Pennsylvania Department of Environmental Protection

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Harrisburg, PA 17105-2063

June 23, 2011

Secretary 717-787-2814

Mr. Shawn M. Garvin
Regional Administrator
U.S. Environmental Protection Agency, Region III
1650 Arch Street (Mail Code: 3RA00)
Philadelphia, PA 19103-2029

Dear Mr. Garvin:

Pursuant to Section 107(d) of the Clean Air Act (CAA), enclosed are the Commonwealth of Pennsylvania's designation recommendations pertinent to the 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) of 75 parts per billion (ppb), which was promulgated by the U.S. Environmental Protection Agency (EPA) on June 2, 2010. (75 *Fed. Reg.* 35520).

During the 2008-2010 timeframe used for the designation recommendations, the Commonwealth of Pennsylvania had 28 SO_2 monitors operating statewide. Two of the monitors are special purpose monitors which do not meet the required network design criteria for the SO_2 NAAQS. Of the 26 network SO_2 monitors operating in the Commonwealth, 21 monitors show concentrations below the 1-hour SO_2 standard.

Based on 2008-2010 monitoring data which exceeds the 75 ppb standard, the Pennsylvania Department of Environmental Protection (DEP) is recommending "nonattainment" designations for Allegheny, Beaver, Indiana, and Warren counties. In recent years, SO_2 emissions have declined significantly in the Commonwealth due to the installation of control technology to comply mainly with the Clean Air Interstate Rule. We're anticipating further reductions following the promulgation of the Transport Rule and the maximum achievable control technology standards, and may revise our recommendations based on the 2009-2011 monitoring data.

Since DEP has not yet conducted dispersion modeling to support the monitoring data showing attainment of the standard, DEP recommends that the remaining counties in Pennsylvania be designated as "unclassifiable." We understand that EPA will provide notice of any modifications to Pennsylvania's recommendations at least 120 days prior to issuing the final designations for the 1-hour SO_2 standard. In response to EPA's proposed modifications, DEP may supplement its initial recommendations based on dispersion modeling that will be conducted for certain areas in the Commonwealth prior to EPA's issuance of final designations in February 2012.

Should you have questions or need additional information during the development of the final SO_2 NAAQS designations for Pennsylvania, please contact Joyce E. Epps, Director, Bureau of Air Quality, by e-mail at jeepps@state.pa.us or by telephone at 717-787-9702.

Sincerely,

Michael L. Krancer
Secretary

Enclosures

Commonwealth of Pennsylvania

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DESIGNATION RECOMMENDATIONS FOR THE 2010 1-HOUR SULFUR DIOXIDE NATIONAL AMBIENT AIR QUALITY STANDARD

JUNE 2011

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Designation Recommendations For the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard

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Overview of this document

The federal Clean Air Act (CAA) provides a mechanism for states to make recommendations to the United States Environmental Protection Agency (EPA) on the designation of areas meeting and not meeting the National Ambient Air Quality Standards (NAAQS). Section 107(d)(1) of the CAA establishes requirements and procedures for designating areas as "attainment," "nonattainment" or "unclassifiable" (if adequate data is not available) following EPA's promulgation of the NAAQS. 42 U.S.C. § 7409(d)(1).

In June 2010, EPA revised the NAAQS for sulfur dioxide (SO_2) (signed June 2, 2010, published June 22, 2010 at 75 FR 35,520). A new 1-hour primary standard of 75 parts per billion (ppb) was established, and the existing 24-hour and annual primary standards were revoked. The 1-hour standard is based on the 3-year average of the annual 99^{th} percentile of 1-hour daily maximum concentrations.

Following the promulgation of a NAAQS, each state submits NAAQS designation recommendations to EPA for all areas within its borders one year after the promulgation of the revised NAAQS; designation recommendations for the SO_2 NAAQS are due to EPA by June 3, 2011. The CAA authorizes the EPA Administrator to modify the designation recommendations and to provide an opportunity for states to demonstrate why the proposed modification is not appropriate.

In this document, the Department of Environmental Protection (DEP or Department) is making recommendations to EPA on behalf of the Commonwealth of Pennsylvania concerning the designation of attainment and nonattainment areas in Pennsylvania for the 2010 SO_2 NAAQS. The designation recommendations are based primarily on air quality monitoring data for 2008-2010. EPA anticipates making initial final designations by June 2012. The Department will continue to work with EPA during the SO_2 NAAQS designation process, which is described in more detail below.

What is SO_2 and why was a new standard necessary?

SO_2 is one of a group of highly reactive gasses known as "oxides of sulfur."

Current scientific evidence links health effects with short-term exposure to SO_2 ranging from 5-minutes to 24-hours. Adverse respiratory effects include narrowing of the airways which can cause difficulty breathing and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing). Studies also show an association between short-term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses--particularly in at-risk populations including children, the elderly and asthmatics.

EPA sets the NAAQS based on its review of existing scientific knowledge about the adverse health and welfare effects. The CAA requires EPA to review and update periodically, if necessary, the NAAQS to "protect public health with an adequate margin of safety" based on the latest, best-available science. EPA's evaluation of the scientific information and the risks posed by breathing SO_2 indicate that this new 1-hour standard will protect public health by reducing people's exposure to high short-term (5-minutes to 24-hours) concentrations of SO_2. The revised primary standard is consistent with the advice and recommendations of EPA's principal independent science advisors on NAAQS: the Clean Air Scientific Advisory Committee.

EPA estimates that the revised standard will yield health benefits valued between $13 billion and $33 billion, including reduced hospital admissions, emergency room visits, work days lost due to illness, and cases of aggravated asthma and chronic bronchitis, among other benefits.

Emissions that lead to high concentrations of SO_2 generally also lead to the formation of other oxides of sulfur. Reducing SO_2 emissions is expected to have the important co-benefit of reducing the formation of fine sulfate particles that pose significant public health threats.

EPA also revised the monitoring network requirements when it promulgated the 1-hour standard. All newly sited SO_2 monitors must be operational by January 1, 2013. Therefore, EPA will be basing its initial designations upon monitors in operation prior to 2012 and upon any refined air quality modeling completed by the states or EPA.

Nationally, the largest sources of SO_2 emissions are fossil fuel combustion units at power plants and other industrial facilities. Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high-sulfur fuels by home heating equipment, locomotives, large ships, and non-road equipment.

According to information compiled for 2008 emissions, large stationary sources contribute almost 90 percent of the SO_2 emissions in the Commonwealth, with most of those emissions coming from electric generation units. The latest year for which emissions for all sectors is available is 2008. Only large stationary sources are required to provide emissions information annually.

What is the process for designating areas and attaining the standard?

Section 107(d)(1)(B) of the CAA requires EPA to designate areas as nonattainment, attainment or unclassifiable after promulgating a new NAAQS. 42 U.S.C. § 7407(d)(1)(B). Following promulgation of new or revised air standards, Governors are required to submit recommendations for attainment, nonattainment and unclassifiable areas. Governors' recommendations for attainment, nonattainment and unclassifiable designations are to be submitted to EPA by June 3, 2011, one year after the promulgation of the revised NAAQS. EPA may make modifications and promulgate all or part of a Governor's recommendations. If EPA determines that a modification to the recommendation is necessary, EPA will notify the state no later than 120 days prior to promulgating the designation (120-day letter), and must give the state an opportunity to demonstrate why the potential modification is inappropriate. The CAA requires EPA to make final designations within two years of promulgation of a NAAQS unless there is insufficient information, in which case EPA may extend the time period by one year.

EPA stated in the preamble to the 2010 NAAQS that due to the generally localized impacts of SO_2, EPA has not historically considered monitoring alone to be an adequate nor the most appropriate tool to identify all maximum concentrations of SO_2. Therefore, EPA expects it will integrate air quality dispersion modeling into all phases of the SO_2 NAAQS implementation. Dispersion modeling 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.

Because of the expected reliance upon dispersion modeling in ultimately determining the boundaries of designated areas, EPA indicated it would provide additional guidance to states for designations and plans. However, EPA stated in its preamble to the 2010 NAAQS that it will take time for EPA to issue the guidance, and that it may not be available for states to use in their initial recommendations. EPA suggested that initial state designation recommendations of unclassifiable would not be unexpected for areas without violations at an air quality monitor. In its March 24, 2011 memorandum, *Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards*, EPA also indicated that even the first round of designations may not identify all areas where NAAQS violations may be occurring, and that states would address any such areas in the course of developing State Implementation Plan (SIP) revisions under Section 110(a) of the Clean Air Act.

The CAA requires states to submit Section 110(a) SIP revisions describing how the state will implement, maintain and enforce the new SO_2 NAAQS. This obligation applies to all areas, whatever their designation. In the case of SO_2, the preamble to the NAAQS promulgation explains the analytical framework states are expected to use in submitting these SIP revisions. To qualify areas as attainment, states are expected to describe how the standard will be maintained. For designated nonattainment areas, states are required to submit attainment demonstration SIP revisions, including implementation of all reasonably available control measures, incremental reductions showing reasonable further progress, emission inventories and contingency measures. All SIP revisions are subject to public review and comment, including a public hearing.

Designated nonattainment areas are required to attain the standard as expeditiously as practicable, but no later than five years from the effective date of designation.

Anticipated milestones for the 1-hour SO_2 NAAQS are:

June 3, 2011	State recommendations due to EPA
February 3, 2012	EPA notifies Pennsylvania if EPA intends to modify recommendations for areas with existing monitoring networks and sufficient data
February 20, 2012	EPA anticipates opening a 30-day public comment period of intended designations
April 3, 2012	State deadline for response to EPA notification
June 2012	EPA makes final designations for areas based on existing monitoring network
January 2013	Additional monitoring to be operational
June 2013	Section 110(a) SIPs due for all areas
February 2014	Attainment demonstration SIP revisions due to EPA for nonattainment areas (18 months from the effective date of designation)
Mid-2015	Three years of data from new monitors become available to evaluate any additional monitored violations.
August 2017	Latest date by which nonattainment areas designated in 2012 must attain the NAAQS (5 years from the effective date of designations)

What would be the effects of designation as nonattainment?
The CAA contains different requirements for new and modified stationary sources in areas designated as nonattainment. In addition, the "general conformity" provisions of the CAA apply only in nonattainment and maintenance areas; the requirements of these provisions require federally-funded actions and projects must conform to the SIP in order not to interfere with NAAQS attainment and maintenance. Due to the relatively small amounts of sulfur in gasoline and on-road diesel fuel, transportation conformity (which addresses only highway vehicle emissions) does not apply to the SO_2 NAAQS.

Designation methodology

EPA guidance for designation boundaries.
Section 107(d)(1) of the CAA defines an area as nonattainment if it does not meet the NAAQS or if it is contributing to ambient air quality in a nearby area that does not meet the NAAQS. 42 U.S.C. § 7407(d)(1).

EPA stated in the June 22, 2010 rulemaking that the expected presumptive boundary for any area designated nonattainment would be the county boundary associated with a violation. States may provide additional information for larger or smaller nonattainment areas; the additional information would most likely be refined dispersion modeling. In its March 24, 2011 memorandum, *Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards*, EPA also recommended defining nonattainment boundaries with the use of well-defined jurisdictional lines or immovable landmarks or other readily identifiable boundaries.

EPA did not identify other specific factors in the preamble to the June 22, 2010 rulemaking that states should consider in their designation recommendations, but it did so in its March 24, 2011, memorandum. Because 1-hour SO_2 violations are generally associated with a large specific source (usually a stationary source), not all of the factors associated with regional pollutants such as ozone or fine particulates are appropriate considerations for this pollutant, such as population growth. EPA is recommending states base boundary recommendations on five factors, and other available data:

1. air quality data
2. emissions-related data
3. meteorology
4. geography and topography
5. jurisdictional and other boundaries

The Department has not yet conducted dispersion modeling for its SO_2 sources to be used in informing designation recommendations, because EPA guidance was not issued in sufficient time. The Department will conduct dispersion modeling in accordance with EPA guidance for many of its SO_2 sources to be able to respond to EPA before EPA makes its final designations in June 2012, including responding to the notice EPA must provide 120 days before the final designations if EPA intends to modify our recommended designations. Modeling will enable the Department to better consider the five factors recommended by EPA for boundary recommendations. The Department will aim to fulfill its obligations to submit Section 110(a) SIP revisions by June 2013 and submit attainment demonstrations in February 2014.

Designation Recommendations

The Department has determined that the EPA presumptive county boundary approach is reasonable for Pennsylvania.

EPA stated in the preamble to the 1-hour SO_2 NAAQS rulemaking that, for these initial designation recommendations, states should use monitoring data from the existing SO_2 network for the years 2008-2010. The Department and the local air quality agencies in Philadelphia and Allegheny counties operated 28 monitors in 20 counties during the period 2008-2010. Two of the monitors are special purpose monitors which do not meet the required network design criteria for the SO_2 NAAQS. The Department will provide EPA with any updated information available (for example, monitoring data for 2011 and a design value for 2009-2011) in response to EPA's 120-day letter expected in February 2012.

Attainment Areas

Of the 26 network monitors, 21 monitors in 16 counties did not show violations of the 1-hour SO_2 standard (including 3 monitors where data is incomplete). EPA stated in the preamble to the NAAQS rulemaking that absent monitoring data and air quality modeling results showing no violations, it expects that the initial designations will be unclassifiable as required by the Clean Air Act. Since the Department has not completed any dispersion modeling for designation purposes, no areas are being recommended as attainment at this time. If Department-conducted or evaluated dispersion modeling for sources in these counties can demonstrate attainment of the 1-hour standard, the Department will revise its recommendations from unclassifiable to attainment.

Nonattainment Areas

Monitors in Allegheny, Beaver, Indiana and Warren counties are violating the 1-hour SO_2 NAAQS using monitoring data from 2008-2010. The Department is recommending that these counties be designated as nonattainment areas.

In addition, Section 107(d)(1)(C)(i) of CAA, regarding designations by operation of law, provides that an area designated as nonattainment with respect to any air pollutant before November 1990 is designated as a nonattainment area for that pollutant. Portions of Armstrong County (Madison, Mahoning, Boggs, Washington and Pine townships) are designated as nonattainment for the 3-hour and annual SO_2 NAAQS. Therefore, the Department expects EPA to include these townships in its designations as nonattainment for the 1-hour SO_2 standard.

Unclassifiable Areas

At this time, the Department is recommending that all other counties in Pennsylvania be designated as unclassifiable.

The Department will be conducting or evaluating refined air quality dispersion modeling for sources. However, in Pennsylvania, there are more than 100 facilities with SO_2 emissions more than 100 tons per year (tpy) (determined by the maximum annual emissions in 2007, 2008 or 2009) and as many as 1,300 facilities with any reported SO_2 emissions. Modeling for these sources will be an enormous and resource intensive undertaking. EPA guidance was not provided in sufficient time to ensure modeling for a June 2011, submission of recommendations conforming to the guidance.

The Department may revise its recommendations regarding unclassifiable areas to recommend that designations be revised to either nonattainment or attainment based upon that modeling. There is little doubt that there are modeled violations in the Commonwealth associated with large sources of SO_2 emissions outside those counties with violating monitors. For example, of the five facilities with 2007-2009 maximum annual emissions of 100,000 tpy or greater, only one is in a county that is monitoring nonattainment.

Dispersion modeling to support the Department's 1-hour SO_2 designation recommendations will follow the United States Environmental Protection Agency (USEPA) March 24, 2011 memorandum, *Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards*. The Department intends to make available to the public the results of any modeling that has been completed by February 2012. EPA has indicated it would also provide an opportunity for public comment at that time of its intended designations and responses to state recommendations.

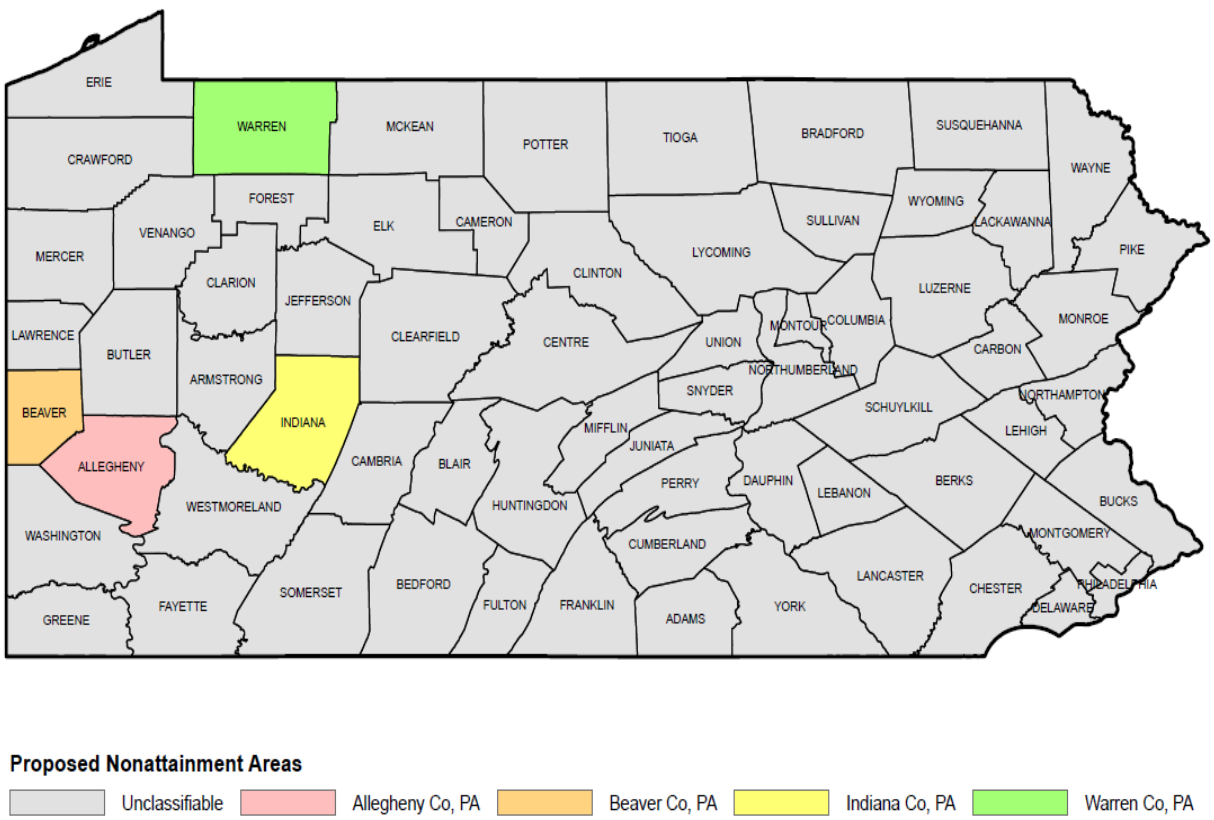
Table 1 summarizes the Commonwealth's recommendations by county. Figure 1 is a map showing the recommended nonattainment areas.

