

ENCLOSURE 1  
Pennsylvania's April 8, 2013 Letter  
Regarding 1-hour SO<sub>2</sub> Designations

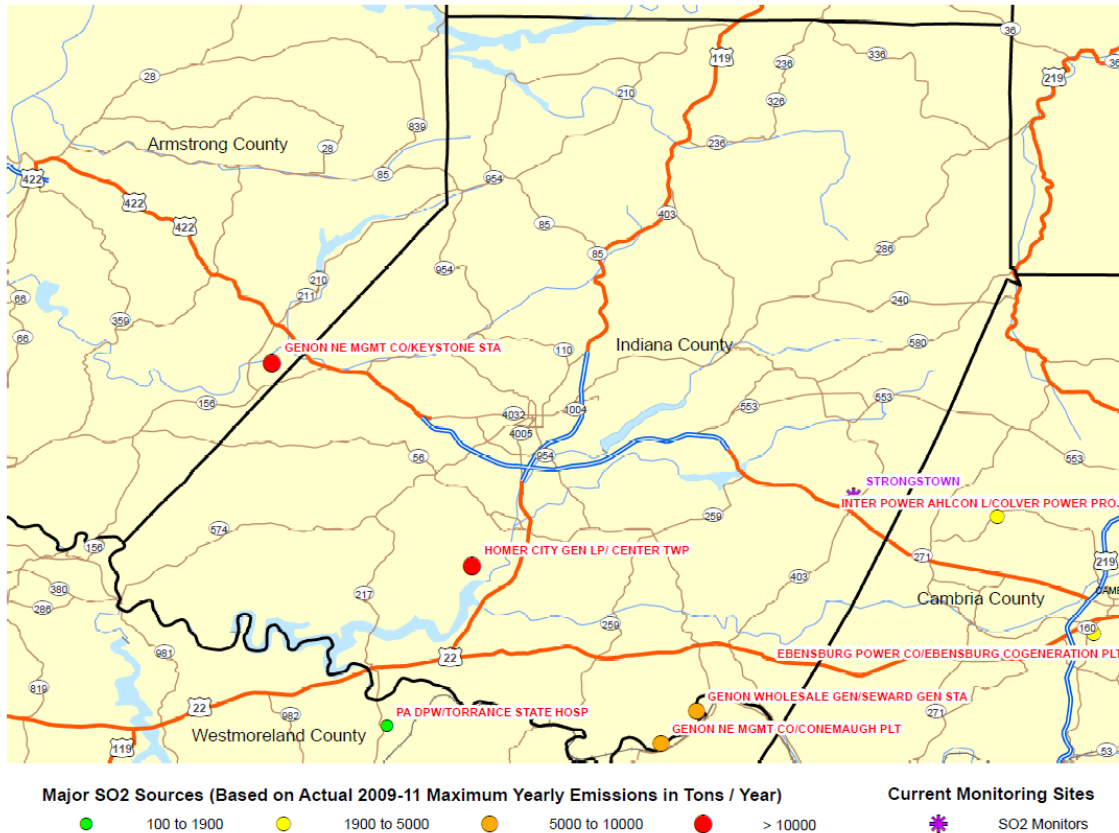
INDIANA COUNTY

On February 7, 2013, the EPA released its proposal for 1-hour SO<sub>2</sub> designation areas across the Commonwealth of Pennsylvania. With the exception of EPA's addition of portions of Armstrong County, EPA's intended designations agreed with the Department's original 1-hour SO<sub>2</sub> nonattainment area recommendation, submitted on June 23, 2011. However, the EPA added a portion of Armstrong County, which includes the Genon Northeast Management-Keystone (Keystone) power facility, to the Indiana County nonattainment area. After further consideration and analysis, the Department recommends that EPA remove all portions of Armstrong County from the agency's final designation of the Indiana County SO<sub>2</sub> nonattainment area. The reasons for excluding Armstrong County from the Indiana County nonattainment area are described in the following sections.

**Overview**

The Department recommended in its June 23, 2011, recommendation letter to EPA that Indiana County be designated as nonattainment for the 1-hour SO<sub>2</sub> NAAQS (of 75 parts per billion (ppb)) because the county contains an air monitoring station that is violating the NAAQS. At the end of 2012, the monitor in Strongstown, situated on the eastern side of Indiana County, had a design value of 81 ppb. Indiana County also contains three major power facilities: Homer City Generating Station (Homer City), which is located 24 kilometers to the west-southwest of the Strongstown monitor; Seward Generating Station, which is located 20 kilometers to the south-southwest of the Strongstown monitor; and GenOn Conemaugh Plant, which is located 23 kilometers to the south-southwest of the Strongstown monitor.

