process	FLEXSYSP	590744.00	4448754.00	231	16.46	293.00	17.37	0.20	YES	0.150	0.153	0.153	
ARCELORMITTAL Combustion Stack	ARCLCOMB	594973.00	4446474.00	233	79.60	589.00	8.12	2.44	YES	--	--	6.237	Restarted Apr 2014
ARCELORMITTAL COG Flaring	ARCLCOGF	594622.00	4446451.00	233	91.43	1273.00	20.00	0.61	N/A	--	--	5.255	Restarted Apr 2014
ARCELORMITTAL Boilers 1-2	ARCLBLRS	594701.00	4446431.00	233	34.10	435.78	8.19	2.56	YES	--	--	3.370	Restarted Apr 2014
ARCELORMITTAL Quenching	ARCLQNCH	594776.00	4446506.00	233	18.20	366.48	2.68	4.57	N/A	--	--	0.000	Restarted Apr 2014
ARCELORMITTAL Battery Soaking	ARCLBATS	594905.00	4446469.00	233	9.14	1422.05	6.10	0.46	N/A	--	--	0.496	Restarted Apr 2014
ARCELORMITTAL Battery Pushing Fugitives	ARCLBATP	594907.00	4446480.00	233	7.14	1033.16	3.05	1.59	N/A	--	--	0.446	Restarted Apr 2014
WORLD KITCHEN	WORLDK	593637.00	4444424.00	232	30.50	672.05	12.53	1.07	N/A	2.005	2.215	2.224	Added for screening

Modeling Inventory, Volume Sources, Actuals 2012-2014 (for Performance Testing)

VOLUME SOURCE	ID	UTMx	UTMy	ELEV	REL HEIGHT	INIT SY	INIT SZ	2012 ACTUAL g/s	2013 ACTUAL g/s	2014 ACTUAL g/s	COMMENT
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 1	ETBFMC1	597248.00	4471879.00	225	18.00	5.74	8.37	0.0145	0.0136	0.0241	Intermittent, ladle drying; total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 2	ETBFMC2	596873.87	4472180.30	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 3	ETBFMC3	596891.65	4472174.10	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 4	ETBFMC4	596909.43	4472167.90	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 5	ETBFMC5	596927.22	4472161.70	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 6	ETBFMC6	596945.00	4472155.50	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 7	ETBFMC7	596962.78	4472149.30	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 8	ETBFMC8	596980.57	4472143.10	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 9	ETBFMC9	596998.35	4472136.90	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 10	ETBFMC10	597016.13	4472130.70	228	18.00	8.76	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 11	ETBFMC11	597091.85	4472159.25	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 12	ETBFMC12	597109.64	4472152.81	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 13	ETBFMC13	597127.42	4472146.37	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 14	ETBFMC14	597145.21	4472139.94	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 15	ETBFMC15	597163.00	4472133.50	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 16	ETBFMC16	597180.79	4472127.06	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 17	ETBFMC17	597198.58	4472120.63	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 18	ETBFMC18	597216.36	4472114.19	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 19	ETBFMC19	597234.15	4472107.75	228	18.00	8.80	8.37	0.0145	0.0136	0.0241	Intermittent, seasonal (rail thaw); total emis/19
US STEEL EDGAR THOMSON BF1 Casthouse (Roof + Fume) Seg a	ETCAST1a	597195.60	4472010.14	225	27.13	7.07	12.62	0.0875	0.0700	0.0825	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF1 Casthouse (Roof + Fume) Seg b	ETCAST1b	597190.40	4471995.86	225	27.13	7.07	12.62	0.0875	0.0700	0.0825	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF3 Casthouse (Roof + Fume) Seg a	ETCAST3a	597072.80	4472065.30	225	30.78	6.13	14.32	0.1305	0.0670	0.0600	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF3 Casthouse (Roof + Fume) Seg b	ETCAST3b	597078.30	4472046.27	225	30.78	6.13	14.32	0.1305	0.0670	0.0600	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 1	ETBOP1	596533.86	4472310.98	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 2	ETBOP2	596536.90	4472321.56	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 3	ETBOP3	596539.94	4472332.13	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 4	ETBOP4	596542.98	4472342.71	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 5	ETBOP5	596546.02	4472353.29	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 6	ETBOP6	596549.06	4472363.87	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 7	ETBOP7	596552.10	4472374.44	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 8	ETBOP8	596555.14	4472385.02	228	53.11	5.12	24.70	0.0910	0.0858	0.0715	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 1	ETCCLMF1	596609.70	4472367.61	228	51.16	4.79	23.79	0.0074	0.0056	0.0060	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 2	ETCCLMF2	596612.35	4472377.55	228	51.16	4.79	23.79	0.0074	0.0056	0.0060	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 3	ETCCLMF3	596615.00	4472387.50	228	51.16	4.79	23.79	0.0074	0.0056	0.0060	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 4	ETCCLMF4	596617.65	4472397.45	228	51.16	4.79	23.79	0.0074	0.0056	0.0060	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 5	ETCCLMF5	596620.30	4472407.39	228	51.16	4.79	23.79	0.0074	0.0056	0.0060	Line roof vent, separated segments, CC_LMF emis/5
GUARDIAN Glass Rolling Fugitives Seg 1	GUARDR1	592152.80	4456591.21	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 2	GUARDR2	592155.74	4456595.61	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 3	GUARDR3	592158.67	4456600.00	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 4	GUARDR4	592161.60	4456604.40	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 5	GUARDR5	592164.53	4456608.80	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 6	GUARDR6	592167.47	4456613.20	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 7	GUARDR7	592170.40	4456617.60	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 8	GUARDR8	592173.33	4456622.00	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 9	GUARDR9	592176.26	4456626.39	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 10	GUARDR10	592179.20	4456630.79	231	12.19	2.46	5.67	0.0395	0.0221	0.0204	Line roof vent, separated segments, Rolling emis/10

Modeling Inventory, Buoyant Line Volume Sources, Actuals 2012-2014 (for Performance Testing)

BUOYANT LINE VOLUME SOURCE	ID	UTMx	UTMy	ELEV	REL HEIGHT	INIT SY	INIT SZ	2012 ACTUAL g/s	2013 ACTUAL g/s	2014 ACTUAL g/s	COMMENT
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 1	CLB01S01	595737.07	4461971.76	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 2	CLB01S02	595755.20	4461951.38	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 3	CLB01S03	595773.33	4461931.00	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 4	CLB01S04	595791.46	4461910.62	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 5	CLB01S05	595809.58	4461890.24	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 6	CLB01S06	595827.71	4461869.87	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 7	CLB01S07	595845.84	4461849.49	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 8	CLB01S08	595863.96	4461829.11	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 9	CLB01S09	595882.09	4461808.73	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 10	CLB01S10	595900.22	4461788.35	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 11	CLB01S11	595918.35	4461767.97	231	varying	12.69	ht/4.3	0.1575	0.1572	0.1636	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 1	CLB13S01	595276.08	4462317.81	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 2	CLB13S02	595293.30	4462298.51	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 3	CLB13S03	595310.52	4462279.21	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 4	CLB13S04	595327.75	4462259.91	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 5	CLB13S05	595344.97	4462240.61	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 6	CLB13S06	595362.19	4462221.31	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 7	CLB13S07	595379.41	4462202.02	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 8	CLB13S08	595396.63	4462182.72	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 9	CLB13S09	595413.86	4462163.42	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 10	CLB13S10	595431.08	4462144.12	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 11	CLB13S11	595448.30	4462124.82	231	varying	12.03	ht/4.3	0.1202	0.1168	0.1149	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 1	CLB19S01	595234.25	4462249.30	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 2	CLB19S02	595251.47	4462229.93	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 3	CLB19S03	595268.69	4462210.57	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 4	CLB19S04	595285.91	4462191.21	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 5	CLB19S05	595303.13	4462171.84	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 6	CLB19S06	595320.34	4462152.48	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 7	CLB19S07	595337.56	4462133.11	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 8	CLB19S08	595354.78	4462113.75	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 9	CLB19S09	595372.00	4462094.39	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 10	CLB19S10	595389.22	4462075.02	231	varying	12.05	ht/4.3	0.1732	0.1677	0.1637	Battery fugitives/10 segs
US STEEL CLAIRTON B Battery Fugitives Seg 1	CLBBS01	595521.36	4462332.37	231	varying	13.62	ht/4.3	0.0535	0.0535	0.0514	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 2	CLBBS02	595540.89	4462310.56	231	varying	13.62	ht/4.3	0.0535	0.0535	0.0514	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 3	CLBBS03	595560.43	4462288.76	231	varying	13.62	ht/4.3	0.0535	0.0535	0.0514	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 4	CLBBS04	595579.96	4462266.95	231	varying	13.62	ht/4.3	0.0535	0.0535	0.0514	Battery fugitives/4 segs
US STEEL CLAIRTON C Battery Fugitives Seg 1	CLBCS01	595668.59	4462167.01	231	varying	15.33	ht/4.3	0.3393	0.2088	0.2310	Battery fugitives/4 segs (2012 partial)
US STEEL CLAIRTON C Battery Fugitives Seg 2	CLBCS02	595690.52	4462142.39	231	varying	15.33	ht/4.3	0.3393	0.2088	0.2310	Battery fugitives/4 segs (2012 partial)
US STEEL CLAIRTON C Battery Fugitives Seg 3	CLBCS03	595712.45	4462117.78	231	varying	15.33	ht/4.3	0.3393	0.2088	0.2310	Battery fugitives/4 segs (2012 partial)
US STEEL CLAIRTON C Battery Fugitives Seg 4	CLBCS04	595734.38	4462093.16	231	varying	15.33	ht/4.3	0.3393	0.2088	0.2310	Battery fugitives/4 segs (2012 partial)

Modeling Inventory, Point Sources, Allowables (Base and Control Case) - Page 1

POINT SOURCE	ID	UTMx	UTMy	ELEV	HEIGHT	TEMP	VEL	DIAM	BLDG	BASE ALLOW g/s	CONTROL CASE g/s	COMMENT
US STEEL CLAIRTON Quench Tower 1	CLQNCH1	595964.00	4461731.00	231	30.48	358.49	3.54	6.80	YES	0.0950	0.0950	
US STEEL CLAIRTON Quench Tower 5	CLQNCH5	595472.00	4462078.00	231	30.48	358.49	3.54	7.10	YES	--	--	Replaced by 5A
US STEEL CLAIRTON Quench Tower 7	CLQNCH7	595430.00	4462047.00	231	37.18	362.77	2.99	8.81	YES	--	--	Replaced by 7A
US STEEL CLAIRTON Quench Tower B	CLQNCHB	595460.00	4462374.00	231	41.15	368.55	4.30	9.51	YES	0.5150	0.5150	
US STEEL CLAIRTON Quench Tower C	CLQNCHC	595622.00	4462186.00	231	50.00	378.00	3.66	12.67	YES	0.6300	0.6300	
US STEEL CLAIRTON Quench Tower 5A	CLQNCH5A	595223.00	4462366.00	231	50.00	378.00	3.66	12.67	YES	0.9520	0.9520	
US STEEL CLAIRTON Quench Tower 7A	CLQNCH7A	595188.00	4462316.00	231	50.00	378.00	3.66	12.67	YES	0.9090	0.9090	
US STEEL CLAIRTON PEC Baghouse 1-3 (seg a)	CLPEC1a	595865.75	4461872.18	231	24.99	324.83	18.81	0.91	YES	0.6425	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 1-3 (seg b)	CLPEC1b	595861.10	4461877.19	231	24.99	324.83	18.81	0.91	YES	0.6425	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 1-3 (seg c)	CLPEC1c	595856.39	4461882.39	231	24.99	324.83	18.81	0.91	YES	0.6425	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg a)	CLPEC13a	595324.70	4462210.47	231	24.99	324.83	18.23	0.91	YES	0.6769	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg b)	CLPEC13b	595320.28	4462215.54	231	24.99	324.83	18.23	0.91	YES	0.6769	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 13-15 (seg c)	CLPEC13c	595315.94	4462220.42	231	24.99	324.83	18.23	0.91	YES	0.6769	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg a)	CLPEC19a	595319.97	4462206.37	231	24.99	304.83	17.94	0.91	YES	0.8289	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg b)	CLPEC19b	595315.54	4462211.35	231	24.99	304.83	17.94	0.91	YES	0.8289	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 19-20 (seg c)	CLPEC19c	595311.02	4462216.53	231	24.99	304.83	17.94	0.91	YES	0.8289	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg a)	CLPECBa	595439.48	4462426.08	231	15.54	324.83	13.79	1.22	YES	0.6656	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg b)	CLPECBb	595430.87	4462433.71	231	15.54	324.83	13.79	1.22	YES	0.6656	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse B (seg c)	CLPECBc	595420.91	4462441.34	231	15.54	324.83	13.79	1.22	YES	0.6656	--	Modeled as 3 segments (emis/3)
US STEEL CLAIRTON PEC Baghouse 1-3 (seg a)	CLPEC1a	595865.75	4461872.18	231	24.99	324.83	18.81	0.91	YES	--	0.1790	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 1-3 (seg b)	CLPEC1b	595861.10	4461877.19	231	24.99	324.83	18.81	0.91	YES	--	0.1790	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 1-3 (seg c)	CLPEC1c	595856.39	4461882.39	231	24.99	324.83	18.81	0.91	YES	--	0.1790	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 1-3 (seg d)	CLPEC1d	595863.60	4461874.40	231	24.99	324.83	18.81	0.91	YES	--	0.1790	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 1-3 (seg e)	CLPEC1e	595858.80	4461879.70	231	24.99	324.83	18.81	0.91	YES	--	0.1790	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 13-15 (seg a)	CLPEC13a	595324.70	4462210.47	231	24.99	324.83	18.23	0.91	YES	--	0.1880	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 13-15 (seg b)	CLPEC13b	595320.28	4462215.54	231	24.99	324.83	18.23	0.91	YES	--	0.1880	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 13-15 (seg c)	CLPEC13c	595315.94	4462220.42	231	24.99	324.83	18.23	0.91	YES	--	0.1880	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 13-15 (seg d)	CLPEC13d	595317.90	4462218.00	231	24.99	324.83	18.23	0.91	YES	--	0.1880	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 13-15 (seg e)	CLPEC13e	595322.60	4462212.80	231	24.99	324.83	18.23	0.91	YES	--	0.1880	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 19-20 (seg a)	CLPEC19a	595319.97	4462206.37	231	24.99	304.83	17.94	0.91	YES	--	0.1960	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 19-20 (seg b)	CLPEC19b	595315.54	4462211.35	231	24.99	304.83	17.94	0.91	YES	--	0.1960	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 19-20 (seg c)	CLPEC19c	595311.02	4462216.53	231	24.99	304.83	17.94	0.91	YES	--	0.1960	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 19-20 (seg d)	CLPEC19d	595313.00	4462214.00	231	24.99	304.83	17.94	0.91	YES	--	0.1960	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse 19-20 (seg e)	CLPEC19e	595317.70	4462208.80	231	24.99	304.83	17.94	0.91	YES	--	0.1960	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg a)	CLPECBa	595439.60	4462430.50	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg b)	CLPECBb	595435.90	4462433.40	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg c)	CLPECBc	595420.80	4462445.60	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg d)	CLPECBd	595432.50	4462436.10	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg e)	CLPECBe	595428.60	4462439.30	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg f)	CLPECBf	595424.50	4462442.60	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg g)	CLPECBg	595436.00	4462425.70	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg h)	CLPECBh	595432.20	4462428.70	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg i)	CLPECBi	595428.70	4462431.50	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg j)	CLPECBj	595424.30	4462435.10	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg k)	CLPECBk	595420.30	4462438.20	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse B (seg l)	CLPECBl	595416.80	4462441.30	231	15.54	324.83	13.79	1.22	YES	--	0.0787	Modeled as individual stacks for control case
US STEEL CLAIRTON PEC Baghouse C	CLPECC	595678.00	4462007.00	231	30.00	328.20	16.79	2.49	YES	1.7136	1.0900	
US STEEL CLAIRTON Battery 1 Underfiring	CLCOMB1	595871.00	4461845.00	231	68.58	526.49	10.64	2.34	YES	4.0121	1.8290	
US STEEL CLAIRTON Battery 2 Underfiring	CLCOMB2	595866.00	4461852.00	231	68.58	534.27	10.55	2.44	YES	4.0121	1.6080	
US STEEL CLAIRTON Battery 3 Underfiring	CLCOMB3	595742.00	4461989.00	231	68.58	539.27	10.55	2.44	YES	4.0121	1.8570	
US STEEL CLAIRTON Battery 13 Underfiring	CLCOMB13	595389.00	4462164.00	231	68.58	535.38	8.04	2.59	YES	4.2210	2.2030	
US STEEL CLAIRTON Battery 14 Underfiring	CLCOMB14	595380.00	4462174.00	231	68.58	536.49	8.04	2.59	YES	4.2210	2.2180	
US STEEL CLAIRTON Battery 15 Underfiring	CLCOMB15	595253.00	4462318.00	231	68.58	541.49	8.04	2.59	YES	4.2210	2.9520	
US STEEL CLAIRTON Battery 19 Underfiring	CLCOMB19	595273.00	4462117.00	231	76.20	519.27	7.38	3.81	YES	7.7528	4.6530	

Modeling Inventory, Point Sources, Allowables (Base and Control Case) - Page 2

POINT SOURCE	ID	UTMx	UTMy	ELEV	HEIGHT	TEMP	VEL	DIAM	BLDG	BASE ALLOW g/s	CONTROL CASE g/s	COMMENT
US STEEL CLAIRTON Battery 20 Underfiring	CLCOMB20	595258.00	4462134.00	231	76.20	542.05	7.38	3.81	YES	7.7537	4.2690	
US STEEL CLAIRTON B Battery Underfiring	CLCOMBB	595477.00	4462406.00	231	97.84	515.38	9.83	3.66	YES	11.5348	3.7570	
US STEEL CLAIRTON C Battery Underfiring	CLCOMBC	595768.00	4462126.00	231	98.14	503.20	8.62	3.66	YES	2.6460	5.6280	
US STEEL CLAIRTON Boiler 1	CLBLR1	595004.00	4462714.00	231	57.91	457.60	29.56	2.62	YES	20.6016	17.8930	
US STEEL CLAIRTON Boiler 2	CLBLR2	594989.00	4462717.00	231	57.91	437.05	21.94	2.16	YES	13.0386		
US STEEL CLAIRTON Boiler R1	CLBLRR1	594892.00	4462604.00	231	50.29	524.27	23.01	2.59	YES	6.2080		
US STEEL CLAIRTON Boiler R2	CLBLRR2	594892.00	4462604.00	231	50.29	524.27	23.01	2.59	YES	6.2080		
US STEEL CLAIRTON Boiler T1	CLBLRT1	594845.00	4462563.00	231	26.52	544.27	19.14	1.46	YES	4.2287		
US STEEL CLAIRTON Boiler T2	CLBLRT2	594837.00	4462569.00	231	26.52	543.16	19.14	1.46	YES	4.2287		
US STEEL CLAIRTON SCOT Incinerator	CLSCOT	595575.00	4462036.00	231	45.72	638.16	17.43	1.17	YES	4.7480	3.0240	
US STEEL CLAIRTON Misc. Flaring	CLFLARE	595580.00	4462050.00	231	8.26	1273.00	20.00	0.63	N/A	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON Riley Boiler 1	ETRB1	597057.00	4471990.00	225	49.17	672.04	14.59	4.22	YES	46.7929	--	
US STEEL EDGAR THOMSON Riley Boiler 2	ETRB2	597042.00	4471996.00	225	49.17	672.04	14.59	4.22	YES	46.7929		
US STEEL EDGAR THOMSON Riley Boiler 3	ETRB3	597027.00	4472001.00	225	49.17	672.04	14.59	4.22	YES	46.7929		
US STEEL EDGAR THOMSON Riley Boilers (Planned Stack)	ETBLRSN	597042.70	4472014.20	225	70.00	672.04	20.97	6.10	YES	--	70.1700	New stack, aggregated flues
US STEEL EDGAR THOMSON Blast Furnace 1 Stoves	ETBF1STV	597180.00	4472051.00	225	79.42	464.82	13.24	3.28	YES	44.4839	12.4110	
US STEEL EDGAR THOMSON Blast Furnace 3 Stoves	ETBF3STV	597014.00	4472084.00	225	57.05	522.59	20.81	2.59	YES	44.4839	11.3400	
US STEEL EDGAR THOMSON Casthouse Baghouse (4 comps)	ETCASTB	597131.00	4471997.00	225	27.43	394.26	10.00	3.60	YES	5.6830	5.6830	4 compartments aggregated to 1 stack
US STEEL EDGAR THOMSON BFG Flare	ETBFGF	597166.00	4471984.00	225	66.00	1273.00	20.00	0.92	YES	--	--	Intermittent, screened out
US STEEL IRVIN Boiler #1	IRBLR1	593149.00	4465476.00	287	19.50	635.38	10.23	1.10	YES	2.1634	1.1900	
US STEEL IRVIN Boiler #2	IRBLR2	593171.00	4465165.00	287	21.94	537.05	8.00	1.28	YES	2.2932	1.2630	
US STEEL IRVIN Boilers #3-4	IRBLR3	593419.00	4465596.00	287	22.86	644.26	9.70	1.42	YES	2.2555	1.2410	Boilers 3 and 4 exhaust to same stack
US STEEL IRVIN 80" Mill Reheat Furnace 1	IR80IN1	593177.00	4465871.00	287	20.00	710.38	29.43	1.98	YES	2.5300	2.1520	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 2	IR80IN2	593178.00	4465884.00	287	20.00	710.38	29.43	1.98	YES	2.5300	2.1520	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 3	IR80IN3	593179.00	4465896.00	287	20.00	710.38	29.43	1.98	YES	2.5300	2.1520	67% of furnace emissions at this stack
US STEEL IRVIN 80" Mill Reheat Furnace 4	IR80IN4	593180.00	4465909.00	287	20.00	710.38	29.43	1.98	YES	3.7950	3.2280	
US STEEL IRVIN 80" Mill Reheat Furnace 5	IR80IN5	593181.00	4465923.00	287	20.00	710.38	29.43	1.98	YES	3.7950	3.2280	
US STEEL IRVIN 80" Mill Reheat Waste Stack 6	IR80INW	593243.00	4465922.00	287	28.34	710.38	29.43	1.82	YES	3.7950	3.2280	Excess exhaust from furnaces 1-3
US STEEL IRVIN #1 Galv Line Preheat	IRGALV1	593352.00	4465406.00	287	25.30	944.26	9.48	1.42	YES	1.8434	0.0050	
US STEEL IRVIN #2 Galv Line Preheat	IRGALV2	593350.00	4465386.00	287	26.82	944.26	2.66	1.37	YES	0.4879	0.0010	
US STEEL IRVIN HPH Annealing Furnaces (seg a)	IRHPH_a	593328.56	4465585.48	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg b)	IRHPH_b	593325.15	4465553.51	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg c)	IRHPH_c	593321.76	4465521.64	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg d)	IRHPH_d	593318.44	4465489.75	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg e)	IRHPH_e	593315.27	4465457.80	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg f)	IRHPH_f	593311.57	4465425.87	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN HPH Annealing Furnaces (seg g)	IRHPH_g	593308.19	4465393.98	287	21.33	527.60	10.00	0.76	YES	0.5886	0.2591	31 furnaces (modeled as 7 segments, emis/7)
US STEEL IRVIN Open Coil Annealing	IROCA	593335.00	4465243.00	287	21.33	310.94	10.52	2.96	YES	3.1563	1.7370	16 furnaces total
US STEEL IRVIN Continuous Annealing	IRCONTA	593341.00	4464903.00	287	36.57	513.72	10.52	1.07	YES	1.2200	1.2197	
US STEEL IRVIN Peach Tree Flare A&B	IRPTF	592868.00	4464808.00	333	18.28	1273.00	20.00	0.63	N/A	--	--	Intermittent, screened out
US STEEL IRVIN COG Flares 1-3	IRCOGF	593237.00	4464601.00	287	8.99	1273.00	20.00	0.63	N/A	--	--	Intermittent, screened out
ALLEGHENY ENERGY MITCHELL Boiler 33	MITCHELL	587839.00	4452707.00	228	114.29	320.38	19.20	6.10	YES	225.9052	--	Deactivated in Oct 2013
ALLEGHENY ENERGY MITCHELL Boiler B&W Oil	MITCHBW	587838.00	4452754.00	228	58.82	463.70	7.92	4.27	YES	70.1533	--	Deactivated in Oct 2013
ALLEGHENY ENERGY MITCHELL Aux Boiler	MITCHAUX	587756.00	4452812.00	228	45.72	469.20	6.98	1.06	YES	3.4022	--	Deactivated in Oct 2013
NRG ELRAMA Boilers 1-4	ELRAMA	592059.00	4456413.00	229	119.48	324.83	15.07	7.92	YES	422.6272	--	Deactivated in Oct 2012
BAY VALLEY Boilers 1-2	BAYVLY1	585581.00	4478787.00	222	76.22	472.00	6.40	3.05	YES	--	--	Screened out
BAY VALLEY Boilers 3-4,8	BAYVLY3	585592.00	4478798.00	222	76.22	394.00	3.35	3.05	YES	--	--	Screened out
GUARDIAN Melt Furnaces (no DI)	GUARDM	592123.00	4456544.00	231	24.99	535.22	25.51	2.70	YES	--	--	Shutdown in Aug 2015
GUARDIAN Melt Furnaces (w/DI and ESP)	GUARDMDI	592157.00	4456511.00	231	30.48	554.67	22.10	1.98	YES	3.0618	--	Shutdown in Aug 2015
HARSCO (BRADDOCK REC) Rotary Dryer	HARSCO	597415.00	4471857.00	228	12.19	366.50	16.76	0.91	YES	0.6692	0.2270	
KELLY RUN Landfill Ground Flare	KELLYRN	594649.00	4456398.00	355	10.67	1160.93	0.79	2.03	N/A	--	--	Screened out
NRG CHESWICK Main Boiler	CHESWICK	602375.00	4488256.00	231	168.40	328.72	17.01	8.15	YES	--	--	Screened out
NRG CHESWICK Aux Boiler	CHESAUX	602451.00	4488203.00	231	69.82	629.83	28.42	1.21	YES	--	--	Screened out
FLEXSYS Boilers	FLEXSYSB	590756.00	4448729.00	231	14.93	461.89	2.00	8.23	YES	--	--	Screened out

Modeling Inventory, Point Sources, Allowables (Base and Control Case) - Page 3

POINT SOURCE	ID	UTMx	UTMy	ELEV	HEIGHT	TEMP	VEL	DIAM	BLDG	BASE ALLOW g/s	CONTROL CASE g/s	COMMENT
FLEXSYS Process	FLEXSYSP	590744.00	4448754.00	231	16.46	293.00	17.37	0.20	YES	--	--	Screened out
ARCELORMITTAL Combustion Stack	ARCLCOMB	594973.00	4446474.00	233	79.60	589.00	8.12	2.44	YES	5.9460	5.9460	Restarted Apr 2014 (App W T-8.1)
ARCELORMITTAL COG Flaring	ARCLCOGF	594622.00	4446451.00	233	91.43	1273.00	20.00	0.61	N/A	1.5779	1.5779	Restarted Apr 2014 (App W T-8.1)
ARCELORMITTAL Boilers 1-2	ARCLBLRS	594701.00	4446431.00	233	34.10	435.78	8.19	2.56	YES	2.7204	2.7204	Restarted Apr 2014 (App W T-8.1)
ARCELORMITTAL Quenching	ARCLQNCH	594776.00	4446506.00	233	18.20	366.48	2.68	4.57	N/A	0.0000	0.0000	Restarted Apr 2014 (App W T-8.1)
ARCELORMITTAL Battery Soaking	ARCLBATS	594905.00	4446469.00	233	9.14	1422.05	6.10	0.46	N/A	0.0151	0.0151	Restarted Apr 2014 (App W T-8.1)
ARCELORMITTAL Battery Pushing Fugitives	ARCLBATP	594907.00	4446480.00	233	7.14	1033.16	3.05	1.59	N/A	0.7144	0.7144	Restarted Apr 2014 (App W T-8.1)
WORLD KITCHEN	WORLDK	593637.00	4444424.00	232	30.50	672.05	12.53	1.07	N/A	--	--	Screened out

Modeling Inventory, Volume Sources, Allowables (Base and Control Case)

VOLUME SOURCE	ID	UTMx	UTMy	ELEV	REL HEIGHT	INIT SY	INIT SZ	BASE ALLOW g/s	CONTROL CASE g/s	COMMENT
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 1	ETBFMC1	597248.00	4471879.00	225	18.00	5.74	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 2	ETBFMC2	596873.87	4472180.30	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 3	ETBFMC3	596891.65	4472174.10	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 4	ETBFMC4	596909.43	4472167.90	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 5	ETBFMC5	596927.22	4472161.70	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 6	ETBFMC6	596945.00	4472155.50	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 7	ETBFMC7	596962.78	4472149.30	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 8	ETBFMC8	596980.57	4472143.10	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 9	ETBFMC9	596998.35	4472136.90	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 10	ETBFMC10	597016.13	4472130.70	228	18.00	8.76	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 11	ETBFMC11	597091.85	4472159.25	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 12	ETBFMC12	597109.64	4472152.81	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 13	ETBFMC13	597127.42	4472146.37	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 14	ETBFMC14	597145.21	4472139.94	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 15	ETBFMC15	597163.00	4472133.50	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 16	ETBFMC16	597180.79	4472127.06	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 17	ETBFMC17	597198.58	4472120.63	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 18	ETBFMC18	597216.36	4472114.19	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF Fugitives (Misc. Comb.) Seg 19	ETBFMC19	597234.15	4472107.75	228	18.00	8.80	8.37	--	--	Intermittent, screened out
US STEEL EDGAR THOMSON BF1 Casthouse (Roof + Fume) Seg a	ETCAST1a	597195.60	4472010.14	225	27.13	7.07	12.62	0.1719	0.1266	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF1 Casthouse (Roof + Fume) Seg b	ETCAST1b	597190.40	4471995.86	225	27.13	7.07	12.62	0.1719	0.1266	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF3 Casthouse (Roof + Fume) Seg a	ETCAST3a	597072.80	4472065.30	225	30.78	6.13	14.32	0.1441	0.1064	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BF3 Casthouse (Roof + Fume) Seg b	ETCAST3b	597078.30	4472046.27	225	30.78	6.13	14.32	0.1441	0.1064	Roof vent, 2 segments, emis/2
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 1	ETBOP1	596533.86	4472310.98	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 2	ETBOP2	596536.90	4472321.56	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 3	ETBOP3	596539.94	4472332.13	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 4	ETBOP4	596542.98	4472342.71	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 5	ETBOP5	596546.02	4472353.29	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 6	ETBOP6	596549.06	4472363.87	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 7	ETBOP7	596552.10	4472374.44	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON BOP Process Fuel Use (Roof Monitor) Seg 8	ETBOP8	596555.14	4472385.02	228	53.11	5.12	24.70	0.0697	0.1046	Line roof vent, separated segments, BOP emis/8
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 1	ETCCLMF1	596609.70	4472367.61	228	51.16	4.79	23.79	0.1323	0.1323	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 2	ETCCLMF2	596612.35	4472377.55	228	51.16	4.79	23.79	0.1323	0.1323	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 3	ETCCLMF3	596615.00	4472387.50	228	51.16	4.79	23.79	0.1323	0.1323	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 4	ETCCLMF4	596617.65	4472397.45	228	51.16	4.79	23.79	0.1323	0.1323	Line roof vent, separated segments, CC_LMF emis/5
US STEEL EDGAR THOMSON Continuous Casting/LMF (Roof Mon) Seg 5	ETCCLMF5	596620.30	4472407.39	228	51.16	4.79	23.79	0.1323	0.1323	Line roof vent, separated segments, CC_LMF emis/5
GUARDIAN Glass Rolling Fugitives Seg 1	GUARDR1	592152.80	4456591.21	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 2	GUARDR2	592155.74	4456595.61	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 3	GUARDR3	592158.67	4456600.00	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 4	GUARDR4	592161.60	4456604.40	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 5	GUARDR5	592164.53	4456608.80	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 6	GUARDR6	592167.47	4456613.20	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 7	GUARDR7	592170.40	4456617.60	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 8	GUARDR8	592173.33	4456622.00	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 9	GUARDR9	592176.26	4456626.39	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10
GUARDIAN Glass Rolling Fugitives Seg 10	GUARDR10	592179.20	4456630.79	231	12.19	2.46	5.67	0.0869	--	Line roof vent, separated segments, Rolling emis/10

Modeling Inventory, Buoyant Line Volume Sources, Allowables (Base and Control Case)

BUOYANT LINE VOLUME SOURCE	ID	UTMx	UTMy	ELEV	REL HEIGHT	INIT SY	INIT SZ	BASE ALLOW g/s	CONTROL CASE g/s	COMMENT
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 1	CLB01S01	595737.07	4461971.76	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 2	CLB01S02	595755.20	4461951.38	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 3	CLB01S03	595773.33	4461931.00	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 4	CLB01S04	595791.46	4461910.62	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 5	CLB01S05	595809.58	4461890.24	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 6	CLB01S06	595827.71	4461869.87	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 7	CLB01S07	595845.84	4461849.49	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 8	CLB01S08	595863.96	4461829.11	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 9	CLB01S09	595882.09	4461808.73	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 10	CLB01S10	595900.22	4461788.35	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 1-3 Fugitives Seg 11	CLB01S11	595918.35	4461767.97	231	varying	12.69	ht/4.3	0.2778	0.2202	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 1	CLB13S01	595276.08	4462317.81	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 2	CLB13S02	595293.30	4462298.51	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 3	CLB13S03	595310.52	4462279.21	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 4	CLB13S04	595327.75	4462259.91	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 5	CLB13S05	595344.97	4462240.61	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 6	CLB13S06	595362.19	4462221.31	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 7	CLB13S07	595379.41	4462202.02	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 8	CLB13S08	595396.63	4462182.72	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 9	CLB13S09	595413.86	4462163.42	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 10	CLB13S10	595431.08	4462144.12	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 13-15 Fugitives Seg 11	CLB13S11	595448.30	4462124.82	231	varying	12.03	ht/4.3	0.2217	0.1610	Battery fugitives/11 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 1	CLB19S01	595234.25	4462249.30	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 2	CLB19S02	595251.47	4462229.93	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 3	CLB19S03	595268.69	4462210.57	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 4	CLB19S04	595285.91	4462191.21	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 5	CLB19S05	595303.13	4462171.84	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 6	CLB19S06	595320.34	4462152.48	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 7	CLB19S07	595337.56	4462133.11	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 8	CLB19S08	595354.78	4462113.75	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 9	CLB19S09	595372.00	4462094.39	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON Batteries 19-20 Fugitives Seg 10	CLB19S10	595389.22	4462075.02	231	varying	12.05	ht/4.3	0.3107	0.2291	Battery fugitives/10 segs
US STEEL CLAIRTON B Battery Fugitives Seg 1	CLBBS01	595521.36	4462332.37	231	varying	13.62	ht/4.3	0.0631	0.0631	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 2	CLBBS02	595540.89	4462310.56	231	varying	13.62	ht/4.3	0.0631	0.0631	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 3	CLBBS03	595560.43	4462288.76	231	varying	13.62	ht/4.3	0.0631	0.0631	Battery fugitives/4 segs
US STEEL CLAIRTON B Battery Fugitives Seg 4	CLBBS04	595579.96	4462266.95	231	varying	13.62	ht/4.3	0.0631	0.0631	Battery fugitives/4 segs
US STEEL CLAIRTON C Battery Fugitives Seg 1	CLBCS01	595668.59	4462167.01	231	varying	15.33	ht/4.3	0.3416	0.2547	Battery fugitives/4 segs
US STEEL CLAIRTON C Battery Fugitives Seg 2	CLBCS02	595690.52	4462142.39	231	varying	15.33	ht/4.3	0.3416	0.2547	Battery fugitives/4 segs
US STEEL CLAIRTON C Battery Fugitives Seg 3	CLBCS03	595712.45	4462117.78	231	varying	15.33	ht/4.3	0.3416	0.2547	Battery fugitives/4 segs
US STEEL CLAIRTON C Battery Fugitives Seg 4	CLBCS04	595734.38	4462093.16	231	varying	15.33	ht/4.3	0.3416	0.2547	Battery fugitives/4 segs

Modeling Inventory, Buoyant Line Source Parameters

BUOYANT LINE SOURCE	ID	Elev (m)	UTMx (m) nw	UTMy (m) nw	UTMx (m) se	UTMy (m) se
US STEEL CLAIRTON Batteries 1-3	CLBATT1_3	231	595732.52	4461976.88	595922.90	4461762.85
US STEEL CLAIRTON Batteries 13-15	CLBATT13_15	231	595271.42	4462323.03	595452.96	4462119.60
US STEEL CLAIRTON Batteries 19-20	CLBATT19_20	231	595229.60	4462254.53	595393.87	4462069.79
US STEEL CLAIRTON B Battery	CLBATTB	231	595515.79	4462338.59	595585.53	4462260.73
US STEEL CLAIRTON C Battery	CLBATTC	231	595663.04	4462173.24	595739.93	4462086.93

BUOYANT LINE SOURCE (cont.)	ID	Avg Bldg (Line) Length (m)	Avg Bldg Ht (m)	Avg Bldg Width (m)	Avg Line Width (m)	Spacing (m)
US STEEL CLAIRTON Batteries 1-3	CLBATT1_3	287.0	8.5	13.7	1.0	0.0
US STEEL CLAIRTON Batteries 13-15	CLBATT13_15	273.0	8.8	14.0	1.0	0.0
US STEEL CLAIRTON Batteries 19-20	CLBATT19_20	247.0	10.5	14.0	1.0	0.0
US STEEL CLAIRTON B Battery	CLBATTB	106.0	15.1	16.7	1.0	0.0
US STEEL CLAIRTON C Battery	CLBATTC	115.0	15.1	16.7	1.0	0.0

BUOYANT LINE SOURCE (cont.)	ID	Exit Temp (K)	Amb Temp (K)	Exit Vel (m/s)	Avg Line Buoyancy (m^4/s^3)	Release Ht (m)
US STEEL CLAIRTON Batteries 1-3	CLBATT1_3	1144.27	284.27	3.05	6447.3	8.5
US STEEL CLAIRTON Batteries 13-15	CLBATT13_15	1144.27	284.27	3.05	6132.8	8.8
US STEEL CLAIRTON Batteries 19-20	CLBATT19_20	1144.27	284.27	3.05	5548.7	10.5
US STEEL CLAIRTON B Battery	CLBATTB	1144.27	284.27	3.05	2381.2	15.1
US STEEL CLAIRTON C Battery	CLBATTC	1144.27	284.27	3.05	2583.4	15.1

NOTES

Data is used to derive BLP inputs

Line widths originally estimated from flows
- See PM10 SIP for flow calcs
- Avg flow about 450 m^3/s per line (avg width = 0.5 m)

Assume constant line width for batteries
- Based on release points (standpipes, leaks, flames)
- Estimated as 1.0 m avg

Exit velocities taken from observations
- Pushing, car, and soaking vary from 5-20 ft/s
- Avg estimated as 10 ft/s (3.05 m/s)

Battery Temperatures:
- Ovens = 1800-2100 °F, surface = 400-500 °F
- Pushing, car, and soaking vary from 1400-2000 °F
- Avg exit temp estimated as 1600 °F

Ambient temp used in calculation:
- Avg for Pgh year-round = 52 °F

Battery emissions based on:
- Soaking
- Pushing (pre, PEC/uncontrolled)
- Traveling hot car

BLP Line Buoyancy (F')

L is the average building (line) length (m),
H_B is the average building height (m),
W_M is the average line source width (m),
W_B is the average building width (m),
δ_x is the average spacing between buildings (m), and
F' is the average line source buoyancy parameter (m^4/s^3)

where

$$F' = \frac{g\ L\ W_M\ w\ (T_s - T_a)}{T_s}$$

and

g is the gravitational acceleration (m/s^2),
w is the exit velocity (m/s),
T_s is the exit temperature (K), and
T_a is the ambient air temperature (K)

D-4: Variability and Averaging Period Analysis

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Variability and Averaging Period Analysis

This section describes the approach and calculations used to determine longer-term averaging limits for sources with fuel-based variability. These sources use coke oven gas (COG) as a fuel, and emissions can be dependent on the inherent variability from the production and desulfurization processes related to the COG sulfur content.

Introduction

The EPA SO_2 SIP Guidance for 1-Hour SO_2 Nonattainment Area State Implementation Plan Submittals (April 23, 2014) describes a longer-term average methodology that can be applicable to sources with operational and/or fuel-based variability. The concept of comparable stringency assumes that a lower limit over a longer averaging time is statistically consistent with a constant modeled hourly critical emission value (CEV).

From the EPA Guidance: "emission limits based on averaging times longer than 1-hour, up to 30 days, may in some cases provide adequate assurance that the 1-hour SO_2 standard will be attained, so long as the limit reflects comparable stringency to the 1-hour average emission limit that modeling shows to provide for attainment and a source's hourly emissions can be effectively measured."

This SIP utilized maximum achievable emission rates for all sources and all hours over a 3-year period. The use of longer-term averaging of the hourly limit allows for a more real-world approach to emissions and impacts, since all sources are not at maximum operation for all hours.

The use of longer-term averaging does allow for some hours to exceed the CEV; however, most hours are required to be lower than the CEV in order to meet longer-term averages, which are lower than the modeled CEV. From the EPA Guidance, the expected net result is that a longer-term comparably stringent limit will provide a "sufficient constraint on the frequency and magnitude of occurrences of elevated emissions (especially if supplemented with more direct limits on these occurrences) that a control strategy based on such limits would reasonably provide for attainment." Additionally, "supplemental limits on the frequency and/or magnitude of occasions of elevated emissions can be a valuable element of a plan that protects against NAAQS violations."

Methodology

The three most recent years (2014-2016) of coke oven gas used by U. S. Steel were examined for variability in hourly H_2S content. U. S. Steel uses four primary COG process streams to deliver fuel to the Mon Valley Works plants (Clairton, Irvin, and Edgar Thomson). All coke oven gas is produced and desulfurized at the Clairton Plant and then distributed via pipeline to the other two plants.

The different lines distribute COG to processes as follows:

- Unit 1 Line: Clairton Plant, Batteries 1-3, B, and C underfiring (combustion)
- Unit 2 Line: Clairton Plant, Batteries 13-15 and 19-20 underfiring (combustion)
- A Line: Irvin Plant, 80-Inch Hot Strip Mill (HSM)
- B Line: All other "downriver" processes
    - Clairton Plant, Boilers
    - Irvin Plant, except for the 80" HSM
    - Edgar Thomson Plant (and Harsco/Braddock Recovery)

Since Edgar Thomson uses COG in combination with other fuels, including blast furnace gas (BFG) and natural gas (NG), longer-term averaging was not used for limits for any process at this plant.

Adjustment factors were determined from the variability for each line and applied to the modeled CEVs in order to scale down the modeled short-term rates for each corresponding process. All hours during breakdown/malfunction or planned outage periods were removed for the analysis, since the variability is based on normal operating conditions. Additionally, for proper statistical calculations on longer-term bases, only periods with at least 75% data completeness were used in the analysis. (Note that data completeness and breakdown exceptions do not apply to actual SO_2 calculations, which would use all valid hours for averaging.[1])

In accordance with EPA Guidance, the following steps were used for determining the adjustment ratios:

1. Remove known breakdown/malfunction hours

2. Determine hourly statistics, including 1-hour 99th percentile values for each line

3. For 24-hour block periods (calendar day, midnight-to-midnight) with more than 17 valid hours (75% data completeness), calculate 24-hour averages for each day over the 3-year period

4. Calculate the 99th percentiles of the 24-hour averages for each line over the 3-year period

5. From the 24-hour averages, for each rolling 30-day period with more than 22 valid 24-hour averages, calculate rolling 30-day averages for each line over the 3-year period

6. Calculate the 99th percentiles of the 30-day averages over the 3-year period

7. Calculate adjustment factors for the longer-term 24-hour and 30-day averages based on the ratio of the 99th percentiles to the 1-hour 99th percentiles

For the 30-day averaging, calculations can be made on either a forward or backward basis. For this analysis, the first 29-days of 2014 included a forward rolling average, with the remainder of the days averaged on a backward rolling basis.

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[1] Valid hours would represent those with valid measurements of sulfur content and flow rates during operation of a process. These hours would include hours during breakdowns or malfunctions and would exclude hours when the process was not operating. E.g., if a process operated for 5 hours during a calendar day, and the H_2S analyzers and flow meters were functioning properly, the 24-hour average would be the average of the 5 hourly concentrations. Rolling consecutive 30-day averages would accordingly use only non-missing 24-hour averages to comprise a 30-day average (e.g., if a 30-day period contained 19 non-missing 24-hour averages, the 30-day average would be the average of the 19 24-hour averages).

Additionally, if only natural gas is used during any of the 24 hours in a calendar day, these hours would also be included in the averaging, with SO_2 calculated from the natural gas flow rates and emission factors for the sulfur content of natural gas.

Statistics and Averages

From the 2014-2016 hourly COG data, hourly statistics for H_2S grains per line were calculated, as shown below in Table D-4-1.

Table D-4-1. Hourly Statistics for COG Lines

Hourly Statistic	Unit 1	Unit 2	A Line	B Line
Average	6.036	6.235	1.593	9.107
Standard Deviation	2.325	3.744	1.351	4.207
1-Hour 99th Percentile	12.571	15.096	5.469	17.146

The 1-hour statistics indicate a significant amount of variability between the averages and high ranges (99th percentiles) of the H_2S content. For a look at the distribution of H_2S concentrations, histograms were developed for each line, as shown in Figure D-4-1. Bins were grouped by increments of 1 grain of H_2S for a range of 1-20 grains, then by increments of 5 for the range of 20-40 grains.

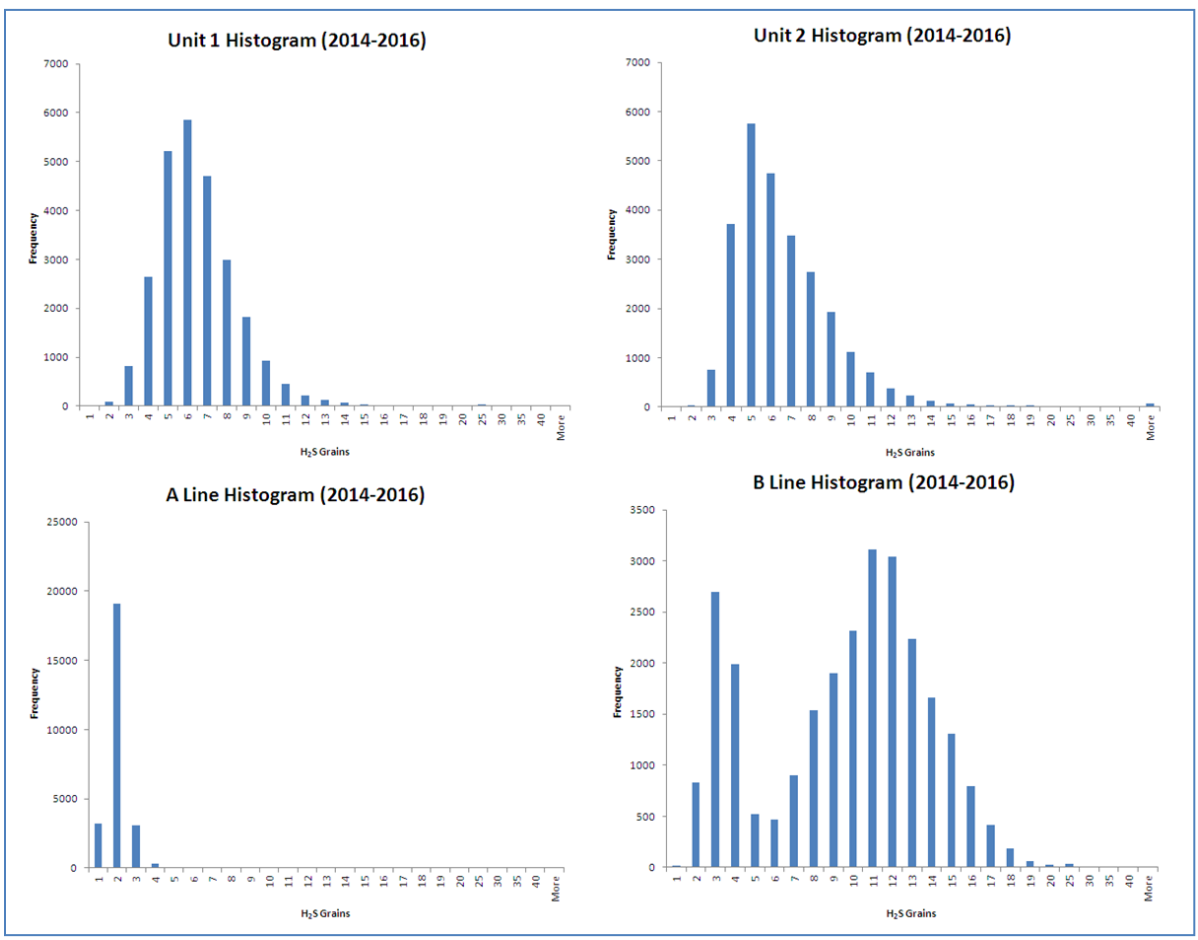

Figure D-4-1. Histograms for H2S grains, by COG Line, 2014-2016

The B Line histogram indicates a change in grain distribution, due to the VCU upgrade in April 2016. The distribution before and after the VCU upgrade is shown in Figure D-4-2. (Note: the A Line is less affected by the VCU upgrades than the B line; more reductions in sulfur content are seen for the B Line.)

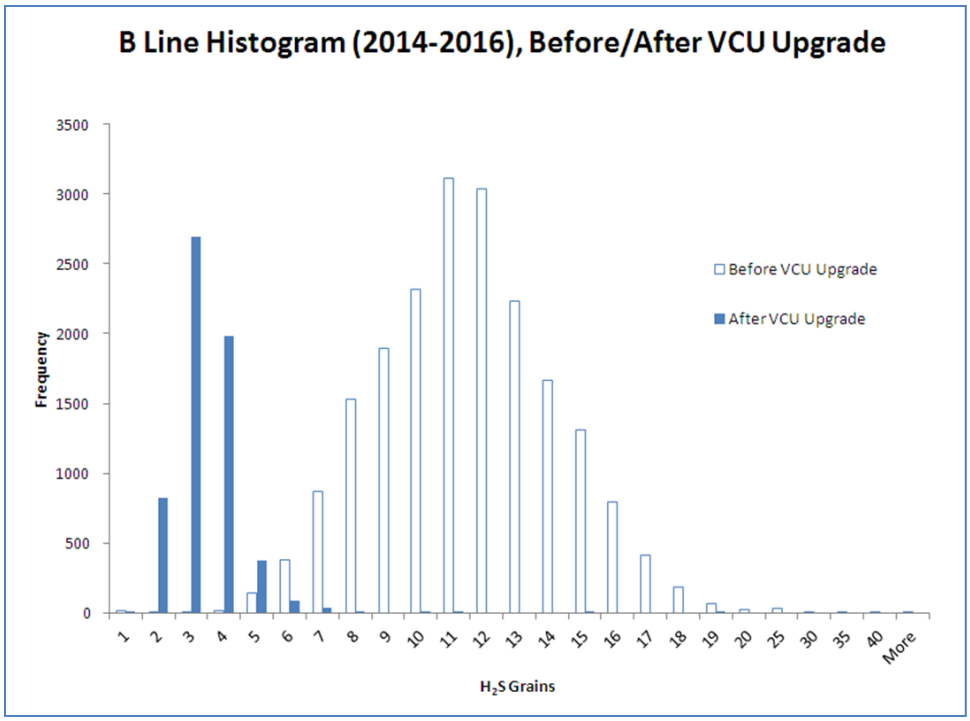

Figure D-4-2. Histogram for H2S grains, B Line, Before/After VCU Upgrade

Since variability analysis should be based on a large set of statistical data (3-5 years, as recommended by the EPA Guidance), the B Line does not contain sufficient data to determine variability solely after the VCU upgrades.

The 8 months of data available with the VCU upgrade were further examined for a comparison to data before the upgrade. Looking at the overall H_2S content, grains are reduced from an average of 10.972 (before upgrade) to an average of 2.893 (after upgrade). Using the ratio of before-to-after averages to scale up the grains after the upgrade, a theoretical look at the distribution without the VCU control can be calculated.

The grain distributions before and after the VCU upgrade, with the post-control grains scaled up to pre-control levels, are shown in Figure D-4-3.

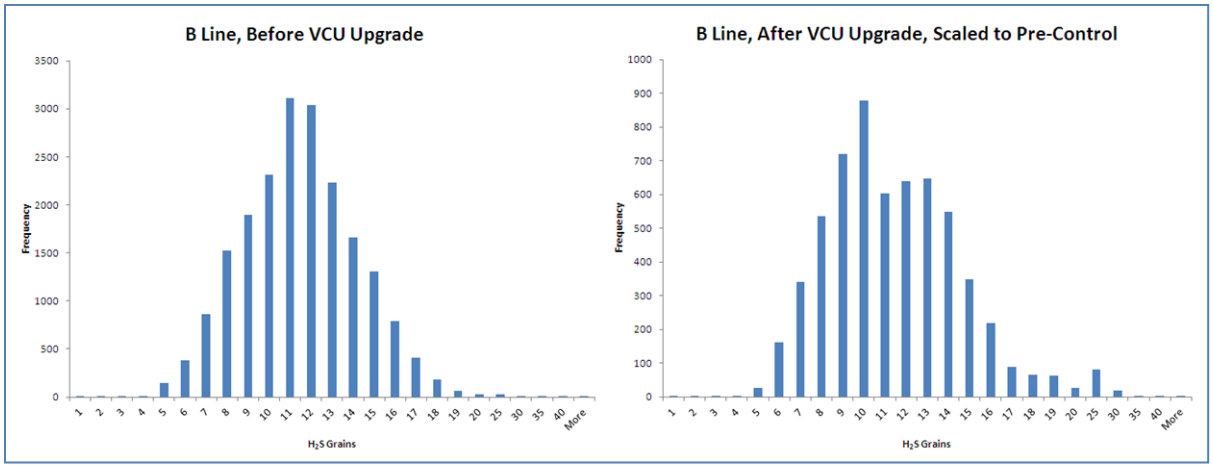

Figure D-4-3 Histogram for H2S grains, B Line, Before and After VCU Upgrade (w/scaled Post-Upgrade)

Figure D-4-3 shows similar distributions of the H_2S grains with/without the VCU control. This suggests that the use of the full 3 years data is representative of overall variability for B Line, with/without the VCU control.

For the next steps in the variability and longer-term averaging calculations, 24-hour and 30-day statistics were calculated for 2014-2016 for each COG line, shown in Tables D-4-2 and D-4-3, respectively.

Table D-4-2. 24-Hour Statistics for COG Lines

24-Hour (Block) Statistics	Unit 1	Unit 2	A Line	B Line
Average	5.799	5.608	1.419	10.204
Standard Deviation	1.874	3.154	1.074	4.038
24-Hour 99th Percentile	11.493	13.554	5.067	16.187

Table D-4-3. 30-Day Statistics for COG Lines

30-Day (Rolling) Statistics	Unit 1	Unit 2	A Line	B Line
Average	5.839	5.727	1.450	10.580
Standard Deviation	1.227	1.816	0.596	3.584
30-Day 99th Percentile	9.016	12.037	4.637	14.291

The adjustment factors for the longer-term averaging periods are the ratios of the 24-hour percentile to the 1-hour 99th percentile and the 30-day 99th percentile to the 1-hour 99th percentile for each line. Table D-4-4 shows the 24-hour and 30-day adjustment factors for each line.

Table D-4-4. Adjustment Factors for 24-Hour and 30-Day Averaging

Adjustment Factors	Unit 1	Unit 2	A Line	B Line
24-Hour Average Basis	0.914	0.898	0.927	0.944
30-Day Average Basis	0.717	0.797	0.848	0.834

The ratios in Table D-4-4 above (by COG line) were applied to the corresponding modeled CEVs (by process) as shown in Tables 3-1 and 3-3 of the SIP narrative. Coke oven gas concentration data and calculations are available via DVD upon request.

Example SO_2 and Longer-Term Average Calculations

As an example of the hourly SO_2 calculations and longer-term averaging, one of the Clairton battery underfiring processes (Battery 20) was selected along with first 2-month period (Jan.-Feb. 2014) of corresponding Unit 2 hourly COG data used in the variability analysis. Maximum COG flow rates of 572000 cubic feet (cf) for each hour were used for an examination of SO_2 at maximum possible operation. Unit 2 had an average H_2S content of 5.71 gr/100 scf for this period, with a maximum of 33.27 gr/100 scf.

SO_2 is calculated from the H_2S grains as follows:

SO_2 Emission Rate (lb/hr) = Actual COG Flow Rate (scf/hour) / 100 (scf/100 scf) x H_2S Concentration (gr/100 scf) / 7000 (gr/lb) / H_2S Molecular Weight (lb/lb-mol) x SO_2 Molecular Weight (lb/lb-mol)

Complete stoichiometric conversion of H_2S to SO_2 is assumed. For sources that have aggregate limits, the hourly SO_2 would be summed from each process, then the 24-hour and 30-day averaging would be applied.

Table D-4-5. Example Hourly SO_2 Calculations with 24-Hour Averages

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/1/2014	0	4.733	572000	7.280	33.88	
1/1/2014	1	3.941	572000	6.062	33.88	
1/1/2014	2	4.176	572000	6.423	33.88	
1/1/2014	3	4.472	572000	6.879	33.88	
1/1/2014	4	4.029	572000	6.198	33.88	
1/1/2014	5	3.690	572000	5.676	33.88	
1/1/2014	6	3.840	572000	5.906	33.88	
1/1/2014	7	4.054	572000	6.236	33.88	
1/1/2014	8	4.184	572000	6.435	33.88	
1/1/2014	9	3.859	572000	5.936	33.88	
1/1/2014	10	4.120	572000	6.337	33.88	
1/1/2014	11	4.363	572000	6.712	33.88	
1/1/2014	12	4.316	572000	6.638	33.88	
1/1/2014	13	4.123	572000	6.341	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/1/2014	14	3.847	572000	5.918	33.88	
1/1/2014	15	3.368	572000	5.181	33.88	
1/1/2014	16	4.427	572000	6.809	33.88	
1/1/2014	17	4.590	572000	7.060	33.88	
1/1/2014	18	4.691	572000	7.216	33.88	
1/1/2014	19	4.836	572000	7.439	33.88	
1/1/2014	20	4.250	572000	6.537	33.88	
1/1/2014	21	4.216	572000	6.484	33.88	
1/1/2014	22	3.769	572000	5.797	33.88	
1/1/2014	23	3.377	572000	5.195	33.88	6.362
1/2/2014	0	4.191	572000	6.446	33.88	
1/2/2014	1	3.739	572000	5.750	33.88	
1/2/2014	2	3.637	572000	5.594	33.88	
1/2/2014	3	3.859	572000	5.936	33.88	
1/2/2014	4	3.453	572000	5.312	33.88	
1/2/2014	5	4.394	572000	6.759	33.88	
1/2/2014	6	3.554	572000	5.467	33.88	
1/2/2014	7	3.868	572000	5.949	33.88	
1/2/2014	8	3.741	572000	5.754	33.88	
1/2/2014	9	4.112	572000	6.325	33.88	
1/2/2014	10	4.466	572000	6.870	33.88	
1/2/2014	11	4.368	572000	6.719	33.88	
1/2/2014	12	4.560	572000	7.015	33.88	
1/2/2014	13	5.412	572000	8.324	33.88	
1/2/2014	14	4.724	572000	7.266	33.88	
1/2/2014	15	4.348	572000	6.688	33.88	
1/2/2014	16	3.794	572000	5.835	33.88	
1/2/2014	17	4.089	572000	6.290	33.88	
1/2/2014	18	4.932	572000	7.586	33.88	
1/2/2014	19	4.147	572000	6.379	33.88	
1/2/2014	20	4.230	572000	6.506	33.88	
1/2/2014	21	3.982	572000	6.124	33.88	
1/2/2014	22	4.123	572000	6.342	33.88	
1/2/2014	23	4.237	572000	6.517	33.88	6.406
1/3/2014	0	5.512	572000	8.478	33.88	
1/3/2014	1	4.901	572000	7.539	33.88	
1/3/2014	2	4.604	572000	7.082	33.88	
1/3/2014	3	4.416	572000	6.793	33.88	
1/3/2014	4	4.289	572000	6.598	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/3/2014	5	5.364	572000	8.251	33.88	
1/3/2014	6	4.726	572000	7.270	33.88	
1/3/2014	7	3.998	572000	6.150	33.88	
1/3/2014	8	4.395	572000	6.760	33.88	
1/3/2014	9	4.447	572000	6.840	33.88	
1/3/2014	10	4.046	572000	6.224	33.88	
1/3/2014	11	4.235	572000	6.514	33.88	
1/3/2014	12	3.963	572000	6.095	33.88	
1/3/2014	13	4.624	572000	7.113	33.88	
1/3/2014	14	5.652	572000	8.693	33.88	
1/3/2014	15	4.789	572000	7.367	33.88	
1/3/2014	16	4.967	572000	7.640	33.88	
1/3/2014	17	4.404	572000	6.773	33.88	
1/3/2014	18	4.772	572000	7.340	33.88	
1/3/2014	19	4.441	572000	6.831	33.88	
1/3/2014	20	5.007	572000	7.701	33.88	
1/3/2014	21	4.928	572000	7.580	33.88	
1/3/2014	22	4.960	572000	7.629	33.88	
1/3/2014	23	5.163	572000	7.941	33.88	7.217
1/4/2014	0	5.605	572000	8.621	33.88	
1/4/2014	1	5.389	572000	8.289	33.88	
1/4/2014	2	5.541	572000	8.524	33.88	
1/4/2014	3	5.515	572000	8.483	33.88	
1/4/2014	4	4.932	572000	7.585	33.88	
1/4/2014	5	4.644	572000	7.144	33.88	
1/4/2014	6	5.172	572000	7.956	33.88	
1/4/2014	7	6.301	572000	9.693	33.88	
1/4/2014	8	5.679	572000	8.735	33.88	
1/4/2014	9	5.956	572000	9.161	33.88	
1/4/2014	10	5.404	572000	8.312	33.88	
1/4/2014	11	5.427	572000	8.348	33.88	
1/4/2014	12	5.743	572000	8.834	33.88	
1/4/2014	13	6.005	572000	9.237	33.88	
1/4/2014	14	5.686	572000	8.746	33.88	
1/4/2014	15	5.279	572000	8.119	33.88	
1/4/2014	16	5.291	572000	8.138	33.88	
1/4/2014	17	5.409	572000	8.319	33.88	
1/4/2014	18	5.501	572000	8.462	33.88	
1/4/2014	19	5.568	572000	8.565	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/4/2014	20	4.896	572000	7.530	33.88	
1/4/2014	21	5.066	572000	7.792	33.88	
1/4/2014	22	5.489	572000	8.443	33.88	
1/4/2014	23	4.968	572000	7.641	33.88	8.362
1/5/2014	0	6.586	572000	10.131	33.88	
1/5/2014	1	5.637	572000	8.671	33.88	
1/5/2014	2	6.809	572000	10.473	33.88	
1/5/2014	3	5.430	572000	8.352	33.88	
1/5/2014	4	6.137	572000	9.439	33.88	
1/5/2014	5	6.508	572000	10.010	33.88	
1/5/2014	6	6.426	572000	9.883	33.88	
1/5/2014	7	4.962	572000	7.633	33.88	
1/5/2014	8	5.328	572000	8.196	33.88	
1/5/2014	9	5.311	572000	8.170	33.88	
1/5/2014	10	5.823	572000	8.956	33.88	
1/5/2014	11	6.798	572000	10.456	33.88	
1/5/2014	12	6.506	572000	10.007	33.88	
1/5/2014	13	6.336	572000	9.746	33.88	
1/5/2014	14	6.691	572000	10.292	33.88	
1/5/2014	15	7.396	572000	11.376	33.88	
1/5/2014	16	6.897	572000	10.609	33.88	
1/5/2014	17	7.160	572000	11.014	33.88	
1/5/2014	18	7.407	572000	11.393	33.88	
1/5/2014	19	7.749	572000	11.920	33.88	
1/5/2014	20	9.149	572000	14.073	33.88	
1/5/2014	21	8.131	572000	12.507	33.88	
1/5/2014	22	6.617	572000	10.179	33.88	
1/5/2014	23	6.143	572000	9.449	33.88	10.122
1/6/2014	0	6.772	572000	10.417	33.88	
1/6/2014	1	7.555	572000	11.621	33.88	
1/6/2014	2	7.510	572000	11.551	33.88	
1/6/2014	3	5.640	572000	8.676	33.88	
1/6/2014	4	5.360	572000	8.245	33.88	
1/6/2014	5	5.387	572000	8.286	33.88	
1/6/2014	6	5.571	572000	8.568	33.88	
1/6/2014	7	4.968	572000	7.642	33.88	
1/6/2014	8	5.497	572000	8.455	33.88	
1/6/2014	9	4.408	572000	6.780	33.88	
1/6/2014	10	4.587	572000	7.055	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/6/2014	11	4.496	572000	6.916	33.88	
1/6/2014	12	5.139	572000	7.904	33.88	
1/6/2014	13	5.061	572000	7.785	33.88	
1/6/2014	14	4.519	572000	6.952	33.88	
1/6/2014	15	4.997	572000	7.686	33.88	
1/6/2014	16	5.295	572000	8.145	33.88	
1/6/2014	17	5.439	572000	8.366	33.88	
1/6/2014	18	8.059	572000	12.396	33.88	
1/6/2014	19	7.456	572000	11.469	33.88	
1/6/2014	20	7.094	572000	10.911	33.88	
1/6/2014	21	7.279	572000	11.196	33.88	
1/6/2014	22	8.105	572000	12.467	33.88	
1/6/2014	23	7.483	572000	11.511	33.88	9.208
1/7/2014	0	8.632	572000	13.277	33.88	
1/7/2014	1	6.906	572000	10.622	33.88	
1/7/2014	2	6.465	572000	9.944	33.88	
1/7/2014	3	10.036	572000	15.437	33.88	
1/7/2014	4	5.599	572000	8.613	33.88	
1/7/2014	5	5.589	572000	8.596	33.88	
1/7/2014	6	5.882	572000	9.048	33.88	
1/7/2014	7	4.691	572000	7.216	33.88	
1/7/2014	8	3.783	572000	5.818	33.88	
1/7/2014	9	5.681	572000	8.738	33.88	
1/7/2014	10	3.122	572000	4.802	33.88	
1/7/2014	11	12.387	572000	19.053	33.88	
1/7/2014	12	2.945	572000	4.529	33.88	
1/7/2014	13	3.399	572000	5.227	33.88	
1/7/2014	14	2.627	572000	4.041	33.88	
1/7/2014	15	2.950	572000	4.537	33.88	
1/7/2014	16	2.843	572000	4.374	33.88	
1/7/2014	17	2.538	572000	3.903	33.88	
1/7/2014	18	2.286	572000	3.515	33.88	
1/7/2014	19	2.235	572000	3.437	33.88	
1/7/2014	20	2.228	572000	3.426	33.88	
1/7/2014	21	2.604	572000	4.005	33.88	
1/7/2014	22	2.394	572000	3.683	33.88	
1/7/2014	23	2.503	572000	3.850	33.88	7.071
1/8/2014	0	3.368	572000	5.181	33.88	
1/8/2014	1	2.355	572000	3.622	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/8/2014	2	2.867	572000	4.409	33.88	
1/8/2014	3	2.410	572000	3.706	33.88	
1/8/2014	4	2.668	572000	4.104	33.88	
1/8/2014	5	2.859	572000	4.398	33.88	
1/8/2014	6	3.046	572000	4.685	33.88	
1/8/2014	7	2.723	572000	4.188	33.88	
1/8/2014	8	3.079	572000	4.736	33.88	
1/8/2014	9	3.168	572000	4.874	33.88	
1/8/2014	10	2.659	572000	4.090	33.88	
1/8/2014	11	2.803	572000	4.311	33.88	
1/8/2014	12	2.955	572000	4.545	33.88	
1/8/2014	13	2.549	572000	3.920	33.88	
1/8/2014	14	3.111	572000	4.786	33.88	
1/8/2014	15	2.900	572000	4.461	33.88	
1/8/2014	16	3.179	572000	4.890	33.88	
1/8/2014	17	2.843	572000	4.373	33.88	
1/8/2014	18	2.772	572000	4.264	33.88	
1/8/2014	19	2.720	572000	4.184	33.88	
1/8/2014	20	2.844	572000	4.374	33.88	
1/8/2014	21	2.957	572000	4.548	33.88	
1/8/2014	22	2.521	572000	3.877	33.88	
1/8/2014	23	2.587	572000	3.980	33.88	4.354
1/9/2014	0	2.730	572000	4.200	33.88	
1/9/2014	1	2.648	572000	4.073	33.88	
1/9/2014	2	2.973	572000	4.573	33.88	
1/9/2014	3	2.548	572000	3.920	33.88	
1/9/2014	4	3.131	572000	4.816	33.88	
1/9/2014	5	3.519	572000	5.412	33.88	
1/9/2014	6	2.705	572000	4.161	33.88	
1/9/2014	7	2.481	572000	3.816	33.88	
1/9/2014	8	3.603	572000	5.542	33.88	
1/9/2014	9	2.605	572000	4.007	33.88	
1/9/2014	10	3.061	572000	4.708	33.88	
1/9/2014	11	3.759	572000	5.782	33.88	
1/9/2014	12	3.275	572000	5.037	33.88	
1/9/2014	13	3.390	572000	5.215	33.88	
1/9/2014	14	4.013	572000	6.173	33.88	
1/9/2014	15	3.163	572000	4.865	33.88	
1/9/2014	16	4.385	572000	6.744	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/9/2014	17	3.905	572000	6.006	33.88	
1/9/2014	18	3.046	572000	4.686	33.88	
1/9/2014	19	3.539	572000	5.443	33.88	
1/9/2014	20	3.968	572000	6.103	33.88	
1/9/2014	21	3.488	572000	5.365	33.88	
1/9/2014	22	3.954	572000	6.082	33.88	
1/9/2014	23	4.248	572000	6.535	33.88	5.136
1/10/2014	0	4.338	572000	6.672	33.88	
1/10/2014	1	3.917	572000	6.024	33.88	
1/10/2014	2	4.107	572000	6.317	33.88	
1/10/2014	3	3.428	572000	5.273	33.88	
1/10/2014	4	4.039	572000	6.212	33.88	
1/10/2014	5	4.247	572000	6.533	33.88	
1/10/2014	6	3.698	572000	5.688	33.88	
1/10/2014	7	3.979	572000	6.121	33.88	
1/10/2014	8	4.324	572000	6.651	33.88	
1/10/2014	9	3.352	572000	5.155	33.88	
1/10/2014	10	3.795	572000	5.837	33.88	
1/10/2014	11	4.126	572000	6.347	33.88	
1/10/2014	12	4.287	572000	6.593	33.88	
1/10/2014	13	5.016	572000	7.715	33.88	
1/10/2014	14	4.990	572000	7.676	33.88	
1/10/2014	15	4.124	572000	6.344	33.88	
1/10/2014	16	4.595	572000	7.067	33.88	
1/10/2014	17	4.534	572000	6.974	33.88	
1/10/2014	18	4.055	572000	6.237	33.88	
1/10/2014	19	4.589	572000	7.058	33.88	
1/10/2014	20	4.729	572000	7.274	33.88	
1/10/2014	21	4.201	572000	6.462	33.88	
1/10/2014	22	4.691	572000	7.215	33.88	
1/10/2014	23	5.194	572000	7.989	33.88	6.560
1/11/2014	0	5.245	572000	8.068	33.88	
1/11/2014	1	5.392	572000	8.294	33.88	
1/11/2014	2	5.133	572000	7.896	33.88	
1/11/2014	3	4.770	572000	7.338	33.88	
1/11/2014	4	5.482	572000	8.433	33.88	
1/11/2014	5	3.883	572000	5.973	33.88	
1/11/2014	6	3.846	572000	5.916	33.88	
1/11/2014	7	4.883	572000	7.511	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/11/2014	8	4.814	572000	7.405	33.88	
1/11/2014	9	4.443	572000	6.834	33.88	
1/11/2014	10	5.750	572000	8.845	33.88	
1/11/2014	11	5.244	572000	8.067	33.88	
1/11/2014	12	4.882	572000	7.509	33.88	
1/11/2014	13	5.996	572000	9.223	33.88	
1/11/2014	14	5.132	572000	7.894	33.88	
1/11/2014	15	4.552	572000	7.001	33.88	
1/11/2014	16	5.265	572000	8.098	33.88	
1/11/2014	17	4.955	572000	7.621	33.88	
1/11/2014	18	4.314	572000	6.635	33.88	
1/11/2014	19	5.922	572000	9.109	33.88	
1/11/2014	20	6.058	572000	9.318	33.88	
1/11/2014	21	6.122	572000	9.417	33.88	
1/11/2014	22	5.819	572000	8.950	33.88	
1/11/2014	23	4.721	572000	7.262	33.88	7.859
1/12/2014	0	6.594	572000	10.143	33.88	
1/12/2014	1	5.411	572000	8.322	33.88	
1/12/2014	2	6.015	572000	9.252	33.88	
1/12/2014	3	5.347	572000	8.225	33.88	
1/12/2014	4	4.593	572000	7.064	33.88	
1/12/2014	5	5.389	572000	8.290	33.88	
1/12/2014	6	5.404	572000	8.312	33.88	
1/12/2014	7	5.064	572000	7.790	33.88	
1/12/2014	8	5.524	572000	8.497	33.88	
1/12/2014	9	5.168	572000	7.949	33.88	
1/12/2014	10	5.393	572000	8.296	33.88	
1/12/2014	11	5.585	572000	8.591	33.88	
1/12/2014	12	5.173	572000	7.957	33.88	
1/12/2014	13	5.096	572000	7.839	33.88	
1/12/2014	14	5.171	572000	7.953	33.88	
1/12/2014	15	4.081	572000	6.277	33.88	
1/12/2014	16	4.889	572000	7.521	33.88	
1/12/2014	17	5.960	572000	9.168	33.88	
1/12/2014	18	17.516	572000	26.942	33.88	
1/12/2014	19	33.273	572000	51.178	33.88	
1/12/2014	20	32.449	572000	49.912	33.88	
1/12/2014	21	16.593	572000	25.522	33.88	
1/12/2014	22	7.589	572000	11.673	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/12/2014	23	7.973	572000	12.264	33.88	13.539
1/13/2014	0	10.510	572000	16.166	33.88	
1/13/2014	1	11.542	572000	17.753	33.88	
1/13/2014	2	10.598	572000	16.301	33.88	
1/13/2014	3	10.696	572000	16.453	33.88	
1/13/2014	4	11.875	572000	18.265	33.88	
1/13/2014	5	11.043	572000	16.986	33.88	
1/13/2014	6	9.931	572000	15.275	33.88	
1/13/2014	7	11.074	572000	17.033	33.88	
1/13/2014	8	9.033	572000	13.895	33.88	
1/13/2014	9	6.750	572000	10.383	33.88	
1/13/2014	10	8.459	572000	13.011	33.88	
1/13/2014	11	6.523	572000	10.034	33.88	
1/13/2014	12	5.977	572000	9.193	33.88	
1/13/2014	13	7.577	572000	11.655	33.88	
1/13/2014	14	8.041	572000	12.369	33.88	
1/13/2014	15	9.138	572000	14.056	33.88	
1/13/2014	16	6.709	572000	10.319	33.88	
1/13/2014	17	10.247	572000	15.761	33.88	
1/13/2014	18	8.415	572000	12.943	33.88	
1/13/2014	19	8.106	572000	12.469	33.88	
1/13/2014	20	7.776	572000	11.961	33.88	
1/13/2014	21	10.131	572000	15.582	33.88	
1/13/2014	22	9.035	572000	13.898	33.88	
1/13/2014	23	7.518	572000	11.564	33.88	13.889
1/14/2014	0	9.988	572000	15.363	33.88	
1/14/2014	1	13.366	572000	20.560	33.88	
1/14/2014	2	10.656	572000	16.390	33.88	
1/14/2014	3	9.826	572000	15.114	33.88	
1/14/2014	4	10.976	572000	16.883	33.88	
1/14/2014	5	9.878	572000	15.194	33.88	
1/14/2014	6	6.427	572000	9.886	33.88	
1/14/2014	7	6.232	572000	9.586	33.88	
1/14/2014	8	7.702	572000	11.847	33.88	
1/14/2014	9	8.332	572000	12.816	33.88	
1/14/2014	10	6.650	572000	10.229	33.88	
1/14/2014	11	6.585	572000	10.129	33.88	
1/14/2014	12	9.135	572000	14.051	33.88	
1/14/2014	13	8.079	572000	12.427	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/14/2014	14	7.822	572000	12.032	33.88	
1/14/2014	15	6.456	572000	9.930	33.88	
1/14/2014	16	9.317	572000	14.332	33.88	
1/14/2014	17	7.779	572000	11.965	33.88	
1/14/2014	18	9.077	572000	13.962	33.88	
1/14/2014	19	7.474	572000	11.497	33.88	
1/14/2014	20	11.172	572000	17.184	33.88	
1/14/2014	21	7.716	572000	11.868	33.88	
1/14/2014	22	7.902	572000	12.154	33.88	
1/14/2014	23	8.559	572000	13.166	33.88	13.273
1/15/2014	0	11.506	572000	17.698	33.88	
1/15/2014	1	7.992	572000	12.293	33.88	
1/15/2014	2	10.774	572000	16.572	33.88	
1/15/2014	3	11.076	572000	17.036	33.88	
1/15/2014	4	12.402	572000	19.076	33.88	
1/15/2014	5	11.708	572000	18.008	33.88	
1/15/2014	6	12.352	572000	18.999	33.88	
1/15/2014	7	9.162	572000	14.092	33.88	
1/15/2014	8	8.375	572000	12.882	33.88	
1/15/2014	9	11.376	572000	17.497	33.88	
1/15/2014	10	8.418	572000	12.949	33.88	
1/15/2014	11	13.570	572000	20.873	33.88	
1/15/2014	12	8.905	572000	13.697	33.88	
1/15/2014	13	11.731	572000	18.045	33.88	
1/15/2014	14	7.444	572000	11.449	33.88	
1/15/2014	15	7.840	572000	12.059	33.88	
1/15/2014	16	11.764	572000	18.095	33.88	
1/15/2014	17	13.840	572000	21.287	33.88	
1/15/2014	18	11.739	572000	18.056	33.88	
1/15/2014	19	16.404	572000	25.232	33.88	
1/15/2014	20	23.816	572000	36.632	33.88	
1/15/2014	21	16.175	572000	24.879	33.88	
1/15/2014	22	14.268	572000	21.947	33.88	
1/15/2014	23	13.007	572000	20.007	33.88	18.307
1/16/2014	0	11.198	572000	17.224	33.88	
1/16/2014	1	8.589	572000	13.211	33.88	
1/16/2014	2	10.648	572000	16.379	33.88	
1/16/2014	3	11.898	572000	18.302	33.88	
1/16/2014	4	9.994	572000	15.372	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/16/2014	5	10.572	572000	16.262	33.88	
1/16/2014	6	31.482	572000	48.424	33.88	
1/16/2014	7	12.521	572000	19.259	33.88	
1/16/2014	8	8.721	572000	13.414	33.88	
1/16/2014	9	5.251	572000	8.077	33.88	
1/16/2014	10	4.326	572000	6.654	33.88	
1/16/2014	11	5.693	572000	8.757	33.88	
1/16/2014	12	5.063	572000	7.788	33.88	
1/16/2014	13	4.789	572000	7.366	33.88	
1/16/2014	14	4.581	572000	7.046	33.88	
1/16/2014	15	4.601	572000	7.077	33.88	
1/16/2014	16	4.861	572000	7.477	33.88	
1/16/2014	17	4.734	572000	7.282	33.88	
1/16/2014	18	5.150	572000	7.922	33.88	
1/16/2014	19	5.599	572000	8.612	33.88	
1/16/2014	20	5.426	572000	8.347	33.88	
1/16/2014	21	5.744	572000	8.835	33.88	
1/16/2014	22	5.569	572000	8.566	33.88	
1/16/2014	23	5.342	572000	8.217	33.88	12.328
1/17/2014	0	7.656	572000	11.776	33.88	
1/17/2014	1	6.166	572000	9.484	33.88	
1/17/2014	2	6.219	572000	9.566	33.88	
1/17/2014	3	5.496	572000	8.454	33.88	
1/17/2014	4	6.977	572000	10.731	33.88	
1/17/2014	5	6.189	572000	9.519	33.88	
1/17/2014	6	6.421	572000	9.876	33.88	
1/17/2014	7	5.311	572000	8.169	33.88	
1/17/2014	8	5.951	572000	9.154	33.88	
1/17/2014	9	6.999	572000	10.765	33.88	
1/17/2014	10	5.788	572000	8.903	33.88	
1/17/2014	11	6.334	572000	9.743	33.88	
1/17/2014	12	6.164	572000	9.481	33.88	
1/17/2014	13	6.208	572000	9.548	33.88	
1/17/2014	14	6.056	572000	9.314	33.88	
1/17/2014	15	5.782	572000	8.894	33.88	
1/17/2014	16	5.814	572000	8.942	33.88	
1/17/2014	17	7.090	572000	10.906	33.88	
1/17/2014	18	6.577	572000	10.116	33.88	
1/17/2014	19	5.606	572000	8.622	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/17/2014	20	5.579	572000	8.582	33.88	
1/17/2014	21	5.632	572000	8.663	33.88	
1/17/2014	22	6.425	572000	9.883	33.88	
1/17/2014	23	4.387	572000	6.747	33.88	9.410
1/18/2014	0	6.857	572000	10.547	33.88	
1/18/2014	1	5.876	572000	9.039	33.88	
1/18/2014	2	5.364	572000	8.250	33.88	
1/18/2014	3	4.390	572000	6.753	33.88	
1/18/2014	4	4.269	572000	6.566	33.88	
1/18/2014	5	4.427	572000	6.809	33.88	
1/18/2014	6	5.723	572000	8.803	33.88	
1/18/2014	7	4.517	572000	6.947	33.88	
1/18/2014	8	4.896	572000	7.531	33.88	
1/18/2014	9	5.434	572000	8.358	33.88	
1/18/2014	10	5.177	572000	7.963	33.88	
1/18/2014	11	5.937	572000	9.133	33.88	
1/18/2014	12	5.235	572000	8.052	33.88	
1/18/2014	13	5.756	572000	8.853	33.88	
1/18/2014	14	5.118	572000	7.872	33.88	
1/18/2014	15	5.440	572000	8.367	33.88	
1/18/2014	16	5.940	572000	9.136	33.88	
1/18/2014	17	5.875	572000	9.036	33.88	
1/18/2014	18	6.322	572000	9.724	33.88	
1/18/2014	19	6.794	572000	10.450	33.88	
1/18/2014	20	6.379	572000	9.812	33.88	
1/18/2014	21	6.798	572000	10.456	33.88	
1/18/2014	22	6.369	572000	9.796	33.88	
1/18/2014	23	5.170	572000	7.952	33.88	8.592
1/19/2014	0	6.993	572000	10.756	33.88	
1/19/2014	1	6.028	572000	9.273	33.88	
1/19/2014	2	5.801	572000	8.922	33.88	
1/19/2014	3	6.288	572000	9.673	33.88	
1/19/2014	4	6.813	572000	10.479	33.88	
1/19/2014	5	6.735	572000	10.359	33.88	
1/19/2014	6	5.684	572000	8.742	33.88	
1/19/2014	7	5.423	572000	8.342	33.88	
1/19/2014	8	5.588	572000	8.596	33.88	
1/19/2014	9	5.482	572000	8.432	33.88	
1/19/2014	10	8.374	572000	12.881	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/19/2014	11	8.321	572000	12.799	33.88	
1/19/2014	12	5.437	572000	8.362	33.88	
1/19/2014	13	7.844	572000	12.065	33.88	
1/19/2014	14	5.200	572000	7.998	33.88	
1/19/2014	15	5.009	572000	7.705	33.88	
1/19/2014	16	5.421	572000	8.339	33.88	
1/19/2014	17	6.219	572000	9.566	33.88	
1/19/2014	18	5.571	572000	8.568	33.88	
1/19/2014	19	6.623	572000	10.187	33.88	
1/19/2014	20	7.148	572000	10.994	33.88	
1/19/2014	21	6.961	572000	10.706	33.88	
1/19/2014	22	8.772	572000	13.493	33.88	
1/19/2014	23	7.948	572000	12.225	33.88	9.978
1/20/2014	0	9.200	572000	14.151	33.88	
1/20/2014	1	8.041	572000	12.368	33.88	
1/20/2014	2	7.814	572000	12.019	33.88	
1/20/2014	3	7.468	572000	11.487	33.88	
1/20/2014	4	8.891	572000	13.676	33.88	
1/20/2014	5	8.392	572000	12.908	33.88	
1/20/2014	6	6.504	572000	10.003	33.88	
1/20/2014	7	8.136	572000	12.514	33.88	
1/20/2014	8	7.391	572000	11.369	33.88	
1/20/2014	9	5.449	572000	8.382	33.88	
1/20/2014	10	7.714	572000	11.866	33.88	
1/20/2014	11	9.225	572000	14.189	33.88	
1/20/2014	12	8.536	572000	13.130	33.88	
1/20/2014	13	9.370	572000	14.412	33.88	
1/20/2014	14	7.918	572000	12.180	33.88	
1/20/2014	15	8.468	572000	13.025	33.88	
1/20/2014	16	6.669	572000	10.257	33.88	
1/20/2014	17	5.127	572000	7.887	33.88	
1/20/2014	18	5.092	572000	7.832	33.88	
1/20/2014	19	5.440	572000	8.367	33.88	
1/20/2014	20	3.666	572000	5.638	33.88	
1/20/2014	21	4.524	572000	6.959	33.88	
1/20/2014	22	4.589	572000	7.058	33.88	
1/20/2014	23	4.307	572000	6.625	33.88	10.763
1/21/2014	0	6.891	572000	10.599	33.88	
1/21/2014	1	4.772	572000	7.340	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/21/2014	2	4.019	572000	6.182	33.88	
1/21/2014	3	4.338	572000	6.673	33.88	
1/21/2014	4	5.910	572000	9.091	33.88	
1/21/2014	5	4.342	572000	6.679	33.88	
1/21/2014	6	5.333	572000	8.202	33.88	
1/21/2014	7	3.507	572000	5.394	33.88	
1/21/2014	8	4.277	572000	6.579	33.88	
1/21/2014	9	4.058	572000	6.242	33.88	
1/21/2014	10	4.800	572000	7.383	33.88	
1/21/2014	11	5.227	572000	8.040	33.88	
1/21/2014	12	4.451	572000	6.847	33.88	
1/21/2014	13	4.410	572000	6.783	33.88	
1/21/2014	14	4.425	572000	6.806	33.88	
1/21/2014	15	4.414	572000	6.789	33.88	
1/21/2014	16	4.641	572000	7.139	33.88	
1/21/2014	17	4.655	572000	7.160	33.88	
1/21/2014	18	5.256	572000	8.085	33.88	
1/21/2014	19	4.683	572000	7.203	33.88	
1/21/2014	20	4.918	572000	7.564	33.88	
1/21/2014	21	6.267	572000	9.640	33.88	
1/21/2014	22	5.955	572000	9.160	33.88	
1/21/2014	23	4.971	572000	7.646	33.88	7.468
1/22/2014	0	7.434	572000	11.435	33.88	
1/22/2014	1	5.318	572000	8.179	33.88	
1/22/2014	2	4.873	572000	7.495	33.88	
1/22/2014	3	4.953	572000	7.619	33.88	
1/22/2014	4	5.342	572000	8.216	33.88	
1/22/2014	5	5.352	572000	8.232	33.88	
1/22/2014	6	5.794	572000	8.912	33.88	
1/22/2014	7	5.121	572000	7.877	33.88	
1/22/2014	8	4.959	572000	7.628	33.88	
1/22/2014	9	5.766	572000	8.869	33.88	
1/22/2014	10	8.568	572000	13.179	33.88	
1/22/2014	11	4.983	572000	7.665	33.88	
1/22/2014	12	5.102	572000	7.848	33.88	
1/22/2014	13	6.184	572000	9.512	33.88	
1/22/2014	14	10.424	572000	16.034	33.88	
1/22/2014	15	9.554	572000	14.696	33.88	
1/22/2014	16	9.372	572000	14.416	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/22/2014	17	5.140	572000	7.905	33.88	
1/22/2014	18	5.300	572000	8.153	33.88	
1/22/2014	19	5.565	572000	8.561	33.88	
1/22/2014	20	5.836	572000	8.977	33.88	
1/22/2014	21	5.568	572000	8.565	33.88	
1/22/2014	22	5.348	572000	8.227	33.88	
1/22/2014	23	5.275	572000	8.113	33.88	9.430
1/23/2014	0	7.251	572000	11.152	33.88	
1/23/2014	1	6.029	572000	9.273	33.88	
1/23/2014	2	5.510	572000	8.475	33.88	
1/23/2014	3	6.426	572000	9.883	33.88	
1/23/2014	4	6.834	572000	10.512	33.88	
1/23/2014	5	5.932	572000	9.125	33.88	
1/23/2014	6	6.011	572000	9.245	33.88	
1/23/2014	7	6.084	572000	9.357	33.88	
1/23/2014	8	6.573	572000	10.111	33.88	
1/23/2014	9	6.521	572000	10.030	33.88	
1/23/2014	10	6.165	572000	9.483	33.88	
1/23/2014	11	6.174	572000	9.496	33.88	
1/23/2014	12	6.761	572000	10.399	33.88	
1/23/2014	13	7.213	572000	11.095	33.88	
1/23/2014	14	5.650	572000	8.691	33.88	
1/23/2014	15	6.258	572000	9.626	33.88	
1/23/2014	16	7.027	572000	10.808	33.88	
1/23/2014	17	5.798	572000	8.918	33.88	
1/23/2014	18	6.290	572000	9.675	33.88	
1/23/2014	19	6.016	572000	9.253	33.88	
1/23/2014	20	7.391	572000	11.368	33.88	
1/23/2014	21	5.834	572000	8.974	33.88	
1/23/2014	22	6.496	572000	9.992	33.88	
1/23/2014	23	6.500	572000	9.997	33.88	9.789
1/24/2014	0	9.211	572000	14.168	33.88	
1/24/2014	1	6.991	572000	10.754	33.88	
1/24/2014	2	6.434	572000	9.897	33.88	
1/24/2014	3	6.758	572000	10.395	33.88	
1/24/2014	4	7.126	572000	10.961	33.88	
1/24/2014	5	6.831	572000	10.508	33.88	
1/24/2014	6	6.788	572000	10.442	33.88	
1/24/2014	7	6.804	572000	10.465	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/24/2014	8	6.205	572000	9.544	33.88	
1/24/2014	9	6.261	572000	9.630	33.88	
1/24/2014	10	5.765	572000	8.867	33.88	
1/24/2014	11	6.371	572000	9.800	33.88	
1/24/2014	12	5.565	572000	8.560	33.88	
1/24/2014	13	5.926	572000	9.115	33.88	
1/24/2014	14	6.523	572000	10.033	33.88	
1/24/2014	15	5.043	572000	7.757	33.88	
1/24/2014	16	4.498	572000	6.919	33.88	
1/24/2014	17	4.561	572000	7.016	33.88	
1/24/2014	18	5.097	572000	7.839	33.88	
1/24/2014	19	5.703	572000	8.773	33.88	
1/24/2014	20	6.712	572000	10.324	33.88	
1/24/2014	21	6.486	572000	9.976	33.88	
1/24/2014	22	6.346	572000	9.761	33.88	
1/24/2014	23	6.694	572000	10.297	33.88	9.658
1/25/2014	0	8.662	572000	13.323	33.88	
1/25/2014	1	7.138	572000	10.979	33.88	
1/25/2014	2	6.509	572000	10.011	33.88	
1/25/2014	3	6.986	572000	10.746	33.88	
1/25/2014	4	7.797	572000	11.993	33.88	
1/25/2014	5	6.475	572000	9.959	33.88	
1/25/2014	6	6.954	572000	10.696	33.88	
1/25/2014	7	6.466	572000	9.946	33.88	
1/25/2014	8	7.498	572000	11.534	33.88	
1/25/2014	9	7.601	572000	11.691	33.88	
1/25/2014	10	7.567	572000	11.639	33.88	
1/25/2014	11	6.856	572000	10.546	33.88	
1/25/2014	12	7.461	572000	11.477	33.88	
1/25/2014	13	8.885	572000	13.667	33.88	
1/25/2014	14	6.872	572000	10.570	33.88	
1/25/2014	15	6.737	572000	10.363	33.88	
1/25/2014	16	6.936	572000	10.668	33.88	
1/25/2014	17	6.952	572000	10.693	33.88	
1/25/2014	18	6.937	572000	10.670	33.88	
1/25/2014	19	6.354	572000	9.773	33.88	
1/25/2014	20	6.448	572000	9.918	33.88	
1/25/2014	21	5.884	572000	9.051	33.88	
1/25/2014	22	5.270	572000	8.107	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/25/2014	23	5.690	572000	8.752	33.88	10.699
1/26/2014	0	8.011	572000	12.323	33.88	
1/26/2014	1	6.624	572000	10.189	33.88	
1/26/2014	2	6.969	572000	10.719	33.88	
1/26/2014	3	6.082	572000	9.354	33.88	
1/26/2014	4	7.871	572000	12.107	33.88	
1/26/2014	5	7.791	572000	11.984	33.88	
1/26/2014	6	8.623	572000	13.263	33.88	
1/26/2014	7	8.020	572000	12.336	33.88	
1/26/2014	8	5.742	572000	8.833	33.88	
1/26/2014	9	5.562	572000	8.555	33.88	
1/26/2014	10	5.967	572000	9.178	33.88	
1/26/2014	11	6.311	572000	9.708	33.88	
1/26/2014	12	6.708	572000	10.317	33.88	
1/26/2014	13	6.781	572000	10.430	33.88	
1/26/2014	14	6.748	572000	10.380	33.88	
1/26/2014	15	6.794	572000	10.450	33.88	
1/26/2014	16	7.221	572000	11.107	33.88	
1/26/2014	17	8.961	572000	13.783	33.88	
1/26/2014	18	7.383	572000	11.356	33.88	
1/26/2014	19	8.336	572000	12.822	33.88	
1/26/2014	20	7.543	572000	11.603	33.88	
1/26/2014	21	6.895	572000	10.606	33.88	
1/26/2014	22	5.556	572000	8.546	33.88	
1/26/2014	23	4.972	572000	7.648	33.88	10.733
1/27/2014	0	7.369	572000	11.335	33.88	
1/27/2014	1	5.423	572000	8.341	33.88	
1/27/2014	2	6.539	572000	10.058	33.88	
1/27/2014	3	7.078	572000	10.887	33.88	
1/27/2014	4	7.339	572000	11.288	33.88	
1/27/2014	5	6.500	572000	9.999	33.88	
1/27/2014	6	5.559	572000	8.551	33.88	
1/27/2014	7	4.109	572000	6.320	33.88	
1/27/2014	8	4.839	572000	7.444	33.88	
1/27/2014	9	6.131	572000	9.430	33.88	
1/27/2014	10	6.201	572000	9.539	33.88	
1/27/2014	11	5.987	572000	9.210	33.88	
1/27/2014	12	6.061	572000	9.323	33.88	
1/27/2014	13	7.038	572000	10.826	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/27/2014	14	7.297	572000	11.224	33.88	
1/27/2014	15	6.681	572000	10.277	33.88	
1/27/2014	16	6.028	572000	9.271	33.88	
1/27/2014	17	6.132	572000	9.431	33.88	
1/27/2014	18	6.202	572000	9.539	33.88	
1/27/2014	19	6.030	572000	9.274	33.88	
1/27/2014	20	6.226	572000	9.577	33.88	
1/27/2014	21	6.134	572000	9.434	33.88	
1/27/2014	22	6.745	572000	10.374	33.88	
1/27/2014	23	6.316	572000	9.714	33.88	9.611
1/28/2014	0	8.930	572000	13.736	33.88	
1/28/2014	1	6.554	572000	10.081	33.88	
1/28/2014	2	6.283	572000	9.665	33.88	
1/28/2014	3	6.907	572000	10.624	33.88	
1/28/2014	4	6.494	572000	9.988	33.88	
1/28/2014	5	6.589	572000	10.135	33.88	
1/28/2014	6	6.764	572000	10.404	33.88	
1/28/2014	7	6.047	572000	9.302	33.88	
1/28/2014	8	5.817	572000	8.947	33.88	
1/28/2014	9	5.440	572000	8.367	33.88	
1/28/2014	10	5.796	572000	8.915	33.88	
1/28/2014	11	5.496	572000	8.453	33.88	
1/28/2014	12	5.802	572000	8.925	33.88	
1/28/2014	13	5.964	572000	9.174	33.88	
1/28/2014	14	5.895	572000	9.068	33.88	
1/28/2014	15	5.423	572000	8.341	33.88	
1/28/2014	16	5.509	572000	8.473	33.88	
1/28/2014	17	5.640	572000	8.675	33.88	
1/28/2014	18	5.759	572000	8.858	33.88	
1/28/2014	19	5.537	572000	8.516	33.88	
1/28/2014	20	5.234	572000	8.051	33.88	
1/28/2014	21	5.377	572000	8.271	33.88	
1/28/2014	22	5.089	572000	7.828	33.88	
1/28/2014	23	5.388	572000	8.288	33.88	9.212
1/29/2014	0	8.177	572000	12.578	33.88	
1/29/2014	1	6.282	572000	9.662	33.88	
1/29/2014	2	5.756	572000	8.854	33.88	
1/29/2014	3	5.558	572000	8.549	33.88	
1/29/2014	4	5.798	572000	8.919	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/29/2014	5	6.214	572000	9.558	33.88	
1/29/2014	6	5.227	572000	8.040	33.88	
1/29/2014	7	5.911	572000	9.093	33.88	
1/29/2014	8	5.511	572000	8.476	33.88	
1/29/2014	9	6.284	572000	9.665	33.88	
1/29/2014	10	6.570	572000	10.106	33.88	
1/29/2014	11	5.329	572000	8.196	33.88	
1/29/2014	12	5.527	572000	8.501	33.88	
1/29/2014	13	5.618	572000	8.641	33.88	
1/29/2014	14	4.819	572000	7.412	33.88	
1/29/2014	15	4.696	572000	7.224	33.88	
1/29/2014	16	4.663	572000	7.173	33.88	
1/29/2014	17	4.672	572000	7.186	33.88	
1/29/2014	18	4.698	572000	7.226	33.88	
1/29/2014	19	4.817	572000	7.409	33.88	
1/29/2014	20	5.376	572000	8.269	33.88	
1/29/2014	21	5.322	572000	8.185	33.88	
1/29/2014	22	5.088	572000	7.827	33.88	
1/29/2014	23	4.552	572000	7.001	33.88	8.490
1/30/2014	0	6.952	572000	10.693	33.88	
1/30/2014	1	4.622	572000	7.109	33.88	
1/30/2014	2	4.829	572000	7.427	33.88	
1/30/2014	3	4.654	572000	7.159	33.88	
1/30/2014	4	4.825	572000	7.422	33.88	
1/30/2014	5	5.094	572000	7.836	33.88	
1/30/2014	6	4.769	572000	7.336	33.88	
1/30/2014	7	4.251	572000	6.538	33.88	
1/30/2014	8	6.223	572000	9.571	33.88	
1/30/2014	9	7.813	572000	12.017	33.88	
1/30/2014	10	8.088	572000	12.441	33.88	
1/30/2014	11	8.225	572000	12.651	33.88	
1/30/2014	12	8.022	572000	12.339	33.88	
1/30/2014	13	7.597	572000	11.685	33.88	
1/30/2014	14	8.024	572000	12.342	33.88	
1/30/2014	15	7.211	572000	11.091	33.88	
1/30/2014	16	7.905	572000	12.159	33.88	
1/30/2014	17	7.307	572000	11.239	33.88	
1/30/2014	18	6.767	572000	10.408	33.88	
1/30/2014	19	6.361	572000	9.785	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
1/30/2014	20	6.424	572000	9.881	33.88	
1/30/2014	21	6.955	572000	10.697	33.88	
1/30/2014	22	6.513	572000	10.018	33.88	
1/30/2014	23	6.845	572000	10.529	33.88	10.016
1/31/2014	0	7.795	572000	11.990	33.88	
1/31/2014	1	6.854	572000	10.542	33.88	
1/31/2014	2	6.216	572000	9.561	33.88	
1/31/2014	3	6.020	572000	9.259	33.88	
1/31/2014	4	6.296	572000	9.685	33.88	
1/31/2014	5	5.631	572000	8.662	33.88	
1/31/2014	6	5.655	572000	8.699	33.88	
1/31/2014	7	4.761	572000	7.323	33.88	
1/31/2014	8	4.474	572000	6.881	33.88	
1/31/2014	9	3.805	572000	5.853	33.88	
1/31/2014	10	3.906	572000	6.007	33.88	
1/31/2014	11	4.063	572000	6.250	33.88	
1/31/2014	12	4.631	572000	7.124	33.88	
1/31/2014	13	4.288	572000	6.596	33.88	
1/31/2014	14	4.599	572000	7.074	33.88	
1/31/2014	15	4.365	572000	6.713	33.88	
1/31/2014	16	4.394	572000	6.759	33.88	
1/31/2014	17	4.827	572000	7.425	33.88	
1/31/2014	18	4.993	572000	7.680	33.88	
1/31/2014	19	5.531	572000	8.507	33.88	
1/31/2014	20	4.834	572000	7.435	33.88	
1/31/2014	21	4.818	572000	7.411	33.88	
1/31/2014	22	4.966	572000	7.639	33.88	
1/31/2014	23	4.647	572000	7.148	33.88	7.843
2/1/2014	0	7.116	572000	10.945	33.88	
2/1/2014	1	4.984	572000	7.667	33.88	
2/1/2014	2	5.031	572000	7.739	33.88	
2/1/2014	3	4.587	572000	7.055	33.88	
2/1/2014	4	5.848	572000	8.995	33.88	
2/1/2014	5	5.298	572000	8.149	33.88	
2/1/2014	6	5.231	572000	8.046	33.88	
2/1/2014	7	4.825	572000	7.422	33.88	
2/1/2014	8	5.338	572000	8.211	33.88	
2/1/2014	9	5.466	572000	8.408	33.88	
2/1/2014	10	4.884	572000	7.512	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/1/2014	11	5.544	572000	8.528	33.88	
2/1/2014	12	5.689	572000	8.750	33.88	
2/1/2014	13	5.853	572000	9.003	33.88	
2/1/2014	14	5.680	572000	8.736	33.88	
2/1/2014	15	6.734	572000	10.357	33.88	
2/1/2014	16	5.257	572000	8.087	33.88	
2/1/2014	17	5.044	572000	7.758	33.88	
2/1/2014	18	4.884	572000	7.512	33.88	
2/1/2014	19	5.196	572000	7.992	33.88	
2/1/2014	20	4.358	572000	6.704	33.88	
2/1/2014	21	3.643	572000	5.604	33.88	
2/1/2014	22	4.134	572000	6.358	33.88	
2/1/2014	23	3.892	572000	5.986	33.88	7.980
2/2/2014	0	6.074	572000	9.342	33.88	
2/2/2014	1	4.368	572000	6.718	33.88	
2/2/2014	2	4.495	572000	6.914	33.88	
2/2/2014	3	4.910	572000	7.552	33.88	
2/2/2014	4	4.286	572000	6.593	33.88	
2/2/2014	5	4.620	572000	7.106	33.88	
2/2/2014	6	4.555	572000	7.006	33.88	
2/2/2014	7	4.611	572000	7.092	33.88	
2/2/2014	8	4.948	572000	7.612	33.88	
2/2/2014	9	5.019	572000	7.719	33.88	
2/2/2014	10	5.150	572000	7.922	33.88	
2/2/2014	11	4.493	572000	6.911	33.88	
2/2/2014	12	4.455	572000	6.852	33.88	
2/2/2014	13	4.463	572000	6.864	33.88	
2/2/2014	14	4.765	572000	7.329	33.88	
2/2/2014	15	3.964	572000	6.097	33.88	
2/2/2014	16	3.860	572000	5.938	33.88	
2/2/2014	17	3.897	572000	5.994	33.88	
2/2/2014	18	5.062	572000	7.786	33.88	
2/2/2014	19	5.004	572000	7.697	33.88	
2/2/2014	20	4.560	572000	7.013	33.88	
2/2/2014	21	4.409	572000	6.781	33.88	
2/2/2014	22	4.640	572000	7.138	33.88	
2/2/2014	23	4.648	572000	7.149	33.88	7.130
2/3/2014	0	6.545	572000	10.067	33.88	
2/3/2014	1	4.710	572000	7.244	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/3/2014	2	4.598	572000	7.072	33.88	
2/3/2014	3	4.922	572000	7.571	33.88	
2/3/2014	4	4.848	572000	7.457	33.88	
2/3/2014	5	5.135	572000	7.898	33.88	
2/3/2014	6	5.117	572000	7.870	33.88	
2/3/2014	7	4.668	572000	7.180	33.88	
2/3/2014	8	5.187	572000	7.978	33.88	
2/3/2014	9	5.394	572000	8.297	33.88	
2/3/2014	10	5.053	572000	7.773	33.88	
2/3/2014	11	4.662	572000	7.170	33.88	
2/3/2014	12	5.569	572000	8.566	33.88	
2/3/2014	13	4.788	572000	7.364	33.88	
2/3/2014	14	4.814	572000	7.405	33.88	
2/3/2014	15	5.140	572000	7.906	33.88	
2/3/2014	16	5.522	572000	8.494	33.88	
2/3/2014	17	5.730	572000	8.813	33.88	
2/3/2014	18	5.298	572000	8.149	33.88	
2/3/2014	19	5.635	572000	8.667	33.88	
2/3/2014	20	5.491	572000	8.447	33.88	
2/3/2014	21	5.321	572000	8.184	33.88	
2/3/2014	22	4.915	572000	7.559	33.88	
2/3/2014	23	4.801	572000	7.384	33.88	7.938
2/4/2014	0	6.768	572000	10.409	33.88	
2/4/2014	1	4.883	572000	7.511	33.88	
2/4/2014	2	5.260	572000	8.091	33.88	
2/4/2014	3	5.823	572000	8.957	33.88	
2/4/2014	4	5.681	572000	8.738	33.88	
2/4/2014	5	5.501	572000	8.461	33.88	
2/4/2014	6	6.066	572000	9.331	33.88	
2/4/2014	7	4.776	572000	7.346	33.88	
2/4/2014	8	4.951	572000	7.615	33.88	
2/4/2014	9	5.580	572000	8.582	33.88	
2/4/2014	10	5.763	572000	8.864	33.88	
2/4/2014	11	6.008	572000	9.241	33.88	
2/4/2014	12	5.334	572000	8.205	33.88	
2/4/2014	13	4.231	572000	6.508	33.88	
2/4/2014	14	3.470	572000	5.337	33.88	
2/4/2014	15	2.953	572000	4.542	33.88	
2/4/2014	16	3.405	572000	5.238	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/4/2014	17	3.440	572000	5.292	33.88	
2/4/2014	18	3.572	572000	5.494	33.88	
2/4/2014	19	4.199	572000	6.458	33.88	
2/4/2014	20	4.807	572000	7.394	33.88	
2/4/2014	21	4.961	572000	7.631	33.88	
2/4/2014	22	4.678	572000	7.195	33.88	
2/4/2014	23	5.345	572000	8.221	33.88	7.528
2/5/2014	0	6.730	572000	10.352	33.88	
2/5/2014	1	4.454	572000	6.851	33.88	
2/5/2014	2	6.812	572000	10.478	33.88	
2/5/2014	3	6.085	572000	9.359	33.88	
2/5/2014	4	4.866	572000	7.485	33.88	
2/5/2014	5	5.631	572000	8.661	33.88	
2/5/2014	6	7.512	572000	11.554	33.88	
2/5/2014	7	6.299	572000	9.689	33.88	
2/5/2014	8	7.309	572000	11.242	33.88	
2/5/2014	9	5.096	572000	7.838	33.88	
2/5/2014	10	5.236	572000	8.053	33.88	
2/5/2014	11	6.260	572000	9.629	33.88	
2/5/2014	12	4.743	572000	7.295	33.88	
2/5/2014	13	5.323	572000	8.188	33.88	
2/5/2014	14	6.107	572000	9.393	33.88	
2/5/2014	15	4.789	572000	7.365	33.88	
2/5/2014	16	5.416	572000	8.330	33.88	
2/5/2014	17	4.485	572000	6.899	33.88	
2/5/2014	18	6.287	572000	9.671	33.88	
2/5/2014	19	6.230	572000	9.583	33.88	
2/5/2014	20	6.177	572000	9.500	33.88	
2/5/2014	21	5.874	572000	9.035	33.88	
2/5/2014	22	5.496	572000	8.454	33.88	
2/5/2014	23	5.654	572000	8.697	33.88	8.900
2/6/2014	0	7.140	572000	10.982	33.88	
2/6/2014	1	5.679	572000	8.735	33.88	
2/6/2014	2	6.112	572000	9.402	33.88	
2/6/2014	3	3.965	572000	6.098	33.88	
2/6/2014	4	4.161	572000	6.400	33.88	
2/6/2014	5	4.500	572000	6.921	33.88	
2/6/2014	6	4.471	572000	6.878	33.88	
2/6/2014	7	4.366	572000	6.716	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/6/2014	8	4.454	572000	6.851	33.88	
2/6/2014	9	4.079	572000	6.274	33.88	
2/6/2014	10	4.468	572000	6.873	33.88	
2/6/2014	11	4.232	572000	6.509	33.88	
2/6/2014	12	3.827	572000	5.886	33.88	
2/6/2014	13	3.310	572000	5.091	33.88	
2/6/2014	14	4.111	572000	6.323	33.88	
2/6/2014	15	3.549	572000	5.459	33.88	
2/6/2014	16	3.296	572000	5.069	33.88	
2/6/2014	17	13.131	572000	20.198	33.88	
2/6/2014	18	3.321	572000	5.108	33.88	
2/6/2014	19	4.446	572000	6.838	33.88	
2/6/2014	20	4.107	572000	6.317	33.88	
2/6/2014	21	3.667	572000	5.640	33.88	
2/6/2014	22	3.582	572000	5.509	33.88	
2/6/2014	23	4.154	572000	6.390	33.88	7.186
2/7/2014	0	6.521	572000	10.030	33.88	
2/7/2014	1	4.602	572000	7.079	33.88	
2/7/2014	2	4.226	572000	6.500	33.88	
2/7/2014	3	7.741	572000	11.907	33.88	
2/7/2014	4	4.540	572000	6.983	33.88	
2/7/2014	5	4.709	572000	7.243	33.88	
2/7/2014	6	5.057	572000	7.779	33.88	
2/7/2014	7	4.873	572000	7.495	33.88	
2/7/2014	8	5.566	572000	8.561	33.88	
2/7/2014	9	5.381	572000	8.277	33.88	
2/7/2014	10	5.789	572000	8.905	33.88	
2/7/2014	11	6.221	572000	9.568	33.88	
2/7/2014	12	6.742	572000	10.371	33.88	
2/7/2014	13	7.148	572000	10.995	33.88	
2/7/2014	14	6.682	572000	10.278	33.88	
2/7/2014	15	5.538	572000	8.519	33.88	
2/7/2014	16	5.930	572000	9.121	33.88	
2/7/2014	17	5.623	572000	8.650	33.88	
2/7/2014	18	5.612	572000	8.632	33.88	
2/7/2014	19	5.910	572000	9.090	33.88	
2/7/2014	20	6.111	572000	9.399	33.88	
2/7/2014	21	6.260	572000	9.629	33.88	
2/7/2014	22	5.741	572000	8.830	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/7/2014	23	5.111	572000	7.862	33.88	8.821
2/8/2014	0	8.430	572000	12.966	33.88	
2/8/2014	1	5.679	572000	8.735	33.88	
2/8/2014	2	5.407	572000	8.317	33.88	
2/8/2014	3	5.941	572000	9.138	33.88	
2/8/2014	4	5.865	572000	9.022	33.88	
2/8/2014	5	5.508	572000	8.472	33.88	
2/8/2014	6	5.796	572000	8.915	33.88	
2/8/2014	7	5.789	572000	8.905	33.88	
2/8/2014	8	5.608	572000	8.627	33.88	
2/8/2014	9	5.709	572000	8.781	33.88	
2/8/2014	10	6.166	572000	9.484	33.88	
2/8/2014	11	6.040	572000	9.291	33.88	
2/8/2014	12	6.320	572000	9.722	33.88	
2/8/2014	13	5.826	572000	8.962	33.88	
2/8/2014	14	5.731	572000	8.816	33.88	
2/8/2014	15	11.491	572000	17.674	33.88	
2/8/2014	16	3.748	572000	5.766	33.88	
2/8/2014	17	4.605	572000	7.083	33.88	
2/8/2014	18	6.157	572000	9.470	33.88	
2/8/2014	19	6.104	572000	9.389	33.88	
2/8/2014	20	5.599	572000	8.612	33.88	
2/8/2014	21	5.207	572000	8.009	33.88	
2/8/2014	22	5.464	572000	8.404	33.88	
2/8/2014	23	5.741	572000	8.831	33.88	9.225
2/9/2014	0	8.297	572000	12.763	33.88	
2/9/2014	1	6.405	572000	9.853	33.88	
2/9/2014	2	6.260	572000	9.628	33.88	
2/9/2014	3	6.109	572000	9.396	33.88	
2/9/2014	4	5.840	572000	8.983	33.88	
2/9/2014	5	6.308	572000	9.703	33.88	
2/9/2014	6	5.633	572000	8.664	33.88	
2/9/2014	7	5.576	572000	8.577	33.88	
2/9/2014	8	6.074	572000	9.342	33.88	
2/9/2014	9	5.608	572000	8.626	33.88	
2/9/2014	10	5.508	572000	8.472	33.88	
2/9/2014	11	6.337	572000	9.747	33.88	
2/9/2014	12	6.683	572000	10.279	33.88	
2/9/2014	13	6.487	572000	9.978	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/9/2014	14	5.154	572000	7.927	33.88	
2/9/2014	15	5.873	572000	9.034	33.88	
2/9/2014	16	5.693	572000	8.756	33.88	
2/9/2014	17	6.102	572000	9.386	33.88	
2/9/2014	18	6.062	572000	9.325	33.88	
2/9/2014	19	6.554	572000	10.082	33.88	
2/9/2014	20	6.505	572000	10.006	33.88	
2/9/2014	21	7.218	572000	11.103	33.88	
2/9/2014	22	5.823	572000	8.957	33.88	
2/9/2014	23	5.278	572000	8.118	33.88	9.446
2/10/2014	0	8.743	572000	13.448	33.88	
2/10/2014	1	7.624	572000	11.726	33.88	
2/10/2014	2	7.706	572000	11.854	33.88	
2/10/2014	3	6.954	572000	10.696	33.88	
2/10/2014	4	6.731	572000	10.354	33.88	
2/10/2014	5	6.771	572000	10.416	33.88	
2/10/2014	6	6.068	572000	9.334	33.88	
2/10/2014	7	5.635	572000	8.668	33.88	
2/10/2014	8	6.446	572000	9.914	33.88	
2/10/2014	9	5.951	572000	9.154	33.88	
2/10/2014	10	5.584	572000	8.589	33.88	
2/10/2014	11	6.118	572000	9.410	33.88	
2/10/2014	12	6.373	572000	9.803	33.88	
2/10/2014	13	6.369	572000	9.797	33.88	
2/10/2014	14	5.828	572000	8.965	33.88	
2/10/2014	15	5.442	572000	8.370	33.88	
2/10/2014	16	6.122	572000	9.417	33.88	
2/10/2014	17	5.921	572000	9.108	33.88	
2/10/2014	18	5.516	572000	8.485	33.88	
2/10/2014	19	5.239	572000	8.058	33.88	
2/10/2014	20	5.353	572000	8.234	33.88	
2/10/2014	21	4.792	572000	7.371	33.88	
2/10/2014	22	5.235	572000	8.052	33.88	
2/10/2014	23	5.323	572000	8.188	33.88	9.475
2/11/2014	0	7.455	572000	11.467	33.88	
2/11/2014	1	4.948	572000	7.610	33.88	
2/11/2014	2	5.656	572000	8.700	33.88	
2/11/2014	3	5.323	572000	8.187	33.88	
2/11/2014	4	4.998	572000	7.688	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/11/2014	5	5.122	572000	7.879	33.88	
2/11/2014	6	5.374	572000	8.266	33.88	
2/11/2014	7	4.600	572000	7.075	33.88	
2/11/2014	8	4.944	572000	7.604	33.88	
2/11/2014	9	5.005	572000	7.698	33.88	
2/11/2014	10	5.557	572000	8.548	33.88	
2/11/2014	11	6.027	572000	9.270	33.88	
2/11/2014	12	6.419	572000	9.874	33.88	
2/11/2014	13	6.505	572000	10.006	33.88	
2/11/2014	14	5.891	572000	9.062	33.88	
2/11/2014	15	5.835	572000	8.975	33.88	
2/11/2014	16	5.635	572000	8.668	33.88	
2/11/2014	17	5.234	572000	8.051	33.88	
2/11/2014	18	5.203	572000	8.004	33.88	
2/11/2014	19	4.973	572000	7.649	33.88	
2/11/2014	20	5.275	572000	8.114	33.88	
2/11/2014	21	5.459	572000	8.396	33.88	
2/11/2014	22	5.065	572000	7.790	33.88	
2/11/2014	23	4.634	572000	7.128	33.88	8.404
2/12/2014	0	7.487	572000	11.516	33.88	
2/12/2014	1	5.549	572000	8.535	33.88	
2/12/2014	2	5.546	572000	8.531	33.88	
2/12/2014	3	5.919	572000	9.105	33.88	
2/12/2014	4	6.470	572000	9.952	33.88	
2/12/2014	5	5.575	572000	8.575	33.88	
2/12/2014	6	5.838	572000	8.980	33.88	
2/12/2014	7	5.832	572000	8.971	33.88	
2/12/2014	8	5.823	572000	8.957	33.88	
2/12/2014	9	6.254	572000	9.620	33.88	
2/12/2014	10	5.978	572000	9.195	33.88	
2/12/2014	11	6.135	572000	9.436	33.88	
2/12/2014	12	6.266	572000	9.638	33.88	
2/12/2014	13	6.360	572000	9.783	33.88	
2/12/2014	14	5.825	572000	8.960	33.88	
2/12/2014	15	5.844	572000	8.990	33.88	
2/12/2014	16	5.760	572000	8.860	33.88	
2/12/2014	17	5.208	572000	8.011	33.88	
2/12/2014	18	5.716	572000	8.792	33.88	
2/12/2014	19	5.370	572000	8.260	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/12/2014	20	5.197	572000	7.994	33.88	
2/12/2014	21	5.393	572000	8.295	33.88	
2/12/2014	22	5.950	572000	9.153	33.88	
2/12/2014	23	5.153	572000	7.925	33.88	9.001
2/13/2014	0	7.427	572000	11.424	33.88	
2/13/2014	1	6.132	572000	9.432	33.88	
2/13/2014	2	5.650	572000	8.691	33.88	
2/13/2014	3	6.166	572000	9.484	33.88	
2/13/2014	4	6.033	572000	9.279	33.88	
2/13/2014	5	5.913	572000	9.095	33.88	
2/13/2014	6	6.251	572000	9.615	33.88	
2/13/2014	7	5.121	572000	7.878	33.88	
2/13/2014	8	5.266	572000	8.099	33.88	
2/13/2014	9	5.173	572000	7.958	33.88	
2/13/2014	10	5.029	572000	7.735	33.88	
2/13/2014	11	4.945	572000	7.607	33.88	
2/13/2014	12	5.238	572000	8.057	33.88	
2/13/2014	13	6.194	572000	9.528	33.88	
2/13/2014	14	6.223	572000	9.572	33.88	
2/13/2014	15	6.207	572000	9.548	33.88	
2/13/2014	16	6.065	572000	9.329	33.88	
2/13/2014	17	6.580	572000	10.121	33.88	
2/13/2014	18	6.572	572000	10.109	33.88	
2/13/2014	19	7.244	572000	11.142	33.88	
2/13/2014	20	6.357	572000	9.778	33.88	
2/13/2014	21	7.063	572000	10.864	33.88	
2/13/2014	22	5.758	572000	8.856	33.88	
2/13/2014	23	5.592	572000	8.602	33.88	9.242
2/14/2014	0	7.685	572000	11.820	33.88	
2/14/2014	1	5.401	572000	8.307	33.88	
2/14/2014	2	5.581	572000	8.585	33.88	
2/14/2014	3	6.041	572000	9.293	33.88	
2/14/2014	4	6.016	572000	9.253	33.88	
2/14/2014	5	5.870	572000	9.030	33.88	
2/14/2014	6	6.397	572000	9.840	33.88	
2/14/2014	7	5.991	572000	9.215	33.88	
2/14/2014	8	6.135	572000	9.437	33.88	
2/14/2014	9	5.957	572000	9.162	33.88	
2/14/2014	10	6.075	572000	9.344	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/14/2014	11	6.508	572000	10.011	33.88	
2/14/2014	12	7.203	572000	11.080	33.88	
2/14/2014	13	5.938	572000	9.134	33.88	
2/14/2014	14	6.405	572000	9.852	33.88	
2/14/2014	15	6.592	572000	10.140	33.88	
2/14/2014	16	6.784	572000	10.434	33.88	
2/14/2014	17	7.079	572000	10.888	33.88	
2/14/2014	18	7.721	572000	11.876	33.88	
2/14/2014	19	6.832	572000	10.509	33.88	
2/14/2014	20	6.333	572000	9.741	33.88	
2/14/2014	21	6.592	572000	10.140	33.88	
2/14/2014	22	6.128	572000	9.426	33.88	
2/14/2014	23	6.003	572000	9.233	33.88	9.823
2/15/2014	0	8.023	572000	12.340	33.88	
2/15/2014	1	6.945	572000	10.682	33.88	
2/15/2014	2	6.575	572000	10.114	33.88	
2/15/2014	3	6.723	572000	10.342	33.88	
2/15/2014	4	6.957	572000	10.701	33.88	
2/15/2014	5	8.437	572000	12.978	33.88	
2/15/2014	6	7.407	572000	11.392	33.88	
2/15/2014	7	6.108	572000	9.395	33.88	
2/15/2014	8	5.713	572000	8.788	33.88	
2/15/2014	9	5.838	572000	8.980	33.88	
2/15/2014	10	6.110	572000	9.399	33.88	
2/15/2014	11	5.836	572000	8.977	33.88	
2/15/2014	12	6.469	572000	9.951	33.88	
2/15/2014	13	6.473	572000	9.957	33.88	
2/15/2014	14	6.467	572000	9.948	33.88	
2/15/2014	15	5.549	572000	8.536	33.88	
2/15/2014	16	6.621	572000	10.185	33.88	
2/15/2014	17	6.973	572000	10.725	33.88	
2/15/2014	18	6.046	572000	9.300	33.88	
2/15/2014	19	6.674	572000	10.266	33.88	
2/15/2014	20	6.435	572000	9.898	33.88	
2/15/2014	21	6.627	572000	10.193	33.88	
2/15/2014	22	5.613	572000	8.634	33.88	
2/15/2014	23	6.100	572000	9.383	33.88	10.044
2/16/2014	0	8.143	572000	12.524	33.88	
2/16/2014	1	6.540	572000	10.059	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/16/2014	2	6.892	572000	10.602	33.88	
2/16/2014	3	6.931	572000	10.661	33.88	
2/16/2014	4	6.549	572000	10.073	33.88	
2/16/2014	5	7.589	572000	11.674	33.88	
2/16/2014	6	6.221	572000	9.568	33.88	
2/16/2014	7	5.313	572000	8.172	33.88	
2/16/2014	8	4.917	572000	7.563	33.88	
2/16/2014	9	5.369	572000	8.258	33.88	
2/16/2014	10	6.595	572000	10.145	33.88	
2/16/2014	11	5.987	572000	9.209	33.88	
2/16/2014	12	6.747	572000	10.377	33.88	
2/16/2014	13	6.800	572000	10.459	33.88	
2/16/2014	14	6.578	572000	10.118	33.88	
2/16/2014	15	5.910	572000	9.091	33.88	
2/16/2014	16	7.428	572000	11.425	33.88	
2/16/2014	17	7.820	572000	12.028	33.88	
2/16/2014	18	7.350	572000	11.305	33.88	
2/16/2014	19	7.996	572000	12.299	33.88	
2/16/2014	20	7.730	572000	11.890	33.88	
2/16/2014	21	6.965	572000	10.713	33.88	
2/16/2014	22	6.176	572000	9.500	33.88	
2/16/2014	23	6.260	572000	9.630	33.88	10.306
2/17/2014	0	8.677	572000	13.347	33.88	
2/17/2014	1	6.096	572000	9.377	33.88	
2/17/2014	2	7.179	572000	11.043	33.88	
2/17/2014	3	7.285	572000	11.206	33.88	
2/17/2014	4	7.402	572000	11.386	33.88	
2/17/2014	5	6.848	572000	10.534	33.88	
2/17/2014	6	7.385	572000	11.359	33.88	
2/17/2014	7	7.203	572000	11.079	33.88	
2/17/2014	8	6.951	572000	10.692	33.88	
2/17/2014	9	7.169	572000	11.027	33.88	
2/17/2014	10	7.240	572000	11.137	33.88	
2/17/2014	11	6.871	572000	10.568	33.88	
2/17/2014	12	6.761	572000	10.399	33.88	
2/17/2014	13	6.445	572000	9.914	33.88	
2/17/2014	14	6.988	572000	10.749	33.88	
2/17/2014	15	7.023	572000	10.803	33.88	
2/17/2014	16	7.759	572000	11.934	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/17/2014	17	7.304	572000	11.235	33.88	
2/17/2014	18	6.326	572000	9.731	33.88	
2/17/2014	19	6.592	572000	10.140	33.88	
2/17/2014	20	5.743	572000	8.833	33.88	
2/17/2014	21	5.518	572000	8.488	33.88	
2/17/2014	22	5.285	572000	8.129	33.88	
2/17/2014	23	4.991	572000	7.677	33.88	10.449
2/18/2014	0	7.696	572000	11.838	33.88	
2/18/2014	1	5.843	572000	8.987	33.88	
2/18/2014	2	6.372	572000	9.801	33.88	
2/18/2014	3	5.663	572000	8.711	33.88	
2/18/2014	4	5.880	572000	9.044	33.88	
2/18/2014	5	5.750	572000	8.845	33.88	
2/18/2014	6	4.712	572000	7.248	33.88	
2/18/2014	7	4.804	572000	7.389	33.88	
2/18/2014	8	4.500	572000	6.921	33.88	
2/18/2014	9	4.436	572000	6.823	33.88	
2/18/2014	10	4.735	572000	7.283	33.88	
2/18/2014	11	4.531	572000	6.970	33.88	
2/18/2014	12	4.522	572000	6.956	33.88	
2/18/2014	13	5.389	572000	8.290	33.88	
2/18/2014	14	5.420	572000	8.336	33.88	
2/18/2014	15	5.274	572000	8.112	33.88	
2/18/2014	16	4.464	572000	6.866	33.88	
2/18/2014	17	4.680	572000	7.199	33.88	
2/18/2014	18	3.871	572000	5.954	33.88	
2/18/2014	19	4.194	572000	6.452	33.88	
2/18/2014	20	4.389	572000	6.751	33.88	
2/18/2014	21	3.716	572000	5.715	33.88	
2/18/2014	22	3.930	572000	6.046	33.88	
2/18/2014	23	3.686	572000	5.670	33.88	7.592
2/19/2014	0	6.581	572000	10.122	33.88	
2/19/2014	1	4.445	572000	6.837	33.88	
2/19/2014	2	4.006	572000	6.162	33.88	
2/19/2014	3	3.941	572000	6.062	33.88	
2/19/2014	4	4.437	572000	6.824	33.88	
2/19/2014	5	4.899	572000	7.536	33.88	
2/19/2014	6	5.172	572000	7.955	33.88	
2/19/2014	7	4.907	572000	7.548	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/19/2014	8	5.004	572000	7.697	33.88	
2/19/2014	9	5.367	572000	8.255	33.88	
2/19/2014	10	5.725	572000	8.806	33.88	
2/19/2014	11	6.780	572000	10.429	33.88	
2/19/2014	12	7.457	572000	11.470	33.88	
2/19/2014	13	5.987	572000	9.209	33.88	
2/19/2014	14	5.517	572000	8.487	33.88	
2/19/2014	15	5.091	572000	7.830	33.88	
2/19/2014	16	4.247	572000	6.532	33.88	
2/19/2014	17	4.321	572000	6.647	33.88	
2/19/2014	18	4.811	572000	7.401	33.88	
2/19/2014	19	4.888	572000	7.519	33.88	
2/19/2014	20	5.023	572000	7.726	33.88	
2/19/2014	21	4.675	572000	7.191	33.88	
2/19/2014	22	4.641	572000	7.139	33.88	
2/19/2014	23	4.514	572000	6.943	33.88	7.847
2/20/2014	0	6.854	572000	10.542	33.88	
2/20/2014	1	5.003	572000	7.695	33.88	
2/20/2014	2	4.614	572000	7.096	33.88	
2/20/2014	3	4.719	572000	7.258	33.88	
2/20/2014	4	5.616	572000	8.638	33.88	
2/20/2014	5	5.764	572000	8.866	33.88	
2/20/2014	6	5.246	572000	8.069	33.88	
2/20/2014	7	4.353	572000	6.696	33.88	
2/20/2014	8	3.636	572000	5.592	33.88	
2/20/2014	9	4.061	572000	6.247	33.88	
2/20/2014	10	4.836	572000	7.439	33.88	
2/20/2014	11	4.601	572000	7.077	33.88	
2/20/2014	12	4.949	572000	7.612	33.88	
2/20/2014	13	4.150	572000	6.384	33.88	
2/20/2014	14	4.823	572000	7.419	33.88	
2/20/2014	15	5.101	572000	7.845	33.88	
2/20/2014	16	4.303	572000	6.619	33.88	
2/20/2014	17	4.941	572000	7.600	33.88	
2/20/2014	18	4.518	572000	6.949	33.88	
2/20/2014	19	4.634	572000	7.128	33.88	
2/20/2014	20	4.205	572000	6.467	33.88	
2/20/2014	21	4.361	572000	6.708	33.88	
2/20/2014	22	4.342	572000	6.679	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/20/2014	23	3.879	572000	5.966	33.88	7.275
2/21/2014	0	4.855	572000	7.467	33.88	
2/21/2014	1	4.967	572000	7.640	33.88	
2/21/2014	2	4.810	572000	7.399	33.88	
2/21/2014	3	4.875	572000	7.498	33.88	
2/21/2014	4	4.471	572000	6.877	33.88	
2/21/2014	5	4.716	572000	7.253	33.88	
2/21/2014	6	4.989	572000	7.673	33.88	
2/21/2014	7	4.401	572000	6.769	33.88	
2/21/2014	8	4.719	572000	7.259	33.88	
2/21/2014	9	3.835	572000	5.898	33.88	
2/21/2014	10	4.309	572000	6.628	33.88	
2/21/2014	11	4.168	572000	6.412	33.88	
2/21/2014	12	4.349	572000	6.689	33.88	
2/21/2014	13	4.287	572000	6.594	33.88	
2/21/2014	14	4.030	572000	6.199	33.88	
2/21/2014	15	4.848	572000	7.458	33.88	
2/21/2014	16	5.230	572000	8.045	33.88	
2/21/2014	17	4.045	572000	6.221	33.88	
2/21/2014	18	4.403	572000	6.773	33.88	
2/21/2014	19	4.319	572000	6.644	33.88	
2/21/2014	20	4.386	572000	6.747	33.88	
2/21/2014	21	4.321	572000	6.646	33.88	
2/21/2014	22	3.795	572000	5.838	33.88	
2/21/2014	23	4.165	572000	6.407	33.88	6.876
2/22/2014	0	4.587	572000	7.056	33.88	
2/22/2014	1	5.194	572000	7.989	33.88	
2/22/2014	2	4.687	572000	7.209	33.88	
2/22/2014	3	4.793	572000	7.372	33.88	
2/22/2014	4	4.632	572000	7.125	33.88	
2/22/2014	5	4.619	572000	7.105	33.88	
2/22/2014	6	4.658	572000	7.165	33.88	
2/22/2014	7	3.769	572000	5.797	33.88	
2/22/2014	8	4.123	572000	6.342	33.88	
2/22/2014	9	4.723	572000	7.265	33.88	
2/22/2014	10	4.466	572000	6.869	33.88	
2/22/2014	11	4.440	572000	6.830	33.88	
2/22/2014	12	4.717	572000	7.256	33.88	
2/22/2014	13	4.729	572000	7.274	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/22/2014	14	4.323	572000	6.649	33.88	
2/22/2014	15	3.644	572000	5.605	33.88	
2/22/2014	16	3.242	572000	4.987	33.88	
2/22/2014	17	2.865	572000	4.407	33.88	
2/22/2014	18	2.634	572000	4.051	33.88	
2/22/2014	19	2.836	572000	4.362	33.88	
2/22/2014	20	2.889	572000	4.444	33.88	
2/22/2014	21	3.302	572000	5.079	33.88	
2/22/2014	22	3.644	572000	5.605	33.88	
2/22/2014	23	3.435	572000	5.284	33.88	6.214
2/23/2014	0	4.006	572000	6.162	33.88	
2/23/2014	1	4.174	572000	6.420	33.88	
2/23/2014	2	4.178	572000	6.426	33.88	
2/23/2014	3	4.209	572000	6.474	33.88	
2/23/2014	4	4.454	572000	6.851	33.88	
2/23/2014	5	4.517	572000	6.948	33.88	
2/23/2014	6	4.081	572000	6.277	33.88	
2/23/2014	7	3.695	572000	5.683	33.88	
2/23/2014	8	3.227	572000	4.963	33.88	
2/23/2014	9	3.550	572000	5.461	33.88	
2/23/2014	10	3.814	572000	5.867	33.88	
2/23/2014	11	3.530	572000	5.430	33.88	
2/23/2014	12	3.602	572000	5.541	33.88	
2/23/2014	13	3.563	572000	5.480	33.88	
2/23/2014	14	4.156	572000	6.392	33.88	
2/23/2014	15	3.614	572000	5.558	33.88	
2/23/2014	16	3.767	572000	5.795	33.88	
2/23/2014	17	3.833	572000	5.895	33.88	
2/23/2014	18	4.122	572000	6.341	33.88	
2/23/2014	19	3.909	572000	6.012	33.88	
2/23/2014	20	4.540	572000	6.983	33.88	
2/23/2014	21	4.705	572000	7.237	33.88	
2/23/2014	22	4.325	572000	6.653	33.88	
2/23/2014	23	3.826	572000	5.885	33.88	6.114
2/24/2014	0	3.921	572000	6.031	33.88	
2/24/2014	1	4.070	572000	6.261	33.88	
2/24/2014	2	4.150	572000	6.383	33.88	
2/24/2014	3	4.273	572000	6.573	33.88	
2/24/2014	4	4.494	572000	6.912	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/24/2014	5	4.897	572000	7.533	33.88	
2/24/2014	6	4.502	572000	6.925	33.88	
2/24/2014	7	4.860	572000	7.476	33.88	
2/24/2014	8	4.775	572000	7.345	33.88	
2/24/2014	9	4.515	572000	6.945	33.88	
2/24/2014	10	4.484	572000	6.897	33.88	
2/24/2014	11	4.169	572000	6.412	33.88	
2/24/2014	12	4.578	572000	7.041	33.88	
2/24/2014	13	4.729	572000	7.273	33.88	
2/24/2014	14	4.900	572000	7.537	33.88	
2/24/2014	15	5.075	572000	7.806	33.88	
2/24/2014	16	4.849	572000	7.458	33.88	
2/24/2014	17	4.374	572000	6.728	33.88	
2/24/2014	18	4.292	572000	6.602	33.88	
2/24/2014	19	4.373	572000	6.727	33.88	
2/24/2014	20	4.446	572000	6.839	33.88	
2/24/2014	21	4.701	572000	7.230	33.88	
2/24/2014	22	4.495	572000	6.914	33.88	
2/24/2014	23	3.997	572000	6.148	33.88	6.917
2/25/2014	0	4.035	572000	6.206	33.88	
2/25/2014	1	4.025	572000	6.192	33.88	
2/25/2014	2	4.512	572000	6.940	33.88	
2/25/2014	3	4.722	572000	7.263	33.88	
2/25/2014	4	3.365	572000	5.175	33.88	
2/25/2014	5	3.658	572000	5.626	33.88	
2/25/2014	6	4.076	572000	6.270	33.88	
2/25/2014	7	4.156	572000	6.393	33.88	
2/25/2014	8	4.058	572000	6.242	33.88	
2/25/2014	9	3.946	572000	6.070	33.88	
2/25/2014	10	3.552	572000	5.463	33.88	
2/25/2014	11	3.968	572000	6.103	33.88	
2/25/2014	12	3.944	572000	6.067	33.88	
2/25/2014	13	4.145	572000	6.376	33.88	
2/25/2014	14	3.740	572000	5.752	33.88	
2/25/2014	15	3.822	572000	5.880	33.88	
2/25/2014	16	4.041	572000	6.215	33.88	
2/25/2014	17	4.089	572000	6.289	33.88	
2/25/2014	18	4.348	572000	6.687	33.88	
2/25/2014	19	4.648	572000	7.150	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/25/2014	20	4.227	572000	6.501	33.88	
2/25/2014	21	4.649	572000	7.151	33.88	
2/25/2014	22	3.959	572000	6.090	33.88	
2/25/2014	23	3.738	572000	5.750	33.88	6.244
2/26/2014	0	3.541	572000	5.446	33.88	
2/26/2014	1	3.697	572000	5.686	33.88	
2/26/2014	2	4.232	572000	6.510	33.88	
2/26/2014	3	4.356	572000	6.701	33.88	
2/26/2014	4	4.691	572000	7.215	33.88	
2/26/2014	5	4.599	572000	7.074	33.88	
2/26/2014	6	4.047	572000	6.225	33.88	
2/26/2014	7	3.939	572000	6.058	33.88	
2/26/2014	8	3.660	572000	5.630	33.88	
2/26/2014	9	3.879	572000	5.967	33.88	
2/26/2014	10	3.963	572000	6.096	33.88	
2/26/2014	11	4.525	572000	6.960	33.88	
2/26/2014	12	4.431	572000	6.816	33.88	
2/26/2014	13	5.162	572000	7.940	33.88	
2/26/2014	14	5.497	572000	8.456	33.88	
2/26/2014	15	5.189	572000	7.981	33.88	
2/26/2014	16	4.843	572000	7.449	33.88	
2/26/2014	17	4.790	572000	7.368	33.88	
2/26/2014	18	4.880	572000	7.506	33.88	
2/26/2014	19	5.021	572000	7.723	33.88	
2/26/2014	20	4.859	572000	7.473	33.88	
2/26/2014	21	5.270	572000	8.106	33.88	
2/26/2014	22	4.754	572000	7.312	33.88	
2/26/2014	23	4.537	572000	6.979	33.88	6.945
2/27/2014	0	4.588	572000	7.058	33.88	
2/27/2014	1	4.840	572000	7.444	33.88	
2/27/2014	2	4.861	572000	7.476	33.88	
2/27/2014	3	4.892	572000	7.524	33.88	
2/27/2014	4	5.115	572000	7.868	33.88	
2/27/2014	5	5.298	572000	8.149	33.88	
2/27/2014	6	4.733	572000	7.280	33.88	
2/27/2014	7	4.147	572000	6.379	33.88	
2/27/2014	8	3.640	572000	5.599	33.88	
2/27/2014	9	3.884	572000	5.974	33.88	
2/27/2014	10	3.354	572000	5.160	33.88	

Date	Hour	H2S (gr/100 scf)	Max COG Flow Rate (cf/hr)	Calculated SO2 (lb/hr)	Modeled CEV (lb/hr)	24-Hour Avg (lb/hr)
2/27/2014	11	3.633	572000	5.588	33.88	
2/27/2014	12	3.938	572000	6.058	33.88	
2/27/2014	13	3.958	572000	6.088	33.88	
2/27/2014	14	4.107	572000	6.317	33.88	
2/27/2014	15	4.052	572000	6.232	33.88	
2/27/2014	16	3.917	572000	6.024	33.88	
2/27/2014	17	3.738	572000	5.749	33.88	
2/27/2014	18	3.408	572000	5.242	33.88	
2/27/2014	19	4.289	572000	6.597	33.88	
2/27/2014	20	4.272	572000	6.572	33.88	
2/27/2014	21	4.493	572000	6.911	33.88	
2/27/2014	22	4.330	572000	6.660	33.88	
2/27/2014	23	4.150	572000	6.383	33.88	6.514
2/28/2014	0	4.382	572000	6.739	33.88	
2/28/2014	1	4.433	572000	6.818	33.88	
2/28/2014	2	5.006	572000	7.701	33.88	
2/28/2014	3	5.290	572000	8.137	33.88	
2/28/2014	4	5.100	572000	7.844	33.88	
2/28/2014	5	5.029	572000	7.735	33.88	
2/28/2014	6	5.130	572000	7.890	33.88	
2/28/2014	7	4.489	572000	6.905	33.88	
2/28/2014	8	4.910	572000	7.553	33.88	
2/28/2014	9	5.428	572000	8.350	33.88	
2/28/2014	10	4.614	572000	7.096	33.88	
2/28/2014	11	4.750	572000	7.306	33.88	
2/28/2014	12	4.811	572000	7.400	33.88	
2/28/2014	13	4.623	572000	7.110	33.88	
2/28/2014	14	4.117	572000	6.333	33.88	
2/28/2014	15	4.442	572000	6.833	33.88	
2/28/2014	16	4.134	572000	6.358	33.88	
2/28/2014	17	3.984	572000	6.128	33.88	
2/28/2014	18	3.863	572000	5.942	33.88	
2/28/2014	19	4.103	572000	6.310	33.88	
2/28/2014	20	4.443	572000	6.834	33.88	
2/28/2014	21	3.972	572000	6.110	33.88	
2/28/2014	22	3.961	572000	6.093	33.88	
2/28/2014	23	3.615	572000	5.560	33.88	6.962

From the 24-hour averages, the 30-day rolling averages are then calculated. The 24-averages would also be used for the supplementary conditions of no more than three consecutive days above the 24-hour limit.