Table 1. Recommended SO_2 Designations in Pennsylvania

PA Counties	Recommendation
Adams County	Unclassifiable
Allegheny County	Nonattainment
Armstrong County	Unclassifiable
Beaver County	Nonattainment
Bedford County	Unclassifiable
Berks County	Unclassifiable
Blair County	Unclassifiable
Bradford County	Unclassifiable
Bucks County	Unclassifiable
Butler County	Unclassifiable
Cambria County	Unclassifiable
Cameron County	Unclassifiable
Carbon County	Unclassifiable
Centre County	Unclassifiable
Chester County	Unclassifiable
Clarion County	Unclassifiable
Clearfield County	Unclassifiable
Clinton County	Unclassifiable
Columbia County	Unclassifiable
Crawford County	Unclassifiable
Cumberland County	Unclassifiable
Dauphin County	Unclassifiable
Delaware County	Unclassifiable
Elk County	Unclassifiable
Erie County	Unclassifiable
Fayette County	Unclassifiable
Forest County	Unclassifiable
Franklin County	Unclassifiable
Fulton County	Unclassifiable
Greene County	Unclassifiable
Huntingdon County	Unclassifiable
Indiana County	Nonattainment
Jefferson County	Unclassifiable
Juniata County	Unclassifiable

PA Counties	Recommendation
Lackawanna County	Unclassifiable
Lancaster County	Unclassifiable
Lawrence County	Unclassifiable
Lebanon County	Unclassifiable
Lehigh County	Unclassifiable
Luzerne County	Unclassifiable
Lycoming County	Unclassifiable
McKean County	Unclassifiable
Mercer County	Unclassifiable
Mifflin County	Unclassifiable
Monroe County	Unclassifiable
Montgomery County	Unclassifiable
Montour County	Unclassifiable
Northampton County	Unclassifiable
Northumberland County	Unclassifiable
Perry County	Unclassifiable
Philadelphia County	Unclassifiable
Pike County	Unclassifiable
Potter County	Unclassifiable
Schuylkill County	Unclassifiable
Snyder County	Unclassifiable
Somerset County	Unclassifiable
Sullivan County	Unclassifiable
Susquehanna County	Unclassifiable
Tioga County	Unclassifiable
Union County	Unclassifiable
Venango County	Unclassifiable
Warren County	Nonattainment
Washington County	Unclassifiable
Wayne County	Unclassifiable
Westmoreland County	Unclassifiable
Wyoming County	Unclassifiable
York County	Unclassifiable

Figure 1. Recommended Nonattainment Areas.



Discussion of related factors

A general discussion of each factor and sources of information relevant to SO_2 designations is provided in this section of the document. The Department is using this information in prioritizing and conducting its modeling for purposes of working with EPA on designations during the designation process.

1. Air quality

The Department's designation recommendations for the short-term SO_2 NAAQS are based on the 2010 SO_2 design values[1] (calculated using the 2008, 2009, and 2010 monitored data).

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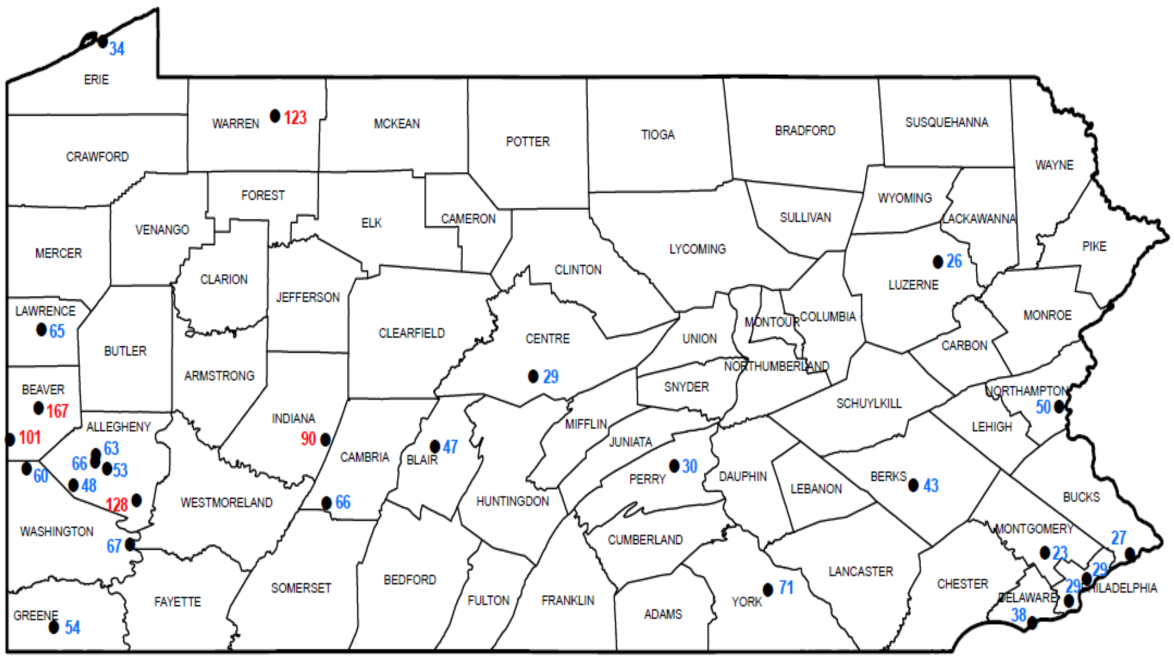
[1] The design value for the 1-hour SO_2 standard is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

Table 2. Design Values by Monitor (2008-2010)

County	Site	1-hour Design Value (ppb)
Allegheny Co.	Avalon	63
Allegheny Co.	Liberty	128
Allegheny Co.	Pittsburgh (BAPC)	29*
Allegheny Co.	Pittsburgh (Carnegie-DEP)	special purpose
Allegheny Co.	South Fayette	48
Allegheny Co.	Stowe	66
Beaver Co.	Brighton Twp	167
Beaver Co.	Hookstown	101
Berks Co.	Reading Airport	43
Blair Co.	Altoona	47
Bucks Co.	Bristol	27
Cambria Co.	Johnstown	66
Centre Co.	State College	29
Delaware Co.	Chester	38
Erie Co.	Erie	34
Greene Co.	Holbrook	special purpose
Indiana Co.	Strongstown	90
Lawrence Co.	New Castle	65
Luzerne	Wilkes-Barre	26
Montgomery Co.	Norristown	23
Northampton Co.	Easton	50
Perry Co.	Perry County	30
Philadelphia Co.	AMS	29*
Philadelphia Co.	Ritner	29*
Warren Co.	Warren Overlook	123
Washington Co.	Charleroi	67
Washington Co.	Florence	60
York Co.	York	71

(* does not meet data completeness requirement)

Figure 2. Design Values by Monitor (2008-2010)



Appearing in Red - 2010 1-hour SO_2 Design Values Above the Standard of 75 ppb

Appearing in Blue - 2010 1-hour SO_2 Design Values Below the Standard of 75 ppb

The DEP's *Ambient Air Monitoring Network Plan – 2011* (June 25, 2010), the Philadelphia Air Management Services' (AMS) *2010/2011 Air Monitoring Network Plan* (July 1, 2010) and the Allegheny County Health Department's (ACHD) *"Monitoring Network Review"* (July 1, 2010) describe the Commonwealth's plans for additional SO_2 monitoring. These documents are available on each of the respective agencies' websites as listed in the reference section. However, since these monitors will not have three years of data by the time EPA makes its initial designations, the SO_2 designation recommendations are based only upon the existing network.

2. Emissions

The counties that the Department is recommending as SO_2 nonattainment areas contain the following number of large sources (over 100 tpy of SO_2 in 2007, 2008 or 2009) of SO_2:

Allegheny County: 7 facilities
Beaver County: 3 facilities
Indiana County: 3 facilities
Warren County: 1 facility

A list of sources emitting over 100 tpy of SO_2 (maximum 2007-2009 reported emissions data) sorted by county is provided in Appendix A.

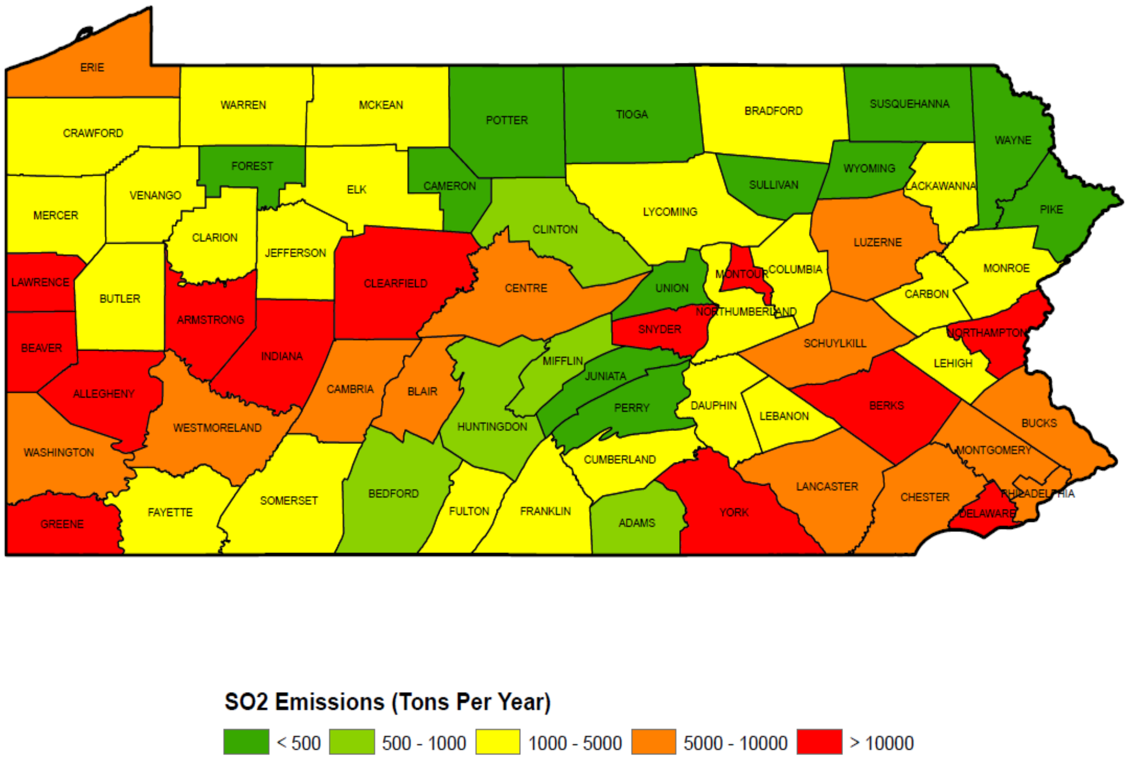
EPA expects active stationary sources to be the primary contributors to violations of the 1-hour SO_2 NAAQS. Note that these sources are not the only sources of SO_2 emissions. For example, the combustion of coal and oil for heating and industrial, commercial, or institutional purposes and the combustion of diesel for transportation purposes also contribute to SO_2 emissions.

The Department prepares an emission inventory for all criteria pollutants from all sectors every three years. Only stationary source data is available every year; the most recent full inventory was for the year 2008.

Table 3. Pennsylvania SO2 Emissions – 2008

SECTOR	**Emissions Tons per Year**	**Emissions Percent**
Stationary	864,732	87.0%
		(% of stationary)
Electric Generating Unit (EGU)	819,015	94.7%
Non-EGU	45,717	5.3%
Area stationary (includes small sources and home heating)	125,855	12.7%
Highway	1,661	0.2%
Nonroad	2,183	0.2%
TOTAL	**994,430**	

Figure 3. Pennsylvania SO_2 Emissions By County (2008)



3. Current level of emission controls

As indicated above, EGUs contribute about 82 percent of the SO_2 emissions in Pennsylvania. The EPA has included 40 EGUs operating in the Commonwealth in its National Electric Energy Data System (NEEDS). NEEDS 4.10 is the database of existing and planned-committed units which are in the EPA Base Case for the Integrated Planning Model (IPM) runs for the proposed Transport Rule (August 2, 2010). IPM is a multi-regional, dynamic, deterministic linear programming model of the U.S. electric power sector.

The Clean Air Interstate Rule and acid rain programs have caused significant reductions to be made in Pennsylvania in SO_2 emissions from sources affected by those programs in recent years.

Table 4. SO_2 Emissions from EGUs

(Source: EPA Acid Rain Program)

YEAR	SO2 (Tons)
2007	951,186.1
2008	831,914.9
2009	573,618.7
2010	393,196.4

Table 5 identifies EGUs in Pennsylvania and existing SO_2 controls.

Table 5. Controls on Electric Generating Units over 100 tons per year of SO_2 Emissions (Max 2007-2009)

(Source: EPA National Electric Energy Data System v 410)

FACILITY	FIRING	COUNTY	CONTROL
Cheswick	Coal Steam	Allegheny	Wet Scrubber
Keystone	Coal Steam	Armstrong	Wet Scrubber
Armstrong Power Station	Coal Steam	Armstrong	
Bruce Mansfield	Coal Steam	Beaver	Wet Scrubber
AES Beaver Valley Partners Beaver Valley	Coal Steam	Beaver	Wet Scrubber
Titus	Coal Steam	Berks	
Wheelabrator Falls	Munic solid waste	Bucks	Dry Scrubber
Colver Power Project	Coal Steam	Cambria	Reagent Injection
Ebensburg Power	Coal Steam	Cambria	Reagent Injection
Cambria Cogen	Coal Steam	Cambria	Reagent Injection
Panther Creek Energy Facility	Coal Steam	Carbon	Reagent Injection
Cromby Generating Station	Coal Steam	Chester	Wet Scrubber
Cromby Generating Station	O/G Steam	Chester	
Piney Creek Project	Coal Steam	Clarion	Reagent Injection
Shawville	Coal Steam	Clearfield	
Eddystone Generating Station	Coal Steam	Delaware	Wet Scrubber
Eddystone Generating Station	O/G Steam	Delaware	
Eddystone Generating Station	O/G Steam	Delaware	
Hatfields Ferry Power Station	Coal Steam	Greene	Wet Scrubber
Conemaugh	Coal Steam	Indiana	Wet Scrubber
Homer City Station	Coal Steam	Indiana	Wet Scrubber on 1 of 3 coal sources
Seward	Coal Steam	Indiana	Dry Scrubber
New Castle	Coal Steam	Lawrence	
PPL Montour	Coal Steam	Montour	Wet Scrubber

Table 5. Controls on EGUs continued			
FACILITY	**FIRING**	**COUNTY**	**CONTROL**
Portland	Coal Steam	Northampton	
Northampton Generating Company	Coal Steam	Northampton	Reagent Injection
PPL Martins Creek	O/G Steam	Northampton	Shutdown*
Foster Wheeler Mt Carmel Cogen	Coal Steam	Northumberland	Dry Scrubber
John B Rich Memorial Power Station	Coal Steam	Schuylkill	Reagent Injection
WPS Westwood Generation LLC	Coal Steam	Schuylkill	Reagent Injection
Wheelabrator Frackville Energy	Coal Steam	Schuylkill	Reagent Injection
St Nicholas Cogen Project	Coal Steam	Schuylkill	Reagent Injection
Sunbury Generation LP	Coal Steam	Snyder	Wet Scrubber on 4 coal sources
Sunbury Generation LP	Coal Steam	Snyder	Reagent Injection on 2 coal sources
Scrubgrass Generating	Coal Steam	Venango	Reagent Injection
Elrama	Coal Steam	Washington	Wet Scrubber
Mitchell Power Station	Coal Steam	Washington	Wet Scrubber
Mitchell Power Station	O/G Steam	Washington	
PPL Brunner Island	Coal Steam	York	Wet Scrubber
P H Glatfelter	Coal Steam	York	Reagent Injection on 1 of 4 sources

*Included in EPA's database for analysis purposes

SO_2 controls can include wet or dry scrubbers, also known as flue gas desulfurization (FGD) systems. SO_2 scrubbers use chemical and physical absorption to remove SO_2 from the flue gas. Wet scrubbers use a liquid sorbent to remove SO_2 and the flue gas leaving the absorber is moisture saturated. With dry scrubbers the flue gas leaving the absorber is not saturated. For circulating fluidized bed units (as shown in the "Firing" field), this field indicates whether reagent injection is used for SO_2 control. Reagent injection involves adding finely crushed limestone to the fluidized bed. During combustion, the limestone is reduced to lime, the sulfur in the fuel is oxidized to form SO_2, and, in the presence of excess oxygen, the SO_2 reacts with the lime particles to form calcium sulfate, which can be removed with the bottom ash or collected with the fly ash by a downstream particulate matter control device.

Existence of SO_2 controls does not necessarily equate to modeled attainment of the 1-hour SO_2 standard. EPA guidance recommends that dispersion modeling for designation purposes “should be based on the use of maximum allowable emissions or federally enforceable permit limits.”

The Commonwealth has also proposed lower sulfur limits for commercial fuel oil, both for heating and industrial/commercial purposes. Finally, EPA has issued rules to reduce sulfur in fuel used in large commercial marine vessels (directly affecting the ports of Erie, Pittsburgh and Philadelphia, but with significant ambient air effects much farther inland). Beginning in 2015, fuel used by all vessels operating in these areas cannot exceed 0.1 percent fuel sulfur (1,000 ppm). This requirement is expected to reduce SO_2 emissions by more than 85 percent.

4. Geography/topography and meteorology

Local terrain and meteorology affect the direction of transport and the dispersion of pollutants. The recommended model for SO_2 modeling, AERMOD, contains modules that account for terrain and meteorology. Meteorological data must be spatially and climatologically (temporally) representative of the area of interest. The representativeness of the data is dependent on: (1) the proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected. Because most of the largest SO_2 sources have been through relatively recent plan approval processes that required air quality modeling, the Department believes that it has representative meteorological data in-house for its modeling efforts related to designations.

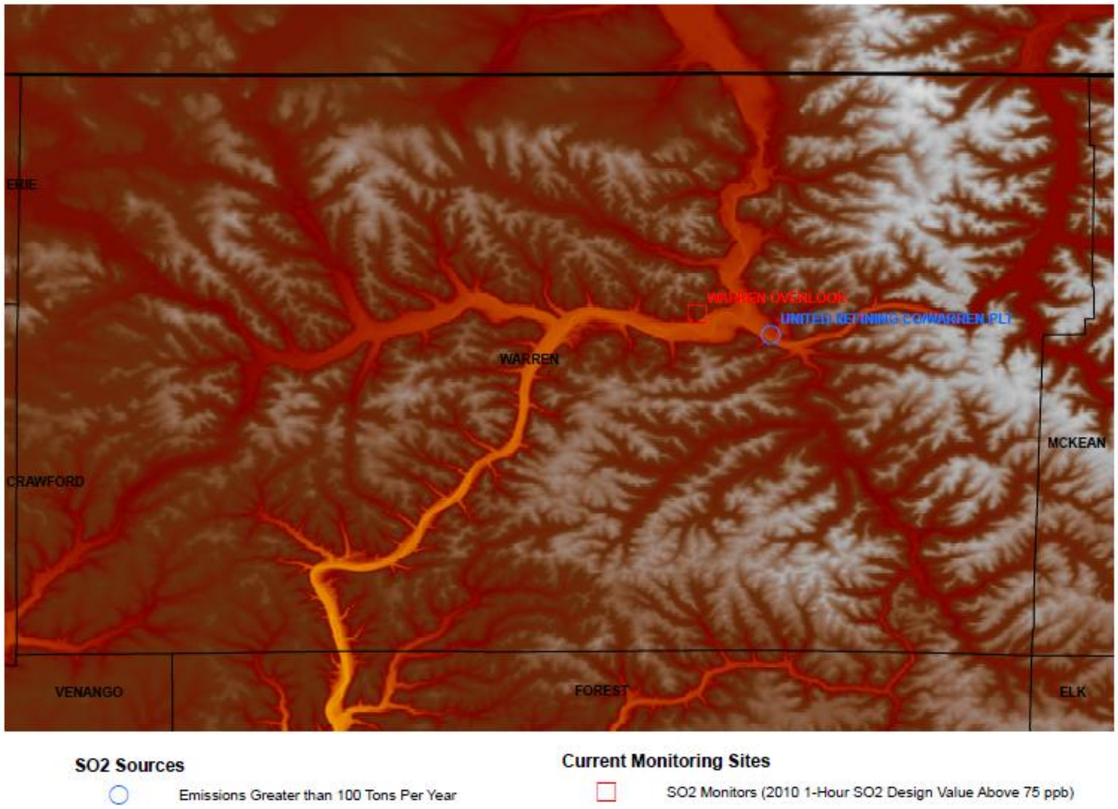
Air quality impact analysis must also consider how terrain features influence the behavior of air pollution plumes. AERMOD uses a terrain preprocessor to generate elevation data for each model receptor. It also provides information that allows the dispersion model to simulate the effects of air flowing over hills or splitting to flow around hills.