Keystone, on which EPA focused in adding a portion of Armstrong County to the nonattainment area, is in eastern Armstrong County, 37 kilometers to the west-northwest of the Strongstown monitor. A map displaying the major SO<sub>2</sub> sources proximity to the Strongstown monitor is provided below.



Due to the prevailing westerly wind flow across Indiana County and Keystone's and Homer City's orientation with respect to Strongstown (see map above), the following analysis will focus on the Keystone and Homer City power facilities.

### Justification for a Smaller Nonattainment Area

EPA proposed Elderton Borough, Plumcreek and South Bend Townships within Armstrong County be included in the Indiana County nonattainment area. These municipalities, which encompass the Keystone facility within Armstrong County, should not be included with Indiana County nonattainment area for the following reasons:

1. EPA based its decision on the 2008 NEI

The Technical Support Document attached to the February 6, 2013, letter from EPA Regional Administrator Shawn M. Garvin to Governor Tom Corbett, states that EPA used data contained in the 2008 National Emission Inventory to assess the impact of sources on the Strongstown monitor. The 2008 inventory does not include the impact of significant reduction of emissions from facilities that has occurred since 2008. The Acid Rain data obtained from the Clean Air Markets Division database (<http://ampd.epa.gov/ampd/>) demonstrates the significant emission reductions that have occurred.

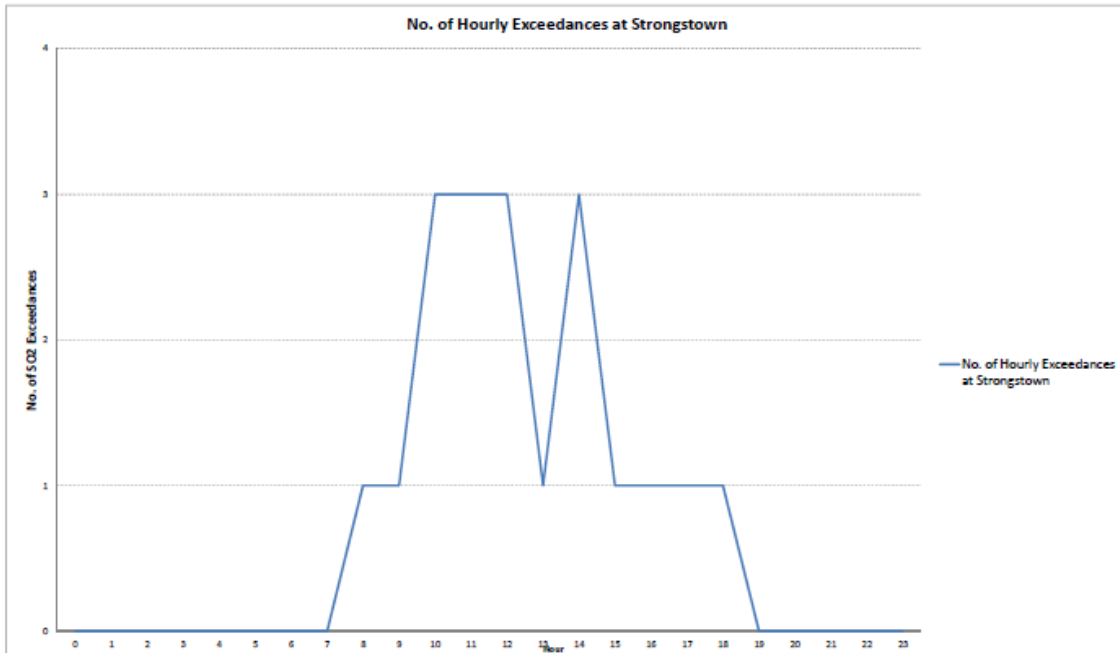
STATE	FACILITY_NAME	ORISPL_CODE	YEAR	SO <sub>2</sub> (Tons)
PA	Conemaugh	3118	2008	6,282.3
PA	Homer City	3122	2008	102,483.8
PA	Keystone	3136	2008	189,993.8
PA	Seward	3130	2008	7,771.2
PA	Conemaugh	3118	2012	6,311.7
PA	Homer City	3122	2012	99,773.6
PA	Keystone	3136	2012	29,419.8
PA	Seward	3130	2012	4,333.3

The data shows significant emission reductions at the Keystone facility as a result of the installation of a wet sulfur dioxide scrubber. Emissions at Keystone have been reduced by approximately 85% (The remaining major emitting facility, Homer City, is currently installing a two SO<sub>2</sub> scrubbers after which all three units will be controlled. The impact of this installation will be included in the attainment demonstration developed for this anticipated nonattainment area.).