Table D-4-6. Example 30-Day Rolling Averages

Date	24-Hour Avg (lb/hr)	30-Day Avg (lb/hr)
1/1/2014	6.362	9.461
1/2/2014	6.406	9.511
1/3/2014	7.217	9.563
1/4/2014	8.362	9.560
1/5/2014	10.122	9.546
1/6/2014	9.208	9.460
1/7/2014	7.071	9.449
1/8/2014	4.354	9.453
1/9/2014	5.136	9.602
1/10/2014	6.560	9.738
1/11/2014	7.859	9.835
1/12/2014	13.539	9.888
1/13/2014	13.889	9.717
1/14/2014	13.273	9.554
1/15/2014	18.307	9.420
1/16/2014	12.328	9.137
1/17/2014	9.410	9.061
1/18/2014	8.592	9.091
1/19/2014	9.978	9.153
1/20/2014	10.763	9.073
1/21/2014	7.468	8.976
1/22/2014	9.430	8.970
1/23/2014	9.789	8.885
1/24/2014	9.658	8.765
1/25/2014	10.699	8.647
1/26/2014	10.733	8.521
1/27/2014	9.611	8.372
1/28/2014	9.212	8.283
1/29/2014	8.490	8.193
1/30/2014	10.016	9.461
1/31/2014	7.843	9.511
2/1/2014	7.980	9.563
2/2/2014	7.130	9.560
2/3/2014	7.938	9.546

Date	24-Hour Avg (lb/hr)	30-Day Avg (lb/hr)
2/4/2014	7.528	9.460
2/5/2014	8.900	9.449
2/6/2014	7.186	9.453
2/7/2014	8.821	9.602
2/8/2014	9.225	9.738
2/9/2014	9.446	9.835
2/10/2014	9.475	9.888
2/11/2014	8.404	9.717
2/12/2014	9.001	9.554
2/13/2014	9.242	9.420
2/14/2014	9.823	9.137
2/15/2014	10.044	9.061
2/16/2014	10.306	9.091
2/17/2014	10.449	9.153
2/18/2014	7.592	9.073
2/19/2014	7.847	8.976
2/20/2014	7.275	8.970
2/21/2014	6.876	8.885
2/22/2014	6.214	8.765
2/23/2014	6.114	8.647
2/24/2014	6.917	8.521
2/25/2014	6.244	8.372
2/26/2014	6.945	8.283
2/27/2014	6.514	8.193
2/28/2014	6.962	8.142

Note: In this example, the 30-day average is a forward rolling average for the first 29 days (e.g., average of day 1 to day 30, then day 2 to day 31, etc.). After the 30th day, the average is a backward rolling average.

The 30-day limit for this process is 27.00 lb/hr with a 24-hour supplementary limit of 30.42 lb/hr (not to be exceeded on a three consecutive day basis). From this example, the process would not have exceeded either the 30-day limit or the 24-hour supplementary limit.

The modeled 1-hour CEV would have been exceeded on four hours over the 2-month period at maximum operating capacity. (Actual calculations of hourly SO_2 values would include the specific hourly flow rates for each process.) Average actual flow rate for this period was about 397000 cf/hr (about 70% of maximum capacity). Using the average actual flow rate, two hours would have exceeded the hourly CEV by less than 2 lb/hr.

Looking at the specific hours that were above the CEV (at any flow rate), Liberty monitored values ranged from 0-13 ppb during these hours. Meteorology during these times was typical for January/February conditions and featured both stable and unstable dispersion conditions.

Conclusions

The use of longer-term averaging is appropriate for specific sources in this SIP that are subject to fuel-based variability. 30-day average limits must be met for all rolling 30-day periods, with a supplemental condition that no three consecutive days can exceed the 24-hour limit. These limits would ensure that prolonged periods of elevated emissions are not occurring during potentially unfavorable periods of meteorology. The three consecutive-day 24-hour supplementary limit condition is also consistent with the NAAQS in that three exceedance days in a year would increase the likelihood of a monitored 99th percentile above the NAAQS.

SO_2 SIP

Appendix E

Screening Analysis

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Screening Analysis

Initial determination of sources to be modeled was based on the modeling protocol (given in Appendix A). Sources identified as potential contributors to the NAA were first screened using the AERSCREEN model. If initial screening showed impacts above the significant impact level (SIL), refined screening was then performed using AERMOD, along with additional analyses.

Initial Screening

The determination of sources to explicitly model for the SO_2 nonattainment area is a multistep process:

1) Statewide information is gathered for inventoried SO_2 sources within the geographic modeling domain (maximum of 50 km distance).
2) Sources and monitors are mapped along with the NAA boundaries.
3) Sources in the modeling that are represented by monitors by direction/sector are screened out.
4) Sources that cannot be accounted for by background monitors are further examined through modeled impacts.
5) AERSCREEN is used for initial screening.
6) If above the SIL, AERMOD and supporting analyses are used for refined screening of sources.

AERSCREEN[1] is the preferred model for screening. For small isolated sources, screening was performed on an individual basis. For facilities with more than one emission point or stack, sources were modeled either as an aggregated source or as individual sources, adding the maximum 1-hour concentrations together to assess cumulative impacts.

AERSCREEN does not output a design value concentration based on the 99th percentile form of the 1-hour SO_2 standard, but rather a maximum 1-hour concentration that can be used as a conservative estimate for comparison with the NAAQS. If the maximum 1-hour concentration output from AERSCREEN is below EPA's suggested SIL (3 ppb for the 1-hour SO_2 NAAQS), that source can be "screened out" from the model.

If a facility's maximum 1-hour concentration was above the 1-hour SIL, that source is then examined in the refined screening process. If the source showed potential contributions to nonattainment after refined screening, then that source was included in the SIP model.

Below is a table showing AERSCREEN results based on actual emissions from 2011-2012 (higher of either year, unless otherwise noted).

[1] At the time of the initial screening, version 11126 was the most recent version available

AERSCREEN Results

Facility Name	County	2011 SO2 (tons/yr)	2012 SO2 (tons/yr)	Max SO2 (g/s)	Distance to NAA (km)	Max Impact (µg/m³)	Max Impact (ppb)	Model in AERMOD
Allegheny Energy/Springdale	Allegheny	1.281	6.649	0.191	16.00	0.0	0.0	NO
Allegheny Ludlum/Brackenridge	Allegheny	32.652	31.800	0.939	24.00	1.6	0.6	NO
Bay Valley Foods LLC/Pittsburgh	Allegheny	313.170	268.222	9.009	10.00	31.1	11.9	**YES**
Chambers Dev. Co. Inc./Monroeville	Allegheny	5.886	5.500	0.169	1.17	5.0	1.9	NO
Clairton Slag Inc./West Elizabeth	Allegheny	0.539	0.707	0.020	0.06	5.0	1.9	NO
Eastman Chem Resins Inc./Jefferson	Allegheny	0.390	0.440	0.013	0.35	1.9	0.7	NO
Guardian Ind. Corp./Jefferson Hills	Allegheny	73.263	82.677	2.378	0.24	56.8	21.7	**YES**
Harsco Metals (Braddock Recovery)	Allegheny	6.653	7.857	0.226	0.08	51.3	19.6	**YES**
Kelly Run SANI/MSW Landfill	Allegheny	2.548	2.687	0.077	0.28	20.6	7.9	**YES**
Koppers Inc./Clairton Plant	Allegheny	0.440	0.205	0.013	0.11	0.5	0.2	NO
Lane Construction/Bridgeville Plant	Allegheny	9.771	5.172	0.281	11.90	1.3	0.5	NO
NRG Energy Inc./Cheswick Station	Allegheny	9290.308	1910.843	54.969 (2012)	14.70	13.2	5.0	**YES**
Redland Brick Inc./Harmar Plant	Allegheny	42.073	28.216	1.210	16.10	2.2	0.9	NO
Universal Stainless & Alloy/Bridgeville	Allegheny	14.246	14.906	0.429	10.30	1.9	0.7	NO
USS/Irvin Plant	Allegheny	1465.514	635.112	42.158	0.23	808.4	308.5	**YES**
USS/Clairton Plant	Allegheny	1279.002	1737.962	49.996	0.30	966.5	368.9	**YES**
USS/Edgar Thomson Plant	Allegheny	418.689	1430.722	41.158	0.40	663.5	253.2	**YES**
Allegheny Energy/Mitchell	Washington	864.420	1569.720	45.156	0.30	1017.0	388.1	**YES**
Flexsys Amer. LTD PAR/Monongahela	Washington	7.930	5.271	0.228	2.30	15.8	6.0	**YES**
NRG Energy Inc./Elrama Power Plant	Washington	428.080	249.000	12.315	0.28	54.2	20.7	**YES**
Greensburg Thermal LLC/Greensburg	Westmoreland	19.158	19.012	0.551	18.10	1.6	0.6	NO
ArcelorMittal Monessen LLC/ Monessen	Westmoreland	0.100	0.072	12.415 (PTE)	3.60	168.0	64.1	**YES**

Notes:
- Cheswick FGD was not fully in operation in 2011; therefore, 2012 emissions are the more applicable for screening
- ArcelorMittal did not restart at full operation until 2014; potential-to-emit (PTE) rates were used for screening

Refined Screening

Sources that were above the SIL from AERSCREEN were further examined through refined screening for more recent years (2012-2014). Refined screening included AERMOD modeling at default settings using the most appropriate surface meteorology and actual emissions. Additional supporting analyses were also used in conjunction with the modeled results as applicable, including monitored data analysis, wind direction analysis, source modifications, etc.

Methodology

The following methodology was used in the refined screening analysis:

1) Examine modeled contributions at actual emission rates in the NAA for the source.

    a. Similar to the initial screening, if a source shows a maximum 1-hour impact (averaged over 3 years) at the refined level that is less than the SIL, it can be "screened out."

    b. If a source is contributing less than background to be added for any hour (based on the background methodology), it may already be accounted for by background and can be considered for screening out.

    c. Concentration gradients may also be examined as an indication of the extent of modeled contributions in the NAA. An insignificant gradient, either lateral (cross-wind) or longitudinal (along-wind) may further indicate that a source is represented by background.

2) Examine monitored and meteorological data for potential contributions from the source.

    a. A wind direction sector is first identified for which a source can potentially affect the area. For sources within the NAA, this is all wind directions. For sources outside the area, especially distant sources, contributions are dependent on wind conditions on a 1-hour basis.

    b. Hourly monitored and wind data for all known sites are examined in comparison to the source sector. If high monitored data spikes occur when winds are outside of the source sector, that source is not likely contributing to exceedances.

3) Examine supporting data for evidence of possible contributions to nonattainment.

    a. This may include pollutant controls, permit conditions, operating scenarios, geographic location, nearby (cluster) sources, applicable state/federal rules, etc.

    b. For intermittent sources, this can include how/when the source is operated.

For some intermittent sources, the source cannot physically operate at full potential/allowable rates while related sources are at allowable rates. These sources are not to be included in the final modeled demonstration at allowable rates. However, it should be demonstrated that these sources have not contributed to nonattainment at actual operating conditions over recent years.

The refined modeling was based on facility-wide emissions for the identified sources, with no combined impacts from other facilities considered. All processes with SO_2 emissions during 2012-2014 timeframe were modeled for each facility, including intermittent sources. Note that the U.S. Steel Mon Valley Works is one contiguous facility; but due to distance between each plant, contributions from each plant were examined separately.

Modeling was based on the maximum 1st-highs for each receptor as a conservative comparison to the NAAQS and to background values.[2] Additionally, no low wind or other AERMOD options were used for this effort, so the results may be *overly* conservative without some options used for the final modeling demonstration. The focus of the screening was to determine the *capability* of any source to negatively affect the NAA and its relevance to the overall attainment demonstration.

Meteorology

Surface meteorology was based on either Pittsburgh airport (KPIT) or Liberty surface data (merged with necessary KPIT surface parameters such as cloud cover). For the more distant sources, especially tall stacks, KPIT is the most appropriate to represent regional wind flow. For sources within or near the NAA, Liberty was selected as the most appropriate met data.

Note that while Allegheny County airport (KAGC) lies within the NAA, Pittsburgh airport is generally the preferred airport for ACHD modeling applications. Reasons for this preference include:

- KPIT is a better overall site for plateau-based surface observations. It lies on a larger plateau, with less influence from trees, structures, or changes in elevation.
- Wind directions show a southerly bias at KAGC (see Figures E-1 through E-3 below) that is not seen at other airports in Allegheny County and in PA[3] The KAGC site appears to be specific to its location in West Mifflin.
- Test results using KAGC (see model performance) can show odd results compared to the conceptual model or results using other met data.
- KPIT surface data is a better complement to the KPIT upper air data measurements, since the sounding balloons are launched only 3.3 miles away in Moon Twp.

AGC is acceptable however for general meteorological conditions, such as wind speed, pressure, temperature, precipitation, etc., and for wind directions in the vicinity of the airport.

[2] The 1-hour NAAQS is based on 4th-highs (99th percentiles). Background is based on 2nd-highs by season for each hour.

[3] PA secondary airport wind roses: http://www.climate.psu.edu/features/wind_roses/

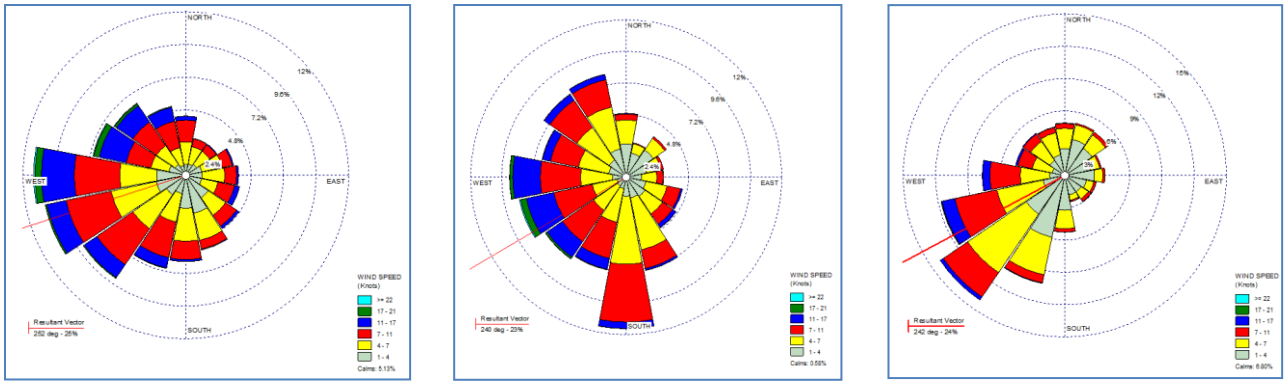

Figure E-1. KPIT (left), KAGC (middle), and Liberty (right) Wind Roses, 2006-2010

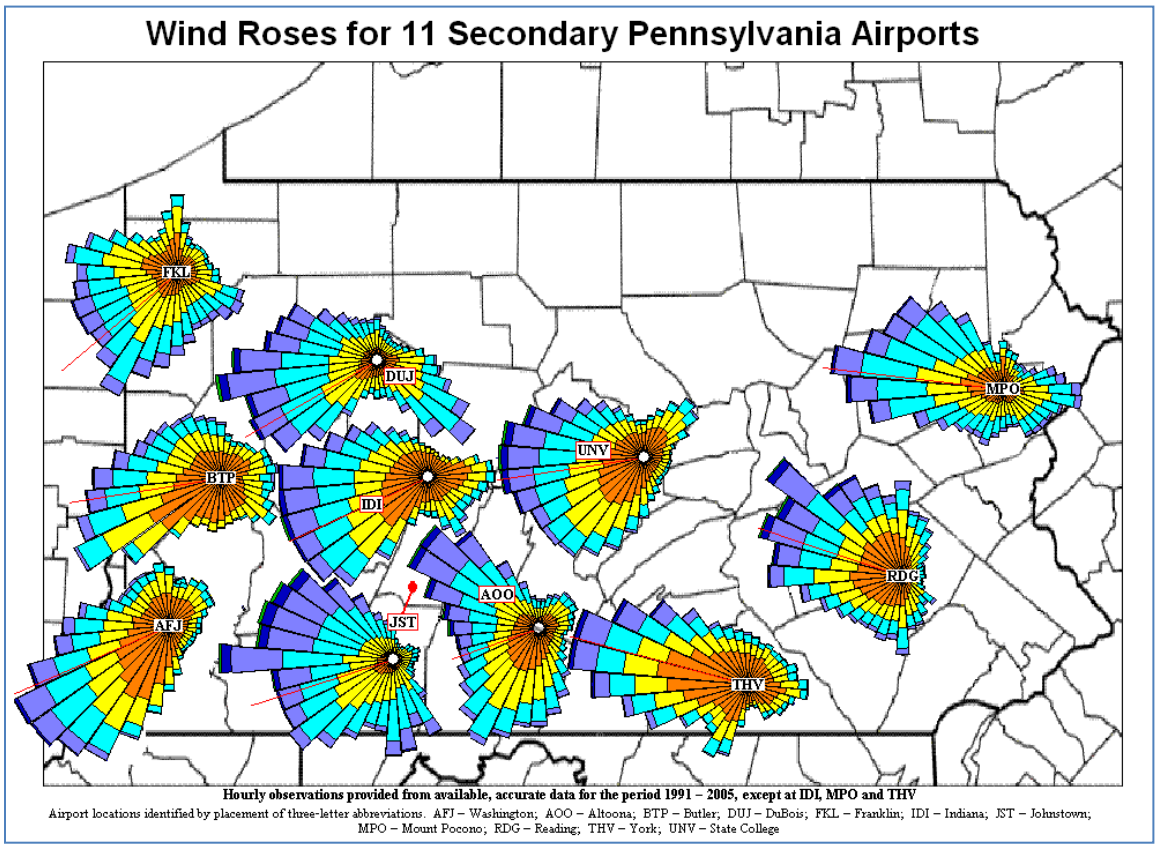

Figure E-2. PA Secondary Airport Wind Roses, 1991-2005

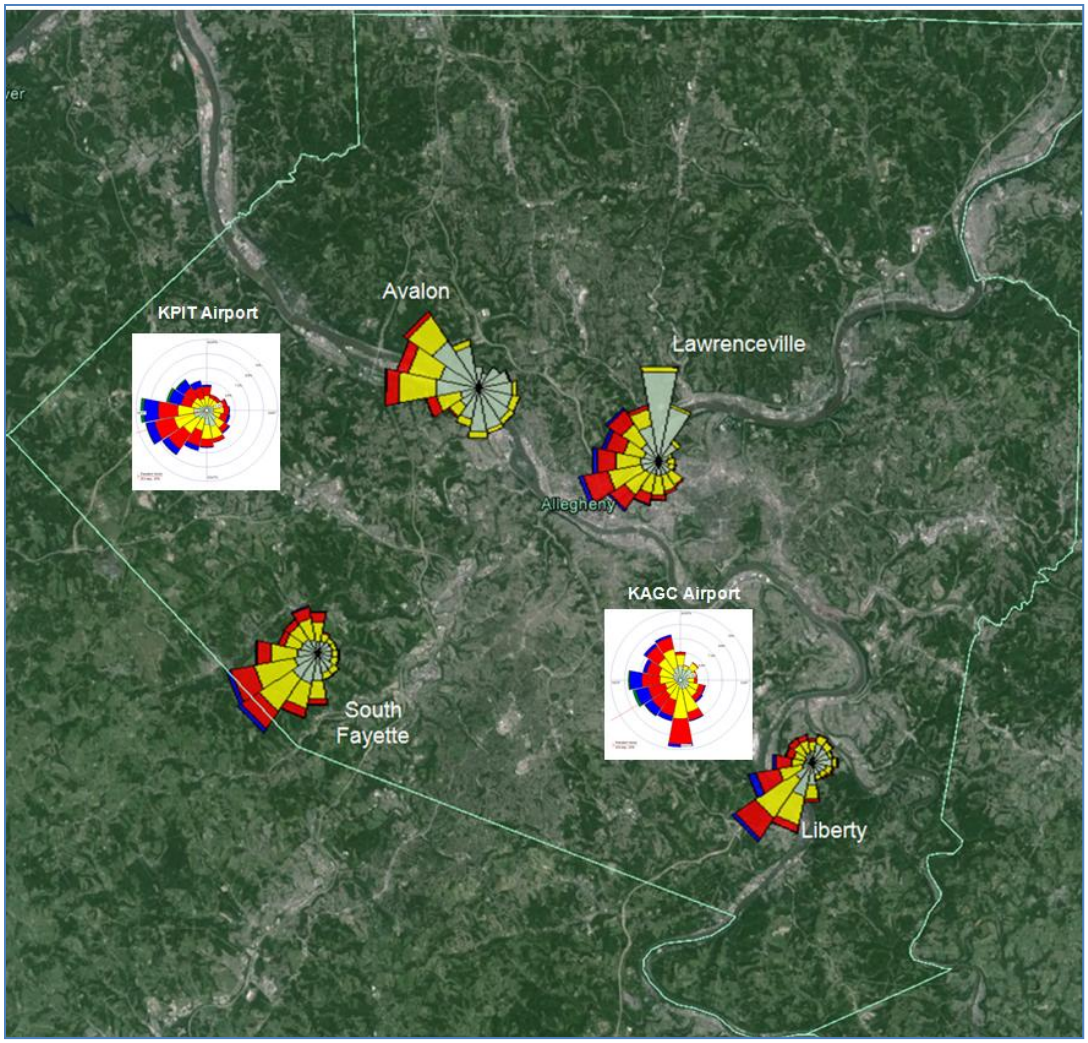

Figure E-3. Allegheny County Airport and Local Meteorological Sites, 2010-2014

Figures E-1 through E-3 show that KPIT and Liberty are likely better sites than AGC to represent surface-based meteorology outside of and within the NAA, respectively.

(Note that the final modeling for the attainment demonstration used MMIF for meteorological data, which was deemed to be the most appropriate at each source location within the NAA. Some results in this appendix – for sources included in the final demonstration – are based on model results using MMIF data as the more definitive approach. See Appendix A for more details.)

Model Used and Receptor Grid

The AERMOD version used for the refined screening was 14134[4] at default settings, with no background added. Below is a figure showing the screening grid used for the refined screening with AERMOD. Receptors were placed at 200 m spacing throughout the NAA. For sources within the NAA, on-property receptors were also removed.

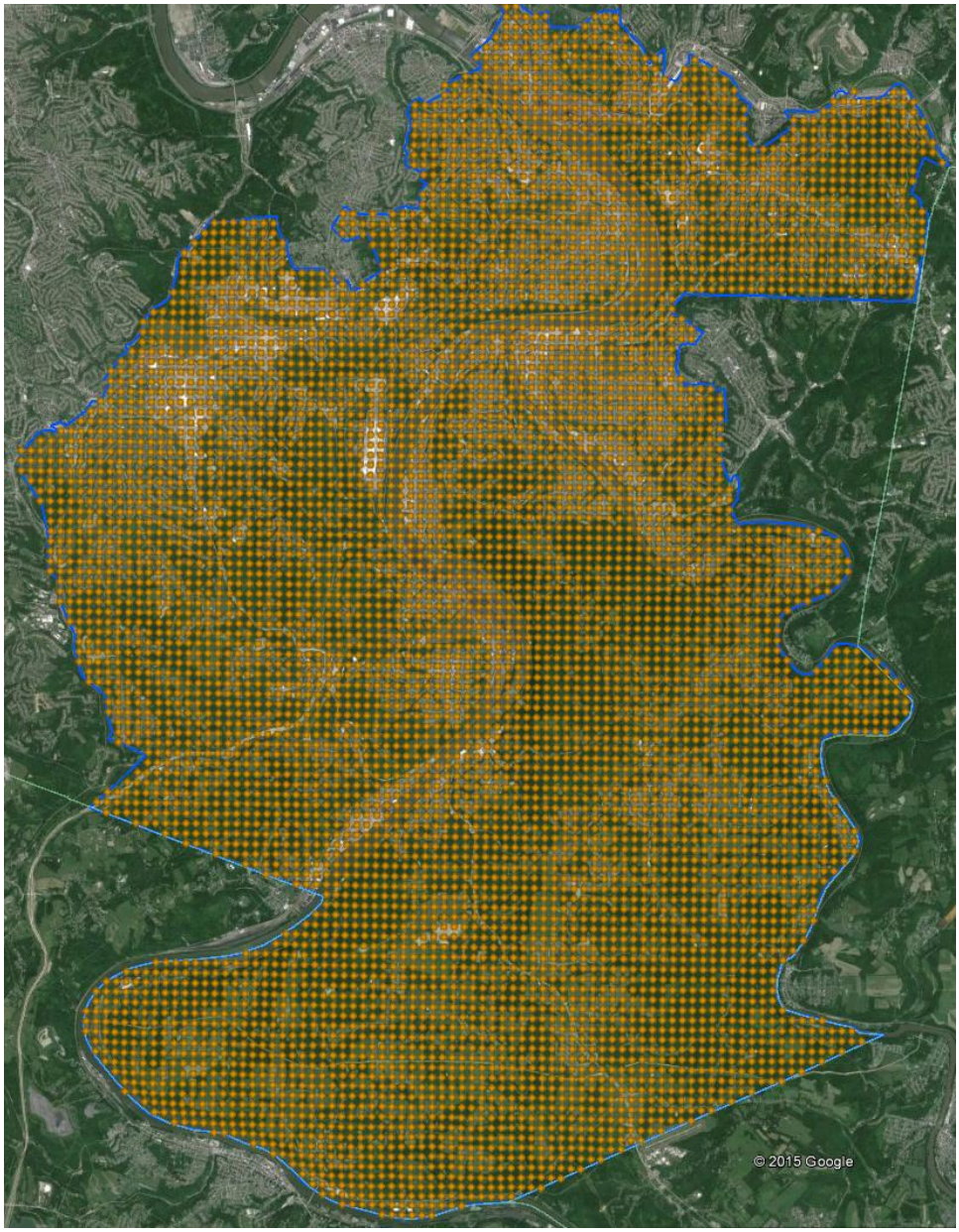

Figure E-4. Refined Screening Grid

[4] Version 15181 was released in July 2015, followed by versions 16216 in Dec. 2016 and 16216r in Jan. 2017. Final SIP modeling was performed using version 16216r.

Refined screening results for this screening grid by facility/source are given on the following pages.

Bay Valley

Bay Valley is a steam-producing plant located at the previous Heinz factory location on the North Shore of Pittsburgh. It lies 9.91 km to the NW of the NAA (at its closest distance), potentially affecting the NAA when winds are from the 290-359° sector. This can be upwind area for some hours, based on KPIT airport winds. There are few sources between Bay Valley and the NAA other than nonpoint and mobile sources.

Bay Valley lies almost exactly between the Lawrenceville site to the NE and the former Carnegie Science Center site to the SW (discontinued at the end of 2013). Some Bay Valley impacts may already be accounted for by the use of Lawrenceville for background, so the refined screening may be conservative for this source.

Additionally, Bay Valley utilized coal until early 2014, when the fuel was switched completely to natural gas. An emphasis for this analysis was placed on "before/after" the fuel conversion.

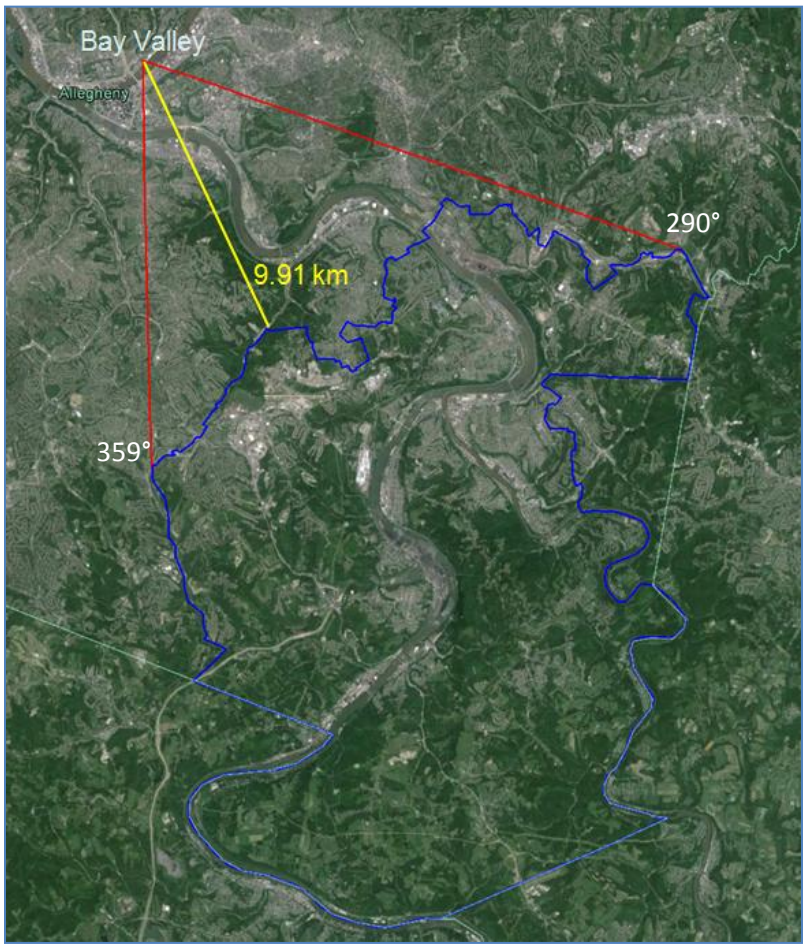

Figure E-5. Bay Valley Location in Relation to NAA

The maximum average 1-hour modeled impact from Bay Valley over the 2-year period of 2012-2013 (during the coal-fired operation) was 34.00 µg/m³ (13.0 ppb) on the NW edge of the NAA. (KPIT airport meteorological data was used for the modeling.) This is generally above the background recorded at Lawrenceville, and it's likely that Bay Valley was not fully accounted for by Lawrenceville as background. However, modeled levels were significantly below exceedance levels, and Bay Valley was not a likely contributor to nonattainment in the NAA.

The maximum 1-hour modeled impact from Bay Valley in 2014 (during the switch to natural gas) was 1.57 µg/m³ (0.6 ppb) in the NAA. This is less than the SIL for SO_2.

The fuel switch modification at Bay Valley was part of an installation permit (issued in 2015), with a permanent and enforceable limit. Therefore, Bay Valley can be considered to be screened out, with no further analysis required.

Cheswick

NRG Cheswick is a coal-fired power plant located 14.75 km to the NNE of the NAA at its closest distance, potentially affecting the NAA when winds are from the 355-35° sector. This is generally downwind of the NAA based on KPIT winds. Flue gas desulfurization (FGD) controls have been in operation for this plant since mid-2011.

There are sources of SO_2 between Cheswick and the NAA, and there is no background monitor in the vicinity of Cheswick. Therefore, Cheswick emissions along with more distant source emissions likely constitute the majority of transported emissions into the NAA when winds are from the NNE.

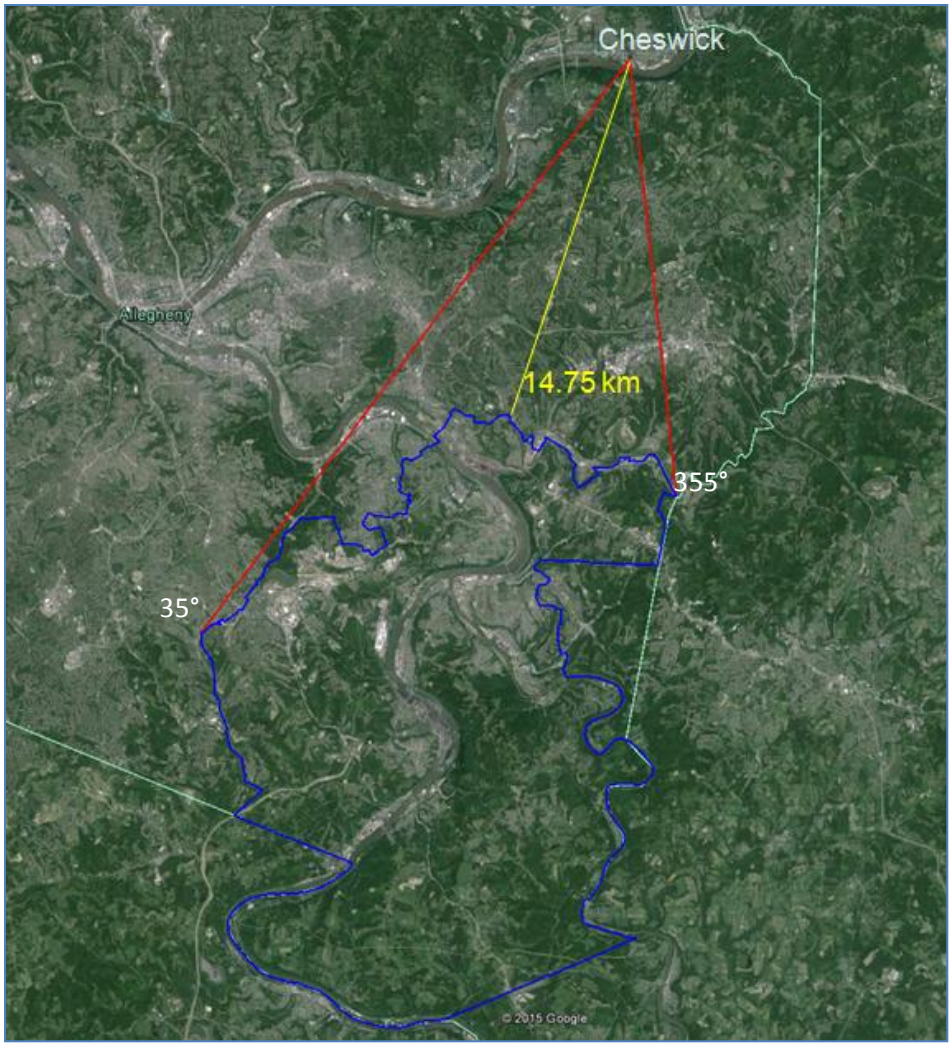

Figure E-6. Cheswick Location in Relation to NAA

Cheswick was modeled using hourly CEMS values of SO_2 (as downloaded from CAMD) and with KPIT meteorological data over the period 2012-2014. The maximum average 1-hour modeled impact was 28.29 µg/m³ (10.8 ppb) on the NE edge of the NAA. There is little concentration gradient through the area, showing more of an incremental along-wind "ripple" effect in the NAA.

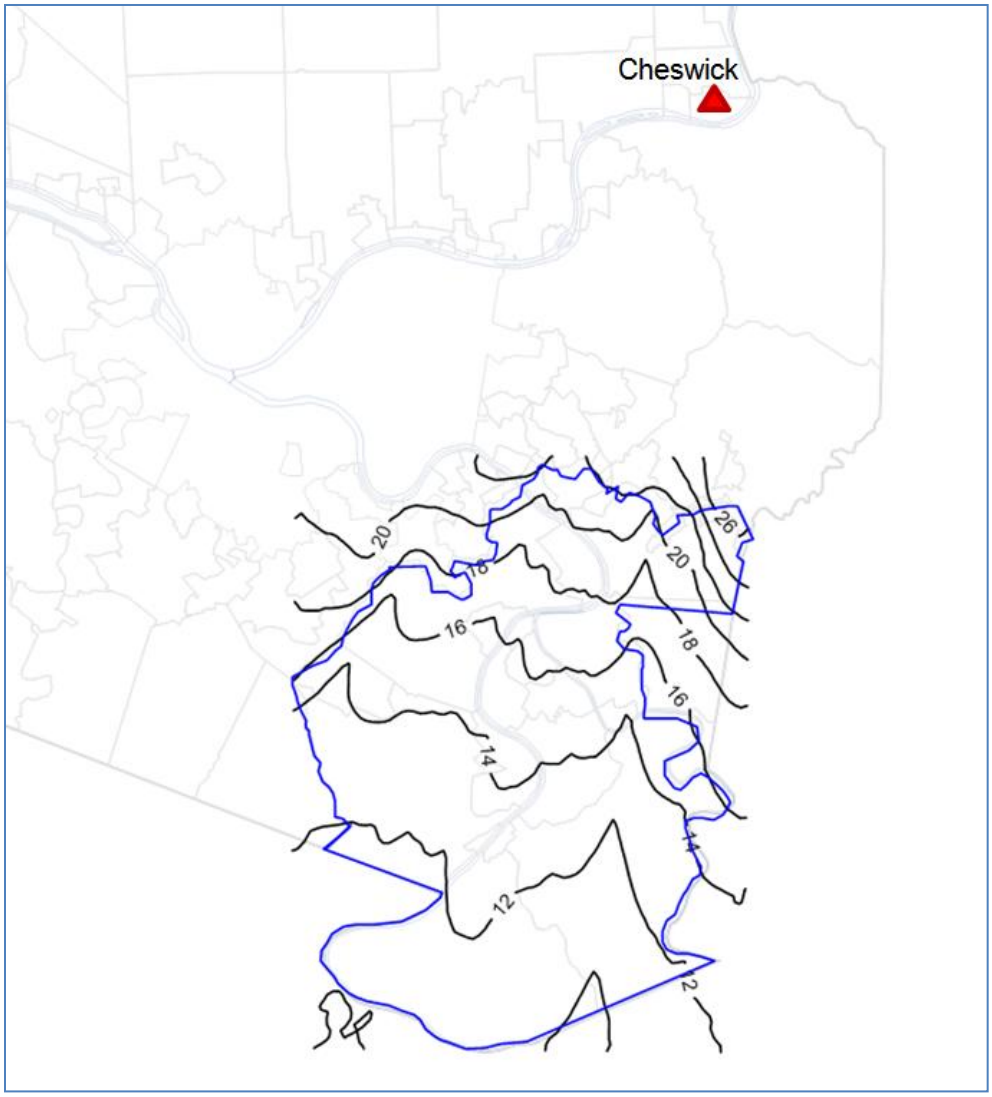

Figure E-7. Maximum Modeled Cheswick 1-Hour Impacts in the NAA (in µg/m³)

(Note: some contours extend beyond the NAA due to the gridding and contouring of results.)

Since there is no background monitor in the vicinity of Cheswick, South Fayette was used as a general background monitor for comparison to maximum Cheswick impacts by hour/season. Figure E-8 below shows Cheswick impacts in relation to South Fayette background values for 2012-2014.

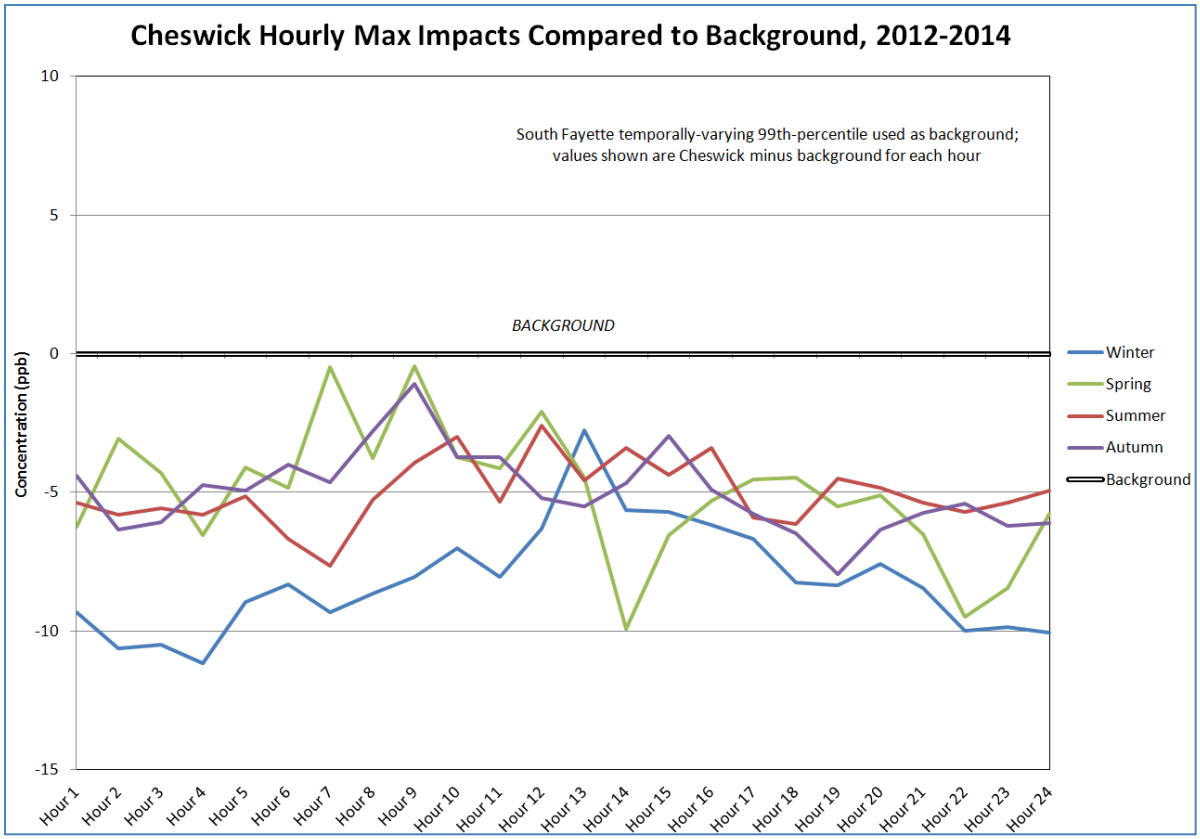

Figure E-8. Maximum Modeled Cheswick 1-Hour Impacts Compared to South Fayette Background (in ppb)

Figure E-8 shows that Cheswick maximum seasonal hourly values are below South Fayette background. It can be assumed that Cheswick emissions are already accounted for by the addition of background to model results, and inclusion of Cheswick would likely result in double-counting of emissions.

Additionally, wind directions were examined from all meteorological sites in the NAA when SO_2 concentrations at North Braddock and Liberty were above 75% of the NAAQS. The figure below shows composite wind roses from KPIT, KAGC, and Liberty during high hours at either monitor site over the timeframe 2012-2014.

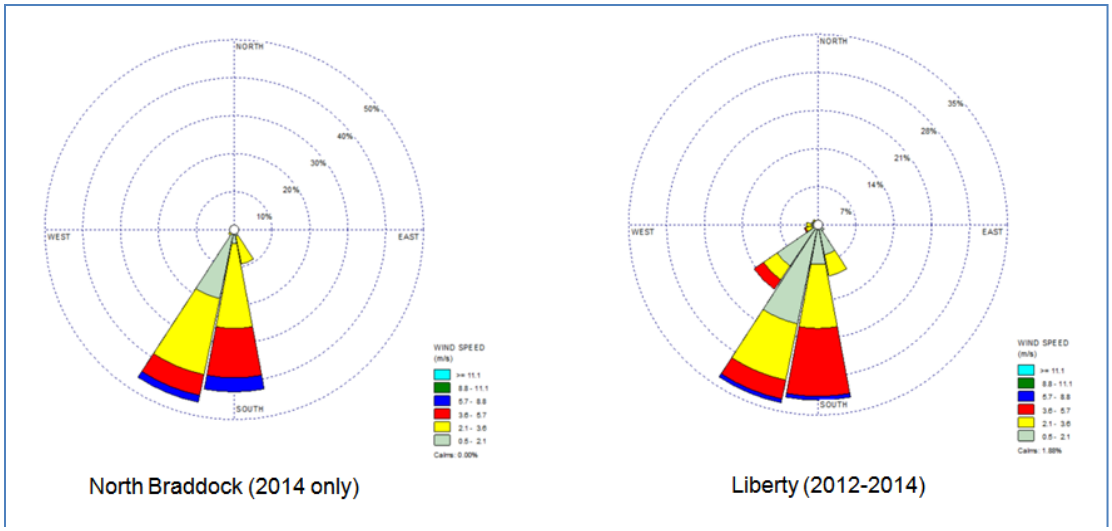

Figure E-9. Composite Wind Roses During Elevated SO_2 Hours at Monitor Sites

Figure E-9 shows that there were no wind directions from the Cheswick sector during high monitored values. North Braddock and Liberty were highest when winds were from the SW and S directions.

Additionally, PA DEP identified Cheswick as a source for "air quality characterization" under the SO2 Data Requirements Rule (DRR, or "phase 3" of the NAAQS). This requires that Cheswick demonstrates either modeled or monitored attainment of the 2010 SO_2 NAAQS at any surrounding location.

Based on the above evidence, Cheswick has not contributed to nonattainment in the NAA and furthermore must demonstrate attainment in northeastern Allegheny County and surrounding counties. Cheswick can therefore be considered to be screened out from the modeling demonstration, with no further analysis required.

Harsco (Braddock Recovery)

Harsco Metals (Braddock Recovery Inc.) processes materials on the property of the USS Edgar Thomson plant within the NAA.

Harsco was modeled for 2012-2014 using Liberty meteorological data. The maximum impact in the NAA (off-property of USS Edgar Thomson) was 18.77 µg/m³ (7.2 ppb). This value is above the SIL, but below background values. However, because of the location of Harsco within the NAA (and on Title V source property) and the potential for combined impacts with Edgar Thomson processes, Harsco was kept in the final modeling demonstration.

Kelly Run

Kelly Run is a municipal landfill located in Forward Twp., with SO_2 emissions from ground flaring. Kelly Run was modeled for 2012-2014 using Liberty meteorological data. The maximum impact in the NAA was 7.11 µg/m³ (2.7 ppb) immediately off-property. This value is

below the SIL; therefore, Kelly Run was considered to be screened out of the modeling and accounted for by background already added to the modeling.

Elrama

NRG Elrama is a former coal-fired power plant just outside of the NAA in Union Twp., Washington Co. This plant operated until Oct. 2012.

Elrama was modeled using hourly CEMS values of SO_2 from CAMD and with Liberty meteorological data for 2012. The maximum impact in the NAA was 30.83 µg/m³ (11.8 ppb) in Forward Twp.

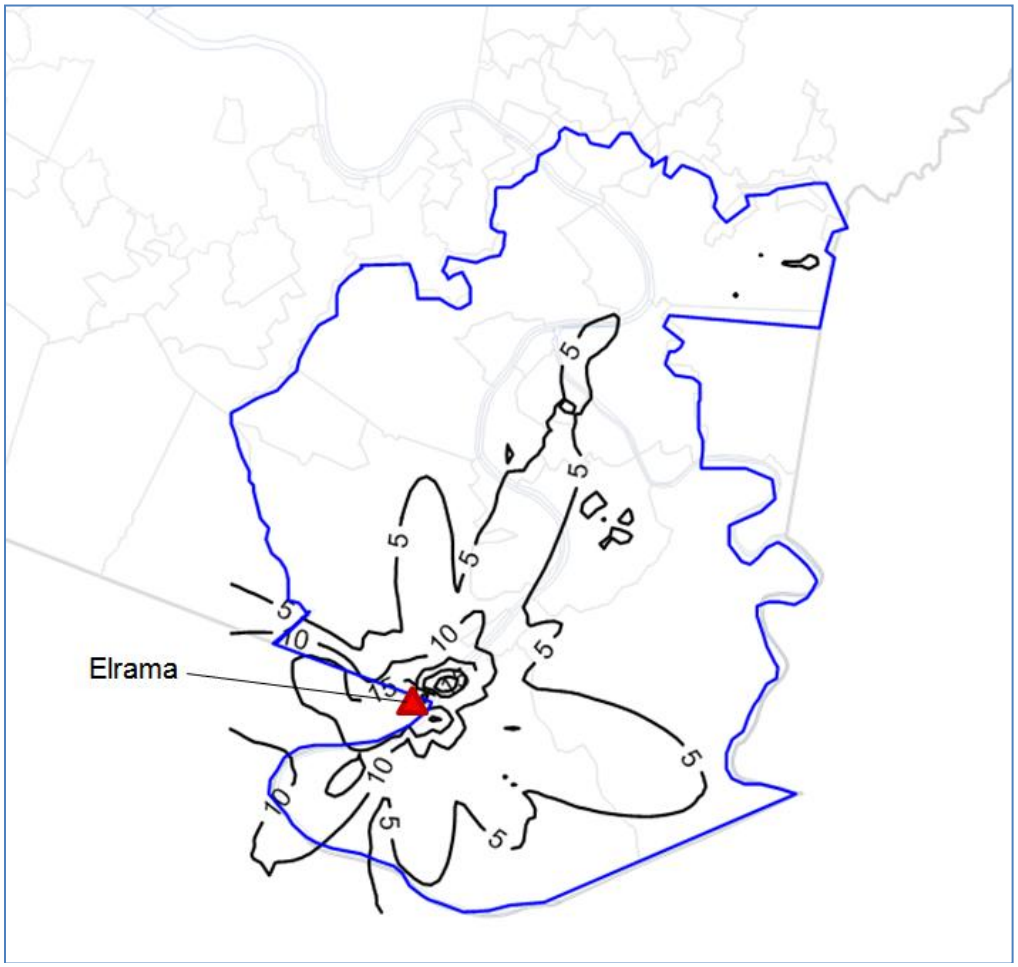

Figure E-10. Maximum Modeled Elrama 1-Hour Impacts in the NAA (in µg/m³)

This source also showed both lateral (cross-wind) and longitudinal (along-wind) gradients in the NAA. While this source has shutdown, it was kept in the modeling demonstration to properly account for all impacts in the base case allowable scenario (as well as model performance runs).

Mitchell

Allegheny Energy Mitchell is a former coal-fired power plant just outside of the NAA, also in Union Twp., Washington Co. This plant operated until Oct. 2013.

Mitchell was modeled using hourly CEMS values of SO_2 from CAMD and with Liberty meteorological data for 2012-2013. The maximum impact in the NAA was 116.03 µg/m³ (44.36 ppb) in Forward Twp.

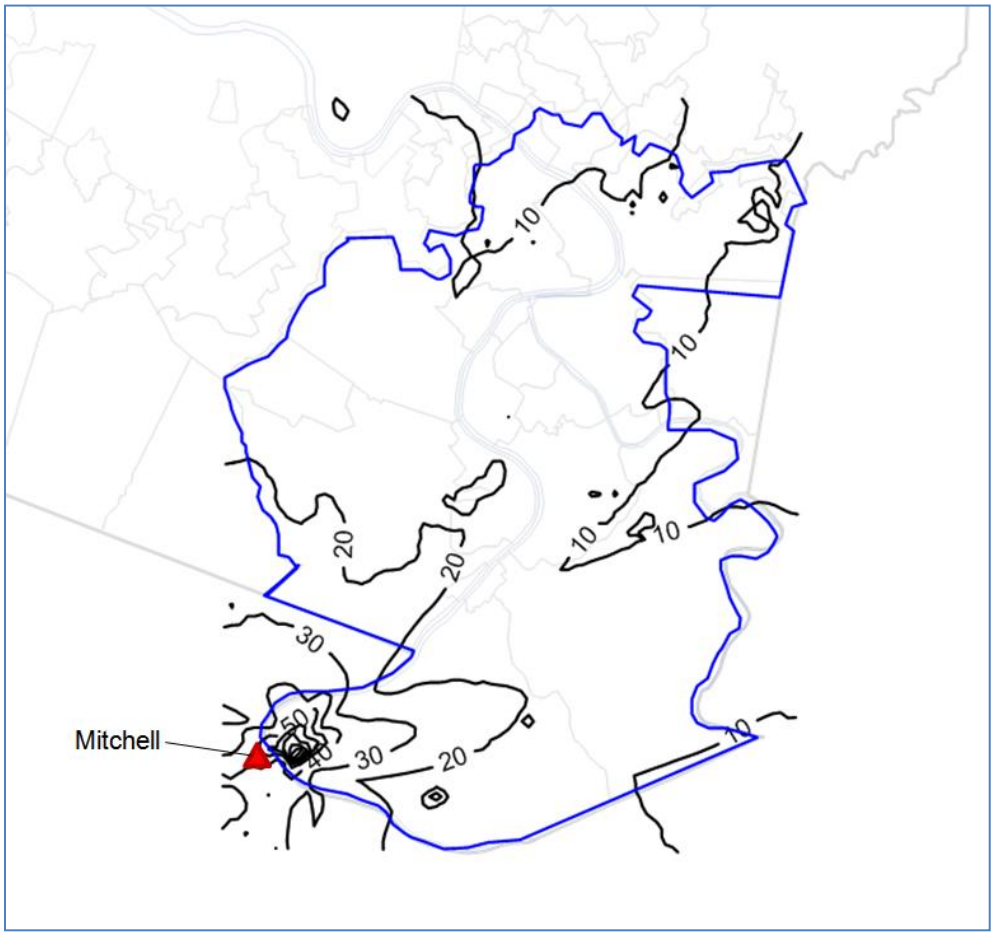

Figure E-11. Maximum Modeled Mitchell 1-Hour Impacts in the NAA (in µg/m³)

Similar to Elrama, Mitchell showed concentration gradients through the NAA. Although this source has shutdown, it was kept in the modeling demonstration to properly account for all impacts for the base case scenario (and performance runs).

World Kitchen

World Kitchen is a kitchenware manufacturer located in Charleroi in Washington Co., 5.51 miles to the south of the NAA. World Kitchen potentially affects the NAA when winds are from the 149-226° sector; this is generally upwind of the NAA and difficult to apportion contributions to World Kitchen and other sources based on wind direction alone.

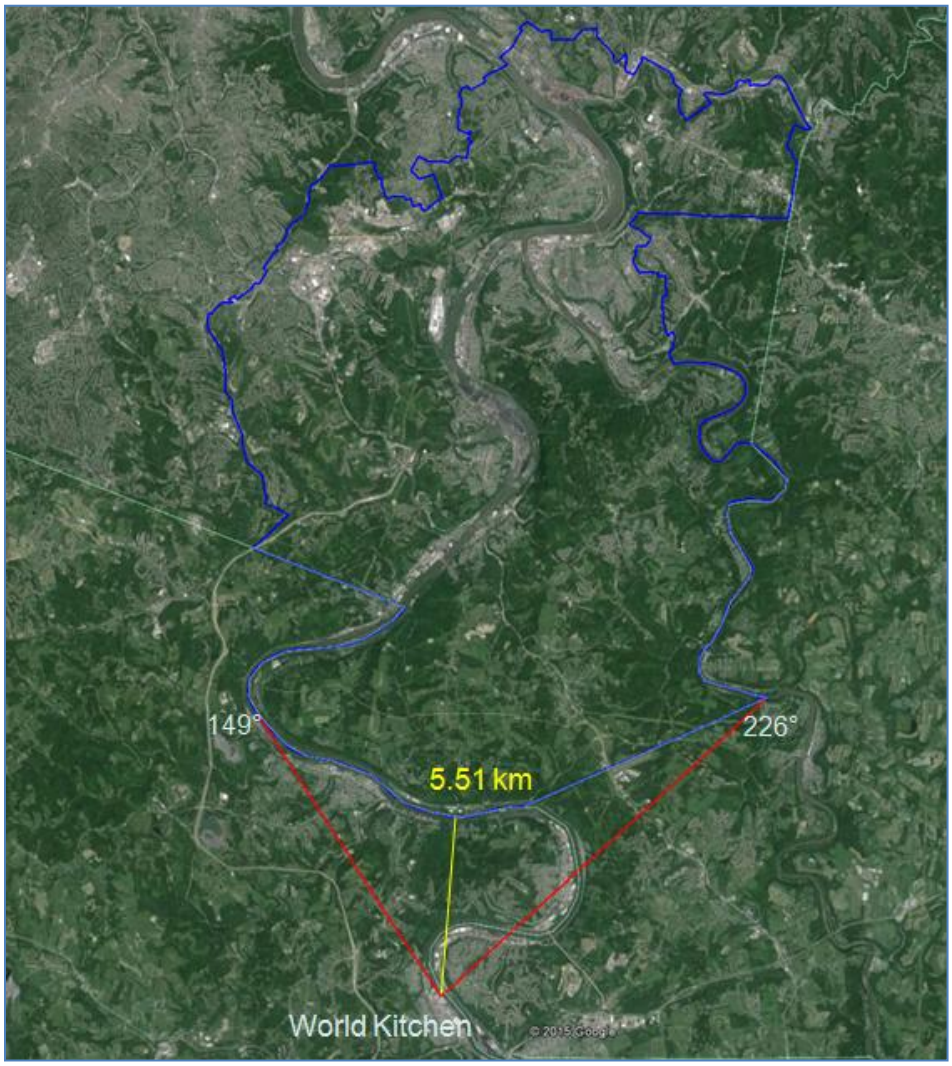

Figure E-12. World Kitchen Location in Relation to NAA

World Kitchen is also adjacent to the Charleroi monitor (operated by PA DEP), which may include some source-oriented influences from nearby sources, including ArcelorMittal. Therefore, the Charleroi monitor is not appropriate as a background monitor for comparison to World Kitchen impacts. However, Charleroi values were lower prior to the restart of ArcelorMittal in mid-2014, indicating that World Kitchen does not contribute to Charleroi concentrations, let alone monitors in the NAA.

World Kitchen was modeled for 2012-2014 using Liberty meteorological data. The maximum 1-hour impact was 22.60 µg/m³ (8.7 ppb) on the southern edge of the NAA (Forward Twp.). Note: World Kitchen operated at high production levels compared to previous years (see PA DEP eFacts), and this impact may be higher than typical.

Since modeled impacts are above the SIL, maximum impacts were next compared to background values for South Fayette (similar to the Cheswick analysis).

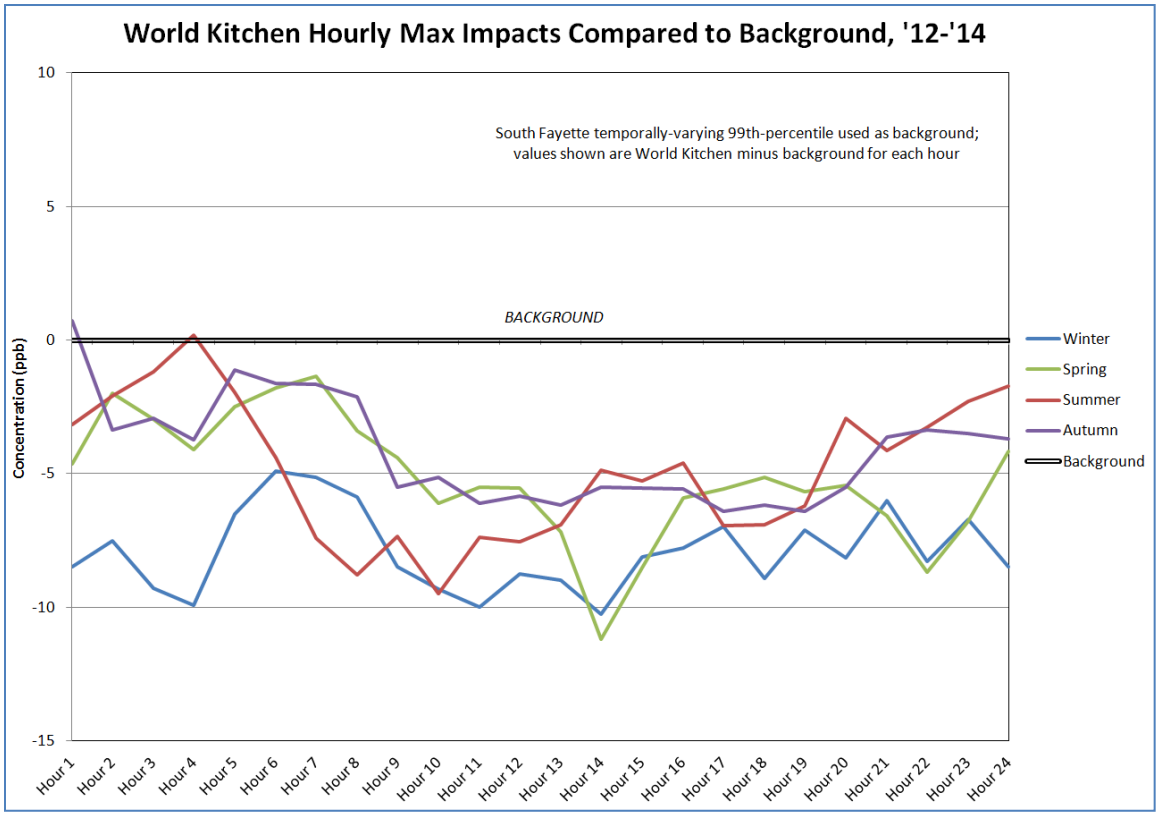

Figure E-13. Maximum Modeled World Kitchen 1-Hour Impacts Compared to South Fayette Background (in ppb)

World Kitchen contributed maximum seasonal/hourly 1-hour values that are below background except for small amounts (< 1 ppb) for one autumn and one summer hour. World Kitchen impacts are likely already accounted for by background values added to the modeling.

Wind direction analysis is inconclusive since World Kitchen lies in the general direction when concentrations are the highest. However, maximum impacts occur at North Braddock and Liberty during low wind speeds conditions. Due to the distance from World Kitchen to either Liberty or North Braddock, it can be assumed that World Kitchen has not contributed to monitored high hours.

Based on the above analysis, World Kitchen would not be applicable to the control strategy for this SIP and can be considered to be screened out from the modeling demonstration.

Flexsys

Flexsys America is a chemical manufacturer in Washington Co., 2.23 miles to the SW of the NAA. Flexsys potentially affects the NAA when winds are from the 150-256° sector, which is generally upwind of the NAA.

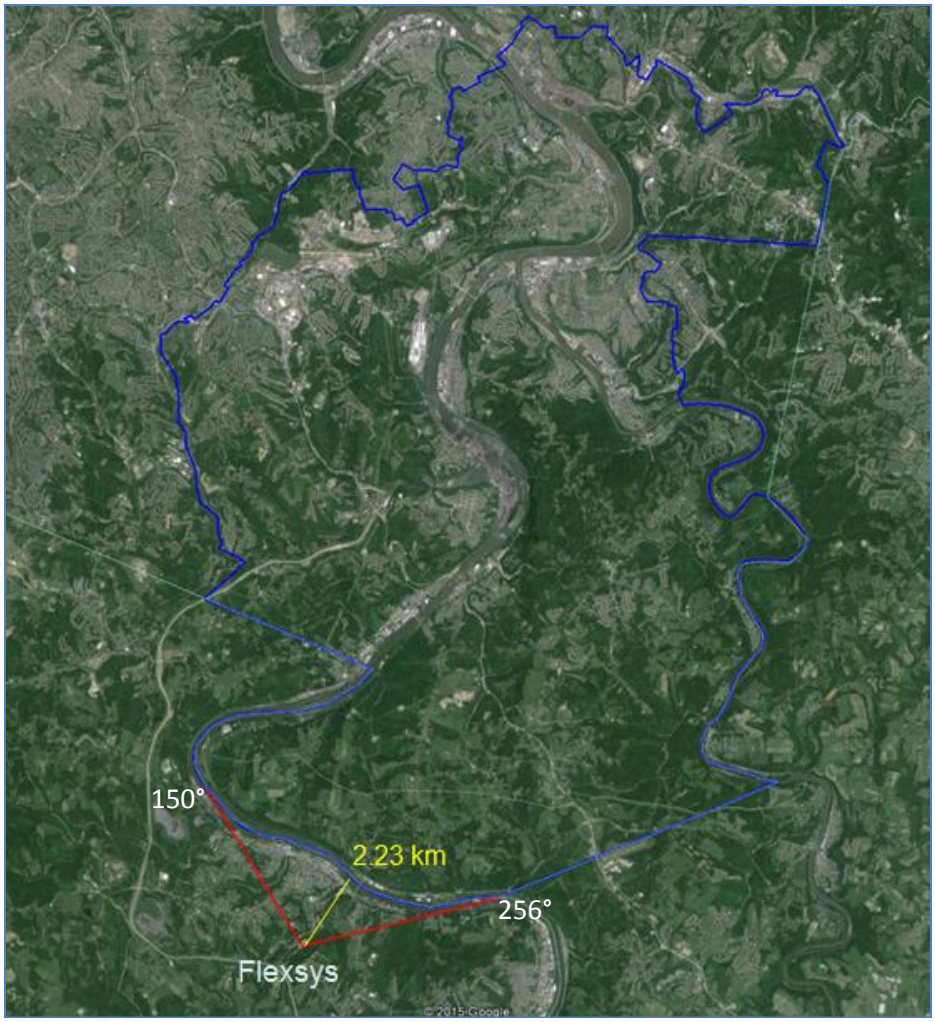

Figure E-14. Flexsys Location in Relation to NAA

Flexsys was modeled for 2012-2014 using Liberty meteorological data. The maximum 1-hour impact was 7.9 µg/m³ (3.0 ppb) on the SW edge of the NAA (Forward Twp.). Since this value is equal to the SIL, Flexsys was considered to be screened out from further modeling.

<u>ArcelorMittal</u>

ArcelorMittal Monessen is a coke manufacturing facility in Monessen, Westmoreland Co., 3.49 miles to the south of the NAA. It was idled for several years and restarted in April 2014. ArcelorMittal potentially affects the NAA when winds are from the 134-230° sector, which is generally upwind of the NAA.

ArcelorMittal cannot be screened by the Charleroi monitor, since the monitor lies further away from the NAA and also shows some source-oriented influences in 2014 that may be due to ArcelorMittal.

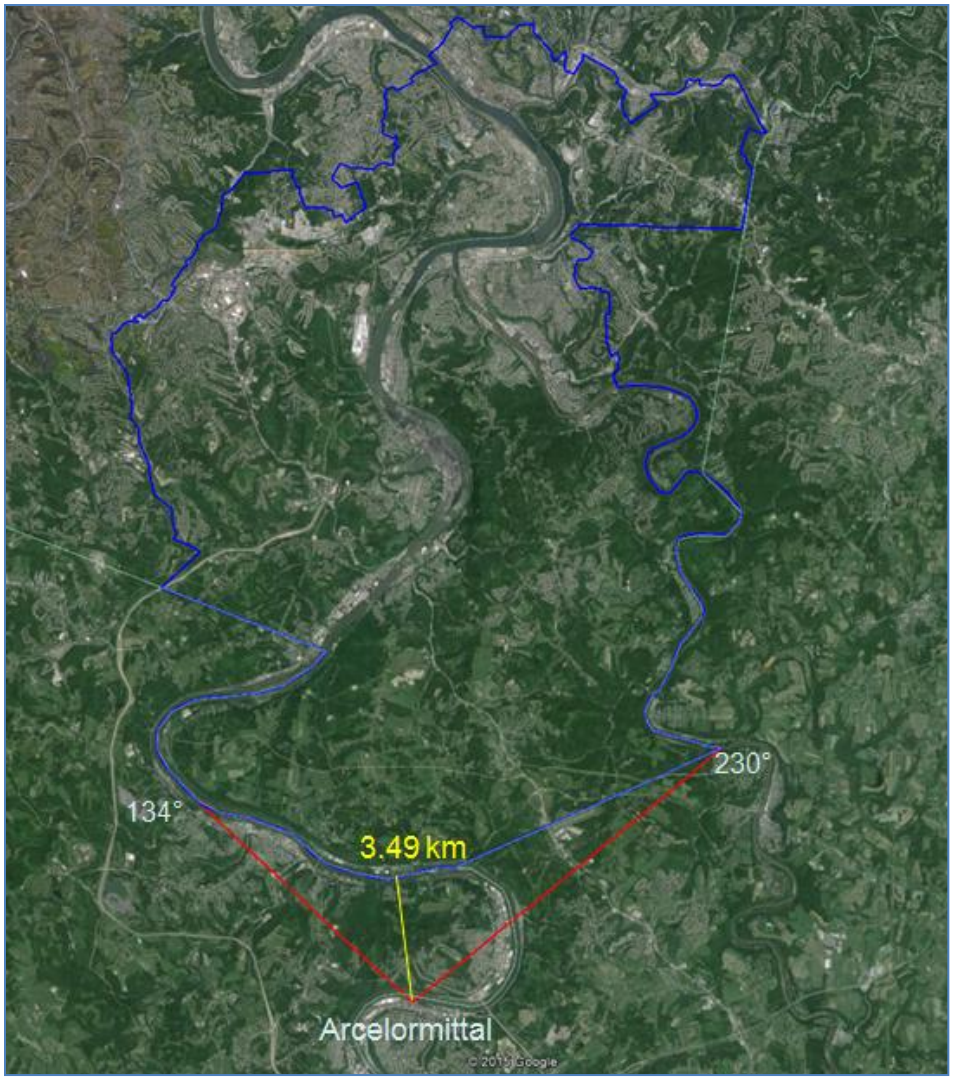

Figure E-15. ArcelorMittal Location in Relation to NAA

ArcelorMittal was modeled for 2014 using Liberty meteorological data. The maximum 1-hour impact was 164.90 µg/m³ (63.1 ppb) in Forward Twp. Note that this is a conservative approach for several reasons:

- The NAAQS is based on 4th-highs of daily hourly maximums, not 1st-highs
- Only one of year actual emissions were available, with possible startup and breakdown emissions associated with 2014 emissions
- The low wind option ADJ_U* was not used for the refined screening testing
- Buoyant fugitives were modeled as point sources, since the immediate near-field impacts are outside of the NAA and not characterized as varying-height volumes
- MMIF meteorological data was not used for the refined screening

Like mentioned previously, the purpose of the refined screening was to determine the possibility of sources to impact the NAA. Modeled impacts on a 4th-high basis and using MMIF data show lower concentrations. (See Appendix I.)

Figure E-16 below shows the contoured maximum impacts from ArcelorMittal in the NAA.

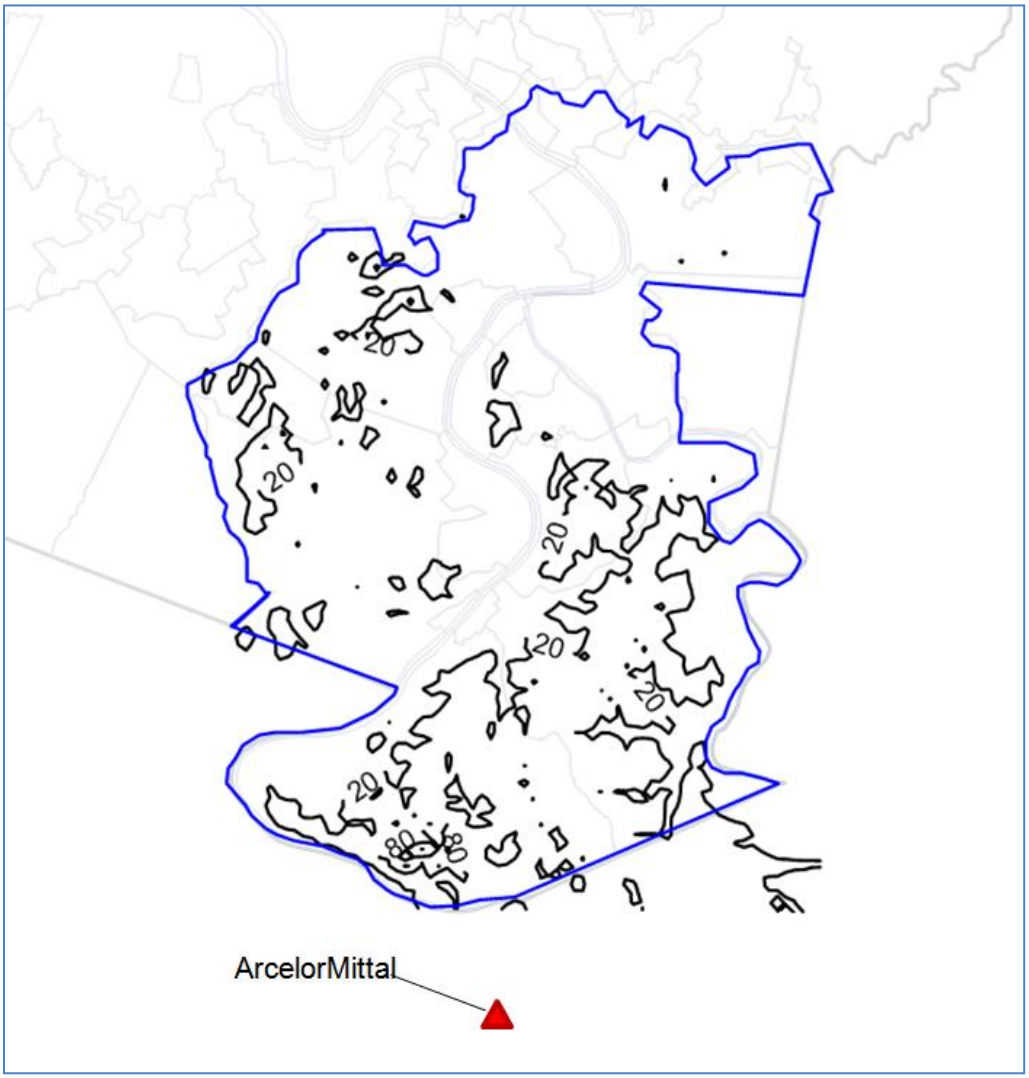

Figure E-16. Maximum Modeled ArcelorMittal 1-Hour Impacts in the NAA (in µg/m³)

ArcelorMittal shows a significant concentration gradient in the NAA, with high concentrations in the southern part of the NAA and considerably smaller impacts in the remainder of the NAA.

Most of the impacts in the NAA, including those closer to Liberty and North Braddock, are similar to background values; this could lead to some double-counting with background for cumulative impacts at receptors in the northern portion of the NAA. However, due to the potential for high values in Forward Twp., this source was kept in the modeling demonstration.

Since ArcelorMittal is located outside of the NAA but shows impacts above the SIL and background and with a significant concentration gradient, it is classified as a “nearby” source. Emissions used for ArcelorMittal were therefore based on Table 8.1 of the modeling guideline (40 CFR Part 51 Appendix W), shown below in Figure E-17.

Table 8-1. - Point Source Model Emission Inputs for SIP Revisions of Inert Pollutants[1]					
Averaging time	Emissions limit (lb/MMBtu)[2]	X	Operating level (MMBtu/hr)[2]	X	Operating factor (*e.g.* , hr/yr, hr/day)
Stationary Point Source(s) Subject to SIP Emissions Limit(s) Evaluation for Compliance with Ambient Standards *(Including Areawide Demonstrations)*					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.		Actual or design capacity (whichever is greater), or federally enforceable permit condition.		Actual operating factor averaged over the most recent 2 years.[3]
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.		Actual or design capacity (whichever is greater), or federally enforceable permit condition.[4]		Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological database).[5]
Nearby Source(s) [6]					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.[6]		Annual level when actually operating, averaged over the most recent 2 years.[3]		Actual operating factor averaged over the most recent 2 years.[3, 8]
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.[6]		Temporally representative level when actually operating, reflective of the most recent 2 years.[3, 7]		Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological database).[5]
Other Source(s) [6, 9]					
The ambient impacts from Non-nearby or Other Sources (*e.g.* , natural sources, minor sources and ,distant major sources, and unidentified sources) can be represented by air quality monitoring data unless adequate data do not exist.					

Figure E-17. Table 8.1 of 40 CFR Part 51 Appendix W (Modeling Guideline)

ArcelorMittal emissions used for the attainment demonstration were based on maximum allowable limits as applied to temporarily representative operating levels for all hours in 2012-2014. Maximum limits were based on permitted limits (45 gr H_2S in COG) or other emission factors used in the calculation of allowable emissions. Temporarily representative levels were based on daily throughputs of COG or coke. (See Appendix I for modeled actual impacts by facility using MMIF.)

Guardian

Guardian showed screening impacts above background levels for 2012-2014 (but below the NAAQS) using both Liberty and MMIF meteorological data. Guardian was therefore kept in the modeling demonstration. (See Appendix I for modeled actual impacts by facility using MMIF.)

U.S. Steel Mon Valley Works

All USS Mon Valley Works plants showed screening impacts above background levels for 2012-2014, using both Liberty and MMIF meteorological data, with Clairton and Edgar Thomson showing impacts above the NAAQS. However, these plants include some intermittent sources that were excluded since they are not applicable to the allowable scenario (see more below under Intermittent Sources). All other USS sources were modeled in the attainment demonstration. (See Appendix I for modeled actual impacts by facility using MMIF.)

Intermittent Sources

While some sources can be considered non-continuous batch processes by nature, "intermittent" sources for the purpose of this SIP are those that cannot physically operate at full capacity while other processes are at full capacity or those that operate only during seasonal, emergency, or excess conditions. These sources are not applicable to the final modeling at allowable rates because they would lead to an unachievable level of emissions at full operation.

The analysis for these sources was based on actual operation over 2012-2014, but results from previous years were also considered when examining some sources.

- Irvin COG Flaring: These sources burn excess COG that is not utilized by Irvin or the other USS Mon Valley Works plants. These flares operate on an intermittent basis during normal (actual) operation, but would not have enough COG available at maximum operation at all USS plants and Harsco.

  The highest 4th-high daily maximum hourly impact from these sources at actual operation, based on the final model configuration with MMIF and ADJ_U*, show a concentration of 62.15 µg/m³ (23.8 ppb) in year 2014. This year coincided with the highest flaring emissions at Irvin over a 15-year period (since 2000); 2012-2013 emissions led to lower impacts (average of 31.24 µg/m³ or 11.9 ppb).

  Additionally, the control strategy for this SIP will reduce flaring emissions based on lower sulfur content in COG. Irvin flaring also shows little cumulative impact throughout the NAA at actual emissions. Therefore, based on the above data, Irvin flaring can be screened out from the modeling demonstration.

- Clairton COG Flaring: Miscellaneous intermittent flaring at Clairton is a small source of SO_2, leading to less than 1.2 µg/m³ (0.5 ppb) in any modeled year. Clairton flaring can therefore be screened out from the modeling demonstration.

- Edgar Thomson BFG Flaring: Blast furnace gas (BFG) flaring showed a maximum 4th-high of 71.91 µg/m³ (27.8 ppb) in 2014. However, 2014 included emissions during equipment maintenance that were considerably higher than previous years. More typical BFG flaring impacts (average of 2012-2013) are 10.41 µg/m³ (4.0 ppb). BFG Flaring also shows little cumulative impacts with other sources during typical operation. BFG Flaring can therefore be screened out of the modeling demonstration.

- Edgar Thomson Blast Furnace Miscellaneous: Miscellaneous blast furnace emissions are from COG use for rail thawing (cold weather only) and ladle drying. Impacts ranged from 75.29 to 127.40 µg/m³ (28.8 to 48.7 ppb) from these sources in 2012-2014.

  Emissions from rail thawing are highly variable, depending on weather conditions. Highest impacts from these sources are also at the fence line of the Edgar Thomson property, with little transport beyond the fence line.

Additionally, similar to the Irvin flaring sources, blast furnace miscellaneous combustion emissions will be significantly reduced by lower sulfur content in COG as described in the control strategy. Therefore, these sources can be excluded from the final attainment demonstration.

SO_2 SIP

Appendix F

WRF Model Performance Evaluation

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Date
November 2015

Prepared for:
Allegheny County Health Department

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Project Number:
06-35842A

ALLEGHENY COUNTY HEALTH DEPARTMENT

SO_2 STATE IMPLEMENTATION PLAN

WRF MODEL PERFORMANCE EVALUATION

RAMBOLL ENVIRON

ALLEGHENY COUNTY HEALTH DEPARTMENT
SO2 STATE IMPLEMENTATION PLAN
WRF MODEL PERFORMANCE EVALUATION

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APPENDICES

Additional METSTAT Plots
Precipitation Plots

Acronyms and Abbreviations

ACHD	Allegheny County Health Department
ESRL	Earth Systems Research Laboratory
FDDA	Four Dimensional Data Assimilation
ISHO	Integrated Surface Hourly Observations
KAGC	Surface Identifier for Allegheny County Airport
KPIT	Surface and upper-air identifier for Pittsburgh Airport
LCC	Lambert Conformal Conic map projection
LSM	Land-Surface Model
LST	Local Standard Time
MADIS	Meteorological Assimilation Data Ingest System observation archive
METSTAT	Meteorological /Statistical Program
MMM	Meso-scale Meteorological Modeling
MPE	Model Performance Evaluation
NAM	North American Model
NCEP	National Center for Environmental Prediction
NCDC	National Climatic Data Center
NOAA	National Oceanographic and Atmospheric Administration
NOHRSC	National Operational Hydrologic Remote Sensing Center
NWS	National Weather Service
PBL	Planetary Boundary Layer
PRISM	Parameter-elevation Regressions on Independent Slopes Model
RMSE	Root Mean Square Error
RTG	Real-Time Global
SCAS-OSU	Spatial Climate Analysis Service at Oregon State University
SIP	State Implementation Plan
SNODAS	Snow Data Assimilation System
SODAR	Sonic Detection and Ranging
SST	Sea Surface Temperature
UTC	Coordinated Universal Time
WPS	WRF Pre-processing System
WRAP	Western Regional Air Partnership
WRF	Weather Research and Forecasting model

1. INTRODUCTION

Ramboll Environ US Corporation (Ramboll Environ) conducted meteorological modeling to provide meteorological fields for use in air-dispersion modeling within the Allegheny, PA sulfur dioxide (SO_2) nonattainment area in the southeastern portion of Allegheny County. The Weather Research and Forecasting (WRF) meteorological model (NCAR, 2015) was selected for high resolution meteorological modeling of the region for the period of January 1st, 2012 through December 31st, 2014. WRF's research and operational application ensures state-of-the-science physics and adaptability to a wide range of environments, through a broad selection of physics options, allowing us to develop the best-performing configuration for simulating meteorology in the region.

1.1 Meteorological Modeling

Over the past decade, emergent requirements for numerical simulation of urban and regional scale air quality have led to intensified efforts to construct high-resolution emissions, meteorological, and air quality data sets. It is now possible, for example, to exercise sophisticated mesoscale prognostic meteorological models and Eulerian and Lagrangian photochemical/aerosol models, for multi-seasonal periods over near-continental scale domains, in a matter of weeks with the application tailored to a specific air quality modeling project.

The WRF model contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes for each type of physical process. There is a WRF Pre-processing System (WPS) that generates the initial and boundary conditions used by WRF, based on topographic datasets, land use information, and larger-scale atmospheric and oceanic models.

1.2 ACHD Meteorological Modeling

The ACHD study performed WRF meteorological modeling of the Allegheny, PA SO_2 nonattainment area using a nested-grid structure of five grids nested in a 3:1 nesting ratio (36/12/4/1.333/0.444 km) as pictured in Figure 1. Ramboll Environ performed sensitivity testing on several WRF model configurations to optimize a high-resolution, three-year dataset for use in air dispersion modeling.

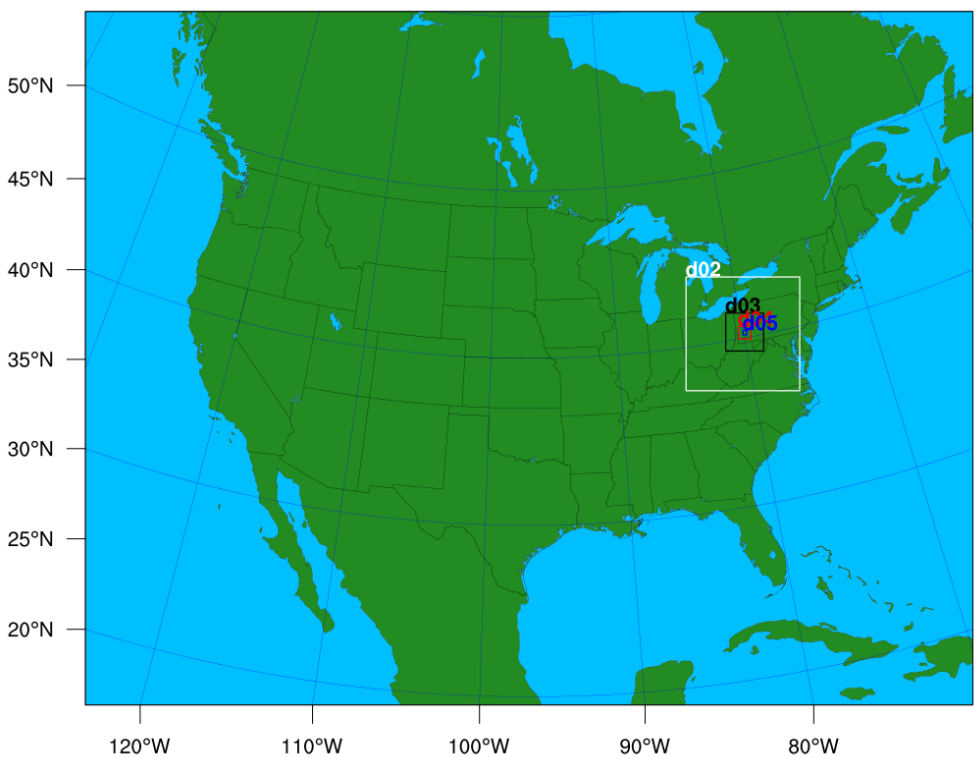

Figure 1. ACHD WRF (36/12/4/1.333/0.444 km) Modeling Domains

2. WRF MODELING METHODOLOGY

This Section describes the methodology used for conducting the WRF simulation for the January 2012 to December 2014 modeling period, and describes the model configuration used in the final WRF dataset for the ACHD SO_2 air dispersion modeling.

2.1 Model Inputs and Initial Configuration

A brief summary of the WRF configuration and input data used for this model performance evaluation is provided below.

2.1.1 WRF Version and Options

Model Selection: The publicly available version of WRF, version 3.6.1, was used for the ACHD simulation. The WPS pre-processor programs including GEOGRID, UNGRIB and METGRID were used to develop model inputs.

Topographic Inputs: Topographic information for the WRF was developed using the standard WRF terrain databases. The 36 km domain was based on the 10 minute global data; the 12 km domain was based on the 2 minute data; and the 4, 1.333, and 0.444 km domains were based on the 30 second data.

Vegetation Type and Land Use Inputs: Vegetation type and land use information was developed using the most recently-released databases provided with the WRF distribution. Standard WRF surface characteristics corresponding to each land use category were employed.

Atmospheric Data Inputs: WRF relies on other model or re-analysis output to provide initial and boundary conditions (IC/BC). The first guess fields were taken from the 12 km (Grid #218) North American Model (NAM) archives available from the National Climatic Data Center (NCDC) NOMADS server. These were objectively re-analyzed using traditional observational data (meteorological towers) to the higher resolution of each WRF grid, using the OBSGRID program. These fields are used both to initialize the model, and used with analysis nudging (on selected domains) to guide the model to best match the observations.

Time Integration: Adaptive time stepping was used to maximize the time step that the model can use while keeping the model numerically stable. The model time step was adjusted based on the domain-wide horizontal and vertical stability Courant-Friedrichs-Lewy (CFL) target value of 0.8.

Diffusion Options: Horizontal Smagorinsky first-order closure with sixth-order numerical diffusion and suppressed up-gradient diffusion were used.

Lateral Boundary Conditions: Lateral boundary conditions were specified from the initialization dataset on the 36 km CONUS domain with continuous updates nested from each "parent" domain to its "child" domain.

Top and Bottom Boundary Conditions: The top boundary condition was selected as an implicit Rayleigh dampening for the vertical velocity. Consistent with the model application for non-idealized cases, the bottom boundary condition was selected as physical, not free-slip.

Water Temperature Inputs: The water temperature data were taken from the NCEP RTG daily global one-twelfth degree analysis, and was updated every 24 hours (as opposed to fixed for each WRF initialization).

Snow Cover: The model runs use the 1 km resolution snow data from the SNOw Data Assimilation System (SNODAS). SNODAS is a modeling and data assimilation system developed by the NOAA National Weather Service's National Operational Hydrologic Remote Sensing Center (NOHRSC) to provide the best possible estimates of snow cover and associated variables to support hydrologic modeling and analysis. SNODAS includes procedures to ingest and downscale output from Numerical Weather Prediction (NWP) models and to simulate snow cover using a physically based, spatially-distributed energy and mass-balance snow model (NOHRSC, 2004). The product used is very similar to that used by NOAA's Rapid Refresh (RAP) assimilation/modeling system.

FDDA Data Assimilation: The WRF model was run with a combination of analysis and observation nudging (i.e., Four Dimensional Data assimilation [FDDA]). Analysis nudging was used for winds, temperature, and humidity on the 36 and 12 km domains. The nudging used both surface and aloft nudging, but nudging for temperature and mixing ratio was not performed in the lower atmosphere (i.e., within the boundary layer). The WRF simulation used observation nudging within the 4 km and 1.333 km domains for winds, temperature, and humidity. Observation nudging was performed using the Meteorological Assimilation Data Ingest System (MADIS, 2015) observation archive. There was no nudging of the 0.444 km domain, as only two sites were inside.

Physics Options: The WRF model contains many different physics options. The physics options chosen for the WRF configuration are presented in Table 1.

Application Methodology: The WRF model was executed in 5.5-day blocks initialized at 12Z every five days. Model results were output every 60 minutes and output files were split at twelve (12) hour intervals. Twelve (12) hours of spin-up were included in each 5-day block before the data were used in the subsequent evaluation. The model was run at the 36, 12, 4, 1.333, and 0.444 km resolution from January 2012 through December 2014.

Table 1. Physics Options used in the ACHD WRF Dataset

Physics Scheme	Option
Longwave Radiation	RRTMG
Shortwave Radiation	RRTMG
Microphysics	Thompson
Cumulus Parameterization	Kain-Fritsch in 36 and 12 km only
Planetary Boundary Layer (PBL)	MYJ
Land Surface Model (LSM)	Noah
Surface Layer	Monin-Obukhov

2.1.2 Domain Configuration

The WRF Domain configuration is comprised of a system of simultaneous nested grids. Figure 1 shows the WRF modeling grids at 36/12/4/1.333/0.444 km. All WRF grids are defined on a Lambert Conformal Conic (LCC) projection centered at 40°N, 97°W with true latitudes at 33°N and 45°N (the so-called standard RPO projection). The outermost domain with 36 km resolution includes the entire continental United States and parts of Canada and Mexico. The inner 12 km regional grid covers the northeastern portion of the Unites States. The 4 km domain covers the four state areas of Pennsylvania, Ohio, West Virginia, and Maryland. Figure 2 pictures the 1.333 km domain with grid cells, covering multiple counties in southwest Pennsylvania, as well as the nested 0.444 km domain. Figure 3 shows the inner 0.444 km domain with grid cells, covering the nonattainment portion of Allegheny County as pictured. Table 2 provides the domain specifications used in the modeling study.

Table 2. WRF Domain Specifications

Grid Spacing (km)	Number of Points (West-East)	Number of Points (South-North)	Starting Point (West-East)	Starting Point (South-North)
36	165	129	-	-
12	64	64	112	59
4	64	64	23	23
1.333	64	64	22	21
0.444	58	67	24	21

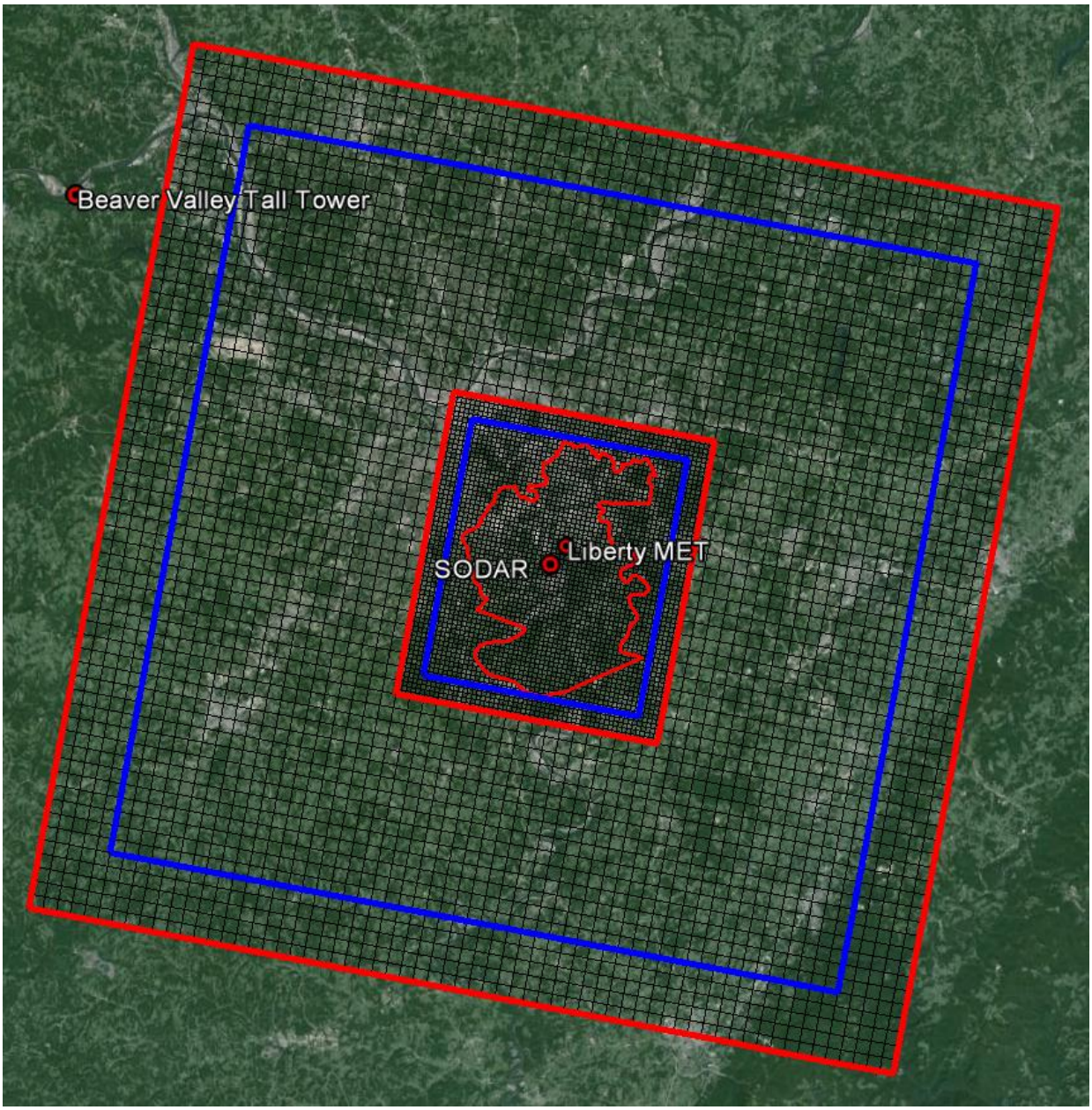

Figure 2. WRF grid d04 (1.333 km, outer red rectangle) and grid d05 (0.444 km, inner red rectangle). Blue rectangles show usable areas of 1.333 and 0.444 km domains.

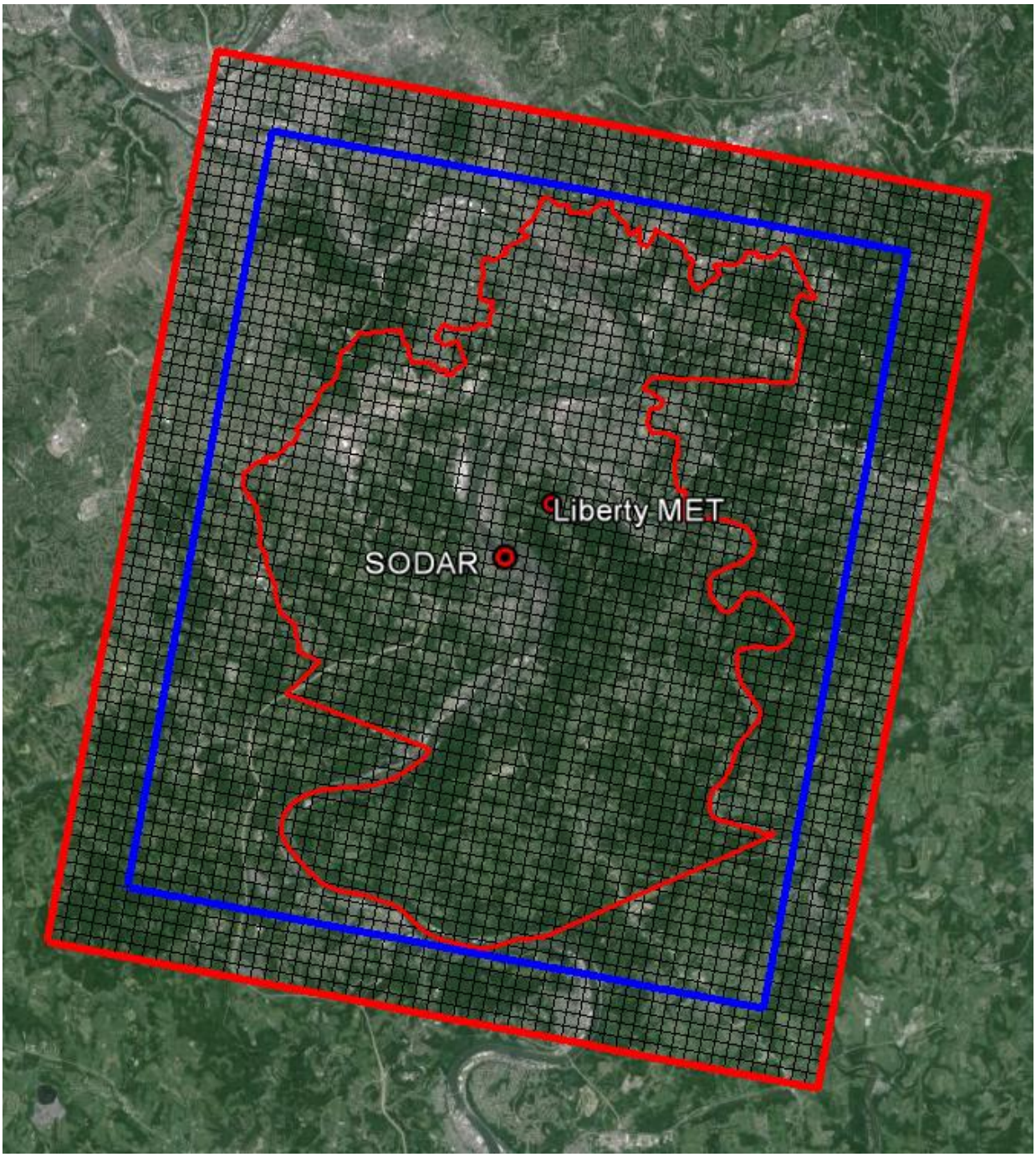

Figure 3. WRF grid d05 (0.444 km, red rectangle) with the non-attainment area. The blue rectangle shows the usable portion of the 0.444 km domain.

2.1.3 Model Vertical Resolution

High vertical resolution enables the model to more accurately capture the convective updraft velocities in summer and low level temperature inversions frequently present during winter. The ACHD WRF modeling was based on 37 vertical layers with an approximately 11 meter thick lowest layer. Table 3 illustrates the vertical layer structure used in this modeling project.

Table 3. ACHD WRF Dataset Model Levels

Level	Eta	Pressure (mb)	Height (m)	ΔZ (m)
1	1.0000	1013	0.0	
2	0.9985	1012	11.2	11.2
3	0.9970	1010	22.4	11.2
4	0.9955	1009	33.7	11.2
5	0.9940	1008	44.9	11.2
6	0.9925	1006	56.1	11.3
7	0.9910	1005	67.4	11.3
8	0.9895	1003	78.7	11.3
9	0.9870	1001	97.5	18.8
10	0.9845	999	116.4	18.9
11	0.9820	997	135.3	18.9
12	0.9795	994	154.2	18.9
13	0.9770	992	173.2	19.0
14	0.9745	990	192.2	19.0
15	0.9720	987	211.2	19.0
16	0.9690	985	234.1	22.9
17	0.9660	982	257.1	22.9
18	0.9610	977	295.4	38.4
19	0.9510	968	372.6	77.1
20	0.9360	955	489.4	116.8
21	0.9210	941	607.6	118.2
22	0.9010	923	767.4	159.8
23	0.8810	904	929.7	162.4
24	0.8600	885	1103.1	173.4
25	0.8200	849	1441.9	338.8
26	0.7600	794	1973.0	531.1
27	0.7000	739	2534.6	561.6
28	0.6000	648	3550.4	1015.8
29	0.5000	557	4689.7	1139.3
30	0.4000	465	5991.9	1302.2
31	0.3000	374	7520.7	1528.8
32	0.2200	301	8979.7	1459.0
33	0.1500	237	10514.7	1535.0
34	0.1000	191	11832.4	1317.6
35	0.0600	155	13084.9	1252.5
36	0.0270	125	14313.8	1228.9
37	0.0000	100	15513.7	1199.9

3. WRF MODEL PERFORMANCE EVALUATION

Both a quantitative and qualitative evaluation of the ACHD WRF simulation were conducted. The quantitative evaluation compared both integrated surface hourly and on-site meteorological observations with WRF predictions matched by time and location. The qualitative evaluation compared twice daily vertical profiles with upper-air data and on-site hourly SODAR profiles with WRF predictions matched by time and location. Additionally, monthly total spatial precipitation fields based on observations (PRISM data) were compared with the WRF gridded monthly total precipitation fields. Below we summarize the main features of the WRF simulation model performance evaluation.

3.1 Quantitative Evaluation Using METSTAT

A quantitative model performance evaluation of the ACHD WRF simulation was performed using integrated hourly surface and on-site meteorological measurements and the publicly-available METSTAT software (Ramboll Environ, 2015) evaluation tool. METSTAT calculates statistical performance metrics for bias, error and correlation for surface winds, temperature, and mixing ratio (i.e., water vapor or humidity). To evaluate the performance of a meteorological model simulation for air quality model applications, a number of performance benchmarks for comparison are typically used. Table 4 lists the meteorological model performance benchmarks for simple (Emery et al., 2001) and complex (Kemball-Cook et al., 2005) situations. The simple benchmarks were developed by analyzing well-performing meteorological model evaluation results for simple, mostly flat terrain conditions and simple meteorological conditions (e.g., stationary high pressure) that were mostly conducted to support air quality modeling studies (e.g., ozone SIP modeling). The complex benchmarks were developed during the Western Regional Air Partnership (WRAP) regional haze modeling and are performance benchmarks for more complex conditions, such as the complex terrain of the Rocky Mountains and Alaska (Kemball-Cook et al., 2005). McNally (2009) analyzed multiple annual runs that included complex terrain conditions and suggested an alternative set of benchmarks for temperature under more complex conditions. The purpose of the benchmarks is to understand how good or poor the results are relative to other model applications run for the United States.

In this section, Ramboll Environ compared the initial WRF meteorological variables to the benchmarks as an indication of WRF model performance. These benchmarks include bias and error in temperature, wind direction and mixing ratio as well as the wind speed bias and Root Mean Squared Error (RMSE) between the models and databases.

Table 4. Meteorological Model Performance Benchmarks for Simple and Complex Conditions

Parameter	Emery et al. (2001)	Kemball-Cook et al. (2005)	McNally (2009)	Resulting Criteria
Conditions	Simple	Complex	Complex	Complex
Temperature Bias	≤ ±0.5 K	≤ ±2.0 K	≤ ±1.0 K	≤ ±1.0 K
Temperature Error	≤ 2.0 K	≤ 3.5 K	≤ 3.0 K	≤ 3.0 K
Temperature IOA	≥ 0.8	(not addressed)	(not addressed)	≥ 0.8
Humidity Bias	≤ ±1.0 g/kg	≤ ±0.8 g/kg	≤ ±1.0 g/kg	≤ ±1.0 g/kg
Humidity Error	≤ 2.0 g/kg	≤ 2.0 g/kg	≤ 2.0 g/kg	≤ 2.0 g/kg
Humidity IOA	≥ 0.6	(not addressed)	(not addressed)	≥ 0.6
Wind Speed Bias	≤ ±0.5 m/s	≤ ±1.5 m/s	(not addressed)	≤ ±1.5 m/s
Wind Speed RMSE	≤ 2.0 m/s	≤ 2.5 m/s	(not addressed)	≤ 2.5 m/s
Wind Speed IOA	≥ 0.6	(not addressed)	(not addressed)	≥ 0.6
Wind Dir. Bias	≤ ±10 degrees	(not addressed)	(not addressed)	≤ ±10 degrees
Wind Dir. Error	≤ 30 degrees	≤ 55 degrees	(not addressed)	≤ 55 degrees

The output from the ACHD WRF simulation was compared against on-site meteorological data obtained from the Liberty monitoring station operated by Allegheny County and the National Climate Data Center's (NCDC) global-scale, quality-controlled DS3505 integrated surface hourly observational (ISHO) data as verification data (NOAA-NCDC, 2015). Global hourly and synoptic

observations are compiled from numerous sources into a single common ASCII format and common data model. The DS3505 database contains records of most official surface meteorological stations from airports, military bases, reservoirs/dams, agricultural sites, and other sources dating from 1901 to the present. Figure 4 is a terrain map of the 0.444 km domain, showing the geography of the ridgelines and river valley, with the locations of both the Liberty monitoring station and closest DS3505 station at the Allegheny Airport (KAGC).

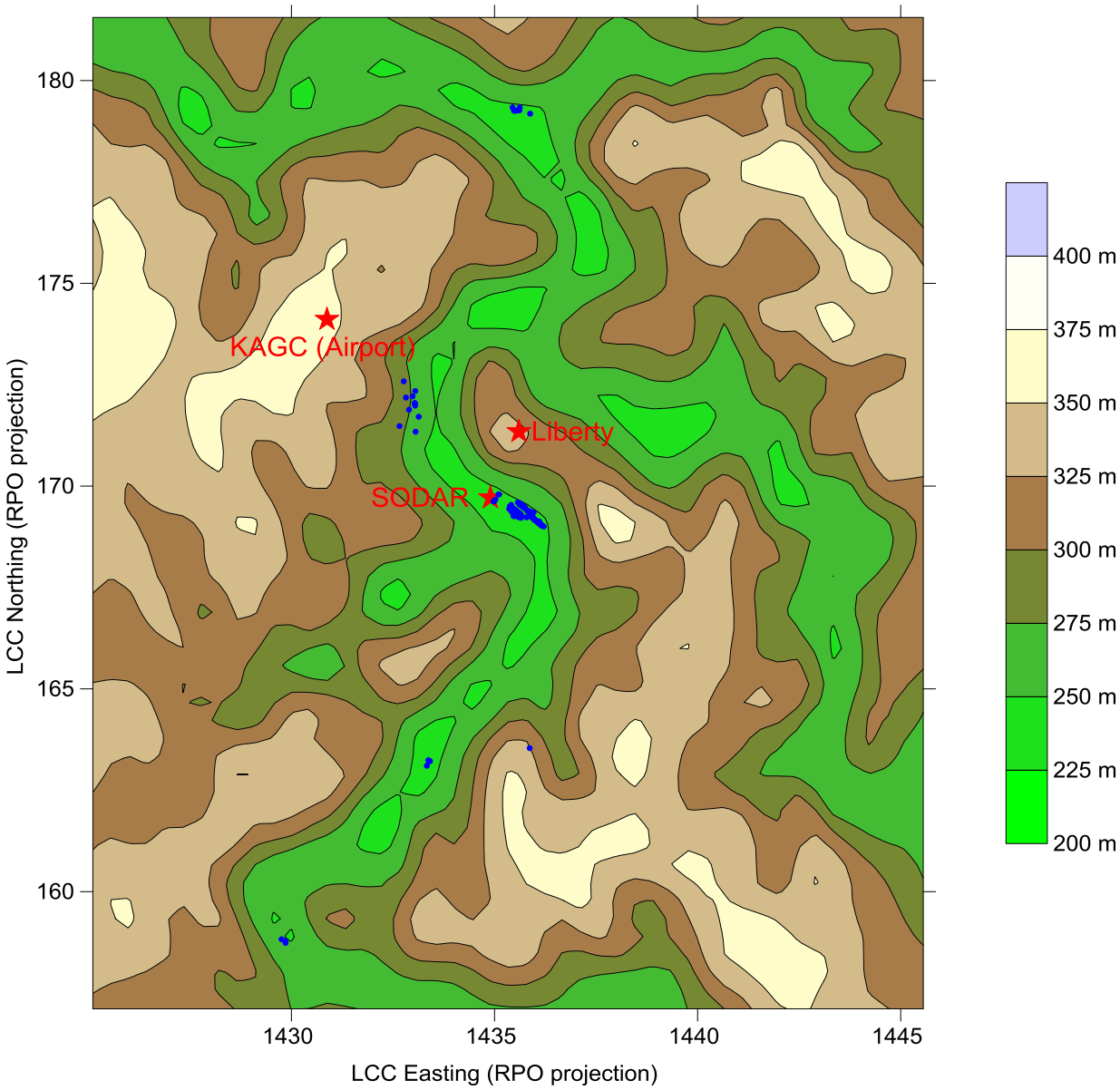

Figure 4. Terrain map of 0.444 km domain with Liberty and airport meteorological stations (red stars) and sources (blue dots)

A standard set of statistical metrics from the METSTAT package was used. These metrics were calculated on hourly, daily and monthly time frames for wind speed, wind direction, temperature, and humidity at the surface, using all available observational weather data. The WRF surface meteorological model performance metrics were compared against the simple and complex model performance goals using "soccer plots." Soccer plots use two WRF performance metrics as X-axis and Y-axis values (e.g., temperature bias as X, and temperature error as Y) along with the performance benchmarks. The closer the symbols are to the zero origin, the better the model performance. It is also easy to see when the two WRF performance metrics fall within the benchmark lines. We present monthly surface meteorological model performance across the 1.333 km (d04) county area in section 3.1.2. An analysis of the surface performance at the Liberty station and Allegheny County Airport locations are in Appendix A.

3.1.1 Quantitative Statistics

The quantitative analysis was conducted using METSTAT. Statistical measures calculated by METSTAT include observation and prediction means, prediction bias, and prediction error that are given as follows.

Mean observation (M_o) is calculated using values from all sites for a given time period by

Eq. (**1**):

$$M_o = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I} O_j^i \qquad \textbf{(1)}$$

where O^i_j is the individual observed quantity at site *i* and time *j*, and the summations are over all sites (I) and over time periods (J).

Mean Prediction (M_p) is calculated from simulation results that are interpolated to each observation used to calculate the mean observation for a given time period by Eq. (**2**):

$$M_p = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I} P_j^i \qquad \textbf{(2)}$$

where P^i_j is the individual predicted quantity at site *i* and time *j*. Note the predicted mean wind speed and mean resultant direction are derived from the vector-average (for east-west component *u* and north-south component *v*), from which the

Bias (B) is calculated as the mean difference in prediction-observation pairings with valid data within a given analysis region and for a given time period by Eq. (**3**):

$$B = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(P_j^i - O_j^i\right) \qquad \textbf{(3)}$$

Gross Error (E) is calculated as the mean *absolute* difference in prediction-observation pairings with valid data within a given analysis region and for a given time period by Eq. (4**)**:

$$E = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left|P_j^i - O_j^i\right| \qquad \textbf{(4)}$$

Note that the bias and gross error for winds are calculated from the predicted-observed residuals in speed and direction (not from vector components *u* and *v*). The direction error for a given prediction-observation pairing is limited to range from 0 to ±180°.

Root Mean Square Error (RMSE) is calculated as the square root of the mean squared difference in prediction-observation pairings with valid data within a given analysis region and for a given time period by Eq (**5**):

$$RMSE = \left[\frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(P_j^i - O_j^i\right)^2\right]^{\frac{1}{2}} \qquad \textbf{(5)}$$

The RMSE, as with the gross error, is a good overall measure of model performance. However, since large errors are weighted heavily (due to squaring), large errors in a small sub-region may produce a large RMSE even though the errors may be small and quite acceptable elsewhere.

3.1.2 METSTAT Evaluation Using Integrated Surface Hourly Observations

Figure 5 through Figure 8 presents soccer plots of WRF performance in the 1.333 km domain for all months, from 2012 through 2014, evaluated against all DS3505 observations within the domain.

Wind direction performed well, with all months falling within the simple conditions threshold. There is a slight positive wind direction bias in the model, around 2-7 degrees, most likely from the terrain influence of the river valley. Soccer plots of wind speed performance are presented in Figure 6. WRF performs reasonably well with all months falling within the complex conditions thresholds. The model reflects a small positive bias, roughly 0.5 to 1.3 m/s. In Figure 7, WRF performs well for temperatures in d04. Half of all months are within the simple conditions threshold, while the other half are slightly outside the benchmark, in the complex conditions. Warmer months display a slight positive temperature bias and colder months tend to have a slight negative bias. WRF humidity performance in Figure 8 shows a positive humidity bias in the model, with half of all months inside the simple conditions threshold and the other half with increasing bias and error. Several of the warmer month plots fall outside the complex conditions benchmark.

Figure 21 through Figure 27 in Appendix A compares METSTAT performance plots of the Liberty met station and the Pittsburgh surface met station (KPIT) in the 1.333 km (d04) domain for all months in 2012 to 2014. Note that the Liberty on-site station database did not contain a humidity variable. Wind direction performed well for Liberty and considerably well for Pittsburgh. The Liberty station displays a slight positive wind direction bias with one month, August of 2014, outside of the complex conditions thresholds. There is a small positive bias in wind speed performance for both stations as well, with WRF indicating higher wind speeds of 0.5 to 1.5 m/s. Temperature performed well for both stations, with a slight negative (cooler) temperature bias in Pittsburgh. The Pittsburgh humidity performance is indicative of all stations within the 1.333 km domain, containing a positive bias for warmer months.

Figure 28 through Figure 34 compares METSTAT performance plots of the Liberty met station and the Allegheny County Airport met station (KAGC) in the 0.444 km (d05) domain for all months in 2012 to 2014. Wind direction performance was satisfactory for both stations, with a positive wind direction bias for all months. One-third of all months fall outside of the complex conditions threshold, with no seasonal trend in higher biases. Wind speed performed well for Allegheny County Airport and was satisfactory for the Liberty station. Higher wind speed and wind direction biases for the Liberty station is most likely due to the terrain channeling effects of the valley area. Temperature performed well for both stations, with a slight negative bias displayed for the Allegheny County Airport. The Allegheny County Airport humidity performance in the 0.444 km domain is similar to other stations in the 1.333 km domain with an increased humidity bias, especially in the warmer months.

Overall, WRF performed well in both the 1.333 km and 0.444 km domains. The METSTAT performance benchmarks were originally developed involving statistics averaged over a large number of surface observations sites. Considering the limited amount of integrated surface hourly stations within the higher-resolution domains (four in the 1.333 km domain, two in the 0.444 km domain) the results are acceptable for the Study area.

