Allegheny County Health Department
Air Quality Program
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Pittsburgh, PA 15201

Draft 2010 Five-Year Monitoring Network Assessment

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1. Introduction

The U.S. Environmental Protection Agency (EPA) finalized an amendment to the ambient air monitoring regulations on October 17, 2006. As part of this amendment, EPA added the following requirement for state or local monitoring agencies to conduct a network assessment once every five years.

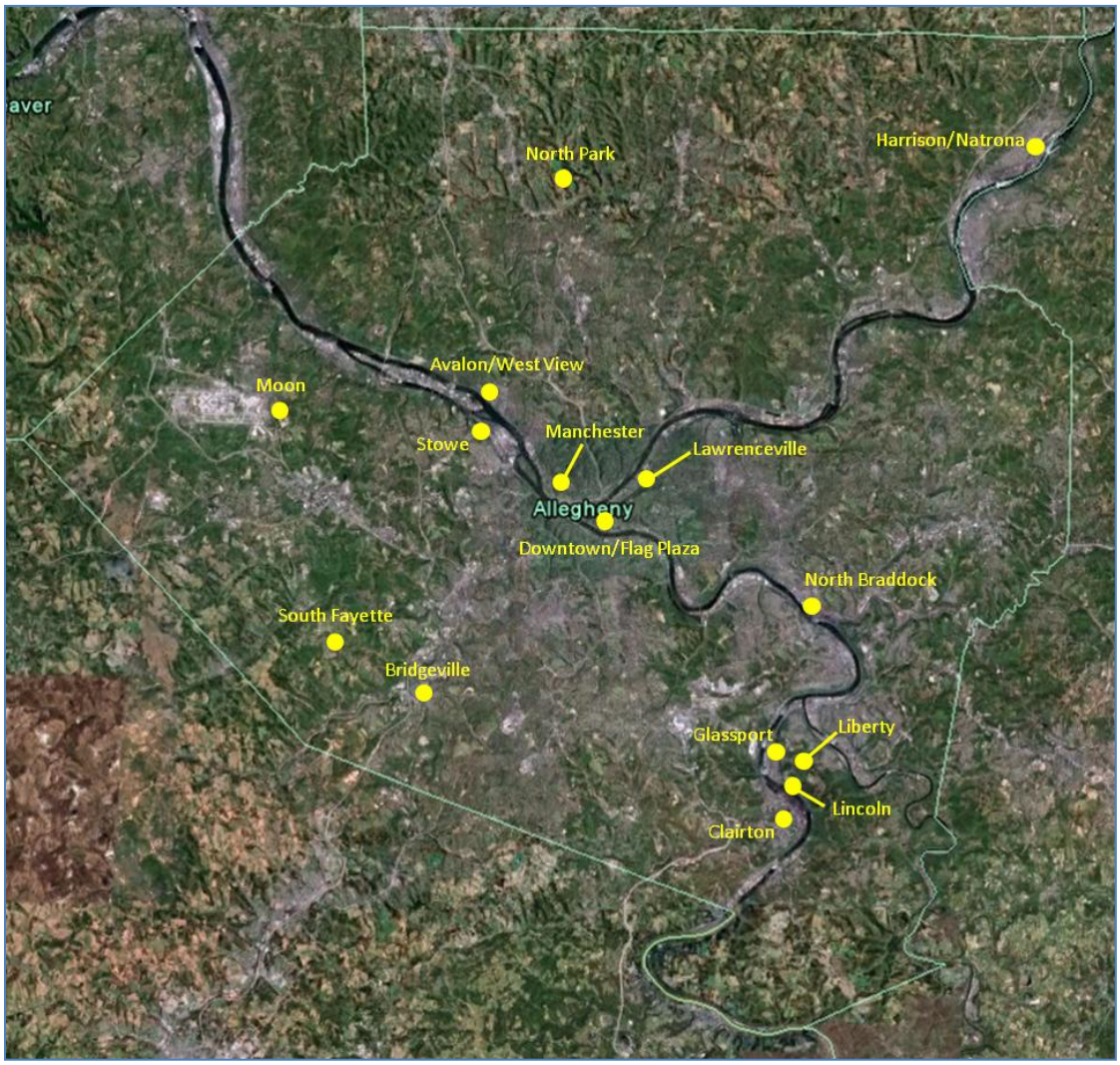
> 40 CFR Part 58.10.e: "The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For PM2.5, the assessment also must identify needed changes to population-oriented sites. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The first assessment is due July 1, 2010."

This report provides the network assessment for the Allegheny County Health Department (ACHD) Air Quality Program's monitoring network. This report was also used for determinations in network design as provided in the ACHD 2010 Annual Network Review.

One monitor site located at Carnegie Science Center on the North Shore of Allegheny County is owned and operated by the Pennsylvania Department of Environmental Protection (PA DEP). Similarly, many sites in surrounding PA counties operated by PA DEP were used to examine areas of coverage and data interpolations shown in this report. Assessment and determinations of the monitors at these sites were excluded in this report since the sites do not fall under the jurisdiction of ACHD.

The locations of current ACHD criteria pollutant sites are shown in Figure 1-1 on the following page. Many of these sites also include air toxics and/or meteorological monitors.

Figure 1-1. Current ACHD Monitoring Network



Specific information about the monitors at each site and close-up aerial maps of each site are given in the 2010 Network Review document.

Note: This map does not include one site that monitors hydrogen sulfide only and three sites that monitor dustfall only (not federally-regulated pollutants).

2. Tools and Methodology

Assessment Data

Data for the assessment analysis was compiled by ACHD from in-house databases and various public sources. Time periods and locations of downloadable data are summarized in Table 2-1 below.

Table 2-1. Data Used in the Assessment

Information Gathered	Time Period	Web Site Location of Data (if available)
Design Values	2006 to 2008	http://www.epa.gov/airtrends/values.html
Network Maps	Active	http://www.epa.gov/airexplorer/monitor_kml.htm
Nonattainment Areas	Active	http://www.epa.gov/air/data/index.html
Population	1990-2008	http://factfinder.census.gov
Pollutant Trends	1988 to 2008	http://www.epa.gov/airtrends/
Analysis Tools: - Population Animation - Area Served - Correlation Matrix - Removal Bias - New Sites Tool	2005 to 2008 (2 three-year periods)	http://www.epa.gov/ttn/amtic/netassess
Meteorological Data	2006 to 2008	For airport data, National Weather Service: http://www.nws.noaa.gov/ Also, National Climatic Data Center: http://www.ncdc.noaa.gov/oa/ncdc.html Note: Wind roses were generated from in-house ACHD met data.
Speciation Data	Recent Years	http://www.epa.gov/airexplorer/
Air Quality Index	Recent Years	http://www.epa.gov/airtrends/aqi_info.html http://www.epa.gov/cgi-bin/htmSQL/mxplorer/trend_aqi.hsql
Emission Inventories	Recent Years	http://www.epa.gov/air/data/
Traffic Counts	Recent Years	State Transportation Department or Other

Assessment Tools

Downloadable EPA network assessment tools were utilized to generate the analyses described in the bulleted list below.

- Population Animation: Shows the change in population for the U.S. from 1990 through 2008. The close-up of Allegheny County in 2008 was used for this report.

- Area Served: Shows the area served by each monitor within a network, including population served. Can be used for all pollutants and for various networks, depending on monitors selected. For this assessment, Allegheny County monitors served as the network, with surrounding Southwestern PA monitors included for $PM_{2.5}$ and ozone areas.

- Correlation Matrix: Shows the correlation and relative difference between several monitors within a network for 2005-2008 (two 3-year periods). The smallest ellipses translate into the best correlation between sites, with a straight line showing exact correlation. The lighter colors indicate lower relative difference. The network used for this tool is the Pittsburgh MSA.

- Removal Bias: Shows the bias for 2005-2008 by interpolation if a site is removed. A site that is statistically significant to the interpolation with surrounding sites on a given year is assigned a color-coded ring. Red indicates a positive bias, indicating that the site has low concentrations and would increase the network interpolation with its removal. Blue indicates negative bias, and the interpolation would decrease with its removal. A site that is statistically insignificant is assigned a solid dot, slightly blue or red based on the negligible amount of bias. All 2005-2008 were included in the removal bias interpolations.

- New Sites: Shows an area that is possibly deficient for a monitor. The analysis is based on interpolation between site pairs that meet criteria for a new site. A new site is indicated as a blue star, with active sites shown as dots. All monitors surrounding Allegheny County for 2005-2008 were included in the removal bias interpolations.

Area served was available for all criteria pollutants with more than one site. Population animation overlay for Google Earth was available for 1990-2008, including all sites (active or inactive) during this timeframe. The correlation matrix, removal bias, and new sites tools were applicable to $PM_{2.5}$, PM_{10}, and ozone only.

Ranking Methodology

Table 2-2 below shows the ranking criteria used to rank the parameters at each monitor site. The ranking methodology is based on previous and other Mid-Atlantic region assessments.

Table 2-2. Ranking Criteria

Number of other pollutants at site

NOx, SO_2, CO, PM10, PM2.5, Ozone, Lead

Number of Other Pollutants

	Score
0	0
1	1
2	2
3+	3

Number of Years in Operation

Number of Years	Score
0-5	0.00
6-10	0.25
11-20	0.50
21-30	0.75
31+	1.00

2006-2008 Design Value

PM10, PM2.5	Use Actual 24 Hour DV divided by 10
PM10, PM2.5	Use Actual Annual DV divided by 4
Ozone	Use Actual 8-hour DV multiplied by 13
SO_2	Use Actual 24 Hour DV multiplied by 10, Annual DV multiplied by 30
NO_2	Use Actual Annual DV multiplied by 20
CO	Use Actual Max 1-hour divided by 10, Actual Max 8-hour divided by 3

Site Objective

Meets objective = score of 1, else 0

Population (people/square mi)

People/mi²	Score
0-1000	0.00
1001-2000	0.25
2001-3000	0.50
3001-4000	0.75
4001+	1.00

Closest Site

Distance (km)	Score
0-4	0.00
5-10	0.25
11-15	0.50
16-20	0.75
21+	1.00

3. Standards and Objectives

Standards

Table 3-1 below shows the current National Ambient Air Quality Standards (NAAQS) at the time of this assessment.

Table 3-1. Current NAAQS

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [(1)]	None	
	35 ppm (40 mg/m^3)	1-hour [(1)]		
Lead	0.15 µg/m^3 [(2)]	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [(3)]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [(4)]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour [(5)]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual [(6)] (Arithmetic Average)	Same as Primary	
	35 µg/m^3	24-hour [(7)]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [(8)]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [(9)]	Same as Primary	
	0.12 ppm	1-hour [(10)]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [(1)]
	0.14 ppm	24-hour [(1)]		

(1) Not to be exceeded more than once per year.
(2) Final rule signed October 15, 2008.
(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard
(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).
(5) Not to be exceeded more than once per year on average over 3 years.
(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).
(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

Where possible, assessment results were examined for appropriateness to new proposed standards. The levels of proposed NAAQS and status of review for each standard at the time of this assessment are given in Table 3-2 below.

Table 3-2. Proposed NAAQS

Pollutant	NAAQS Level	Status of Current NAAQS Review	Proposed Changes	Expected Date of Final Decision
Ozone	0.075 ppm 8-hour	Reconsideration of level and secondary NAAQS	Proposal expected in December 2009	August 2010
CO	9 ppm 8-hour 35 ppm 1-hour	Early in Review		May 2011
SO_2	0.03 ppm annual 0.14 ppm daily	Proposal published on December 8, 2009	Proposal to revise primary to a level of between 50 and 100 ppb measured over one-hour	June 2010
NO_2	53 ppb annual mean New - 100 ppb one-hour	Final Rule signed with new one-hour NO_2 NAAQS at 100 ppb. Retained annual average of 53 ppb. Includes provisions for near-roadway monitoring network.		Final Rule was signed on January 22, 2010
$PM_{2.5}$	15 µg/m^3 annual average 35 µg/m^3 daily	Integrated Science Assessment nearing completion; Visibility Assessment and Risk and Exposure Assessment just reviewed by CASAC	Proposal expected by November 2010 – subject to change	July 2011 – subject to change
PM_{10}	150 µg/m^3 daily			
Pb	0.15 ug/m3 rolling 3-month average	Reconsideration of Monitoring Requirements		Mid 2010

Designations

Figures 3-1 and 3-2 below show the current designated nonattainment areas within or including Allegheny County.

Figure 3-1. Ozone (8-Hour) Nonattainment Area

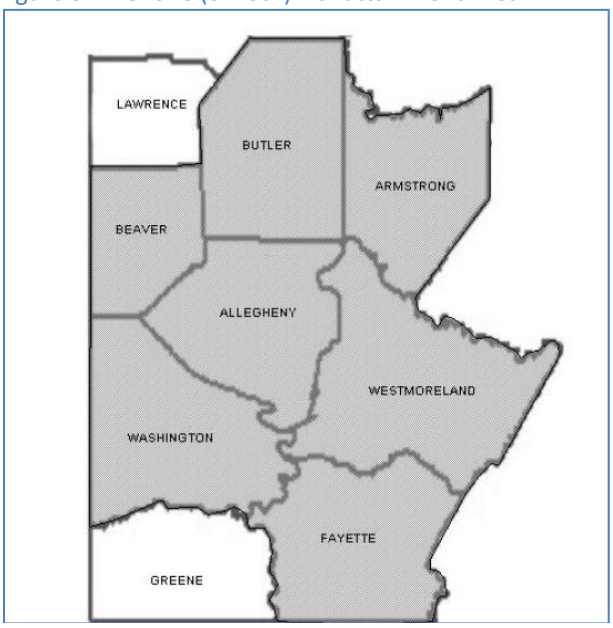
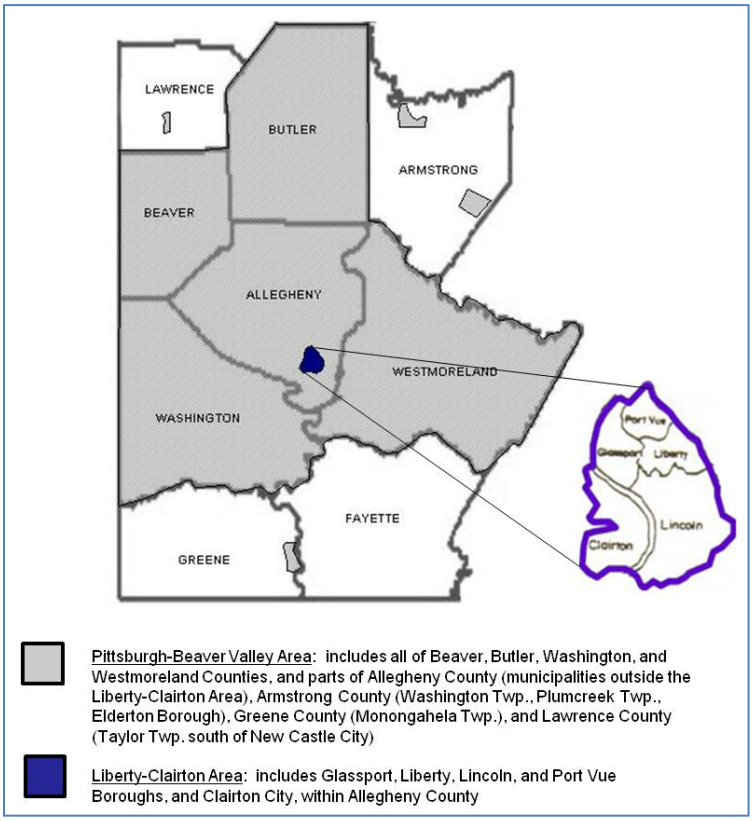


Figure 3-2. $PM_{2.5}$ Nonattainment Areas



Monitoring Objectives

Current or proposed monitor objectives and requirements according to 40 CFR Part 58 Appendix D are summarized below in Table 3-3 for each pollutant.

Table 3-3. Monitoring Objectives

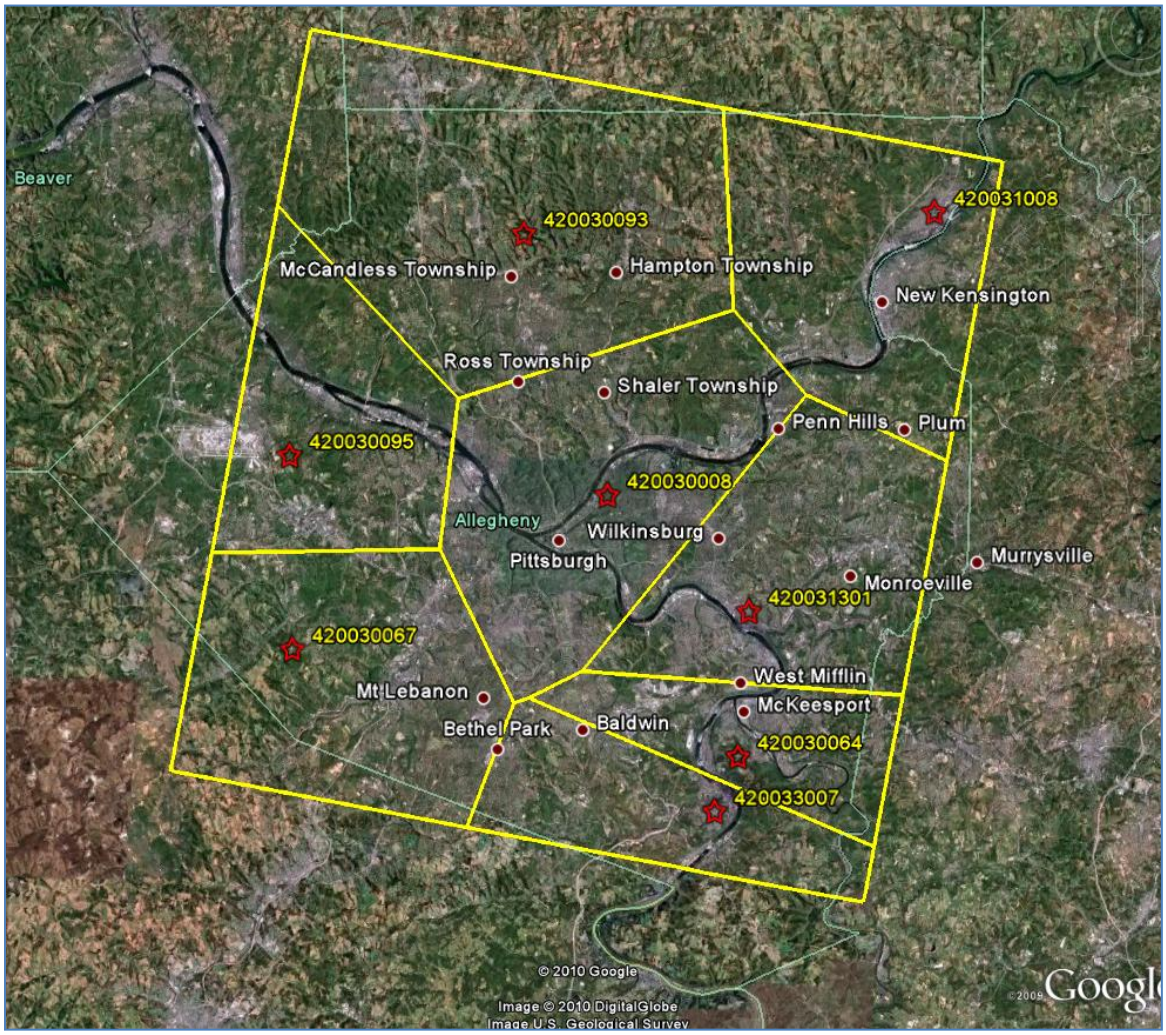
Pollutant	Requirement(s)	Provisions for Locating a Site
Ozone	"…at least one O_3 site for each MSA, or CSA if multiple MSAs are involved, must be designed to record the maximum concentration for that particular area. More than one maximum concentration site may be necessary for some areas."	Appendix D, Section 4.1 - The "…maximum concentration monitor site should be selected in a direction from the city that is most likely to observe the highest O_3 concentrations, more specifically, downwind during periods of photochemical activity. In many cases these, these maximum concentration sites will be located 10 to 30 miles or more downwind from the urban areas where maximum O_3 precursor emissions originate."
CO	Appendix D, Section 4.2 - "Where SLAMS CO monitoring is ongoing, at least one site must be a maximum concentration site for that area under investigation."	Appendix D, Section 4.2 - "Carbon monoxide maxima occur primarily in areas near major roadways and intersections with high traffic density and often poor atmospheric ventilation."
SO_2	PROPOSED – See Appendix D, Section 4.4 in proposal	
NO_2	Appendix D, Section 4.4 – "(a) Within the NO_2 network, there must be one microscale near-road NO_2 monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts…" AADT means the annual average daily traffic.	Appendix D, Section 4.4 "(1) The near-road NO_2 monitoring stations shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO_2 concentrations are expected to occur and siting criteria can be met in accordance with appendix E of this part."
$PM_{2.5}$	Appendix D, Section 4.7 – Table D-5 provides Minimum Monitoring Requirements.	Appendix D, Section 4.7 (b) – "the required monitoring stations or sites must be sited to represent community-wide air quality." "These monitoring stations will typically be at neighborhood or urban–scale; however, …" (1) At least one monitoring station is to be sited in a population-oriented area of expected maximum concentration." (2) For areas with more than one required SLAMS, a monitoring station is to be sited in an area of poor air quality" (c) "The most important spatial scale to effectively characterize the emissions of particulate matter from both mobile and stationary sources is the neighborhood scale for $PM_{2.5}$."
PM_{10}	Appendix D, Section 4.6 – Table D-4 provides Minimum Monitoring Requirements.	Appendix D, Section 4.6 – "(b) although microscale monitoring may be appropriate in some circumstances, the most important spatial scale to effectively characterize the emissions of PM_{10} from both mobile and stationary sources are the middle scales and neighborhood scales."
Pb	Near source monitors required; EPA reconsidering other monitoring requirements	Appendix D, Section 4.5 – "At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each Pb source which emits 1.0 or more ton per year based on either the most recent National Emissions Inventory or other scientifically justifiable method and data…"

4. $PM_{2.5}$ FRM/FEM Analysis

Area Served

The areas served for $PM_{2.5}$ Federal Reference/Equivalent Method (FRM/FEM) monitors are shown on the map in Figure 4-1 below. Monitors shown are all FRM, labeled according to AQS site code, based on active 2008 sites. Note: North Park and Moon (420030093, 420030095) did not operate in 2008 but were restarted in 2009.

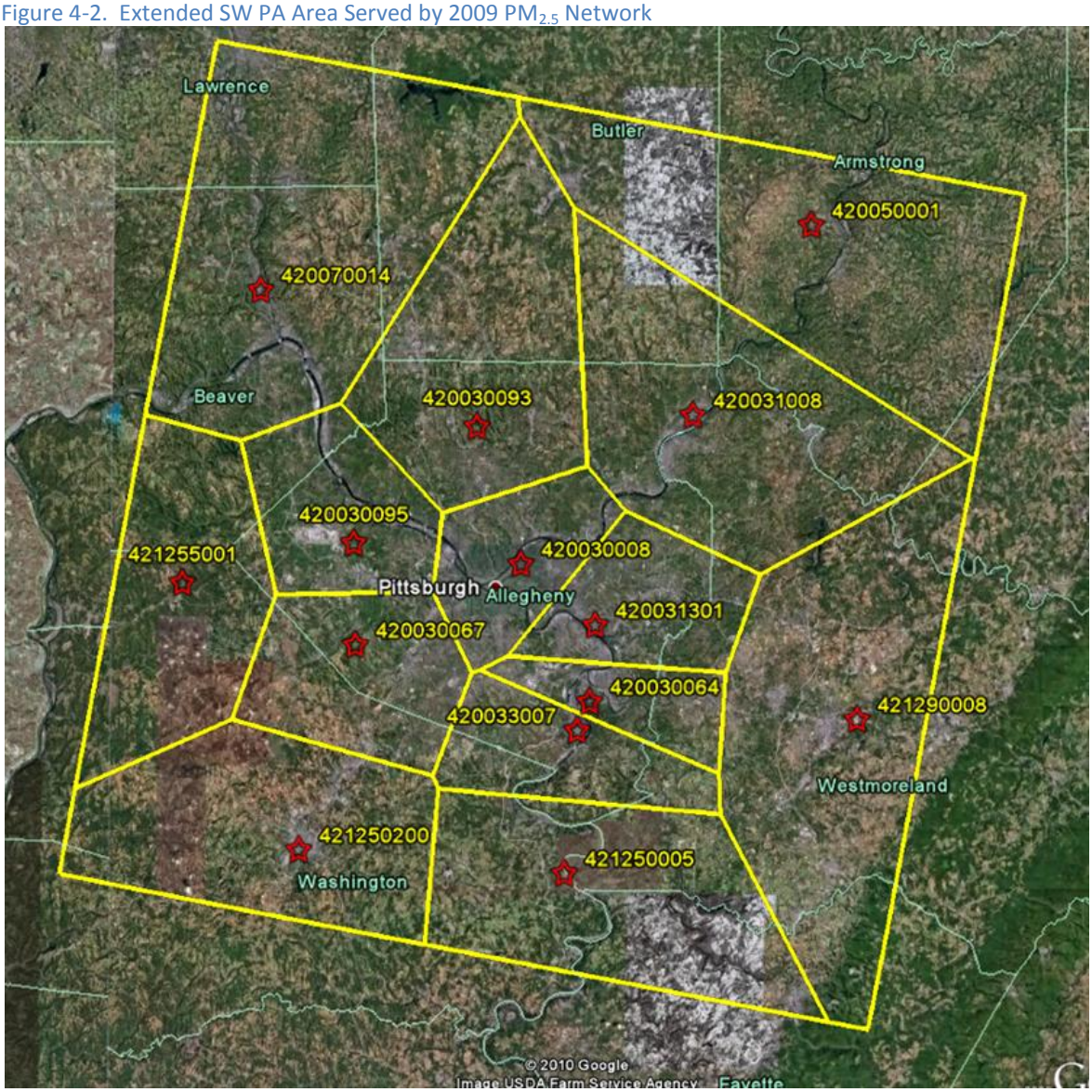
Figure 4-1. Area Served by 2008 $PM_{2.5}$ Network



The map shows a fairly even distribution of $PM_{2.5}$ FRM monitors throughout the County. All monitors are sited according to population exposure objectives, but there are different source types that contribute to each area. Liberty and Clairton (420030064, 420033007) have smaller areas served to address dense residential population in river valleys with heavy industry. Harrison and North Braddock (420031008, 420031301) serve larger areas with both river valley industry and suburban activity. Lawrenceville (420030008) is representative of a more urban exposure, including much of the City of Pittsburgh. South Fayette and North Park (420030067, 420030093) are representative of background and/or suburban air quality. Moon (420030095) has traditionally been considered as an airport-related site but has exhibited background and suburban trends similar to South Fayette and North Park.

To examine the area covered within the larger Southwestern Pennsylvania (SW PA) region, $PM_{2.5}$ FRM/FEM sites in surrounding counties were included along with Allegheny County sites. Four of the surrounding county sites utilize FEM monitors, as of 2009. The larger area served within the multi-county region is shown in Figure 4-2 below.

Figure 4-2. Extended SW PA Area Served by 2009 $PM_{2.5}$ Network



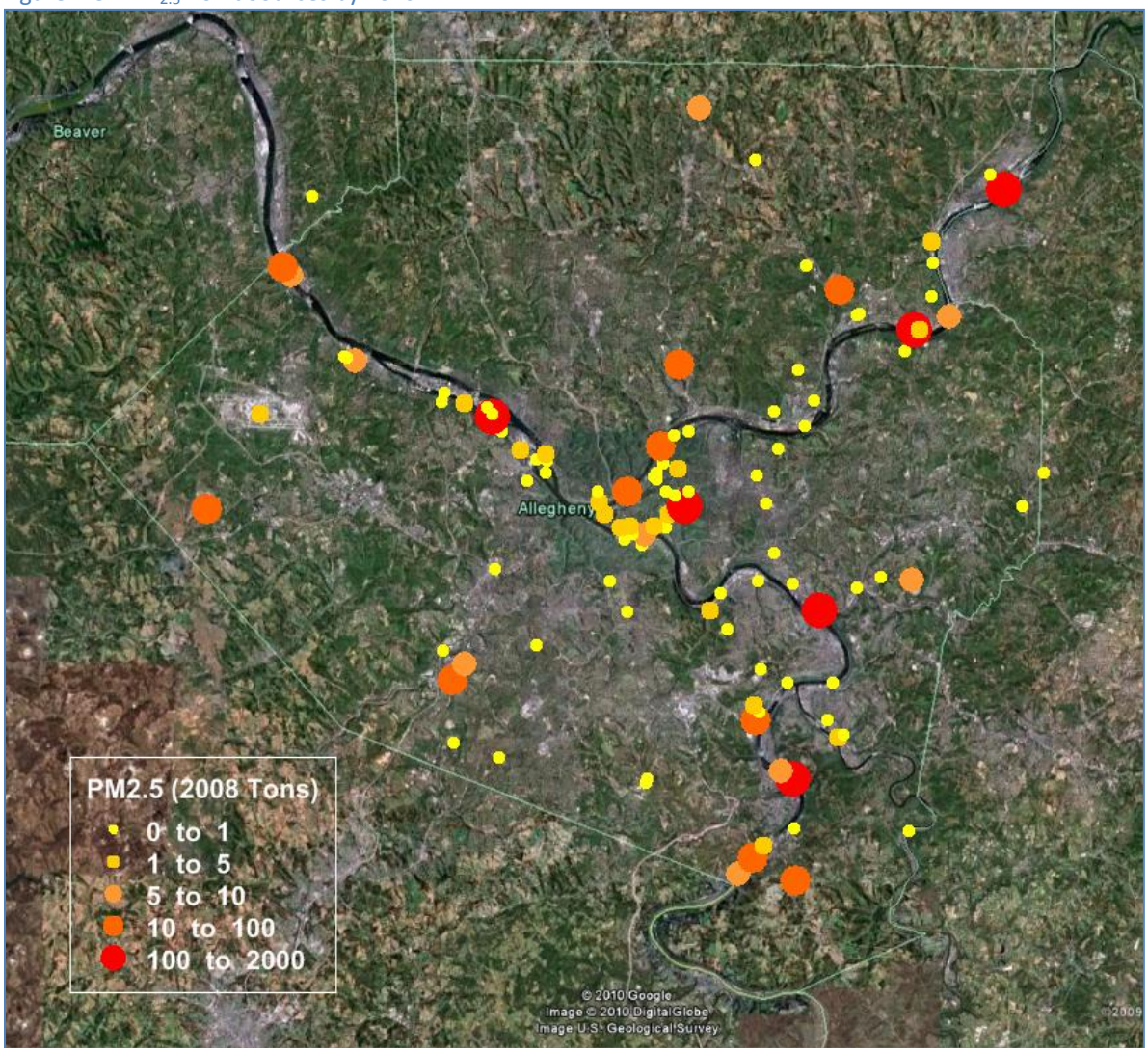
The map shows a fairly even distribution of $PM_{2.5}$ FRM/FEM, similar to the distribution in Allegheny County by itself. The larger combined network is adequate for population exposure, and it also includes measurement of $PM_{2.5}$ transport in and out from the region.

Note: Population densities used in the ranking of Allegheny County monitors were based on area served within Allegheny County alone, since the surrounding counties are not part of the ACHD network jurisdiction.

Emissions

Figure 4-3 below shows the 2008 $PM_{2.5}$ emissions by point source in Allegheny County. The largest sources are steel and electric generation facilities in the river valleys.

Figure 4-3. $PM_{2.5}$ Point Sources by Tons

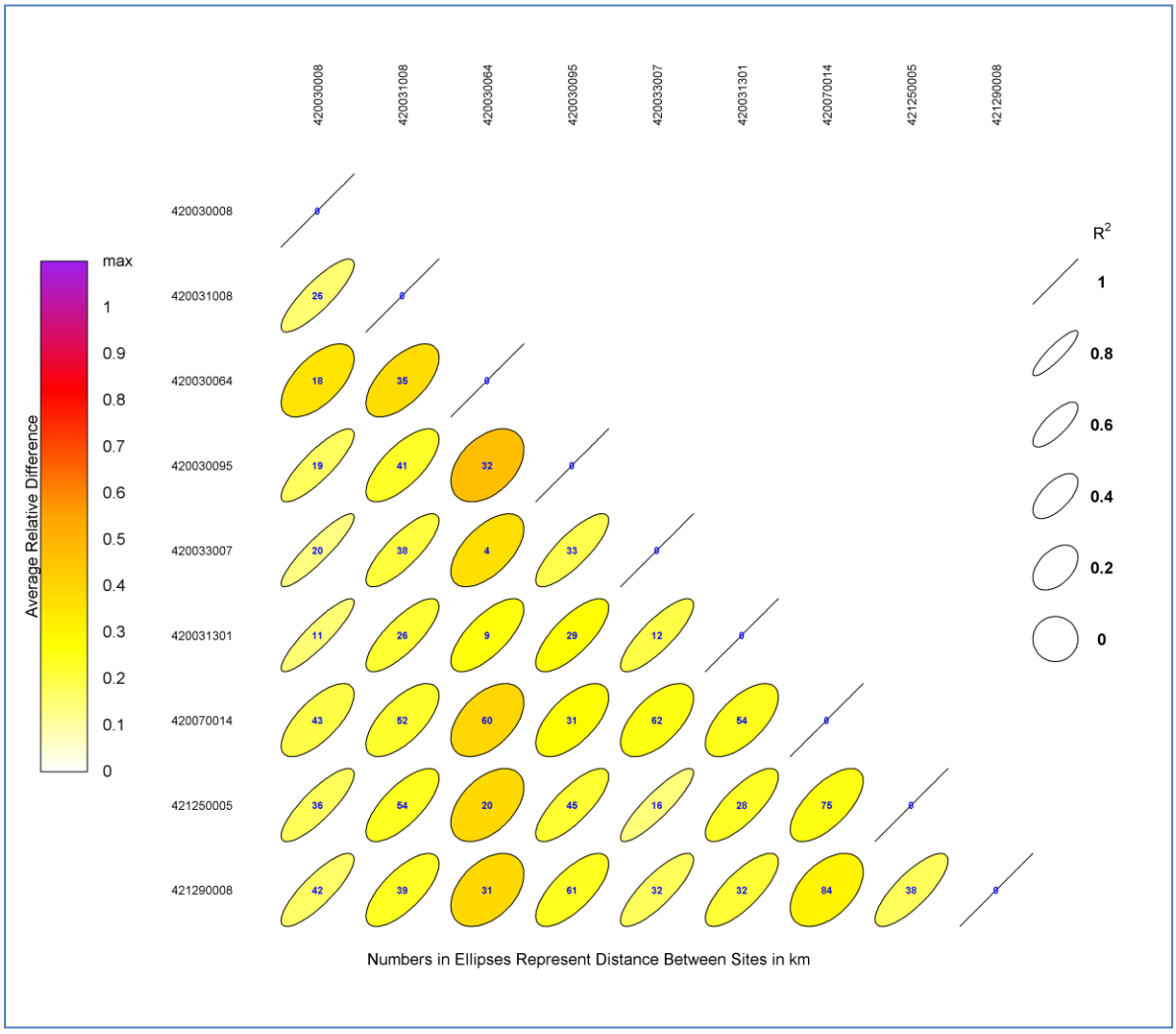


The wide distribution of $PM_{2.5}$ monitors throughout the county is adequate in relation to location of sources. Speciation and source apportionment data has shown that $PM_{2.5}$ is made up of both primary and secondary particulate matter, and placement of $PM_{2.5}$ monitors is based on population exposure. Therefore, several monitors are located throughout the county.

Correlation Matrices

Figure 4-4 below shows the correlation matrix for $PM_{2.5}$ FRM monitors based on 2005-2007 averages. Monitors from Beaver, Washington, and Westmoreland Counties (420070014, 421250005, 421290008) are included to examine consistency throughout the Pittsburgh MSA. Note: North Park and South Fayette were excluded from the EPA correlation matrix tool due to low data recovery in one or more calendar quarters.

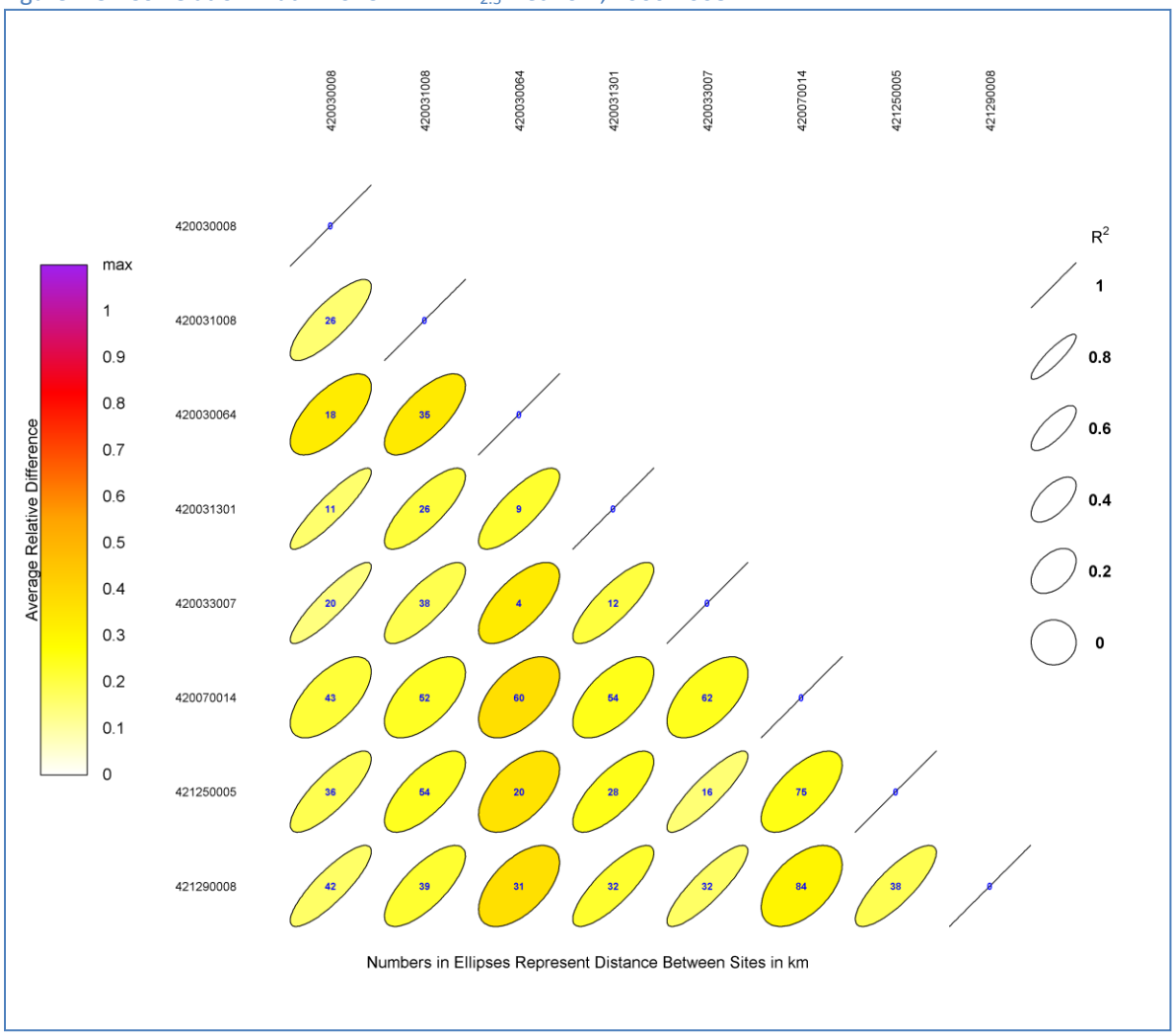
Figure 4-4. Correlation Matrix for SW PA $PM_{2.5}$ Network, 2005-2007



The 2005-2007 matrix shows that North Braddock (420031301) has the best correlation and lowest relative difference compared to other SW PA monitors, indicating consistency within the network and possible redundancy. Lawrenceville (420030008) also shows consistency within the network, except with Liberty (420030064). Liberty shows the lowest correlation and highest relative difference to the rest of the network, indicating inconsistency with the network and supporting the appropriateness of the separate Liberty-Clairton nonattainment area within the Pittsburgh-Beaver Valley nonattainment area.

Figure 4-5 below shows the correlation matrix for $PM_{2.5}$ FRM monitors based on 2006-2008 averages. Note: North Park, South Fayette, and Moon were excluded from the EPA correlation matrix tool due to low data recovery in one or more calendar quarters.

Figure 4-5. Correlation Matrix for SW PA $PM_{2.5}$ Network, 2006-2008

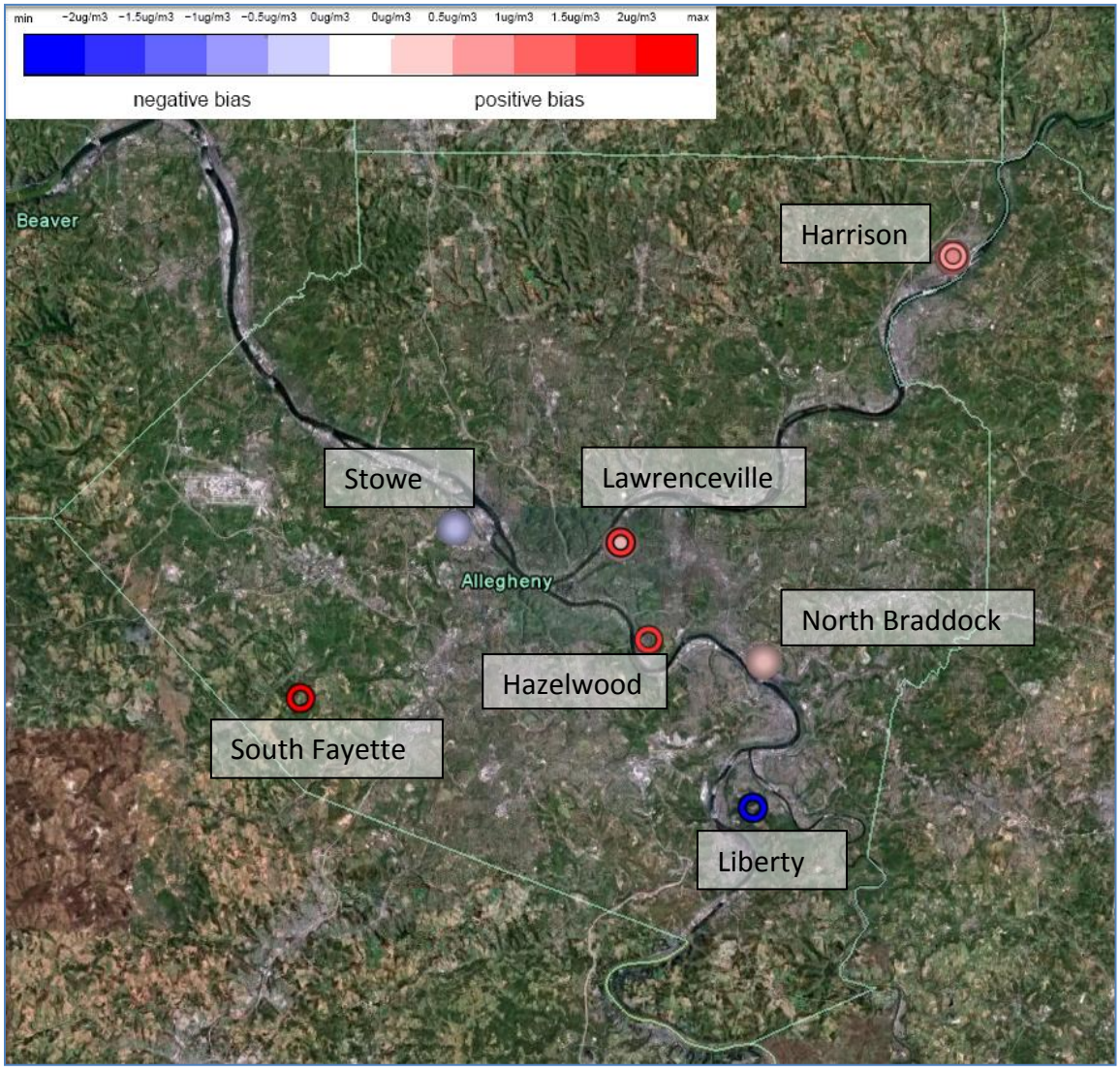


The 2006-2008 matrix shows similar results to 2005-2007, with North Braddock as the most consistent site and Liberty at the least consistent.

Removal Bias

Results from the removal bias tool are shown in Figure 4-6 below for Allegheny County $PM_{2.5}$ FRM monitors on a 1-in-3 basis. Data is based on 2005-2008 data, with all surrounding sites included in the interpolation analysis. Dots and rings for each year are shown stacked on one another. All 1-in-3 schedule monitors in operation since 2005 on are shown on the map.

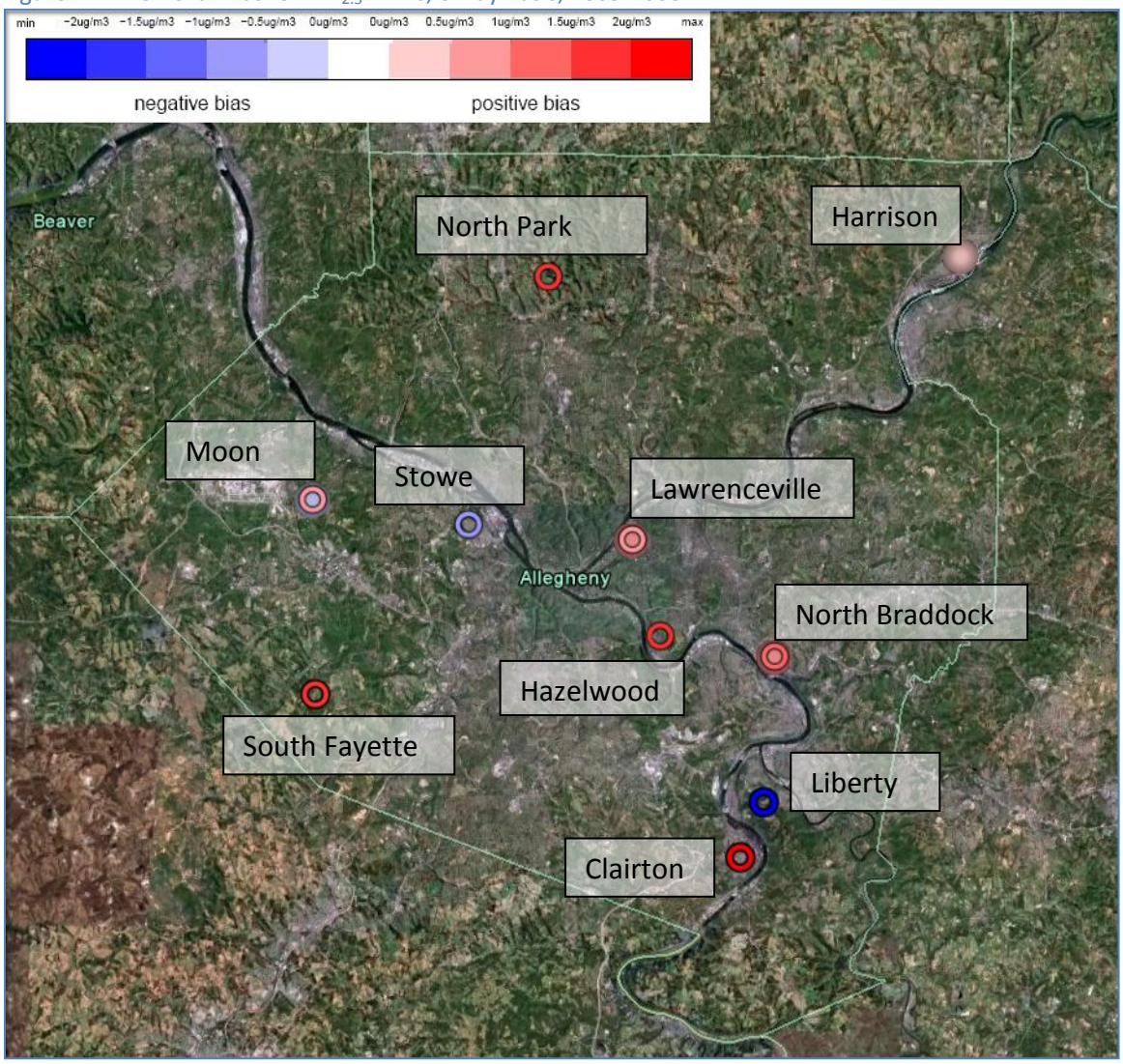
Figure 4-6. Removal Bias for $PM_{2.5}$ FRMs, 3-Day Basis, 2005-2008



Solid dots at North Braddock and Stowe (discontinued after 2005) indicate statistical insignificance on a 1-in-3 basis. Lawrenceville and Harrison show a combination of positive bias (low concentrations) and insignificance, varying by year. South Fayette and Hazelwood (discontinued after 2005) show positive bias. Liberty shows consistent negative bias (high concentrations).