The impact of the installation of scrubber technology at Keystone will be discussed further, below.

## 2. Analysis of Daily Timing of 1-hour SO<sub>2</sub> Exceedances

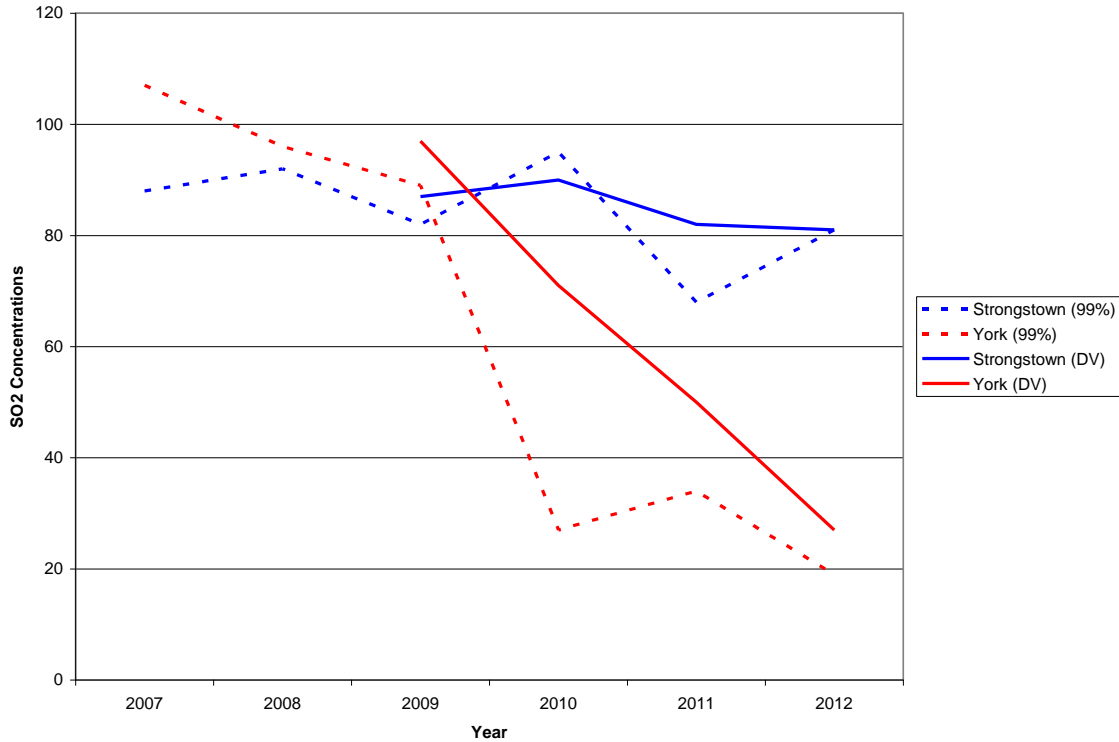
In the Department's original 1-hour SO<sub>2</sub> nonattainment area recommendation, the Department analyzed the time of day that the 1-hour SO<sub>2</sub> exceedances at the Strongstown monitor were occurring between 2008 and 2010. The following graph displays the time of day when the Strongstown monitor was experiencing exceedances of the standard from 2010 through 2012.



As was illustrated during the 2008 through 2010 time period, all of the exceedances from 2010 through 2012 occurred during the late morning/early afternoon period. This indicates regional transport. The highest 1-hour SO<sub>2</sub> concentrations occurred during this time of day because the atmosphere undergoes the most vertical mixing. The weather on these days can be viewed as follows: During the early morning hours, an inversion sets up over the region. Just above the inversion, there is a mixed layer that encompasses a different air mass than that at the surface. During the early morning, the inversion limits vertical mixing within the boundary layer. As the morning progresses, more mixing occurs as the surface begins to warm. It is at this time that the air mass aloft gets mixed down to the surface. A highly modified air mass, like the one potentially over Strongstown, can impact the monitor once the air mass is mixed down to the surface during the daytime heating process.

