

2016 Air Quality Annual Report





**Allegheny County Health Department
Air Quality Program
301 39th St., Bldg. #7
Pittsburgh, PA 15201**

**Annual Report
for
2016
with
1996-2016 Trends**



Pictured on the front cover...

Two asbestos abatement workers properly removing a pipe wrapped in asbestos containing pipe wrap using a method called glove bagging.



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Preface

This report reflects air quality as sampled and validated by the Allegheny County Health Department (ACHD) through the calendar year of 2016.

For comparison to previous data, this report also provides 2015 data and twenty-year trends. For standards that require consecutive years' averages, multi-year averages are also given. Note that multi-year design values will be calculated as specified by the U.S. Environmental Protection Agency (EPA); if the standard requires calculations on a quarterly basis, such as with PM_{2.5}, the multi-year average will be calculated as such.

Exceedances are given for pollutants. An *exceedance* is a concentration that exceeds a standard but does not necessarily constitute a *violation* of a standard. For some standards, a violation is a culmination of several exceedances over a multi-year period. The standards for each pollutant are described in detail in the pollutant sections.

Official validated concentrations are submitted to EPA's Air Quality System (AQS) on a quarterly basis, and selected parameters are available at the AirData website: www.epa.gov/airdata/. Allegheny County 2016 air quality data was submitted for certification in mid-2017.

Unofficial data for ozone and PM_{2.5} is reported to EPA's AIRNow on an hourly basis and is available at the AIRNow website: www.airnow.gov/.

Unofficial Air Quality Index (AQI) levels are also available each hour for all continuously monitored pollutants via ACHD phone recording at 412-578-8179.



1. Executive Summary

The County recorded seven exceedance days for 8-hour ozone in 2016, with four days above 0.075 parts per million (ppm). The ACHD monitors showed attainment of the 8-hour standard of 0.070 ppm for the first time. The highest 3-year average of the 4th maximum concentration for 2014-2016 was 0.070 ppm at Harrison.

For particulate matter 2.5 microns or less in diameter (PM_{2.5}), one of the eight monitoring sites was above the annual standard of 12.0 µg/m³ (micrograms/cubic meter): Liberty was 12.8 µg/m³ for the years 2014-2016.

On a short-term basis, the Liberty FRM (Federal Reference Method) PM_{2.5} monitor exceeded the 24-hour standard of 35 µg/m³ seven times, leading to a 98th-percentile value of 35.8 µg/m³. On December 17, 2006, the new EPA 24-hour PM_{2.5} standard of 35 µg/m³ became effective. For the first time in three years, data from only the Liberty PM_{2.5} monitor in Allegheny County shows nonattainment of this standard.

Concurrent with the revised 24-hour PM_{2.5} standard, the annual standard of 50 µg/m³ for PM₁₀ was revoked. Annual averages are included in this report and may be included in future reports for comparative purposes.

A new 1-hour federal standard of 75 ppb was started in 2010 for SO₂. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor must not exceed 75 ppb.

A new 1-hour federal standard 100 ppb was started in 2010 for NO₂. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor must not exceed 100 ppb.

All exceedances of the short-term standards in 2016 are shown in the table on the next page. All other criteria pollutants were below the annual and short-term federal standards in 2016. Ozone can have a short-term exceedance of either the 1-hour or 8-hour standard and will be labeled as such. The PM_{2.5} short-term exceedances are for the 24-hour standard and the SO₂ short-term exceedances are for the 1-hour standard.



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2016 Exceedances of the Short-Term Federal Standards

Pollutant	Site	Date	Concentration	Standard
Ozone	South Fayette	4/18/2016	0.072 ppm (8-hr.)	0.070 ppm
Ozone	Harrison	7/21/2016	0.076 ppm (8-hr.)	0.070 ppm
Ozone	South Fayette	7/27/2016	0.076 ppm (8-hr.)	0.070 ppm
Ozone	Lawrenceville	9/5/2016	0.076 ppm (8-hr.)	0.070 ppm
Ozone	South Fayette	9/21/2016	0.075 ppm (8-hr.)	0.070 ppm
Ozone	Lawrenceville	9/22/2016	0.073 ppm (8-hr.)	0.070 ppm
Ozone	South Fayette	9/23/2016	0.081 ppm (8-hr.)	0.070 ppm
Ozone	Lawrenceville	9/23/2016	0.077 ppm (8-hr.)	0.070 ppm
PM _{2.5}	Liberty	13 Days	Max = 56.0 µg/m ³	35 µg/m ³
SO ₂	Liberty	4 Hours	Max = 171 ppb	75 ppb



2. Attainment of the Federal Standards

8-Hour Ozone

Allegheny County and the surrounding six counties of the Pittsburgh-Beaver Valley Area have been designated nonattainment for 8-hour ozone, based on 2001-2003 monitored data. In February, 2011 the EPA had issued in 40 CFR part 52, Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; Determination of Attainment for the Pittsburgh-Beaver Valley 8-Hour Ozone Nonattainment area (this is for the old standard of 0.08 ppm). In December 2016, the EPA had issued in 40 CFR part 52, Approval and Promulgation of Air Quality State Implementation Plans; Pennsylvania; Determination of Attainment of 2008 Ozone National Ambient Air Quality Standards; Pittsburgh-Beaver Valley (this is for the old standard of 0.075 ppm). The monitor at Harrison had the highest 3-year average of 0.073 ppm for 2013-2015 in the area. It remained the highest in Allegheny County for 2014-2016 at 0.070 ppm. Allegheny County is in attainment of the 8-hour ozone standard of 0.070 ppm for the first time.



PM_{2.5}

Allegheny County has been designated nonattainment for PM_{2.5} as part of a multi-county Pittsburgh-Beaver Valley Area, based on 2001-2003 monitored data. Additionally, a five-municipality Liberty-Clairton Area was designated nonattainment as a separate area within Allegheny County. Monitored results for 2014-2016 show levels of attainment county-wide, excluding the Liberty-Clairton Area, for the annual standard of 12 µg/m³. The Liberty-Clairton Area is still in violation of the new annual standard.



The County is developing a State Implementation Plan (SIP) for the control of PM_{2.5} in the Liberty-Clairton Area. Funding from the County's Clean Air Fund has been approved for use in this SIP development. The County will also assist the PA DEP in the development of the Pittsburgh-Beaver Valley PM_{2.5} SIP.

SO₂

The County had monitored attainment for SO₂ for 10 consecutive years. EPA redesignated Allegheny County to attainment for SO₂ in 2004. However, the Liberty monitor is in nonattainment of the new 1-Hour NAAQS of 75 ppb. ACHD is in the process of developing a SIP for SO₂.



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Other Criteria

The County has monitored attainment for PM₁₀ for 22 consecutive years. EPA redesignated Allegheny County to attainment for PM₁₀ in 2003.

For 1-hour ozone, the County has monitored attainment for 19 consecutive years. EPA redesignated Allegheny County to attainment for the 1-hour ozone standard in 2001. EPA revoked this standard for Southwestern PA in 2005.

For CO, the County has monitored attainment for 29 consecutive years. EPA redesignated Allegheny County to attainment for CO in 2003.

For NO₂, the County has monitored attainment for over 35 consecutive years and has been in attainment since promulgation of the standard.

For Lead (Pb), in 2014 the County had monitored nonattainment for the first time in over 25 years. The County has monitored attainment in 2015 and 2016.



3. Air Monitoring Results

A. Ozone (O₃)

The federal standard for ozone is based on maximum 8-hour averages within each 8-hour block period within a calendar day. The 8-hour standard of 0.070 parts per million (ppm) must not be exceeded by the 3-year average of the 4th highest 8-hour concentrations. Starting 2016, the ozone season for Allegheny County extends from March 1 through October 31. The South Fayette monitor runs during the ozone season only.

There were seven exceedance days overall for 8-hour ozone in 2016. One of the days included an exceedance at more than one monitor.

Based on predominant wind flow for Allegheny County, South Fayette is considered to represent incoming ozone levels, Lawrenceville represents ambient urban ozone levels, and Harrison represents outgoing ozone levels.

8-Hour Ozone Concentrations

Maximum 8-hour ozone concentrations and exceedance days are given below for 2016, with exceedance concentrations and days shown in red. 2015 values are shown in gray for comparison.

