

Appendix E

Background Analysis: Gavin-Kyger Source Area

In order to perform designation modeling for the Gavin Power Plant and the Kyger Creek Station source area for sulfur dioxide (SO₂), Ohio EPA has conducted an analysis to determine an appropriate and conservative background concentration. Ohio EPA established a background concentration for the 2012 to 2014 period, which is representative of those sources thought to contribute to current and historical monitored concentrations, but are not explicitly modeled. These nearby sources are the Appalachian Power Phillip Sporn and Mountaineer power plants, as well as other smaller sources not meeting the criteria of the Data Requirements Rule. This background was used for base-case modeling using variable actual emissions for the 2012 to 2014 period to determine monitor-specific impacts.

Background was determined using data collected at ambient air quality monitor 39-195-0003 located in Pomeroy, Ohio approximately 15 km North, North-East of the sources. Background can be calculated from this monitor by excluding data from the monitor during times when the wind was coming from the direction of these notable sources.

Background Determination

Data Description:

Hourly ambient SO₂ concentrations recorded at the Pomeroy Monitor, years 2012 to 2014, were compiled from U.S. EPA's Technology Transfer Network, Air Quality System (AQS). (Appendix H of Ohio's recommended designation submittal) Likewise, hourly climate data for the same time period was acquired from the National Climatic Data Center (<http://www.ncdc.noaa.gov/>) for Huntington Tri-State Airport (KHTS).

Methodology:

The hourly SO₂ and wind data for the three years was aligned and SO₂ data was eliminated for those hours when the wind data was missing. To eliminate the impact of the explicitly modeled Gavin Power Plant and Kyger Creek Station sources, SO₂ data for hours when the wind direction was from the sources toward the monitor was eliminated. A narrow sector of wind directions (192.5° - 222.5°) was isolated from all other wind directions. This narrow sector was selected by finding the centerline heading between the monitor and the sources (207.5°), which essentially lie along a line extended along this heading from the monitor, as can be seen in Figure 1. Since all other wind directions are considered, the elimination of this data from the background determination would have little effect on the overall area considered. With all monitor data recorded for this sector excluded from further analysis, the resultant monitored values were compiled for each year of the 2012 to 2014 period and subsequently sorted.