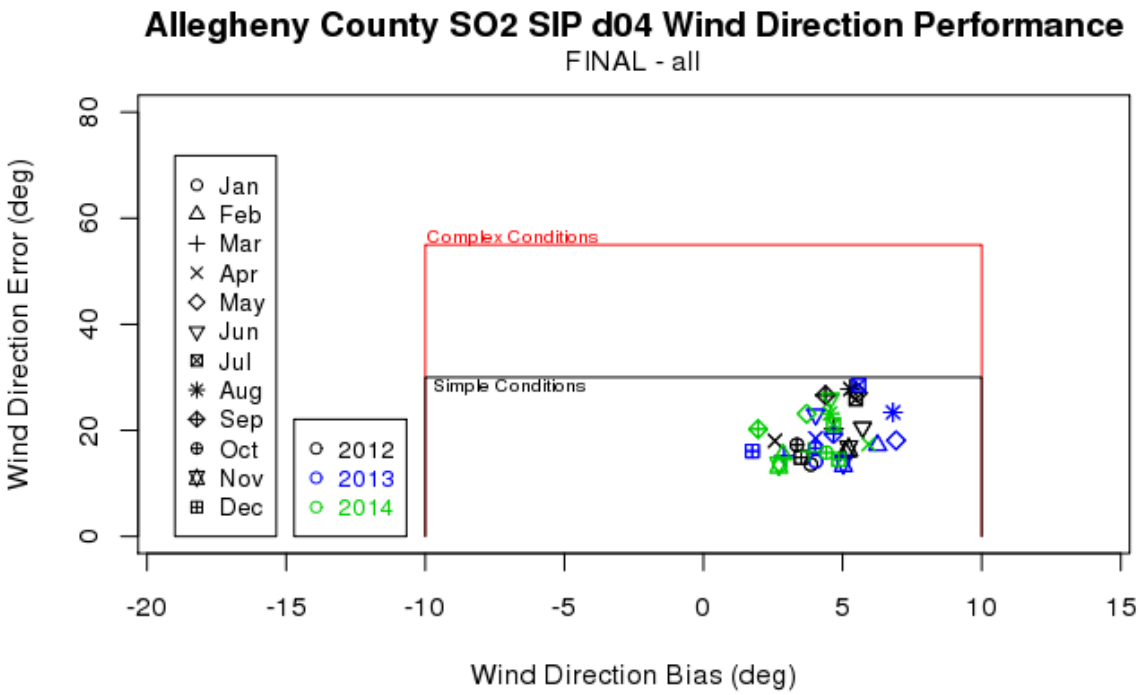

Figure 5. ACHD WRF METSTAT d04 Wind Direction Performance

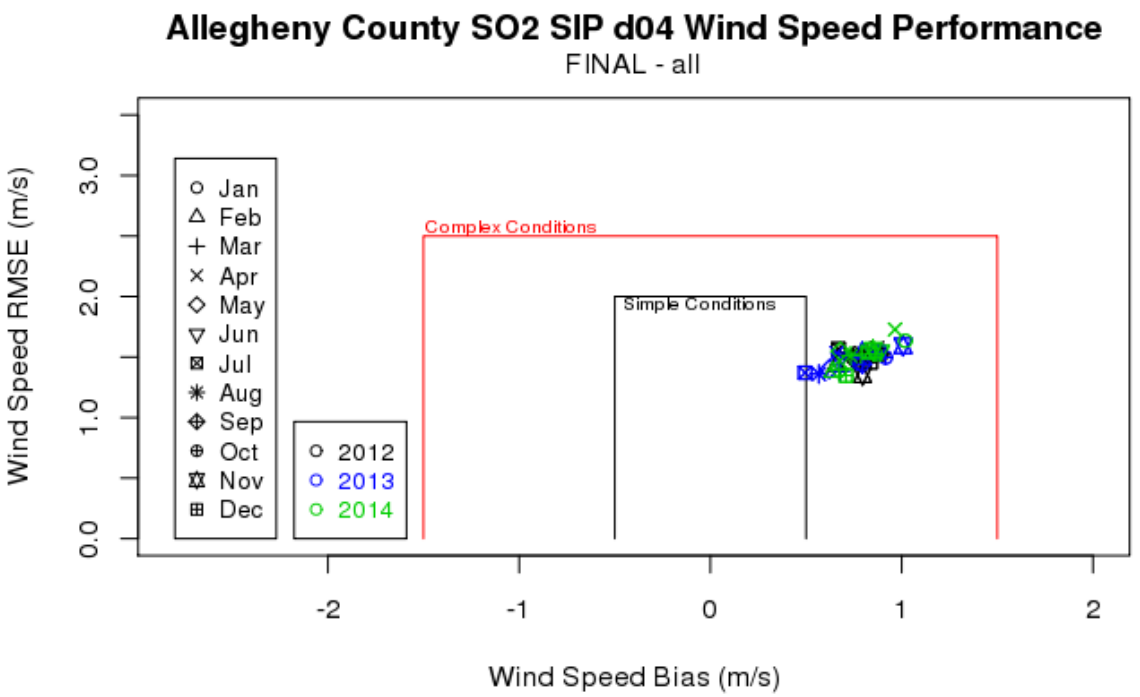

Figure 6. ACHD WRF METSTAT d04 Wind Speed Performance

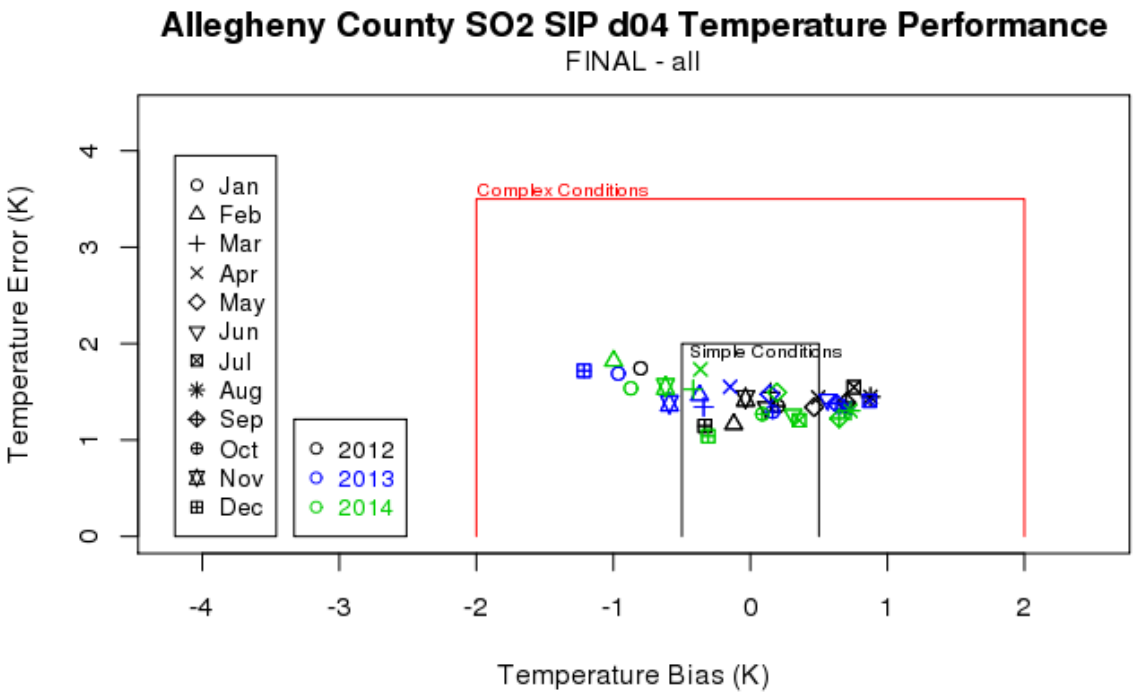

Figure 7. ACHD WRF METSTAT d04 Temperature Performance

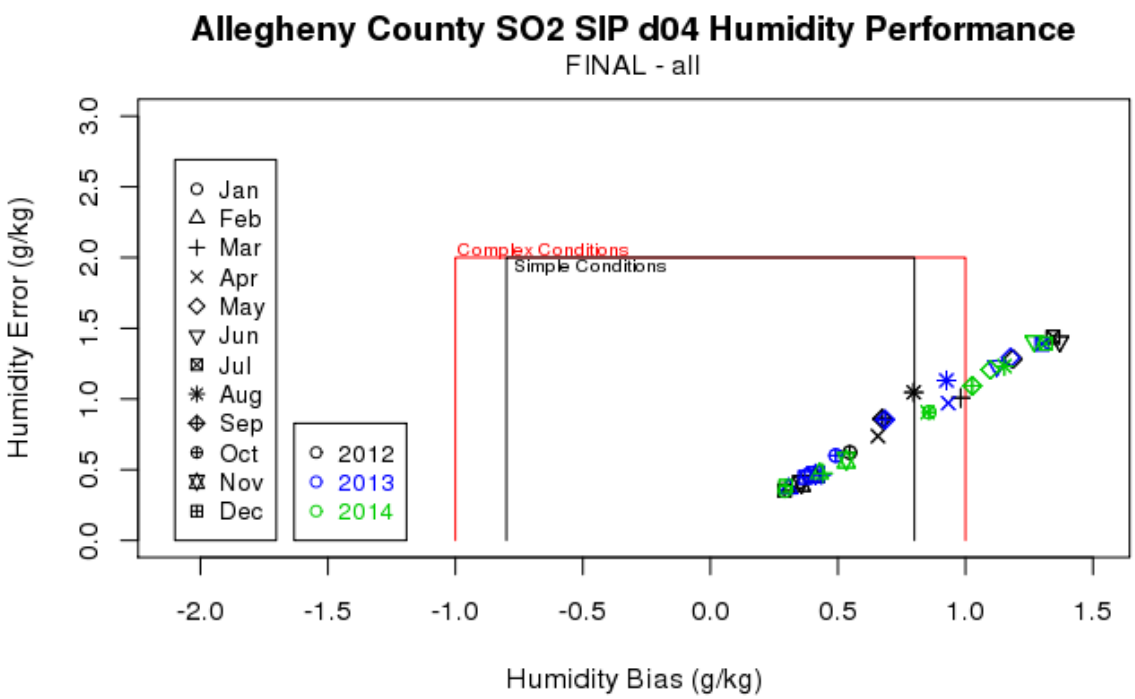

Figure 8. ACHD WRF METSTAT d04 Humidity Performance

3.2 Qualitative Evaluation Using Vertical Profile Analysis

These analyses were conducting using upper air observation datasets within the study domain at Pittsburgh, Pennsylvania, and at the Clairton Site which have time frames that overlap with the WRF modeling.

Upper-air data from the Pittsburgh radiosonde (KPIT) dataset were used to evaluate WRF vertical profiles of predicted temperature and moisture above that location. The KPIT radiosonde dataset is collected and maintained by the National Weather Service (NWS). Radiosondes are launched from KPIT twice per day, at approximately 0 and 12 UTC (7 AM and 7 PM LST). Radiosondes provide high-resolution vertical profiles of temperature, humidity, wind speed and wind direction throughout the troposphere. The data are made publicly available by NOAA on the Earth System Research Laboratory (ESRL) Radiosonde Observation website (www.esrl.noaa.gov/raobs). Ramboll Environ downloaded and stored the radiosonde data from 2012 to 2014 in FSL format for use in WRF model dataset comparisons.

The advantages of traditional radiosonde datasets are the length of the dataset and that they are direct measurements, as opposed to remote sensing. Disadvantages include the low frequency at only twice per day, and that the lowest reported level comes from a different sensor than the rest of the profile and can lead to un-physical profiles. The measurement from the stationary sensor may be warmer than the lowest layer reported by the radiosonde, which is an unstable situation that could not actually occur as the air would rapidly mix and the unstable temperature gradient would be erased.

Wind observations from a REMTECH Sonic Detection and Ranging (SODAR) remote sensing system were obtained from Allegheny County and plotted against the WRF model for use in low level wind comparisons of the non-attainment area. The dataset contained horizontal wind speed and direction, vertical velocity and deviation for the 2014 modeling year. The location of the SODAR instrument is pictured in Figure 4.

Using the SO_2 concentration measurements at the Liberty monitoring station, the two highest "SO_2 episode days" were selected from each modeling year (2012-2014) for vertical profile comparisons. The following days are used for analysis below:

- March 15th, 2012
- July 17th, 2012
- December 1st, 2013
- December 20th, 2013
- January 5th, 2014
- March 31st, 2014

3.2.1 Pittsburgh Temperature, Dew Point, and Wind Speed Soundings

Vertical profile plots showing WRF modeled data from the 1.333 km domain and observed upper-air soundings were created in order to evaluate the performance of the vertical atmospheric structure. The upper-air observation location from the Pittsburgh National Weather Service office (KPIT, WBAN 94823) was selected as the closest sounding site to the Allegheny County SO_2 study area. At a distance of about 24 miles to the northwest (outside of the 0.444 km domain) the KPIT balloon-borne radiosonde launch site provides the nearest representative NWS upper-air data for the study and vicinity.

Figure 9 through Figure 14 display vertical profile comparisons of WRF temperatures and dew points (blue lines) against actual upper-air temperatures and dew points (red lines) on the left panel and comparisons of WRF wind speeds (blue lines) against actual upper-air wind speeds (red lines) on the right panel.

On the left panel in Figure 9, WRF represents the height of the surface-based inversion well, but under-estimates the surface temperature by three degrees Celsius. On the right panel, wind speeds are represented considerably well by WRF from the surface to 4000 feet.

On the morning of July 17th, 2012, WRF captures both the height and depth of the low-level inversion exceptionally well, along with the temperature though 4000 meters in Figure 10. WRF's moisture content is close to the observed profile as dew points match well through the atmosphere. Wind

speeds are also represented well on the right panel, with only a small difference (3 m/s) at around 300 meters above the surface.

In Figure 11, WRF displays an inversion from the surface to around 100 meters, which is not reflected in the observed profile. The temperature and dew point are nearly equal at the surface, suggesting possible low level moisture near saturation, but the actual observations are considerably drier. Wind speeds are also slightly higher though the first 300 meters, as shown in the right panel.

WRF again shows a surface-based inversion in the left panel in Figure 12, which is not represented in the observed profile. Additionally, WRF underestimates the surface temperature by nearly 5 degrees Celsius. This suggests that the model is cooling too rapidly in the winter months after sunset. On the right panel, model wind speeds are also higher through the first 300 meters.

In Figure 13, WRF performs considerably well at modeling both the surface inversion and temperatures through the atmosphere, compared to the observations. The modeled dew point is somewhat smoothed, whereas the observed dew points contain two dry slots, one at around 1500 meters and the other at 2400 meters. Wind speeds also perform well against the observed sounding as shown in the right panel.

On the left panel in Figure 13, WRF represents temperature well through the vertical column, but omits a dry layer from 1000 to 1500 meters. Wind speeds are under-forecasted throughout most of the vertical column in the right panel on this spring morning.

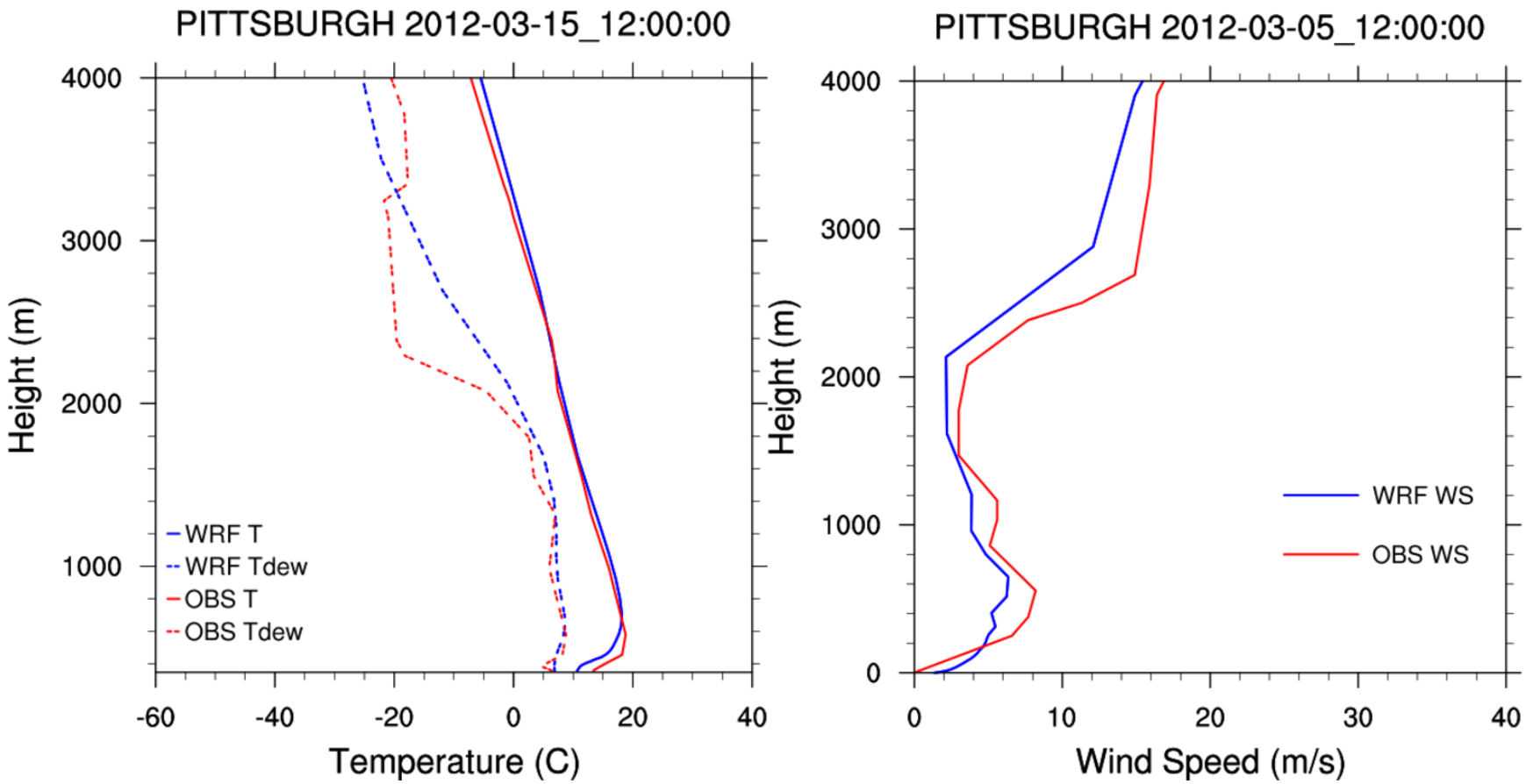

Figure 9. Vertical profile soundings comparing WRF to upper-air data at KPIT on March 15th, 2012 at 12 UTC.

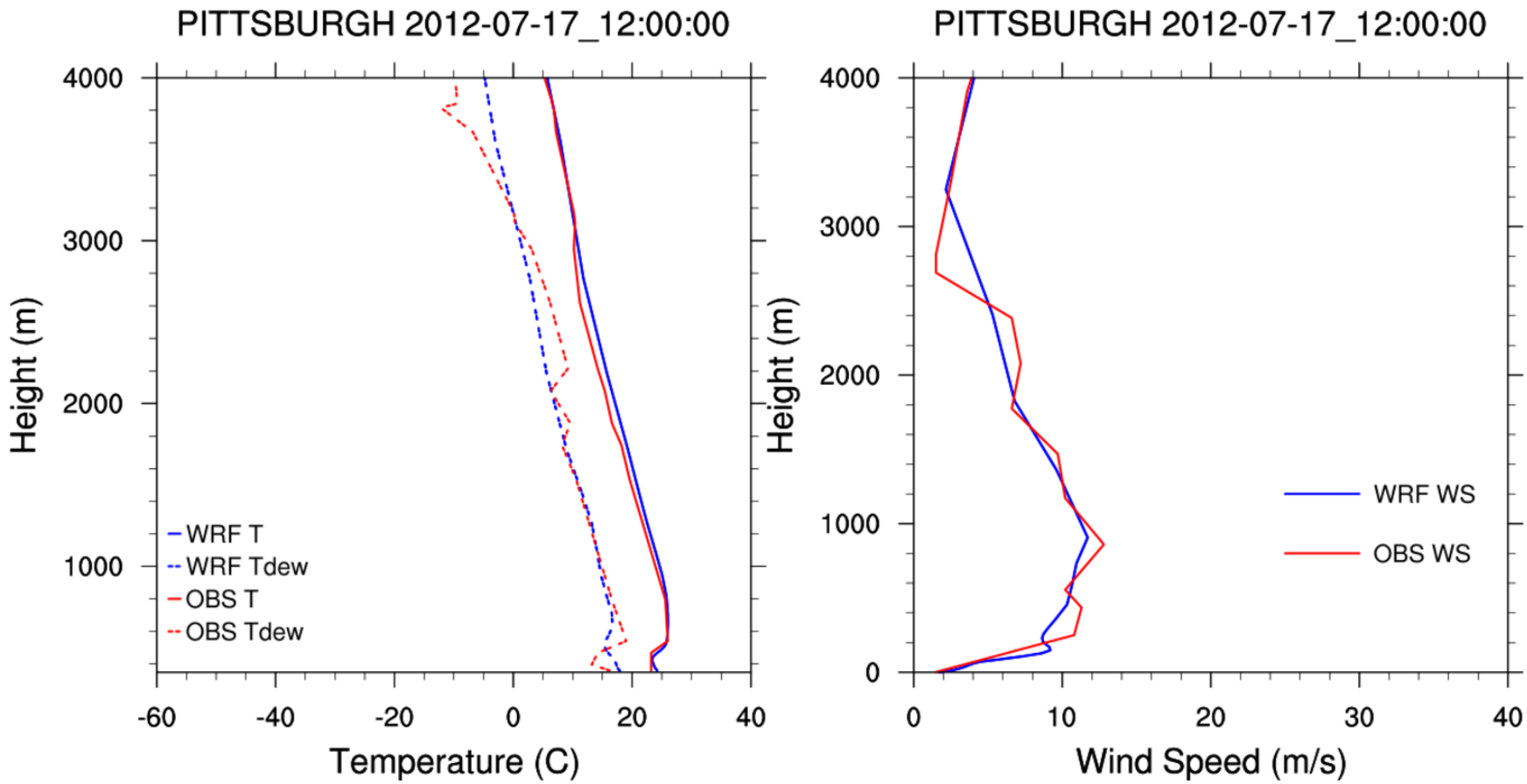

Figure 10. Vertical profile soundings comparing WRF to upper-air data at KPIT on July 17th, 2012 at 12 UTC.

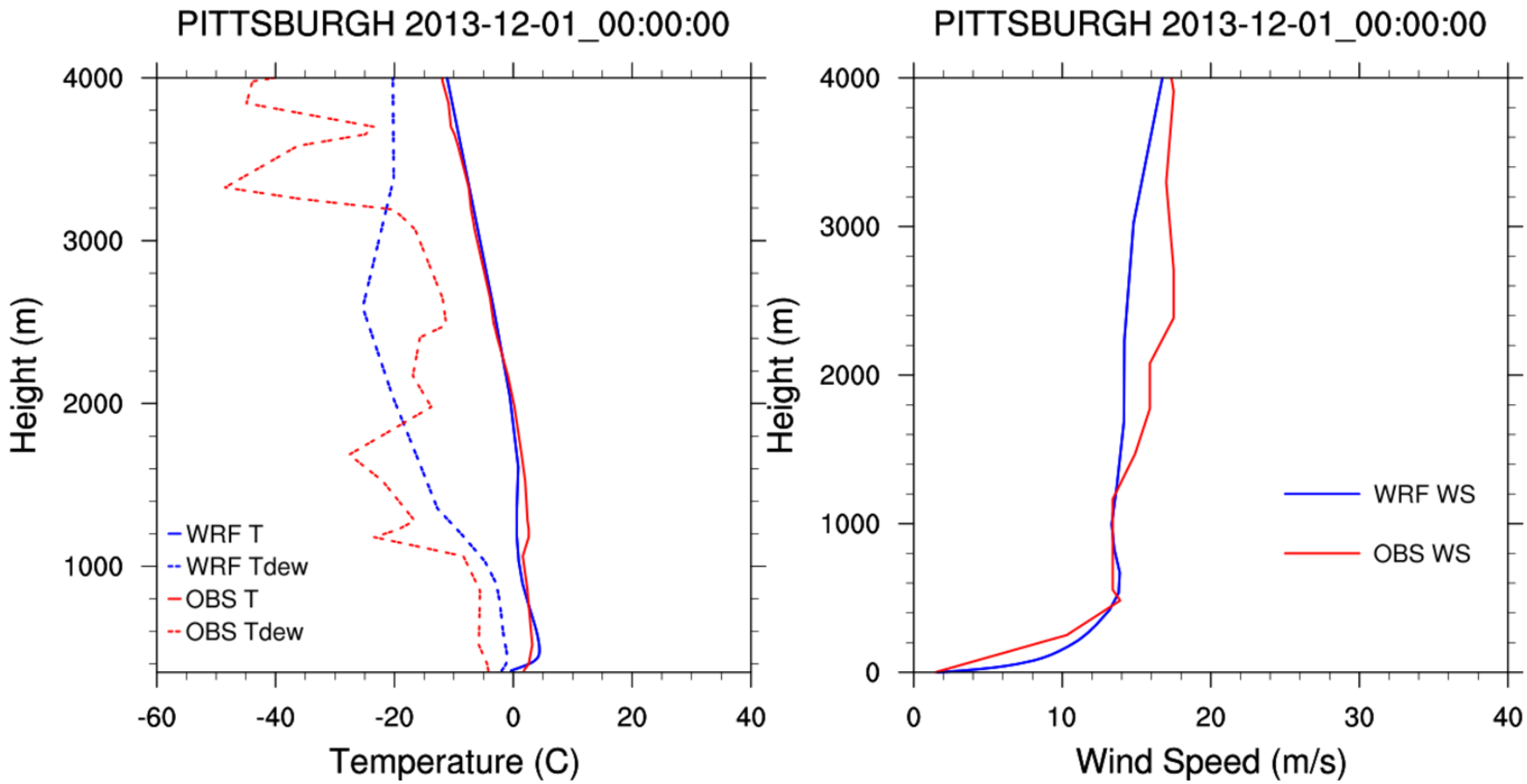

Figure 11. Vertical profile soundings comparing WRF to upper-air data at KPIT on December 1st, 2013 at 00 UTC.

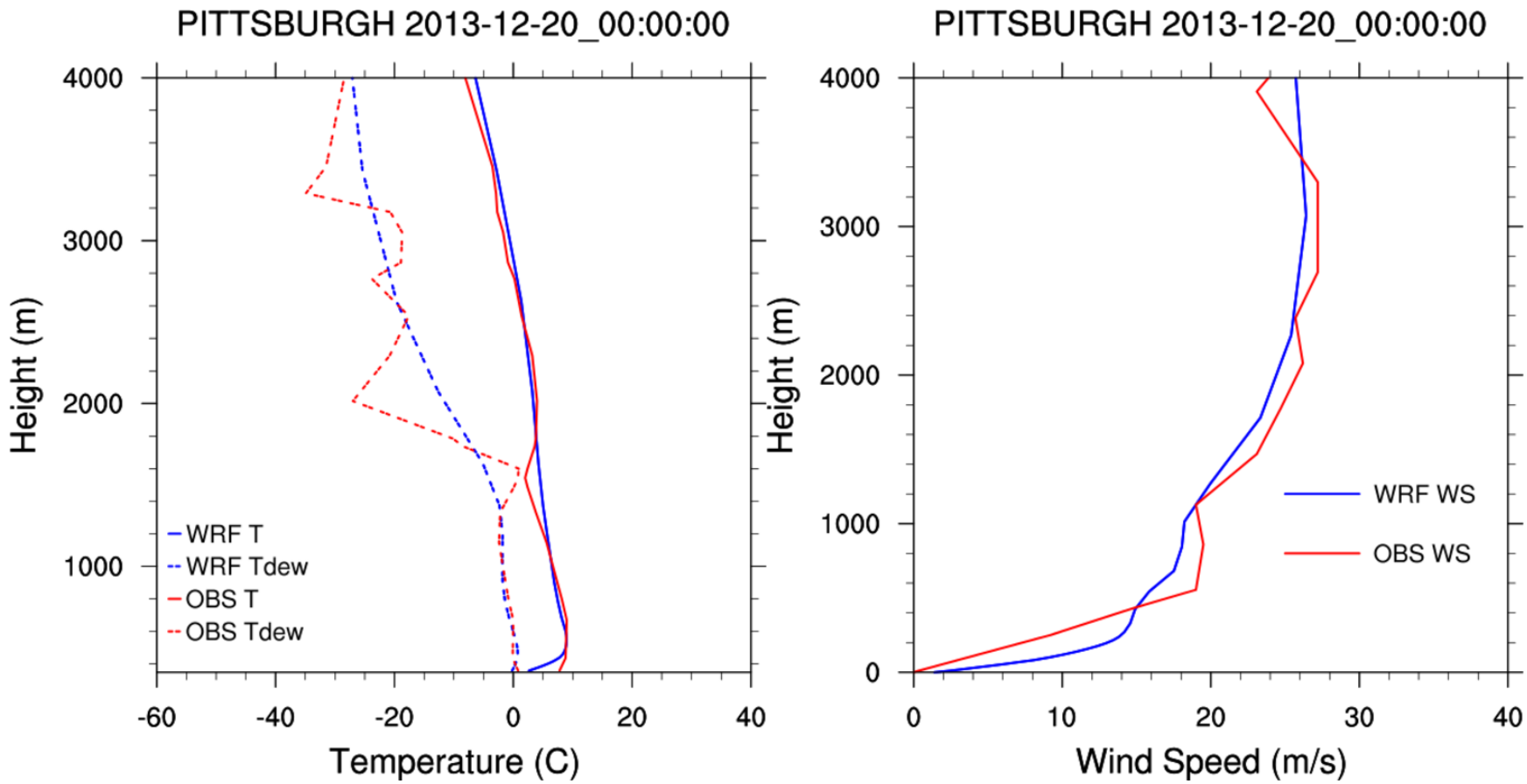

Figure 12. Vertical profile soundings comparing WRF to upper-air data at KPIT on December 20th, 2013 at 00 UTC.

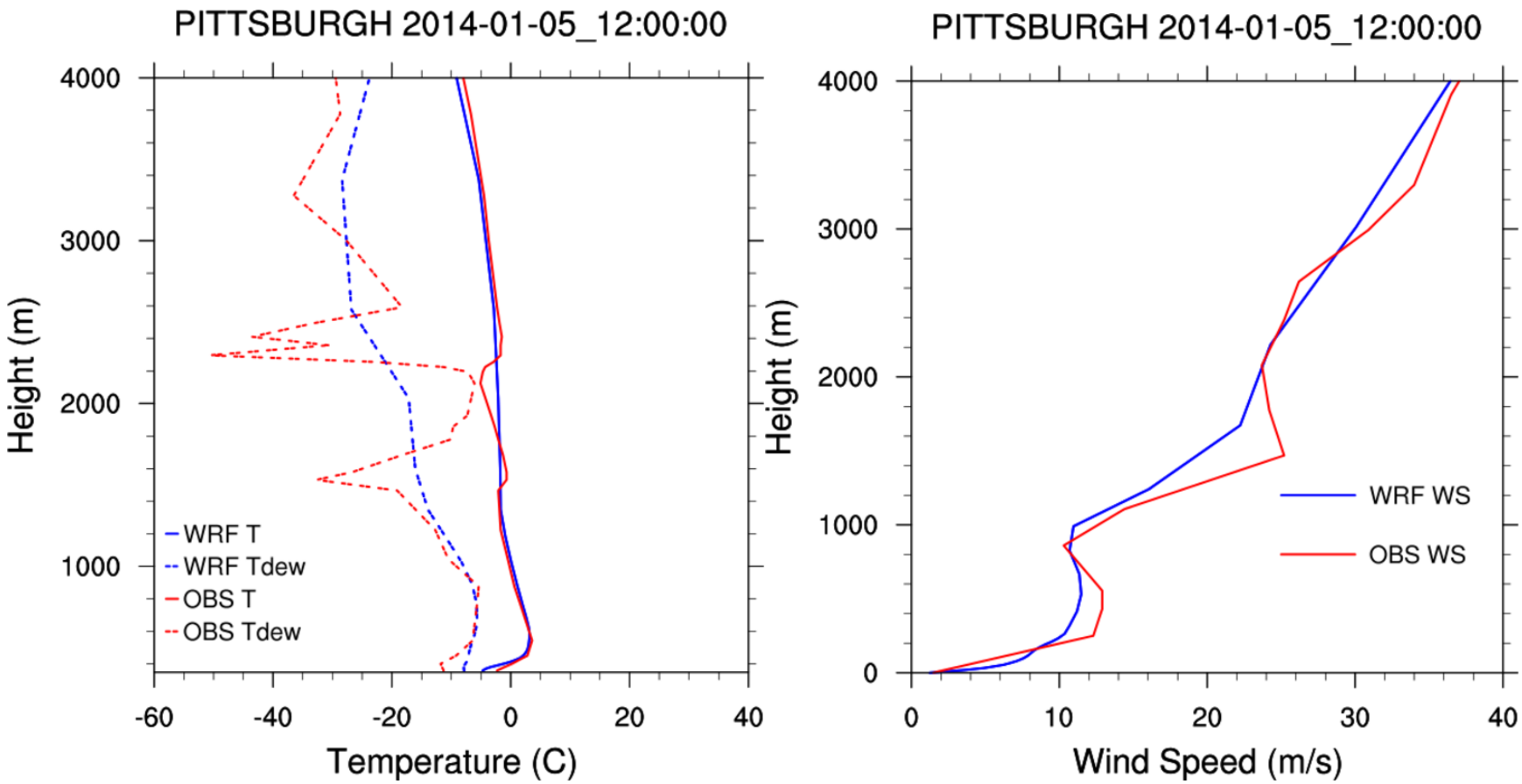

Figure 13. Vertical profile soundings comparing WRF to upper-air data at KPIT on January 5th, 2014 at 12 UTC.

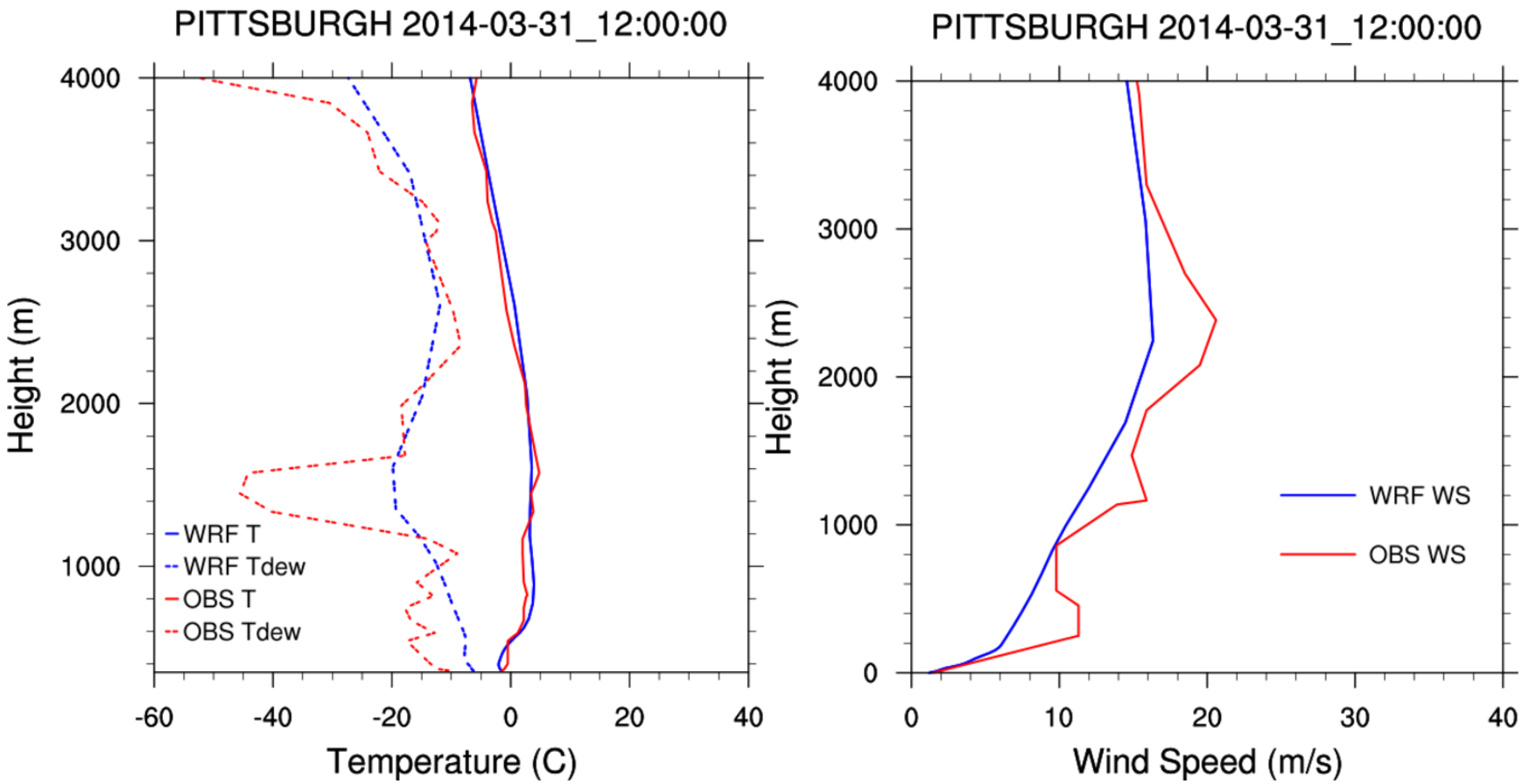

Figure 14. Vertical profile soundings comparing WRF to upper-air data at KPIT on March 31st, 2014 at 12 UTC.

3.2.2 SODAR Wind Speed Soundings

The SODAR instrument measured a profile of wind speed and direction every ten minutes, though many of these retrievals were missing in the dataset. There was a roughly 70 percent recovery of profiles measured in the 30 m to 150 m range, with a maximum altitude of up to 250 m. All profiles were averaged by hour (i.e. six profiles, if there was no missing data) and plotted with the profile from WRF.

Vertical profile plots showing WRF modeled data and data from the SODAR at the US Steel Clairton site were created in order to evaluate the performance of the vertical atmospheric structure in the river valley. Figure 15 through Figure 18 plot the WRF data vs the SODAR data. The top panel of each plot shows the wind speed, the middle panel shows the wind direction, and the lower panel shows the potential temperature. The SODAR at US Steel Clairton measures only wind speed and direction, so there is no comparison possible for the vertical profile of potential temperature. The lower panel is retained to indicate the model's atmospheric stability.

The standard deviation of the (up to) six sub-hourly speed values for each level was calculated, and is indicated by the horizontal gray bars in the top panels. Although not a true Student's T-test, if the WRF profile does not intersect a gray bar (i.e. is more than one standard deviation from the mean SODAR speed) then it may be considered statistically different from the SODAR observation.

Some of the profiles of wind direction appear to change radically with height due to plotting. The wind direction is simply crossing the 0 to 360 boundary. Ramboll Environ attempted to find a single 360 range of wind directions to plot, but some profiles still cross and appear to shift radically.

In Figure 15, WRF matches both the wind speed and wind direction well in the first 50 m above the surface in both the left and the right panel. On the left panel, WRF does very well at reflecting the wind shear conditions from the surface to 50m, but begins to over-predict wind speed through the next 150 m. Above 50 m the SODAR wind direction backs with height, while the model maintains a constant direction.

On both the left and right panels in Figure 16, WRF again matches wind speed and direction well in the first 50 m above the surface. However, the model tends to under-predict wind speeds at higher elevations. A similar case exists in Figure 17, when both SODAR profiles match WRF well in the lower levels but WRF then under-predicts wind speed in the upper levels.

In Figure 18, WRF shows an elevated inversion in the left panel and an over-prediction of winds above the valley height. In the right panel, both the model and observed data match well with wind speed and wind direction. At around 80 m above the surface the SODAR wind direction is veering with height, but WRF maintains a constant wind direction with height. In general, both the SODAR and modeled plots all show weak winds near the surface and the SODAR tends to show more turning with height compared to WRF.

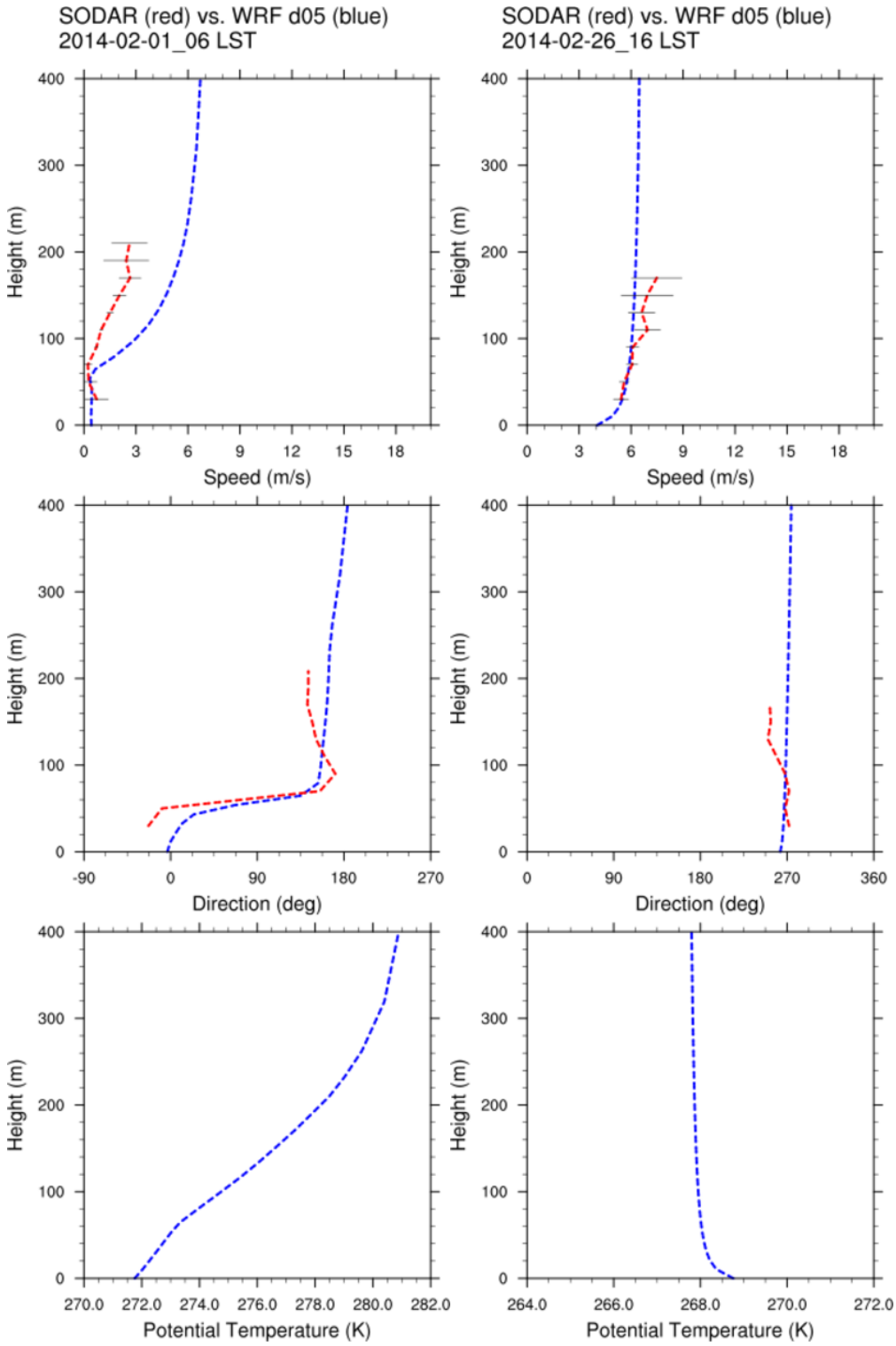

Figure 15. Vertical profiles of WRF data (blue lines) and SODAR data (red lines), on February 1st at 06 LST (left panel) and February 26th at 16 LST (right panel)

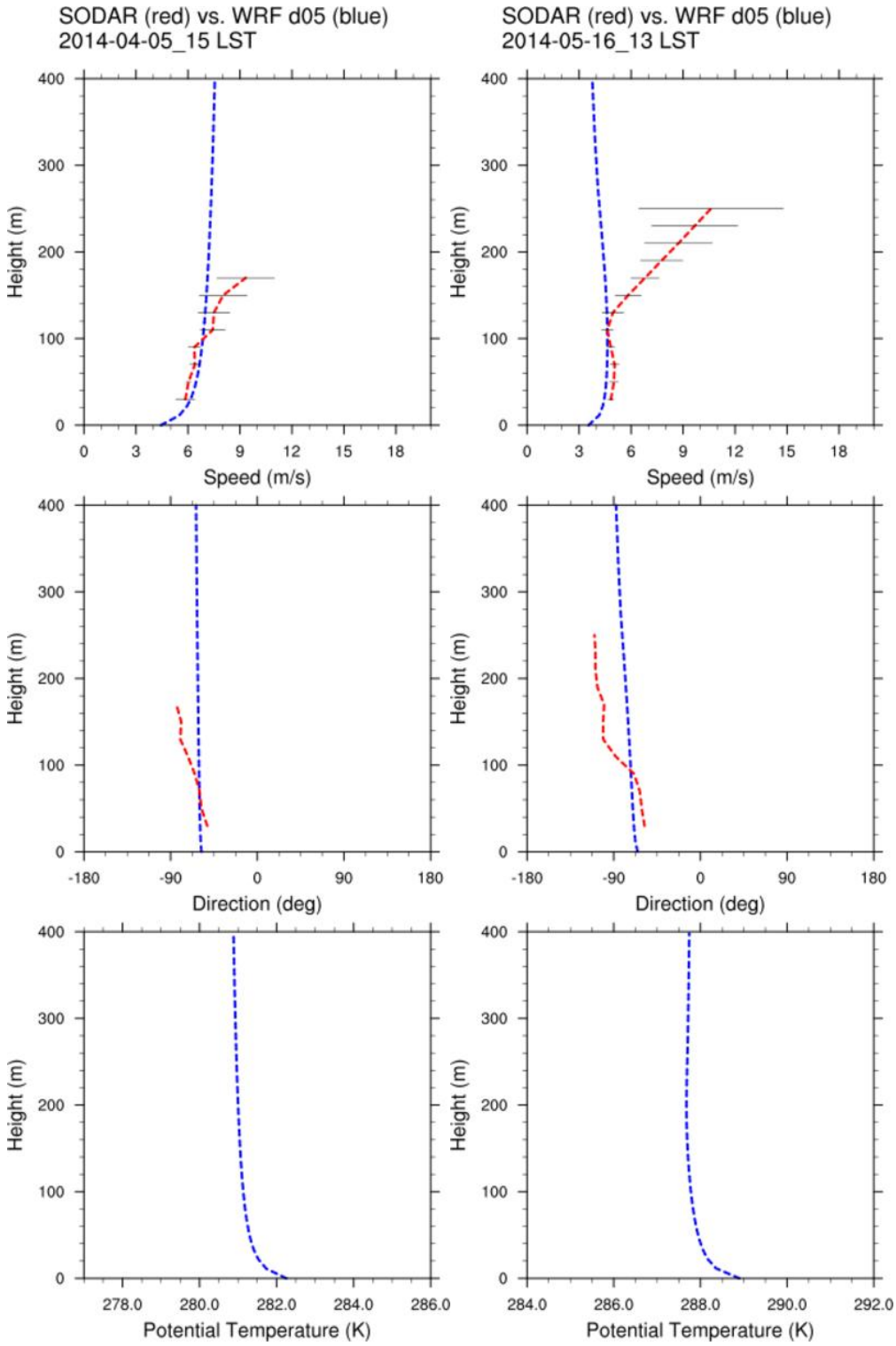

Figure 16. Vertical profiles of WRF data (blue lines) and SODAR data (red lines), on April 5th at 15 LST (left panel) and May 16th at 13 LST (right panel)

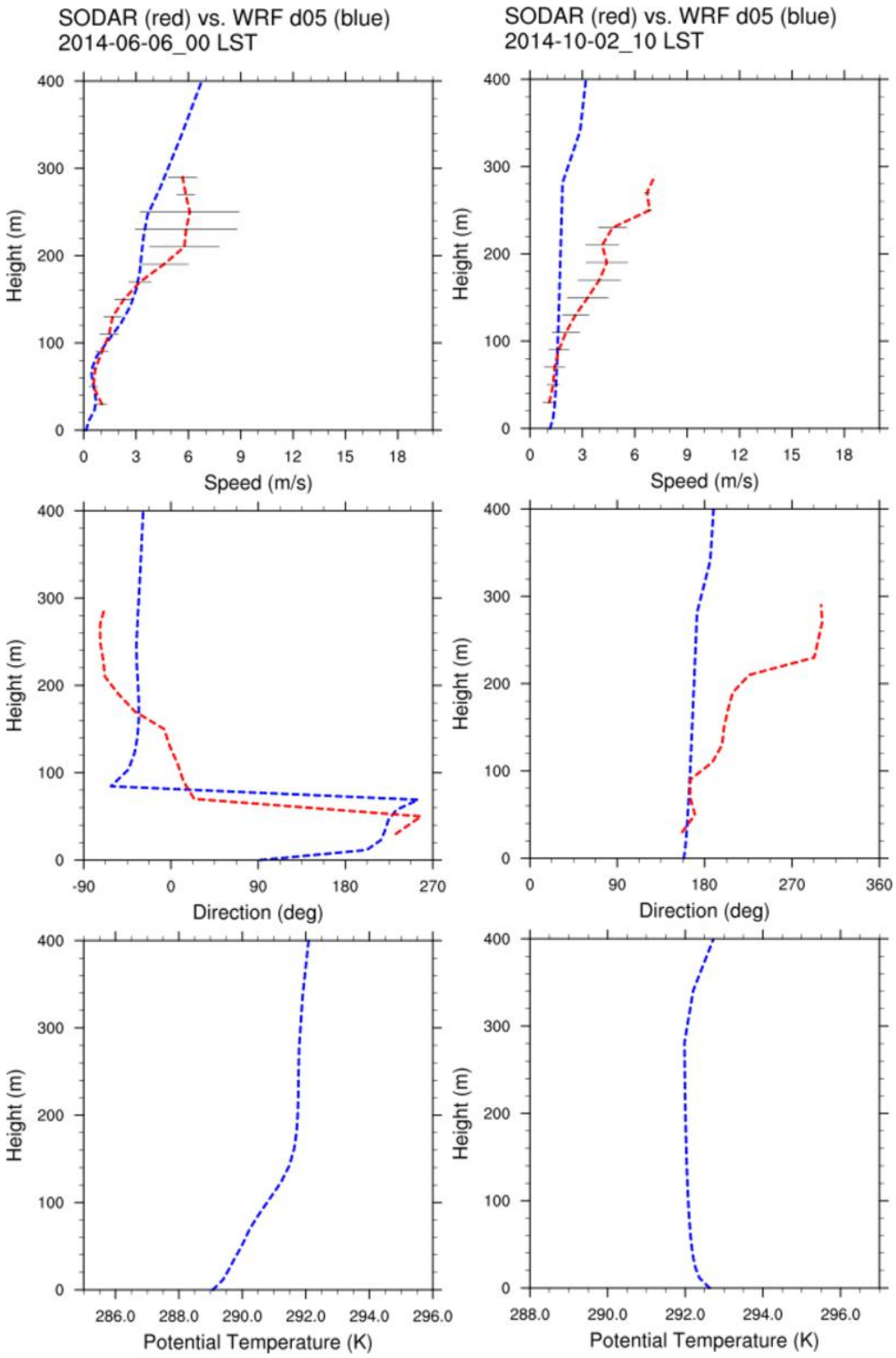

Figure 17. Vertical profiles of WRF data (blue lines) and SODAR data (red lines), on June 6th at 00 LST (left panel) and October 2nd at 10 LST (right panel)

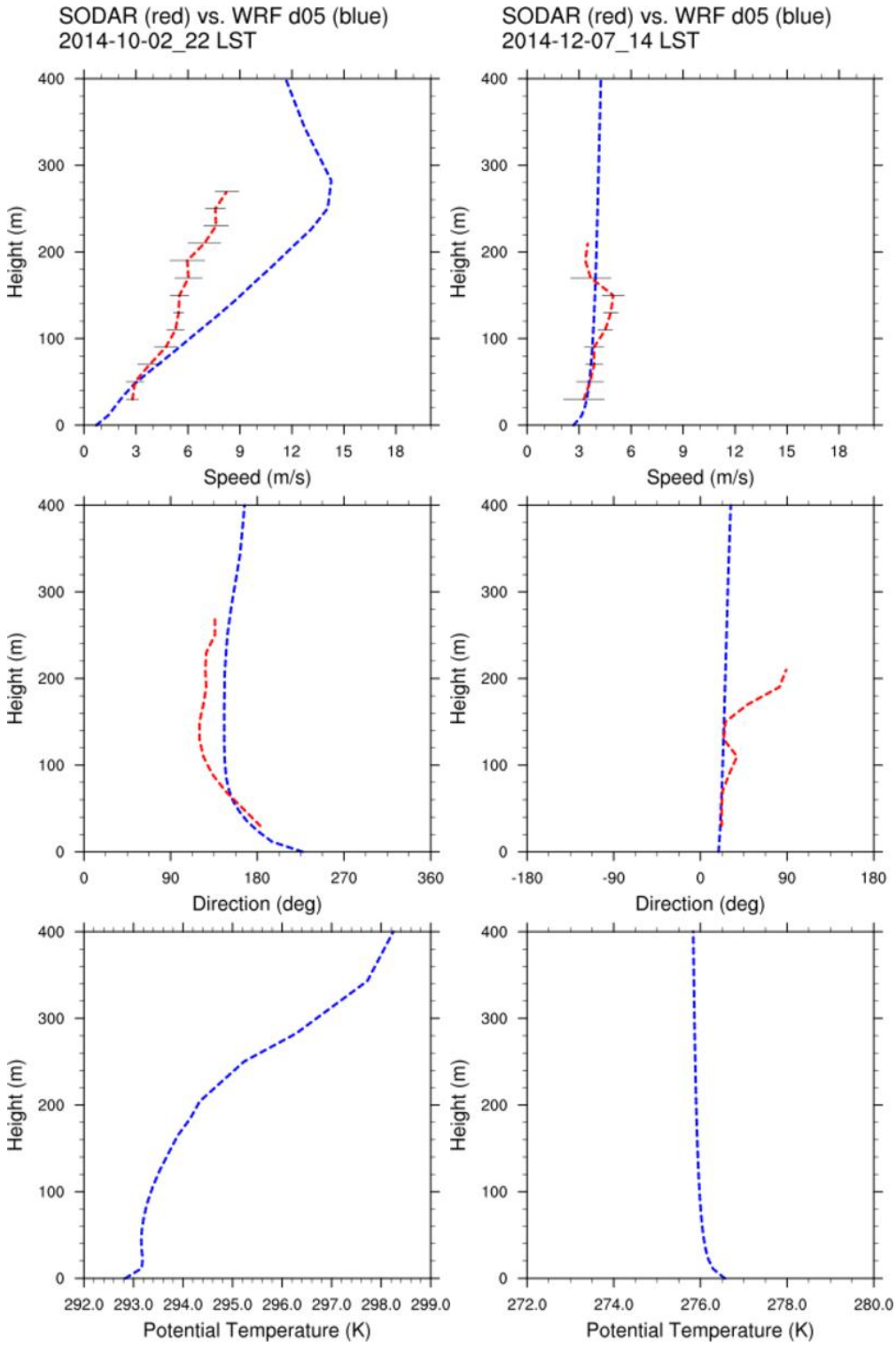

Figure 18. Vertical profiles of WRF data (blue lines) and SODAR data (red lines), on October 2nd at 22 LST (left panel) and December 7th at 14 LST (right panel)

3.3 Qualitative Evaluation Using PRISM Precipitation

This section presents a qualitative comparison of WRF-simulation estimated monthly precipitation with monthly PRISM (Daly, 2008) analysis fields based on observations. Three-year average (2012-2014) monthly precipitation plots were constructed from ACHD WRF output and compared to PRISM three-year average monthly plots for the months of January through December in the 12 km domain d02.

The Parameter-elevation Regressions on Independent Slopes Model (PRISM) datasets are spatial maps of climate elements across the United States built by the Spatial Climate Analysis Service at Oregon State University (SCAS-OSU). Gridded maps of mean monthly and annual precipitation and temperature were built using meteorological station measurements and a set of statistical weighting procedures and corrections based on distance, elevation, topographic orientations and influences, and land-surface type (SCAS-OSU, 2001). The process and results have been extensively peer-reviewed and generally accepted by the climatological community as state-of-the-art representations.

When comparing the WRF and PRISM precipitation data, note should be taken that the PRISM analysis fields only cover the continental United States and do not extend into Canada, over the Great Lakes or any oceanic portions of the domain. The WRF fields, on the other hand, cover the entire domain. Additionally, as the precipitation monitoring sites tend to be located at lower elevations (e.g., airports), the PRISM observation fields may not fully capture the enhanced precipitation at high elevations due to orographic effects that could be present in the WRF simulations. However, unlike early analysis fields based on observations, PRISM does include an elevation effect as one of the parameters in its regression model.

Figure 19 displays one example month of PRISM precipitation data on the top panel, compared to one month of masked WRF precipitation data on the bottom panel for August 2012 in the 36 km domain. WRF over-forecasts the amount of precipitation in the southeast US, but matches the overall average rainfall amount (2.48 inches) with the PRISM precipitation over the entire CONUS.

Figure 20 displays one example month of PRISM precipitation data on the top panel, compared to one month of WRF precipitation data on the bottom panel for February 2012 in the 12 km domain. In this case WRF predicts the extent of the rainfall well over the Appalachian Mountain areas of West Virginia and into south western Pennsylvania.

Figure 35 through Figure 38 in Appendix B display the three-year WRF precipitation datasets and the PRISM data for January through April. WRF represents the spatial extent of the precipitation well in each of the months, reflecting the enhanced rainfall rates along the Appalachian Mountains from mechanical uplift and along the eastern shores of Lake Erie from convective-type uplift conditions. However, WRF tends to under-predict compared to PRISM in the amount of total precipitation across the domain in the winter and early spring months.

Figure 39 through Figure 43 in Appendix B show WRF and PRISM average precipitation comparisons for May through September. WRF again represents the spatial extent rainfall maximums well through portions of West Virginia and western Pennsylvania. In these monthly average cases of spring through summer, WRF overestimates the amount of total precipitation across the domain. This is likely due to the excess moisture in the WRF spring and summer month simulations as reflected in the increased positive bias of humidity in the corresponding months in the METSTAT performance plot results.

WRF and PRISM precipitation comparisons for October through December are shown in Figure 44 through Figure 46 in Appendix B. In October, WRF represents both the spatial extent and amount of rainfall through West Virginia and into southwestern Pennsylvania very well. However, WRF under-predicts total rainfall in the areas of increased precipitation in southeastern Pennsylvania and northern Maryland and along the eastern and southern shores of Lake Erie. In November and December, WRF again under-predicts PRISM monthly averages in total rainfall amounts across much of the domain area.

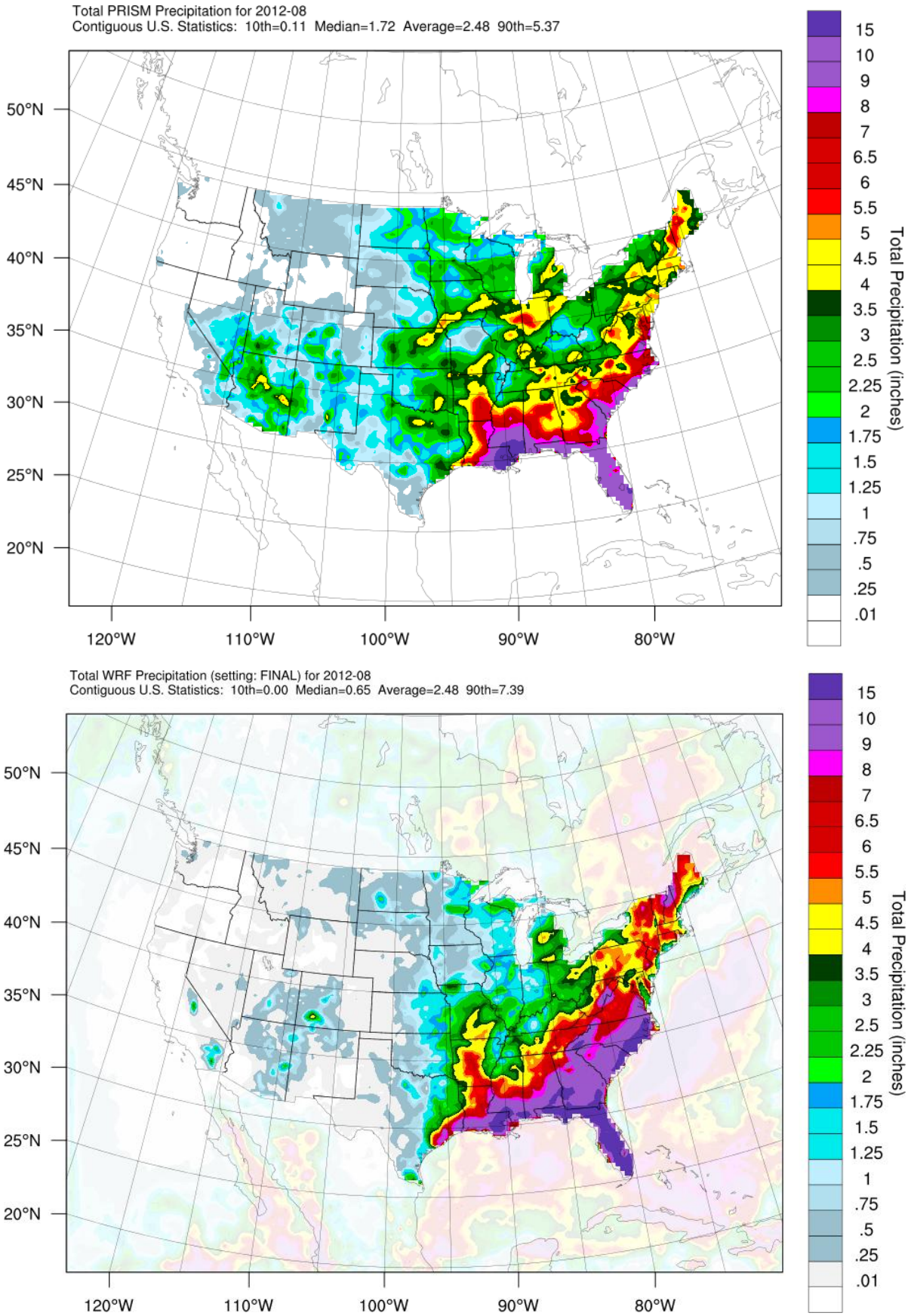

Figure 19. PRISM precipitation (top) and WRF precipitation (bottom) for August 2012 in the 36 km domain

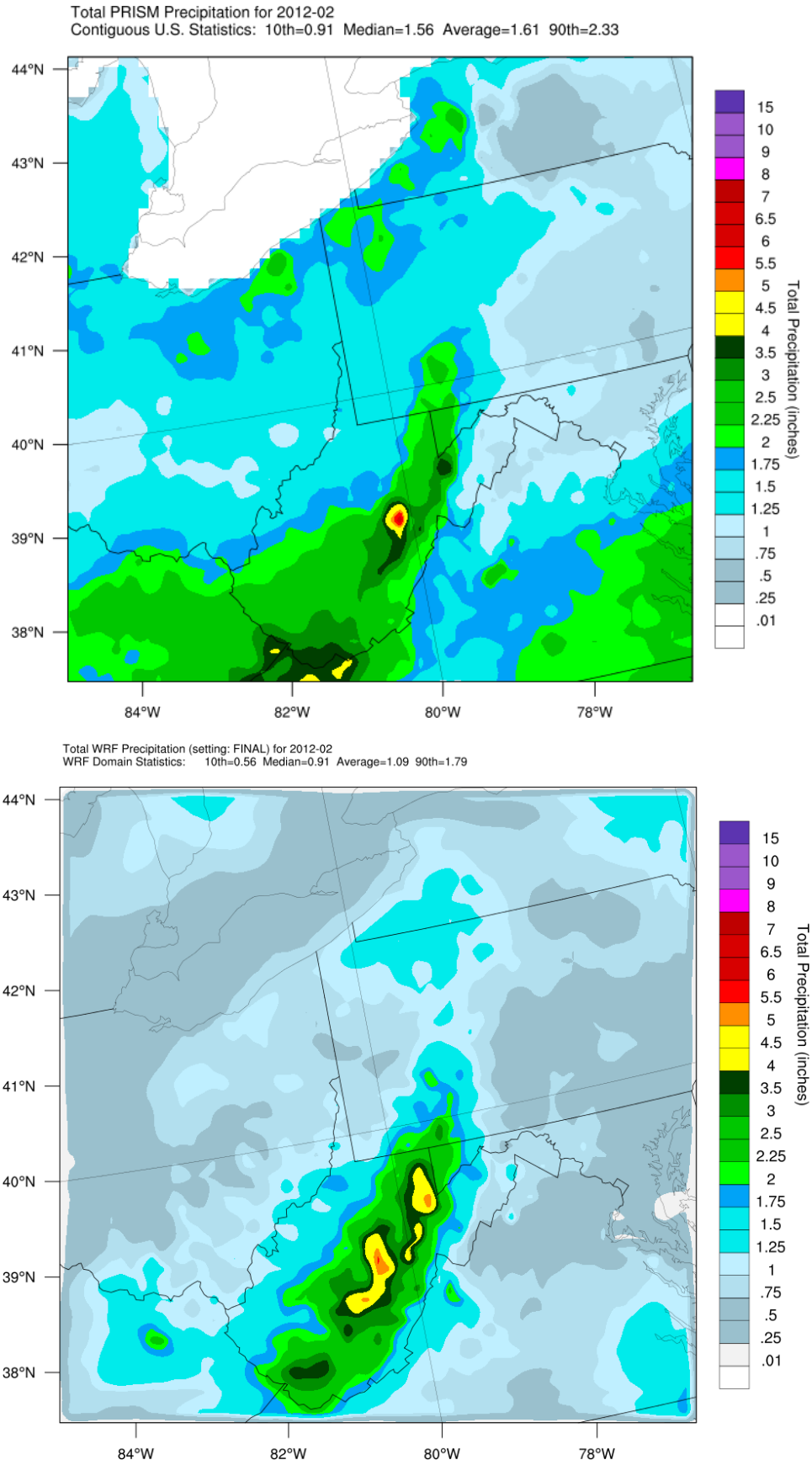

Figure 20. PRISM precipitation (top) and WRF precipitation (bottom) for February 2012 in the 12 km domain

4. SUMMARY AND CONCLUSIONS

The ACHD WRF meteorological model simulation for January 2012 through December 2014 reproduced the observed surface and upper-air meteorological variables well. The 1.333 km (d04) METSTAT performance for wind direction, wind speed, and temperature in the region show a strong agreement between the model and surface observations. The METSTAT performance for humidity does reflect an increased positive bias in the warmer months, leading to additional moisture in the model.

Upper air performance in the 1.333 km (d04) domain shows strong agreement between WRF and radiosonde data, especially in cases of surface based inversions. Vertical profile performance in the 0.444 km (d05) domain also shows strong agreement between WRF and the SODAR data, but only for the first 50 m above the surface.

The precipitation analysis for the 12 km (d02) domain indicates there is a slight understatement of precipitation in the fall and winter months, while higher humidity biases create excess moisture and results in an overstatement of precipitation in the summer months. Modeled precipitation accumulations in southwest Pennsylvania are more improved compared to other regions in the northeast.

Based on our experience, the ACHD WRF modeling's performance provides a sound basis for developing meteorological inputs for air quality dispersion modeling.

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Appendix A
ADDITIONAL METSTAT PLOTS

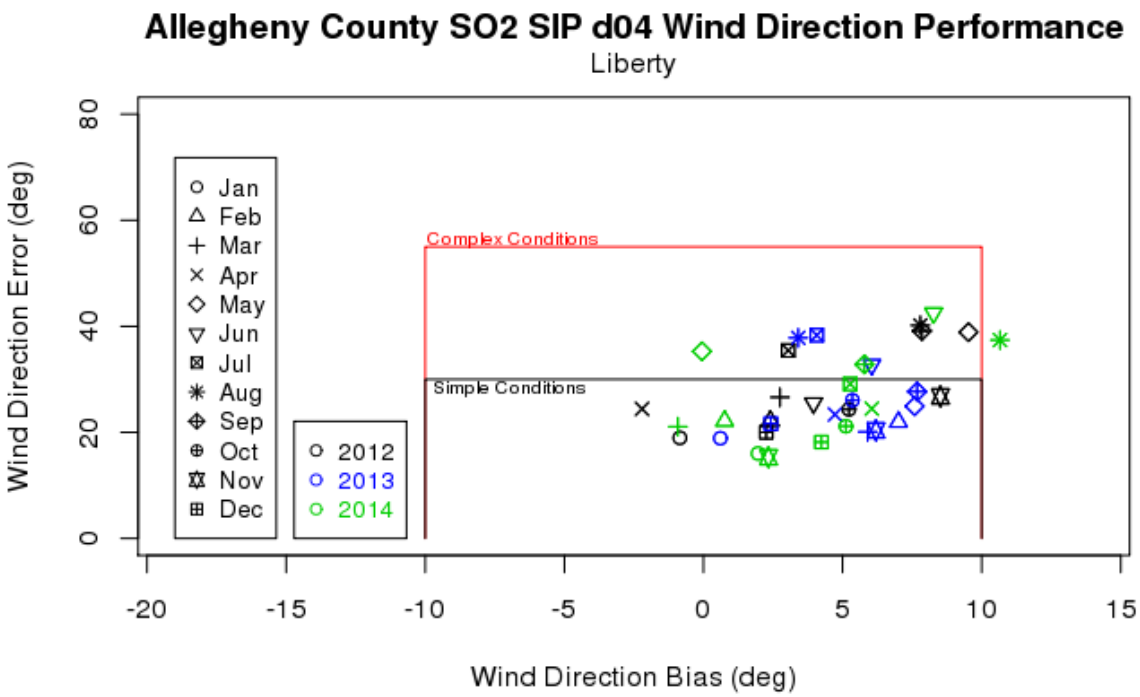

Figure 21. ACHD WRF Liberty Station METSTAT d04 Wind Direction Performance

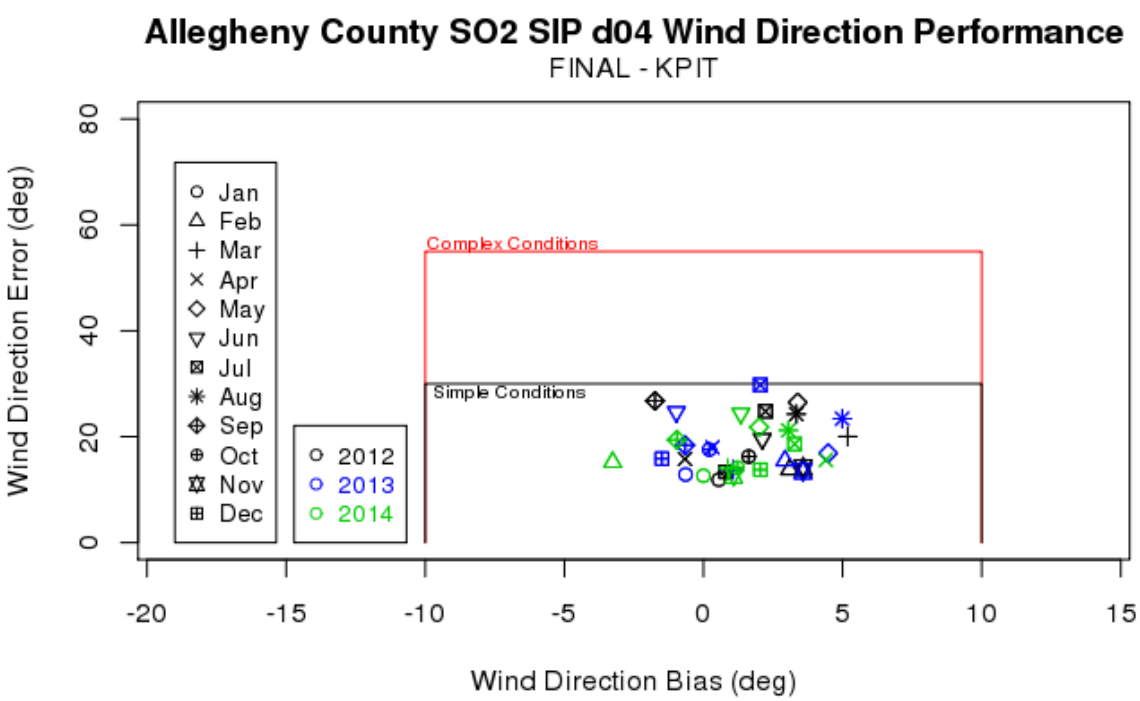

Figure 22. ACHD WRF Pittsburgh Airport METSTAT d04 Wind Direction Performance

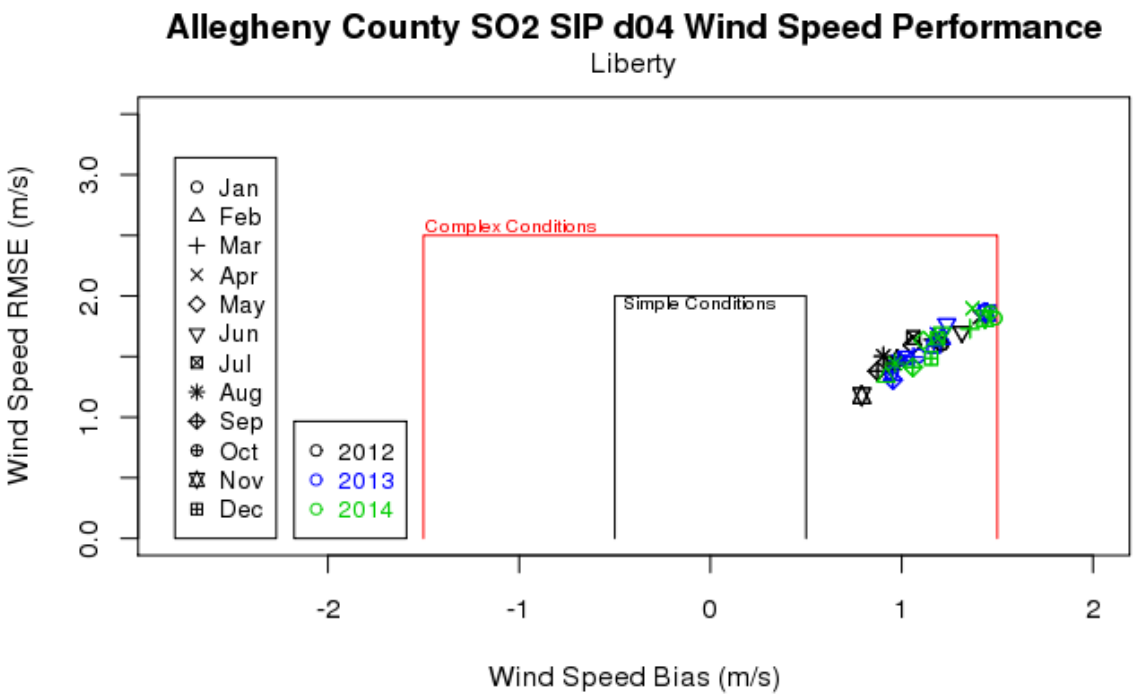

Figure 23. ACHD WRF Liberty Station METSTAT d04 Wind Speed Performance

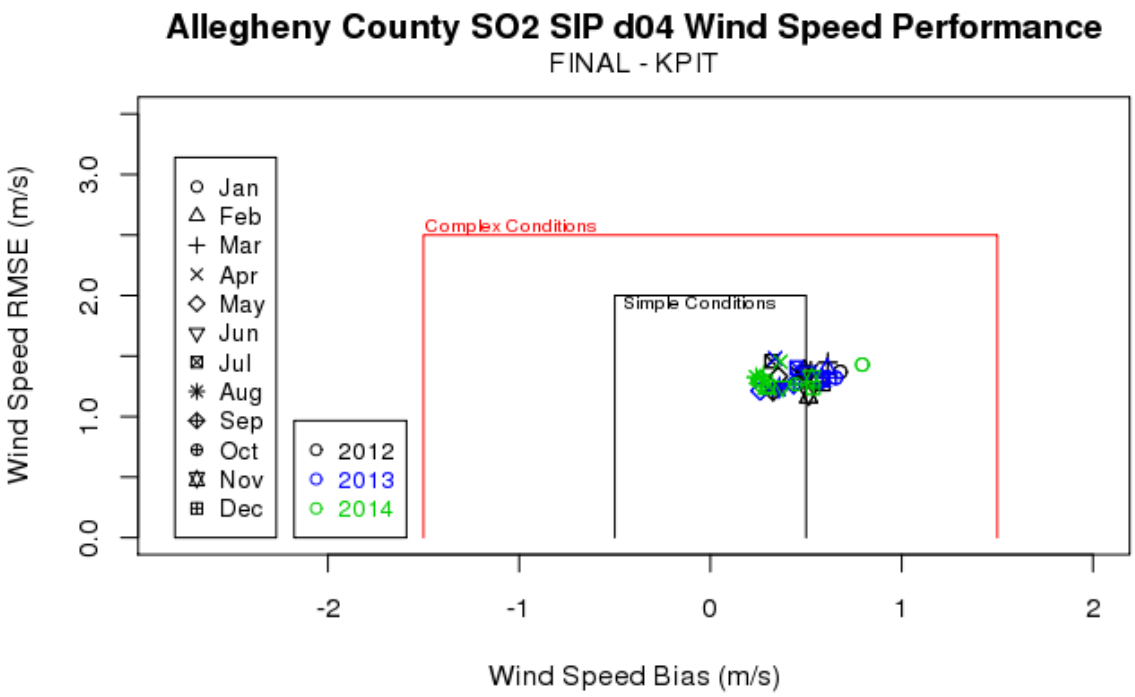

Figure 24. ACHD WRF Pittsburgh Airport METSTAT d04 Wind Speed Performance

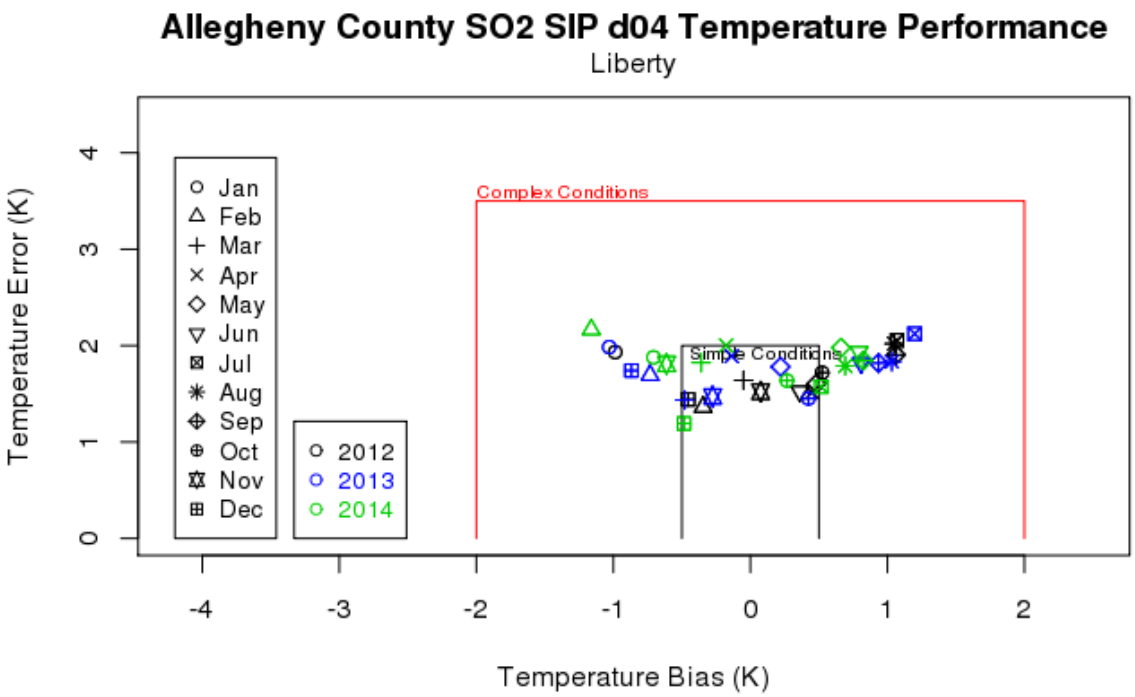

Figure 25. ACHD WRF Liberty Station METSTAT d04 Temperature Performance

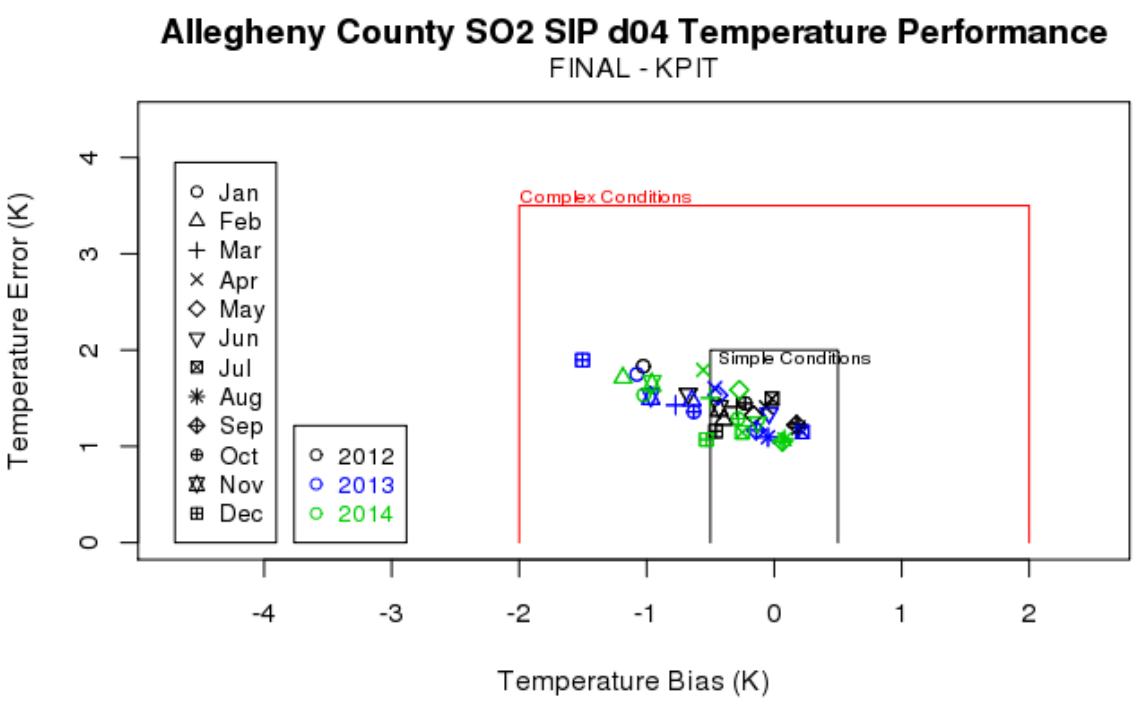

Figure 26. ACHD WRF Pittsburgh Airport METSTAT d04 Temperature Performance

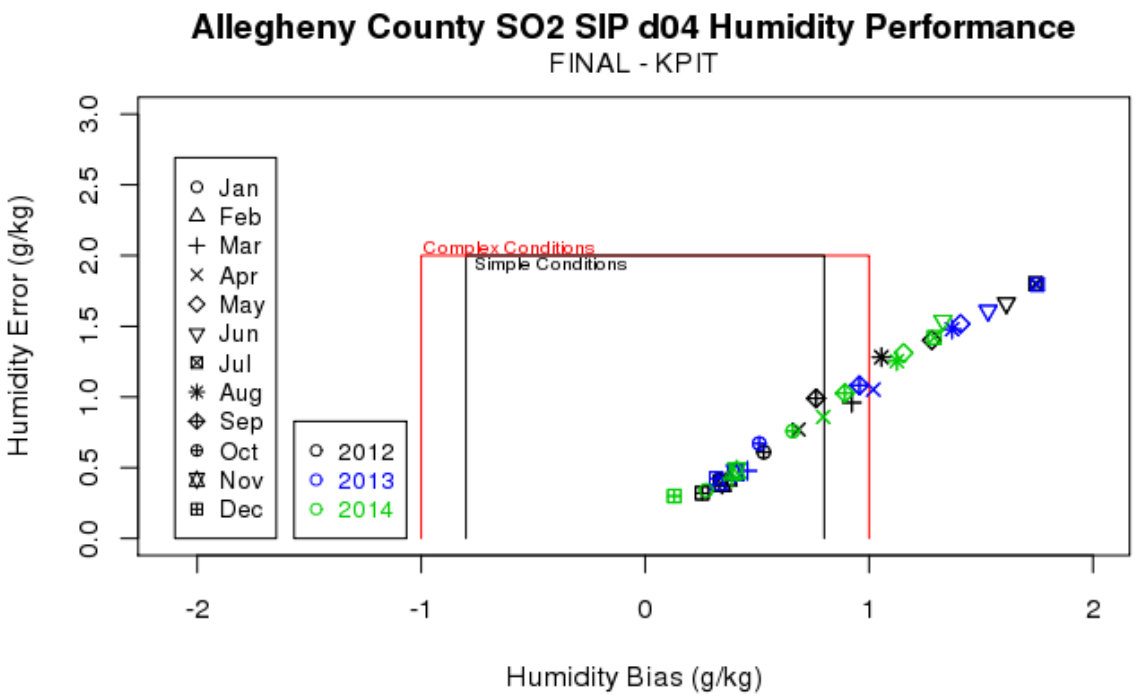

Figure 27. ACHD WRF Pittsburgh Airport METSTAT d04 Humidity Performance

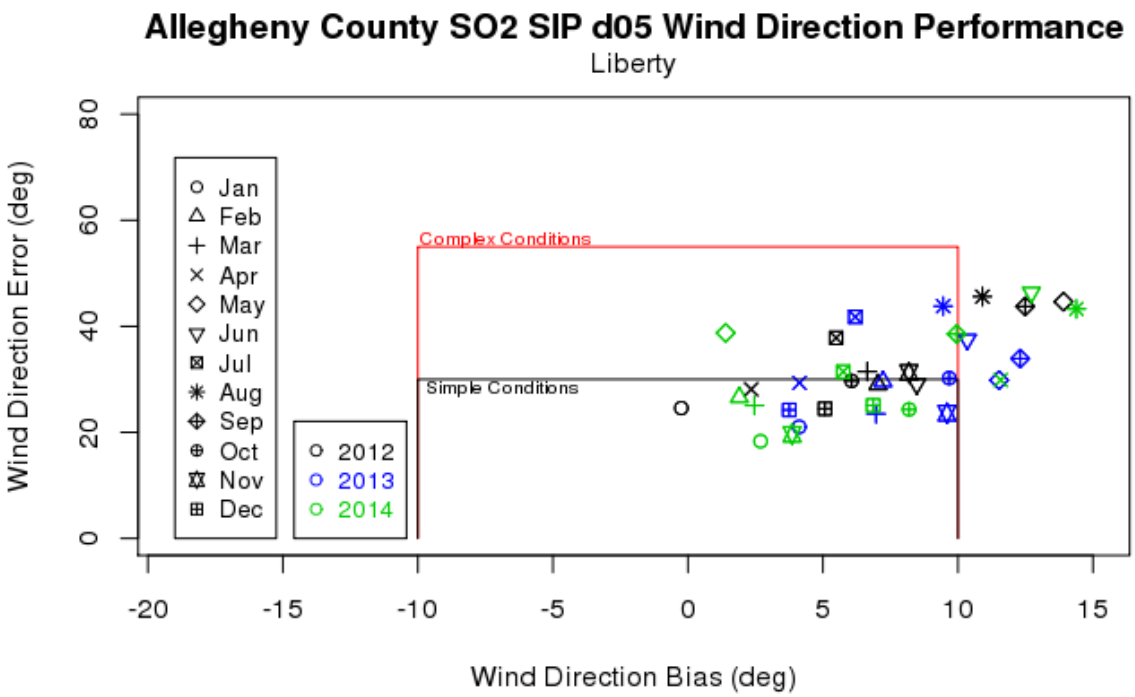

Figure 28. ACHD WRF Liberty Station METSTAT d05 Wind Direction Performance

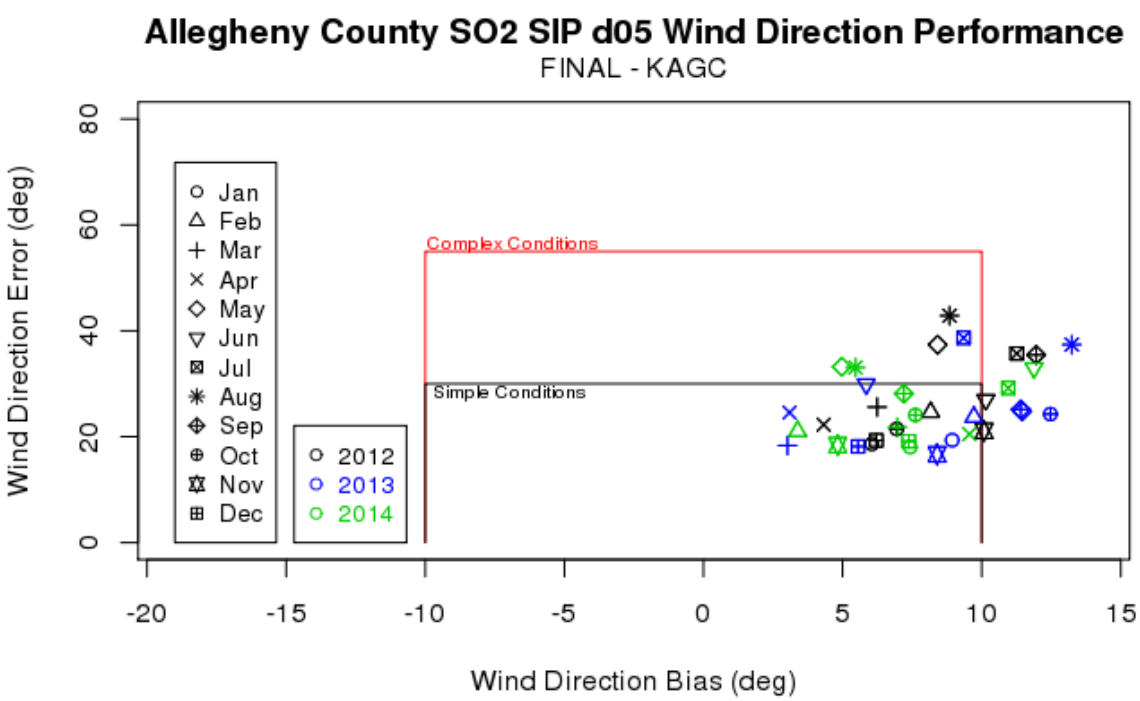

Figure 29. ACHD WRF Allegheny Airport METSTAT d05 Wind Direction Performance

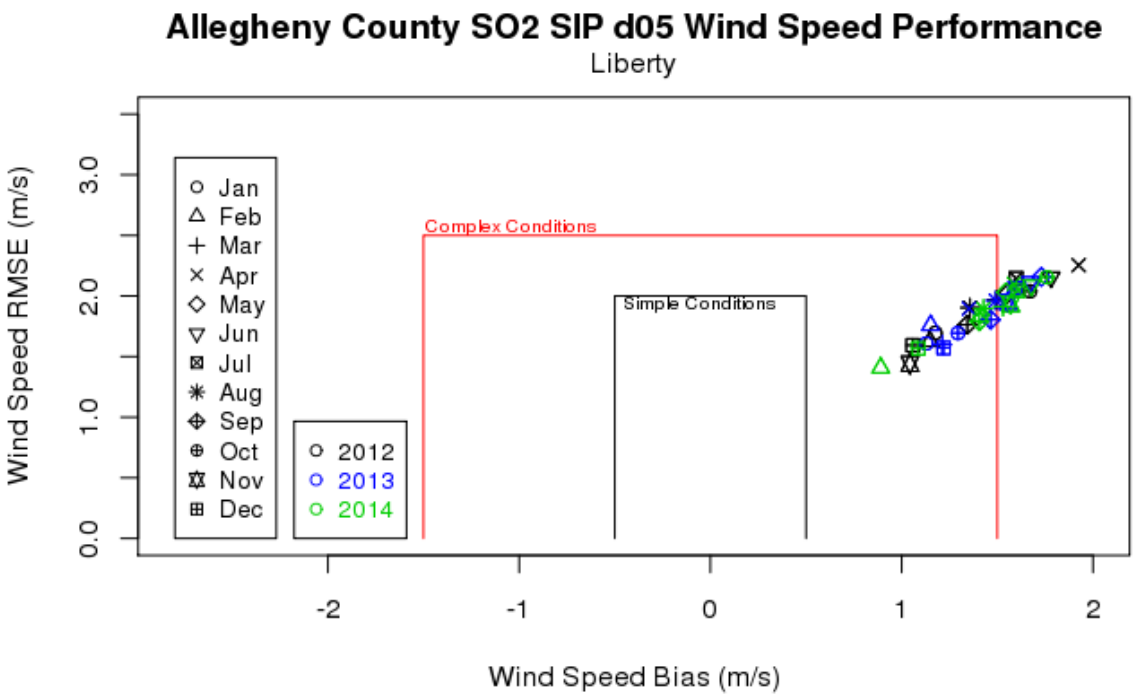

Figure 30. ACHD WRF Liberty Station METSTAT d05 Wind Speed Performance

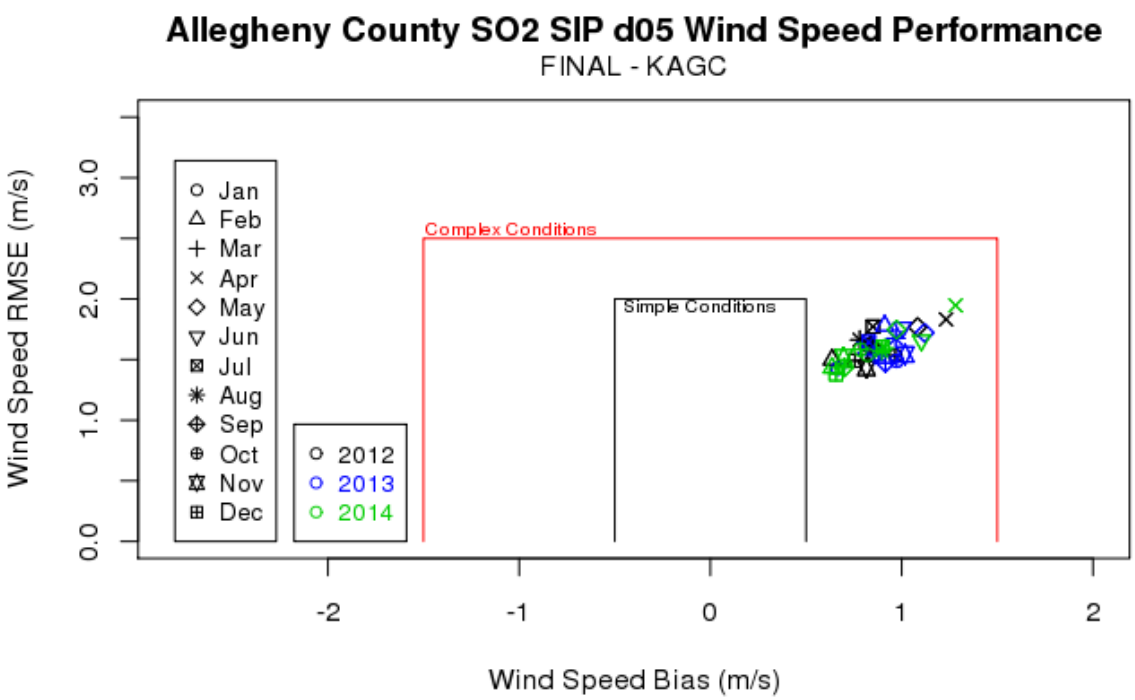

Figure 31. ACHD WRF Allegheny Airport METSTAT d05 Wind Speed Performance

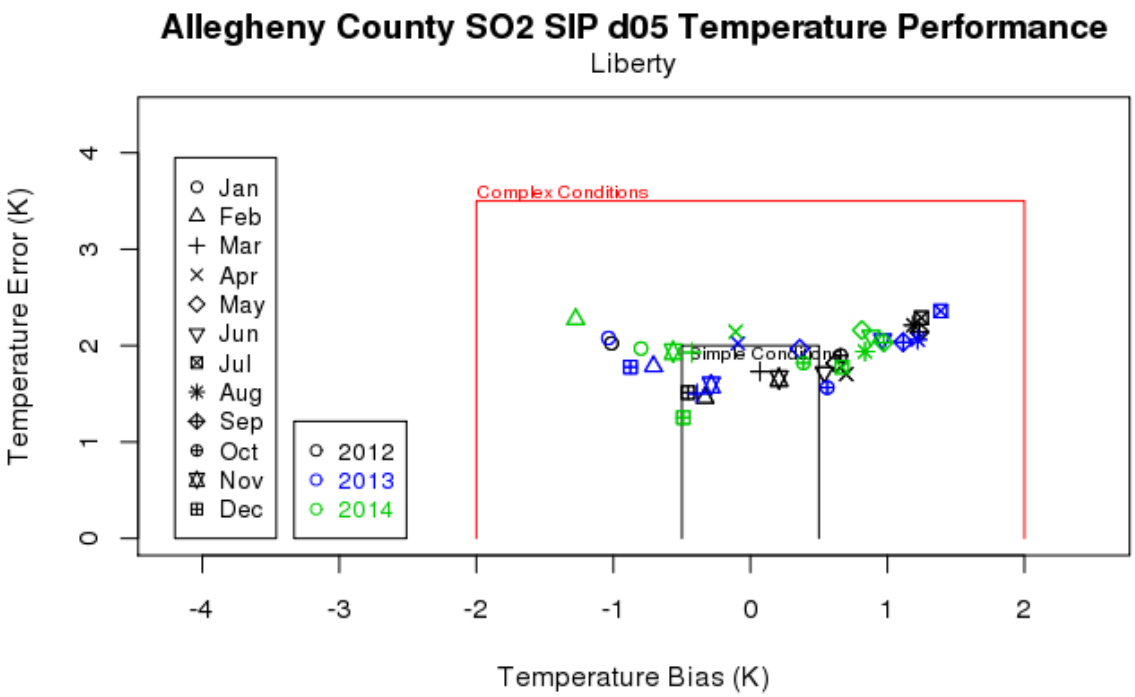

Figure 32. ACHD WRF Liberty Station METSTAT d05 Temperature Performance

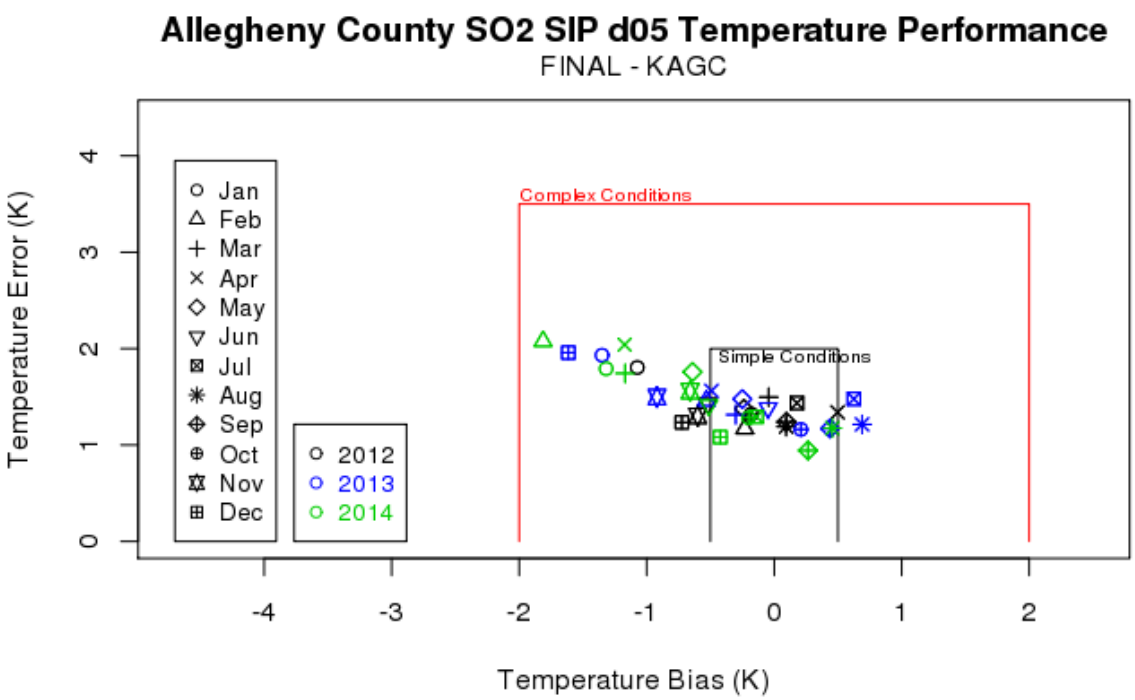

Figure 33. ACHD WRF Allegheny Airport METSTAT d05 Temperature Performance

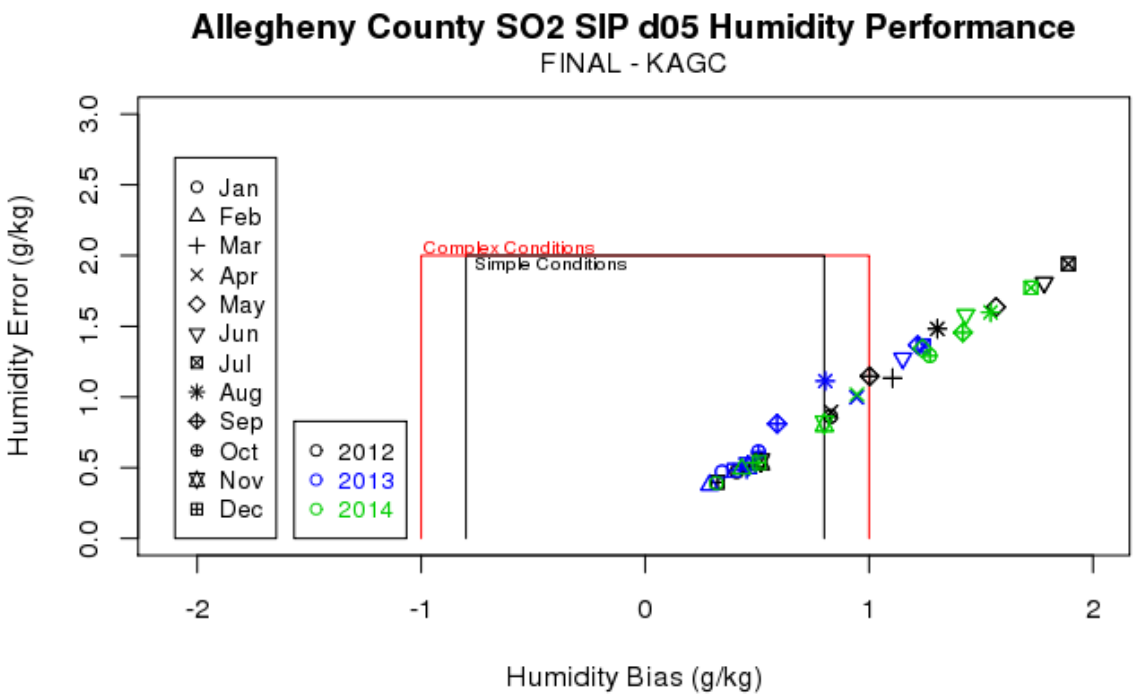

Figure 34. ACHD WRF Allegheny Airport METSTAT d05 Humidity Performance

Appendix B
PRECIPITATION PLOTS

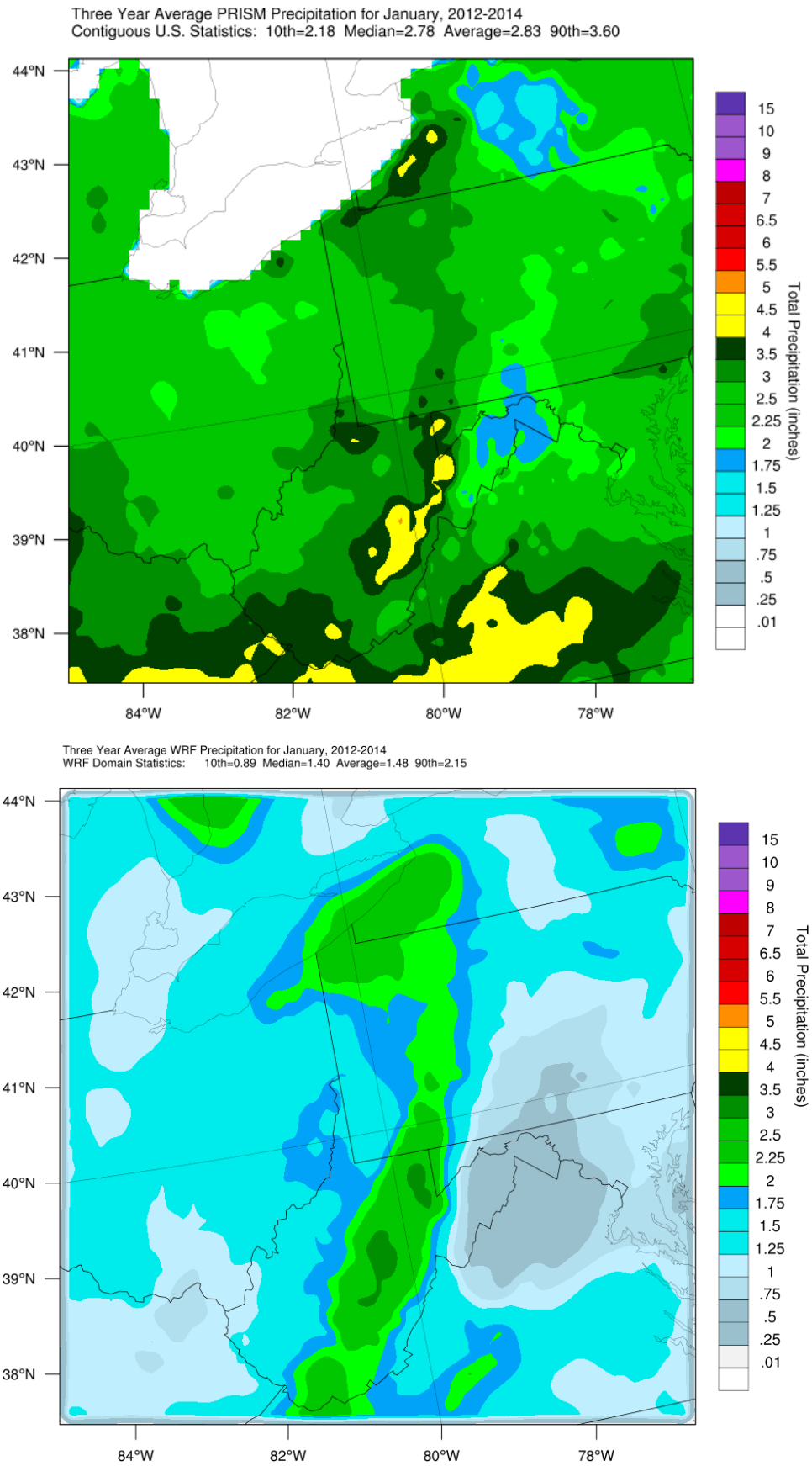

Figure 35. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for January in the 12 km domain

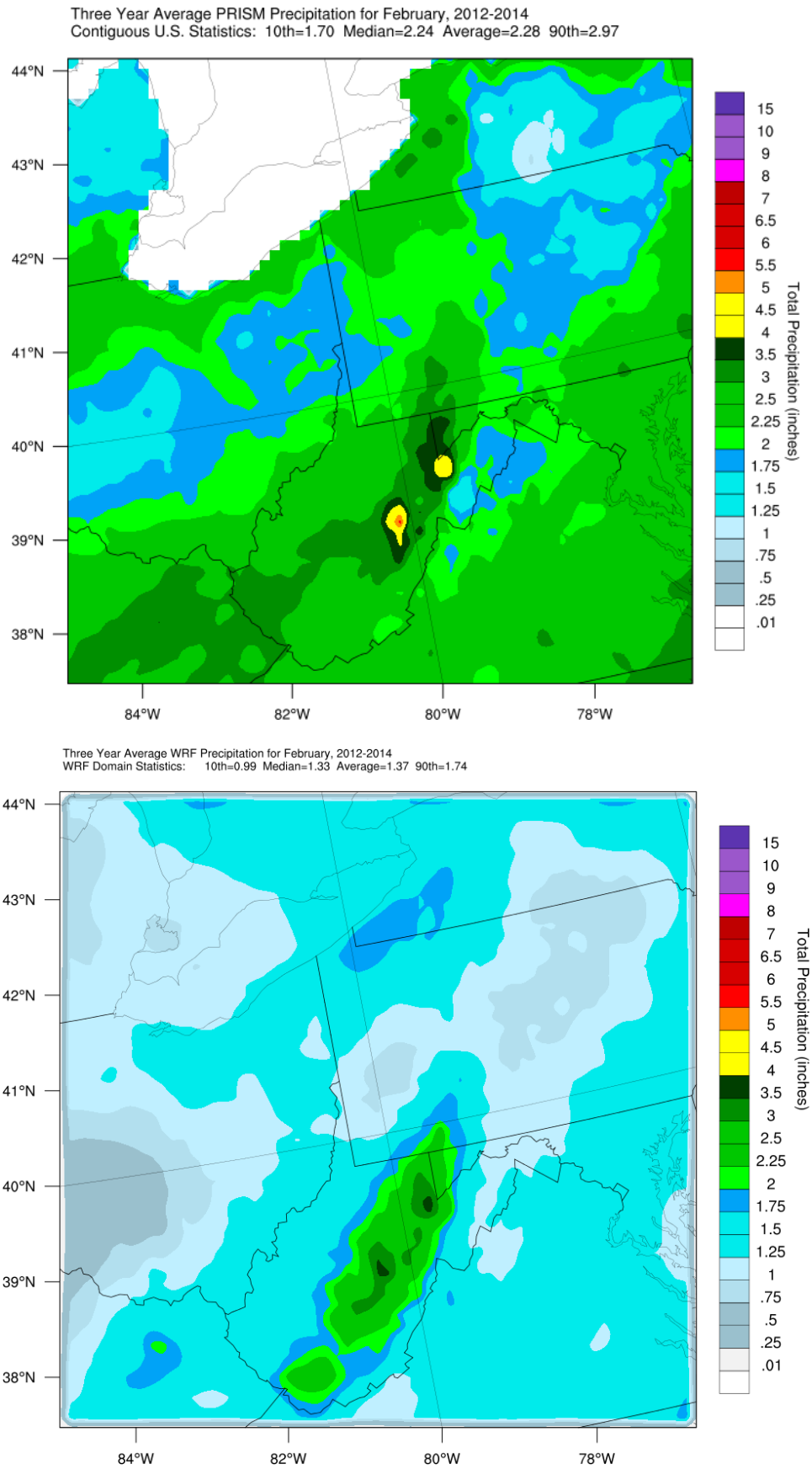

Figure 36. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for February in the 12 km domain

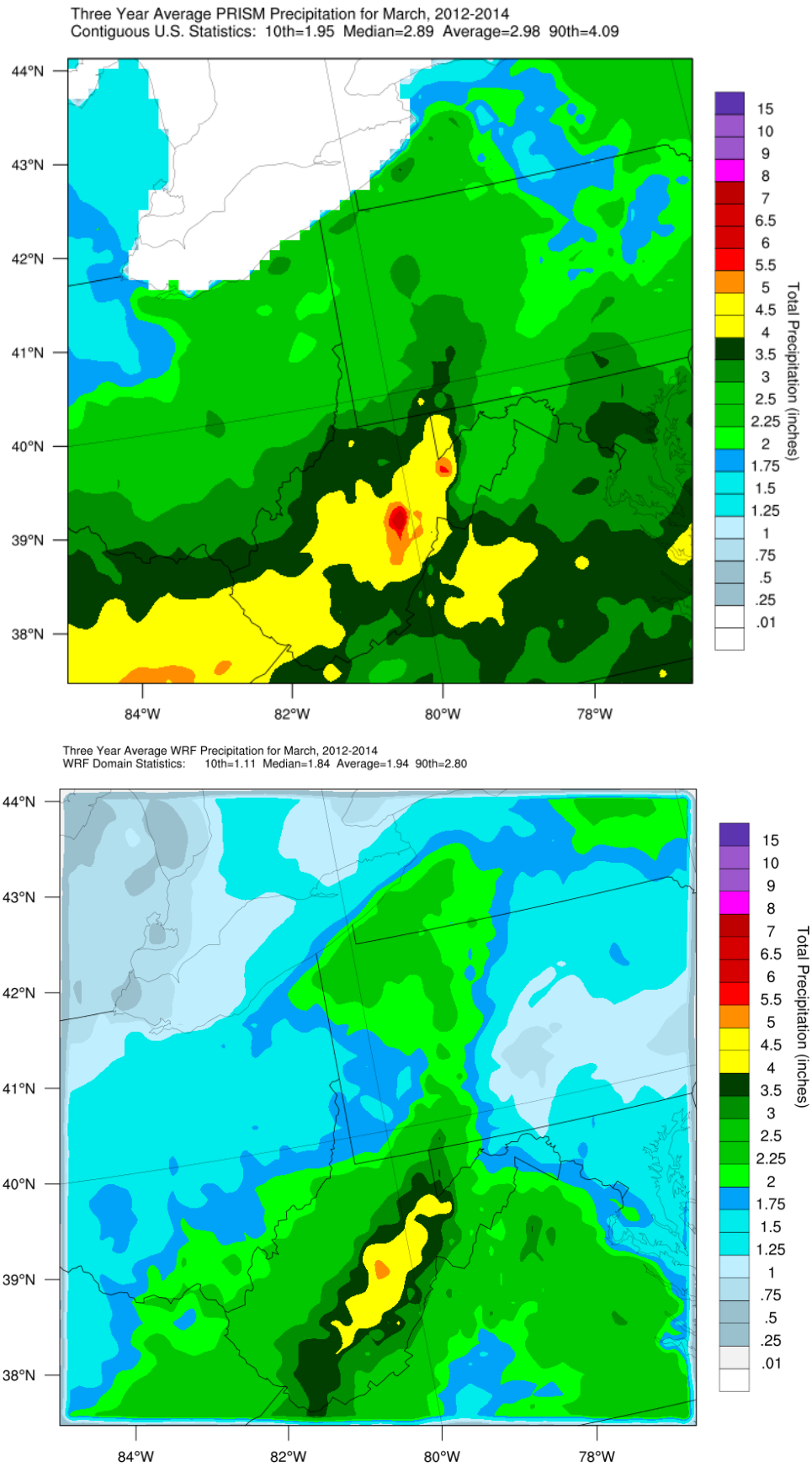

Figure 37. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for March in the 12 km domain

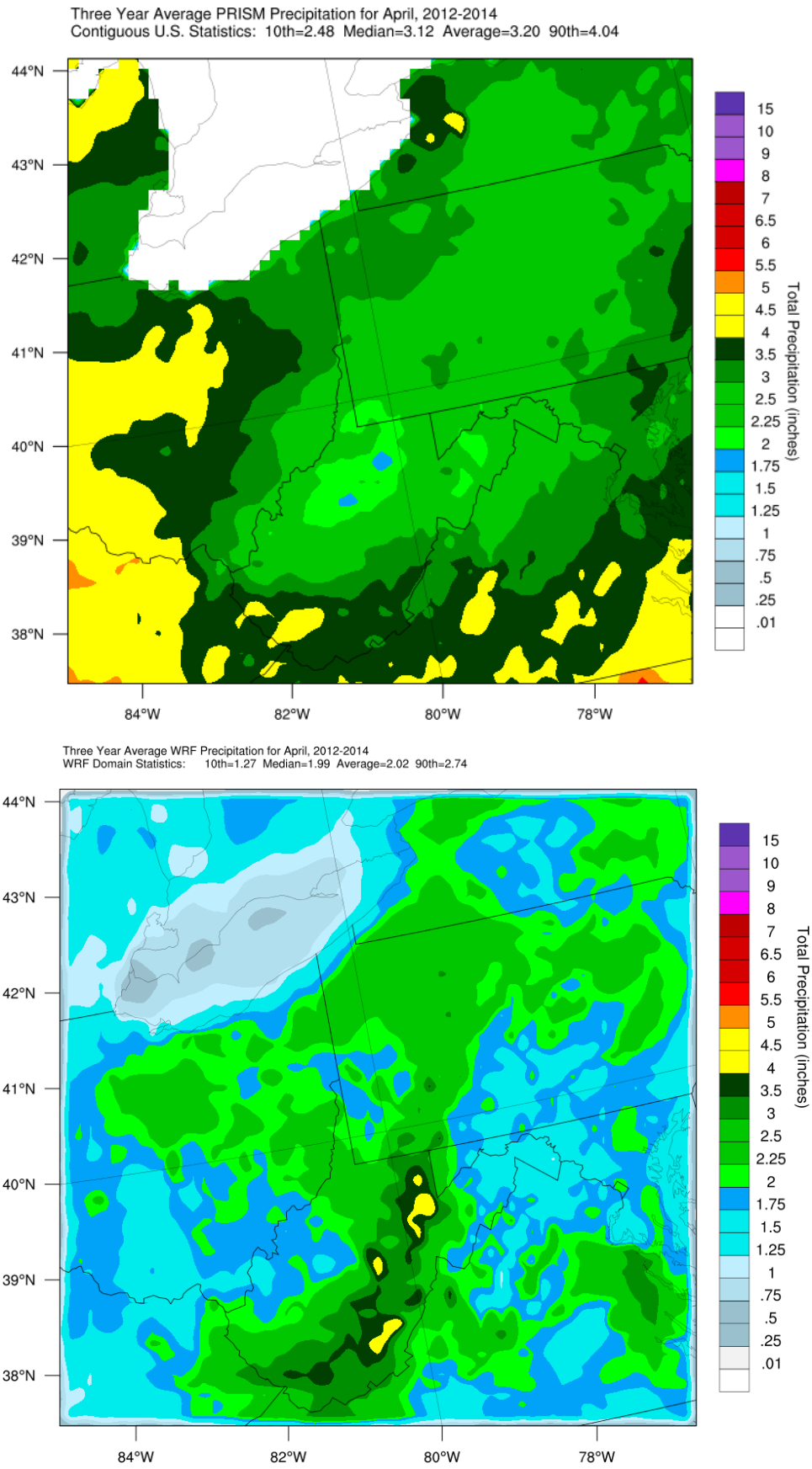

Figure 38. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for April in the 12 km domain

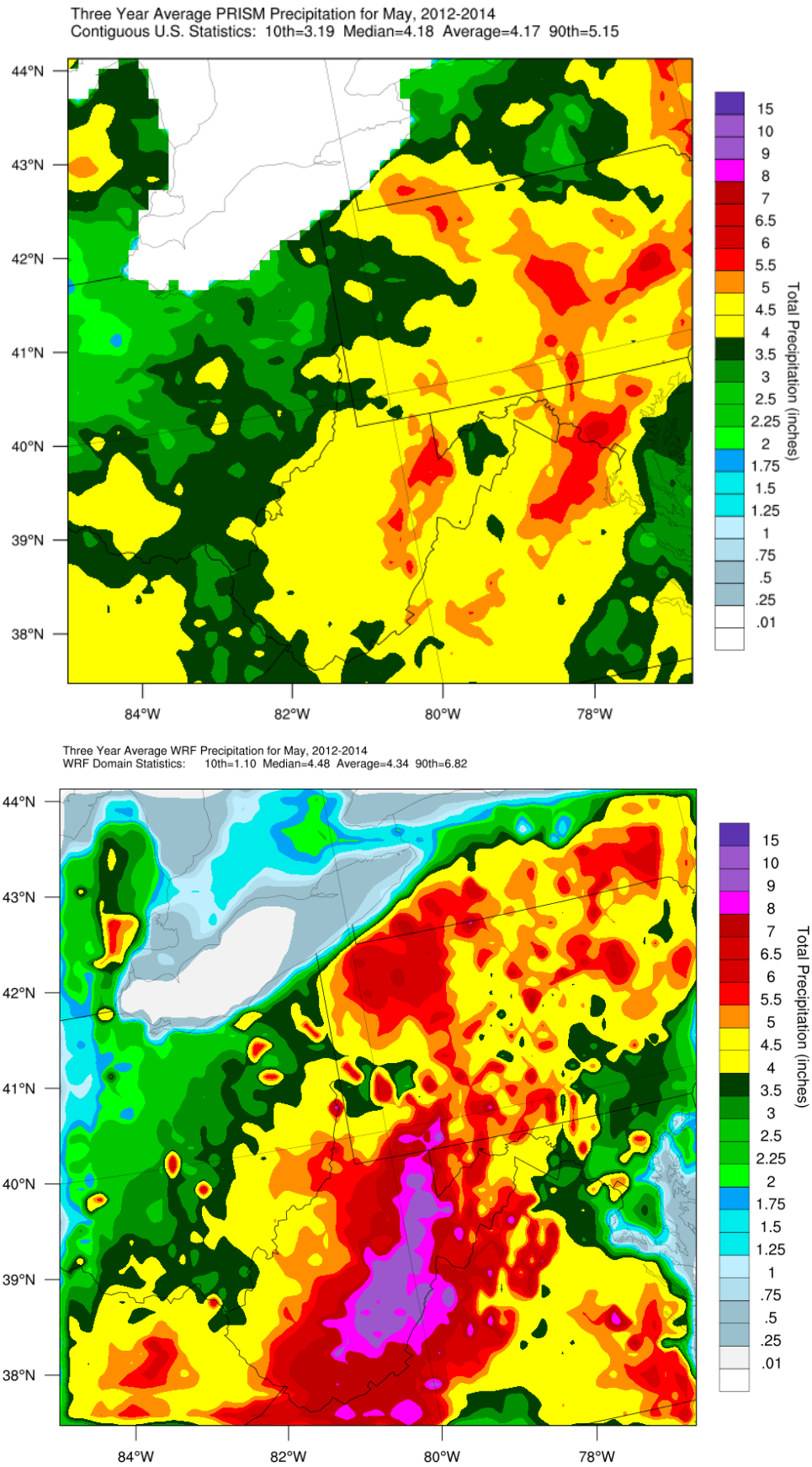

Figure 39. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for May in the 12 km domain

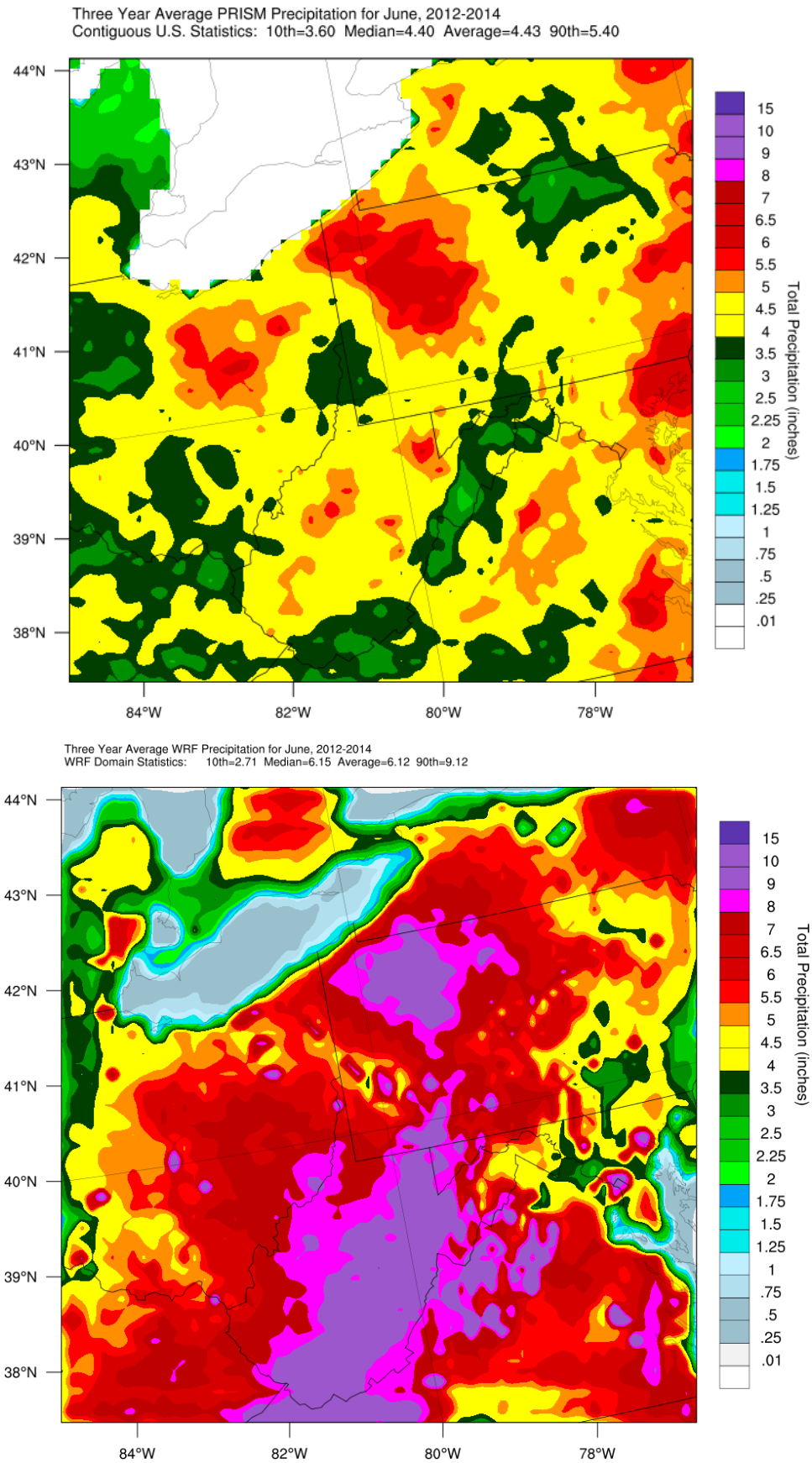

Figure 40. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for June in the 12 km domain

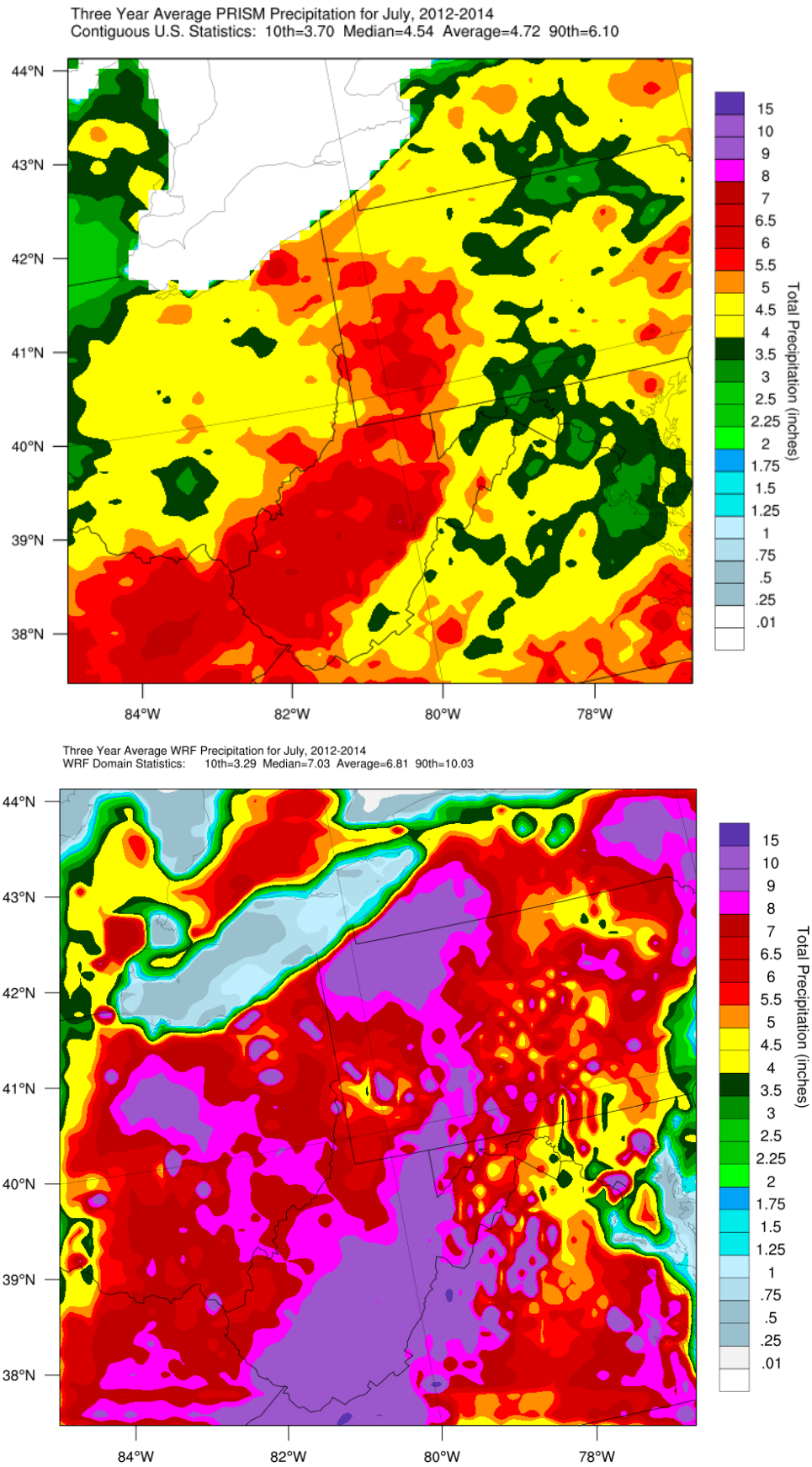

Figure 41. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for July in the 12 km domain

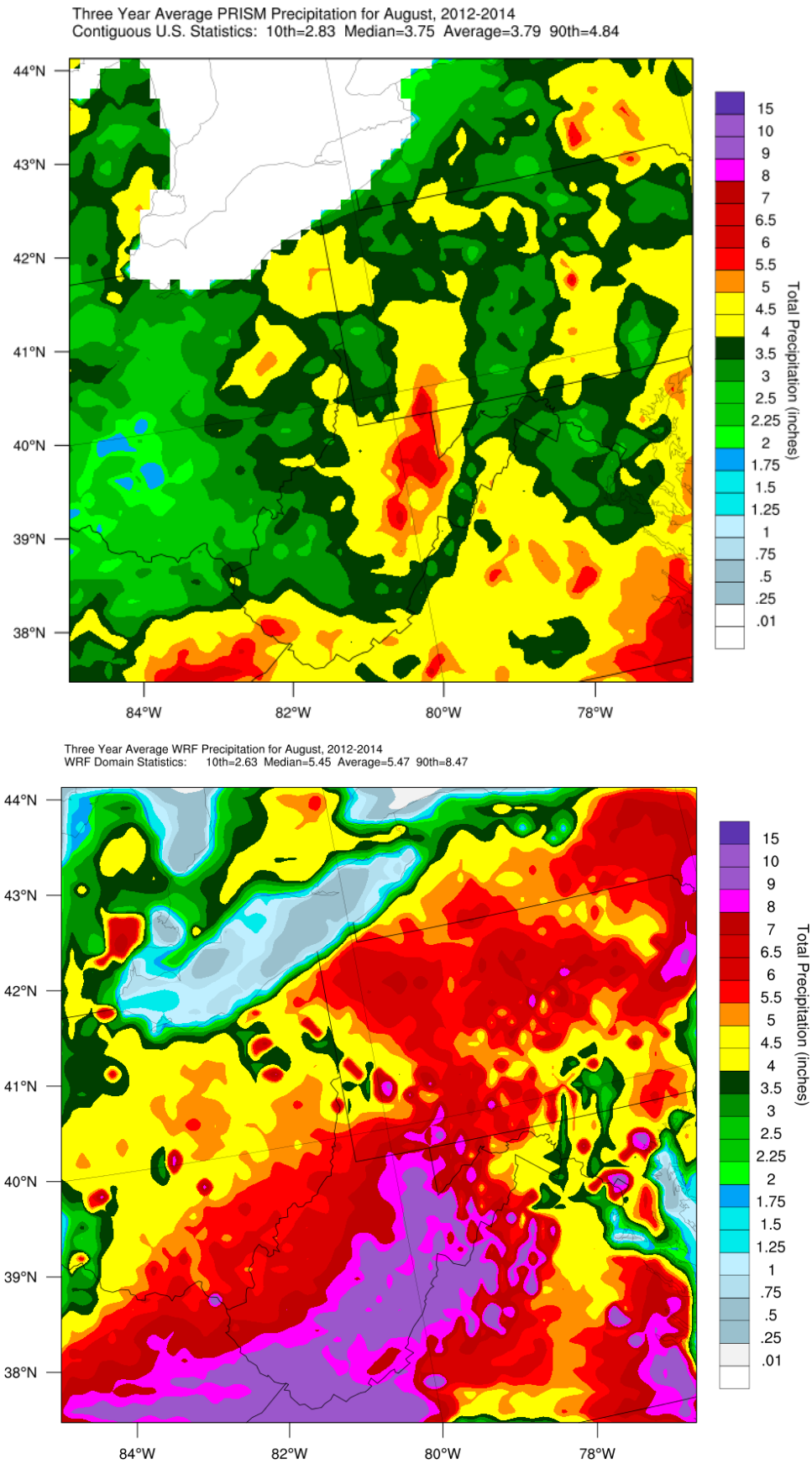

Figure 42. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for August in the 12 km domain

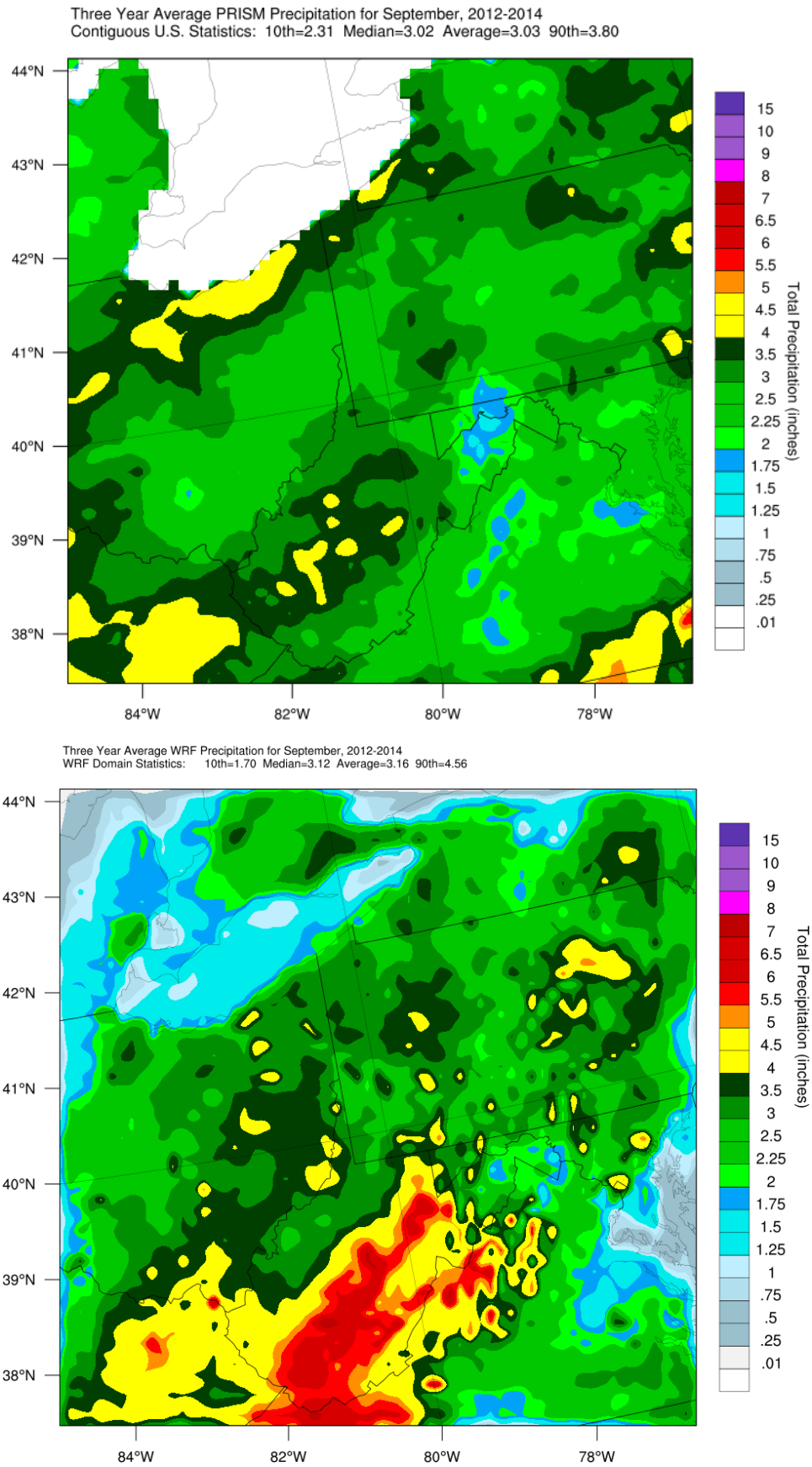

Figure 43. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for September in the 12 km domain

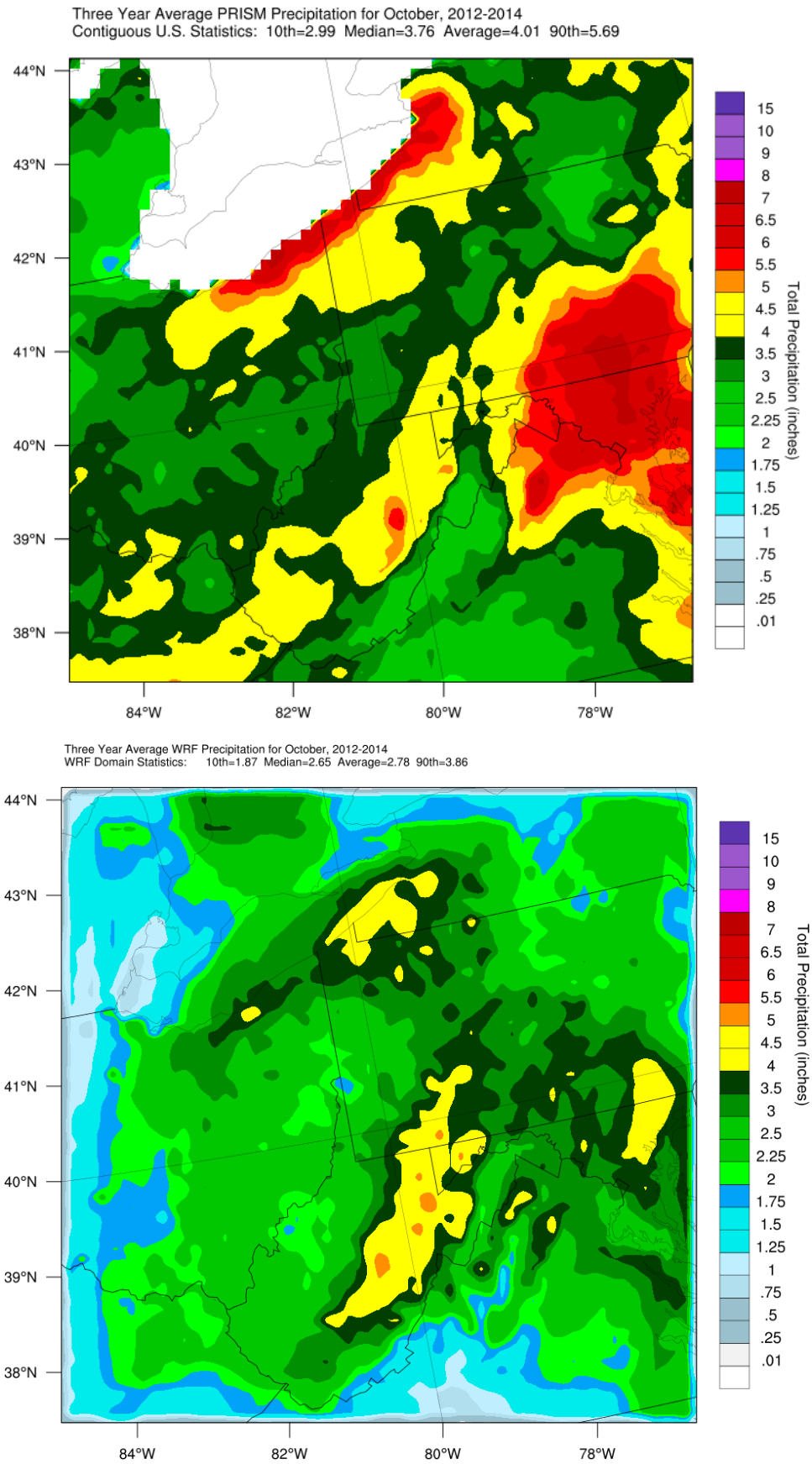

Figure 44. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for October in the 12 km domain

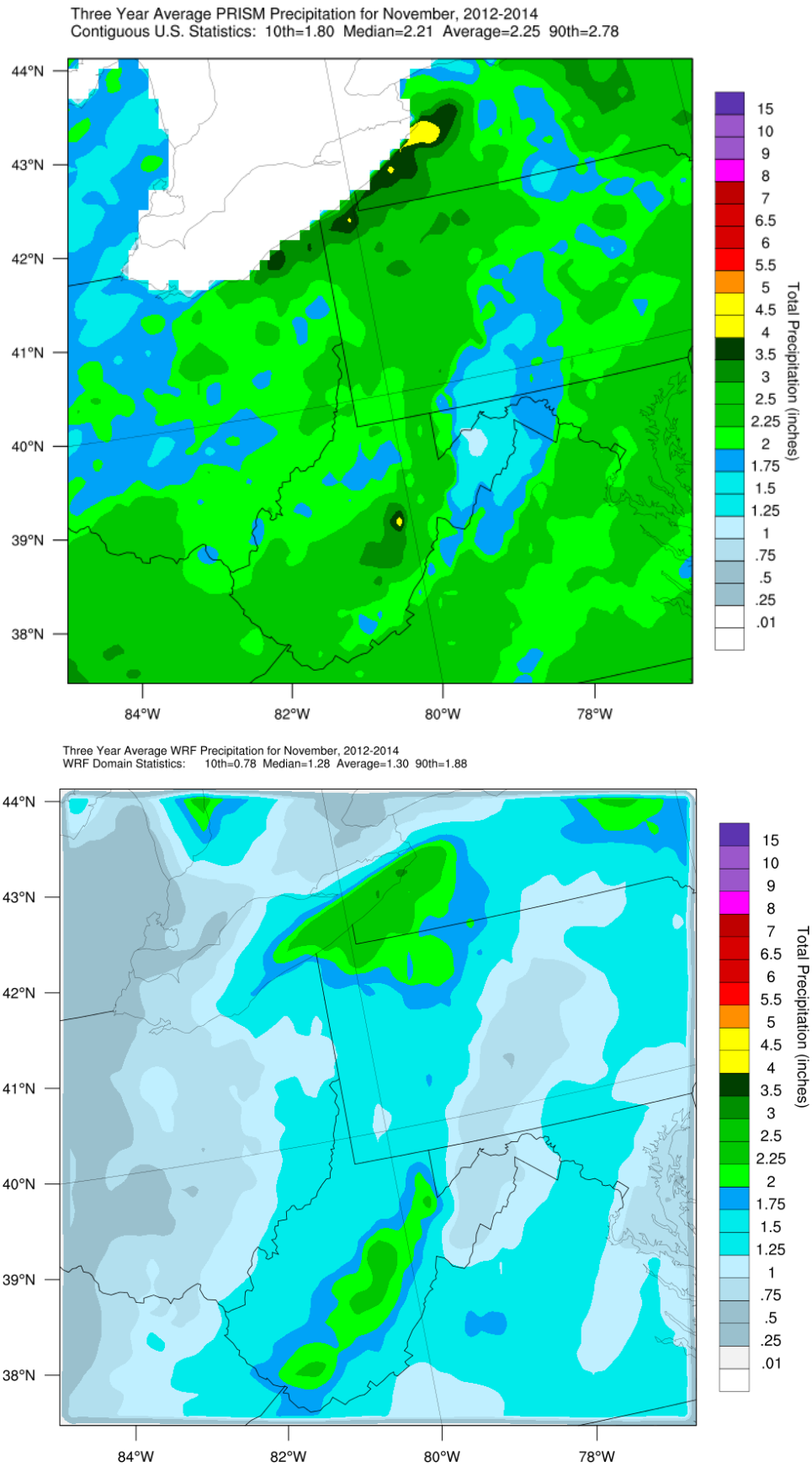

Figure 45. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for November in the 12 km domain

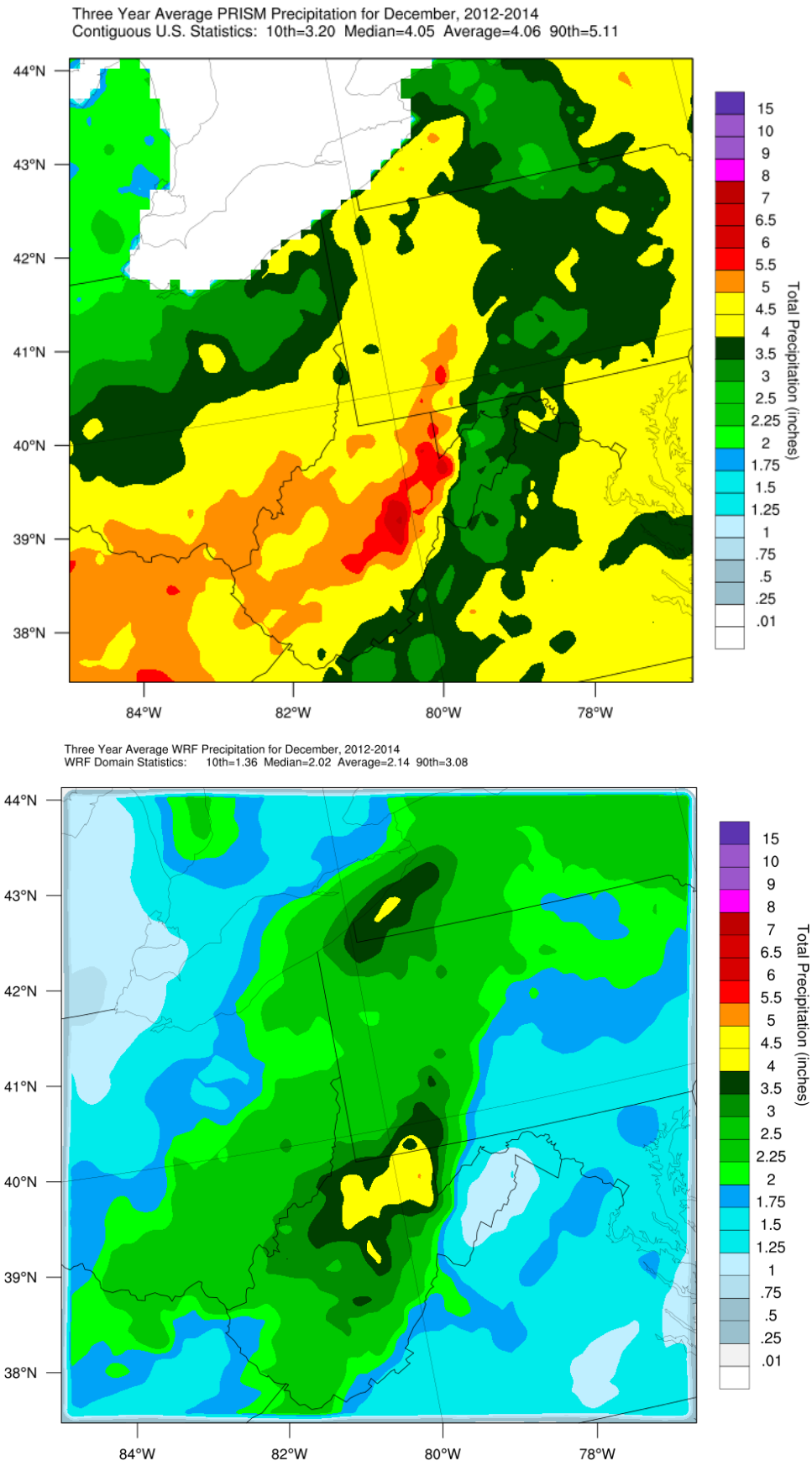

Figure 46. 3-year (2012-2014) PRISM precipitation average (top) and WRF precipitation average (bottom) for December in the 12 km domain

SO_2 SIP

Appendix G

Dispersion Model Performance Evaluation

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Date:

February 2017

Prepared for:

Allegheny County Health Department

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Project Number:
06-35842A

ALLEGHENY COUNTY HEALTH DEPARTMENT SO_2 STATE IMPLEMENTATION PLAN

AIR QUALITY DISPERSION MODEL PERFORMANCE EVALUATION

RAMBOLL ENVIRON

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ACRONYMS AND ABBREVIATIONS

ACHD	Allegheny County Health Department
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
EPA	U.S. Environmental Protection Agency
ESRL	Earth Systems Research Laboratory
FLAG	Federal Land Managers' Air Quality Related Values Work Group
ISHO	Integrated Surface Hourly Observations
KAGC	Surface Identifier for Allegheny County Airport
KPIT	Surface and upper-air identifier for Pittsburgh Airport
METSTAT	Meteorological /Statistical Program
MMIF	Mesoscale Meteorological Interface Program
MMM	Mesoscale Meteorological Modeling
MPE	Model Performance Evaluation
NAAQS	National Ambient Air Quality Standards
NAA	Non-Attainment Area
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
PBL	Planetary Boundary Layer
PRISM	Parameter-elevation Regressions on Independent Slopes Model
SCAS-OSU	Spatial Climate Analysis Service at Oregon State University
SIP	State Implementation Plan
SODAR	Sonic Detection and Ranging
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRF	Weather Research and Forecasting model

1. INTRODUCTION

The Allegheny County Health Department (ACHD) Air Quality Program is preparing a State Implementation Plan (SIP) revision to address sulfur dioxide (SO_2) in the Allegheny, Pennsylvania (PA) nonattainment area (NAA) resulting from the 2010 one-hour SO_2 National Ambient Air Quality Standard (NAAQS). The nonattainment area is located in southeast Allegheny County, PA and is characterized by complex terrain river valleys. The jurisdictions named by the United States Environmental Protection Agency (EPA) and the geographic area can be seen in Figure 1. One monitoring site, the "Liberty" monitor at South Allegheny High School, has measured exceedances of the 2010 SO_2 NAAQS.