8-Hour Std. = 0.070 ppm*						
Site	2015 8-Hour Maximum (ppm)	2016 8-Hour Maximum (ppm)	2015 Exceedance Days	2016 Exceedance Days	2013-2015 8-Hour 3-Yr. Avg. of 4 th Max. (ppm)	2014-2016 8-Hour 3-Yr. Avg. of 4 th Max. (ppm)
Harrison	0.084	0.076	7	1	0.073	0.070
South Fayette	0.073	0.081	1	4	0.066	0.068
Lawrenceville	0.073	0.077	4	3	0.068	0.067

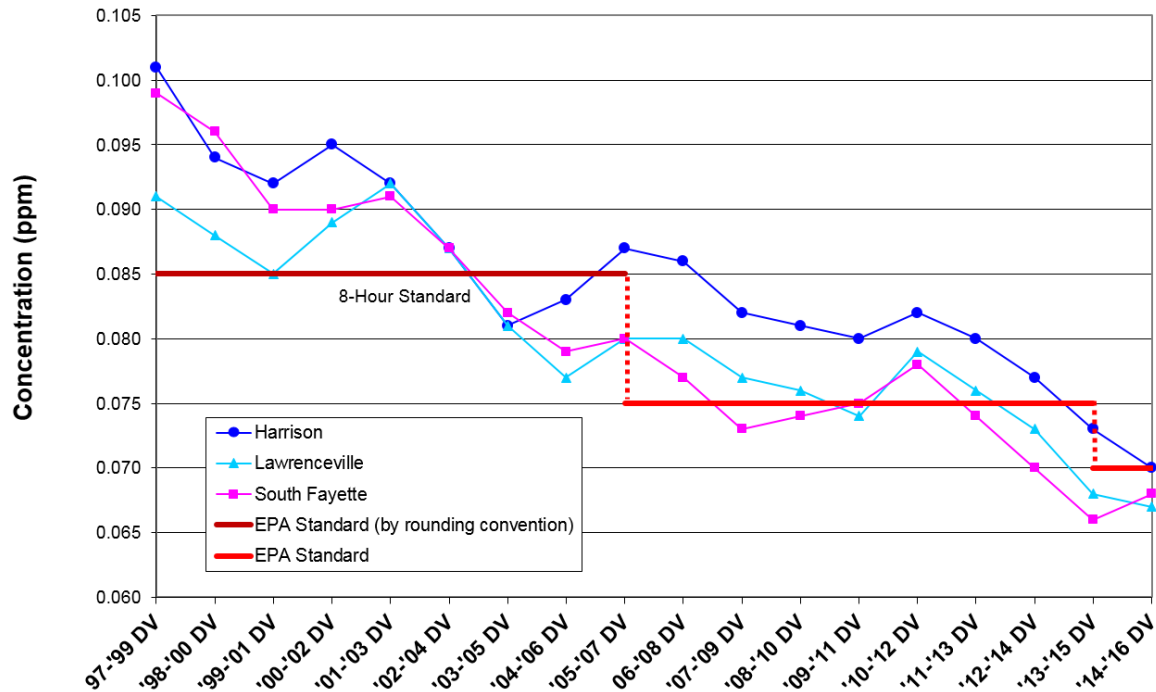
* For comparison to the standards, values are truncated at 1/1000th ppm (e.g., 0.0706 truncates to 0.070 ppm). An exceedance day is one in which any 8-hour period has an average of greater than 0.070 ppm.



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Below is a chart showing the 8-hour design values for the three Allegheny County Health Department sites since 1997.

8-Hour Ozone Design Values, ACHD Sites, 1997 to 2016



1-Hour Ozone Concentrations

The 1-hour standard was revoked for the Pittsburgh-Beaver Valley Area in mid-2005. The former 1-hour standard of 0.12 ppm was not to be exceeded more than once a year, averaged over a 3-year period. 1-hour ozone maximums and exceedances are given in this report for comparative purposes.

Maximum 1-hour concentrations for ozone are given in the table that follows for 2016, with 2015 values shown in gray. "Expected" exceedance days are based on the 3-year average of the actual exceedance days per year, adjusted for missing data.



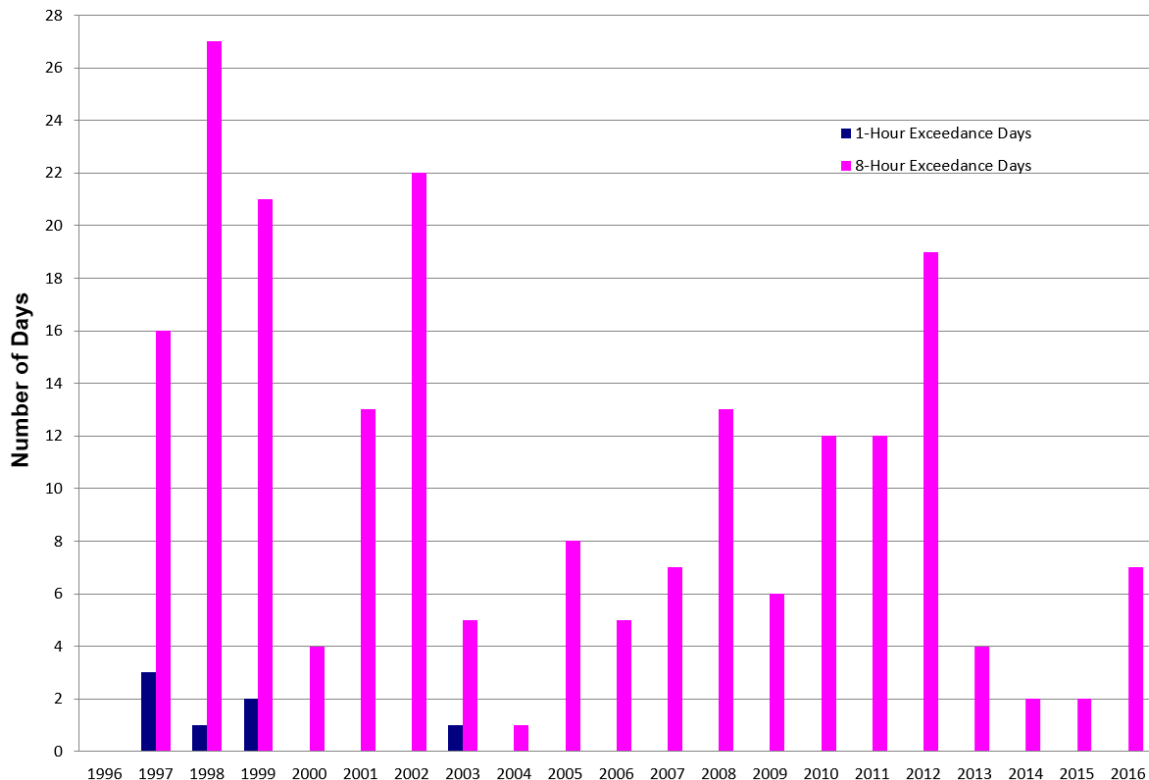
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Former 1-Hour Std. = 0.12 ppm						
Site	2015 1-Hour Maximum (ppm)	2016 1-Hour Maximum (ppm)	2015 Exceedance Days	2016 Exceedance Days	2013-2015 Expected Exceedance Days	2014-2016 Expected Exceedance Days
Lawrenceville	0.086	0.088	0	0	0.0	0.0
South Fayette	0.083	0.085	0	0	0.0	0.0
Harrison	0.090	0.081	0	0	0.0	0.0

* For comparison to the standards, values are rounded to the nearest 1/100th ppm (e.g., 0.126 rounds up to 0.13 ppm). An exceedance day is one in which any hour has a concentration of 0.125 ppm or greater. Concentrations are shown here in thousandths of ppm for detail.

Below is a chart showing ozone exceedance days, both 1-hour and 8-hour, for all Allegheny County sites over the period 1996-2016. Exceedance days represent days when at least one site exceeded the standard. 8-hour exceedance days are shown starting in 1997, when the 8-hour standard was promulgated.

Ozone Exceedance Days, 1996 - 2016





B. Particulate Matter - 2.5 microns or less (PM_{2.5})

PM_{2.5} Filter-Based Monitors, Annual

Federal Reference Method (FRM) filter-based PM_{2.5} monitors are used to determine attainment for an area. The annual federal standard for PM_{2.5} is 12.0 µg/m³ on an annual basis (3-year average).

Annual averages for 2016 are given in the table below, with 2015 averages shown in gray. 2016 annual and 3-year averages that exceeded the standard are shown in red.