Results from the removal bias tool are shown in Figure 4-7 below on a 1-in-6 basis for Allegheny County. This map adds Moon, North Park, and Clairton; bias is similar for the remaining sites on the less frequent sampling schedule.

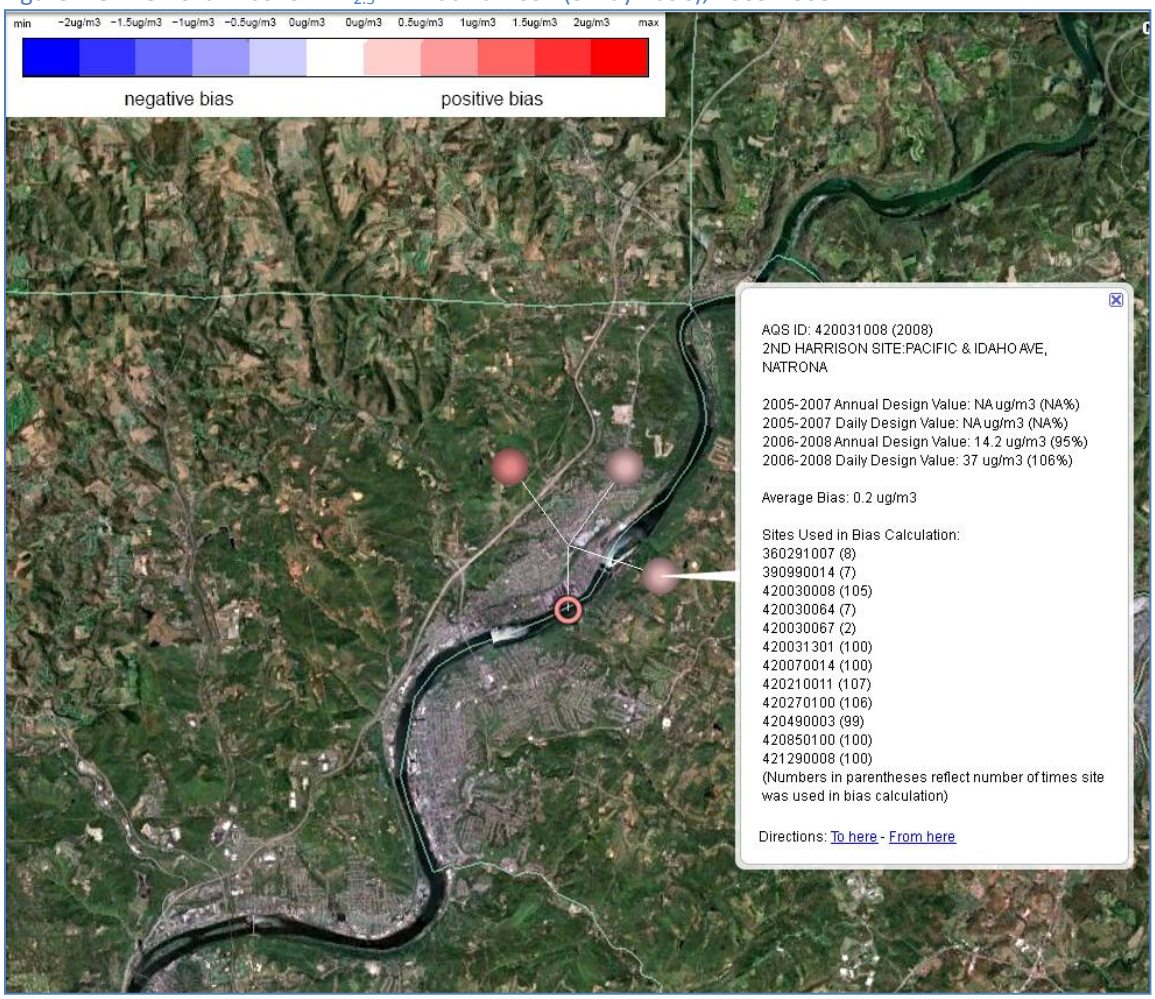
Figure 4-7. Removal Bias for $PM_{2.5}$ FRMs, 6-Day Basis, 2005-2008



Moon shows a combination of positive bias (low concentrations) and insignificance, varying by year. North Park and Clairton show consistent positive bias (low concentrations).

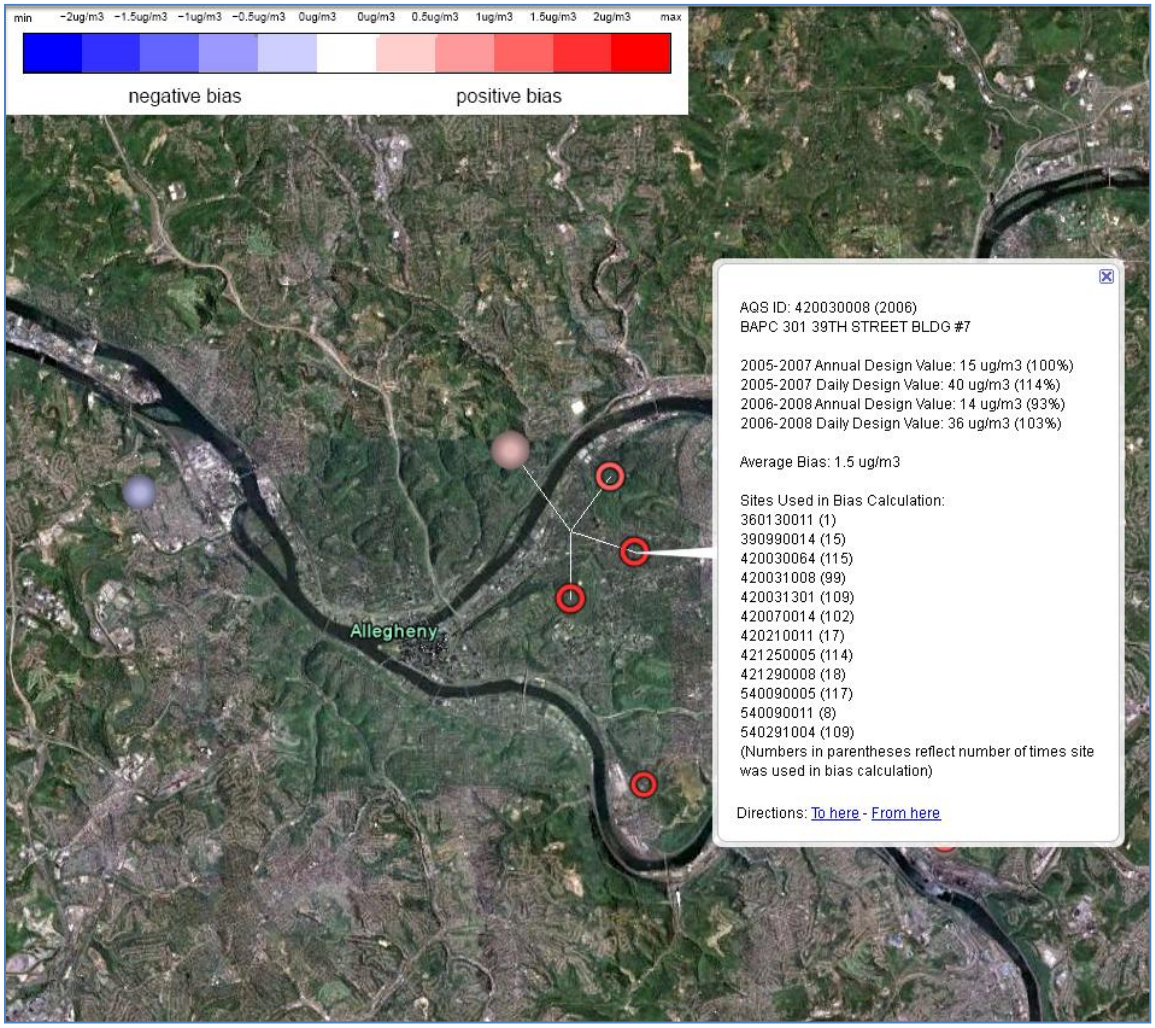
Figures 4-8 through 4-15 below show close-ups of each active site on their respective sampling bases, with the dots and rings expanded for each year analyzed and a description of the removal bias statistics.

Figure 4-8. Removal Bias for $PM_{2.5}$ FRM at Harrison (3-Day Basis), 2005-2008



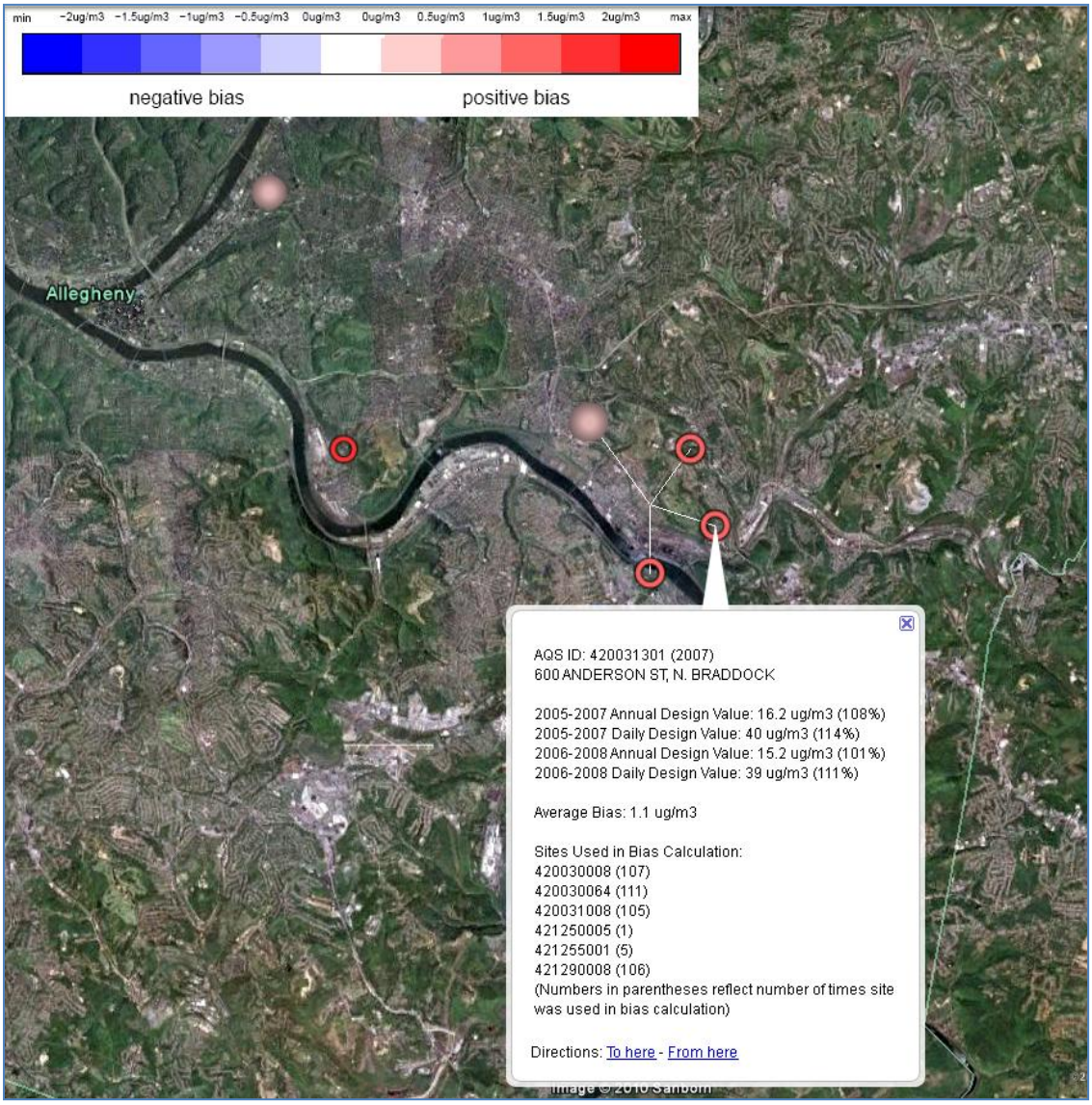
Harrison shows insignificance or slight positive bias during the 4-year period. However, Harrison is important as an outgoing monitor and as a representative of the Allegheny River valley area air quality.

Figure 4-9. Removal Bias for $PM_{2.5}$ FRM at Lawrenceville (3-Day Basis), 2005-2008



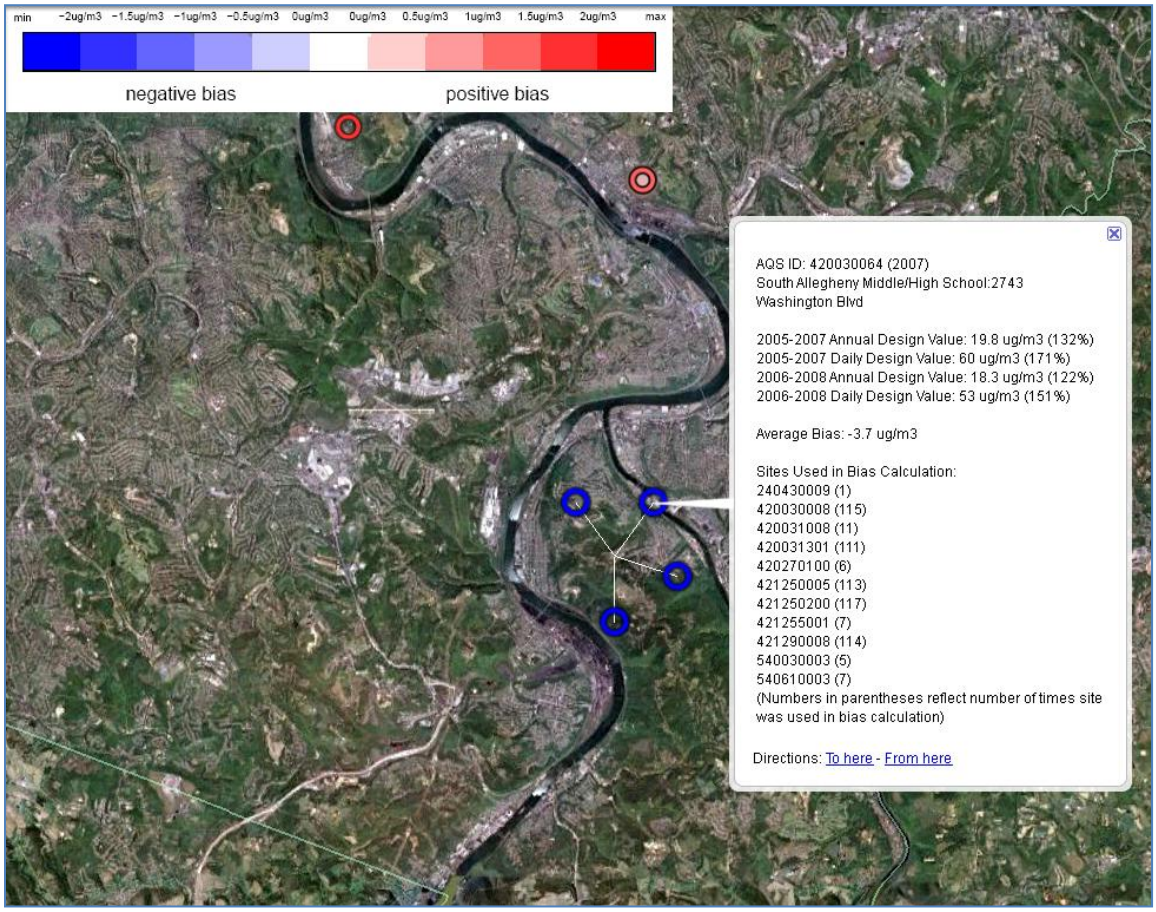
Lawrenceville shows positive bias for positive bias for most years, indicating lower values than surrounding monitors, with one year of insignificance. Lawrenceville is important as an urban NCore site and samples on a daily (1-in-1) basis.

Figure 4-10. Removal Bias for $PM_{2.5}$ FRM at North Braddock (3-Day Basis), 2005-2008



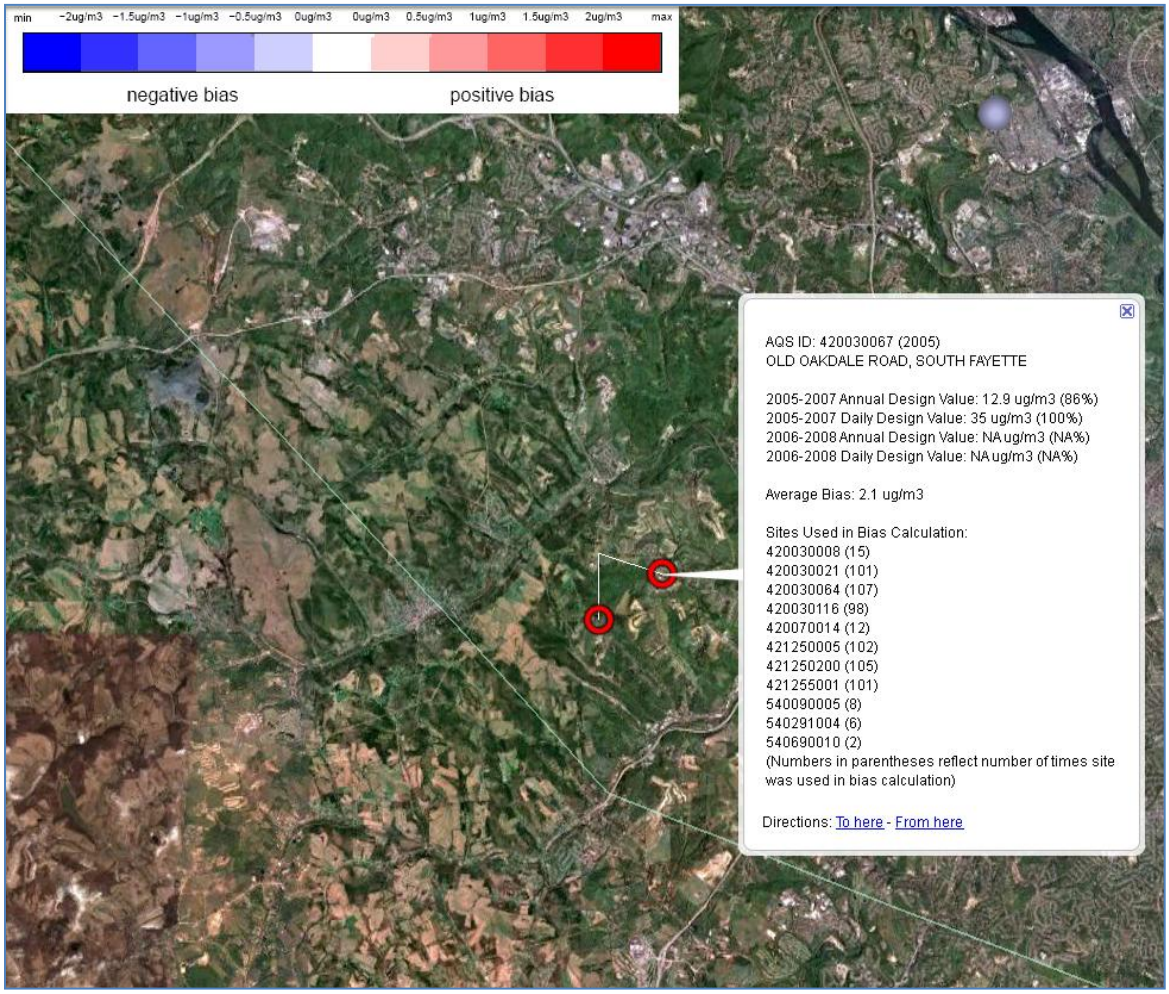
North Braddock shows positive bias for most years with one year of insignificance. While North Braddock usually shows the highest concentrations outside the Liberty-Clairton area, the positive bias is likely due to its proximity to Liberty in the bias interpolations.

Figure 4-11. Removal Bias for $PM_{2.5}$ FRM at Liberty (3-Day Basis), 2005-2008



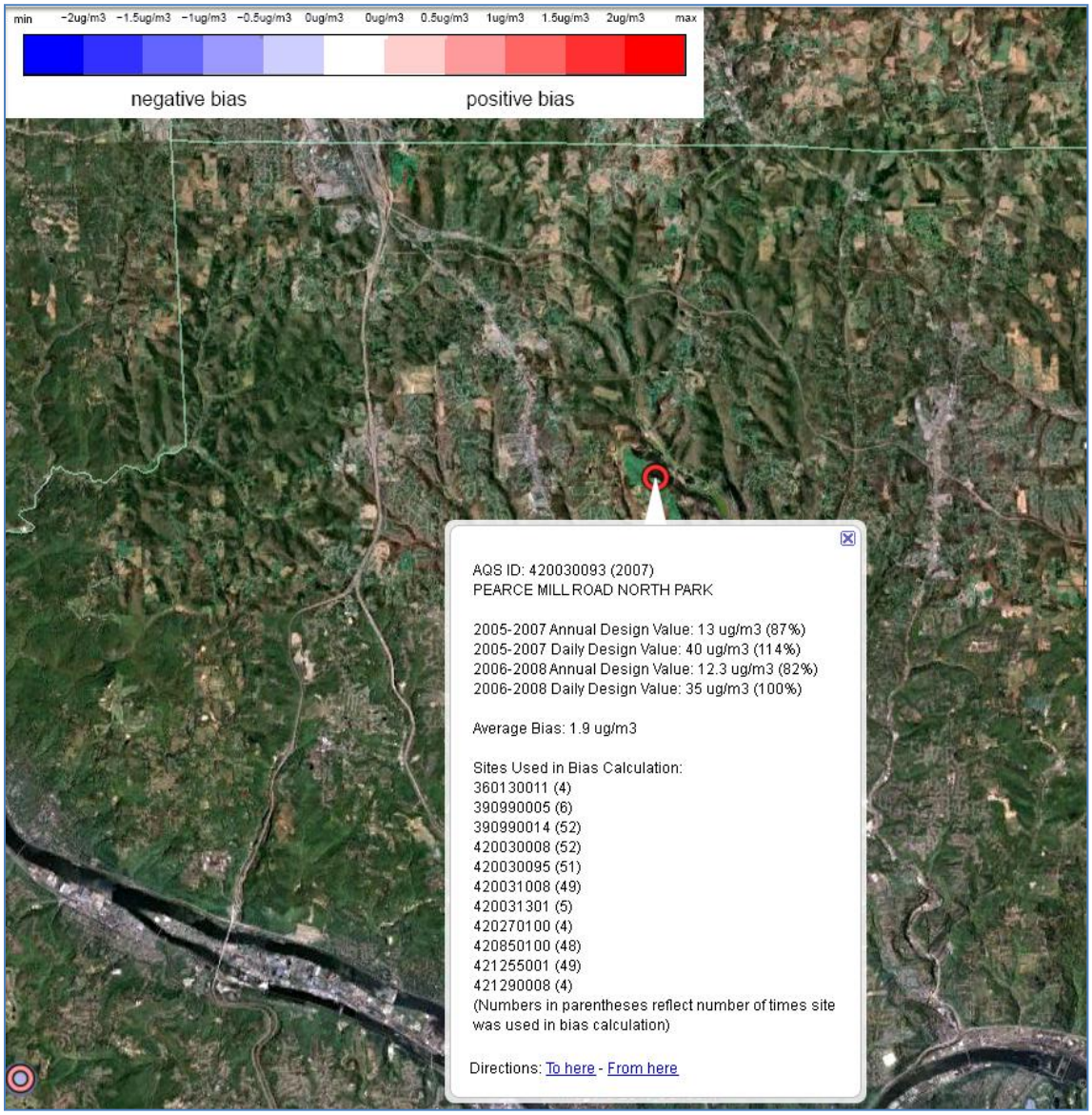
Liberty shows consistent negative bias to the network, indicating its importance as a high concentration monitor.

Figure 4-12. Removal Bias for $PM_{2.5}$ FRM at South Fayette (3-Day Basis), 2005-2008



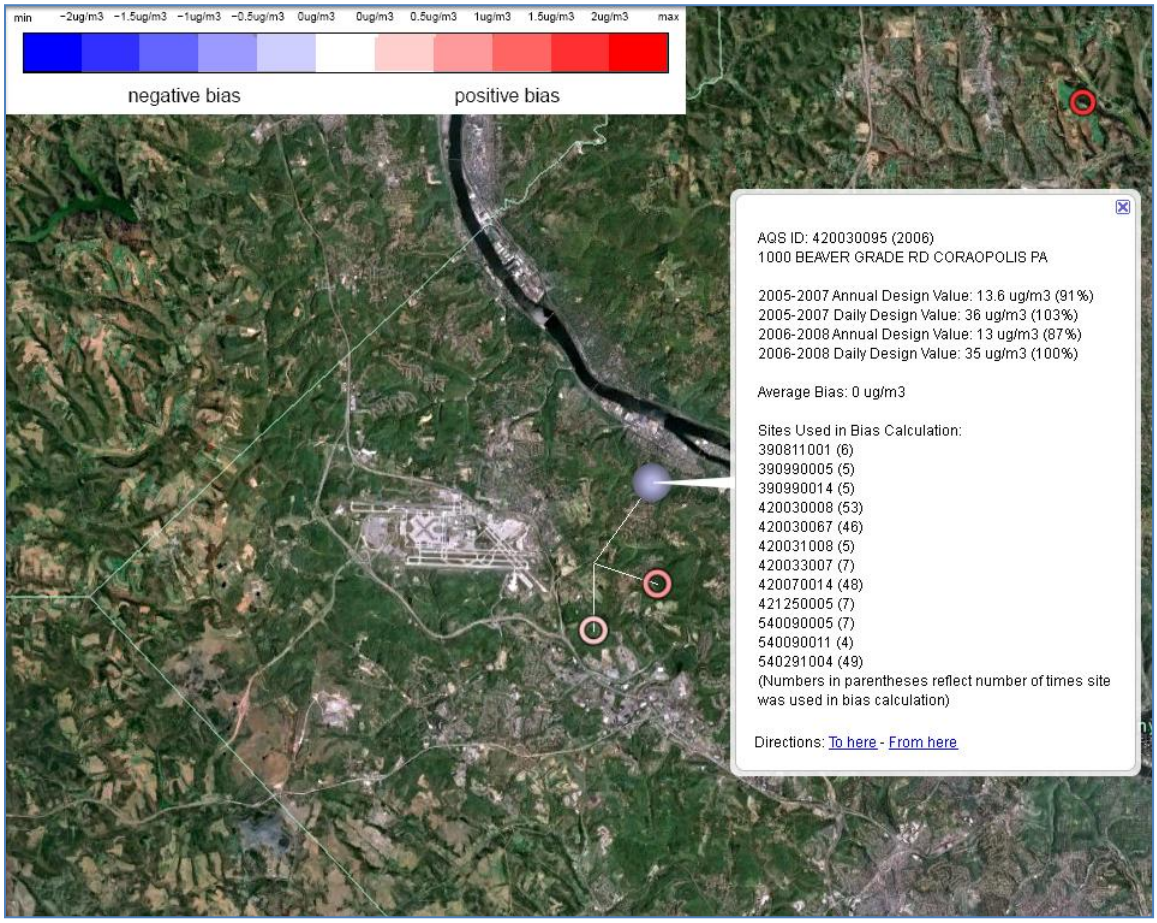
South Fayette shows positive bias for two years – the remaining two years were excluded due to low recovery. South Fayette is important as a background monitor for Allegheny County interpolations.

Figure 4-13. Removal Bias for $PM_{2.5}$ FRM at North Park (6-Day Basis), 2005-2008



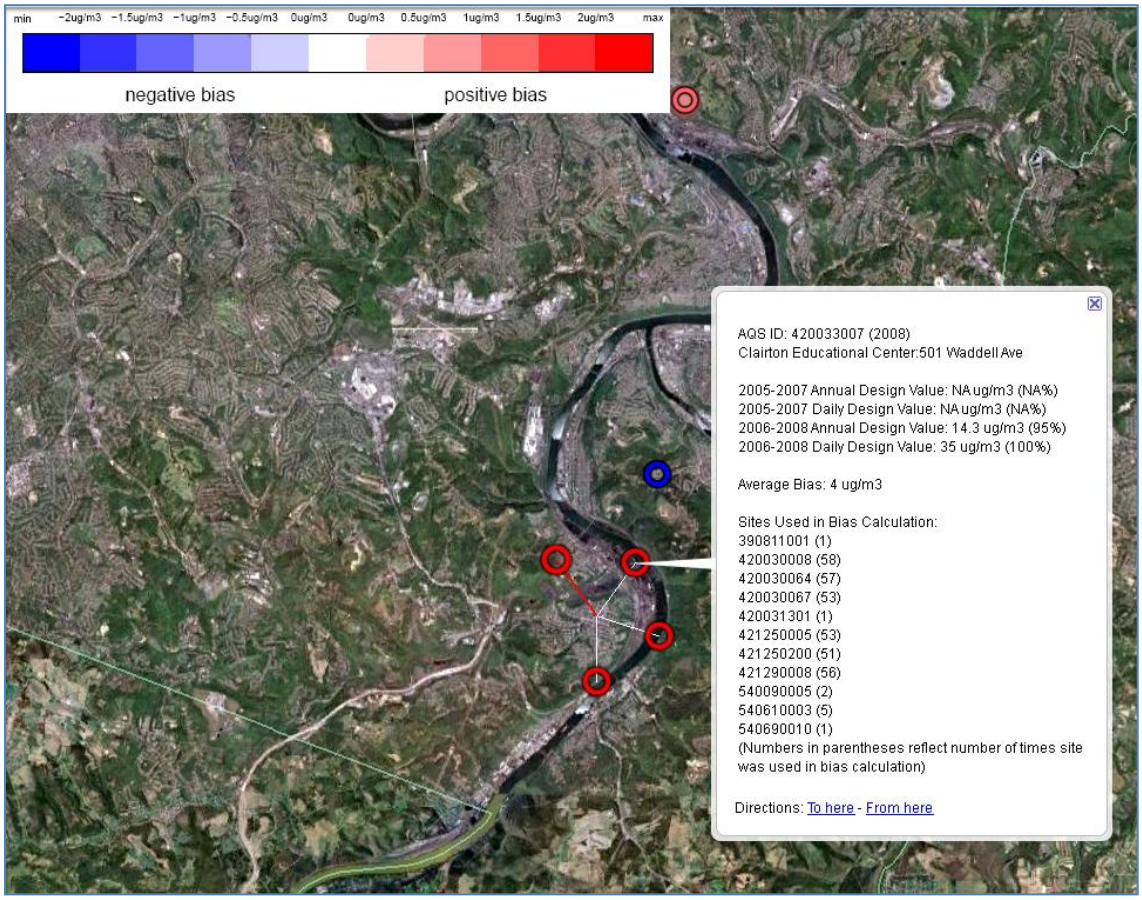
Similar to South Fayette, North Park showed positive bias for the network. Only one year was included in the interpolation due to low data recovery – North Park was inoperative for 2008, but has restarted in 2009.

Figure 4-14. Removal Bias for $PM_{2.5}$ FRM at Moon (6-Day Basis), 2005-2008



Moon showed insignificance or slight positive bias in years included in the interpolations. Moon may be redundant based on the removal bias interpolations. Like North Park, Moon was inoperative for 2008, but has restarted in 2009.

Figure 4-15. Removal Bias for $PM_{2.5}$ FRM at Clairton (6-Day Basis), 2005-2008



Clairton shows positive bias in all years of interpolation, due to its lower values in comparison to Liberty.

New Sites

Figure 4-16 below shows results of the new sites tool for 2008 FRM/FEM monitor sites on a 3-day sampling basis. Note: Only 2008 was available for analysis with the new sites tool, and North Park and Moon were not included due to monitor inoperation.

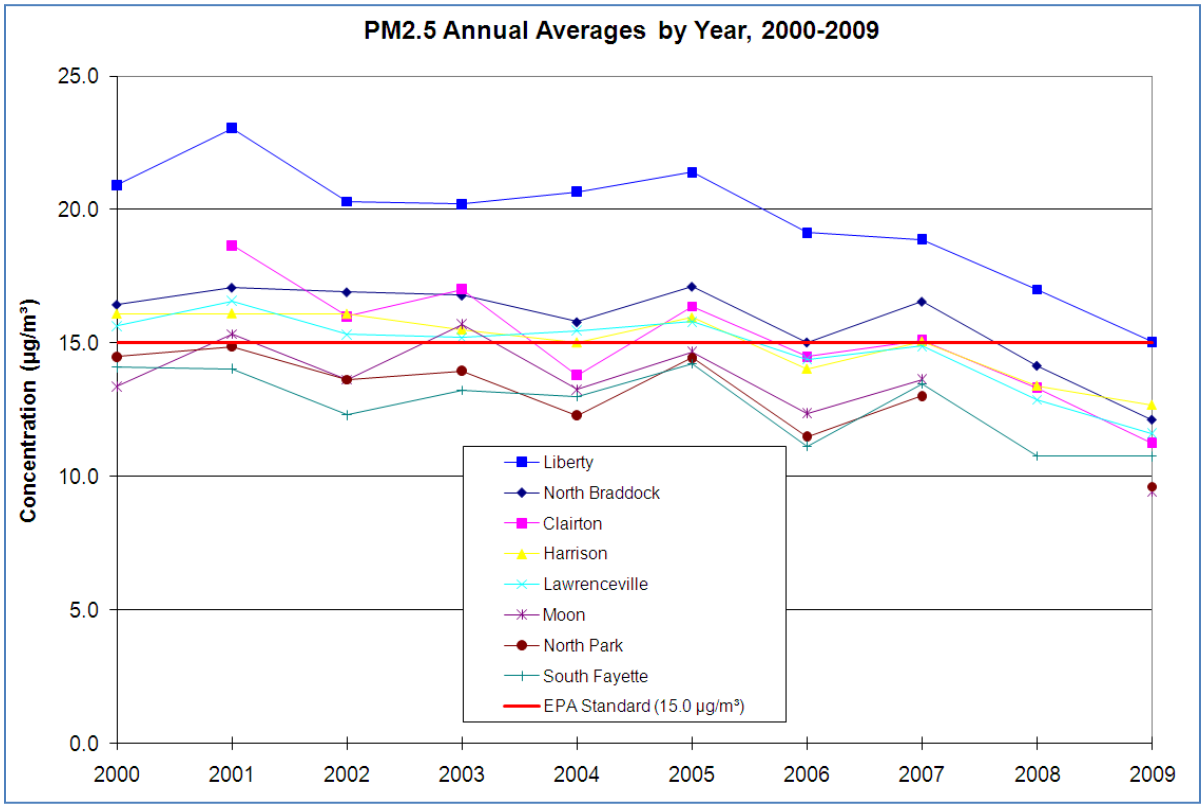
Figure 4-16. New Sites for $PM_{2.5}$ FRM/FEM, 3-Day Basis, 2008

The tool did not generate any possible new sites, despite missing North Park and Moon in the analysis. Note: On a 6-day basis (not shown), Harrison showed that it met criteria from site pairs (a red dot) for a possible nearby site, but no possible new sites were revealed, similar to the 3-day basis shown above.

Monitoring Data Trends

Figure 4-17 below shows long-term (9-year) monitoring trends for $PM_{2.5}$ in Allegheny County, given by annual average. Data is shown for 2000-2009 to include recent data for Moon and North Park, which were inoperative in 2008.

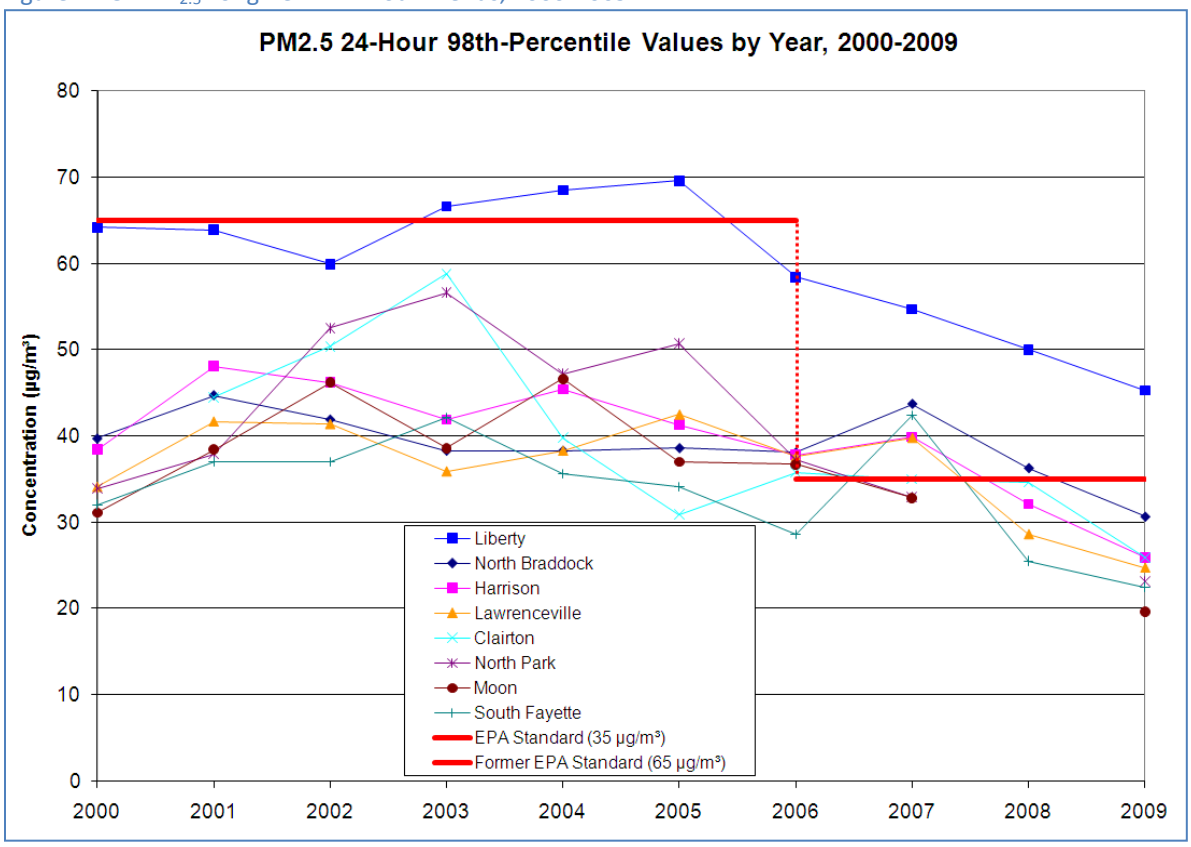
Figure 4-17. $PM_{2.5}$ Long-Term Annual Average Trends, 2000-2009



Long-terms trends show decreasing annual average $PM_{2.5}$ concentrations through 2009. Low production due to economic recession may have led to low concentrations in 2009, but most monitors are showing levels below the standard since 2007. Moon and North Park have averages below 10 µg/m³ (or 66% of the standard) in 2009.

Figure 4-18 below shows long-term (9-year) monitoring trends for $PM_{2.5}$ in Allegheny County, given by 24-hour 98th-percentile.

Figure 4-18. $PM_{2.5}$ Long-Term 24-Hour Trends, 2000-2009



Long-term trends for 24-hour 98th-percentiles similarly show decreasing trends through 2009. Several sites were below 28 µg/m³ (80% of the standard) in 2009.

Rankings

Table 4-1 below shows the ranking values and score/rank for each $PM_{2.5}$ monitor in Allegheny County based on the ranking methodology (see Tools and Methodology section).

Table 4-1. Rankings for Allegheny County $PM_{2.5}$ FRM Monitors

PM2.5 (FRM) Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average (µg/m³)	2006-2008 Design Value Annual Average (µg/m³)	Site Objective	Population (people/mi²)	Closest Site (km)	Notes
Liberty	2	11	54	18.3	Population Exposure	1857	4	
Lawrenceville	4	10	35	15.0	Population Exposure	4117	11	
South Fayette	3	11	32	12.9	Background	1179	12	
Harrison	2	11	37	15.0	Population Exposure	724	25	
North Braddock	1	11	39	15.2	Population Exposure	2622	9	
Clairton	1	9	35	15.3	Population Exposure	1424	4	
Moon	1	10	35	13.6	Population Exposure	909	12	Inactive 2008 (2-year avg)
North Park	0	10	35	12.3	Population Exposure	929	17	Inactive 2008 (2-year avg)

PM2.5 (FRM) Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average	2006-2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank
Liberty	2	0.50	5.4	4.58	1	0.25	0.00	13.7	**1**
Lawrenceville	3	0.25	3.5	3.75	1	1.00	0.50	13.0	**2**
South Fayette	3	0.50	3.2	3.23	1	0.25	0.50	11.7	**3**
Harrison	2	0.50	3.7	3.75	0	0.00	1.00	11.0	**4**
North Braddock	1	0.50	3.9	3.80	1	0.50	0.25	11.0	**4**
Clairton	1	0.25	3.5	3.83	1	0.25	0.00	9.8	**6**
Moon	1	0.25	3.5	3.40	0	0.00	0.50	8.7	**7**
North Park	0	0.25	3.5	3.08	0	0.00	0.75	7.6	**8**

The scoring shows that Liberty has the highest rank due to high design values and significant population exposure. Lawrenceville shows the second-most importance based on population exposure and other monitors included at the site.

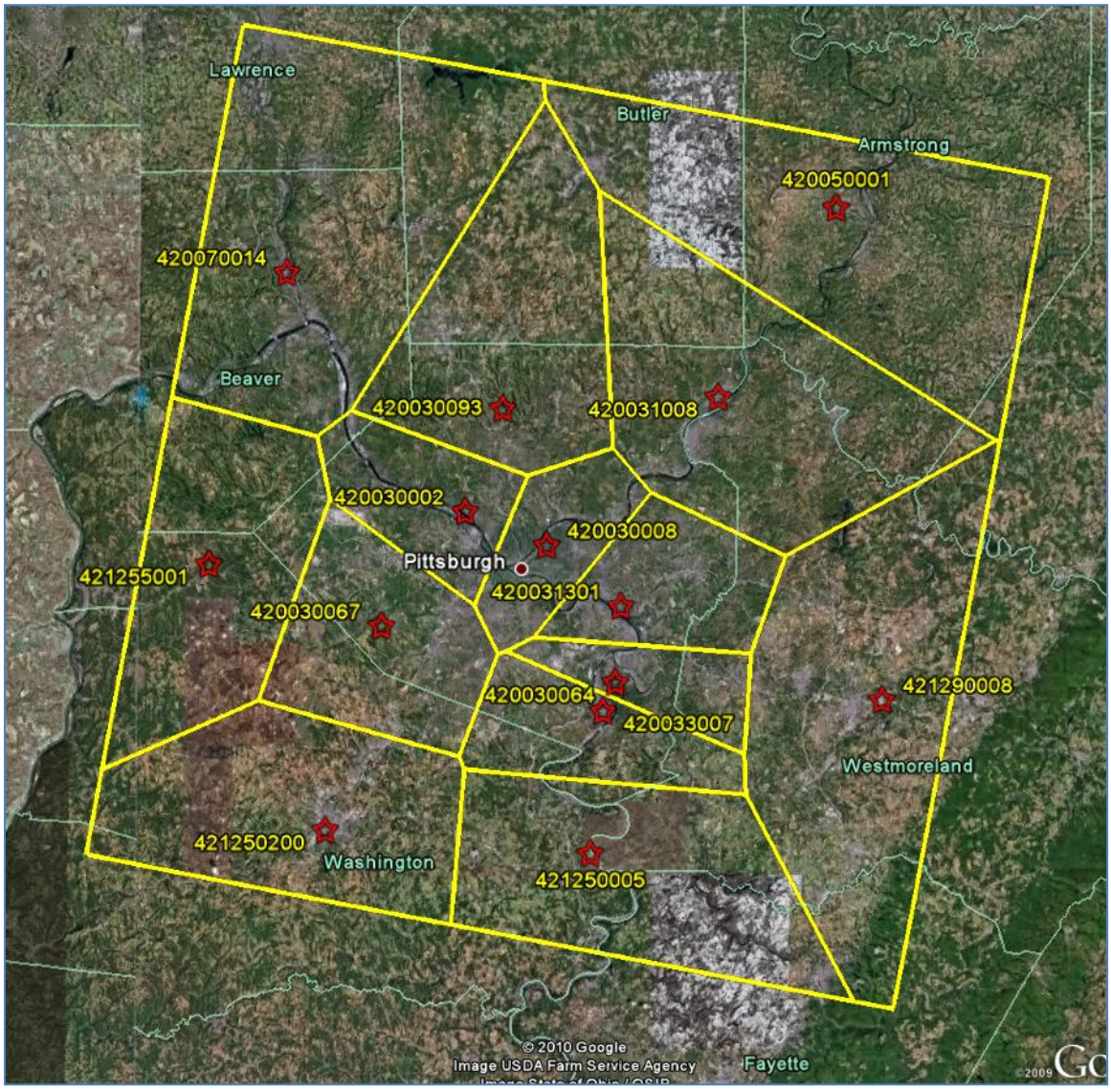
South Fayette, despite low design values, is important as a distant background monitor, collocated with several monitors like at Lawrenceville. Harrison is similarly important due to distance (but as a downwind monitor) and other monitors present at the site. Clairton is ranked near the bottom of the list but is important as an upwind monitor within the Liberty-Clairton region.

Moon and North Park are the lowest-ranked monitors due to low design values and low population exposure densities. These monitors may be redundant to the network, unless the location is deemed important for area served (i.e., North Park is located 17 miles from any other $PM_{2.5}$ monitor).

Summary

Data analysis has shown that Moon may be a redundant site. Avalon will include a $PM_{2.5}$ FRM/FEM site in 2010, changing the area served in western Allegheny County. Figure 4-19 below shows the proposed expanded network for SW PA, with Moon removed and Avalon added.

Figure 4-19. Extended SW PA Area Served by Proposed $PM_{2.5}$ FRM/FEM Network for 2010



The proposed area served shows South Fayette (420030067) coverage widened to include more of western Allegheny County, with Avalon (420030002) representative of the Allegheny County portion of the Ohio Valley.

5. $PM_{2.5}$ Non-FRM/FEM Analysis

Area Served

The area served for $PM_{2.5}$ non-FRM/FEM monitors are shown on the map in Figure 5-1 below. These sites include continuous Tapered Element Oscillating Microbalance (TEOM) monitors and filter-based Chemical Speciation Network (CSN) speciation monitors.