### 3. Analysis of 1-hour SO<sub>2</sub> Monitoring Data at Strongstown from 2007 through 2012

The Strongstown monitor was installed in 2007. Since its inception, the Strongstown monitor has been measuring SO<sub>2</sub> concentrations. Since EPA's inclusion of Armstrong County as a non-attainment area was related to the emissions from Genon's Keystone Facility, it is important to note that in that timeframe, the Keystone facility in Armstrong County installed and began operating scrubbers in late 2009 in accordance with its federally enforceable Plan Approval 03-00027B. The following graph illustrates the trend in the yearly 99<sup>th</sup> percentile SO<sub>2</sub> concentrations and design values from 2007 through 2012 at the Strongstown monitor.



The graph illustrates that while there has been a decline in the SO<sub>2</sub> design value since 2010, the decline has not been as drastic as one would expect with the installation of a scrubber on a facility. The more typical decline can be seen at a monitoring station such as the York monitoring station, in York County, where the decline is largely due to the installation of a scrubber at a nearby power plant. The graph above also demonstrates the decline in the yearly 99<sup>th</sup> percentile SO<sub>2</sub> concentrations and design values from 2007 through 2012 at the York SO<sub>2</sub> monitor. Just like in the case at Strongstown, York's monitor is downwind of a major SO<sub>2</sub> source that recently installed scrubbers to control SO<sub>2</sub>. In 2009, the PPL–Brunner Island facility, which is located approximately 15 miles due north of the York monitor, underwent a similar installation of scrubbers as Keystone did in 2009. The operation of the scrubber at Brunner Island was instrumental in lowering SO<sub>2</sub> concentrations at York.

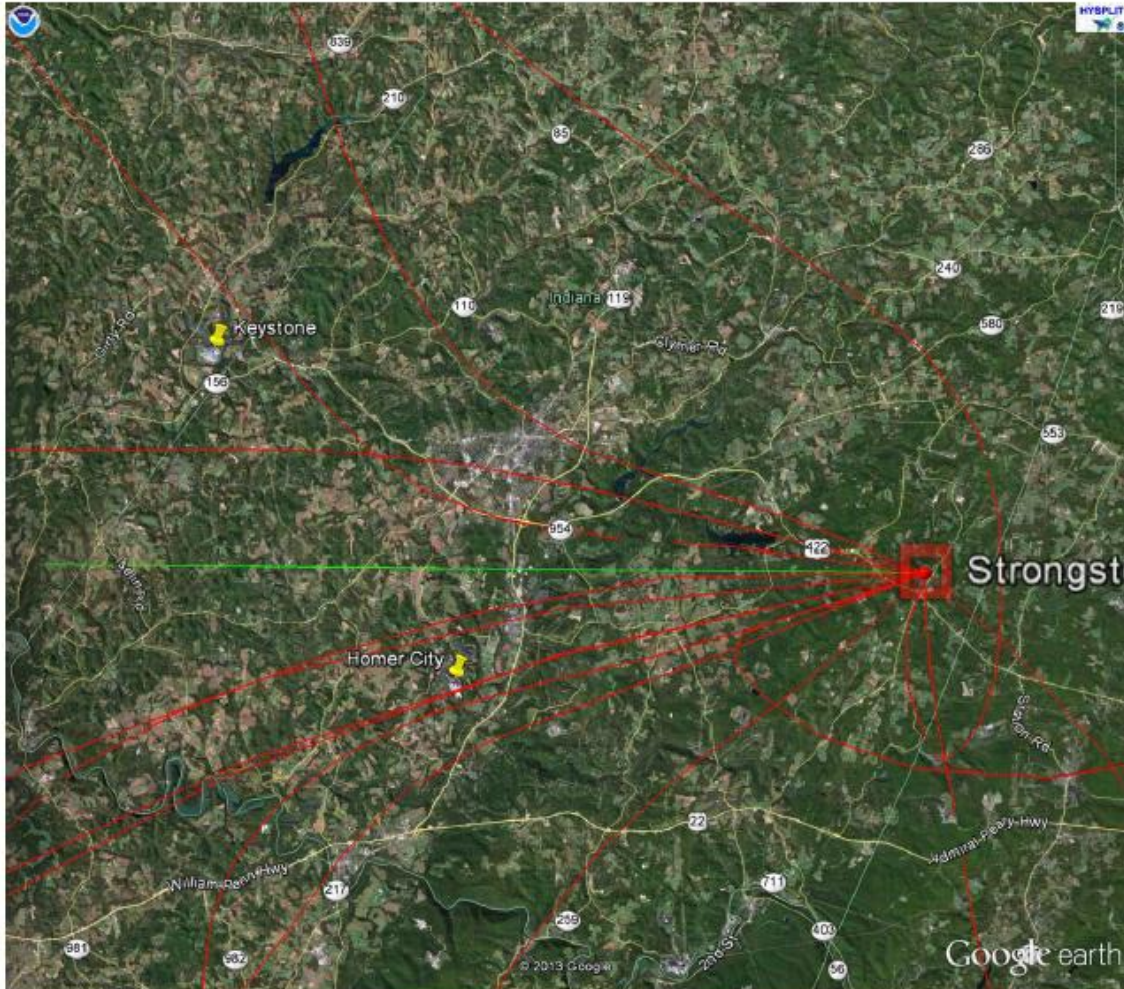
Ultimately, this illustrates that other sources (other than Keystone) are impacting the Strongstown monitor.