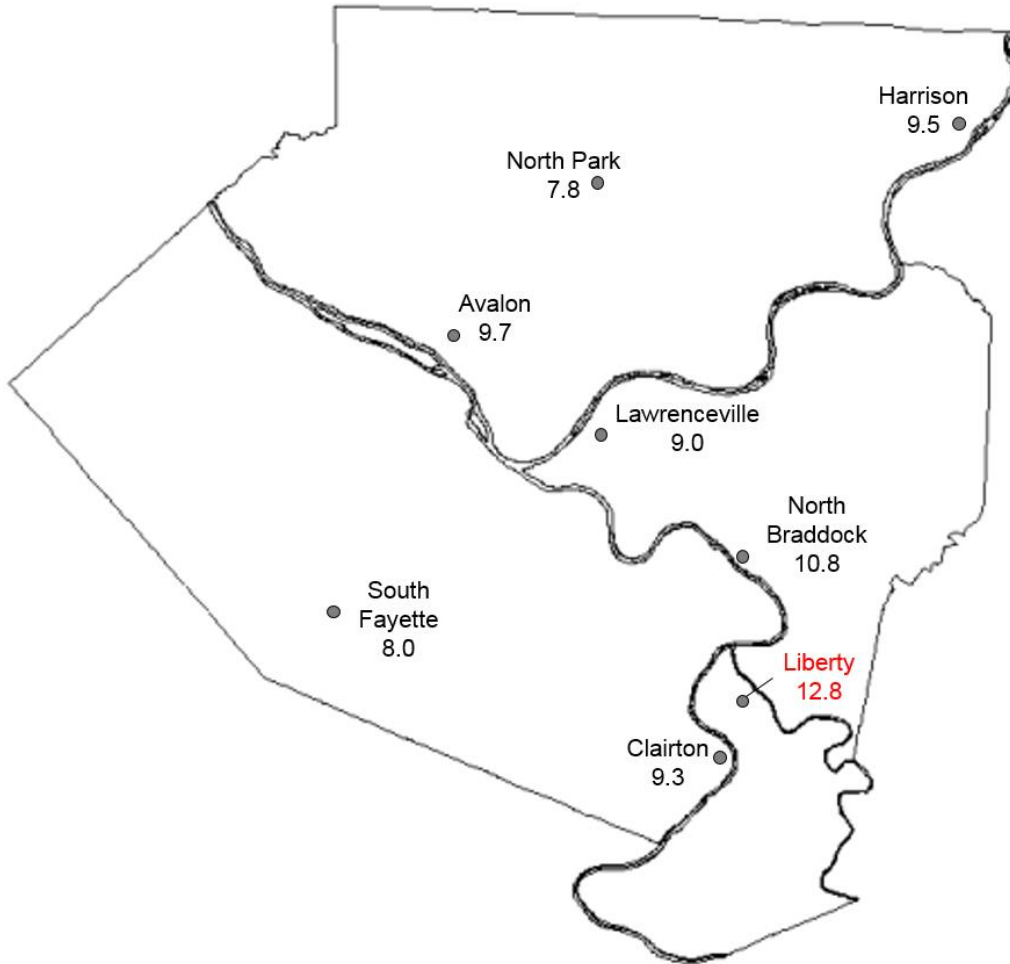
Annual Std. = 12.0 µg/m ³				
Site	2015 Average	2016 Average	2013-2015 3-Year Average	2014-2016 3-Year Average
Liberty	12.9	12.8	12.6	12.8
North Braddock	10.7	10.8	11.2	11.0
Avalon	10.9	9.7	10.6	10.4
Harrison	9.8	9.5	9.8	9.8
Clairton	10.4	9.3	9.9	9.8
Lawrenceville	9.4	9.0	9.7	9.5
South Fayette	8.5	8.0	8.8	8.5
North Park	8.7	7.8	8.5	8.2



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2016 FRM annual averages are also shown on the map below. Sites that exceeded the standard are shown in red.

2016 PM_{2.5} FRM Annual Averages by Site, in $\mu\text{g}/\text{m}^3$

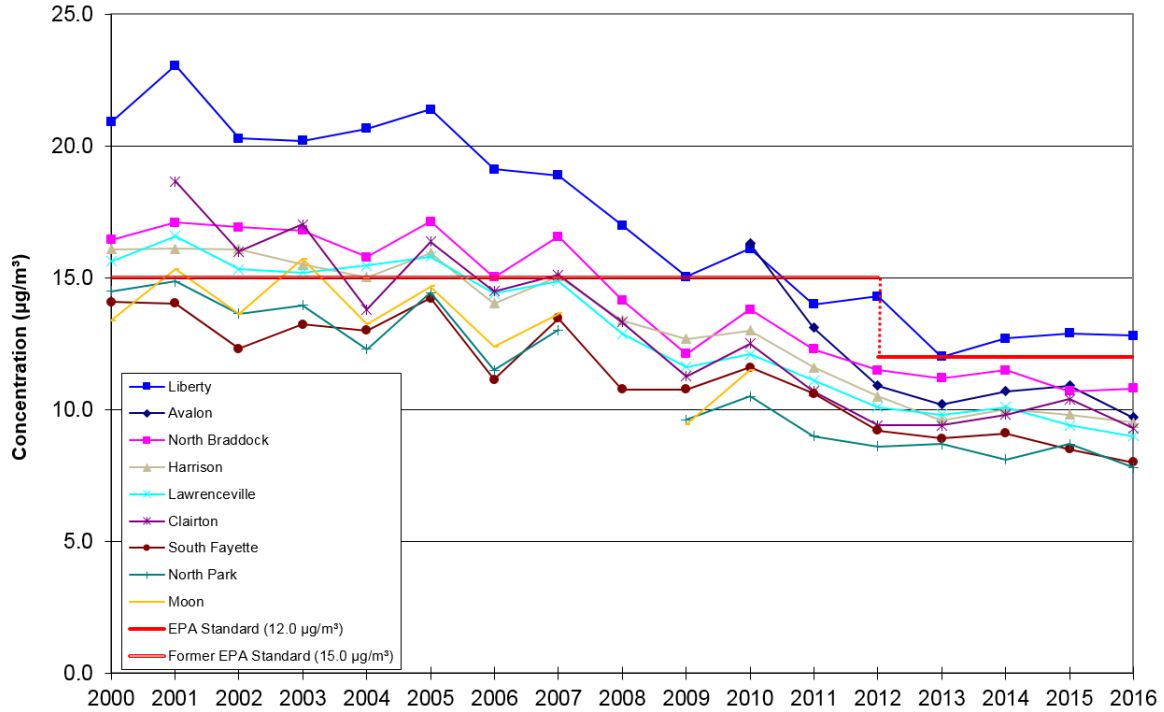




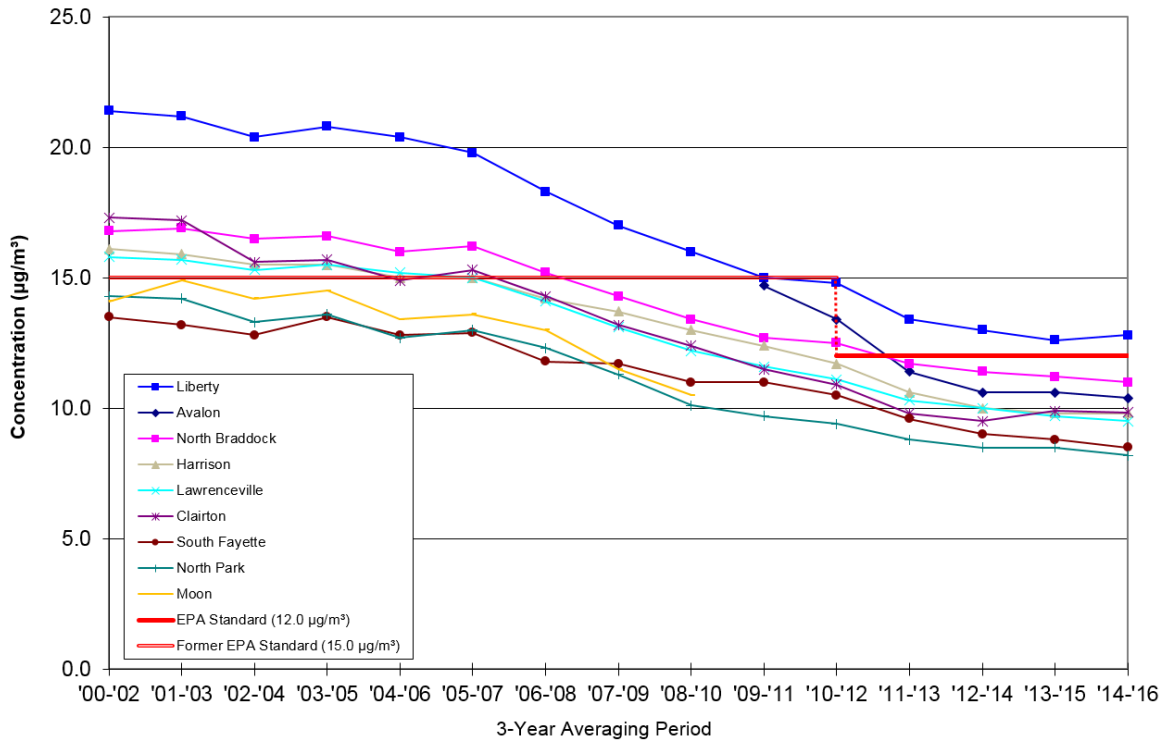
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Long-term trends for the PM_{2.5} annual averages and the PM_{2.5} annual design values are shown in the charts below.