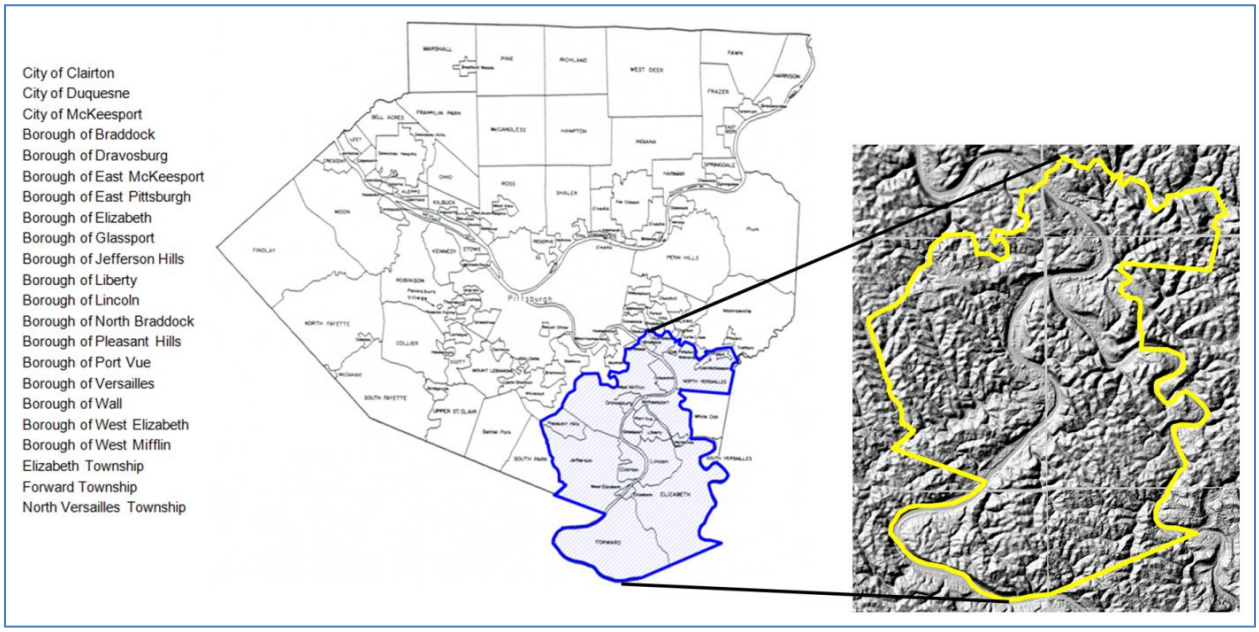

Figure 1. EPA's designated Allegheny, PA SO_2 nonattainment area with terrain features

Air quality dispersion modeling was used to help demonstrate future compliance with the 2010 NAAQS standard. The EPA-recommended model for short-term SO_2 impacts within 50km in complex terrain is the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). Although AERMOD is the preferred model for near-field regulatory modeling, "Appendix W has flexibility to consider alternative models on a case-by-case basis when an adequate demonstration can be made that the alternative model performs better than, or is more appropriate than, the preferred model for a particular application" (U.S. EPA, 2014).

Recent studies (U.S. EPA, 2016a) have demonstrated that the use of accurate, representative meteorological data from prognostic models, such as the Weather Research and Forecasting (WRF) model (UCAR/NCAR, 2013), can improve AERMOD's performance, compared to using less-representative (e.g. the nearest airport) observed meteorological data. With the advent of the 2016 revision to 40 CFR 51 Appendix W, the *Guideline on Air Quality Models*, U.S. EPA now allows prognostic mesoscale meteorological models to provide meteorological input for regulatory dispersion modeling applications (U.S. EPA 2017). WRF results coupled with the Comprehensive Air Quality Model with Extensions model in a

previous Allegheny County SIP demonstration for $PM_{2.5}$ were quite successful in reproducing the complicated flow pattern in the Liberty Borough area.

The EPA Mesoscale Model Interface (MMIF) program can convert WRF model output to produce meteorological files in the input format for several air quality dispersion models. A 3-year, high resolution WRF simulation for Allegheny County was conducted and evaluated (Ramboll Environ 2015) consistent with Appendix W recommendations (U.S. EPA, 2017).

Alternative model testing with WRF-based meteorological inputs to AERMOD was performed to determine whether better model performance compared to high SO_2 events observed at the Liberty monitor can be obtained using an alternative air quality modeling approach. Both WRF-derived and traditional observation-based approaches were tested. Additionally, CALPUFF and SCICHEM, both non-steady-state Gaussian puff models, were also tested using both WRF-derived and observed meteorology. Alternative model predictions were compared with the SO_2 observations, and with each other.

In the Summary and Conclusions (Section 4) we show that using the WRF-MMIF-AERMET-AERMOD sequence of models is able to reproduce the observed SO_2 concentrations in the vicinity of the Liberty monitor quite well. We investigated numerous options in MMIF, AERMET and AERMOD to find the optimal combination of settings.

1.1 Background

EPA revised the National Ambient Air Quality Standard (NAAQS) for SO_2 in June 2010, establishing for the first time a 1-hour standard with a value of 75 ppb (196 µg/m³). A violation of the SO_2 NAAQS occurs when the 99th percentile daily maximum 1-hour SO_2 concentration averaged over three consecutive years exceeds 75 ppb. The Liberty monitoring site in Allegheny County experiences higher SO_2 concentrations than surrounding sites, likely due to the influence of local sources within 5-10 km of the site, and has measured violations of the 2010 SO_2 NAAQS. EPA designated Allegheny, PA a SO_2 nonattainment area on August 5, 2013 (78 FR 47191).

ACHD is responsible for preparing and implementing a State Implementation Plan (SIP) that demonstrates attainment of the new hourly SO_2 NAAQS in the Allegheny, PA nonattainment area. A final attainment demonstration for this area will be provided to the PA DEP, on behalf of ACHD, for submittal to U.S. EPA Region III office as part of the Pennsylvania SIP.

Modeling is a tool used to simulate observed conditions and project future air quality. For air-quality analyses, "air-dispersion modeling," as described by EPA, "uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source. Based on emissions and meteorological inputs, a dispersion model can be used to predict concentrations at selected downwind receptor locations." Thus, an atmospheric model incorporates the three components of the air-pollution system, namely, the sources, dispersion, and receptors of atmospheric pollutants.

The attainment demonstration utilized EPA-preferred models, and alternative modeling techniques for the modeling simulation. AERMOD is the preferred model for near-field regulatory modeling. However, "Appendix W has flexibility to consider alternative models on a case-by-case basis when an adequate demonstration can be made that the alternative model performs better than, or is more appropriate than, the preferred model for a particular application" (U.S. EPA, 2014). A number of alternative modeling approaches were evaluated for the ACHD 1-hour SO_2 SIP. Most of the modeling set-ups tested were variations of a MMIF-AERMOD configuration based on prognostic WRF meteorology input, to

be compared with the standard AERMOD approach using station observations for meteorological input. In addition, results from the CALPUFF and SCICHEM models were examined.

The Cox-Tikvart method was used to examine performance for different model cases/options (U.S. EPA, 1992; Cox and Tikvart, 1990). This includes calculation of a composite performance measure (CPM) based on statistics from different averaging periods (1-hr, 3-hr and 24-hour).

1.2 Justification for the MMIF-AERMOD Approach

The Allegheny, PA SO_2 nonattainment area is made up of complex river valley terrain, roughly 11 miles wide by nearly 15 miles long. It includes a 23-mile winding portion of the Monongahela River, some of which serves as the southern border to the area, and a stretch of the Youghiogheny River that is a small portion of the eastern border of the area. The area includes rural land, densely populated residential areas, and industrial facilities.

The base of the river valley lies at about 720 feet in elevation above mean sea level (MSL), while adjacent hilltops are over 1,100 feet MSL in elevation (i.e., 380 feet above the base of the river valley). Large temperature differences can be seen between hilltop and valley floor observations (e.g., 2 to 7°F) during clear, low-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180° in wind direction between the valley floor and the upper-level winds, with 3-4 mph downslope flows. Most of the industrial sources lie adjacent to the river where wind flows follow the terrain of the meandering river valley, resulting in surface wind directions at industrial facilities a few km apart being very different.

Neither the observed meteorology from the Liberty monitoring station nor from the County airport accurately represents the complex conditions of the valley and neighboring ridgelines. The surface winds at the Liberty monitor (on top of the ridge) shown in Figure 2 are primarily from the southwest, representing the prevailing regional flow. Down in the river valley near the U. S. Steel Clairton Plant a few km to the southwest of Liberty (see Figure 2), the winds include southeast and northwest components due to channeling within the river valley.

The highest hourly SO_2 observations at the Liberty monitor occur at night during strong inversion conditions that reduce dispersion. The changes in the winds going from the floor of the river valley (near the local sources) to the ridge tops (near the Liberty monitor) emphasizes the importance in characterizing the river valley meteorological conditions for accurately simulating transport and dispersion of pollutants in the Allegheny, PA nonattainment area.

Ramboll Environ performed high-resolution mesoscale modeling using WRF, and produced a model performance evaluation of the resulting three-year WRF meteorological dataset. Modeled surface wind speed, wind direction, temperature, and humidity have been quantitatively compared against observations extracted from the Integrated Surface Hourly Dataset (ISHD), and qualitative comparisons using upper air soundings and precipitation fields. The evaluation concluded that ACHD WRF modeling's performance provides a sound basis for developing meteorological inputs for air quality dispersion modeling accounting for the varying winds within the complex river valley terrain.

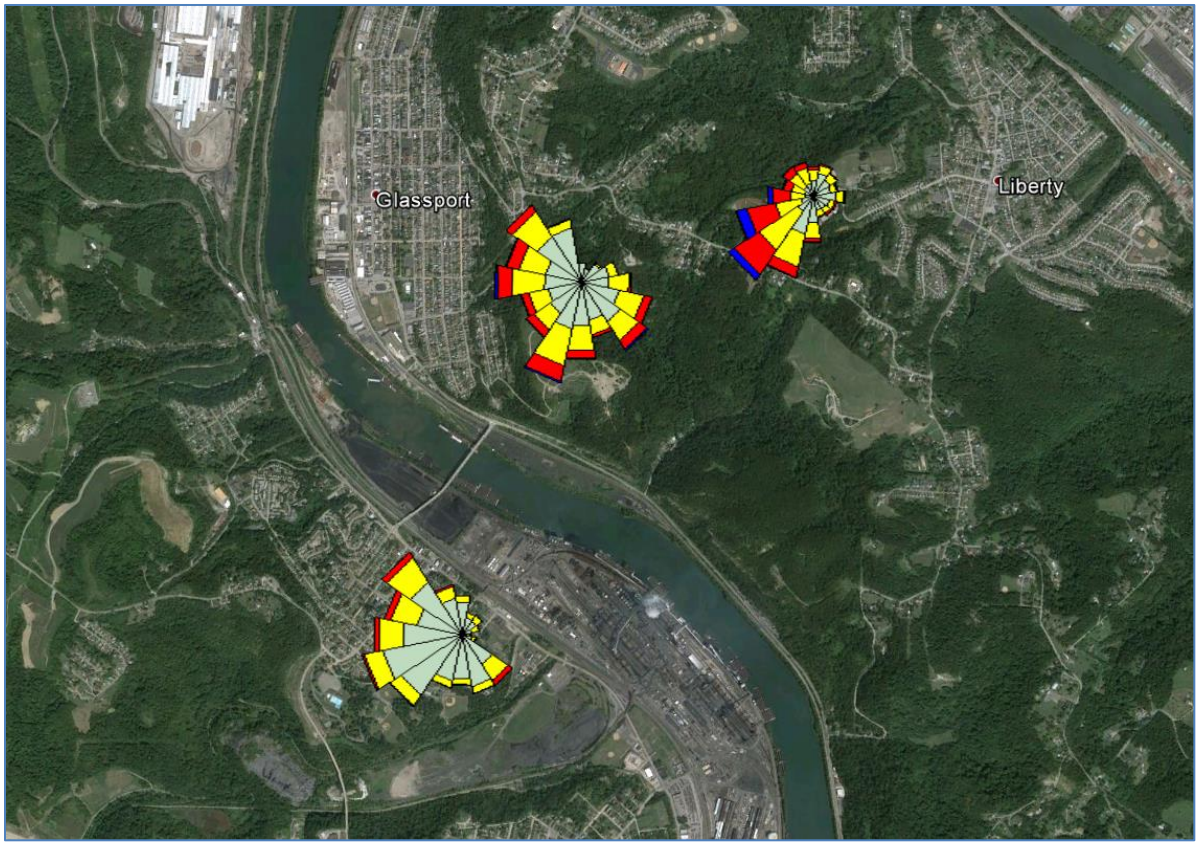

Figure 2. Observed surface wind roses near the Liberty monitor and U.S. Steel Clairton plant.

1.3 Overview of MMIF-AERMOD

The WRF meteorological model (NCAR, 2015) was selected for high resolution meteorological modeling of the region. WRF's research and operational application ensures state-of-the-science physics and adaptability to a wide range of environments, through a broad selection of physics options, allowing us to develop the best-performing configuration for simulating meteorology in the region.

The WRF model contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes for each type of physical process.

WRF meteorological modeling of the Allegheny, PA SO_2 nonattainment area was performed using a nested-grid structure of five grids nested in a 3:1 nesting ratio (36/12/4/1.333/0.444 km) , for the period of January 1st, 2012 through December 31st, 2014. Ramboll Environ performed sensitivity testing on several WRF model configurations to optimize this high-resolution, three-year dataset for use in air dispersion modeling.

1.3.1 Brief overview of MMIF software

WRF model output can be processed with the Mesoscale Model Interface (MMIF) program (Brashers & Emery, 2016) to produce input to AERMOD, SCICHEM, and CALPUFF. For AERMOD, MMIF can either mimic the output of AERMET, or produce files used for input to

AERMET. The 2016 MMIF Guidance (U.S. EPA, 2016) suggests that AERMET be used for the processing of the MMIF data. AERMET can processes several types of meteorological inputs, via its SURFACE, UPPERAIR, and ONSITE pathways, in addition to surface characteristics (normally the output of AERSURFACE). When processing MMIF output, AERMET uses the following pathways:

- ONSITE: MMIF-generated, site-specific (user-specific levels and frequency)
- SURFACE: not used with MMIF
- UPPERAIR: MMIF-generated, site-specific (same user-specific levels)
- Surface characteristics: MMIF-generated, for specific WRF grid cell

Note that because WRF is a mesoscale prognostic model, AERMET's output will feature 100% data completeness, with no "missing" hours.

The MMIF output includes parameters not generally available from NWS or local surface data, including mixing height, 10-2 meter temperature difference (delta_T), and solar radiation. All parameters from MMIF were used for AERMET processing unless found to be inappropriate. Since onsite data is multi-level, it's possible that some levels may be more appropriate than others.

1.4 WRF Model Performance Evaluation Summary

EPA guidance for the application of MMIF states that the adequacy of prognostic meteorological fields must be demonstrated through diagnostic and statistical performance evaluations (U.S. EPA, 2016). Accordingly, both a quantitative and qualitative evaluation of the ACHD WRF simulations were conducted (Ramboll Environ, 2015). The quantitative evaluation compared both NWS and local (Liberty) meteorological observations with WRF predictions matched by time and location. The qualitative evaluation compared twice daily vertical profiles with upper-air data and on-site hourly SODAR profiles with WRF predictions matched by time and location. Additionally, monthly total spatial precipitation fields based on observations (PRISM data) were compared with the WRF gridded monthly total precipitation fields. Below we summarize the main features of the WRF simulation model performance evaluation; more details can be found in the WRF MPE report (Ramboll Environ 2015).

1.4.1 METSTAT Analysis Review for Domain 4 (1.33 km)

Model performance was evaluated using a METSTAT analysis of the Liberty met station and for the Pittsburgh surface met station (KPIT) compared to the 1.333 km (d04) domain for all months in 2012 to 2014. METSTAT is a software program that evaluates WRF near-surface wind speed, wind direction, temperature and mixing ratio (water vapor concentration) against observations at surface meteorological monitoring sites. Wind direction performed well for Liberty and very well for Pittsburgh. The Liberty station displays a slight positive wind direction bias with one month (August 2014) outside of the complex conditions performance benchmark thresholds. There is a small positive bias in wind speed, with WRF indicating higher wind speeds by 0.5 to 1.5 m/s. Temperature performed well for the stations, with a slight negative (cooler) temperature bias in Pittsburgh. The Pittsburgh humidity performance is indicative of all stations within the 1.333 km domain, containing a positive bias for warmer months. Overall, WRF performance was acceptable for the study area in the 1.33 km domain.

1.4.2 METSTAT Analysis Review for Domain 5 (0.444 km)

Model performance was evaluated using a METSTAT analysis of the Liberty met station and the Allegheny County Airport met station (KAGC) in the 0.444 km (d05) domain for all months in 2012 to 2014. Wind direction performance was satisfactory for both stations, with a small positive wind direction bias for all months. One-third of all months fall outside of the complex conditions threshold, with no seasonal trend in higher biases. Wind speed performed well for Allegheny County Airport and was satisfactory for the Liberty station. Higher wind speed and wind direction biases for the Liberty station is most likely due to the terrain channeling effects of the valley area. Temperature verified well for both stations, with a slight negative bias displayed for the Allegheny County Airport. The Allegheny County Airport humidity performance in the 0.444 km domain is similar to other stations in the 1.333 km domain with an increased humidity bias, especially in the warmer summer months. Overall, WRF performance was acceptable for the study area in the 0.444 km domain.

1.4.3 Vertical Profile Qualitative Comparison: SODAR

Wind observations from a REMTECH Sonic Detection and Ranging (SODAR) remote sensing system installed at the U.S. Steel Clairton site were obtained from ACHD and plotted against the WRF model. The dataset contained horizontal wind speed and direction and vertical velocity and deviation, but not temperature or humidity. The data before February 2014, when the SODAR was re-installed after a repair, were deemed faulty and not used. The SODAR instrument measured a profile of wind speed and direction every ten minutes, with a maximum altitude of up to 250 m above the river valley floor. There was a roughly 70 percent data recovery in the 30 m to 150 m range, with lower data recovery above 150 m. All profiles were averaged by hour (i.e. six profiles, if there was no missing data) and plotted together with the profile from WRF. All SODAR plots were analyzed and overall, vertical profile performance in the 0.444 km (d05) domain shows strong agreement between WRF and the SODAR data in the first 50 m above the surface. Above 50 m, there was a tendency for WRF to over-predict with wind speeds, though the data completeness (and corresponding statistical strength) decreases with increasing height above ground.

1.4.4 Vertical Profile Qualitative Comparison: Radiosondes

Upper-air data from the Pittsburgh radiosonde (KPIT) dataset were used to evaluate WRF vertical profiles of predicted temperature and moisture above that location. The KPIT radiosonde dataset is collected and maintained by the National Weather Service (NWS). Radiosondes are launched from KPIT twice per day, at approximately 0 and 12 UTC (7 AM and 7 PM LST). Radiosondes provide high-resolution vertical profiles of temperature, humidity, wind speed, and wind direction throughout the troposphere. The data are made publicly available by NOAA on the Earth System Research Laboratory (ESRL) Radiosonde Observation website[1].

At a distance of about 24 miles to the northwest of Liberty (outside of the 0.444 km domain) the Pittsburgh (KPIT) balloon-borne radiosonde launch site provides the nearest representative NWS upper-air data for the study and vicinity. Vertical profile plots showing WRF modeled data from the 1.333 km domain and observed upper-air soundings were created to evaluate the performance of the vertical atmospheric structure. Using the SO_2 concentration measurements at the Liberty monitoring station, the two highest "SO_2 episode days" were selected from each modeling year (2012-2014) for vertical profile comparisons.

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[1] http://www.esrl.noaa.gov/raobs

Overall, upper air performance in the 1.333 km (d04) domain shows strong agreement between WRF and radiosonde data, especially in cases of surface based inversions.

1.4.5 Qualitative Evaluation Using PRISM Precipitation

Qualitative comparisons of WRF-simulation estimated monthly precipitation with monthly Parameter-elevation Regressions on Independent Slopes Model (PRISM) analysis fields based on observations were conducted. Three-year average (2012-2014) monthly precipitation plots were constructed from the WRF output and compared to PRISM three-year average monthly plots for the months of January through December in the 12 km domain (d02). The finer-resolution domains were considered too small to produce representative statistics, considering the stochastic nature of summertime convective precipitation that dominates the annual cycle.

The PRISM datasets are spatial maps of climate elements across the United States built by the Spatial Climate Analysis Service at Oregon State University (SCAS-OSU). Gridded maps of mean monthly and annual precipitation and temperature were built using meteorological station measurements and a set of statistical weighting procedures and corrections based on distance, elevation, topographic orientations and influences, and land-surface type (SCAS-OSU, 2001). The process and results have been extensively peer-reviewed and generally accepted by the climatological community as state-of-the-art representations.

The precipitation analysis for the 12 km (d02) domain indicates there is a slight understatement of precipitation in the fall and winter months, while higher humidity biases create excess moisture and results in an overstatement of precipitation in the summer months. The modeled precipitation accumulations in southwest Pennsylvania matches the PRISM precipitation better compared to other regions in the northeast U.S.

1.5 Modeling Scenarios and Options

Three dispersion models were selected for testing against SO_2 observations at Liberty, AERMOD, CALPUFF, and SCICHEM.

1.5.1 AERMOD

A number of reasonable AERMOD modeling scenarios were chosen for evaluation, with the goal of identifying the most accurate configuration for the Allegheny, PA NAA. The differences between the model configurations are primarily in the methods for meteorological inputs. Both traditional observation-based and WRF-based meteorological datasets were used in AERMOD, and evaluated in this study.

Several observation-based combinations were tested using data from local observation locations. Applicable sites with complete 3-year datasets were Liberty (LIB), Pittsburgh Airport (KPIT), and Allegheny County Airport (KAGC). Liberty was treated as "onsite" surface observations, while the airports provided surface and upper air data (KPIT only). In addition, datasets spanning only 2014 from the U.S. Steel Clairton (CL) SODAR station, as well as the Beaver Valley (BV) tall tower to the northwest of the NAA were used to provide meteorological inputs for the AERMOD runs.

Because MMIF can provide meteorology at every point within the domain, the MMIF-AERMOD scenarios were run as series of site-specific scenarios. In this approach, MMIF was used to extract a meteorological dataset at the locations of each major facility in the NAA. The SO_2 concentrations near Liberty attributable to each individual source were determined separately (i.e. each facility was run separately, with its own site-specific MMIF-produced MET data) then summed as a final step to obtain the total SO_2 concentration due to all

facilities. The site-specific nature of the meteorology used in this approach is a major reason why we believe the MMIF-based AERMOD runs were more accurate than using a single observation-based meteorological dataset for all facilities within the NAA.

There are a number of input options available in MMIF, leading to a variety of possibilities in generating AERMOD meteorological inputs. MMIF inputs allow the user to specify vertical layer heights for wind and temperature values. Four different sets of vertical layers were tested: the EPA MMIF Guidance layers, an alternative to the EPA Guidance layers, the Federal Land Management (FLM) CALMET Guidance layers, and the levels closest to the native WRF layers. These methods are described in greater detail in Section 2.3.

All four of the MMIF vertical layer scenarios were tested over the two finest WRF simulation domains (1.3 km and 444 m resolution, see Section 2.1). Three different sources of mixing height were also tested; those of WRF, MMIF, and AERMET. Finally, MMIF includes the option of generating inputs to AERMET, or generating the inputs to AERMOD directly (bypassing AERMET processing). Both the AERMET-input and AERMOD-input modes were evaluated for all the scenarios. In total, 48 MMIF scenarios were initially tested as meteorological inputs in AERMOD.

After initial evaluation, the three most accurate MMIF-based scenarios were re-tested with some of the AERMOD system's options, namely LowWind3, Adjust_U*, and Urban dispersion mode. The first two options are intended to avoid over-prediction in low-wind conditions, and are discussed in greater detail in Section 2.3.

Because the WRF Model Performance Evaluation showed a positive wind speed bias above approximately 50 - 75 m above the ground, three additional test cases were run using "native" WRF levels below 50 meters, to be compared against the corresponding scenarios using the "native" WRF levels up to 5000 meters.

1.5.2 CALPUFF

CALPUFF version 5.8.4, a non-steady-state Lagrangian puff dispersion model, was also tested as an alternative to the AERMOD steady-state Gaussian plume model. Three 1-year runs of CALPUFF were performed using MMIF-based meteorology. The CALPUFF run closely followed the FLAG (2010) guidance.

Previous work (not shown in this report) tested the performance of observation-based (traditional CALMET) CALPUFF runs. Because there are only two surface meteorological stations within the modeling domain (KACG and Liberty) the wind fields from traditional CALMET were not as representative as the WRF-based fields. This caused OBS-based CALPUFF to perform noticeably worse than WRF-based CALPUFF, in the initial 1-year test that was performed. We chose therefore to focus on the WRF-based CALPUFF for the full 3-year test case.

1.5.3 SCICHEM

SCICHEM is a non-steady-state Lagrangian puff dispersion model with more advanced chemistry than CALPUFF. SCICHEM version 3.01 and a development version 3.1 were tested as an alternative to AERMOD. Although SCICHEM can calculate the conversion/destruction/ deposition of SO_2, initial tests showed that the rates were small compared to the distance/time between the major sources and the Liberty monitor so SO_2 was treated as a passive tracer. MMIF supplied the 444 m resolution meteorological inputs to SCICHEM.

An initial SCICHEM analysis was performed but resource constraints limited the amount of effort to be devoted to the model evaluation comparison. SCICHEM was therefore excluded from the remainder of the analysis so that more resources could be devoted to the AERMOD and CALPUFF models in the Allegheny, PA 1-hr SO_2 study.

1.5.4 Overview of Modeling Scenarios

The following outline lists all of the ACHD modeling scenarios tested for this study. Only the full 3-year scenarios can be used for ACHD regulatory purposes, but the 2014-only runs (e.g. SODAR-based, or using the Beaver Valley tall tower) were evaluated for their applicability to future modeling.

In total, 59 total AERMOD scenarios were evaluated and compared to the Liberty 3-year SO_2 monitoring dataset. One CALPUFF run was also evaluated.

1.5.4.1 Meteorology Scenarios: 53 separate scenarios total

53 separate dispersion model configurations were evaluated for simulating SO_2 concentrations including AERMOD simulations that used meteorological inputs based on observations (OBS) and WRF (through MMIF) using different receptor grids as well as the CALPUFF and SCICHEM alternative models.

OBS-based AERMOD runs: 5 scenarios

- Liberty on-site, KPIT surface, KPIT upper air
- KPIT surface, KPIT upper air
- KAGC surface, KAGC upper air
- Beaver Valley surface and upper air (2014 only)
- Clairton SODAR surface and upper air (2014 only)

MMIF-based AERMOD runs: 48 total

- WRF-MMIF-AERMOD: (2 domains)×(4 wind level options)×(3 mixing height options) = 24
- WRF-MMIF-AERMET-AERMOD: (2 domains)×(4 wind level options)×(3 mixing height options) = 24

MMIF-based AERMOD runs with WRF vertical levels below 50 meters: 3 total

- Tested for the 444m domain using MMIF, WRF, and AERMET mixing heights
- MMIF-based AERMOD runs with AERMOD *beta* options
- LOWWIND3 – used for the three most accurate MMIF-based scenarios
- ADJ_U* - used for the three most accurate OBS-based scenarios
- Satellite-based Urban Dispersion Option - used for the three most accurate MMIF-based scenarios

MMIF-based AERMOD runs with different receptor grids

- Discrete Liberty monitor grid (a single point, with receptor rings every 100m to 500m radius)
- Flat Discrete Liberty monitor grid (same as above, but with constant receptor elevation)
- Full-domain grid (closer spacing near facilities, 200m spacing between)

CALPUFF

- WRF-MMIF-CALPUFF approach, following EPA (2009) and FLAG (2010) guidance

SCICHEM

- WRF-MMIF-SCICHEM approach, following SCICHEM author's suggestions

2. DISPERSION MODELING METHODOLOGY

AERMOD is the EPA-recommended model for complex terrain and short- and long-term impacts within 50 km of a source. The current regulatory components of the AERMOD modeling system include AERMAP as the terrain processor and AERMET as the meteorology processor (with its pre-pre-processors AERMINUTE and AERSURFACE). AERMAP processes terrain data from the USGS, along with files describing source and receptor locations, to resolve elevations of the sources and receptors as input to AERMOD. AERMET is capable of processing NWS surface and upper-air meteorological data, as well as independent site-specific data (if available) and merging the observations into a single input to AERMOD. AERMET can also be driven by MMIF-produced meteorological model data using prognostic meteorological model output such as WRF, as is the case for many of the ACHD AERMOD scenarios.

2.1 Terrain and Modeling Domain

The domain for AERMAP accounts for terrain throughout a 30 x 30 km rectangular domain surrounding the nonattainment area, shown in Figure 3.

Terrain is similar throughout Allegheny County, with higher elevations to the east/southeast in Westmoreland and Fayette counties. The 30 x 30 km domain is sufficient to resolve elevations outside of the nonattainment area and the resulting critical hill heights generated by AERMAP.

The WRF domain configuration is comprised of a system of nested grids. All WRF grids are defined on a Lambert Conformal Conic (LCC) projection centered at 40° N, 97° W with true latitudes at 33° N and 45° N. The outermost domain with 36 km resolution includes the entire continental United States and parts of Canada and Mexico. The inner 12 km regional grid covers the northeastern portion of the United States. The 4 km domain covers the four state areas of Pennsylvania, Ohio, West Virginia, and Maryland. Figure 4 shows the 1.333 km domain as grid cells covering multiple counties in southwest Pennsylvania, with the inner 444 m domain as grid cells covering the nonattainment portion of Allegheny County. The location of the Liberty monitoring station is also indicated. The red boxes indicate the full range of the WRF grids, with the blue boxes indicating the usable portion after the first five grid cells (not usable due to the numerical methods used to supply boundary conditions to the finer grid) from each edge are removed.

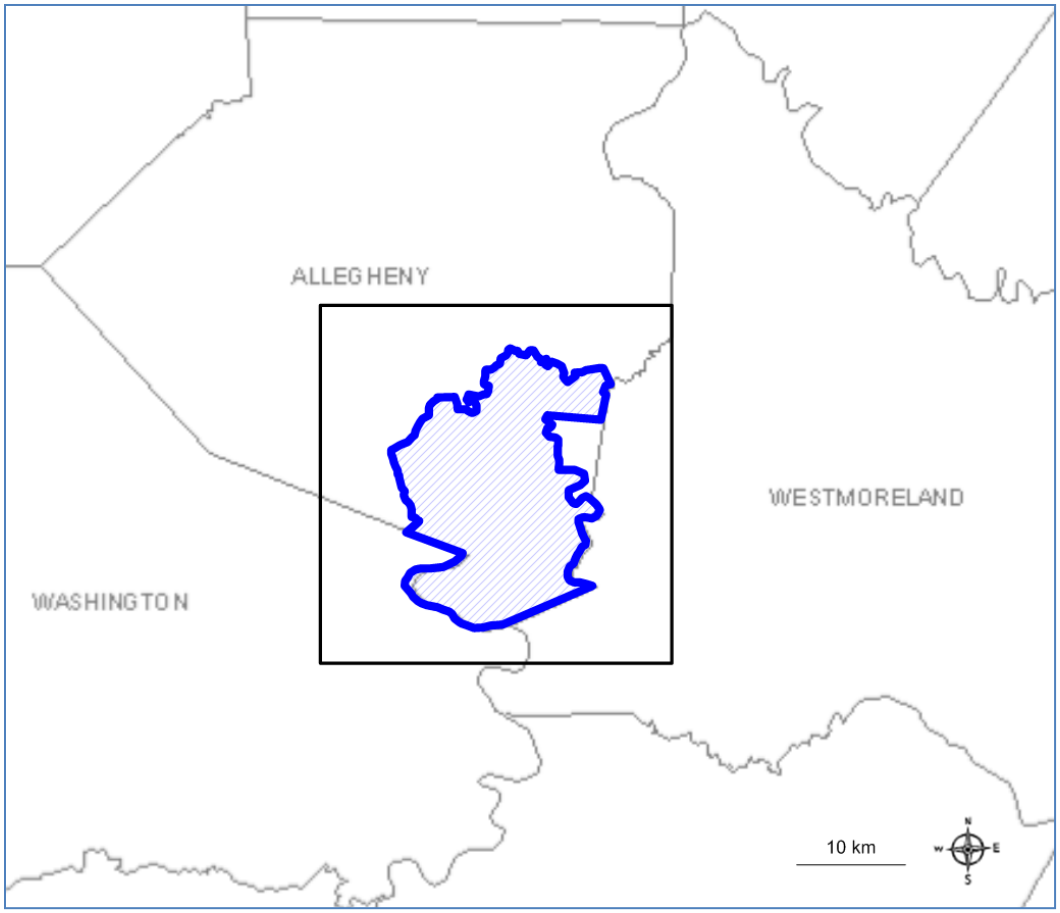


Figure 3. Domain for AERMAP

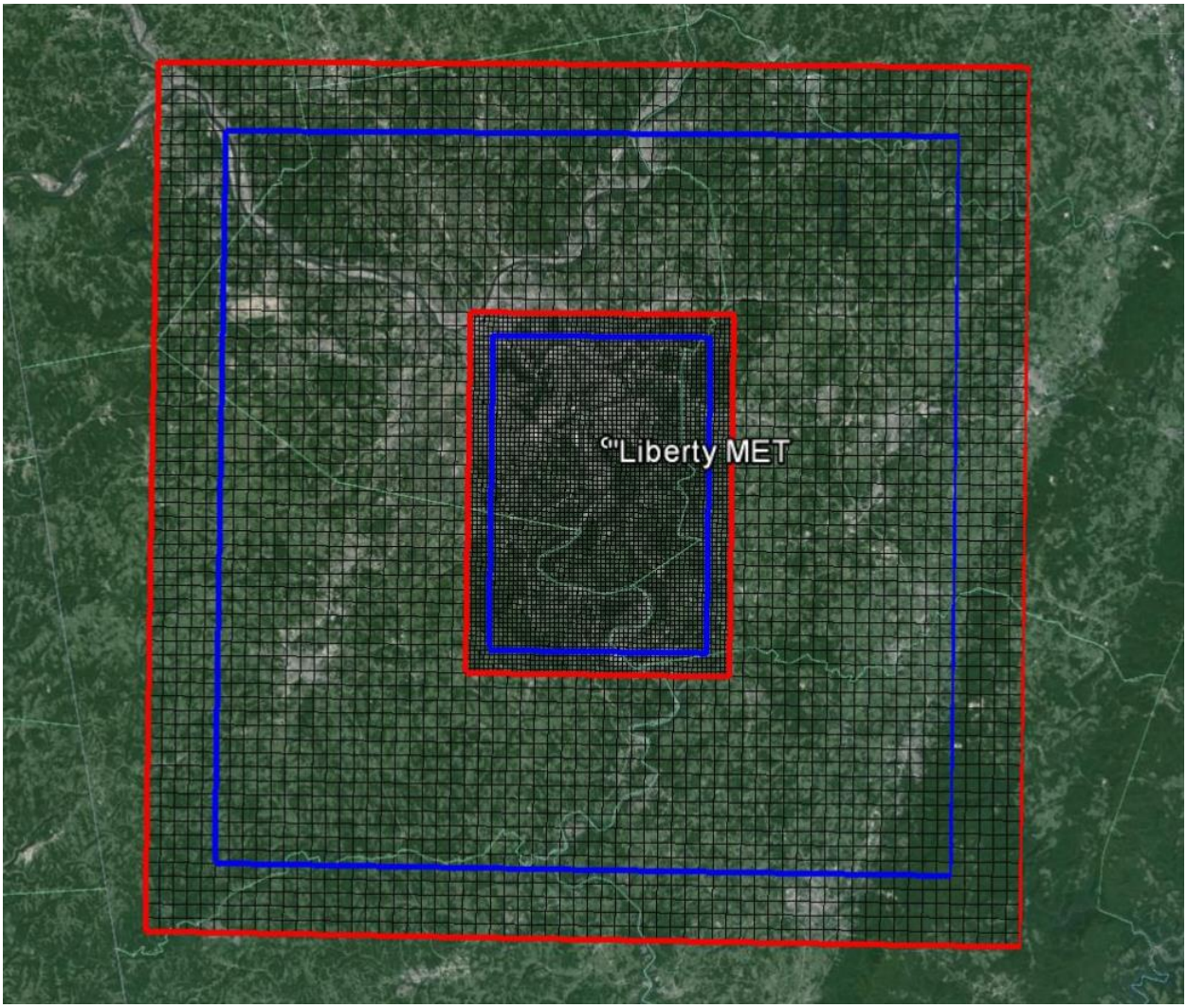


Figure 4. WRF 1.333 km grid (larger red rectangle) and 0.444 km grid d05 (smaller red rectangle).

2.2 Geophysical Data

Terrain and land use processing for observation-based AERMOD runs included the most recent data available for use in the AERMOD system. AERMAP uses USGS NED terrain data, 1/3 (10 m) or 1 (30 m) arc-second resolution. AERSURFACE uses USGS NLCD land cover data from 1992. A contour map of 1 arc-second terrain data for Allegheny County is shown in Figure 5, while a NLCD land cover map for Allegheny County is shown in Figure 6.

Figure 5. NED Terrain Data for Allegheny County (1 arc-second)

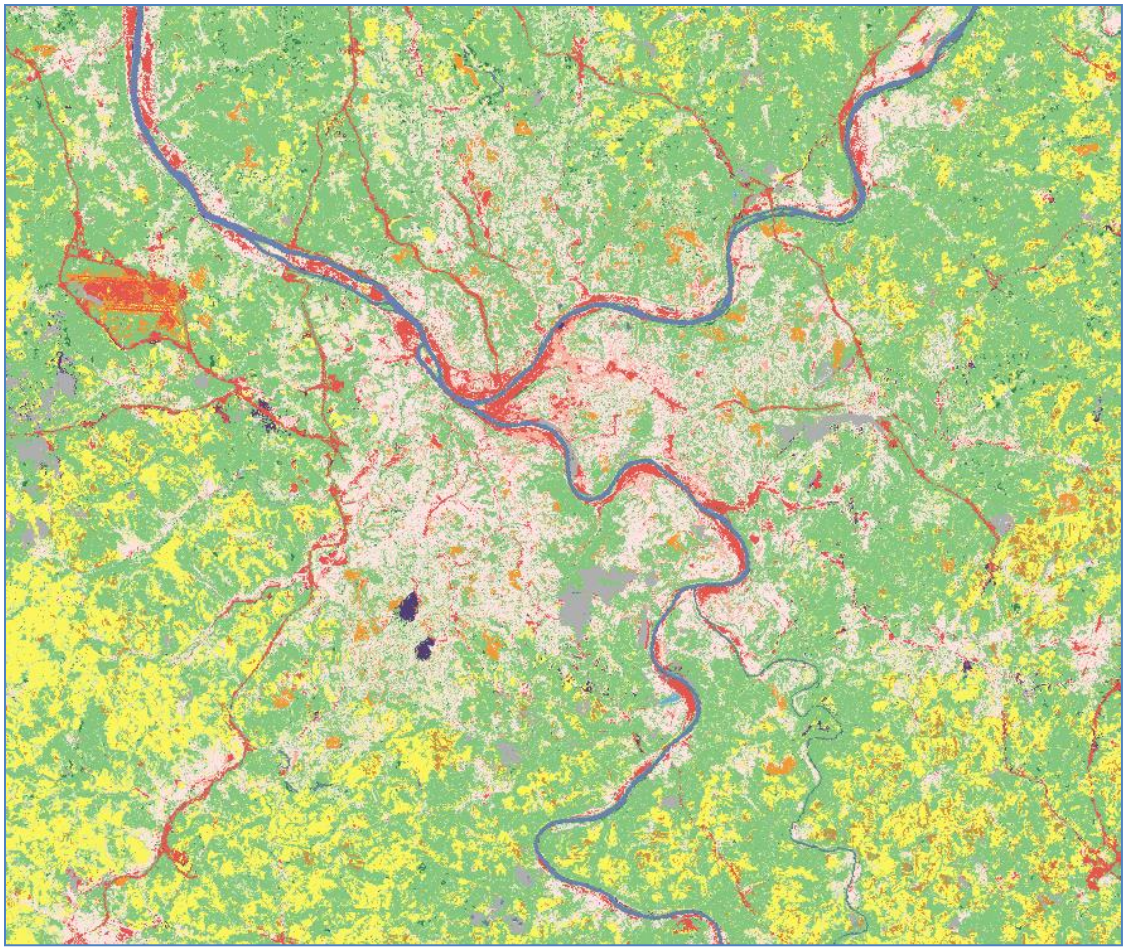


Figure 6. NLCD 1992 Land Cover for Allegheny County

In cases where MMIF produced the meteorological data, AERSURFACE is not used because the vegetation type and land-use information are passed from WRF via MMIF. The inputs for WRF were developed using the United States Geological Survey (USGS) land-use database provided with the WRF distribution. The number of land categories in input data was the USGS default of 24. Standard WRF surface characteristics corresponding to each land use category was employed.

2.3 Meteorological Inputs

AERMET performs the meteorological preprocessing for AERMOD. As described by the AERMET User's Guide (U.S. EPA, 2016b), it generates model-ready meteorological inputs through a three-stage process. First, AERMET extracts data from the raw input files and assesses data quality. The second stage merges the upper-air, surface, and onsite data for 24-hour periods and writes these to an intermediate file. In the third and final stage, AERMET reads the merged file, develops necessary boundary layer parameters needed for dispersion calculations by AERMOD, and outputs AERMOD-ready meteorological files. AERMET is programmed to process surface data from National Weather Service (NWS) via the "SURFACE" pathway, and/or site-specific data from an independent monitoring system via the "ONSITE" pathway. Upper air observations are also input to AERMOD from NWS stations on a twice-daily basis.

Meteorological data for observation-based AERMOD runs were available from several sites. The Pittsburgh Airport (KPIT) and Allegheny County Airport (KAGC) met stations provided complete sets of surface and upper air data for the years 2012 through 2014. The Liberty met station was treated as ONSITE data, and was combined with KPIT upper air data to create a complete dataset (LIBPIT) used to represent the Liberty site. Three-year AERMOD runs were performed for each of these sets of AERMET inputs. In addition, one-year experimental model runs were performed for Beaver Valley (BV) and Clairton (CL) met station data, for which complete data was only available for 2014. Thus, a total of five sets of "onsite" AERMET-AERMOD results were generated and analyzed for this study.

Alternately, AERMET can process prognostic meteorological model output fields output by MMIF. MMIF can provide processed model output as an AERMET-ready input or an AERMOD-ready input (bypassing the AERMET processing). The MMIF user can also select the vertical layer structure of its output. As outlined in Section 1.5, the four methods of MMIF vertical layer definitions tested were:

1. EPA Guidance layer heights from the MMIF Guidance (U.S. EPA 2016) with requested layers vertically interpolated, and centered at 25m, 50m, etc. with a highest layer at 5000m.
2. An alternate version of EPA Guidance, where an initial surface layer height of 20m is defined (so the first layer is centered at 10m) and vertical interpolation is performed using layer-top interface heights. This method was tested as an attempt to avoid using the WRF output variables U10 and V10, by forcing interpolation of the 3-D gridded values to that height.
3. Federal Land Management (FLM) guidance from 2009, which defines 10 layers with an initial surface layer height of 20m, highest layer of only 4000m, and interpolates using layer-top interface heights. These are the CALMET layers required for typical Class I CALPUFF analyses.
4. Native WRF layer heights, with an initial surface layer of 12m, continuing up to the EPA guidance height of 5000m, using interpolation to layer-top interfaces. Because WRF uses a pressure-based vertical coordinate, these "native" WRF layers are approximate. Converting WRF layers to height-based coordinates yields different values in both space and time, and average rounded values were used. In addition, several alternative MMIF scenarios were tested using WRF layer heights less than 50m, because the WRF evaluation showed a positive speed bias aloft.

Starting with version 3.3 of MMIF, there are three options for defining mixing heights. First, WRF produces an hourly planetary boundary layer value, PBLH, which is quantized to WRF levels (i.e. not continuous in a numerical sense). This can be passed through to AERMOD. Alternately, MMIF can be told to re-diagnose the mixing height using the critical bulk Richardson number method. Finally, by not supplying AERMET with any input mixing height, AERMET will output estimates from its own mixed layer model, which simulates mechanical mixing at night and convective growth during the daytime.

AERMOD runs were performed for 2012-2014 using all of these distinct MMIF vertical level schemes and PBL formulation methods through both WRF-MMIF-AERMET-AERMOD and WRF-MMIF-AERMOD (bypassing AERMET) pathways. In addition, all runs were performed using both the 1.333 km (d04) and the 0.444 km (d05) domain output. The results of all

model configurations were evaluated using the Cox-Tikvart testing process described in Section 3. A summary of the MMIF options used is provided below.

A. 2 MMIF input modes: WRF-MMIF-AERMET-AERMOD, and WRF-MMIF-AERMOD

B. Two domains: 1.33 km and 444 m grid spacing

C. Three mixing height formulation methods

    a. MMIF

    b. WRF

    c. AERMET

D. Vertical layer settings:

    a. EPA MMIF Guidance levels

    b. Alternative EPA levels

    c. FLM MMIF Guidance levels

    d. WRF levels below 5 km

    e. WRF levels below 50 meters

    f. Just one 10 m level, simulating a NWS site

2.4 Background Concentrations

Background concentrations based on monitors other than Liberty were provided by ACHD, and were added to modeled concentrations to account for emissions that are not explicitly modeled. Background concentrations in the Allegheny, PA NAA were calculated using a temporally varying approach, based on the 99th percentile monitored concentrations, varying by hour of day and by month, averaged over three years.

2.5 Receptor Grids

Receptor grids in AERMOD are generated by its terrain data preprocessor, AERMAP. AERMAP output evaluates terrain data at receptor locations to deduce the elevation, and calculates the significant hill height for each receptor location.

2.5.1 Liberty Monitor Local Grid

A set of receptors were placed near the Liberty monitor. As shown above in Figure 4, the Liberty monitor lies near the center of the NAA. This receptor network was constructed as a polar grid, resembling concentric "rings" of receptors, centered on the monitor. Each ring was comprised of receptors at 16 radial directions, and spaced in 100m outward increments to a maximum distance of 500 m, for a total of 81 distinct receptors, counting the center. This receptor grid was used for the model evaluations comparing model output to the Liberty monitor observations for 2012-2014. The layout of the receptor grid around the Liberty monitor is illustrated in Figure 7.

In a post-processing step, a subset of the receptors was selected based on their distance from the center of the rings. The idea was to allow for the plume to "miss" the center receptor by a variable amount, to test the robustness of the resulting statistics. The area within about 200 meters of the Liberty monitor is relatively flat, with drainage valleys on both sides (South and North) and a small hill across the drainage valley to the North.

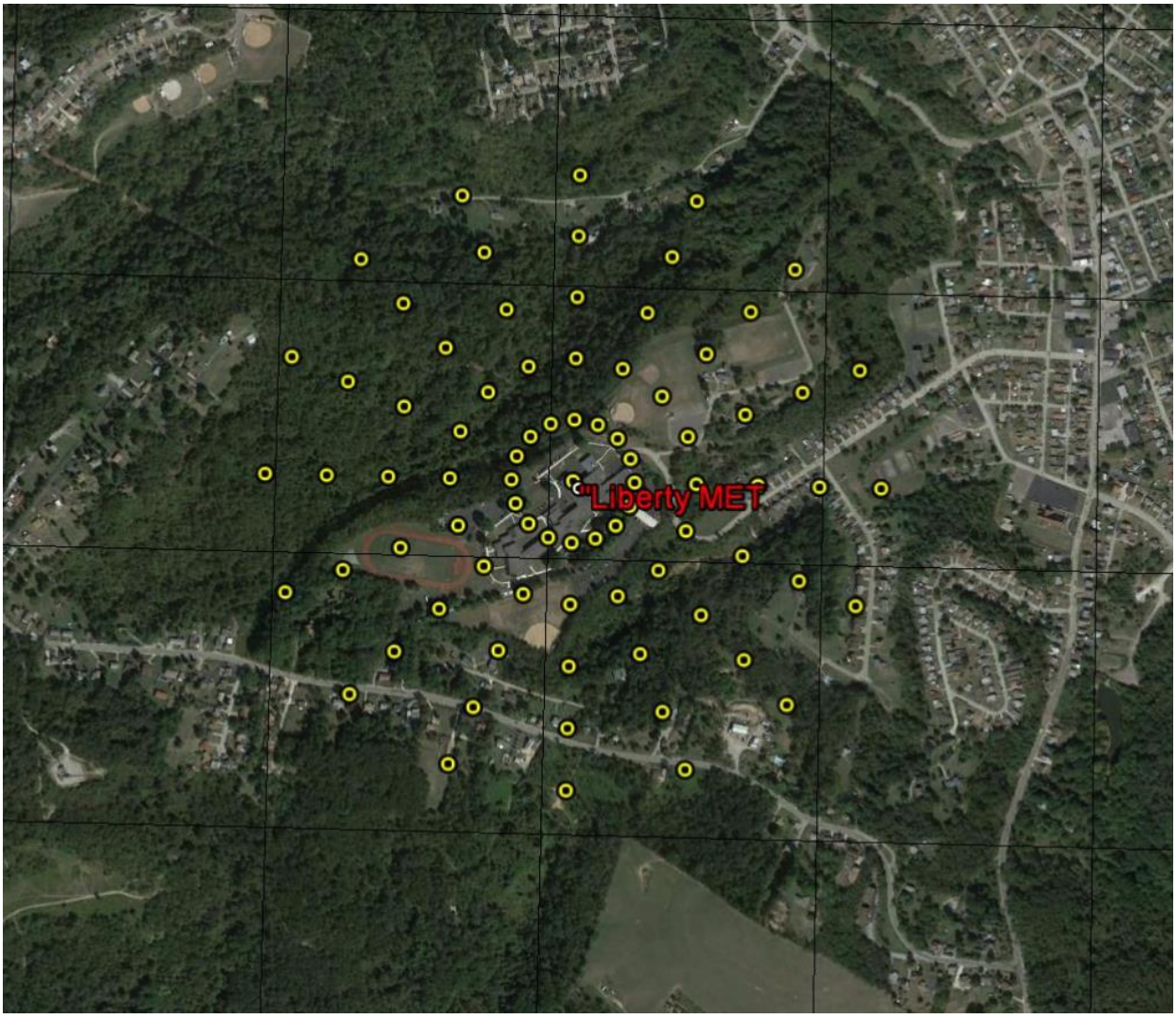


Figure 7: Discrete AERMOD receptor locations, indicated by yellow markers, specified for model evaluations based on the Liberty Monitor.

2.5.2 Liberty Monitor Local Grid with Uniform Receptor Heights

Because AERMOD is very sensitive to receptor elevation, a second receptor grid similar to the original Liberty monitor grid was created. This version set all receptor heights equal to the elevation of the maximum predicted concentration with the grid. The rationale behind testing this grid was to account for the possibility that within such complex terrain, the elevation differentials between receptors could result in drastically different SO_2 concentrations than other nearby receptors. This receptor grid was used for a single additional evaluation of the most accurate AERMOD scenario.

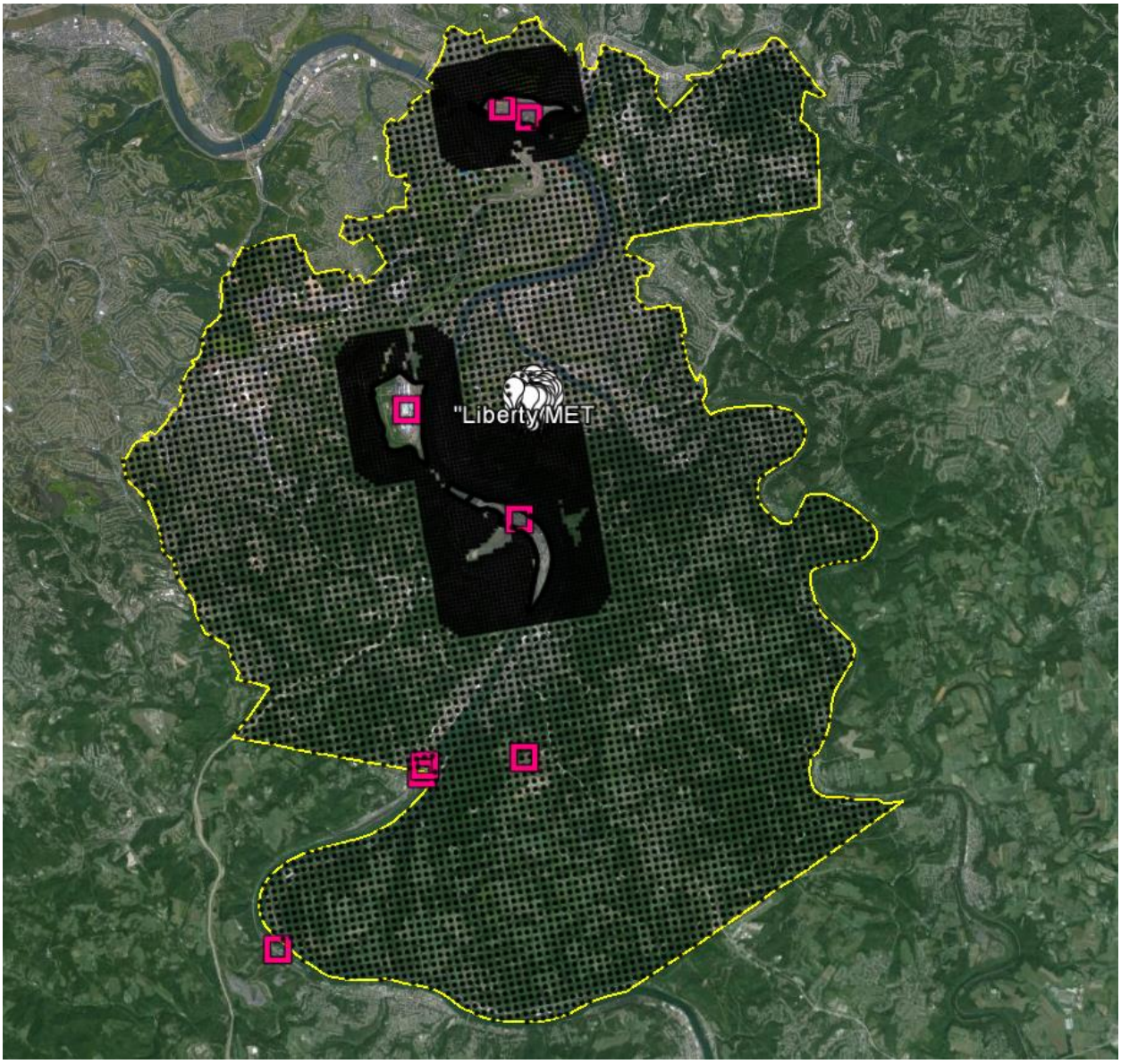


Figure 8: Receptor locations specified by ACHD: full-domain, nested grids.

2.5.3 ACHD Full Domain Grid

In addition, a more comprehensive "full domain" grid was provided by the Allegheny County Health Department for further evaluation. This receptor grid consists of three 100m Cartesian spaced grids nested within a full-domain 200m grid, clipped to the NAA. The nested 100m grids surround the major sources in the NAA: U.S. Steel Edgar Thomson, Harsco/Braddock Recovery, U.S. Steel Irvin, and U.S. Steel Clairton facilities. Additional fenceline receptors with a spacing of 50m surround each facility's perimeter. This receptor set, illustrated in Figure 8 with black dots representing the receptors, contains 9978 receptors in total. The Liberty receptors are also included for scale, shown as white markers near the middle of the domain. With such a large number of receptors in this file, the resources and time needed for model evaluation increase over those required when using the Liberty monitor grid. Therefore, the full domain grid was tested just once for each of the best performing observation-based and WRF-MMIF-based AERMOD configuration, to assess

the costs and benefits of applying the full domain receptor grid. In particular, EPA guidance for AERMOD indicates that it can predict the high values somewhere within the modeling domain, at sometime within the modeling period. This grid was designed to assess that approach, by comparing the highest predicted value *anywhere* within the NAA to the highest value observed at the Liberty monitor.

2.6 AERMOD Modeling Configurations

The AERMOD modeling system was developed as the next generation regulatory air quality dispersion model, designed to incorporate state-of-the-art PBL structure based on Monin-Obukhov Similarity theory. Monin-Obukhov theory uses scaling factors based on the rate of heat and momentum surface fluxes to describe the structure and evolution of the PBL. AERMOD requires a complex set of meteorological inputs to characterize the PBL structure and the turbulence parameters used to estimate rates of dispersion.

AERMOD requires two meteorological files as input: a surface meteorological file (SFC file) and an upper-air temperature and wind profile file (PFL file). Each file contains a time-series of hourly-averaged meteorological variables. The PFL file need only include wind and temperature information at a single height, but turbulence measurements and information at additional heights may improve the accuracy of the simulation by providing a more complete description of the atmospheric structure for AERMOD.

As discussed in Section 2.3, the MMIF program provides a method to extract WRF data and create SFC and PFL meteorology files for AERMOD, either with or without running AERMET.

2.6.1 Default Settings

Version 15181 of AERMOD was used for this dispersion model performance evaluation. After this work was completed, AERMOD v16216r was released, but the primary differences between the two versions are that several options that were *beta* are now regulatory-default. Most of the MMIF-driven and OBS-driven AERMOD runs use default modeling options, in accordance with EPA's guidance. These default settings include:

- Rural mode for all sites in the nonattainment area
- No flagpole receptors
- Building parameters (BPIP runs) for stacks potentially affected by downwash
- Averaging period: 1 hour (for attainment purposes, but the secondary 3-hour and former 24-hour and annual averaging periods will also be examined)

2.6.2 Beta options

The AERMOD settings described above were applied to all of the meteorological scenarios tested, and evaluated for the Allegheny County domain using the multi-layered testing process described in Section 3. The best-performing MMIF-based configuration was then used to test the AERMOD *beta* option of LowWind3, while the best-performing run that used AERMET was applied to test the Adjust_U* option. The results of these new outputs were then re-evaluated to assess the effects of these options.

The LowWind3 *beta* option was incorporated in AERMOD to address a tendency of the model to over-predict pollutant concentrations in stable, low-wind conditions with low-frequency horizontal wind oscillations, or "meander." A separate run with the LowWind3 option was executed using the most accurate MMIF-based AERMOD run, after the initial modeling performance evaluation was completed.

The Adjust_U* (or ADJ_U*) option in AERMOD intended to prevent pollutant over-prediction due to light winds. During low-wind conditions, AERMET has been found to underestimate friction velocity, or U*, which is used to calculate mixing height and initial horizontal and vertical dispersion. The ADJ_U* option activates an alternative method of calculating U* using the Bulk Richardson Number approach based on Luar and Raynor (2009). The ADJ_U* option is an AERMET option (not an AERMOD option), so the most accurate WRF-MMIF-AERMET-AERMOD simulation was re-run with this option and re-evaluated.

AERMOD also contains an URBANOPT pathway that activates urban-specific dispersion algorithms. The purpose of this option is to account for the enhanced dispersion of a convective-like boundary layer that forms during nighttime conditions due to the urban heat island effect. When this option is activated, AERMOD increases the turbulent diffusion compared to the typically stable rural boundary layer.

To characterize the magnitude of the urban heat island effect, AERMOD uses a population input on the URBANOPT keyword. The basis for determining the urban/rural status of a source is provided by the EPA's Guideline on Air Quality Models (U.S. EPA 2017). Typically, the Land Use Procedure within this document is sufficient for determining the urban/rural status of sources. However, some sources are recommended to be modeled as urban sources if they are located in an "urban complex," even if the location doesn't fit the urban category on a population basis.

The site characteristics of many large industrial sources also create heat islands and enhanced nighttime boundary layer convection. Paine et al. (2016) endorses a methodology for calculating an *effective* population to initialize AERMOD's URBANOPT pathway for industrial sources surrounded by rural areas. The calculation depends on facility-to-rural temperature difference given the following equation:

$$\Delta T_{u\text{-}r} = \Delta T_{max}[0.1 \ln(P/P_o) + 1.0]$$

where ΔT_{max} = 12 K, P_o = 2,000,000, and P is the effective population to be input to AERMOD's URBANOPT pathway. To characterize the urban heat island effect over the industrial sources in Allegheny County along the Monongahela River, LANDSAT8 thermal satellite images of the region captured during the 3-year study period were analyzed from all seasons. Estimates of $\Delta T_{u\text{-}r}$ were calculated using brightness temperature readings of the source locations compared to their surrounding areas. Average $\Delta T_{u\text{-}r}$ values of about 10.4 K, corresponding to an effective population of about 500,000, were calculated for the larger industrial sources in the Allegheny, PA NAA.

2.7 Sources and Emissions

The emissions inventory provided by ACHD focused on the significant SO_2 emission sources within or near the non-attainment area (NAA). For the model evaluation the emission rates were best estimates of actual emissions, as opposed to allowable or potential emission rates that must be used in the attainment demonstration AERMOD simulations.

Smaller sources within the NAA and some sources outside of the NAA were screened for impact on the NAA, based on the recommended limit for AERMOD transport of 50 km. Sources within the NAA reporting 0.1 or more tons/year of SO_2 were evaluated using AERSCREEN to determine whether their maximum 1-hour SO_2 impact is above the significant impact level (SIL) of 3 ppb. Sources outside the area reporting 5 or more tons/year of SO_2 emissions were similarly screened. Sources determined to be above the SIL underwent refined screening using AERMOD, where the source concentrations were

compared to background SO_2 concentrations. If the AERMOD-predicted concentrations for a source were below the background concentration, the monitor observations and met data were examined. High observed concentrations from the direction of the source warranted including the source in the final model. If concentrations were low when winds were from the direction of the source, other factors including permits/controls, topography, federal/state rules were examined. Sources were ultimately screened out if evidence suggests that the source does/will not contribute to SO_2 concentrations in the NAA.

The screening process eliminated the Cheswick power plant boilers and Bay Valley boilers from the rest of the modeling assessment, as their maximum SO_2 impacts were found to be sufficiently low in the NAA. These sources were located outside of the modeling domain, to the north. However, two sources to the south outside the NAA were retained, due to their emissions levels. The locations of all the sources to be modeled, as well as the Liberty monitor, are shown below in Figure 9. The boundary of the NAA and the 0.444 km spaced grid (domain 5) are also included for reference.

Stacks and towers were modeled as point sources in AERMOD. Building parameters of these point sources were also included for downwash characterizations in the model. Fugitive emissions from ambient-temperature processes were modeled as volume sources, while buoyant fugitive emissions from the coke oven batteries at USS Clairton were modeled as a series of point sources. Otherwise, all SO_2 emissions from area, non-road, and mobile sources were considered to be background, and are considered to be accounted for in the background concentrations added to the model results.

The characterization of the battery line fugitive emissions the U.S. Steel's Clairton facility as buoyant line sources was complicated due to the uncertainties in approximating the amount of heat and buoyancy affecting these low-level emissions. The Buoyant Line and Point (BLP) model is the preferred method for modeling buoyant line sources and as recently been implemented in AERMOD. However, BLP is a flat terrain model that relies on outdated stability treatment, and therefore is not ideal for the complex terrain of Allegheny County. Although BLP has been incorporated into AERMOD v15181 with significant bug fixes in AERMOD v16216r, there are still a number of limitations. Instead, the battery line fugitives were modeled as a series of point sources in a row, in order to properly account for the buoyancy of the high temperatures (1400-2100 °F) by utilizing the AERMOD plume rise algorithms.

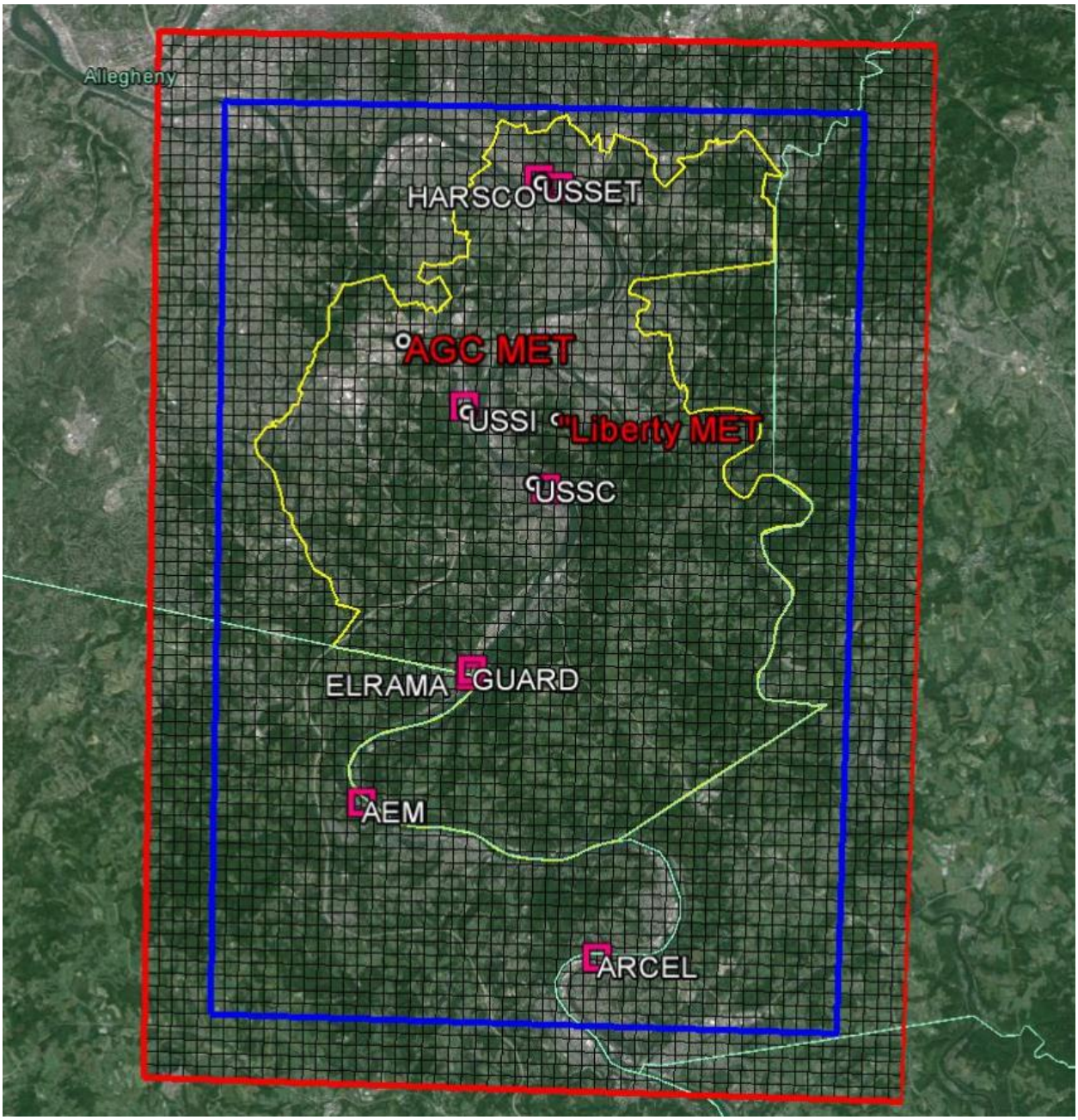


Figure 9: Locations of sources (pink squares), the NAA boundary (yellow), and the 0.444 m grid.

3. DISPERSION MODELING PERFORMANCE EVALUATION

3.1 Multi-Layered Model Testing Process

The Modeling Protocol for Alleghany County 1-hour SO_2 SIP described a multi-layered model testing process, as recommended by the previous EPA modeling guidance (U.S. EPA, 2007). This process was applied to the 3-year AERMOD model evaluation and consists of four components: operational, diagnostic, mechanistic (or scientific also called dynamic), and probabilistic evaluation. For SO_2 modeling, this multi-layered framework may be viewed conceptually as follows:

> Operational Evaluation: Tests the ability of the model to estimate SO_2 concentrations. This evaluation examines whether the measurements are properly represented by the model predictions but does not necessarily ensure that the model is getting "the right answer for the right reason";
>
> Diagnostic Evaluation: For SO_2, this step tests the ability of the model to get the right answer for the right reason;
>
> Mechanistic Evaluation: Tests the ability of the model to predict the response of SO_2 to changes in variables such as emissions and meteorology;
>
> Probabilistic Evaluation: Takes into account the uncertainties associated with the model predictions and observations of SO_2.

The multi-layered testing process was used to evaluate all of the AERMOD configurations. First, the results of all MMIF-based configurations were evaluated against observations using a number of statistical performance measures. This addressed the operational evaluation. The mechanistic evaluation was inherent in this step, given the range of meteorological inputs and configurations for which the results were analyzed. The evaluation was based on model output of $\mu g/m^3$ SO_2, as estimated at the 500m-radius grid of receptors around the Liberty monitoring site, and corresponding observations at the Liberty monitoring station for the entirety of the years 2012 through 2014. The list and definitions of the statistical measures used are provided below in Section 3.2. Within each model configuration, every measure was calculated for the model predictions on three scenarios: site-specific SO_2 concentrations at the Liberty monitor, mean 1-hour concentrations, and maximum 1-hour concentrations. The best-performing model configuration for each scenario within each statistical measure was noted, and total "wins" of all configurations were tabulated to provide a primary estimate of the most accurate AERMOD configuration for 2012-2014 SO_2 concentrations in Allegheny County.

The Operational evaluation also included a series of piecewise analysis steps to more closely assess the relative impacts of each variation between the numerous MMIF-based AERMOD configurations. Namely, the different WRF domains, vertical level configurations, mixing height diagnosis methods, and AERMOD Beta options were alternately compared, with all other factors held constant. The resulting theoretically ideal AERMOD configuration was then compared to that with the most statistical "wins."

Probabilistic evaluation was addressed using the model evaluation method introduced by Cox and Tikvart (1990). This technique is based on the Robust Highest Concentration (RHC) statistic, which is a smoothed estimate of the highest concentrations predicted by each model configuration. To produce this statistic, data is resampled to determine a probability

distribution of outcomes for the model configurations. This method is known as bootstrapping and also results in confidence intervals for composite performance measures (CPM) of all configurations. The CPM combines absolute fractional biases at different averaging times. Thus, a CPM outside of the confidence interval of that for a different model configuration would prove it to be statistically different, in terms of concentration accuracy. This method is known to work best for long-term, sparse network evaluation databases.

The diagnostic evaluation consisted of evaluating the input meteorology where maximum SO_2 concentrations occurred, as well comparing the time and space of the maximum concentrations. The results of this step are summarized in Section 3.4.

3.2 Core Statistical Measure Definitions

To facilitate the operational evaluation of model results, core statistical measures were calculated for each meteorological input scenario, against monitor observations, on three bases: maximum hourly concentrations of each day, site-specific hourly concentrations at the monitor location, and mean hourly concentrations of each day. The core statistical measures examined are listed below in Table 1. In addition, the 99th percentile concentration and number of NAAQS exceedances were calculated for each modeling scenario within the 1-hour daily maximum group.

Table 1. Core Statistical Measures for Air Quality Model Evaluation

Statistical Measure	Mathematical Expression	Notes
Accuracy of paired peak (***A_p***)	$\frac{P - O_{peak}}{O_{peak}}$	P_{peak} = paired (in both time and space) peak prediction
Coefficient of determination (***r^2***)	$\frac{\left[\sum_{i=1}^{N}(P_i - \overline{P})(O_i - \overline{O})\right]^2}{\sum_{i=1}^{N}(P_i - \overline{P})^2 \sum_{i=1}^{N}(O_i - \overline{O})^2}$	P_i = prediction at time and location i; O_i = observation at time and location i; $\overline{P}$ = arithmetic average of P_i, i=1,2,…,N; $\overline{O}$ = arithmetic average of O_i, i=1,2,…,N
Normalized Mean Error (***NME***)	$\frac{\sum_{i=1}^{N}\lvert P_i - O_i \rvert}{\sum_{i=1}^{N} O_i}$	Reported as %
Root Mean Square Error (***RMSE***)	$\left[\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2\right]^{1/2}$	Reported as %

Statistical Measure	Mathematical Expression	Notes
Fractional Gross Error (***F_E***)	$\frac{2}{N}\sum_{i=1}^{N}\left\lvert\frac{P_i - O_i}{P_i + O_i}\right\rvert$	Reported as %
Mean Absolute Gross Error (***MAGE***)	$\frac{1}{N}\sum_{i=1}^{N}\lvert P_i - O_i\rvert$	Reported as concentration (e.g., μg/m^3)
Mean Normalized Gross Error (***MNGE***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{\lvert P_i - O_i\rvert}{O_i}$	Reported as %
Mean Bias (***MB***)	$\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)$	Reported as concentration (e.g., μg/m^3)
Mean Normalized Bias (***MNB***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{(P_i - O_i)}{O_i}$	Reported as %
Mean Fractionalized Bias (Fractional Bias, ***MFB***)	$\frac{2}{N}\sum_{i=1}^{N}\left(\frac{P_i - O_i}{P_i + O_i}\right)$	Reported as %
Normalized Mean Bias **(*NMB*)**	$\frac{\sum_{i=1}^{N}(P_i - O_i)}{\sum_{i=1}^{N}O_i}$	Reported as %
Bias Factor (***BF***)	$\frac{1}{N}\sum_{i=1}^{N}\left(\frac{P_i}{O_i}\right)$	Reported as BF:1 or 1:BF or in fractional notation (BF/1 or 1/BF).

3.3 Operational Evaluation of Model Results

Initial evaluations of AERMOD model performance (not shown) used all receptors within 500m of the Liberty monitor, and compared the maximum predicted concentration over all considered receptors to the measured concentration for that hour. We first evaluated how the system performed using various sub-sets of the receptors, starting with just the center receptor, then adding the receptors at 100m radius, then adding the receptors at 200m radius, etc., out to 500m radius. The best model performance was found when receptors within 200m from the Liberty monitor were used. The terrain in the immediate vicinity of the Liberty monitor is flat within about 200m of the monitor and then slopes downhill both to the South and North. The 200m radius allows for a slight inaccuracy in the wind direction (and resultant plume direction) without triggering AERMOD's terrain treatment of the

plume. The remainder of the assessment presented herein paired the maximum prediction within 200m with the observation at the Liberty monitor.

A Q-Q plot pairing "traditional" OBS-based AERMOD using observations at the Liberty monitor via the ONSITE pathway, combined with surface (SURFACE pathway) and upper air (UPPERAIR pathway) data from the Pittsburgh airport is shown below in Figure 10. The other OBS-based AERMOD results were similar, with strong tendencies to under-predict by over a factor of 2 (the red dotted lines in Figure 10) the higher end of SO_2 concentrations. This poor performance is one of the reasons we investigated the use of prognostic meteorology for defining AERMOD inputs.

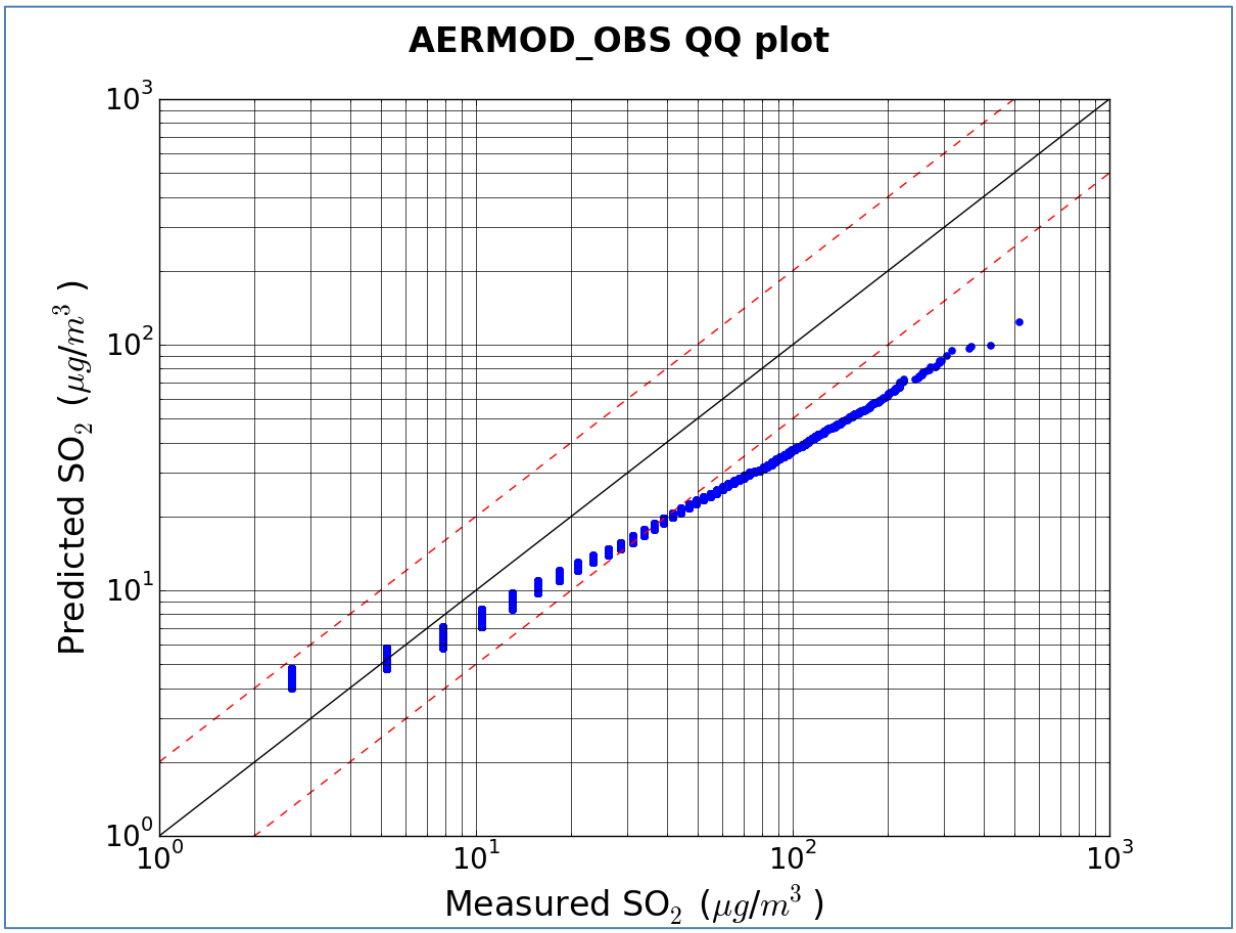


Figure 10. Q-Q plot of AERMOD 1-hr SO_2 predictions using observed meteorology (Liberty ONSITE) compared to SO_2 observations at the Liberty monitoring site.

Based on the available options to both MMIF and the AERMOD modeling system, there are a number of "questions" we set out to answer to identify an adequate dispersion model configuration for simulating SO_2 concentrations in the Allegheny, PA NAA, namely:

- How fine does the resolution of the WRF model need to be?
- How high above the ground does the upper air data need to reach, and how fine does its resolution need to be?
- Which estimate of the mixing height produces the best model performance?

- Does the WRF-MMIF-AERMET-AERMOD method perform better than the WRF-MMIF-AERMOD method?
- Do AERMOD's *beta* options produce better results?

The remainder of this sub-section addresses these questions, one by one.

3.3.1 WRF Domain Resolution

Using the 444m resolution WRF domain yielded slightly more accurate AERMOD results than using the 1.3km domain, particularly for higher concentrations. Both the 444m and 1.3km improved SO_2 prediction significantly over using the 4km grid. While the 1.33km gridded domain generated a marginally superior Cox-Tikvart CPM statistic than the 444m domain (as shown in Figure 11) the finer domain had less of a tendency to over-predict some of the higher SO_2 concentrations, as shown in the Q-Q plots in Figure 12.

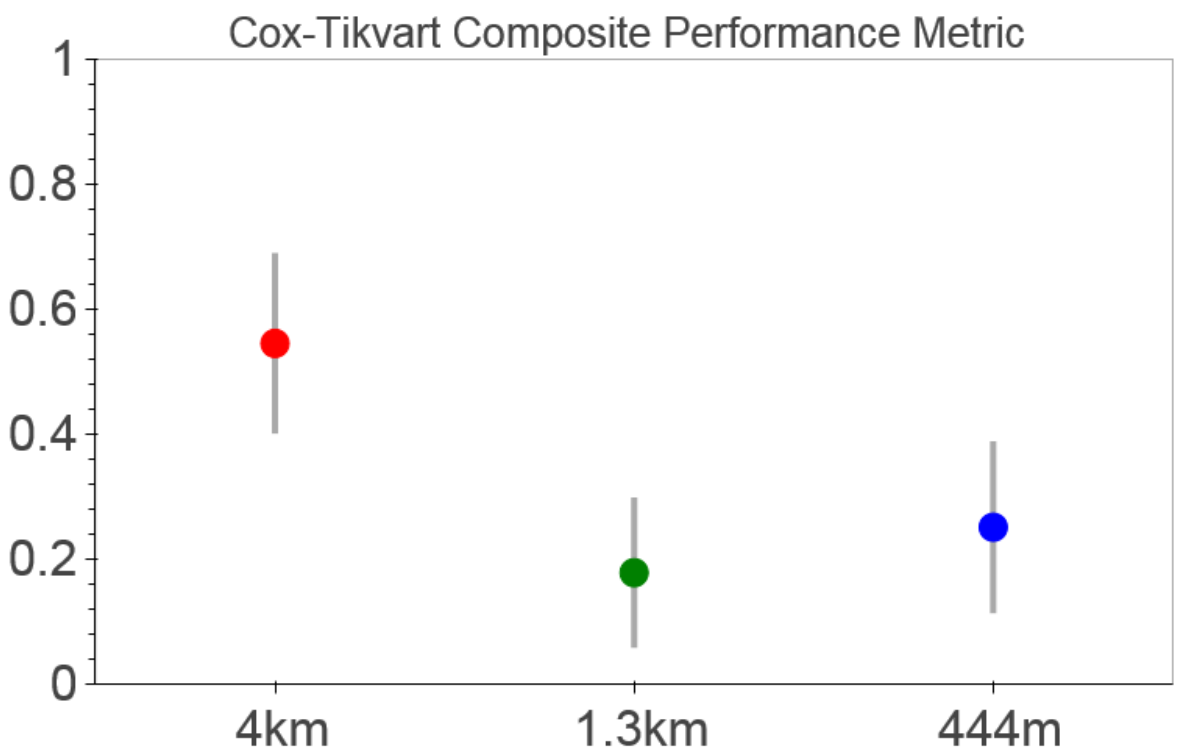
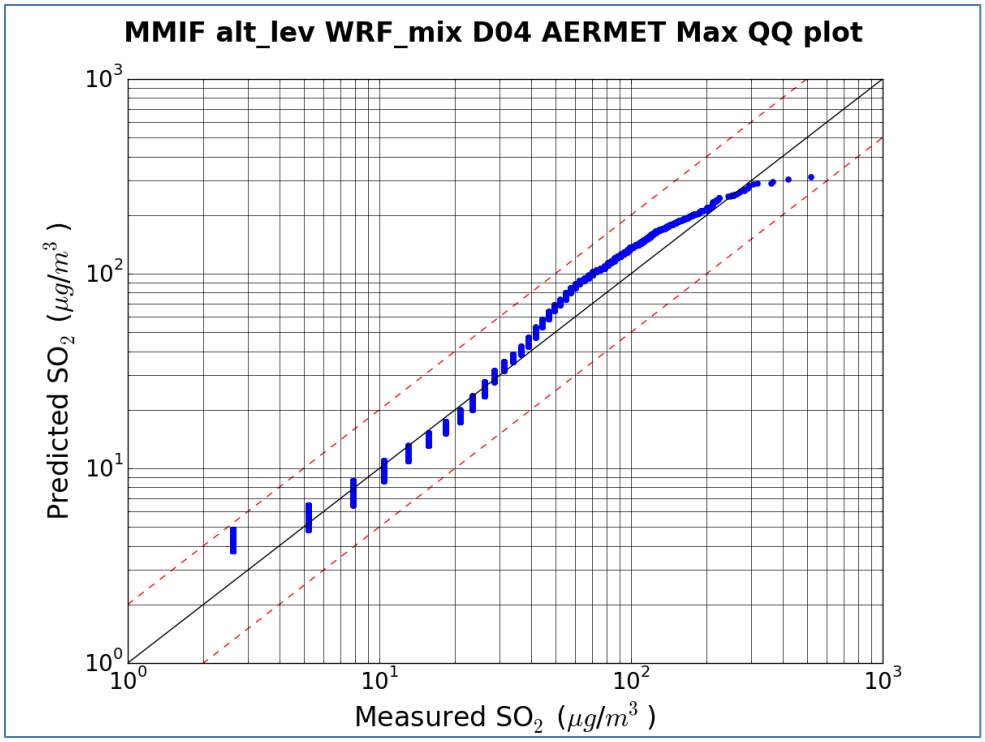


Figure 11. Cox-Tikvart composite performance metrics for various WRF domain horizontal resolutions.



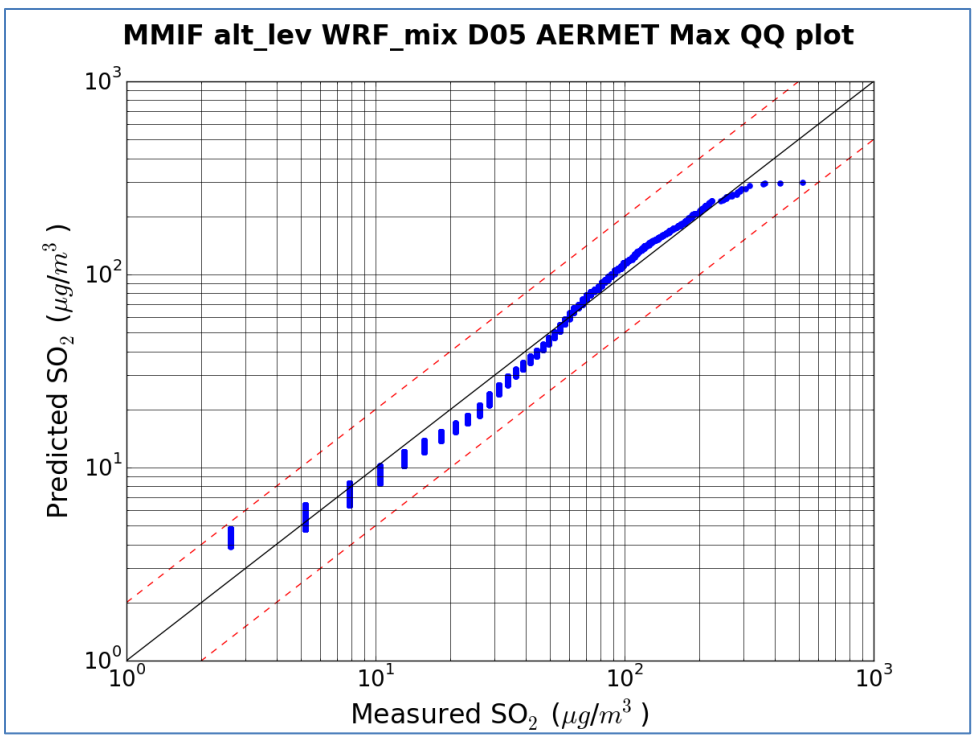


Figure 12. Q-Q plots of paired predicted vs. measured SO_2concentrations for (top) WRF 1.33 km grid spacing and (bottom) WRF 444 m grid spacing using an AERMOD configuration of alternate EPA guidance levels, WRF mixing height diagnosis, and AERMET processing.

3.3.2 Vertical Profile Resolution

AERMOD 1-hr SO_2 performance was similar for all different vertical level methods that were tested through MMIF; namely

- The levels from the EPA MMIF guidance (U.S. EPA, 2016)
  - LAYERS MID 25 50 75 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 4500 5000
- An alternate set of levels similar to the draft MMIF guidance, but with the first level centered at 10m, where the tops of each layer are specified
  - LAYERS TOP 20 50 75 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 4500 5000
- FLM/EPA CALMET guidance levels (U.S. EPA, 2009)
  - LAYERS TOP 20 40 80 120 140 160 180 200 250 300 500 1000 2000 4000
- A set of levels designed to be close to the native WRF levels, below 5km
  - LAYERS TOP 12 22 34 46 56 68 80 98 116 136 154 174 192 212 234 258 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 4500 5000
- A truncated set of levels close to the native WRF level, below 50m
  - LAYERS TOP 12 22 34 46

The last option (WRF_50m) was designed to test whether the positive wind speed bias above 50-75m noted in the WRF model performance evaluation had a noticeable effect. As indicated by the Cox-Tikvart CPM chart in Figure 13, AERMOD sensitivity to vertical resolution was low except for the WRF_50m performance that was notably worse. The best-performing is perhaps the FLM/EPA CALMET guidance levels, though it is not statistically so.

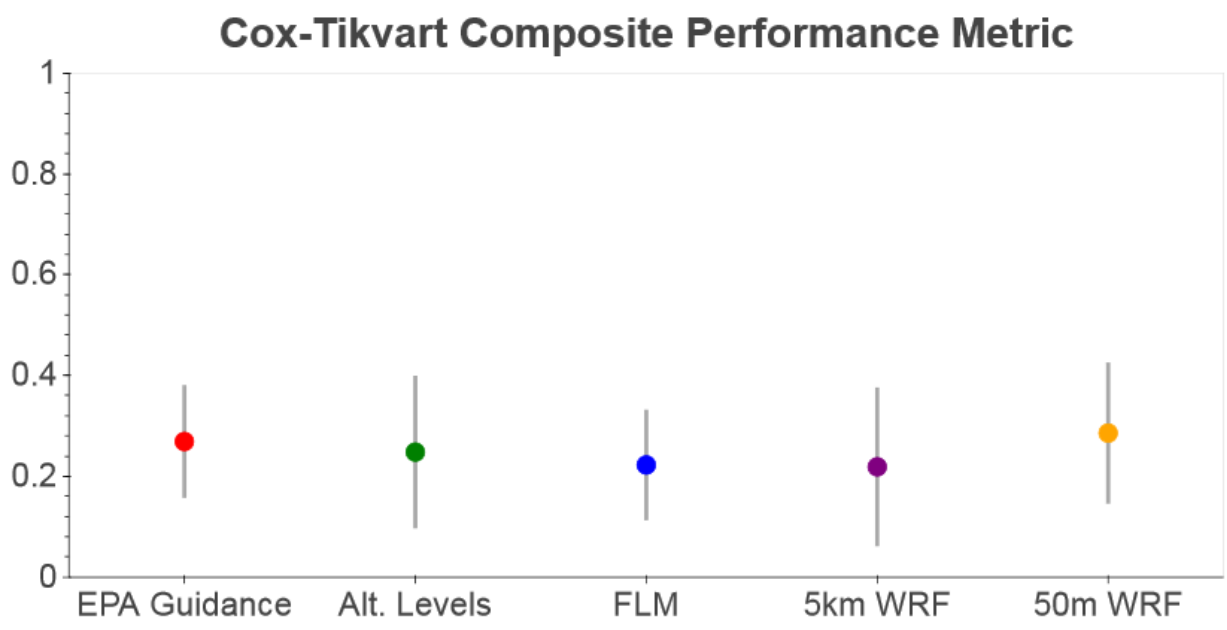


Figure 13. Cox-Tikvart composite performance metrics for various vertical level choices.

3.3.3 Mixing Height formulation

The three sources for mixing height tested in this study were WRF's PBL scheme, MMIF PBL re-diagnosis, and AERMET's mixed layer model. AERMET's mixed layer model yielded the strongest 1-hr SO_2 model performance. The MMIF and AERMET recalculation methods both improved upon the WRF PBL scheme to a similar degree, as seen in Figure 14. Figure 15 illustrates how WRF mixing heights are quantized, "snapped" to the vertical levels in WRF. WRF uses a pressure-based vertical coordinate, which when converted to height above ground will vary in time (because surface pressure varies), but the quantization of levels is clear in the figure. This can lead to significant discrepancy when compared to mixing heights calculated by MMIF or, in this case, AERMET. The AERMET method produced more accurate SO_2 predictions at the highest concentrations, as shown below in Figure 16. The AERMET mixed layer model was selected as the superior mixing height formulation method for its ability to lead to more accurate robust highest concentration (RHC) predictions in AERMOD.

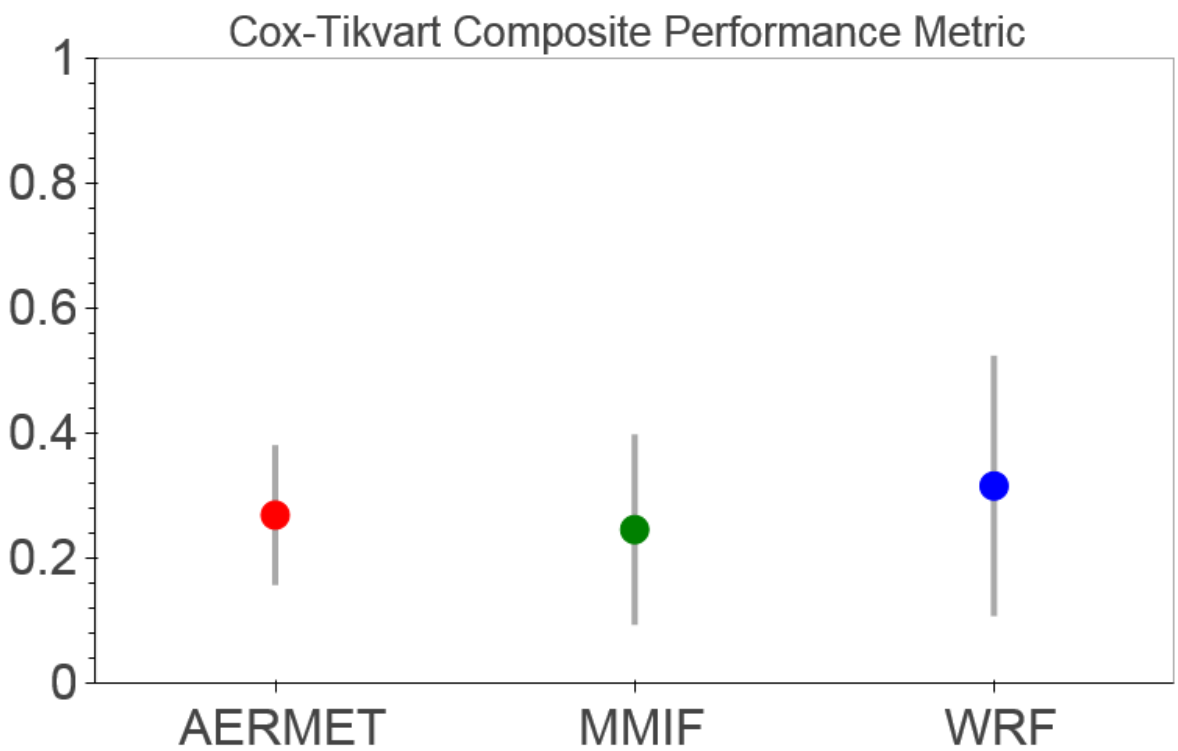


Figure 14. Cox-Tikvart composite performance metrics for AERMET-, MMIF- and WRF-supplied mixing heights

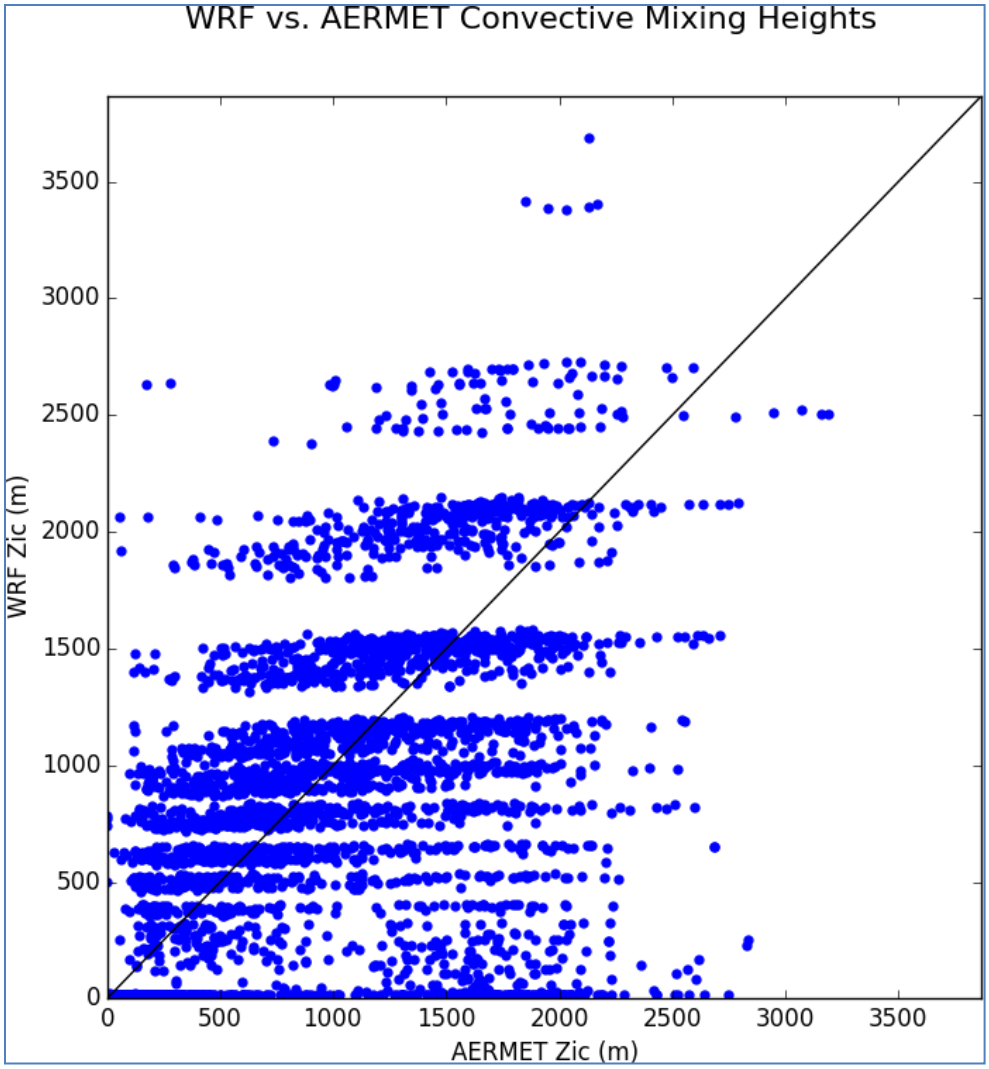
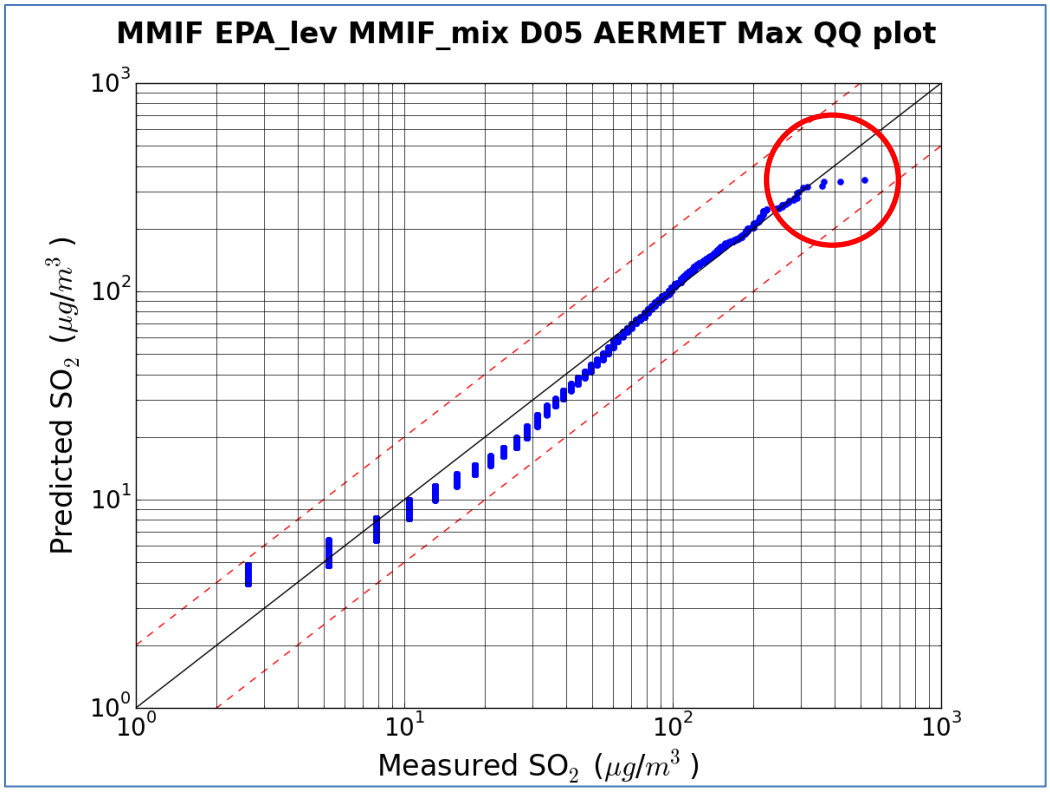


Figure 15. WRF mixing heights vs. AERMET convective mixing heights



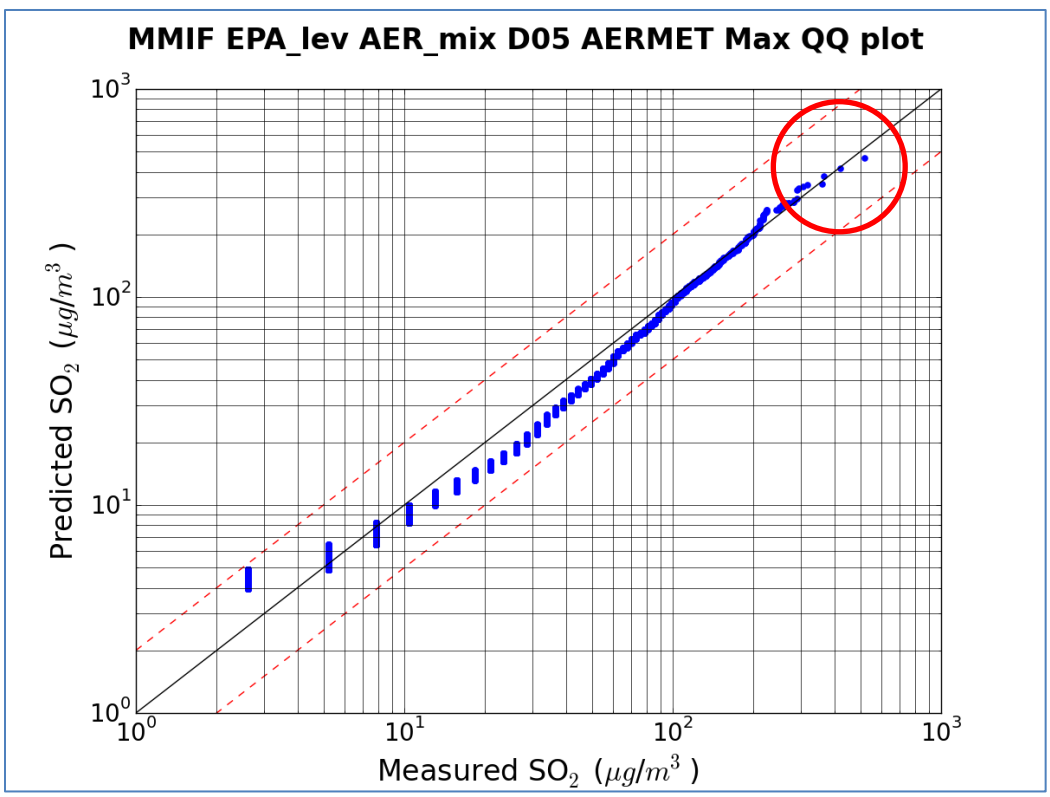


Figure 16. Q-Q plots of predicted vs. measured SO_2 using (top) MMIF mixing heights, and (bottom) AERMET mixing heights

3.3.4 AERMET and AERMOD modes

Utilizing MMIF inputs through AERMET and AERMOD modes provided very similar results, shown in Figure 17. Applying AERMET processing yielded marginal improvements at higher SO_2 concentrations, presumably due to its mixing height model. Therefore the AERMET processing mode, which is consistent with EPA MMIF guidance, was selected.

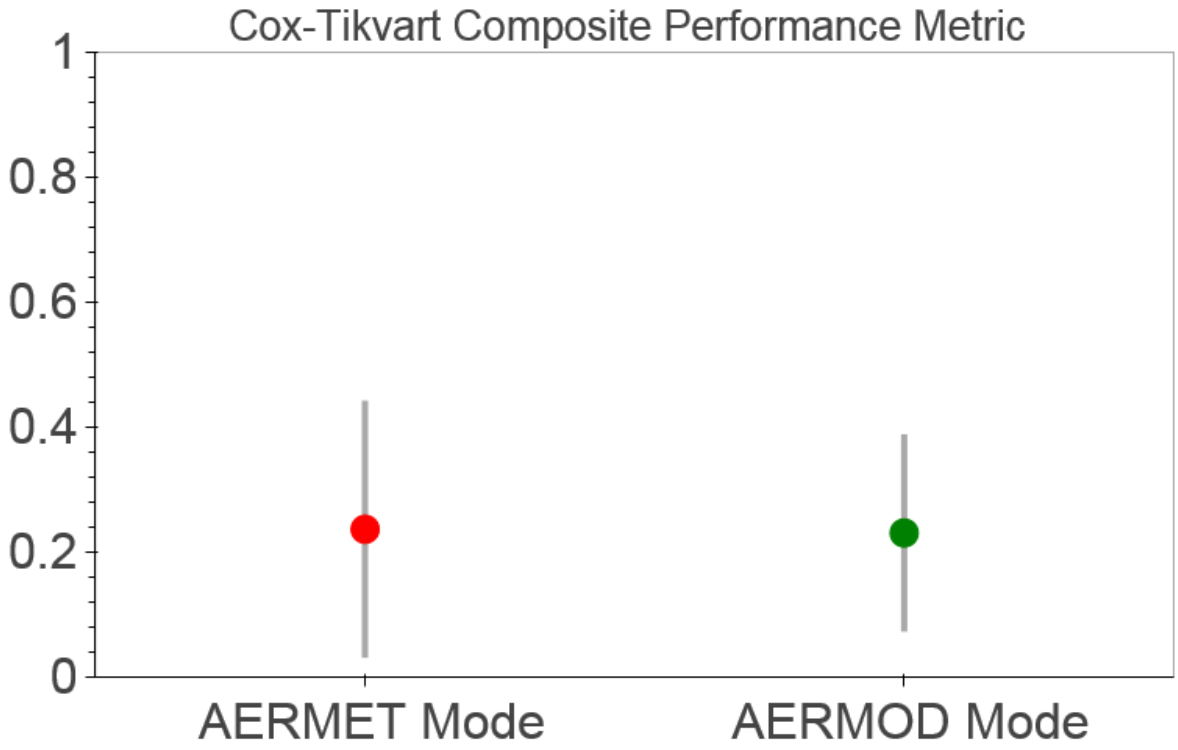


Figure 17. Cox-Tikvart composite performance metrics for AERMET and AERMOD modes in MMIF. AERMOD mode skips the step of running AERMET.

3.3.5 Beta Options

The AERMET option ADJ_U* and the AERMOD *beta* options of LOWWIND3 and effective URBAN dispersion mode are shown in Figure 18. These options failed to improve upon 1-hr SO_2 prediction accuracy for the test cases. Most of the scenarios using these options severely under-predicted 1-hr SO_2 at the Liberty monitor. The LOWWIND3 option did not decrease concentrations as drastically and thus yielded reasonable results when compared with certain AERMOD configurations. However, it did not significantly improve any model scenarios. However, the ADJ_U* option may reduce the presumed over-prediction in the immediate vicinity of the larger industrial facilities (see Figure 30).

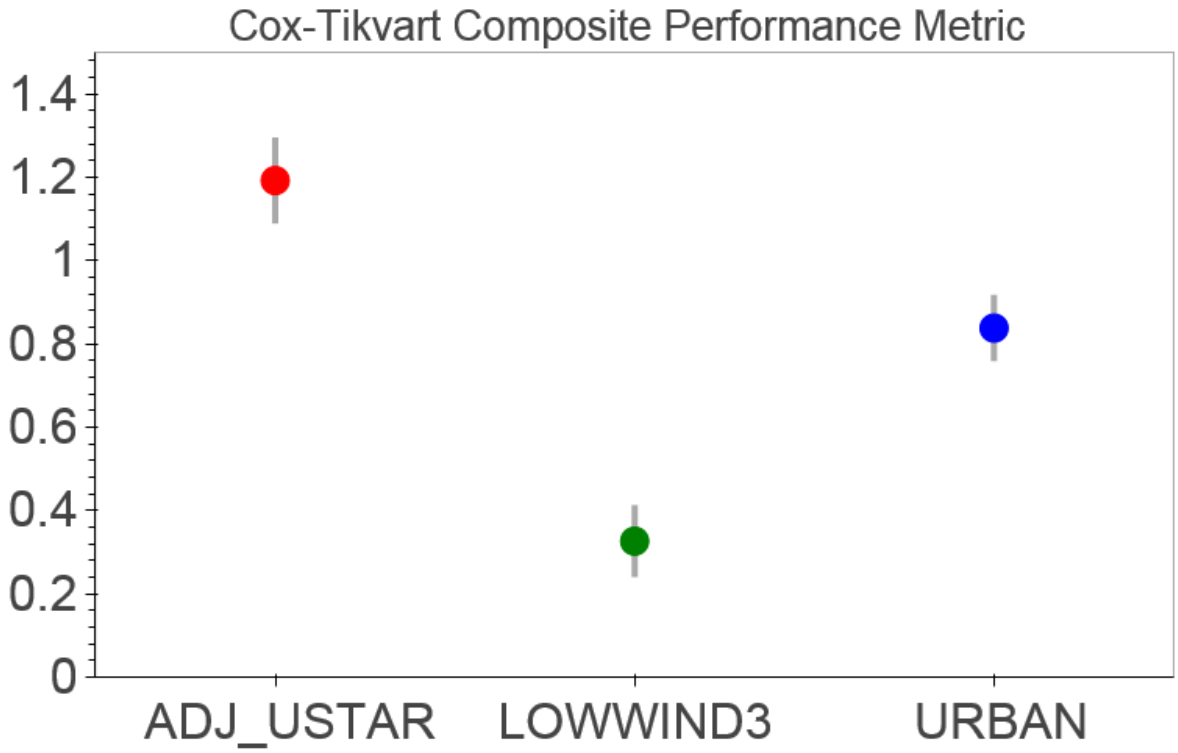


Figure 18. Cox-Tikvart composite performance metrics for three *beta* options in the AERMOD v15181 modeling system.