The Department has conducted initial meteorological and topographic analyses for the monitors in the four recommended nonattainment areas. The analysis confirms that the county nonattainment area is the most reasonable boundary for Warren, Beaver and Allegheny counties, because the sources of the violations are most likely within the county. For Indiana County, the analysis indicated that, while a county boundary is reasonable, further analysis through modeling may be necessary to assess whether the nonattainment boundaries should be refined. Overall, the prominent westerly winds and stronger wind speeds are indicating that the driving source of the higher SO_2 concentrations may be coming from the larger SO_2 sources to the west of Strongstown. These types of sources generally have taller stacks and higher emission rates which helps in the downwind transport of pollution. Until this analysis is completed, the Department is recommending a county nonattainment boundary for Indiana County.

Warren County

Warren County is situated within the western flank of the Appalachian Mountain chain. Figure 4 below displays a topographical overview of all of Warren County. There is one major river that runs through the county. The Allegheny River flows from the Allegheny Reservior (in the far northeastern portion of the county, south and eastward toward Forest County on its way into Pittsburgh. Otherwise, the county is marked by its higher terrain. When combined with the Allegheny River, this higher terrain is what helps drive the meteorological pattern within the county.

Figure 4. Warren County Topographical Map



Warren-Overlook SO_2 Monitoring Location

Warren-Overlook is situated on a portion of the higher terrain in the eastern side of Warren County. Figure 5 displays the location of the Warren-Overlook monitor with respect to the major SO_2 sources. In addition, Figure 2 highlights the terrain above the anemometer of height of the Warren-Overlook meteorological tower (anemometer is at 10 meters plus base elevation of tower at 580 meters). Therefore, the measurements being taken by the Warren-Overlook meteorological tower are likely to be influenced by the higher terrain to its east.

Figure 5. Warren-Overlook Topographical Map

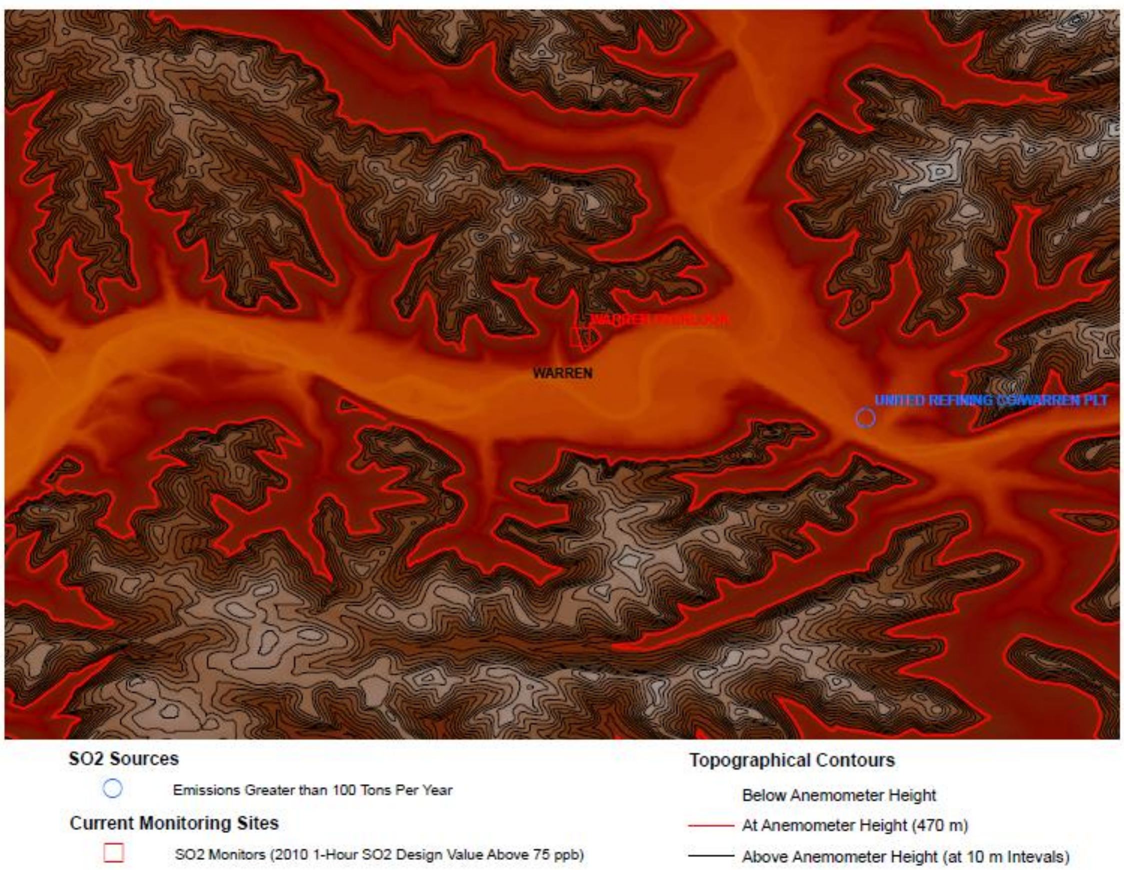
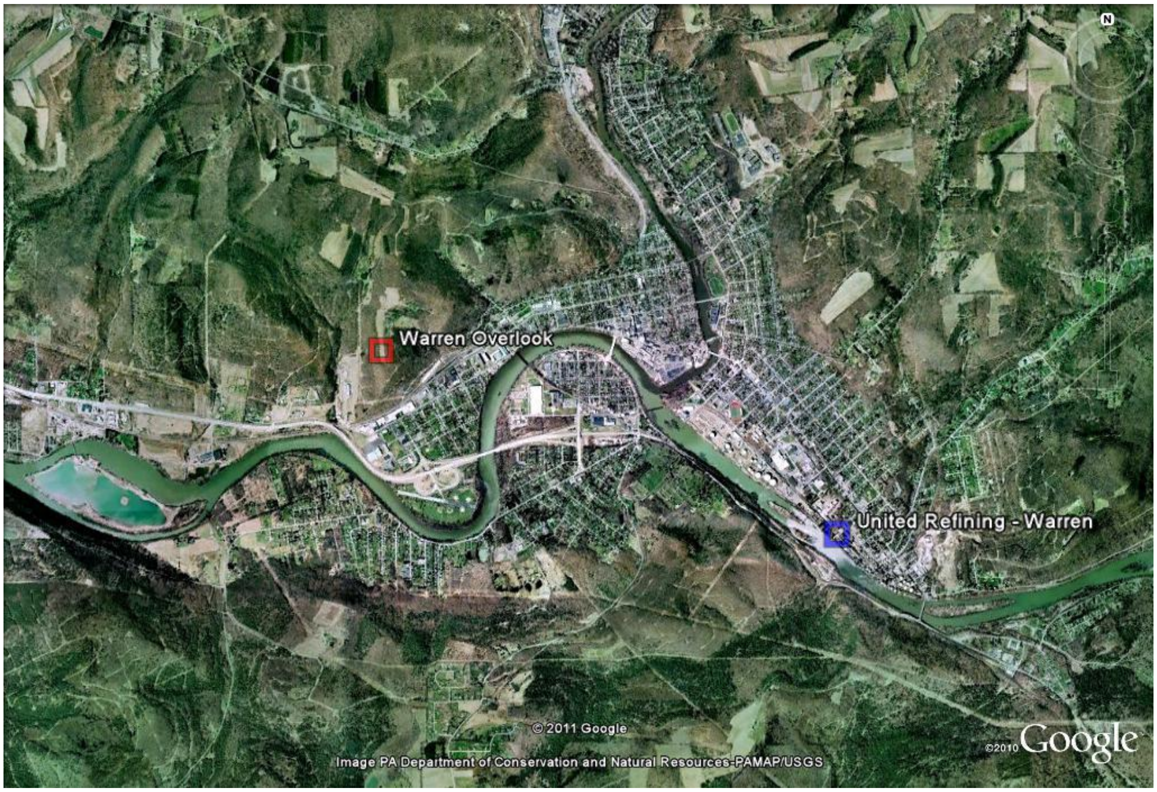


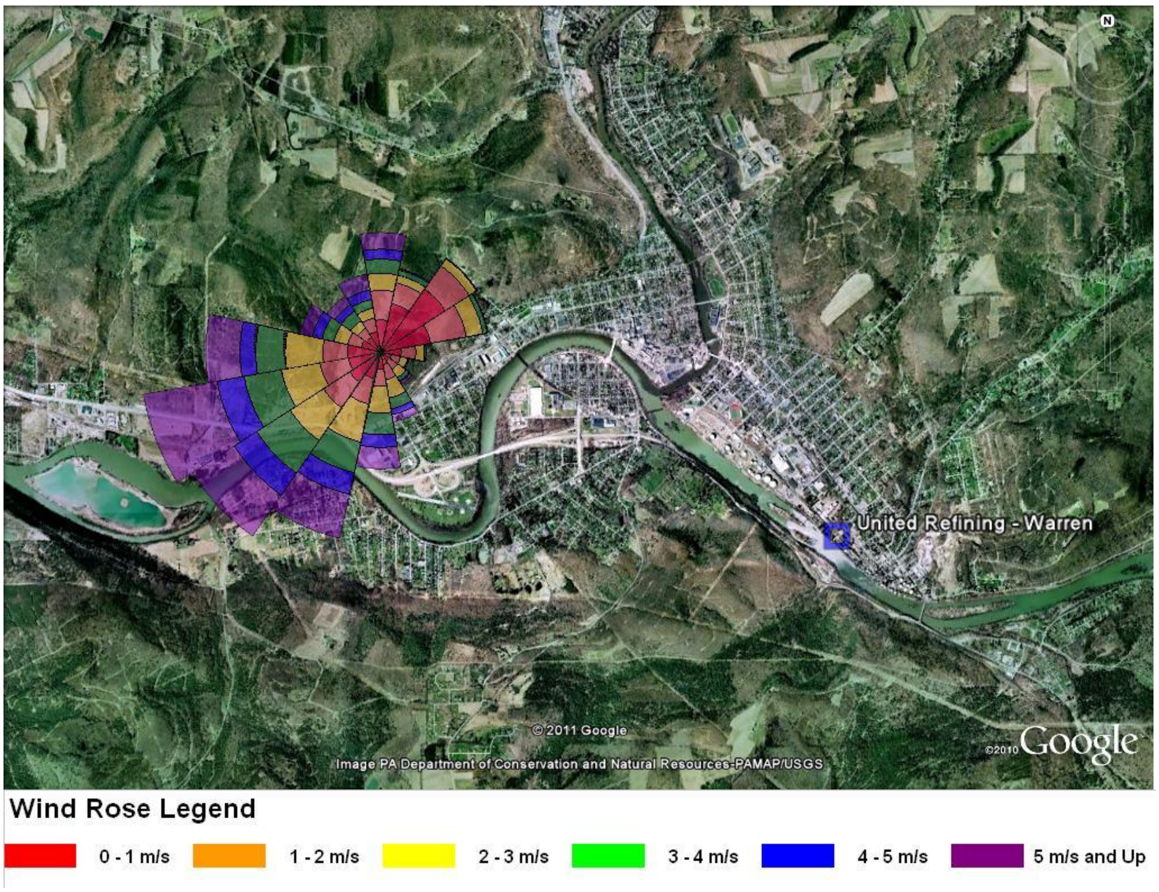
Figure 6 (courtesy of Google Earth) displays a zoomed in look at the actual Warren-Overlook monitoring location with respect to the other regional SO_2 sources.

Figure 6. Warren Overlook Monitoring Location



The impact of the topography near Warren-Overlook can also be seen by looking at the wind measurements that were collected at the Warren-Overlook air monitoring station (meteorological data, including wind direction and speed, are continuously measured). Figure 7 (courtesy of Google Earth) displays the wind data measured at Warren-Overlook's meteorological tower from January 2008 to December 2010 (a full three year dataset).

Figure 7. Wind Rose for the Warren-Overlook Monitor



The wind is primarily out of the west and southwest. There is also a secondary maximum out of the north and east. This wind profile follows the synoptic wind flow over northern Pennsylvania. Stronger winds exist out of the southwest than out of the northeast because the winds out of the southwest are undergoing less friction (the main river that runs through Warren County runs off to the south of the monitoring station). The wind undergoes more friction from the northeast due to the higher terrain in that direction.

Taking a cross section look (in three dimensions within Google Earth) at the local area in Figure 8 below, one can see the relationship of the local terrain with respect to the major SO_2 sources in the region and the Warren-Overlook air monitor station.

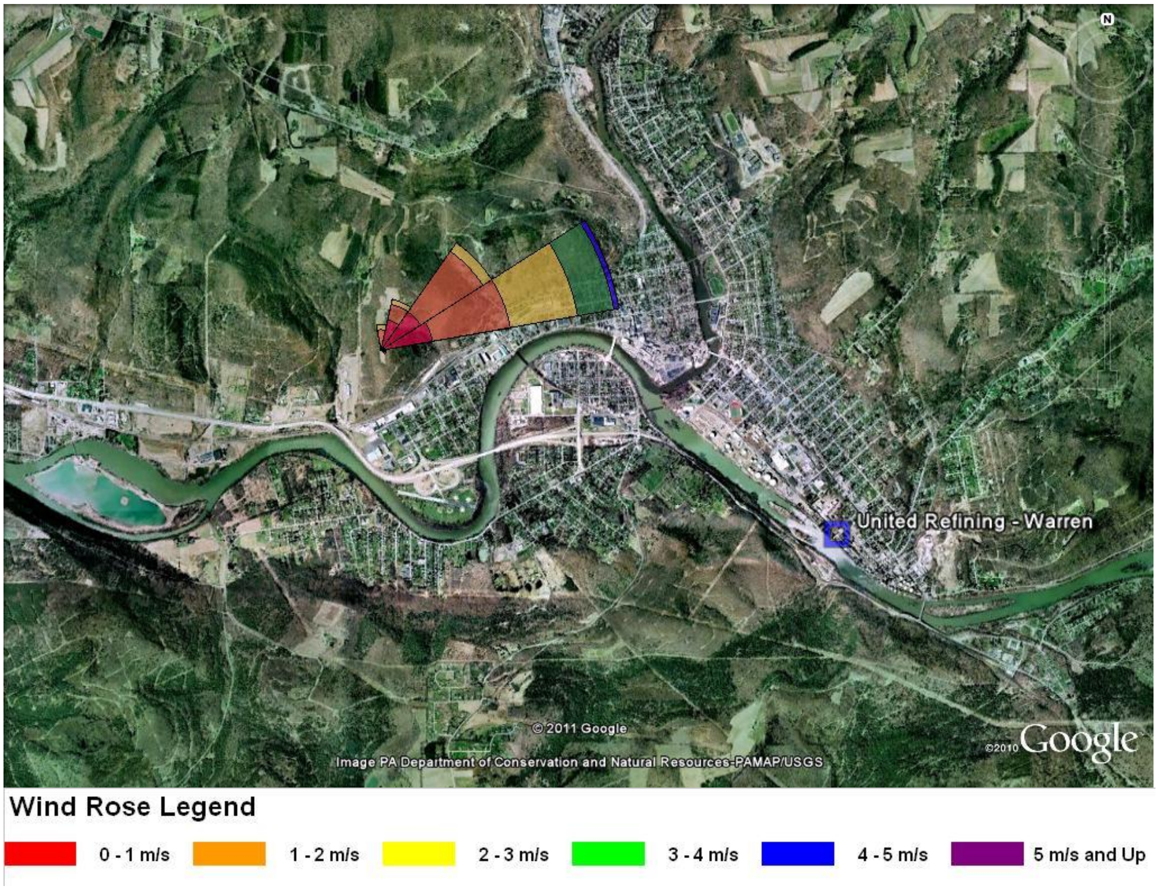
Figure 8. Local Terrain

From Figure 8 (which looks south to north), one can see that the Warren-Overlook air monitoring station sits on the side of a hill. The main SO2 source in the region sits down within the river valley.

Also from Figure 8 above, one can see that the Warren-Overlook monitor lies to the west of the major SO_2 source. The Warren-Overlook monitor acquires SO_2 samples from the air continuously every hour, which results in approximately 8760 hours of samples every year. The latest design value year, 2010 (which is based on data from 2008 to 2010), showed the Warren-Overlook monitor exceeding the new SO_2 standard with a concentration of 123 ppb. The Department analyzed the data to focus in on the hours in which the SO_2 concentrations exceeded the new 1-hour SO_2 standard. 112 hours were found to exceed this threshold. Out of those 112 hours, 88 hours had complete corresponding meteorological data. Then, the Department analyzed the wind data and created a wind rose to coincide with the meteorological data collected on those 88 hours that were found to exceed the new 1-hour SO_2 standard threshold.

Figure 9 shows the results.

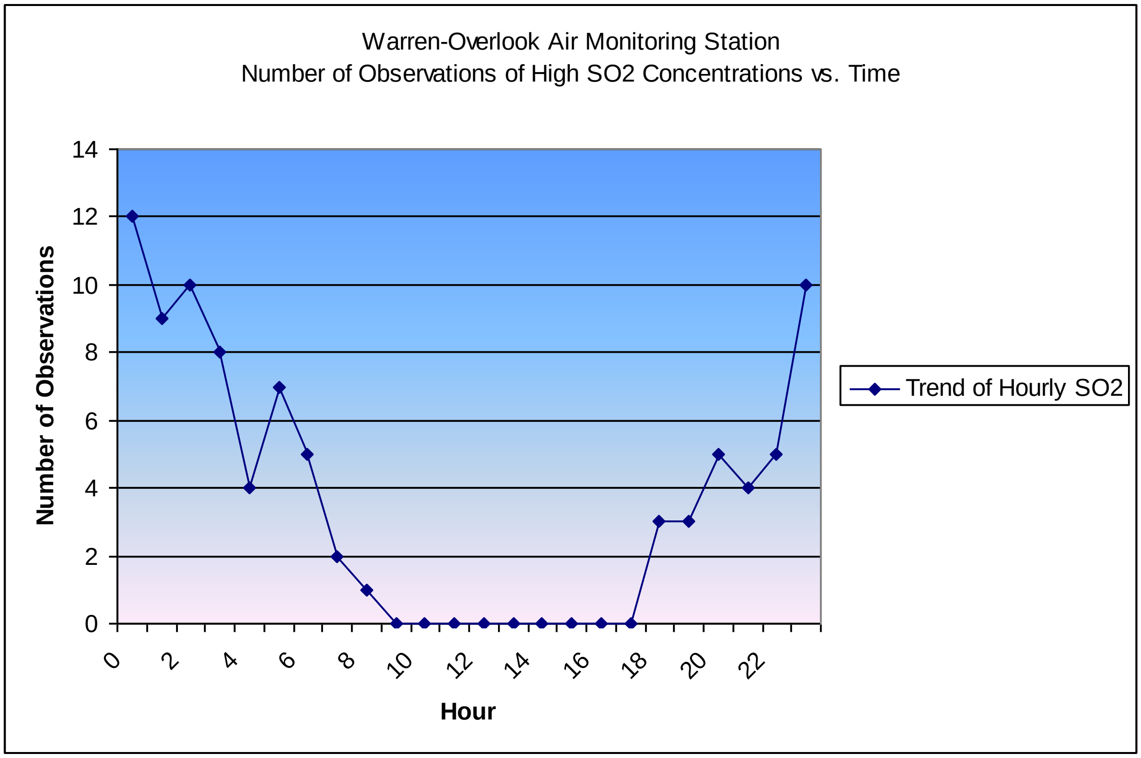
Figure 9. Wind Rose Data for Exceedance Hours



When comparing this figure with Figure 7 above, one will notice that the primary wind direction has changed. During the periods when there are high SO_2 concentrations, the wind is primarily out of the north and east. In addition, wind speeds are generally stronger, out of the east, indicating that the winds are unimpeded (from the impact of higher terrain) from that direction. Rotating counter-clockwise, the winds become generally lighter as the winds undergo more friction (from the higher terrain to the north). The combination of the severe terrain within the Warren-Overlook area combined with northeasterly component of the wind would indicate that a local source within the valley is creating the high SO_2 concentrations.