PM_{2.5} Annual Weighted Means by Year, 2000 to 2016



PM_{2.5} Annual Design Values by 3-Year Period, 2000 to 2016





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PM_{2.5} Filter-Based Monitors, 24-Hour

The 24-hour standard for PM_{2.5} of 65 µg/m³ on a 24-hour basis (3-year average of the 98th-percentile value) was revised in December 2006 to 35 µg/m³.

The maximum 2016 24-hour concentrations and number of exceedance days are shown in the following table, with 2015 values shown in gray. Values for 98th-percentile values by year and by 3-year average are also shown. Exceedances in 2016 are shown in red.

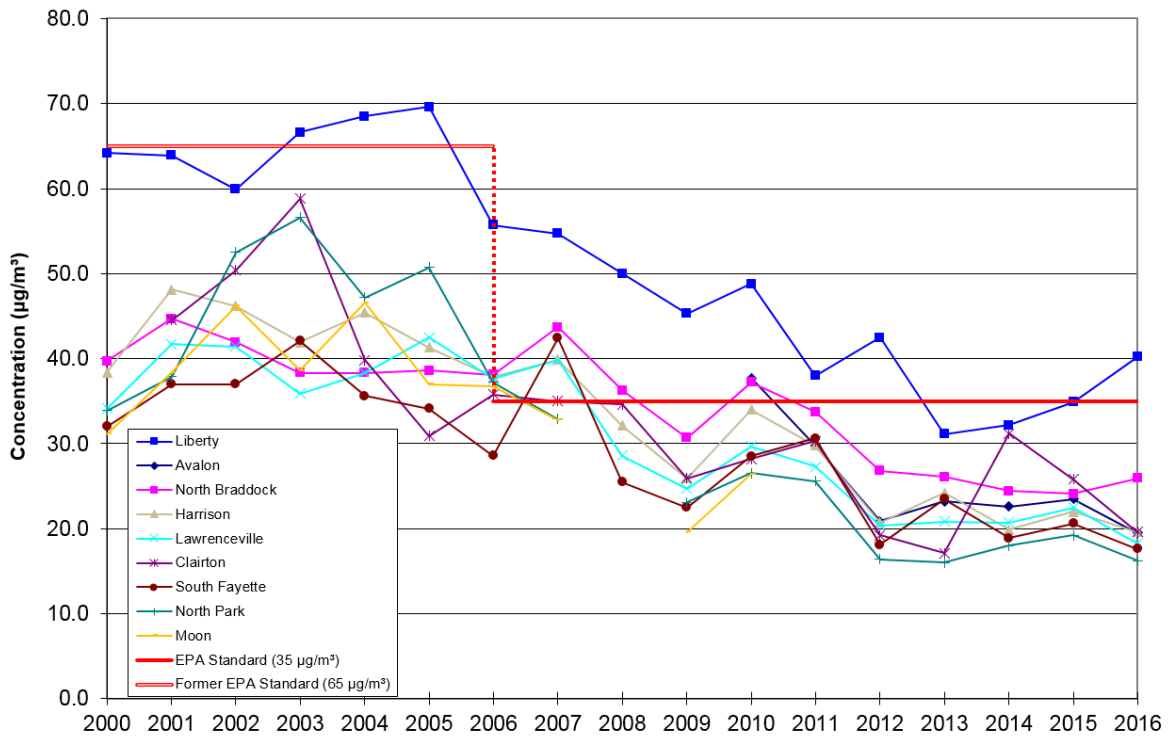
24-Hour Std. = 35 µg/m ³								
Site	2015 24-Hour Max.	2016 24-Hour Max.	2015 24-Hour Exceed.	2016 24-Hour Exceed.	2015 98 th - Percentile Value	2016 98 th - Percentile Value	2013-2015 3-Year Avg. of 98 th - Percentile	2014-2016 3-Year Avg. of 98 th - Percentile
Liberty	58.1	56.0	7	13	34.9	40.2	32.7	35.8
Lawrenceville	27.3	32.2	0	0	22.5	18.3	21.3	20.5
Clairton	30.5	31.9	0	0	25.8	19.6	24.7	25.5
North Braddock	28.0	29.6	0	0	24.1	25.9	24.9	24.8
Harrison	23.5	26.4	0	0	22.0	19.6	22.0	20.5
Avalon	32.4	24.2	0	0	23.5	19.5	23.1	21.9
South Fayette	24.1	18.7	0	0	20.6	17.6	21.0	19.0
North Park	20.4	16.2	0	0	19.2	16.2	17.7	17.8

Long-term trends for the PM_{2.5} 24-hour 98th-percentile by year and the design values by 3-year period are shown in the charts that follow.

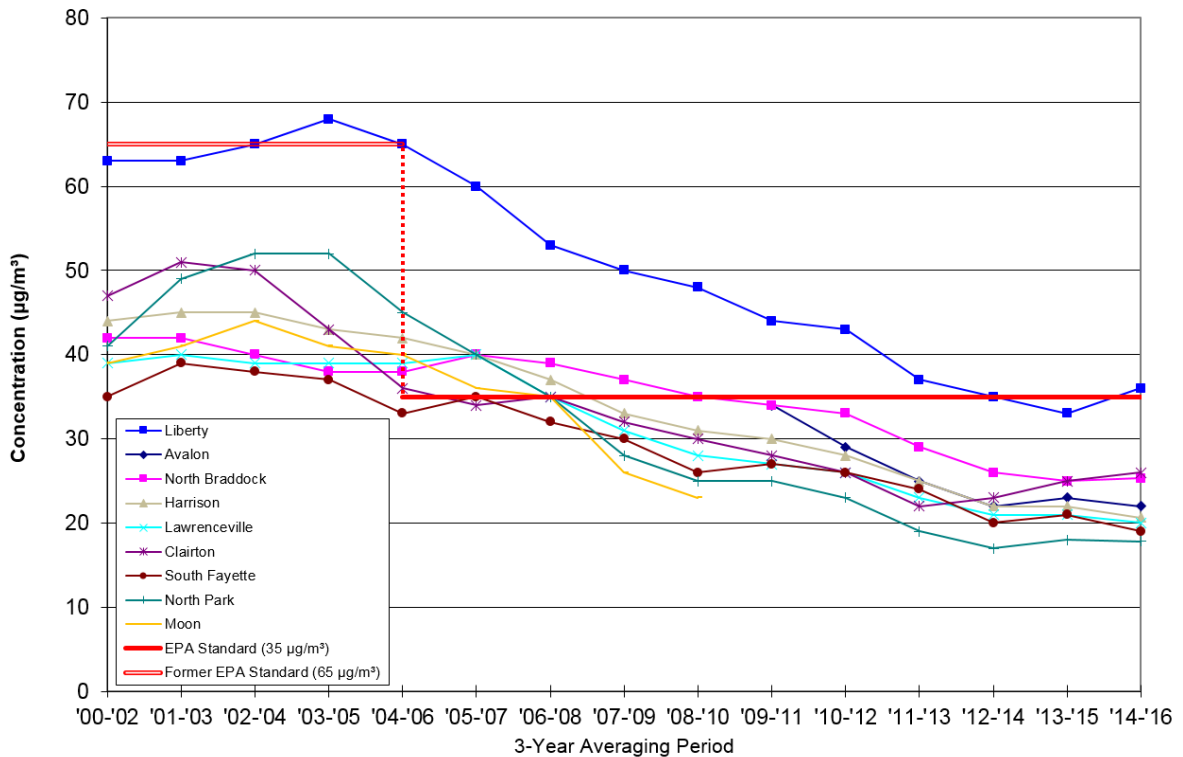


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PM_{2.5} 24-Hour 98th Percentile Values by Year, 2000 to 2016



PM_{2.5} 24-Hour Design Values by 3-Year Period, 2000 to 2016





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PM_{2.5} Continuous Monitors

ACHD's three continuous PM_{2.5} monitors are used mainly for AQI reporting. The monitors at Lawrenceville and Liberty are not used formally in determining attainment of the federal standards, but they do provide estimates of the FRM filter-based values. Since 2007, ACHD reports both the raw (as measured from the monitor) and corrected (correlated to the FRM at the same site) continuous values. All data reported prior to 2007 is considered raw. Note that the Lawrenceville continuous PM_{2.5} monitor was shut down for several months in 2015 due to a roof repair at the site. The Parkway East monitor started operation in 2016 and is used to determine attainment of the federal standards.