#### 4. Trajectory Analysis of 1-hour SO<sub>2</sub> Exceedances at Strongstown from 2010 to 2012

The 2012 1-hour SO<sub>2</sub> design value at the Strongstown monitor was 81 ppb. In order to understand the source region of the exceedances, the National Oceanic and Atmospheric Administration's (NOAA) Hysplit model was utilized. The Hysplit model computes back trajectories of air parcels at one specific point. The following map illustrates the 24-hour back trajectories during each day there was a 1-hour SO<sub>2</sub> NAAQS exceedance at the Strongstown monitor. The map shows the locations of the Strongstown monitor (with the



red box) and Keystone and Homer City (with the yellow pushpins). The red lines indicate the back trajectories while the green line indicates the demarcation line between Homer City and Keystone (the line is drawn at an angle equal distant from Homer City and Keystone with respect to the Strongstown monitor).



Of the fourteen 1-hour SO<sub>2</sub> NAAQS exceedance days between 2010 and 2012, only one trajectory's path comes within five miles of the Keystone power plant. Six trajectories' paths come within five miles of the Homer City plant. An additional seven trajectories come from areas not near Keystone or Homer City.

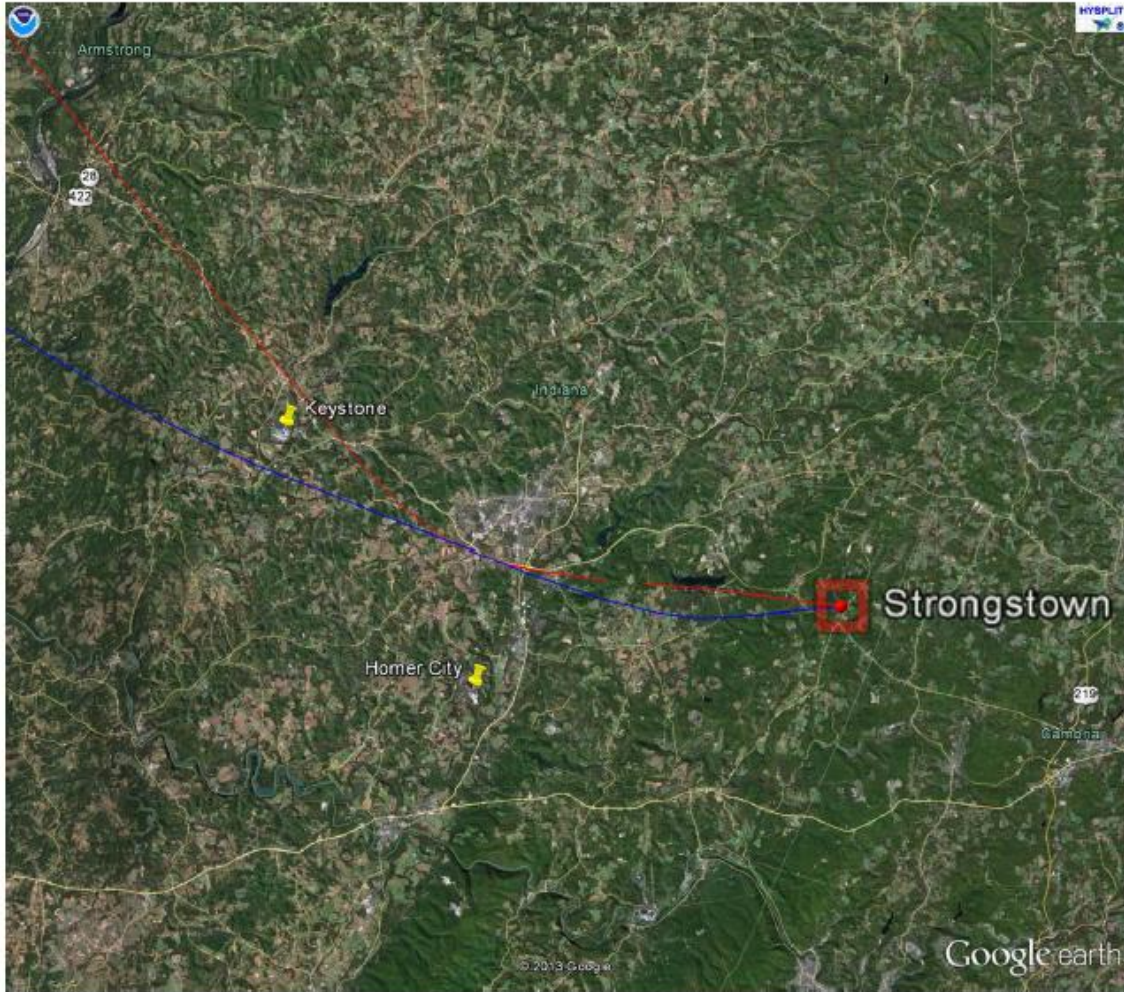
This trajectory analysis indicates that the wind is coming from the Southwest a majority of the time as opposed to Keystone which is Northwest of the monitor.