3.3.6 CALPUFF

Initial tests were conducted using a 1-year WRF dataset and multiple CALPUFF and MMIF configurations (not shown). The initial results from CALPUFF with were not promising, as CALPUFF consistently under-predicted SO_2 concentrations near the Liberty Monitor. To rule out the possibility that the initial test year performance was a statistical outlier, we performed a single CALPUFF test using the best-performing configuration from the initial test year. This "high-resolution" test used more layers than the EPA/FLM 2009 Guidance (U.S. EPA, 2009). Performance for the 3-year dataset was similar to the initial test year.

Most of the MMIF-based AERMOD configurations significantly outperformed the high-resolution meteorology CALPUFF model for 1-hr SO_2 in Allegheny County. CALPUFF model performed notably worse in all performance metrics than nearly all AERMOD test configurations (with the exception of those using the ADJ_U* and Urban dispersion *beta* options) with large negative bias in SO_2 concentrations near the Liberty monitor. Therefore CALPUFF was not considered a viable option for the Allegheny, PA 1-hr SO_2 study. The corresponding CALPUFF Q-Q plot is shown below in Figure 19.

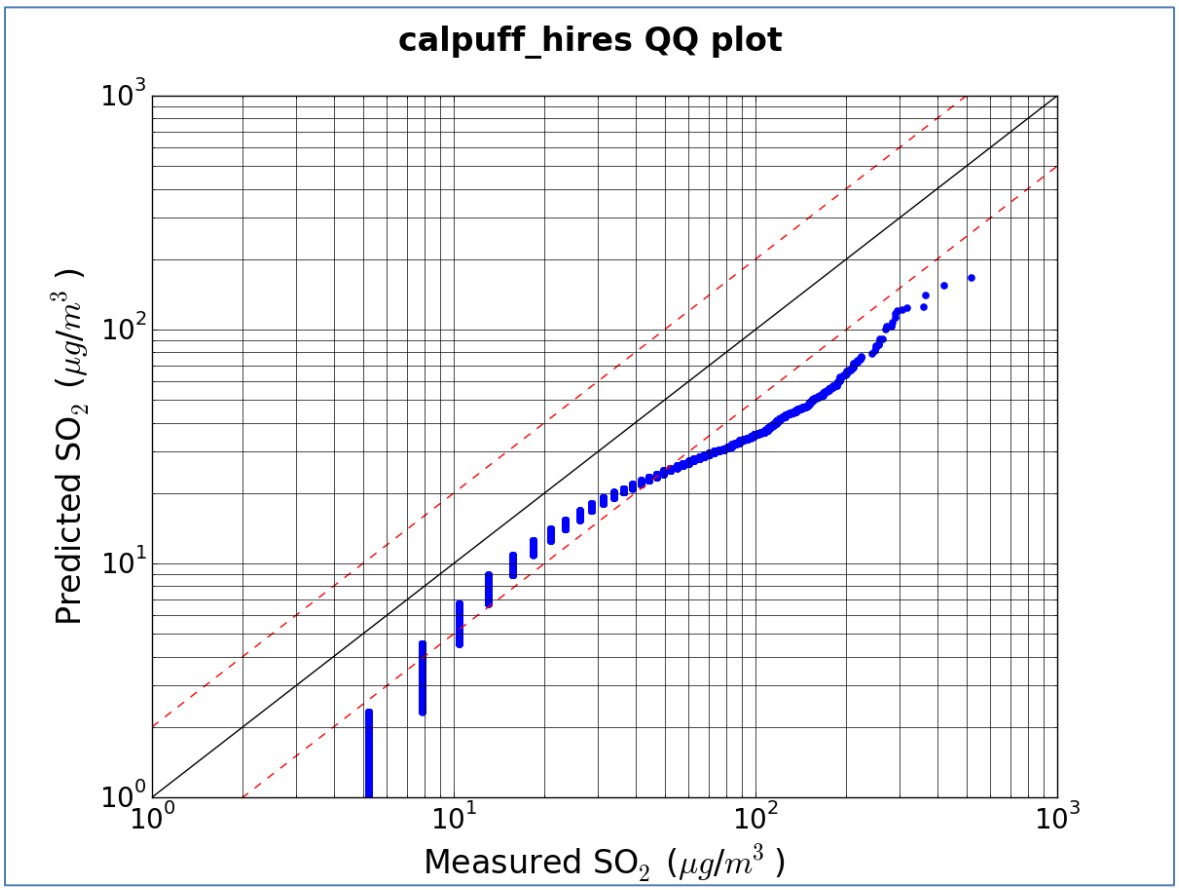


Figure 19. Q-Q plot of predicted vs. measured SO_2 using CALPUFF

3.3.7 Discussion

The step-by-step sensitivity analysis of the model components outlined above has led to the following AERMOD configuration:

- MMIF-based extractions at each facility's location
- 444m resolution WRF data
- AERMET processing mode
- AERMET mixing heights
- EPA guidance vertical levels

This conclusion was formed by comparing each model component option, in a step-by-step process, within a baseline AERMOD model configuration that had been proven to be relatively accurate for the 3-year 1-hr SO_2 study in Allegheny County, PA. The Q-Q plot for this combination was shown previously in the lower plot of Figure 16. The predicted values used for the plot are the maximum hourly SO_2 concentrations modeled within 200m of the Liberty monitoring site. It is evident that this model configuration performed very well at predicting the robust highest concentrations.

The Cox-Tikvart Composite Performance Metric, as described above in Section 3.1, was also used to help evaluate each of the 55 model configurations that were tested for this study. 1000 bootstrap resamples were applied to produce the CPM and corresponding standard deviation for each model configuration. The models with the best three Cox-Tikvart CPM's are listed in Table 2. Also shown are the winner of the step-by-step process (N=4).

The model which generated the lowest (best) CPM differed from that recommended by the piecewise comparison analysis. In fact, the winner of the piecewise comparison generated the 13th-lowest CPM.

The best Cox-Tikvart Composite Model Performance was from N=1, WRF-MMIF-AERMOD (direct mode, skipping AERMET) using WRF vertical layers up to just 50 m, and MMIF mixing heights. It is followed closely in CPM by a similar configuration (N=2) but using WRF-MMIF-AERMET-AERMOD with AERMET mixing heights. Both of these MMIF-based models produced 3-year 99th percentile SO_2 concentrations relatively close to that of the observations – only slightly low. However, the configuration with the best CPM also had the largest under-prediction of the RHC.

The third-best CPM performance (N=3) performed the worst at matching the 99th percentile, the worst in terms of RHC, and the worst in terms of predicting the proper number of exceedances of the NAAQS.

The "winning" model from the step-by-step process (N=4; EPA guidance vertical levels, AERMET mixing height and AERMET processing mode) generated an equally accurate 99th percentile concentration, which is significant for its regulatory relevance. This combination slightly under-predicted RHC, but not as badly as N=1 or N=3. It was also very close in terms of the number of SO_2 exceedances.

Overall, considering not just the CPM but all four metrics shown in Table 2, variant N=2 is perhaps the best overall, even though it features the highest exceedance count and the highest RHC, making it the most conservative choice. If one chooses to value the RHC and CPM of the Cox-Tikvart methodology a little less than the 99th percentile and count of

exceedances, then N=4 could be considered the best-performing model, matching the step-by-step process above.

The Q-Q plots for these two scenarios are shown in Figure 20 and Figure 21. There are only slight differences between the two plots. Perhaps a 60th AERMOD scenario that is a combination of the two, WRF-MMIF-AERMET-AERMOD using EPA levels below 50m and AERMET mixing heights, would produce even better results.

Table 2. Statistics for the configurations with the lowest CPM, and the winner of the step-by-step process

N	Scenario	CPM	99th Percentile (µg/m³)	RHC (µg/m³)	Count > 196 µg/m³
	Liberty Monitor Observations	-	125.7	434.4	23
1	MMIF.wrf_50m.MMIF_mix.D05 AERMOD Mode	0.148	121.1	307.5	24
2	MMIF.wrf_50m.AER_mix.D05 AERMET Mode	0.153	119.7	456.0	28
3	MMIF.EPA_lev.WRF_mix.D05 AERMOD Mode	0.169	111.0	298.1	14
4	MMIF.EPA_lev.AER_mix.D05 AERMET Mode [1]	0.228	121.0	407.5	26

[1] Model configuration selected by the step-by-step analysis process

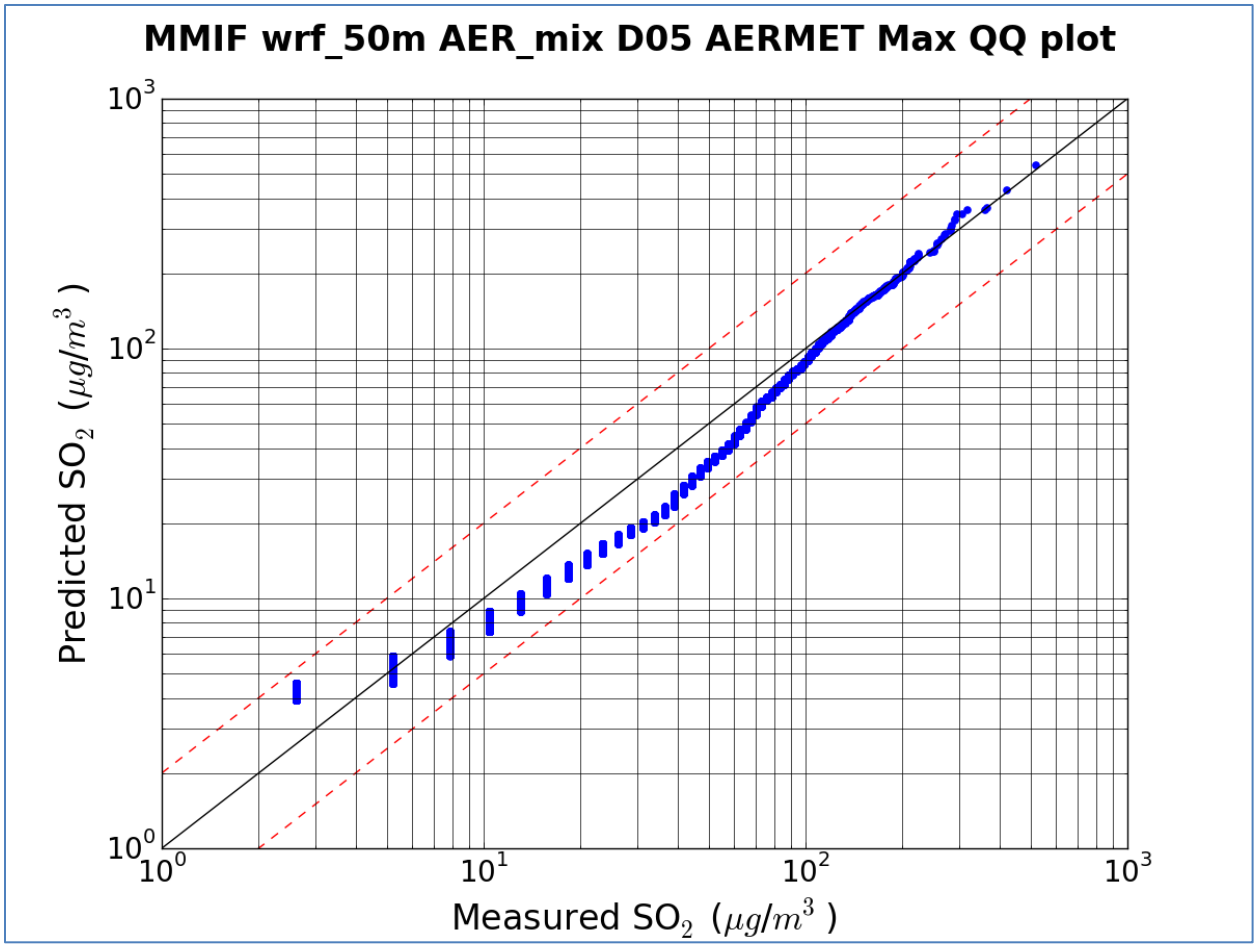


Figure 20. Q-Q plot for native WRF levels below 50m, using AERMET mixing heights, using the 444m WRF domain, in AERMET mode

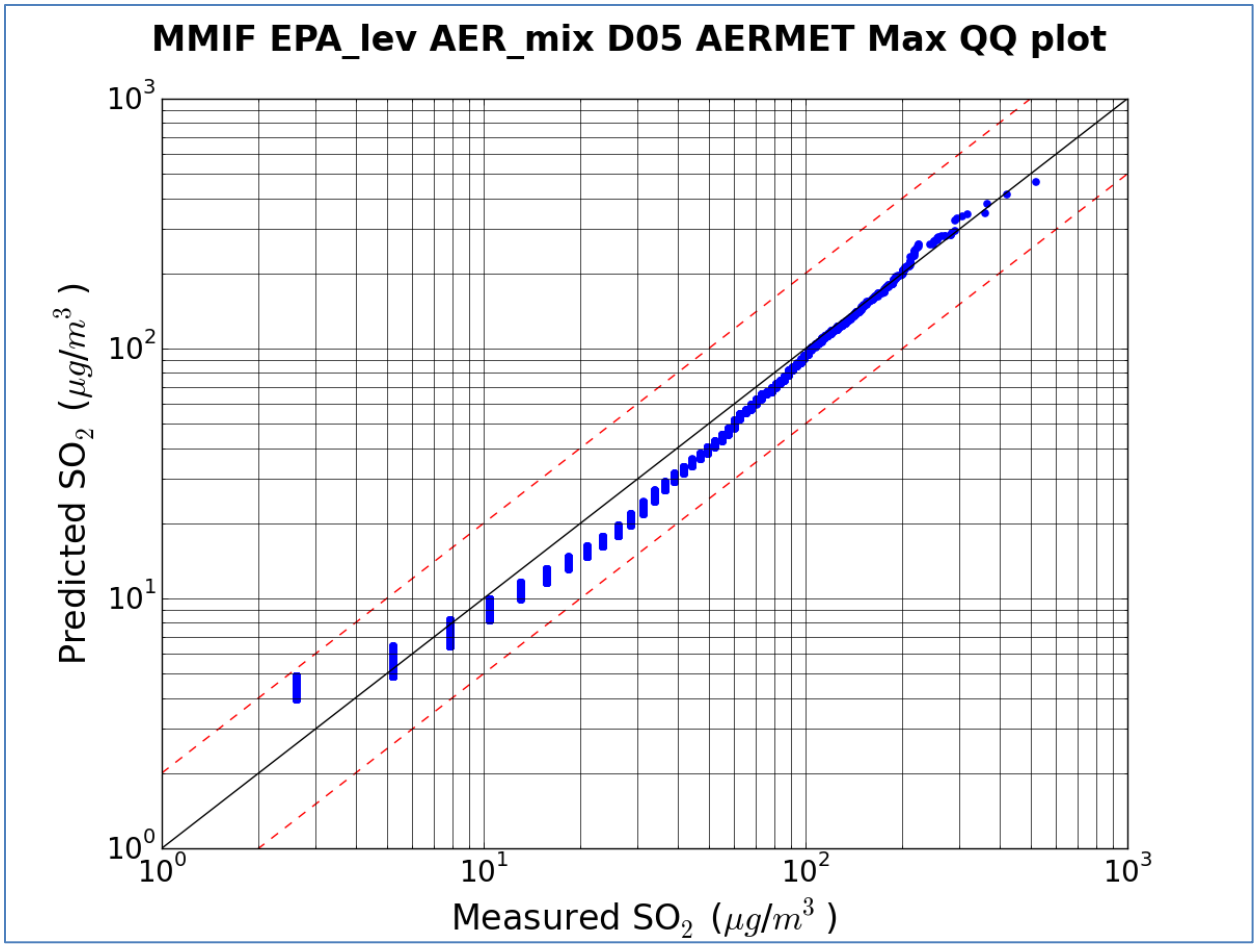


Figure 21. Q-Q plot for EPA Draft Guidance levels, using AERMET's mixing heights, using the 444m WRF domain, in AERMET mode (same as the bottom of Figure 16)

Although the Cox-Tikvart Composite Performance Metric results did not fully agree with the piecewise analysis of MMIF-based AERMOD components, it is still apparent that the superior model for the MMIF-based AERMOD configuration consists of EPA guidance levels, AERMET mixing height and AERMET processing over the finest WRF domain of 444m grid spacing.

Because the motivation for this study was assessing 1-hr SO_2 NAAQS attainment in Allegheny County, the greatest emphasis was placed on accuracy in predicting high-end concentrations. The current requirements for SO_2 attainment are based on a 3-year average of the 99th percentile 1-hr concentration. This places extra importance on achieving accuracy for particular statistic. The winner of the piecewise evaluation is just as accurate in the 3-year 99th percentile concentration and the robust highest concentration statistics as any of the models with higher CPM's. Therefore, the conclusion from initial model analysis remains; the best model performance for 1-hr SO_2 attainment modeling in Allegheny County, PA appears to MMIF-based AERMOD with EPA guidance vertical levels, AERMET mixing height diagnosis and processing, and WRF domain of 444m grid spacing.

3.4 Diagnostic Evaluation of Model Results

The leading MMIF-AERMOD configuration predicted observed maximum SO_2 concentrations with strong temporal accuracy within 200m of the measurement site. However, it is

important to distinguish whether this particular model is producing accurate predictions for the right reasons, or if the apparent accuracy could be a coincidental outcome in spite of erroneous input data. One way to perform this diagnostic evaluation is to compare observed and modeled meteorology leading up to the maximum concentration cases.

In Figure 22 to Figure 25 below, wind roses from met station observations are plotted alongside those representing model extractions at key source locations. The first two, Figure 22 and Figure 23, represent hourly data from the 24 hours leading up to maximum modeled SO_2 concentrations according to the best-performing MMIF-AERMOD configuration. Given this model's apparent accuracy at high-end SO_2 concentrations, agreement between observed and modeled winds would be one indication that the chosen model is making accurate predictions for the right reasons. Observed winds are shown for the Allegheny County Airport (AGC) and Liberty met stations, while extractions of modeled winds are shown for the U.S. Steel Clairton (USSC) and Irvine (USSI) sites, which are the significant SO_2 sources closest to the monitor.

Figure 22 displays surface wind data for the 24 hours leading up to the hour of highest *modeled* hourly SO_2 concentration near the Liberty monitor; 504 μg/m^3 at 4:00 AM on 11/22/2012. This modeled maximum occurred several hours after a period of high observed Liberty concentrations peaking at 249 μg/m^3. While the wind directions differ between sites, both the model and observations show especially calm wind during this period which could be expected to limit pollutant dispersion and lead to high concentrations near the significant sources. In contrast, Figure 23 shows stronger wind speeds during the hours leading up the modeled Liberty concentration of 472 μg/m^3 at 12:00 AM on 9/01/2014. In this case, the modeled wind agrees relatively well with the observations. All sites indicate winds predominantly from the SW. It is also logical that these conditions could lead to high SO_2 concentrations at Liberty, as the U.S. Steel Clairton facility lies just to the SW of the liberty monitor.

Figure 24 and Figure 25 depict wind roses at the same locations in the 24 hours directly prior to the two highest *observed* SO_2 concentrations. The highest observed Liberty 1-hr SO_2 concentration during the three year study period was 422 μg/m^3 at 5:00 AM, 3/13/2012. Figure 24 illustrates that the 24 hours leading up to this maximum were characterized by relatively low wind speeds both modeled and observed near Liberty, with most of these winds coming from the SW. Both the calm nature and SW direction of these winds compare to the modeled and observed conditions of the two maximum modeled concentration cases. At midnight on the morning of 10/24/2012, the second-highest 1-hr concentration of 366 μg/m^3 SO_2 was observed at Liberty. Very similar wind conditions were again observed at the monitor in the build-up to the maximum (Figure 25). This time, the modeled wind at the nearby sources was stronger, but predominantly from the same SW direction.

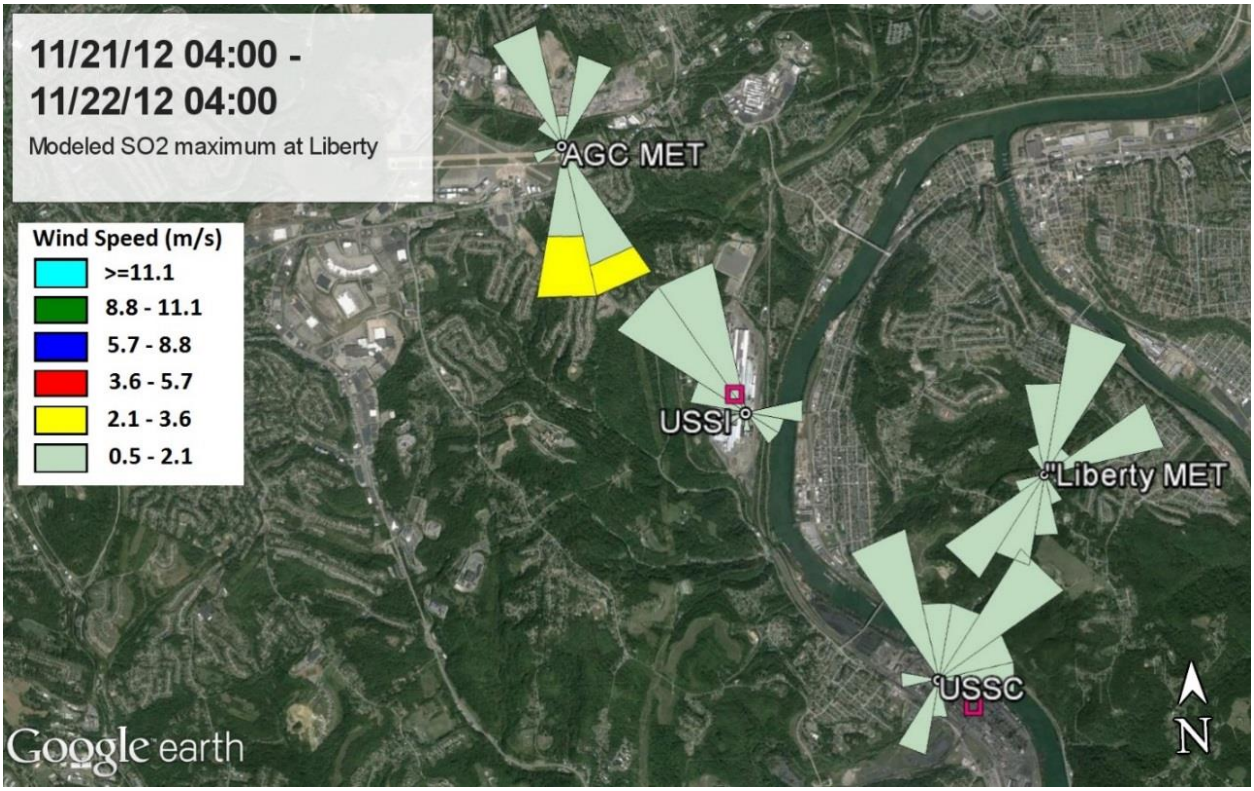


Figure 22. Wind roses for the 24 hours prior to the highest *modeled* 1-hr SO_2 concentration near Liberty. Observed wind is shown at the AGC and Liberty sites, and modeled wind is shown at the nearby USSC and USSI source facilities

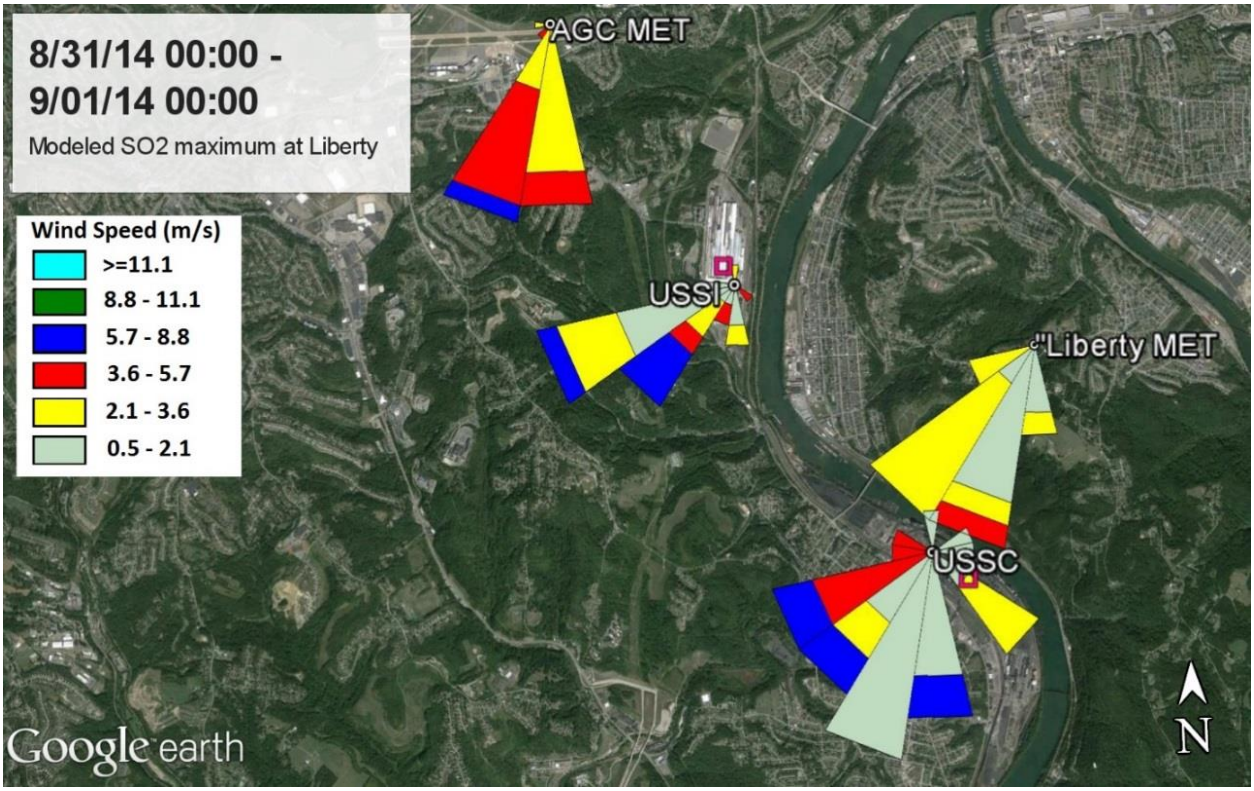


Figure 23. Wind roses for the 24 hours prior to the second-highest *modeled* 1-hr SO_2 concentration near Liberty. Observed wind is shown at the AGC and Liberty sites, while modeled wind is shown at the nearby USSC and USSI source facilities.

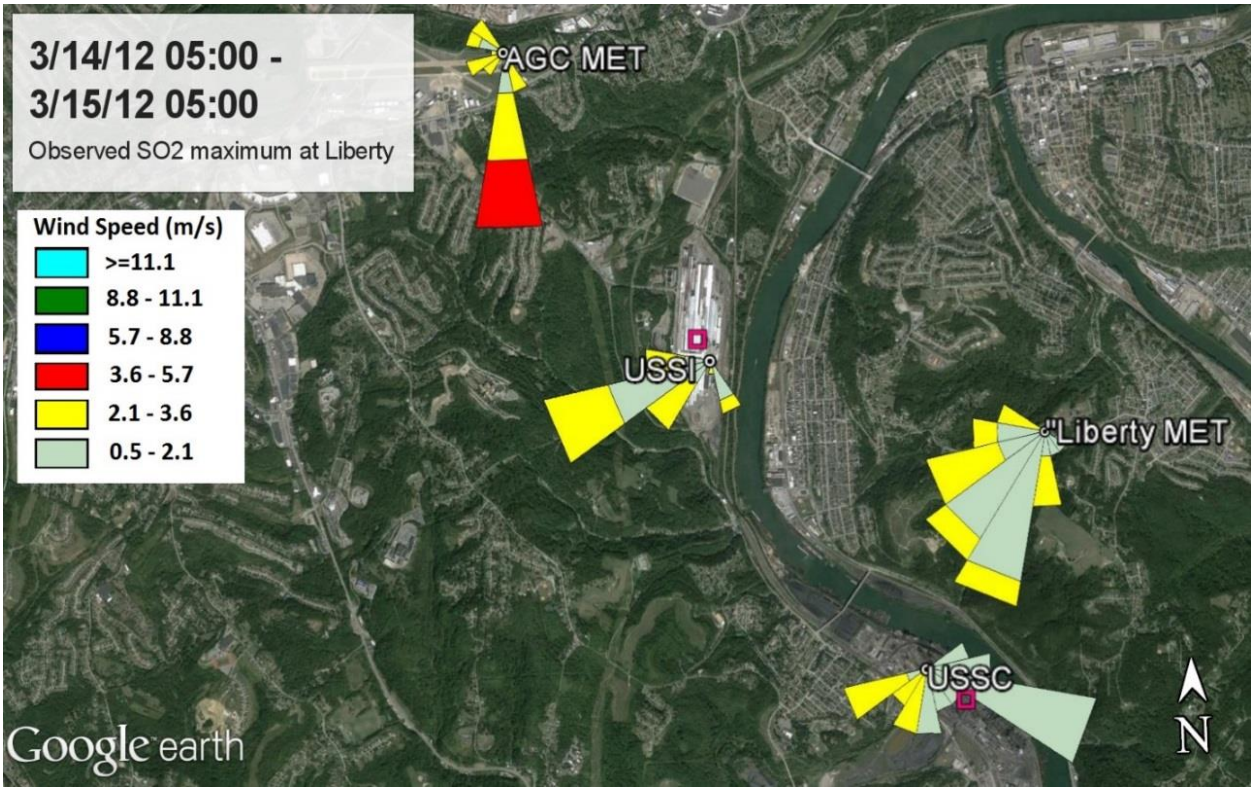


Figure 24. Wind roses for the 24 hours prior to the highest *observed* 1-hr SO_2 concentration at Liberty. Observed wind is shown at the AGC and Liberty sites, while modeled wind is shown at the nearby USSC and USSI source facilities.

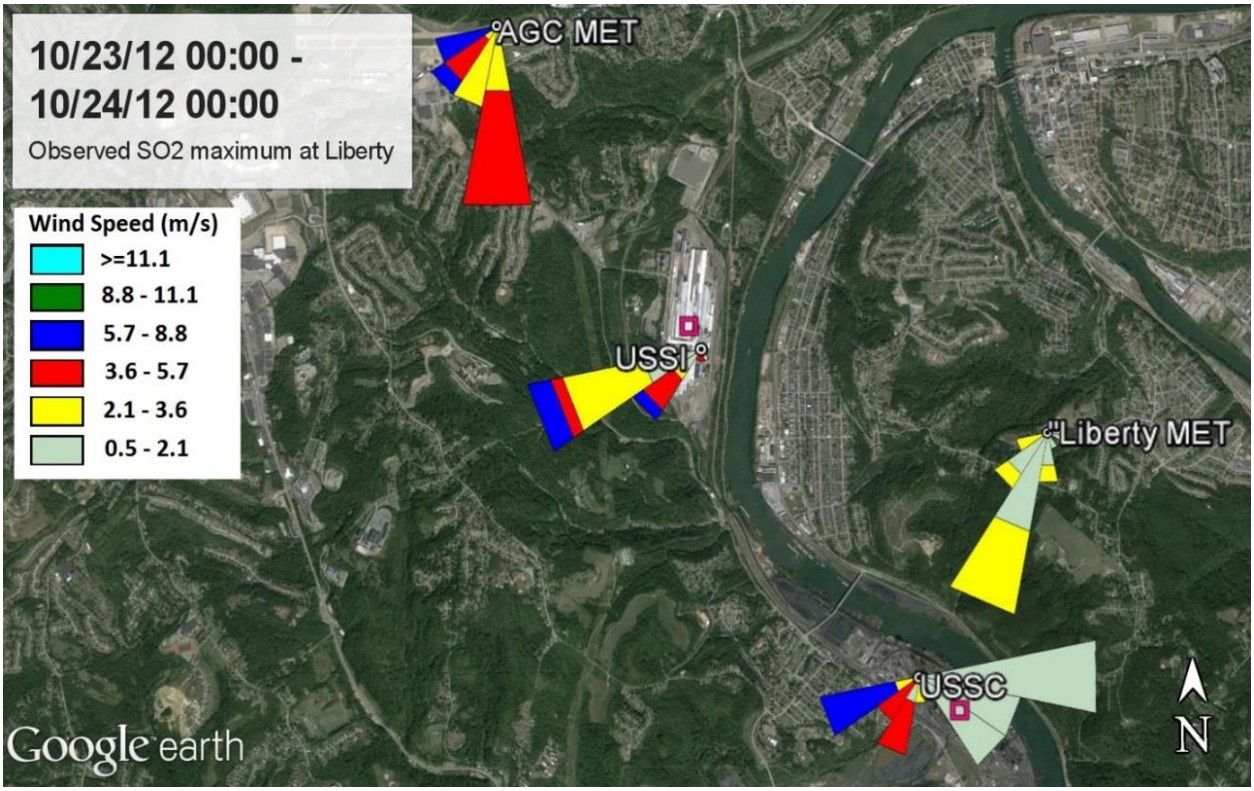


Figure 25. Wind roses for the 24 hours prior to the second-highest *observed* 1-hr SO_2 concentration at Liberty. Observed wind is shown at the AGC and Liberty sites, while modeled wind is shown at the nearby USSC and USSI source facilities.

Most of the peak hourly SO_2 concentrations in the NAA, both modeled and observed, occur in the early morning between midnight and 5:00 AM. This is largely a result of low mixing heights due to decreased surface heat flux during the dark hours.

Another indication of the model producing accurate results for the right reasons would be a strong correlation between mixing heights calculated from modeled and observed meteorology during times of high concentrations. Figure 26 and Figure 27 depict the evolution of the mechanical mixing height calculated by AERMET both from the Liberty observations and from the selected MMIF-AERMOD configuration at the USSC site. The dates shown span the two highest modeled 1-hr SO_2 concentrations shown in Figure 22 to Figure 25. In both cases, the predicted maximums occur during near-surface-level mixing heights in the model.

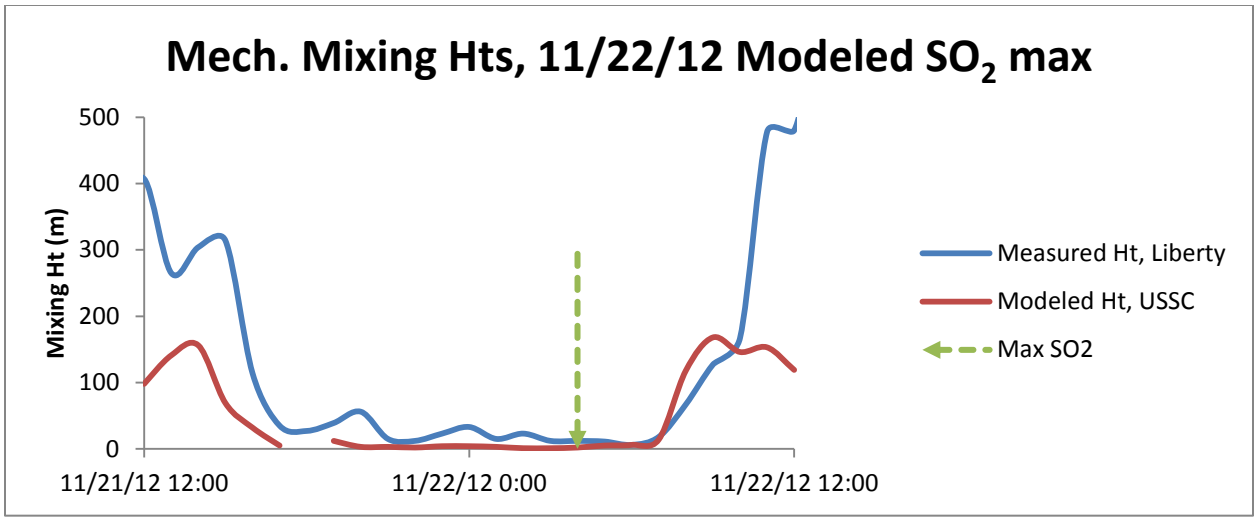


Figure 26. AERMET's mechanical mixing heights based on the Liberty monitor data and on MMIF data at the USSC site, in the hours leading up to the highest modeled SO_2 concentration during 2012-2014.

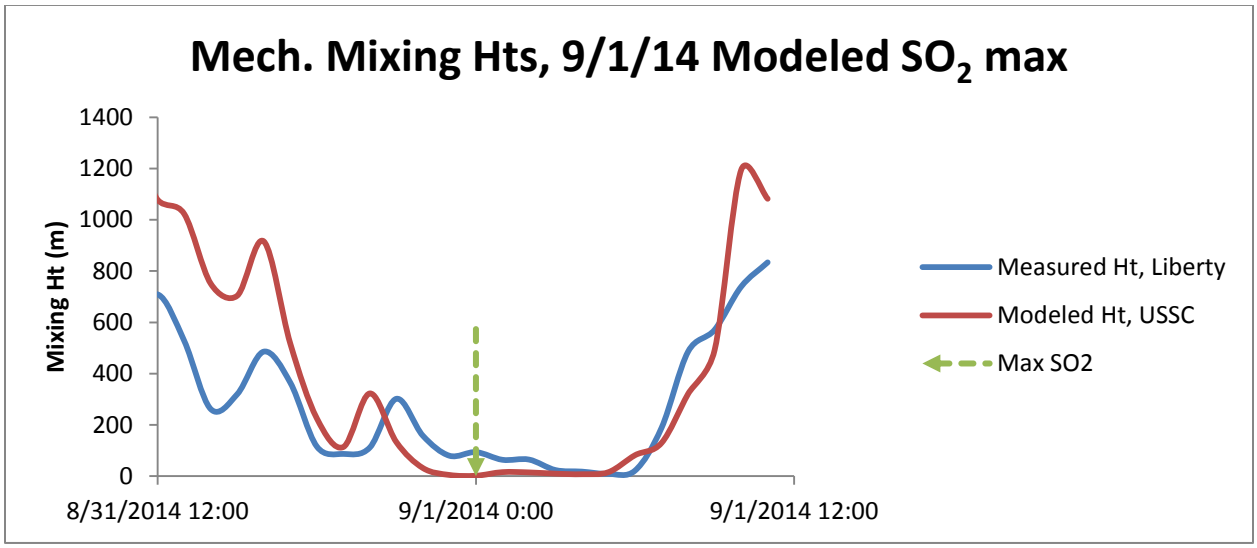


Figure 27. AERMET's mechanical mixing heights based on the Liberty monitor and on MMIF data at the USSC site, in the hours leading up to the second-highest modeled SO_2 concentration.

The observation-based mechanical mixing heights evolve similarly during the times shown. The minimum heights appear to occur 2-3 hours later than the model-based minimum, which helps account for the slight timing offsets between modeled and observed max concentrations. It is also important to note that the USSC site is located on the Monongahela River, while the Liberty met station is located on an adjacent hill approximately 75m higher, which may help explain why the modeled USSC mixing height remains closer to the ground during the nighttime hours. Overall, the relative accuracy of modeled mixing height behavior during these modeled SO_2 maximums indicates that the selected model is indeed attaining accurate predictions for the right reasons; namely representative meteorological conditions.

Contour plots showing predicted 1-hr SO_2 isopleths were developed for both the discrete and full-domain NAA receptor grids in AERMOD. Figure 28 and Figure 30 show the 3-year average of the 4th highest hourly SO_2 concentration of each year. This concentration represents the design value for attainment of the 1-hr SO_2 NAAQS. While the dates and times of this value at a given location may vary, it is plotted for all locations simultaneously in the figures below. These values were specifically extracted from the final AERMOD configuration selected in the evaluation outlined above. On each plot, the isopleth representing 196 μg/m^3 (the value of the SO_2 NAAQS) is bolder than the others.

The model results represented in Figure 28 indicate that the highest SO_2 concentrations may be occurring along the valleys and hillsides to the immediate northwest and southeast of the Liberty monitor, which is located at the high school on the top of a hill. To investigate whether the steep gradient is caused by AERMOD's treatment of terrain, and not by very narrow plumes which would be very sensitive to small errors in wind direction, Figure 29 shows contours derived using the same receptor locations as in Figure 28 but all having the same elevation as the local maximum SO_2 concentration near the Liberty Monitor (309 m). The shape of the contours in Figure 29 indicates that the highs are not caused by very narrow plumes, but instead by AERMOD's treatment of terrain.

Figure 30 includes the model results from the 500m-radius receptor grid overlaid on the contour plot for the full NAA gridded receptor domain. The same color scale is applied to both, and it is apparent that the two result cases do indeed show similar SO_2 design concentrations near the Liberty monitor. However, the larger receptor domain indicates that the highest modeled SO_2 concentrations in the NAA may be occurring closer to the Clairton site. Because no current observations of SO_2 are available close to the Clairton site, these high concentrations were not considered in this dispersion model performance evaluation.

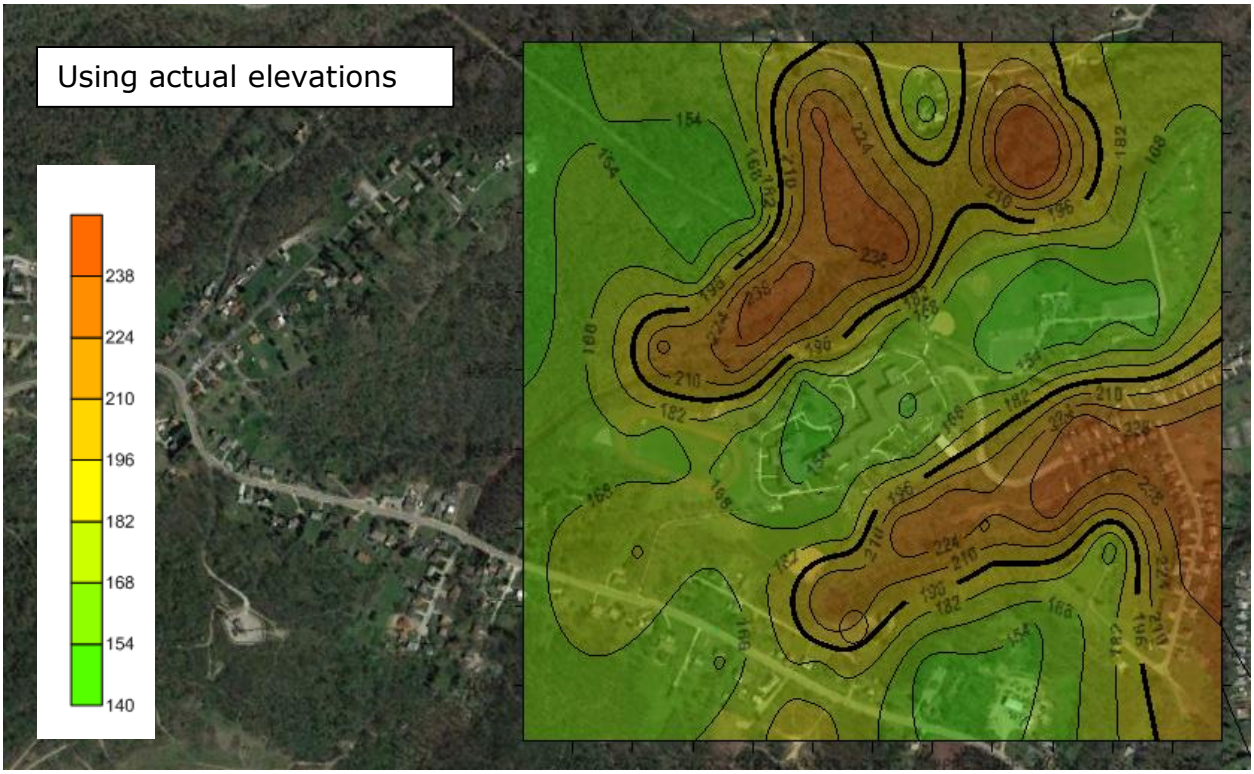


Figure 28. SO_2 design value near the Liberty monitor, using actual elevations.

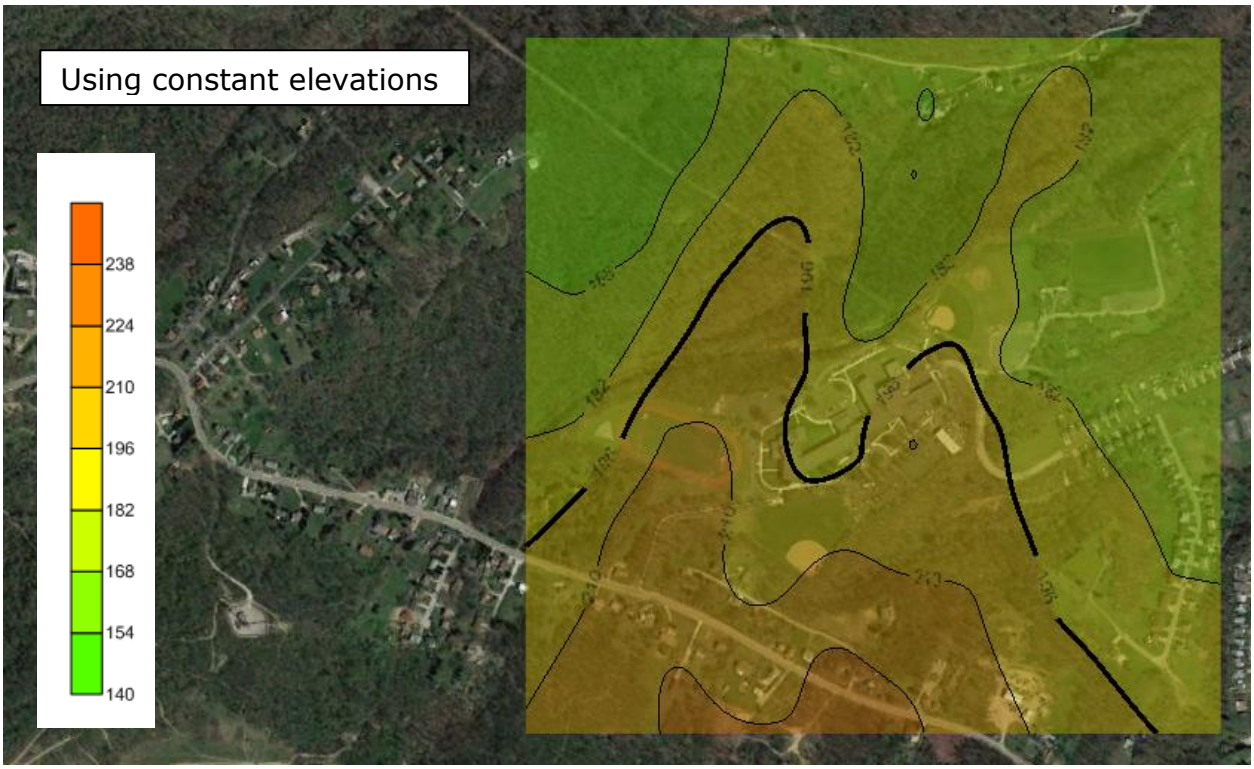


Figure 29. As in Figure 28, but with constant elevation of the high in Figure 28.

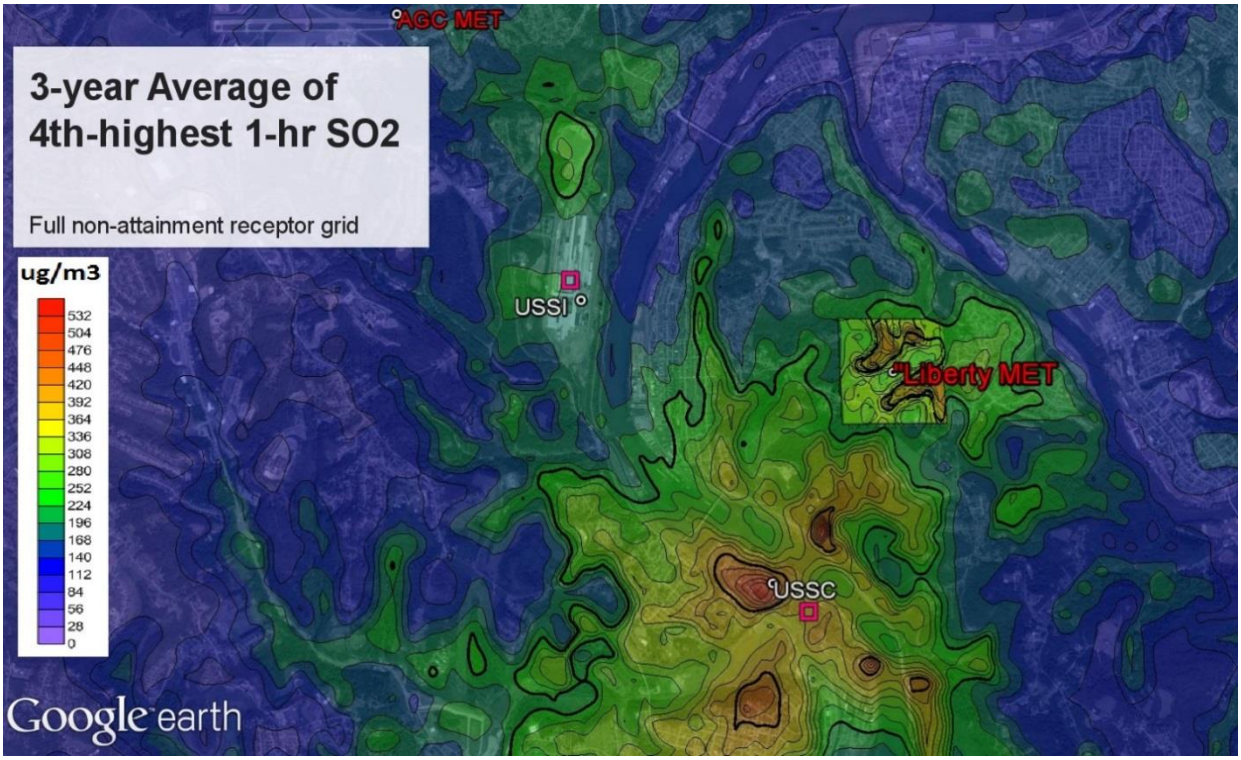


Figure 30. SO_2 design value at all receptors within the full NAA domain.

4. SUMMARY AND CONCLUSIONS

The goal of this dispersion model performance evaluation was to identify a dispersion model and associated modeling techniques that will most accurately support the Allegheny County Health Department's State Implementation Plan revision to address sulfur dioxide (SO_2) in the Allegheny, PA nonattainment area resulting from the 2010 one-hour SO_2 National Ambient Air Quality Standard.

Modeling following the U.S. EPA *Guideline on Air Quality Models* involves using a single meteorological (MET) dataset, derived from NWS or on-site observations and upper-air observations, for all facilities within the nonattainment area. Five such MET datasets were produced using various data sources, but all performed equally poorly at predicting observed 1-hour SO_2 concentrations at the Liberty monitor.

The 2017 revisions to the *Guideline* allow for the use of prognostic meteorological model output, processed through the EPA's mesoscale model interface program (MMIF), in situations where no representative observations exist. ACHD contracted Ramboll Environ to create a suitable prognostic dataset, and evaluate the various modeling techniques (MMIF, AERMET, and AERMOD settings) to identify the best-performing modeling configuration/combination.

Ramboll Environ ran the Weather Research and Forecasting (WRF) model for 2012-2014 (a three year span) with a series of nested grids, with the finest at 444m horizontal resolution. This high-resolution dataset was able to capture and reproduce the complex meteorological situation in the Monongahela River valley that snakes its way through the Allegheny, PA SO_2 nonattainment area.

Three dispersion models were identified to consider: AERMOD, CALPUFF, and SCICHEM. An initial 1-month test case, then an initial 1-year assessment (not shown in this report) were performed using AERMOD, CALPUFF, and SCICHEM. Several CALPUFF scenarios (both observation-based and WRF-based) were assessed, but CALPUFF performance was generally poor. The best-performing CALPUFF scenario from the 1-year assessment was assessed using the full 3-year WRF dataset, but CALPUFF performance remained poor. SCICHEM performance was not able to be assessed for all the meteorological configurations and was dropped from the analysis due to resource constraints. The remaining model, AERMOD, was assessed using 59 combinations of settings and data sources.

This dispersion model performance evaluation used only one monitoring site, and did not consider model-predicted concentrations at other locations in the nonattainment area. It used SO_2 observations from the Liberty monitor for 2012-2014, the same time-span as the WRF simulation. The Liberty monitor is the only one in the Allegheny, PA NAA that violated the 1-hour SO_2 NAAQS. Other appendixes in this SIP revision evaluate expected concentrations on the hillsides of the river valley, and near the fencelines of the industrial facilities.

Multiple methods were used to identify the best-performing configuration of AERMOD, including an operational evaluation, a diagnostic evaluation, a mechanistic evaluation, and a probabilistic evaluation. The first included a series of piecewise analysis steps that investigated the relative performance of each MMIF/AERMET/AERMOD option separately. All evaluations used techniques from the Cox-Tikvart method, including the statistical quantities Robust Highest Concentration (RHC) and Combined Performance Metric (CPM).

Additionally, statistics relevant to the form of the SO_2 NAAQS were used, including the 99th percentile daily maximum 1-hour concentration and the total number of exceedances of the NAAQS value.

There was a tie between two scenarios for the best-performing model-data combination. They are:

1. 444m WRF+MMIF+AERMET+AERMOD, using levels from the EPA MMIF Guidance, and AERMET's calculation of mixing height; and
2. 444m WRF+MMIF+AERMET+AERMOD, using WRF levels below 50m above ground, and AERMET's calculation of mixing height

The two options differ only in terms of the levels extracted by MMIF. Option 1 was the winner of the piecewise analysis, but had a worse CPM score than option 2, and slightly under-predicted the RHC while over-predicting the number of exceedances. Option 2 did slightly worse than option 1 at predicting the 99th percentile, and over-predicted the RHC and the number of exceedances. See Table 2 (page 38), Figure 20 (page 39) and Figure 21 (page 40) and the associated discussion in Section 3.3.7 (beginning page 37).

Either option, or a combination of them (EPA levels below 50m), would be suitable for modeling in support of ACHD's SIP revisions in response to the 2010 SO_2 NAAQS. The Allegheny, PA 1-hour SO_2 SIP ultimately selected option 2 for the attainment demonstration modeling due to slightly better modeling results near the sources and along the valley hillsides.

5. REFERENCES

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SO_2 SIP

Appendix H

MMIF Analysis

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MMIF Analysis

MMIF output was examined by ACHD for appropriateness by domains, levels, and locations for the best configuration of MMIF as AERMOD inputs.

WRF Domains

WRF was developed by Ramboll Environ for ACHD using nested grids (see WRF evaluation) at increasing resolutions. A resolution of 1.33 km was used for the D04 domain encompassing most of Allegheny County (and portions of Washington and Westmoreland Counties), with a resolution of 0.444 km for the D05 domain encompassing the nonattainment area (NAA). The D05 domain is stretched at the bottom edge to account for sources to the south of the NAA.

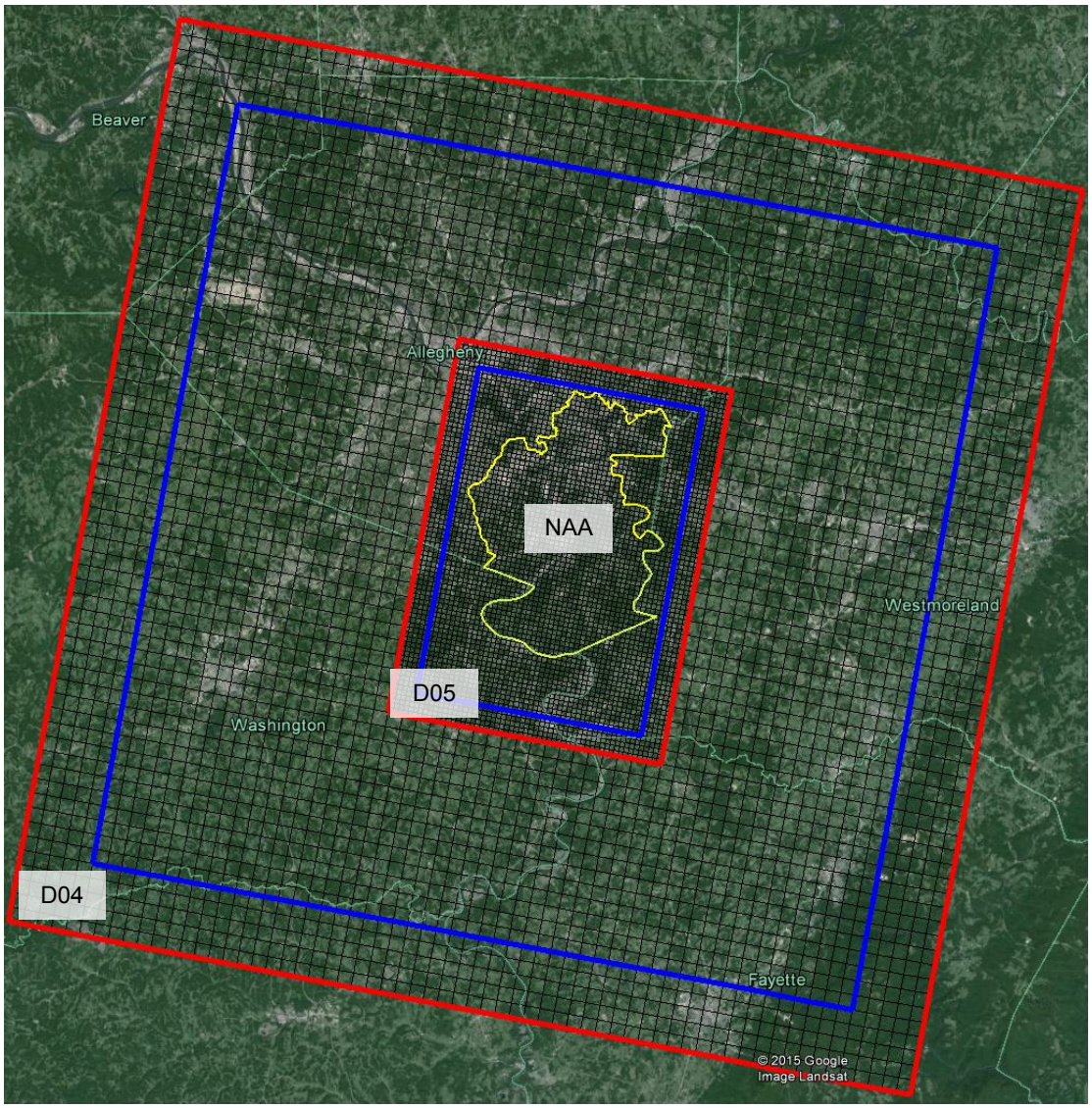


Figure H-1. WRF D04 (1.33km) and D05 (0.444km) Gridded Domains, with NAA (in yellow)

The red borders indicate the outer (or full) domains, with the blue borders indicating the usuable area (5 cells inside the full domain) where boundary conditions have been resolved.

MMIF can be extracted from any of the modeled WRF cells/domains. To represent site-specific data at each source, estimated plant centroids were used were used for extraction of individual MMIF cells. The representative D04 and D05 cells for US Steel (USS) Clairton are shown in the figure below.

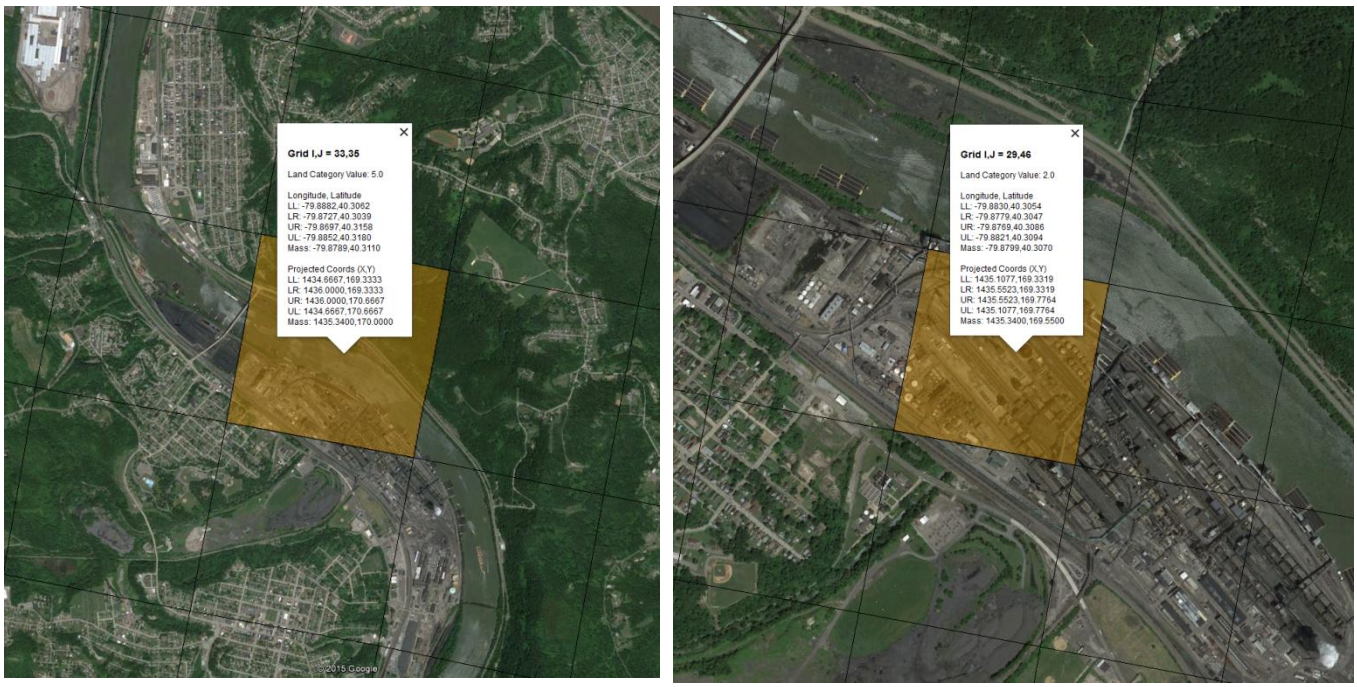


Figure H-2. MMIF D04 (left) and D05 (right) Cells based on USS Clairton Plant Centroid

The D04 domain cells can include surface characteristics for a larger area (for MMIF output, data is averaged to the entire cell), with the D05 cells showing characteristics more specific to the valley locations. MMIF profile elevations are also lower overall in the D05 domain, recognizing more of the valley.

Table H-1. MMIF Profile Elevations, D04 and D05

Example Cell	D04 Elevation	D05 Elevation	Actual Elevation (avg)
USS Clairton	265 m	244 m	231 m
USS Edgar Thomson	258 m	245 m	225 m

Since Liberty is the highest monitor in the NAA, and because multi-level SODAR met data is available at Clairton for comparison to MMIF, emphasis was placed on analysis of the Clairton MMIF cells. (North Braddock was also tested with different MMIF output for operational performance – see Appendix I).

Additionally, multi-level tower data from the Beaver Valley tower, located adjacent to the First Energy Beaver Valley nuclear plant, was used for comparison to wind speeds and

temperatures. The Beaver Valley tower is near Vanport in the Ohio River Valley, which is slightly wider and at a different orientation than the Mon Valley at Clairton; therefore, wind directions are not directly comparable. But overall, vertical behavior for horizontal wind speed and temperature should be consistent between the two river valleys.

MMIF and Measured Data

The Clairton SODAR acoustic instrument measures wind at several vertical levels at the site of US Steel Clairton. The matching MMIF D05 cell is one cell to the left of the plant centroid shown in the previous figure (the D04 cell is the same).

Figure H-3. MMIF D05 Cell for Comparison to SODAR

For a direct comparison to the SODAR data, matching levels were extracted in MMIF. (Note that final MMIF levels are based on slightly different levels – see Appendix A.). Valid data from the SODAR were available starting in late January 2014.

While the SODAR can detect data at higher levels, the following levels were the most consistent for recovery and validity: 30/50/70/90/110/130/150 m. Data recovery for the SODAR is lower than required for regulatory modeling use (90% by quarter), with an annual recovery of about

61% data completeness[1]. However, the SODAR provides an adequate and realistic view of valley-based winds for the Monongahela River Valley and similar SWPA valleys.
SODAR wind speed and direction were compared to MMIF from both the D04 and D05 domains.

Below are radar plots of average wind direction frequencies and wind speeds for the SODAR, MMIF D04, and MMIF D05 for 2014 for 10-150 m levels. Liberty single-level data is included for additional comparison. Directional frequencies were based on 22.5° sectors (16 points of compass, weighted to 8 points).

Note: There can be some inaccuracies with the SODAR at any level. The 30 m level is the most reliable lowest level without noise, and 150 m is generally the highest level before signals are lost. Some individual hours can reach 250 m or higher with accuracy.

[1] "Valid" data from the SODAR consists of hours with data at all of the 30-150 m levels.

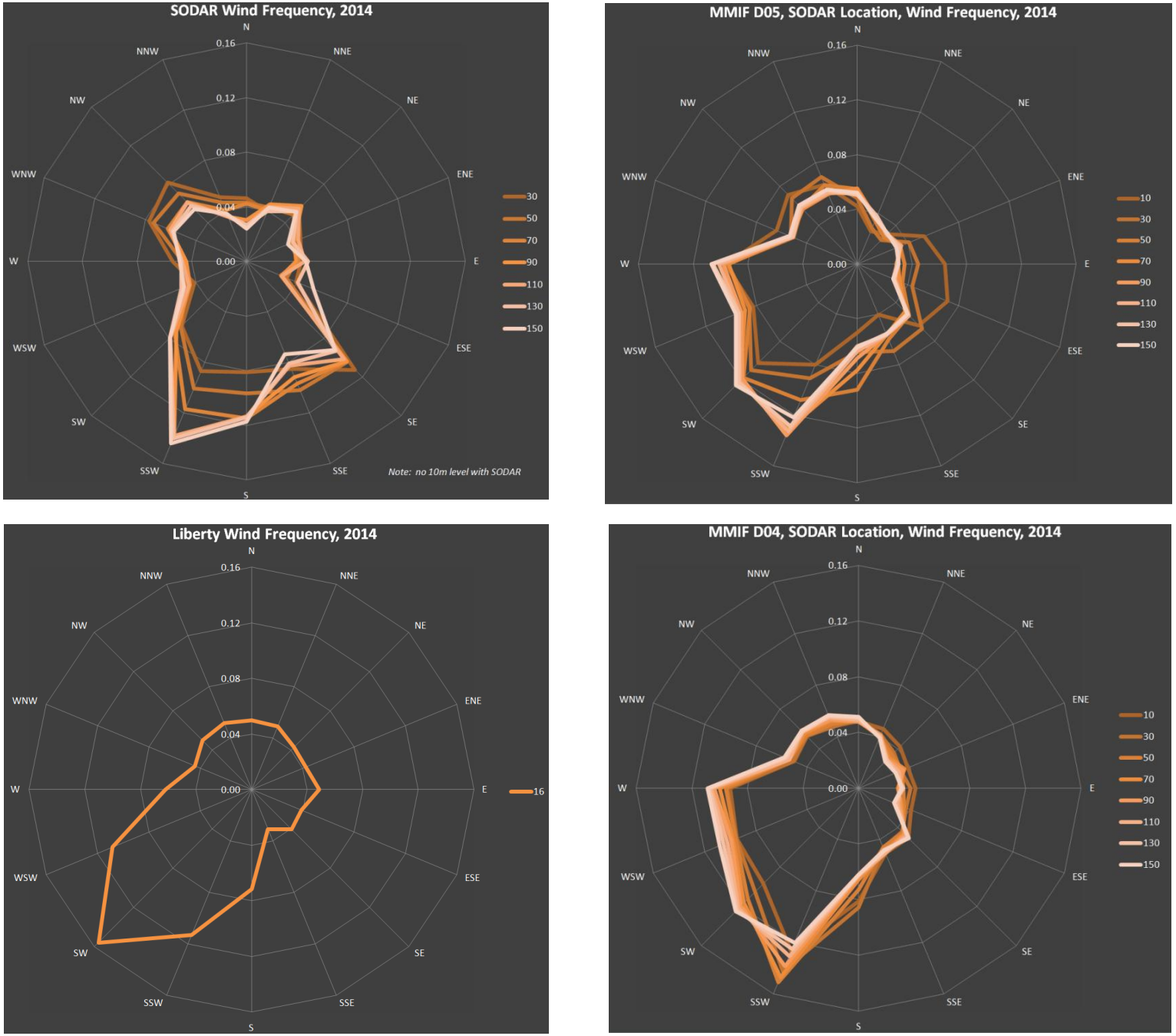


Figure H-4. Radar Plots of Average Wind Direction Frequency, 2014, by Case

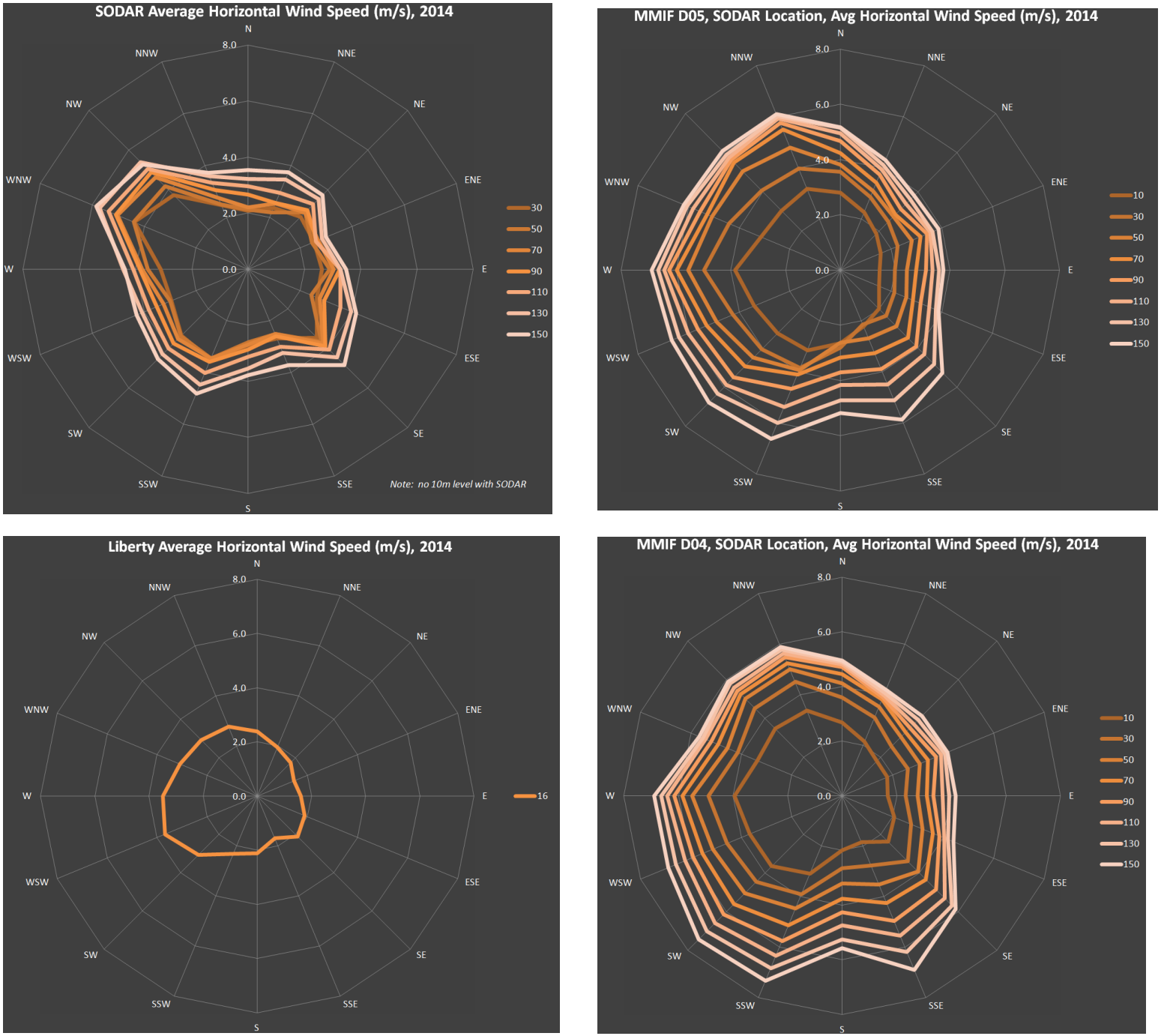


Figure H-5. Radar Plots of Average Horizontal Wind Speed, 2014, by Case

Figure H-4 shows that the MMIF shows a combination of plateau and valley wind flow at the Clairton location. The D05 data shows directions that are a better match to SODAR than the D04, with more wind directions following the valley “channeling” at the lower levels.

Individual SODAR hours can also show partial spiraling at increasing vertical levels with SODAR data, and this is best simulated with the D05 MMIF.

The MMID D04 is a better match to Liberty, which is at a higher elevation and away from valley influence. This indicates that MMIF is properly characterizing the regional wind flow for the area, but the D04 domain cells are too large to sufficiently capture the terrain features in WRF at 1.33 km resolution. (The Monongahela River varies from 200-300 meter in width in Allegheny County.)

Figure H-5 shows that MMIF wind speeds show overestimation at upper levels compared to the SODAR. The SODAR shows closely-grouped average wind speeds by level, with unknown transitions from valley to regional flow during stable conditions. MMIF starts to show wind speeds that are more representative of plateau/airport flow while the levels are physically still in-valley. (Hills are around 120-140 m above the river valley.)

The following figures show hourly average charts of wind speed and temperature for the same meteorological data at 10-150 m levels (with Liberty at 16m). The SODAR and MMIF data are also shown at 3-levels only (10/50/150 m) for comparison to the Beaver Valley tall tower. (Note that 10 m data is not available for SODAR; for the 3-level charts, 30 m level data is used as the lowest level. Also, since SODAR does not include temperature, airport data at 10 m were included for the temperature comparisons.)

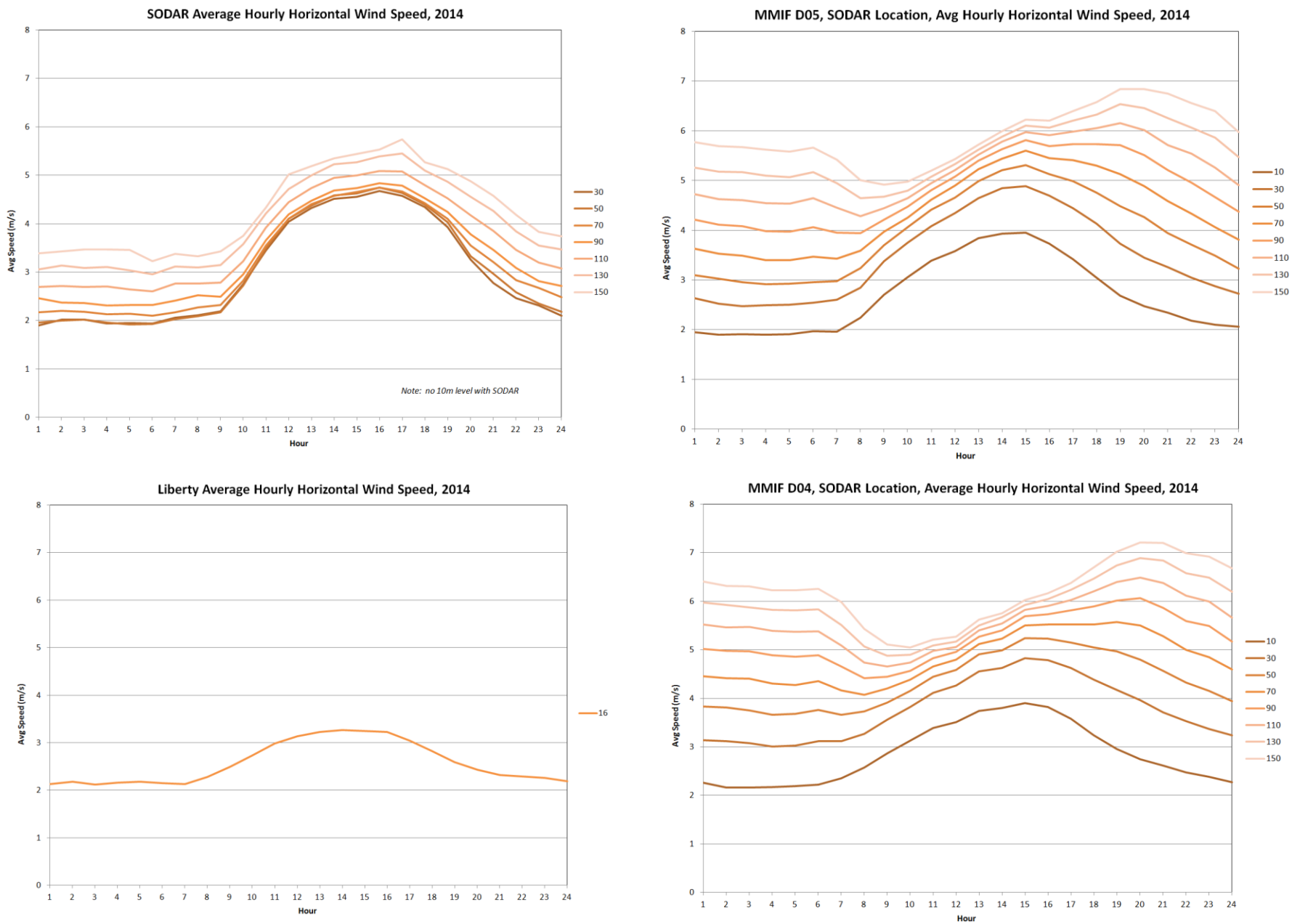


Figure H-6. Average Hourly Horizontal Wind Speed, 2014, by Case

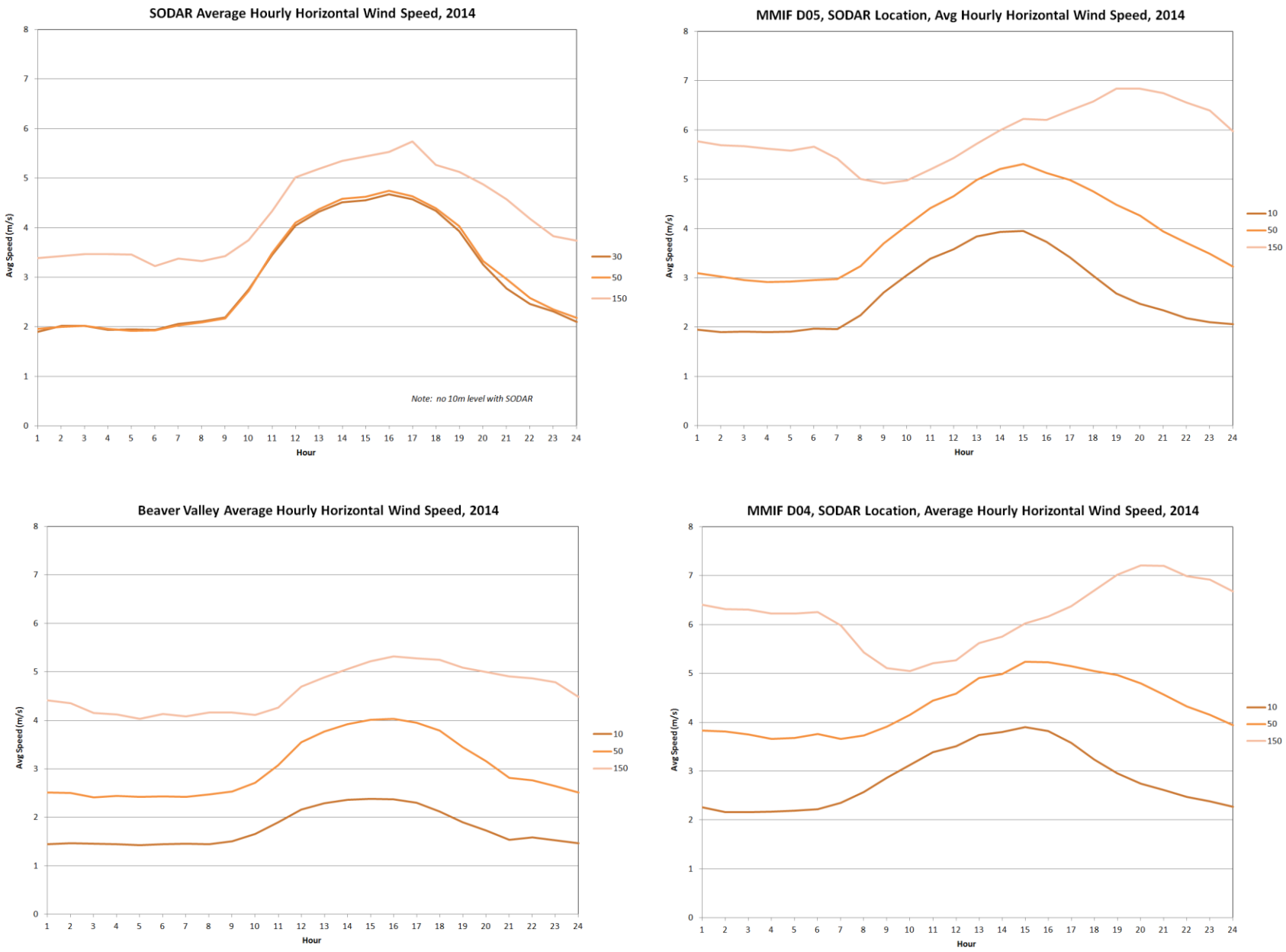


Figure H-7. Average Hourly Horizontal Wind Speed (3 Levels Only), 2014, by Case

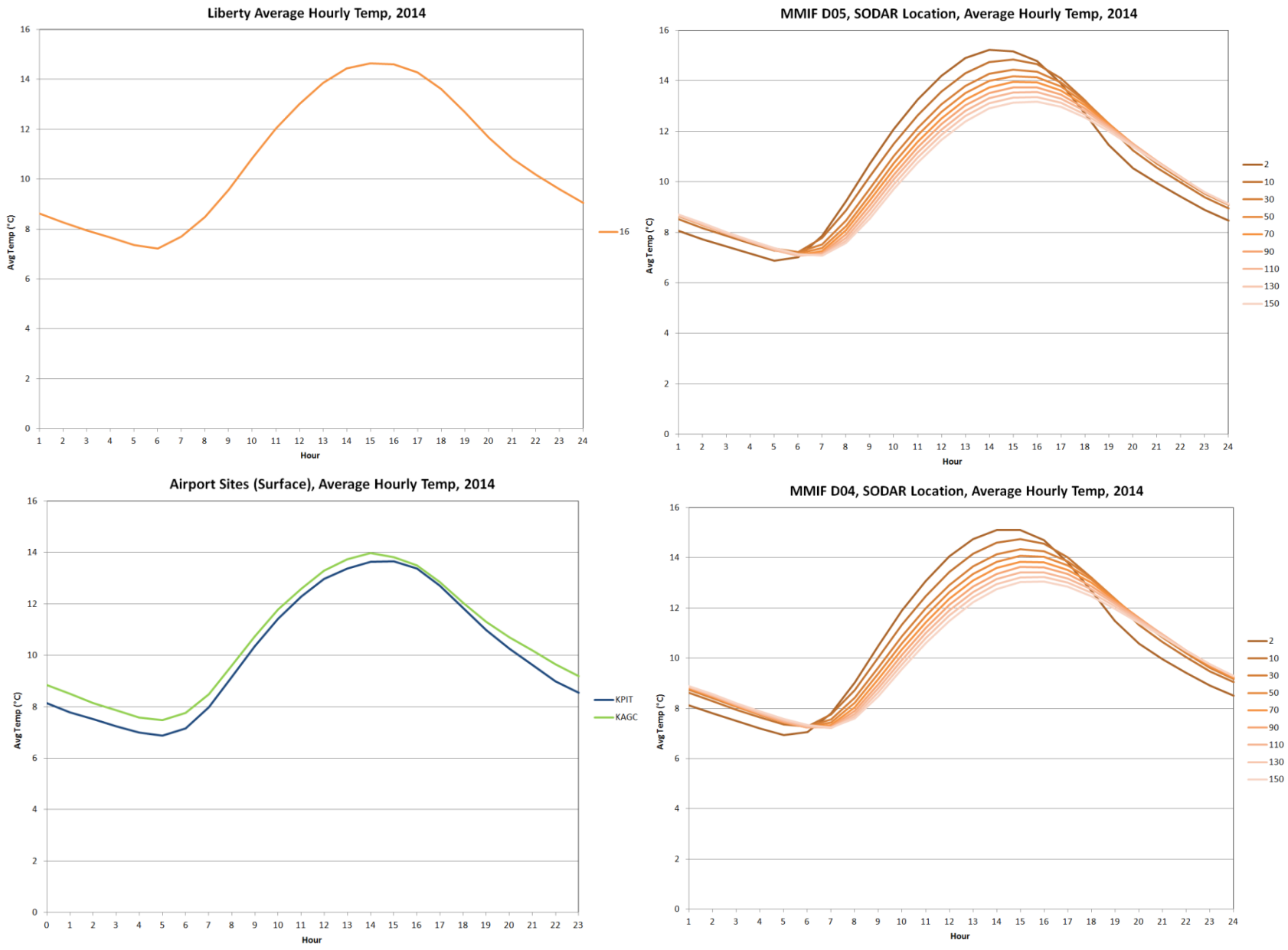


Figure H-8. Average Hourly Temperature, 2014, by Case

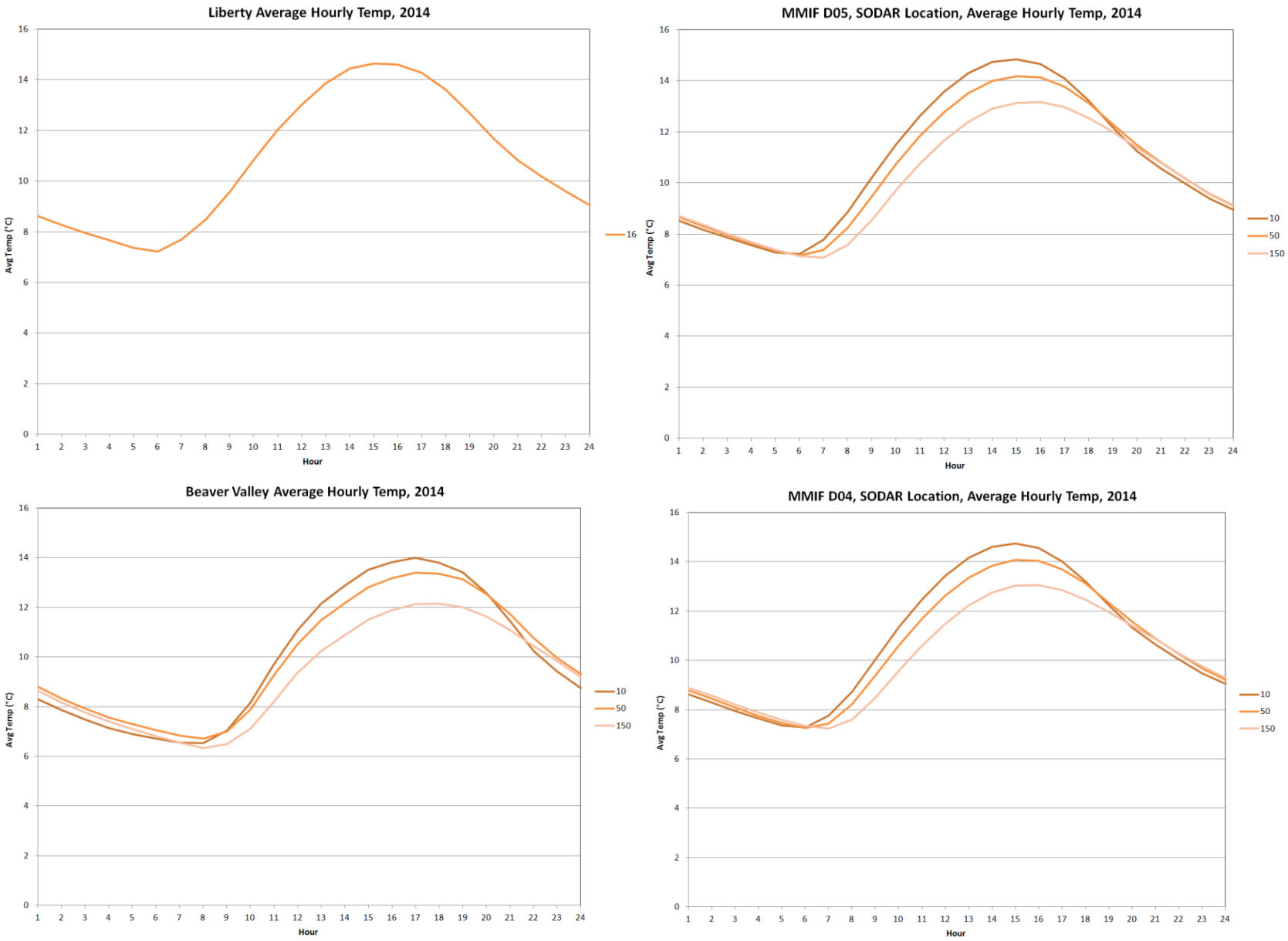


Figure H-9. Average Hourly Temperature (3 Levels Only), 2014, by Case

Figure H-6 shows that MMIF simulates the diurnal wind speed patterns during stable (nighttime) and convective (daytime) conditions at lower levels that are similar to SODAR data. (Note: SODAR does not have 10 m level data.) MMIF D05 shows the better comparison to SODAR than D04, with the larger differences between night/day speeds.

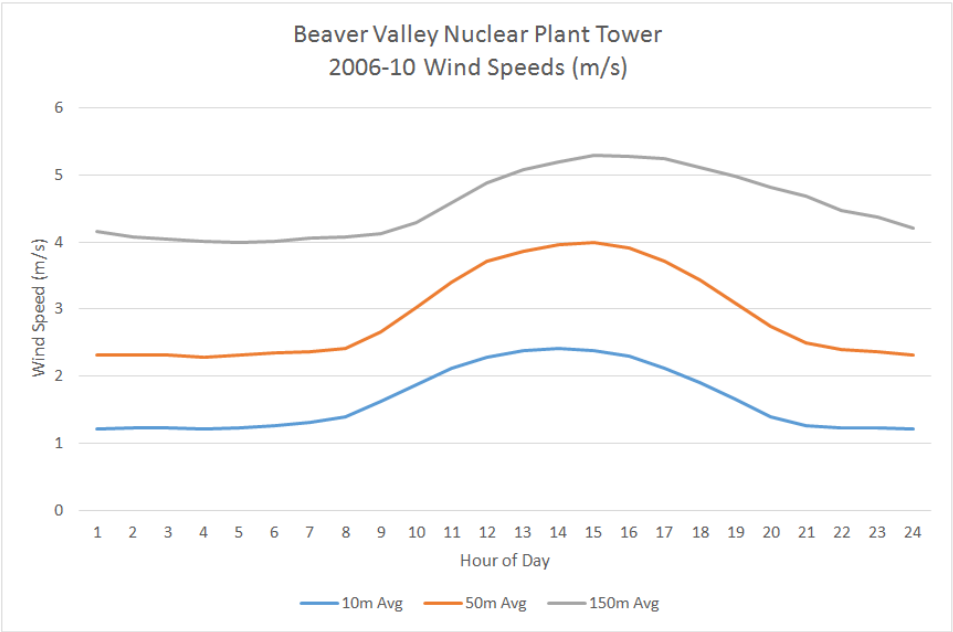
However, the upper levels wind speeds (starting at 50-70 m) shows a high wind speed bias with the MMIF data, similar to the radar wind speed plots.

Figure 8-7 includes Beaver Valley for wind speed comparisons in place of Liberty, but only at matching 3 levels (10/50/150 m). Beaver Valley also shows lower wind speeds than MMIF, but not as constant as SODAR during nighttime stable conditions. (Note: Beaver Valley lies in a wider valley along the the Ohio River, with a different orientation than Clairton.)

The temperature comparison in Figure H-8 shows that MMIF is replicating surface-based temperatures. Figure H-9, which adds Beaver Valley in place of airport data, shows that MMIF is also reproducing multi-level temperatures, including inversion conditions, that are measured at Beaver Valley.

Beaver Valley shows SWPA valley flow that is not seen with other multi-level towers in PA. Figure H-10 compares Beaver Valley average wind speeds in comparison to the Peach Bottom nuclear plant tower, located in southeastern PA in the Susquehanna Valley.

Terrain is less complex in the area surrounding Peach Bottom, and this tower shows a more plateau-like pattern for wind speeds. All levels show more constant hourly wind speeds, with 150 m data showing almost no difference between stable and convective wind speeds.



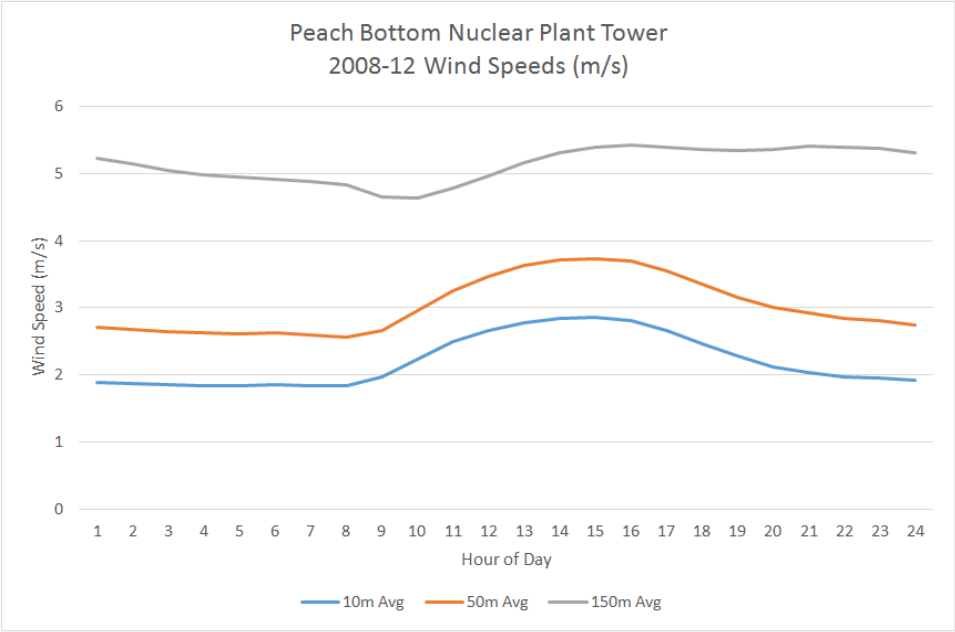


Figure H-10. Average Hourly Wind Speeds for Nuclear Towers in PA

MMIF was also compared to local ACHD meteorological sites in the NAA. Figure H-11 shows MMIF D05 (10 m) and Liberty actual wind roses for 2012-2014 at the Liberty site location.

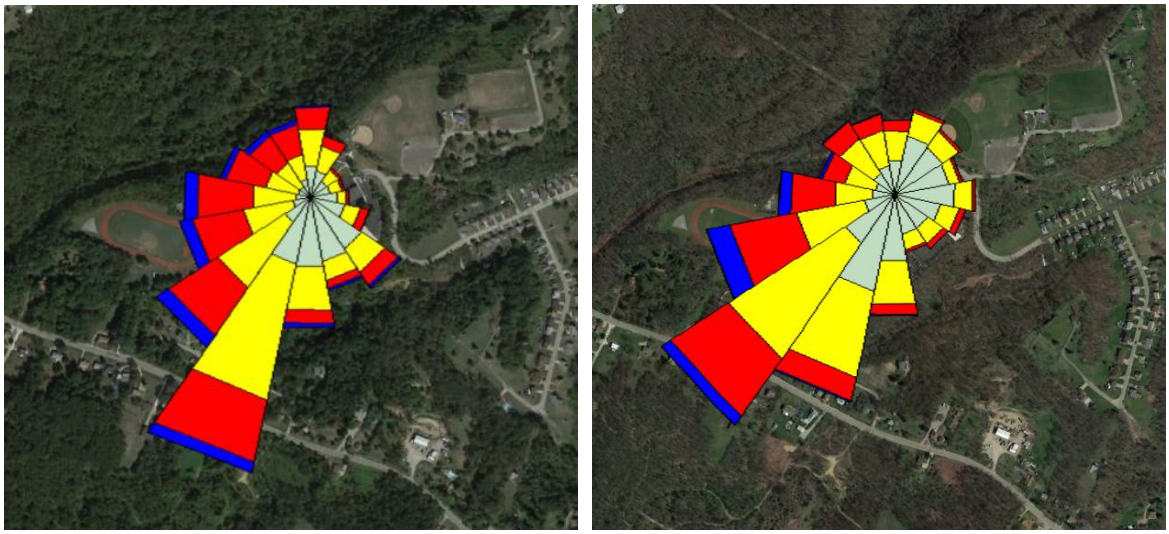


Figure H-11. MMIF D05 (left) and Liberty Actual (right) Wind Roses

Figure H-12 shows MMIF D05 (10 m) and North Braddock actual wind roses at the North Braddock site location. (Note: timeframes are not exact; as only historical multi-year data for North Braddock was available.)

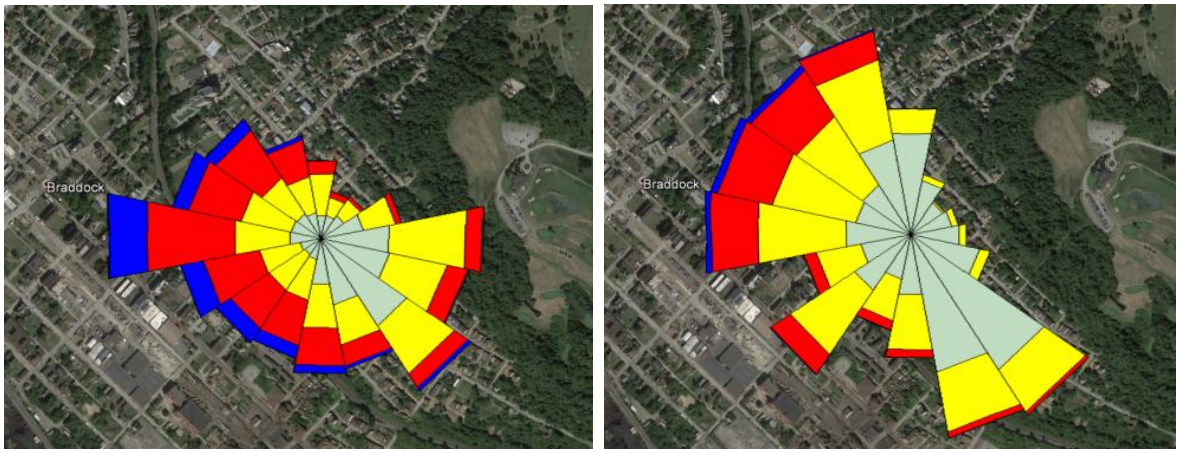


Figure H-12. MMIF D05 (left) and North Braddock Actual (right) Wind Roses

MMIF is showing good prediction of actual surface-based winds at virtually any location within the NAA, with some higher wind speeds.

Wind Speed

WRF/MMIF shows some high wind speed bias overall compared to known meteorological data in SWPA. This is likely due to the smoothing of wind fields over terrain and land use, even at high resolution. WRF is derived from airport data, which generally shows higher wind speeds than local sites. Both KPIT and AGC are also high-elevation sites, with KPIT located at the largest plateau in Allegheny County.

MMIF is however adequately recognizing terrain and river valleys at the highest resolution (0.444 m, D05 domain). Wind speeds start to show discrepancies with measured data at vertical levels of 50-70 m, transitioning to more regional airport-like flow. For in-valley locations where surrounding hillsides can be 120-140 m above the river valley, the SODAR and Beaver Valley data show greater retention of valley flow.

An important aspect with use of MMIF data is that many vertical levels up to 5000 m are supplied to AERMET, which produces the profile (.pfl) file used as input for AERMOD. AERMOD then uses all available data in the .pfl file to generate profiles of the meteorological parameters. Any missing data for an hour is extrapolated or interpolated from 0 to 5000 m by AERMOD.

Typical AERMET/AERMOD modeling involves either surface-based meteorology (e.g., airport) or multi-level towers (with collocated acoustic data, if available). Airport surface measurements are usually at 10 m, multi-level towers are generally up to 150 m, and acoustic data can provide data up to a few hundred meters. In all of these cases, AERMOD is extrapolating data below and above the supplied parameters.

On the following pages, Figure H-13 shows AERMOD-generated average hourly wind speeds up to 5000 m using 2014 Clairton MMIF D05, KPIT airport, Beaver Valley tall tower, and Clairton SODAR data. Figure H-14 shows AERMOD-generated average vertical wind speeds profiles up to 1000 m using the same data.

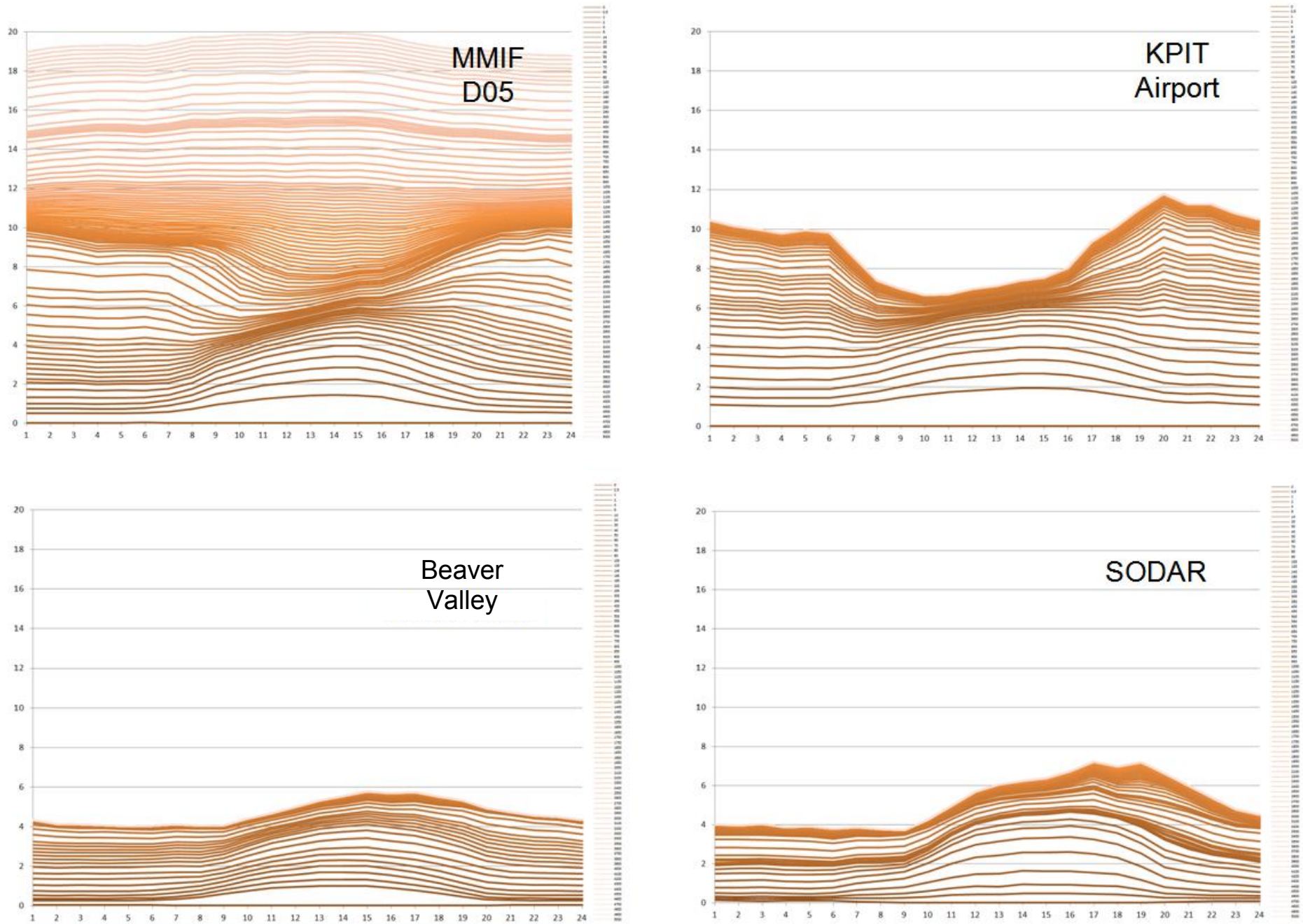


Figure H-13. Hourly Average Wind Speeds to 5000 m as Processed by AERMOD, by Meteorological Data (2014)

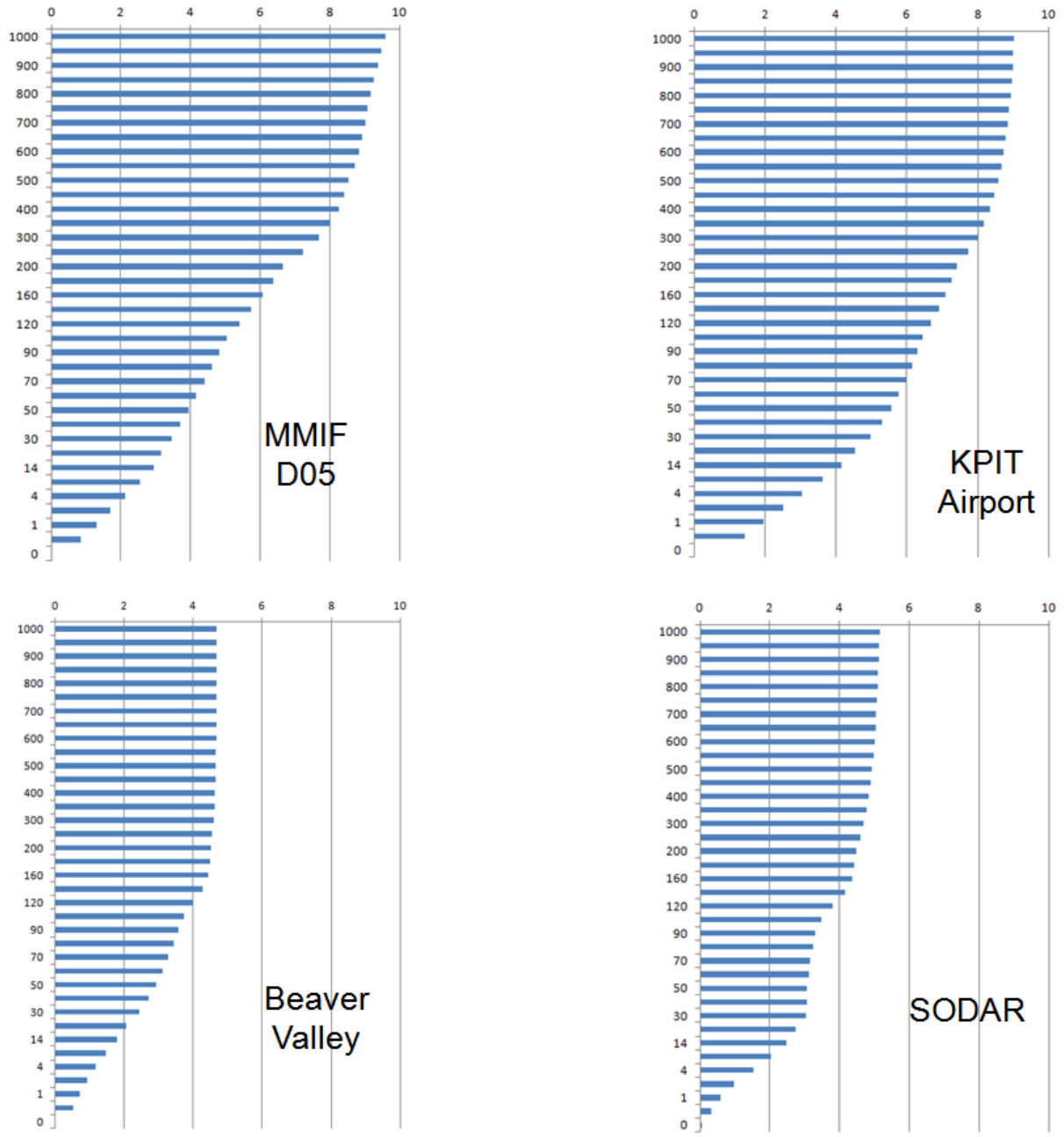


Figure H-14. Average Vertical Wind Speed Profiles (to 1000 m), as Processed by AERMOD, by Meteorological Data (2014)

Figure H-13 reveals that only MMIF data shows data above 12 m/s on an average basis. All other cases, including multi-level data up to 150 m, lead to speeds below 12 m/s on an average basis for all extrapolated levels.

The combination of airport and valley winds can be seen in the graph for MMIF D05. At the lower levels, MMIF produces low wind speeds similar to those seen in the Beaver Valley and SODAR graphs. At higher vertical levels, MMIF shows speeds similar to those in the airport graph until 1000 m or so, when the MMIF shows speeds similar to upper air soundings. (Note: AERMET/AERMOD uses upper air soundings for the determination of stabilities and night/day transitions, while WRF uses upper air soundings to build hourly profiles.)

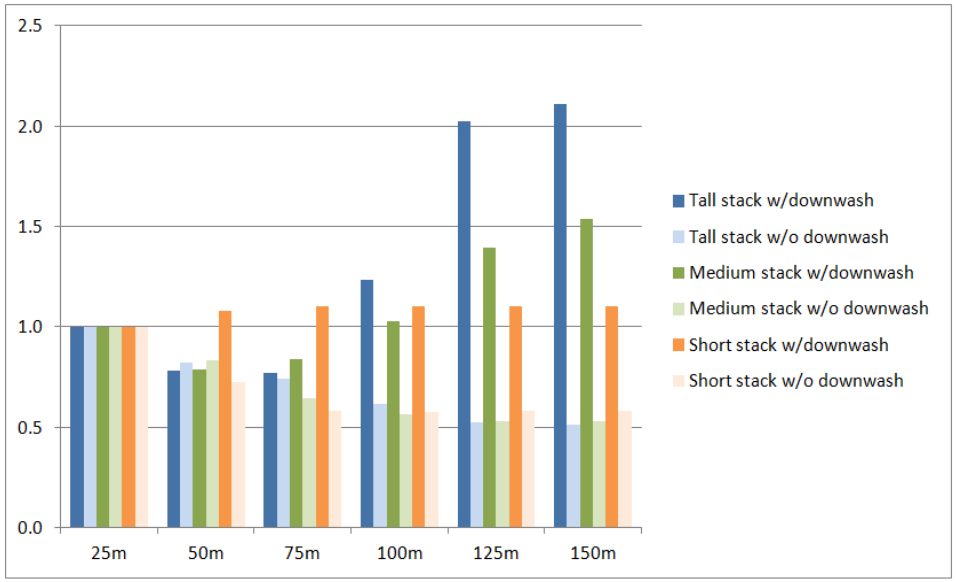
For this modeling demonstration, winds above the top of river valleys (150 m or so) are mostly insignificant; maximum modeled impacts are determined at immediate near-field locations in complex terrain. The characterization of in-valley winds from 10-150 m is more important for this demonstration, especially for low-lying sources and/or sources with building downwash.

Figure H-14 also shows the combination of airport and valley wind speeds for MMIF, similar to Figure H-13. At lower levels near surface (100 m), MMIF resembles the Beaver Valley and SODAR charts. At levels above surface, MMIF is similar to KPIT airport.

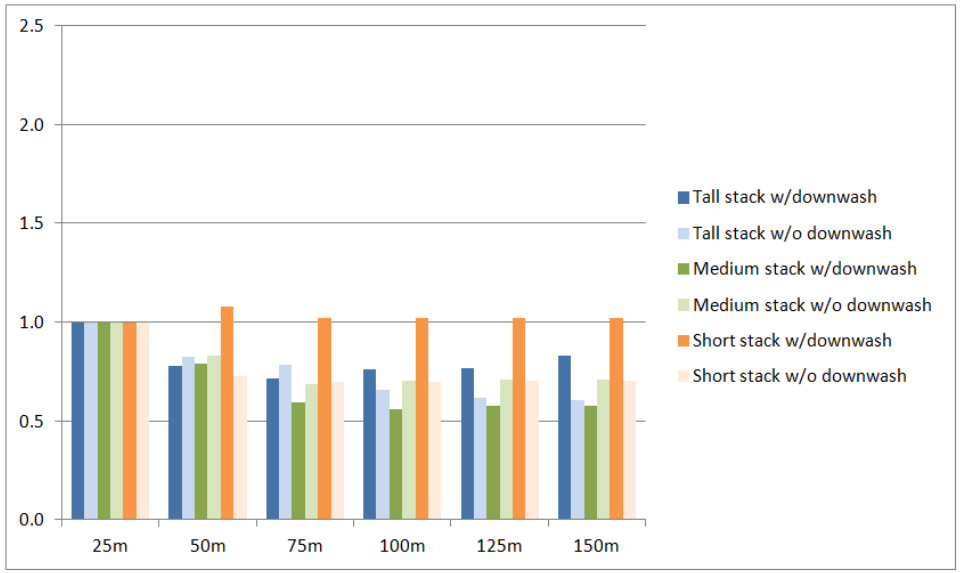
As a test to examine modeled impacts from winds that may be overestimated in the MMIF for in-valley sources, general source types were modeled using 2014 Clairton MMIF D05 and SODAR data at increasing levels. For this test, levels were added incrementally: 25 m only, then 25 and 50 m only, etc. Source included short and medium stacks (below valley height) and tall stacks (near valley height), with and without downwash. Results shown are ratios of impacts in the NAA at the increasing levels compared to the 25 m only case.

Additionally, MMIF D05 was tested with wind speed “skipped” above 50 m. For this test, wind speed is simply not imported (or skipped over) from MMIF onsite input data in AERMET Stage 1. Figure H-15 shows the AERMOD results for these test cases.

MMIF D05, 2014



MMIF D05, 2014 (wind speed to 50 m)



MMIF D05 wind speed skipped in AERMET processing for levels above 50 m

SODAR, 2014

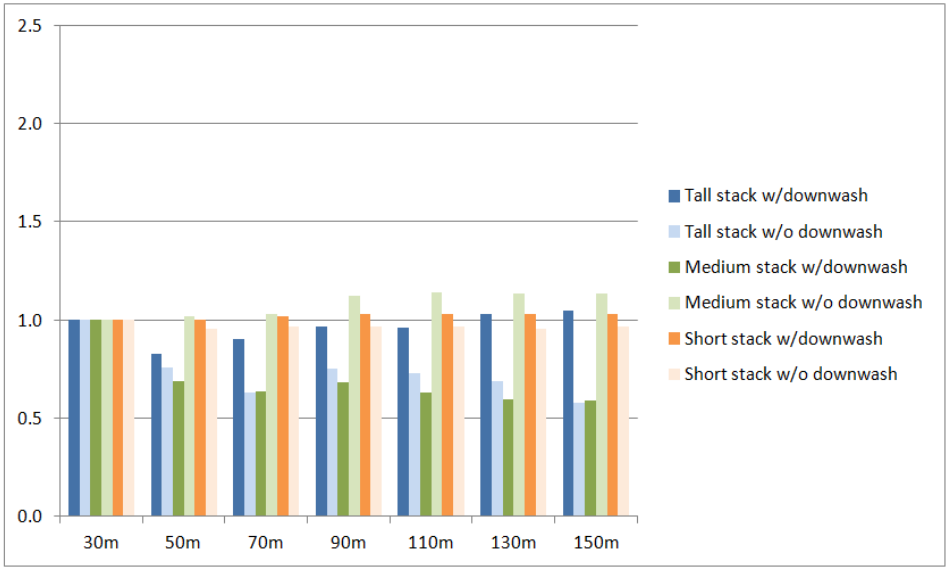
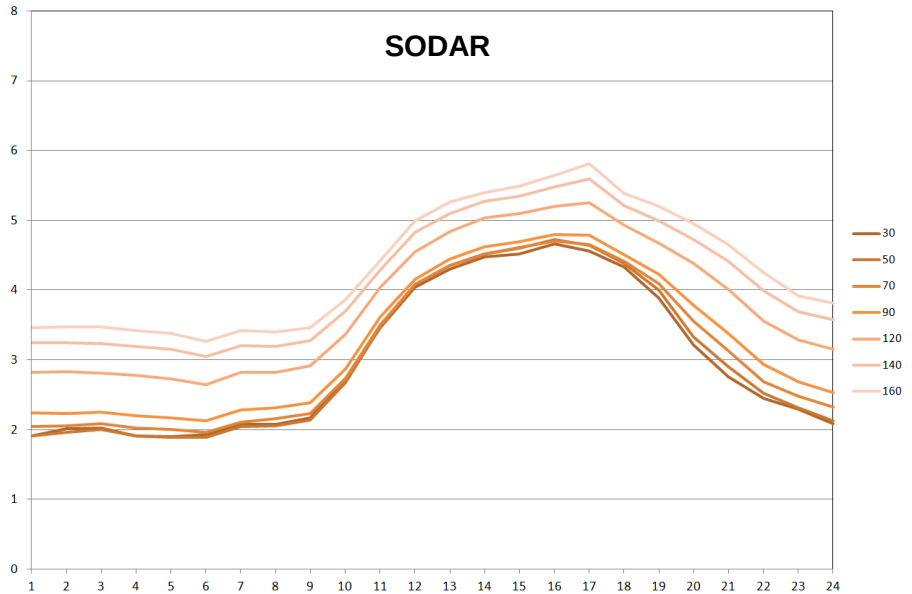


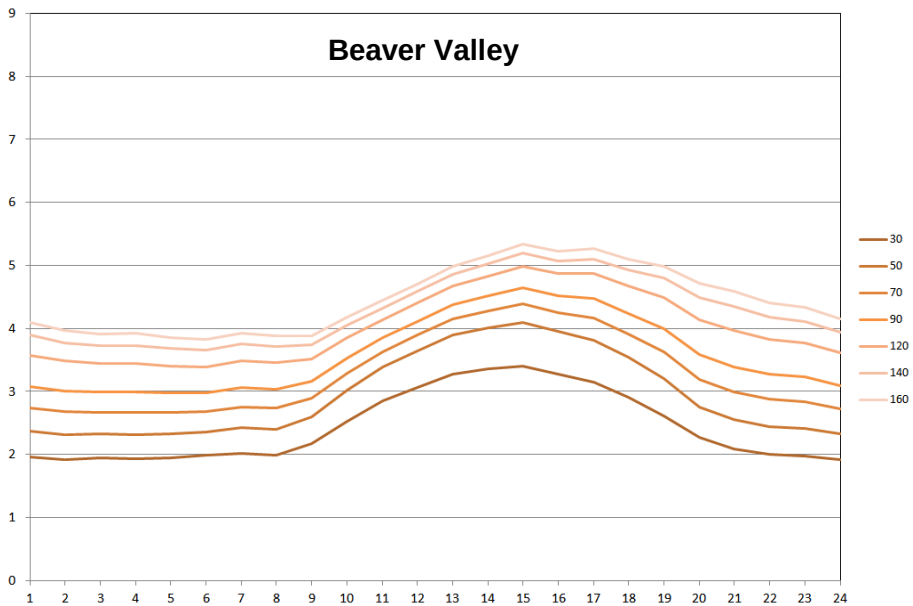
Figure H-15. Modeled Impact Ratios by General Source Type, at Increasing Levels, by Case

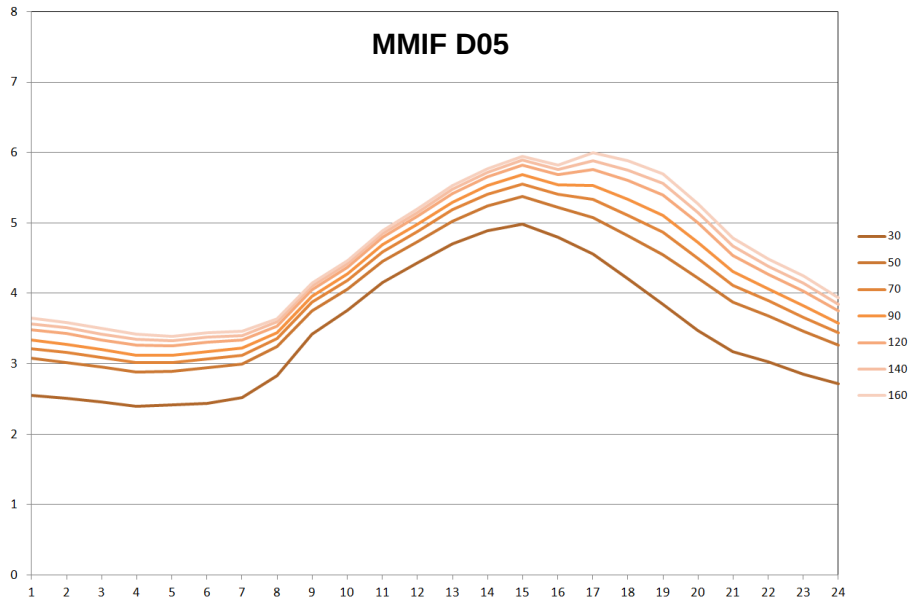
Figure H-15 shows that wind speed bias at upper levels with the MMIF D05 can lead to excess downwash impacts in complex terrain compared to SODAR wind speeds, specifically for medium and tall stacks when wind speeds above 125 m are included. (Results are similar using MMIF D04 data as well.). These higher wind speeds are likely causing excessive wind shear that exaggerates the downwash effects in complex terrain.

The method of skipped wind speeds above 50 m (while keeping other MMIF parameters: direction, temperature, pressure) appears to make the MMIF data more SODAR-like by removing the wind speed bias. Instead of using the supplied MMIF wind speed, AERMOD extrapolates the wind speeds upward based on the surface data to 50 m and atmospheric conditions.

For a further look at the MMIF with skipped speeds, average wind speed charts were created for AERMOD-extrapolated speeds (for 30-160 m) using SODAR, Beaver Valley, and MMIF D05 with surface speeds only (up to 50 m).







MMIF D05 wind speed skipped in AERMET processing for levels above 50 m

Figure H-16. Average Hourly Wind Speeds to 160 m, as Processed by AERMOD, by Meteorological Data (2014), with Skipped MMIF WS (>50 m)

Figure H-16 shows that the use of MMIF surface speeds up to 50 m only is a “fix” to the wind speed bias, making the resulting AERMOD profiles similar to those from the in-valley data (SODAR and Beaver Valley). This is not a customization of any WRF-derived MMIF data but rather an exclusion of data that was found to be overestimated. This may even be a more regulatory approach for wind speed, relying more on AERMOD algorithms for vertical extrapolation of speed instead of WRF-based profiles.

Since proper characterization of low-level meteorology and sources was key to this demonstration, MMIF D05 with surface wind speeds only (to 50 m) was chosen as the most representative meteorological data for the modeling. Wind direction and temperature show better comparisons to known data at higher levels (50-150 m); therefore, all levels for other profiled parameters were imported from MMIF onsite data in AERMET Stage 1.

MMIF D05 Cells

Specific MMIF D05 cells used for the demonstration are shown on the pages below. Each MMIF cell is essentially a virtual multi-level tower at any location.