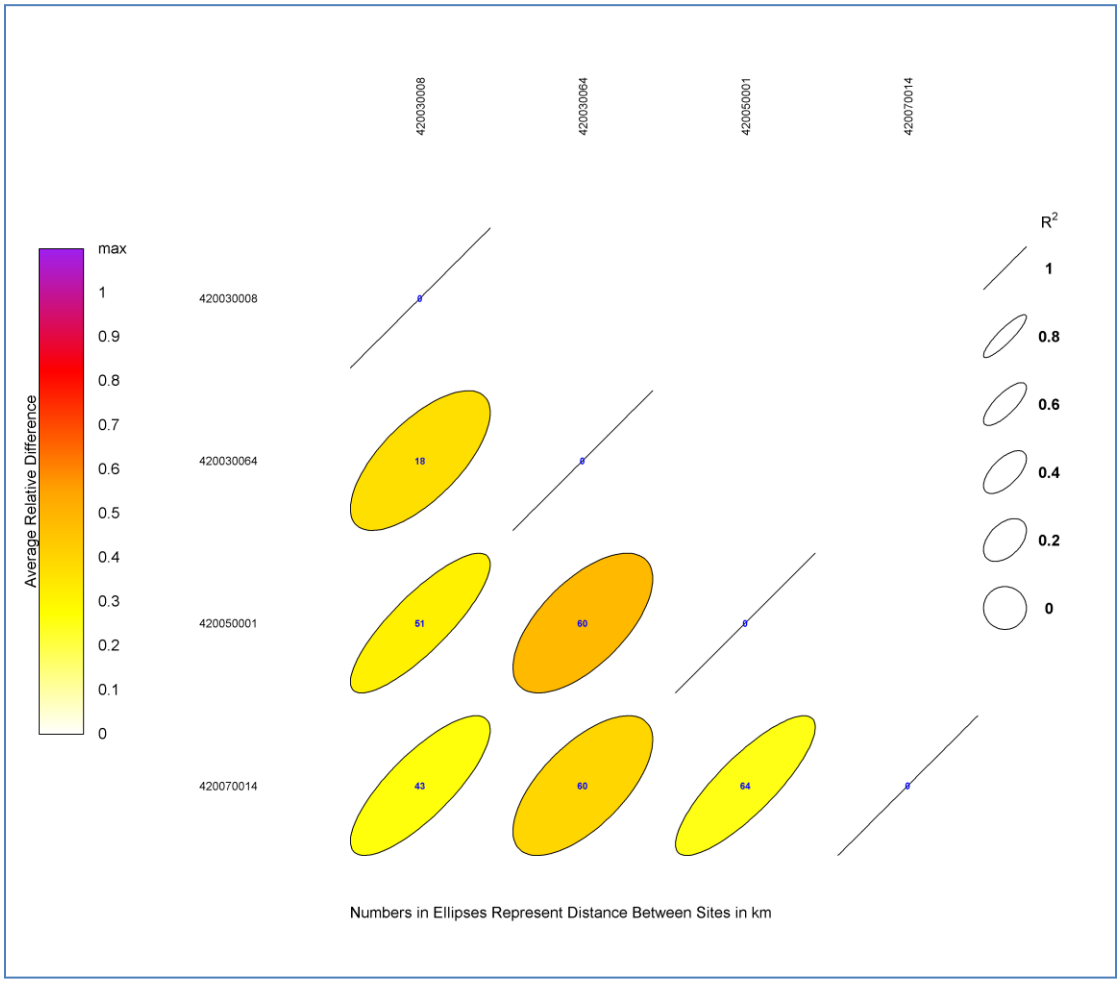
Figure 5-1. Area Served by Current $PM_{2.5}$ Non-FRM/FEM Network

The map in Figure 5-1 shows that Lawrenceville (420030008) provides coverage for urban Pittsburgh while Liberty (420030064) is representative of the industrialized Monongahela Valley region.

Correlation Matrices

Figure 5-2 below shows the correlation matrix for $PM_{2.5}$ continuous TEOM monitors in the Pittsburgh MSA, based on 2005-2007 averages. This figure includes both Allegheny County monitors along with monitors in Beaver and Armstrong Counties (420070014, 420050001).

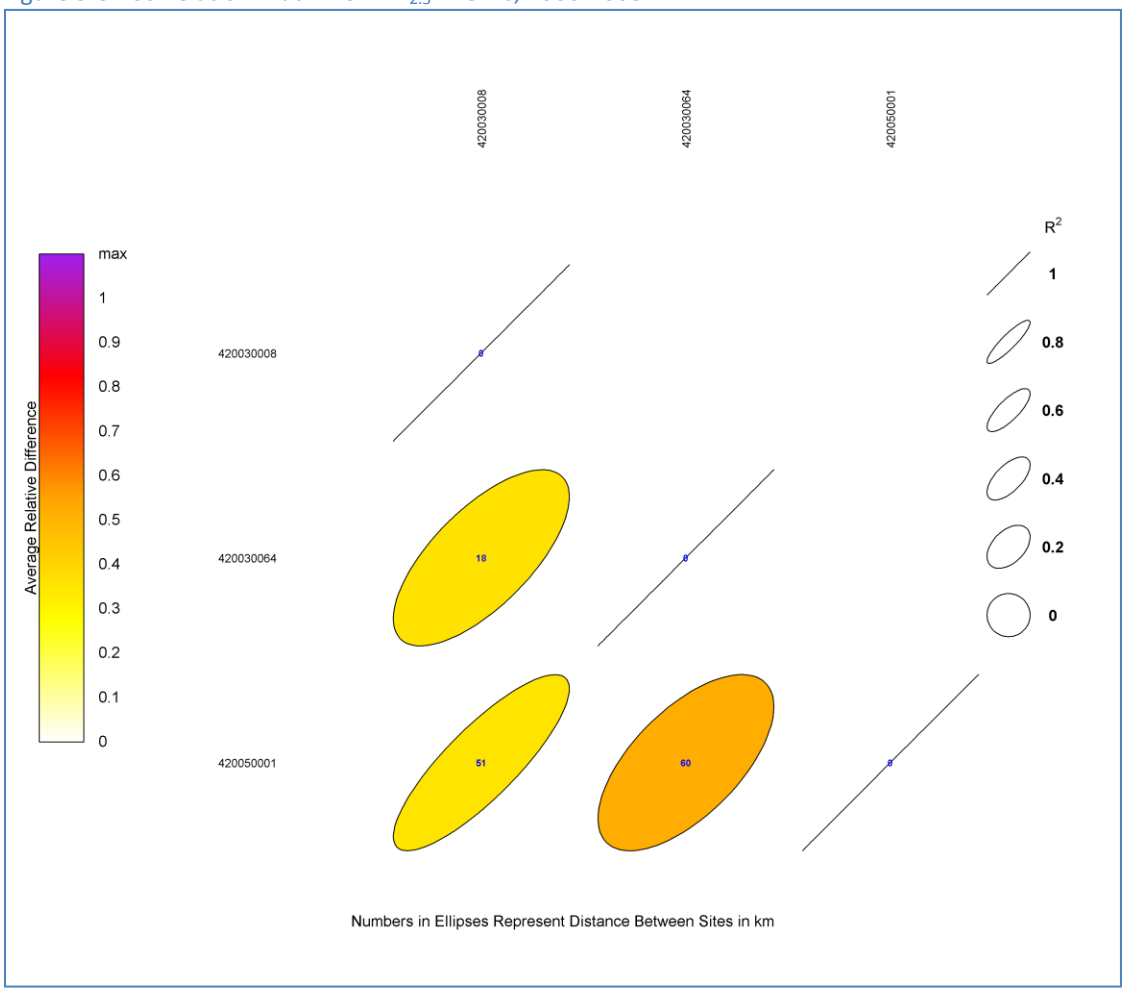
Figure 5-2. Correlation Matrix for $PM_{2.5}$ TEOMs, 2005-2007



The 2005-2007 matrix shows Liberty does not correlate well and shows large differences with the other TEOM monitors in SW PA. This is similar to results seen with the FRM./FEM correlation matrices. The other monitors correlate well with small relative differences between each other.

Figure 5-3 below shows the correlation matrix for $PM_{2.5}$ continuous TEOM monitors in the Pittsburgh MSA, based on 2006-2008 averages. This figure includes one monitor from Armstrong County (420050001).

Figure 5-3. Correlation Matrix for $PM_{2.5}$ TEOMs, 2006-2008

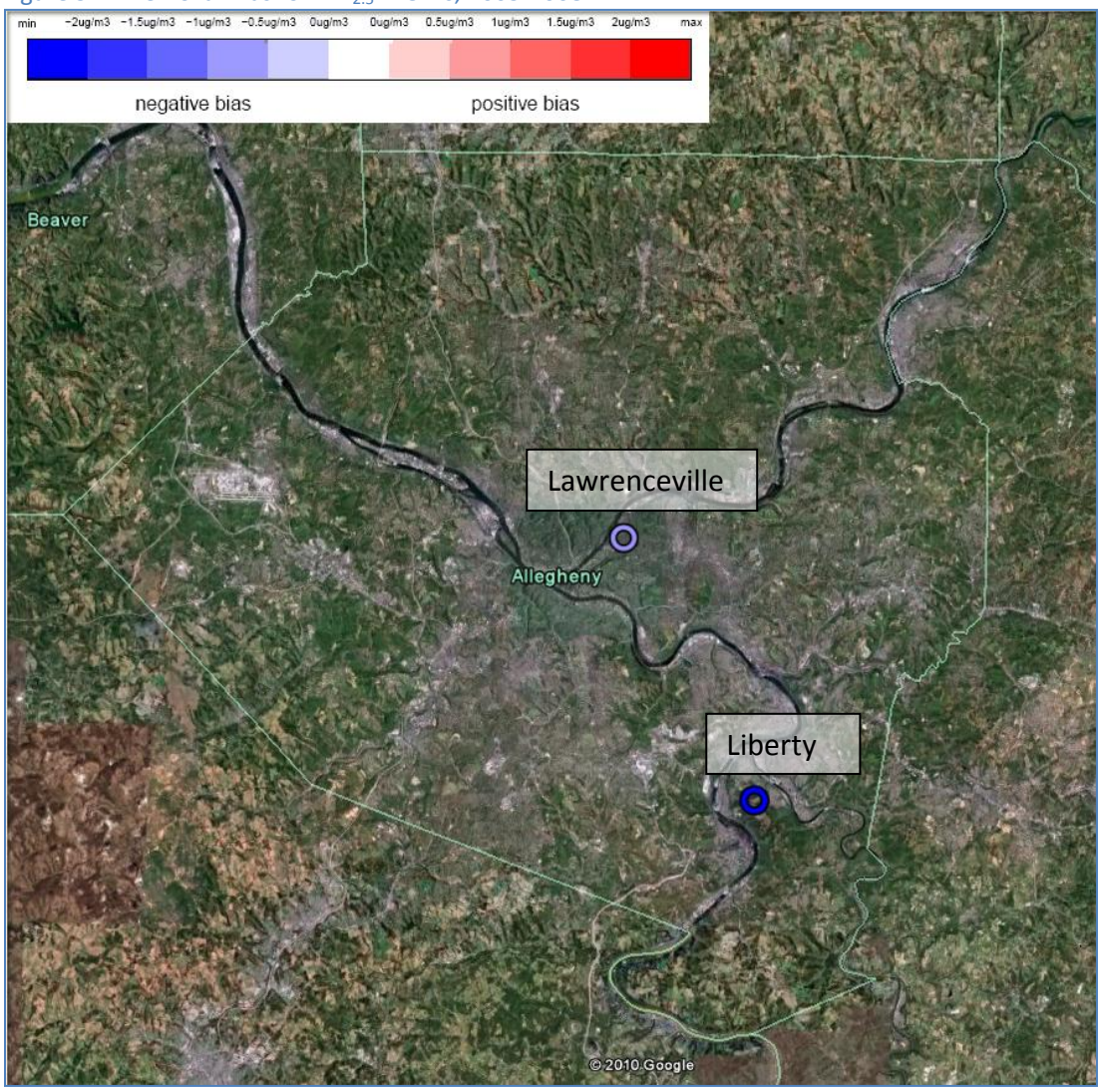


The 2006-2008 matrix shows results similar to the 2005-2007 matrix, but with less surrounding county monitors.

Removal Bias

Results from the removal bias tool are shown in Figure 5-4 below for the $PM_{2.5}$ TEOM network. Data is based on 2005-2008 data, with all surrounding sites included in the interpolation analysis.

Figure 5-4. Removal Bias for $PM_{2.5}$ TEOMs, 2005-2008

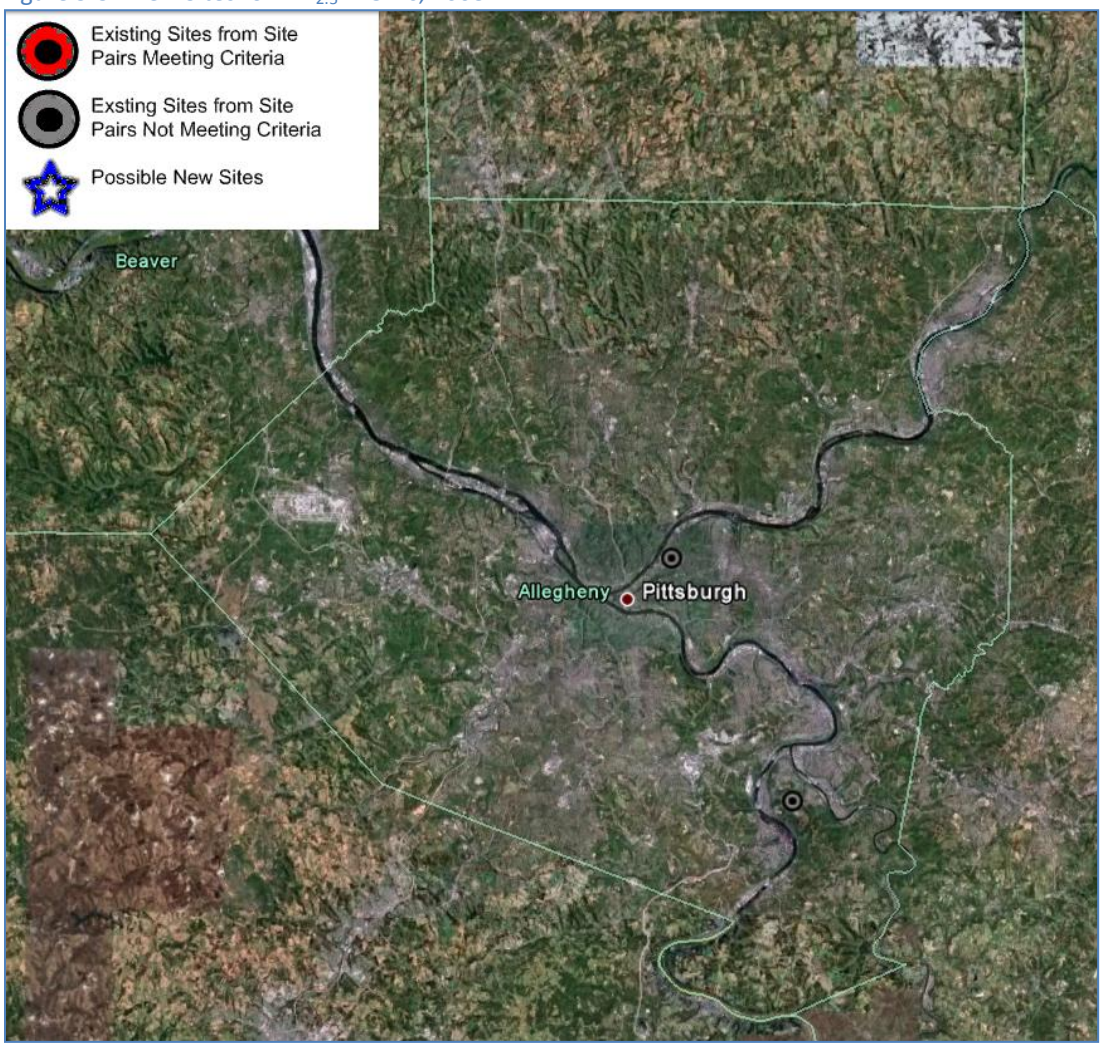


The removal bias for the TEOMs show that Liberty shows the largest negative bias (highest concentrations) compared to surrounding monitors, while Lawrenceville shows slight negative bias. This is logical since Liberty is specific to industrial and meteorological effects in the area, and Lawrenceville is representative of urban air quality which may be slightly higher than surrounding county monitors.

New Sites

Figure 5-5 below shows results of the new sites tool for 2008 $PM_{2.5}$ TEOM monitor sites.

Figure 5-5. New Sites for $PM_{2.5}$ TEOMs, 2008

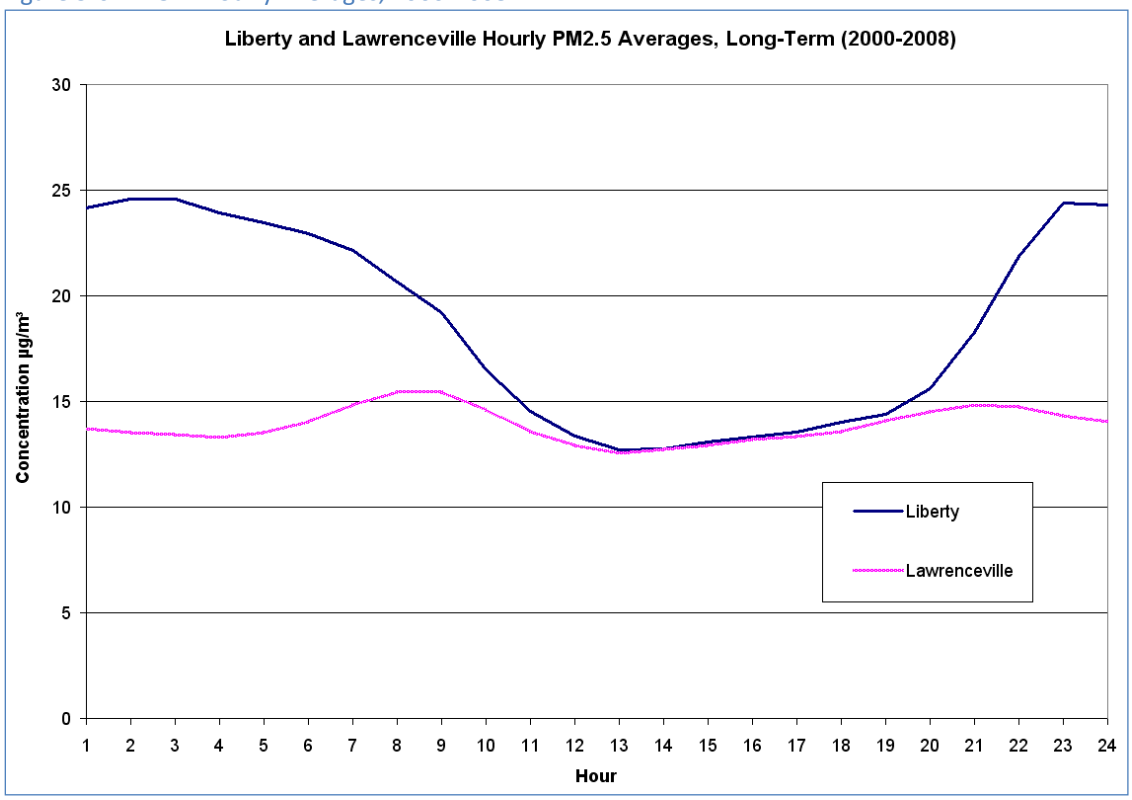


The tool did not generate any possible new site locations.

Monitoring Data Trends

Figure 5-6 below shows long-term (9-year) hourly averages for the Allegheny County TEOM monitors

Figure 5-6. TEOM Hourly Averages, 2000-2008



Liberty records a large variation in $PM_{2.5}$ concentrations on a diurnal basis, due to the strong influence of inversions that lead to nighttime accumulation of particles in the Liberty-Clairton area. Lawrenceville maintains a fairly steady level of $PM_{2.5}$ throughout the day, with small peaks during rush-hour periods.

Rankings

Table 5-1 below shows the ranking values and score/rank for the $PM_{2.5}$ TEOM monitor in Allegheny County based on the ranking methodology.

Table 5-1. Rankings for $PM_{2.5}$ TEOM Monitors

PM2.5 (Continuous) Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average ($\mu g/m^3$)	2006-2008 Design Value Annual Average ($\mu g/m^3$)	Site Objective	Population (people/mi^2)	Closest Site (km)
Liberty	2	11	54	18.3	Population Exposure	2758	18
Lawrenceville	4	10	35	15.0	Population Exposure	5551	18

PM2.5 (Continuous) Score and Rank

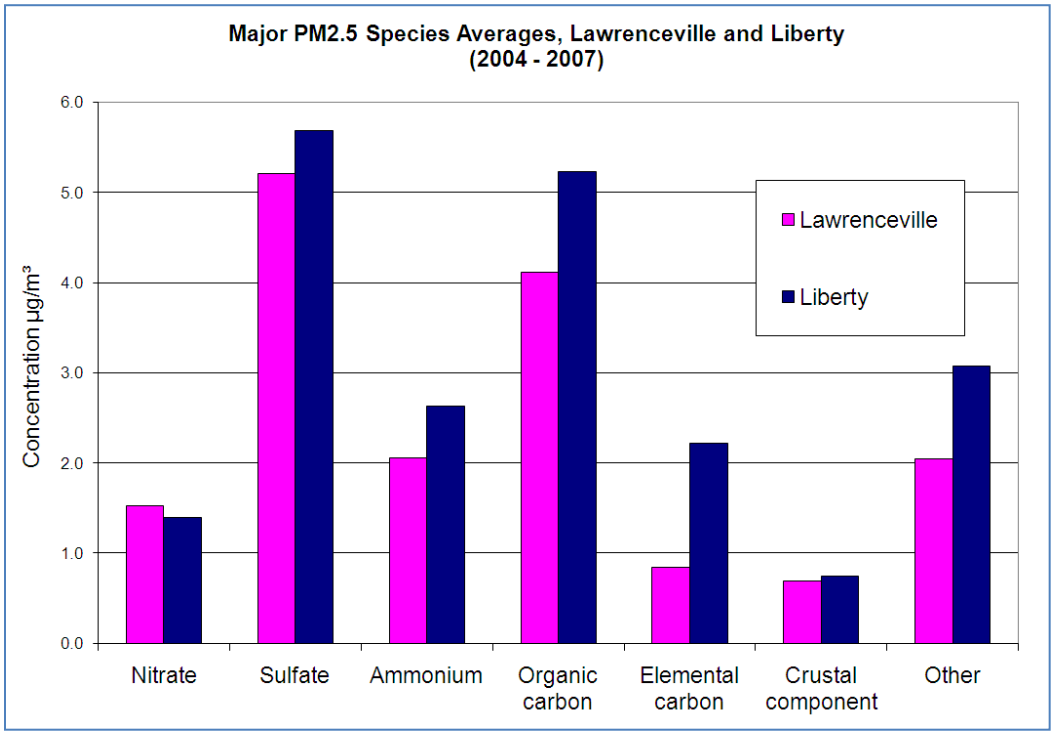
Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average	2006-2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank
Liberty	2	0.50	5.40	4.58	1	0.50	0.75	14.7	**1**
Lawrenceville	3	0.25	3.50	3.75	1	1.00	0.75	13.3	**2**

The scoring shows that Liberty is the highest ranked site based on design values. Lawrenceville is close in score however, due to the high population served and number of other pollutants at the site.

Speciation

Figure 5-7 below shows the 2004-2007 averages of the major species from the speciation monitors at Lawrenceville and Liberty.

Figure 5-7. Speciation Major Species Averages



Liberty shows considerably higher averages for carbons and "other" component, along with slightly higher averages for sulfate and ammonium. Other component represents compounds not included as major species.

Summary

Data analysis shows that the TEOM network for Allegheny County is sufficient for monitoring continuous $PM_{2.5}$ for use in Air Quality Index (AQI) readings. The CSN network is sufficient for characterization of types of species in urban Pittsburgh and in the Monongahela Valley. No changes are required.

6. Ozone Analysis

Area Served

The areas served for ozone monitors in Allegheny County are shown on the map in Figure 6-1 below.

Figure 6-1. Area Served by Current Ozone Network

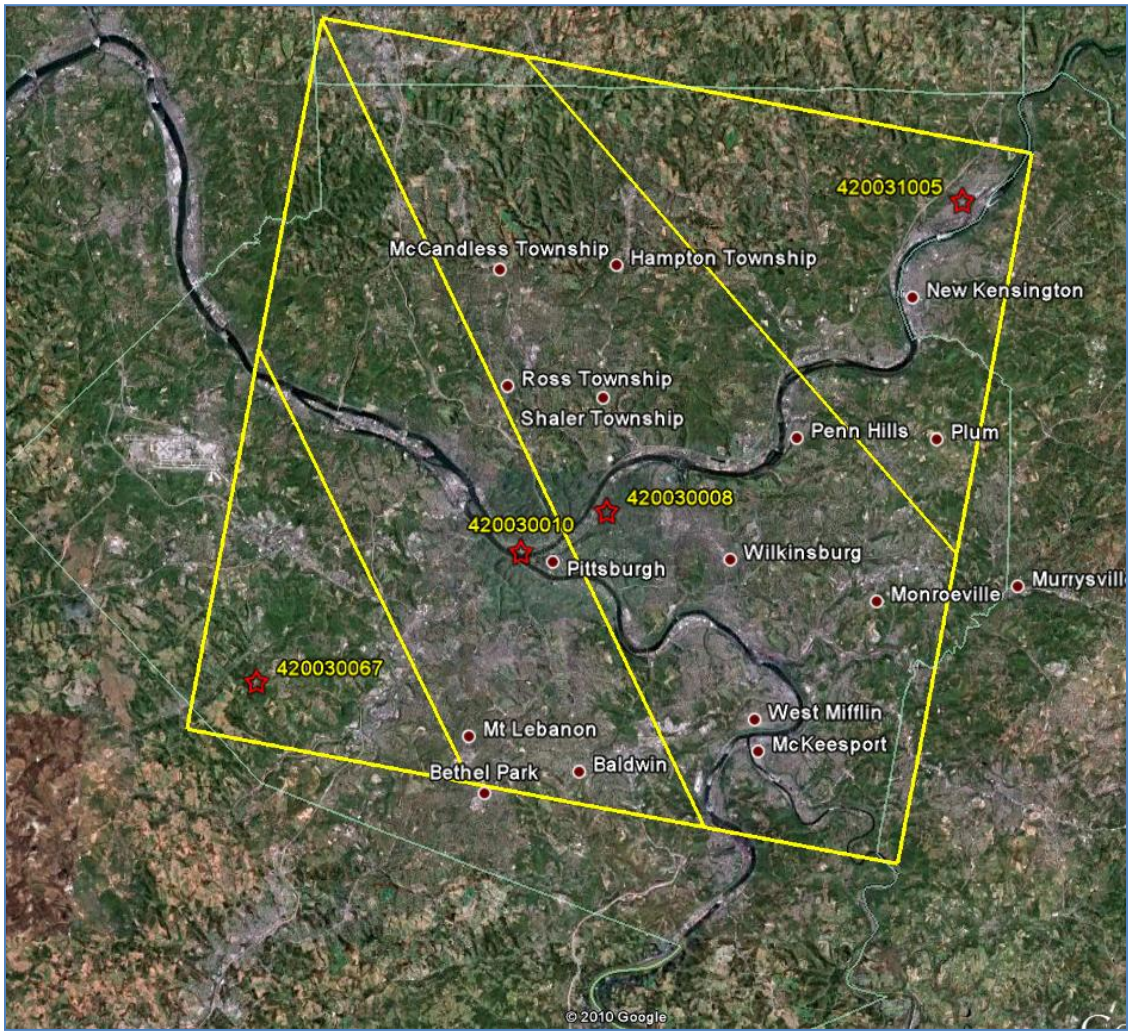


Figure 6-1 shows layered area served from southwest to northeast, following the general wind flow through Allegheny County. This is sufficient for measuring incoming and outgoing ozone concentrations. Note: The Carnegie Science Center site (420030010) is a PA DEP site, not part of the ACHD network.

The areas served for ozone monitors in SW PA are shown on the map in Figure 6-2 below.

Figure 6-2. Extended SW PA Area Served by Current Ozone Network

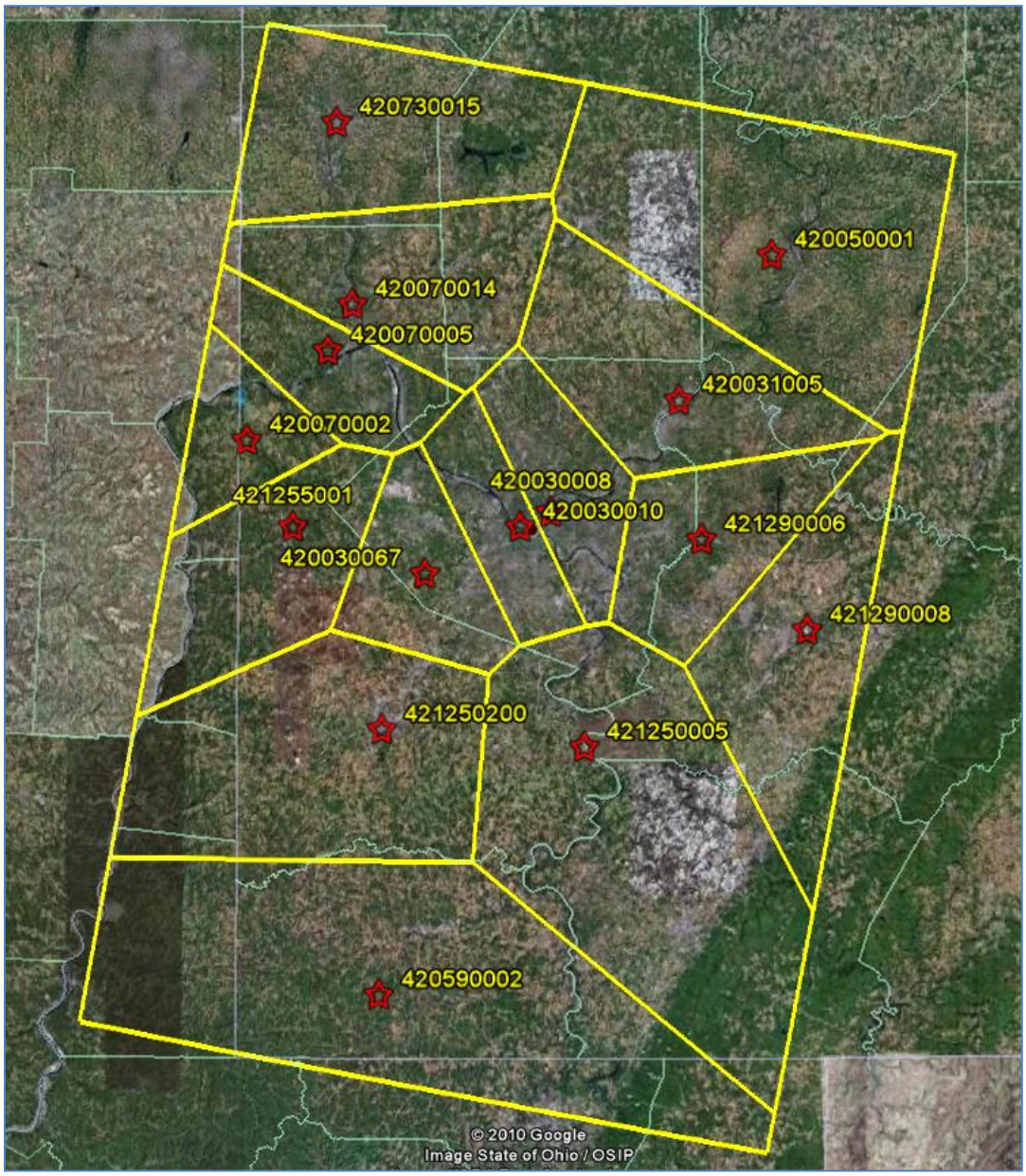


Figure 6-2 shows a broad area served throughout SW PA, sufficient for ozone concentrations in both rural transport and urban areas.

Emissions

Figure 6-3 below shows 2008 VOC emissions from point sources in Allegheny County. VOCs act as ozone precursors along with NO_x emissions. Mobile sources emissions (not shown on map) are also large contributors to VOC emissions.

Figure 6-3. VOC Point sources for 2008

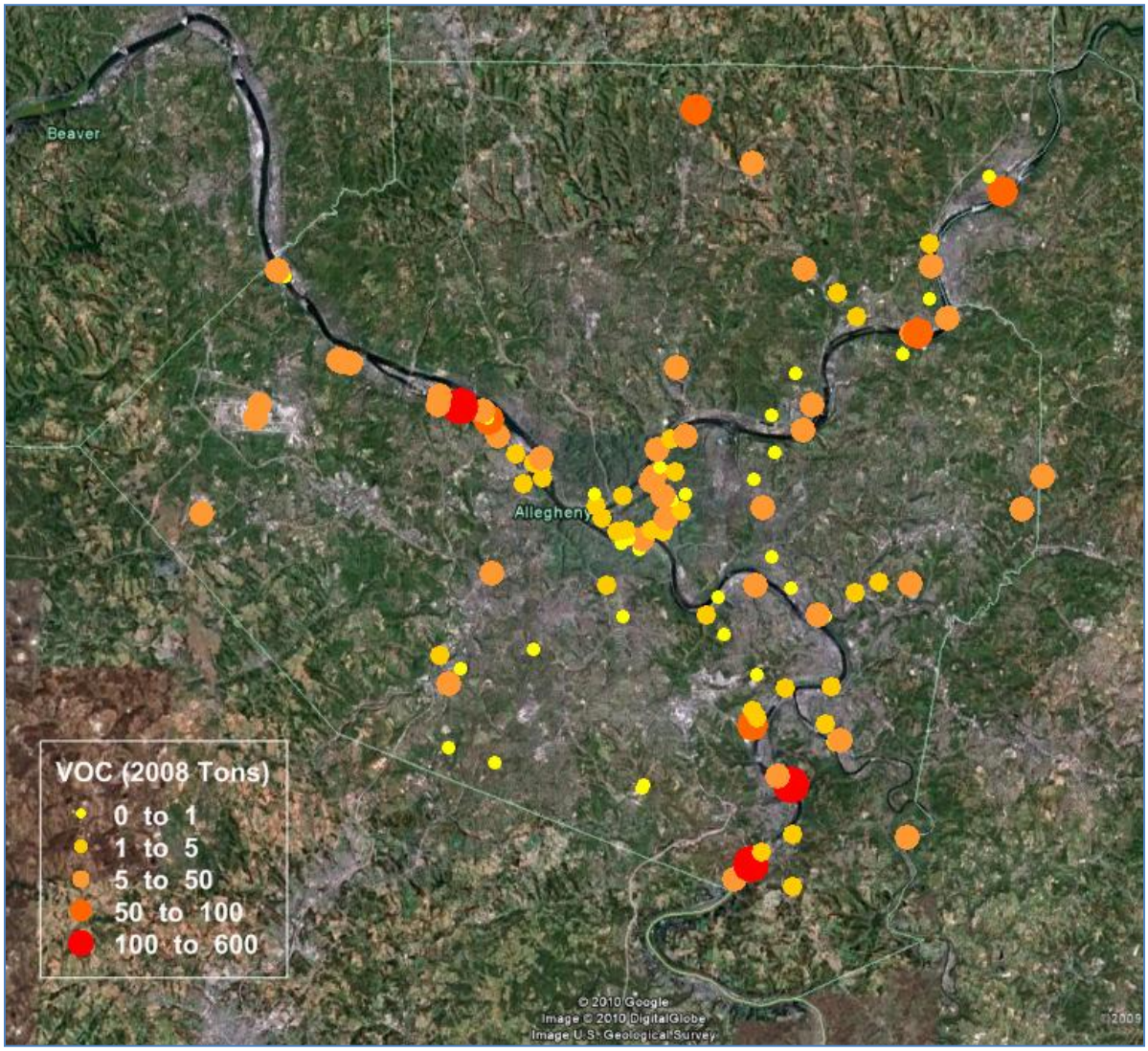
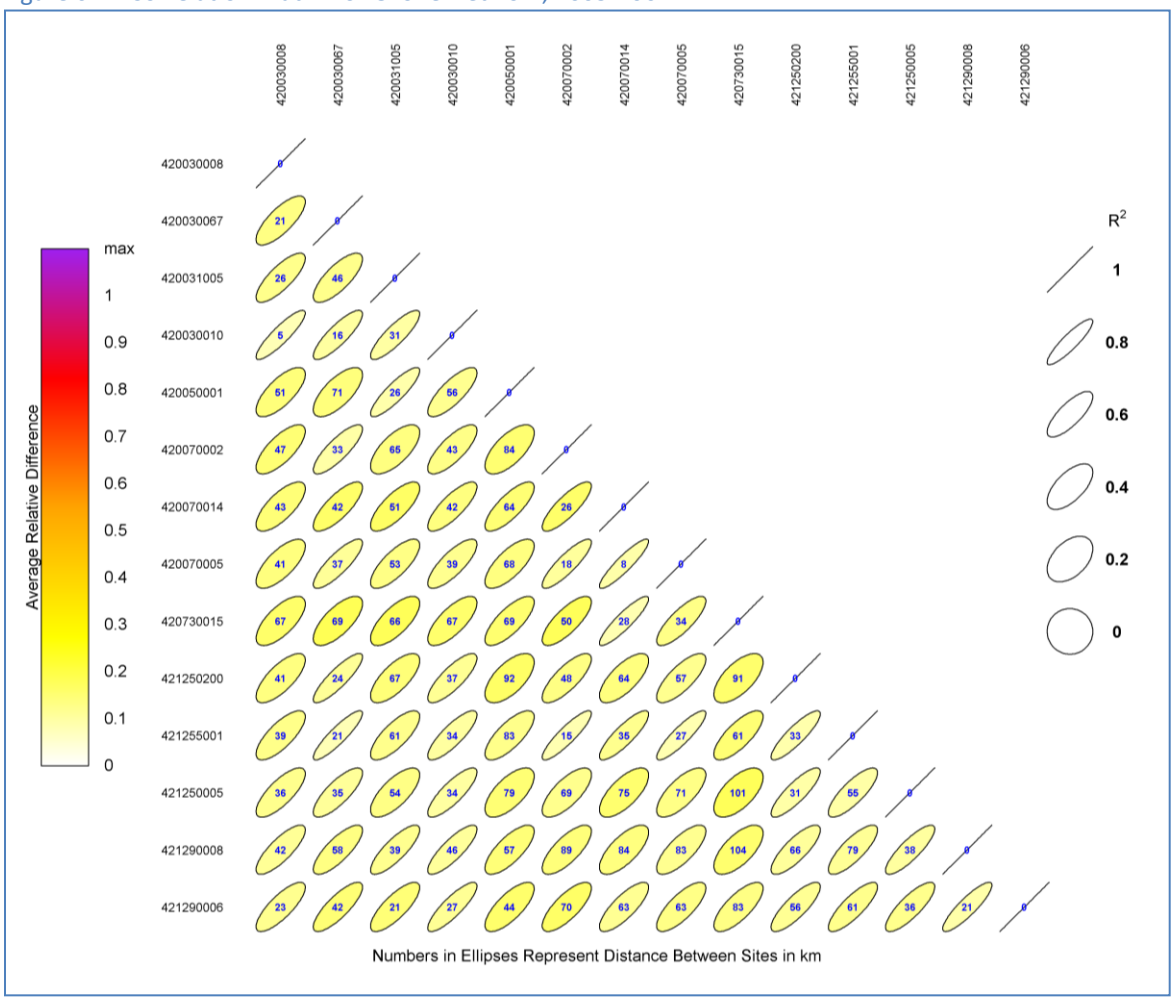


Figure 6-3 shows that VOC point sources are scattered throughout the county, with the largest sources lying in the river valleys. The monitor network is adequate to address ozone emissions formed in and transported out of the county due to these sources and mobile source emissions.

Correlation Matrices

Figure 6-4 below shows the correlation matrix for ozone monitors in the Pittsburgh MSA based on 2005-2007 data.

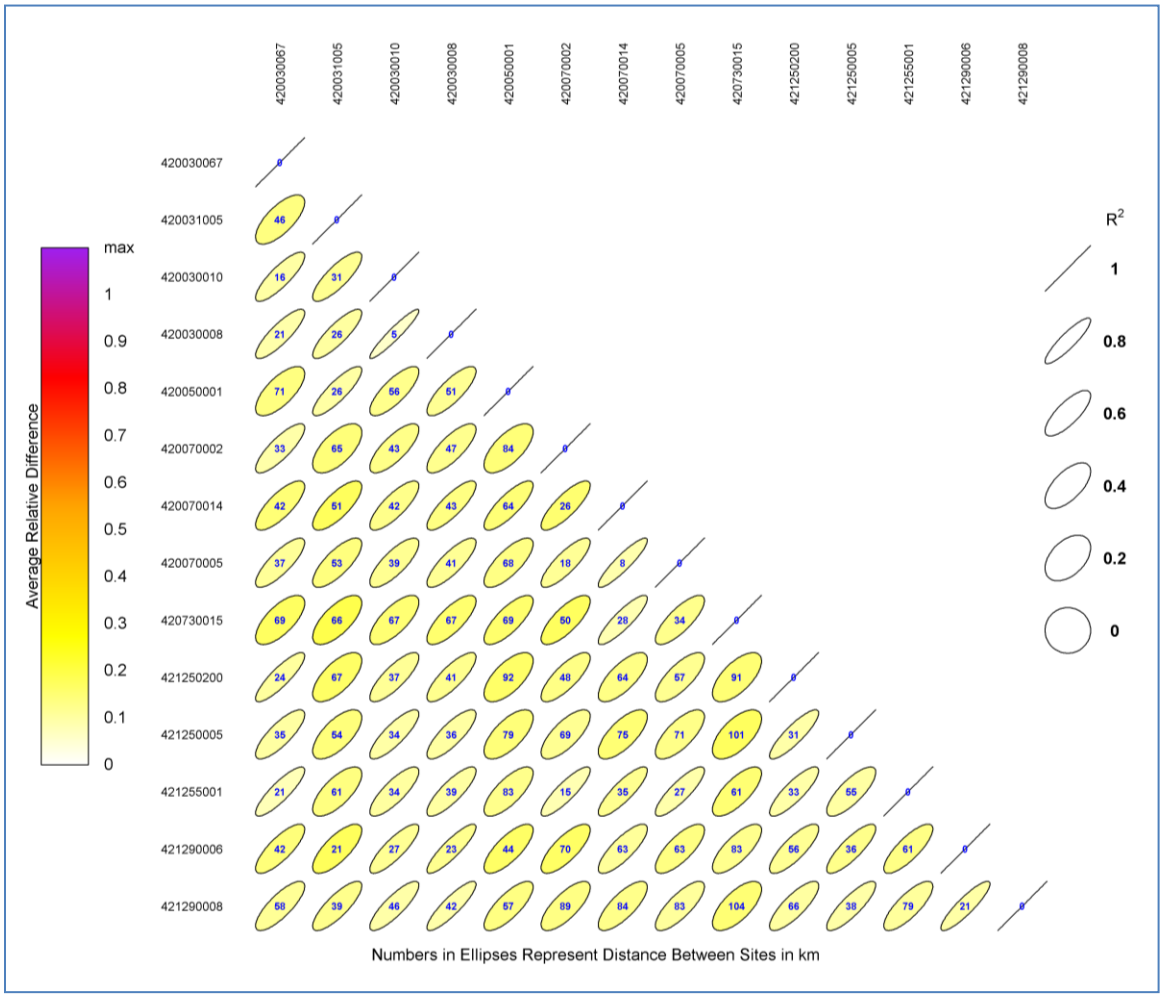
Figure 6-4. Correlation Matrix for Ozone Network, 2005-2007



The 2005-2007 matrix shows good correlation and low relative difference for most monitors.

Figure 6-5 below shows the correlation matrix for ozone monitors based on 2006-2008 averages.

Figure 6-5. Correlation Matrix for Ozone Network, 2006-2008

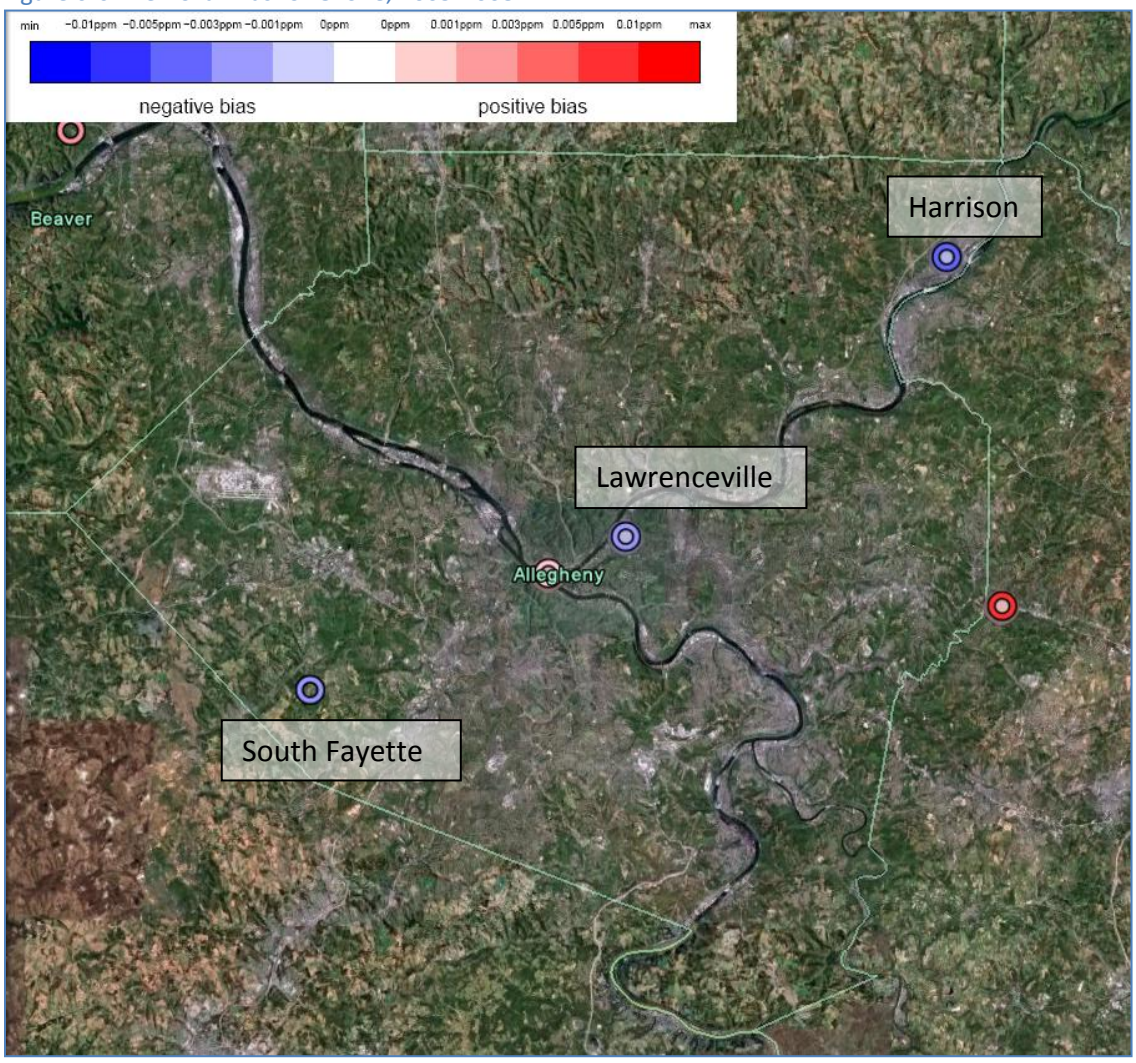


The 2006-2008 matrix shows good correlation and low relative difference for most monitors, similar to 2005-2007.

Removal Bias

Results from the removal bias tool are shown in Figure 6-6 below for the ACHD ozone network. Data is based on 2005-2008 data, with all surrounding sites included in the interpolation analysis.