The time of the day when the SO_2 concentrations are occurring is also of importance. Figure 10 illustrates when the Warren-Overlook monitor is experiencing the high 1-hour SO_2 concentrations.

Figure 10. Time of Day for SO_2 Exceedamces



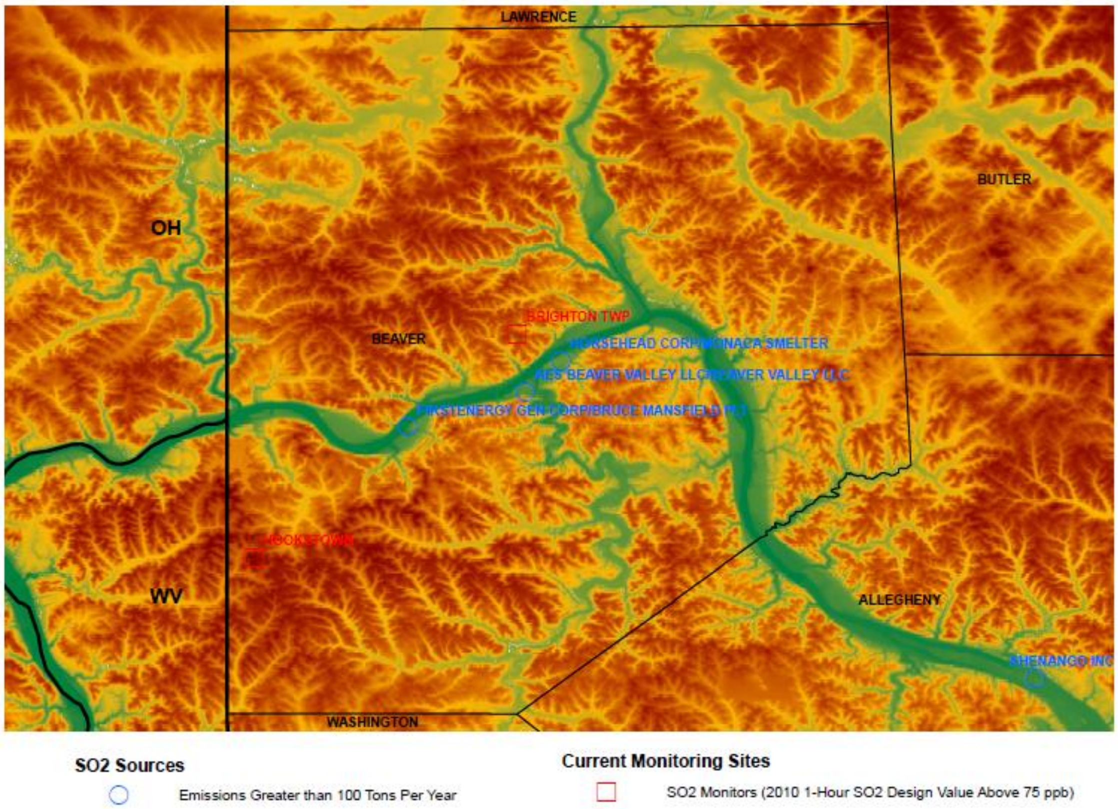
All of the high SO_2 concentrations are occurring in the late evening to early morning hours (from 7 PM to 9 AM). The timing of these exceedances coupled with the fact that the Warren-Overlook monitoring site is situated within a valley increases the likelihood that meteorological inversions are assisting in driving SO_2 concentrations higher. Once an inversion forms and the wind near the surface decreases, localized air pollution becomes trapped near the surface. Therefore, there is even more likelihood that the high SO_2 concentrations are driven by an SO_2 source in close proximity to monitor.

Due to the nature of the high SO_2 concentrations around the Warren-Overlook monitor, the Department is recommending that Warren County be designated nonattainment for the new SO_2 standard.

Beaver County

Beaver County is situated to the west of the Appalachian Mountain chain. Figure 11 below displays a topographical overview of all of Beaver County. There are two major rivers that run through the relatively high terrain of Beaver County. The Ohio River, which flows into the county from Pittsburgh, runs from east to west across the county. The Beaver River, flows from south to north from Lawrence County into the Ohio River near the city of Monaca. When combined with the higher topography, these rivers help drive the meteorological pattern witnessed within the county.

Figure 11. Beaver County Topographical Map



Brighton Township SO_2 Monitoring Location

Brighton Township is situated on higher terrain while being within a mile of the Ohio River (which lies to the south of the monitor). Figure 12 displays the location of the Brighton Township monitor with respect to the major SO_2 sources. In addition, Figure 2 highlights the terrain above the anemometer of height of the Brighton Township meteorological tower (anemometer is at 10 meters plus base elevation of tower at 366 meters). Therefore, the measurements being taken by the Brighton Township meteorological tower are not very influenced by any of the terrain in its immediate vicinity.

Figure 12. Brighton Township (Beaver County) Topographical Map

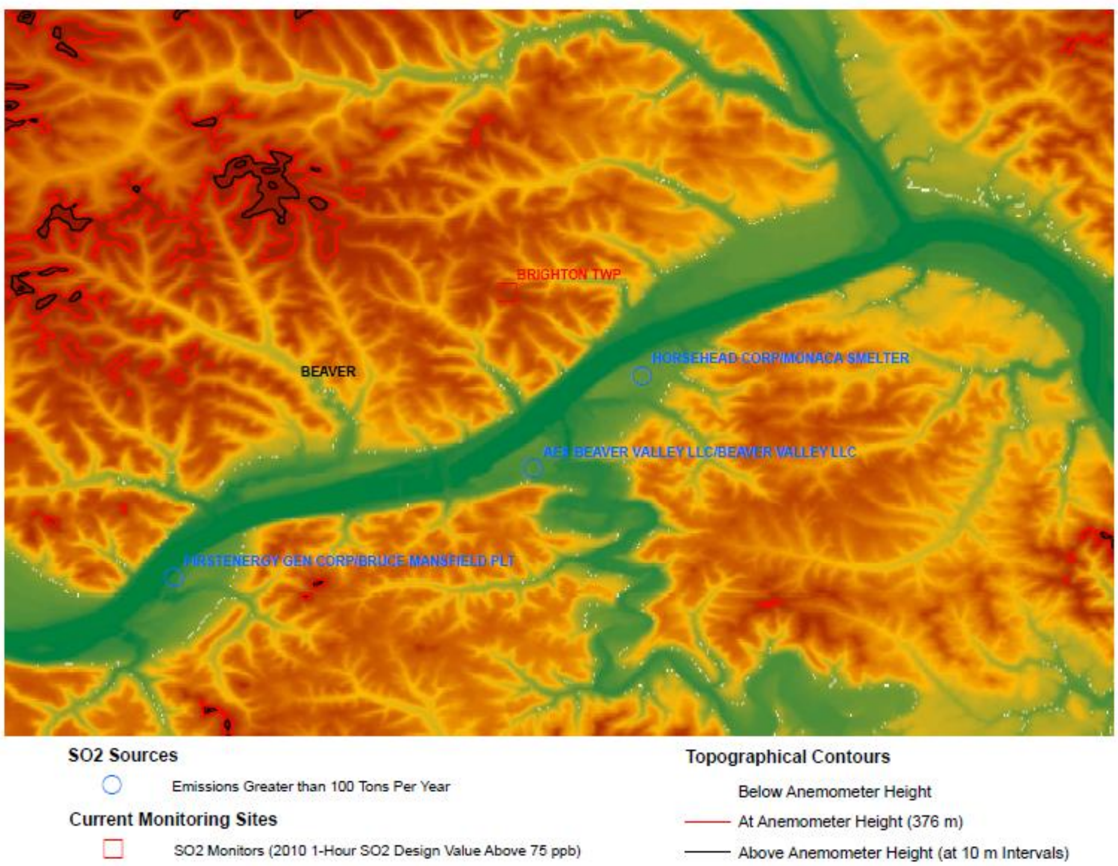
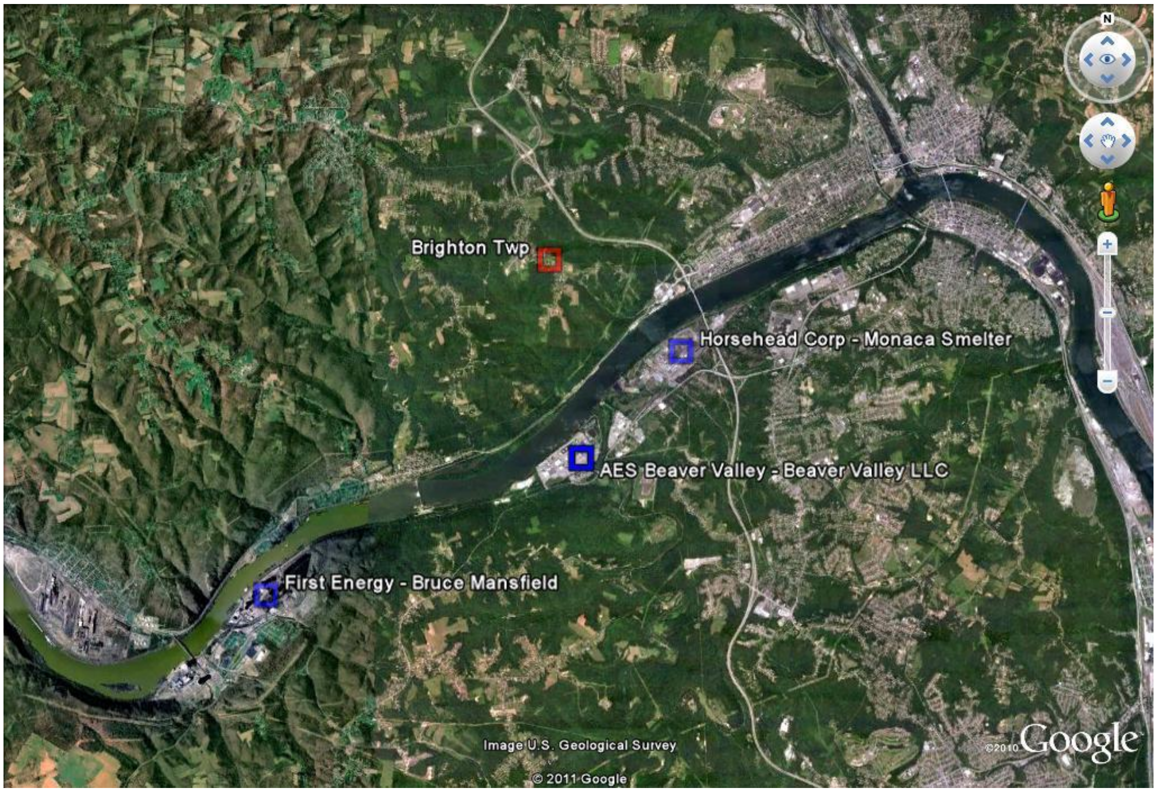


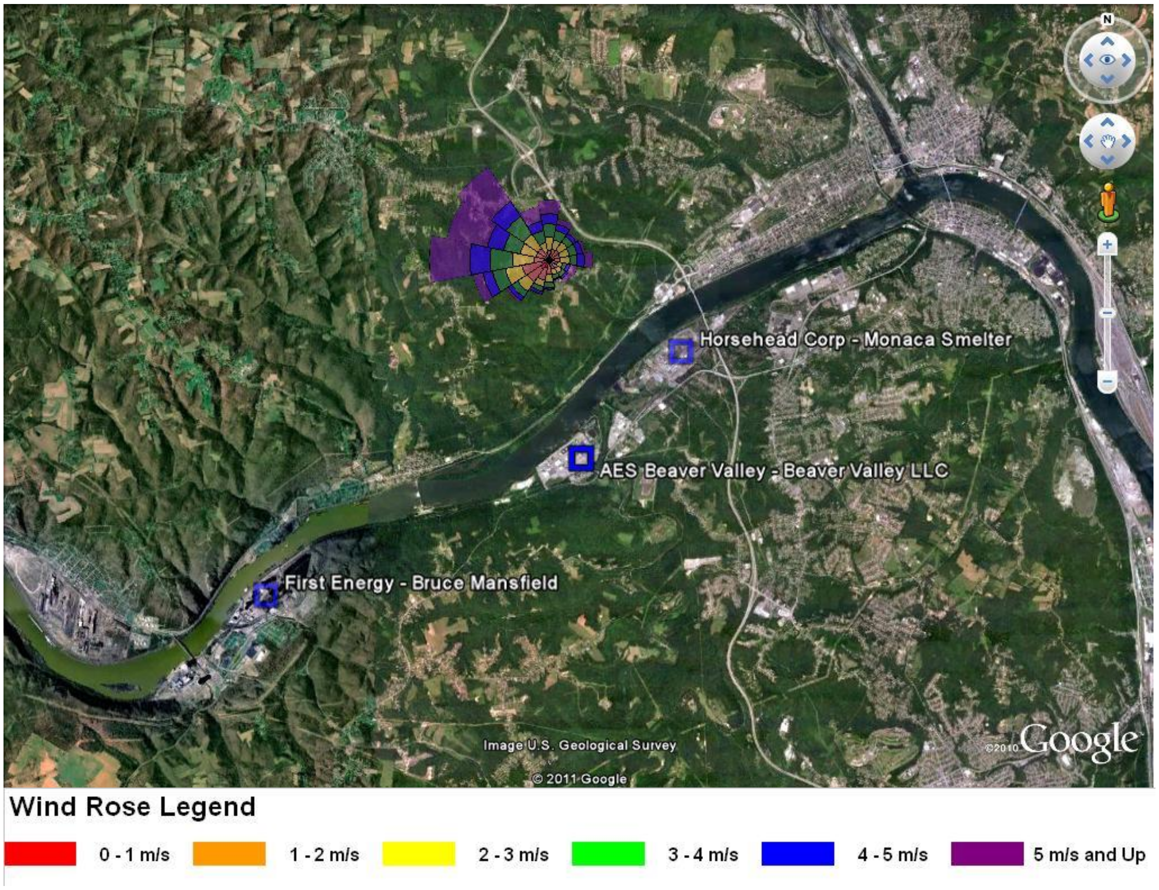
Figure 13 (courtesy of Google Earth) displays a zoomed in look at the actual Brighton Township monitoring location with respect to the other regional SO_2 sources.

Figure 13. Brighton Township Monitoring Location



The impact of the topography near Brighton Township can also be seen by looking at the wind measurements that were collected at the Brighton Township air monitoring station (meteorological data, including wind direction and speed, are continuously measured). Figure 14 (courtesy of Google Earth) displays the wind data measured at Brighton Township's meteorological tower from January 2008 to December 2010 (a full three year dataset).

Figure 14. Wind Rose Data for the Brighton Monitor



The wind is primarily out of the west and northwest. This wind profile follows the synoptic wind flow over the region and is not surprising by referencing Figure 12 above, which shows that there is not any significant terrain that is influencing the wind measurements.

Taking a cross section look (in three dimensions within Google Earth) at the local area in Figure 15 below, one can see the relationship of the local terrain with respect to the major SO_2 sources in the region and the Brighton Township air monitor station.

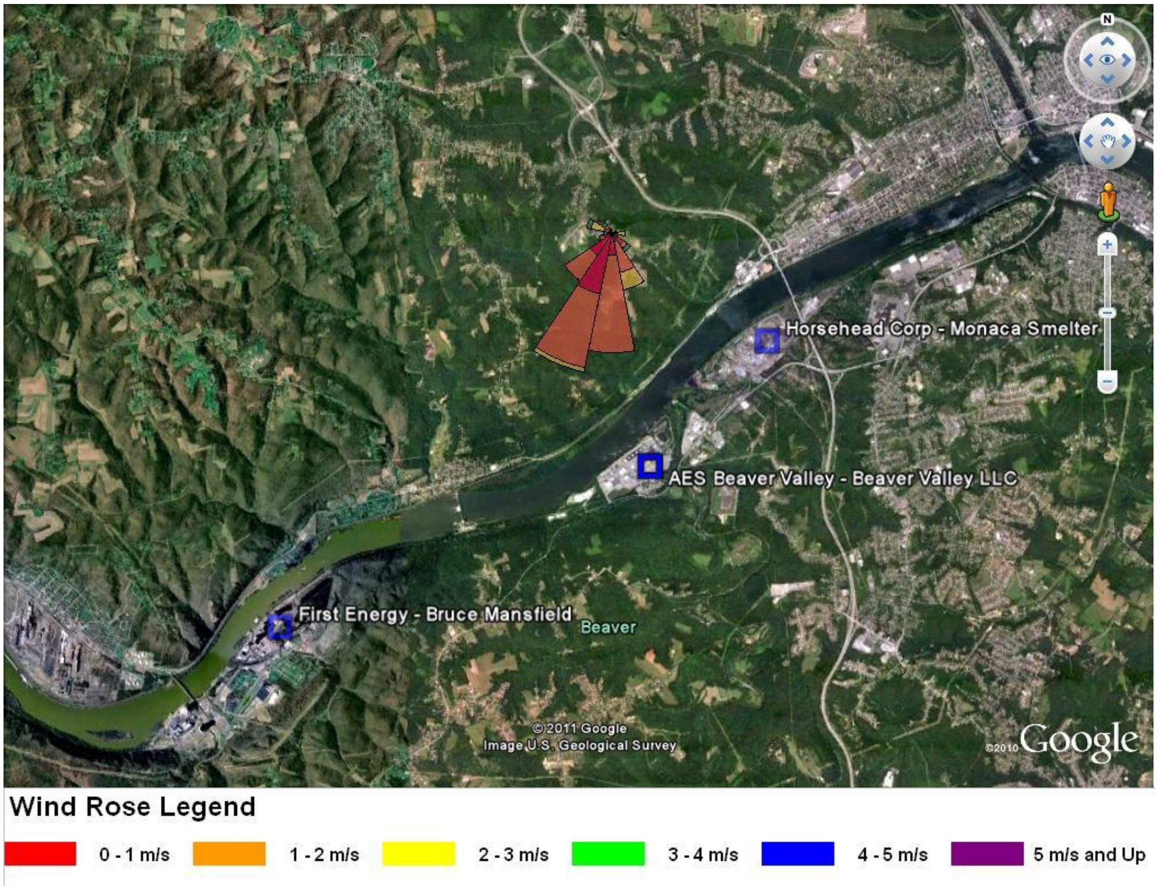
Figure 15. Local Terrain

From Figure 15 (which looks south to north), once again one can see that the Brighton Township air monitoring station sits on top of a local hill, with many of the major SO_2 sources sitting in the Ohio River valley.

Also from Figure 15 above, one can see that the Brighton Township monitor lies to the north of these SO_2 sources. The Brighton Township monitor acquires SO_2 samples from the air continuously every hour, which results in approximately 8760 hours of samples every year. The latest design value year, 2010 (which is based on data from 2008 to 2010), showed the Brighton Township monitor exceeding the new SO_2 standard with a concentration of 167 ppb. The Department analyzed the data to focus in on the hours in which the SO_2 concentrations exceeded the new 1-hour SO_2 standard. 183 hours were found to exceed this threshold. Out of those 183 hours, 110 hours had complete corresponding meteorological data. Then, the Department analyzed the wind data and created a wind rose to coincide with the meteorological data collected on those 110 hours that were found to exceed the new 1-hour SO_2 standard threshold.

Figure 16 shows the results.