Site	Annual Std. = 12.0 µg/m ³ [FRM]			24-Hour Std. = 35 µg/m ³ [FRM]		
	2015 RAW Average	2016 RAW Average	2016 CORRECTED Average	2015 RAW 24-Hour Maximum	2016 RAW 24-Hour Maximum	2016 CORRECTED 24-Hour Maximum
Parkway East	--	10.6	--	--	22.0	--
Lawrenceville	--	10.3	--	--	24.4	--
Liberty	12.2	10.6	11.3	51.7	36.3	45.0

PM_{2.5} Speciation Monitors

Physically, PM_{2.5} is any particle that is 2.5 microns or less in diameter. Chemically, PM_{2.5} is composed of many different chemical compounds. In addition to the FRM and continuous PM_{2.5} monitors, the County operates two PM_{2.5} speciation monitors that are used to measure specific components, or species, of the total collected sample. In the Pittsburgh metro area, the most dominant PM_{2.5} species are sulfates and organic carbon compounds.

The averages of the major species concentrations are given below. Crustal component is made up of fine soil or minute dust particles. Additional material collected by the monitors and not shown below can include particle-bound water, trace amounts of metals and non-metals, and unspciated material.

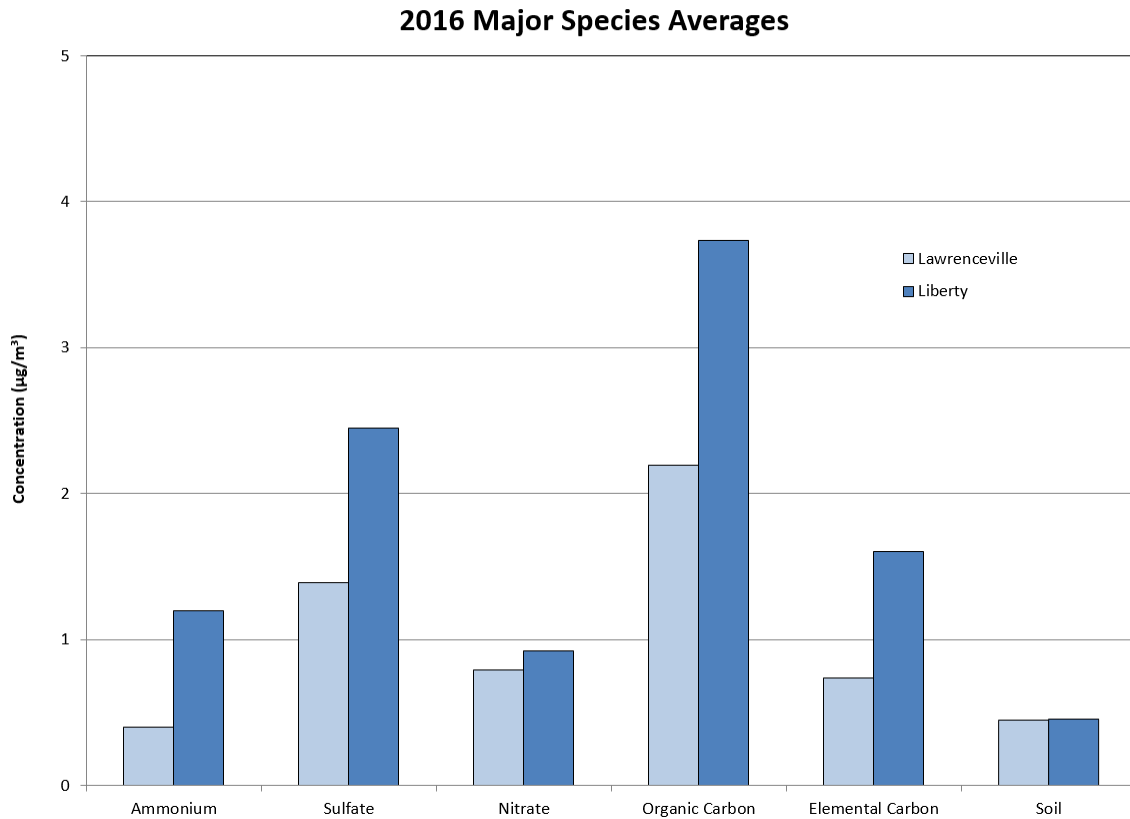


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Annual averages for major species at Lawrenceville and Liberty for 2016 are given below in $\mu\text{g}/\text{m}^3$.

Site	Ammonium	Sulfate	Nitrate	Organic Carbon	Elemental Carbon	Soil
Lawrenceville	0.399	1.390	0.793	2.197	0.737	0.445
Liberty	1.199	2.446	0.920	3.735	1.601	0.455

2016 major species averages are also shown in the column chart below.





C. Particulate Matter - 10 microns or less (PM₁₀)

PM₁₀ is sampled using both intermittent filter-based and continuous monitors throughout the County. Both types of PM₁₀ monitors can be used for comparison to the federal standards of 150 µg/m³ (24-hour). The 24-hour standard can be exceeded an average of once per year over a 3-year period. The PM₁₀ annual standard of 50 µg/m³ was revoked by EPA in December 2006; annual averages have been given below for comparative purposes. The North Braddock Filter-based Monitor and the Monroeville Continuous Monitor were discontinued yearend 2015.

2016 maximums and averages are shown in the table below, with 2015 values shown in gray. There were no exceedances in 2016.

PM₁₀ Filter-Based Monitors

Site	24-Hour Std. = 150 µg/m ³		Former Annual Std. = 50 µg/m ³	
	2015 24-Hour Maximum	2016 24-Hour Maximum	2015 Average	2016 Average
Liberty	64	70	22.0	20.1
Manchester	34	58	18.1	15.5
Avalon	36	47	18.1	14.7
Clairton	41	46	16.2	13.7
South Fayette	32	29	13.3	11.6
North Braddock	42	--	21.7	--

PM₁₀ Continuous Monitors

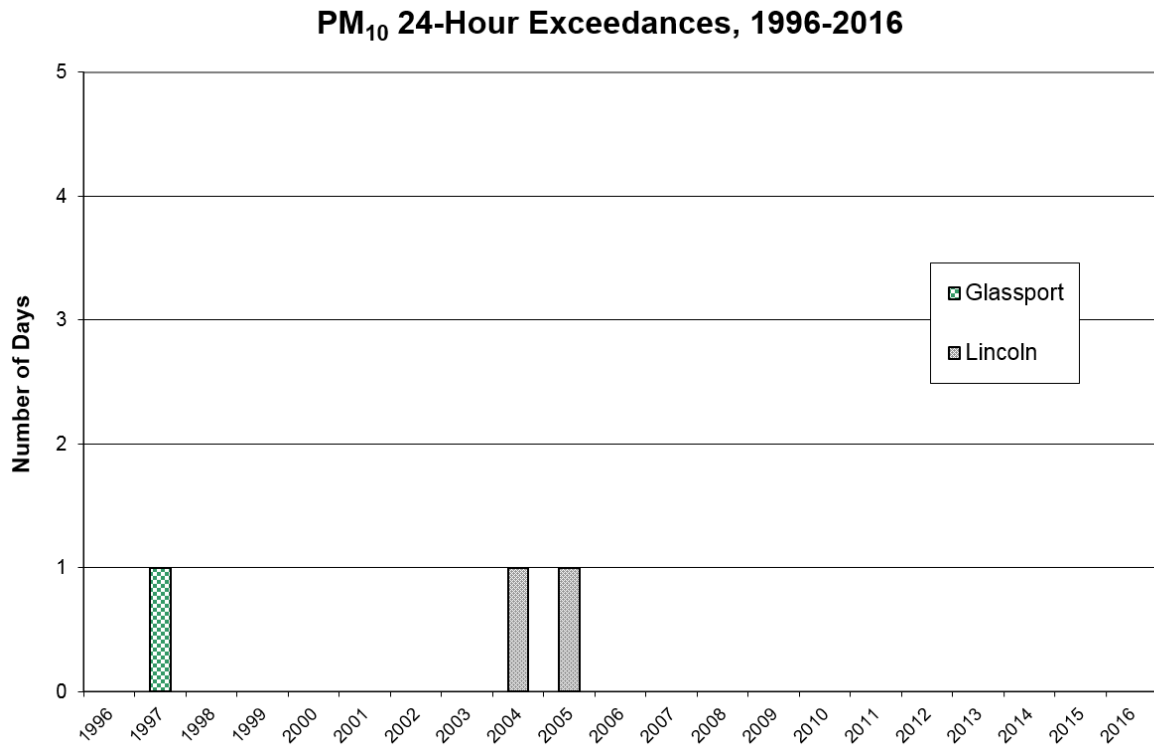
Site	24-Hour Std. = 150 µg/m ³		Former Annual Std. = 50 µg/m ³	
	2015 24-Hour Maximum	2016 24-Hour Maximum	2015 Average	2016 Average
Lincoln	85	93	23.7	23.0
North Braddock	60	81	24.6	23.3
Glassport	91	68	17.4	14.9
Liberty	78	65	19.7	18.7
Flag Plaza	42	59	18.5	15.6
Monroeville	35	--	13.6	--