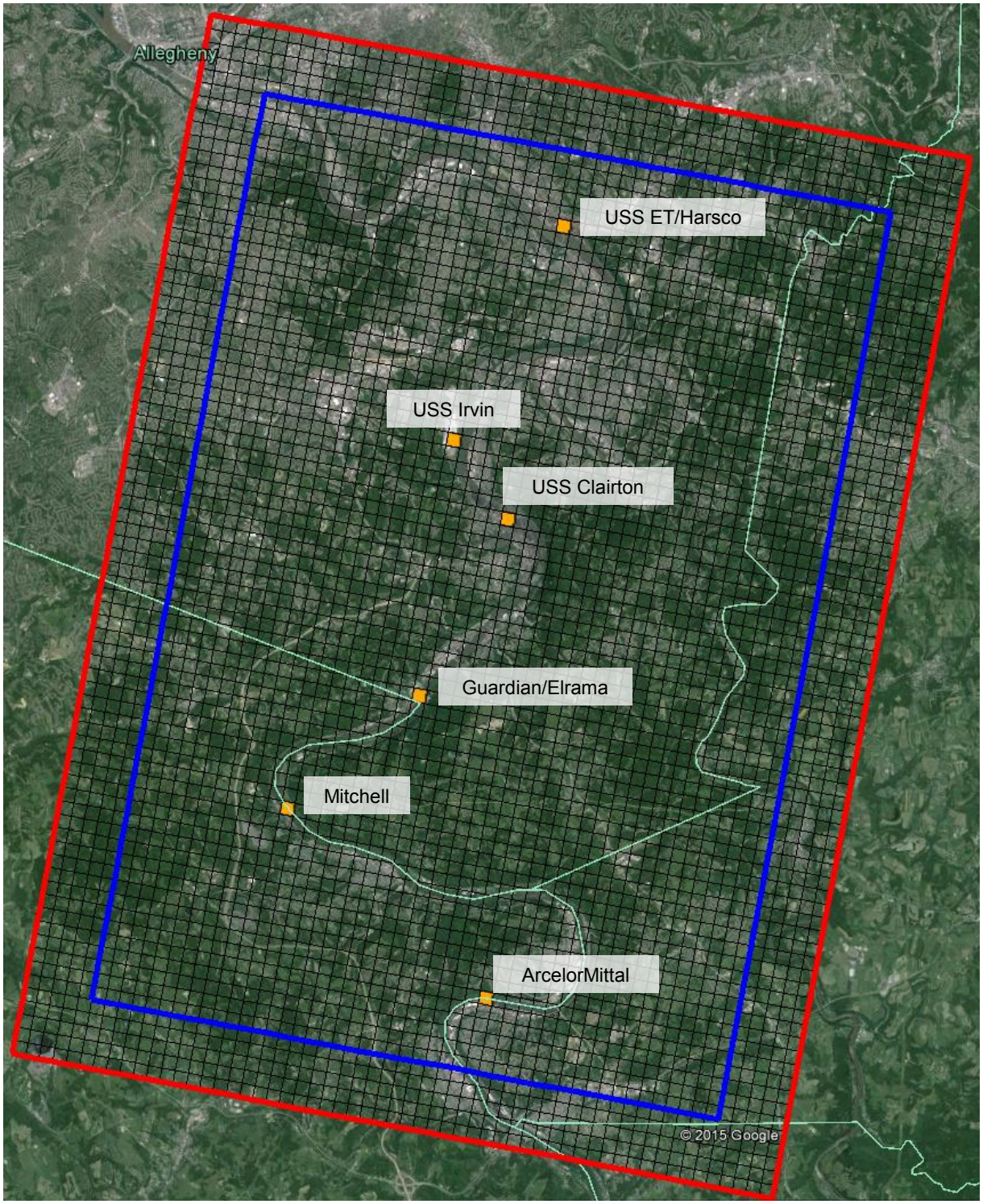


Figure H-17. WRF D05 Domain, with Cells Extracted for AERMOD (in orange)

Table H-2. MMIF D05 Cell Information

Source	Coordinates (i,j)	Profile Elevation
USS Clairton	29,46	244 m
USS Irvin	24,51	263 m
USS Edgar Thomson/Harsco	29,68	245 m
ArcelorMittal	34,11	280 m
Allegheny Energy Mitchell	17,22	244 m
Guardian/NRG Elrama	25,32	245 m

Figure H-18. MMIF D05 Cell, USS Clairton

Figure H-19. MMIF D05 Cell, USS Irvin

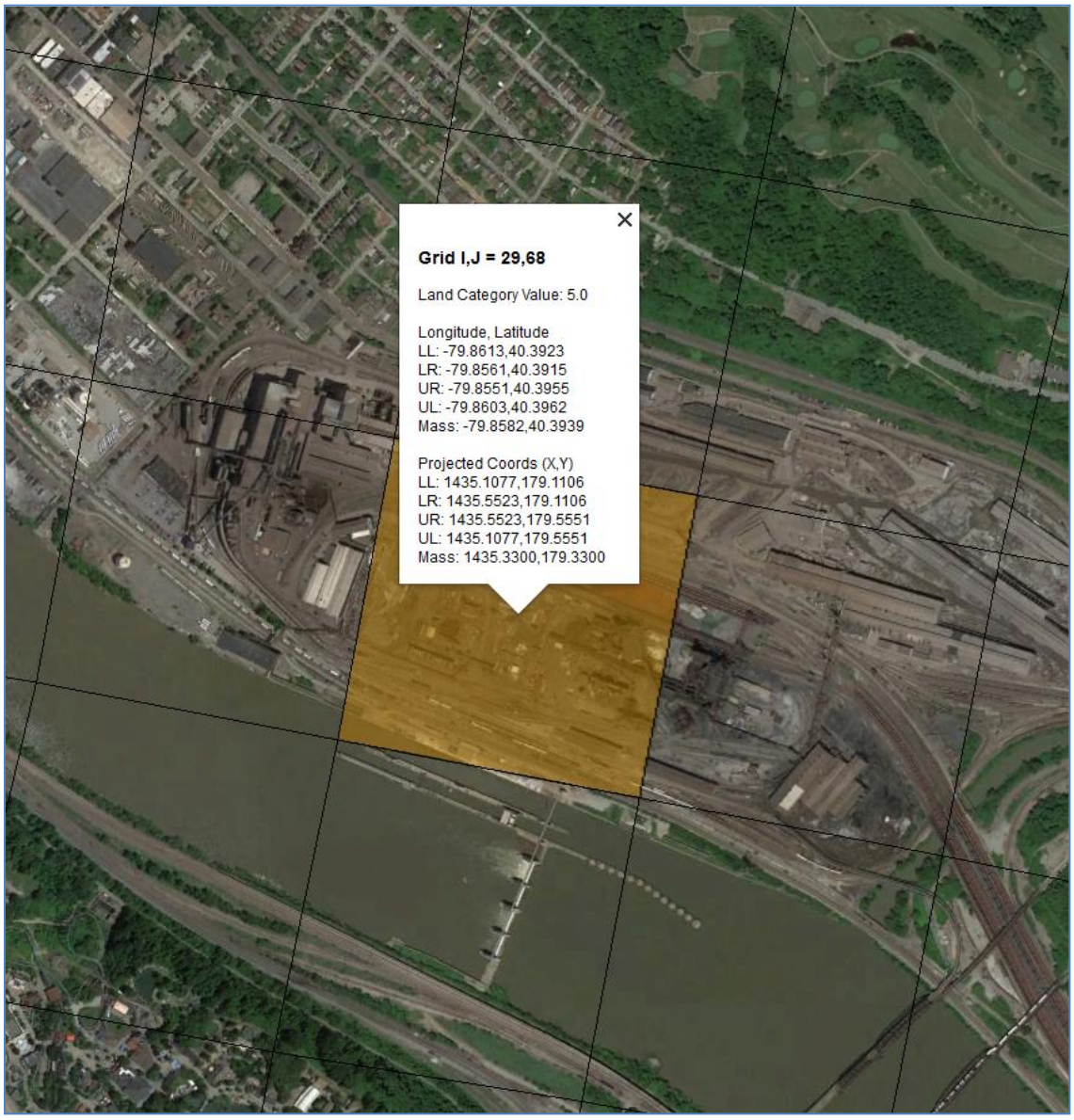


Figure H-20. MMIF D05 Cell, USS Edgar Thomson/Harsco

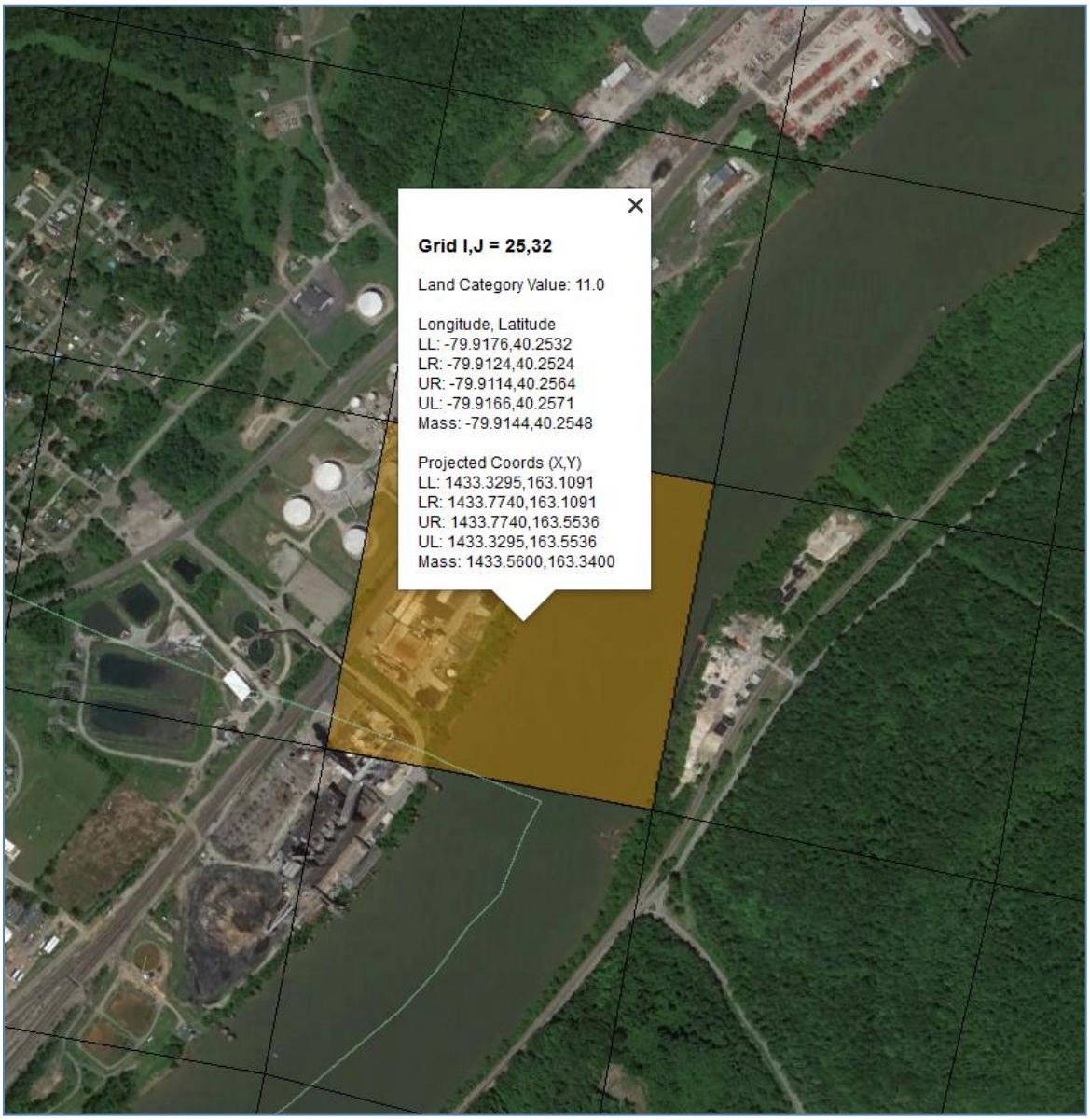


Figure H-21. MMIF D05 Cell, Guardian/Elrama

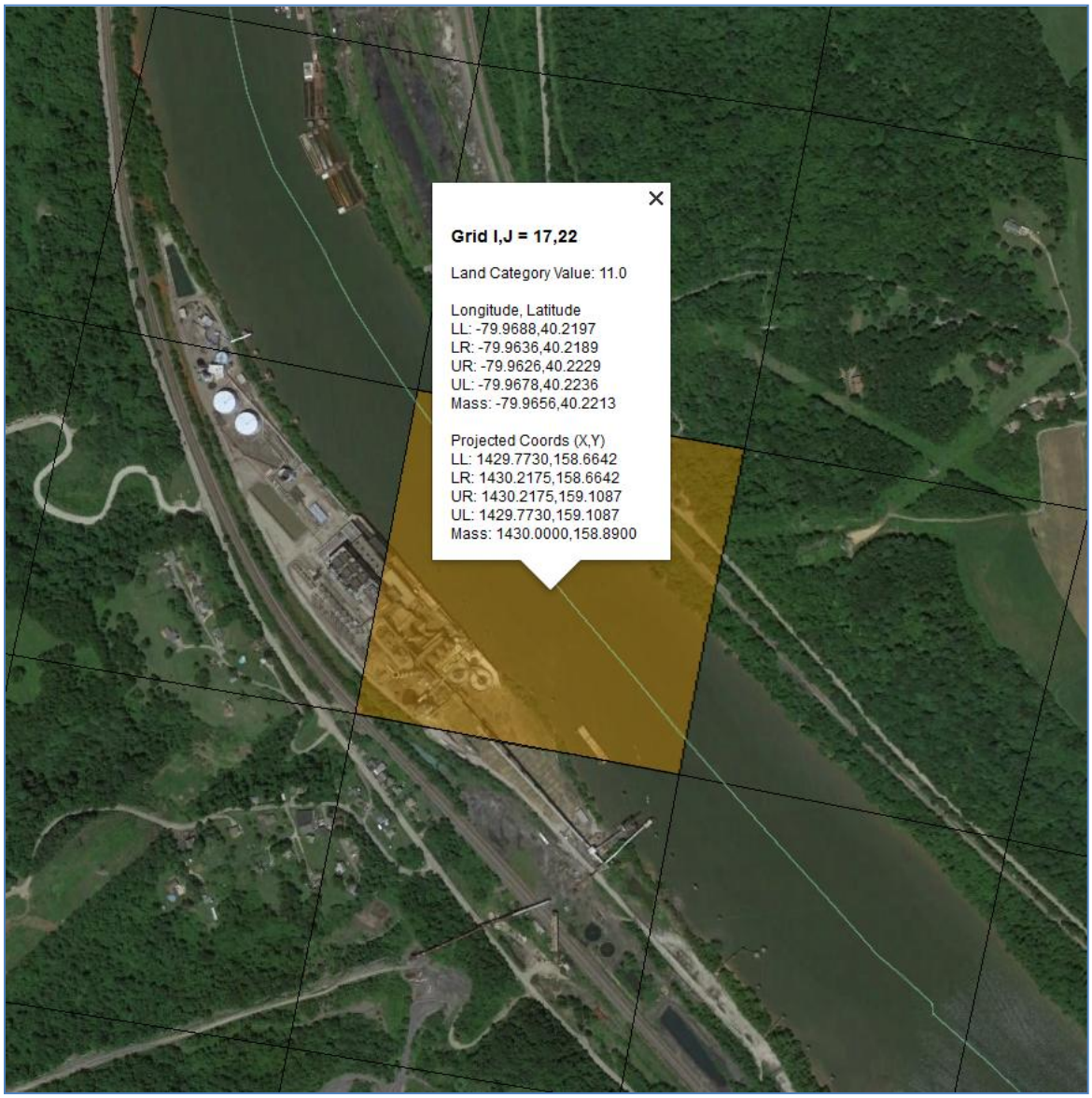


Figure H-22. MMIF D05 Cell, Mitchell

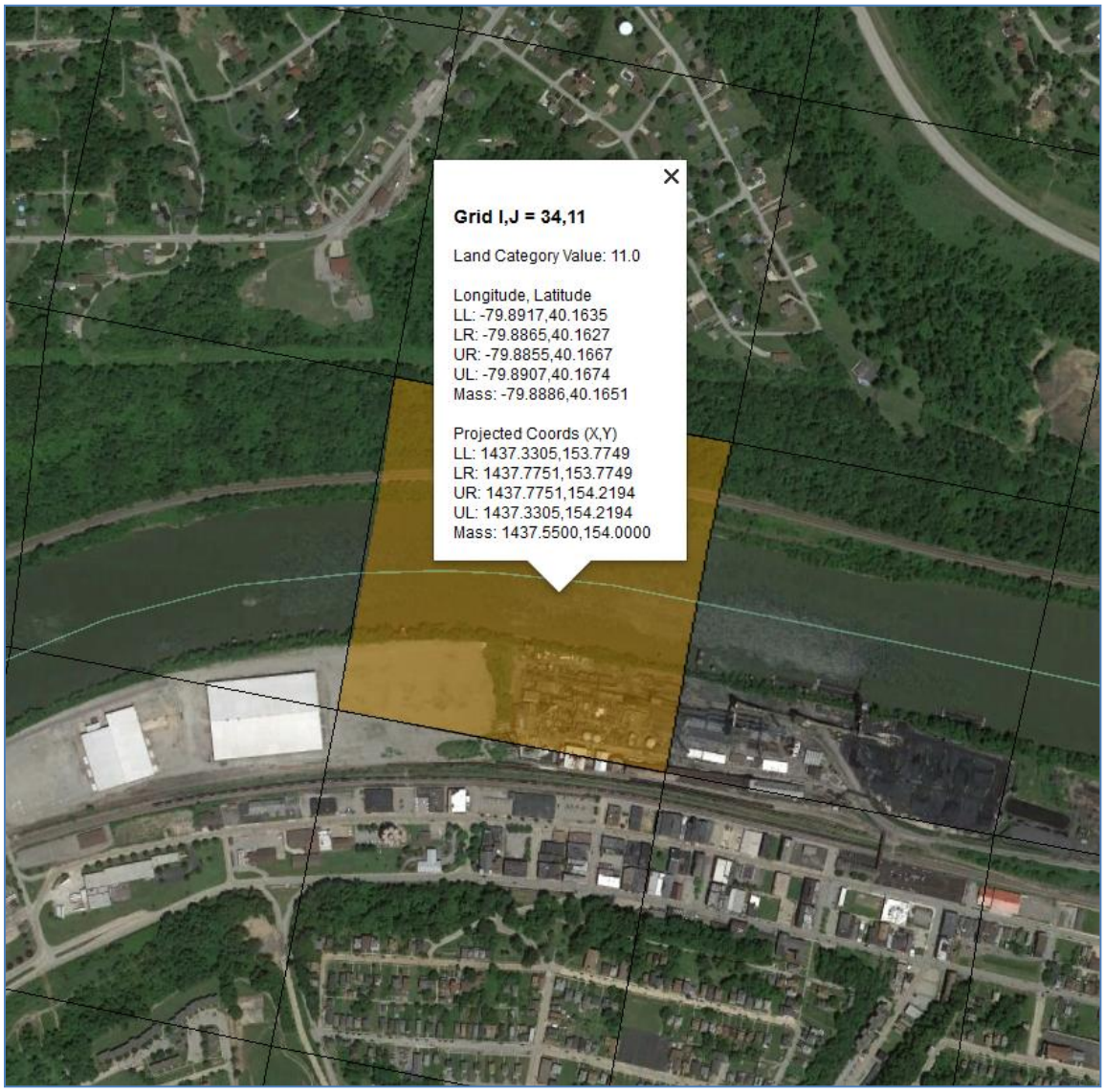


Figure H-23. MMIF D05 Cell, ArcelorMittal

Wind speeds and temperatures for each MMIF cell show similar directional and diurnal effects, with some differences based on location and elevation. Wind directions for each cell show realistic valley channeling through the Monongahela Valley, as shown in the figure below. (Note: Levels are shown in lighter shades with increasing levels (to 150 m). Airport wind roses are shown for comparison (WRF is derived from airport data.)

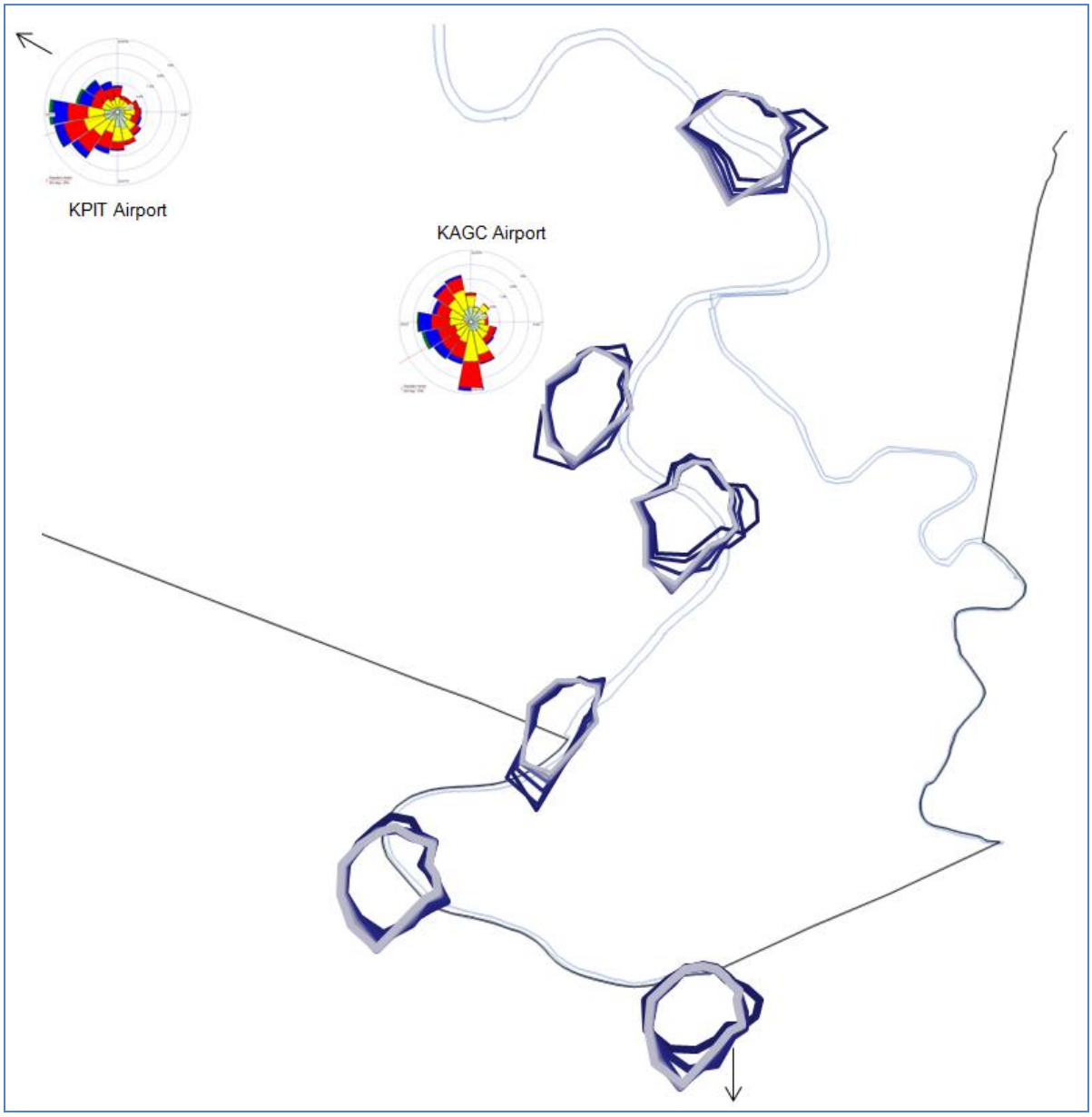


Figure H-24. MMIF D05 Cell Wind Direction Frequency Radar Plots in the Monongahela Valley

Sample MMIF Inputs

Below are samples of selected MMIF input/output files. Modeling files can be made available via data storage device (note: some files are very large in size.)

Sample MMIF Control file (.inp):

```
; This file must be space-delimited or comma-delimited, or a mixture.
; Comment characters are #, ;, and !.  Blank lines are ignored.
; Omitting keywords is the same as giving their default values.

start      2014 01 01 01    ; start time in LST, hour-ending format
stop       2014 12 31 24    ; end   time in LST, hour-ending format

# TimeZone is relative to GMT, i.e. -5 (GMT-05) is the US East Coast

TimeZone   -5   ! default is zero, i.e. GMT-00

# LAYERS has four options: TOP, MID, K, followed by the values to be used.
# Default is the EPA/FLM Guidance layers.
# ACHD Levels

layers top 20 30 40 60 80 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 5000

aer_mixht     AERMET
aer_min_mixht 1.0     ! default (same as AERMET)
aer_min_obuk  1.0     ! default (same as AERMET)
aer_min_speed 0.5     ! default (same as AERMET)
FSL_INTERVAL       6

# Output section

POINT LL 40.3070 -79.8800
### USSC US Steel Clairton
# AERMET
Output aermet useful   mmif.achd_lev.AER_mix.D05/USSC.AERMET.2014.csh
Output aermet onsite   mmif.achd_lev.AER_mix.D05/USSC.AERMET.2014.dat
Output aermet upperair mmif.achd_lev.AER_mix.D05/USSC.AERMET.2014.upa.fsl
Output aermet aersfc   mmif.achd_lev.AER_mix.D05/USSC.AERMET.2014.aersfc.dat
# AERMOD
Output aermod useful   mmif.achd_lev.AER_mix.D05/USSC.AERMOD.2014.info.txt
Output aermod sfc      mmif.achd_lev.AER_mix.D05/USSC.AERMOD.2014.SFC
Output aermod pfl      mmif.achd_lev.AER_mix.D05/USSC.AERMOD.2014.PFL

POINT LL 40.3939 -79.8582
### USSET US Steel Edgar Thomson
# AERMET
```

```
Output aermet useful   mmif.achd_lev.AER_mix.D05/USSET.AERMET.2014.csh
Output aermet onsite   mmif.achd_lev.AER_mix.D05/USSET.AERMET.2014.dat
Output aermet upperair mmif.achd_lev.AER_mix.D05/USSET.AERMET.2014.upa.fsl
Output aermet aersfc   mmif.achd_lev.AER_mix.D05/USSET.AERMET.2014.aersfc.dat
# AERMOD
Output aermod useful   mmif.achd_lev.AER_mix.D05/USSET.AERMOD.2014.info.txt
Output aermod sfc      mmif.achd_lev.AER_mix.D05/USSET.AERMOD.2014.SFC
Output aermod pfl      mmif.achd_lev.AER_mix.D05/USSET.AERMOD.2014.PFL

# INPUT gives filenames of either MM5 or WRF files

INPUT  ../2013-12-31/wrfout_d05_2013-12-30_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2013-12-31_00:00:00
INPUT  ../2013-12-31/wrfout_d05_2013-12-31_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-01_00:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-01_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-02_00:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-02_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-03_00:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-03_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-04_00:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-04_12:00:00
INPUT  ../2013-12-31/wrfout_d05_2014-01-05_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-04_12:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-05_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-05_12:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-06_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-06_12:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-07_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-07_12:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-08_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-08_12:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-09_00:00:00
INPUT  ../2014-01-05/wrfout_d05_2014-01-09_12:00:00
```

Sample MMIF onsite supplied to AERMET (Stage 1):

- Surface level: solar radiation, precipitation, pressure
- First level (2 m): delta_T (temperature difference to next available level)
- For each specified level: wind speed, wind direction, temperature, relative humidity

Date	***Radiation***	***Precip***	***Pressure***			
2014010101	0.00	0.000	9942.888			
	Height	***Speed***	***Direction***	***Temp***	***Rel Hum***	***Delta_T***
	2.00			-5.191	79.570	0.441
	10.00	1.779	204.797	-4.749	76.000	
	25.00	2.849	206.616	-4.774	76.000	
	35.00	3.421	207.835	-4.794	76.000	
	50.00	4.024	210.390	-4.769	75.000	
	70.00	4.573	216.097	-4.647	74.000	
	90.00	4.687	222.918	-4.535	72.000	
	112.50	4.600	230.962	-4.488	71.000	
	137.50	4.715	239.744	-4.482	71.000	
	162.50	5.159	246.425	-4.492	70.000	
	187.50	5.695	250.155	-4.513	69.000	
	225.00	6.550	253.539	-4.633	69.000	
	275.00	7.477	256.732	-4.940	70.000	
	325.00	8.015	258.642	-5.145	70.000	
	375.00	9.183	262.089	-5.636	72.000	
	425.00	9.324	262.442	-5.694	72.000	
	475.00	10.379	264.078	-6.127	73.000	
	550.00	11.343	265.044	-6.496	74.000	
	650.00	13.018	265.871	-7.083	72.000	
	750.00	14.066	266.069	-7.790	69.000	
	850.00	14.686	266.287	-8.262	66.000	
	950.00	15.444	267.184	-9.169	60.000	
	1250.00	18.384	271.946	-9.562	62.000	
	1750.00	24.067	276.613	-10.027	75.000	
	2250.00	30.080	279.557	-11.388	84.000	
	2750.00	35.111	280.420	-13.933	86.000	
	3250.00	35.478	280.184	-14.378	86.000	
	3750.00	38.700	278.318	-18.262	82.000	
	4500.00	40.814	276.832	-20.618	73.000	

Sample MMIF upper air[2]: supplied to AERMET (Stage 1):

4 soundings (hours 0, 6, 12, 18, in UTC)

REC_TYPE	HOUR	DAY	MONTH	YEAR		
254	6	1	JAN	2014		
	WBAN#	WMO#	LAT	LON	ELEV	RTIME
1	99999	999999	40.31N	79.88W	244	600
	HYDRO	MXWD	TROPL	LINES	INDEX	SOURCE
2	32767	32767	32767	31	32767	32767
					SONDE	WSUNITS
3		NONE			32767	ms
	PRES	HT	TEMP	DEWPT	DIR	SPD
9	997	244	-50	-82	208	5
5	994	269	-49	-83	214	9
5	990	294	-50	-84	213	21
5	987	319	-49	-85	216	34
5	984	344	-47	-87	222	41
5	981	369	-46	-88	230	43
5	978	394	-46	-89	236	44
5	975	419	-46	-91	243	48
5	971	444	-45	-92	249	55
5	965	494	-46	-94	253	64
5	958	544	-50	-96	257	74
5	953	594	-52	-97	259	81
5	946	644	-56	-98	262	89
5	944	694	-57	-98	262	92
5	932	744	-63	-101	264	104
5	921	844	-68	-107	265	119
5	914	944	-72	-113	266	129
5	899	1044	-80	-128	266	143
5	887	1144	-87	-142	266	149
5	863	1244	-94	-158	269	165
5	820	1744	-97	-144	274	210
5	770	2244	-107	-135	278	271
5	712	2744	-127	-147	280	326
5	682	3244	-138	-157	280	350
5	630	3744	-164	-184	279	371
5	593	4244	-182	-205	278	386
5	511	5244	-237	-304	275	436

[2] Full format available at: http://www.esrl.noaa.gov/raobs/intl/fsl_format-new.cgi

Sample MMIF surface characteristics supplied to AERMET (Stage 3):

Monthly albedo, Bowen ratio, surface roughness, averaged to MMIF cell (1 sector)

```
** Generated by MMIF VERSION 3.3rc2 2016-07-06
** Center Latitude  (decimal degrees):     40.30704
** Center Longitude (decimal degrees):    -79.87994
** Datum: NWS-84
** Study radius (km) for surface roughness:      0.44444
** The rest of the AERSURFACE inputs are not applicable
**
   FREQ_SECT  MONTHLY  1
   SECTOR   1    0  360
**           Month    Sect    Alb      Bo        Zo
   SITE_CHAR    1       1     0.21     1.72   0.04961
   SITE_CHAR    2       1     0.30     1.92   0.05076
   SITE_CHAR    3       1     0.15     1.16   0.06583
   SITE_CHAR    4       1     0.13     0.50   0.09800
   SITE_CHAR    5       1     0.15     0.70   0.14130
   SITE_CHAR    6       1     0.15     0.42   0.14843
   SITE_CHAR    7       1     0.15     0.48   0.14146
   SITE_CHAR    8       1     0.14     0.61   0.13538
   SITE_CHAR    9       1     0.13     0.90   0.12786
   SITE_CHAR   10       1     0.13     0.90   0.10673
   SITE_CHAR   11       1     0.12     0.63   0.07327
   SITE_CHAR   12       1     0.10     0.96   0.05467
```

SO_2 SIP

Appendix I

AERMOD Evaluation and Configuration

I-1: AERMOD Evaluation

I-2: AERMOD Configuration

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I-1: AERMOD Evaluation

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AERMOD Evaluation

This section of Appendix I contains evaluations of AERMOD options and performance. This is essentially an addendum to Ramboll Environ's model performance evaluation (MPE) in Appendix G, with an expanded look at AERMOD options and performance throughout the NAA.

Ramboll Environ's MPE showed that AERMOD with MMIF meteorology at 0.444 km resolution was the most appropriate model for the demonstration. ACHD's MMIF analysis (Appendix H) additionally showed that the 0.444 km was the most representative of both plateau and localized in-valley flow in the NAA.

Some results in the Appendix G may differ from conclusions in this appendix due to the following, specifically in regard to near-field impacts in the NAA:

- The focus of the MPE was performance at/near the Liberty monitor, irrespective of impacts throughout the full NAA boundaries
- The MPE used point sources for the characterization of buoyant fugitive sources
- THE MPE used AERMOD v15181 for all evaluations; subsequent versions 16216 and 16216r of AERMOD include code revisions specific to near-field overestimations (including ADJ_U*)

This section includes some model results using AERMOD version 15181; in order to save time and not duplicate previous efforts, runs were not repeated if results were equivalent with version 16216 or 16216r. Runs that specifically utilized ADJ_U*, including the final configuration (see next section I-2), used version 16216 or 16216r.

AERMOD Options

Several options are available either as default regulatory or as BETA options with AERMET and AERMOD. Discussions of the results for each option tested for this modeling demonstration are described below.

<u>ADJ_U*</u>

ADJ_U* corrects stable boundary layer parameters in low wind conditions. Parameters include several interdependent variables, including surface friction velocity, mixing height, sensible heat flux, Monin-Obukov length, and cloud cover (using MMIF only).

Tests showed that ADJ_U* was an appropriate option for the area, and ADJ_U* was selected for the final runs with MMIF. The most appropriate processing with MMIF was with AERMET-based mixing heights, since ADJ_U* does not modify mixing heights that are supplied from WRF.

<u>LOWWIND</u>

LOWWIND3 showed some results that were similar to ADJ_U*, possibly with a tendency toward underprediction for some sources and years. However, this option is available as a BETA

option only. Overall, there was insufficient evidence based on model performance to request an alternative modeling approach using LOWWIND3.

URBAN Mode

Urban mode can be selected for areas or sources with large amounts of heat flux. Urban mode adjusts the urban boundary layer for better dispersion during stable conditions.

The MPE found that a heat difference of about 10°C is evident for some sources in the NAA, equivalent to an effective population of 500,000. (Previous studies for ACHD found similar indicators of a localized heat island at USS Clairton.)

However, model runs using an urban population of 500,000 showed underprediction for the NAA. The heat island effect is likely better characterized at the surface level, adding buoyancy to sources rather than modifying the boundary layers. Urban mode was not selected for this demonstration.

Half-Life

The half-life option is available for scenarios where there may be conversion of SO_2 to other compounds (sulfuric acid, sulfates). Half-life is automatically activated when using the Urban mode option and is usually associated with Urban mode processing only, which was not selected for the modeling. Test runs with half-life showed only minor reductions in impacts (1-2 ppb). Additionally, test runs using the SCICHEM model for the MPE showed little conversion in the near-field area. Half-life was therefore not selected for the demonstration.

Wind Speed Threshold

Wind speed thresholds were tested at values lower than the recommended 0.5 m/s. Resulting modeled impacts showed little differences. A threshold of 0.5 m/s was kept as the appropriate threshold.

Horizontal/Capped Stacks

A few stacks in the NAA are angled or partially-capped stacks with presumed building downwash effects. However, the use of the POINTHOR and POINTCAP source types for these sources showed overprediction as well as changes to maximum impact locations from these sources. It was assumed that vertical stacks were more appropriate for the characterization of these sources.

Mixing Heights

Different mixing height options can be selected with MMIF data (see Appendix A). Average hourly mechanical mixing heights by MMIF option are shown in Figure I-1-1 for Clairton MMIF D05 2014 data.

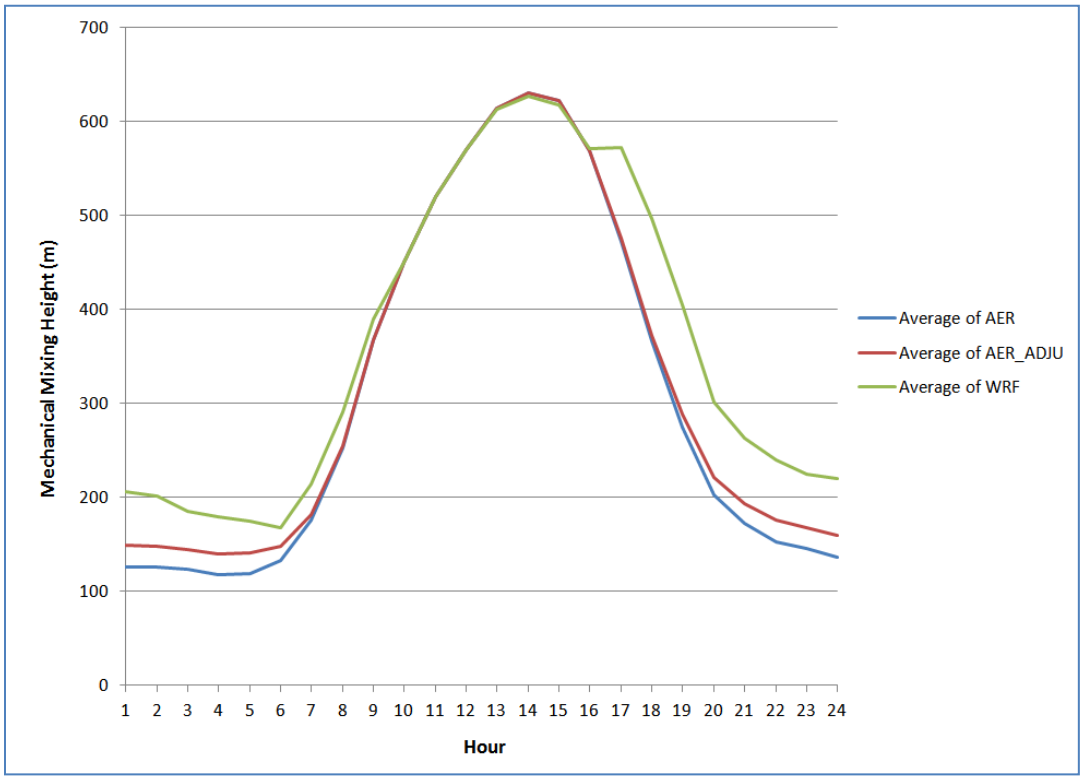


Figure I-1-1. Average Hourly Mechanical Mixing Heights, by Option

AERMET-based mixing heights showed the lowest average values of mixing height, which can lead to modeled overestimation. ADJ_U* corrects the low mixing heights to more realistic values during stable conditions.

WRF mixing heights showed the highest overall average mixing heights during stable conditions.[1] However, WRF mixing heights can lead to periods with several consecutive hours at a minimum mixing height (10 m). There is also an apparent delay in the day-to-night transition with the WRF heights (hour 17), while AERMET-based heights show a smoother transition.

Since AERMET-based mixing heights with ADJ_U* produce more realistic results, and since AERMET-based heights are likely a better complement to AERMOD overall, AERMET-based mixing heights with ADJ_U* were chosen as the best method for mixing height.

[1] MMIF mixing heights are another option from MMIF; results were similar to those from WRF

AERMOD Performance by Monitor Site

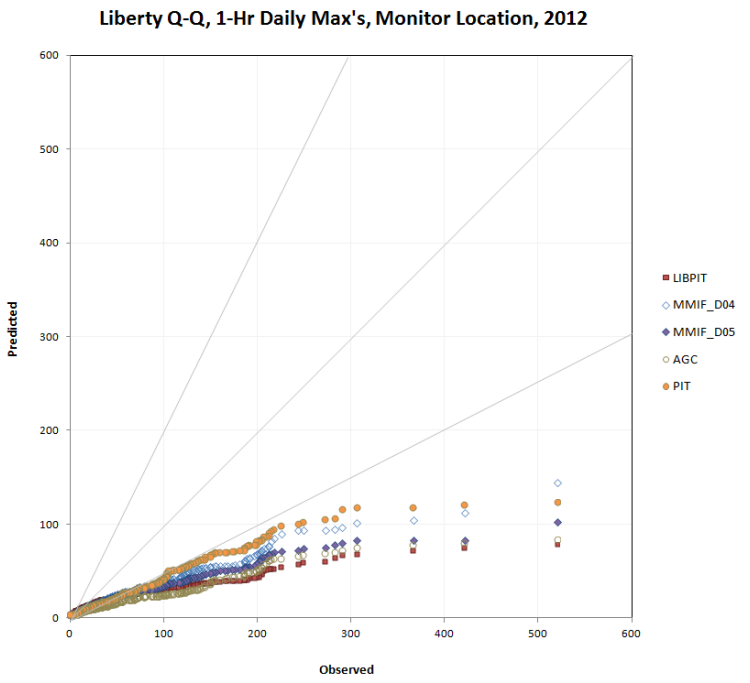
AERMOD performance was based on modeled response in comparison to Liberty and North Braddock monitored data. Relying on historical and conceptual data, expected concentrations in the NAA were also examined. Liberty data is available for the 2012-2014 modeled timeframe, with North Braddock available for 2014 only.

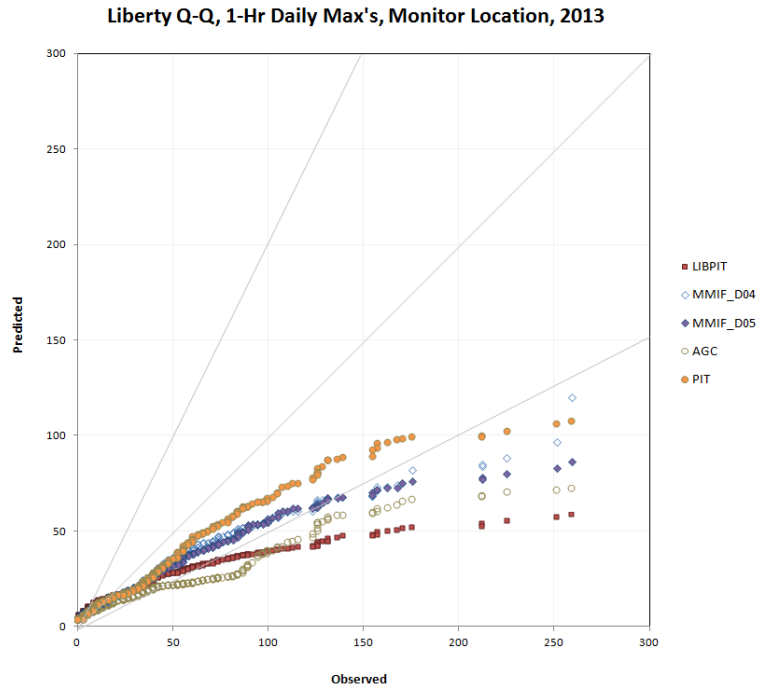
Liberty

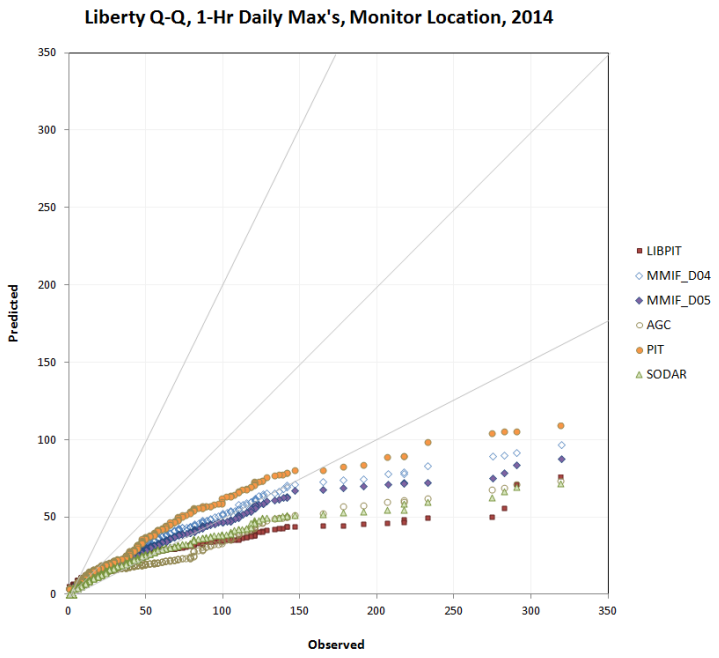
First, performance was tested for actual monitor site locations. Below in Figure 1-1-2 are quantile-quantile (Q-Q) plots for 2012-2014 by year (and average 3-year) daily 1-hour maximums for Liberty using different meteorological data with default AERMOD settings.

Q-Q plots use all data within a given year according to their ranking by quantiles. Data is ranked high-to-low, with errors in time removed from the analysis. Average hourly background values from South Fayette were added to the concentrations based on actual monitored values (varying from 1.0-1.5 ppb).[2]

[2] 1 ppb = 2.6157 μg/m³ for SO_2 at 25°C and 1 atm







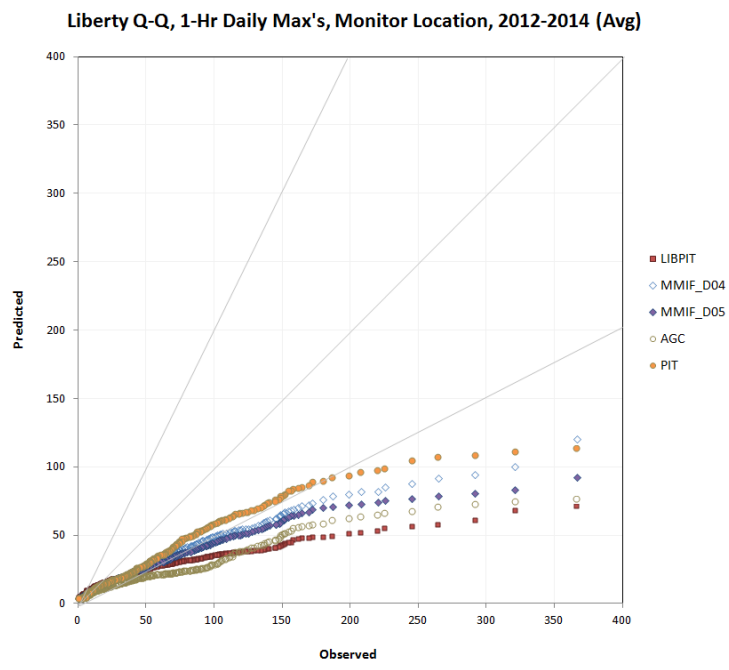


Figure I-1-2. Liberty Q-Qs, by Year, Liberty Actual Monitor Location

Initial testing at the actual (or point) location for the Liberty monitor site shows low model performance at the highest concentrations. This may be primarily due to the steady-state nature of AERMOD, leading to straight-line hourly plume distributions that are not impacting the exact location of the Liberty site.

Actual high-concentration periods are driven by sub-hourly, non-steady-state conditions during strong atmospheric inversions in complex terrain. While vertical temperature profiles are used in AERMOD, the extreme capping of pollutants in river valleys are difficult to characterize in a steady-state basis. This may be true of any current model, as puff modeling showed underprediction (see Appendix G). Real-life conditions can include periods of stagnation, changes in wind speeds on a minute basis, meandering in valleys and hollows, recirculation within the inversion layer, and other phenomena.

As a method of normalizing the modeled conditions to real-life conditions, the receptor area was expanded to better represent the monitored zone. This coincides with the conceptual expansion of additional zones of expected concentrations (high or low) in unmonitored or previously monitored areas (see Appendix A).

The expansion of the receptor area is similar to the test performed in the MPE using constant elevations for Liberty, which led to a better modeled response at the monitor location. The MPE test virtually removed terrain differences surrounding Liberty, while an expanded receptor grid technique stretches the representative monitored area across the complex terrain. Table I-1-1 below shows the monitor scales for SO_2:[3]

Table I-1-1. SO_2 Monitor Scales

Microscale – This scale would typify areas in close proximity to SO2 point and area sources. Emissions from stationary point and area sources, and non-road sources may, under certain plume conditions, result in high ground level concentrations at the microscale. The microscale typically represents an area impacted by the plume with dimensions extending up to approximately 100 meters.
Middle scale – This scale generally represents air quality levels in areas up to several city blocks in size with dimensions on the order of approximately 100 meters to 500 meters. The middle scale may include locations of expected maximum short-term concentrations due to proximity to major SO2 point, area, and/or non-road sources.
Neighborhood scale – The neighborhood scale would characterize air quality conditions throughout some relatively uniform land use areas with dimensions in the 0.5 to 4.0 kilometer range. Emissions from stationary point and area sources may, under certain plume conditions, result in high SO2 concentrations at the neighborhood scale. Where a neighborhood site is located away from immediate SO2 sources, the site may be useful in representing typical air quality values for a larger residential area, and therefore suitable for population exposure and trends analyses.
Urban scale – Measurements in this scale would be used to estimate concentrations over large portions of an urban area with dimensions from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Urban scale sites may also support other monitoring objectives of the SO2 monitoring network such as identifying trends, and when monitors are sited upwind of local sources, background concentrations.

[3] Liberty and North Braddock are both neighborhood scale, with population exposure objectives. Liberty is also highest concentration as a secondary objective. Neighborhood scale is 0.5 to 4 km (of uniform land use). See 40 CFR Part 58 Appendix D.

Based on the monitor scales and objectives for SO_2 at Liberty, the receptor area was expanded to 500 m for comparison to the modeled results. This method forgives time and space for a better comparison to 1-hour modeled results. This is similar to the "nearby" grid cell approach used in ozone and $PM_{2.5}$ photochemical modeling, where the adjacent grid cells are used in the averaging of concentrations.

For the expanded 500 m area comparison, polar (radial) receptors were created for Liberty at 100 m distances in directions at increments of 22.5°.

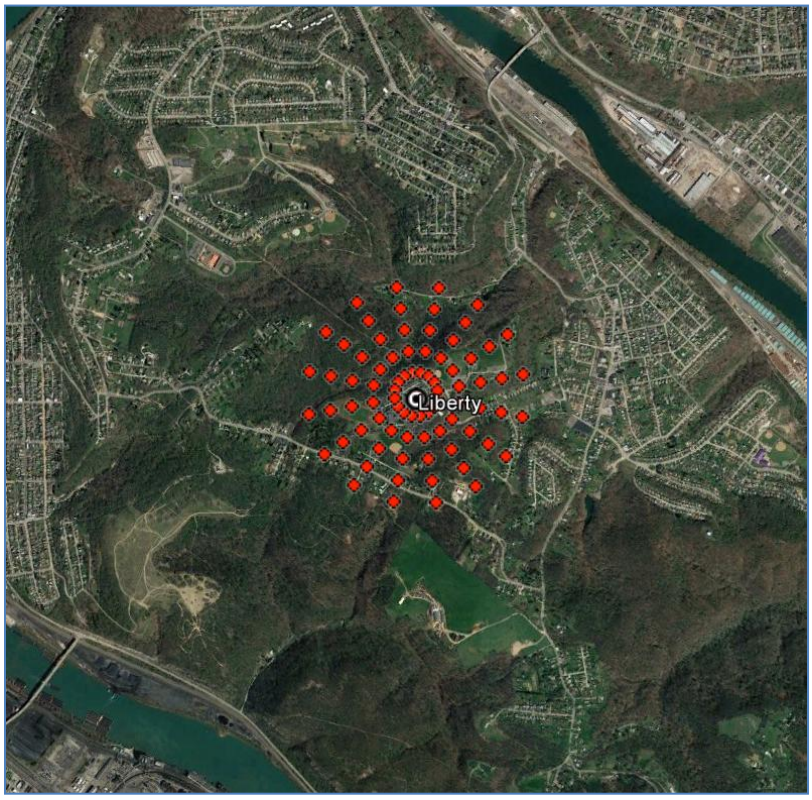


Figure I-1-3. Liberty 500 m Radial Receptors

Figure I-1-4 shows the modeled Q-Q's using the 500 m radial grid by year, as well as by averaged values from the yearly results.

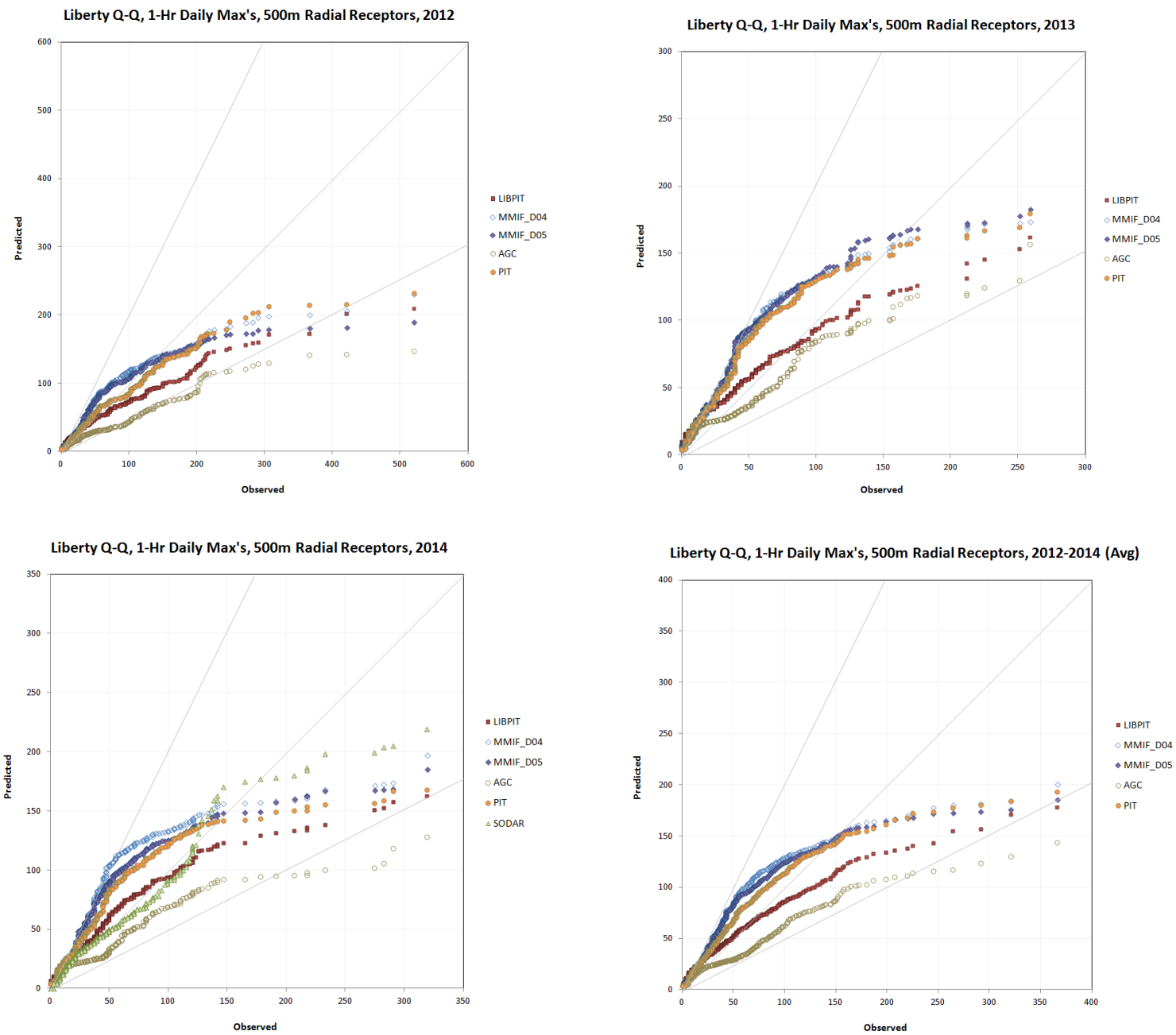


Figure I-1-4. Liberty Q-Qs, by Year, 500 m Radial Receptors

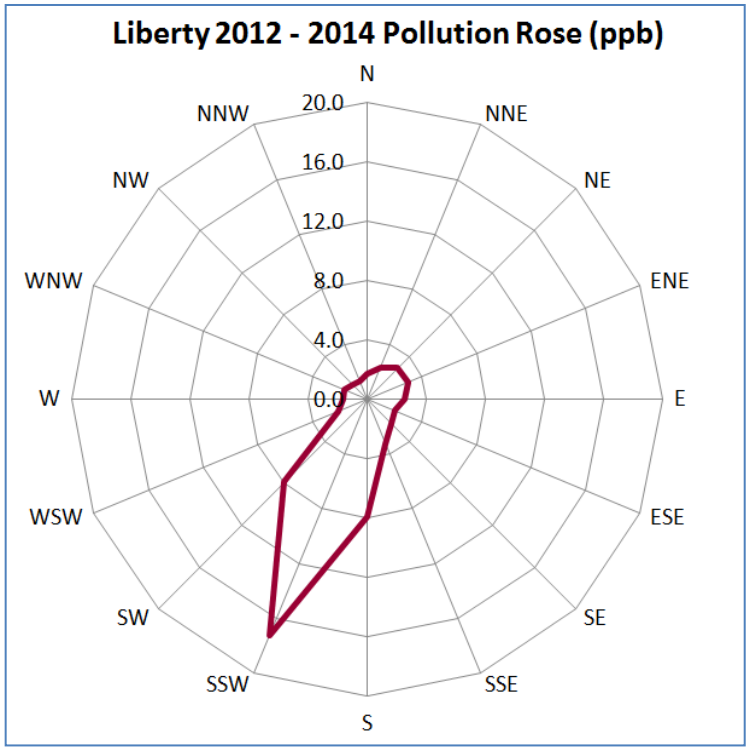
The Liberty 500 m nearby zone is showing better performance for all scenarios. However, overestimation becomes apparent at low/middle concentrations, with the highest concentrations still underestimated using any meteorological data. While examination of low/mid ranges of concentrations are important in the model assessment overall, the highest 1-hour maximums are most important for this SIP. MMIF and SODAR data (2014 only) led to the best results for maximums in the 500 m radial region.

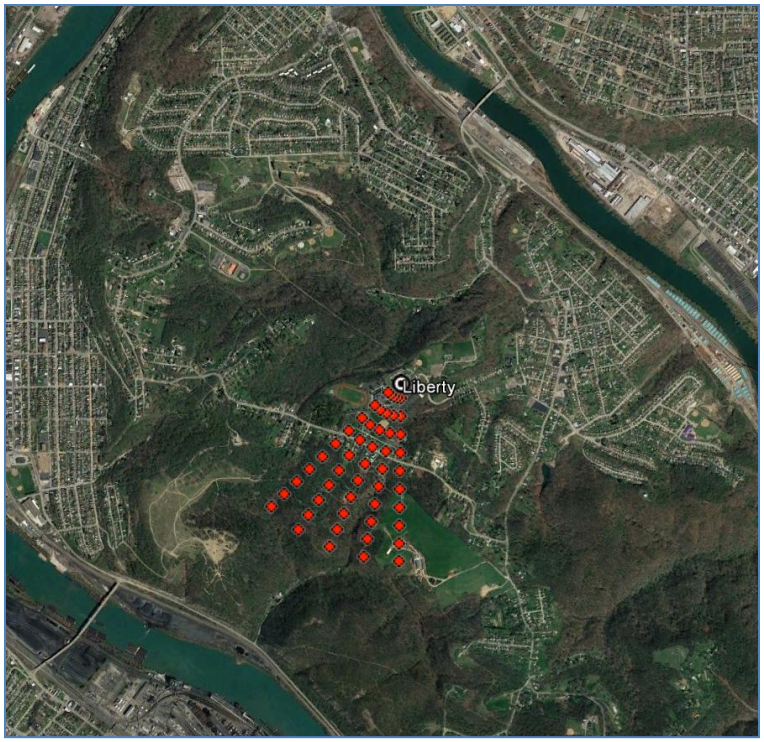
Reexamining the monitoring scale, and taking topography into account, a 500 m radius may not be fully representative of the Liberty monitor. On a middle scale, Liberty represents the South Allegheny High School and some adjacent properties (mostly forested). On a larger neighborhood scale, Liberty probably best represents the secondary zone beyond the highest elevations in the upwind Monongahela Valley (Lincoln and Glassport hillsides). Liberty can also be visualized as the most downwind portion of Coursin Hollow, and the most upwind portion of the Liberty residential zone.

Looking at pollution roses for Liberty, concentrations show a strong dependence on wind directions to the SSW (202.5°) and adjacent sectors. To better match this area, “sector-based” additional radial receptors were placed at distances extending into the larger upwind area including Coursin Hollow, up to 1 km to the SSW at increments of 11.5°.

Figure I-1-5 shows the Liberty pollution rose for 2012-2014, sector receptors, and a cross-sectional diagram of Liberty in the SSW direction.

Figure I-1-6 presents the Q-Q’s using the sector-based receptors at Liberty.





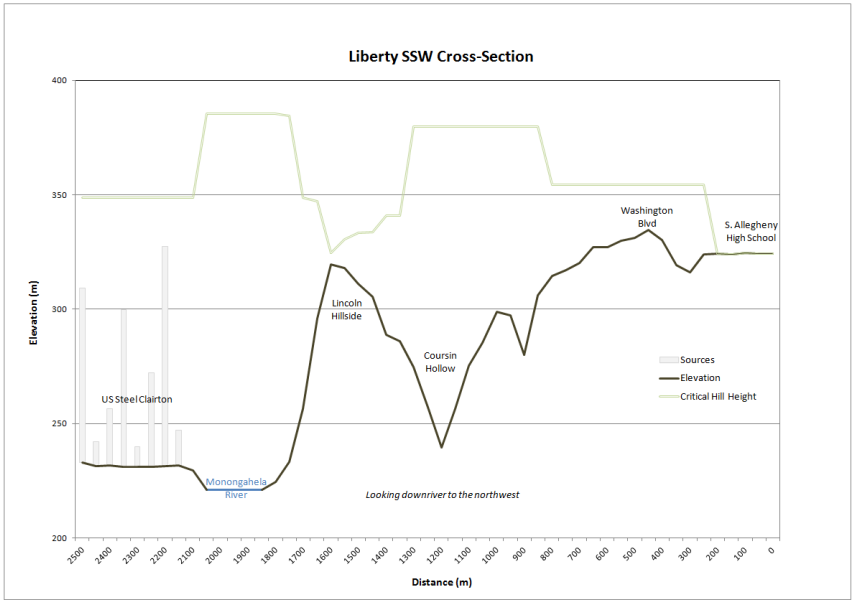


Figure I-1-5. Liberty Pollution Rose, Sector Receptors, and Cross-Section

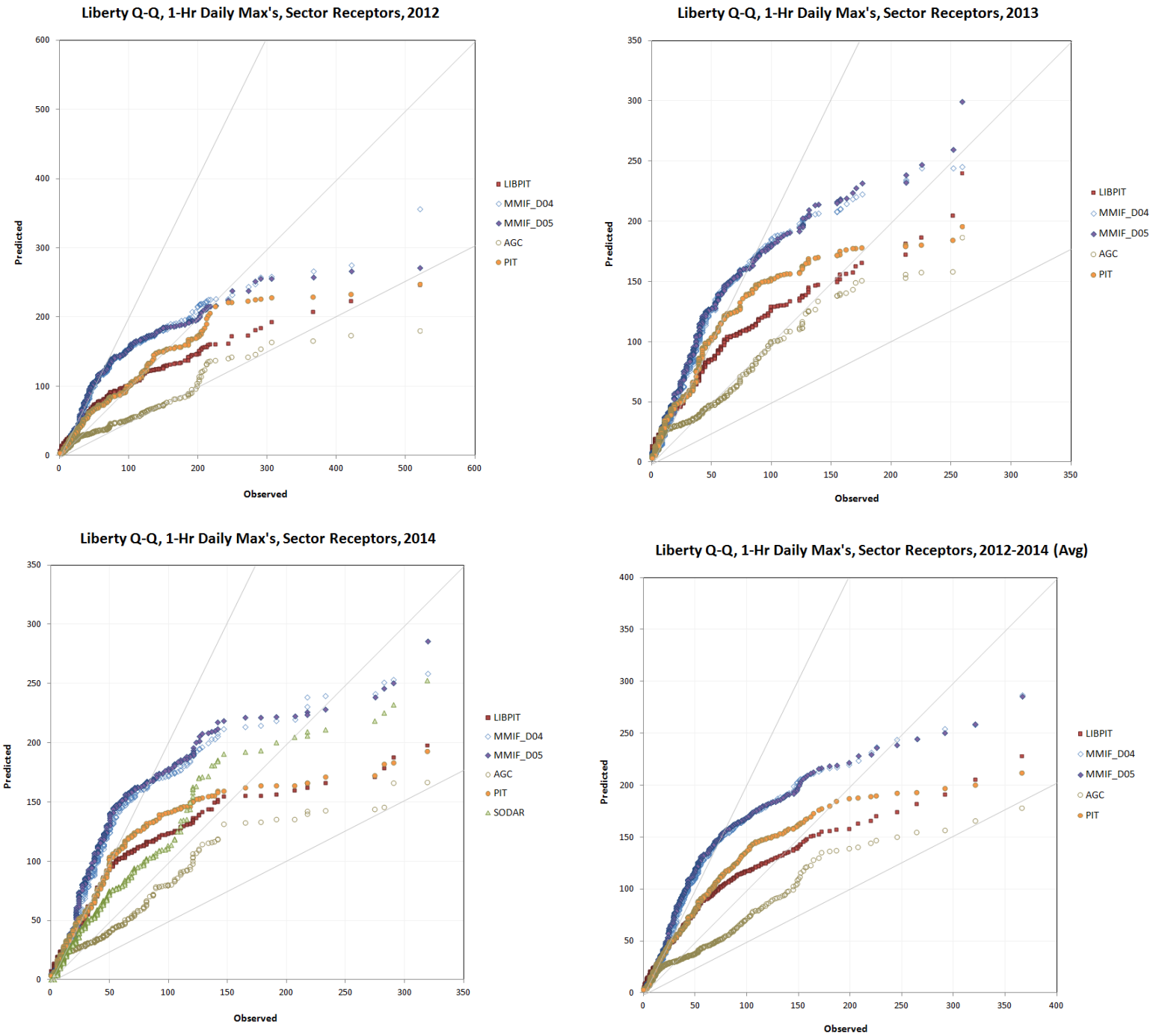


Figure I-1-6. Liberty Q-Qs, by Year, Sector Receptors

The Liberty sector-based zone shows good performance using MMIF data, specifically for maximums above the NAAQS (196.18 µg/m³). MMIF also best replicates the SODAR-based results in 2014. (Note: SODAR is only available for year 2014).

Overprediction is apparent at low to mid-ranges, indicating that the expanded area may not be representative for all ranges of concentrations. However, looking at maximums, MMIF is the best performing case for the prediction of high values. In fact, it is the only meteorological data set that shows modeled exceedances in all years. The use of Liberty and SODAR data are the only other cases to show exceedances. (Note: "LIBPIT" is Liberty onsite data merged with KPIT upper air and required surface variables such as pressure.)

With the release of AERMOD version 16216, ADJ_U* became a regulatory default option for low wind conditions. The sector-based receptor tests shown above were repeated, using the ADJ_U* option. Figure I-1-7 shows the Q-Q results for the same meteorological cases.

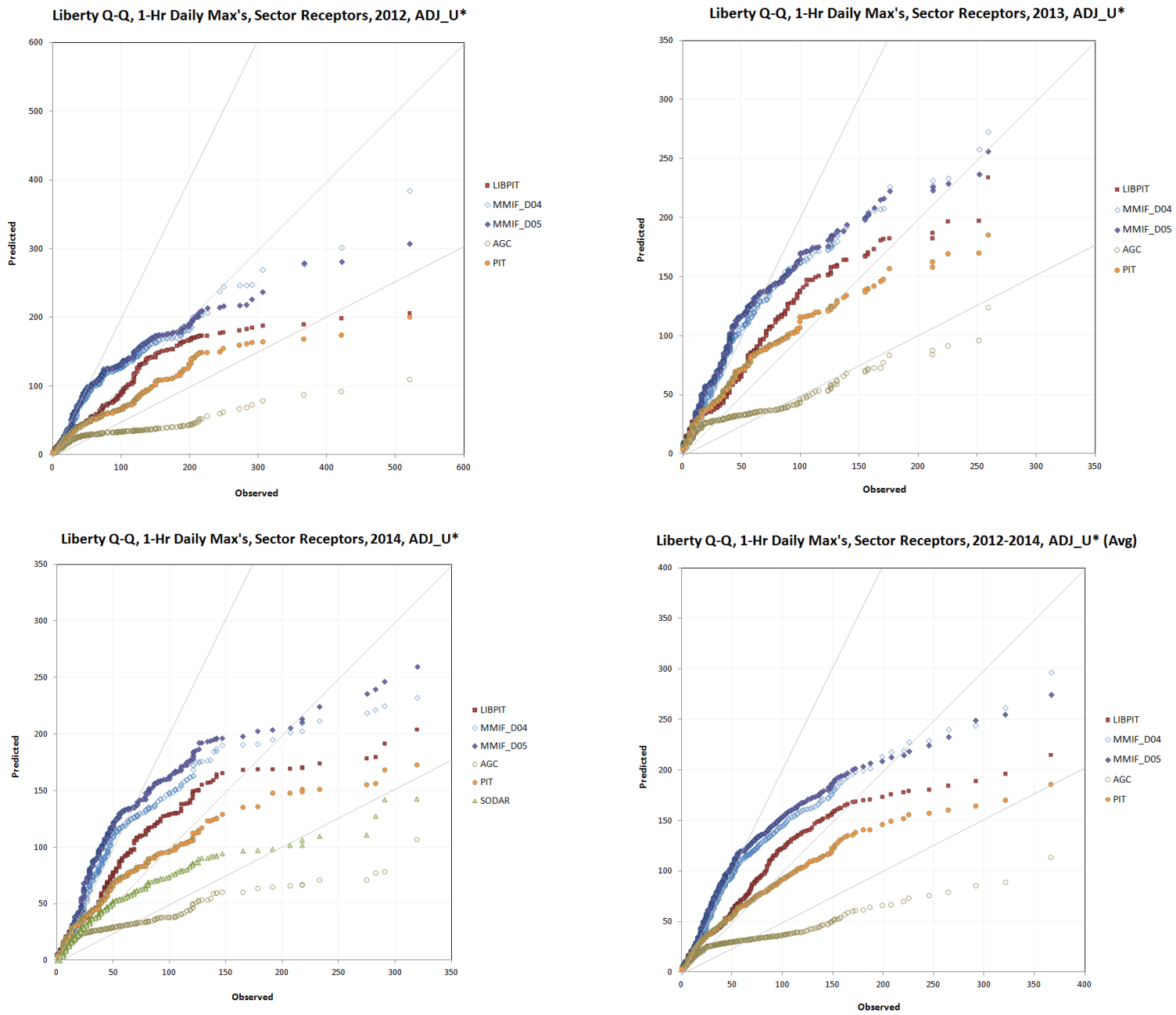


Figure I-1-7. Liberty Q-Qs, by Year, Sector Receptors, ADJ_U*

The use of ADJ_U* reduces some overprediction at lower ranges while maintaining the key high-range concentrations with MMIF. Additionally, the behavior of some surface-based sites can be altered somewhat by ADJ_U*, specifically for airport data. Also, SODAR showed worse performance with ADJ_U*, which may indicate that SODAR performs better with turbulence parameters (like in Figure I-1-6) than with ADJ_U*. (ADJ_U* is not used with turbulence parameters to avoid double-counting of low wind adjustments; turbulence parameters were removed with SODAR for the test results for Figure I-1-7.)

North Braddock

Similar analysis was performed for the North Braddock monitor. Only 2014 monitored data was available for comparison for this site.

Figures I-1-8 through I-1-10 show the North Braddock expanded-scale receptor grids, pollution rose, cross-sectional diagram to the SSE, and Q-Q's for year 2014.

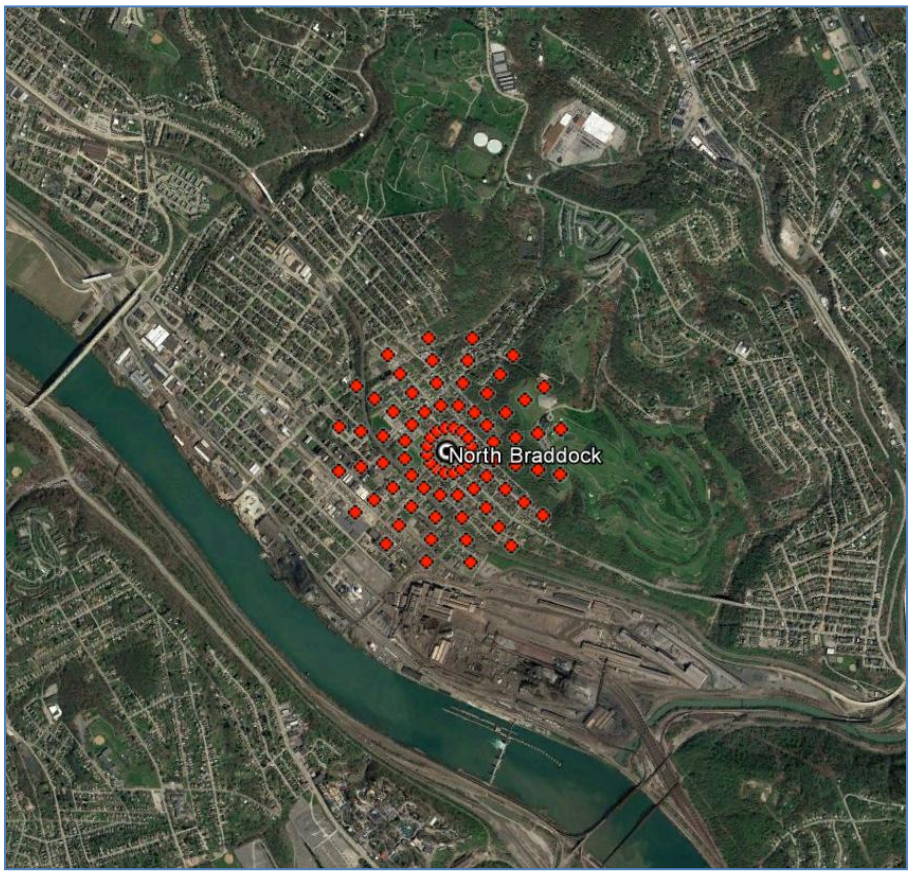
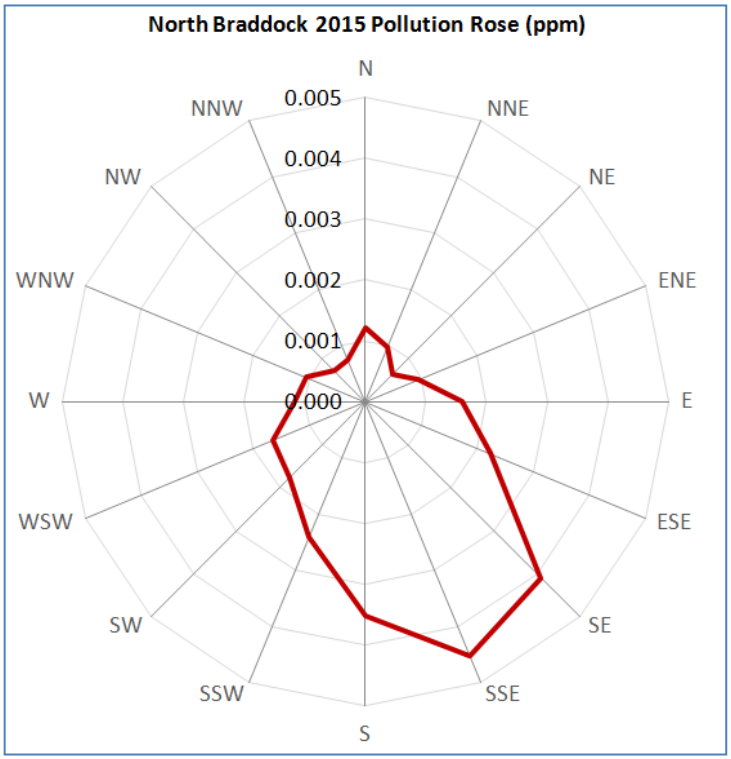
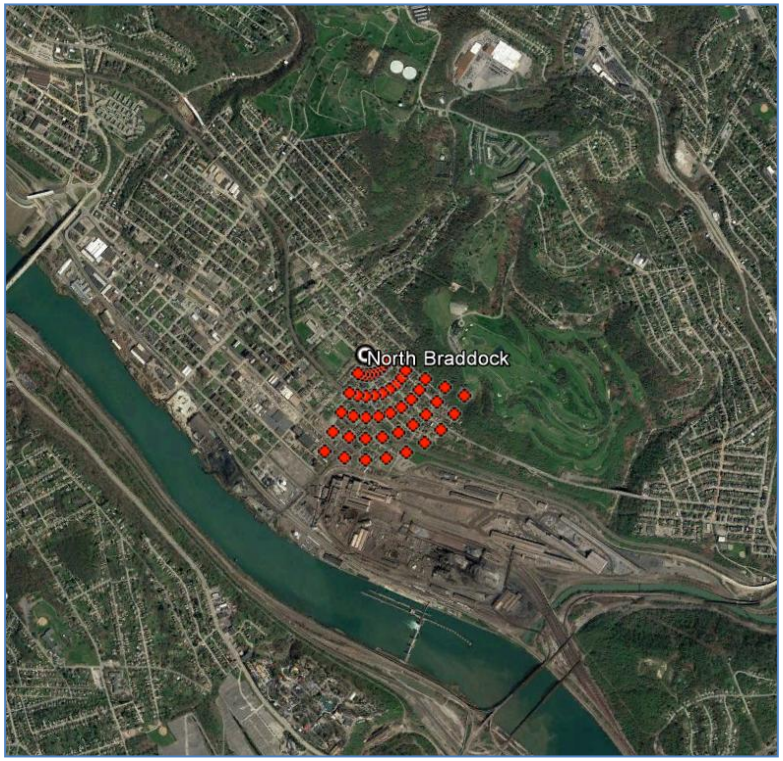


Figure I-1-8. North Braddock 500 m Radial Receptors





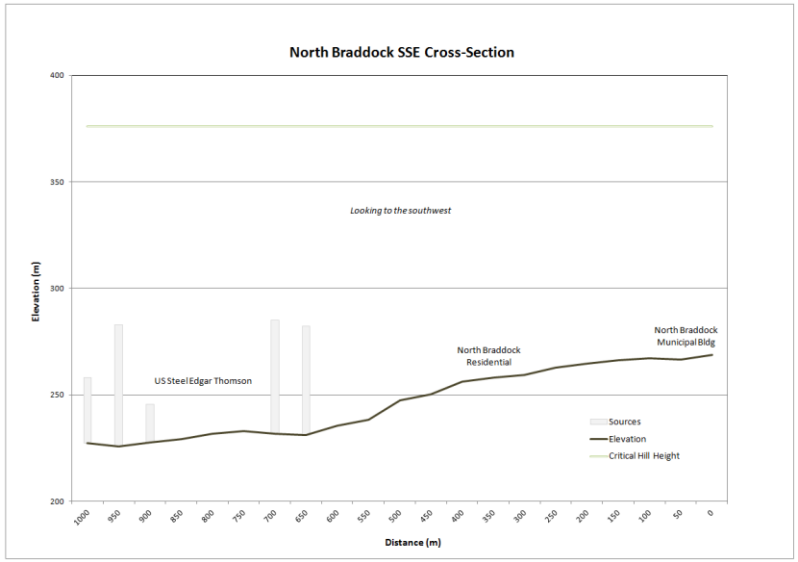


Figure I-1-9. North Braddock Pollution Rose, Sector Receptors, and Cross-Section

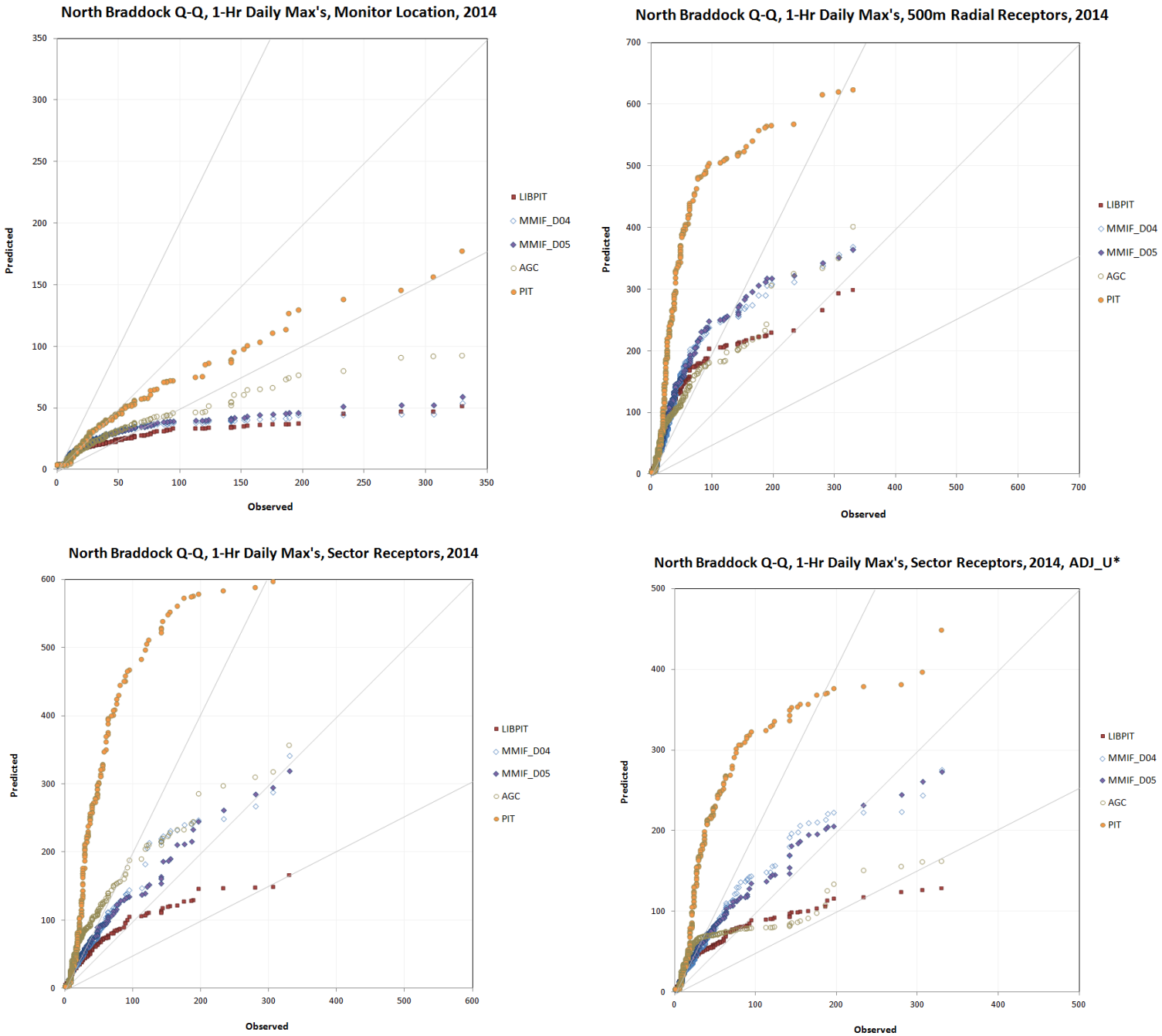


Figure I-1-10. North Braddock Q-Qs, 2014, By Case

North Braddock tests also led to the best results using MMIF. MMIF D05 with ADJ_U* produced an almost exact match to the monitored 4th-high for 2014.

Site Conclusions

MMIF led to the best modeled performance compared to other available meteorological data for both Liberty and North Braddock. MMIF with ADJ_U* also shows good performance, with less overprediction at the larger monitor scales. Monitored results show actual high values during low wind/stable conditions, which is also an indication that ADJ_U* is an appropriate option for the demonstration.

Site-based performance showed similar results for the different MMIF domains (D05 and D04, 0.444 km and 1.33 km, respectively). However, the MMIF analysis from Appendix H shows that D05 is the most representative MMIF domain for the Monongahela Valley. Therefore, MMIF D05 with ADJ_U* is the best meteorological configuration for modeling.

AERMOD Performance in the NAA

Since the modeling demonstration applies to every location in the NAA, it was important to evaluate all modeled concentrations in the NAA at actual concentrations. The modeling protocol describes conceptual data, including historical and other pollutant monitored results, used in the evaluation of the area beyond the monitor scales.

Clairton and Vicinity

Based on historical SO_2 and current PM_{10} data in Clairton and surrounding areas, average ratios were derived for maximum primary impact locations compared to Liberty. Using the same expanded monitor scale methodology from the above performance analysis, the maximum locations should also represent a slightly larger region than an exact monitor location (i.e, the former Glassport SO_2 site represented the Glassport hillside).

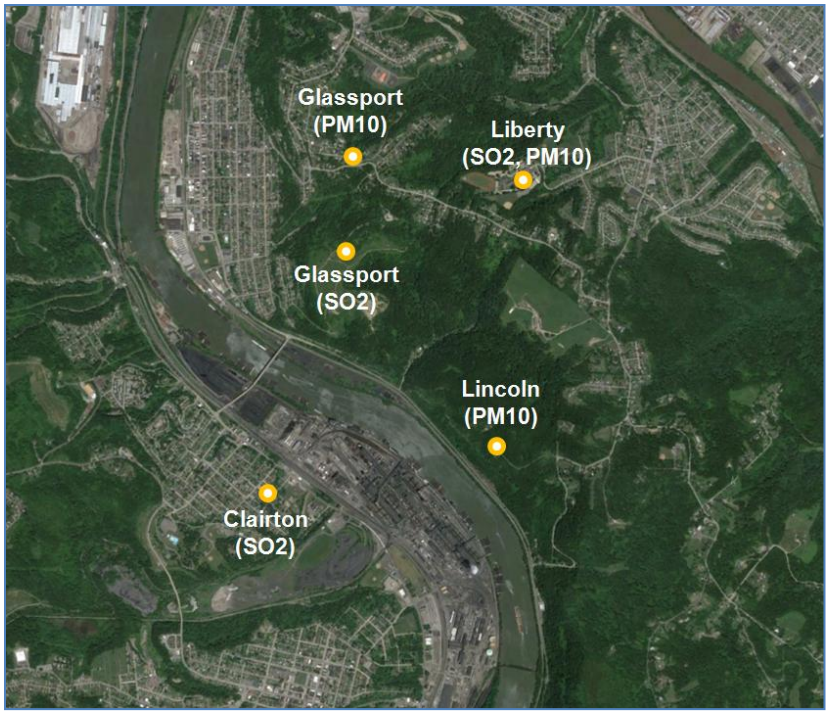


Figure I-1-11. Clairton and Vicinity, Current and Historical Sites

Figure I-1-11 above shows the locations of previous and current sites surrounding Clairton. Data given in the model protocol indicates that Lincoln and Glassport (SO_2 site) are maximum impact hillside locations that are about 25% percent higher than Liberty and Glassport (PM_{10} site) for short-term primary pollutant impacts. (Additionally, upwind locations like the Wilson neighborhood of Clairton (former SO_2 site) should show modeled impacts roughly 30% lower than Liberty.)

Figure I-1-12 below shows annual 99th percentiles for Glassport and Liberty from 1991 to 2005. (Based on a full year of data, the 99th percentile equates to the 4th-highest of the daily maximum 1-hour highs.)

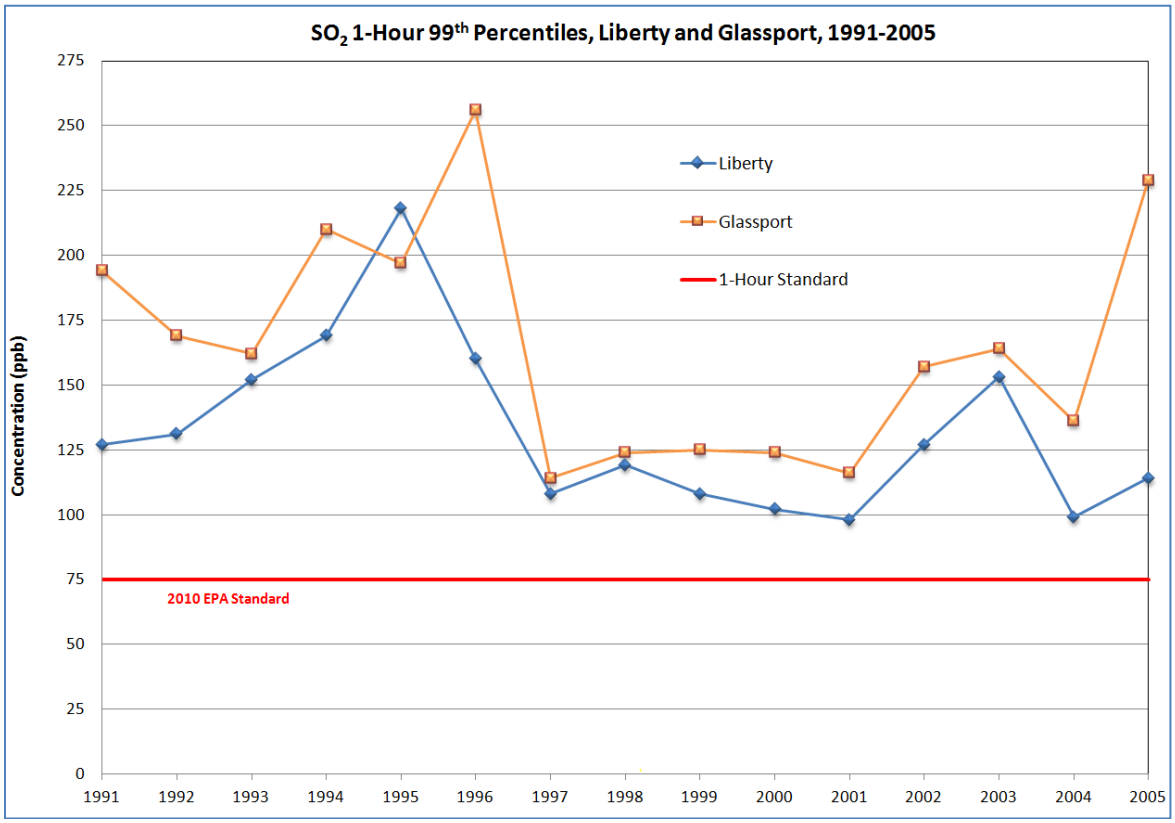


Figure I-1-12. Glassport and Liberty 99th Percentiles, 1991-2005

There were some differences year-to-year for these two sites, but overall trends show consistently higher values for Glassport compared to Liberty. The average ratio of Glassport to Liberty over this timeframe was calculated to be 1.26. (Note: the Glassport site was terminated in 2005 due to site issues.)

The modeling demonstration should therefore produce maximum results downwind of Clairton that are in the range of 1 to 1.26 compared to Liberty monitored results. This range ensures that results are realistic and not showing tendencies of under/overprediction.

Braddock and Vicinity

The modeling protocol also provided averages from a special SO_2 study in 1982-1984 that included monitoring at Braddock Cemetery. Its location in relation to North Braddock is shown in Figure I-1-13.

Figure I-1-13. Braddock and Vicinity, Current and Historical Sites

The ratio of Braddock Cemetery maximums to North Braddock was approximately 1.43. This data included likely source-oriented influences from several sources that are no longer operating.

However, based on wind roses and elevations, the Braddock Cemetery and adjacent Grandview Golf Course hillside are presumed maximum impact locations. Concentrations in this area should be generally higher than North Braddock concentrations. An approximate range of 1 to 1.26 for current air quality conditions, similar to the expected Clairton and vicinity ratios, was used for the Braddock area.

Modeled NAA Maximums

Modeled results using actual emissions over the 2012-2014 timeframe showed that the maximum impacts were in the expected locations.

Table I-1-2 shows maximum 4th-high impacts for the expected maximum regions compared to actual monitored data for 2012-2014. North Braddock monitored data was available only for 2014; therefore, modeled maximums for 2012-2013 in the Braddock area were compared to modeled 4th-highs from the sector-based receptors. Results shown are from AERMOD 16216 with MMIF D05 meteorology and the ADJ_U* option.

Table I-1-2. Maximum Modeled 99th Percentile Concentrations and Ratios

Location	2012	2013	2014	Avg Ratio
Maximum for Clairton Area	338.49	310.32	290.40	
Liberty	305.63	211.59	274.29	
Ratio	*1.11*	*1.47*	*1.06*	*1.21*
Maximum for Braddock Area	362.97	296.74	280.47	
North Braddock	243.33	274.33	232.49	
Ratio	*1.49*	*1.08*	*1.20*	*1.26*

Average ratios for the maximum expected to monitored areas fall within the range of 1 to 1.26, indicating that the model is performing well within the NAA.

Figure I-1-14 on the next page shows a map of the average 3-year values of the 4th-high concentrations throughout the NAA. (Note: some contours go beyond the NAA boundaries due to gridding and mapping.)

The map shows that the concentrations follow the general expected results for the NAA. Maximum concentrations are at the expected hillsides, with other locations (upwind or distant from sources) showing lower concentrations below the NAAQS (196.18 µg/m³). Thus, the modeling demonstration is showing realistic results in comparison to known data and the conceptual model for the NAA. Furthermore, the attainment modeling for future case should be adequate to represent concentrations throughout the NAA, including unmonitored areas.

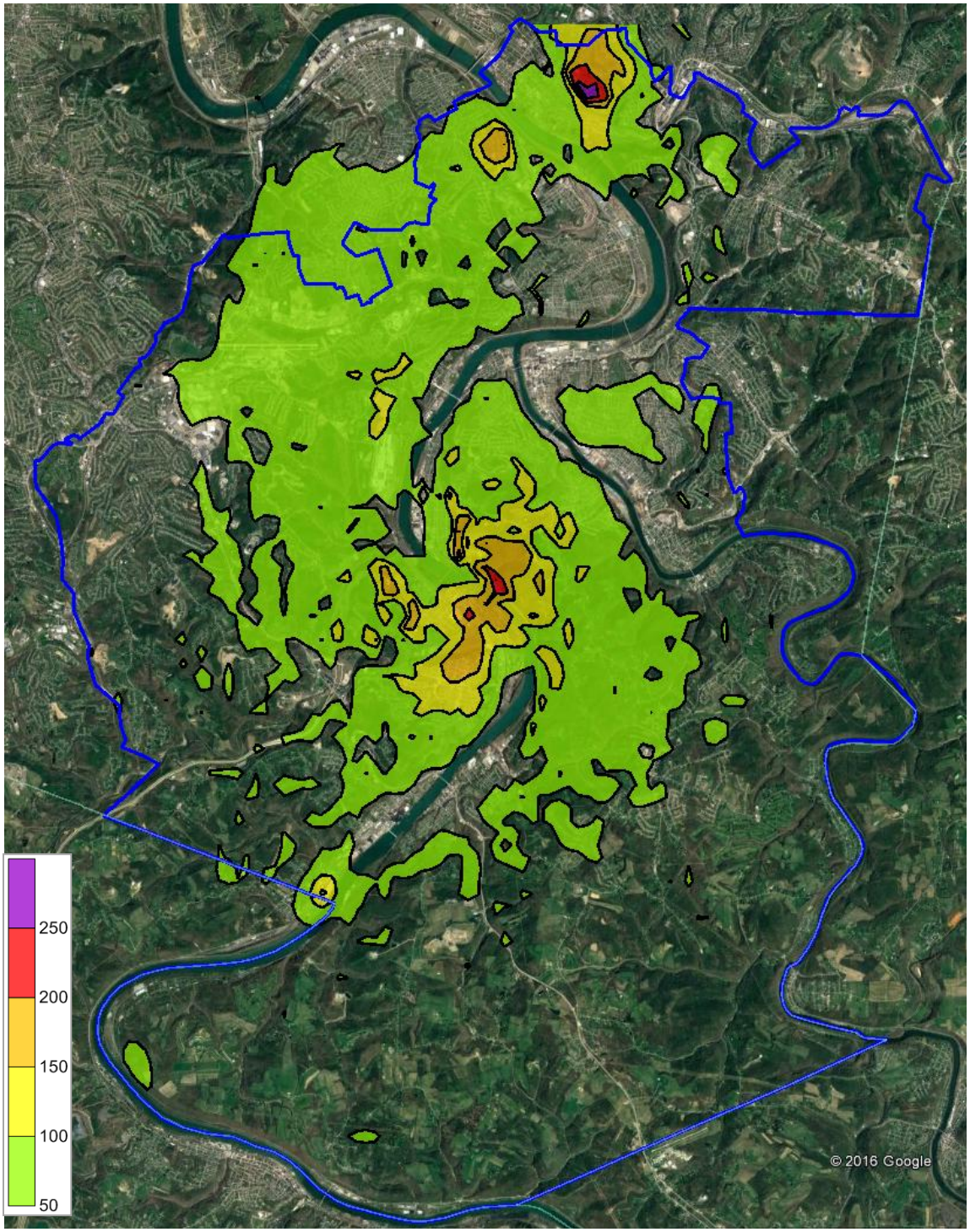


Figure I-1-14. Modeled Results at Actual Emission Rates, Average 2012-2014 (µg/m³)

I-2: AERMOD Configuration

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AERMOD Configuration

This section of Appendix I contains the final AERMOD configuration, summaries of modeled results, and sample model inputs for the attainment demonstration. The model configuration was based on the modeling protocol and addendum (Appendix A). No BETA options were selected for the modeling, based on the final modeling guideline (40 CFR Part 51 Appendix W).

AERMOD Settings

The final AERMOD settings are as given below. No BETA options were selected for the modeling demonstration.

- AERMOD version 16216r
- Generate concentration values (CONC)
- Pollutant ID: sulfur dioxide (SO2) and 1-hour SO_2 NAAQS processing
- Stack-tip downwash (default)
- BPIPPRM building parameters for stacks potentially affected by downwash
- Default calms and missing data processing routines
- No wet or dry depletion/deposition
- Rural dispersion (default)
- Elevated terrain effects (default)
- Flagpole receptors enabled
- MMIF meteorological inputs
- Averaging period: 1 hour (other averaging periods were also tested)

AERMET Settings

The final AERMET preprocessor settings are as given below.

- AERMET version 16216
- MMIF 0.444 km (D05) domain onsite, upper air, and surface characteristics inputs
- Bulk Richardson low-level delta_T and solar radiation for stable boundary layer
- Low wind option ADJ_U* for stable boundary layer
- 0.5 ms/ wind speed threshold
- Temperature substitutions for missing hours

MMIF Settings

The final MMIF settings are as given below.

- AERMET-based mixing heights
- Upper air data every 6 hours
- Levels were extracted using TOP structure for the following vertical layers:

20 30 40 60 80 100 125 150 175 200 250 300 350 400 450 500 600 700 800 900 1000 1500 2000 2500 3000 3500 4000 5000

AERMAP Settings

The final AERMAP preprocessor settings are as given below.

- AERMAP version 11103
- Domain
    - SW corner: 582800, 4447000
    - NE corner: 608200, 4477200
    - UTM zone 17
- Total number of receptors: 10343
- Elevations based on 10 m resolution NED data

Receptor Grid

As also given in the SIP narrative, the final receptor grid is shown in the figure below.

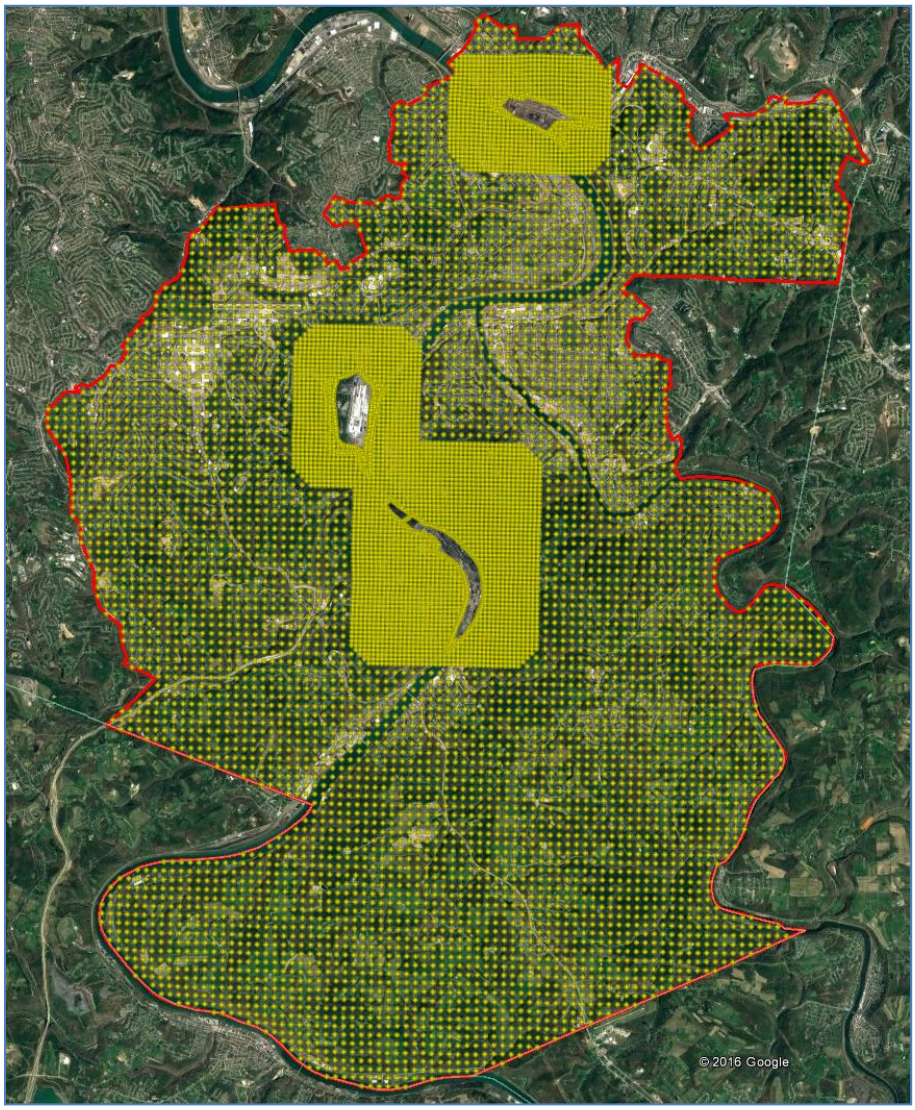

Figure I-2-1. Final Attainment Modeling Receptor Grid

The “blank” areas on the receptor grid map are USS Mon Valley Works fenced properties with 24-hour security that are not considered to be ambient air. Additionally, the USS Mon Valley Works is a contiguous integrated steel facility under one general manager, and test runs showed that the individual plants do not affect one another’s property. Therefore, receptors were removed for all three plants for any model run.

The figures below show the contiguous USS Mon Valley Works properties and fence lines at each plant.

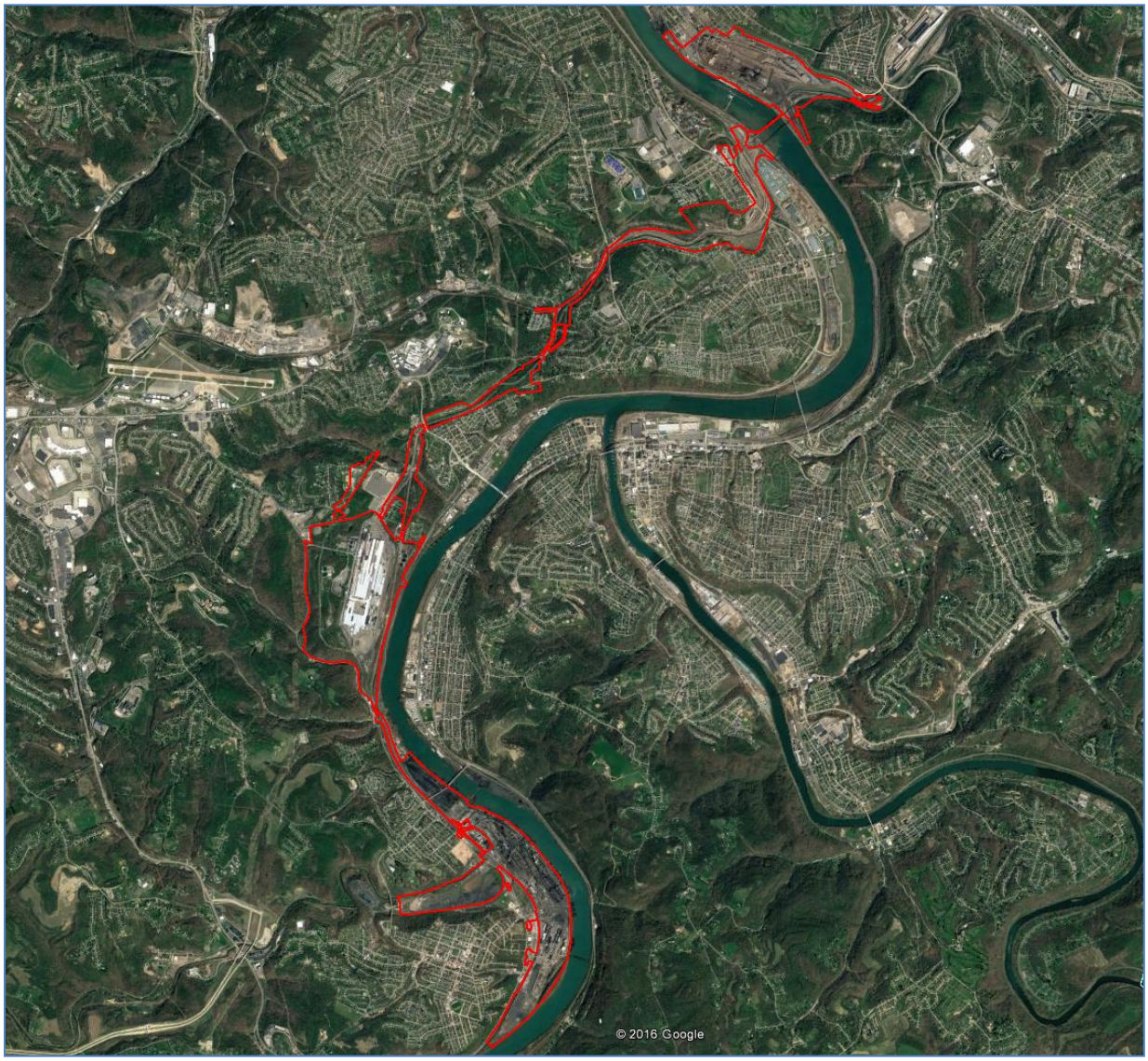

Figure I-2-2. USS Mon Valley Works Contiguous Property in NAA

Note: some USS railroad lines extended beyond the polygon shown in the above figure.

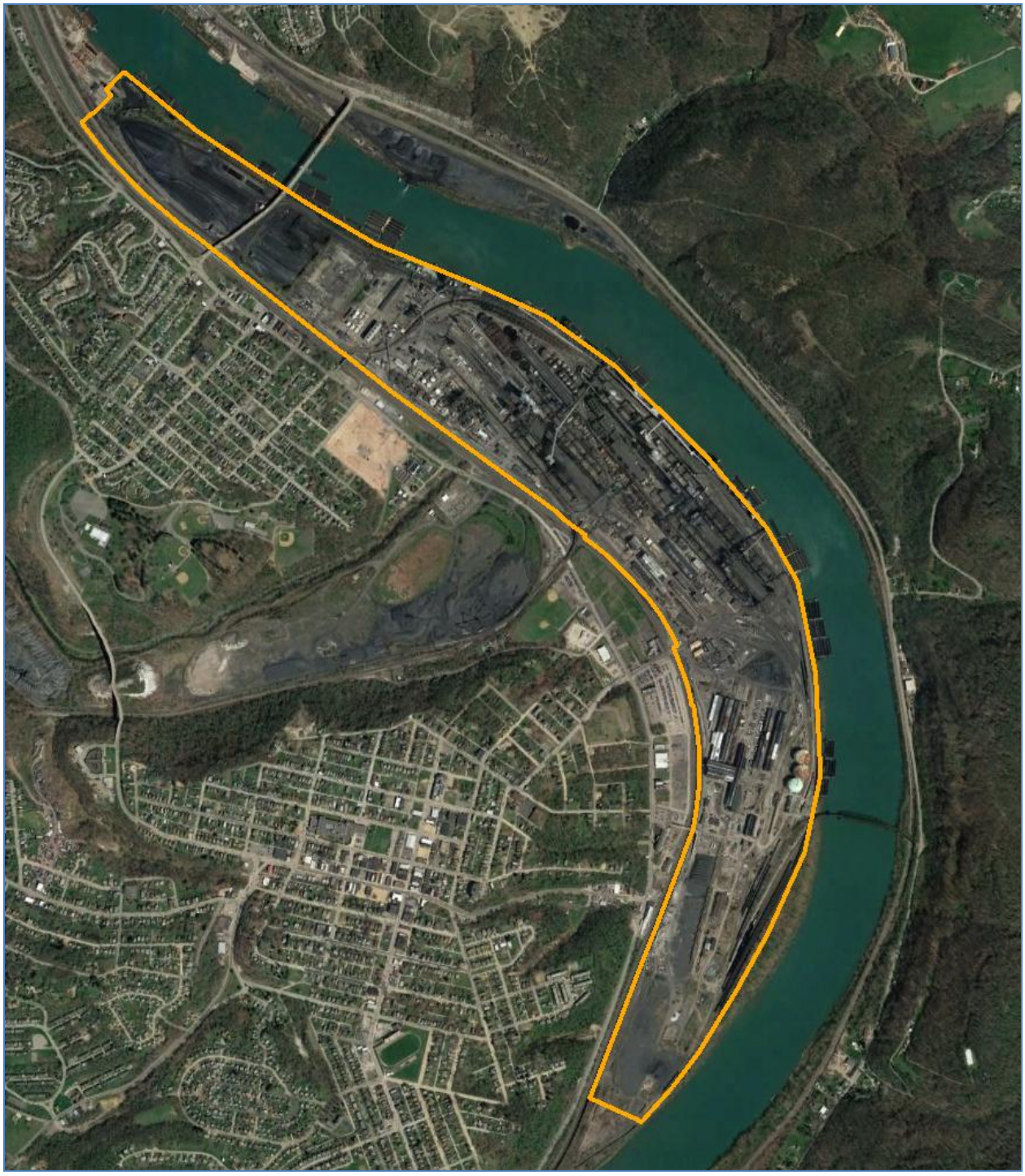

Figure I-2-3. Clairton Fence Line

Note: The Monongahela River and steep embankment on the eastern edge of the Clairton fence line serves as a terrain barrier.

Figure I-2-4. Edgar Thomson Fence Line

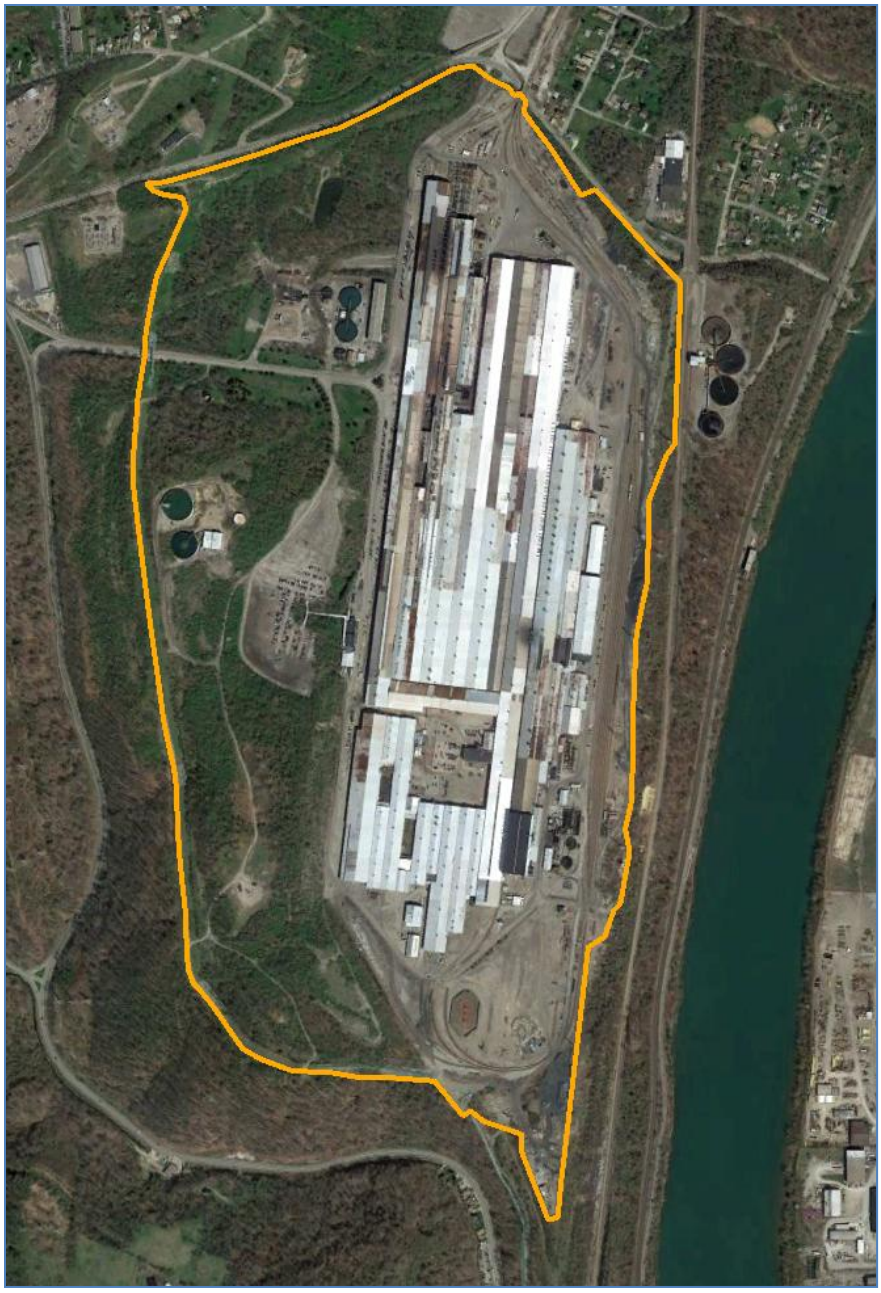

Figure I-2-5. Irvin Fence Line

Details are available for all Allegheny County properties at the Allegheny County real estate portal: http://www2.county.allegheny.pa.us/RealEstate/Search.aspx

Sources Modeled

Point source facilities that were not screened out were included in the modeling analyses, at actual rates for performance evaluations and at allowable/potential rates for the attainment demonstration. These sources are given below:

- USS Mon Valley Works (all plants)
- Harsco
- Guardian
- NRG Elrama
- Allegheny Energy Mitchell
- ArcelorMittal Monessen

Guardian, Elrama, and Mitchell have deactivated and are not included in the future case attainment runs.

The figures below show 3D depictions of the modeled sources in Google Earth as entered into AERMOD in terms of stack heights/locations and buildings.

Figure I-2-6. USS Irvin Plant

Figure I-2-7. USS Clairton Plant

Figure I-2-8. USS Edgar Thomson Plant (current)

Note: Harsco is located on Edgar Thomson property.

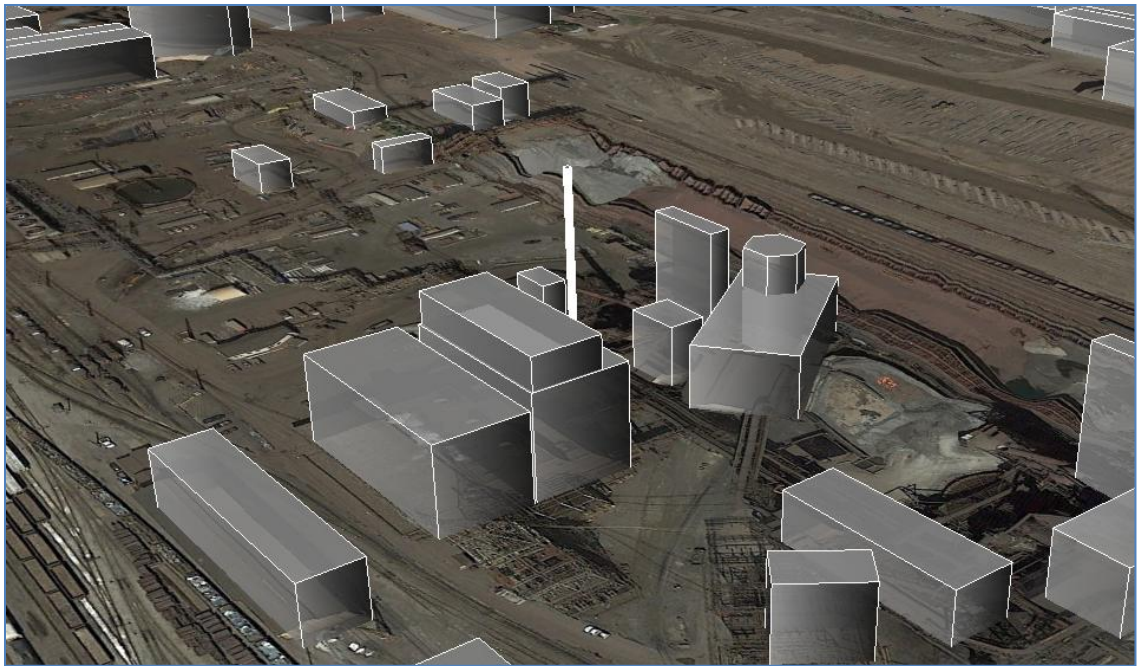

Figure I-2-9. USS Edgar Thomson Proposed Boiler Stack (Future Case)

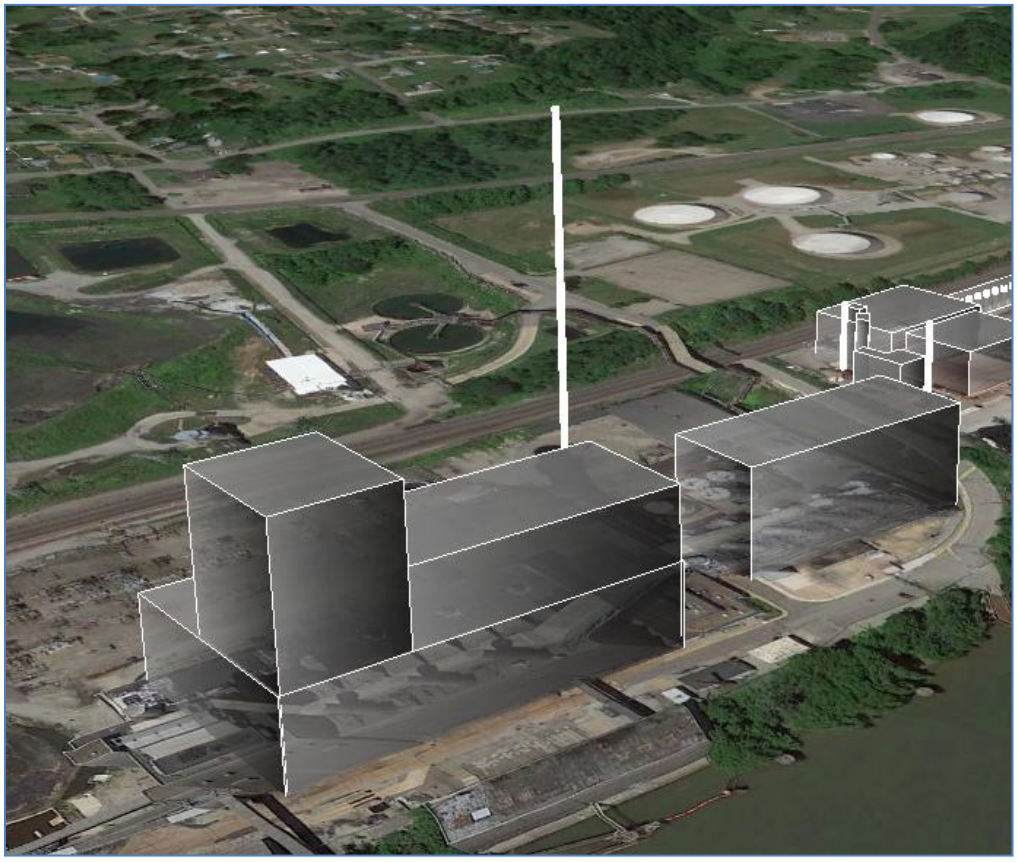

Figure I-2-10. NRG Elrama

Figure I-2-11. Guardian Industries

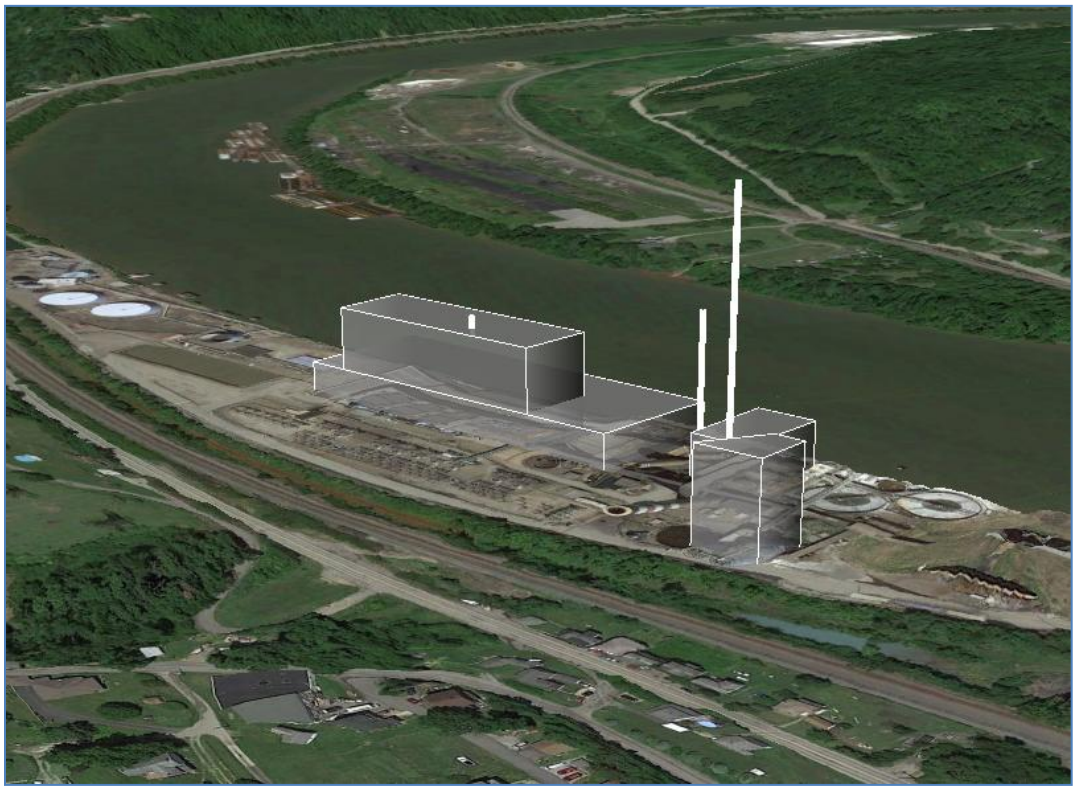

Figure I-2-12. Allegheny Energy Mitchell

Figure I-2-13. ArcelorMittal Monessen

Figure I-2-14 below shows the equally-spaced line volume sources used for the buoyant line sources characterization for Clairton battery fugitives. These volume sources were configured as “separated” volume sources based on the AERMOD and ISC user’s guides.

Each of these volume sources was assigned hourly-varying release heights as calculated from BLPRISE (ACHD-recompiled BLP code). See the model protocol addendum (Appendix A) for more details.

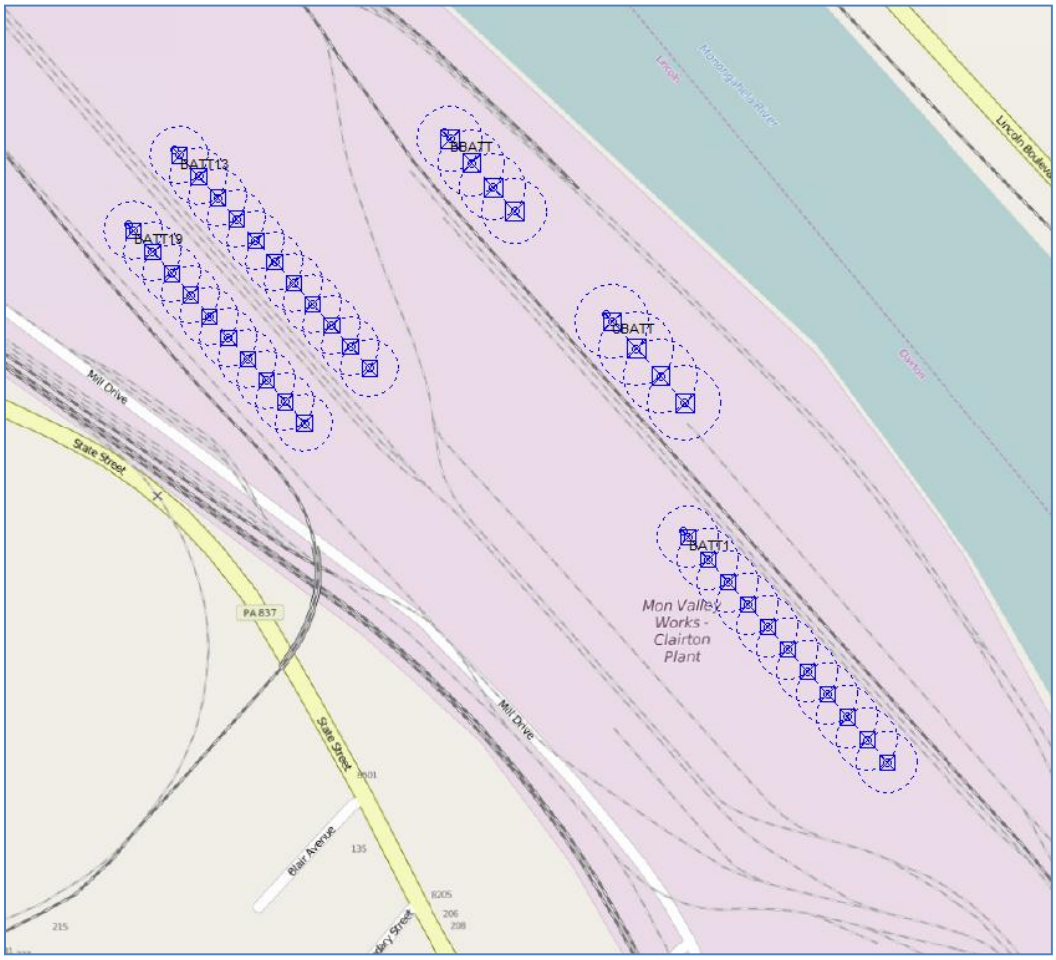

Figure I-2-14. Equally-Spaced Line Volume Sources for Clairton Battery Lines

Modeled Results Summaries

Table I-2-1 shows the modeled results by each facility for the actuals 2012-2014 case, used to for model performance testing (comparison to monitored data). Values shown are the highest 4th-highest daily maximum hourly values by facility and year, at any receptor in the NAA.

Table I-2-1. Modeled Results for Actuals for 2012-2014 (µg/m³)

SOURCE	ACTUALS 2012	ACTUALS 2013	ACTUALS 2014
Clairton	334.98	307.16	284.15
ET	342.01	282.08	273.04
Irvin	84.20	66.88	76.96
ArcelorMittal	--	--	68.28
Harsco (Brad Recov)	44.08	39.62	35.13
Guardian	262.25	156.03	134.99
Elrama	44.75	--	--
Mitchell	88.18	74.79	--
Background	3.92	3.92	3.92
COMBINED ALL	362.97	310.32	290.40

Table I-2-2 shows the modeled results by facility for base case allowables, using 2012-2014 meteorological years. Values shown are the highest 4th-highest daily maximum hourly values by facility and year, at any receptor in the NAA.

Table I-2-2. Modeled Results for Base Case Allowables (µg/m³)

SOURCE	ALLOWABLES 2012	ALLOWABLES 2013	ALLOWABLES 2014
Clairton	444.56	431.83	424.96
ET	1056.39	1029.97	1302.35
Irvin	330.11	347.26	347.86
ArcelorMittal	34.15	31.91	33.87
Harsco (Brad Recov)	130.49	117.27	103.98
Guardian	576.95	613.52	574.98
Elrama	275.46	251.49	208.16
Mitchell	762.22	446.56	572.48
Background	28.77	28.77	28.77
COMBINED ALL	1110.60	1086.50	1349.90

Table I-2-3 shows the modeled results by facility for control case allowables, using 2012-2014 meteorological years. Values shown are the highest 4th-highest daily maximum hourly values by facility and year, at any receptor in the NAA.

Table I-2-3. Modeled Results for Control Case Allowables (µg/m³)

SOURCE	CONTROL 2012	CONTROL 2013	CONTROL 2014
Clairton	182.12	191.83	192.33
ET	185.78	164.18	172.99
Irvin	151.37	174.96	154.72
ArcelorMittal	34.15	31.91	33.87
Harsco (Brad Recov)	44.28	39.79	35.28
Background	24.85	24.85	24.85
COMBINED ALL	216.81	205.35	213.96

MAX LOCATION	CONTROL 2012	CONTROL 2013	CONTROL 2014	3-YEAR AVG
West Mifflin	197.26	187.98	203.27	196.17

Notes for the above Tables I-2-1 through I-2-3:

- NAAQS = 196.18101 µg/m³, based on AERMOD's conversion of 75 ppb
- The next highest locations were in Lincoln (196.14 µg/m³) and in North Braddock (195.07 µg/m³)
- Background is based on the most recent 3-year period (2014-2016) of monitored data from surrounding monitors
- Hourly maximums cannot be summed by facility, since maximums may occur at different times/locations
- Results are based on AERMOD v16216r, with MMIF meteorology, and ADJ_U* option
- Design values (maximum 3-year avg of 4th-max by each receptor) are calculated by individual receptor and cannot be averaged from tables above (only shown for control case in Table I-2-3)
- Control case included an aggregate limit for Clairton Boilers for any hour; 16 different scenarios were tested to find the worst case for boiler impacts, and the worst case was used for the final attainment run

Post-Processing

For post-processing results from different runs (e.g., using different MMIF cells), CALPUFF modeling system post-processors were used.

This requires 3 steps/programs:

- AER2CAL: converts AERMOD post files to CALPUFF format. The AERMOD post files are in unformatted binary format, with the 1-hour averages for each discrete receptor. (See sample AERMOD input below.)

- CALSUM: sums the hourly impacts from different runs, matched in time/space.

- CALPOST: processes the impacts, generates the selected rank(s) for the impact totals in summary and plot formats.

The most recent versions of each tool were used: AER2CAL 1.21, CALSUM 7.0.0, and CALPOST 7.1.0. AER2CAL and CALSUM are related programs with no regulatory status. CALPOST 7.1.0 is not the current EPA-preferred version (6.221).[1] In order to process daily maximums in accordance with the 2010 SO_2 NAAQS, CALPOST versions 6.292 or later are required in order to use the newer "day screen" option under Input Group 3 in the CALPOST input file.

To test the equivalence of the default AERMOD processing to the CALPOST post-processing, individual test sources were run in AERMOD and then post-processed and summed with CALPOST. Results are shown in the table below to 5 decimal places.

Source	AERMOD	CALPOST
Source 1	269.46098	269.46000
Source 2	243.84369	243.84000
Source 3	117.49529	117.50000
Source 4	101.75125	101.75000
Source 5	46.85178	46.85200
Source 6	26.99986	27.00000
TOTAL Summed	280.27415	280.27000

Results are identical between AERMOD and CALPOST, except for some slight differences (±0.01 µg/m³) due to CALPOST rounding the impacts to 5 significant figures, while AERMOD keeps 5 decimal places.

[1] Final Appendix W revisions include the removal of CALPUFF from preferred model status

Sample Model Input/Output Files

Below are samples of selected modeling input/output files. Modeling files can be made available via DVDs or data storage device (note: some output files are very large in size.)