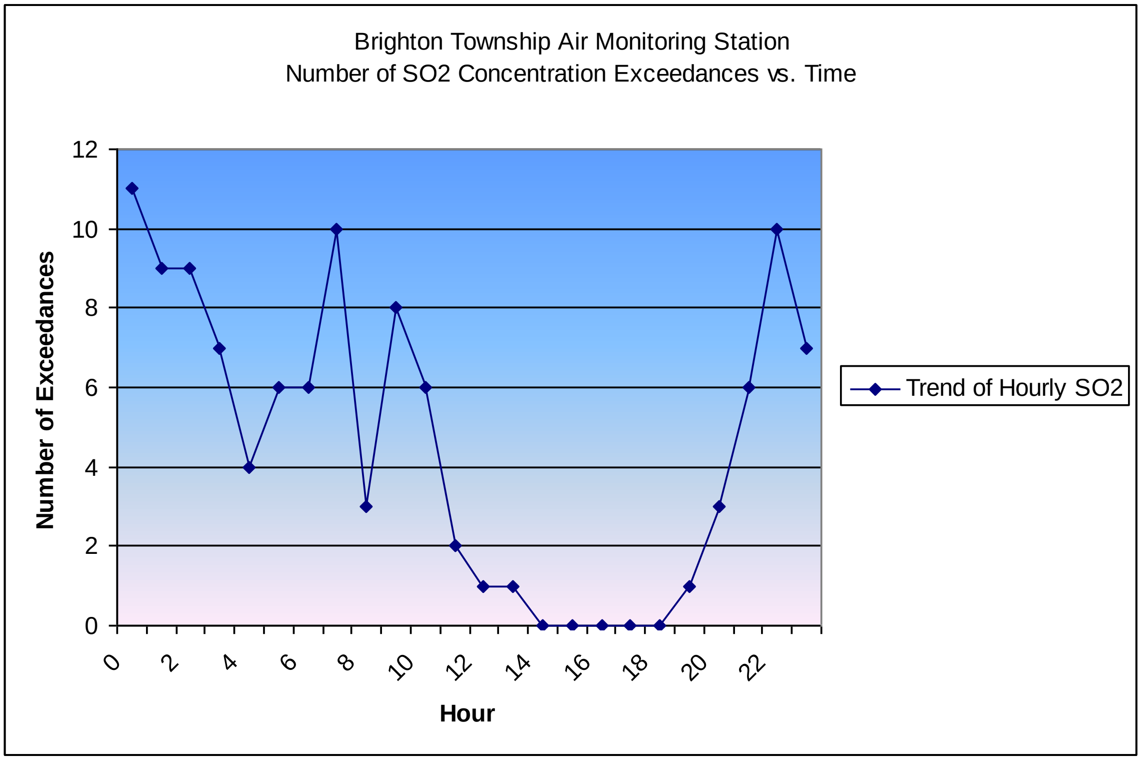
Figure 16. Wind Rose Data for Exceedance Hours



When comparing this figure with Figure 14 above, one will notice that the primary wind direction has changed. During the periods when there are high concentrations of SO_2, the wind is primarily out of the south, southwest. In addition, wind speeds are generally slower, indicating that a much more stable air mass is in place over the region when SO_2 concentrations rise. A stable boundary layer would limit vertical mixing, thus allowing concentrations to build near the surface. Overall, the prominent southwesterly winds and lighter wind speeds are indicating that the driving source of the higher SO_2concentrations is coming from the SO_2 sources sitting within the Ohio River valley to the monitors south.

The time of the day when the SO_2 concentrations are occurring is also of importance. Figure 17 illustrates when the Brighton Township monitor is experiencing the high 1-hour SO_2 concentrations.

Figure 17. Time of Day For SO_2 Exceedances

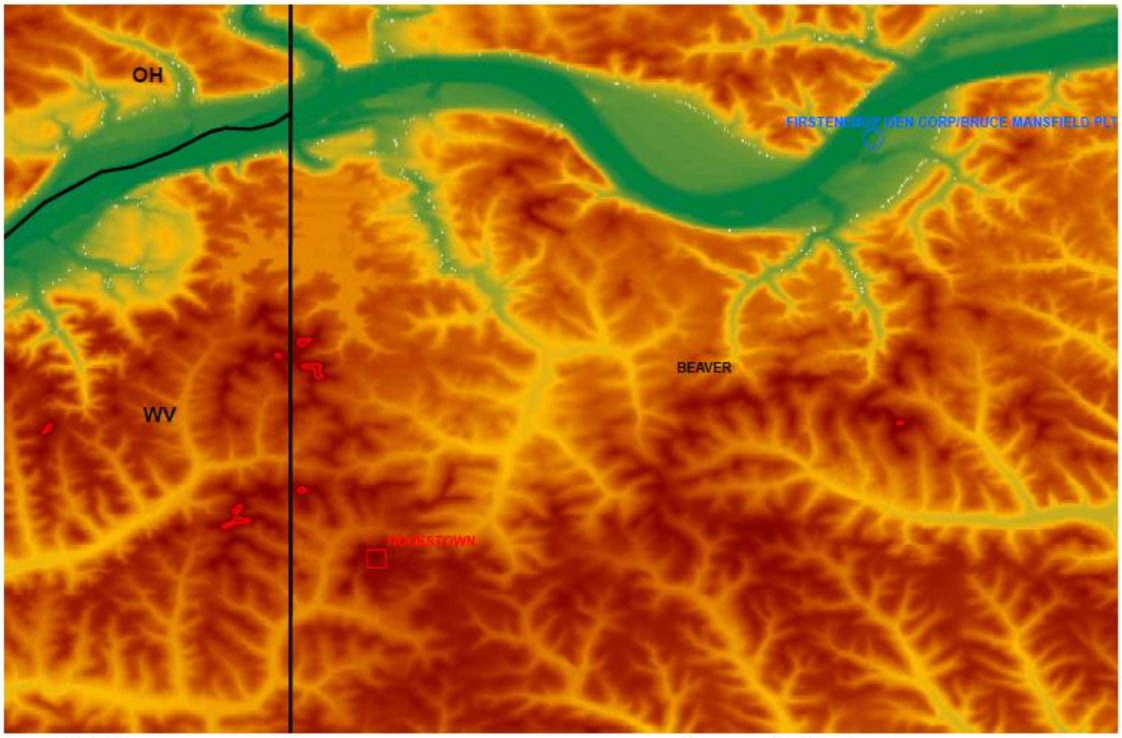


Most of the high SO_2 concentrations are occurring in the late evening to early morning hours (from 8 PM to 10 AM). The timing of these exceedances coupled with the fact that the Brighton Township monitoring site is situated within a valley increases the likelihood that meteorological inversions are assisting in driving SO_2 concentrations higher. Once an inversion forms and the wind near the surface decreases (see Figure 6 for an example of this), localized air pollution becomes trapped near the surface. Therefore, there is even more likelihood that the high SO_2 concentrations are driven by an SO_2 source in close proximity to monitor.

Hookstown SO_2 Monitoring Location

Hookstown is situated on higher terrain while being within several miles of the Ohio River (which lies to the north of the monitor). Figure 18 displays the location of the Brighton Township monitor with respect to the major SO_2 sources. In addition, Figure 18 highlights the terrain above the anemometer height of the Hookstown meteorological tower (anemometer is at 10 meters plus base elevation of tower at 366 meters). Therefore, the measurements being taken by the Hookstown meteorological tower are not very influenced by any of the terrain in its immediate vicinity.

Figure 18. Hookstown (Beaver County) Topographical Map



SO2 Sources

○ Emissions Greater than 100 Tons Per Year

Current Monitoring Sites

□ SO2 Monitors (2010 1-Hour SO2 Design Value Above 75 ppb)

Topographical Contours

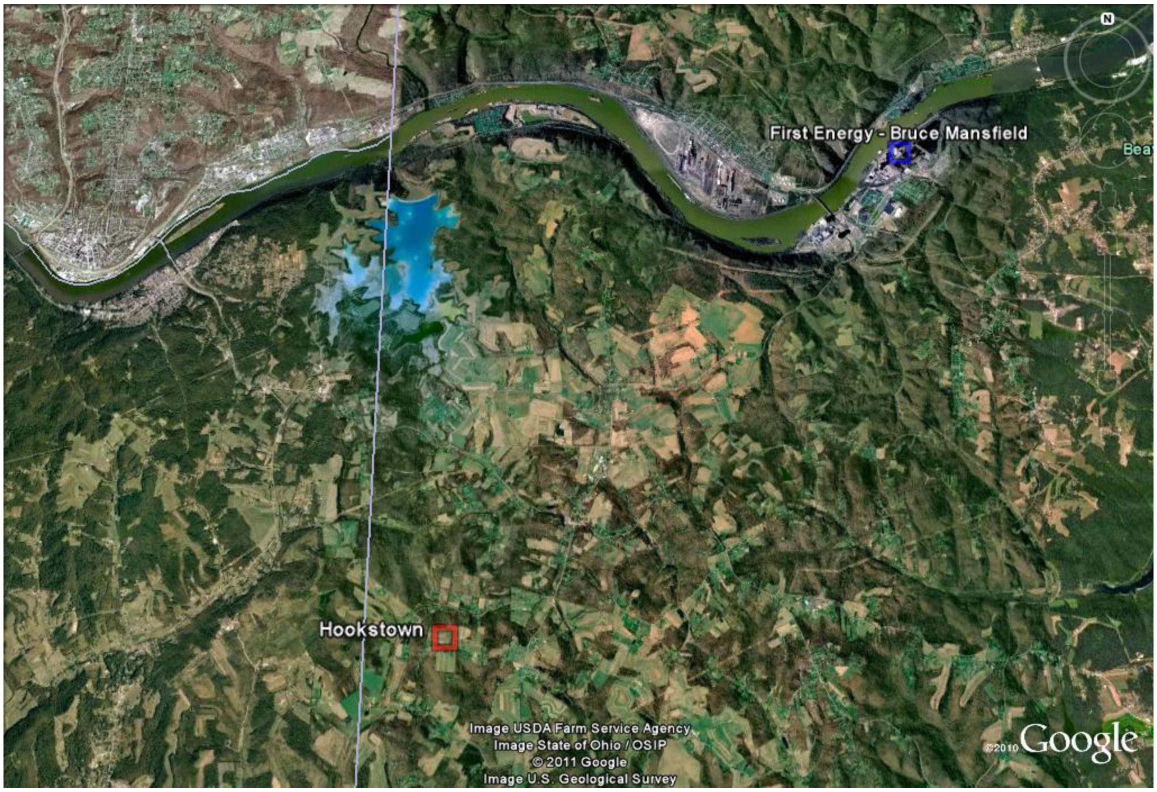
Below Anemometer Height

At Anemometer Height (413 m)

Above Anemometer Height (at 10 m Intervals)

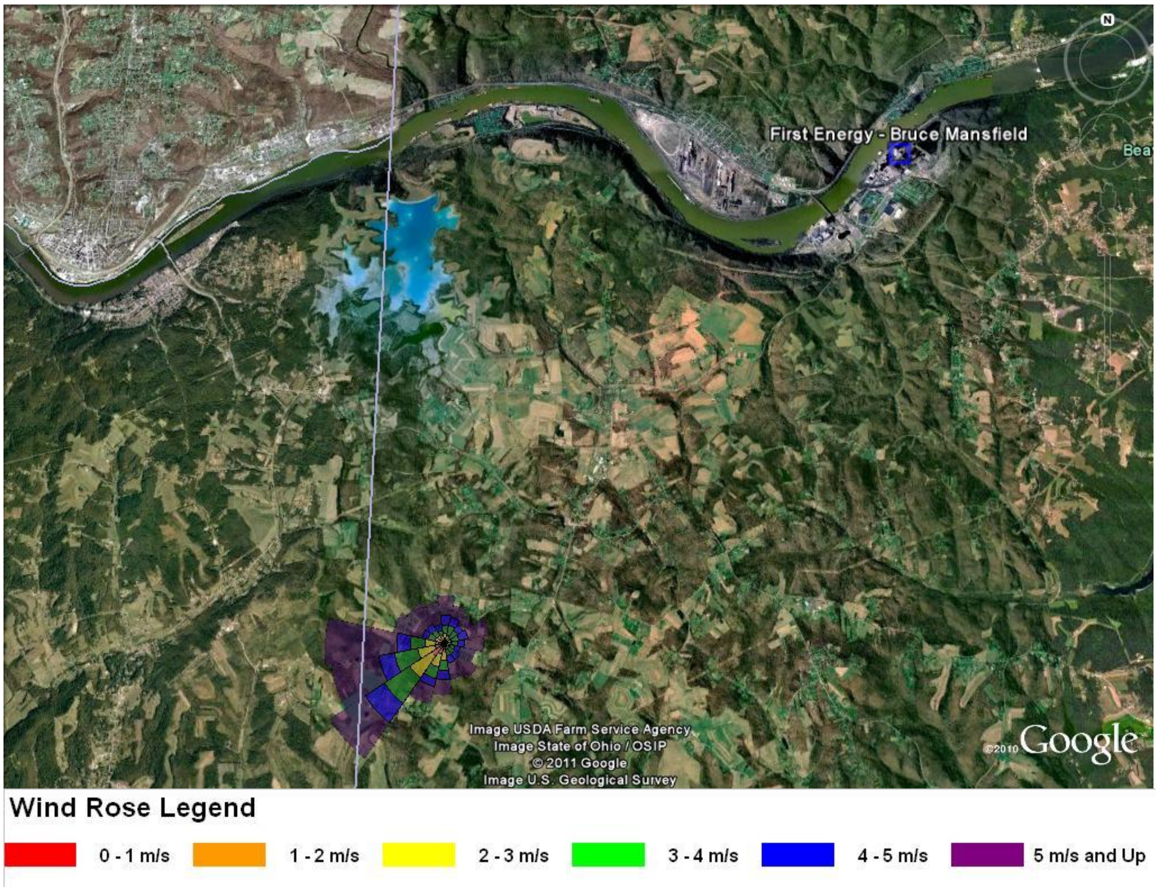
Figure 19 (courtesy of Google Earth) displays a zoomed in look at the actual Hookstown monitoring location with respect to the other regional SO_2 sources.

Figure 19. Hookstown Monitor Location Map



The impact of the topography near Hookstown can also be seen by looking at the wind measurements that were collected at the Hookstown air monitoring station (meteorological data, including wind direction and speed, are continuously measured). Figure 20 (courtesy of Google Earth) displays the wind data measured at Brighton Township's meteorological tower from January 2008 to December 2010 (a full three year dataset).

Figure 20. Wind Rose for the Hookstown Monitor



The wind is primarily out of the west and southwest. This wind profile follows the synoptic wind flow over the region and is not surprising by seeing Figure 18 above, which shows that there is not any significant terrain that is influencing the wind measurements.

Taking a cross section look (in three dimensions within Google Earth) at the local area in Figure 21 below, one can see the relationship of the local terrain with respect to the major SO_2 sources in the region and the Hookstown air monitor station.

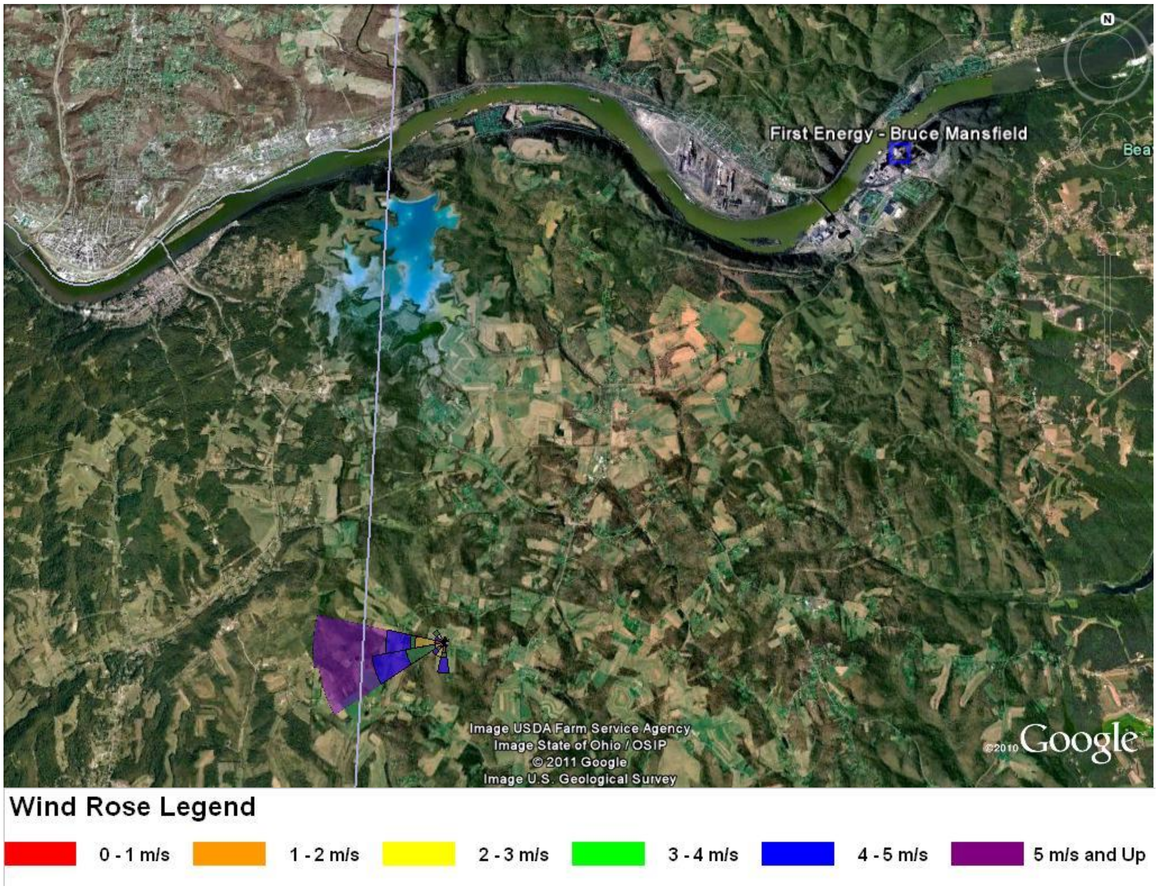
Figure 21. Local Terrain

From Figure 21 (which looks south to north), once again one can see that the Hookstown air monitoring station sits on top of a local hill, with the closest SO_2 source in Pennsylvania sitting in the Ohio River valley off to the north and east of the Hookstown monitor.

Also from Figure 21 above, one can see that the Hookstown monitor lies to the southwest of this SO_2 source. The Hookstown monitor acquires SO_2 samples from the air continuously every hour, which results in approximately 8760 hours of samples every year. The latest design value year, 2010 (which is based on data from 2008 to 2010), showed the Brighton monitor exceeding the new SO_2 standard with a concentration of 101 ppb. The Department analyzed the data to focus in on the hours in which the SO_2 concentrations exceeded the new 1-hour SO_2 standard. 74 hours were found to exceed this threshold. Out of those 74 hours, 74 hours had complete corresponding meteorological data. Then, the Department analyzed the wind data and created a wind rose to coincide with the meteorological data collected on those 74 hours that were found to exceed the new 1-hour SO_2 standard threshold.

Figure 22 shows the results.