##### 5. Trajectory Analysis of Two Specific 1-hour SO<sub>2</sub> Exceedances at Strongstown

Within the past five years, Keystone underwent renovations to install flue gas desulfurization (FGD) scrubbers on its two main turbines. These scrubbers became operational during the second half of 2009. By analyzing a date prior to the second half of 2009 and a date after the second half of 2009, the Department illustrates that Keystone



is not the sole cause of any exceedance. This analysis focuses on the following dates: 9/8/2008, when the maximum daily 1-hour SO<sub>2</sub> concentration was 90 ppb, and 2/4/2010, when the maximum daily 1-hour SO<sub>2</sub> concentration was 95 ppb. The following map illustrates the 24-hour back trajectories for the 9/8/2008 (in blue) and 2/4/2010 (in red) 1-hour SO<sub>2</sub> exceedances at the Strongstown monitor.



Both trajectories run very close to the to the Keystone power facility. The following table analyzes the hourly SO<sub>2</sub> emission rates (in pounds) from the EPA’s Clean Air Markets Division (CAMD) database (<http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard>) for 9/8/2008 and 2/4/2010:

Hour	9/8/2008 (lb/hr)	2/4/2010 (lb/hr)
0	39039.4	3666.1
1	37931.6	3907.6
2	38092.2	3791.8
3	39461.1	4597.7
4	40284.3	8923.4