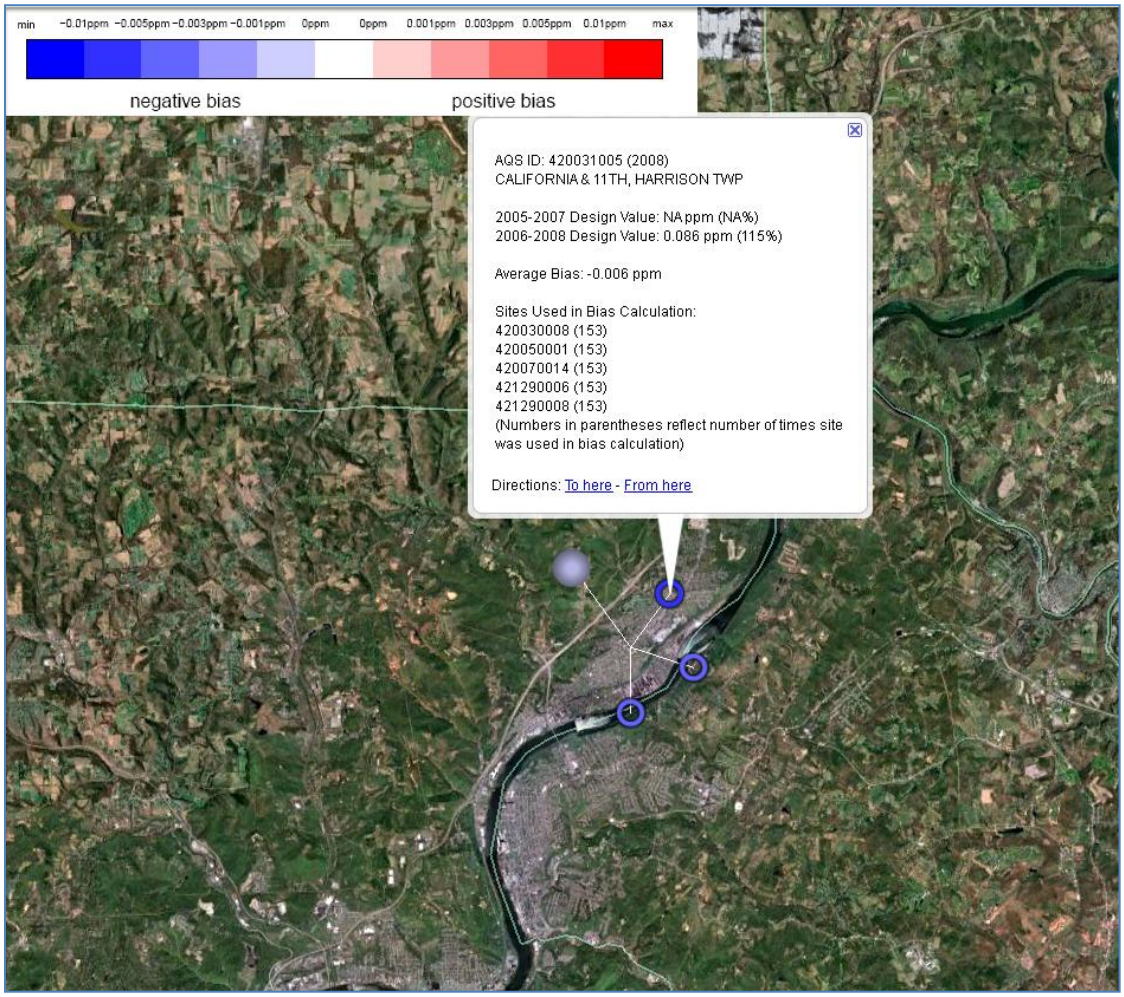
Figure 6-6. Removal Bias for Ozone, 2005-2008



The removal bias shows negative bias for the ACHD monitors, indicating higher concentrations than surrounding monitors in SW PA.

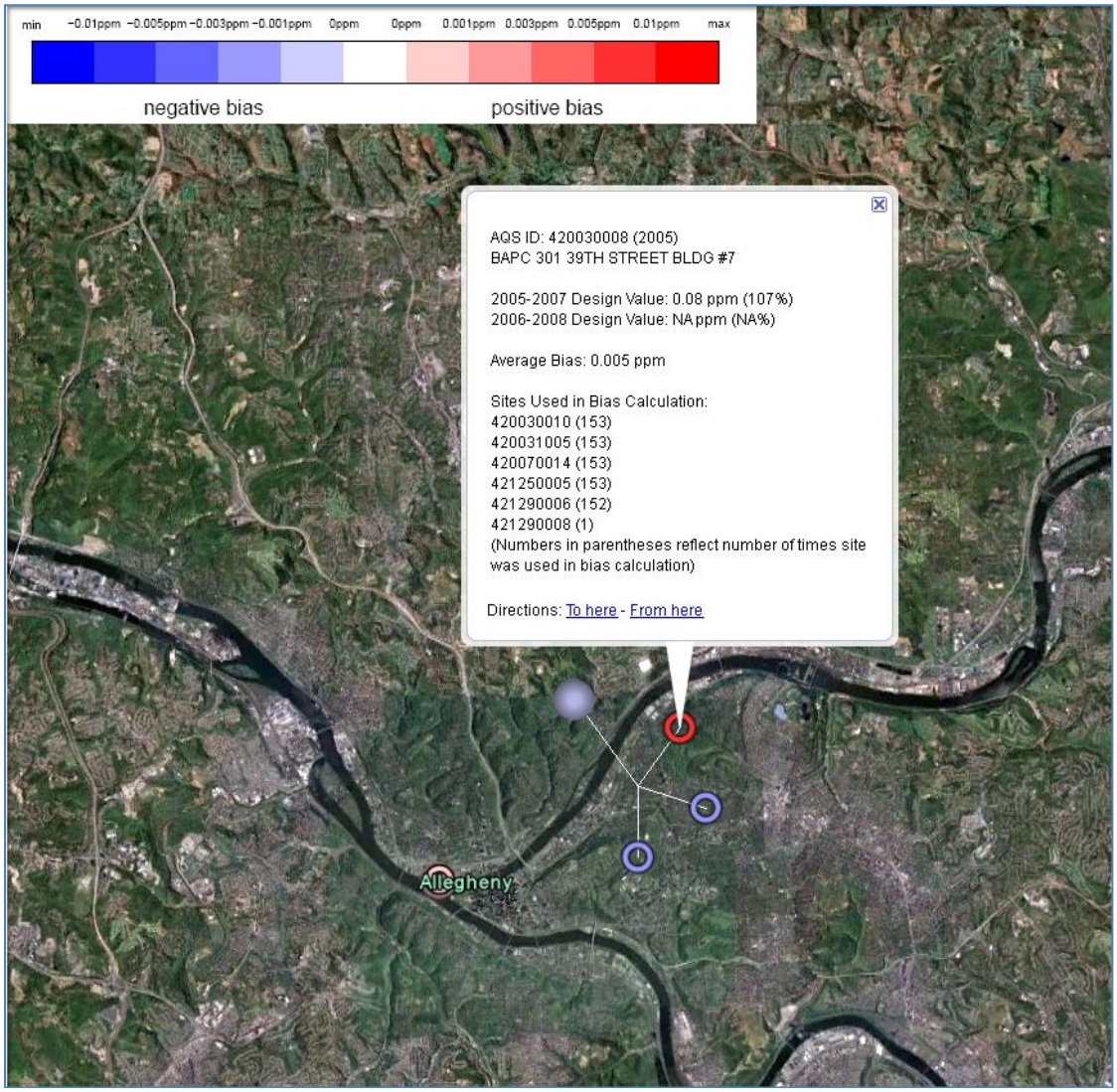
Figures 6-7 through 6-9 below show close-ups of each ozone site, with the dots and rings expanded for each year analyzed and a description of the removal bias statistics.

Figure 6-7. Removal Bias for Ozone at Harrison, 2005-2008



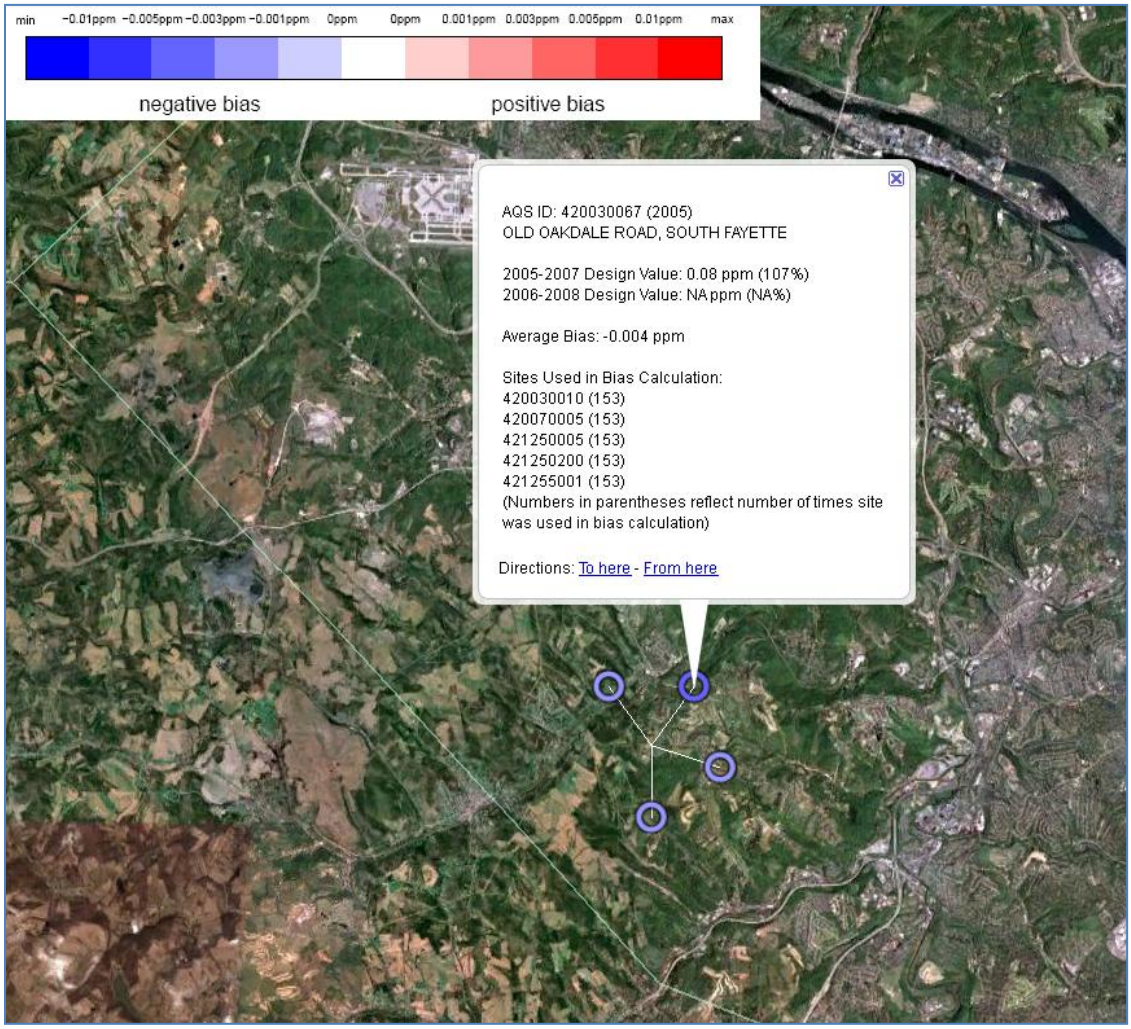
Harrison shows negative bias for most years, indicative of the high relative concentrations compared to surrounding monitors.

Figure 6-8. Removal Bias for Ozone at Lawrenceville, 2005-2008



Lawrenceville shows a mix of bias and insignificance for the 4-year period, indicating its variability with the rest of the network.

Figure 6-9. Removal Bias for Ozone at South Fayette, 2005-2008

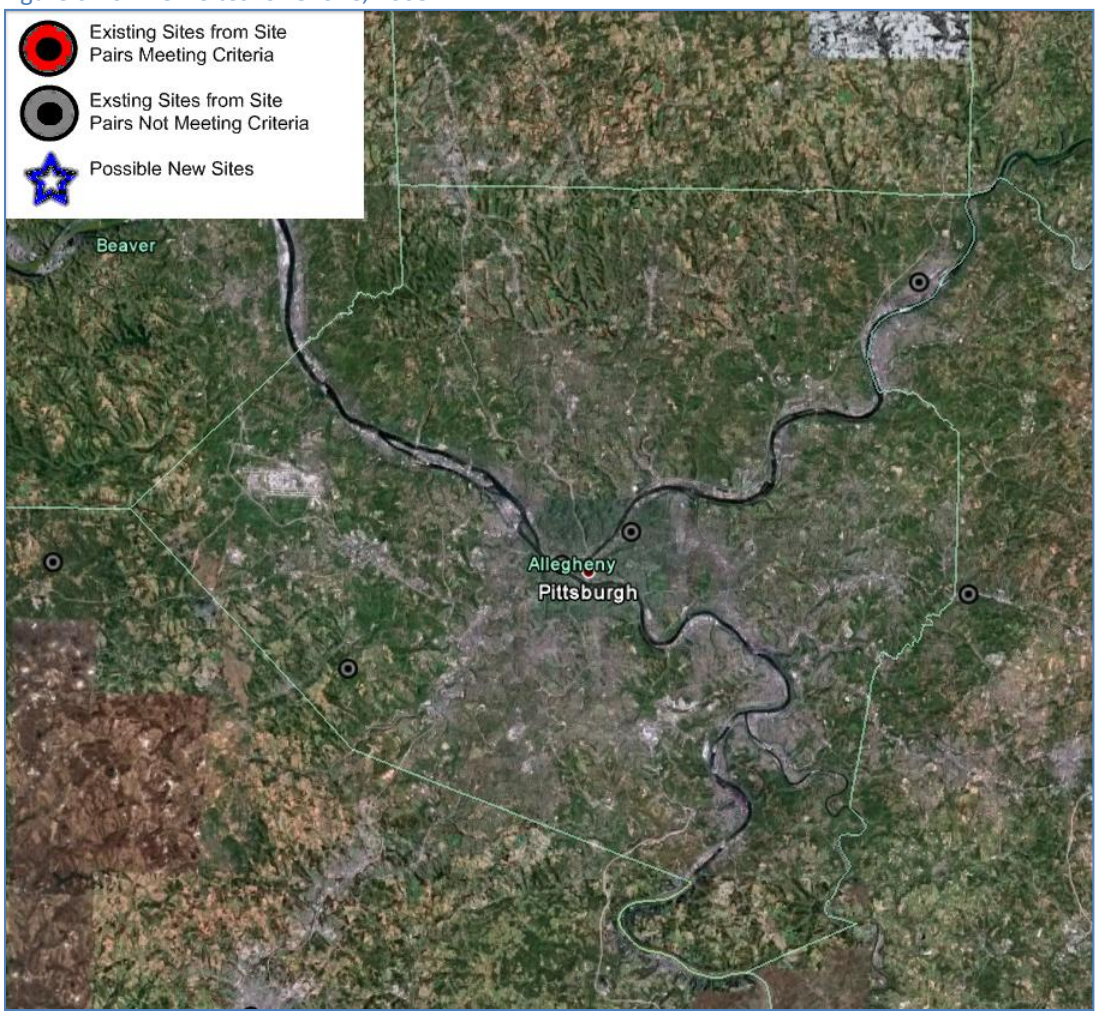


South Fayette shows small negative bias, indicating that it is slightly higher than surrounding monitors in the surrounding area.

New Sites

Figure 6-10 below shows results of the new sites tool for 2008 ozone monitor sites.

Figure 6-10. New Sites for Ozone, 2008

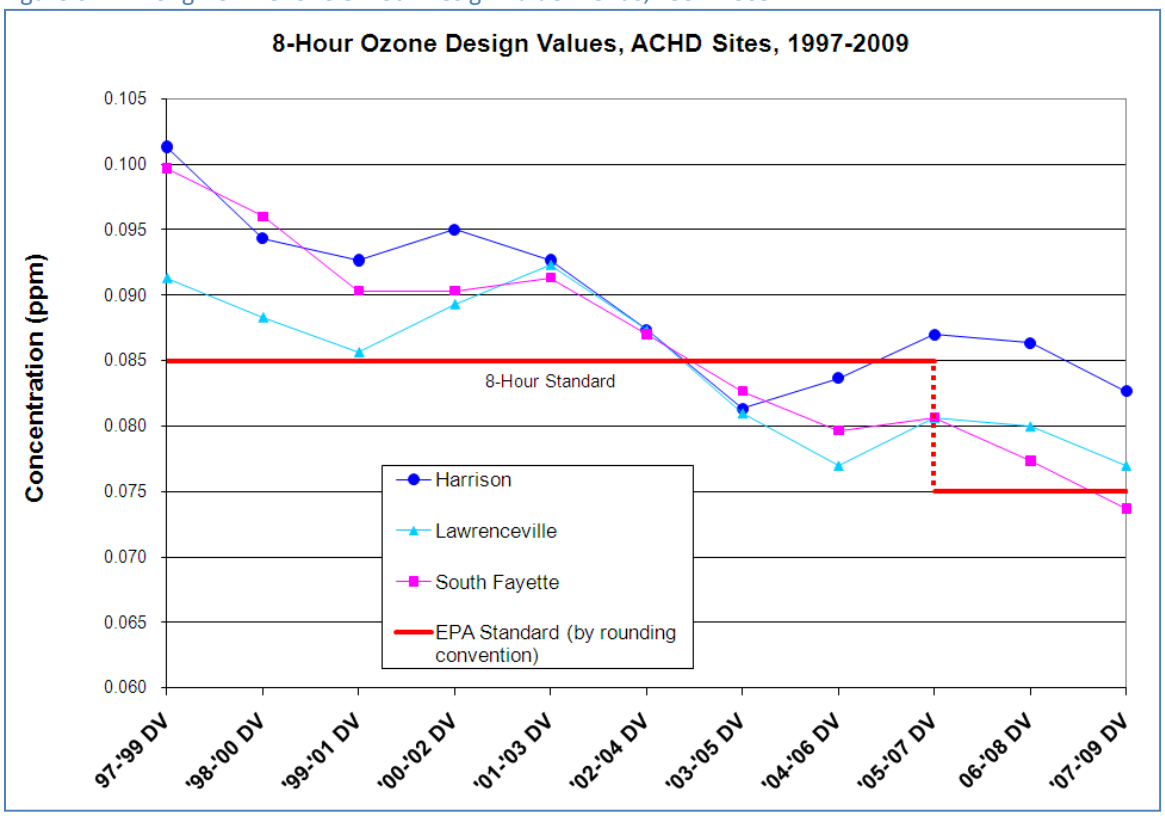


The tool did not generate any possible new sites.

Monitoring Data Trends

Figure 6-11 below shows long-term (13-year) monitoring trends for ozone in Allegheny County.

Figure 6-11. Long-Term Ozone 8-Hour Design Value Trends, 1997-2009



Long-term design values show a decreasing trend for all sites, with South Fayette showing a value below the revised standard of 0.075 ppm.

Rankings

Table 6-1 below shows the ranking values and score/rank for each ozone monitor in Allegheny County (operated by ACHD) based on the ranking methodology.

Table 6-1. Rankings for Ozone Monitors (ACHD Only)

Ozone Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 8-Hour Average (ppm)	Site Objective	Population (people/mi²)	Closest Site (km)
Lawrenceville	4	32	0.080	Population Exposure	2417	5
South Fayette	3	30	0.077	Background	783	16
Harrison	2	20	0.086	Population Exposure	735	26

Ozone Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 8-Hour Average	Site Objective	Population	Closest Site	Score	Rank
Lawrenceville	3	1.00	1.04	1	0.5	0.00	6.54	**1**
South Fayette	3	0.75	1.00	1	0.0	0.75	6.50	**2**
Harrison	2	0.50	1.12	0	0.0	1.00	4.62	**3**

Lawrenceville shows the highest ranking based on its population exposure, number of other pollutants, and years of operation. Harrison, while showing the highest design value, scores low due to low population density and years of operation.

Summary

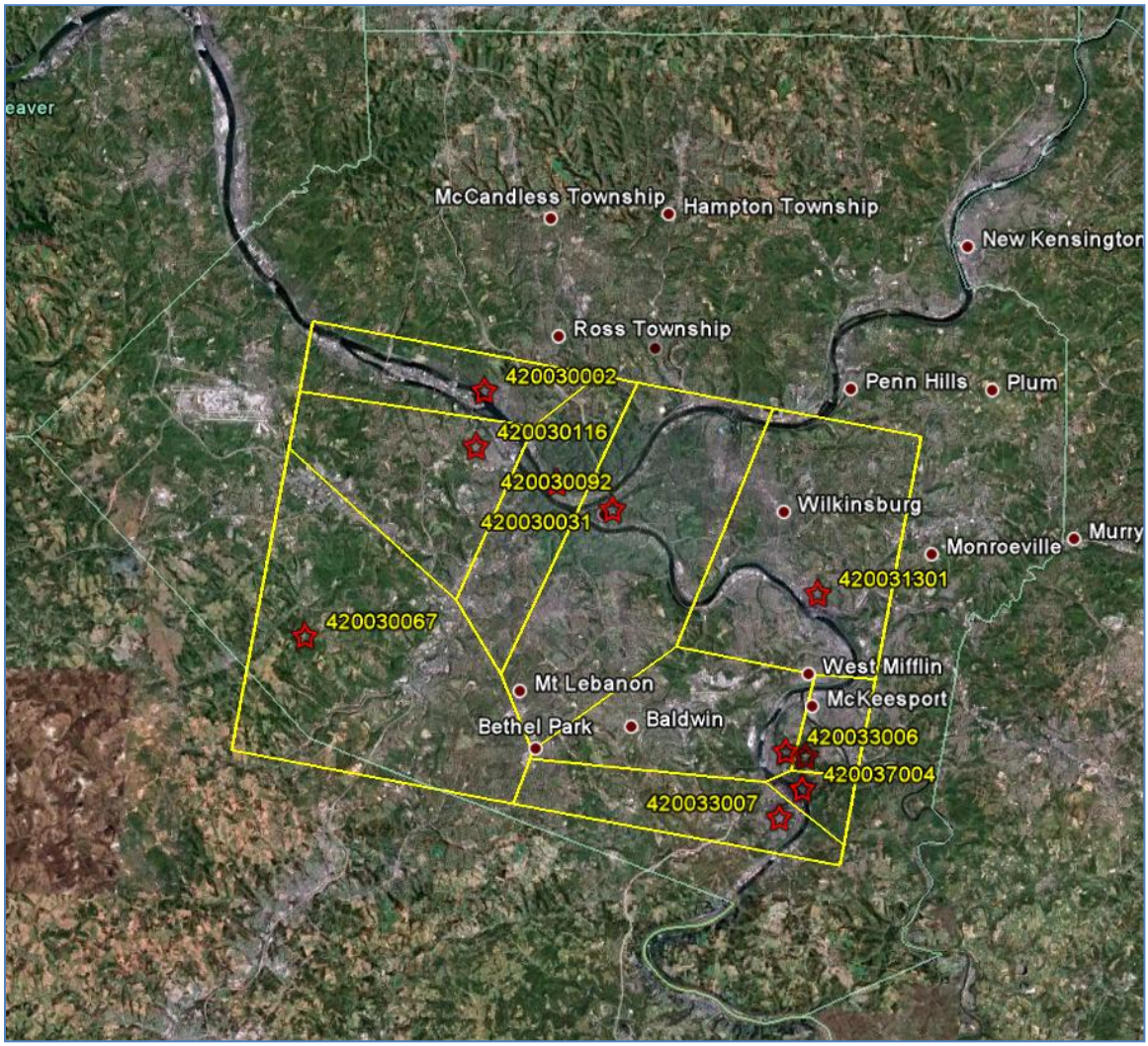
Data analysis shows that the ozone network for Allegheny County is sufficient for monitoring ozone transport and formation throughout Allegheny County and the surrounding SW PA area. No changes are required.

7. PM_{10} Analysis

Area Served

The areas served for PM_{10} monitors are shown on the map in Figure 7-1 below.

Figure 7-1. Area Served by 2008 PM_{10} Network

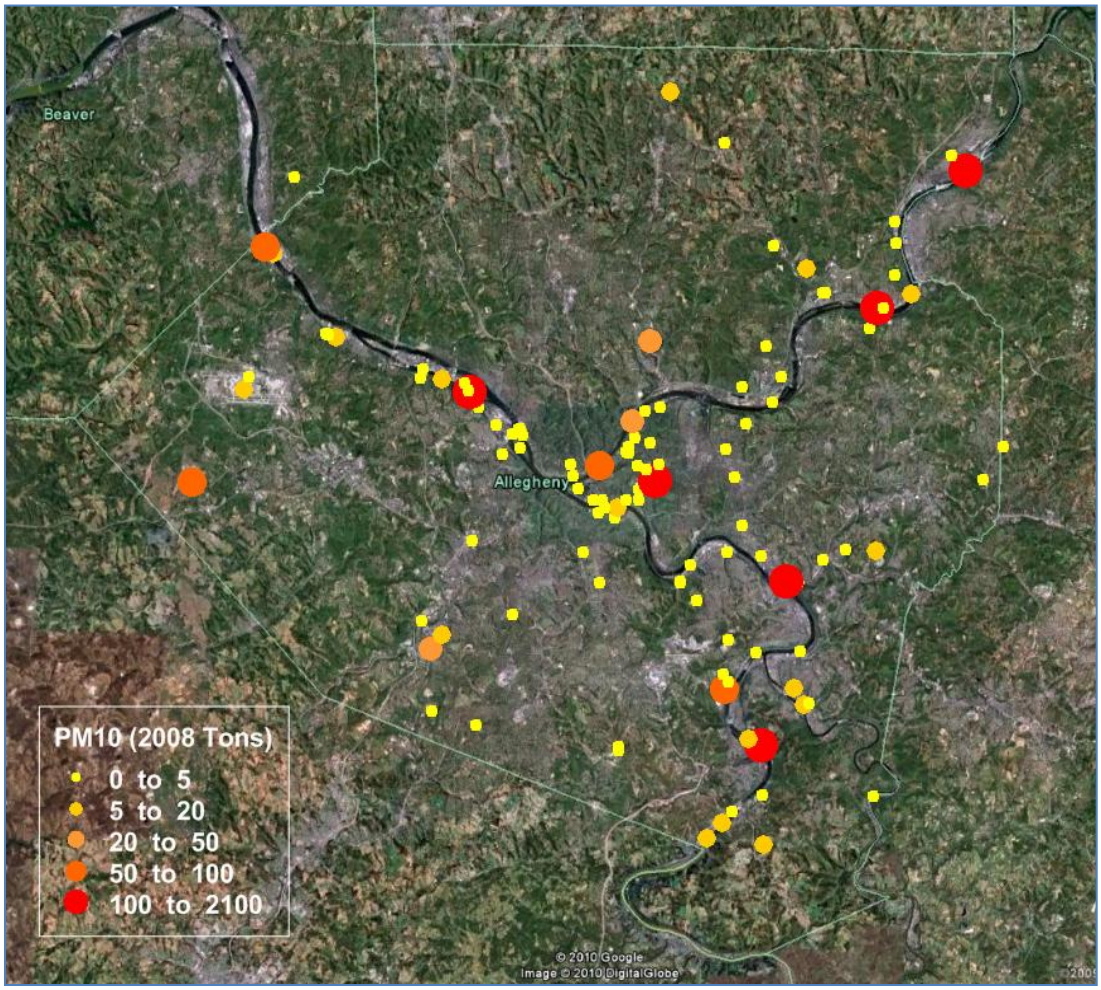


The area served map shows that the PM_{10} network is designed for exposure in industrial river valleys, the downtown Pittsburgh area, and background area.

Emissions

Figure 7-2 below shows the 2008 PM_{10} emissions by point source in Allegheny County. The largest sources are steel facilities in the river valleys.

Figure 7-2. PM_{10} Point Sources by Tons

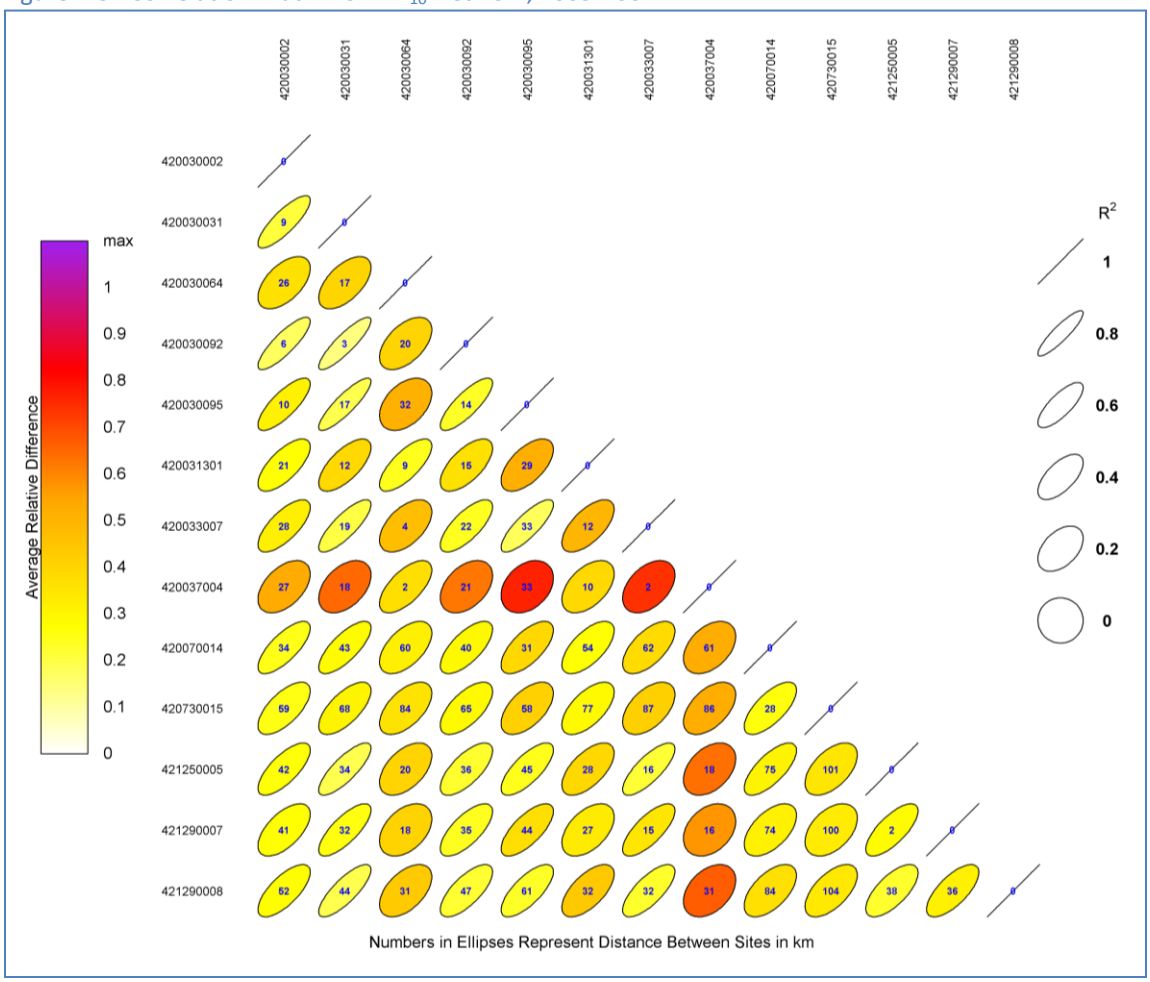


The PM_{10} monitors are located in areas of the highest emissions. There are no monitors in the Allegheny River valley, but emissions in that area are from tall stacks or from sources lying on the edge of the county border. One $PM_{2.5}$ monitor is located in Harrison for exposure of smaller particles.

Correlation Matrices

Figure 7-3 below shows the correlation matrix for PM_{10} monitors in the Pittsburgh MSA based on 2005-2007 averages.

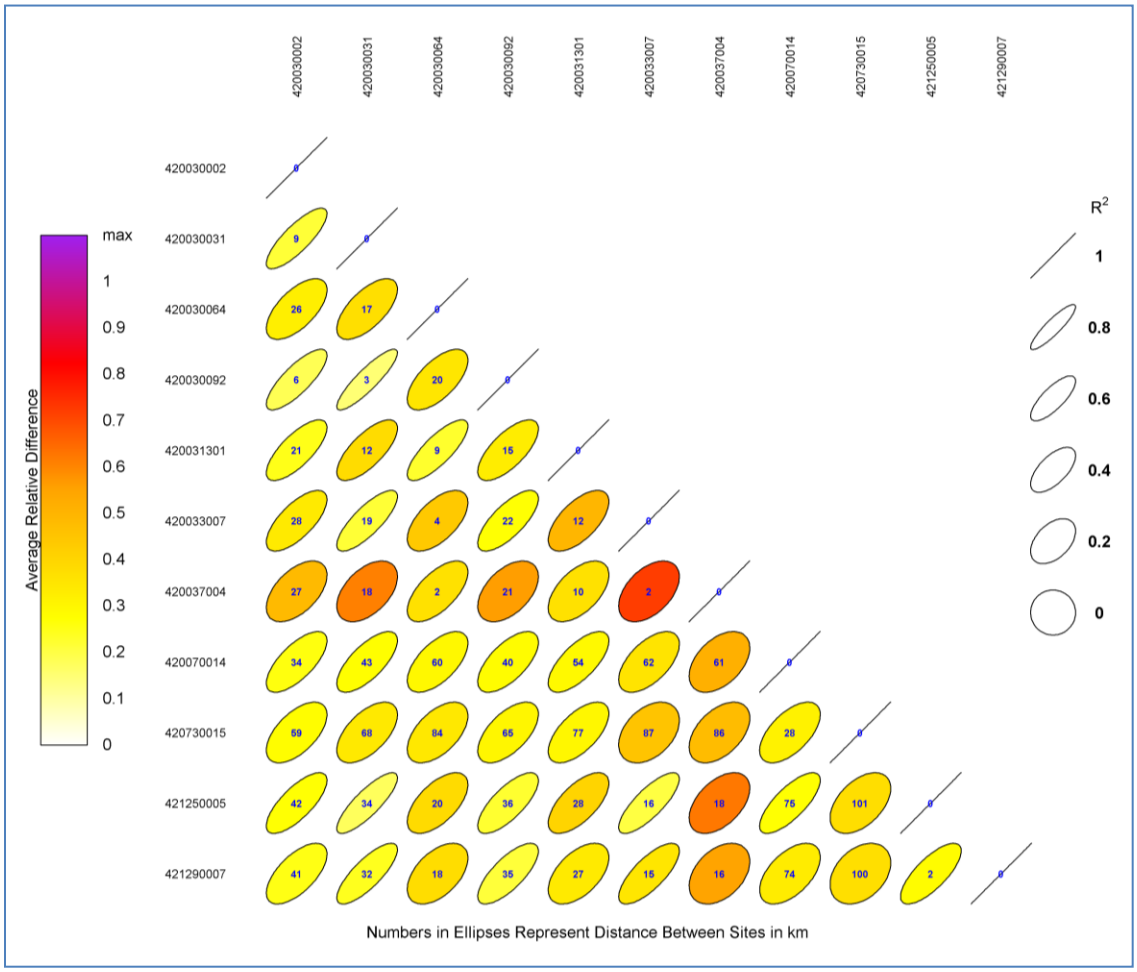
Figure 7-3. Correlation Matrix for PM_{10} Network, 2005-2007



The 2005-2007 matrix shows that Lincoln (420037004) does not correlate and shows large relative differences with other monitors in SW PA. Liberty (420030064) and Glassport (420033007) also shows weak correlation and large relative differences.

Figure 7-4 below shows the correlation matrix for PM_{10} monitors based on 2006-2008 averages.

Figure 7-4. Correlation Matrix for PM_{10} Network, 2006-2008

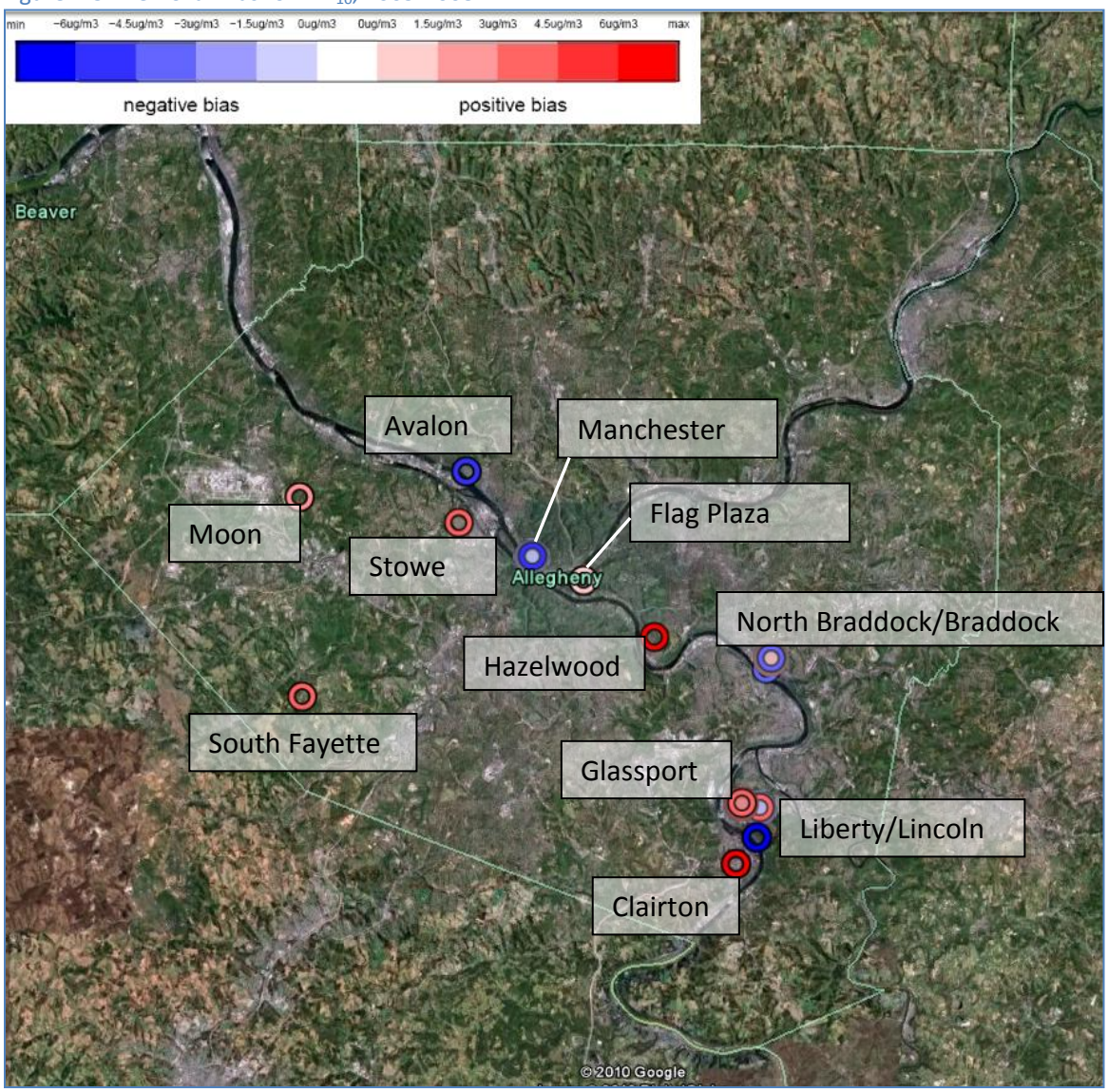


The 2006-2008 matrix shows results similar to 2005-2007, with Lincoln showing the worst correlation and largest relative difference.

Removal Bias

Results from the removal bias tool are shown in Figure 7-5 below for the PM_{10} network. Data is based on 2005-2008 data for all sites in operation during that period, with all surrounding sites included in the interpolation analysis. Dots and rings for each year are shown stacked on one another.

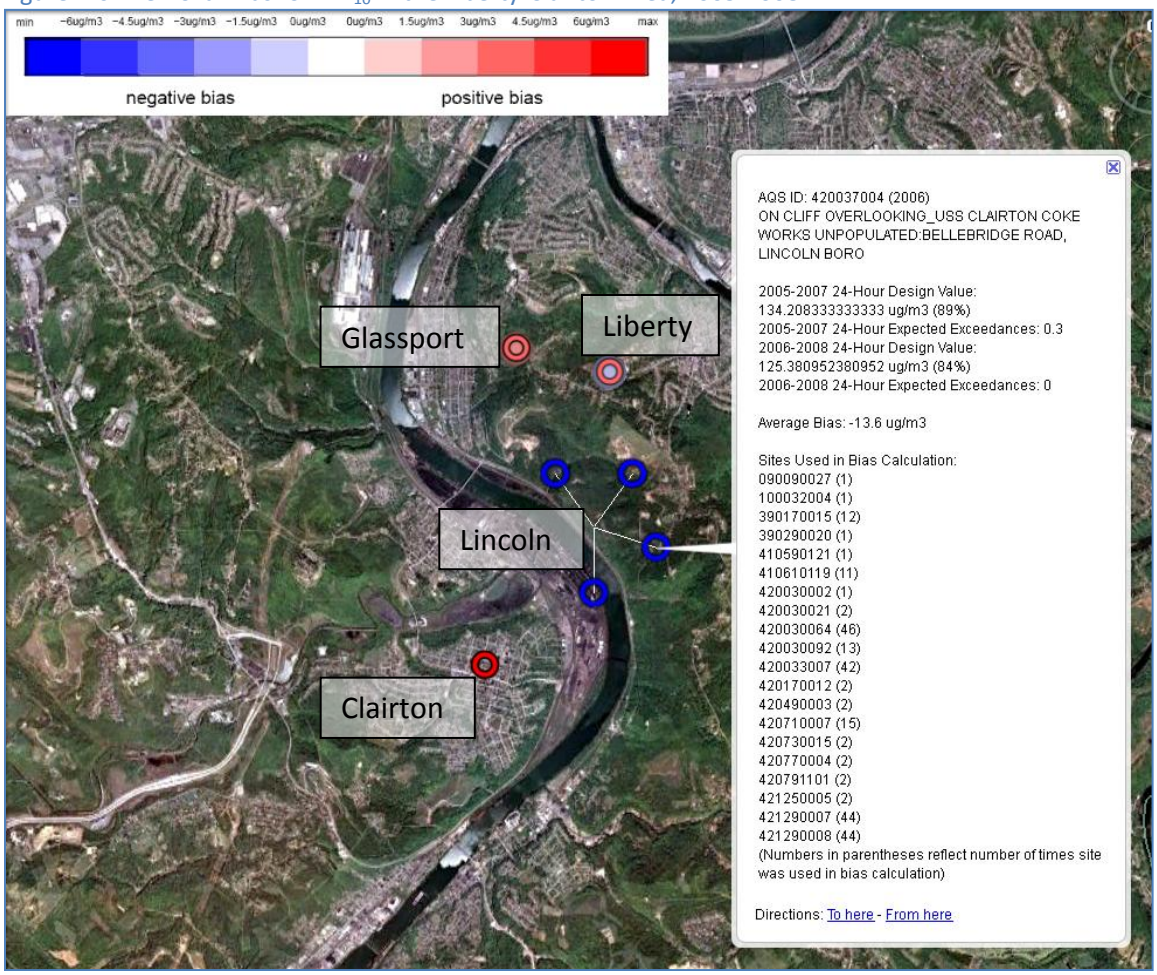
Figure 7-5. Removal Bias for PM_{10}, 2005-2008



The removal bias analysis shows varying results for each site or area. The sites are examined more closely by area on the following pages.

Figures 7-6 through x-x below show close-ups of each PM_{10} area, with the dots and rings expanded for selected sites, showing each year analyzed and a description of the removal bias statistics. Note: Only one site at a time can be expanded with the removal bias tool.

Figure 7-6. Removal Bias for PM_{10} in the Liberty-Clairton Area, 2005-2008



Lincoln shows consistent negative bias within the PM_{10} network, indicating that it records the highest concentrations in the Liberty-Clairton area. Liberty and Glassport show a combination of slight bias and statistical insignificance – these sites record either lower or similar concentrations to Lincoln, depending on daily meteorology. Clairton shows consistent positive bias, or lower concentrations than the surrounding sites.