Note: North Braddock and Monroeville PM₁₀ Continuous Monitors became official the start of 2011.



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Below is a chart showing PM₁₀ 24-hour exceedances for the period 1996-2016. Continuous monitors began operation after 1992. For sites with both filter-based and continuous monitors, data for only the filter-based monitors are shown.





D. Sulfur Dioxide (SO₂)

Sulfur dioxide is monitored at five sites in the County, mostly in industrial areas. The South Fayette monitor is used as a background monitor, providing a measurement of SO₂ entering Allegheny County from the southwest. The former primary federal standards were 0.14 ppm (24-hour average) and 0.03 ppm (annually); the new 1-hour primary federal standard of 75 ppb was started in 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor must not exceed 75 ppb. Maximums and averages for 2016 are shown in the table below, with 2015 values shown in gray. Exceedances in 2016 are shown in red. The NCore trace gas analyzer for SO₂ at Lawrenceville started operation in 2010 and Stowe was discontinued in 2011. The North Braddock SO₂ gas analyzer started operation in 2014.

Site	Former 24-Hour Std. = 0.14 ppm		Former Annual Std. = 0.03 ppm	
	2015 24-Hour Maximum	2016 24-Hour Maximum	2015 Average	2016 Average
Liberty	0.047	0.029	0.005	0.004
North Braddock	0.016	0.019	0.002	0.002
Avalon	0.014	0.009	0.001	0.000
South Fayette	0.006	0.006	0.001	0.001
Lawrenceville	0.008	0.005	0.001	0.001

Site	1-Hour Std. = 75 ppb				
	2015 1-Hour Maximum	2016 1-Hour Maximum	2013-2015 99 th percentile	2014-2016 99 th percentile	2016 Exceedances
Liberty	244	171	99	94	4
North Braddock	80	69	71	64	0
Avalon	56	40	38	30	0
Lawrenceville	29	19	21	17	0
South Fayette	23	15	20	16	0

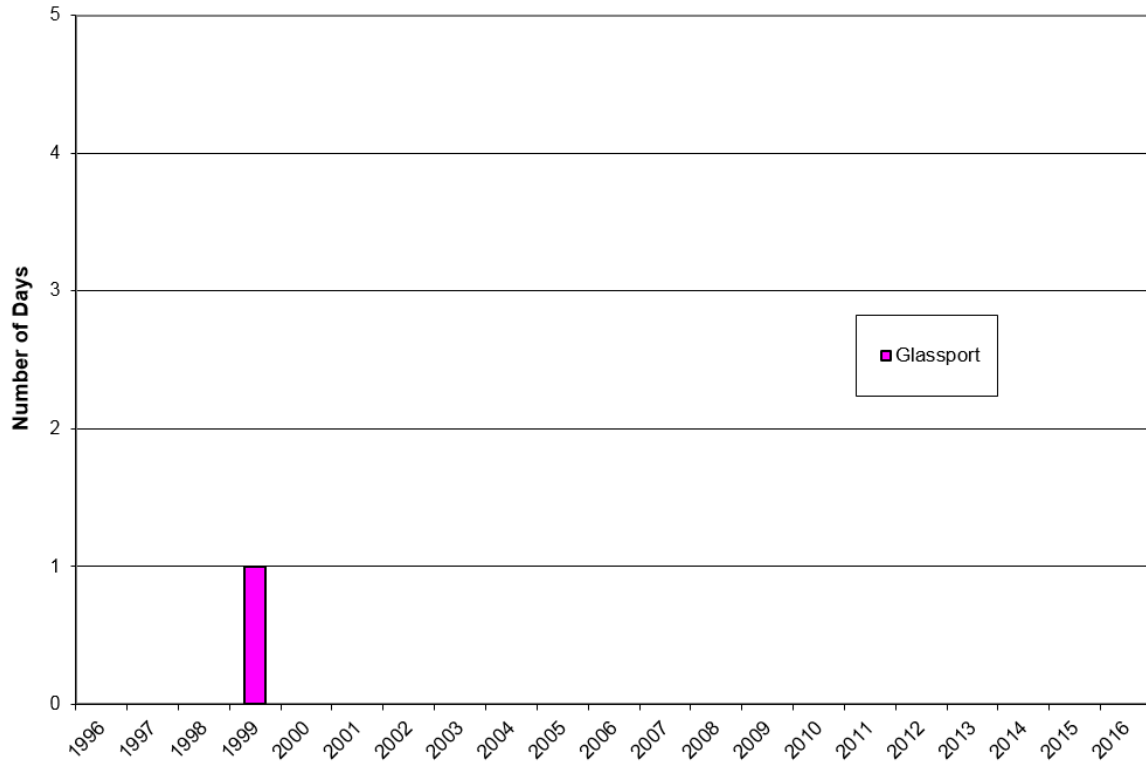
Note: North Braddock 2013-2015 99th percentile is a two year 99th percentile for 2014 and 2015.

SO₂ 24-hour exceedances are shown on the following page for 1996-2016. The former 24-hour standard can be exceeded once per year. Glassport was the last site to exceed the 24-hour standard in 1999.



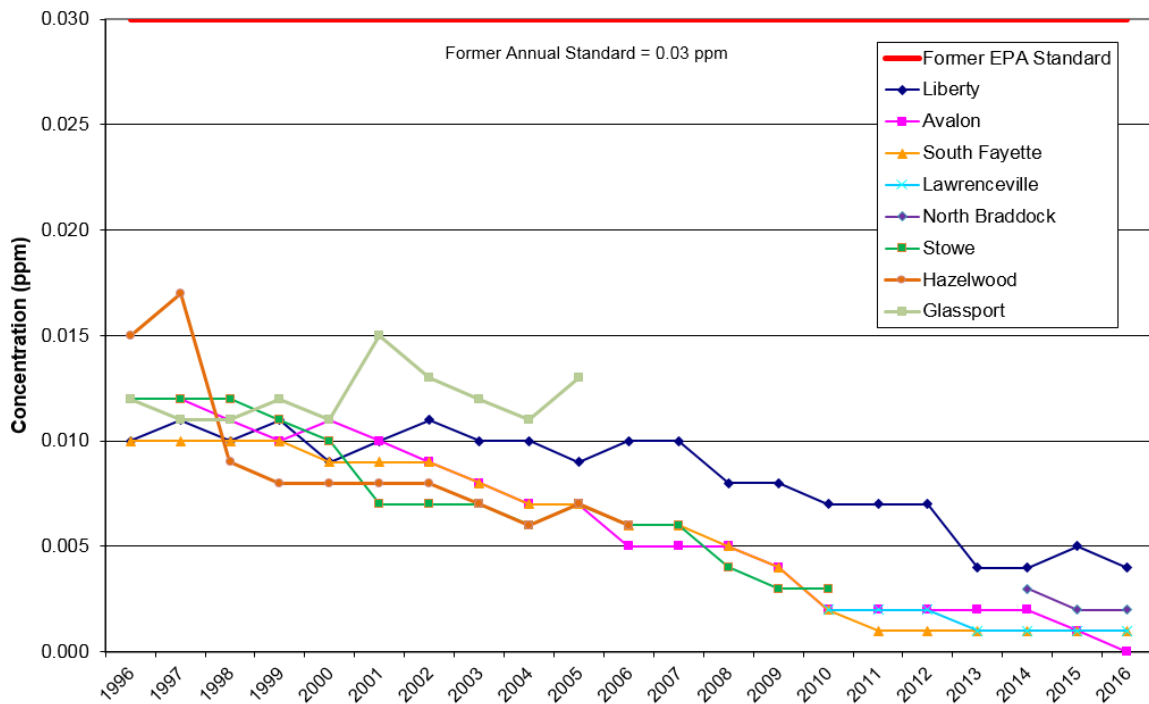
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Sulfur Dioxide 24-Hour Exceedances, 1996-2016



SO₂ annual average trends are shown below for 1996-2016.