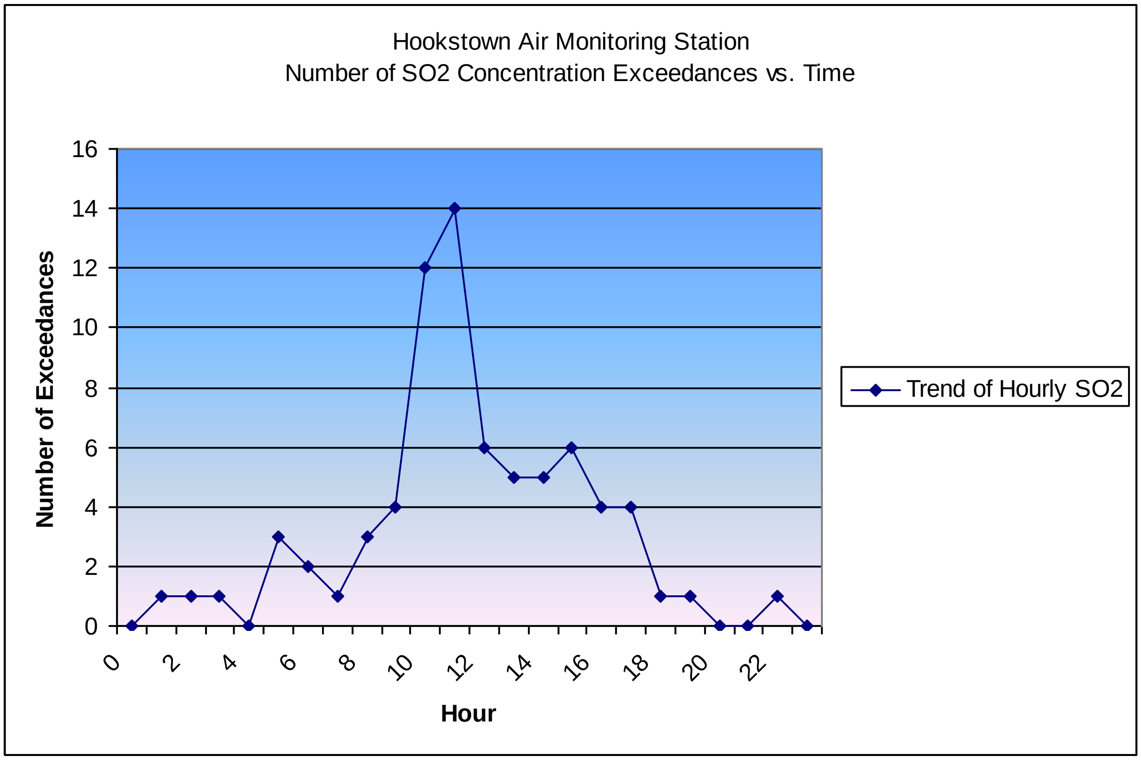
Figure 22. Wind Rose Data for Exceedance Hours



When comparing this figure with Figure 20 above, one will notice that the primary wind direction has changed. During the periods when there are high SO_2 concentrations, the wind is primarily out of the west. In addition, wind speeds are generally stronger, indicating that the high SO_2 concentrations are being driven in from out of state. Comparing the strong westerly component of the winds with the fact that there are no other major SO_2 emissions sources within Pennsylvania in close proximity of the Hookstown monitor indicates that the Hookstown monitor is picking up on the intrastate transport of SO_2. Overall, the prominent westerly winds and stronger wind speeds are indicating that the driving source of the higher SO_2 concentrations is coming from the SO_2 sources cited in states to our west.

The time of the day when the SO_2 concentrations are occurring is also of importance. Figure 23 illustrates when the Hookstown monitor is experiencing the high 1-hour SO_2 concentrations.

Figure 23. Time of Day for SO_2 Exceedances



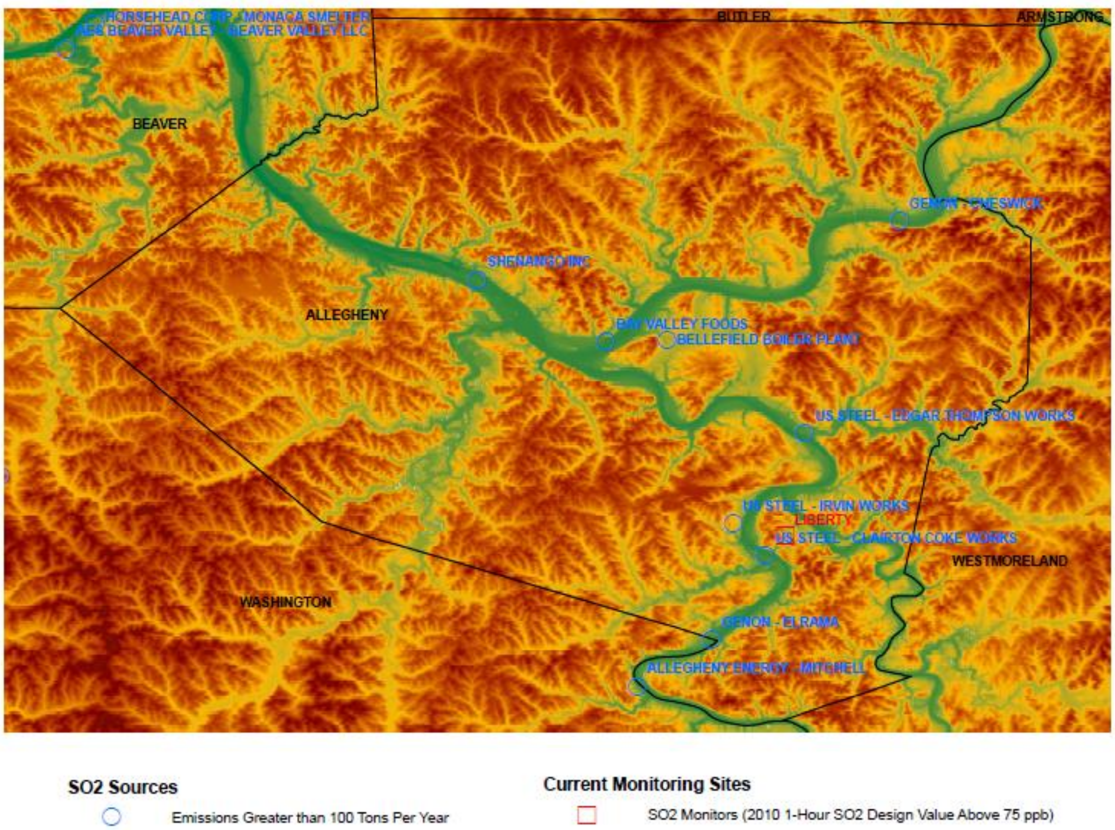
Most of the high SO_2 concentrations are occurring in the middle of the day hours (from 9 AM to 5 PM). The timing of these exceedances coupled with the fact that the Hookstown monitoring site is situated on higher terrain increases the likelihood that intrastate transport is playing a role in the monitored SO_2 concentration exceedances. The middle of the day is when the atmosphere is the most unstable, meaning that more horizontal and vertical mixing is occurring. The onset of this mixing usually occurs in the late morning when, after a cool night, the sun warms the surface. The air at the surface is then warmer and less dense than its surroundings so it wants to rise, inducing vertical motion. The top two hours when we see the most exceedances are 10 and 11 AM, when vertical mixing begins. Therefore, there is even more likelihood that the high SO_2 concentrations are driven by SO_2 sources by SO_2 sources to the west of the Hookstown monitor.

Due to the nature of the high SO_2 concentrations around the Brighton Township and Hookstown monitors, the Department is recommending that Beaver County be designated nonattainment for the new SO_2 standard.

Allegheny County

Allegheny County is situated to the west of the Appalachian Mountain chain. Figure 24 below displays a topographical overview of all of Allegheny County. There are four major rivers that run through the relatively high terrain of Allegheny County. The Monongahela River, which runs from the Washington County line northward, and the Allegheny River, which runs from the Westmoreland County line southward, converges in Pittsburgh to form the Ohio River, which runs from Pittsburgh northwestward toward Beaver County. The Youghiogheny River, in southeastern Allegheny County, flows into the Monongahela River. When combined with the higher topography, these rivers help drive the meteorological pattern witnessed within the county.

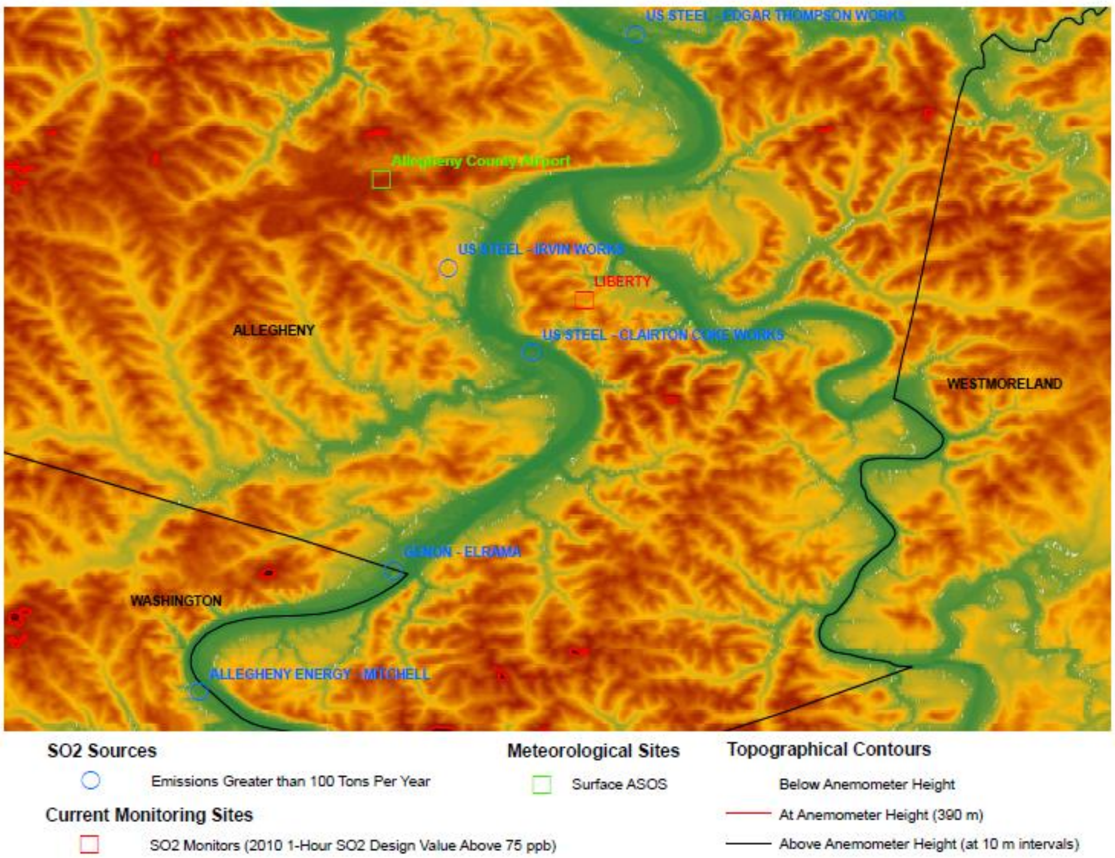
Figure 24. Allegheny County Topographical Map



Liberty SO_2 Monitoring Location

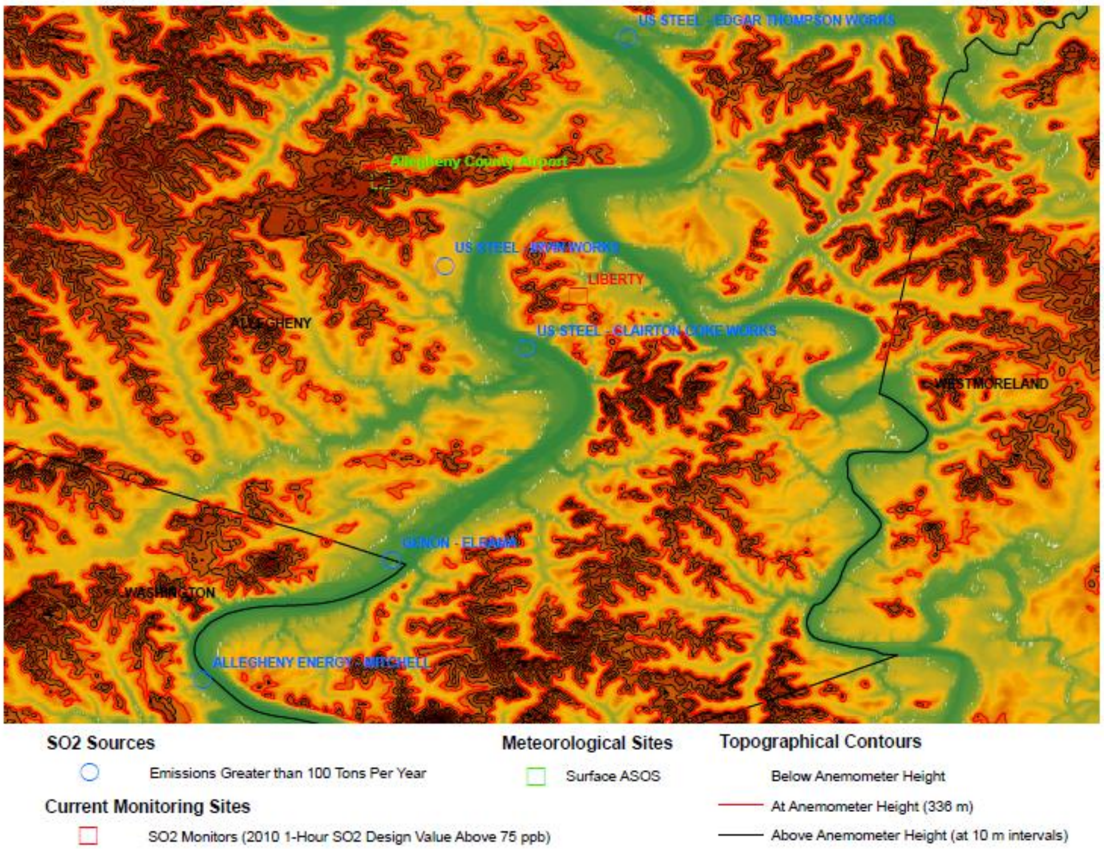
Liberty is situated on higher terrain while being surrounded by two rivers: the Youghiogheny River to the east and the Monongahela River to the west. Figure 25 displays the location of the Liberty monitor with respect to the major SO_2 sources In addition, Figure 2 highlights the terrain above the anemometer of height of the Allegheny County Airport meteorological tower (anemometer is at 10 meters plus base elevation of tower at 380 meters). The measurements being taken by the Allegheny County Airport meteorological tower are likely to not be influenced by any higher terrain.

Figure 25. Allegheny County Airport Topographical Map



The Liberty air monitoring station also collected meteorological data during the three year period (Jaunary 2008 to December 2010). However, the meteorological data set during that time frame was not complete, which is why the Allegheny County Airport's meteorological data was utilized. Figure 26 highlights the terrain above the anemometer of height of the Liberty monitoring station (anemometer plus base elevation of tower at 380 meters). If available, the measurements being taken by the Liberty meteorological tower are likely to be influenced by the local terrain.

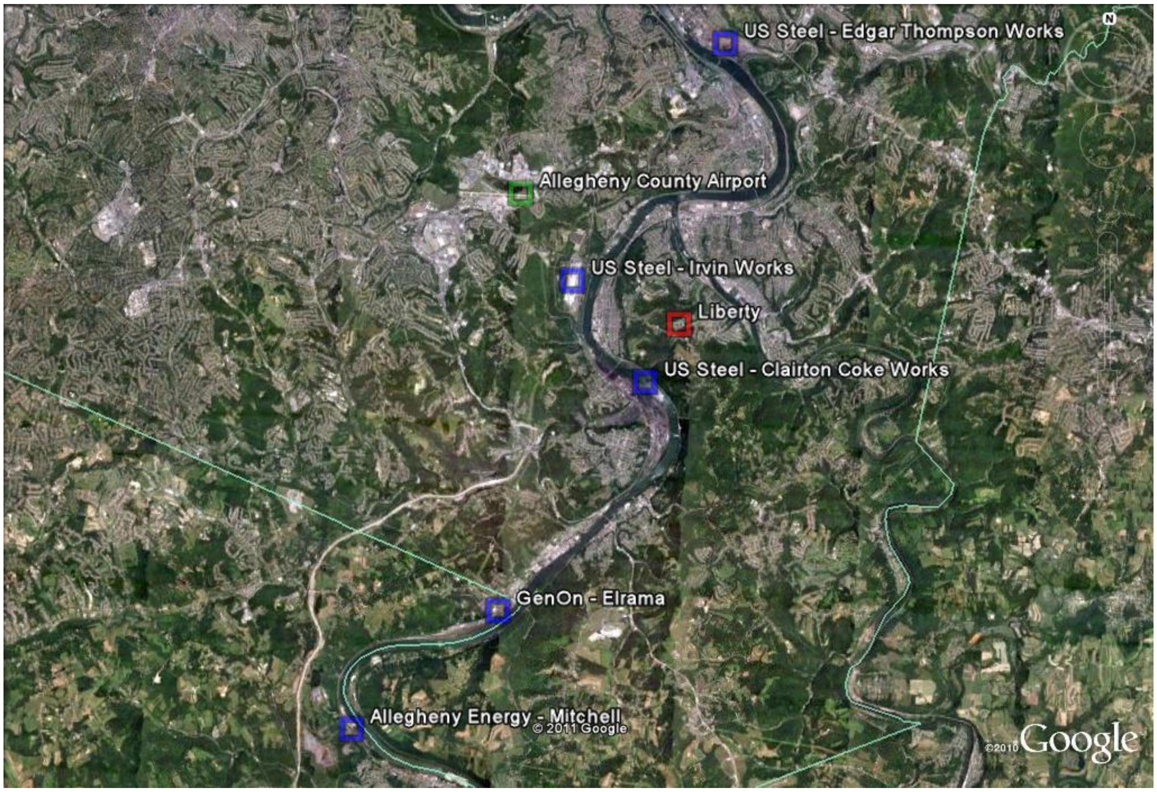
Figure 26. Liberty Monitor Topographical Map



The difference in elevation between the Allegheny County Airport and the Liberty air monitoring stations is approximately 55 meters.

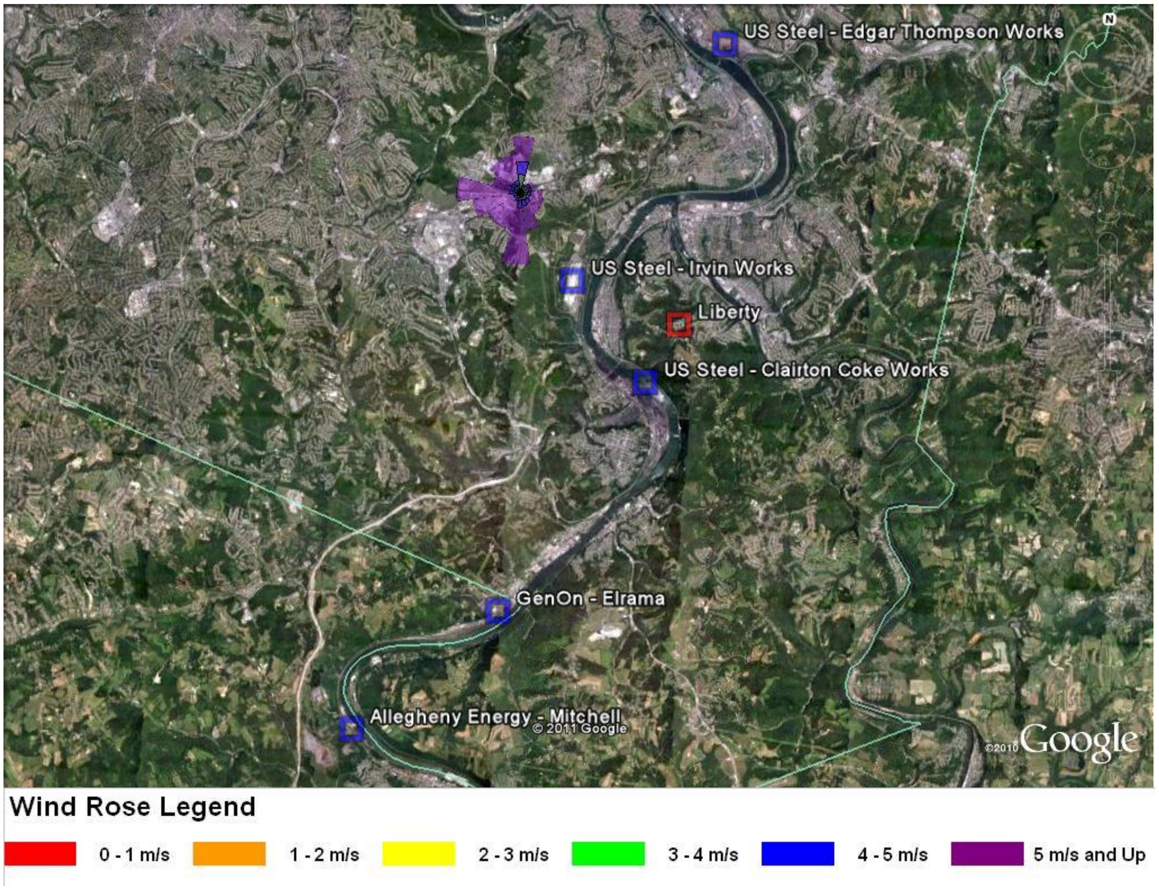
Figure 27 (courtesy of Google Earth) displays a zoomed in look at the actual Liberty monitoring location with respect to the other regional SO_2 sources.