Figure 7-7. Removal Bias for PM_{10} in the Braddock Area, 2005-2008

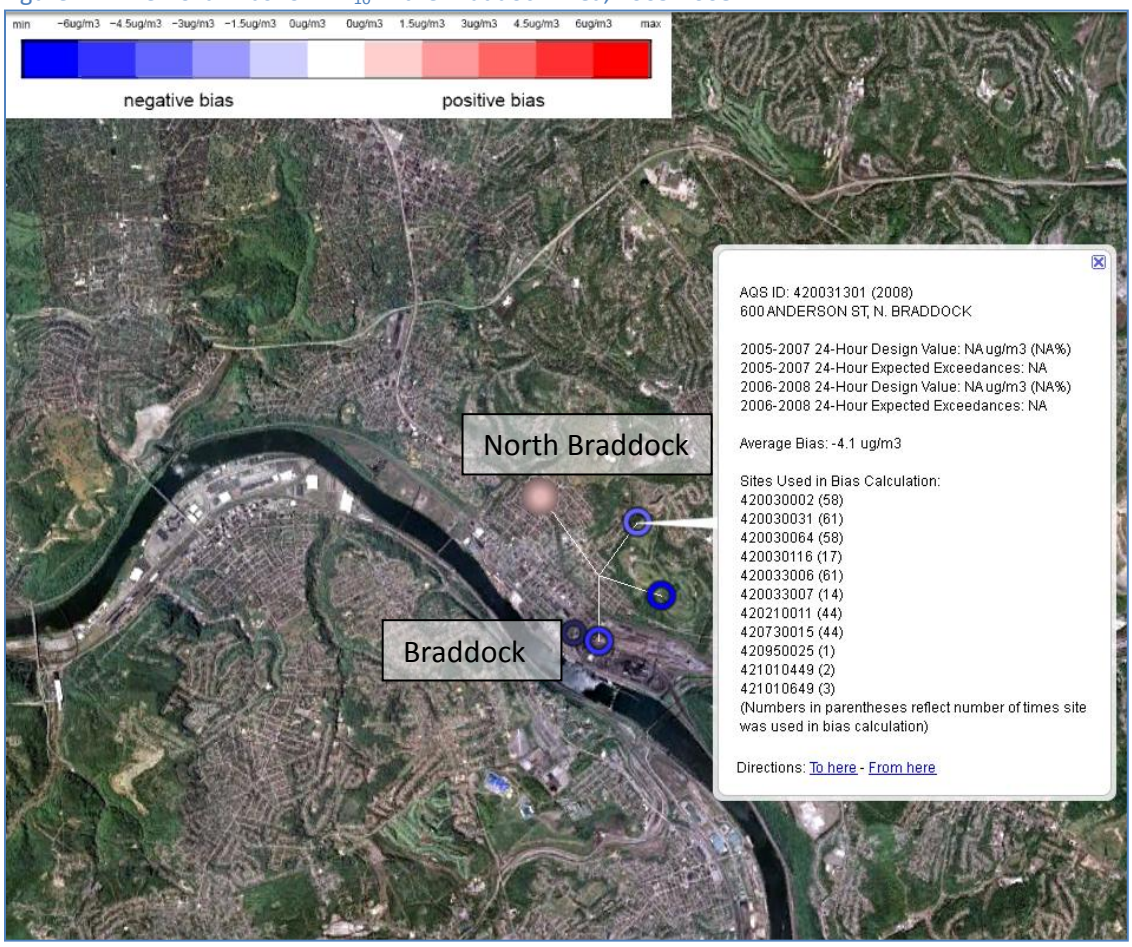
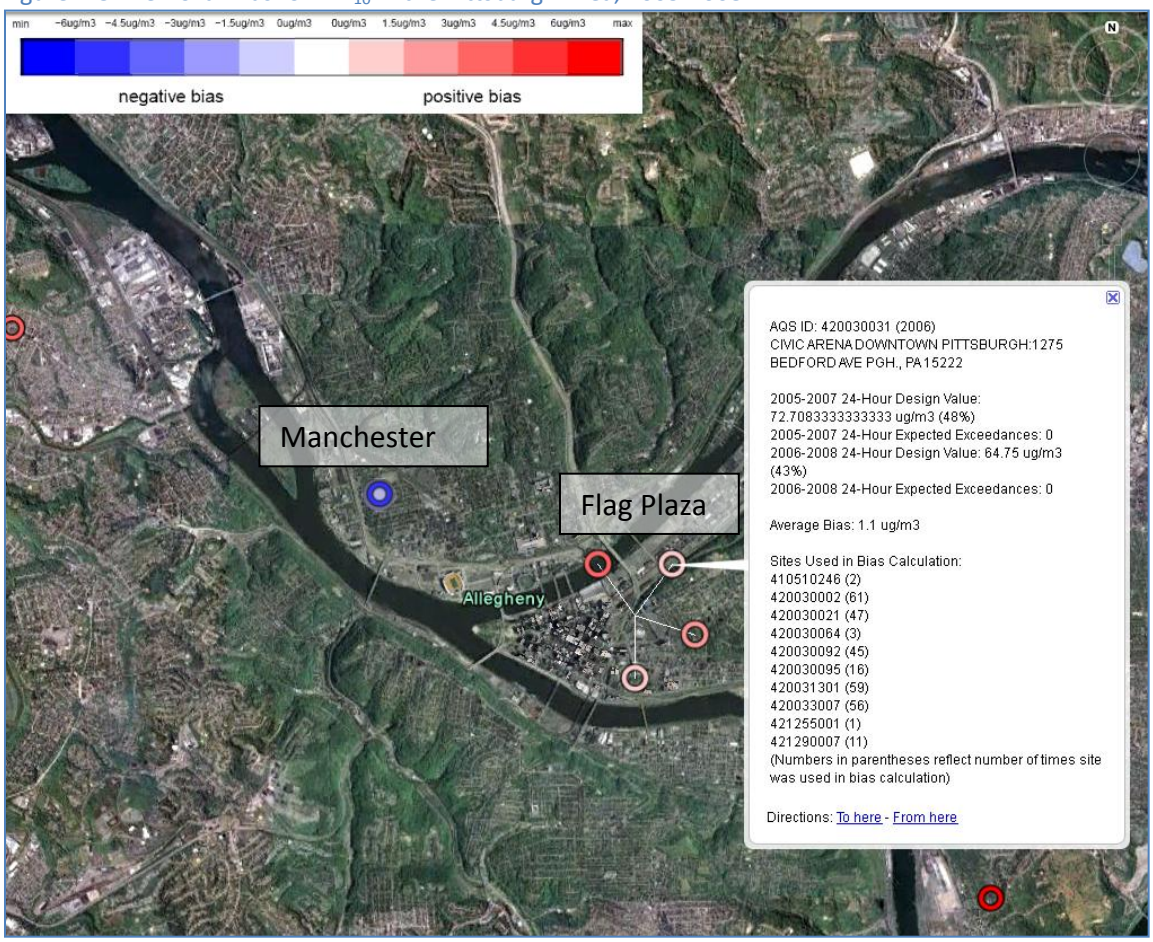


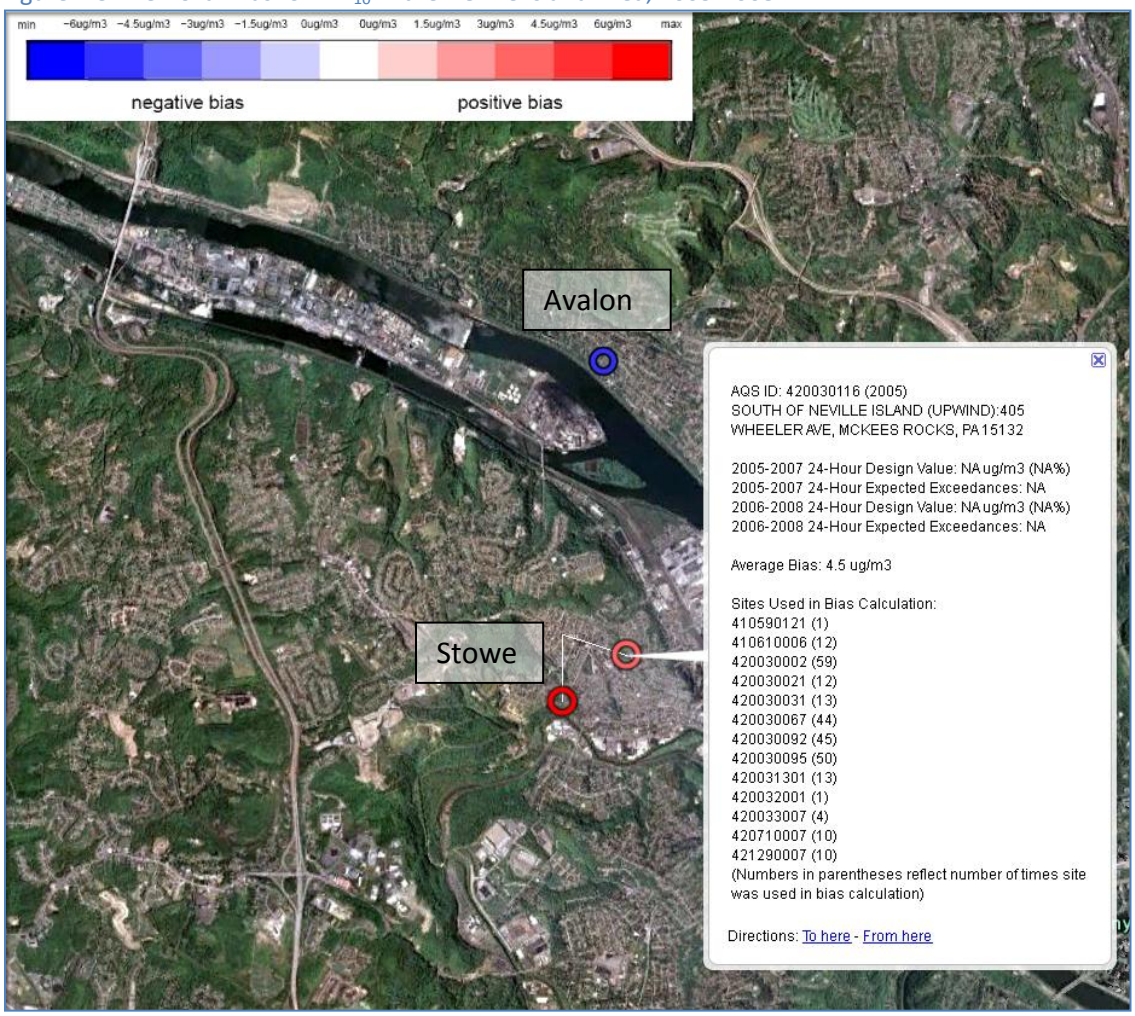
Figure 7-7 shows that North Braddock produces negative bias, with one year of insignificance. The Braddock site (shown by the dark blue ring) showed similar negative bias. [Braddock was discontinued in 2006 due to roof reconstruction at the site.]

Figure 7-8. Removal Bias for PM_{10} in the Pittsburgh Area, 2005-2008



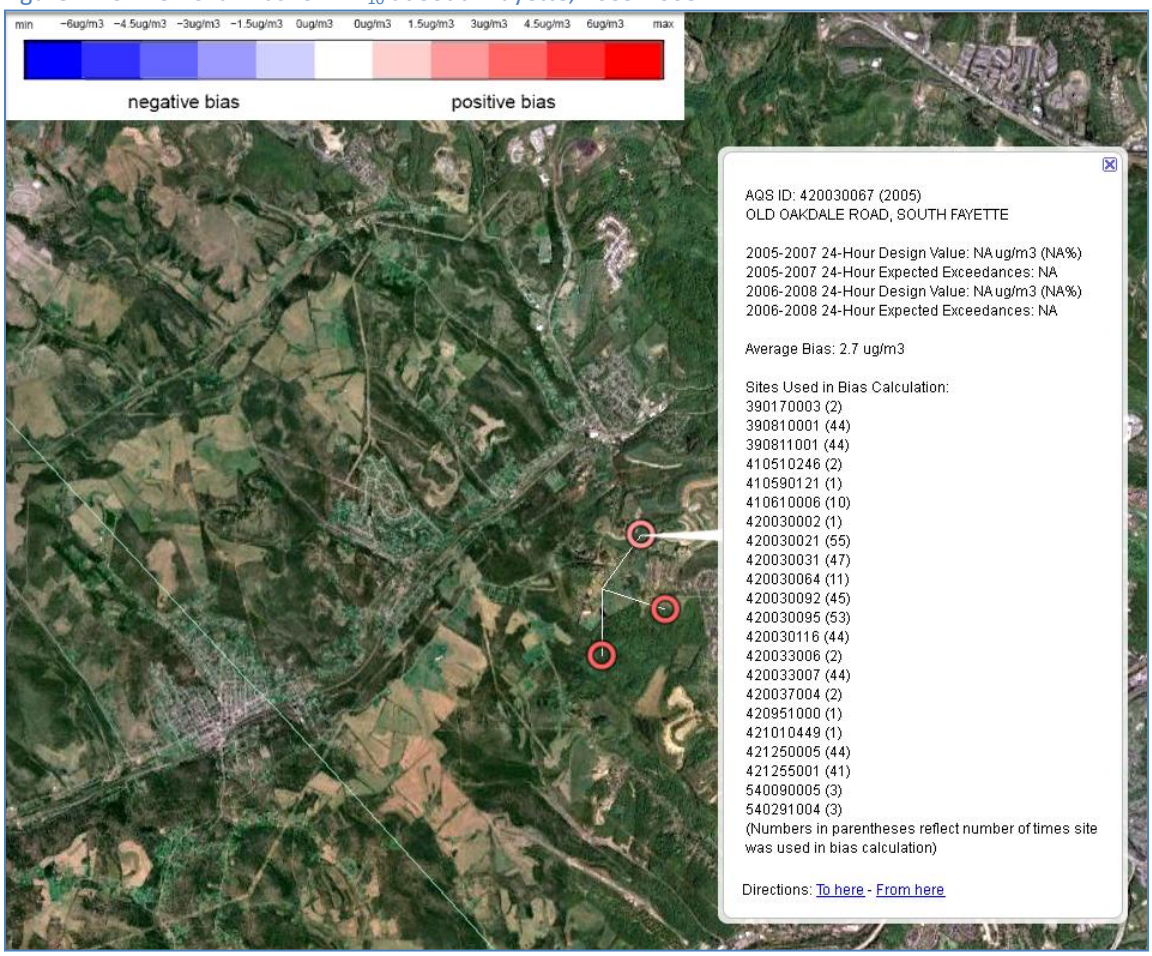
Flag Plaza showed slight positive bias, and Manchester showed negative bias with some statistical insignificance. Both of these sites might be considered redundant to the network; however, they serve specific purposes as downtown and dense urban sites.

Figure 7-9. Removal Bias for PM_{10} in the Neville Island Area, 2005-2008



Avalon shows consistent negative bias to the network, while Stowe shows small positive bias. Stowe may be redundant to the network since it lies out of the general wind direction in the river valley and records concentrations similar to or lower than Avalon.

Figure 7-10. Removal Bias for PM_{10} at South Fayette, 2005-2008

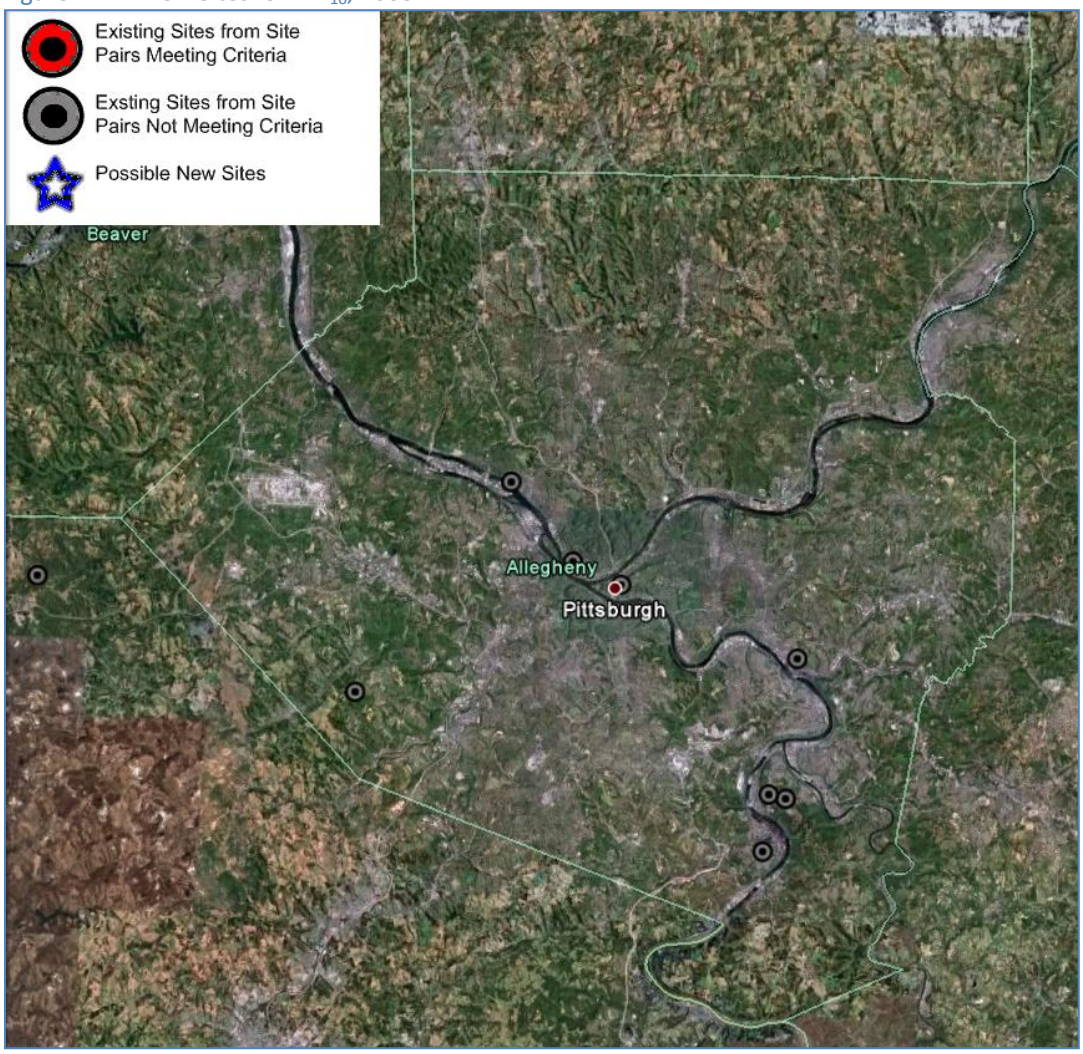


South Fayette shows a slight positive bias within the PM_{10} network, indicating lower concentrations than surrounding monitors. South Fayette serves as a background monitor for Allegheny County.

New Sites

Figure 7-11 below shows results of the new sites tool for 2008 PM_{10} monitor sites.

Figure 7-11. New Sites for PM_{10}, 2008

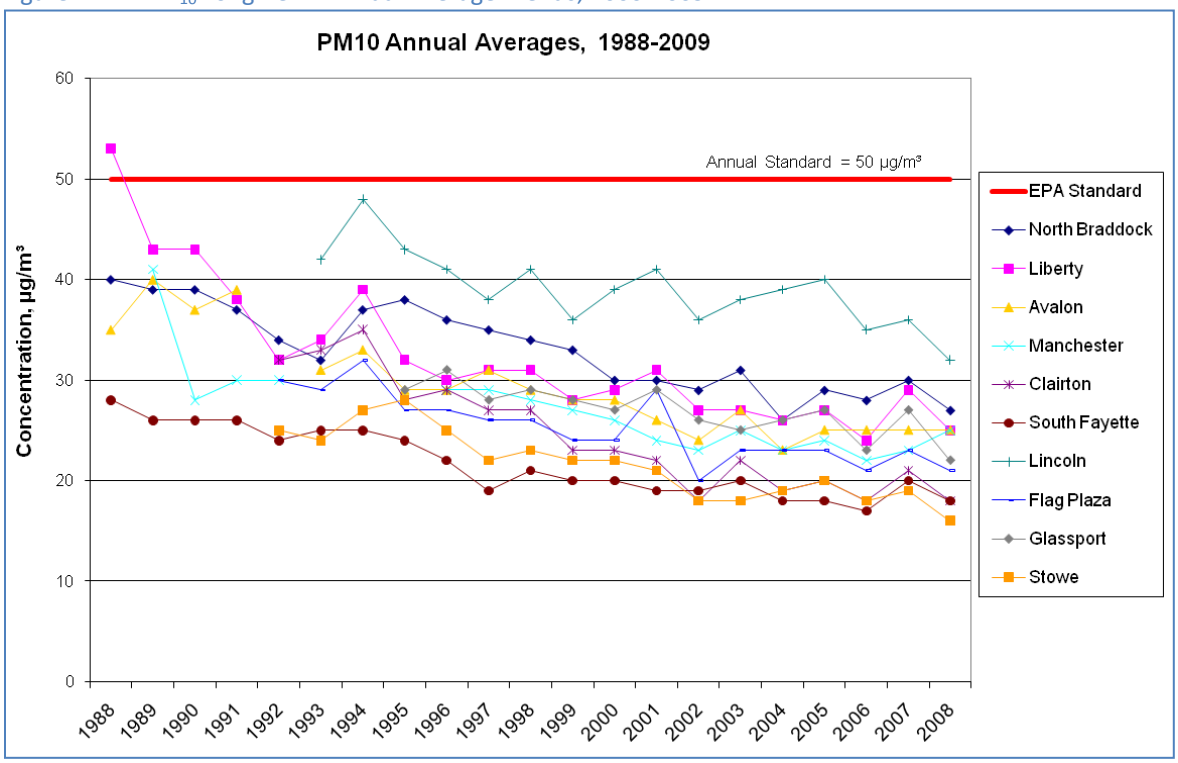


The tool did not generate any possible new sites.

Monitoring Data Trends

Figure 7-12 below shows long-term (20-year) monitoring trends for PM_{10} in Allegheny County, given by annual average.

Figure 7-12. PM_{10} Long-Term Annual Average Trends, 2000-2009



Long-terms trends show decreasing annual average PM_{10} concentrations through 2008.

Rankings

Table 7-1 below shows the ranking values and score/rank for each PM_{10} monitor in Allegheny County based on the ranking methodology.

Table 7-1. Rankings for PM_{10} Monitors

PM10 Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average (µg/m³)	2006-2008 Design Value Annual Average (µg/m³)	Site Objective	Population (people/mi²)	Closest Site (km)	Notes
Lincoln	0	18	128	33.9	Highest Concentration	234	2	Distance from active site
Liberty	2	23	96	26.6	Population Exposure	4249	1	Distance from active site
North Braddock	1	23	72	28.6	Population Exposure	3574	9	Distance from active site
Glassport	0	19	99	24.0	Population Exposure	2293	1	Distance from active site
Flag Plaza	1	24	66	21.2	Population Exposure	5578	3	Distance from active site
South Fayette	3	23	55	18.1	Background	1028	14	Distance from active site
Avalon	1	23	58	24.9	Population Exposure	1956	3	Distance from active site
Manchester	0	21	51	23.2	Population Exposure	4098	3	Distance from active site
Stowe	1	19	64	17.3	Population Exposure	1518	3	Distance from active site
Clairton	1	18	49	19.1	Population Exposure	1379	2	Distance from active site
Braddock	0	22	71	32.0	Population Exposure	2824	1	1985-2006 (2006 only)
Hazelwood	0	23	61	18.5	Population Exposure	4269	5	1985-2007 (2-year avg)
Moon	1	19	48	19.1	Population Exposure	1046	10	1989-2007 (2-year avg)

PM10 Score and Rank

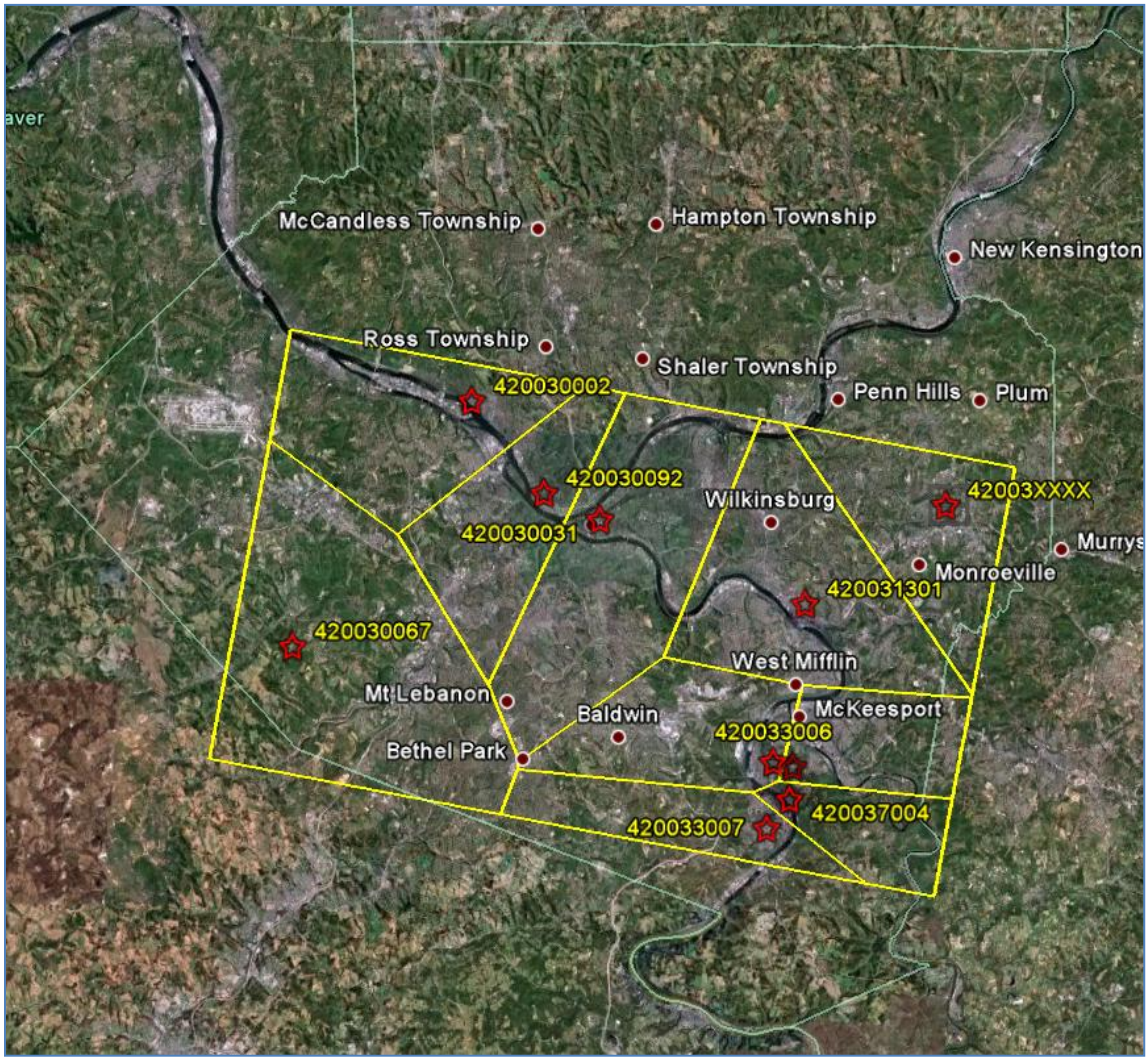
Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average	2006-2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank All	Rank Active
Lincoln	0	0.50	12.8	8.48	1	0.00	0.00	22.8	1	**1**
Liberty	2	0.75	9.6	6.65	1	1.00	0.00	21.0	2	**2**
North Braddock	1	0.75	7.2	7.15	1	0.75	0.25	18.1	3	**3**
Glassport	0	0.50	9.9	6.00	1	0.50	0.00	17.9	4	**4**
Flag Plaza	1	0.75	6.6	5.30	1	1.00	0.00	15.7	6	**5**
South Fayette	3	0.75	5.5	4.53	1	0.25	0.50	15.5	7	**6**
Avalon	1	0.75	5.8	6.23	1	0.25	0.00	15.0	8	**7**
Manchester	0	0.75	5.1	5.80	1	1.00	0.00	13.7	9	**8**
Stowe	1	0.50	6.4	4.33	1	0.25	0.00	13.5	10	**9**
Clairton	1	0.50	4.9	4.78	1	0.25	0.00	12.4	12	**10**
Braddock	0	0.75	7.1	8.00	0	0.50	0.00	16.4	5	-
Hazelwood	0	0.75	6.1	4.63	0	1.00	0.25	12.7	11	-
Moon	1	0.50	4.8	4.78	0	0.25	0.25	11.6	13	-

The scoring shows that Lincoln's high design value gives it the highest rank for the network. Liberty, North Braddock, and Glassport are also highly ranked sites that are downwind of industrial areas. Flag Plaza, South Fayette, and Avalon are ranked in the middle based on their ranking criteria. Manchester, Stowe, and Clairton show the lowest rankings in the network based on their criteria. Clairton is located within the Liberty-Clairton area however, and Manchester serves as a dense urban residential site. Stowe may be redundant based on its proximity to Avalon, similar values to Avalon, and small positive bias to the PM_{10} network.

Summary

Data analysis has shown that Stowe may be redundant for PM_{10} in the Neville Island area. Also, a new site will be established in Monroeville (no site id, given as 42003XXXX on the map) based on public requests. Figure 7-13 below shows the proposed network for 2010 with Stowe removed and Monroeville added.

Figure 7-13. Proposed Area Served for PM_{10} Network, 2010



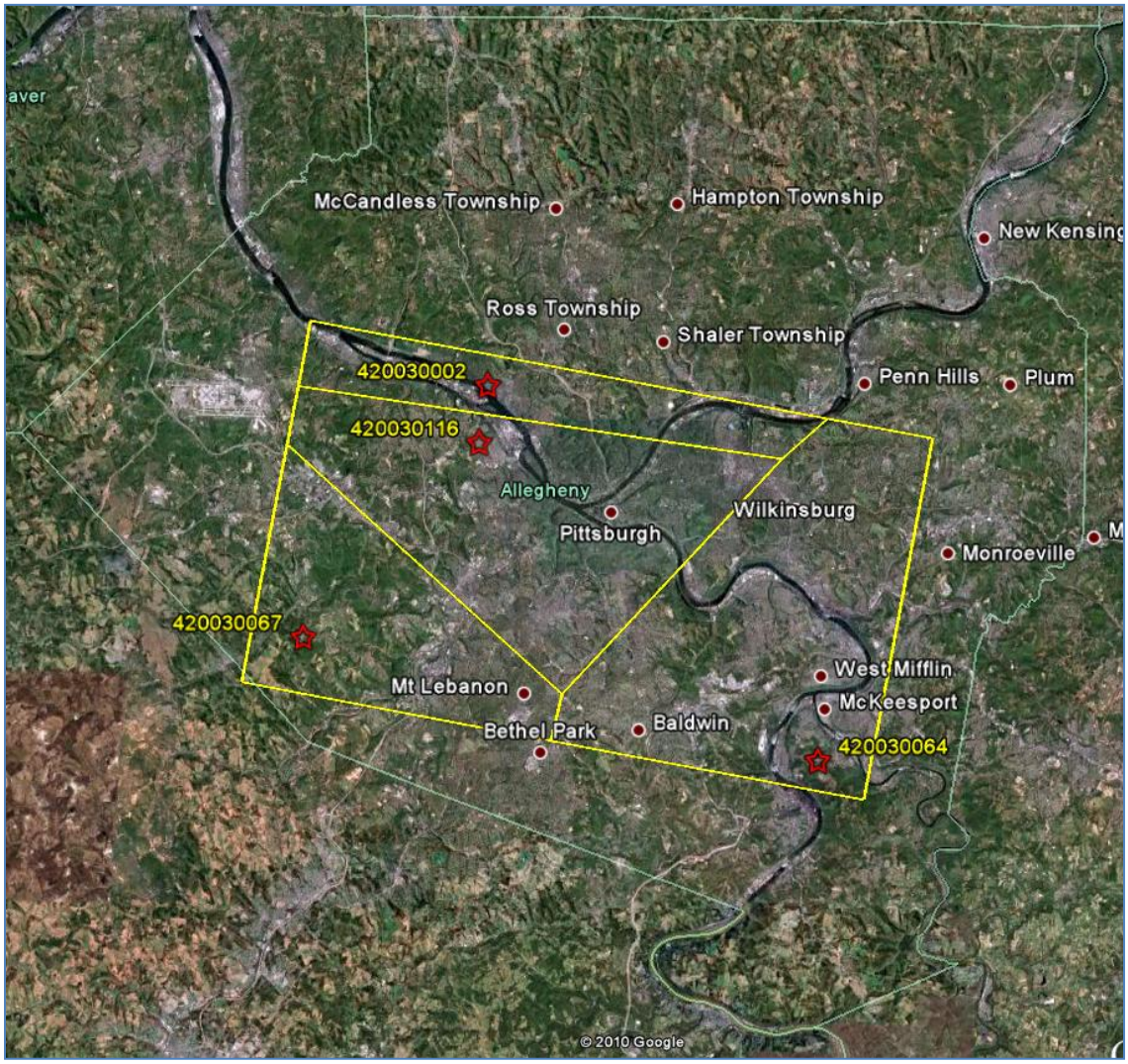
The proposed network would continue to monitor in industrial areas while adding a suburban exposure site in Monroeville (42003XXXX). Additionally, PM_{coarse} monitoring at Lawrenceville (as part of the NCore network) could provide additional PM_{10} data if desirable.

8. Sulfur Dioxide (SO_2) Analysis

Area Served

The area served for sulfur dioxide (SO_2) monitors are shown on the map in Figure 8-1 below. Sites are labeled according to AQS site code, based on active 2008 sites.

Figure 8-1. Area Served by 2008 SO_2 Network

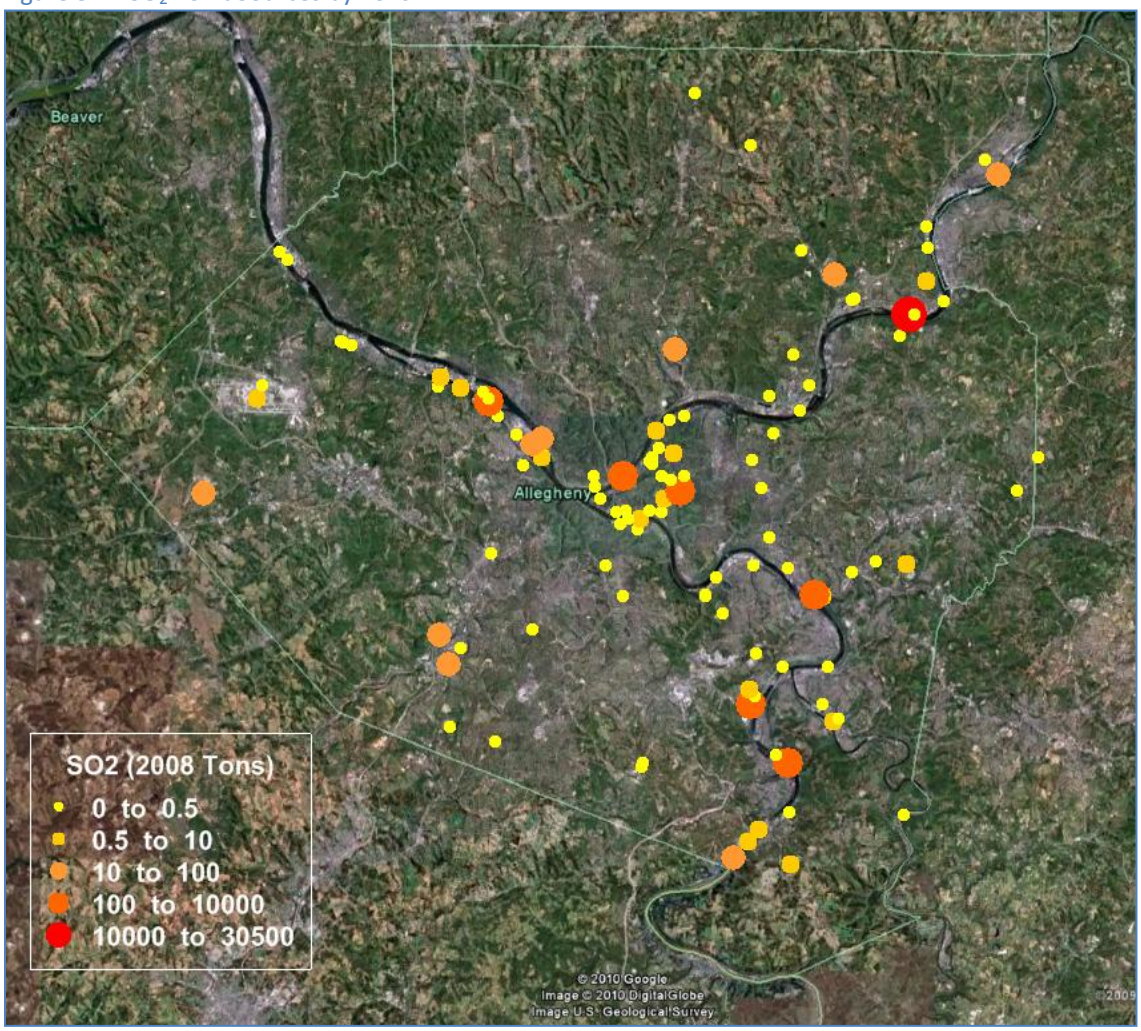


The map shows the distribution of SO_2 monitors in the Monongahela and Ohio River valleys, along with a background site at South Fayette (420030067). The Stowe site (420030116) was placed due to historical modeled concentrations on the hillside opposite Avalon (420030002). It is possible that this site may be redundant based on the proximity of the Avalon site (based on monitored values), prevailing wind directions (see Meteorology section), and emissions reductions at Neville Island sources.

Emissions

Figure 8-2 below shows 2008 emissions of SO_2 by point source in Allegheny County. The largest sources are steel and electric generation facilities in the river valleys.

Figure 8-2. SO_2 Point Sources by Tons

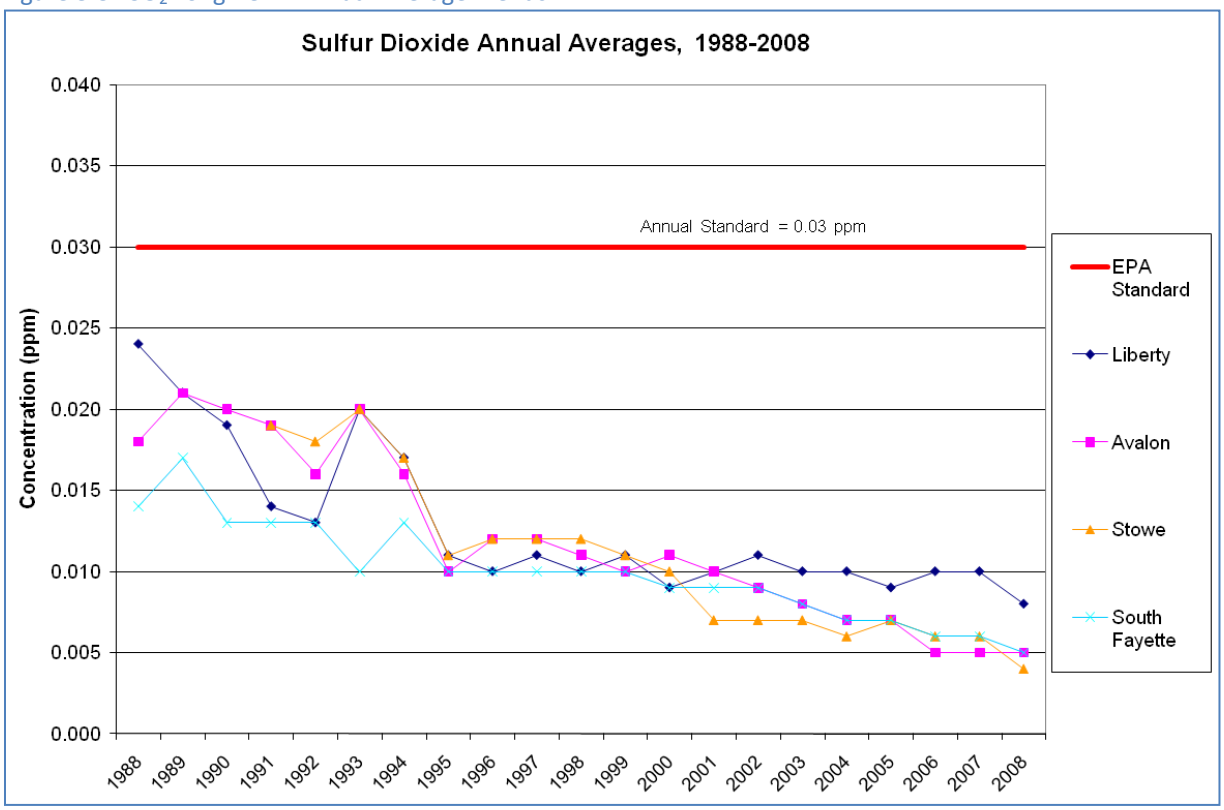


The monitors at Liberty and in the Neville Island area are sufficient for those areas. There is no monitor near the largest source (Cheswick Power Plant), but prevailing wind direction and high stack height allows for dispersion and transport of emissions away from the area. A new trace analyzer for SO_2 has been installed at Lawrenceville in 2009 as part of the NCore network and will provide monitoring in the City of Pittsburgh, where several small and mid-size sources are present.

Monitoring Data Trends

Figure 8-3 below shows long-term (20-year) monitoring trends for SO_2 in Allegheny County, given by annual average.

Figure 8-3. SO_2 Long-Term Annual Average Trends



Long-term trends show decreasing ambient concentrations for SO_2 on an annual basis. Liberty has recorded the highest annual averages over the past several years. An exceedance of the 24-hour standard (0.14 ppm) has not been recorded since 1999, and the county has monitored attainment of SO_2 for over 10 years

Rankings

Table 8-1 below shows the ranking values and score/rank for each SO_2 monitor based on the ranking methodology. The former sites Hazelwood and Glassport have been included in the ranking (shown in gray) for comparative purposes.

Table 8-1. SO_2 Rankings

Sulfur Dioxide Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value 24-Hour Average ($\mu g/m^3$)	2008 Design Value Annual Average ($\mu g/m^3$)	Site Objective	Population (people/mi^2)	Closest Site (km)	Notes
Liberty	2	41.0	0.037	0.008	Highest Concentration	3262	16	Distance from active site
South Fayette	2	30.0	0.019	0.005	Background	1184	14	Distance from active site
Avalon	1	30.0	0.019	0.005	Population Exposure	3110	3	Distance from active site
Stowe	1	19.0	0.016	0.004	Population Exposure	3968	3	Distance from active site
Hazelwood	0	32.5	0.025	0.006	Population Exposure	4835	7	1974-2006 (2006 data)
Glassport	0	21.0	0.070	0.013	Highest Concentration	1773	1	1985-2005 (2005 data)

Sulfur Dioxide Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value 24-Hour Average	2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank All	Rank Active
Liberty	2	1.00	0.37	0.24	1	0.75	0.75	6.11	1	**1**
South Fayette	2	0.75	0.19	0.15	1	0.25	0.50	4.84	2	**2**
Avalon	1	0.75	0.19	0.15	1	0.75	0.00	3.84	3	**3**
Stowe	1	0.50	0.16	0.12	1	0.75	0.00	3.53	4	**4**
Hazelwood	0	1.00	0.25	0.18	0	1.00	0.25	2.68	5	**N/A**
Glassport	0	0.75	0.70	0.39	0	0.25	0.00	2.09	6	**N/A**

Liberty received the highest ranking for SO_2 due to high concentrations, far distance from other sites, dense population, and years of operation. South Fayette, though a background site not affected by heavy industry, is important to the network due to its distance from other sites, years of operation, and background objective.

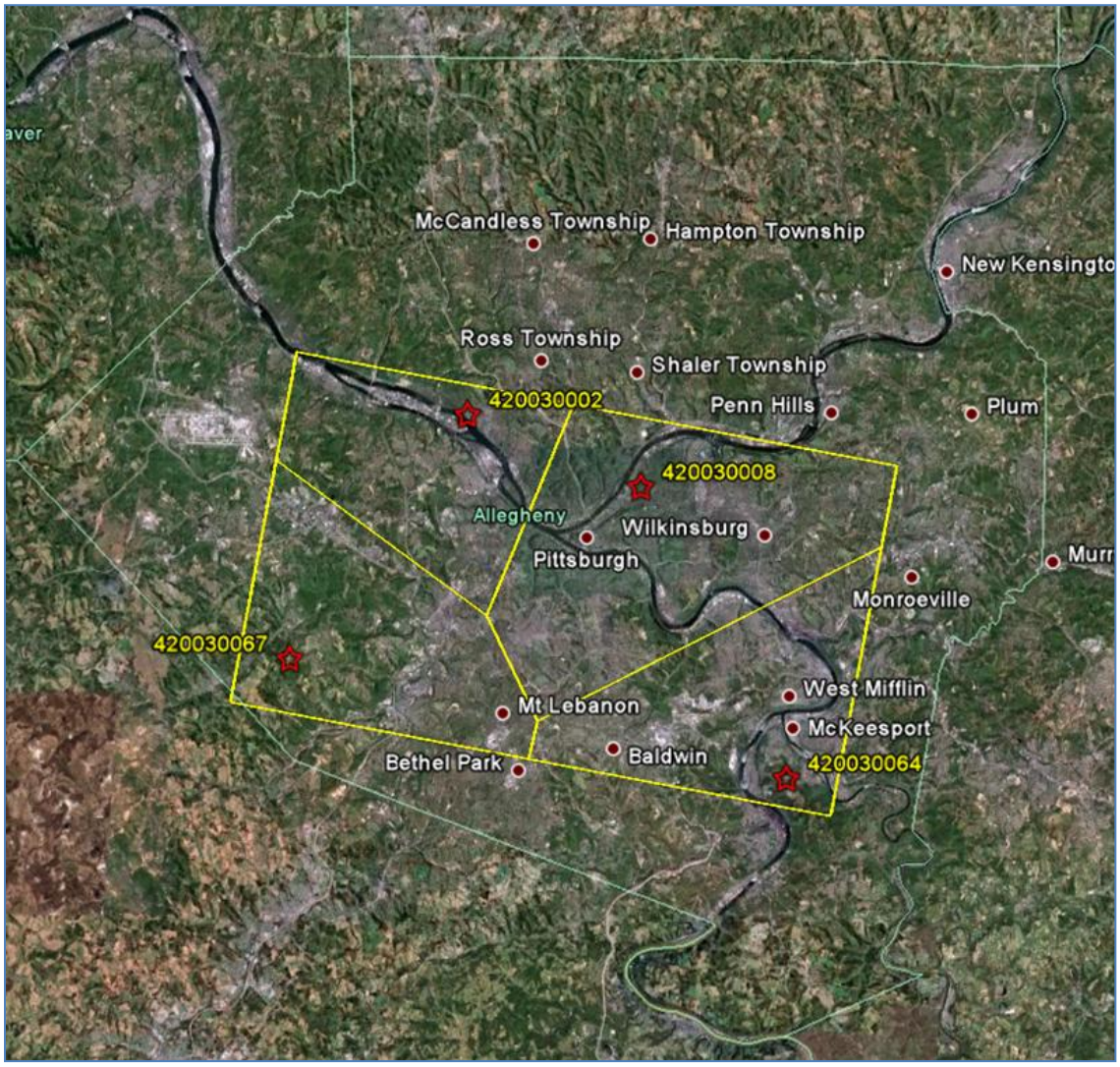
Avalon and Stowe received similar rankings due to similarities in concentration, population densities, and close proximity to each other. Stowe may also be redundant to the network based on this methodology. Analysis of meteorology and emissions indicate that Avalon is the more important site for measuring air quality downwind of industry in the Neville Island area. The removal of Stowe would increase the ranking for Avalon to a score similar to that of South Fayette.

Hazelwood and Glassport showed the lowest rankings, indicating their redundancy and low level of importance to the network. These monitors were appropriately removed from the network.

Summary

Data analysis indicates that Liberty is the most important site to the SO_2 network, while Stowe may be a redundant site. Additionally, Lawrenceville is a new site for SO_2 as part of the NCore program. Figure 8-4 below shows the area covered map with Stowe removed and with Lawrenceville as a new site.

Figure 8-4. Proposed SO_2 Network Area Served



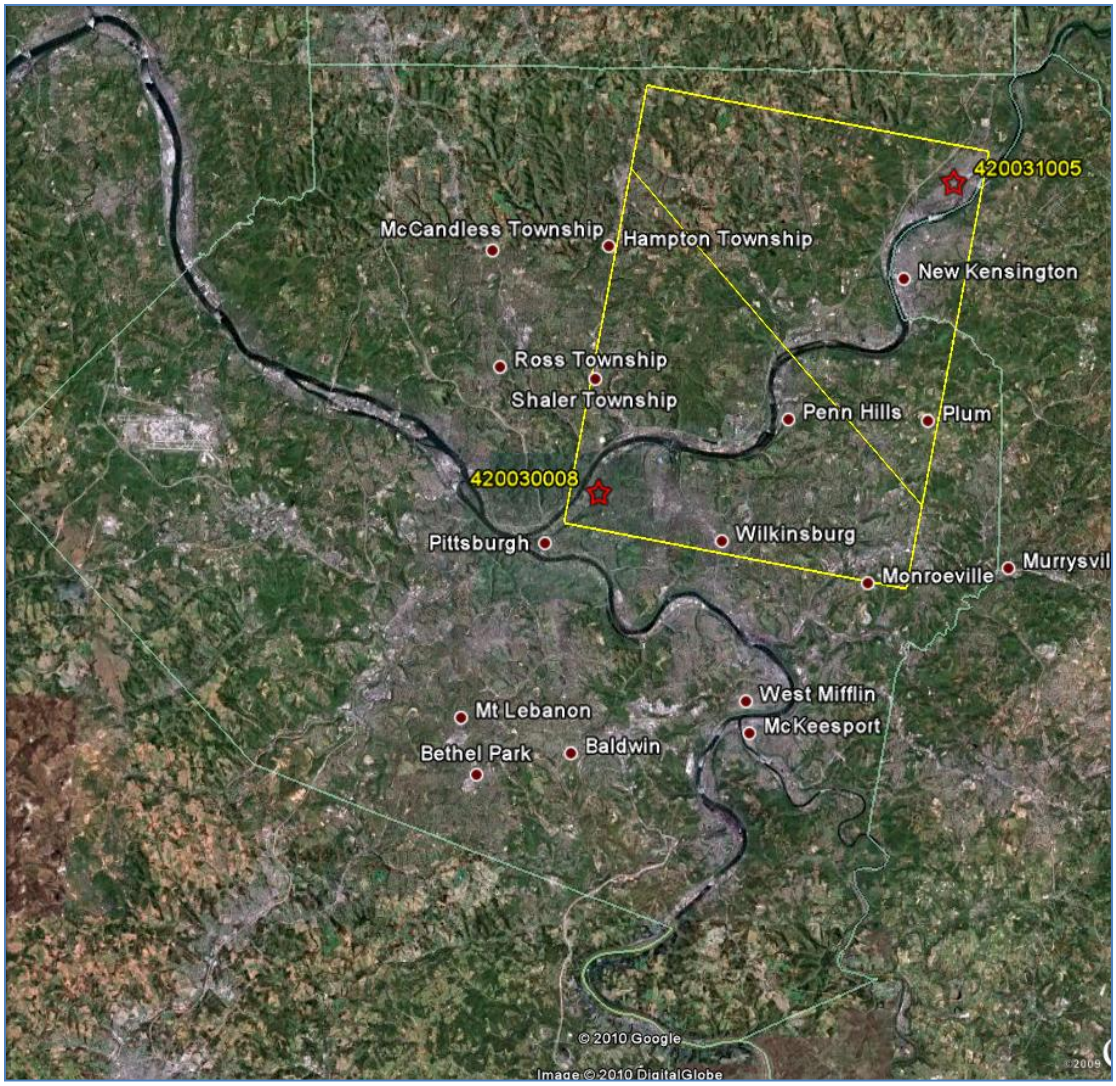
The map shows that the industrial areas in Neville Island and the Monongahela valley would be monitored by the Avalon (420030002) and Liberty (420030064) monitors. The South Fayette (420030067) and Lawrenceville (420030008) monitors would provide coverage on background and urban monitoring scales, respectively. The proposed network should be adequate for the new SO_2 standard (0.075 ppm on a 1-hour basis).