Sample BLP Input

```
USS CLAIRTON BATTERIES 1-3
&GEN
NLINES=1
NREC=13
LPART=.TRUE.
LCOMPR=.TRUE.
LINPUT=.TRUE.
LUTMS=.TRUE.
LTRANS=.FALSE.
/
&RISE
L=287.0
HB=8.5
WB=13.7
WM=1.0
DX=0.0
FPRIME=6447.3
/
&METIN
LMETIN=.FALSE.
LMETOT=.FALSE.
IDSURF=99999
IYSURF=2012
IDUPER=99999
IYUPER=2012
ZMEAS=10.0
IDELS=1
IRU=1
IDAYS=366*1
/
&CALC
/
&OUTPUT
IPCL=1,0,0,0,0,0,0,0,0,0,1
/
   593500.  4459500.      335.
   594000.  4459500.      335.
   594500.  4459500.      305.
   595500.  4459500.      305.
   595750.  4459500.      220.
   596000.  4459500.      274.
   596500.  4459500.      335.
   597000.  4459500.      342.
   597500.  4459500.      335.
   595750.  4459750.      219.
   596000.  4459750.      226.
   593500.  4460000.      335.
   594000.  4460000.      335.
  595732.5 4461976.9  595922.9 4461762.9       8.5      1.00     231.0
```

Sample BLPRISE Output

```
          BLP -- MULTIPLE BUOYANT LINE AND POINT SOURCE DISPERSION MODEL     SCRAM VERSION (DATED 99176)                11/29/16
                                                                                                                        13:03:17
*****************************************************************************************************************************
```

LINE SOURCE PARAMETERS

NUMBER OF LINES: 1

LINE NUMBER	X START (M)	Y START (M)	X END (M)	Y END (M)	Q (GM/SEC)	HEIGHT (M)	ELEVATION (M)
1	595732.5	4461976.9	595922.9	4461762.9	1.00	8.50	231.0

SOURCE CONTRIBUTIONS FROM THE FOLLOWING LINE SOURCES ARE AVAILABLE:

(0=NOT AVAILABLE; 1=AVAILABLE)

LINE SOURCE NUMBER	AVAILABILITY
1	1
1 - 1	1

PLUME RISE HEIGHTS AND DISTANCES OUTPUT

YR	JDAY	HR	DH1	DH2	DH3	DH4	DH5	DH6	DH7	XF1	XF2	XF3	XF4	XF5	XF6	XF7	XFB	XFS
2014	1	1	0.00	102.41	115.01	127.74	140.49	153.21	165.86	0.00	79.30	85.66	92.01	98.37	104.72	111.08	79.30	111.08
2014	1	2	0.00	132.67	141.73	150.85	160.00	169.15	178.29	0.00	81.70	85.51	89.31	93.11	96.91	100.71	81.70	100.71
2014	1	3	0.00	177.96	177.96	177.96	177.96	177.96	177.96	0.00	151.66	151.66	151.66	151.66	151.66	151.66	244.08	151.66
2014	1	4	0.00	202.15	202.15	202.15	202.15	202.15	202.15	0.00	117.69	117.69	117.69	117.69	117.69	117.69	251.16	117.69
2014	1	5	0.00	200.78	200.78	200.78	200.78	200.78	200.78	0.00	120.98	120.98	120.98	120.98	120.98	120.98	252.84	120.98
2014	1	6	0.00	208.14	208.14	208.14	208.14	208.14	208.14	0.00	107.72	107.72	107.72	107.72	107.72	107.72	248.20	107.72
2014	1	7	0.00	186.91	186.91	186.91	186.91	186.91	186.91	0.00	114.35	114.35	114.35	114.35	114.35	114.35	206.66	114.35
2014	1	8	0.00	218.27	218.27	218.27	218.27	218.27	218.27	0.00	125.90	125.90	125.90	125.90	125.90	125.90	277.01	125.90
2014	1	9	0.00	236.87	236.87	236.87	236.87	236.87	236.87	0.00	172.93	172.93	172.93	172.93	172.93	172.93	235.21	172.93
2014	1	10	0.00	42.61	406.57	684.36	923.33	1138.82	1337.95	0.00	95.14	605.27	1115.40	1625.54	2135.67	2645.80	95.14	2645.80
2014	1	11	0.00	370.41	955.56	1406.63	1795.51	2146.53	2471.14	0.00	286.05	796.18	1306.32	1816.45	2326.58	2836.71	286.05	2836.71
2014	1	12	0.00	Inf	Inf	Inf	Inf	Inf	Inf	0.00	215.08	725.22	1235.35	1745.48	2255.61	2765.74	215.08	2765.74
2014	1	13	0.00	400.08	1176.01	1769.90	2281.03	2742.07	3168.25	0.00	256.98	767.11	1277.24	1787.38	2297.51	2807.64	256.98	2807.64
2014	1	14	0.00	Inf	Inf	Inf	Inf	Inf	Inf	0.00	215.08	725.22	1235.35	1745.48	2255.61	2765.74	215.08	2765.74
2014	1	15	0.00	52.14	312.58	519.71	699.56	862.40	1013.24	0.00	158.57	668.70	1178.84	1688.97	2199.10	2709.23	158.57	2709.23
2014	1	16	0.00	15.29	151.81	268.92	372.85	467.96	556.61	0.00	133.14	643.27	1153.41	1663.54	2173.67	2683.80	133.14	2683.80
2014	1	17	0.00	12.68	120.08	214.85	299.75	377.83	450.81	0.00	149.70	659.83	1169.96	1680.10	2190.23	2700.36	149.70	2700.36
2014	1	18	0.00	5.55	119.94	221.80	312.96	396.74	475.04	0.00	87.45	597.58	1107.71	1617.84	2127.97	2638.11	87.45	2638.11
2014	1	19	0.00	132.54	143.26	154.03	164.81	175.54	186.23	0.00	207.63	219.61	231.59	243.56	255.54	267.52	207.63	267.52
2014	1	20	0.00	190.84	190.84	190.84	190.84	190.84	190.84	0.00	176.80	176.80	176.80	176.80	176.80	176.80	275.80	176.80
2014	1	21	0.00	191.11	191.11	191.11	191.11	191.11	191.11	0.00	167.39	167.39	167.39	167.39	167.39	167.39	272.27	167.39
2014	1	22	0.00	229.68	229.68	229.68	229.68	229.68	229.68	0.00	125.46	125.46	125.46	125.46	125.46	125.46	282.34	125.46
2014	1	23	0.00	267.31	267.31	267.31	267.31	267.31	267.31	0.00	113.80	113.80	113.80	113.80	113.80	113.80	286.72	113.80
2014	1	24	0.00	221.82	221.82	221.82	221.82	221.82	221.82	0.00	127.11	127.11	127.11	127.11	127.11	127.11	278.67	127.11

Sample AERMET Input (Stage 1)

```
JOB
    MESSAGES USSC.AERMET.2014.ER1
    REPORT   USSC.AERMET.2014.OU1

UPPERAIR
    DATA     USSC.AERMET.2014.UPA.FSL      FSL
    EXTRACT  USSC.AERMET.2014.UPA.FSL.IQA
    QAOUT    USSC.AERMET.2014.UPA.FSL.OQA

    LOCATION 99999   40.307N   79.880W   5
    XDATES   2014/01/01 2014/12/31
    AUDIT    UAPR UAHT UATT UATD UAWD UAWS

ONSITE
    DATA     USSC.AERMET.2014.DAT
    QAOUT    USSC.AERMET.2014.OQA
    XDATES   2014/01/01 2014/12/31
    LOCATION 99999   40.307N   79.880W   0     244.49
    READ    1 OSYR OSMO OSDY OSHR INSO PRCP PRES
    READ    2 HT01 TT01 RH01 DT01
    READ    3 HT02 WS02 WD02 TT02 RH02
    READ    4 HT03 WS03 WD03 TT03 RH03
    READ    5 HT04 WS04 WD04 TT04 RH04
    READ    6 HT05 WS05 WD05 TT05 RH05
    READ    7 HT06 WS06 WD06 TT06 RH06
    READ    8 HT07 WS07 WD07 TT07 RH07
    READ    9 HT08 WS08 WD08 TT08 RH08
    READ   10 HT09 WS09 WD09 TT09 RH09
    READ   11 HT10 WS10 WD10 TT10 RH10
    READ   12 HT11 WS11 WD11 TT11 RH11
    READ   13 HT12 WS12 WD12 TT12 RH12
    READ   14 HT13 WS13 WD13 TT13 RH13
    READ   15 HT14 WS14 WD14 TT14 RH14
    READ   16 HT15 WS15 WD15 TT15 RH15
    READ   17 HT16 WS16 WD16 TT16 RH16
    READ   18 HT17 WS17 WD17 TT17 RH17
    READ   19 HT18 WS18 WD18 TT18 RH18
    READ   20 HT19 WS19 WD19 TT19 RH19
    READ   21 HT20 WS20 WD20 TT20 RH20
    READ   22 HT21 WS21 WD21 TT21 RH21
    READ   23 HT22 WS22 WD22 TT22 RH22
    READ   24 HT23 WS23 WD23 TT23 RH23
    READ   25 HT24 WS24 WD24 TT24 RH24
    READ   26 HT25 WS25 WD25 TT25 RH25
    READ   27 HT26 WS26 WD26 TT26 RH26
    READ   28 HT27 WS27 WD27 TT27 RH27
    READ   29 HT28 WS28 WD28 TT28 RH28
    READ   30 HT29 WS29 WD29 TT29 RH29

    FORMAT  1 (2x,4I2.2,F10.2,2F10.3,10x)
    FORMAT  2 (10x,F10.2,20x,3F10.3)
    FORMAT  3 (10x,F10.2,4F10.3)
    FORMAT  4 (10x,F10.2,4F10.3)
    FORMAT  5 (10x,F10.2,4F10.3)
    FORMAT  6 (10x,F10.2,4F10.3)
    FORMAT  7 (10x,F10.2,4F10.3)
    FORMAT  8 (10x,F10.2,4F10.3)
    FORMAT  9 (10x,F10.2,4F10.3)
    FORMAT 10 (10x,F10.2,4F10.3)
    FORMAT 11 (10x,F10.2,4F10.3)
    FORMAT 12 (10x,F10.2,4F10.3)
    FORMAT 13 (10x,F10.2,4F10.3)
    FORMAT 14 (10x,F10.2,4F10.3)
    FORMAT 15 (10x,F10.2,4F10.3)
    FORMAT 16 (10x,F10.2,4F10.3)
    FORMAT 17 (10x,F10.2,4F10.3)
    FORMAT 18 (10x,F10.2,4F10.3)
    FORMAT 19 (10x,F10.2,4F10.3)
```

```
    FORMAT 20 (10x,F10.2,4F10.3)
    FORMAT 21 (10x,F10.2,4F10.3)
    FORMAT 22 (10x,F10.2,4F10.3)
    FORMAT 23 (10x,F10.2,4F10.3)
    FORMAT 24 (10x,F10.2,4F10.3)
    FORMAT 25 (10x,F10.2,4F10.3)
    FORMAT 26 (10x,F10.2,4F10.3)
    FORMAT 27 (10x,F10.2,4F10.3)
    FORMAT 28 (10x,F10.2,4F10.3)
    FORMAT 29 (10x,F10.2,4F10.3)
    FORMAT 30 (10x,F10.2,4F10.3)

    DELTA_TEMP    1     2.00    10.00
    OSHEIGHTS      2.0
    OSHEIGHTS      10.00     25.00     35.00     50.00     70.00     90.00
    OSHEIGHTS     112.50    137.50    162.50    187.50    225.00    275.00
    OSHEIGHTS     325.00    375.00    425.00    475.00    550.00    650.00
    OSHEIGHTS     750.00    850.00    950.00   1250.00   1750.00   2250.00
    OSHEIGHTS    2750.00   3250.00   3750.00   4500.00
    THRESHOLD     0.5
    RANGE WS 0 <= 50 999
    RANGE WD 0 <= 360 999
    RANGE TT -49 < 49 999
    RANGE DT01 -2 < 5 999
    RANGE INSO -1 < 1250 9999
    RANGE PRES 7500 < 10999 99999

    AUDIT TT01 DT01 RH01 INSO PRCP PRES
```

Sample AERMET Input (Stage 2)

```
JOB
    MESSAGES USSC.AERMET.2014.ER2
    REPORT   USSC.AERMET.2014.OU2

UPPERAIR
    QAOUT    USSC.AERMET.2014.UPA.FSL.OQA

ONSITE
    QAOUT    USSC.AERMET.2014.OQA

MERGE
    XDATES   2014/01/01 2014/12/31
    OUTPUT   USSC.AERMET.2014.MER
```

Sample AERMET Input (Stage 3)

```
JOB
    MESSAGES USSC.AERMET.2014.ER3
    REPORT   USSC.AERMET.2014.OU3

METPREP
    DATA     USSC.AERMET.2014.MER
    XDATES   2014/01/01 2014/12/31
    MODEL    AERMOD
    METHOD   STABLEBL BULKRN
    METHOD   STABLEBL ADJ_U*
    METHOD   WIND_DIR NORAND
    METHOD   ASOS_ADJ NO_ADJ
    METHOD   UASELECT SUNRISE
    AERSURF  USSC.AERMET.2014.AERSFC.DAT
    OUTPUT   USSC_MMIF_AERMET_D05_2014_ALL_AER_ADJU.SFC
    PROFILE  USSC_MMIF_AERMET_D05_2014_ALL_AER_ADJU.PFL
```

Sample AERSUFACE Input (AERMET Stage 3)

```
** Generated by MMIF VERSION 3.3rc2 2016-07-06
** Center Latitude  (decimal degrees):     40.30704
** Center Longitude (decimal degrees):    -79.87994
** Datum: NWS-84
** Study radius (km) for surface roughness:      0.44444
** The rest of the AERSURFACE inputs are not applicable
**
   FREQ_SECT  MONTHLY  1
   SECTOR   1    0  360
**           Month    Sect    Alb      Bo        Zo
   SITE_CHAR    1       1     0.21     1.72   0.04961
   SITE_CHAR    2       1     0.30     1.92   0.05076
   SITE_CHAR    3       1     0.15     1.16   0.06583
   SITE_CHAR    4       1     0.13     0.50   0.09800
   SITE_CHAR    5       1     0.15     0.70   0.14130
   SITE_CHAR    6       1     0.15     0.42   0.14843
   SITE_CHAR    7       1     0.15     0.48   0.14146
   SITE_CHAR    8       1     0.14     0.61   0.13538
   SITE_CHAR    9       1     0.13     0.90   0.12786
   SITE_CHAR   10       1     0.13     0.90   0.10673
   SITE_CHAR   11       1     0.12     0.63   0.07327
   SITE_CHAR   12       1     0.10     0.96   0.05467
```

Sample AERMOD Input

```
CO STARTING
   TITLEONE  Clairton, 2012 Allowables, NAA Nested Receptor Grid
   TITLETWO  1-Hr SO2 Control Case C27 Run, MMIF D05 WS50, 2012
   POLLUTID  SO2
   MODELOPT  DFAULT CONC
   FLAGPOLE  0.0
   AVERTIME  1
   RUNORNOT  RUN
   ERRORFIL  ERRORS.OUT
** DEBUGOPT  MODEL
CO FINISHED

SO STARTING
   ELEVUNIT  METERS
**
**                   QS       HS      TS      VS     DS
** POINT             ----     ---     ----    ----   ---
** UNITS             g/s       m       K      m/s     m
**
** DESCRSRC  US STEEL CLAIRTON Quench Tower 1
   LOCATION  CLQNCH1   POINT     595964  4461731    231
   SRCPARAM  CLQNCH1   0.095   30.48   358.49    3.54   6.80
   BUILDHGT  CLQNCH1     8.50    8.50    8.50    0.00    0.00    0.00
   BUILDHGT  CLQNCH1     0.00    0.00    8.50    8.50    8.50    8.50
   BUILDHGT  CLQNCH1     8.50    8.50    8.50    8.50    8.50    8.50
   BUILDHGT  CLQNCH1     8.50    8.50    8.50    0.00    0.00    0.00
   BUILDHGT  CLQNCH1     0.00    0.00    8.50    8.50    8.50    8.50
   BUILDHGT  CLQNCH1     8.50    0.00    8.50    8.50    8.50    8.50
   BUILDWID  CLQNCH1   318.78  337.64  346.24    0.00    0.00    0.00
   BUILDWID  CLQNCH1     0.00    0.00  265.00  223.99  176.17  123.00
   BUILDWID  CLQNCH1    66.09   24.71  156.47  207.83  252.88  290.24
   BUILDWID  CLQNCH1   318.78  337.64  346.24    0.00    0.00    0.00
   BUILDWID  CLQNCH1     0.00    0.00  265.00  283.82  243.16  195.12
   BUILDWID  CLQNCH1   141.15    0.00  156.48  207.83  252.88  290.24
   BUILDLEN  CLQNCH1   283.82  243.16  195.12    0.00    0.00    0.00
   BUILDLEN  CLQNCH1     0.00    0.00  237.00  275.77  306.16  327.25
   BUILDLEN  CLQNCH1   338.39  339.97  351.95  350.44  338.28  315.85
   BUILDLEN  CLQNCH1   283.82  243.16  195.12    0.00    0.00    0.00
   BUILDLEN  CLQNCH1     0.00    0.00  237.00  318.78  337.64  346.23
   BUILDLEN  CLQNCH1   344.31    0.00  351.95  350.44  338.28  315.85
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   XBADJ     CLQNCH1  -359.65 -360.26 -368.55 -362.84 -346.10 -318.85
   XBADJ     CLQNCH1  -281.91 -236.40 -183.72    0.00    0.00    0.00
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   YBADJ     CLQNCH1   -54.87    0.00   11.87   45.58   77.92  107.88
...
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RE FINISHED

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   PROFFILE  USSC_MMIF_AERMET_D05_2012_WS50_AER_ADJU.PFL
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   UAIRDATA  99999  2012  MMIF_USS_CLN
   SITEDATA  99999  2012  MMIF_USS_CLN
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   PROFBASE  244.0  METERS
ME FINISHED

OU STARTING
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   PLOTFILE  1  CLBLRS 4  MMIF_CLBLRS_4TH_2012.PLT  52
   PLOTFILE  1  PECS   4  MMIF_PECS_4TH_2012.PLT   53
   PLOTFILE  1  COMBS  4  MMIF_COMBS_4TH_2012.PLT  54
   PLOTFILE  1  QNCHS  4  MMIF_QNCHS_4TH_2012.PLT  55
   PLOTFILE  1  SCOT   4  MMIF_SCOT_4TH_2012.PLT  56
   PLOTFILE  1  BATTS  4  MMIF_BATTS_4TH_2012.PLT  57
   POSTFILE  1  ALL UNFORM  MMIF_CLN_2012.POS
OU FINISHED
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SO_2 SIP

Appendix J

Source Documentation

J-1: U. S. Steel

J-2: Guardian Industries

J-3: NRG Elrama

J-4: Allegheny Energy Mitchell

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J-1: U. S. Steel

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USS Clairton Plant, Coke Oven Gas (COG) Control Projects

This section describes the controls to be implemented at the USS Mon Valley Works – Clairton Plant. The Clairton Plant produces metallurgical grade coke from destructive distillation of coal. A total of 10 conventional by-products recovery coke oven batteries are capable of producing in excess of 12,000 tons/day of coke. Below is a general process flow diagram of the Clairton operations.

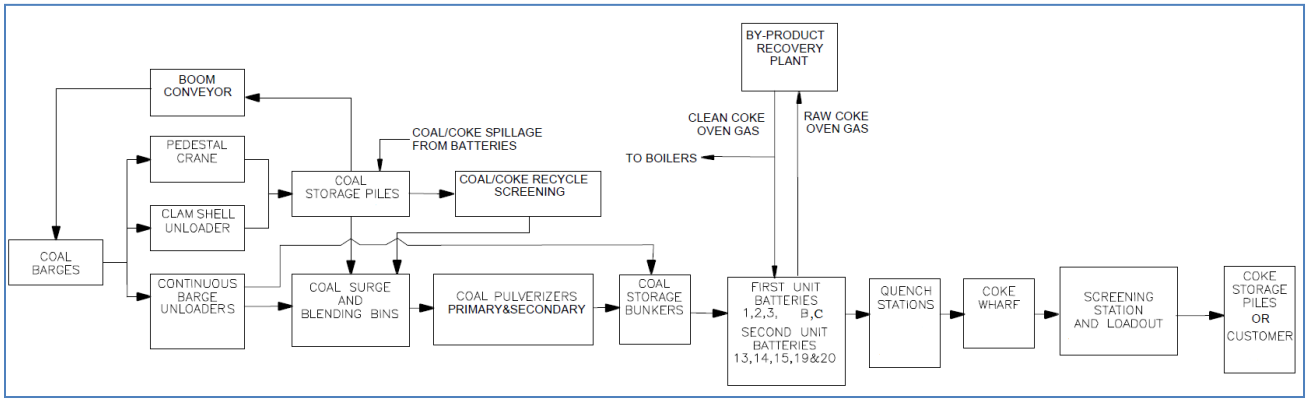

Figure J-1. USS Clairton General Process Flow Diagram

As part of the By-Product Recovery Plant, the Desulfurization Plant processes the coke oven gas (COG) that has been processed at the No. 1 and No. 2 Control Rooms. The vacuum carbonate unit(s) cleans and splits a portion of the coke oven gas stream for combustion use, while the Claus and SCOT plants further process the coke oven gas for elemental sulfur recovery and tail gas incineration.

The process flow diagram for the desulfurization plant is shown below.

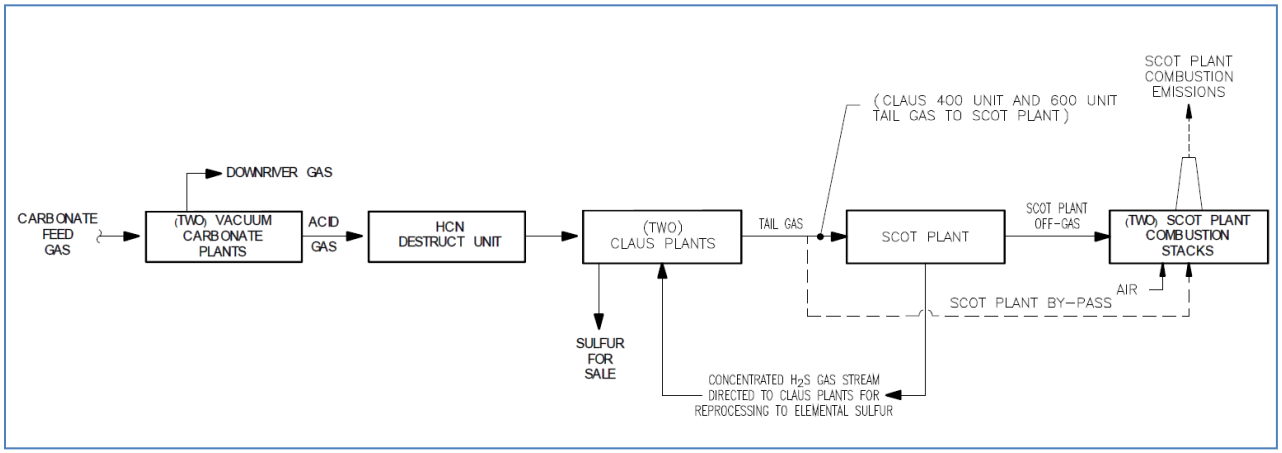

Figure J-2. USS Clairton Desulfurization Plant Process Flow Diagram

100 and 600 Vacuum Carbonate Unit (VCU) Project

A portion of the raw COG produced during the coking process is cleaned and desulfurized using a cryogenic gas separation process and returned to the batteries as fuel to sustain the underfiring/cokemaking cycle. The remainder is composed of cryogenically produced downriver gas and carbonate feed gas streams. Essentially all of the hydrogen sulfide (H_2S) contained in the raw COG is concentrated in the carbonate feed gas stream. Upon leaving the cryogenic gas separation plant, the carbonate feed gas is further processed through a VCU for sulfur removal and recovery, thereby creating a desulfurized fuel gas.

Within the VCU, the carbonate feed gas passes through a trayed absorber column where it is contacted with a carbonate solution. Once the carbonate solution absorbs and picks up H_2S, the gas stream leaves the absorber column and travels to combustion sources. Once the solution is regenerated or stripped, it is returned to the absorber column for reuse within the continuous absorption/stripping vacuum carbonate process.

The absorption process efficiency is highly dependent upon how well the lean solution entering the absorber is stripped of residual H_2S and regenerated. In order to increase solution regeneration efficiency, new internals were designed, purchased and installed within the stripper column. This process change increased the number of theoretical stripping stages available and significantly improved solution regeneration efficiency. As a result, the revamped stripper column has enabled the absorber column to achieve significantly lower H_2S levels in the downriver gas stream.

Figure J-3. Dual flow tray assembly (15 installed previously on 2 ft spacing)

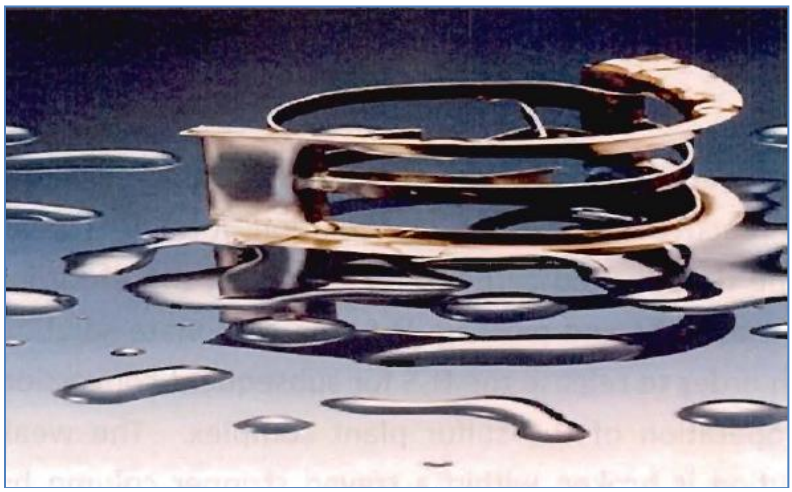

Figure J-4. Random packing element (several hundred thousand on a 25 ft bed)

This project also includes making the same modifications to the 600 VCU for redundancy. This would enable a consistent level of carbonate feed gas desulfurization to be achieved regardless of which VCU is in service at any given time. Modifying the 600 VCU allows for consistent levels of SO_2 emissions at all three facilities using COG when one of the units is taken down for maintenance.

Claus Plant Tail Gas Recycle Project

The Coke By-Products Recovery Plant includes several complex operations. The SCOT Plant receives "tail gas" flow from the Claus Plant after elemental sulfur is recovered for sale. The SCOT plant converts tail gas constituents into H_2S. During this process, the H_2S is absorbed, stripped, and redirected back to the Claus Plant. The remaining clean gas stream contains little to no H_2S and is combusted prior to exiting the SCOT plant stack. Currently and as is the industry standard, when the SCOT plant is down, sulfur removal of the tail gas received from the Claus Plant does not occur, and therefore, the sulfur dioxide emissions from the SCOT plant combustion stacks are increased. The recycle project would re-route the tail gas back to the first unit suction main.

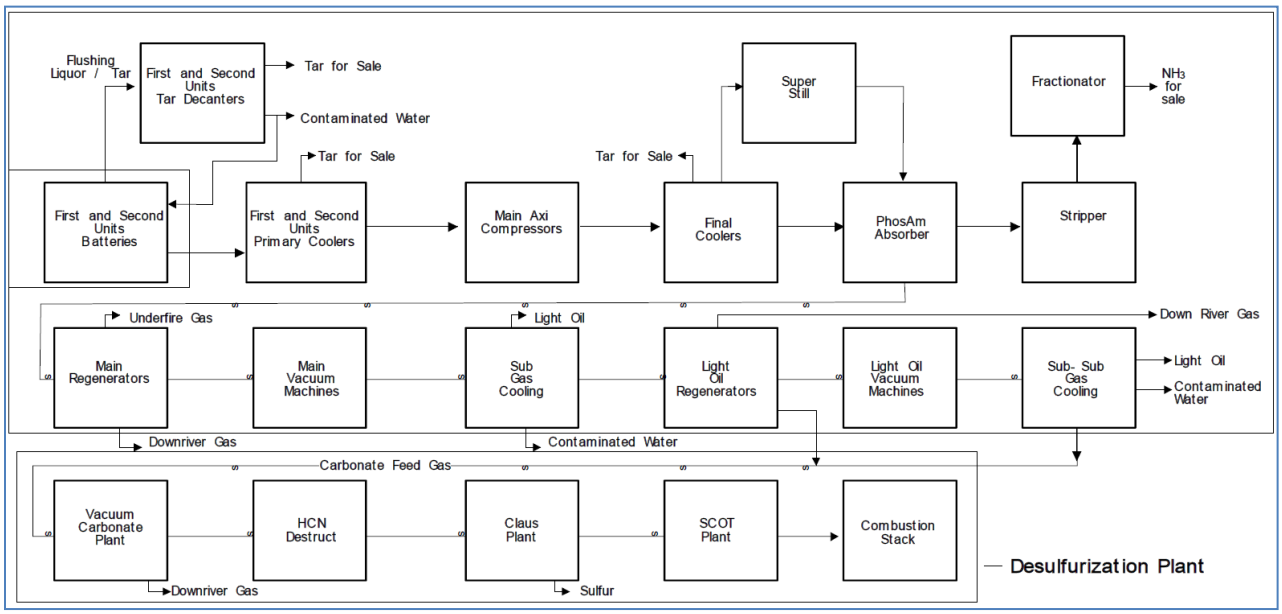

Figure J-5. USS Clairton By-Products (and Desulfurization) Process Flow Diagram

SO_2 emissions from the SCOT plant during normal operation are estimated at 60 tpy. This, however, does not include SO_2 emissions that occur during outages (which are needed for maintenance). When the SCOT Plant is not operating during the typical annual 2-3 week outage, approximately 80 tpy of emissions can result during the outage period. Increased emissions of SO_2 attributable to SCOT plant outages have been shown to elevate SO_2 impacts making it difficult to maintain compliance with the NAAQS especially if the outage occurs during unfavorable meteorological conditions. Potential increased SO_2 emissions of > 4 tons/day can be expected over this period because the gas is still being combusted in the SCOT Plant even though it has not been processed through the SCOT Plant as normal. This suggests that

shutdown of the SCOT plant can lead to increased SO_2 impacts. As shown in Figure J-6 below, the feed to the SCOT Plant (Claus Plant tail gas) is a completely different gas stream than the downriver or underfire streams, and the H_2S grains are not representative of the feed gas being combusted in the SCOT Plant.

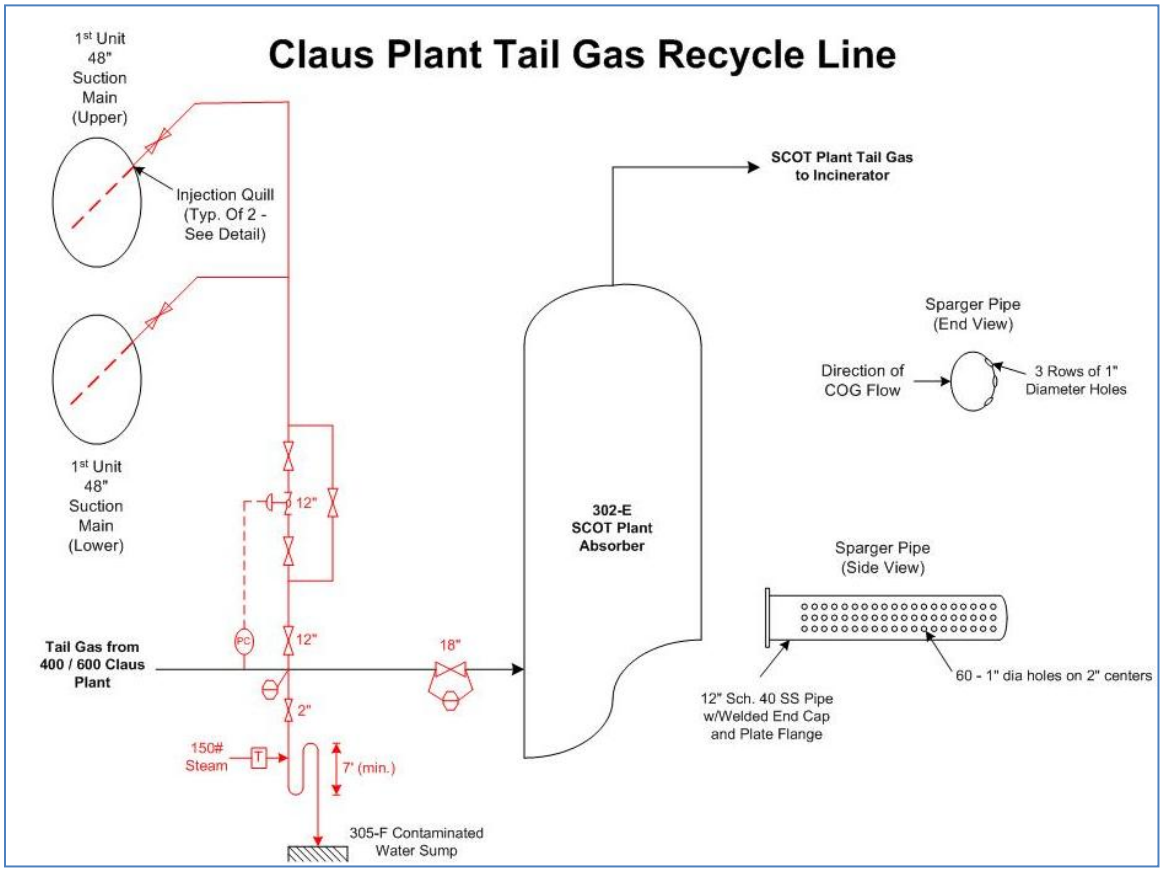

Figure J-6. USS Clairton Claus Tail Gas Recycle Line (shown in red)

The installation of this recycle line will reroute the tail gas from the Claus Plant that normally feeds the SCOT Plant back to the 1st unit suction main. This eliminates the potentially higher sulfur SCOT Plant feed being combusted. As stated above, when the SCOT Plant is down, the gas is not being processed through the system as normal, no further compounds are removed, but the gas is still combusted at the SCOT Plant. This reroute will continue to circulate the Claus Plant tail gas through the system until the SCOT Plant is brought back online. At that point, normal operations resume; all gas combusted at the incinerator stack will have first been processed through the SCOT Plant.

Claus plant tail gas containing H_2S and SO_2 has the potential to be highly corrosive. Therefore, the recycling of tail gas will only be performed during planned/unplanned SCOT plant outages.

Main Regenerator Switching Valve Project (not included in control strategy)

The Clairton Plant's Gas Handling Department is currently developing a switching valve replacement campaign which will reduce the H_2S grains in the underfire gas stream which is consumed by the Clairton batteries. Emission reductions have not been quantified for this project; this project has therefore not been included in the control strategy, only as weight of evidence that reductions will continue at the Clairton Plant.

The coke oven gas generated during the coking process is taken from the batteries through a complex gas processing system that includes main regenerators that employ an extremely low temperature technology, or cryogenics. To achieve this separation the regenerators progress through four phases. The regenerators are grouped into six groups of four, referred to as quads. To allow for the switching between phases, each vessel is equipped with a switching valve which allows the gas to enter or exit the vessel. Because of the pressure difference from one side of a closed valve to the other, a leak in a switching valve can cause gas to escape into the downriver or underfire stream (depending on the phase). This can cause an increase in the H2S grains in these streams. By reducing the leakage rate of the switching valves, the gas stream stays in the column and is cleaned instead of leaking through the valve and bypassing the cleaning process.

U. S. Steel will install custom machined valves for the regenerators which will result in significantly lower leakage rates and a reduction in sulfur dioxide emissions from the combustion stacks. U. S. Steel is scheduled to begin the valve replacement project by late 2017 or early 2018 with all quads anticipated for replacement within the next 5 years.

USS Edgar Thomson Plant, Proposed New Boiler Stack

USS will construct a new exhaust stack for the Riley boilers at the Edgar Thomson (ET) plant. The current stacks (one for each of the three boilers) are located on the roof of the boiler house building (see Appendix I) at a height of 49.17 m. This height is approximately 10.67 m from the top of the boilerhouse roof and well below the surrounding terrain.

The new stack located adjacent to the boilerhouse to the NE will be release point for all boiler emissions from a new combined flue system. This is the most feasible location for the new configuration. The proposed pre-construction height for this stack will be a minimum of 70 m.

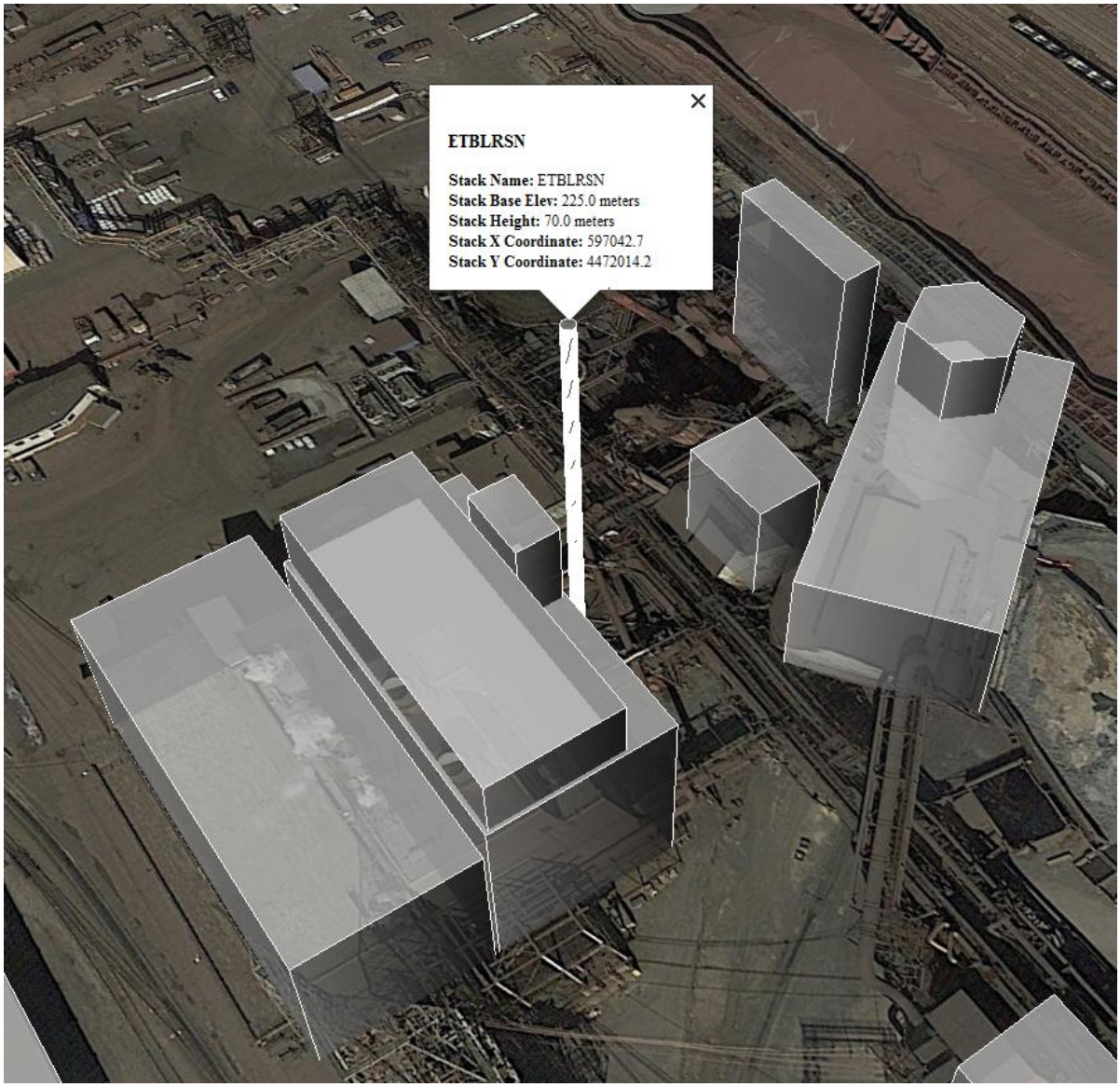

Figure J-7. USS ET Proposed New Stack and Surrounding Structures

(Note: diameter not shown to scale; the proposed diameter is 6.1 m with a maximum exit velocity of 20.97 m/s.)

The proposed stack is below GEP height (96.75 m) based on the surrounding structures, with the boilerhouse being the dominant structure for building-influenced downwash.

On the following pages are the building and stack inputs used in the BPIPPRM modeling preprocessor (version 04274), along with the calculated downwash parameters and GEP height for the new stack.

BPIPPRM Inputs

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BPIPPRM Output

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SO2 Rileys Combined Stack

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DATE :  1/16/2017
TIME : 21:24:11
SO2 Rileys Combined Stack

============================
BPIP PROCESSING INFORMATION:
============================

  The P  flag has been set for preparing downwash related data
         for a model run utilizing the PRIME algorithm.

  Inputs entered in METERS     will be converted to meters using
   a conversion factor of    1.0000.  Output will be in meters.

  The UTMP variable is set to UTMY.  The input is assumed to be in
    UTM coordinates.  BPIP will move the UTM origin to the first pair of
    UTM coordinates read.  The UTM coordinates of the new origin will
    be subtracted from all the other UTM coordinates entered to form
    this new local coordinate system.

  Plant north is set to   0.00 degrees with respect to True North.


SO2 Rileys Combined Stack



               PRELIMINARY* GEP STACK HEIGHT RESULTS TABLE
                         (Output Units: meters)

                          Stack-Building            Preliminary*
        Stack    Stack     Base Elevation    GEP**   GEP Stack
        Name     Height    Differences       EQN1    Height Value


      ETBLRSN    70.00         0.00        96.75        96.75

  * Results are based on Determinants 1 & 2 on pages 1 & 2 of the GEP
    Technical Support Document.  Determinant 3 may be investigated for
    additional stack height credit.  Final values result after
    Determinant 3 has been taken into consideration.
 ** Results were derived from Equation 1 on page 6 of GEP Technical
    Support Document.  Values have been adjusted for any stack-building
    base elevation differences.

    Note:  Criteria for determining stack heights for modeling emission
    limitations for a source can be found in Table 3.1 of the
    GEP Technical Support Document.
```

BPIP (Dated: 04274)

DATE : 1/16/2017
TIME : 21:24:11

SO2 Rileys Combined Stack

BPIP output is in meters

SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	38.70	38.70
SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	29.60	38.70
SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	38.70	38.70
SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	38.70	38.70
SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	29.60	38.70
SO	BUILDHGT	ETBLRSN	38.70	38.70	38.70	38.70	38.70	38.70
SO	BUILDWID	ETBLRSN	53.96	51.38	54.12	55.22	54.63	52.39
SO	BUILDWID	ETBLRSN	48.55	43.25	36.62	28.88	28.74	28.97
SO	BUILDWID	ETBLRSN	36.67	43.25	48.53	52.32	54.53	55.08
SO	BUILDWID	ETBLRSN	53.96	51.38	54.12	55.22	54.63	52.39
SO	BUILDWID	ETBLRSN	48.56	43.24	36.62	28.88	28.74	28.97
SO	BUILDWID	ETBLRSN	36.67	43.25	48.53	52.32	54.53	55.08
SO	BUILDLEN	ETBLRSN	28.88	20.47	28.97	36.67	43.26	48.53
SO	BUILDLEN	ETBLRSN	52.32	54.53	55.08	53.96	52.39	54.12
SO	BUILDLEN	ETBLRSN	55.22	54.63	52.39	48.56	43.24	36.62
SO	BUILDLEN	ETBLRSN	28.88	20.47	28.97	36.67	43.25	48.53
SO	BUILDLEN	ETBLRSN	52.32	54.53	55.08	53.96	52.39	54.12
SO	BUILDLEN	ETBLRSN	55.22	54.63	52.39	48.56	43.25	36.62
SO	XBADJ	ETBLRSN	-37.90	-33.06	-36.05	-38.02	-38.83	-38.47
SO	XBADJ	ETBLRSN	-36.93	-34.28	-30.58	-25.95	-21.11	-18.08
SO	XBADJ	ETBLRSN	-15.00	-11.46	-7.57	-3.46	0.77	4.97
SO	XBADJ	ETBLRSN	9.02	12.59	7.08	1.35	-4.42	-10.06
SO	XBADJ	ETBLRSN	-15.39	-20.25	-24.50	-28.00	-31.28	-36.04
SO	XBADJ	ETBLRSN	-40.22	-43.17	-44.82	-45.10	-44.01	-41.59
SO	YBADJ	ETBLRSN	-1.03	-5.07	-8.98	-12.61	-15.86	-18.62
SO	YBADJ	ETBLRSN	-20.82	-22.39	-23.28	-23.46	-19.46	-21.56
SO	YBADJ	ETBLRSN	-19.68	-17.21	-14.20	-10.77	-7.01	-3.04
SO	YBADJ	ETBLRSN	1.02	5.07	8.98	12.61	15.86	18.62
SO	YBADJ	ETBLRSN	20.82	22.39	23.28	23.46	19.46	21.56
SO	YBADJ	ETBLRSN	19.68	17.21	14.21	10.77	7.01	3.04

J-2: Guardian Industries

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GUARDIAN

Glass • Automotive • Building Products

Guardian Industries Corp.
World Headquarters
2300 Harmon Road
Auburn Hills, MI 48326-1714
Direct Dial. (248) 340-2108
Email: mmetz@guardian.com

Michael M. Metz
Associate General Counsel

November 23, 2015

Mr. Michael Parker
Attorney
Air Quality Program
Allegheny County Health Department
301 39th Street – Bldg. #7
Pittsburgh, PA 15201-1891

Subject: Title V Air Permit Termination
Permit No. 0023

Dear Mr. Parker:

This letter is to confirm our discussion regarding the termination of the Floreffe Plant's Title V Permit No. 0023. As reported to ACHD via Gregg Eckstein's letter to Sandra Etzel, dated August 11, 2015, all processing operations permanently ceased to operate as of August 10, 2015. There are no processing activities at the plant nor are there any remaining reporting requirements that are not covered by the ACHD Article XXI.

Guardian realizes that an Air Emission Survey (AES) report for calendar year 2015 will be due on, or about, March 1, 2016. Guardian is prepared to submit this report as soon as the ACHD forms are available. Further, based on the results of the emission calculations submitted in the AES, Guardian is prepared to pay the resultant emission fee. The emission fee is expected to be due on, or about, July 1, 2016. The submittal of the AES and the payment of the emission fee are required by Article XXI.

Since the Title V Permit is no longer necessary, Guardian is requesting the permit be terminated.

Respectfully,

Mike Metz

GUARDIAN
Glass • Automotive • Building Products

August 11, 2015

Enforcement Chief
Allegheny County Health Department
Air Quality Program
301 39th Street, Building # 7
Pittsburgh, PA 15201

RE: Consent Order and Agreement dated January 7, 2015 (COA)
Title V Operating Permit #0023

Dear Enforcement Chief:

Please be advised that, as of Monday August 10, 2015, all processing operations at the Guardian Industries Corp., Floreffe Plant, (Guardian) have permanently ceased to operate. Also, payment of COA stipulated penalties has been sent to the ACHD under separate cover.

In accordance with §III.C. of the referenced COA, Guardian requests that the Allegheny County Health Department terminate Title V Operating Permit #0023. Upon termination of the permit, all requirements of the COA will be satisfied. Also, in accordance with §III.C. of the referenced COA, Guardian requests ACHD to declare the authorization to operate and the obligations and conditions thereunder to be of no further force and effect.

Please contact me at 412-382-3397 or geckstein@guardian.com if you have any questions or comments.

Respectfully,

Gregg E Eckstein

Gregg E. Eckstein
Environmental Engineer,
Guardian Industries Corp.

COUNTY OF ALLEGHENY

RICH FITZGERALD
COUNTY EXECUTIVE

November 23, 2015

Mr. Michael Metz
Guardian Industries Corp.
2300 Harmon Road
Auburn Hills, MI 48326-1714

Dear Mr. Metz:

The Department is writing this letter in response to Guardian Industries' request for termination of Major Source Operating Permit # 0023 issued on January 28, 2013. Based on an August 31, 2015, inspection (Partial Compliance Evaluation (PCE)), the Department has verified that glass-making operations have ceased at the Floreffe Plant.

Therefore upon your request and in accordance with Article XXI §2103.12.f.3, the permit is terminated as of the date of this letter. Guardian's requirement to submit a timely and complete emissions inventory and the associated emission fees, remain. If you have any questions regarding the Department's action, please don't hesitate to call me at 412-578-8116. I will be glad to help you.

Sincerely,

Sandra Etzel
Chief Engineer

cc: Dean DeLuca, Enforcement

KAREN HACKER, MD, MPH, DIRECTOR
ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM
301 39TH STREET • CLACK HEALTH CENTER • BUILDING 7
PITTSBURGH, PA 15201-1811
PHONE (412) 578-8103 • FAX (412) 578-8144
24-HR (412) 687-ACHD (2243) • WWW.ACHD.NET

ALLEGHENY COUNTY HEALTH DEPT
AIR QUALITY PROGRAM

INSPECTION REPORT

SECTION A: SITE DATA	PFID: 737350	Permit No. 0023
Date of Inspection: 2/4/16	Announced?: No	Date of Next Inspection: N/A
Name of Site: Guardian Industries	Source Type: Major [√] Syn. Minor [ ] Minor [ ] No Permit [ ]	Site Address: 1000 Glass House Road Jefferson Hills, PA 15025 412-384-3400
Name, Address of Responsible Official: Al Feree		Title: Plant Maintenance Engineer

SECTION B: (Check all that apply)

COMPLIANCE STATUS: Compliance Yes √ No Not Determined EPA CMS Code: 90

POLLUTANTS: PM/PM10 SOx NOx VOC CO HAPs Pb VEs Odors

SECTION C: AREAS EVALUATED DURING INSPECTION

[√]Compliance Monitoring Check	[ ]Complaint Investigation	[√]Records / Reports
[ ]Compliance Progress Check	[ ]Sample Taken	[√]Operation / Maintenance
[ ]Self Monitoring Check	[ ]Installation Permit	[√]Information Gathering
[ ]Source Test	[√]Operating Permit	[ ]Other, Specify

Partial Compliance Evaluation(PCE) **In Compliance**

The plant has been completely demolished. Cleanup should be complete by the end of February. This is one month later than planned because of unforeseen delays obtaining the necessary permits from the borough. There is still some cullet on site. Guardian plans to sell it.

See attached pictures.

Person Interviewed Name: Greg Eckstein	Title: Environmental Eng.	Signature:	Date:2/4/16
Inspector Name: Marie Kelly	Title: Air Quality Scientist	Signature: Marie Kelly	Date: 2/4/16

This document is official notification that a representative of the Allegheny County Health Department, Air Quality Program, inspected the above site. The findings of this inspection are shown above and on any attached pages. Any violations which were uncovered during the inspection are indicated. Violations may also be discovered upon examination of the results of the laboratory analysis and subsequent review of Department records. Notification will be forthcoming if such violations are noted.

Reviewed by _____

INSPECTION REPORT

Summary

The permitted activities listed below have all been discontinued.

- Dry Scrubber ESP
- Virgin Lime Silo Bag-house
- Used Lime Silo Bag-house
- Glass and Roll Coating
- Float Glass Cutting
- Diesel Generators
- Cullet Return Cyclones
- Cullet Pads
- Glass Melting Furnace

Usable process and control equipment has been dismantled and shipped to other Guardian facilities or sold into the used equipment market. The facility has received permission to break up the molten glass in the furnace and bury it in onsite.

Reviewed by _____

KOMATSU

E
DOWNSTREAM

F
DOWNSTREAM

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J-3: NRG Elrama

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TVOP-63-00014-

APR 12 2013
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

NRG Energy
Southpointe Operations Center
121 Champion Way
Canonsburg, PA 15317
Telephone: (724) 597-8405
Email: john.shimshock@nrgenergy.com

April 11, 2013

Overnight Delivery
Ms. Barbara R. Hatch, P.E.
Environmental Engineer Manager
Pennsylvania Department of Environmental Protection
Air Quality Program – Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

Re: GenOn Power Midwest, LP – Elrama Generating Station
Title V Operating Permit No. 63-00014 - Maintenance and Reactivation Plans for Boiler Nos. 1 through 4 (Source IDs 031 through 034)

Dear Ms. Hatch:

Please find attached a maintenance and reactivation plan for Boiler Nos. 1 through 4 licensed to operate at the GenOn Power Midwest, LP (a subsidiary of NRG Energy) – Elrama Generating Station. The plan was prepared and is submitted pursuant to 25 Pa. Code §§127.11 and 127.215. In support of the renewal of Elrama's Title V operating permit, NRG previously communicated to the Department that NRG "deactivated" (i.e., made units unavailable for dispatch by PJM Interconnection, LLC) Units 1 through 3 effective June 1, 2012 and Unit 4 effective October 1, 2012. Because less than one year has elapsed since the date of last operations of the Elrama boilers, this submittal satisfies deadline for submittal of such plan as specified in 25 Pa. Code §127.11a(a)(1). Subsequent to the last operations and as described herein, the Elrama boilers were placed into a protective layup (mothballed) status and will be maintained as such for the foreseeable future.

Additionally, with this submittal, NRG is requesting the Department to

- Preserve the emissions in the inventory per 25 Pa. Code §127.11a(a)(3);
- Review and approve the reactivation plan per 25 Pa. Code §§127.11 and 127.215; and
- Continue with efforts in support of issuance of a renewed Title V operating permit. If NRG elects to reactivate any or all of the Elrama boilers, then such units can not be operated in the absence of a current Title V operating permit per 25 Pa. Code §127.11a(f).

NRG is grateful for the Department's effort in support of various air operating permit issues for Elrama, and we are looking forward to future exchanges. If you have any questions or comments regarding this submittal, please contact me via telephone or email as listed above.

Very truly yours,

John P. Shimshock

John P. Shimshock
Sr. Air Environmental Specialist

Attachment

NRG Energy
Southpointe Operations Center
121 Champion Way
Canonsburg, PA 15317
Telephone: (724) 597-8405
Email: john.shimshock@nrgenergy.com

Certification by a Responsible Official per 25 Pa. Code §127.402(d)

Based on the information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate and complete.

Signature: Ed Russell

Name: Ethan M. Russell

Official Title: Plant Manager

Telephone No.: (724) 535 - 1810

Date Signed: 4/11/13

GenOn Power Midwest, LP
Elrama Generating Station – Elrama, PA (Washington County)
Title V Operating Permit No. 63-00014
Maintenance and Reactivation Plans for Boiler Nos. 1 through 4 (Source IDs 031 through 034)

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
121.1	*Deactivation*—Cessation of the emissions of an air pollutant from air contamination source, emissions unit or facility. *Air contamination source*—Any place, facility or equipment, stationary or mobile, at, from or by reason of which there is emitted into the outdoor atmosphere any air contaminant. *Facility*—An air contamination source or a combination of air contamination sources located on one or more contiguous or adjacent properties and which is owned or operated by the same person under common control.	Per previous communications to the Department, GenOn "deactivated" (i.e., make units unavailable for dispatch by PJM Interconnection, LLC) Units 1 through 3 effective June 1, 2012 and Unit 4 effective October 1, 2012. The Elrama units were placed into a protective layup (mothballed) status and will be maintained as such for the foreseeable future. The four Elrama units were last operated on Unit 1: June 23, 2012 - fired with oil only to flash-dry the boiler in support of the protective layup (mothballing) activities; prior to this activity, Unit 1 was previously operated on November 29, 2011 Unit 2: May 30, 2012 * Unit 3: May 30, 2012 * Unit 4: September 3, 2012 - fired with oil only to flash-dry the boiler in support of the protective layup (mothballing) activities; prior to this activity, Unit 4 was previously operated on August 21, 2012 *: the boiler was drained immediately thereafter and flash-dried If GenOn elects to reactivate (i.e., make the units available for dispatch by PJM) and the time period between the (i) date of the most recent operations and (ii) projected operations date is greater than 1 year (i.e., 12 consecutive months), then GenOn will seek to reactivate the selected units as outlined below. Other than Units 1 through 4, there are no other stationary non-exempt point sources at the Elrama Generating Station. Fugitive and area emission sources include activities in support of coal, limestone and ash handling and storage.
127.11	Except as provided in § § 127.11a and 127.215 (relating to reactivation of sources; and reactivation), a person may not cause or permit the construction or modification of an air contamination source, the reactivation of an air contamination source after the source has been out of operation or production for 1 year or more, or the installation of an air cleaning device on an air contamination source, unless the construction, modification, reactivation or installation has been approved by the Department.	

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
127.11a(a)	Except as provided by § 127.215 (relating to reactivation), a source which has been out of operation or production for at least 1 year but less than or equal to 5 years may be reactivated and will not be considered a new source if the following conditions are satisfied:	Please see below
127.11a(a)	(1) The owner or operator shall, within 1 year of the deactivation submit to the Department and implement a maintenance plan which includes the measures to be taken, including maintenance, upkeep, repair or rehabilitation procedures, which will enable the source to be reactivated in accordance with the terms of the permit issued to the source.	The Elrama maintenance plan is comprised of the following activities: 1) Water-wash the gas-side of each boiler and connecting flue gas ductwork to the flue gas desulphurization (FGD) system, the FGD vessels and mist eliminators, and other process supports to remove corrosive deposits; remove the washings and deposits 2) Open, drain and ventilate the water side of each condenser and other water supply or retainer systems 3) Remove lubricants from most equipment 4) Install and operate five portable propane-fired heaters (space heaters which are exempt from Plan Approval requirements per 25 Pa. Code §127.14(a)(5)) and in-line fans and ducts throughout the power block, screen house and FGD system to maintain ambient air temperatures above the dewpoint, thus minimizing the potential of corrosion from moisture. 5) Install and operate strip heaters on all 4160 V FGD ID fans to prevent deterioration of dielectric properties 6) Remove and store selected electrical brushes; opened AC & DC electrical switches on selected breakers 7) Stabilize asbestos-containing materials (ACM) and lead paint deposits where necessary 8) Transfer residual coal from the coal bunkers to the coal yard; water-wash the coal bunkers and ventilated to dry; vacuum coal feeders and pulverizer mills to remove corrosive deposits 9) Remove excess coal from coal yard, thus minimizing the potential for fugitive dust emissions; drain and clean the No. 2 fuel oil tank and remove oil inventory

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
		10) Drain and clean other tanks that stored various support materials (e.g., 19% aqueous ammonia for the SNCR systems); remove materials, and route materials to vendor or appropriate disposal firm 11) Remove and store various boiler oxygen analyzers (diagnostic analyzers); CEMs and exhaust gas flow probes continue to be maintained in the same manner prior to the Units 1 through 4 "deactivation." 12) Continue to prepare and submit all required monitoring and compliance reports per the current Title V operating permit
	(2) The owner or operator shall submit a reactivation plan to the Department for approval at least 60 days prior to the proposed date of reactivation. The reactivation plan shall include sufficient measures to ensure that the source will be reactivated in compliance with the permit requirements. The permittee may submit a reactivation plan to the Department at any time during the term of its operating permit. The reactivation plan may also be submitted to and reviewed by the Department as part of the plan approval or permit application or renewal process.	The Elrama reactivation plan is comprised of the following activities: ➢ Undo, reverse or cease various protective layup (mothballing) activities, specifically items 2) through 6) and 8) through 10) included in the maintenance plan presented above ➢ Initiate efforts in support of repairing or replacing selected equipment deficiencies identified in work backlog reports ➢ Perform commissioning activities of various electrical, hydrostatic and control systems to ensure that the equipment is in a condition to operate as designed and in accordance with all applicable safety specifications ➢ Conduct pre-start performance testing of plant equipment (e.g., pumps, compressors, fans) to ensure that capacities and vibration signatures are within acceptable range of performance ➢ Conduct pre-start performance testing of plant control systems (e.g., electrical and hydrostatic) to ensure that such systems direct operations as designed ➢ Operate the boilers, generators and steam turbines in accordance with the plant's start-up and operating procedures; maintain compliance with the applicable emission limits while operating the boiler(s) in the same manner prior to the Units 1 through 4 "deactivation"
	(3) The owner or operator of the source shall submit a notice to the Department within 1 year of deactivation requesting preservation of emissions in the inventory and indicating the intent to reactivate the source.	Please see the attached transmittal letter

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
	(4) The owner or operator of the source shall comply with the terms and conditions of the maintenance plan while the source is deactivated, and shall comply with the terms of the reactivation plan and operating permit upon reactivation.	GenOn will comply as required.
	(5) The owner or operator of the source with an approved reactivation plan and operating permit shall notify the Department in writing at least 30 days prior to reactivation of the source.	GenOn will notify the Department as required.
127.11a(e)	A source located in a nonattainment area that would emit an air contaminant related to the nonattainment designation or a source that would emit NO_x or VOC emissions may not be reactivated unless the proposed emissions are included in the SIP emission inventory or until the proposed emissions of these contaminants from the source are submitted to and approved by the EPA as an amendment of the SIP. The Department may refuse to allow reactivation of such a source for cause.	Administrative permitting requirement that will be addressed if reactivation is requested.
127.11a(f)	The source shall have an operating permit prior to reactivation.	The Elrama Generating Station is licensed to operate under the aforementioned Title V permit, which expired on 12-31-2006, but was extended pursuant to 25 Pa. Code §127.446(c) pending issuance of a renewed Title V permit. GenOn expects the Department to issue a renewed Title V permit in calendar year 2013.
127.215(a)	A facility which has been out of operation or production for 1 year or more during the term of its operating permit may be reactivated within the term of its operating permit and will not be considered a new facility subject to this subchapter if the following conditions are satisfied:	The "deactivation" of the four Elrama units would satisfy the criteria that the facility "has been out of operation or production" (i.e. the plant did not generate and provide electricity to the grid). This requirement is essentially the same as 127.11a(a).

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
	(1) The permittee shall within 1 year of the deactivation submit in writing to the Department and implement a maintenance plan which includes the measures to be taken, including maintenance, upkeep, repair or rehabilitation procedures, which will enable the facility to be reactivated in accordance with the terms of the permit.	This requirement is essentially the same as 127.11a(a)(1).
	(2) The permittee shall submit a reactivation plan at least 30 days prior to the proposed date of reactivation. The reactivation plan shall include sufficient measures to ensure that the facility will be reactivated in compliance with the permit requirements. The permittee may submit a reactivation plan to the Department at any time during the term of its operating permit. The reactivation plan may also be submitted to and approved in writing by the Department as part of the plan approval or permit application process.	This requirement is essentially the same as 127.11a(a)(2).
	(3) The permittee shall notify the Department in writing within 1 year of deactivation requesting preservation of the emissions in the inventory and indicating the intent to reactivate the facility.	This requirement is essentially the same as 127.11a(a)(3).
	(4) The permittee shall comply with the terms and conditions of the following: (i) Maintenance plan while the facility is deactivated. (ii) Reactivation plan and the operating permit upon reactivation.	This requirement is essentially the same as 127.11a(a)(4).

25 Pa. Code Regulatory Citation	Requirement (highlighting added by GenOn)	GenOn's Response
127.215(b)	(b) The Department will approve or disapprove in writing the complete reactivation plan within 30 days of plan submission, unless additional time is required based on the size or complexity of the facility.	This requirement is also addressed in 127.11a(a)(2).
127.215(c)	For a facility which is deactivated in accordance with subsection (a), ERCs may be created only if an ERC registry application is filed within 2 years of deactivation.	Administrative permitting requirement

*: Reference 25 Pa. Code, Article III – Air Resources – Chapters 121 through 145
http://www.pacode.com/secure/data/025/articleICIII_toc.html

OBSERVER-REPORTER

Washington, Pennsylvania

Proof of Publication

In compliance with the Newspaper Advertising Act of July 9, 1976, P.L. 877, No. 160, as amended.
COMMONWEALTH OF PENNSYLVANIA, COUNTY OF WASHINGTON SS:
Before me, a Notary Public in and for said County and State, personally appeared

David F. Lyle who being duly sworn according to law, deposes and says that he is the CFO of the Observer Publishing Company, a Pennsylvania corporation, and its agent in this behalf, that the said company is the owner and publisher of the Observer-Reporter, successor to The Washington Observer, established September 18, 1871, and The Washington Reporter, established August 15, 1808, a daily newspaper of general circulation, printed and published and having its place of business at Washington, Washington County, Pennsylvania where it or its predecessors have been established and published continuously for more than six months prior to the publication of the notice hereto attached; that the printed notice or advertisement hereto attached is a copy of an official advertisement, official notice, legal notice or legal advertisement exactly as printed or published in the Observer-Reporter in its regular editions on the following date or dates:

December 20, 21, 22, 2012

that neither the affiant nor the Observer Publishing Company is interested in the subject matter of said notice or advertising and that all of the allegations of this affidavit as to the time, place and character of publication are true.

Sworn to and subscribed before me this 27 day of December 2012

Eleanor B. Smith

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Eleanor B. Smith, Notary Public
City of Washington, Washington County
My Commission Expires June 2, 2016
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

Public Notice **Public Notice** **Public Notice**

NOTICE OF INTENT TO ISSUE
Department of Environmental Protection
Air Quality Title V Operating Permit Renewal
Acid Rain Permit Renewal
Elrama Power Station
GenOn Power Midwest, LP

In accordance with 25 Pa. Code §§ 127.424, 127.425 and 127.521, the Department of Environmental Protection (DEP) is providing notice that it intends to issue a renewal Title V Operating Permit (TVOP-63-00014) to GenOn Power Midwest, LP for the operation of the Elrama Power Station, located in Union Township, Washington County. DEP also intends to issue a renewal Acid Rain Permit for this facility. The name and address of the applicant is GenOn Power Midwest, LP, 121 Champion Way, Suite 200, Canonsburg, PA 15317.

The main sources at this facility consist of four pulverized coal-fired boilers. Units 1 and 2 are rated at 1,200 MMBtu/Hr, Unit 3 is rated at 1,300 MMBtu/Hr and Unit 4 is rated at 1,890 MMBtu/Hr. The three smaller boilers were installed in the 1950s and Unit 4 was installed in 1960. Each boiler is equipped with dedicated multicione/electrostatic precipitator systems for control of particulate matter. Emissions of the exhausts from all four boilers are then put through a sulfur dioxide/particulate matter scrubber into a common stack. The plant uses No. 2 fuel oil as a start-up fuel. The boilers are also authorized to combust synfuel. All four units are authorized, but not required, to operate selective non-catalytic reduction systems for control of nitrogen oxide (NOx) emissions. Units 1, 2 and 3 are authorized, but not required, to operate amine-enhanced fuel lean gas reburn systems for control of NOx emissions. Supporting equipment at this site includes material storage and handling equipment and other smaller sources.

This facility has the potential to emit the following type and quantity of air contaminants (on an annual basis): 537 tons of carbon monoxide, 11,353 tons of nitrogen oxides, 1,785 tons of particulate matter, 14,670 tons of sulfur oxides, 47tons of volatile organic compounds, 214.7 tons of ammonia, 370.3 tons of total hazardous air pollutants including 264 tons hydrochloric acid, 94 tons hydrogen fluoride, 0.45 tons of lead and 135 pounds of mercury, and 5,080,000 tons of carbon dioxide equivalents (greenhouse gases). No emission or equipment changes are being proposed by this action. The emission restriction, testing, monitoring, recordkeeping, reporting and work practice conditions of the TVOP have been derived from the applicable requirements of 40 CFR Parts 52, 60, 63, 64, 68, 72, 73, 74, 75, 76, 96, 97, 98 and PA Code Title 25, Article III, Chapters 121 through 145.

DEP also intends to issue a renewal Acid Rain Permit for this site. Matthew J. Pistner is the Designated Representative for Acid Rain purposes at this facility. The Acid Rain Permit is included by reference in the Title V Operating Permit renewal. The coal-fired units are subject to a Phase II NOx Averaging Plan.

Copies of the application, DEP's analysis and other documents used in the evaluation of the application are available for public inspection during normal business hours at DEP, 400 Waterfront Drive, Pittsburgh, PA 15222. Appointments for scheduling a file review may be made by calling 412-442-4286. Any person wishing to provide DEP with additional information that they believe should be considered prior to the issuance of this permit may submit the information to DEP at the address shown above. A 30-day comment period, from the date of this publication, will exist for the submission of comments. Each written comment must contain the following information:

1. Name, address and telephone number of the person submitting the comments.
2. Identification of the proposed permit (specify TVOP-63-00014) in objections to issuance of the permit.

A public hearing may be held, if DEP, in its discretion, decides that such a hearing is warranted based on the information received. All persons submitting comments or requesting a hearing will be notified of the decision to hold a hearing by publication in the newspaper or by the Pennsylvania Bulletin, or by telephone, where DEP determines such notification by telephone is sufficient. Written comments or requests for a public hearing should be directed to Barbara Hatch, Air Quality Environmental Engineer Manager, DEP, Southwest Regional Office, 400 Waterfront Drive, Pittsburgh, PA 15222 or bhatch@pa.gov.

12-20, 21, 22

Hatch, Barbara

From: Shealey, Sharene <Sharene.Shealey@nrgenergy.com>
Sent: Monday, December 31, 2012 12:47 PM
To: Hatch, Barbara
Cc: Shimshock, John
Subject: RE: Elrama Intent to Issue Newspaper Notice.doc
Attachments: Elrama TVOP Intent to Issue Notice Publication Proof_12-31-2012.pdf

Hi Barb,

We received proof of publication today (12/31/12), a scan of which is attached. You should receive the original Wednesday, 1/2/2013.

I'm sorry for the delay, but I had to call the Observer-Reporter to remind them to send this. They said they got behind because of the holidays.

Happy New Year!
Sharene

From: Hatch, Barbara [mailto:bhatch@pa.gov]
Sent: Wednesday, December 19, 2012 12:10 PM
To: Shimshock, John
Cc: Shealey, Sharene
Subject: RE: Elrama Intent to Issue Newspaper Notice.doc

Great!

From: Shimshock, John [mailto:John.Shimshock@nrgenergy.com]
Sent: Wednesday, December 19, 2012 11:19 AM
To: Hatch, Barbara
Cc: Shealey, Sharene
Subject: RE: Elrama Intent to Issue Newspaper Notice.doc

Thanks Barb- the newspaper notice is scheduled to be published in the Observer Recorder on December 20 through 22, 2012. I'll be on holiday / vacation next week, but Sharene has kindly agreed to be on the look-out for the proof of publication, which will be forwarded to you as soon as practicable. Merry Christmas, Happy New Year, Happy Holidays – John.

From: Hatch, Barbara [mailto:bhatch@pa.gov]
Sent: Tuesday, December 18, 2012 4:07 PM
To: Shimshock, John
Subject: Elrama Intent to Issue Newspaper Notice.doc

John,

Attached please find a notice of our intent to issue the renewal TVOP for the Elrama facility. Please follow the regulations below and have it published for 3 days in a local newspaper. You are required to publish it within 10 days, and provide proof of publication within 7 days.

Any questions, get in touch.

Barb

Barbara R. Hatch, P.E. | Environmental Engineer Manager
Department of Environmental Protection | Air Quality Program
Southwest Regional Office
400 Waterfront Drive | Pittsburgh, PA 15222
Phone: 412-442-5226 | Fax: 412-442-4194
www.depweb.state.pa.us

§ 127.424. Public notice.

(a) Except as provided in § 127.462 (relating to minor operating permit modifications), the Department will prepare a notice of action to be taken on applications for an operating permit.

(b) For sources identified in § 127.44(a)(1)—(4) (relating to public notice), the notice required by subsection (a) will be completed and sent to the applicant, the EPA, any state within 50 miles of the facility and any state whose air quality may be affected and that is contiguous to this Commonwealth. The applicant shall, within 10 days of receipt of notice, publish the notice on at least 3 separate days in a prominent place and size in a newspaper of general circulation in the county in which the source is to be located. Proof of the publication shall be filed with the Department within 1 week thereafter. An operating permit will not be issued by the Department if the applicant fails to submit the proof of publication.

File TVOP-63-00014 Elrama

RECEIVED
JAN 27 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

NRG Energy
121 Champion Way
Canonsburg, PA 15317

January 24, 2014

BRA SWRO

Mr. Randy Bordner
Rachel Carson State Office Building
12th Floor, P.O. Box 8468
Harrisburg, PA 17105-8468

Subject: Clean Air Interstate Rule – Annual Gross Electrical Output Report for Calendar Year 2013

Dear Mr. Bordner:

In accordance with Title 25 of the Pennsylvania Code § 145.213, and § 145.223, please find the attached report showing monthly gross electrical output for the NRG Energy CAIR affected facilities located in the commonwealth of Pennsylvania.

If you have any questions regarding this report, please feel free to contact Tony Catanese at 724-597-8477.

I am authorized to make this submission on behalf of the owners and operators of the source or units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted with this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information including the possibility of fine or imprisonment.

Sincerely,

Mark A. Gouveia
CAIR Designated Representative

Attachments

Station Elrama
ORIS Number 3098

Generating Unit	1	2	3	4
2013	Gross Electrical Output (MWh)			
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
Ozone Season Total	0.0	0.0	0.0	0.0
Annual Total	0.0	0.0	0.0	0.0

NRG Energy
121 Champion Way
Canonsburg, PA 15317
sharene.shealey@nrgenergy.com
724-597-8232

RECEIVED
FEB 20 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

February 19, 2014

OVERNIGHT MAIL

Mr. Keith Gratzmiller
District Supervisor
Pennsylvania Department of Environmental Protection
Bureau of Air Quality
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Re: Elrama Generating Station
Title V Operating Permit No. 63-00014
2013 Air Emission Source Report

Dear Mr. Gratzmiller:

In accordance with Title V Operation Permit No. 63-00014 conditions C#019 and C#20, please find enclosed the original and one copy of the calendar year 2013 air emission source report for Elrama Generating Station. This report is being submitted via hard copy per the instructions of PA DEP's Central Office.

If you have any questions regarding this report, please contact me at the telephone number or email address listed above.

Sincerely,

Sharene D. Shealey
Manager, Air Resources PJM

Appendix J CERTIFICATION OF DATA ACCURACY

RECEIVED
FEB 20 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

AIR POLLUTION CONTROL ACT
CERTIFICATION OF DATA ACCURACY

FOR COMPANIES SUBJECT TO EMISSION STATEMENT REGULATION

Firm-Plant Code (federal tax ID + plant code assigned by DEP): 52-2201498-1

AFS Number (AIRS ID assigned by DEP):

Primary Facility ID (assigned by DEP): 239914

Company Name: NRG Power Midwest LP/Elrama Power Plant

Plant Address: 30 Duquesne Light Way
Elrama, PA 15038

I, Ethan Russell, certify under penalty of law as provided in 18 Pa. C.S. §4904 and Section 9(b)(2) of the Air Pollution Control Act, 35 P.S., §4009(b)(2) that I am a company officer or plant manager or authorized representative of the facility identified above, authorized to make this affidavit. I further certify that, based on information and belief formed after reasonable inquiry, the statements and information contained in this Emission Statement are true, accurate, and complete.

Signature: Ethan Russell

Name: Ethan Russell
(Print or Type)

Title: Plant Manager
(Print or Type)

Date: 2/13/14

Pennsylvania Department of Environmental Protection
Bureau of Air Quality
Emission Inventory Production Report

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

Region: PITTSBURGH County: Washington Municipality: Union Twp
SIC: 4911 Trans. & Utilities - Electric Services NAICS: 221112 Fossil Fuel Electric Power Generation

Contact	Name	Address	Telephone
FIRM	**S Shealey**	**121 Champion Way, Canonsburg, PA - 15317-5817**	**724-597-8232**
LOCAD		30 Duquesne Light Way, Elrama, PA - 15038	
INSP	M. Weinheimer	Po Box 800, Elrama, PA - 15038	412-382-6945
MAILA		121 Champion Way, Canonsburg, PA - 15317-5817	
PRMT	S Shealey	121 Champion Way, Canonsburg, PA - 15317-5817	724-597-8232
REOFF	E Russell	Po Box 800, Elrama, PA - 15038	724-535-1810

RECEIVED
FEB 20 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

SITE LOCATION INFORMATION

Map: 0-80.44 Latitude: 40 deg, 15 min, 11.16 sec N UTM Coordinates: Zone: 17 North: 4456.41
Elevation(Ft): 752 Longitude: -79 deg, 55 min, 05.67 sec W East: 591.998

SITE POLLUTANT SUMMARY

(SUM OF INDIVIDUAL AND MISCELLANEOUS SOURCES)
EMISSION ESTIMATES (0.0 TONS/YEAR)

AMMONIA	0.00	PM-CON	0.00
CO	0.00	SOX	0.00
LEAD	0.00	VOC	0.00
NOX	0.00	CARBON DIOXIDE	0.00
PM10	5.38	METHANE	0.00
PM2.5	0.72	NITROUS OXIDE	0.00

FUEL USE SUMMARY

Type	Total Use

Type	Total Use

SUB FACILITIES INCLUDED

Type	*SF*	*Name*
FML	531041	Sncr At Elrama Units 1
CU	031	No. 1 Boiler
CU	032	No. 2 Boiler
CU	033	No. 3 Boiler
CU	034	No. 4 Boiler
PRO	101	Facility Fugitive Emissions Pm10/Pm
PRO	102	Facility Point Pm/Pm10 Emissions Vent

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

Fuel Location: 531041 SNCR AT ELRAMA UNITS 1 SF Type: FML

Date Installed: 01-JAN-52 Fuel Stored: Bituminous Capacity: 4,900 Tons

Sub Facilities fed in 2012. Make changes or additions for the 2013 production year.

034 No. 4 Boiler
033 No. 3 Boiler
032 No. 2 Boiler

2013 Fuel Tests:

Date Collected:_____ %Ash:_____ %Sulfur:_____ BTU (Lb/Gal/CuFt) :_____

Date Collected:_____ %Ash:_____ %Sulfur:_____ BTU (Lb/Gal/CuFt) :_____

Date Collected:_____ %Ash:_____ %Sulfur:_____ BTU (Lb/Gal/CuFt) :_____

Date Collected:_____ %Ash:_____ %Sulfur:_____ BTU (Lb/Gal/CuFt) :_____

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

CU 031 → CD C01 → CD C05 → EP S01

Source did not operate in CY2013

Sub Facility : 031 NO. 1 BOILER SF Type: CU

Rated Input (MMBTU/HR) : 1,200.000
Rated Output (MW) : 97.000
Date Installed : 01-APR-52
Boiler Type : Dry Bottom Vertically Fired Boiler

Category : 11.002 EXTERNAL COMBUSTION -- Coal Combustion

Fuel : #2 Oil

SCC: 10100501 External Combustion Boilers - ; - Electric Generation - ; - Distillate Oil - ; - Grades 1 And 2 Oil - Burned

%Ash ___.___ %Sulfur ___.___ BTU/Lb-Gal-CuFt ___,___

Monthly Throughputs in Gallons			
SCHEDULE 1	JAN: _____	FEB: _____	MAR: _____
Date Effective:			
Date End:	APR: _____	MAY: _____	JUN: _____
Total Days:	JUL: _____	AUG: _____	SEP: _____
Total Hours:			
Days Per Week:	OCT: _____	NOV: _____	DEC: _____

Fuel : Bituminous

SCC: 10100202 External Combustion Boilers - ; - Electric Generation - ; - Bituminous/Subbituminous Coal - ; - Pulverized Coal: Dry Bottom (B - Burned

%Ash ___.___ %Sulfur ___.___ BTU/Lb-Gal-CuFt ___,___

Monthly Throughputs in Tons			
SCHEDULE 1	JAN: _____	FEB: _____	MAR: _____
Date Effective:			
Date End:	APR: _____	MAY: _____	JUN: _____
Total Days:	JUL: _____	AUG: _____	SEP: _____
Total Hours:			
Days Per Week:	OCT: _____	NOV: _____	DEC: _____

Changes in Fuel(s) Used, Control Device(s) or Exhaust _____

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Ammonia	7664417		
* CO	630080		
* Lead	7439921		
* NOX	10102440		

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

Sub Facility : 031 NO. 1 BOILER SF Type: CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* PM10			
* PM2.5			
* PM-CON			
* SOX	7446095		
* VOC			
* Carbon Dioxide	124389		
* Methane	74828		
* Nitrous Oxide	10024972		
* Formaldehyde	50000		
* Hydrochloric Acid	7647010		
* Hydrocyanic Acid	74908		
* Hydrogen Fluoride	7664393		
* Mercury	7439976		
* Naphthalene	91203		
* Polycyclic Organic Matter			
* Selenium	7782492		
* Sulfuric Acid	7664939		
ADDITIONAL (Print):			
Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

FML 531041

CU 032 → CD C02 → CD C05 → EP S01

Source did not operate in CY2013

Sub Facility : 032 NO. 2 BOILER SF Type: CU

Rated Input (MMBTU/HR) : 1,200.000 Date Installed : 01-JAN-53
Rated Output (MW) : 97.000 Boiler Type : Dry Bottom Vertically Fired Boiler
Category : 11.002 EXTERNAL COMBUSTION -- Coal Combustion

Fuel : #2 Oil
SCC: 10100501 External Combustion Boilers - ; - Electric Generation - ; - Distillate Oil - ; - Grades 1 And 2 Oil - Burned
%Ash ___.___ %Sulfur ___.___ BTU/Lb-Gal-CuFt ___.___

	Monthly Throughputs in Gallons		
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Fuel : Bituminous Fuel Data Based on FML: 531041
SCC: 10100202 External Combustion Boilers - ; - Electric Generation - ; - Bituminous/Subbituminous Coal - ; - Pulverized Coal: Dry Bottom (B - Burned

	Monthly Throughputs in Tons		
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Changes in Fuel(s) Used, Control Device(s) or Exhaust _____

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Ammonia	7664417		
* CO	630080		

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

Sub Facility : 032 NO. 2 BOILER SF Type: CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Lead	7439921		
* NOX	10102440		
* PM10			
* PM2.5			
* PM-CON			
* SOX	7446095		
* VOC			
* Carbon Dioxide	124389		
* Methane	74828		
* Nitrous Oxide	10024972		
* Formaldehyde	50000		
* Hydrochloric Acid	7647010		
* Hydrocyanic Acid	74908		
* Hydrogen Fluoride	7664393		
* Mercury	7439976		
* Naphthalene	91203		
* Polycyclic Organic Matter			
* Selenium	7782492		
* Sulfuric Acid	7664939		
ADDITIONAL (Print):			
Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

FML 531041 → CU 033 → CD C03 → CD C05 → EP S01

Source did not operate in CY2013

Sub Facility : 033 NO. 3 BOILER SF Type: CU

Rated Input (MMBTU/HR) : 1,300.000 Date Installed : 01-JAN-52
Rated Output (MW) : 109.000 Boiler Type :Dry Bottom Vertically Fired Boiler
Category : 11.002 EXTERNAL COMBUSTION -- Coal Combustion

Fuel : #2 Oil
SCC: 10100501 External Combustion Boilers - ; - Electric Generation - ; - Distillate Oil - ; - Grades 1 And 2 Oil - Burned
%Ash ___.___ %Sulfur ___.___ BTU/Lb-Gal-CuFt ___,___

Monthly Throughputs in Gallons			
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Fuel : Bituminous Fuel Data Based on FML: 531041
SCC: 10100202 External Combustion Boilers - ; - Electric Generation - ; - Bituminous/Subbituminous Coal - ; - Pulverized Coal: Dry Bottom (B - Burned

Monthly Throughputs in Tons			
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Changes in Fuel(s) Used, Control Device(s) or Exhaust _____

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Ammonia	7664417		
* CO	630080		

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

Sub Facility : 033 NO. 3 BOILER SF Type: CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Lead	7439921		
* NOX	10102440		
* PM10			
* PM2.5			
* PM-CON			
* SOX	7446095		
* VOC			
* Carbon Dioxide	124389		
* Methane	74828		
* Nitrous Oxide	10024972		
* Formaldehyde	50000		
* Hydrochloric Acid	7647010		
* Hydrocyanic Acid	74908		
* Hydrogen Fluoride	7664393		
* Mercury	7439976		
* Naphthalene	91203		
* Polycyclic Organic Matter			
* Selenium	7782492		
* Sulfuric Acid	7664939		

ADDITIONAL (Print):

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

FML 531041 → CU 034 → CD C04 → CD C05 → EP S01

Source did not operate in CY2013

Sub Facility : 034 NO. 4 BOILER SF Type: CU

Rated Input (MMBTU/HR) : 1,890.000 Date Installed : 01-APR-52
Rated Output (MW) : 171.000 Boiler Type :Dry Bottom
Category : 11.002 EXTERNAL COMBUSTION -- Coal Combustion

Fuel : #2 Oil
SCC: 10100501 External Combustion Boilers - ; - Electric Generation - ; - Distillate Oil - ; - Grades 1 And 2 Oil - Burned
%Ash ___.___ %Sulfur ___.___ BTU/Lb-Gal-CuFt ___,___

	Monthly Throughputs in Gallons		
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Fuel : Bituminous Fuel Data Based on FML: 531041
SCC: 10100202 External Combustion Boilers - ; - Electric Generation - ; - Bituminous/Subbituminous Coal - ; - Pulverized Coal: Dry Bottom (B - Burned

	Monthly Throughputs in Tons		
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:	JUL:	AUG:	SEP:
Total Hours:			
Days Per Week:	OCT:	NOV:	DEC:

Changes in Fuel(s) Used, Control Device(s) or Exhaust _____

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Ammonia	7664417		
* CO	630080		

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

Sub Facility : 034 NO. 4 BOILER SF Type: CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
* Lead	7439921		
* NOX	10102440		
* PM10			
* PM2.5			
* PM-CON			
* SOX	7446095		
* VOC			
* Carbon Dioxide	124389		
* Methane	74828		
* Nitrous Oxide	10024972		
* Formaldehyde	50000		
* Hydrochloric Acid	7647010		
* Hydrocyanic Acid	74908		
* Hydrogen Fluoride	7664393		
* Mercury	7439976		
* Naphthalene	91203		
* Polycyclic Organic Matter			
* Selenium	7782492		
* Sulfuric Acid	7664939		

ADDITIONAL (Print):

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

PRO 101 → EP Z101

Sub Facility : 101 FACILITY FUGITIVE EMISSIONS PM10/PM SF Type: PRO

Rated Input (MMBTU/HR) :
Date Installed :
Rated Output (MW) :
Category :

Material : PM/PM10
SCC: 30510303 Industrial Processes - ; - Mineral Products - ; - Bulk Materials Open Stockpiles - ; - Coal

	Monthly Throughputs in Tons		
SCHEDULE 1	JAN: 2,600	FEB: 2,600	MAR: 2,600
Date Effective: 01/01/13	APR: 2,600	MAY: 2,600	JUN: 2,600
Date End: 10/28/13	JUL: 2,600	AUG: 2,600	SEP: 2,600
Total Days: 301	OCT: 2,600	NOV: 0	DEC: 0
Total Hours: 7,224			
Days Per Week: 7			

Changes in Fuel(s) Used, Control Device(s) or Exhaust _____

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
Ammonia	7664417		
CO	630080		
Lead	7439921		
NOX	10102440		
PM10		5.38	AP-42
PM2.5		0.72	AP-42
PM-CON			
SOX	7446095		
VOC			
Carbon Dioxide	124389		
Methane	74828		
Nitrous Oxide	10024972		

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013 NRG POWER MIDWEST LP/ELRAMA POWER PLT	Tax ID/Plant Code: 52-2201498-1 PF Id: 239914

Sub Facility : 101	FACILITY FUGITIVE EMISSIONS PM10/PM	SF Type: PRO

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

ADDITIONAL (Print):

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

PRO 102

EP Z102

Source did not operate in CY2013

Sub Facility : 102 FACILITY POINT PM/PM10 EMISSIONS VENTS SF Type: PRO

Rated Input (MMBTU/HR) :

Date Installed :

Rated Output (MW) :

Category :

Material :

SCC: 39999999 Industrial Processes - ; - Misc. Manufacturing Industries - ; - Misc. Industrial Processes - ; - See Comment **

Monthly Throughputs in Tons			
SCHEDULE 1	JAN:	FEB:	MAR:
Date Effective:			
Date End:	APR:	MAY:	JUN:
Total Days:			
Total Hours:	JUL:	AUG:	SEP:
Days Per Week:	OCT:	NOV:	DEC:

Changes in Fuel(s) Used, Control Device(s) or Exhaust

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method
Ammonia	7664417		
CO	630080		
Lead	7439921		
NOX	10102440		
PM10			
PM2.5			
PM-CON			
SOX	7446095		
VOC			
Carbon Dioxide	124389		
Methane	74828		
Nitrous Oxide	10024972		

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013
NRG POWER MIDWEST LP/ELRAMA POWER PLT

Tax ID/Plant Code: 52-2201498-1
PF Id: 239914

Sub Facility : 102 FACILITY POINT PM/PM10 EMISSIONS VENTS SF Type: PRO

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements :

ADDITIONAL (Print):

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method

* SCC Factor Exists (See attached worksheet)

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

OTHER MISCELLANEOUS SUB FACILITY EMISSIONS (Criteria/HAPs/Non-Criteria)

SF (Optional Name)	Pollutant	CAS	Emission Amt (0.0 TPY)	Calc. Method

NOTE: Most pollutants need to be reported if greater than 0.5 TPY. The following pollutants need to be reported if greater than the amounts listed:

Polychlorobiphenols (PCB)	0.01 TPY
Lead (Pb)	0.01 TPY
Polycyclic Organic Mater (POM)	0.01 TPY
Dioxins (submit Lbs/Yr only)	0.02 Lbs/Yr
Furans (submit Lbs/Yr only)	0.02 Lbs/Yr
Mercury (Hg):	
Coal fired electric generating units (EGU)	0.0001 TPY
Non-coal fired EGUs	0.0005 TPY
All other sub facilities	0.01 TPY

Input Form For: 2013 NRG POWER MIDWEST LP/ELRAMA POWER PLT	Tax ID/Plant Code: 52-2201498-1 PF Id: 239914

AIR POLLUTION CONTROL ACT
CERTIFICATION OF DATA ACCURACY
FOR COMPANIES SUBJECT TO EMISSION STATEMENT REGULATION

Company Name : NRG POWER MIDWEST LP/ELRAMA POWER PLT

Plant Address : 30 DUQUESNE LIGHT WAY
ELRAMA PA 15038

I, Ethan Russell, certify under penalty of law as provided in18 Pa. C.S. Section 4904 and Section 9(b)(2) of the Air Pollution Control Act, 35 P.S., Section 4009(b)(2) that I am a company officer or plant manager of the facility identified above, authorized to make this affidavit. I further certify that, based on information and belief formed after reasonable inquiry, the statements and information contained in this Emission Statement are true, correct, and complete.

Ed Russell
(Signature)

Name: Ethan Russell
(Print or Type Name)

Title: Plant Manager
(Print or Type Title)

Date: 2/13/14

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

2013 AIR QUALITY EMISSION FACTOR WORKSHEET

Note: Industry or source specific data (such as material balance) or testing data should be used if available and believed to be more accurate.

Sub Facility 031 SF Type CU SF Name NO. 1 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
Ammonia	7664417	1-01-005-01	0.8000		LBS/Th Gal
Ammonia	7664417	1-01-002-02	0.0006		LBS/Tons
CO	630080	1-01-005-01	5.0000		LBS/Th Gal
CO	630080	1-01-002-02	0.5000		LBS/Tons
NOX	10102440	1-01-005-01	24.0000		LBS/Th Gal
NOX	10102440	1-01-002-02	21.0000		LBS/Tons
PM10		1-01-005-01	1.0000		LBS/Th Gal
PM10		1-01-002-02	2.3000	A	LBS/Tons
SOX	7446095	1-01-005-01	143.6000	S	LBS/Th Gal
SOX	7446095	1-01-002-02	38.0000	S	LBS/Tons
VOC		1-01-005-01	0.2000		LBS/Th Gal
VOC		1-01-002-02	0.0700		LBS/Tons
Carbon Dioxide	124389	1-01-005-01	22,513.0000		LBS/Th Gal
Carbon Dioxide	124389	1-01-002-02	5,133.0000		LBS/Tons
Formaldehyde	50000	1-01-005-01	0.0600		LBS/Th Gal
Hydrochloric Acid	7647010	1-01-002-02	1.2000		LBS/Tons
Hydrogen Fluoride	7664393	1-01-002-02	0.1500		LBS/Tons
Methane	74828	1-01-005-01	0.9039		LBS/Th Gal
Methane	74828	1-01-002-02	0.6041		LBS/Tons
Naphthalene	91203	1-01-005-01	0.0003		LBS/Th Gal
Nitrous Oxide	10024972	1-01-005-01	0.1764		LBS/Th Gal
Nitrous Oxide	10024972	1-01-002-02	0.0882		LBS/Tons
Polycyclic Organic Matter		1-01-005-01	0.0033		LBS/Th Gal

Sub Facility 032 SF Type CU SF Name NO. 2 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
Ammonia	7664417	1-01-005-01	0.8000		LBS/Th Gal
Ammonia	7664417	1-01-002-02	0.0006		LBS/Tons
CO	630080	1-01-005-01	5.0000		LBS/Th Gal
CO	630080	1-01-002-02	0.5000		LBS/Tons
NOX	10102440	1-01-005-01	24.0000		LBS/Th Gal
NOX	10102440	1-01-002-02	21.0000		LBS/Tons
PM10		1-01-005-01	1.0000		LBS/Th Gal
PM10		1-01-002-02	2.3000	A	LBS/Tons

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

2013 AIR QUALITY EMISSION FACTOR WORKSHEET

Note: Industry or source specific data (such as material balance) or testing data should be used if available and believed to be more accurate.

Sub Facility 032 SF Type CU SF Name NO. 2 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
SOX	7446095	1-01-005-01	143.6000	S	LBS/ Th Gal
SOX	7446095	1-01-002-02	38.0000	S	LBS/ Tons
VOC		1-01-005-01	0.2000		LBS/ Th Gal
VOC		1-01-002-02	0.0700		LBS/ Tons
Carbon Dioxide	124389	1-01-005-01	22,513.0000		LBS/ Th Gal
Carbon Dioxide	124389	1-01-002-02	5,133.0000		LBS/ Tons
Formaldehyde	50000	1-01-005-01	0.0600		LBS/ Th Gal
Hydrochloric Acid	7647010	1-01-002-02	1.2000		LBS/ Tons
Hydrogen Fluoride	7664393	1-01-002-02	0.1500		LBS/ Tons
Methane	74828	1-01-005-01	0.9039		LBS/ Th Gal
Methane	74828	1-01-002-02	0.6041		LBS/ Tons
Naphthalene	91203	1-01-005-01	0.0003		LBS/ Th Gal
Nitrous Oxide	10024972	1-01-005-01	0.1764		LBS/ Th Gal
Nitrous Oxide	10024972	1-01-002-02	0.0882		LBS/ Tons
Polycyclic Organic Matter		1-01-005-01	0.0033		LBS/ Th Gal

Sub Facility 033 SF Type CU SF Name NO. 3 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
Ammonia	7664417	1-01-005-01	0.8000		LBS/ Th Gal
Ammonia	7664417	1-01-002-02	0.0006		LBS/ Tons
CO	630080	1-01-005-01	5.0000		LBS/ Th Gal
CO	630080	1-01-002-02	0.5000		LBS/ Tons
NOX	10102440	1-01-005-01	24.0000		LBS/ Th Gal
NOX	10102440	1-01-002-02	21.0000		LBS/ Tons
PM10		1-01-005-01	1.0000		LBS/ Th Gal
PM10		1-01-002-02	2.3000	A	LBS/ Tons
SOX	7446095	1-01-005-01	143.6000	S	LBS/ Th Gal
SOX	7446095	1-01-002-02	38.0000	S	LBS/ Tons
VOC		1-01-005-01	0.2000		LBS/ Th Gal
VOC		1-01-002-02	0.0700		LBS/ Tons
Carbon Dioxide	124389	1-01-005-01	22,513.0000		LBS/ Th Gal
Carbon Dioxide	124389	1-01-002-02	5,133.0000		LBS/ Tons
Formaldehyde	50000	1-01-005-01	0.0600		LBS/ Th Gal
Hydrochloric Acid	7647010	1-01-002-02	1.2000		LBS/ Tons

Input Form For: 2013 Tax ID/Plant Code: 52-2201498-1
NRG POWER MIDWEST LP/ELRAMA POWER PLT PF Id: 239914

2013 AIR QUALITY EMISSION FACTOR WORKSHEET

Note: Industry or source specific data (such as material balance) or testing data should be used if available and believed to be more accurate.

Sub Facility 033 SF Type CU SF Name NO. 3 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
Hydrogen Fluoride	7664393	1-01-002-02	0.1500		LBS/Tons
Methane	74828	1-01-005-01	0.9039		LBS/Th Gal
Methane	74828	1-01-002-02	0.6041		LBS/Tons
Naphthalene	91203	1-01-005-01	0.0003		LBS/Th Gal
Nitrous Oxide	10024972	1-01-005-01	0.1764		LBS/Th Gal
Nitrous Oxide	10024972	1-01-002-02	0.0882		LBS/Tons
Polycyclic Organic Matter		1-01-005-01	0.0033		LBS/Th Gal

Sub Facility 034 SF Type CU SF Name NO. 4 BOILER

Pollutant	CAS	SCC	Factor	A/S **	Unit
Ammonia	7664417	1-01-005-01	0.8000		LBS/Th Gal
Ammonia	7664417	1-01-002-02	0.0006		LBS/Tons
CO	630080	1-01-005-01	5.0000		LBS/Th Gal
CO	630080	1-01-002-02	0.5000		LBS/Tons
NOX	10102440	1-01-005-01	24.0000		LBS/Th Gal
NOX	10102440	1-01-002-02	21.0000		LBS/Tons
PM10		1-01-005-01	1.0000		LBS/Th Gal
PM10		1-01-002-02	2.3000	A	LBS/Tons
SOX	7446095	1-01-005-01	143.6000	S	LBS/Th Gal
SOX	7446095	1-01-002-02	38.0000	S	LBS/Tons
VOC		1-01-005-01	0.2000		LBS/Th Gal
VOC		1-01-002-02	0.0700		LBS/Tons
Carbon Dioxide	124389	1-01-005-01	22,513.0000		LBS/Th Gal
Carbon Dioxide	124389	1-01-002-02	5,133.0000		LBS/Tons
Formaldehyde	50000	1-01-005-01	0.0600		LBS/Th Gal
Hydrochloric Acid	7647010	1-01-002-02	1.2000		LBS/Tons
Hydrogen Fluoride	7664393	1-01-002-02	0.1500		LBS/Tons
Methane	74828	1-01-005-01	0.9039		LBS/Th Gal
Methane	74828	1-01-002-02	0.6041		LBS/Tons
Naphthalene	91203	1-01-005-01	0.0003		LBS/Th Gal
Nitrous Oxide	10024972	1-01-005-01	0.1764		LBS/Th Gal
Nitrous Oxide	10024972	1-01-002-02	0.0882		LBS/Tons
Polycyclic Organic Matter		1-01-005-01	0.0033		LBS/Th Gal

** A - % Ash; S - % Sulphur [Factor * % (A or S) * Throughput]

63-014 TVOP

Elrama Generating Station
30 Duquesne Light Drive
Elrama, PA 15038

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MAY 15 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

May 13, 2014

Overnight Delivery
Ms. Barbara R. Hatch, P.E.
Environmental Engineer Manager
Air Quality Program - Southwest Regional Office
Pennsylvania Department of Environmental Protection
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Re: NRG Power Midwest LP - Elrama Generating Station
Title V Operating Permit No. 63-00014
Request to Withdraw Permit Applications

Dear Ms. Hatch:

NRG Power Midwest LP ("NRG") hereby requests to withdraw the Title V Operating ("TVOP") and Acid Rain Permit Applications for Elrama Generating Station ("Elrama"). Effective November 4, 2013, Boiler Nos. 1 through 4 at Elrama were officially retired and as such, Elrama no longer meets the definition of "Title V facility" given at 25 Pa. Code § 121.1. Both actual and potential emissions of all air contaminants are less than the major source thresholds and Elrama will not operate any air contamination sources that are required to obtain a plan approval or operating permit.

Boiler Nos. 1, 2, and 3 were deactivated on June 1, 2012, and Boiler No. 4 was deactivated on October 1, 2012. A timely Maintenance and Reactivation Plan was submitted for the boilers (Revision 01, May 14, 2013) wherein Elrama requested preservation of emissions in the inventory. In accordance with that plan and 25 Pa. Code § 127.207, an application for ERC creation was submitted to the Department on December 18, 2013.

A semi-annual monitoring report for the period January 1 – May 31, 2014 and a TVOP annual compliance certification for the period and December 19, 2013 – May 31, 2014 will be submitted for Elrama within 30 days of May 31, 2014. Unless the Department objects, these will be the final semi-annual monitoring report and TVOP annual compliance certification submitted for Elrama. The final PADEP Emission Report (CEMS) for Elrama was submitted on January 20, 2014. If required, a final annual emission report will be submitted no later than March 1, 2015.

If you have any questions or comments regarding this submittal, please contact Sharene Shealey at 724-597-8232 or sharene.shealey@nrgenergy.com.

I certify that the statements and information in this letter are to the best of my knowledge and belief true, accurate, and complete.

Sincerely,

Ethan M. Russell
Plant Manager, Elrama Generating Station

Cc: Charles Zadakis - PADEP

RECEIVED
AUG 21 2014
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

NRG Energy
121 Champion Way
Canonsburg, PA 15317
Kevin.shumaker@nrgenergy.com
724-597-8390

August 15, 2014

Via Overnight Mail

Ms. Barbara R. Hatch, P.E.
Southwest Regional Office
Pennsylvania Department of Environmental Protection
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Subject: NRG Power Midwest LP – Elrama Generating Station – Emissions Reduction Credit Application Revision

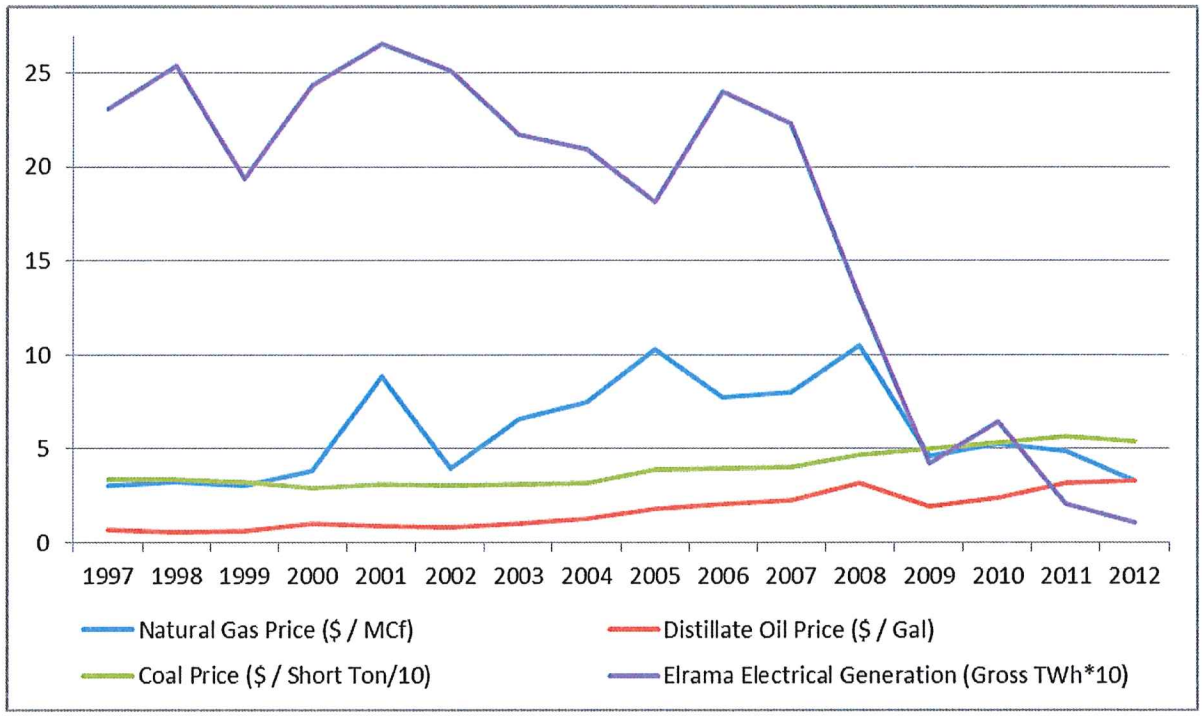
Dear Ms. Hatch:

NRG Power Midwest LP ("NRG"), owner of the Elrama Generating Station located in Elrama, Pennsylvania ("Elrama Station") submits the attached revised Emissions Reduction Credit ("ERC") registry application for permanent emissions reductions related to the retirement of the Elrama Station. Elrama Units 2 & 3 ceased operation on May 30, 2012, and were followed by Unit 1 on June 23, 2012, and Unit 4 on September 3, 2012 (collectively, "the Units"). The Elrama Station was permanently retired on November 4, 2013. On April 11, 2013, NRG mailed to your attention the Maintenance and Reactivation Plans for Boilers 1 through 4 requesting that emissions in the inventory be preserved. This revision is being submitted to separate the ERC requests for Unit 1, Units 2 & 3 and Unit 4 because of the three different cessation dates.

In accordance with 25 Pa. Code § 127.207(1)(i), the requested ERCs are surplus as they are included in the current emissions inventory and are not required to be used to meet any past or current SIP, attainment demonstration, RFP, emissions limitation, compliance plans, or any currently effective regulation or permit applicable to Elrama Station. While the Units at Elrama Station would be subject to 40 CFR 63 Subpart UUUUU: National Emission Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Utility Steam Generating Units ("MATS"), the units would not be required to reduce emissions of any criteria pollutants under this regulation. Compliance with MATS can be demonstrated by complying with emission limits for total non-mercury HAP metals, hydrogen chloride, and mercury, none of which are included in the subject ERC application.

To determine the baseline emission rate, the ERC Registry Application instructions state that emissions from the two calendar years immediately preceding the emission reductions in this instance, 2010-2011, should be used. The instructions also include provisions that allow an applicant to choose a different 2-year period within the preceding 5-year period if the preceding 2-year period is not representative of normal operations at the facility.

NRG believes that a two-year period from 2007-2008 is most representative of normal operations for the Elrama Station during the 5-year period preceding the deactivation date. The Elrama Station ran significantly less hours during 2010 and 2011 than it had historically, in large part because of the dramatic changes in fossil fuel prices during the past five years. As depicted on the graph below, coal (the Elrama Station's primary fuel) and No. 2 fuel oil (the Elrama Station's start-up fuel) prices increased significantly whereas natural gas prices decreased significantly (Units 1-4 at the Elrama Station are not capable of firing natural gas). These fuel prices changes have resulted in the preferential dispatching of natural gas-fired electrical generating units before coal-fired electrical generating units.



Sources:
Pennsylvania Natural Gas Price Sold to Electric Power Consumers (Dollars per Thousand Cubic Feet)
http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SPA_a.htm
see Excel file for Electric Power Price 1997-2012

Pennsylvania No 2 Distillate Retail Sales by Refiners (Dollars per Gallon)
http://www.eia.gov/dnav/pet/pet_pri_refoth_dcu_SPA_a.htm
Select Pennsylvania, annual, see Excel file for Sale to End Users, No. 2 Distillate 1983-2012

Average Price of Coal Delivered to Electric Power Sector Pennsylvania (Dollars per Short Ton / 10)
http://www.eia.gov/coal/annual/
See table for Average Price of Coal Delivered to End Use Sector by Census Division and State

Elrama Electrical Generation - combined gross generation, Units 1, 2, 3, and 4

NRG appreciates your attention to this request. If you have any questions or comments, please feel free to contact me at (724) 597-8390.

Sincerely,

Kevin R. Shumaker
Air Quality Specialist

ERCAPP.DOC: Rev. 6/99

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Emission Reduction Credit (ERC) Registry Application

- *This ERC Registry Application may be used by a major or non-major facility.*
- *ERCs may be created only if the ERC Registry Application is filed within one year of actual emission reductions.*
- *Read instructions for the ERC Registry Application prior to completing this form.*

Section 1 - Identity and Location of Air Contamination Source

1A. Facility/Corporation Information

Facility Name: NRG Power Midwest LP	Facility Address: 121 Champion Way Canonsburg, PA 15317
Telephone Number: 724-597-8000	Fax Number: 724-597-8870

1B. Facility Operator Information

(Complete if operator is different from company)

Operator's Name: SAME Federal ID Number: 52-2201498-1	Company Address: SAME
Telephone Number: SAME	Fax Number: SAME

1C. Plant/Facility Information

Plant Name: Elrama Generating Station Federal ID Number: 52-2201498-1	Plant Address: 30 Duquesne Light Way Elrama, PA 15038-0800
Telephone Number: 412-382-6902	Fax Number: 412-384-8010
Municipality/Township: Union Township	County: Washington

1D. Facility Type

☒ Major Facility ☐ Non-Major Facility	Permit No. (Title V/RACT/Synthetic Minor): Title V Permit No: 63-00014

1E. Contact Person for this Application

Name: Kevin R. Shumaker Title: Air Quality Specialist	Mailing Address: 121 Champion Way Canonsburg, PA 15317
Telephone Number: 724-597-8390	Fax Number: 724-597-8870

1F. Certification Statement

I, Ethan M. Russell, certify under penalty of law as provided in 18 Pa. C.S.A. § 4904 and 35 P.S. § 4009(b)(2)) that I am authorized to make this Certification on behalf of the facility identified in this application and based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate and complete. I further certify that the emission reductions will be maintained as set forth in this application and that the emission reductions were not previously used in netting transactions, alternative emissions limitations, acid rain allowances or to generate other emission reduction credits.

Ed Russell	Plant Manager	8/14/14
Signature	Title	Date

Section 2 - ERC-Generating Source Information

Provide the following information for the ERC-generating source

2A. Type of Source: Boilers 1, 2, 3, and 4, including dedicated support processes; Plant haul roads, material handling, conveyors, bulldozing, and wind erosion of stockpile	2B. Plan Approval\Permit Number: Title V Permit No: 63-00014 Note: A permit is required for any source that is continuing to operate
2C. Manufacturer of Source: Boilers 1, 2, 3, and 4: Babcock and Wilcox	2D. Model Number: Boilers 1,2: RB127/ Boiler 3: RB193 / Boiler 4: RB333
2E. Date of Installation of the Source: Boiler 1: 1952 Boiler 2: 1953 Boiler 3: 1954 Boiler 4: 1960	2F. Air Cleaning Device Boiler 1: SNCR/LNB/OFA/ESP/FGD Boiler 2: SNCR/LNB/OFA/ESP/FGD Boiler 3: SNCR/LNB/OFA/ESP/FGD Boiler 4: SNCR/LNB/ESP/FGD
2G. Source ID/Designation 031, 032, 033, 034 (Boilers 1, 2, 3, 4) 101 Facility Fugitive Emissions PM10/PM 102 Facility Point PM/PM10 Emission Vents	2H. Hourly Rated Capacity Boiler 1: 1,200 MMBtu/hr Boiler 2: 1,200 MMBtu/hr Boiler 3: 1,300 MMBtu/hr Boiler 4: 1,890 MMBtu/hr
2I. Annual Throughput: 14,629 Tons/Yr Bituminous Coal 4,380,000 Gal/Yr #2 Fuel Oil	2J. Other Information: None

Section 3 - ERC Generation Techniques

Check appropriate box(es) to identify applicable ERC-generating technique(s)

- ☐ Shutdown of a source at an existing facility
- ☒ Shutdown of an existing facility
- ☐ Permanent curtailment of production or operation hours
- ☐ Improved control measures including improved control of fugitive emissions
- ☐ Installation of an air pollution control devise beyond regulatory requirements
- ☐ Use of lower volatile organic compound (VOC) coatings than required
- ☐ New technology and/or materials (not required by applicable law)
- ☐ Process equipment modifications (not required by applicable law)
- ☐ Incidental emissions reduction of nonhazardous air pollutants
- ☐ Economic Incentive Program
- ☐ Other: _____

Section 4 - Intended use of ERCs

Check appropriate box(es) to specify intended use of ERCs

- ☐ Netting/Offsetting
- ☒ Banking/Trading/Selling Purposes

Section 5 –Emissions Reduction Initiation Date

Actual/Expected Date of Initiation of Emission Reduction: Actual Dates: Unit 1: 06/23/12; Units 2 and Unit 3: 05/30/2012; Unit 4: 09/03/2012

Section 6 - Baseline Emission Rate Summary for Unit 1

Baseline emission rate (expressed in lbs/hr or tons/yr) is based on the lower of actual or allowable emissions calculated over two (2) calendar years immediately preceding the reduction unless otherwise approved by the Department.

Calendar Year	Hours of Operation	VOC lbs/hr	VOC TPY	NOx lbs/hr	NOx TPY	Other see attachment lbs/hr	Other see attachment TPY
2007	5703		4.10		1101.82		See Att. 1
2008	2689		1.67		463.80		See Att. 1
Average:	4196		2.89		782.81		See Att. 1
Average Actual Emissions corrected with applicable SIP limitations * *RACT/MACT/LAER/BACT, etc.			**2.89**		**782.81 (permit allowable ≤ 11,353)**		**See Att. 1**
Revised Allowable Emissions after emission reductions:			**0**		**0**		**See Att. 1**
Available ERCs:			**2.89**		**782.81**		**See Att. 1**

Emission rates after reduction:

VOC:	0	Lbs/Hour	0	Tons/Year
NOx:	0	Lbs/Hour	0	Tons/Year
Other:	0	Lbs/Hour	0	Tons/Year

Baseline Emission Rate Summary for Units 2 and 3

Calendar Year	Hours of Operation	VOC lbs/hr	VOC TPY	NOx lbs/hr	NOx TPY	Other see attachment lbs/hr	Other see attachment TPY
2007	U2: 5549 U3: 6639		8.97		2408.26		See Att. 1
2008	U2: 3891 U3: 3845		5.16		1429.11		See Att. 1
Average:	U2: 4720 U3: 5242		7.06		1918.69		See Att. 1
Average Actual Emissions corrected with applicable SIP limitations * *RACT/MACT/LAER/BACT, etc.			**7.06**		**1918.69 (permit allowable ≤ 11,353)**		**See Att. 1**
Revised Allowable Emissions after emission reductions:			**0**		**0**		**See Att. 1**
Available ERCs:			**7.06**		**1918.69**		**See Att. 1**

Emission rates after reduction:

VOC:	0	Lbs/Hour	0	Tons/Year
NOx:	0	Lbs/Hour	0	Tons/Year
Other:	0	Lbs/Hour	0	Tons/Year

Baseline Emission Rate Summary for Unit 4

Calendar Year	Hours of Operation	VOC lbs/hr	VOC TPY	NOx lbs/hr	NOx TPY	Other see attachment lbs/hr	Other see attachment TPY
2007	6451		9.37		2517.36		See Att. 1
2008	4770		5.88		1630.31		See Att. 1
Average:			7.63		2073.84		See Att. 1

Average Actual Emissions corrected with applicable SIP limitations * *RACT/MACT/LAER/BACT, etc.		**7.63**		**2073.84 (permit allowable ≤ 11,353)**		**See Att. 1**
Revised Allowable Emissions after emission reductions:		**0**		**0**		**See Att. 1**
Available ERCs:		**7.63**		**2073.84**		**See Att. 1**

Emission rates after reduction:

VOC:	0	Lbs/Hour	0	Tons/Year
NOx:	0	Lbs/Hour	0	Tons/Year
Other:	0	Lbs/Hour	0	Tons/Year

Do the above baseline emission estimates agree with emission statements submitted for PEDS/AIMS and any fees that have been paid, if applicable?

☒ Yes ☐ No If "No", submit request to amend emissions inventory along with this application.

Is the facility subject to any proposed maximum achievable control technology standards for hazardous air pollutants (MACT)? If yes, specify federal citation including Subpart.

☒ Yes Subpart: 40 CFR 63 Subpart UUUUU ☐ No

Section 7 - Emission Quantification Methods

Check appropriate box(es) for method(s) used to determine the baseline emission rate. Attach copies of source tests, summaries of records, measurements or calculation methods used to estimate the baseline emissions.

- ☒ Performance test data on same unit
- ☐ Performance test data on similar unit
- ☒ Continuous emission monitoring data
- ☐ Equipment vendor emission data and guarantees
- ☒ Emission factors from technical reference or article
- ☒ AP-42 Emission Factors Table Number: various – see attachment
- ☐ EPA Test Data Document Document Number: _____
- ☐ Other: _____

Section 8 - Emission Characteristics

Provide the following information to determine the ambient impact of the emissions reduction

(a) Hours of Operation: 8760	(b) Hourly Rate (specify unit): 5,590 MMBtu/Hr
(c) Stack Height (from ground level): 392 ft.	(d) Stack Inside Diameter: 26 ft.
(e) Exhaust Volume: 2,089,666 ACFM (Common stack flow rate)	(f) Exhaust Temperature: 125° F

(g) Seasonal Period (months) Operated: January to December

Is the affected source in compliance with all applicable requirements?

☒ Yes ☐ No If "No", attach a list of the violation(s), date(s) and location(s) specified in the Notice of Violation.

List all attachments provided to evaluate this ERC Registry Application.

Attachment 1: ERC Credit Request

Attachment 2: Historic Yearly Emissions for Elrama Units 1-4 and Fugitive Sources

Attachment 3: Historic Emission Factors Used for Annual Emission Statements CY 2007-2008

OFFICIAL USE ONLY

Regional Office: _____ Date Received: _____

Reviewed By: _____ Date Reviewed: _____

Plan Approval Number: _____ Date Submitted: _____

Previous Netting Transaction Date and Plan Approval Number: _____ _____

Comments:

Central Office NSR Section:

Reviewed By: _____ Entry Date: _____

Comments:

NRG Power Midwest LP - Elrama Generating Station

Attachment 1

ERC Credit Request

Unit 1

	Baseline Emissions (TPY)		Two Year Average
Pollutant	2007	2008	Credit Request
CO	42.21	17.48	**29.84**
Lead	0.04	0.01	**0.02**
NOx	1101.82	463.80	**782.81**
PM 2.5	33.30	8.34	**20.82**
PM10	125.29	26.75	**76.02**
SO2	780.09	338.57	**559.33**
VOC	4.10	1.67	**2.89**

Units 2 and 3

	Baseline Emissions (TPY)		Two Year Average
Pollutant	2007	2008	Credit Request
CO	92.27	53.85	**73.06**
Lead	0.08	0.04	**0.06**
NOx	2408.26	1429.11	**1918.69**
PM 2.5	72.79	25.71	**49.25**
PM10	273.85	82.42	**178.13**
SO2	1705.04	1043.25	**1374.14**
VOC	8.97	5.16	**7.06**

Unit 4

	Baseline Emissions (TPY)		Two Year Average
Pollutant	2007	2008	Credit Request
CO	96.45	61.43	**78.94**
Lead	0.08	0.05	**0.06**
NOx	2517.36	1630.31	**2073.84**
PM 2.5	76.08	29.33	**52.71**
PM10	286.26	94.02	**190.14**
SO2	1782.29	1190.12	**1486.20**
VOC	9.37	5.88	**7.63**

NRG Power Midwest LP - Elrama Generating Station
Attachment 2

Historic Yearly Emissions for Elrama Unit 1 and Fugitive Sources*

Year	Unit 1 - Pollutant (TPY)								Coal Usage (Tons)	No. 2 Fuel Oil Usage (Gal)	Heat Input (mmBtu)
	CO	Lead	NOx	PM10	PM2.5	Total PM (PM10 + PM 2.5)	SOX	VOC			
2007	**42.21**	**0.04**	**1101.82**	**125.29**	**33.30**	**158.59**	**780.09**	**4.10**	**173,520**	**354,675**	**4,175,189**
2008	**17.48**	**0.01**	**463.80**	**26.75**	**8.34**	**35.09**	**338.57**	**1.67**	**64,718**	**149,911**	**1,761,988**
2009	0.75	0.00	18.30	2.20	0.49	2.69	14.38	0.07	2,588	72,543	72,812
2010	11.68	0.01	93.00	8.18	2.28	10.46	83.63	0.28	15,375	150,546	399,394
2011	4.91	0.00	43.45	8.33	1.65	9.99	33.15	0.28	6,544	94,452	178,918
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	840	0
2013	**Last date of operation - 6/23/12, Deactivated 6/1/12**								0	0	0

Historic Yearly Emissions for Elrama Units 2 and 3 and Fugitive Sources*

Year	Units 2 and 3 - Pollutant (TPY)								Coal Usage (Tons)	No. 2 Fuel Oil Usage (Gal)	Heat Input (mmBtu)
	CO	Lead	NOx	PM10	PM2.5	Total PM (PM10 + PM 2.5)	SOX	VOC			
2007	**92.27**	**0.08**	**2408.26**	**273.85**	**72.79**	**346.64**	**1705.04**	**8.97**	**380,785**	**498,613**	**9,125,720**
2008	**53.85**	**0.04**	**1429.11**	**82.42**	**25.71**	**108.13**	**1043.25**	**5.16**	**223,629**	**351,784**	**5,429,215**
2009	6.79	0.00	165.15	19.88	4.42	24.30	129.77	0.62	26,859	295,546	657,119
2010	76.36	0.05	607.96	53.49	14.92	68.41	546.73	1.86	100,982	660,092	2,610,929
2011	21.08	0.01	186.67	35.81	7.10	42.91	142.41	1.21	28,899	286,123	768,706
2012	6.74	0.00	53.64	19.20	3.10	22.31	48.92	0.45	11,900	124,740	250,380
2013	**Last date of operation (both units) - 5/30/12, Deactivated 6/1/12**								0	0	0

Historic Yearly Emissions for Elrama Unit 4 and Fugitive Sources*

Year	Unit 4 - Pollutant (TPY)								Coal Usage (Tons)	No. 2 Fuel Oil Usage (Gal)	Heat Input (mmBtu)
	CO	Lead	NOx	PM10	PM2.5	Total PM (PM10 + PM 2.5)	SOX	VOC			
2007	**96.45**	**0.08**	**2517.36**	**286.26**	**76.08**	**362.34**	**1782.29**	**9.37**	**359,240**	**154,219**	**9,539,153**
2008	**61.43**	**0.05**	**1630.31**	**94.02**	**29.33**	**123.36**	**1190.12**	**5.88**	**235,374**	**228,371**	**6,193,575**
2009	37.53	0.02	913.55	109.99	24.44	134.43	717.85	3.43	144,134	303,740	3,634,969
2010	125.86	0.08	1002.16	88.17	24.60	112.77	901.22	3.06	158,351	417,618	4,303,805
2011	37.38	0.02	331.00	63.50	12.59	76.08	252.52	2.14	46,740	242,028	1,363,065
2012	27.59	0.02	219.36	78.54	12.69	91.22	200.08	1.82	32,000	177,660	1,023,995
2013	**Last date of operation 9/3/12, Deactivated 10/1/12**								0	0	0

*Total plant emissions and fugitive source PM emissions apportioned to Units 1, 2&3, and 4 by Heat Input

Preceding 5-Year Period

2007-2008 = Baseline emissions used for ERC calculations

Note: PM10 and PM2.5 emissions include the filterable component only

NRG Power Midwest LP - Elrama Generating Station

Attachment 3

Historic Emission Factors Used for Annual Emission Statements (AES) Reports CY 2007-2008

Pollutant	Fuel Type	Boilers 1-4		References
		(lb / MMBtu)	(lb / ton coal)	
CO	Coal No. 2 Fuel Oil	0.0206 0.0363		AP-42 AP42 Table 1.3-1
Lead	Coal No. 2 Fuel Oil	 9.00E-06	4.20E-04	AP-42 Table 1.1-18 AP-42 Table 1.3-10
NOx	Coal No. 2 Fuel Oil	CEMS Data		
PM 10	Coal No. 2 Fuel Oil	0.05 / 0.017 0.0145		Stack test 08/07/03 / Stack Test 12/16/08 AP-42, Table 1.3-1
PM 2.5	Coal No. 2 Fuel Oil	0.05 / 0.008		AP-42 Table 1.1-6 / Stack test 12/16/08 No factor available
SO2	Coal No. 2 Fuel Oil	CEMS Data		
VOC	Coal No. 2 Fuel Oil	0.0019 0.00145		Stack test 8/3/05 AP42 Table 1.3-3

Pollutant	Fugitive Sources	Point Vent Sources	Fuel Oil Storage Tank
CO	NA		NA
Lead	NA		NA
NOx	NA		NA
PM 10	See note 1 below		NA
PM 2.5	See note 1 below		NA
SO2	NA		NA
VOC	NA		See note 2 below

1. Fugitive and Vent Source PM emission factors are calculated variables from AP-42 section 13.2
2. Fuel Oil Storage VOC values based on working loss and breathing loss calculations from TANKS program
3. PM10 and PM2.5 emission factors are for the filterable component only

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Southwest Regional Office

MEMO

OFFICIAL FILE COPY

TO Air Quality Permit File 63-00014

FROM Barbara R. Hatch, PE
Environmental Engineer Manager
Air Quality Program

THROUGH Mark A. Wayner, PE
Regional Program Manager
Air Quality Program

DATE February 24, 2015

RE Review of ERC Registry Application
NRG Power Midwest, LP
Elrama Station
Union Township, Washington County
PF 239914

NRG Power Midwest, LP (NRG) has submitted an Emission Reduction Credit ("ERC") Registry Application in order to generate ERCs resulting from the shutdown of the Elrama Station located in Union Township, Washington County. This was an electricity generating facility previously operated under TVOP-63-00014. Plant consisted of four pulverized coal-fired Babcock and Wilcox boilers, rated at 1,200, 1,200, 1,300 and 1,890 mmbtu/hr and installed in 1952, 1953, 1954, and 1960, respectively. Supporting equipment included material handling, haul roads, conveyors, bulldozing and stockpiles.

ERCs are used to offset emission increases subject to the non-attainment new source review provisions of 25 Pa. Code §§ 127.201 -127.210. Attainment and non-attainment designations are only set for pollutants with National Ambient Air Quality Standards and these pollutants are identified as criteria pollutants. ERCs have been requested for CO, Lead, NOx, PM10, PM2.5, SOx and VOCs. Each of these is a criteria pollutant or criteria pollutant precursor in the case of NO_x and VOC. The applicant's intended use of the ERCs is for banking/trading/selling purposes.

In accordance with 25 Pa. Code § 127.207(2), "… an ERC registry application shall be submitted to the Department within 2 years of the initiation of an emissions reduction used to generate ERCs." Unit 1 ceased operations on June 23, 2012; Units 2 and 3 ceased operations on May 30, 2012; and Unit 4 was deactivated on October 1, 2102. All activity at the Elrama Station ceased operations on November 4, 2013. This ERC registry application was received by the Department on December 19, 2013, thereby fulfilling the 2 year requirement. Submitting the ERC registry application within one year of deactivation the plant also meets the requirements of 25 Pa. Code § 127.207(2)(i) and (ii) which apply to deactivated sources or facilities. At DEP's request, the ERC application was revised to separate emissions from the sources in accordance with their shutdown dates. Revised application was received on August 21, 2014.

In accordance with 25 Pa. Code § 127.207(4)(i)(B) "When the Department determines that the 2-year period immediately preceding the emissions reduction is not representative of the normal emission rates or characteristics of the existing facility, the Department may specify a different 2-year period if that

period of time or other conditions are representative of normal operations occurring within the preceding 5 calendar years." NRG has proposed, and the Department agrees, that the two-year period of 2007 through 2008 is most representative of normal operations during the 5-year period preceding the shutdown.

In accordance with 25 Pa. Code § 127.207(1), "A creditable emissions decrease or ERC shall be surplus, permanent, quantified, and federally enforceable…"

- **Surplus:** Emissions from the above sources have been reported in the 2007and 2008 Air Information Management System ("AIMS") emissions inventory. Emission decreases due to this shutdown were not required to meet a past or current State Implementation Plant ("SIP"), attainment demonstration, Reasonable Further Progress ("RFP"), emissions limitation, compliance plan, or required for any emissions reduction required under the Clean Air Act ("CAA") or Air Pollution Control Act ("APCA").

  In accordance with the applicable requirements of 40 CFR Part 75, the NOx and SOx emissions from Units 1, 2, 3 and 4 were continuously monitored using Continuous Emission Monitoring Systems (CEMS). The CEMs Reports for calendar years 2007 and 2008 were examined. No exceedances of allowable NOx and SOx emission rates were identified, so all NOx and SOx ERCs requested are surplus from a compliance perspective.

  If they had continued to operate after April 16, 2015, the EGUs would have been subject to the applicable provisions of 40 CFR 63, Subpart UUUUU – National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units (commonly referred to as the Mercury and Air Toxics (MATS) Rule). However, this rule is related to hazardous air pollutants, not criteria pollutants, and the sources shut down before the compliance date of the rule. Therefore, there is no requirement to discount the ERCs for purposes of 40 CFR 63, Subpart UUUUU.

- **Permanent:** On April 12, 2013, DEP received a Maintenance and Reactivation Plan from NRG for the Elrama facility. They also requested preservation of their emissions in the inventory. Theoretically, this could preserve NRG's ability to reactivate the facility in accordance with 25 Pa Code 127.11a. However, the shutdown of this facility must be permanent in order for ERCs to be generated.

  Administratively, NRG has taken several steps that render Elrama permanently shut down. The interconnect agreement between NRG and Duquesne Light has been severed. On May 15, 2014, DEP received a letter from NRG requesting withdrawal of pending TVOP and Acid Rain renewal applications. NRG stated that they "will not operate any air contamination sources that are required to obtain a plan approval or operating permit." On November 26, 2013, DEP received NRG's Retired Unit Exemption Forms for Units 1-4. These remove Elrama from all of the allowance based (Acid Rain, CAIR, Transport Rule) programs administered by the EPA Clean Air Market Division.

  A number of physical actions have been taken. Duquesne Light has demolished the switchyard adjacent to the Elrama facility. The lime handling system has been demolished. Oil has been

drained from all transformers, gearboxes and storage tanks. As sources were shut down, NRG did not engage in the lay-up procedures that would have been necessary to allow the sources to be reactivated. Sources that have the oil removed from them and are not laid up properly begin to deteriorate and become inoperable very quickly.

If these EGUs had continued to operate, they would have been subject to the applicable requirements of 40 CFR 63, Subpart UUUUU on April 16, 2015. Under their physical design, they could not have met the UUUUU requirements.

In accordance with 25 Pa. Code §127.207 (7), "the owner or operator shall on an annual basis certify in writing to the Department the continuance of the shutdown." In the cover letter associated with this approval, DEP has requested that provide a completed "Certification of Shutdown" be submitted each year on the anniversary of this ERC approval, for the previous calendar year.

- **Quantified:** Actual emissions reported for the 2007 and 2008 AIMS emission inventory were calculated using a combination of continuous emissions monitoring data, Department-approved stack test results, AP-42 emission factors and source classification code emission factors. NRG recalculated their emissions for purposes of the ERC Registry Application, and provided numbers that differed slightly from those in AIMS and for which NRG paid applicable Title Fee Emission Fees. Therefore, DEP is granting the ERCs based on the AIMS emission inventory.

  Source 101, Fugitive Dust Emissions, included all the fugitive particulate matter emissions arising from material handling operations, haul roads, conveyors, bulldozing and stockpiles. The NOx and SOx contributions of individual sources to the total were calculated to provide numbers used to distribute Source 101 emissions among the 4 EGUs. Fifteen percent (15%) of Source 101 emissions was attributed to Unit 1; forty percent (40%) of Source 101 emissions was attributed to Units 2 and 3 and forty-five percent (45%) of Source 101 emissions was attributed to Unit 4.

- **Enforceable:** ERC's as listed below will be included in the ERC Registry and made federally enforceable in a Plan Approval prior to their use.

Table 1 lists the 2007, 2008 and average Department-approved AIMS data for criteria pollutants from this site during the baseline period. Tables 2, 3 and 4 provide the ERCs granted and other information that will be entered into the ERC Registry.

Per Title 25 PA Code Section 127.206(f), ERC's generated by the shutdown of a facility which are not included in a plan approval and used as offsets will expire for use as offsets 10 years after the date the facility ceased emitting the ERC generating emissions. The applicant has applied to use the ERCs for banking/trading/selling purposes. As such, these ERCs will expire for use as offsets on the dates indicated in Tables 2, 3 and 4 if not used as described.