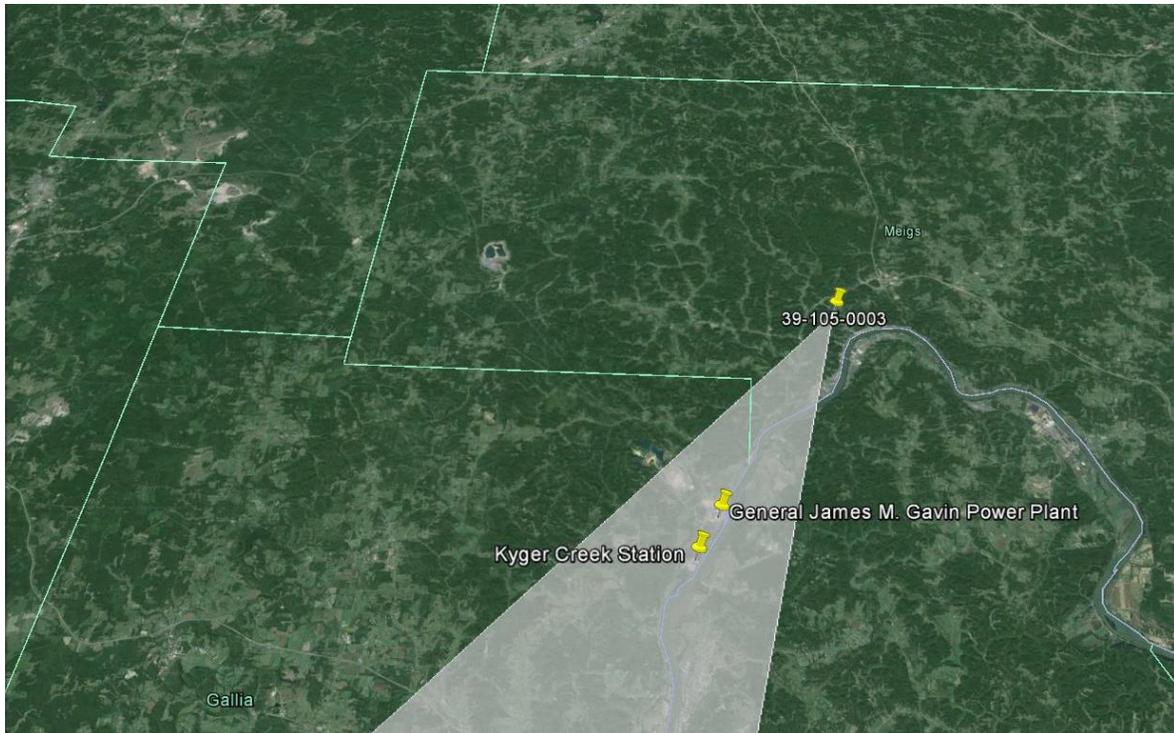


Figure 1: Monitor and source locations with 192.5° to 222.5° wind sector eliminated from background determination.

Analysis and Results:

Conservatively, Ohio EPA calculated the 99th percentile of hourly monitor values for each year of the 2012 to 2014 period to be considered as the background concentration values. This analysis yielded a range of background concentrations from 7 to 13 ppb. Ohio EPA chose 10 ppb as the background concentration, representing the three year average of the 99th percentiles, (9.6 ppb, rounded up). The results of the above analysis are shown in Table 1, below.

Annual 99th Percentile maximum of Monitored SO₂ Concentrations, 2012-2014			
	2012	2013	2014
Background SO₂ (ppb)	7	9	13

Table 1: Annual 99th percentile SO₂ concentrations, Pomeroy Monitor

This choice of 10 ppb as the background concentration is even more conservative considering results of modeling at the location of this monitor. Ohio EPA has performed dispersion modeling with AERMOD both with and without the new low wind and friction velocity beta options (as discussed in Appendix C of Ohio’s recommended designation submittal, and in all cases the model overestimates monitored values, as shown in Figure 2, even before including the 10 ppb background in the modeled values.

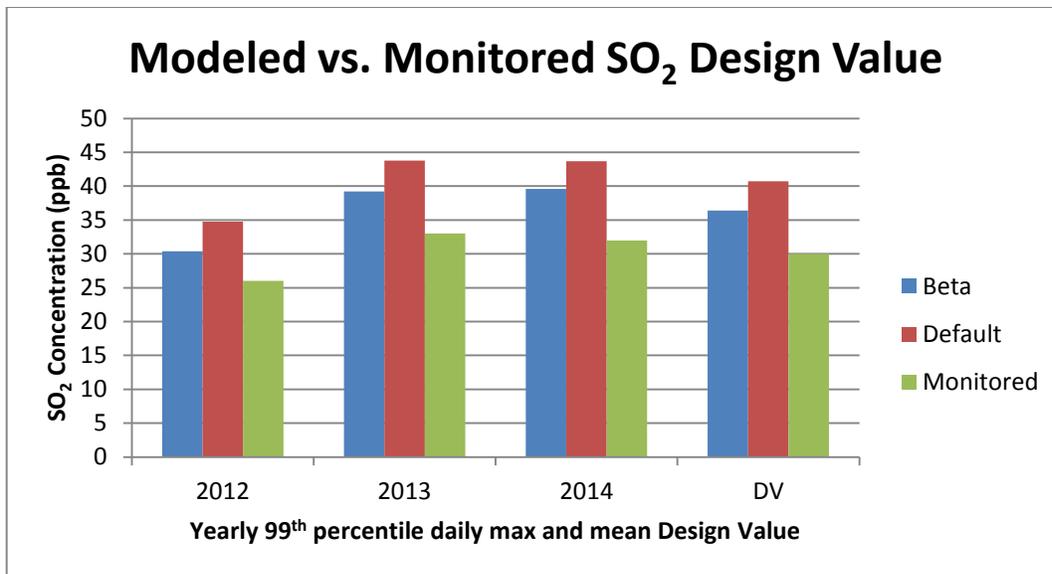


Figure 2: Yearly 99th percentile daily max and mean design value for the three year period of SO₂ concentration at the Pomeroy monitor location from the monitor data and modeled with and without new beta options.

Given this overestimation of the model value at the monitor location even before incorporating any background concentration, Ohio EPA is confident that 10 ppb is a very conservative and acceptable background concentration.