9. Nitrogen Dioxide (NO_2) Analysis

Area Served

The area served for nitrogen dioxide (NO_2) monitors are shown on the map in Figure 9-1 below. Sites are labeled according to AQS site code, based on active 2008 sites.

Figure 9-1. Area Served by 2008 NO_2 Network

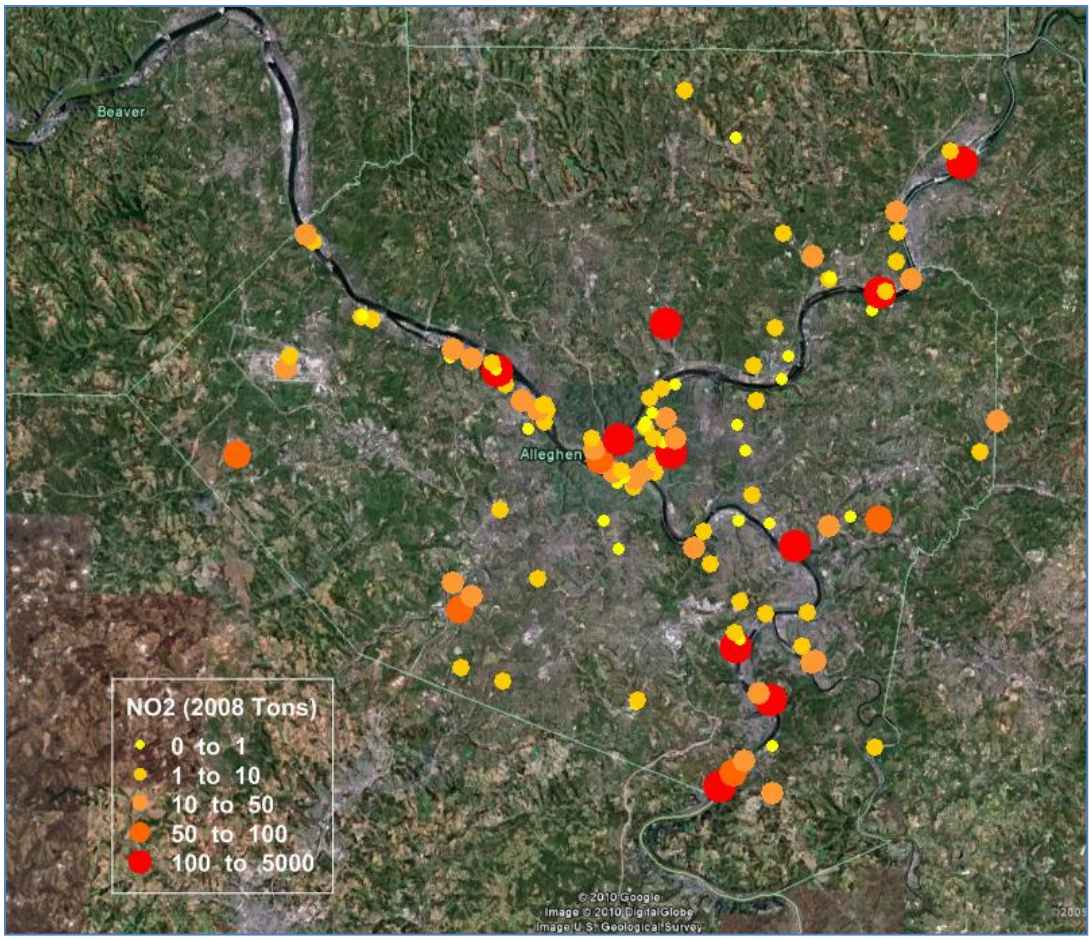


The map shows NO_2 network has been designed to cover the urban residential and long-range downwind region in the City of Pittsburgh. Both sites are collocated with ozone monitors. NO_2 has generally been measured for ambient levels, with focus as a precursor for ozone. Proposed federal standards will likely require an additional site near a major highway to assess exposure to traffic emissions.

Emissions

Figure 9-2 below shows 2008 emissions of NO_2 by point source in Allegheny County.

Figure 9-2. NO_2 Point Sources by Tons

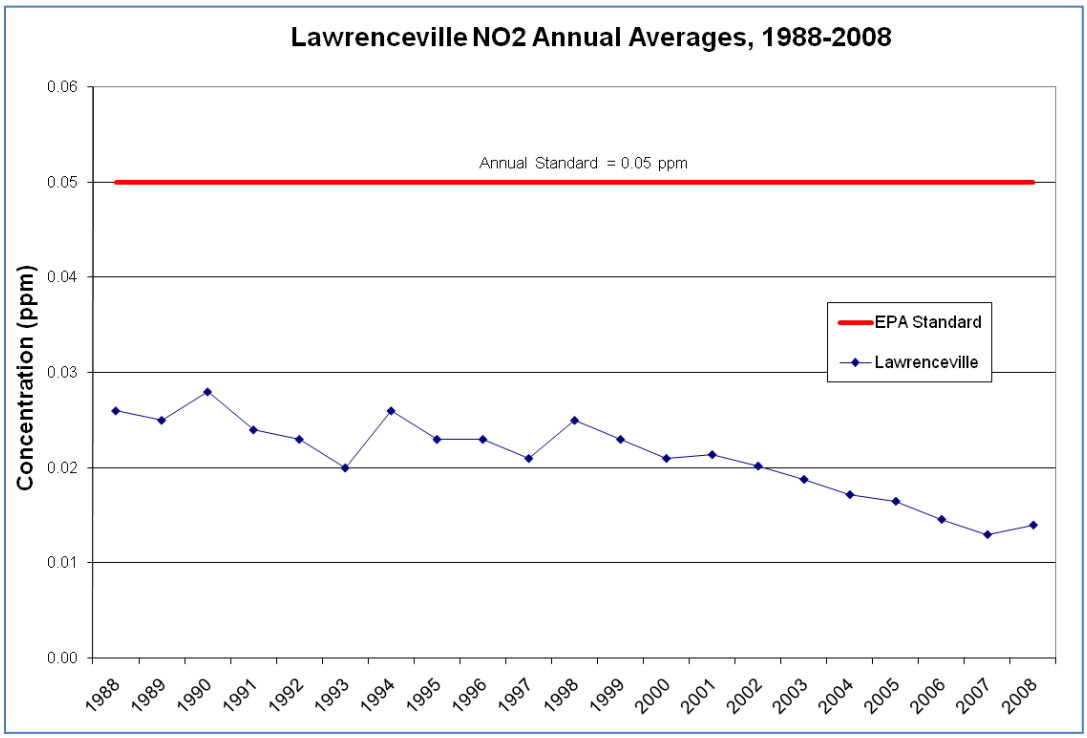


Both small and large sources of NO_2 are scattered throughout the county, with the highest densities in the industrial valleys and urban areas. The point source emissions do not account for mobile source emissions near interstate highways and major local arteries.

Monitoring Data Trends

Figure 9-3 below shows long-term (20-year) monitoring trends for NO_2 in Allegheny County, given by annual average.

Figure 9-3. NO_2 Long-Term Annual Average Trends



Long-term trends show decreasing ambient concentrations for NO_2 on an annual basis. Note: Lawrenceville is the only site with a 20-year period of operation. An exceedance of the NO_2 standard has never been recorded in Allegheny County.

Rankings

Table 9-1 below shows the ranking values and score/rank for each NO_2 monitor based on the ranking methodology.

Table 9-1. NO_2 Rankings

Nitrogen Dioxide Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value Annual Average (ppm)	Site Objective	Population (people/mi²)	Closest Site (km)
Lawrenceville	3	30	0.014	Population Exposure	2895	26
Harrison	2	9	0.011	Population Exposure	843	26

Nitrogen Dioxide Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank
Lawrenceville	3	0.75	0.28	1	0.5	1.00	6.53	**1**
Harrison	2	0.25	0.22	0	0.0	1.00	3.47	**2**

Lawrenceville shows the most importance to the network based on ranking methodology.

Summary

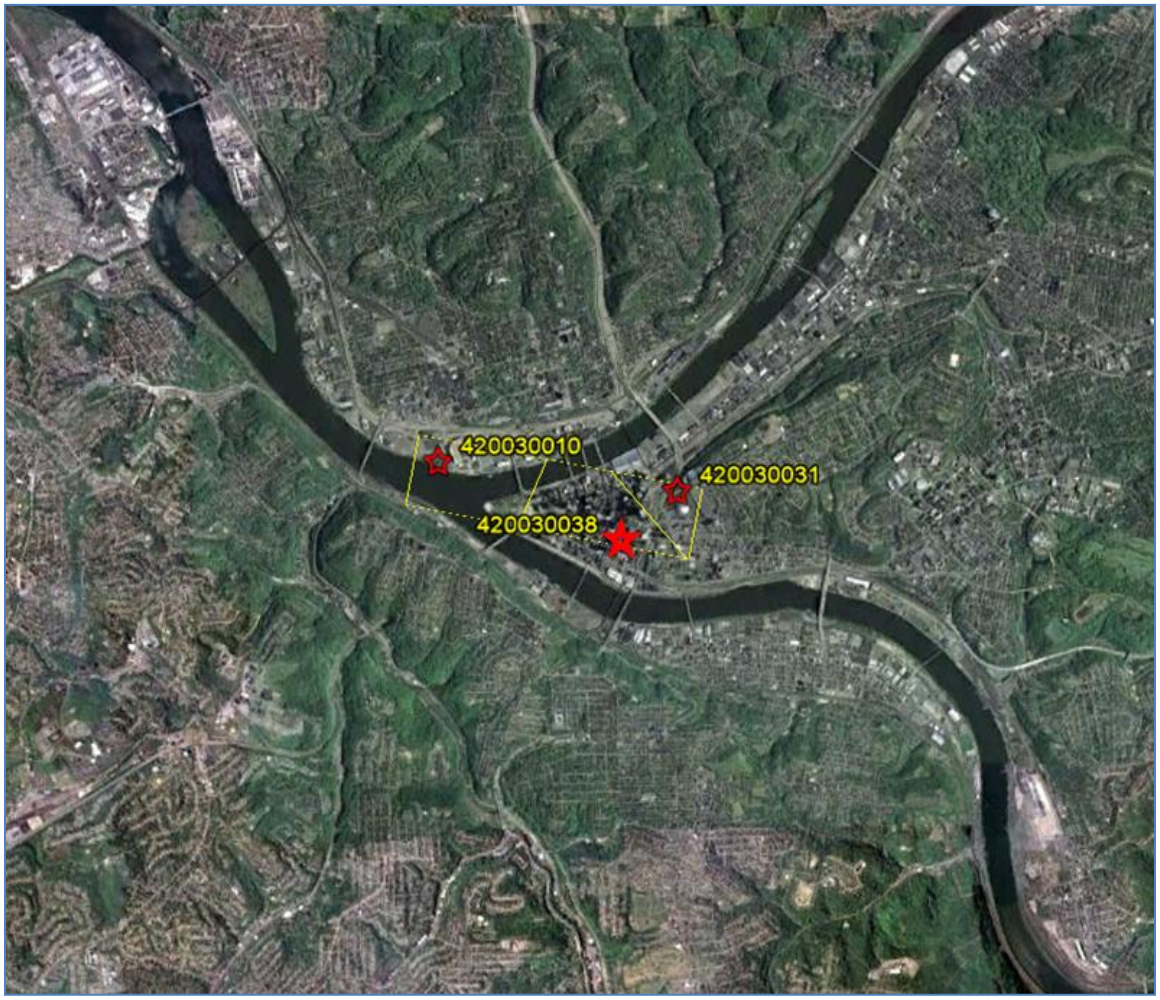
Data analysis indicates that Lawrenceville and Harrison are sufficient for monitoring NO_2 under the former objectives, but a new near-road site will likely be required based on revised monitoring objectives.

10. Carbon Monoxide (CO) Analysis

Area Served

The area served for carbon monoxide (CO) monitors are shown on the map in Figure 10-1 below. Sites are labeled according to AQS site code, based on active 2008 sites. Note: the Carnegie Science Center site (420030010) is operated by PA DEP.

Figure 10-1. Area Served by 2008 CO Network

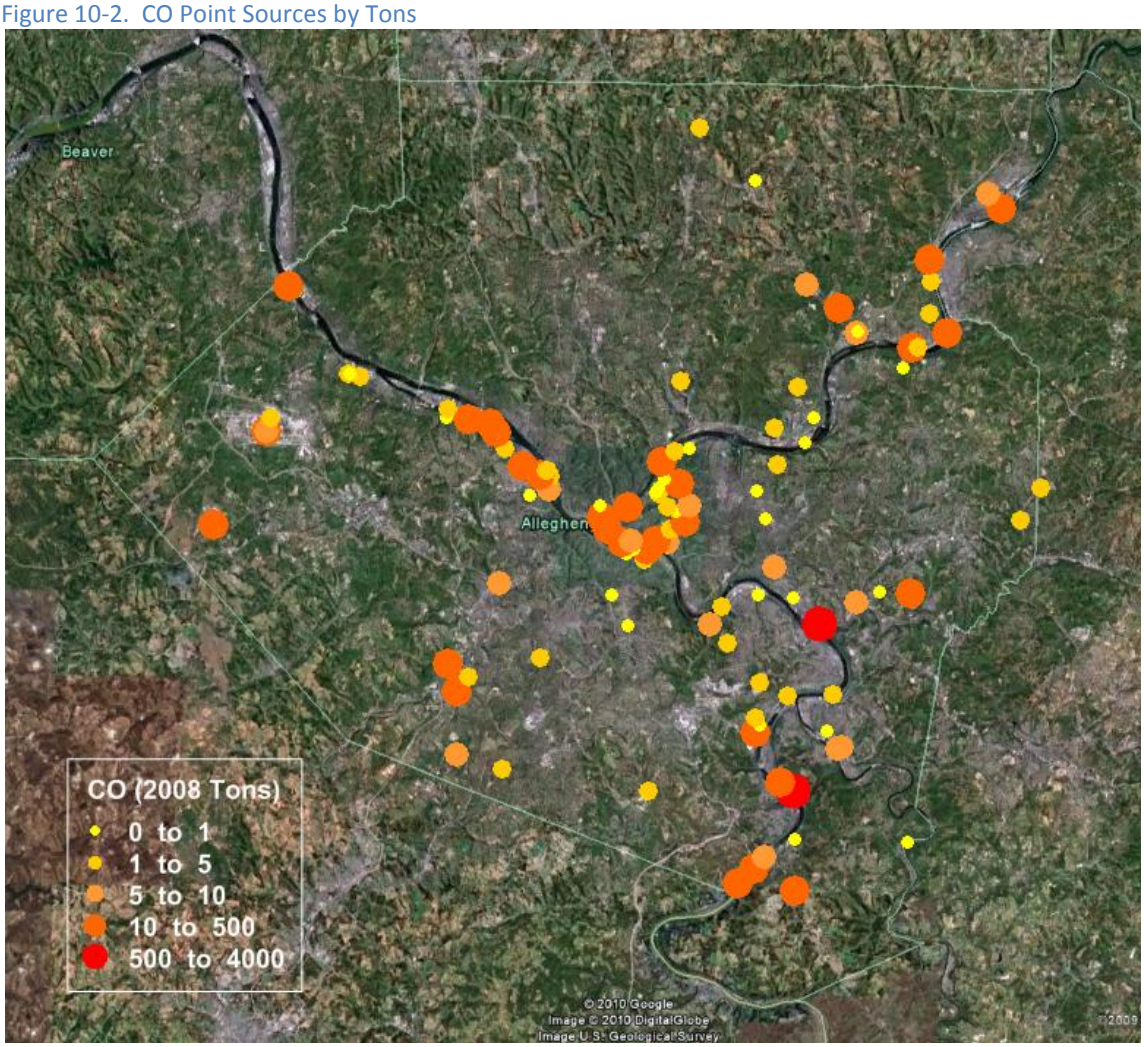


The area covered for CO is focused on the downtown area, which was previously designated as a nonattainment area for CO. The Downtown monitor (420030038, formerly known as Courthouse) is exposed to the most traffic emissions and records the highest levels of CO.

Emissions

Figure 10-2 below shows 2008 emissions of CO by point source in Allegheny County.

Figure 10-2. CO Point Sources by Tons



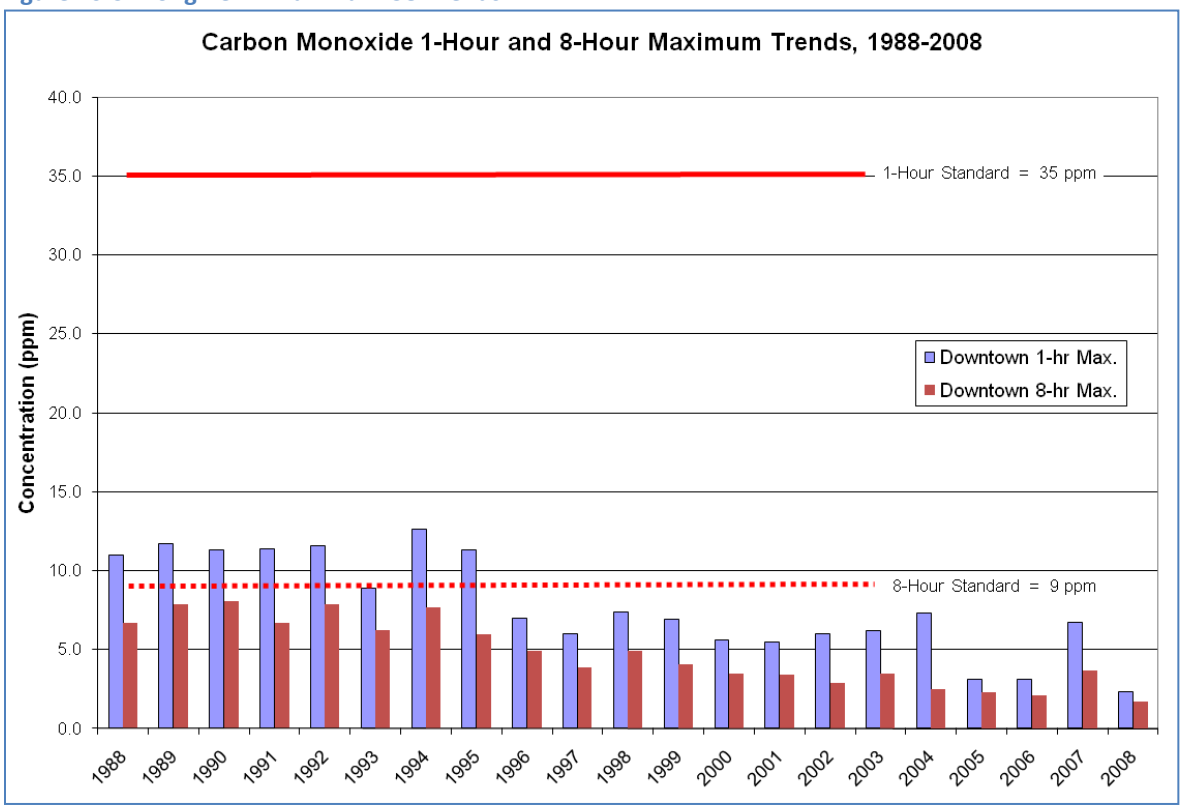
The map shows several point sources near downtown Pittsburgh and in the river valleys. The downtown area monitors are appropriate for achieving monitoring objectives for CO, since mobile emissions (not shown on map) are the primary goal for CO. Industrial point emissions in the river valleys are generally from elevated rooftops or stacks, with better dispersion than mobile emissions at ground level.

Additionally, a new trace-level CO monitor has begun operation in 2009 at Lawrenceville as part of the NCore network. This monitor will measure CO exposure at an urban residential scale, downwind of the downtown Pittsburgh area.

Monitoring Data Trends

Figure 10-3 below shows long-term (20-year) monitoring trends for CO in the downtown area (ACHD monitors), given by short-term maximums for each year.

Figure 10-3. Long-Term Maximum CO Trends



Long-term trends show decreasing ambient concentrations for CO. The 8-hour standard has not been exceeded since 1995.

Rankings

Table 10-1 below shows the ranking values and score/rank for each CO monitor (operated by ACHD) based on the ranking methodology.

Table 10-1. Rankings for CO Sites (ACHD Only)

Carbon Monoxide Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value 1-Hour Average (ppm)	2008 Design Value 8-Hour Average (ppm)	Site Objective	Population (people/mi²)	Closest Site (km)
Flag Plaza	1	7	1.8	1.3	Population Exposure	6334	1
Downtown	0	29	2.3	1.7	Population Exposure	6334	1

Carbon Monoxide Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2008 Design Value 1-Hour Average	2008 Design Value 8-Hour Average	Site Objective	Population	Closest Site	Score	Rank
Flag Plaza	1	0.25	0.18	0.43	1	1	0	3.863	**1**
Downtown	0	0.75	0.23	0.57	1	1	0	3.547	**2**

Downtown and Flag Plaza earned similar scores for CO. Since the sites are less than 1 km from one another, operation of both sites may be redundant.

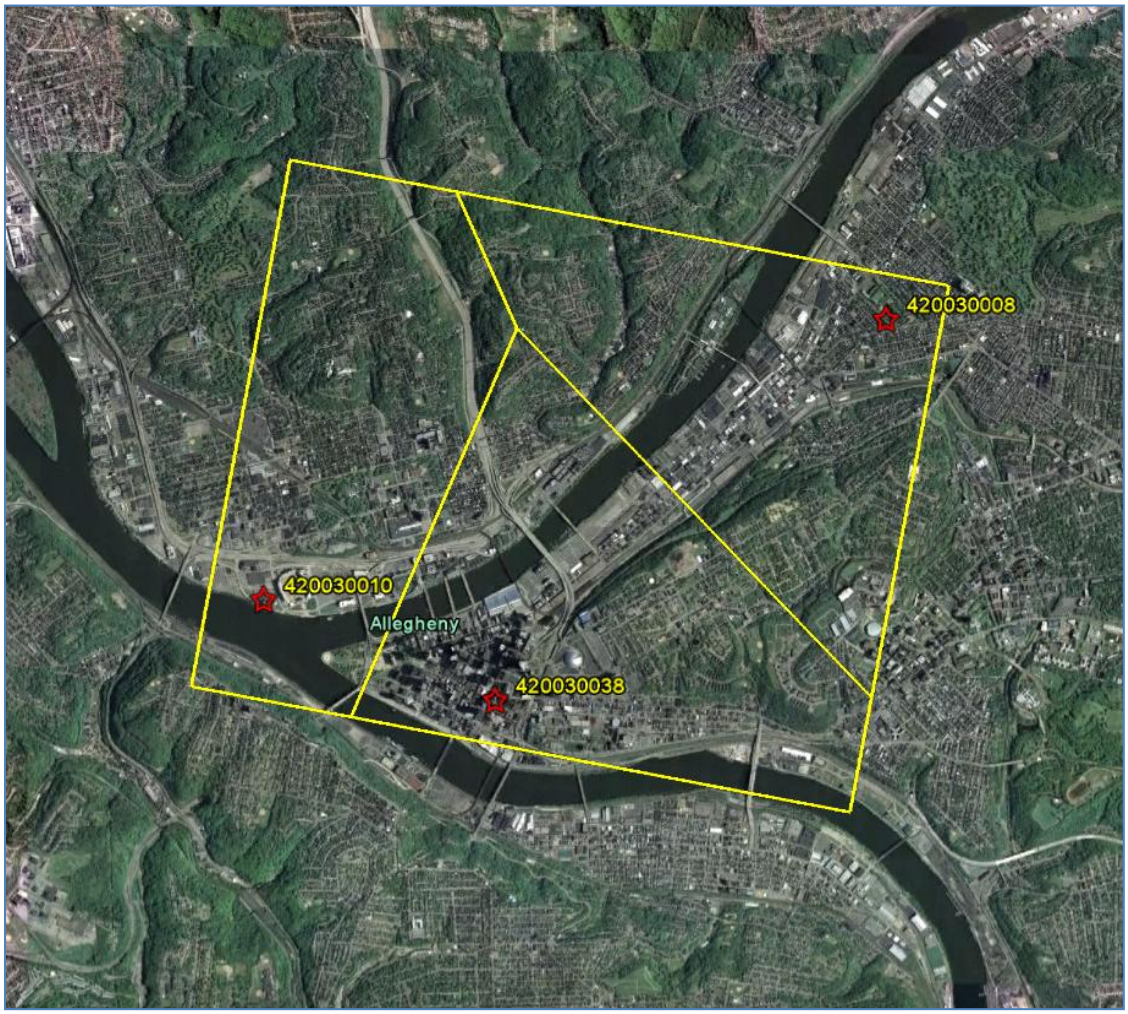
Flag Plaza earned a slightly higher score than Downtown based on other pollutants monitored at the site, but the Downtown site is more important to the network based on design values and years of operation. Downtown also better meets the monitor objectives, located closer to roadways in an area of maximum concentration.

Summary

Data analysis indicates that operation of the Flag Plaza monitor may be redundant for CO. Furthermore, a new CO monitor at Lawrenceville as part of the NCore network has expanded the area served for CO.

Figure 10-4 below shows the area served with the removal of Flag Plaza and addition of Lawrenceville to the network.

Figure 10-4. Proposed CO Area Served



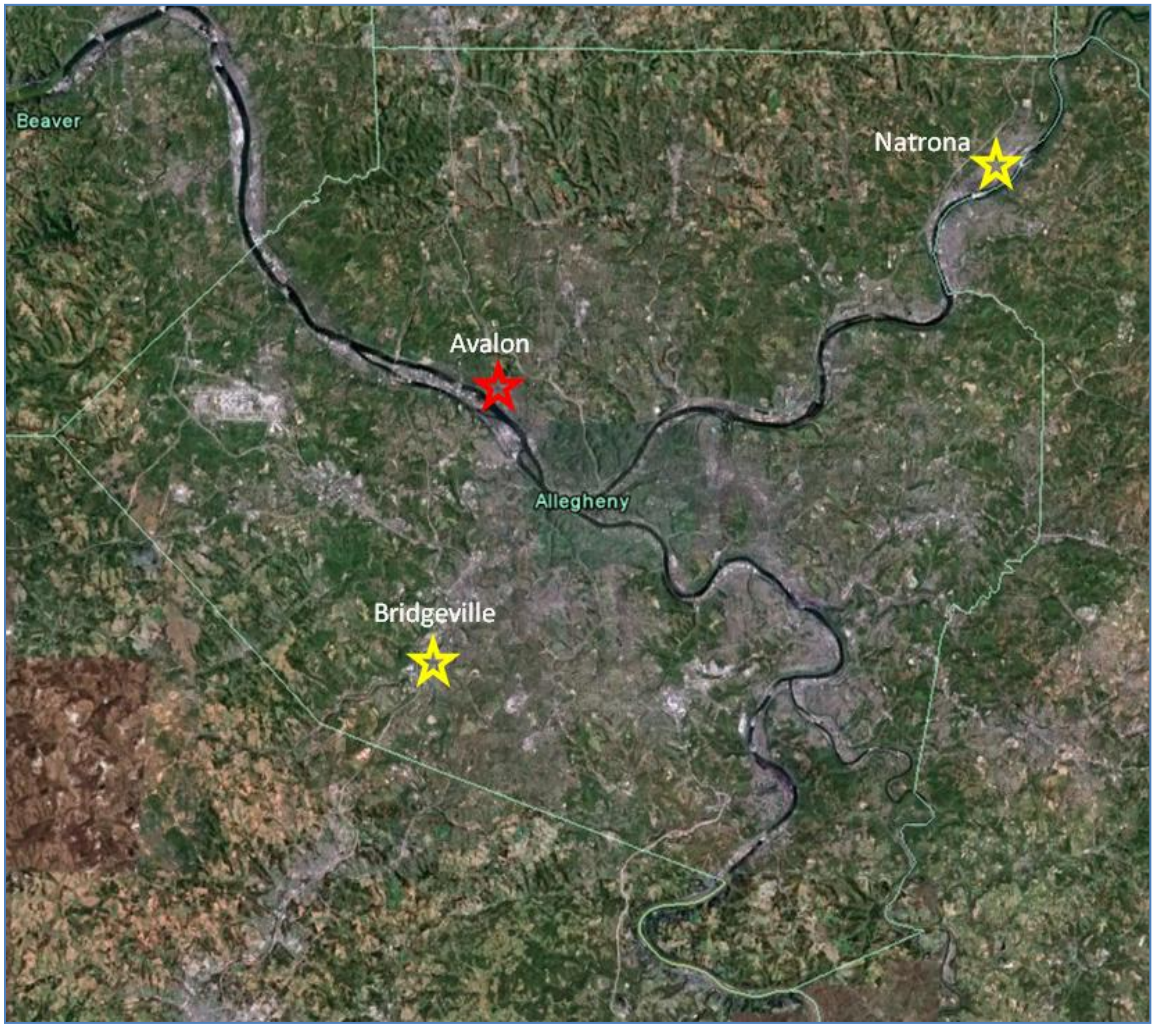
The proposed CO network would retain Downtown (420030038) as the maximum concentration site, with Lawrenceville (420030008) as an urban-residential exposure site. The Carnegie Science Center (420030010, operated by PA DEP) would serve as an additional downtown-area exposure site on the North Shore.

11. Lead (Pb) Analysis

Area Served

The sites for lead (Pb) monitors are shown on the map in Figure 11-1 below. New sites for 2009 based on the revised monitoring objectives are shown in yellow.

Figure 11-1. Area Served by 2009 Pb Network



The Avalon site (shown in red) was initially located to monitor industrial emissions but has also served as the population exposure monitor for lead in Allegheny County since the termination of the Braddock site. [Note: Braddock was terminated due to roof reconstruction and is no longer viable as a monitoring site.].

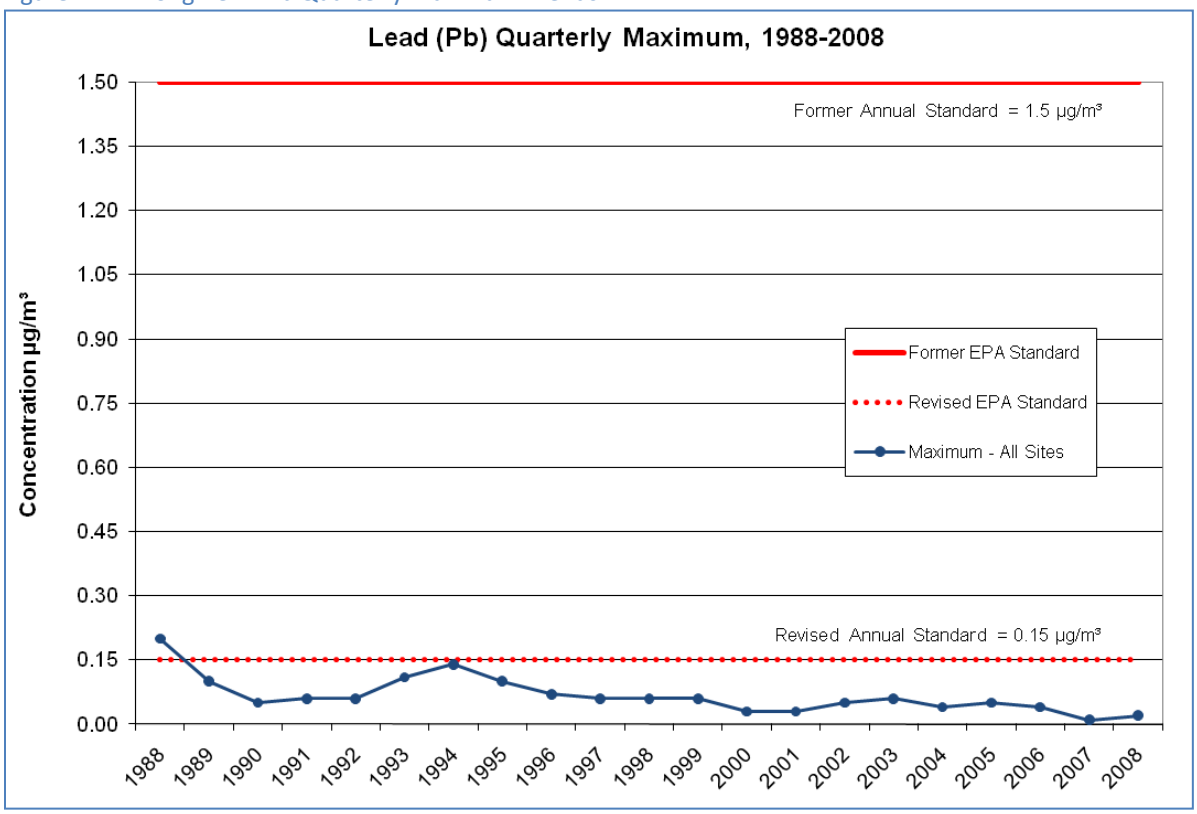
The two new sites at Bridgeville and Natrona are based on lead emissions of 1 ton or greater in those areas. More monitors may be required if the standard is revised to address sources of 0.5 ton or greater.

Additionally, a new lead monitor will be placed at Lawrenceville in 2010 as part of the NCore network for urban population exposure.

Monitoring Data Trends

Figure 11-2 below shows long-term (20-year) monitoring trends for lead in Allegheny County, given by quarterly maximum in each year.

Figure 11-2. Long-Term Pb Quarterly Maximum Trends



Long-term trends show decreasing ambient concentrations for Pb. Values have been much lower than the former standard primarily due to the use of unleaded gasoline. The Avalon site is showing lower values than the current standard of 0.15 µg/m³ as well, but the Avalon site is not suitable for the newer monitoring objectives.

Summary

Avalon is redundant for lead monitoring under the new standards and has measured ambient lead levels well below both the former and revised standards. There are no sources emitting 0.5 tons of lead or greater near Avalon, based on recent emissions inventories.

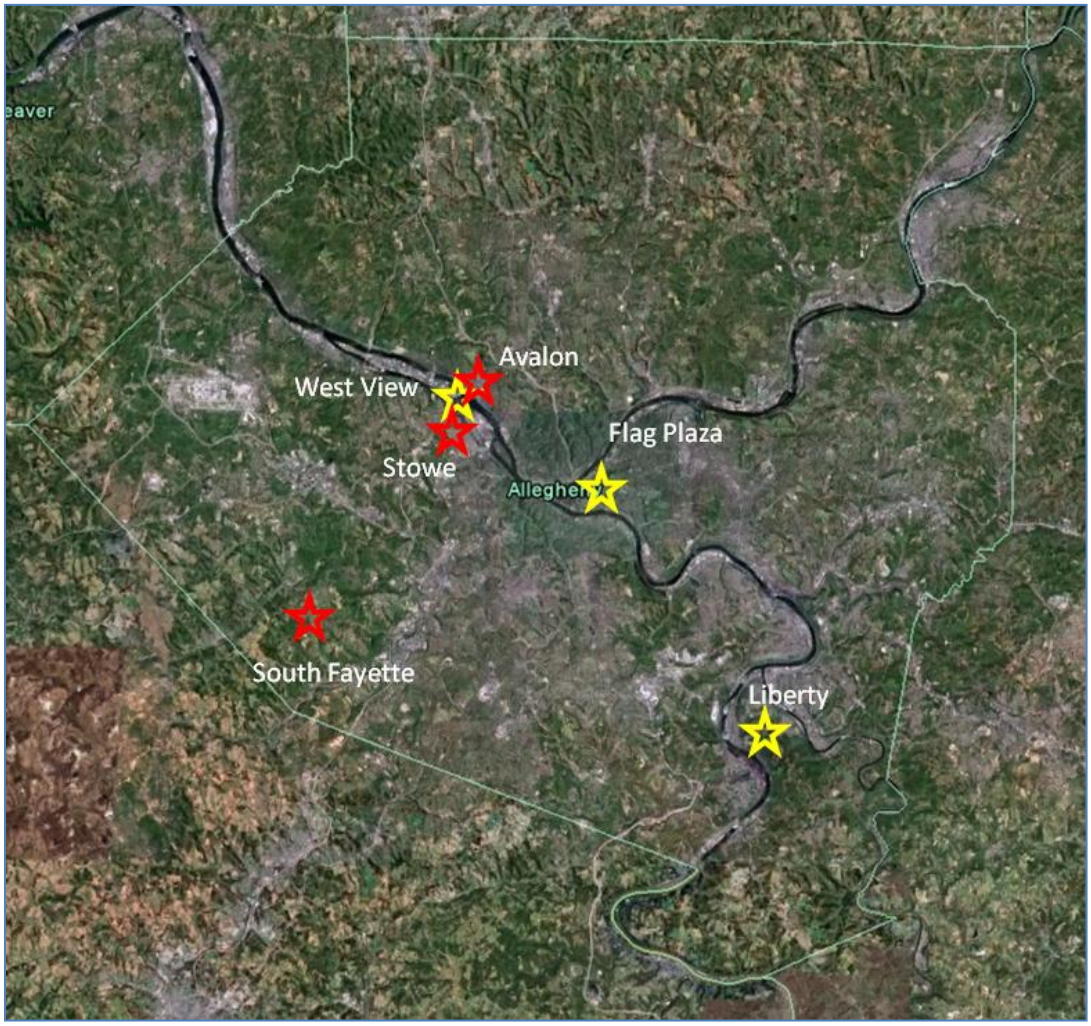
A new site in Lawrenceville will address population exposure for a large metropolitan area according to NCore monitoring requirements. Figure 11-3 below shows the proposed lead network, including the source-oriented monitors at Bridgeville and Natrona, with the Avalon monitor moved to Lawrenceville to monitor population exposure.

Figure 11-3. Proposed Pb Network

12. Air Toxics

Figure 12-1 below shows the locations of ACHD air toxics sites from 2006 through current (current sites in yellow). This includes 3 sites that operated as part of an air toxics study during 2006-2007 (sites shown in red). The Flag Plaza site includes SUMA canister, carbonyl cartridge, and UV-DOAS open path toxics monitoring. The West View site contains a UV-DOAS open path monitor, and the Liberty site has a continuous benzene monitor.

Figure 12-1. Air Toxics Sites, 2006-Current



Canister and Carbonyl

Table 12-1 below shows the annual averages for selected compounds at the canister and carbonyl sites. Flag Plaza data is given by three-year averages for 2006-2008, while the air quality study sites are shown for the most recent year of operation (2007).

Table 12-1. Averages for Air Toxics at ACHD Sites, 2006-2008

HAP	Flag Plaza 2006-2008 Avg. (ppb)	Avalon 2007 Avg. (ppb)	Stowe 2007 Avg. (ppb)	South Fayette 2007 Avg. (ppb)
1,1,1-Trichloroethane (Methyl chloroform)	0.02	0.02	0.01	0.01
1,1,2,2-Tetrachloroethane	0.00	0.00	0.00	0.00
1,1,2-Trichloroethane	0.00	0.00	0.00	0.00
1,1-Dichloroethane	0.00	0.00	0.00	0.00
1,1-Dichloroethylene (-ethene, DCE, Vinylidene chloride)	0.00	0.00	0.00	0.00
1,2,4-Trichlorobenzene	0.00	0.00	0.00	0.00
1,2-Dibromoethane (Ethylene dibromide)	0.00	0.00	0.00	0.00
1,2-Dichloroethane (Ethylene dichloride)	0.01	0.01	0.01	0.01
1,2-Dichloropropane	0.00	0.00	0.00	0.00
1,3-Butadiene	0.07	0.07	0.05	0.02
1,4-Dichlorobenzene	0.09	0.01	0.01	0.01
Acetaldehyde	0.94	0.99	1.04	0.79
Acetone	1.85	1.45	2.25	1.31
Acrolein	0.08	0.07	0.06	0.02
Benzene	0.42	0.71	0.73	0.28
Benzyl chloride	0.00	0.00	0.01	0.00
Bromoform (Tribromomethane)	0.00	0.00	0.00	0.00
Bromomethane	0.01	0.01	0.01	0.01
Carbon disulfide	0.04	0.02	0.02	0.02
Carbon tetrachloride	0.09	0.08	0.09	0.09
Chlorobenzene	0.00	0.00	0.06	0.01
Chloroethane	0.01	0.00	0.02	0.01
Chloroethene (Vinyl chloride)	0.00	0.00	0.02	0.00
Chloroform	0.03	0.02	0.02	0.02
Chloromethane	0.67	0.60	0.61	0.61
cis-1,3-Dichloro-1-propene (-propylene)	0.00	0.00	0.00	0.00
Ethylbenzene	0.08	0.09	0.06	0.03
Formaldehyde	1.59	2.11	1.69	1.71
Hexachloro-1,3-butadiene (Hexachlorobutadiene)	0.00	0.00	0.00	0.00

HAP	Flag Plaza 2006-2008 Avg. (ppb)	Avalon 2007 Avg. (ppb)	Stowe 2007 Avg. (ppb)	South Fayette 2007 Avg. (ppb)
Hexane	0.25	0.19	0.16	0.12
m-/p-Xylene	0.24	0.25	0.18	0.08
Methyl ethyl ketone (MEK)	0.31	0.31	0.28	0.19
Methyl isobutyl ketone (MIK)	0.01	0.02	0.01	0.00
Methylene chloride (Dichloromethane)	0.90	0.10	0.10	0.12
o-Xylene	0.09	0.10	0.08	0.03
Propionaldehyde	0.31	0.23	0.19	0.17
Styrene	0.03	0.07	0.05	0.01
Tetrachloroethylene	0.04	0.04	0.03	0.02
Toluene	0.73	0.81	0.58	0.39
Trans-1,3-Dichloro-1-propene (-propylene)	0.00	0.00	0.00	0.00
Trichloroethylene (-ethene, TCE)	0.36	0.01	0.01	0.00

Toxic monitoring at Flag Plaza, Avalon, Stowe, and South Fayette recorded similar concentrations for the majority of hazardous air pollutants, with some exceptions.

South Fayette typically recorded pollutant levels lower than Flag Plaza, Avalon, and Stowe.

Flag Plaza recorded significantly higher levels of methylene chloride (Dichloromethane) and 1,4-dichlorobenzene than the other three sites. The Flag Plaza monitors also recorded higher levels of hexane, propionaldehyde, and trichloroethylene.

Avalon recorded the highest levels of formaldehyde and toluene. Avalon monitors also recorded high levels of benzene.

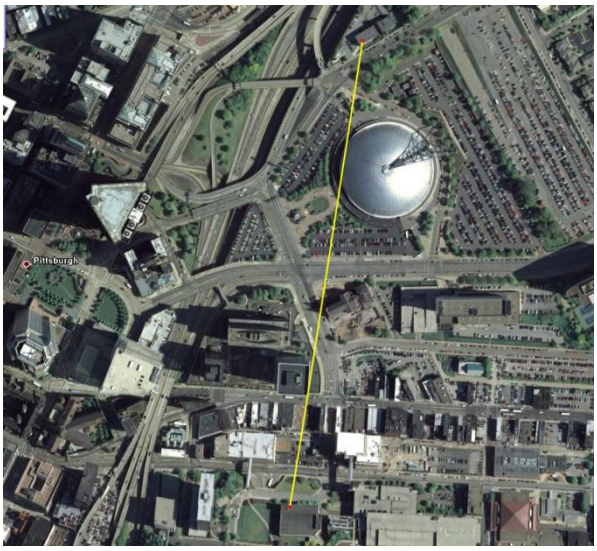
The highest benzene levels were recorded at Stowe. Stowe also recorded the highest levels of acetone and benzene of the four sites.

UV-DOAS Open Path

Open path UV-DOAS toxics monitoring began in Downtown Pittsburgh at Flag Plaza, adjacent to the Central Business District, in May 2006. The Downtown monitor continuously measures several HAP compounds from a beam of light 642 meters in length. The light is projected from the rooftop of the Gumberg Library (at Duquesne Univ.) to the rooftop of Scout Center at Flag Plaza (next to Mellon Arena). Table 12-2 below shows averages and hourly maximums for 2008 from the Flag Plaza UV-DOAS monitor.

Table 12-2. 2008 UV DOAS Data for Downtown (Flag Plaza)

Downtown (Flag Plaza)		
HAP	**2008 Average (ppb)**	**2008 1-Hour Maximum (ppb)**
Formaldehyde	1.791	15.370
Benzene	1.248	8.710
Phenol	0.149	5.710
Toluene	6.872	18.360
Ethylbenzene	13.885	27.690
Mercury	0.035	0.089
p-Xylene	0.586	1.850
m-Xylene	2.225	7.460
o-Xylene	4.176	16.080
Styrene	0.793	1.970



Open path UV-DOAS toxics monitoring also began in the Neville Island Area in May 2006. The Neville monitor continuously measures several HAP compounds over a distance of 486 meters, from West View Water (on Neville Island) across the Ohio River to Avalon (off of Rt. 65).

Table 12-3 below shows averages and hourly maximums for 2008 from the West View UV-DOAS monitor.

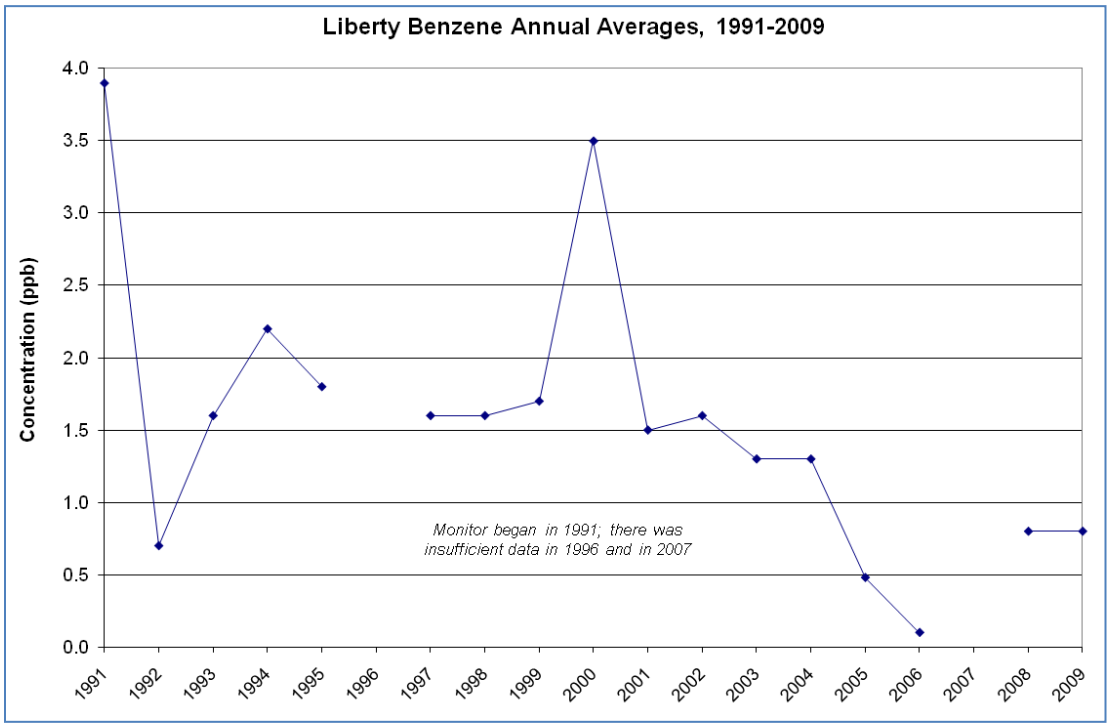
Table 12-3. 2008 UV DOAS Data for West View

West View		
HAP	**2008 Average (ppb)**	**2008 1-Hour Maximum (ppb)**
Formaldehyde	5.731	17.780
Benzene	1.919	18.920
Phenol	1.641	13.200
Toluene	0.710	8.050
Ethylbenzene	8.437	22.780
Mercury	0.026	0.068
p-Xylene	1.882	3.610
m-Xylene	1.307	9.150
o-Xylene	8.211	32.800
Styrene	0.503	10.850

Liberty Benzene

Figure 12-2 below shows long-term benzene trends for the Liberty benzene monitor. Recent data have shown lower concentrations than previous years such as 1991 and 2000.