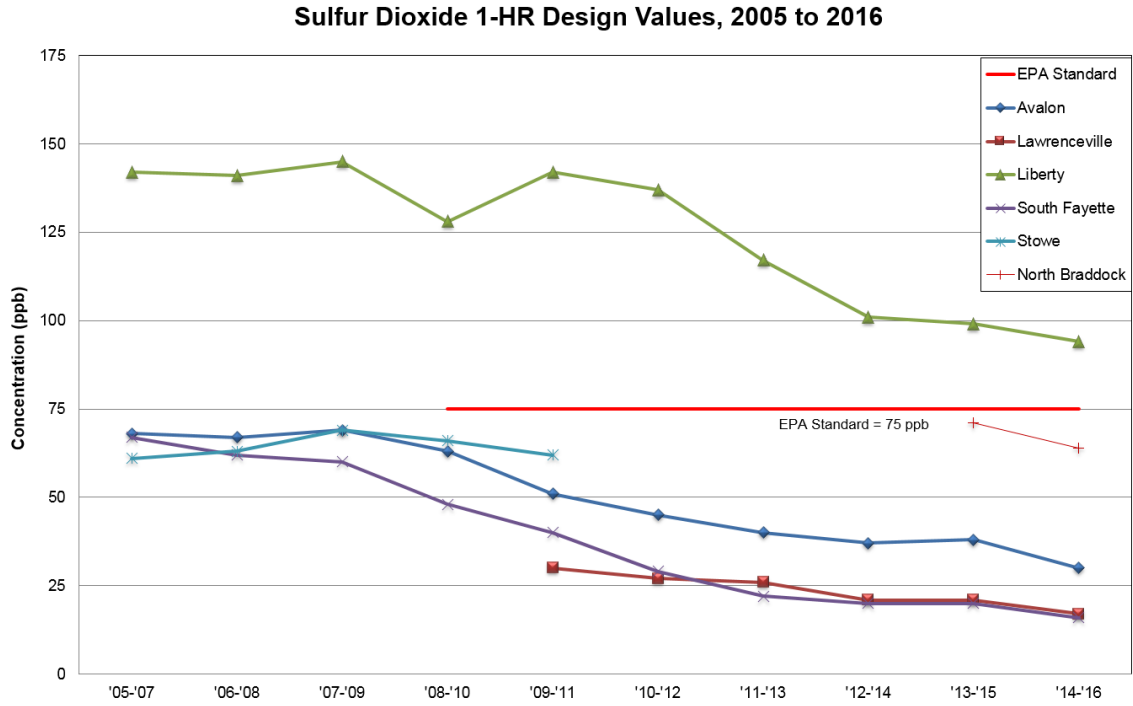
Sulfur Dioxide Annual Averages, 1996-2016





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SO₂ one-hour design value trends are shown below for 2005-2016.





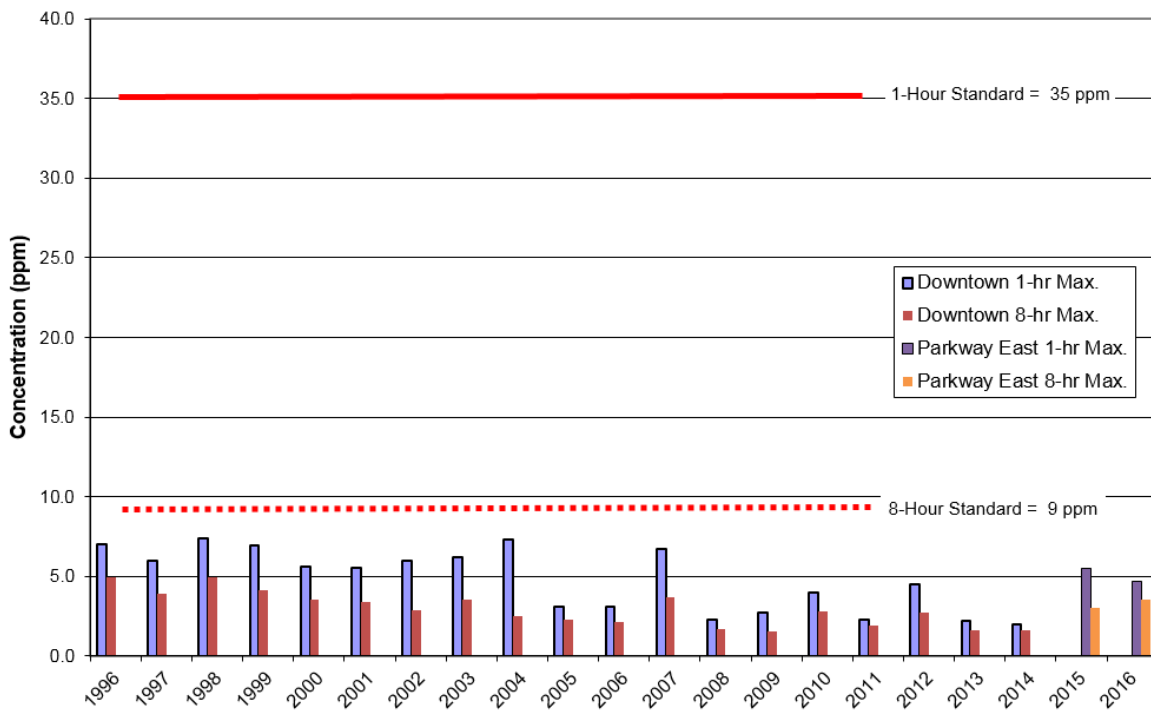
E. Carbon Monoxide (CO)

The County operates three carbon monoxide (CO) monitors; one in the Downtown Pittsburgh area. The NCore trace gas analyzer for CO at Lawrenceville started operation in 2010. The Parkway East, Near Road, trace gas analyzer for CO started operation on 9/1/2014 and the Downtown CO monitor was discontinued on 8/27/2014. The federal standards for CO are 35 ppm on an hourly basis and 9 ppm on an 8-hour average basis. Maximums for 2016 are shown in the table below, with 2015 values shown in gray.

Site	1-Hour Std. = 35 ppm		8-Hour Std. = 9 ppm	
	2015 1-Hour Maximum	2016 1-Hour Maximum	2015 8-Hour Maximum	2016 8-Hour Maximum
Parkway East	5.5	4.7	3.0	3.5
Flag Plaza	1.3	2.1	1.1	1.7
Lawrenceville	1.3	1.5	1.1	1.2

Carbon monoxide maximum trends are shown below for 1996-2016. The County has not exceeded the 8-hour standard since 1987.

Carbon Monoxide 1-Hour and 8-Hour Maximum Trends, 1996-2016





F. Nitrogen Dioxide (NO₂)

Nitrogen oxides are monitored at two sites in the County. Nitrogen dioxide (NO₂) is calculated each hour by subtracting nitrogen oxide (NO) from the total nitrogen oxides (NO_x) concentration. Starting in 2010, the standard for NO₂ is now 0.053 ppm (53 ppb) on an annual average basis. A new 1-hour federal standard 100 ppb was started in 2010. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor must not exceed 100 ppb. 2016 averages are shown in the table below, with 2015 values shown in gray. The Parkway East, Near Road, trace gas analyzer for NO₂ started operation on 9/1/2014 and the Lawrenceville NO₂ monitor was discontinued on 8/25/2014.