Figure 27. Liberty Monitor Location Map



The impact of the topography near Liberty can also be seen by looking at the wind measurements that were collected at the Allegheny County Airport meteorological tower. Figure 28 (courtesy of Google Earth) displays the wind data measured at the Allegheny County Airport's meteorological tower from January 2008 to December 2010 (a full three year dataset).

Figure 28. Wind Rose for the Allegheny County Airport



The wind is primarily out of the west and south. There is also a secondary maximum out of the north. This wind profile follows the synoptic wind flow over southwestern Pennsylvania. Stronger winds exist at this monitoring station because the wind is not undergoing any friction because it is not impacted by higher terrain.

Taking a cross section look (in three dimensions within Google Earth) at the local area in Figure 29 below, one can see the relationship of the local terrain with respect to the major SO_2 sources in the region and the Liberty air monitor station.

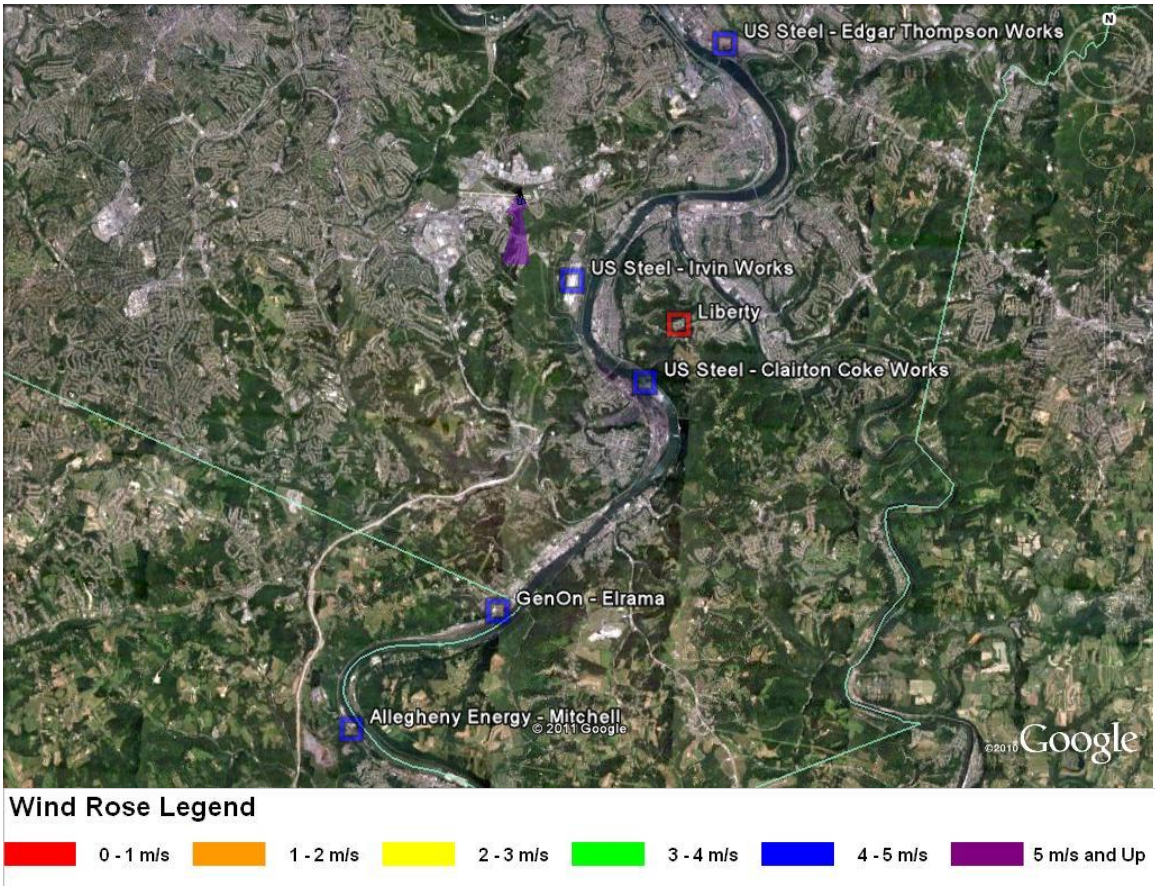
Figure 29. Local Terrain

From Figure 29 (which looks north to south), one can see that the Liberty air monitoring station sits on top of a hill. However, there is higher terrain surrounding the monitor, creating valley like influences. The main SO_2 sources in the region are at lower elevation as they sit down within the river valley.

Figure 28 above shows that the Liberty monitor is centrally located between multiple major SO_2 sources. The Liberty monitor acquires SO_2 samples from the air continuously every hour, which results in approximately 8760 hours of samples every year. The latest design value year, 2010 (which is based on data from 2008 to 2010), showed the Liberty monitor exceeding the new SO_2 standard with a concentration of 128 ppb. The Department analyzed the data to focus in on the hours in which the SO_2 concentrations exceeded the new 1-hour SO_2 standard. 116 hours were found to exceed this threshold. Out of those 116 hours, 116 hours had complete corresponding meteorological data. Then, the Department analyzed the wind data and created a wind rose to coincide with the meteorological data collected on those 116 hours that were found to exceed the new 1-hour SO_2 standard threshold.

Figure 30 shows the results.

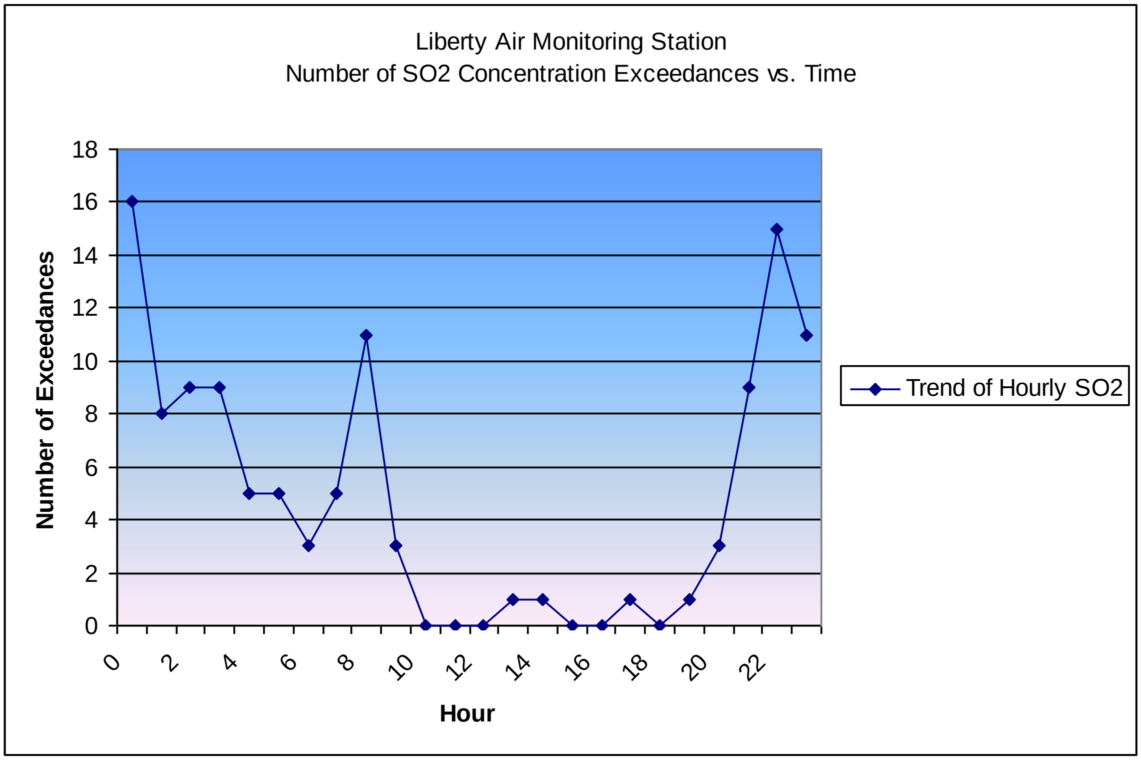
Figure 30. Wind Rose Data for Exceedance Hours



When comparing this figure with Figure 28 above, one will notice that the primary wind direction has changed. During the periods when there are high SO_2 concentrations, the wind is primarily out of the south. In addition, wind speeds are generally stronger, indicating that the winds are unimpeded (from any terrain) from that direction. As Figure 25 and Figure 26 displayed, the Allegheny County Airport location is not influenced by higher terrain while the Liberty location is. The Allegheny County airport meteorological tower is measuring winds at 55 meters above the Liberty meteorological tower. Therefore, the stronger winds at the Allegheny County airport could potentially signify the longer range transport issue affecting the Liberty monitor.

The time of the day when the SO_2 concentrations are occurring is also of importance. Figure 31 illustrates when the Liberty monitor is experiencing the high 1-hour SO_2 concentrations.

Figure 31. Time of Day for SO_2 Exceedances



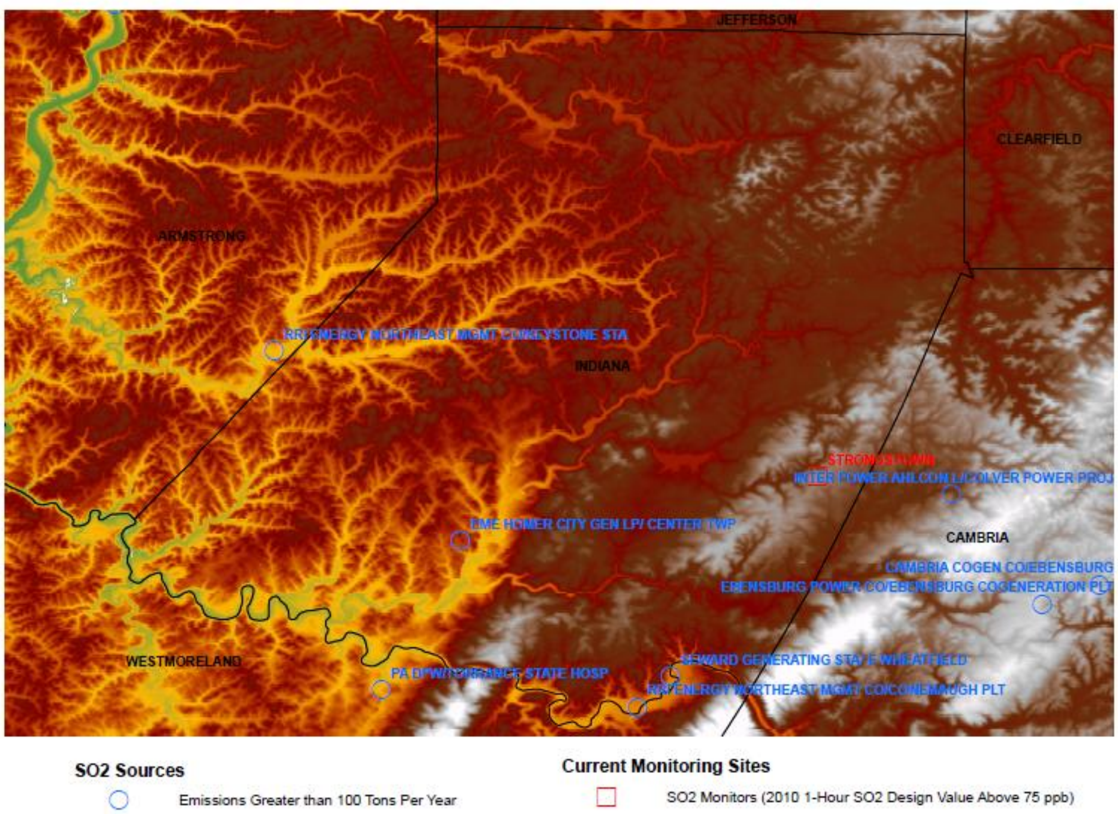
Most of the high SO_2 concentrations are occurring in the late evening to early morning hours (from 10 PM to 8 AM). The timing of these exceedances coupled with the fact that the Liberty monitoring site is situated within a valley increases the likelihood that meteorological inversions are assisting in driving SO_2 concentrations higher. Once an inversion forms and the wind near the surface decreases (see Figure 6 for an example of this), localized air pollution becomes trapped near the surface. Therefore, there is even more likelihood that the high SO_2 concentrations are driven by an SO_2 source in close proximity to monitor. Note the rise in exceedances from 7 AM to 8 AM. This could signify the regional transport of SO_2 in the region. Inversions usually begin to break down during the late morning (in the 8 AM to 11 AM time frame). As the inversion breaks, the air mass aloft mixes down toward the surface. If this air mass aloft has elevated SO_2 concentrations within it, those higher concentrations will likely be picked up by the monitor at the surface.

Due to the nature of the high SO_2 concentrations around the Liberty monitor, the Department is recommending that Allegheny County be designated nonattainment for the new SO_2 standard.

Indiana County

Indiana County is situated within the western flank of the Appalachian Mountain chain. Figure 32 below displays a topographical overview of all of Indiana County. There is one major river that runs through the county. The Conemaugh River, which runs across southern Indiana County, forms the border between Indiana County and Westmoreland County. Otherwise, then a few tributary streams, the county is primarily land. Ultimately, the meteorological pattern is driven by the higher terrain in the eastern half of Indiana County.

Figure 32. Indiana County Topographical Map



Strongstown SO_2 Monitoring Location

Strongstown is situated on a portion of the higher terrain in the eastern side of Indiana County. Figure 33 displays the location of the Strongstown monitor with respect to the major SO_2 sources. In addition, Figure 2 highlights the terrain above the anemometer of height of the Strongstown meteorological tower (anemometer is at 10 meters plus base elevation of tower at 580 meters). Therefore, the measurements being taken by the Strongstown meteorological tower are likely to be influenced by the higher terrain to its east.

Figure 33. Strongstown (Indiana County) Topographical Map

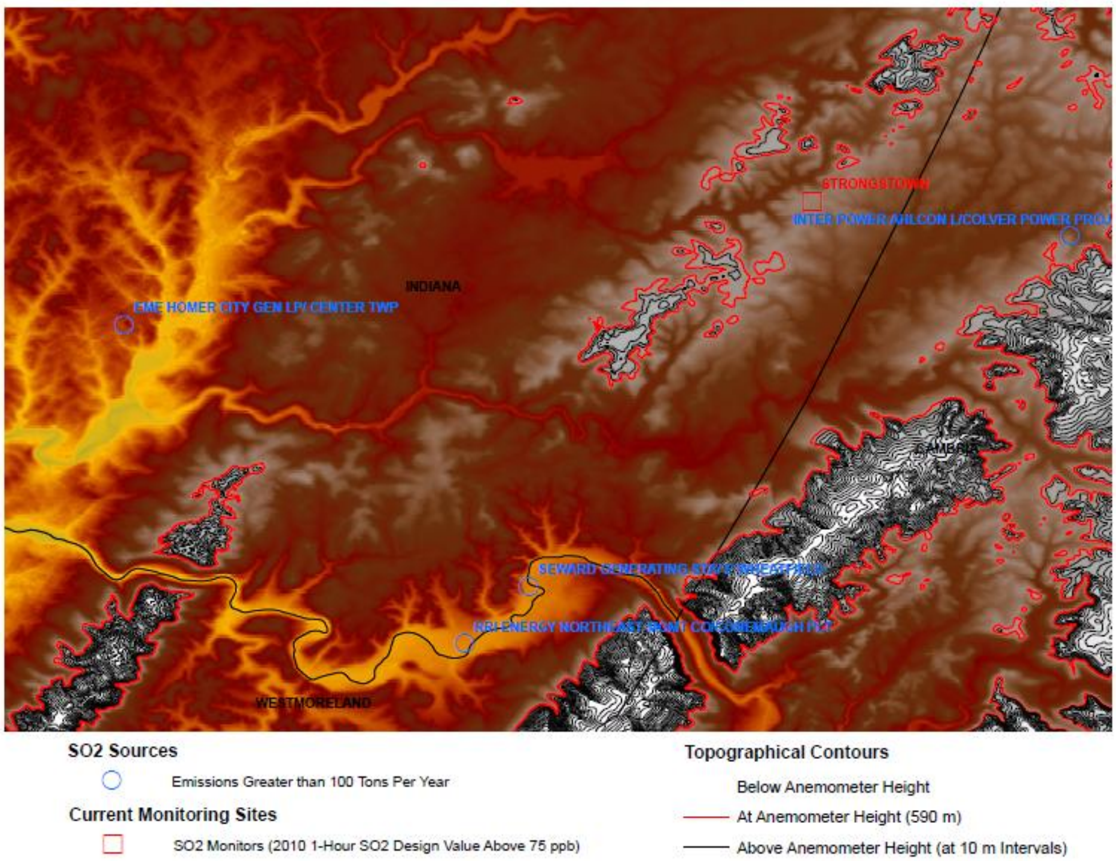
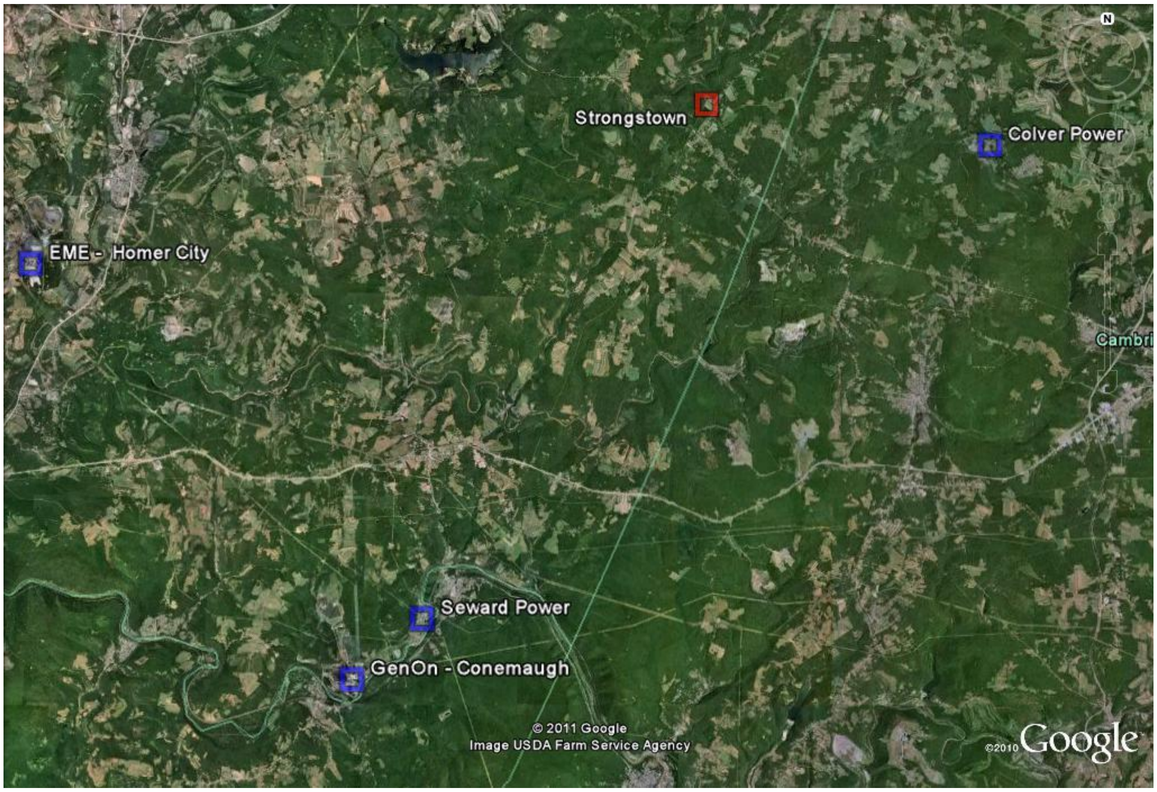


Figure 34 (courtesy of Google Earth) displays a zoomed in look at the actual Strongstown monitoring location with respect to the other regional SO_2 sources.