Figure 12-2. Long-Term Liberty Benzene Trends, by Annual Average



13. Meteorology

The geography brought on by the three river system of Allegheny County creates complex wind flow patterns. The topography of the county can be described as a dissected plateau, with three major river valleys: Allegheny, Monongahela, and Ohio. These valleys are locations for major industries. Meteorological data collected from plateau sites, such as the Pittsburgh International Airport (PIT), are not always representative of wind flow patterns within the highly industrialized river valleys.

While the winds tend to blow through the county from the southwest at the plateau level, winds within the river valleys tend to be more complex. Typically during the nighttime, a decoupling between the river valley and plateau temperature and wind velocity profiles exists. The river valley flow pattern is usually oriented down river while the plateau flow pattern usually has a cross-river orientation. The three rivers have many tributaries which are effectively notches in the side of the river valley. These notches can create unusual wind direction patterns as the wind enters or leaves the main river valley. The combination of river valley flow and plateau flow create, under the above mentioned meteorological conditions, divergence, convergence and even circular flow near these notches. During the daytime with the heating of the earth and air, the temperatures and wind velocity profiles become more unified and smaller deviations are expected between the plateau and river valley flows.

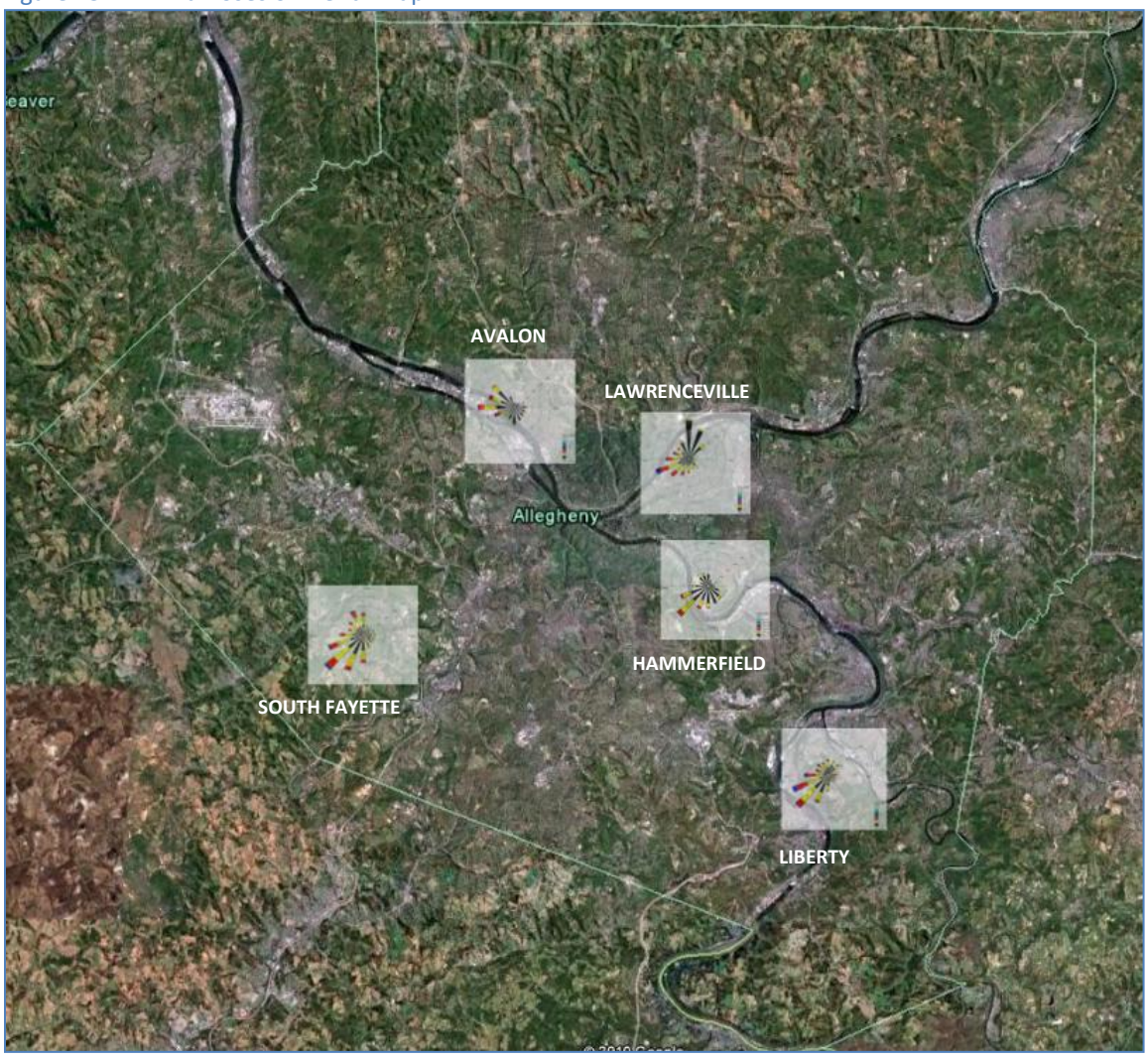
The wind speeds at the plateau level are an important factor in the determination of wind directions in river valleys. If the surface-to-upper-level wind velocities are organized in a manner conducive to high wind speeds at the surface, then the river valley wind direction will tend to follow the plateau wind direction. If the plateau wind speeds reduce to approximately four meters per second or less, the organization and the persistence of the wind direction in the river valley will start to change as compared to the plateau level, and local physical and meteorological characteristics of the river valley may start to dominate. .

Location of Meteorological Sites

The ACHD meterological network has been designed to monitor air at both the regional plateau and river valley levels. Annual and seasonal wind roses from five sites in operation from 2006 through current (Avalon, Hammerfield, Liberty, Lawrenceville, and South Fayette) are shown on the following pages. Additional meteorological sites in river valley areas such as Harrison may provide useful information for future air quality studies.

Figure 13-1 below shows year-round wind roses by site, overlaid on an aerial map of Allegheny County. Wind roses indicate frequencies of hourly wind direction and wind speed.

Figure 13-1: Wind Roses on Aerial Map



Note: Wind roses are based on wind data from 2006-2008 except for Lawrenceville, which is a new location with wind data from mid-2009 through mid-2010.

Avalon

Avalon lies at an elevation of 836 feet, approximately 130 ft above the Ohio River. It exhibits a combination of regional and valley flow and is adequate for characterizing wind in the Neville Island industrial area. Figures 13-2 and 13-3 show the year-round and seasonal wind roses for Avalon.

Figure 13-2: Avalon Year-Round Data (2006-2008)

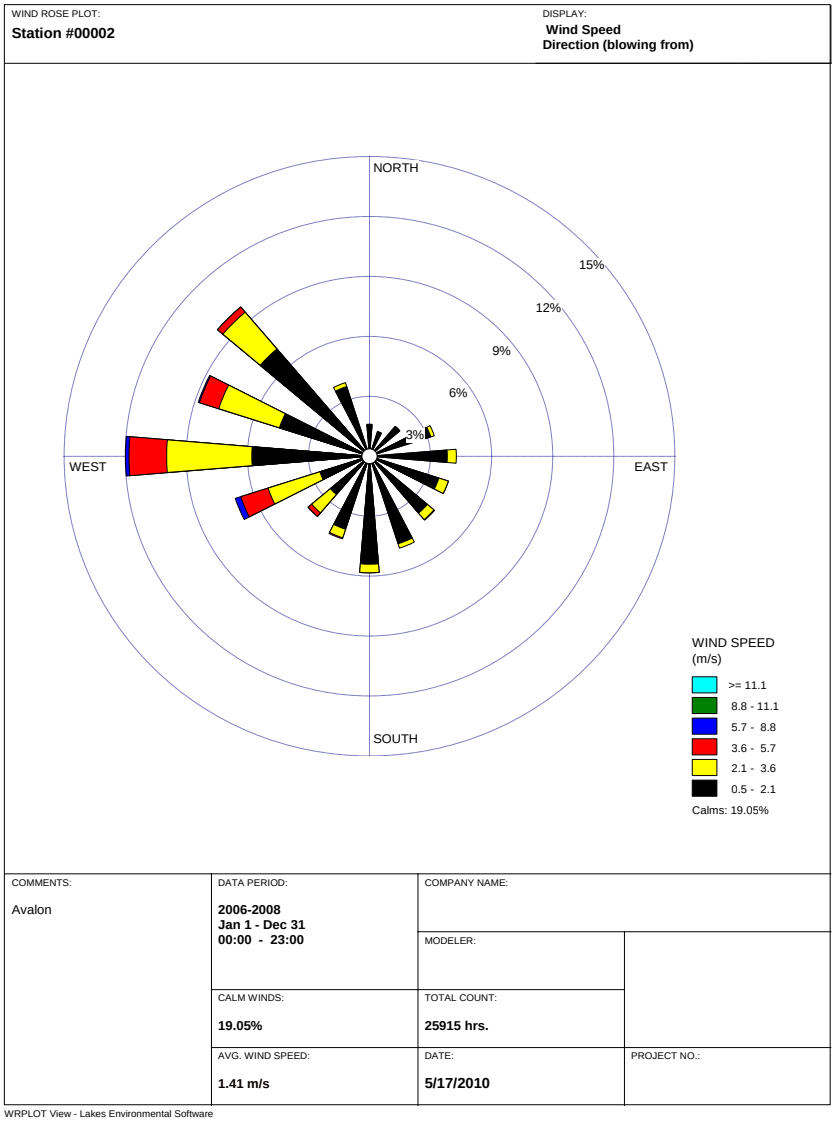
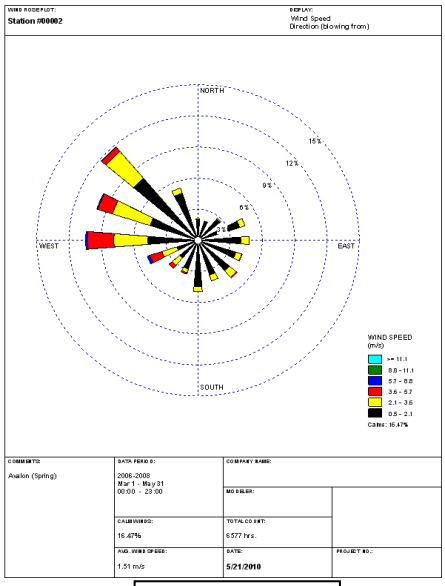
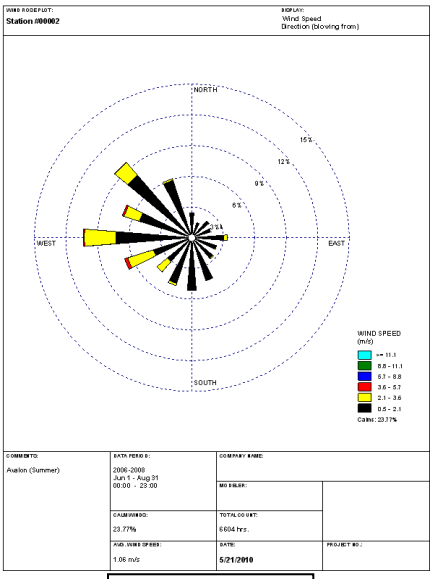


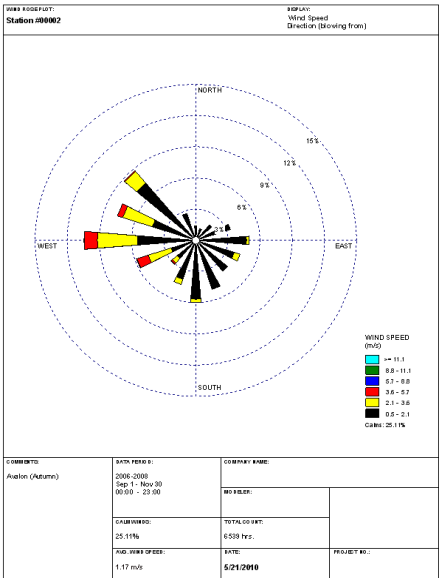
Figure 13-3: Avalon Seasonal Data (2006-2008)



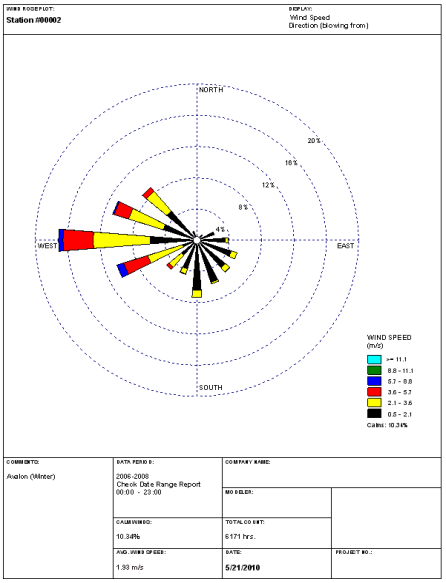
Spring



Summer



Autumn



Winter

Avalon shows a combination of westerly and valley winds during all seasons.

Hammerfield

Hammerfield was located at an elevation of 1019 feet, approximately 330 ft above the Monongahela River and exhibited mostly regional flow with some valley flow. Due to poor site characteristics (surrounding tree cover, low location on hillside), Hammerfield was deemed to be inadequate for wind sensors and was discontinued in 2009. Figures 13-4 and 13-5 show the year-round and seasonal wind roses for Hammerfield through 2008.

Figure 13-4: Hammerfield Year-Round Data (2006-2008)

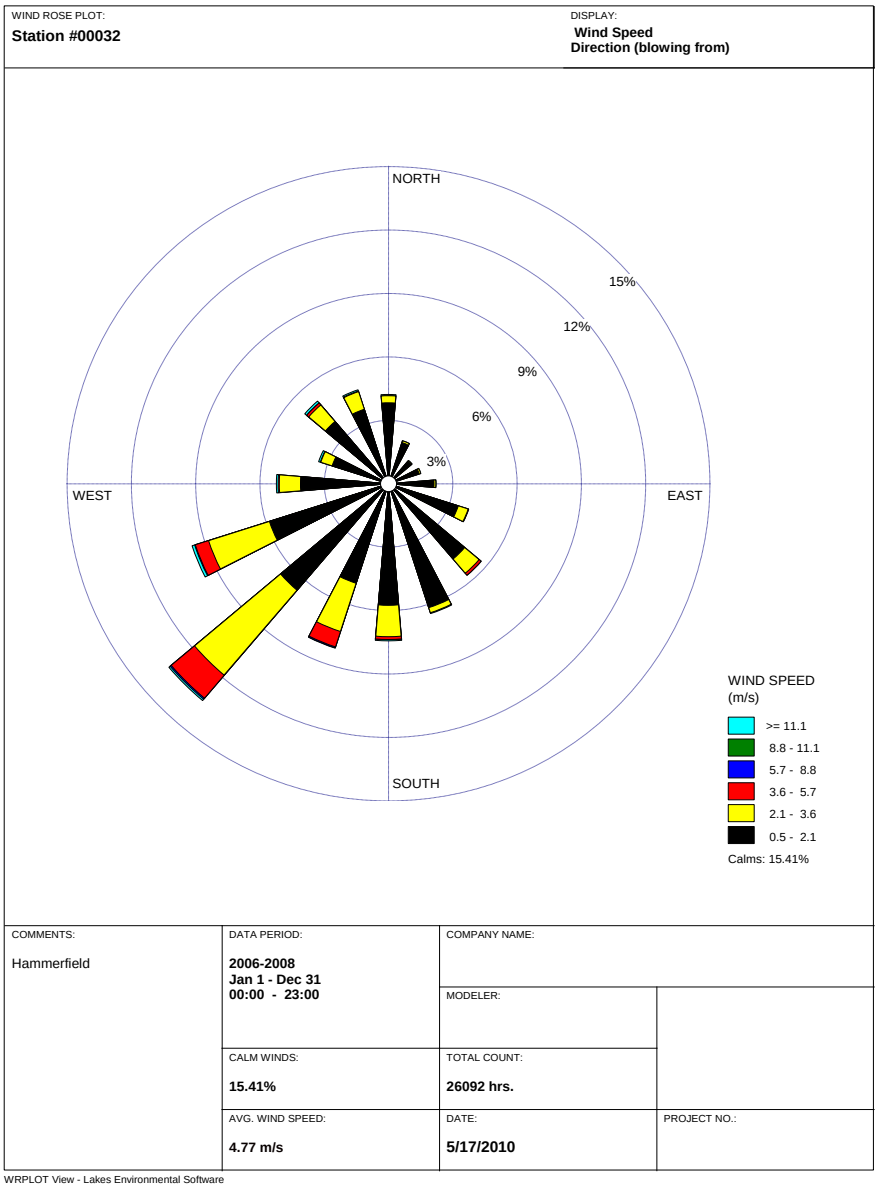
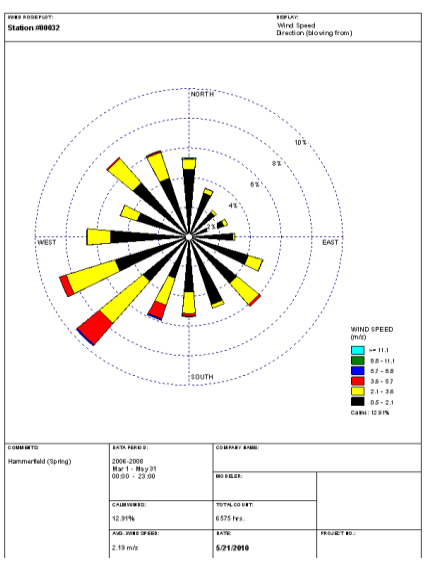
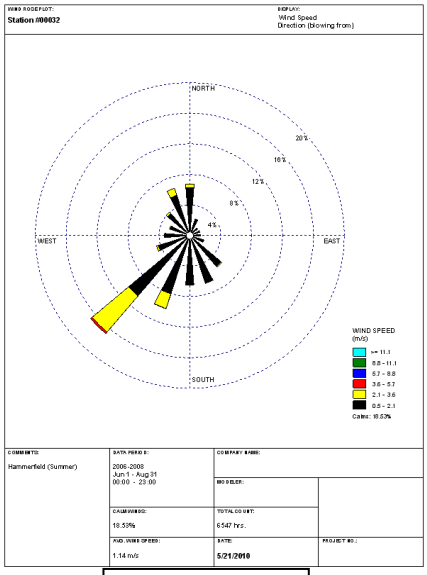


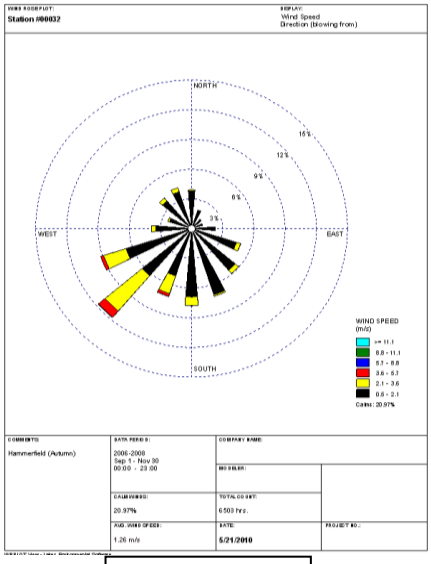
Figure 13-5: Hammerfield Seasonal Data (2006-2008)



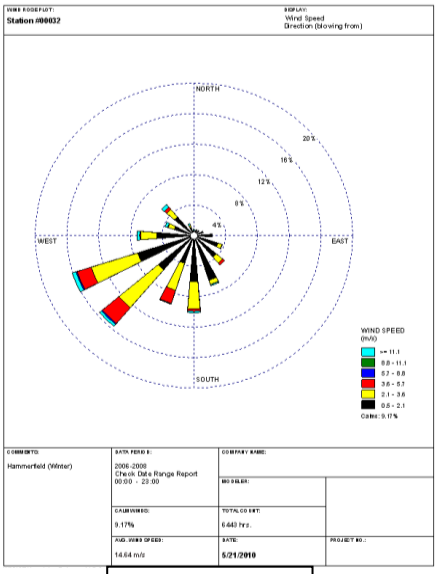
Spring



Summer



Autumn



Winter

Hammerfield recorded regional southwesterly winds in summer through winter seasons, with more variable flow during spring.

Liberty

Liberty lies at an elevation of 1061 feet between the Monongahela and Youghiogheny river valleys. It exhibits mostly regional flow and is adequate for characterizing wind in the Liberty area. Figures 13-6 and 13-7 show the year-round and seasonal wind roses for Liberty.

Figure 13-6: Liberty Year-Round Data (2006-2008)

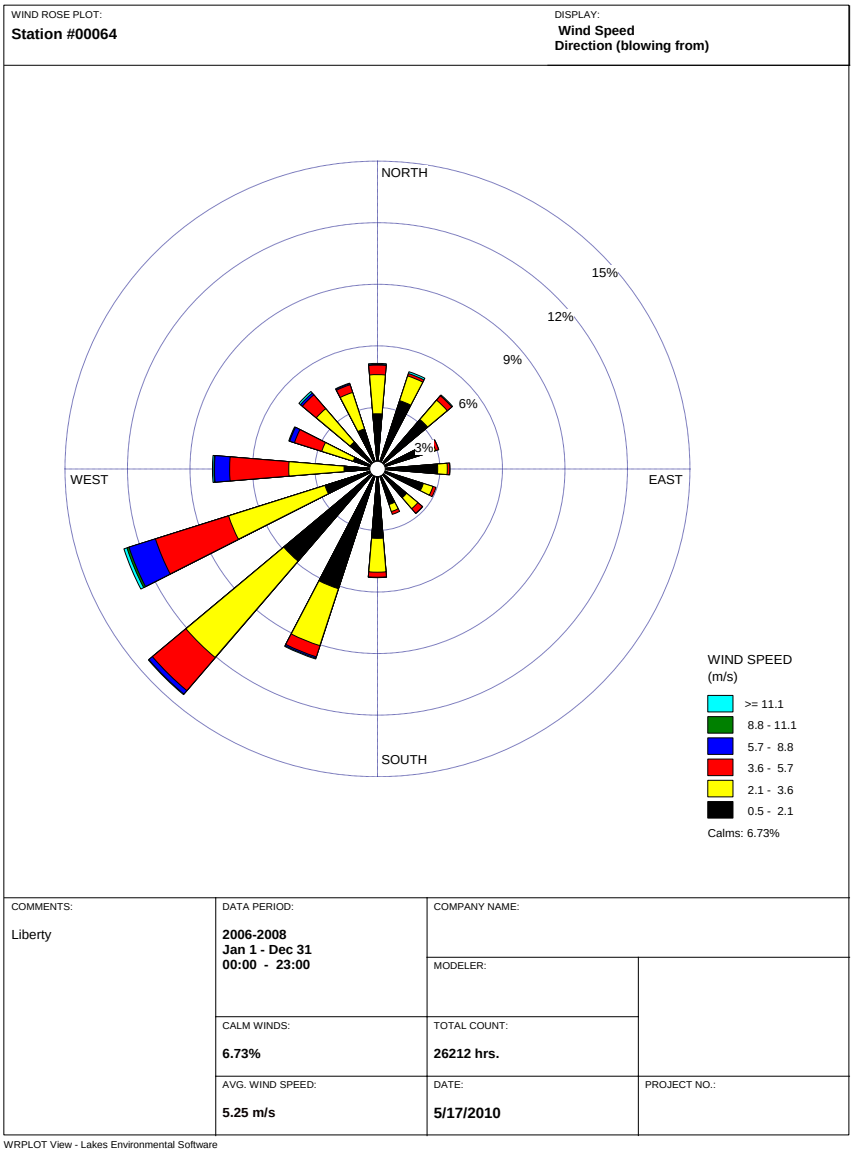
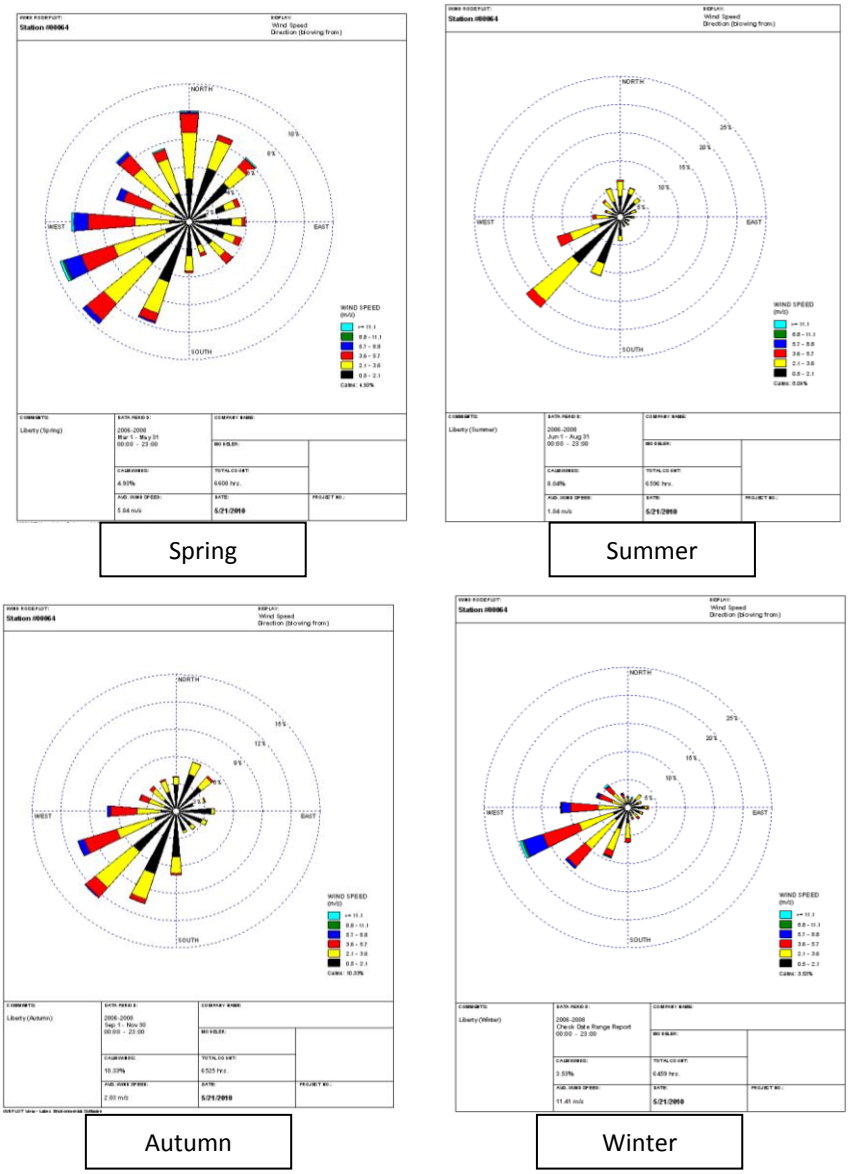


Figure 13-7: Liberty Seasonal Data (2006-2008)



Liberty exhibits regional southwesterly winds year-round, with more variable flow during spring.

Lawrenceville

Lawrenceville lies at an elevation of 847 feet, approximately 130 feet above the Allegheny River (0.5 miles away). It exhibits a combination of regional and valley flow. Figures 13-8 and 13-9 show the year-round and seasonal wind roses for Lawrenceville. Note: Lawrenceville is a new site as part of the NCore network and represents less than a full year of data (July 2009 – May 2010).

Figure 13-8: Lawrenceville Year-Round Data (2009-2010)

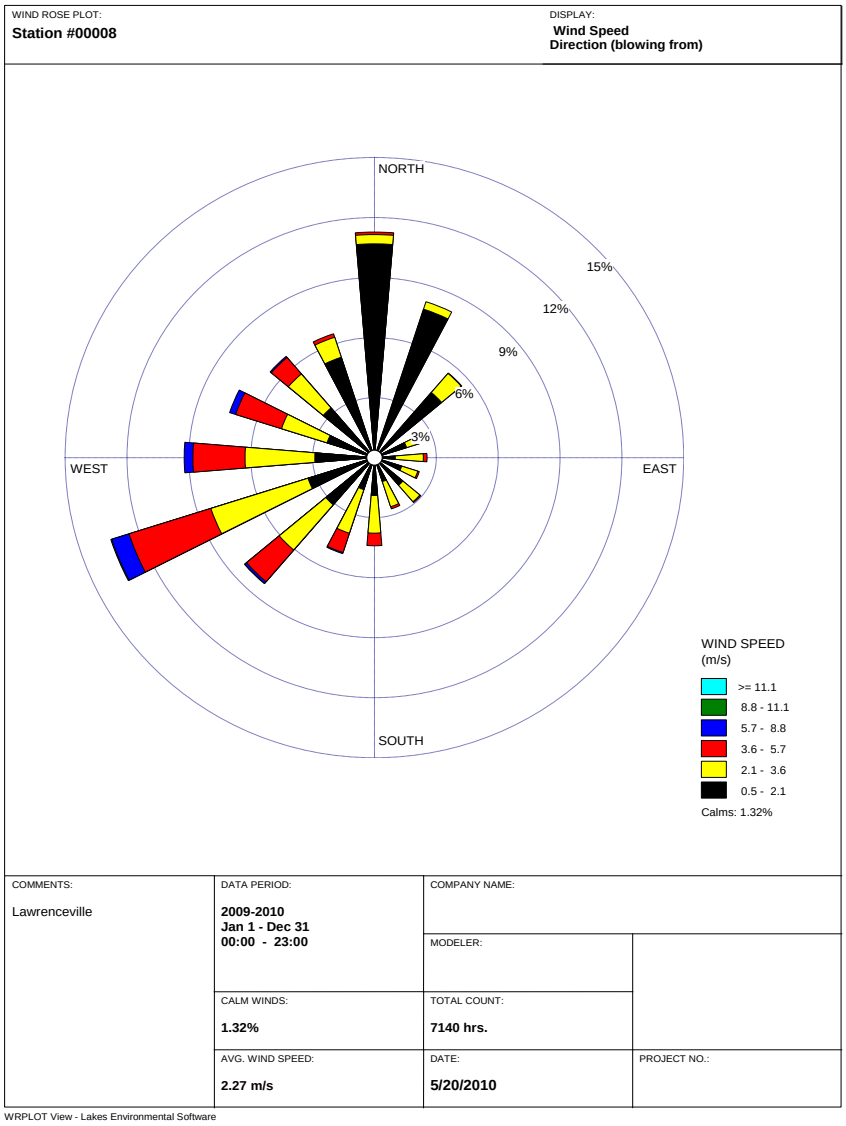
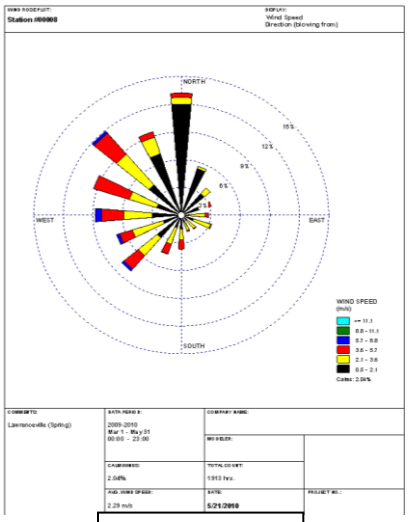
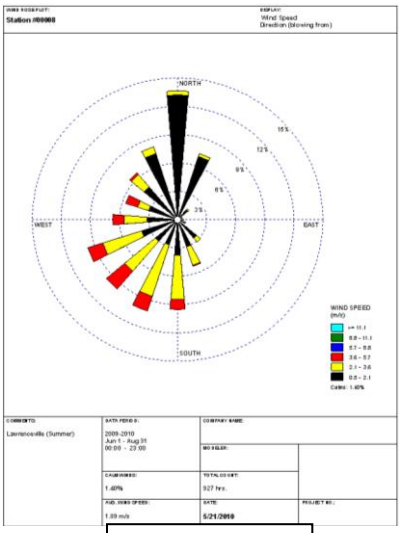


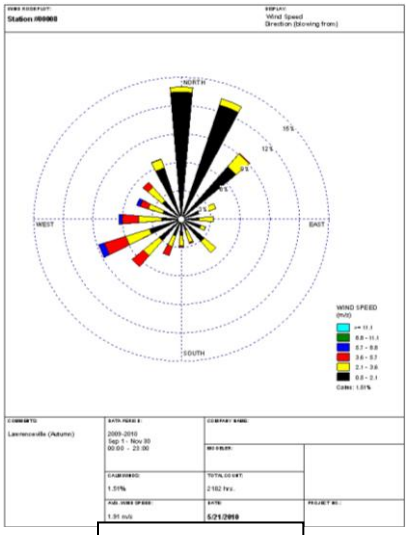
Figure 13-9: Lawrenceville Seasonal Data (2009-2010)



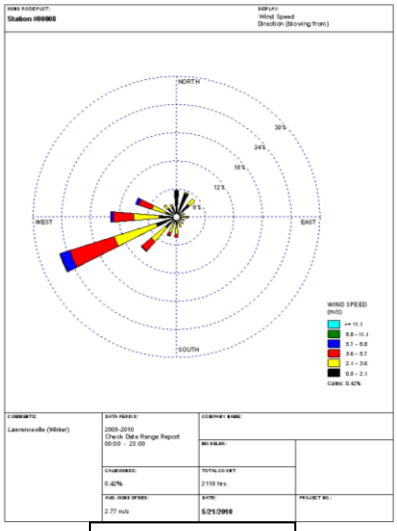
Spring



Summer



Autumn



Winter

Lawerenceville shows regional southwesterly winds at moderate-to-high wind speeds, with a high frequency of northerly winds at low wind speeds. The winter data shows less calm and low wind speeds than other seasons.

South Fayette

South Fayette lies at a high elevation of 1235 feet and shows similar wind patterns to the National Weather Service Pittsburgh International Airport (PIT) site. It exhibits regional flow like the PIT site but at lower overall wind speeds, presumably due to different heights above ground or different types of equipment. Figures 13-10 and 13-11 show the year-round and seasonal wind roses for South Fayette.

Figure 13-10: South Fayette Year-Round Data (2006-2008)

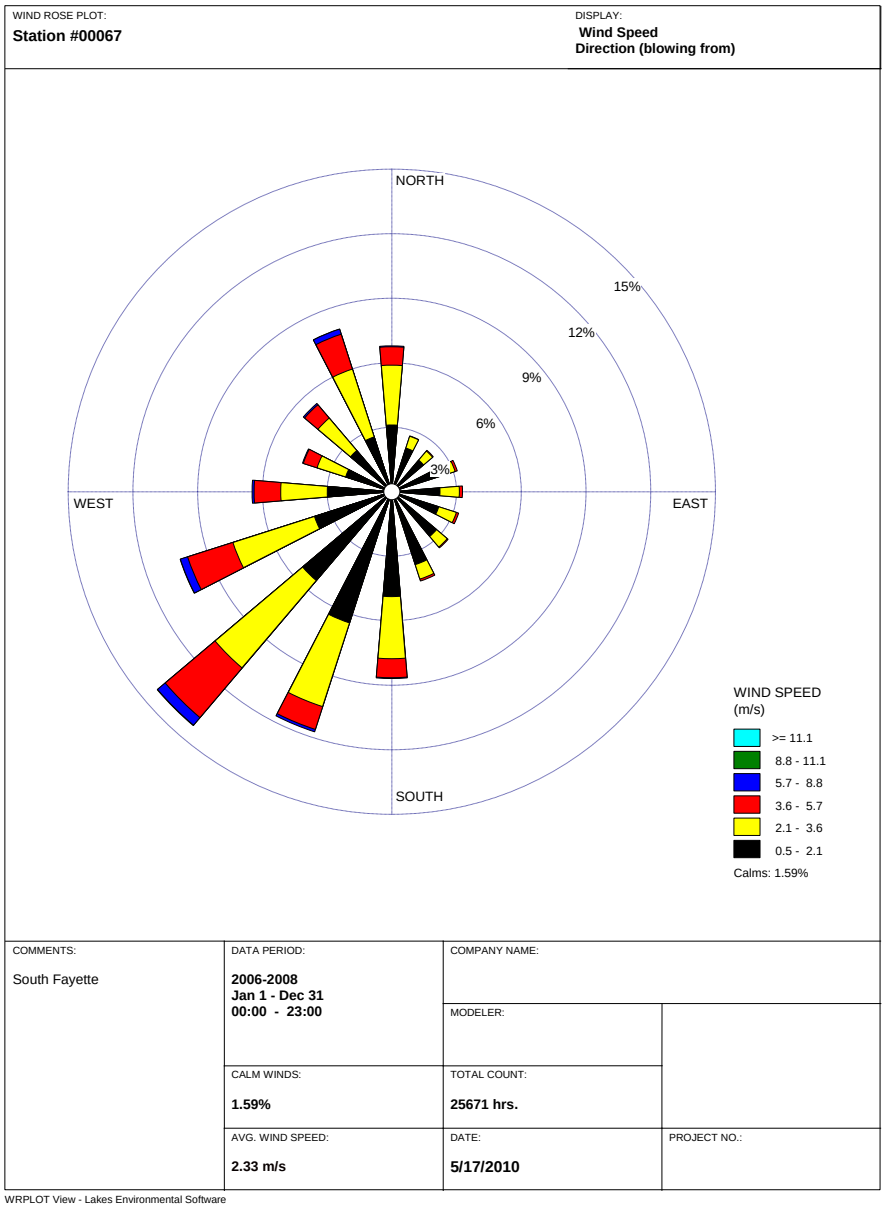
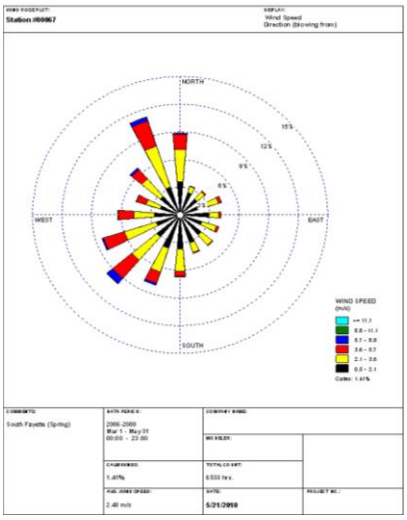
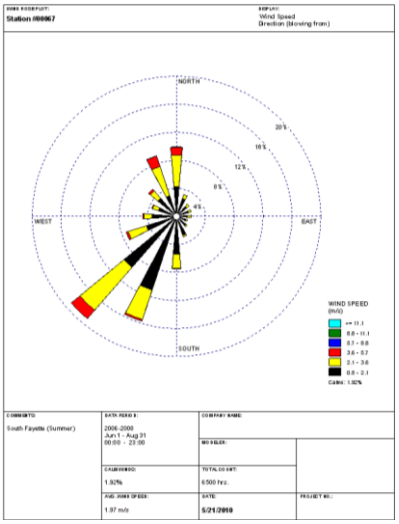


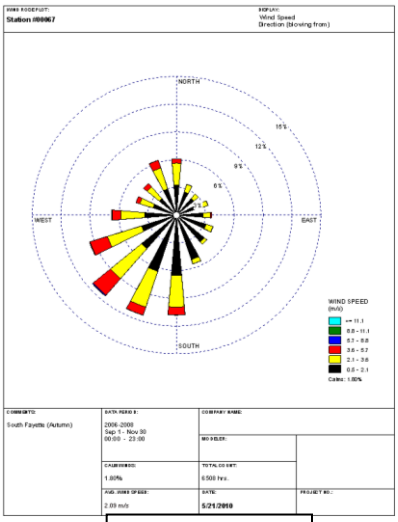
Figure 13-11: South Fayette Seasonal Data (2006-2008)



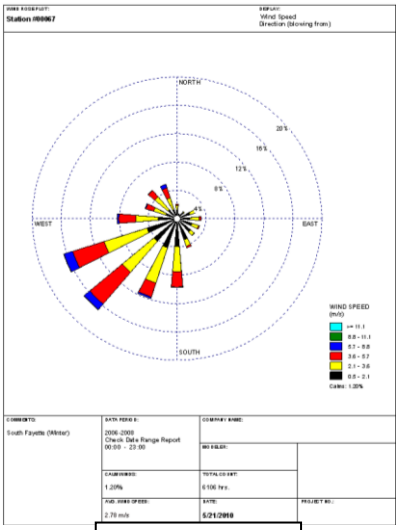
Spring



Summer



Autumn



Winter

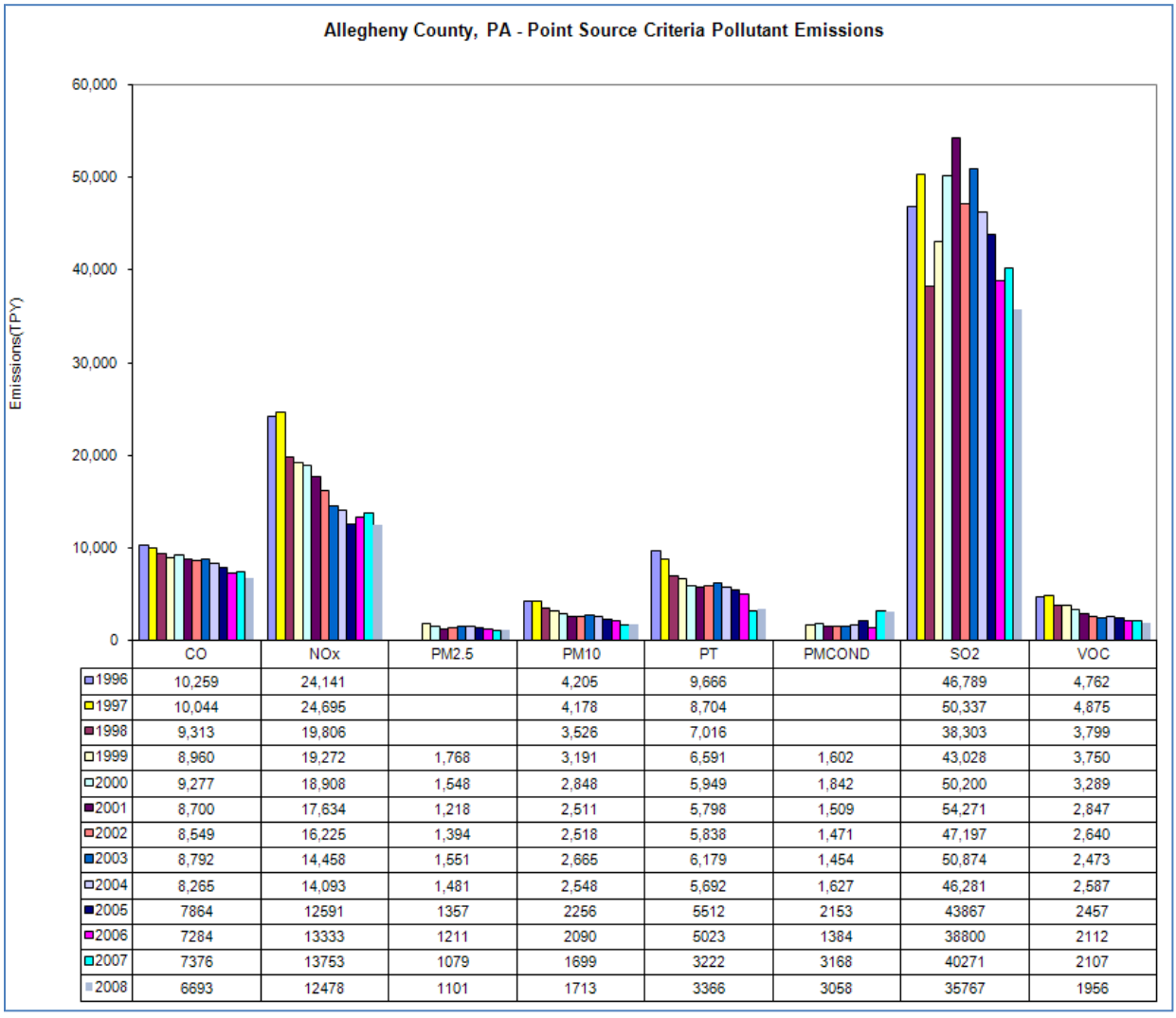
South Fayette shows regional southwesterly winds year-round, with more variable winds in spring and autumn seasons.

14. Emissions Inventory

Point source air emissions in Allegheny County have declined significantly since 1996 through 2008. Emissions of carbon monoxide have declined 35%, nitrogen oxides 48%, PM_{10} 59%, volatile organic compounds 59%, and sulfur dioxide 23.6%.

Figure 14-1 below shows total emissions (in tons/year) of criteria air pollutants from point sources in Allegheny County for 1996-2008. Over 80% of the sulfur dioxide is emitted by a coal-fired power plant.