TABLE 1

		EMISSIONS (TPY)																				
		CO			Lead			NOx			PM10			PM2.5			SOx			VOC		
ID	Source	2007	2008	AVE	2007	2008	AVE	2007	2008	AVE	2007	2008	AVE	2007	2008	AVE	2007	2008	AVE	2007	2008	AVE
031	Unit 1	44.27	16.55	30.41	0.04	0.01	0.03	1101.20	468.77	784.99	111.97	14.12	63.05	32.37	6.57	19.47	782.07	328.20	555.14	4.28	1.58	2.93
101 (15%)	Fugitive Dust Emissions	-	-	-	-	-	-	-	-	-	14.53	12.83	13.68	1.77	1.00	1.38	-	-	-	-	-	-
TOTALS		-	-	30.41	-	-	0.03	-	-	784.99	-	-	76.73	-	-	20.85	-	-	555.14	-	-	2.93
032 & 033	Units 2 & 3	96.46	56.79	76.63	0.08	0.04	0.06	2416.40	1433.81	1925.11	245.47	48.61	147.04	71.04	22.71	46.88	1719.07	1035.84	1377.46	9.35	5.43	7.39
101 (40%))	Fugitive Dust Emissions	-	-	-	-	-	-	-	-	-	38.76	34.22	36.49	4.72	2.65	3.69	-	-	-	-	-	-
TOTALS		-	-	76.63	-	-	0.06	-	-	1925.11	-	-	183.53	-	-	50.56	-	-	1377.6	-	-	7.39
034	Unit 4	90.20	59.41	74.81	0.08	0.05	0.07	2509.85	1620.65	2065.25	231.06	50.95	141.01	66.96	23.87	45.42	1766.28	1207.90	1487.09	8.79	5.69	7.25
101 (45%)	Fugitive Dust Emissions		-								43.60	38.49	41.05	5.31	2.99	4.15						
TOTALS				74.81			0.07			2065.25			182.06			49.57			1487.09			7.25

TABLE 2
ERCs from Shutdown of Unit 1

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	30.41	6/23/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.03		
Source: Unit 1	NOx	784.99		
County: Washington	PM10	76.73		
Contact Person: Keith Schmidt	PM2.5	20.85		
Telephone Number: 724-597-8193	SOx	555.14		
	VOC	2.93		

TABLE 3
ERCs from Shutdown of Units 2 and 3

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	76.63	5/30/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.06		
Source: Units 2 and 3	NOx	1,925.11		
County: Washington	PM10	183.53		
Contact Person: Keith Schmidt	PM2.5	50.56		
Telephone Number: 724-597-8193	SOx	1,377.46		
	VOC	7.39		

TABLE 4
ERCs from Shutdown of Unit 4

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	74.81	9/3/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.07		
Source: Unit 4	NOx	2,065.25		
County: Washington	PM10	182.06		
Contact Person: Keith Schmidt	PM2.5	49.57		
Telephone Number: 724-597-8193	SOx	1,487.09		
	VOC	7.25		

Southwest Regional Office

February 24, 2015

Keith Schmidt
Director - Environmental
NRG Power Midwest LP
121 Champion Way
Canonsburg, PA 15317

RE: ERC Registry Application
Case File 63-00014
Elrama Power Plant
Union Township, Washington County

Dear Mr. Schmidt,

This letter is to notify NRG Power Midwest LP (NRG) the Department of Environmental Protection (DEP) has reviewed and approved the Emission Reduction Credit (ERC) Registry Application submitted as a result of the shutdown of the Elrama facility. The amount and expiration dates of the ERCs are shown in Attachment 1. In accordance with 25 Pa. Code §127.206(f), ERCs generated from a shutdown of sources which are not included in a permit and used as offsets will expire for use as offsets 10 years after the date the sources ceased emitting the ERC-generating emissions. These ERCs are certified as of February 24, 2015 and have been entered into the ERC Registry system for banking/trading/selling purposes.

NRG may use these certified ERCs either to satisfy new source review (NSR) requirements at the same plant, or to trade or sell the ERCs for use as offsets at new or modified facilities. The Pennsylvania ERC Registry lists you as the contact person and your telephone number as 724-597-8193. Please notify our office if there is any change in the contact information.

In order for the ERCs to be valid, the ERC-generating sources must remain permanently shut down. In accordance with 25 Pa. Code §127.207 (7), "the owner or operator shall on an annual basis certify in writing to the Department the continuance of the shutdown." Please provide a completed "Certification of Shutdown" each year on the anniversary of this ERC approval, for the previous calendar year. Form is provided as Attachment 2.

If the company plans to bring these shutdown sources back into production, the company shall submit an appropriate Plan Approval application. The company and subsequent users of the credits shall comply with the requirements of 25 Pa. Code §§127.206-127.209.

Should you have questions or need additional information, please contact Mark Gorog at mgorog@pa.gov or (412) 442-4150 or me at mwayner@pa.gov or by telephone at (412) 442-4161.

Sincerely,

Mark A. Wayner, P.E.
Environmental Program Manager
Air Quality

cc: File 63-00014 Krishnan Ramamurthy, Central Office

ATTACHMENT 1

ERCs from Shutdown of Unit 1

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	30.41	6/23/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.03		
Source: Unit 1	NOx	784.99		
County: Washington	PM10	76.73		
Contact Person: Keith Schmidt	PM2.5	20.85		
Telephone Number: 724-597-8193	SOx	555.14		
	VOC	2.93		

ERCs from Shutdown of Units 2 and 3

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	76.63	5/30/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.06		
Source: Units 2 and 3	NOx	1,925.11		
County: Washington	PM10	183.53		
Contact Person: Keith Schmidt	PM2.5	50.56		
Telephone Number: 724-597-8193	SOx	1,377.46		
	VOC	7.39		

ERCs from Shutdown of Unit 4

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	74.81	9/3/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.07		
Source: Unit 4	NOx	2,065.25		
County: Washington	PM10	182.06		
Contact Person: Keith Schmidt	PM2.5	49.57		
Telephone Number: 724-597-8193	SOx	1,487.09		
	VOC	7.25		

ATTACHMENT 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reductions credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable)**:**

Facility/Plant Name:

Address:

County Name:

List of sources shutdown:

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year _____.

_____ _____
Signature of a responsible official Date

_____ _____
Name (print)Title

Elrama ERC Calculations
TVOP-63-00014
PF 239914

Source 101 - Fugitive Dust

	2007	2008	AVE
PM10	96.9	85.54	91.22
PM2.5	11.8	6.64	9.22

Unit 1 - POC

Pollutant	2007	2008	Ave
CO	44.27	16.55	30.41
Lead	0.04	0.01	0.03
Nox	1,101.20	468.77	784.99
PM10	111.97	14.12	63.05
PM2.5	32.37	6.57	19.47
SO2	782.07	328.20	555.14
VOC	4.28	1.58	2.93

Unit 1 - Fugitive Dust

					TOTAL
PM10	0.15	91.22	13.68		76.73
PM2.5	0.15	9.22	1.38		20.85

Units 2 & 3 - POC

Pollutant	2007	2008	Ave
CO	96.46	56.79	76.63
Lead	0.08	0.04	0.06
Nox	2,416.40	1,433.81	1,925.11
PM10	245.47	48.61	147.04
PM2.5	71.04	22.71	46.88
SO2	1,719.07	1,035.84	1,377.46
VOC	9.35	5.43	7.39

Units 2 & 3

					TOTAL
PM10	0.40	91.22	36.49		183.53
PM2.5	0.40	9.22	3.69		50.56

Unit 4 - POC

Pollutant	2007	2008	Ave
CO	90.20	59.41	74.81
Lead	0.08	0.05	0.07
Nox	2,509.85	1,620.65	2,065.25
PM10	231.06	50.95	141.01
PM2.5	66.96	23.87	45.42
SO2	1,766.28	1,207.90	1,487.09
VOC	8.79	5.69	7.24

Unit 4 - Fugitive Dust

					TOTAL
PM10	0.45	91.22	41.05		182.05
PM2.5	0.45	9.22	4.15		49.56

BRHatch, 2/23/2015

Pennsylvania Department of Environmental Protection
Air Quality Program
Emission Fees Comparison Summary Report

Emission Year: 2007
Primary Facility: 239914 GENON POWER MIDWEST LP/ELRAMA POWER PLT
Tax Id/ Plant: 52-2201498-1 NRG POWER MIDWEST LP

Region: 05 Pittsburgh
District: 51 Pittsburgh
County: 63 Washington

Pollutants	Emission Inventory			Emission Fee			Fee Difference ($)
	Reported (TPY)	Chargeable (TPY)	Fee Projected ($)	Reported (TPY)	Chargeable (TPY)	Fee Due($)	
2,4-Dinitrotoluene	0	0	.00	0.925	0.925	48.36	<48.36>
Acetaldehyde	0	0	.00	0.26	0.26	13.52	<13.52>
Acrolein	0	0	.00	0.132	0.132	6.76	<6.76>
Ammonia	6.93	6.93	360.36	6.94	6.94	360.88	<.52>
Arsenic	0	0	.00	0.188	0.188	9.88	<9.88>
Benzene	0	0	.00	0.594	0.594	30.68	<30.68>
CO	230.93	230.93	.00			.00	.00
Chromium	0	0	.00	0.119	0.119	6.24	<6.24>
Cyanide Compounds	0	0	.00	1.14	1.14	59.28	<59.28>
Formaldehyde	0	0	.00	0.14	0.14	7.28	<7.28>
Hydrochloric Acid	113.27	113.27	5,890.04	113	113	5,876.00	14.04
Hydrogen Chloride (Anhydrous)	0	0	.00			.00	.00
Hydrogen Fluoride	40.16	40.16	2,088.32	40.2	40.2	2,090.40	<2.08>
Isophorone	0	0	.00	0.139	0.139	7.28	<7.28>
Lead	0.2	0.2	10.40	0.192	0.192	9.88	.52
Manganese	0	0	.00	0.224	0.224	11.44	<11.44>
Mercury	0.04	0.04	2.08	0.029	0.029	1.56	.52
Methane	18.271	18.27	.00			.00	.00
Methyl Chloride Chloromethane	0	0	.00	0.261	0.261	13.52	<13.52>
Methyl Ethyl Ketone	0	0	.00	0.093	0.093	4.68	<4.68>
Methyl Hydrazine	0	0	.00	0.211	0.211	10.92	<10.92>
Methyl Methacrylate	0	0	.00	0.146	0.146	7.80	<7.80>
NOX	4,000	4,000	208,000.00	4,000	4,000	208,000.00	.00
Nickel	0	0	.00	0.128	0.128	6.76	<6.76>
PM10	685.4	684.83	35,611.16	685.4	683.052	35,518.60	92.56
PM2.5	182.17	182.17	.00			.00	.00
Propionaldehyde	0	0	.00	0.14	0.14	7.28	<7.28>
SOX	4,000	4,000	208,000.00	4,000	4,000	208,000.00	.00
Selenium	0.33	0.33	17.16	0.328	0.328	17.16	.00
Toluene	0	0	.00	0.113	0.113	5.72	<5.72>
VOC	22.44	22.44	1,166.88	22.4	18.981	986.96	179.92
bis(2-Ethylhexyl)phthalate	0	0	.00	0.265	0.265	14.04	<14.04>
	Totals:	9,299.57	$461,146.40		8,867.94	$461,132.88	$13.52

Pennsylvania Department of Environmental Protection
Air Quality Program
Emission Fees Comparison Summary Report

Emission Year: 2008
Primary Facility: 239914 GENON POWER MIDWEST LP/ELRAMA POWER PLT
Tax Id/ Plant: 52-2201498-1 NRG POWER MIDWEST LP

Region: 05 Pittsburgh
District: 51 Pittsburgh
County: 63 Washington

Pollutants	Emission Inventory			Emission Fee			Fee Difference ($)
	Reported (TPY)	Chargeable (TPY)	Fee Projected ($)	Reported (TPY)	Chargeable (TPY)	Fee Due($)	
Ammonia	0.45	0.45	24.30	0.45	0.45	24.30	.00
Benz(a)anthracene	0	0	.00			.00	.00
Benzo(a)pyrene	0	0	.00			.00	.00
CO	132.75	132.75	.00			.00	.00
Chrysene	0	0	.00			.00	.00
Fluoranthene	0	0	.00			.00	.00
Formaldehyde	0.022	0.02	1.08	0.022	0.022	1.08	.00
Hydrochloric Acid	9.85	9.85	531.90	9.85	9.85	531.90	.00
Hydrogen Chloride (Anhydrous)	0	0	.00			.00	.00
Hydrogen Fluoride	1.95	1.95	105.30	1.95	1.95	105.30	.00
Lead	0.1	0.1	5.40	0.1	0.1	5.40	.00
Mercury	0.01	0.01	.54	0.01	0.01	.54	.00
Methane	10.475	10.47	.00			.00	.00
NOX	3,523.23	3,523.23	190,254.42	3,523.23	3,523.23	190,254.42	.00
Naphthalene	0	0	.00			.00	.00
PM10	203.19	202.75	10,948.50	203.19	202.75	10,948.50	.00
PM2.5	63.39	63.39	.00			.00	.00
Polycyclic Organic Matter	0.001	0	.00	0.001	0.001	.00	.00
SO2	0	0	.00			.00	.00
SOX	2,571.94	2,571.94	138,884.76	2,571.94	2,571.94	138,884.76	.00
Selenium	0.33	0.33	17.82	0.33	0.33	17.82	.00
Sulfur Trioxide	0	0	.00			.00	.00
VOC	12.72	12.7	685.80	12.72	12.697	685.80	.00
Totals:		6,529.94	$341,459.82		6,323.33	$341,459.82	$.00

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

The Bureau prepared this report based on the Continuous Sour ce Monitoring System (CSMS) data submitted by the company. The Facility Summary appears below. The individual Continuous Source Monitoring System Reports contain summary and daily data and appear on the remaining pages.

If you have questions concerning the data summaries, please contact Charles J. Zadakis (717-772-3944 or czadakis@state.pa.us). If you have questions concerning the enforcement information, please contact Ronald G. Gray (717-772-4482 or rongray@state.pa.us). If you have questions concerning any case settlement matters, please contact William S. Baxter (412-442-4168 or wbaxter@state.pa.us) from your regional office.

FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2007**
Location: **Elrama** Quarter: **1**
Region: **Southwest**

Monitored Parameter	Quarterly Average		Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
						Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***									
NOx	**0.507**	**lbs/MBtu**	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.358851**	**lbs/MBtu**	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
		Source summary:	**100.00%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
		Location summary:	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
					Total Penalty:	**$ 0**			

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2007**
Location: **Elrama** Quarter: **2**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.478 lbs/MBtu**	**91.71 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.279480 lbs/MBtu**	**91.67 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
	Source summary:	**91.69%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
	Location summary:	**91.69 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 0**			

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Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2007**
Location: **Elrama** Quarter: **3**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.5227592 lbs/MBtu**	**92.71 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.431068 lbs/MBtu**	**92.71 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
	Source summary:	**92.71%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
	Location summary:	**92.71 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 0**			

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2007**
Location: **Elrama** Quarter: **4**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.5177051 lbs/MBtu**	**85.10 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.408547 lbs/MBtu**	**85.10 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
	Source summary:	**85.10%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
	Location summary:	**85.10 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 0**			

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2008**
Location: **Elrama** Quarter: **1**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.5058441 lbs/MBtu**	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.356588 lbs/MBtu**	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
	Source summary:	**100.00%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
	Location summary:	**100.00 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 0**			

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Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2008**
Location: **Elrama** Quarter: **2**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.5252247 lbs/MBtu**	**63.46 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.398608 lbs/MBtu**	**63.46 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
	Source summary:	**63.46%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
	Location summary:	**63.46 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 0**			

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2008**
Location: **Elrama** Quarter: **3**
Region: **Southwest**

Monitored Parameter	Quarterly Average		Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
						Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***									
NOx	**0.4719537**	**lbs/MBtu**	**35.91 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.369822**	**lbs/MBtu**	**35.91 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**104**
		Source summary:	**35.91%**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
		Location summary:	**35.91 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**2**
					Total Penalty:	**$ 0**			

QUARTERLY CONTINUOUS SOURCE MONITORING REPORT

Department of Environmental Protection
Bureau of Air Quality
Harrisburg, PA 17105-8468

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FACILITY SUMMARY

Company: **Orion Power Midwest LP** Year: **2008**
Location: **Elrama** Quarter: **4**
Region: **Southwest**

Monitored Parameter	Quarterly Average	Time Subject to Monitoring re Quarter	Emission Violation Days	Excess Invalid Averages	Report Penalties			Emission Result ID
					Emission	Data Availability	Late	
Source: ***Units 1, 2, 3, 4***								
NOx	**0.4736192 lbs/MBtu**	**40.17 %**	**0**	**0**	**$ 0**	**$ 0**	**$ 0**	**404**
SO2	**0.424170 lbs/MBtu**	**40.17 %**	**1**	**0**	**$ 2,000**	**$ 0**	**$ 0**	**104**
	Source summary:	**40.17%**	**1**	**0**	**$ 2,000**	**$ 0**	**$ 0**	**2**
	Location summary:	**40.17 %**	**1**	**0**	**$ 2,000**	**$ 0**	**$ 0**	**2**
				Total Penalty:	**$ 2,000**			

PERMIT INFORMATION

1

COMPANY:	NRG Power Midwest, LP	CASEFILE	63-014		
PLANT	Elrama Station	STATUS:	I	IRSIDNO:	52-2201498

PERMIT:NO:	63-00014K	PERTYPE:	ERC	EngName:	Barb
SOURCE:		EX:DATE:		TO ENGINEER:	
CONTROL 1:				TO CHIEF:	12/19/2013
CONTROL 2:		REGULATION TYPE:			
CONTROL 3:		SOURCE TYPE:			
PLA APP REC'D		PLA ISSUED		OPP APP REC'D	
MUN NOT REC'D:		PLA ISSUE PUB:		RECPT PUBLISHED:	
HISTORY REC'D		LAST PLX APP REC'D:		Mun Op Not Rec'd Date:	
PLA REC'T PUB		LAST PLX ISSUED:			
		CONSTRUCTED:		HISTORY REC'D:	
Date Amendment Received:	12/19/2013	Title V Intent to Issue Pub Date:		OPP ISSUED:	
Date Amendment Issued:				OPP ISSUE PUBLISHED:	
		Due Date			
Date Amendment Published:					
Compliance History:	No	Compliance History Date:			

SICCODE:	4911	CONTACT			COMPANY OFFICIAL		
EPACLASS:	A1	Sharene D. Shealey (SEE COMMENTS)	TITLE:	Environmental Manager	Ethan M. Russell	TITLE:	Plant Manager
AIIMS:	10	121 Champion Way			PO Box 800		
☐	PERHISTORY	Canonsburg	PA	15317	Elrama	PA	15038
		PHONE:	(724) 597-8000	EX:	PHONE:	(724) 535-1810	EX:
FEEDATE:		DEAR	Ms. Shealey		DEAR	Mr. Russell	
PAIDTO:					FIX CLIENT:	141195	
		LOCCODE:	63960		FIX SITE:	237511	
AKA:	Duquesne Light, Orion Power Midwest, GenOn	MUNICIPALITY:	Union Twp		Primary Fac #		
		INSPECTOR:	Bill Jester		FIX AUTH #:		
COMMENTS:					FIX APS #:		

Operations ceased Sept. 2012, Units 1-4 retired 11/4/13.

0.6

63-00014 - General

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOUTHWEST REGIONAL OFFICE

March 10, 2015

Keith Schmidt, Director - Environmental
NRG Power Midwest LP
121 Champion Way
Canonsburg, PA 15317

RE: ERC Registry Application
Case File 63-00014
Elrama Power Plant
Union Township, Washington County

OFFICIAL FILE COPY

Dear Mr. Schmidt:

This letter is to notify NRG Power Midwest LP (NRG) that the Department of Environmental Protection (DEP) has reviewed and approved the Emission Reduction Credit (ERC) Registry Application submitted as a result of the shutdown of the Elrama facility. The amount and expiration dates of the ERCs are shown in Attachment 1. In accordance with 25 Pa. Code §127.206(f), ERCs generated from a shutdown of sources which are not included in a permit and used as offsets will expire for use as offsets 10 years after the date the sources ceased emitting the ERC-generating emissions.

NRG may use these certified ERCs either to satisfy new source review (NSR) requirements at the same plant, or to trade or sell the ERCs for use as offsets at new or modified facilities. The Pennsylvania ERC Registry lists you as the contact person and your telephone number as 724-597-8193. Please notify our office if there is any change in the contact information.

In order for the ERCs to be valid, the ERC-generating sources must remain permanently shut down. In accordance with 25 Pa. Code §127.207 (7), "the owner or operator shall on an annual basis certify in writing to the Department the continuance of the shutdown." Please provide a completed "Certification of Shutdown" each year on the anniversary of this ERC approval, for the previous calendar year. Form is provided as Attachment 2.

If the company plans to bring these shutdown sources back into production, the company shall submit an appropriate Plan Approval application. The company and subsequent users of the credits shall comply with the requirements of 25 Pa. Code §§127.206-127.209.

Should you have questions or need additional information, please contact me at bhatch@pa.gov or by telephone at (412) 442-5226 or Mark Gorog at mgorog@pa.gov or (412) 442-4150.

Sincerely,

Barbara R. Hatch, P.E.
Environmental Engineer Manager
Air Quality

cc: File 63-00014 Krishnan Ramamurthy, Central Office

ATTACHMENT 1

ERCs from Shutdown of Unit 1

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	30.41	6/23/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.03		
Source: Unit 1	NOx	784.99		
County: Washington	PM10	76.73		
Contact Person: Keith Schmidt	PM2.5	20.85		
Telephone Number: 724-597-8193	SOx	555.14		
	VOC	2.93		

ERCs from Shutdown of Units 2 and 3

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	76.63	5/30/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.06		
Source: Units 2 and 3	NOx	1,925.11		
County: Washington	PM10	183.53		
Contact Person: Keith Schmidt	PM2.5	50.56		
Telephone Number: 724-597-8193	SOx	1,377.46		
	VOC	7.39		

ERCs from Shutdown of Unit 4

Facility Information:	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
NRG Power Midwest LP	CO	74.81	9/3/2022	Banking/Trading/ Selling
Source Location: Elrama Power Plant	Lead	0.07		
Source: Unit 4	NOx	2,065.25		
County: Washington	PM10	182.06		
Contact Person: Keith Schmidt	PM2.5	49.57		
Telephone Number: 724-597-8193	SOx	1,487.09		
	VOC	7.25		

ATTACHMENT 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reductions credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable)**:**

Facility/Plant Name:

Address:

County Name:

List of sources shutdown:

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year _____.

_____ _____
Signature of a responsible official Date

_____ _____
Name (print)Title

400 Waterfront Drive, Pittsburgh, PA 15222-4745

412.442.4000 FAX 412.442.4194 www.dep.state.pa.us

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Air Quality
March 19, 2015

SUBJECT:	PERMIT INACTIVATION MEMO
TO FILE:	63-014
FROM:	Jill R. Geisler Program Support
PERMIT NO.:	TV-63-00014
COMPANY:	NRG Power Midwest, LP Elrama Station
LOCATION:	Union Twp Washington County
SOURCE:	Electric Power Generation Plant
DATE OF INACTIVATION:	5/15/2014
REASON FOR INACTIVATION:	Renewal application withdrawn. Boilers 1-3 deactivated 6/1/2012; Boiler 4 10/1/2012. Maintenance Plan rec'd 5/15/2013. 2013 last year emissions existed.

OFFICIAL FILE COPY

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHWEST REGIONAL OFFICE

March 19, 2015

CERTIFIED MAIL: 7003 2260 0005 8731 1513

Sharene D. Shealey, Environmental Manager
NRG Power Midwest, LP
121 Champion Way
Canonsburg, PA 15317

RE: TV-63-00014
Elrama Station
Union Twp
Washington County

Dear Ms. Shealey:

In accordance with your May 13, 2014 letter, the Department is inactivating the referenced operating permit and all associated Air Quality approvals at the Elrama Station. Please note that any future construction or modification of an air contamination source, the installation of an air cleaning device on an air contamination source, or the reactivation of an air contamination source after the source has been out of operation or production for one year or more will require prior written approval from the Department.

> Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, 717-787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, 800-654-5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at 717-787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER,

YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717-787-3483) FOR MORE INFORMATION.

Sincerely,

Barbara Hatch, P.E.
Acting Regional Manager
Air Quality Program

cc: 63-014
Operations Chief (Tim Kuntz)
District Office (Rich Kilpatrick)
Harrisburg C.O

63-014

121 Champion Way
Canonsburg, PA 15317
Luke.Beachlet@nrg.com
Writer's Direct Dial No.
(724) 597-8058

March 24, 2015

Barbra R. Hatch
Environmental Engineer Manager
Pennsylvania Department of Environmental Protection
Southwest Regional Office
Air Quality Program Manager
400 Waterfront Drive
Pittsburgh, PA 15222-4745

RECEIVED
MAR 25 2015
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Re: NRG Power Midwest LP –Elrama Power Plant Certification of Shutdown.

Dear Mrs. Hatch:

Please find the enclosed document entitled "Certification of Continued Shutdown". Elrama station did not operate during calendar years 2013 and 2014. NRG will continue to submit the certification annually until the facility or source is dismantled or removed. If you have any questions you can contact me at 724-597-8058

Very truly yours,

Luke Beachler
Air Quality Specialist

ATTACHMENT 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reductions credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable): 63-00014

Facility/Plant Name: Elrama Generating Station

Address: 30 Duquesne Light Way

Elrama PA 15038-0800

County Name: Washington

List of sources shutdown: Boiler 1
Boiler 2
Boiler 3
Boiler 4

Comments:

RECEIVED
MAR 25 2015
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year 2013 - now.

Ethan Russell
Signature of a responsible official

3/19/15
Date

Ethan M Russell
Name (print)Title

400 Waterfront Drive, Pittsburgh, PA 15222-4745

412.442.4000 FAX 412.442.4194

www.dep.state.pa.us

63-014

NRG Energy
121 Champion Way
Canonsburg, PA 15317
Kevin.shumaker@nrgenergy.com
724-597-8390

OFFICIAL FILE COPY

January 27, 2016

Mark Gorog
Pennsylvania Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Re: NRG Power Midwest LP –Elrama Generating Station, Certification of Shutdown.

Dear Mr. Gorog:

In accordance with 25 Pa. Code § 127.207 (7), please find the enclosed "Certification of Continued Shutdown" documentation for the Elrama Generating Station.

The Elrama Generating Station remains shutdown, and did not operate during 2015. NRG will continue to submit the certification annually until the facility or source is dismantled or removed. If you have any questions, please feel free to contact me at 724-597-8390.

Sincerely,

Kevin R. Shumaker
Air Quality Specialist

RECEIVED
JAN 29 2016
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Enclosures – Attachment 2 and duplicate copy

ATTACHMENT 2

COMMONWEATLH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

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This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable): 63-00014

Facility/Plant Name: Elrama Generating Station

Address: 30 Duquesne Light Way
Elrama, PA 15038-0800

County Name: Washington

List of sources shutdown: Boilers 1, 2, 3, and 4

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year 2015.

Signature of a responsible official

1/27/16
Date

Ethan M. Russell – Plant Manager
Name (print) Title

NRG Energy
121 Champion Way
Canonsburg, PA 15317
Kevin.shumaker@nrgenergy.com
724-597-8390

February 13, 2017

Mark Gorog
Pennsylvania Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Re: NRG Power Midwest LP –Elrama Generating Station, Certification of Shutdown.

Dear Mr. Gorog:

In accordance with 25 Pa. Code § 127.207 (7), please find the enclosed "Certification of Continued Shutdown" documentation for the Elrama Generating Station.

The Elrama Generating Station remains shutdown, and did not operate during 2016. NRG will continue to submit the certification annually until the facility or source is dismantled or removed. If you have any questions, please feel free to contact me at 724-597-8390.

Sincerely,

Kevin R. Shumaker
Air Quality Specialist

RECEIVED
FEB 16 2017
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Enclosures – Attachment 2 and duplicate copy

ATTACHMENT 2

COMMONWEATLH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reduction credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable): 63-00014

Facility/Plant Name: Elrama Generating Station

Address: 30 Duquesne Light Way
Elrama, PA 15038-0800

County Name: Washington

List of sources shutdown: Boilers 1, 2, 3, and 4

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year 2016.

Ethan M Russell
Signature of a responsible official

2/13/17
Date

Ethan M. Russell – Plant Manager
Name (print) Title

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J-4: Allegheny Energy Mitchell

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TVOP-63-00016

FirstEnergy

76 South Main St.
Akron, Ohio 44308

1-800-646-0400

April 30, 2015

Ms. Barbara Hatch BRH
Southwest Regional Office
Pennsylvania Department of Environmental Protection
400 Waterfront Drive
Pittsburgh, PA 15222

RECEIVED
APR 30 2015
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Dear Ms. Hatch:

Re: Emission Reduction Credit (ERC) Registry Application
Mitchell Power Station
Title V Permit #63-00016

Enclosed please find an Emission Reduction Credit Registry (ERC) Application for Mitchell Power Station. The application is submitted in duplicate as required.

The requested ERCs qualify as surplus ERCs and no discounting is needed. The Mitchell facility is in compliance with all applicable federal and state limitations for VOC, NO_x, SO_2, and PM10. Any new emission limits from upcoming regulations under allowance-based programs, such as CAIR or CSAPR will not affect the requested ERC total because we hold allowances in our accounts under these programs.

If you have any questions or concerns, please do not hesitate to contact me via email at efoster@firstenergycorp.com or by telephone at (330) 384-4749.

Sincerely,

Eric R. Foster

Eric R. Foster
Engineer IV

Enclosures
By UPS Ground

ERCAPP.DOC: Rev. 6/99

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

RECEIVED
APR 30 2015
AIR QUALITY
DEPT ENVIRONMENTAL PROTECTION

Emission Reduction Credit (ERC) Registry Application

- *This ERC Registry Application may be used by a major or non-major facility.*
- *ERCs may be created only if the ERC Registry Application is filed within one year of actual emission reductions.*
- *Read instructions for the ERC Registry Application prior to completing this form.*

Section 1 - Identity and Location of Air Contamination Source

1A. Facility/Corporation Information

Facility Name: Allegheny Energy Supply Company, LLC	Facility Address: 800 Cabin Hill Dr. Greensburg, PA 15601
Telephone Number: (724) 838-3000	Fax Number: (234) 678-2384

1B. Facility Operator Information

(Complete if operator is different from company)

Operator's Name: Allegheny Energy Supply Company, LLC Federal ID Number: 23-3020481-2	Company Address: 800 Cabin Hill Dr. Greensburg, PA 15601
Telephone Number: (724) 838-3000	Fax Number: (234) 678-2384

1C. Plant/Facility Information

Plant Name: Mitchell Power Station Federal ID Number: 23-3020481-2	Plant Address: 50 Electric Way New Eagle, PA 15067-2050
Telephone Number: (724) 838-3000	Fax Number: (234) 678-2384
Municipality/Township: Union Twp	County: Washington

1D. Facility Type

[X] Major Facility [ ] Non-Major Facility	Permit No. (Title V/RACT/Synthetic Minor): Title V #63-00016

1E. Contact Person for this Application

Name: Eric R. Foster Title: Engineer IV	Mailing Address: 76 S. Main St. (AGO-13) Akron, OH 44308-0000
Telephone Number: 330-384-4749	Fax Number: 330-384-5433

1F. Certification Statement

I, Raymond L. Evans, certify under penalty of law as provided in 18 Pa. C.S.A. § 4904 and 35 P.S. § 4009(b)(2)) that I am authorized to make this Certification on behalf of the facility identified in this application and based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate and complete. I further certify that the emission reductions will be maintained as set forth in this application and that the emission reductions were not previously used in netting transactions, alternative emissions limitations, acid rain allowances or to generate other emission reduction credits.

Signature	Vice President, Environmental & Technologies Title	4/29/15 Date

Section 2 - ERC-Generating Source Information

Provide the following information for the ERC-generating source

2A. Type of Source: Coal-fired Boiler (1) ✓	2B. Plan Approval\Permit Number: Title V #63-00016 Note: A permit is required for any source that is continuing to operate
2C. Manufacturer of Source: C-E	2D. Model Number: N/A
2E. Date of Installation of the Source: 1963	2F. Air Cleaning Device ESP and Wet Scrubber
2G. Source ID/Designation Unit 034	2H. Hourly Rated Capacity 2988 MMBtu/hr per Boiler
2I. Annual Throughput: 440,774 Tons/yr (Avg. 2011 and 2012)	2J. Other Information: N/A

Section 3 - ERC Generation Techniques

Check appropriate box(es) to identify applicable ERC-generating technique(s)

- [X] Shutdown of a source at an existing facility
- [ ] Shutdown of an existing facility
- [ ] Permanent curtailment of production or operation hours
- [ ] Improved control measures including improved control of fugitive emissions
- [ ] Installation of an air pollution control devise beyond regulatory requirements
- [ ] Use of lower volatile organic compound (VOC) coatings than required
- [ ] New technology and/or materials (not required by applicable law)
- [ ] Process equipment modifications (not required by applicable law)
- [ ] Incidental emissions reduction of nonhazardous air pollutants
- [ ] Economic Incentive Program
- [ ] Other: _____

Section 4 - Intended use of ERCs

Check appropriate box(es) to specify intended use of ERCs

- [ ] Netting/Offsetting
- [X] Banking/Trading/Selling Purposes

Section 5 –Emissions Reduction Initiation Date

Actual/Expected Date of Initiation of Emission Reduction: Unit 034 - 10/4/2013

Section 6 - Baseline Emission Rate Summary

Baseline emission rate (expressed in lbs/hr or tons/yr) is based on the lower of actual or allowable emissions calculated over two (2) calendar years immediately preceding the reduction unless otherwise approved by the Department.

Calendar Year	Hours of Operation	VOC lbs/hr	VOC TPY	NOx lbs/hr	NOx TPY	Other SOx lbs/hr	Other SOx TPY
2012 Unit 034	6045	5.2	15.9	652	1970.0	519.1	1569.0
2011 Unit 034	4756	4.6	10.9	548	1303.0	362.6	862.3
Average:	5401	4.9	13.4	600	1636.5	440.9	1215.7
Average Actual Emissions corrected with applicable SIP limitations * *RACT/MACT/LAER/BACT, etc.			N/A		N/A		N/A
Revised Allowable Emissions after emission reductions:			0		0		0
Available ERCs:			13.4		1636.5		1215.7

Emission rates after reduction:

VOC: 0 Lbs/Hour 0 Tons/Year
NOx: 0 Lbs/Hour 0 Tons/Year
Other: 0 Lbs/Hour 0 Tons/Year

Do the above baseline emission estimates agree with emission statements submitted for PEDS/AIMS and any fees that have been paid, if applicable?

☒ Yes ☐ No If "No", submit request to amend emissions inventory along with this application.

Is the facility subject to any proposed maximum achievable control technology standards for hazardous air pollutants (MACT)? If yes, specify federal citation including Subpart.

☒ Yes Subpart: 40 CFR 63, Subpart UUUUU ☐ No

Section 7 - Emission Quantification Methods

Check appropriate box(es) for method(s) used to determine the baseline emission rate. Attach copies of source tests, summaries of records, measurements or calculation methods used to estimate the baseline emissions.

☐ Performance test data on same unit
☐ Performance test data on similar unit
☒ Continuous emission monitoring data (NOx and SOx)
☐ Equipment vendor emission data and guarantees
☐ Emission factors from technical reference or article
☒ AP-42 Emission Factors Table Number: Table 1.1-19 (VOC)
☐ EPA Test Data Document Document Number: _____
☐ Other: _____

Section 6 - Baseline Emission Rate Summary

Baseline emission rate (expressed in lbs/hr or tons/yr) is based on the lower of actual or allowable emissions calculated over two (2) calendar years immediately preceding the reduction unless otherwise approved by the Department.

Calendar Year	Hours of Operation	PM-10 lbs/hr	PM-10 TPY	PM-2.5 lbs/hr	PM-2.5 TPY	Other N/A lbs/hr	Other N/A TPY
2012 Unit 034	6045	56.5	170.9	36.6	110.6		
2011 Unit 034	4756	46.6	110.8	30.1	71.7		
Average:	5401	51.6	140.8	33.4	91.1		
Average Actual Emissions corrected with applicable SIP limitations * *RACT/MACT/LAER/BACT, etc.			N/A		N/A		N/A
Revised Allowable Emissions after emission reductions:			0		0		
Available ERCs:			140.8		91.1		

Emission rates after reduction:

PM10: 0 Lbs/Hour 0 Tons/Year
PM2.5: 0 Lbs/Hour 0 Tons/Year
Other: 0 Lbs/Hour 0 Tons/Year

Do the above baseline emission estimates agree with emission statements submitted for PEDS/AIMS and any fees that have been paid, if applicable?

☒ Yes ☐ No If "No", submit request to amend emissions inventory along with this application.

Is the facility subject to any proposed maximum achievable control technology standards for hazardous air pollutants (MACT)? If yes, specify federal citation including Subpart.

☒ Yes Subpart: 40 CFR 63, Subpart UUUUU ☐ No

Section 7 - Emission Quantification Methods

Check appropriate box(es) for method(s) used to determine the baseline emission rate. Attach copies of source tests, summaries of records, measurements or calculation methods used to estimate the baseline emissions.

☐ Performance test data on same unit
☐ Performance test data on similar unit
☒ Continuous emission monitoring data (NOx and SO2)
☐ Equipment vendor emission data and guarantees
☐ Emission factors from technical reference or article
☒ AP-42 Emission Factors Table Number: 1.1-6 (PM10 and PM2.5 fraction of total filterable PM)
☐ EPA Test Data Document Document Number: _____
☒ Other: Stack tests (total filterable PM and PM condensibles fraction)

Section 8 - Emission Characteristics

Provide the following information to determine the ambient impact of the emissions reduction

(a) Hours of Operation: 0 hrs/day	(b) Hourly Rate (specify unit): 0 lb/hr
(c) Stack Height (from ground level): N/A	(d) Stack Inside Diameter: N/A
(e) Exhaust Volume: N/A	(f) Exhaust Temperature: N/A
(g) Seasonal Period (months) Operated: N/A to _____	

Is the affected source in compliance with all applicable requirements?

☒ Yes ☐ No If "No", attach a list of the violation(s), date(s) and location(s) specified in the Notice of Violation.

List all attachments provided to evaluate this ERC Registry Application.

1. Baseline Emission Rate Summary / Calculations
2. Emission Inventory Production Report - 2011
3. Emission Inventory Production Report - 2012

OFFICIAL USE ONLY

Regional Office: _____ Date Received: _____
Reviewed By: _____ Date Reviewed: _____
Plan Approval Number: _____ Date Submitted: _____
Previous Netting Transaction Date and Plan Approval Number: _____ _____
Comments:

Central Office NSR Section:
Reviewed By: _____ Entry Date: _____
Comments:

ATTACHMENT 1
Baseline Emission Rate Summary / Calculations

Mitchell Power Station

ERC Application

Section 6 - Baseline Emission Rate Summary

BASELINE YEAR SELECTION: Emission Reduction Year = 2013

Year	Annual Throughput (tons)
2012	**525,335**
2011	**356,212**
2010	436,553
2009	373,494
2008	664,994
Average:	**440,774**

2 years prior to emission reduction year are representative of normal operation

BASELINE EMISSION RATES (PM includes plant fugitives and stack condensibles):

Calendar Year	Unit	Hours of Operation	VOC		NOx		Other: SO2		Other: PM-10		Other: PM-2.5	
			lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
2012	3	6045	5.2	15.9	652	1970.0	519.1	1,569.0	56.5	170.9	36.6	110.6
2011	3	4756	4.6	10.9	548	1303.0	362.6	862.3	46.6	110.8	30.1	71.7
	Unit Average	5401	4.9	13.4	600	1636.5	440.9	1215.7	51.6	140.8	33.4	91.1

ATTACHMENT 2
Emission Inventory Production Report - 2011

Pennsylvania Department of Environmental Protection
Bureau of Air Quality
Emission Inventory Production Report

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Region: SOUTHWESTERN **County:** Washington **Municipality:** Monongahela City
SIC: 4911 - Trans. & Utilities - Electric Services
NAICS: 221112 - Fossil Fuel Electric Power Generation

Contact	Name	Address	Telephone
FIRM	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
CONOP	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
FEEAD	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
PRMT	J Lefik	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6136
REOFF	D Mcintire	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6788
LOCAD		50 Electric Way, New Eagle, PA - 15067-2050	--

FACILITY LOCATION INFORMATION

Map: 0-80.44 **Latitude:** 40 deg, 13 min, 16.70 sec N **UTM Coordinates:** **North:** 4452.62
Elevation(Ft): 762 **Longitude:** -79 deg, 58 min, 07.73 sec W **Zone:** 17 **East:** 587.74

FACILITY POLLUTANT SUMMARY
(SUM OF INDIVIDUAL AND MISCELLANEOUS SOURCES)
EMISSION ESTIMATES (0.0 TONS/YEAR)

Ammonia	0.2950
CO	29.2900
Lead	0.0382
NOX	1,305.2800
PM10	127.3300
PM2.5	73.7400
SOX	864.4200
VOC	11.1800
Arsenic	0.0314
Barium	0.0421
Benzene	0.2316
Butane	0.1100
Cadmium	0.0046
Chromium	0.0341
Cobalt Compounds	0.0072
Copper	0.0220
Cyanide Compounds	0.0000
Ethane	0.1620
Formaldehyde	0.0473
Hexane	0.0350
Hydrochloric Acid	8.6500
Hydrogen Fluoride	1.7600
Manganese	0.0503
Mercury	0.0063
Methane	7.2460
Molybdenum	0.0000
Naphthalene	0.0000
Nickel	0.0373
Pentane	0.1360
Polycyclic Organic Matter	0.0001
Propane	0.0840

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

FACILITY POLLUTANT SUMMARY
(SUM OF INDIVIDUAL AND MISCELLANEOUS SOURCES)
EMISSION ESTIMATES (0.0 TONS/YEAR)

Sulfuric Acid	78.0300
Toluene	0.0430
Vanadium	0.0464
Zinc	0.1330

FUEL USAGE SUMMARY

Fuel Type	Total Use
Bituminous	356212 Tons
#2 Oil	68019 Gal
Natural Gas	104254 MCF

SUB FACILITIES INCLUDED

Type	SF	Name
FML	FM01	Coal Pile
CU	032	B & W Oil Unit
CU	033	B & W Oil Unit
CU	034	Mitchell Unit 3 (Boiler 33)
CU	035	Auxiliary Boiler 1
CU	036	Auxiliary Boiler 2
PRO	102	Facility Fugitive Dust Emissions
CU	031	B & W Oil Unit

Fuel Location: **FM01** **Coal Pile** **SF Type:** **FML**
Date Installed: 09/01/1963 **Fuel Stored:** Bituminous **Capacity:** 120000 Tons

Sources fed in 2011:
034 MITCHELL UNIT 3 (BOILER 33)

2011 Fuel Tests:
Date Collected: 12/31/2011 **% Ash:** 11.75 **% Sulfur:** 2.90 **BTU(Lb/Gal/CuFt):** 11540

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **102 Facility Fugitive Dust Emissions** **SF Type:** **PRO**
Material: coal dust
Fuel:
Fuel Data Based on FML:
SCC: 30588801 - Industrial Processes;Mineral Products;Fugitive Emissions;Specify In Comments Field

Monthly Throughputs in Tons				
SCHEDULE 1	JAN:	52,070.00	JUL:	67,110.00
Date Effective: 01/01/2011	FEB:	24,820.00	AUG:	34,580.00
Date End: 12/31/2011	MAR:	29,970.00	SEP:	16,782.00
Total Days: 216	APR:	23,290.00	OCT:	0.00
Total Hours: 4756	MAY:	43,430.00	NOV:	9,646.00
Days Per Week: 4	JUN:	46,710.00	DEC:	7,804.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
Ammonia	7664417	0.0000	SEE COMMENT	
CO	630080	0.0000	SEE COMMENT	
Lead	7439921	0.0000	SEE COMMENT	
NOX	10102440	0.0000	SEE COMMENT	
* PM10		16.3400	AP-42 LATEST AVAILABLE	
PM2.5		1.9000	AP-42 LATEST AVAILABLE	
SOX	7446095	0.0000	SEE COMMENT	
VOC		0.0000	SEE COMMENT	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **031 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 12/01/1948
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt
141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2011	FEB:	0.00	AUG:	0.00
Date End: 12/31/2011	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 0	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* CO	630080	0.0000	AP-42 LATEST AVAILABLE	
Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.0000	CONTINUOUS EMISSION MONITORING	
* PM10		0.0000	AP-42 LATEST AVAILABLE	
PM2.5		0.0000	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0000	AP-42 LATEST AVAILABLE	
* VOC		0.0000	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **032 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 02/01/1949
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt 141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2011	FEB:	0.00	AUG:	68,019.00
Date End: 12/31/2011	MAR:	0.00	SEP:	0.00
Total Days: 2	APR:	0.00	OCT:	0.00
Total Hours: 26	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2011	FEB:	0.00	AUG:	576.00
Date End: 12/31/2011	MAR:	0.00	SEP:	0.00
Total Days: 2	APR:	0.00	OCT:	0.00
Total Hours: 26	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: 032 B & W Oil Unit **SF Type: CU**

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0280	AP-42 LATEST AVAILABLE	
* CO	630080	0.1900	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.1000	CONTINUOUS EMISSION MONITORING	
* PM10		0.0400	AP-42 LATEST AVAILABLE	
PM2.5		0.0000	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.1000	AP-42 LATEST AVAILABLE	
* VOC		0.0100	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0010	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0001	AP-42 LATEST AVAILABLE	
* Chromium	7440473	0.0003	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0010	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0011	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0000	AP-42 LATEST AVAILABLE	
* Manganese	7439965	0.0001	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0001	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0010	AP-42 LATEST AVAILABLE	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0008	AP-42 LATEST AVAILABLE	
* Pentane	109660	0.0010	AP-42 LATEST AVAILABLE	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0000	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **033 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 11/01/1949
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt
141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2011	FEB:	0.00	AUG:	0.00
Date End: 12/31/2011	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 0	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	0.0000	AP-42 LATEST AVAILABLE	
Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.0000	CONTINUOUS EMISSION MONITORING	
* PM10		0.0000	AP-42 LATEST AVAILABLE	
PM2.5		0.0000	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0000	AP-42 LATEST AVAILABLE	
* VOC		0.0000	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **034 Mitchell Unit 3 (Boiler 33)** **SF Type: CU**
Rated Input (MMBTU/HR): 2988 Date Installed: 09/01/1963
Fuel: Bituminous **Fuel Data Based on FML:** FM01
SCC: 10100202 - External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (B Burned

Monthly Throughputs in Tons				
SCHEDULE 1	JAN:	52,070.00	JUL:	67,110.00
Date Effective: 01/01/2011	FEB:	24,820.00	AUG:	34,580.00
Date End: 12/31/2011	MAR:	29,970.00	SEP:	16,782.00
Total Days: 216	APR:	23,290.00	OCT:	0.00
Total Hours: 4756	MAY:	43,430.00	NOV:	9,646.00
Days Per Week: 4	JUN:	46,710.00	DEC:	7,804.00

Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	2,794.00	JUL:	0.00
Date Effective: 01/01/2011	FEB:	8,698.00	AUG:	4,285.00
Date End: 12/31/2011	MAR:	13,608.00	SEP:	3,508.00
Total Days: 216	APR:	5,062.00	OCT:	0.00
Total Hours: 4756	MAY:	4,139.00	NOV:	10,055.00
Days Per Week: 4	JUN:	2,824.00	DEC:	9,305.00

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: 034 Mitchell Unit 3 (Boiler 33) **SF Type:** CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.2040	AP-42 LATEST AVAILABLE	
* CO	630080	27.3800	CO. STACK TEST APPROVED BY DEP	
* Lead	7439921	0.0382	SEE COMMENT	
* NOX	10102440	1,303.0000	CONTINUOUS EMISSION MONITORING	
* PM10		110.8000	CO. STACK TEST APPROVED BY DEP	
PM2.5		71.6700	AP-42 LATEST AVAILABLE	
* SOX	7446095	862.3000	CONTINUOUS EMISSION MONITORING	
* VOC		10.8600	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0314	SEE COMMENT	
* Barium	7440393	0.0420	SEE COMMENT	
* Benzene	71432	0.2316	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0680	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0045	SEE COMMENT	
* Chromium	7440473	0.0338	SEE COMMENT	
Cobalt Compounds		0.0072	SEE COMMENT	
* Copper	7440508	0.0220	SEE COMMENT	
Cyanide Compounds		0.0000	SEE COMMENT	
* Ethane	74840	0.1000	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0452	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0000	AP-42 LATEST AVAILABLE	
* Hydrochloric Acid	7647010	8.6500	SEE COMMENT	
* Hydrogen Fluoride	7664393	1.7600	SEE COMMENT	
* Manganese	7439965	0.0502	SEE COMMENT	
* Mercury	7439976	0.0062	SEE COMMENT	
* Methane	74828	7.1990	AP-42 LATEST AVAILABLE	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0365	SEE COMMENT	
* Pentane	109660	0.0840	AP-42 LATEST AVAILABLE	
Polycyclic Organic Matter		0.0001	SEE COMMENT	
* Propane	74986	0.0520	AP-42 LATEST AVAILABLE	
Sulfuric Acid	7664939	78.0300	SEE COMMENT	
* Toluene	108883	0.0429	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0464	SEE COMMENT	
* Zinc	7440666	0.1329	SEE COMMENT	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **035 Auxiliary Boiler 1** **SF Type: CU**
Rated Input (MMBTU/HR): 27 Date Installed:
Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10200602 - External Combustion Boilers;Industrial;Natural Gas;10-100 Million Btu/Hr Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	416.67	JUL:	416.67
Date Effective: 01/01/2011	FEB:	416.67	AUG:	416.67
Date End: 12/31/2011	MAR:	416.67	SEP:	416.67
Total Days: 8	APR:	416.67	OCT:	416.67
Total Hours: 188	MAY:	416.67	NOV:	416.67
Days Per Week: 0	JUN:	416.67	DEC:	416.67

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* CO	630080	0.2090	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.2490	AP-42 LATEST AVAILABLE	
* PM10		0.0190	AP-42 LATEST AVAILABLE	
PM2.5		0.0190	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0010	AP-42 LATEST AVAILABLE	
* VOC		0.0190	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0050	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0000	AP-42 LATEST AVAILABLE	
* Chromium	7440473	0.0000	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0080	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0040	AP-42 LATEST AVAILABLE	
* Manganese	7439965	0.0000	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0000	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0060	AP-42 LATEST AVAILABLE	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0000	AP-42 LATEST AVAILABLE	
* Pentane	109660	0.0060	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0040	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	
* Ammonia	7664417	0.0080	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facility: **036 Auxiliary Boiler 2** **SF Type: CU**
Rated Input (MMBTU/HR): 27 Date Installed:
Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	2,866.67	JUL:	2,866.67
Date Effective: 01/01/2011	FEB:	2,866.67	AUG:	2,866.67
Date End: 12/31/2011	MAR:	2,866.67	SEP:	2,866.67
Total Days: 55	APR:	2,866.67	OCT:	2,866.67
Total Hours: 1299	MAY:	2,866.67	NOV:	2,866.67
Days Per Week: 1	JUN:	2,866.67	DEC:	2,866.67

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0550	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	1.7190	AP-42 LATEST AVAILABLE	
* PM10		0.1310	AP-42 LATEST AVAILABLE	
PM2.5		0.1310	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0100	AP-42 LATEST AVAILABLE	
* VOC		0.1410	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0360	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0000	AP-42 LATEST AVAILABLE	
* Chromium	7440473	0.0000	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0530	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0010	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0310	AP-42 LATEST AVAILABLE	
* Manganese	7439965	0.0000	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0000	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0400	AP-42 LATEST AVAILABLE	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	1.4440	AP-42 LATEST AVAILABLE	
* Pentane	109660	0.0450	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0280	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

OTHER MISCELLANEOUS SUB FACILITY EMISSIONS (Criteria/ HAPs/ Non-Criteria)

SF (Optional Name)	Pollutant	CAS	Emission Amt (0.0 TPY)	Calc. Method

NOTE: Most pollutants need to be reported if greater than 0.5 TPY. The following pollutants need to be reported if greater than the amounts listed:

Polychlorobiphenols (PCB)	0.01 TPY
Lead (Pb)	0.01 TPY
Polycyclic Organic Mater (POM)	0.01 TPY
Dioxins (submit Lbs/Yr only)	0.02 TPY
Furans (submit Lbs/Yr only)	0.02 Lbs/Yr
Mercury (Hg):	
Coal fired electric generating units (EGU)	0.0001 TPY
Non-coal fired EGUs	0.0005 TPY
All other sub facilities	0.01 TPY

Input Form For: 2011 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

NOTES

From: James Lefik **Date:** 02/28/2012
Subject: Emission Factors
Message:
These results derived from "TRI for Power Plants" program

From: James Lefik **Date:** 02/28/2012
Subject: Emissions of pollutants other than PM
Message:
These pollutants are not considered particulate matter

From: James Lefik **Date:** 02/28/2012
Subject: Estimate
Message:
Unit ran 188 total hours for 2011 and burned 5.0 MMcf of natural gas. Monthly throughput estimated as total amount of gas burned divided by 12.

From: James Lefik **Date:** 02/28/2012
Subject: Estimates
Message:
Unit ran a total of 1,299 hours in 2011 and burned 34.4 MMcf of natural gas. Estimated monthly throughput by dividing annual gas thoughput by 12.

ATTACHMENT(S) TO THIS REPORT

There are no documents attached to this report.

Attachment 3
Emission Inventory Production Report - 2012

Pennsylvania Department of Environmental Protection
Bureau of Air Quality
Emission Inventory Production Report

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Region: SOUTHWESTERN **County:** Washington **Municipality:** Union Twp
SIC: 4911 - Trans. & Utilities - Electric Services
NAICS: 221112 - Fossil Fuel Electric Power Generation

Contact	Name	Address	Telephone
FIRM	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
LOCAD		50 Electric Way, New Eagle, PA - 15067-2050	--
CONOP	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
FEEAD	J Hammer	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6064
PRMT	J Lefik	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	724-838-6136
REOFF	F Von Ahn	800 Cabin Hill Dr, Greensburg, PA - 15601-1650	330-436-1300

FACILITY LOCATION INFORMATION

Map: 0-80.44 **Latitude:** 40 deg, 13 min, 16.70 sec N **UTM Coordinates:** **North:** 4452.62
Elevation(Ft): 762 **Longitude:** -79 deg, 58 min, 07.73 sec W **Zone:** 17 **East:** 587.74

FACILITY POLLUTANT SUMMARY
(SUM OF INDIVIDUAL AND MISCELLANEOUS SOURCES)
EMISSION ESTIMATES (0.0 TONS/YEAR)

Ammonia	0.0020
CO	39.5300
Lead	0.0270
NOX	1,971.0800
PM10	210.2400
PM2.5	115.2500
SOX	1,569.7200
VOC	16.0000
Arsenic	0.0270
Barium	0.0600
Benzene	0.3400
Butane	0.0010
Cadmium	0.0040
Carbon Dioxide	1,272,642.0000
Chromium	0.0390
Cobalt Compounds	0.0110
Copper	0.0310
Cyanide Compounds	0.6600
Ethane	0.0620
Formaldehyde	0.0700
Hexane	0.0510
Hydrochloric Acid	9.6200
Hydrogen Fluoride	2.2900
Manganese	0.0490
Mercury	0.0470
Methane	150.4000
Molybdenum	0.0000
Naphthalene	0.0000
Nickel	0.0390
Nitrous Oxide	21.9000
PM-CON	62.1400

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

FACILITY POLLUTANT SUMMARY
(SUM OF INDIVIDUAL AND MISCELLANEOUS SOURCES)
EMISSION ESTIMATES (0.0 TONS/YEAR)

Pentane	0.0020
Polycyclic Organic Matter	0.0000
Propane	0.0010
Sulfuric Acid	124.1800
Toluene	0.0600
Vanadium	0.0410
Zinc	0.1180

FUEL USAGE SUMMARY

Fuel Type	Total Use
Natural Gas	38.31 MMCF
Bituminous	525335 Tons
#2 Oil	84309 Gal

SUB FACILITIES INCLUDED

Type	SF	Name
FML	FM01	Coal Pile
CU	031	B & W Oil Unit
CU	032	B & W Oil Unit
CU	033	B & W Oil Unit
CU	034	Mitchell Unit 3 (Boiler 33)
CU	035	Auxiliary Boiler 1
CU	036	Auxiliary Boiler 2
PRO	102	Facility Fugitive Dust Emissions

Fuel Location: **FM01** **Coal Pile** **SF Type:** **FML**
Date Installed: 09/01/1963 **Fuel Stored:** Bituminous **Capacity:** 120000 Tons

Sources fed in 2012:
034 MITCHELL UNIT 3 (BOILER 33)

2012 Fuel Tests:
Date Collected: 02/01/2012 **% Ash:** 13.50 **% Sulfur:** 3.01 **BTU(Lb/Gal/CuFt):** 11945

Pennsylvania Department of Environmental Protection
Bureau of Air Quality
Emission Inventory Production Report

Input Form For: 2012
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA

Tax ID/Plant Code: 23-3020481-2
PF ID: 557833

Sub Facilty: **102 Facility Fugitive Dust Emissions**
Material: coal dust
Fuel:
SCC: 30588801 - Industrial Processes;Mineral Products;Fugitive Emissions;Specify In Comments Field

SF Type: **PRO**

Fuel Data Based on FML:

Monthly Throughputs in Tons				
SCHEDULE 1	JAN:	0.00	JUL:	65,550.00
Date Effective: 01/01/2012	FEB:	27,056.00	AUG:	57,367.00
Date End: 12/31/2012	MAR:	21,875.00	SEP:	53,951.00
Total Days: 365	APR:	18,662.00	OCT:	53,821.00
Total Hours: 8760	MAY:	72,736.00	NOV:	57,503.00
Days Per Week: 7	JUN:	50,643.00	DEC:	46,171.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
Ammonia	7664417	0.0000	NO FACTOR AVAILABLE	
CO	630080	0.0000	NO FACTOR AVAILABLE	
Lead	7439921	0.0000	NO FACTOR AVAILABLE	
NOX	10102440	0.0000	NO FACTOR AVAILABLE	
* PM10		39.2200	AP-42 LATEST AVAILABLE	
PM2.5		4.6500	AP-42 LATEST AVAILABLE	
SOX	7446095	0.0000	NO FACTOR AVAILABLE	
VOC		0.0000	NO FACTOR AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **031 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 12/01/1948
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt
141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2012	FEB:	0.00	AUG:	19,099.00
Date End: 12/31/2012	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 19	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	0.0570	AP-42 LATEST AVAILABLE	
Lead	7439921	0.0000	SEE COMMENT	
* NOX	10102440	0.2000	CONTINUOUS EMISSION MONITORING	
* PM10		0.0310	CO. STACK TEST APPROVED BY DEP	
PM2.5		0.0310	CO. STACK TEST APPROVED BY DEP	
* SOX	7446095	0.2000	CONTINUOUS EMISSION MONITORING	
* VOC		0.0020	AP-42 LATEST AVAILABLE	
Carbon Dioxide	124389	190.5000	CONTINUOUS EMISSION MONITORING	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
Methane	74828	0.0086	SEE COMMENT	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
Nitrous Oxide	10024972	0.0017	SEE COMMENT	
PM-CON		0.0070	CO. STACK TEST APPROVED BY DEP	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **032 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 02/01/1949
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt 141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2012	FEB:	0.00	AUG:	0.00
Date End: 12/31/2012	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 0	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2012	FEB:	0.00	AUG:	0.00
Date End: 12/31/2012	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 0	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **032 B & W Oil Unit** **SF Type: CU**

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Manganese	7439965	0.0000	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0000	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0000	SEE COMMENT	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0000	AP-42 LATEST AVAILABLE	
Nitrous Oxide	10024972	0.0000	CONTINUOUS EMISSION MONITORING	
PM-CON		0.0000	CO. STACK TEST APPROVED BY DEP	
* Pentane	109660	0.0000	AP-42 LATEST AVAILABLE	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0000	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0000	AP-42 LATEST AVAILABLE	
* PM10		0.0000	AP-42 LATEST AVAILABLE	
PM2.5		0.0000	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0000	CONTINUOUS EMISSION MONITORING	
* VOC		0.0000	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0000	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0000	AP-42 LATEST AVAILABLE	
Carbon Dioxide	124389	0.0000	CONTINUOUS EMISSION MONITORING	
* Chromium	7440473	0.0000	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0000	SEE COMMENT	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	0.0000	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	SEE COMMENT	
* NOX	10102440	0.0000	CONTINUOUS EMISSION MONITORING	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **033 B & W Oil Unit** **SF Type: CU**
Rated Input (MMBTU/HR): 841 Date Installed: 11/01/1949
Fuel: #2 Oil **Fuel Data Based on FML:**
SCC: 10100501 - External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 And 2 Oil Burned

%ASH 0 %SULFUR .5 BTU/Lb-Gal-CuFt
141000

Monthly Throughputs in Gal				
SCHEDULE 1	JAN:	0.00	JUL:	0.00
Date Effective: 01/01/2012	FEB:	0.00	AUG:	64,940.00
Date End: 12/31/2012	MAR:	0.00	SEP:	0.00
Total Days: 1	APR:	0.00	OCT:	0.00
Total Hours: 24	MAY:	0.00	NOV:	0.00
Days Per Week: 0	JUN:	0.00	DEC:	0.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	0.1920	AP-42 LATEST AVAILABLE	
Lead	7439921	0.0000	SEE COMMENT	
* NOX	10102440	0.6000	CONTINUOUS EMISSION MONITORING	
* PM10		0.1060	CO. STACK TEST APPROVED BY DEP	
PM2.5		0.1060	CO. STACK TEST APPROVED BY DEP	
* SOX	7446095	0.5000	CONTINUOUS EMISSION MONITORING	
* VOC		0.0080	AP-42 LATEST AVAILABLE	
Carbon Dioxide	124389	647.4000	CONTINUOUS EMISSION MONITORING	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
Methane	74828	0.0292	SEE COMMENT	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
Nitrous Oxide	10024972	0.0058	SEE COMMENT	
PM-CON		0.0250	CO. STACK TEST APPROVED BY DEP	
* Polycyclic Organic Matter		0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **034 Mitchell Unit 3 (Boiler 33)** **SF Type: CU**
Rated Input (MMBTU/HR): 2988 Date Installed: 09/01/1963
Fuel: Bituminous **Fuel Data Based on FML:** FM01
SCC: 10100202 - External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (B Burned

Monthly Throughputs in Tons				
SCHEDULE 1	JAN:	0.00	JUL:	65,550.00
Date Effective: 01/01/2012	FEB:	27,056.00	AUG:	57,367.00
Date End: 12/31/2012	MAR:	21,875.00	SEP:	53,951.00
Total Days: 252	APR:	18,662.00	OCT:	53,821.00
Total Hours: 6045	MAY:	72,736.00	NOV:	57,503.00
Days Per Week: 5	JUN:	50,643.00	DEC:	46,171.00

Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in MCF				
SCHEDULE 1	JAN:	0.00	JUL:	1,329.60
Date Effective: 01/01/2012	FEB:	7,401.00	AUG:	0.00
Date End: 12/31/2012	MAR:	1,771.00	SEP:	2,230.00
Total Days: 252	APR:	8,887.00	OCT:	2,448.90
Total Hours: 6045	MAY:	1,670.20	NOV:	2,636.00
Days Per Week: 5	JUN:	3,669.00	DEC:	4,052.40

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: 034 Mitchell Unit 3 (Boiler 33) **SF Type:** CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	39.1700	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0270	SEE COMMENT	
* NOX	10102440	1,970.0000	CONTINUOUS EMISSION MONITORING	
* PM10		170.8800	AP-42 LATEST AVAILABLE	
PM2.5		110.5900	AP-42 LATEST AVAILABLE	
* SOX	7446095	1,569.0000	CONTINUOUS EMISSION MONITORING	
* VOC		15.8600	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0270	SEE COMMENT	
* Barium	7440393	0.0600	SEE COMMENT	
* Benzene	71432	0.3400	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0000	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0040	SEE COMMENT	
Carbon Dioxide	124389	1,271,715.7000	SEE COMMENT	
* Chromium	7440473	0.0390	SEE COMMENT	
Cobalt Compounds		0.0110	SEE COMMENT	
* Copper	7440508	0.0310	SEE COMMENT	
Cyanide Compounds		0.6600	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0600	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0700	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0500	AP-42 LATEST AVAILABLE	
* Hydrochloric Acid	7647010	9.6200	SEE COMMENT	
* Hydrogen Fluoride	7664393	2.2900	SEE COMMENT	
* Manganese	7439965	0.0490	SEE COMMENT	
* Mercury	7439976	0.0470	SEE COMMENT	
* Methane	74828	150.4000	SEE COMMENT	
* Molybdenum	7439987	0.0000	SEE COMMENT	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0390	SEE COMMENT	
Nitrous Oxide	10024972	21.9000	SEE COMMENT	
PM-CON		62.1100	CO. STACK TEST APPROVED BY DEP	
* Pentane	109660	0.0000	AP-42 LATEST AVAILABLE	
Polycyclic Organic Matter		0.0000	NO FACTOR AVAILABLE	
* Propane	74986	0.0000	AP-42 LATEST AVAILABLE	
Sulfuric Acid	7664939	124.1790	SEE COMMENT	
* Toluene	108883	0.0600	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0410	SEE COMMENT	
* Zinc	7440666	0.1180	SEE COMMENT	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **035 Auxiliary Boiler 1** **SF Type: CU**
Rated Input (MMBTU/HR): 27 Date Installed:
Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10200602 - External Combustion Boilers;Industrial;Natural Gas;10-100 Million Btu/Hr Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in CF				
SCHEDULE 1	JAN:	619,109.00	JUL:	0.00
Date Effective: 01/01/2012	FEB:	206,193.00	AUG:	0.00
Date End: 12/31/2012	MAR:	136,122.00	SEP:	1,682.00
Total Days: 72	APR:	51,450.00	OCT:	18,339.00
Total Hours: 1722	MAY:	1,257.00	NOV:	77,395.00
Days Per Week: 1	JUN:	0.00	DEC:	184,234.00

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0020	AP-42 LATEST AVAILABLE	
* CO	630080	0.0530	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.0630	AP-42 LATEST AVAILABLE	
* PM10		0.0050	AP-42 LATEST AVAILABLE	
PM2.5		0.0050	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0000	AP-42 LATEST AVAILABLE	
* VOC		0.0050	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0010	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0000	AP-42 LATEST AVAILABLE	
Carbon Dioxide	124389	75.5000	SEE COMMENT	
* Chromium	7440473	0.0000	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0020	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0010	AP-42 LATEST AVAILABLE	
* Manganese	7439965	0.0000	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0000	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0010	SEE COMMENT	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0000	AP-42 LATEST AVAILABLE	
Nitrous Oxide	10024972	0.0000	SEE COMMENT	
* Pentane	109660	0.0020	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0010	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: **036 Auxiliary Boiler 2** **SF Type: CU**
Rated Input (MMBTU/HR): 27 Date Installed:
Fuel: Natural Gas **Fuel Data Based on FML:**
SCC: 10100601 - External Combustion Boilers;Electric Generation;Natural Gas;Boilers > 100 Million Btu/Hr Except Tangential Burned

%ASH 0 %SULFUR 0 BTU/Lb-Gal-CuFt 1020

Monthly Throughputs in CF				
SCHEDULE 1	JAN:	0.00	JUL:	3,280.00
Date Effective: 01/01/2012	FEB:	0.00	AUG:	0.00
Date End: 12/31/2012	MAR:	0.00	SEP:	14,595.00
Total Days: 5	APR:	0.00	OCT:	1.00
Total Hours: 98	MAY:	1,325.00	NOV:	0.00
Days Per Week: 0	JUN:	3,706.00	DEC:	0.00

Input Form For: 2012 **Tax ID/Plant Code:** 23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA **PF ID:** 557833

Sub Facilty: 036 Auxiliary Boiler 2 **SF Type:** CU

Actual Emission Estimates (Tons/Yr) For Emission Fees And Emission Statements:

Pollutant	CAS	Emission Amt (0.0 TPY)	Calculation Method	Use Factor
* Ammonia	7664417	0.0000	AP-42 LATEST AVAILABLE	
* CO	630080	0.0010	AP-42 LATEST AVAILABLE	
* Lead	7439921	0.0000	AP-42 LATEST AVAILABLE	
* NOX	10102440	0.0010	AP-42 LATEST AVAILABLE	
* PM10		0.0000	AP-42 LATEST AVAILABLE	
PM2.5		0.0000	AP-42 LATEST AVAILABLE	
* SOX	7446095	0.0000	AP-42 LATEST AVAILABLE	
* VOC		0.0000	AP-42 LATEST AVAILABLE	
* Barium	7440393	0.0000	AP-42 LATEST AVAILABLE	
* Benzene	71432	0.0000	AP-42 LATEST AVAILABLE	
* Butane	106978	0.0000	AP-42 LATEST AVAILABLE	
* Cadmium	7440439	0.0000	AP-42 LATEST AVAILABLE	
Carbon Dioxide	124389	1.4000	SEE COMMENT	
* Chromium	7440473	0.0000	AP-42 LATEST AVAILABLE	
* Copper	7440508	0.0000	AP-42 LATEST AVAILABLE	
* Ethane	74840	0.0000	AP-42 LATEST AVAILABLE	
* Formaldehyde	50000	0.0000	AP-42 LATEST AVAILABLE	
* Hexane	110543	0.0000	AP-42 LATEST AVAILABLE	
* Manganese	7439965	0.0000	AP-42 LATEST AVAILABLE	
* Mercury	7439976	0.0000	AP-42 LATEST AVAILABLE	
* Methane	74828	0.0000	SEE COMMENT	
* Molybdenum	7439987	0.0000	AP-42 LATEST AVAILABLE	
* Naphthalene	91203	0.0000	AP-42 LATEST AVAILABLE	
* Nickel	7440020	0.0000	AP-42 LATEST AVAILABLE	
Nitrous Oxide	10024972	0.0000	SEE COMMENT	
* Pentane	109660	0.0000	AP-42 LATEST AVAILABLE	
* Propane	74986	0.0000	AP-42 LATEST AVAILABLE	
* Toluene	108883	0.0000	AP-42 LATEST AVAILABLE	
* Vanadium	7440622	0.0000	AP-42 LATEST AVAILABLE	
* Zinc	7440666	0.0000	AP-42 LATEST AVAILABLE	
* Arsenic	7440382	0.0000	AP-42 LATEST AVAILABLE	

*** SCC Factor Exists**

Input Form For: 2012		**Tax ID/Plant Code:**	23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA		**PF ID:**	557833

OTHER MISCELLANEOUS SUB FACILITY EMISSIONS (Criteria/ HAPs/ Non-Criteria)

SF (Optional Name)	Pollutant	CAS	Emission Amt (0.0 TPY)	Calc. Method

NOTE: Most pollutants need to be reported if greater than 0.5 TPY. The following pollutants need to be reported if greater than the amounts listed:

Polychlorobiphenols (PCB)	0.01 TPY
Lead (Pb)	0.01 TPY
Polycyclic Organic Mater (POM)	0.01 TPY
Dioxins (submit Lbs/Yr only)	0.02 TPY
Furans (submit Lbs/Yr only)	0.02 Lbs/Yr
Mercury (Hg):	
Coal fired electric generating units (EGU)	0.0001 TPY
Non-coal fired EGUs	0.0005 TPY
All other sub facilities	0.01 TPY

Input Form For:	2012	**Tax ID/Plant Code:**	23-3020481-2
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA		**PF ID:**	557833

NOTES

From: James Lefik **Date:** 02/15/2013
Subject: Emission Factors for HAPs, Acid Gases and GHGs
Message:
"TRI for Powerplants" software used for calculating HAPs metals and acid gases; GHG factors derived from 40 CFR Part 98, Subpart C, Tables C-1 and C-2

From: James Lefik **Date:** 02/15/2013
Subject: GHG Emissions
Message:
Used 40 CFR 98, Subpart C, Tables C-1 and C-2

From: James Lefik **Date:** 02/15/2013
Subject: GHG Factors
Message:
Taken from 40 CFR Part 98, Subpart C, Tables C-1 and C-2

From: James Lefik **Date:** 02/15/2013
Subject: HAPs and GHG Factors
Message:
HAPs results from TRI for Powerplants; GHG factors from 40 CFR 98, Subpart C, Tables C-1 and C-2

From: James Lefik **Date:** 02/15/2013
Subject: HAPs and GHG emissions factors
Message:
Taken from TRI for Powerplants and 40 CFR Part 98, Subpart C, Tables C-1 and C-2

From: James Lefik **Date:** 02/15/2013
Subject: Emissions factors and results
Message:
This boiler did not run in 2012, emissions from generating Unit 2 are broken up in Oil Boilers 1 and 3, which provide steam for Unit 2.

ATTACHMENT(S) TO THIS REPORT

There are no documents attached to this report.

COMMONWEALTH OF PENNSYLVANIA **MEMO**
Department of Environmental Protection
Southwest Regional Office

TO Air Quality Permit File Number TV-63-00016

FROM Jesse Parihar
Air Quality Engineering Specialist
Air Quality Program

THROUGH Barbara R. Hatch, P.E
Environmental Engineer Manager
Air Quality Program

Mark R. Gorog, P.E
Regional Manager
Air Quality Program

DATE June 09, 2015

RE Review of Emission Reduction Credit (ERC) Application
Allegheny Energy Supply Company, LLC
Mitchell Power Station
Union Township, Washington County
PF ID: 557883

Allegheny Energy Supply Company, LLC ("AES") has submitted an Emission Reduction Credit ("ERC") Registry Application in order to generate ERCs from the shutdown of one (1) bituminous coal and natural gas-fired boiler known as Unit 3 (Boiler 33) at the Mitchell Power Station, located in Union Township, Washington County. Unit 3 (Boiler 33) is an external combustion boiler used to provide steam for electric generating Unit 3 and rated at 2,988 MMBtu/hr to produce 288 megawatts of electricity. Unit 3 (Boiler 33) was designed by Combustion Engineering and installed on September 1, 1963. NO_x and SO_x emissions are reported in AIMS (Air Information Management System) per Continuous Emission Monitor System (CEMS) records which were installed on the unit. The other emissions VOC, PM_{10}, and $PM_{2.5}$ are based on actual consumption of coal and natural gas.

AES has previously shut down Generating Unit 2 (Oil Boilers 1, 2, and 3) for which they have submitted maintenance and reactivation plan to the Department on March 29, 2011. On May 28, 2015, the applicant informed during the telephone conversation that AES did not claim any emission credits from Unit 2 since the emissions from Unit 2 were insignificant.

ERCs are used to offset emission increases and subject to 25 Pa. Code §127.201 Subchapter E. [non-attainment] New Source Review. Attainment and non-attainment designations are only set for pollutants with National Ambient Air Quality Standards and these pollutants are identified as criteria pollutants. ERCs have been requested for VOC, NO_x, SO_x, PM_{10}, and $PM_{2.5}$. Each of these is a criteria pollutant or criteria pollutant precursor in the case of NO_x and VOC. The applicant's intended use of the ERCs is for banking/trading/selling purposes.

In accordance with 25 Pa. Code § 127.207(2), "… an ERC registry application shall be submitted to the Department within 2 years of the initiation of an emissions reduction used to generate ERCs." Unit 3 (Boiler 33) was deactivated on October 4, 2013, and has been shut down since then. This ERC registry

application was received by the Department on April 30, 2015, thereby fulfilling this requirement. The Department received the 'notice of the request of preservation of emissions in the inventory' on October 1, 2014, i.e. within one year of deactivation of the sources also meets the requirements of 25 Pa. Code § 127.207(2)(i) and (ii) which apply to deactivated sources or facilities.

In accordance with 25 Pa. Code § 127.207(4)(i)(A), "The average actual emissions or allowable emissions, whichever is lower, shall be calculated over the 2 calendar years immediately preceding the emissions reduction which generated the creditable emissions decrease or ERC." Additionally per 25 Pa Code §127.207(4)(i)(B), "When the Department determines that the 2-year period immediately preceding the emission reduction is not representative of the normal emission rates or characteristics of the existing facility, the Department may specify a different 2-year period if that period of time or other conditions are representative of normal operations occurring within the preceding 5 calendar years." AES has requested ERCs based on actual emissions during 2011 and 2012.

In accordance with 25 Pa. Code § 127.207(1), "A creditable emissions decrease or ERC shall be surplus, permanent, quantified, and federally enforceable..."

- **Surplus:** Emissions from the shutdown sources have been reported in the 2011 and 2012 AIMS emissions inventory. The emission decreases due to this shutdown were not required to meet a past or current State Implementation Plant ("SIP"), attainment demonstration, Reasonable Further Progress ("RFP"), emissions limitation, compliance plan, or required for any emissions reduction required under the Clean Air Act ("CAA") or Air Pollution Control Act ("APCA").

  In accordance with the applicable requirements of 40 CFR Part 75, the NO_x and SO_x emissions from Unit 3 were continuously monitored using Continuous Emission Monitoring Systems (CEMS). The CEMs Reports for calendar years 2011 and 2012 were examined. No exceedances of allowable NO_x and SO_x emission rates were identified, so all NO_x, SO_x, VOC, PM_{10}, and $PM_{2.5}$ ERCs requested are surplus from a compliance perspective.

  If the facility had continued to operate the Units 3 after April 16, 2015, then this Units 3 would have been subject to the applicable provisions of 40 CFR 63, Subpart UUUUU – National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units (commonly referred to as the Mercury and Air Toxics (MATS) Rule). However, this rule is related to hazardous air pollutants, not criteria pollutants, and the sources shut down before the compliance date of the rule. Therefore, there is no requirement to discount the ERCs for purposes of 40 CFR 63, Subpart UUUUU.

- **Permanent:** Unit 3 (Boiler 33) at this site has been permanently shut down.

- **Quantified:**

  - NO_x emissions for the Unit 3 (Boiler 33) have been reported for years 2011 and 2012 in AIMS emission report. NOx ERCs claimed in this application were based on actual CEMS readings.

  - SO_x emissions for the Unit 3 (Boiler 33) have been reported for years 2011 and 2012 in AIMS emission report. SO_x ERCs claimed in this application were based on actual CEMS readings.

  - VOC emissions for the Unit 3 (Boiler 33) have been reported for years 2011 and 2012 in AIMS emission report. VOC ERCs claimed in this application were based on latest available AP-42.

- PM_{10} emissions for the Unit 3 (Boiler 33) have been reported for years 2011 and 2012 in AIMS emission report. PM_{10} ERCs claimed in this application were based on latest available AP-42. Baseline PM_{10} emission rates include plant fugitives and stack condensable.

- $PM_{2.5}$ emissions for the Unit 3 (Boiler 33) have been reported for years 2011 and 2012 in AIMS emission report. $PM_{2.5}$ ERCs claimed in this application were based on latest available AP-42. Baseline $PM_{2.5}$ emission rates include plant fugitives and stack condensable.

Annual emission rates submitted with the ERC registry application match the AIMS emission inventory for all criteria pollutants and also for which any applicable fees have been paid.

Federally Enforceable: ERCs as listed below will be included in the ERC Registry and an ERC Approval issued prior to their use.

Per 25 PA Code Section 127.207(2), an ERC registry application shall be submitted to the Department within 2 years of the initiation of an emissions reduction. The application was received on April 30, 2015, and operations of Unit 3 were terminated as of October 4, 2013.

Per 25 Pa Code §127.207(2)(i), "The owner or operator of an ERC-generating source or facility shall submit a written notice to the Department within 1 year after the deactivation of a source or facility to request preservation of the emissions in the inventory." This notice was received on October 1, 2014, and operations of Unit 3 were terminated as of October 4, 2013.

- **Enforceable**: Per 25 PA Code Section 127.207(2) ERCs as listed below will be included in the ERC Registry and will be made enforceable by including them in a Plan Approval prior to their use.

Per 25 PA Code Section 127.207, in establishing a baseline to calculate ERCs, the average actual or allowable emissions, whichever is less, shall be calculated over two calendar years immediately preceding the emission reduction or a different 2-year period if that period of time or other conditions are representative of normal operations occurring within the preceding 5 calendar years. The applicant has last operated the Unit 3 (Boiler 33) on October 4, 2013. The applicant has elected 2013 year as emission reduction year and has taken the baseline emissions from for two prior emission reduction years i.e. 2011 and 2012. Therefore, ERCs of Unit 3 (Boiler 33) is based on year 2011 and 2012 emissions only. Baseline emission rates are calculated by the applicant for two-year period for VOC, NO_x, SO_x, PM_{10}, and $PM_{2.5}$ as shown below Table: 1

Table: 1
Baseline Emission Rates

Calendar Year	Unit	Hrs. of Operation	VOC		NO_x		SO_x		PM_{10}		$PM_{2.5}$	
			lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
2012	3	6045	5.26	15.9	652	1,970	519.1	1,569	56.54	170.9	36.6	110.6
2011	3	4756	4.60	10.9	548	1,303	362.6	862.3	46.60	110.8	30.15	71.7
Unit Average		5401	4.93	13.4	600	1,636.5	440.9	1,215.7	51.6	140.9	33.4	91.2

1. PM includes plant fugitives and stack condensable.
2. The above baseline emissions are as reported in AIMS for 2012 and 2011 years.

The total ERCs Allegheny Energy Supply Company, LLC can generate from the shutdown of the Unit 3 (Boiler 33) for each pollutant are listed below in Table: 2.

Table: 2
Available ERC's

Pollutant	Available ERC's (tons)
VOC	13
NO_x	1,636
SO_x	1,215
PM_{10}	140
$PM_{2.5}$	91

Note: The emissions were rounded down to the next lowest full ton.

Per Title 25 PA Code Section 127.206(f), ERCs generated by the curtailment or shutdown of a facility which are not included in a plan approval and used as offsets will expire for use as offsets 10 years after the date the facility ceased emitting the ERC generating emissions. The applicant has applied to use the ERC's for banking/trading/selling purposes. As such these ERCs will expire for use as offsets on October 4, 2023 if not used as described.

TABLE: 3
ERCs from Shutdown of Unit 3 (Boiler 33)

Facility Information	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
Allegheny Energy Supply Company, LLC Source Location: Mitchell Power Station Source: Unit 3 (Boiler 33) County: Washington Contact Person: Eric R. Foster Telephone Number: (330) 436-1530	VOC	13	10/04/2023	Banking/Trading/Selling
	NO_x	1,636		
	SO_x	1,215		
	PM_{10}	141		
	$PM_{2.5}$	91		

CC: Stephen Todd –Hbg. Operations – K. Gratzmiller M. Jirousek - Allegheny Energy

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Southwest Regional Office

June 10, 2015

Eric R. Foster Engineer IV
FirstEnergy, West Akron Campus
341 White Pond Drive
Akron, Ohio 44320

RE: ERC Registry Application
Case File 63-00016
Mitchell Power Station
Union Township, Washington County

Dear Mr. Foster:

This letter is to notify Allegheny Energy Supply Company, LLC (Allegheny Energy) that the Department of Environmental Protection (DEP) has reviewed and approved the Emission Reduction Credit (ERC) Registry Application submitted as a result of the shutdown of Unit 3 (Boiler 33) at Mitchell Power Station located in Union Township, Washington County. The amount and expiration dates of the ERCs are shown in Attachment 1. In accordance with 25 Pa. Code §127.206(f), ERCs generated from a shutdown of sources which are not included in a permit and used as offsets will expire for use as offsets 10 years after the date the sources ceased emitting the ERC-generating emissions.

Allegheny Energy may use these certified ERCs either to satisfy new source review (NSR) requirements at the same plant, or to trade or sell the ERCs for use as offsets at new or modified facilities. The Pennsylvania ERC Registry lists you as the contact person and your telephone number as 330-436-1530. Please notify our office if there is any change in the contact information.

In order for the ERCs to be valid, the ERC-generating sources must remain permanently shut down. In accordance with 25 Pa. Code §127.207 (7), "the owner or operator shall on an annual basis certify in writing to the Department the continuance of the shutdown." Please provide a completed "Certification of Shutdown" each year on the anniversary of this ERC approval, for the previous calendar year. Form is provided as Attachment 2.

If the company plans to bring these shutdown sources back into production, the company shall submit an appropriate Plan Approval application. The company and subsequent users of the credits shall comply with the requirements of 25 Pa. Code §§127.206-127.209.

Should you have questions or need additional information, please contact me at bhatch@pa.gov or by telephone at (412) 442-5226 or Mark Gorog at mgorog@pa.gov or (412) 442-4150.

Sincerely,

Barbara R. Hatch, P.E.
Environmental Engineer Manager
Air Quality

cc: File 63-00016
Stephen Todd, Central Office

ATTACHMENT 1

ERCs from Shutdown of Unit 3

Facility Information	Criteria Pollutant	Certified ERCs Available (tpy)	Expiration Date	Intended Use of ERCs
Allegheny Energy Supply Company, LLC Source Location: Armstrong Power Plant Source: Unit 3 County: Armstrong Contact Person: Eric R. Foster Telephone Number: (330) 436-1530	VOC NO_x SO_x PM_{10} $PM_{2.5}$	13 1,636 1,215 141 91	10/04/2023	Banking/Trading/ Selling

ATTACHMENT 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reductions credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable)**:**

Facility/Plant Name:

Address:

County Name:

List of sources shutdown:

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year _____.

_____ _____
Signature of a responsible official Date

_____ _____
Name (print)Title

AlleghenyEnergy Supply
A FirstEnergy Company

OFFICIAL FILE COPY

June 13, 2016

Mr. Mark Gorog
Air Quality Program Manager
PA Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

RE: Annual Certification of Shutdown for ERC Approval
Case File 63-00016
Mitchell Power Station
Union Township, Washington County

Dear Mr. Gorog:

In accordance with the Department approval letter dated June 17, 2015 for the Emission Reduction Credit (ERC) Registry Application submitted as a result of the shutdown of the Mitchell Power Station, this correspondence provides the annual certification of the continuance of the shutdown. A completed "Certification of Shutdown" (Attachment 2) for calendar year 2015 is enclosed.

It is our understanding that this annual certification of continued shutdown will be required until the ERC credits are used or have expired.

If you have any questions concerning this matter, please contact Jim Lefik by telephone at (724) 838-6136 or by email at jlefik@firstenergycorp.com.

Sincerely,

Raymond L. Evans
Vice President
Environmental and Technologies

Enclosure

c: Krishnan Ramamurthy, Central Office
PADEP Bureau of Air Quality
Rachel Carson State Office Building
400 Market Street, 12th Floor
PO Box 8468
Harrisburg, PA 17105-8468

RECEIVED
JUN 13 2016
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ATTACHMENT 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

CERTIFICATION OF CONTINUED SHUTDOWN

This certificate is required for a shutdown source or facility for which emission reductions credits (ERCs) have been approved by the Department.

In accordance with 25 Pa. Code § 127.207 (7), the owner or operator of a shutdown source or facility must certify annually that the facility or source is shutdown unless the facility or source has been dismantled or removed. If the facility or source is completely dismantled or removed, certification is not required.

This certificate is to be submitted in duplicate to the appropriate regional office and must be signed by a responsible official.

Title V Operating Permit Number (if applicable):
63-00016
Facility/Plant Name:
ALLEGHENY ENERGY SUPPLY COMPANY, LLC - MITCHELL POWER STATION
Address:
50 ELECTRIC WAY
NEW EAGLE, PA 15067-2050
County Name:
WASHINGTON
List of sources shutdown:
SOURCE ID 034: CE COAL-FIRED BOILER - UNIT 3 (BOILER 33)

Comments:

Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. 4009 (b)(2), I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this certificate are true, accurate, and complete. I further certify that the sources identified above did not operate during calendar year 2015.

Signature of a responsible official

6/4/2016
Date

Raymond L. Evans
Name (print)

Vice President, Environmental and Technologies
Title

SO_2 SIP

Appendix K

Installation Permits

K-1: U. S. Steel Clairton

K-2: U. S. Steel Edgar Thomson

K-3: U. S. Steel Irvin

K-4: Harsco (Braddock Recovery)

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Installation Permits

This appendix includes the source installation permits that provide enforceability of the limits included in the Control Strategy of the SIP. All installation permits are federally enforceable for Allegheny County. Some permit conditions that are not directly applicable to this SIP have been redacted.

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K-1: U. S. Steel Clairton

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ALLEGHENY COUNTY HEALTH DEPARTMENT

AIR QUALITY PROGRAM
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1811

Federally Enforceable Installation Permit For 1-Hour SO_2 NAAQS

Issued To:	**U. S. Steel Mon Valley Works** **Clairton Plant** 400 State Street Clairton, PA 15025-1855	**ACHD Permit#:**	**0052-I017**
		Date of Issuance:	September 14, 2017
		Expiration Date:	(See Section III.12)

Issued By: _____
JoAnn Truchan, P.E.
Section Chief, Engineering

Prepared By: _____
Hafeez A. Ajenifuja
Air Quality Engineer

TABLE OF CONTENTS

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III. GENERAL CONDITIONS 6

IV. SITE LEVEL TERMS AND CONDITIONS 11

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AMENDMENTS:

DATE	*SECTION(S)*

I. CONTACT INFORMATION

Facility Location:
U. S. Steel Mon Valley Works
Clairton Plant
400 State Street
Clairton, PA 15025-1855

Permittee/Owner:
U. S. Steel Mon Valley Works
Clairton Plant
400 State Street
Clairton, PA 15025-1855

Responsible Official: **Kurt Barshick**
Title: General Manager
Company: U. S. Steel Mon Valley Works
Address: P.O. Box 878
Dravosburg, PA 15034
Telephone Number: (412) 675-2600
Fax Number: (412) 675-5407

Facility Contact: **Jonelle Scheetz**
Title: Environmental Control Engineer
Telephone Number: (412) 233-1015
Fax Number: (412) 233-1011
E-mail Address: jsscheetz@uss.com

AGENCY ADDRESSES:

ACHD Contact:
Chief Engineer
Allegheny County Health Department
Air Quality Program
301 39th Street, Building #7
Pittsburgh, PA 15201-1811

EPA Contact:
Enforcement Programs Section (3AP12)
USEPA Region III
1650 Arch Street
Philadelphia, PA 19103-2029

II. FACILITY DESCRIPTION

FACILITY DESCRIPTION

U. S. Steel Mon Valley Works Clairton Plant is the largest by-products coke plant in North America. The Clairton Plant operates 10 coke batteries and produces approximately 13,000 tons of coke per day from the destructive distillation (carbonization) of more than 18,000 tons of coal. During the carbonization process, approximately 225 million cubic feet of coke oven gas are produced. The volatile products of coal contained in the coke oven gas are recovered in the by-products plant. In addition to the coke oven gas, daily production of these by-products include 145,000 gallons of crude coal tar, 55,000 gallons of light oil, 35 tons of elemental sulfur, and 50 tons of anhydrous ammonia. The coke produced is used in the blast furnace operations in the production of molten iron for steel making.

[redacted]

The emission units regulated by this permit are summarized in Table II-1:

TABLE II-1: Emission Unit Identification

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
B001	Boiler 1	NA	760 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
B002	Boiler 2	NA	481 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
B005	Boiler R1	NA	229 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
B006	Boiler R2	NA	229 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
B007	Boiler T1	NA	56 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
B008	Boiler T2	NA	156 MMBtu/hour	Coke Oven Gas and Natural Gas	NA
P001	Battery 1 (Underfiring)	NA	517,935 tons of coal charged per year	Coke Oven Gas and Natural Gas	S001
P002	Battery 2 (Underfiring)	NA	517,935 tons of coal charged per year	Coke Oven Gas and Natural Gas	S002

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P003	Battery 3 (Underfiring)	NA	517,935 tons of coal charged per year	Coke Oven Gas and Natural Gas	S003
P007	Battery 13 (Underfiring)	NA	545,675 tons of coal charged per year	Coke Oven Gas and Natural Gas	S007
P008	Battery 14 (Underfiring)	NA	545,675 tons of coal charged per year	Coke Oven Gas and Natural Gas	S008
P009	Battery 15 (Underfiring)	NA	545,675 tons of coal charged per year	Coke Oven Gas and Natural Gas	S009
P010	Battery 19 (Underfiring)	NA	1,002,290 tons of coal charged per year	Coke Oven Gas and Natural Gas	S010
P011	Battery 20 (Underfiring)	NA	1,002,290 tons of coal charged per year	Coke Oven Gas and Natural Gas	S011
P012	B Battery (Underfiring)	NA	1,491,025 tons of coal charged per year	Coke Oven Gas and Natural Gas	S012
P046	C Battery (Underfiring)	NA	1,379,059 tons of coal charged/year	Coke Oven Gas and Natural Gas	S046
P013	Quench Tower 1	NA	1,553,805 tons of coal per year	Incandescent coke and water	NA
P017	Quench Tower B	NA	1,491,025 tons of coal per year	Incandescent coke and water	NA
P047	Quench Tower C	NA	1,379,059 tons of coal per year	Incandescent coke and water	NA
P015A	Quench Tower 5A	NA	1,270,200 tons of coke per year	Incandescent coke and water	NA
P016A	Quench Tower 7A	NA	1,555,630 tons of coke per year	Incandescent coke and water	NA

DECLARATION OF POLICY

[redacted]

[redacted]

III. GENERAL CONDITIONS

[redacted]

[redacted]

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b. Unless specified otherwise in this permit or in the applicable regulation, the term "*year*" shall mean any twelve (12) consecutive months.

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15. Reporting Requirements (§2103.12.k)

a. The permittee shall submit reports of any required monitoring at least every six (6) months. All instances of deviations from permit requirements must be clearly identified in such reports. All required reports must be certified by the Responsible Official.

b. Prompt reporting of deviations from permit requirements is required, including those attributable to upset conditions as defined in this permit and Article XXI §2108.01.c, the probable cause of such deviations, and any corrective actions or preventive measures taken.

c. All reports submitted to the Department shall comply with the certification requirements of General Condition III.4 above.

d. Semiannual reports required by this permit shall be submitted to the Department as follows:

1) One semiannual report is due by July 31 of each year for the time period beginning January 1 and ending June 30.
2) One semiannual report is due by January 31 of each year for the time period beginning July 1 and ending December 31.

e. Quarterly reports required by this permit shall be submitted to the Department on the last day of the month following each calendar quarter. The first quarterly report for the period October 4, 2018 to December 31, 2018, will be due January 31, 2019.

f. Reports may be emailed to the Department at aqreports@alleghenycounty.us in lieu of mailing a hard copy.

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IV. SITE LEVEL TERMS AND CONDITIONS

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25. SO_2 Compliance Monitoring

a. The permittee shall not operate, or allow to be operated, any source in such manner that unburned coke oven gas is emitted into the open air. In addition, the permittee shall not flare, mix, or combust coke oven gas, or allow such gas to be flared, mixed or combusted unless the concentration of sulfur compounds, measured as hydrogen sulfide, in such gas is less than or equal to 35 grains per hundred dry standard cubic feet of coke oven gas produced by Clairton Plant, when all sulfur emissions from the Claus Sulfur Recovery Plant and the tail gas cleaning equipment thereon, expressed as equivalent H_2S are added to the measured H_2S. The concentration of sulfur compounds specified shall include the tail-gas sulfur, measured as hydrogen sulfide, emitted from sulfur removal equipment. [§2105.21.h].

b. For sources listed in Table V-A-1, the permittee shall determine the H_2S grain loading and flow rate of the fuel as combusted. The permittee shall record the output of each system for measuring sulfur dioxide emissions discharged to the atmosphere.

26. SO_2 Compliance

The restrictions and requirements in Sections V.A and 0 will become effective on or before October 4, 2018.

V. EMISSION UNIT LEVEL TERMS AND CONDITIONS

A. SO_2 Limits – Boilers and Coke Oven Battery Underfire Stacks

1. Restrictions:

a. The combustion units listed in Table V-A-1 shall only combust natural gas and coke oven gas. (§2102.04.b.6)

b. SO_2 emissions from the following sources shall not exceed the limitations in Table V-A-1 below: [§2102.04.b.6, §2105.21.h]

TABLE V-A-1. SO_2 Emission Limitations

Process	Thirty-day (30-day) Emission Limit* (lb/hr)	Supplementary 24-hr Limit** (lb/hr)
Boiler 1	118.44***	134.06***
Boiler 2		
Boiler R1		
Boiler R2		
Boiler T1		
Boiler T2		
Battery 1 Underfiring	10.41	13.27
Battery 2 Underfiring	9.15	11.66
Battery 3 Underfiring	10.57	13.47
Battery 13 Underfiring	13.93	15.70
Battery 14 Underfiring	14.03	15.80
Battery 15 Underfiring	18.67	21.04
Battery 19 Underfiring	29.37	33.09
Battery 20 Underfiring	27.00	30.42
B Battery Underfiring	21.38	27.26
C Battery Underfiring	32.03	40.83

* Limits are based on a rolling 30-day average of 24-hour (calendar day) averages.

** Supplementary 24-hour limit is not to be exceeded more than 3 times consecutively (over any consecutive 3 calendar day period).

*** Emission limits are on an aggregate basis.

2. Testing Requirements:

a. The permittee shall have sulfur dioxide (SO_2) emissions stack tests performed on the boiler stacks and battery underfire stacks at least once every two years as required by Article XXI §2108.02.b. SO_2 emission tests shall be conducted according to Method 6, 6A, 6B, or 6C as specified in 40 CFR 60, Appendix A. The permittee shall submit a stack test protocol to the Department for approval at least 45 days prior to the test date(s). [§2108.02.b and §2108.02.e]

b. Emissions of SO_2 shall be determined by converting the H_2S grain loading of the fuel burned and the fuel flow rate to pounds per hour to determine compliance with the emission limitations of Table V-A-1 above. [§2103.12.h.1]

[redacted].

3. Monitoring Requirements:

a. Except for monitor malfunctions, , associated repairs, and required quality assurance or control activities (including as applicable, calibration checks and required zero and span adjustments), the permittee shall continuously monitor and record the H_2S concentration (in grains(gr)/100 dscf) of the COG combusted and the fuel flow rate required in Site Level Condition IV.25.b. Continuously shall be defined as at least once every 15 minutes. [§2102.04.b.6; §2103.12.i]

b. Monitoring of the H_2S concentration of the COG shall meet the requirements of 90% data availability . [§2102.04.b.6; §2103.12.i]

c. On or before March 31, 2018, the permittee shall propose, for Department approval, a procedure for measuring the H_2S content of the gas during periods of monitoring malfunction or breakdowns. [§2102.04.b.6; §2103.12.i]

4. Record Keeping Requirements:

a. The permittee shall keep records of hourly fuel use (COG and natural gas) and hourly H_2S concentration in grains per 100 dscf. [§2103.12.j]

b. The permittee shall record all instances of non-compliance with the conditions of this permit upon occurrence along with corrective action taken to restore compliance. [§2102.04.b.6]

[redacted].

5. Reporting Requirements:

a. The permittee shall report the concentration of H_2S per 100 dscf of COG averaged over a calendar day to the Department on a quarterly basis, in accordance with General Condition III.15.e. All instances of non-compliance with the conditions of this permit along with all corrective action taken to restore the subject equipment to compliance shall be reported. [§2103.12.k]

b. Reporting instances of non-compliance in accordance with condition V.A.5.a above, does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. (§2103.12.k)

c. Reporting instances of non-compliance does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. (§2103.12.k)

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[redacted].

B. SO_2 Limits – PEC Baghouses, SCOT Stack, Quench Towers, and Hot Cars

1. Restrictions:

a. During planned outages of the SCOT Plant, the permittee shall re-route the Claus Plant tail gas to the battery suction main. [§2102.04.b.6]

b. In the event of an unplanned SCOT Plant outage, the Claus Plant tail gas shall be re-routed to the battery suction main as soon as practicable. [§2102.04.b.6]

c. SO_2 emissions from the following sources shall not exceed the limitations in Table V-B-1 below: [§2102.04.b.6, §2105.21.h.4]

TABLE V-B-1: SO_2 Emission Limitations

POLLUTANT	SO_2 Emission Limit (lb/hr)
PEC Baghouse 1-3	7.10
PEC Baghouse 13-15	7.46
PEC Baghouse 19-20	7.78
PEC Baghouse B	7.50
PEC Baghouse C	8.65
SCOT Stack	24.00
Quench Tower 1	0.75
Quench Tower B	4.09
Quench Tower C	5.00
Quench Tower 5A	7.56
Quench Tower 7A	7.21
Batteries 1-3 Hot Car	10.64
Batteries 13-15 Hot Car	11.21
Batteries 19-20 Hot Car	13.73
C Battery Hot Car	5.82

2. Testing Requirements:

a. The permittee shall perform or cause to be performed baghouse emission stack tests for SO_2 at least once every two years in accordance with approved EPA methods and performed according to §2108.02 of Article XXI. [§2108.02]

b. The permittee shall have SCOT Plant emission stack tests for SO_2 conducted at least once every two years in accordance with approved EPA methods and performed according to §2108.02 of Article XXI. [§2108.02]

[redacted]

3. Monitoring Requirements:

a. The permittee shall monitor and record the online (operating) hours of the SCOT Plant. [§2103.12.i]

b. The permittee shall record the number of pushes per day and the amount of coal charged daily for each Battery Unit. [§2103.12.i]

4. Record Keeping Requirements:

a. The permittee shall record all instances of non-compliance with the conditions of this permit upon occurrence along with corrective action taken to restore compliance. [§2102.04.b.6; §2103.12.j]

b. The permittee shall maintain monthly records of all monitoring required per Condition V.B.3 for at least five (5) years. These records shall be made available to the Department upon request for inspection and/or copying. [§2102.04.b.6; §2103.12.j.2]

5. Reporting Requirements:

a. The permittee shall report to the Department quarterly, in accordance with General Condition III.15.e, all instances of non-compliance with the conditions of this permit along with all corrective action taken to restore the subject equipment to compliance. [§2103.12.k]

b. Reporting instances of non-compliance in accordance with condition V.A.5.a above, does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. [§2103.12.k]

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K-2: U. S. Steel Edgar Thomson

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AIR QUALITY PROGRAM
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1811

Federally Enforceable Installation Permit For 1-Hour SO_2 NAAQS

Issued To:	**U. S. Steel Mon Valley Works** **Edgar Thomson Plant** 13th Street and Braddock Avenue Braddock, PA 15104	**ACHD Permit#:**	**0051-I006**
		Date of Issuance:	September 14, 2017
		Expiration Date:	(See Section III.12)

Issued By: _____
JoAnn Truchan, P.E.
Section Chief, Engineering

Prepared By: _____
Hafeez A. Ajenifuja
Air Quality Engineer

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AMENDMENTS:

DATE	*SECTION(S)*

I. CONTACT INFORMATION

Facility Location:	**U. S. Steel Mon Valley Works** **Edgar Thomson Plant** 13th Street and Braddock Avenue Braddock, PA 15104
Permittee/Owner:	**U. S. Steel Mon Valley Works** **Edgar Thomson Plant** 13th Street and Braddock Avenue Braddock, PA 15104
Responsible Official:	**Kurt Barshick**
Title:	General Manager
Company:	U. S. Steel Mon Valley Works
Address:	P.O. Box 878 Dravosburg, PA 15122
Telephone Number:	412-675-2600
Fax Number:	412-675-5407
Facility Contact:	**Coleen M. Davis**
Title:	Sr. Environmental Control Engineer
Telephone Number:	412-273-4730
Fax Number:	412-273-7099
E-mail Address:	cdavis@uss.com

AGENCY ADDRESSES:

ACHD Contact:	**Chief Engineer** **Allegheny County Health Department** Air Quality Program 301 39th Street, Building #7 Pittsburgh, PA 15201-1811
EPA Contact:	**Enforcement Programs Section (3AP12)** **USEPA Region III** 1650 Arch Street Philadelphia, PA 19103-2029

II. FACILITY DESCRIPTION

FACILITY DESCRIPTION

The U. S. Steel Mon Valley Works Edgar Thomson Plant (ET) is an iron and steel making facility that produces mainly steel slabs. Raw materials such as coke, iron-bearing materials, and fluxes are charged to blast furnaces in the iron making process. Molten metal (iron) is tapped from the blast furnace at the casthouse into transfer ladles. The hot metal is then transferred to a hot metal mixer or direct pour station in preparation for desulfurization. For desulfurization, a reagent is added to the hot metal, causing sulfur and other impurities to form and rise to the surface. Desulfurized hot metal is then introduced into the basic oxygen process (BOP), where the hot metal is transformed into molten steel. Scrap, alloys, fluxes, and oxygen are also introduced at the BOP. The liquid steel is tapped from the BOP vessels and transferred to the ladle metallurgy facility (LMF) or Vacuum Degasser, where the properties of the steel can be more precisely refined according to customer specifications. To achieve this additional refining at the LMF or Vacuum Degasser, specific alloying materials are added to the process. The refined liquid steel is then charged to the dual strand continuous caster mold. The steel slabs are formed in the continuous caster and are cut to length, ground, slit as necessary, and shipped offsite. There are three Riley Boilers at ET, which are used to generate steam, heat, and electricity for the plant. The three primary fuels for the boilers are Blast Furnace Gas (BFG), Coke Oven Gas, (COG), and Natural Gas (NG).

The facility has two (2) processes that are operated by an outside contractor:

1. BOP Slag Processing; and
2. Waste Product Recycling and Briquetting.

The BOP slag handling system is being operated by Tube City IMS, LLC, while the Waste Product Recycling and Briquette is operated by Braddock Recovery Inc, a division of Harsco Corporation.

Both Tube City IMS, Inc. and Braddock Recovery Inc. are located on U .S. Steel Edgar Thomson property and are considered Title V facilities by ACHD. These facilities are part of the same major source, acting as support facilities to Edgar Thomson Plant, and will be obtaining their own Title V operating permit in the near future.

In addition, BOC Gases (Linde) is another support facility that is located outside U. S. Steel Edgar Thomson compound but supplies oxygen to U. S. Steel Edgar Thomson Plant. BOC Gases is also supplying gases to other companies and is therefore not considered a co-located Title V facility at this time.

The facility, which is located in Braddock, Pennsylvania, is a major source of particulate matter less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOC), and Hazardous Air Pollutants (HAPs), as defined in Section 2101.20 of Article XXI.

[redacted]

[redacted]

The emission units regulated by this permit are summarized in Table II-1:

TABLE II-1: Emission Unit Identification

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P001a	Blast Furnace No. 1 Casthouse	NA	1,752,000 TPY (Production)	Coke, Iron- Bearing Materials, Fluxes	S002
P001b	Blast Furnace No. 1 Stoves	NA	495 MMBtu/hour (total)	BFG, COG & Natural Gas	S001
P002a	Blast Furnace No. 3 Casthouse	NA	1,752,000 TPY (Production)	Coke, Iron- Bearing Materials, Fluxes	S002
P002b	Blast Furnace No. 3 Stoves	NA	495 MMBtu/hour (total)	BFG, COG & Natural Gas	S004
P003	Basic Oxygen Process (BOP) Shop	NA	3, 467,500 TPY (Production)	Hot Metal (Iron), Fluxes, Scrap, Alloy Additives	S005-S008
P005	Dual Strand Caster	NA	3, 467,500 TPY (Production)	Steel (Liquid), Fluxes	N/A
B001	Riley Boiler No. 1	NA	525 MMBtu/hr	Blast Furnace Gas, Coke Oven Gas & Natural Gas	S012
B002	Riley Boiler No. 2	NA	525 MMBtu/hr	Blast Furnace Gas, Coke Oven Gas & Natural Gas	S013
B003	Riley Boiler No. 3	NA	525 MMBtu/hr	Blast Furnace Gas, Coke Oven Gas & Natural Gas	S014

DECLARATION OF POLICY

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III. GENERAL CONDITIONS

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15. Reporting Requirements (§2103.12.k)

a. The permittee shall submit reports of any required monitoring at least every six (6) months. All instances of deviations from permit requirements must be clearly identified in such reports. All required reports must be certified by the Responsible Official.

b. Prompt reporting of deviations from permit requirements is required, including those attributable to upset conditions as defined in this permit and Article XXI §2108.01.c, the probable cause of such deviations, and any corrective actions or preventive measures taken.

c. All reports submitted to the Department shall comply with the certification requirements of General Condition III.4 above.

d. Semiannual reports required by this permit shall be submitted to the Department as follows:

1) One semiannual report is due by July 31 of each year for the time period beginning January 1 and ending June 30.
2) One semiannual report is due by January 31 of each year for the time period beginning July 1 and ending December 31.

e. In accordance with Department procedures, reports may be emailed to the Department at aqreports@alleghenycounty.us in lieu of mailing a hard copy.

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IV. SITE LEVEL TERMS AND CONDITIONS

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27. SO_2 Compliance Monitoring

The permittee shall not operate, or allow to be operated, any source in such manner that unburned coke oven gas is emitted into the open air. In addition, the permittee shall not flare, mix, or combust coke oven gas, or allow such gas to be flared, mixed or combusted unless the concentration of sulfur compounds, measured as hydrogen sulfide, in such gas is less than or equal to 35 grains per hundred dry standard cubic feet of coke oven gas produced by the Clairton Plant, when all sulfur emissions from the Claus Sulfur Recovery Plant and the tail gas cleaning equipment thereon, expressed as equivalent H_2S are added to the measured H_2S. The concentration of sulfur compounds specified shall include the tail-gas sulfur, measured as hydrogen sulfide, emitted from sulfur removal equipment. [§2105.21.h].

28. SO_2 Compliance

The restrictions and requirements in Section V.A will become effective on or before October 4, 2018.

V. EMISSION UNIT LEVEL TERMS AND CONDITIONS

A. SO_2 Limits

The permittee is subject to the following conditions:

1. Restrictions:

a. The combustion units listed in Table V-A-1 shall only combust natural gas, blast furnace gas, and coke oven gas.

b. The permittee shall construct a new stack consisting of combined flue systems for Riley Boilers 1, 2, and 3. All three Riley boilers shall exhaust at all times to the new stack, constructed to a minimum release height of 70 meters.

c. SO_2 emissions from the following sources shall not exceed the limitations in Tables V-A-1 and V-A-2 below: [§2102.04.b.6, §2105.21.h.4]

TABLE V-A-1: Combustion Unit Emission Limitations

PROCESS/EQUIPMENT	MAXIMUM ALLOWABLE SO_2 EMISSION RATE (lb/hr)
Riley Boiler 1	556.91 (On a combined stack basis)
Riley Boiler 2	
Riley Boiler 3	
Blast Furnace 1 Stoves	98.50
Blast Furnace 3 Stoves	90.00

TABLE V-A-2: Emission Limitations (Non-Combustion)

PROCESS/EQUIPMENT	MAXIMUM ALLOWABLE SO_2 EMISSION RATE (lb/hr)
Blast Furnace 1 Casthouse (roof & fume suppression)	2.01
Blast Furnace 3 Casthouse (roof & fume suppression)	1.69
BOP Process (roof)	6.64
Continuous Casting (roof)	5.25
Casthouse Baghouse	45.10

2. Testing Requirements:

a. The permittee shall have sulfur dioxide (SO_2) emissions stack tests performed on the boiler combined stacks within 6 months of completion of equipment installation. Emissions testing of the boiler combined stack and emission units listed in Table V-A-1 shall be tested at least once every two years. SO_2 emission tests shall be conducted according to Article XXI, §2108.02. The permittee shall submit a stack test protocol to the Department for approval at least 45 days prior to the test date(s). [§2108.02.b and §2108.02.e]

[redacted]

3. Monitoring Requirement:

a. The permittee shall determine the hourly H_2S concentration of the gas, per conditions V.A.3.b and V.A.3.c, and the amount of fuel combusted in each emission unit listed in Tables V-A-1 and V-A-2. [§2102.04.b.6; §2103.12.i]

b. The permittee shall determine the H_2S content of the blast furnace gas combusted at the facility at least once every calendar quarter. The sulfur content of BFG shall be determined by obtaining and analyzing samples of BFG produced at the blast furnaces at a sample location downstream of the gas cleaning system but prior to a combustion source. [§2102.04.b.6; §2103.12.i]

c. Except for monitor malfunctions, associated repairs, and required quality assurance or control activities (including as applicable, calibration checks and required zero and span adjustments), the permittee shall continuously monitor and record the H_2S concentration (in grains(gr)/100 dscf) of the COG combusted and the fuel flow rate. Continuously shall be defined as at least once every 15 minutes. Under the current operating scenario, coke oven gas measurements are taken at the Clairton Plant. [§2102.04.b.6; §2103.12.i]

4. Record Keeping Requirements:

a. The permittee shall keep records of fuel combusted on an hourly basis in each of the emission units listed in Table V-A-1. [§2103.12.j]

b. The permittee shall record all instances of non-compliance with the conditions of this permit upon occurrence along with corrective action taken to restore compliance**.** [§2103.12.j]

[redacted]

5. Reporting Requirements:

a. The permittee shall report to the Department semi-annually, in accordance with General Condition III.15, all instances of non-compliance with the conditions of this permit along with all corrective action taken to restore the subject equipment to compliance. If all the terms and conditions of this permit are complied with during the reporting period, then no report is necessary under this permit condition. [§2103.12.k]

b. Reporting instances of non-compliance in accordance with condition V.A.5.a above, does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. [§2103.12.k]

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K-3: U. S. Steel Irvin

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ALLEGHENY COUNTY HEALTH DEPARTMENT

AIR QUALITY PROGRAM
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1811

Federally Enforceable Installation Permit For 1-Hour SO_2 NAAQS

Issued To:	**U. S. Steel Mon Valley Works** **Irvin Plant** Camp Hollow Road West Mifflin, PA 15212	**ACHD Permit#:**	**0050-I008**
		Date of Issuance:	September 14, 2017
		Expiration Date:	(See Section III.12)

Issued By: _____
JoAnn Truchan, P.E.
Section Chief, Engineering

Prepared By: _____
Hafeez A. Ajenifuja
Air Quality Engineer

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A. SO_2 LIMITS 19

AMENDMENTS:

DATE SECTION(S)

I. CONTACT INFORMATION

Facility Location:	**U. S. Steel Mon Valley Works** **Irvin Plant** Camp Hollow Road West Mifflin, PA 15122
Permittee/Owner:	**U. S. Steel Mon Valley Works** **Irvin Plant** Camp Hollow Road West Mifflin, PA 15122
Responsible Official:	**Kurt Barshick**
Title:	General Manager
Company:	U. S. Steel Mon Valley Works
Address:	P.O. Box 878 Dravosburg, PA 15122
Telephone Number:	(412) 675-2600
Fax Number:	(412) 675-5407
Facility Contact:	**Dan Belack**
Title:	Environmental Engineer
Telephone Number:	(412) 675-7382
Fax Number:	(412) 675-7822
E-mail Address:	dbelack@uss.com

AGENCY ADDRESSES:

ACHD Contact:	**Chief Engineer** **Allegheny County Health Department** Air Quality Program 301 39th Street, Building #7 Pittsburgh, PA 15201-1811
EPA Contact:	**Enforcement Programs Section (3AP12)** **USEPA Region III** 1650 Arch Street Philadelphia, PA 19103-2029

II. FACILITY DESCRIPTION

FACILITY DESCRIPTION

The U. S. Steel Mon Valley Works Irvin Plant is a secondary steel processing facility located in West Mifflin Borough, Allegheny County, Pennsylvania. The Irvin Plant receives steel slabs and performs one of several finishing processes on the steel slabs. The finishing processes commonly referred to as secondary steel processes, include hot and cold rolling, continuous pickling, annealing, and galvanizing. The facility is composed of an 80" hot strip mill, 64" & 84" continuous hydrochloric acid pickle lines, a cold reduction mill, HPH annealing furnaces, open coil annealing furnaces, a continuous annealing furnace, continuous galvanizing line no. 1, continuous galvanizing and aluminum coating line no. 2, four coke oven gas flares, and four natural gas/coke oven gas fired boilers.

[redacted]

The emission units regulated by this permit are summarized in Table II-1:

TABLE II-1: Emission Unit Identification

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P001-P005	80-Inch Hot Strip Mill Reheat Furnaces No. 1 to No. 5	NA	140 MMBtu/Hr	Coke Oven Gas and Natural Gas	SP1-SP6
P011	Continuous Annealing	NA	45 MMBtu/hr	Coke Oven Gas and Natural Gas	SP13
P009	HPH Batch Annealing Furnaces (31 individual furnaces)	NA	4.9 MMBtu/hr, each furnace	Coke Oven Gas and Natural Gas	SP10
P010	Open Coil Annealing Furnaces No. 1 to 9	NA	7.2 MMBtu/hr, each furnace	Coke Oven Gas and Natural Gas	SP12
P010	Open Coil Annealing Furnaces No. 10 to 13	NA	9.0 MMBtu/hr, each furnace	Coke Oven Gas and Natural Gas	SP12
P010	Open Coil Annealing Furnaces No. 14	NA	5.4 MMBtu/hr	Coke Oven Gas and Natural Gas	SP12
P010	Open Coil Annealing Furnaces No. 15 to 16	NA	7.47 MMBtu/hr, each furnace	Coke Oven Gas and Natural Gas	SP12

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
B001	Boiler No. 1	NA	79.8 MMBtu/hr	Coke Oven Gas and Natural Gas	SB1
B002	Boiler No. 2	NA	84.6 MMBtu/hr	Coke Oven Gas and Natural Gas	SB2
B003	Boiler No. 3	NA	41.6 MMBtu/hr	Coke Oven Gas and Natural Gas	SB3
B004	Boiler No. 4	NA	41.6 MMBtu/hr	Coke Oven Gas and Natural Gas	SB3

DECLARATION OF POLICY

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III. GENERAL CONDITIONS

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15. Reporting Requirements (§2103.12.k)

a. The permittee shall submit reports of any required monitoring at least every six (6) months. All instances of deviations from permit requirements must be clearly identified in such reports. All required reports must be certified by the Responsible Official.

b. Prompt reporting of deviations from permit requirements is required, including those attributable to upset conditions as defined in this permit and Article XXI §2108.01.c, the probable cause of such deviations, and any corrective actions or preventive measures taken.

c. All reports submitted to the Department shall comply with the certification requirements of General Condition III.4 above.

d. Semiannual reports required by this permit shall be submitted to the Department as follows:

1) One semiannual report is due by July 31 of each year for the time period beginning January 1 and ending June 30.
2) One semiannual report is due by January 31 of each year for the time period beginning July 1 and ending December 31.

e. Quarterly reports required by this permit shall be submitted to the Department on the last day of the month following each calendar quarter. The first quarterly report for the period October 4, 2018 to December 31, 2018, will be due January 31, 2019.

f. Reports may be emailed to the Department at aqreports@alleghenycounty.us in lieu of mailing a hard copy.

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IV. SITE LEVEL TERMS AND CONDITIONS

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25. SO_2 Compliance Monitoring

a. The permittee shall not flare, mix or combust coke oven gas, or allow such gas to be flared, mixed, or combusted as a fuel for or at any source unless the concentration of sulfur compounds, measured as hydrogen sulfide, in such gas is less than or equal to 35 grains per hundred dry standard cubic feet of coke oven gas. (§2105.21.h)

b. For sources listed in Table V.A.1, the permittee shall determine the H_2S grain loading and flow rate of the fuel as combusted. The permittee shall record the output of each system for measuring sulfur dioxide emissions discharged to the atmosphere.

26. SO_2 Compliance

The restrictions and requirements in Section V.A will become on or before effective October 4, 2018.

V. EMISSION UNIT LEVEL TERMS AND CONDITIONS

A. SO_2 Limits

The permittee is subject to the following conditions:

1. Restrictions:

a. The combustion units listed in Table V-A-1 shall only combust natural gas and coke oven gas. [§2102.04.b.6]

b. SO_2 emissions from the following sources shall not exceed the limitations in Table V-A-1 below: [§2102.04.b.6, §2105.21.h]

TABLE V-A-1: SO_2 Emission Limitations

Process	30 day Rolling Average Limit* (lb/hr)	Supplementary 24-hr Limit** (lb/hr)
Boiler #1	7.88	8.92
Boiler #2	8.36	9.46
Boilers #3-4 (aggregate)	8.21	9.30
80" Hot Strip Mill (aggregate)	108.63	118.75
HPH Annealing Furnaces (aggregate)	12.00	13.58
Open Coil Annealing (aggregate)	11.50	13.02
Continuous Annealing	8.07	9.14

* Limits are based on a rolling 30-day average of 24-hour (calendar day) averages.

** Supplementary 24-hour limit is not to be exceeded more than 3 times consecutively (over any consecutive 3 calendar day period).

2. Testing Requirements:

a. The permittee shall have sulfur dioxide (SO_2) emissions stack tests performed on emission units listed in Table V-A-1 at least once every two years as required by Article XXI §2108.02.b. SO_2 emission tests shall be conducted according to Method 6, 6A, 6B, or 6C as specified in 40 CFR 60, Appendix A. The permittee shall submit a stack test protocol to the Department for approval at least 45 days prior to the test date(s). [§2108.02.b; §2108.02.e]

b. Emissions of SO_2 shall be determined by converting the H_2S grain loading of the fuel burned and the fuel flow rate, to pounds per hour to determine compliance with the emission limitations of Table V-A-1 above. [§2103.12.h]

[redacted]

3. Monitoring Requirements:

Except for monitor malfunctions, associated repairs, and required quality assurance or control activities (including as applicable, calibration checks and required zero and span adjustments), the permittee shall continuously monitor and record the H_2S concentration (in grains(gr)/100 dscf) of the COG combusted and the fuel flow rate required in Site Level Condition IV.25.b. Continuously shall be defined as at least once every 15 minutes. [§2102.04.b.6; §2103.12.i]

4. Record Keeping Requirements:

a. The permittee shall keep records of hourly fuel use (COG and natural gas) and hourly H_2S concentration in grains per 100 dscf. [§2102.04.b.6; §2103.12.j]

b. The permittee shall record all instances of non-compliance with the conditions of this permit upon occurrence along with corrective action taken to restore compliance**.** [§2102.04.b.6; §2103.12.j]

[redacted]

5. Reporting Requirements:

a. The permittee shall report the concentration of H_2S per 100 dscf of COG averaged over a calendar day to the Department on a quarterly basis, in accordance with General Condition III.15.e. All instances of non-compliance with the conditions of this permit along with all corrective action taken to restore the subject equipment to compliance shall be reported. [§2103.12.k]

b. Reporting instances of non-compliance does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. [§2103.12.k]

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K-4: Harsco (Braddock Recovery)

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ALLEGHENY COUNTY HEALTH DEPARTMENT

AIR QUALITY PROGRAM
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1811

Federally Enforceable Installation Permit For 1-Hour SO_2 NAAQS

Issued To:	**Braddock Recovery, Inc.** **A Subsidiary of Harsco Corp.** 1300 Braddock Avenue Braddock, PA 15104	**ACHD Permit#:**	**0265-I001**
		Date of Issuance:	September 14, 2017
		Expiration Date:	(See Section III.12)

Issued By: _____
JoAnn Truchan, P.E.
Section Chief, Engineering

Prepared By: _____
Hafeez Ajenifuja
Air Quality Engineer

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I. CONTACT INFORMATION 3

II. FACILITY DESCRIPTION 4

III. GENERAL CONDITIONS 5

IV. SITE LEVEL TERMS AND CONDITIONS 10

V. EMISSION UNIT LEVEL TERMS AND CONDITIONS 18

A. PROCESS P005: ROTARY DRYER 18

AMENDMENTS:

DATE	*SECTION(S)*

I. CONTACT INFORMATION

Facility Location: **Braddock Recovery, Inc.**
1300 Braddock Avenue
Braddock, PA 15104

Permittee/Owner: **Braddock Recovery, Inc., a Subsidiary of Harsco Corp.**
300 Seven Fields Blvd
Seven Fields, PA 16046

Responsible Official: **Glenn Hundertmark**
Title: Manager, Environmental Control
Company: Harsco Corporation
Address: 300 Seven Fields Blvd, Suite 300
Seven Fields, PA 16046
Telephone Number: (724) 741-6662
Fax Number: (724) 741-6696
E-mail Address: ghundertmark@harsco.com

Facility Contact: **Michael Buvalla**
Title: Plant Manager
Telephone Number: (412) 351-5420
Fax Number: (724) 741-6696
E-mail Address: mbuvalla@harsco.com

AGENCY ADDRESSES:

ACHD Contact: **Chief Engineer**
Allegheny County Health Department
Air Quality Program
301 39th Street, Building #7
Pittsburgh, PA 15201-1811

EPA Contact: **Enforcement Programs Section (3AP12)**
USEPA Region III
1650 Arch Street
Philadelphia, PA 19103-2029

II. FACILITY DESCRIPTION

FACILITY DESCRIPTION

Braddock Recovery, Inc. (Braddock Recovery), a subsidiary of Harsco Corporation, is located on the U. S. Steel Edgar Thompson site. This facility receives by-products from U. S. Steel, including furnace flue dust, slag and sludge, mill scale, and coke fines, dries them in a rotary kiln fired with coke oven gas, combines them with lime, cement, sodium silicate, water, bentonite and molasses in a wet mixing process in two pugmills, and forms the moist mix into briquettes. These finished briquettes are piled on-site with a radial stacker and then loaded onto railcars and sent back to U. S. Steel Edgar Thomson to be used in the furnaces. The raw materials are loaded into the first stage of the process with a front-end loader. The front-end loader loads finished briquettes onto a conveyor and then into the railcars. Materials are moved through the entire process by a series of conveyors. The rotary kiln is controlled by a cyclone and a fabric filter. The particulate removed with these control devices is sent back to screw conveyor (S008). A vibrating screen is used just after the kiln to remove particles that are too large. Another vibrating screen is used at the end of the process to separate fine particles from the finished briquettes. These fines are then re-directed via conveyor to the mixers. The front-end loader loads finished briquettes onto a conveyor and then into the railcars. There are paved roadways and storage piles on-site. Fugitive particulate emissions from the storage piles are controlled by watering. Fugitive particulate emissions from the unpaved roadways are controlled with watering for dust control. Most operations occur in enclosed spaces.

The facility, which is located in Braddock, Pennsylvania, is a minor source of all criteria pollutants and Hazardous Air Pollutant (HAPs), as defined in Section 2101.20 of Article XXI. However, the facility is considered a major source based on operating, managing or supporting the U. S. Steel Edgar Thomson Plant "Waste Product Recycling and Briquetting Process.

[redacted]

The emission units regulated by this permit are summarized in Table II-1:

TABLE II-1: Emission Unit Identification

I.D.	SOURCE DESCRIPTION	SO_2 CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P005	Rotary Kiln Dryer	NA	50 tons/hr	Sludge, Mill Scale, Coke Breeze, Flue Dust, Coke Oven Gas	Stack 01

DECLARATION OF POLICY

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III. GENERAL CONDITIONS

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15. Reporting Requirements (§2103.12.k)

a. The permittee shall submit reports of any required monitoring at least every six (6) months. All instances of deviations from permit requirements must be clearly identified in such reports. All required reports must be certified by the Responsible Official.

b. Prompt reporting of deviations from permit requirements is required, including those attributable to upset conditions as defined in this permit and Article XXI §2108.01.c, the probable cause of such deviations, and any corrective actions or preventive measures taken.

c. All reports submitted to the Department shall comply with the certification requirements of General Condition III.4 above.

d. Semiannual reports required by this permit shall be submitted to the Department as follows:
   1) One semiannual report is due by July 31 of each year for the time period beginning January 1 and ending June 30.
   2) One semiannual report is due by February 1 of each year for the time period beginning July 1 and ending December 31.

e. Reports may be emailed to the Department at aqreports@alleghenycounty.us in lieu of mailing a hard copy.

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IV. SITE LEVEL TERMS AND CONDITIONS

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V. EMISSION UNIT LEVEL TERMS AND CONDITIONS

A. Process P005: Rotary Dryer

Process Description:	Rotary Kiln Dryer
Facility ID:	S004
Max. Design Rate/Units:	24.59 MMBTU/hr
Fuel:	Coke Oven Gas
Raw Materials:	Briquettes for Blast Furnace and BOP Shop
Control Device(s):	One (1) Cyclone and One (1) Baghouse

1. Restrictions

a. Emissions of SO_2 from the rotary kiln (S004) shall not exceed the emissions limitations in Table V-A-1 below. [§2102.04.b.6, §2105.21.h.~~4~~]

TABLE V-A-1: Rotary Kiln Emission Limitations

POLLUTANT	Hourly Emission Limit (lbs/hr)	Annual Emission Limit (tons/year)*
SO_2	1.80	7.88

* A year is defined as any consecutive 12-month period.

2. Testing Requirements

a. Emissions of SO_2 shall be determined by stack testing or converting the H_2S concentration (grains/100 dscf) of the fuel burned and the fuel flow rate, to pounds per hour of SO_2. [§2102.04.b.6; §2103.12.h]

b. The Department reserves the right to require additional emissions testing sufficient to assure compliance with the terms and conditions of this permit. Such testing shall be performed in accordance with §2108.02. [§2103.12.h.1]

3. Monitoring Requirements

The permittee may determine the hourly H_2S concentrations (grains/100 dscf) of the fuel burned, or the permittee may obtain the hourly H_2S concentrations from U.S. Steel. [§2103.12.i]

4. Record Keeping Requirements

a. The permittee shall keep records of hourly fuel use and hourly H_2S concentration (grains/100 dscf) to be used for SO_2 emission calculations. [§2103.12.j]

b. The permittee shall record all instances of non-compliance with the conditions of this permit upon occurrence along with corrective action taken to restore compliance. [§2102.04.b.6; §2103.12.j]

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5. Reporting Requirements

a. The permittee shall report all instances of non-compliance with the conditions of this permit along with all corrective action taken to restore the subject equipment to compliance to the Department semiannually in accordance with General Condition III.15.d. [§2103.12.k]

b. Reporting instances of non-compliance in accordance with condition V.A.5.a above, does not relieve the permittee of the requirement to report breakdowns in accordance with Site Level Condition IV.8, if appropriate. [§2103.12.k]

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