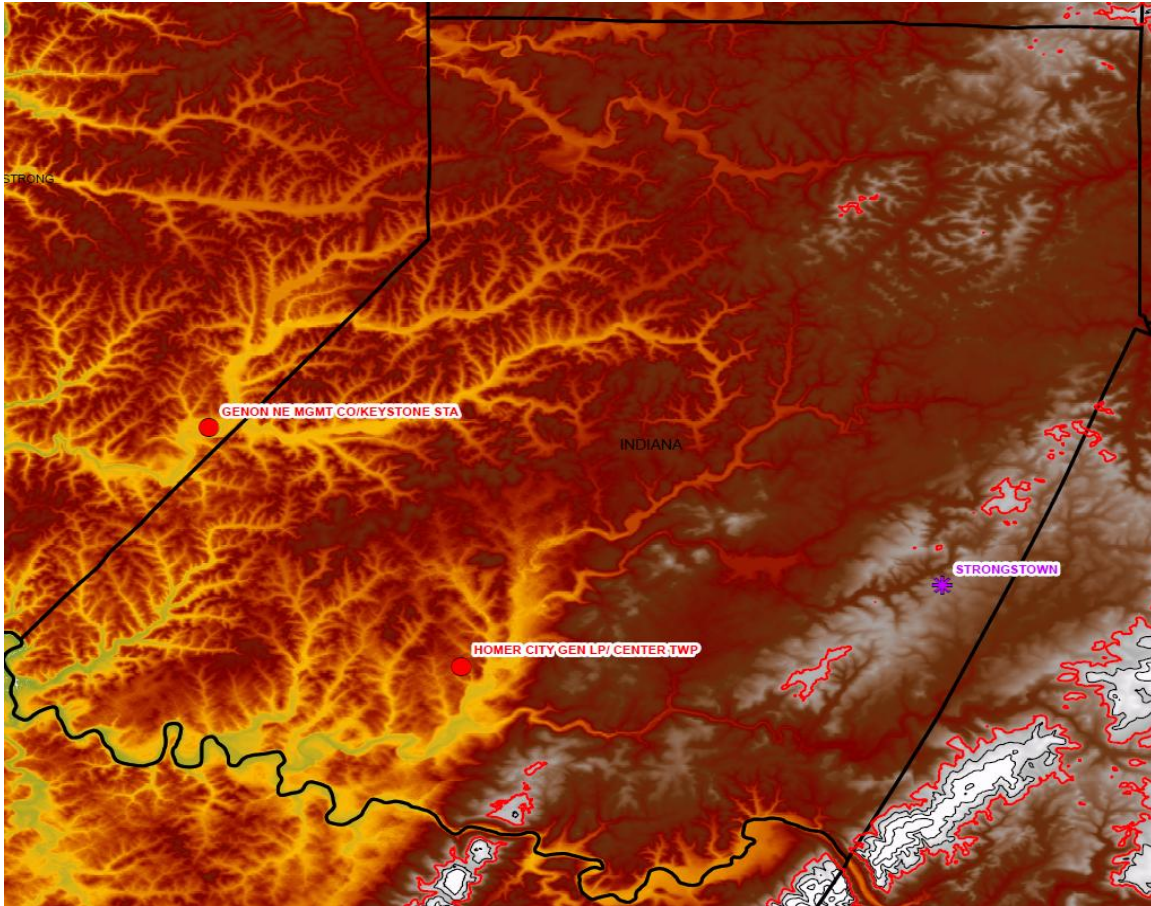
5	43187.7	8816.8
6	42869.6	8929.2
7	43683	8528.8
8	43811.1	8825.6
9	43125.7	9177.1
10	43185.5	9656.7
11	43192.2	9613.4
12	43471.2	9394.9
13	44146.8	10448.4
14	44672.8	11096.2
15	44841.9	11320.2
16	45299.8	8424.2
17	45358.4	8325.1
18	45339.2	8887.9
19	45031.7	10220.7
20	45262.3	7372.9
21	45399.6	7548.8
22	44842.1	7673.1
23	44746.7	7472.1
Average	43178.2	8192.4

This table illustrates the daily average hourly emission rates were 5.2 times less in 2/4/2010 than in 9/8/2008, which highlights the impact of having SO<sub>2</sub> controls Keystone. However, there was still a 1-hour SO<sub>2</sub> exceedance of the NAAQS on each of these days. If Keystone were the sole contributor of the violation on each of these days, the daily maximum 1-hour SO<sub>2</sub> concentration measured at Strongstown should be markedly higher on 9/8/2008 than on 2/4/2010. The daily maximum 1-hour SO<sub>2</sub> concentration measured on 9/8/2008 was 90 ppb, 5 ppb lower than the 1-hour SO<sub>2</sub> concentration measured on 2/4/2010. This illustrates that Keystone cannot be considered the sole contributor in either of the violations, even though the trajectories on these two days originate from the region surrounding Keystone..