Figure 14-1: Allegheny County Point Source Emissions, 1996-2008

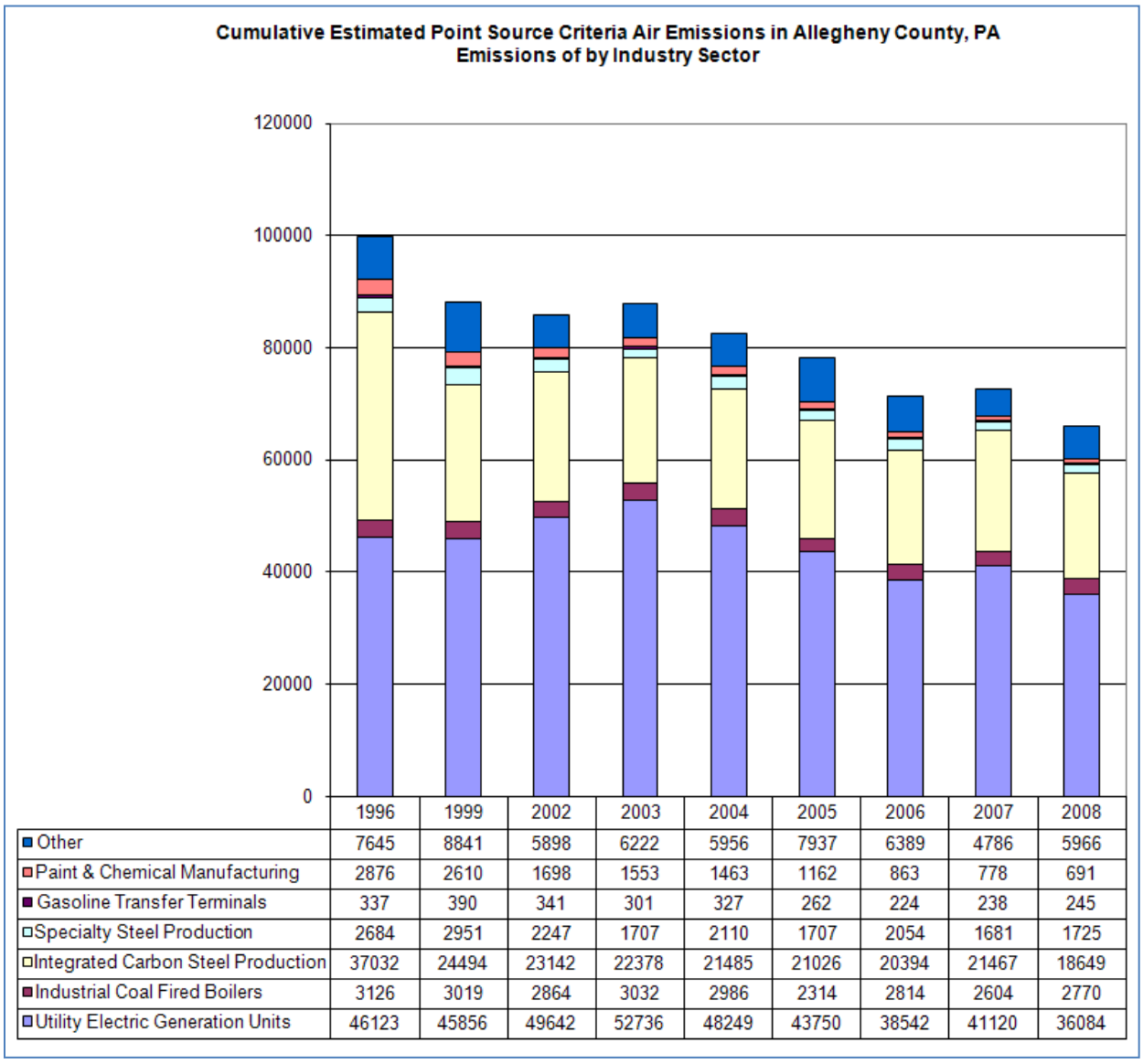


	CO	NOx	PM2.5	PM10	PT	PMCOND	SO2	VOC
1996	10,259	24,141		4,205	9,666		46,789	4,762
1997	10,044	24,695		4,178	8,704		50,337	4,875
1998	9,313	19,806		3,526	7,016		38,303	3,799
1999	8,960	19,272	1,768	3,191	6,591	1,602	43,028	3,750
2000	9,277	18,908	1,548	2,848	5,949	1,842	50,200	3,289
2001	8,700	17,634	1,218	2,511	5,798	1,509	54,271	2,847
2002	8,549	16,225	1,394	2,518	5,838	1,471	47,197	2,640
2003	8,792	14,458	1,551	2,665	6,179	1,454	50,874	2,473
2004	8,265	14,093	1,481	2,548	5,692	1,627	46,281	2,587
2005	7864	12591	1357	2256	5512	2153	43867	2457
2006	7284	13333	1211	2090	5023	1384	38800	2112
2007	7376	13753	1079	1699	3222	3168	40271	2107
2008	6693	12478	1101	1713	3366	3058	35767	1956

CO – carbon monoxide
NO_x – emissions of oxides of nitrogen reported as nitrogen dioxide
$PM_{2.5}$ – filterable particulate with an aerodynamic diameter less than 2.5 microns
PM_{10} – filterable particulate with an aerodynamic diameter less than 10 microns
PT – total filterable particulate
PMCOND – condensable particulate matter in the vapor state at temperatures above 68°F
SO_2 – sulfur dioxide
VOCs – volatile organic compounds

Figure 14-2 below details emissions of total criteria pollutant from individual point source industrial sectors in the County for 1996 through 2008. The six identified industrial sectors (non-other) account for approximately 90% of all criteria point source air emissions. Contributions from individual sectors show declines from the 1996 base year despite some increases attributable to variable business conditions.

Figure 14-2: Point Source Emissions by Industry Sector



	1996	1999	2002	2003	2004	2005	2006	2007	2008
Other	7645	8841	5898	6222	5956	7937	6389	4786	5966
Paint & Chemical Manufacturing	2876	2610	1698	1553	1463	1162	863	778	691
Gasoline Transfer Terminals	337	390	341	301	327	262	224	238	245
Specialty Steel Production	2684	2951	2247	1707	2110	1707	2054	1681	1725
Integrated Carbon Steel Production	37032	24494	23142	22378	21485	21026	20394	21467	18649
Industrial Coal Fired Boilers	3126	3019	2864	3032	2986	2314	2814	2604	2770
Utility Electric Generation Units	46123	45856	49642	52736	48249	43750	38542	41120	36084

Electric generation units and carbon steel facilities show the largest contribution to point source criteria pollutant emissions in Allegheny County.

Figure 14-3 below summarizes mobile source emission estimates for Allegheny County in 2009 according to functional class of roadway, as compiled by the Southwestern Pennsylvania Commission (SPC) Emissions are calculated by emission factors for each pollutant, scaled according to vehicle miles traveled and average speed of roadway.

Figure 14-3: Mobile Source Emissions

2009 Pittsburgh Area Annual Emission Summary by Functional Class
(Tons/Year)

Allegheny County

Area		Functional Class	VMT	Speed (mph)	$PM_{2.5}$	PM_{10}	VOC	CO	NOX	SO2	NH3
Rural											
	1	Interstate									
	2	Other Prin. Arterial	49,792,439	56.1	1.36	2.22	27.75	603.86	75.56	0.58	5.16
	6	Minor Arterial	34,703,012	45.9	0.72	1.29	20.26	407.18	36.39	0.37	3.71
	7	Major Collector	11,562,525	43.3	0.30	0.49	6.75	130.42	14.06	0.13	1.21
	8	Minor Collector	5,124,821	41.3	0.12	0.20	3.04	57.69	5.61	0.06	0.54
	9	Local	18,422,289	33.0	0.45	0.76	16.83	196.82	21.37	0.20	1.94
		Rural Subtotal	119,605,086	46.1	2.95	4.97	74.63	1,395.96	152.99	1.35	12.55
Small Urban											
	11	Interstate									
	12	Other Fwy/Ex									
	14	Prin. Arterial									
	16	Minor Arterial									
	17	Collector									
	19	Local									
		Small Urban Subtotal									
Urban											
	11	Interstate	2,193,651,784	40.6	66.63	105.69	1,320.29	27,520.48	4,068.41	26.90	223.73
	12	Other Fwy/Ex	976,423,921	54.0	21.59	37.67	561.23	12,632.71	1,303.87	10.57	103.69
	14	Prin. Arterial	2,616,408,564	27.9	54.11	96.55	1,685.80	30,108.56	2,669.98	27.64	279.87
	16	Minor Arterial	2,017,773,079	26.4	37.64	69.62	1,352.14	22,840.95	1,868.51	20.60	217.93
	17	Collector	884,154,921	20.4	17.19	31.32	639.18	10,137.84	860.09	9.15	95.14
	19	Local	1,229,202,690	20.5	24.34	44.08	1,113.25	13,189.73	1,187.83	12.67	132.06
		Urban Subtotal	9,917,614,959	28.7	221.50	384.94	6,671.88	116,430.27	11,958.70	107.54	1,052.42
		Region Total	10,037,220,045	28.8	224.45	389.90	6,746.51	117,826.23	12,111.69	108.88	1,064.97

15. Population Change

Population has decreased consistently for Allegheny County and the Pittsburgh Metropolitan Statistical Area (MSA) in the past 2 decades. Table 15-1 below shows the changes in population for the Pittsburgh MSA for April 1, 2000 through July 1, 2009 as taken from U.S. Census Bureau estimates.

Table 15-1. Pittsburgh Population Change

Pittsburgh MSA Population Statistics	
2000 Population	2,431,086
2009 Population	2,354,957
Change, 2000 to 2009	-76,129
Percent Change	-3.1%

Figure 15-1 below shows a map of color-coded percent decreases in population for Allegheny County for 1990 through 2008, as generated by the EPA population animation tool. All criteria pollutant sites are shown on the map, both active (circles) and inactive (triangles) sites.

Figure 15-1. Population Change for Allegheny County, 1990-2008

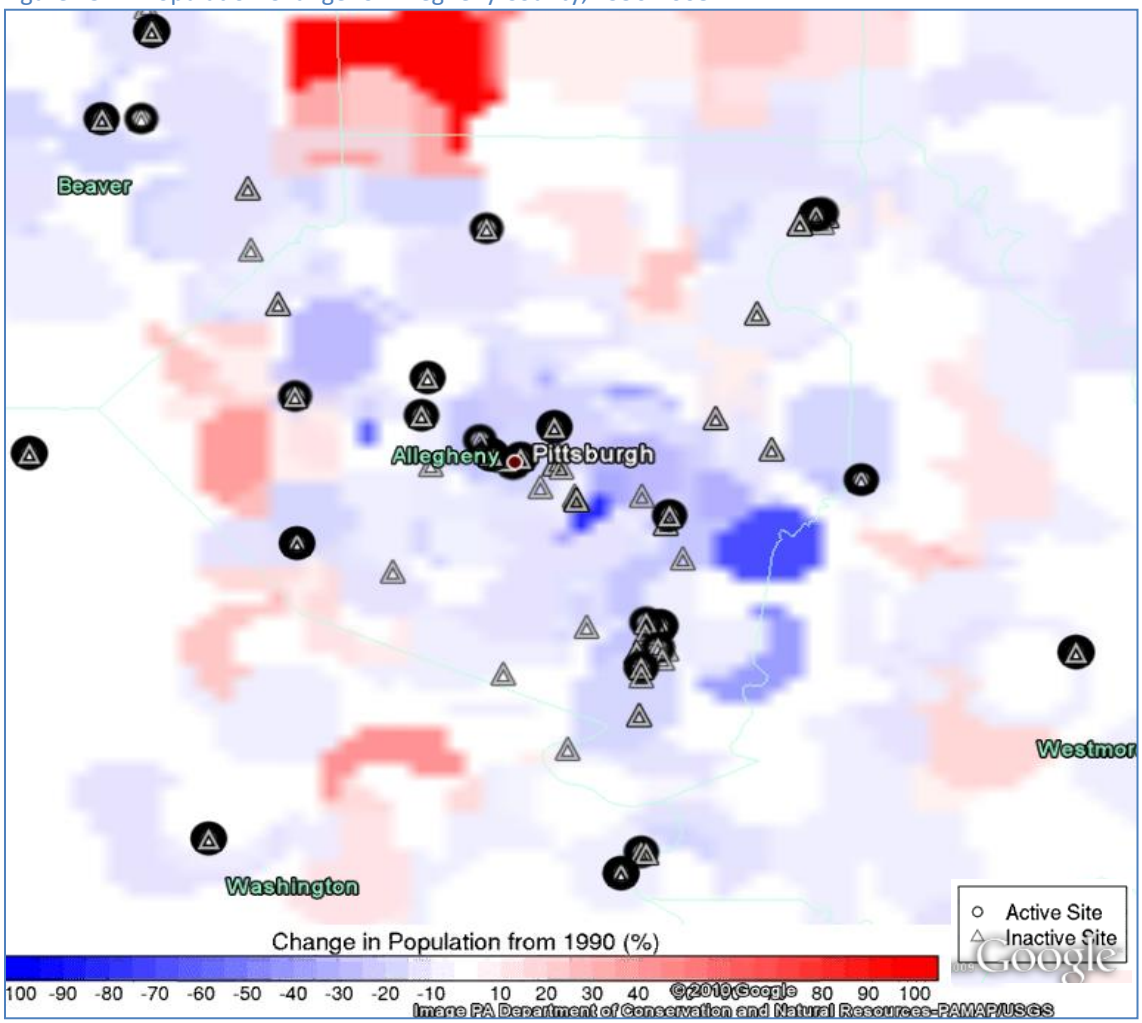


Figure 15-1 shows that no sites were inactivated in areas of population increase. Some increases in suburban population are located in western and northern areas of Allegheny County but are represented

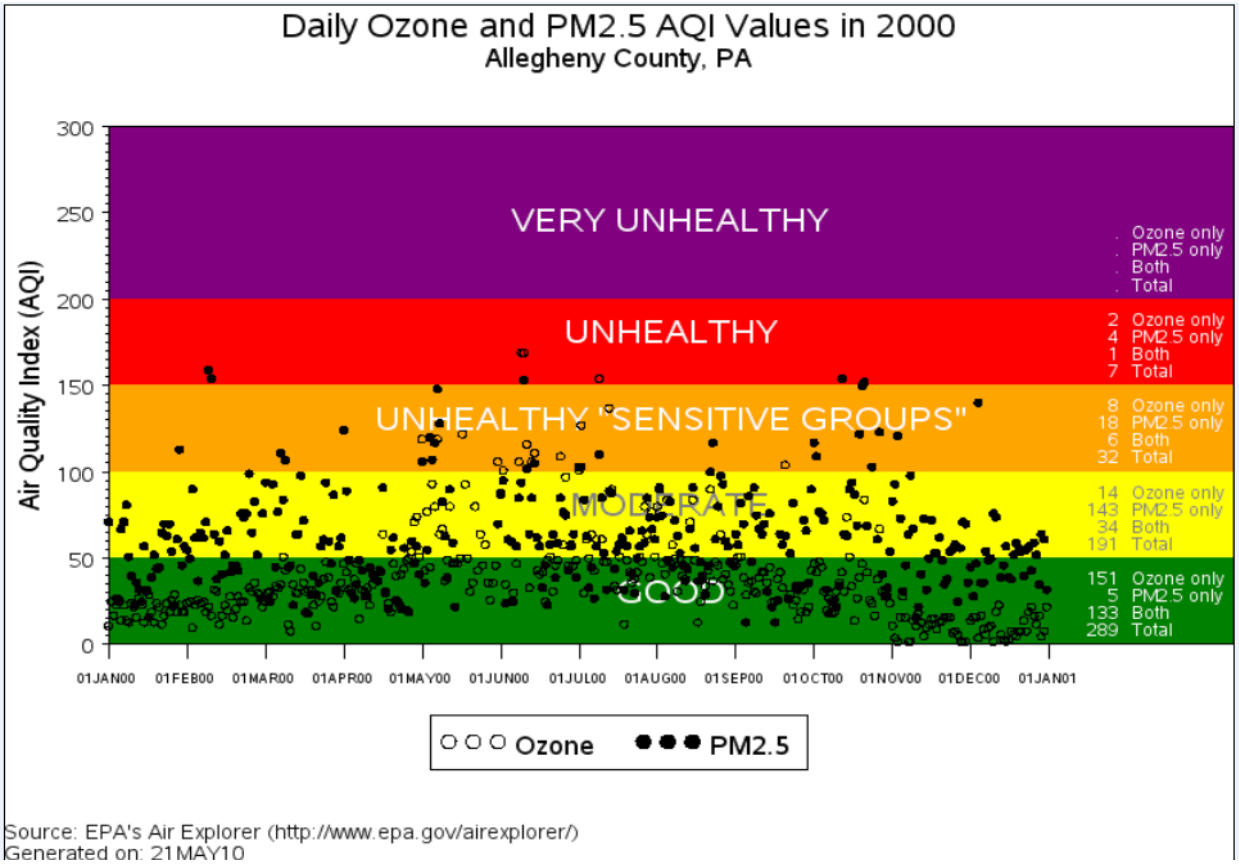
by active sites, specifically PM2.5 population-based monitors. Most sites are located in areas of decreasing or zero population change with emphasis on dense urban and industrial scopes, including areas that may be deemed environmental justice areas. The monitoring network is therefore adequate in design for population exposure.

16. AQI Summary

2000

Allegheny County saw *good* to *moderate* air 92.5% of the time. Air in the county was *unhealthy for sensitive groups* 6.17% of the time and *unhealthy* 1.35% of the time (7.52% combined). The county saw 0 *very unhealthy* days in 2000. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

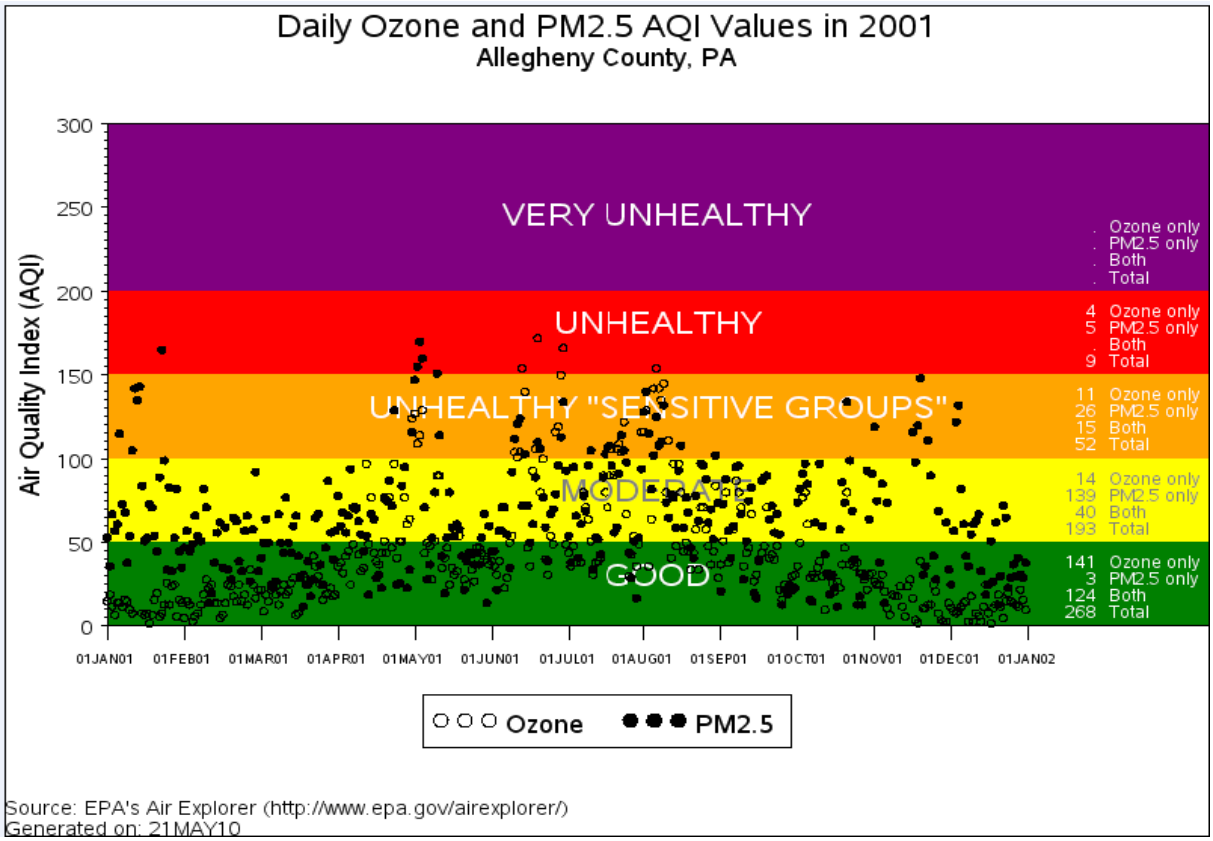
Figure 16-1. 2000 Daily Ozone and PM2.5 AQI Values



2001

Allegheny County saw *good* to *moderate* air 88.3% of the time. Air in the county was *unhealthy for sensitive groups* 9.96% of the time and *unhealthy* 1.72% of the time (11.7% combined). The county saw 0 *very unhealthy* days in 2001. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

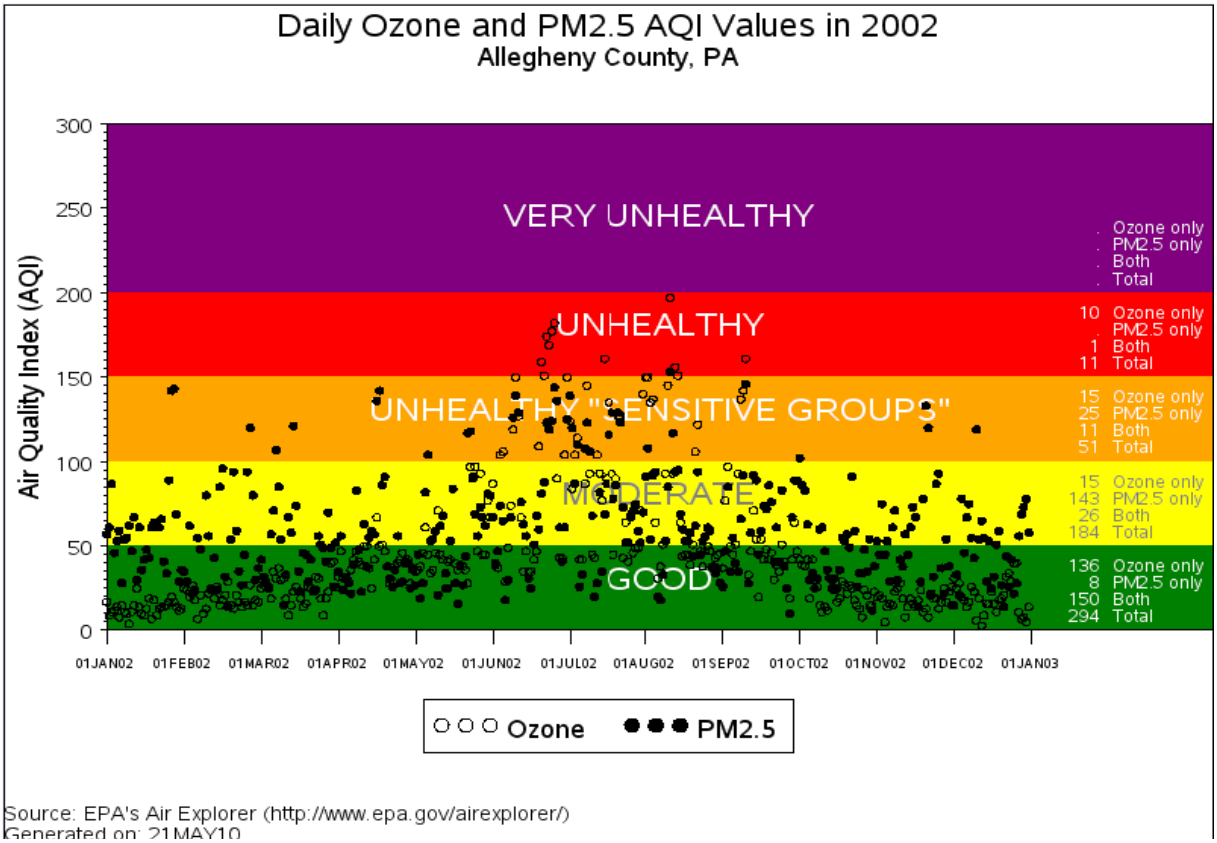
Figure 16-2. 2001 Daily Ozone and PM2.5 AQI Values



2002

Allegheny County saw *good* to *moderate* air 88.5% of the time. Air in the county was *unhealthy for sensitive groups* 9.44% of the time and *unhealthy* 2.04% of the time (11.5% combined). The county saw 0 *very unhealthy* days in 2002. *Unhealthy* marks were primarily due to Ozone and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

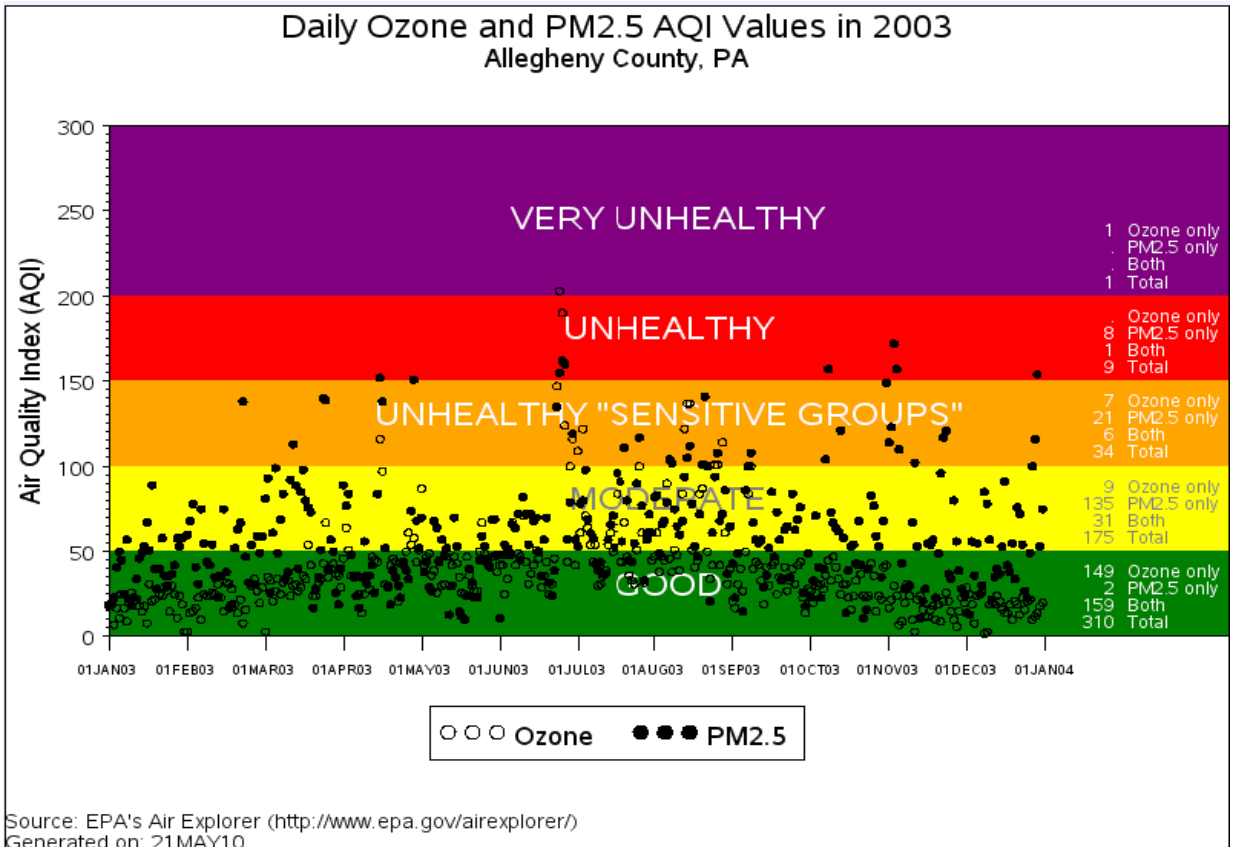
Figure 16-3. 2002 Daily Ozone and PM2.5 AQI Values



2003

Allegheny County saw *good* to *moderate* air 91.7% of the time. Air in the county was *unhealthy for sensitive groups* 6.43% of the time and *unhealthy* 1.70% of the time (8.13% combined). The county saw 1 *very unhealthy* day in 2003. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

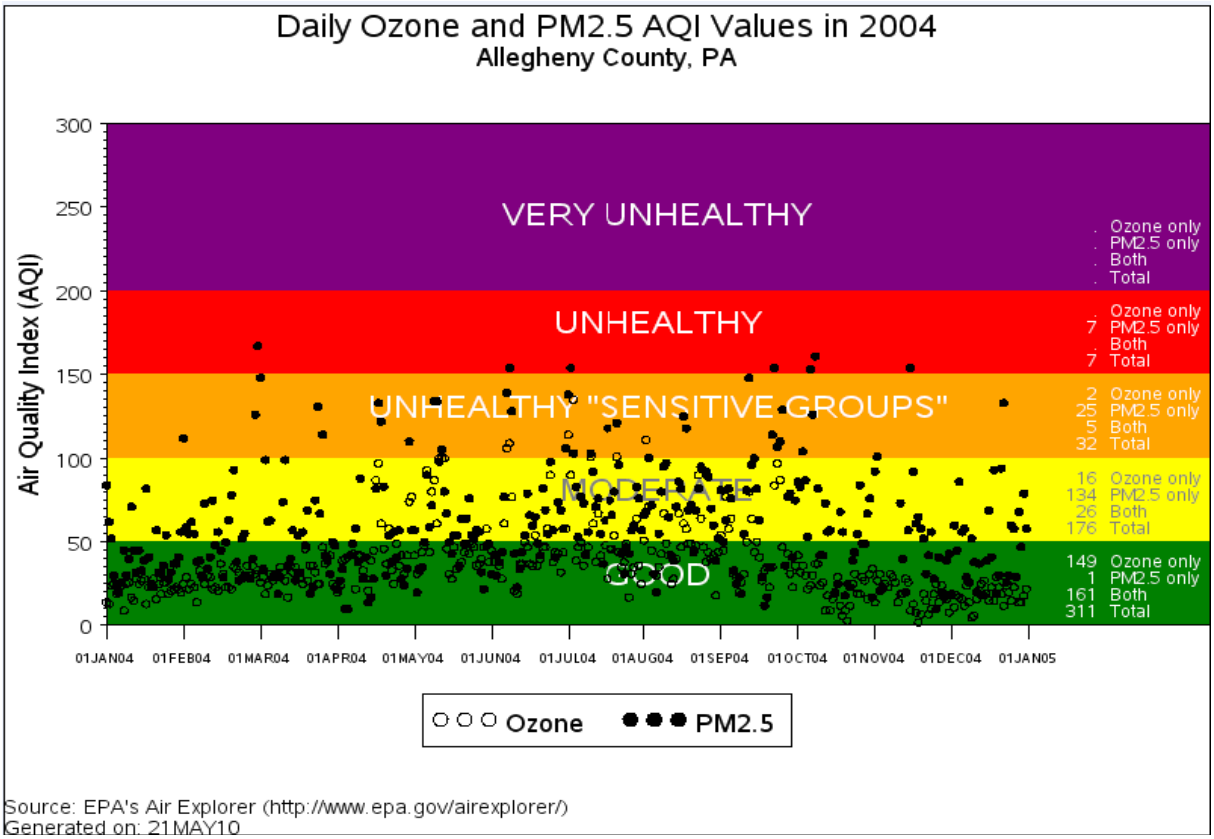
Figure 16-4. 2003 Daily Ozone and PM2.5 AQI Values



2004

Allegheny County saw *good* to *moderate* air 92.6% of the time. Air in the county was *unhealthy for sensitive groups* 6.08% of the time and *unhealthy* 1.33% of the time (7.41% combined). The county saw 0 *very unhealthy* days in 2004. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

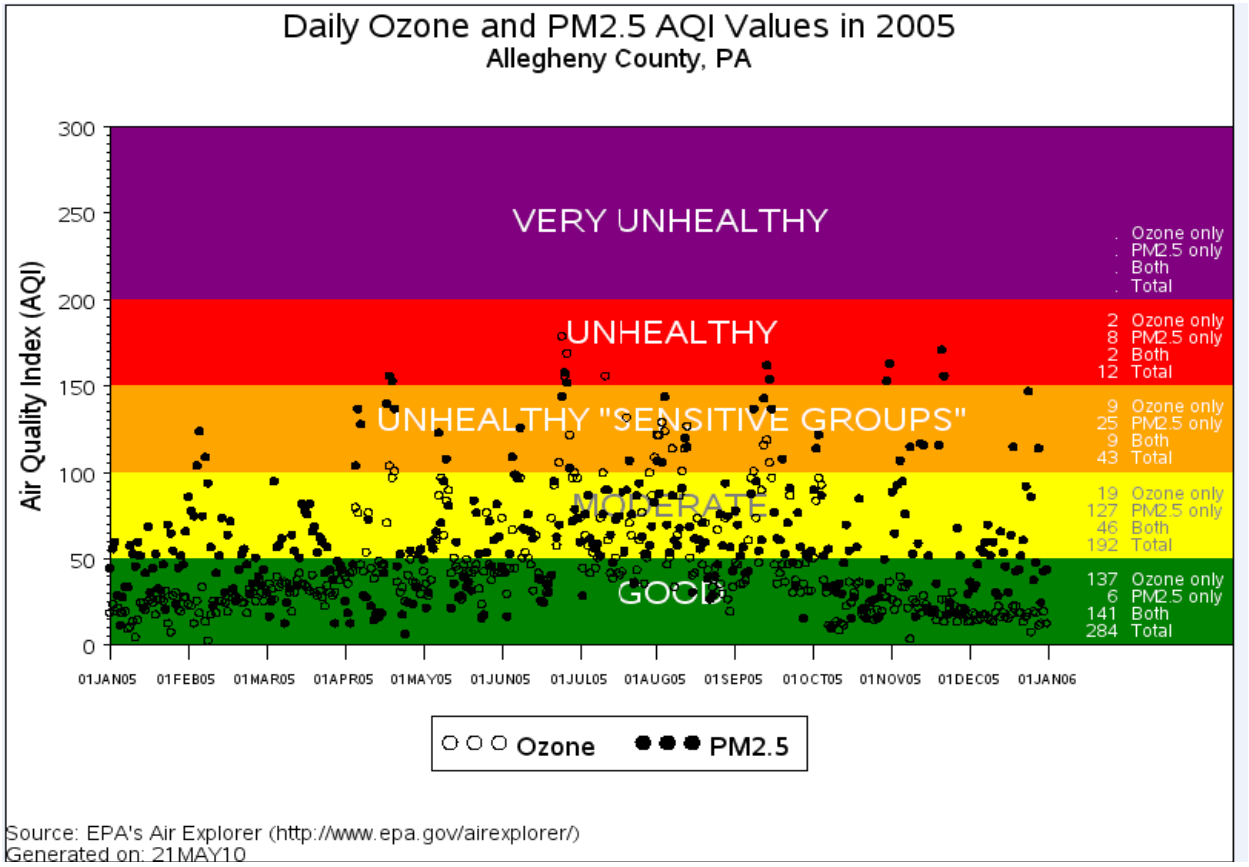
Figure 16-5. 2004 Daily Ozone and PM2.5 AQI Values



2005

Allegheny County saw *good* to *moderate* air 89.6% of the time. Air in the county was *unhealthy for sensitive groups* 8.10% of the time and *unhealthy* 2.26% of the time (10.36% combined). The county saw 0 *very unhealthy* days in 2005. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

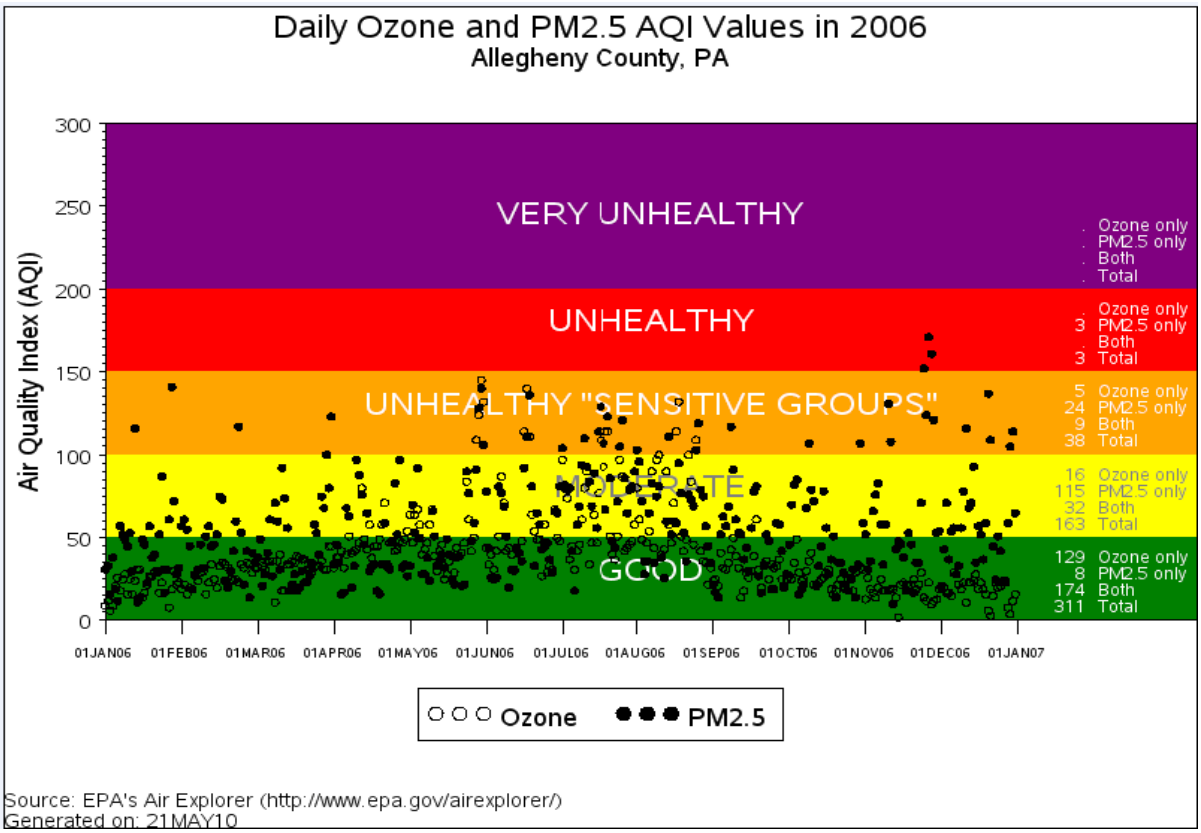
Figure 16-6. 2005 Daily Ozone and PM2.5 AQI Values



2006

Allegheny County saw *good* to *moderate* air 92.0% of the time. Air in the county was *unhealthy for sensitive groups* 7.38% of the time and *unhealthy* 0.58% of the time (7.96% combined). The county saw 0 *very unhealthy* days in 2006. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

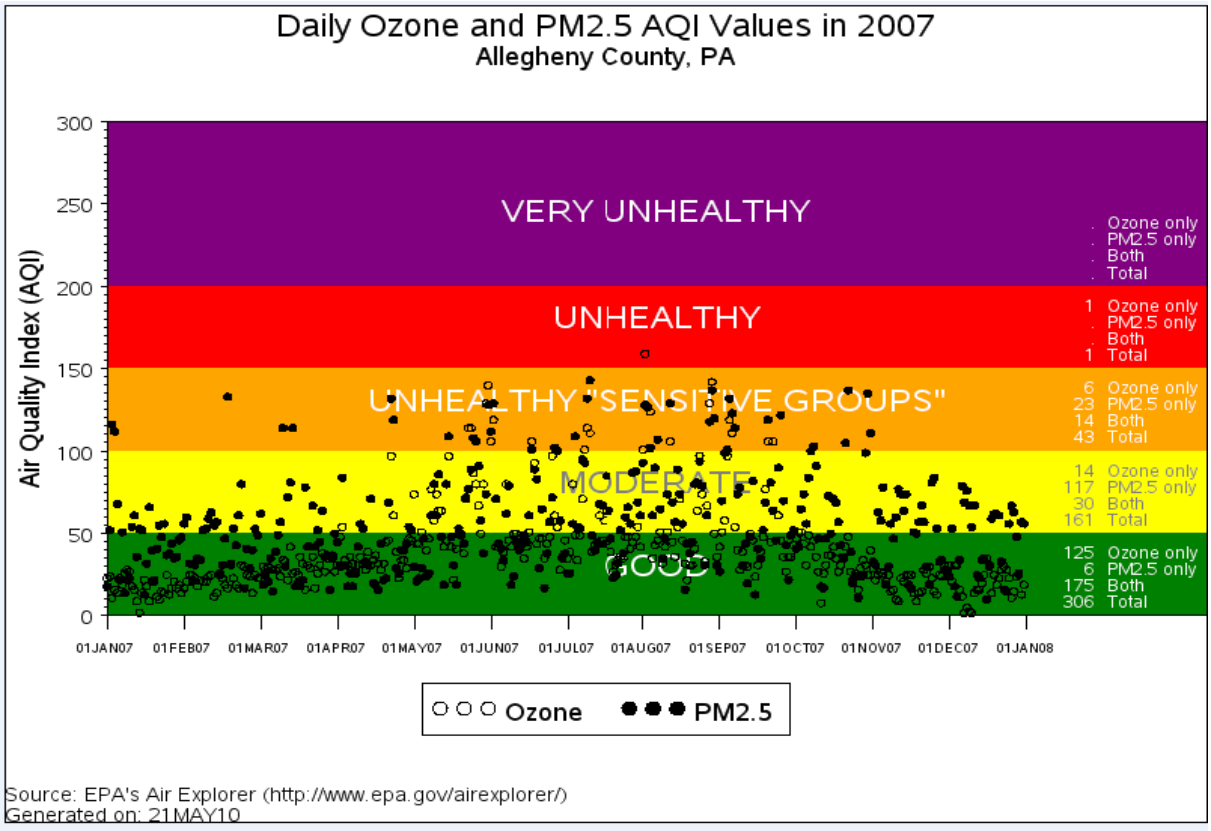
Figure 16-7. 2006 Daily Ozone and PM2.5 AQI Values



2007

Allegheny County saw *good* to *moderate* air 91.4% of the time. Air in the county was *unhealthy for sensitive groups* 8.41% of the time and *unhealthy* 0.20% of the time (8.61% combined). The county saw 0 *very unhealthy* days in 2007. The *unhealthy* mark was due to Ozone and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

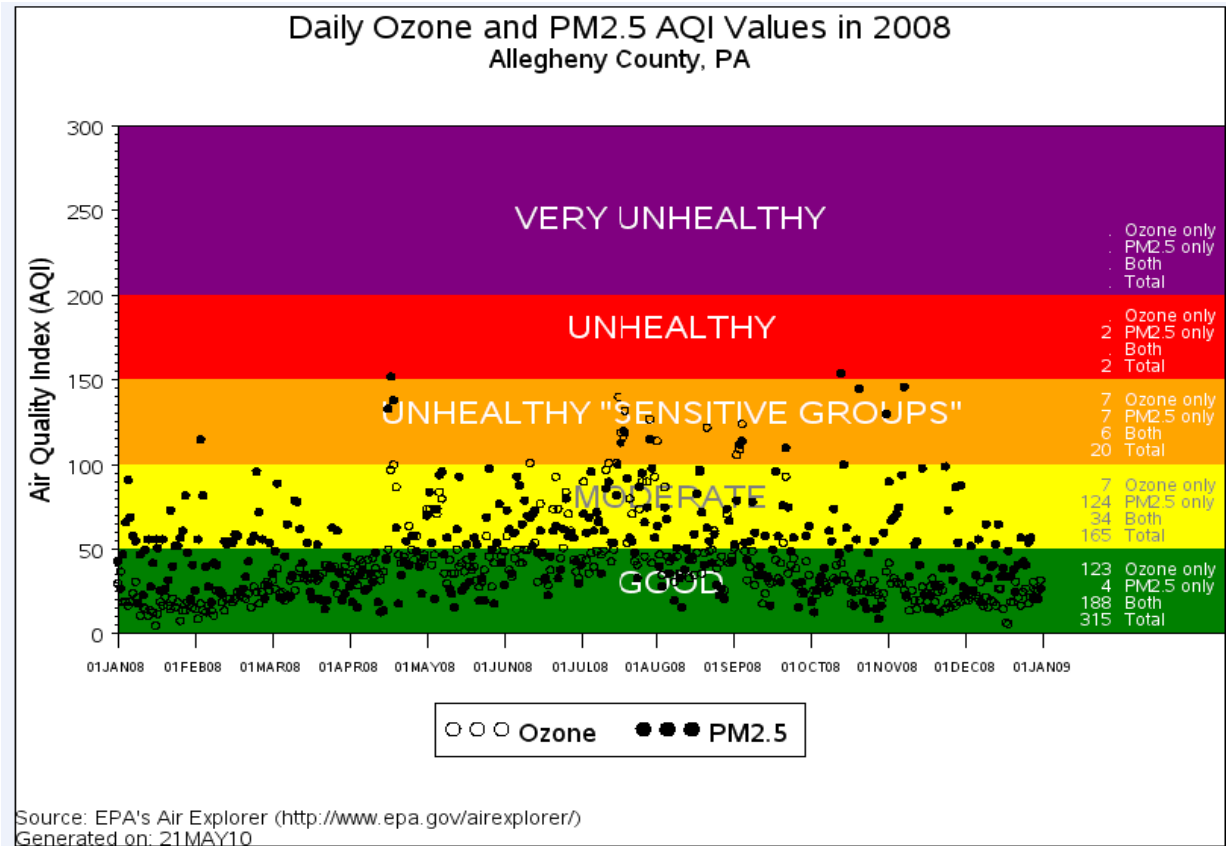
Figure 16-8. 2007 Daily Ozone and PM2.5 AQI Values



2008

Allegheny County saw *good* to *moderate* air 95.6% of the time. Air in the county was *unhealthy for sensitive groups* 3.98% of the time and *unhealthy* 0.40% of the time (4.34% combined). The county saw 0 *very unhealthy* days in 2008. *Unhealthy* marks were due to PM2.5 and *unhealthy for sensitive groups* marks were equally due to ozone and $PM_{2.5}$.

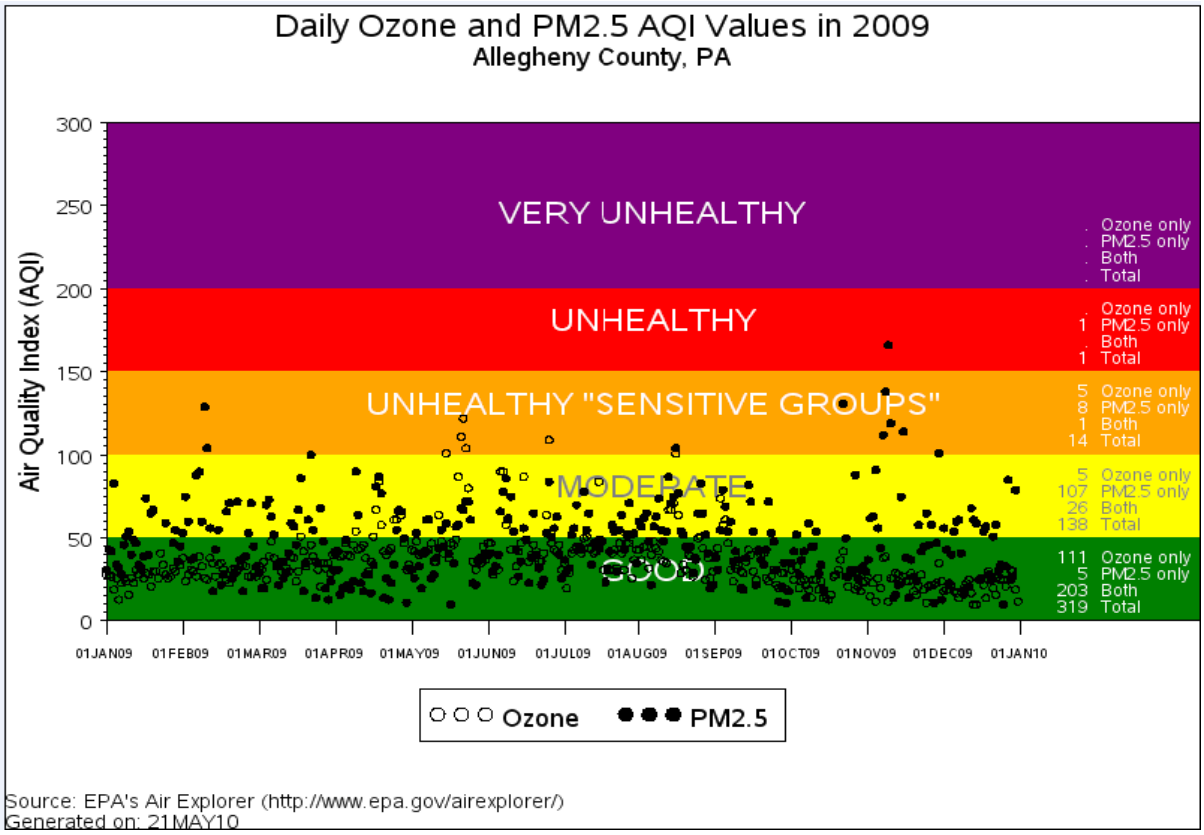
Figure 16-9. 2008 Daily Ozone and PM2.5 AQI Values



2009

Allegheny County saw *good* to *moderate* air 96.8% of the time. Air in the county was *unhealthy for sensitive groups* 2.97% of the time and *unhealthy* 0.21% of the time (3.18% combined). The county saw 0 *very unhealthy* days in 2009. *Unhealthy* and *unhealthy for sensitive groups* marks were primarily due to $PM_{2.5}$.

Figure 16-10. 2009 Daily Ozone and PM2.5 AQI Values



1990-1999
Number of Days with Air Quality Index Values Greater than 100

Table 16-1. Number of Days with AQI Values Greater than 100

1990	26
1991	39
1992	12
1993	32
1994	37
1995	38
1996	31
1997	40
1998	59
1999-2008 includes $PM_{2.5}$	
1999	50