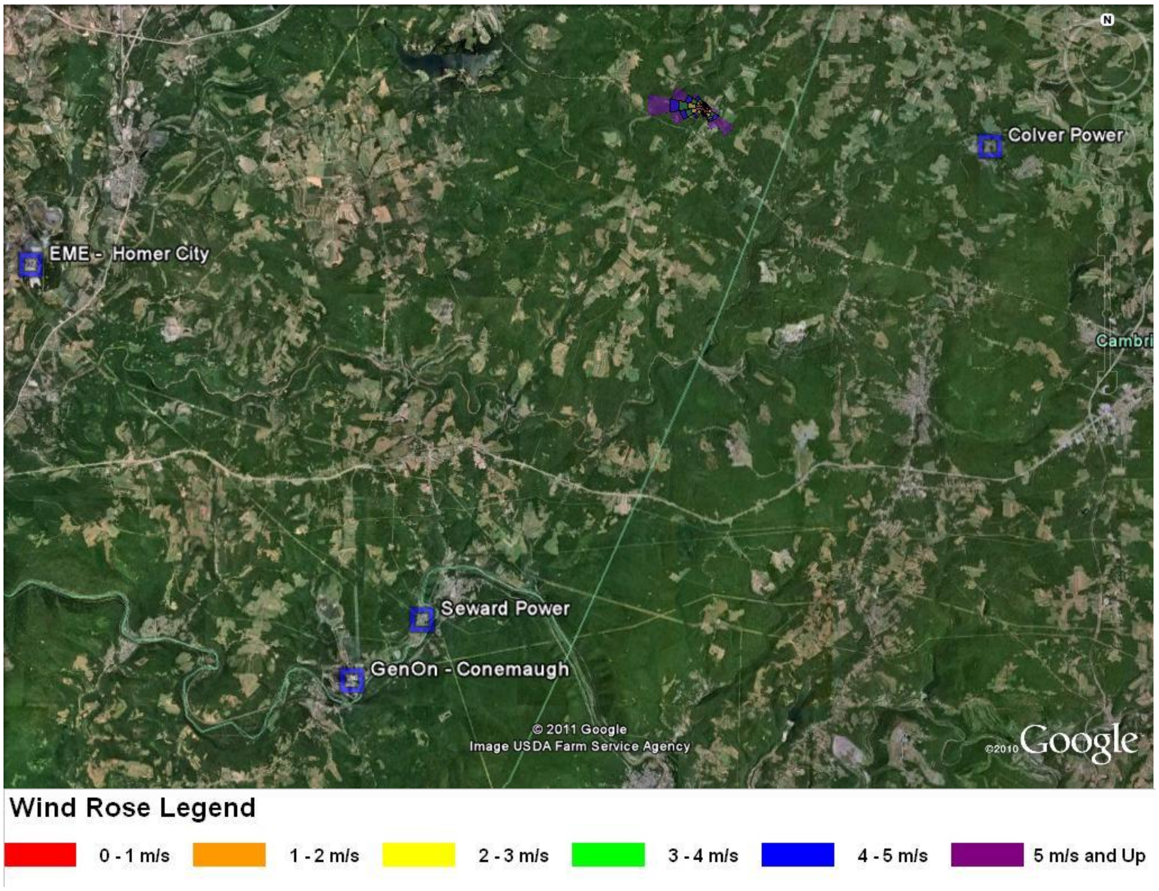
Figure 34. Strongstown Monitoring Location



The impact of the topography near Strongstown can also be seen by looking at the wind measurements that were collected at the Strongstown air monitoring station (meteorological data, including wind direction and speed, are continuously measured).

Figure 35 (courtesy of Google Earth) displays the wind data measured at Strongstown's meteorological tower from January 2008 to December 2010 (a full three year dataset).

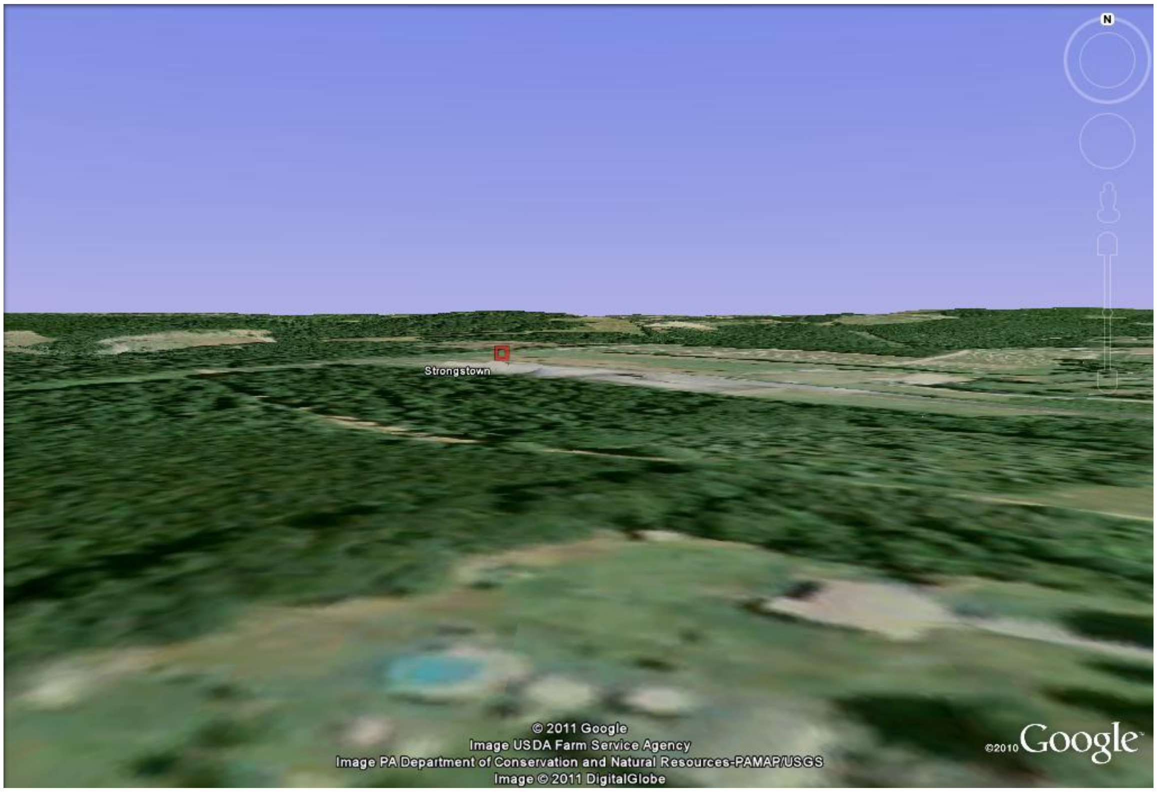
Figure 35. Wind Rose for the Strongstown Monitor



The wind is primarily out of the west. There is also a strong influence of northeasterly winds. Generally, this wind profile follows the synoptic wind flow over the region and is not surprising by seeing Figure 34 above, which shows that there is not any significant terrain to the west of Strongstown that is influencing the wind measurements.

Taking a cross section look (in three dimensions within Google Earth) at the local area in Figure 36 below, one can see the relationship of the local terrain with respect to the major SO_2 sources in the region and the Strongstown air monitor station.

Figure 36. Local Terrain

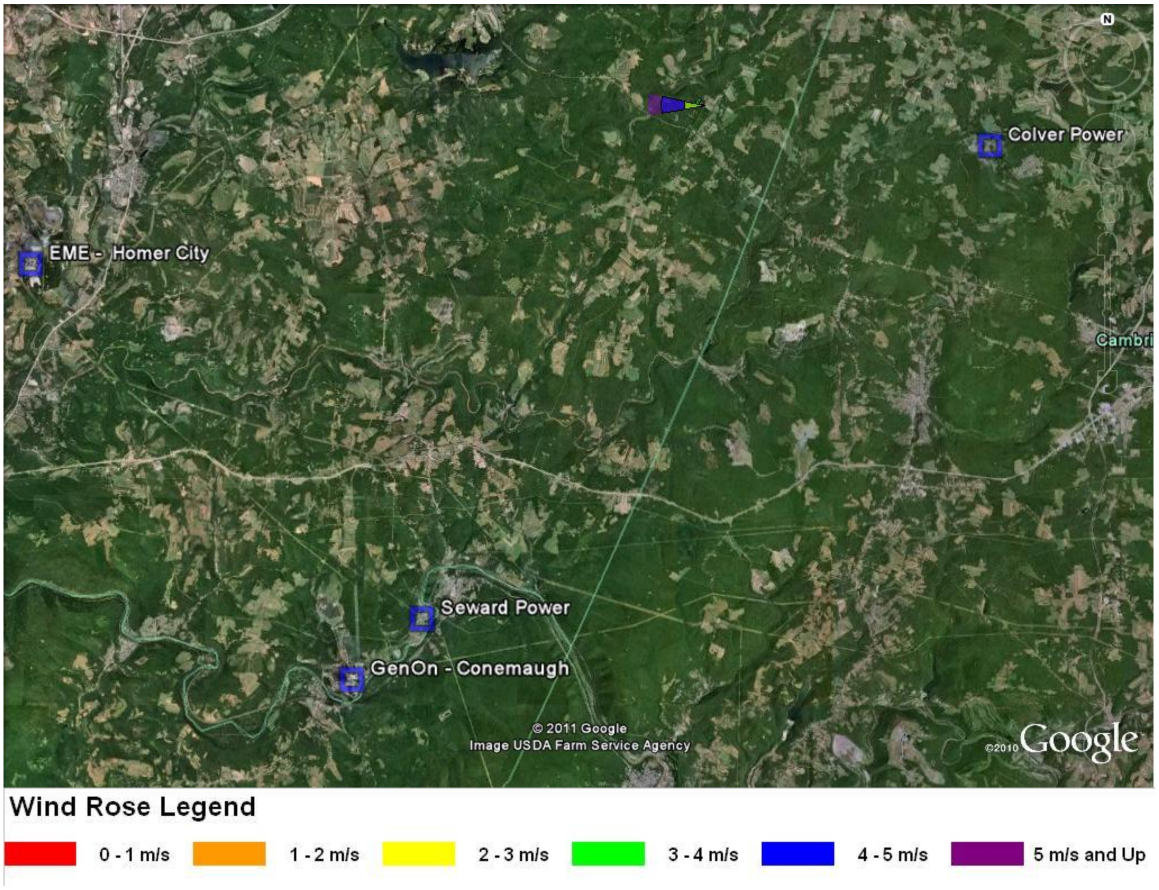


From Figure 36 (which looks south to north), once again one can see that the Strongstown air monitoring station sits on top of a local hill.

From Figure 35 above, one can see that the Strongstown monitor lies to the east of several major SO_2 sources. The Strongstown monitor acquires SO_2 samples from the air continuously every hour, which results in approximately 8760 hours of samples every year. The latest design value year, 2010 (which is based on data from 2008 to 2010), showed the Strongstown monitor exceeding the new SO_2 standard with a concentration of 90 ppb. The Department analyzed the data to focus in on the hours in which the SO_2 concentrations exceeded the new 1-hour SO_2 standard. 25 hours were found to exceed this threshold. Out of those 74 hours, 23 hours had complete corresponding meteorological data. Then, the Department analyzed the wind data and created a wind rose to coincide with the meteorological data collected on those 23 hours that were found to exceed the new 1-hour SO_2 standard threshold.

Figure 37 shows the results.

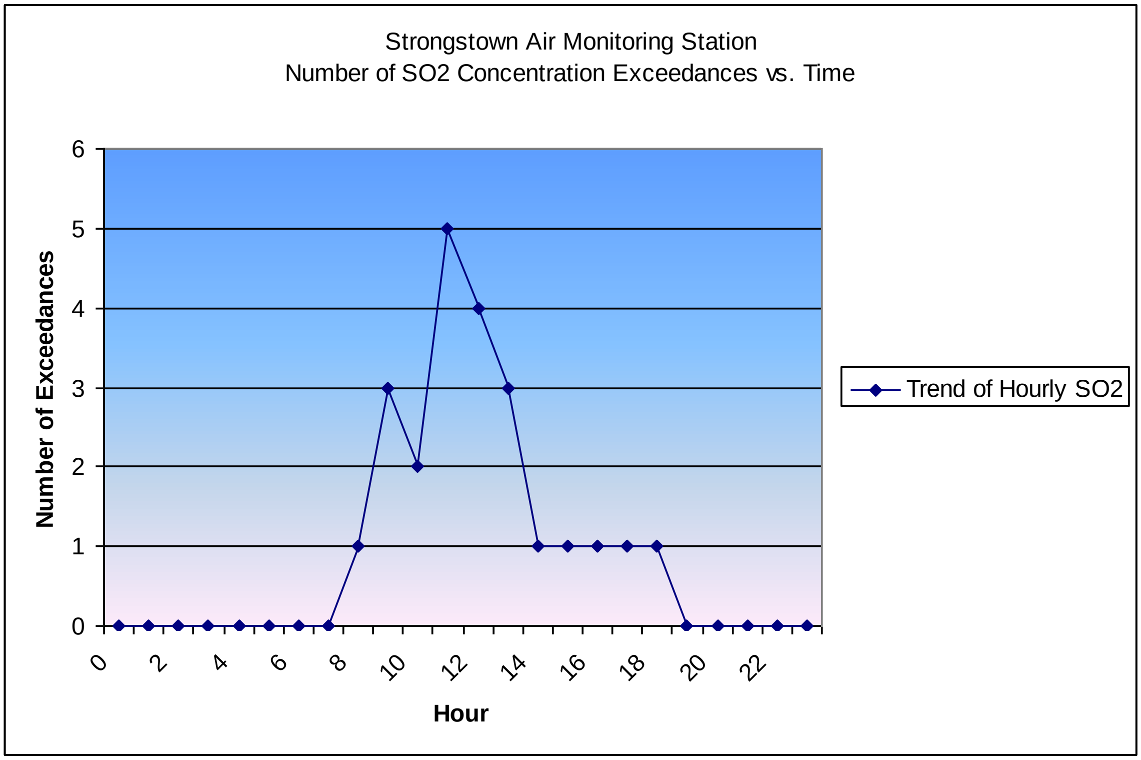
Figure 37. Wind Rose Data for Exceedance Hours



When comparing this figure with Figure 34 above, one will notice that the primary wind direction has generally stayed the same. During the periods when there are high SO_2 concentrations, the wind continues to be primarily out of the west. In addition, wind speeds are generally stronger, indicating that the high SO_2 concentrations are being driven in from further distances away. Comparing the strong westerly component of the winds with the fact that there are no other major SO_2 emissions sources within Pennsylvania in close proximity of the Strongstown monitor indicates that the Strongstown monitor is picking up on the interstate transport of SO_2. Overall, the prominent westerly winds and stronger wind speeds are indicating that the driving source of the higher SO_2 concentrations is coming from the larger SO_2 sources (these types of sources generally have taller stacks and higher emission rates which helps in the downwind transport of pollution) to the west of Strongstown.

The time of the day when the SO_2 concentrations are occurring is also of importance. Figure 38 illustrates when the Strongstown monitor is experiencing the high 1-hour SO_2 concentrations.

Figure 38. Time of Day for SO_2 Exceedances



Most of the high SO_2 concentrations are occurring in the middle of the day hours (from 9 AM to 2 PM). The timing of these exceedances coupled with the fact that the Strongstown monitoring site is situated on higher terrain increases the likelihood that interstate transport is playing a role in the monitored SO_2 concentration exceedances. The middle of the day is when the atmosphere is the most unstable, meaning that more horizontal and vertical mixing is occurring. The onset of this mixing usually occurs in the late morning when, after a cool night, the sun warms the surface. The air at the surface is then warmer and less dense than its surroundings so it wants to rise, inducing vertical motion. The top two hours when we see the most exceedances are 11 AM and 12 PM, when vertical mixing begins. Therefore, there is even more likelihood that the high SO_2 concentrations are driven by SO_2 sources to the west of the Strongstown monitor.

Due to the nature of the high SO_2 concentrations around the Strongstown monitor, the Department is recommending that Indiana County be designated nonattainment for the new SO_2 standard.

5. Jurisdictional and other boundaries

At this time, the Department is recommending that county boundaries be used to define areas for designation purposes. EPA has indicated that the presumptive county boundary will serve as the nonattainment area unless evidence indicates that a different planning area is justified. Inventory data for non-point sources is more accurate and available on the county level which will be useful in meeting the requirements in nonattainment areas for emission inventory information and for reasonable further progress (incremental emission reductions). The Department is using EPA's presumptive county assumption to recommend the boundaries of nonattainment areas associated with monitors violating the 1-hour SO_2 standard. The Department will be conducting refined modeling to better characterize boundaries relating to nonattainment and attainment areas.

Acronyms and Terms

AERMOD	AMS/EPA Regulatory Model
AMS	American Meteorological Society
CAA	Clean Air Act
CFR	Code of Federal Regulations
DEP	Department of Environmental Protection (Pennsylvania)
EGU	Electric Generating Unit
EPA	Environmental Protection Agency (United States)
FGD	flue gas desulfurization
IPM	Integrated Planning Model
MSA	Metropolitan Statistical Areas
NAAQS	National Ambient Air Quality Standards
NEEDS	National Electric Energy Data System
OMB	Office of Management and Budget (United States)
ppb	parts per billion
SIP	State Implementation Plan
SO_2	Sulfur dioxide
tpy	tons per year
U.S.C.	United States Code

References

EPA, Final Rule, "*Primary National Ambient Air Quality Standards for Sulfur Dioxide*," (75 FR 35,520; June 22, 2010)

EPA, *Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards,* from Stephen D. Page, Director, EPA Office of Air Quality Planning and Standards, March 24, 2011.

The DEP's "*Ambient Air Monitoring Network Plan – 2011*" (June 25, 2010) http://www.dep.state.pa.us/dep/deputate/airwaste/aq/aqm/principal.htm

The Philadelphia Air Management Services' (AMS) "*2010/2011 Air Monitoring Network Plan*" (July 1, 2010) http://www.phila.gov/health/AirManagement/

The Allegheny County Health Department's (ACHD) "*Monitoring Network Review*" (July 1, 2010) http://www.achd.net/air/index.html

EPA Aerometric Information Retrieval System (AIRS), Air Quality System, http://www.epa.gov/air/data/index.html

EPA National Electric Energy Data System (NEEDS) v.4.10 http://www.epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html#needs

Office of Management and Budget, notice of decision, *2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas* (75 Fed. Reg. 37,246 (June 28, 2010 and corrected July 7, 2010). The updated list of statistical areas is available at the following website: www.census.gov/population/www/metroareas/metrodef.html

Office of Management and Budget, Bulletin No. 10-2, "*Update of Statistical Area Definitions and Guidance on Their Uses*," December 2009.

U.S. Census Bureau, Geography Division, Cartographic Products Management Branch, Metropolitan and Micropolitan Statistical Areas Wall Maps, November 2008. http://www.census.gov/geo/www/maps/msa_maps2008/us_wall_1108.html