#### 6. Analysis of Topography in Indiana and Surrounding Counties

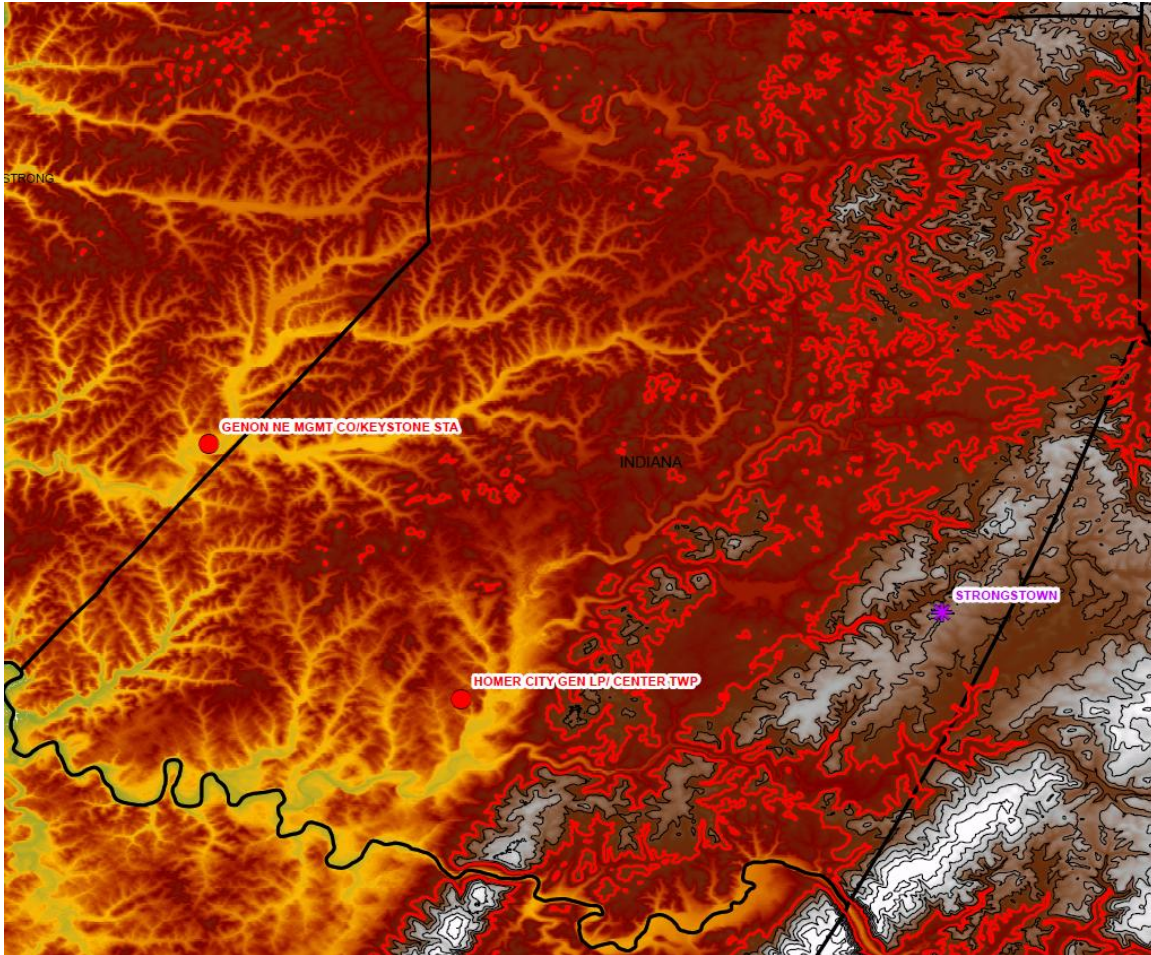
The Strongstown monitor is situated at an elevation of 1900 feet. By comparison, the base elevation of the Homer City facility is 1200 feet and the base elevation of the Keystone facility is 1010 feet. Homer City has three turbines. Two of these turbines have a stack height of 800 feet. The third stack height is 1216 feet. Keystone has two stack heights measured at 562.5 feet. The combined base elevation plus stack height of Homer City's two shortest stacks is 2000 feet while the combined base elevation plus stack of Keystone's stacks is 1572.5 feet. The following map displays the terrain at and above Homer City's two shortest stack tops across Indiana County and surrounding counties.





As the map demonstrates there is no intervening terrain between Homer City and Strongstown. Not taking into account actual plume rise, the stack heights at Homer City rise 100 feet above the base elevation at the Strongstown monitor. As discussed in point 1 above, Homer City's emissions have the potential to rise into the mixed layer and then mix down to the surface once daytime heating commences.

In contrast, the following map illustrates the terrain at and above stack top at Keystone across Indiana County and surrounding counties.



As the map demonstrates there is intervening terrain between Keystone and the Strongstown monitor. Not taking into account actual plume rise, the stack heights at Keystone will have to rise another 327.5 feet to reach the base elevation at the Strongstown monitor. The impact from Keystone is more likely to impact terrain between Keystone and Strongstown than to reach Strongstown.

## Conclusion

After considering the facts described above, the Department is recommending that that EPA remove the portion of Armstrong County it added to the Department's original 1-Hour SO<sub>2</sub> designations recommendations, from the Indiana County SO<sub>2</sub> nonattainment area. Back trajectories on exceedance days of the 1-hour SO<sub>2</sub> standard indicate that the air is not blowing in from the area near the Keystone facility a majority of the time. In addition, the analysis of the pre- and post-scrubber installation at Keystone prove that even when the air mass was blowing in from the area near Keystone, it did not have an impact on the SO<sub>2</sub> concentration at the Strongstown monitor. Finally, the topography coupled with time of day of the 1-hour SO<sub>2</sub> exceedances indicates that other sources within Indiana County are likely the main contributors of SO<sub>2</sub> nonattainment within Indiana County. A new map of the proposed 1-hour SO<sub>2</sub> nonattainment area is provided



below. This proposed nonattainment area is consistent with the Department's recommended nonattainment designation submitted to EPA on June 23, 2011.