Site	Annual Std. = 53 ppb		1-Hour Std. = 100 ppb			
	2015 Average	2016 Average	2015 1-Hour Maximum	2016 1-Hour Maximum	2013-2015 98 th percentile	2014-2016 98 th percentile
Parkway East	13	11	51	48	42	41
Harrison	7	7	38	47	36	38

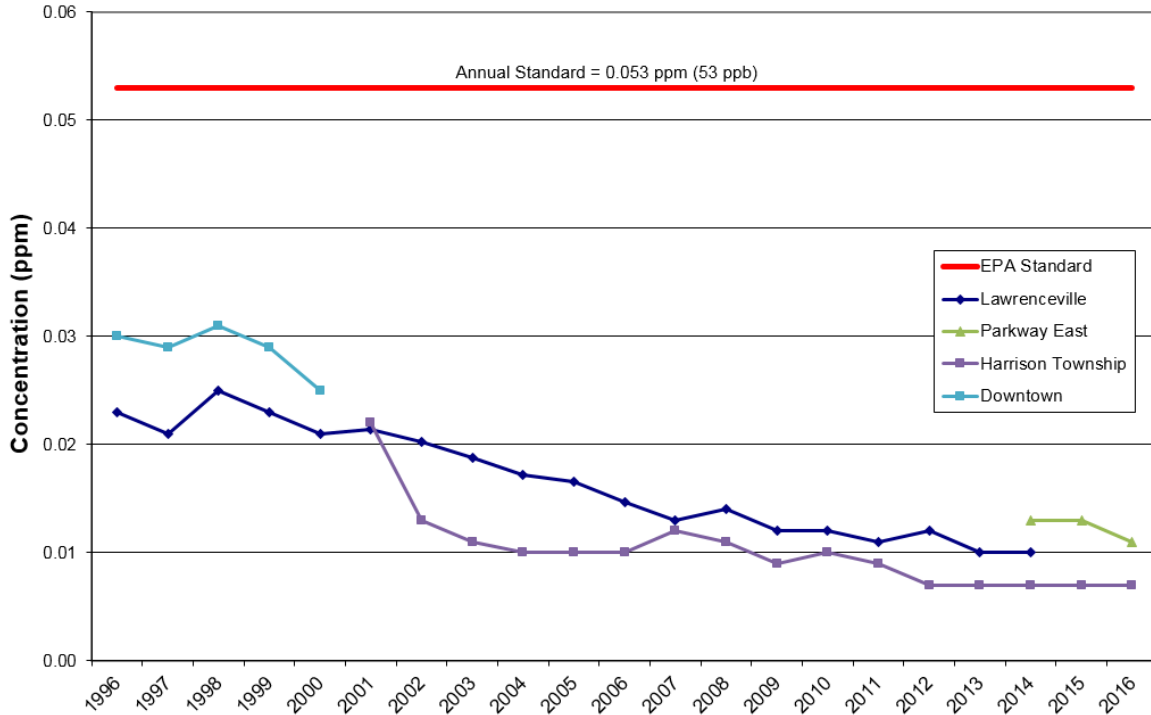
Note: Parkway East 2013-2015 98th percentile is a two year 98th percentile for 2014 and 2015.

Long-term trends for NO₂ annual averages are shown on the following page for 1996-2016.



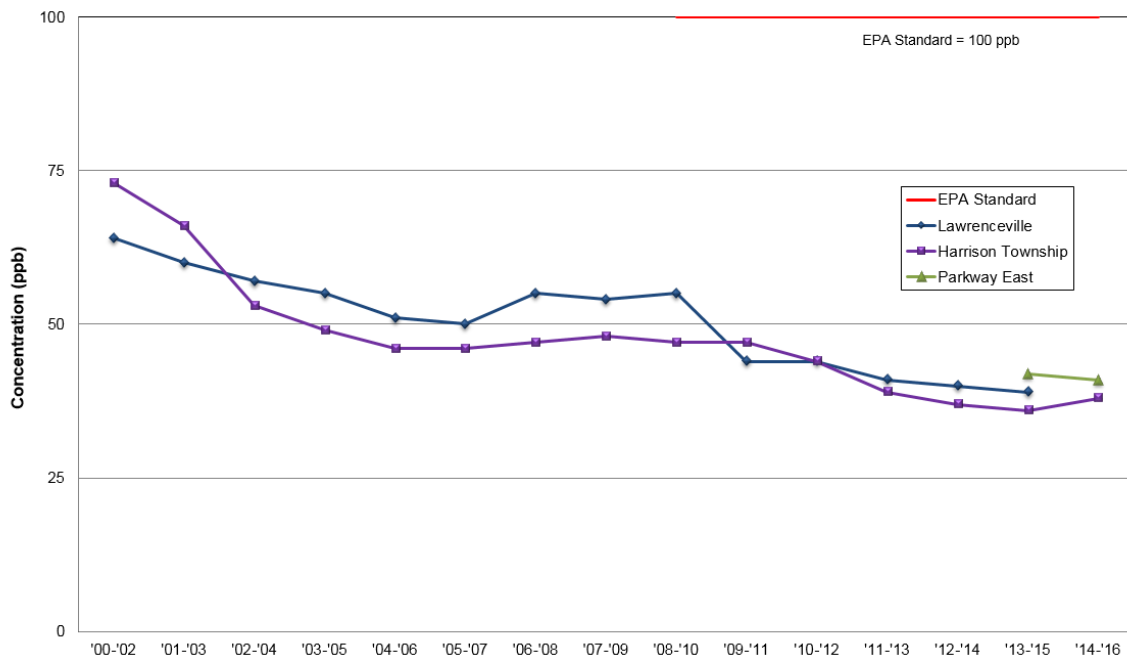
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Nitrogen Dioxide Annual Averages, 1996-2016



NO₂ one-hour design value trends are shown below for 2000-2016.

Nitrogen Dioxide 1-HR Design Values, 2000 to 2016



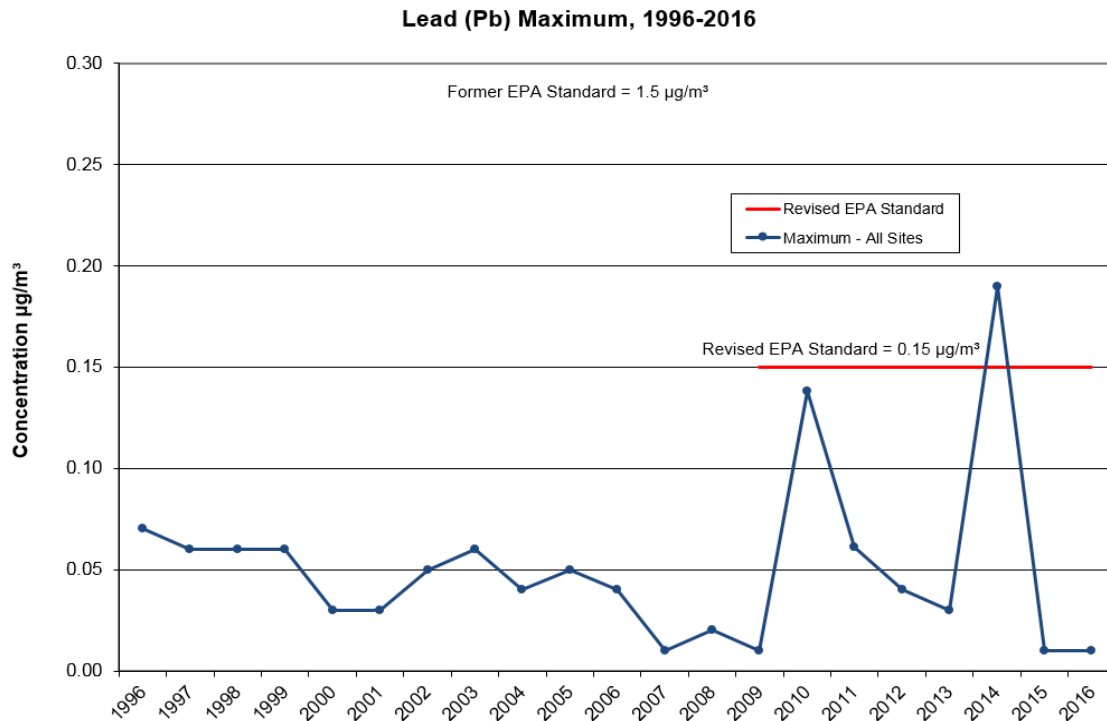


G. Lead (Pb)

Lead is analyzed at the laboratory from the two TSP filter sites in the network. The federal standard was 1.5 $\mu\text{g}/\text{m}^3$ on a quarterly average basis; however, in 2009 the federal standard was changed to 0.15 $\mu\text{g}/\text{m}^3$ on a 3-month rolling average basis at local conditions. 2016 3-month rolling average maximums are shown in the table below, with 2015 3-month rolling average maximums shown in gray. Exceedances in 2016 are shown in red. Both Bridgeville and Natrona started operation in 2010. The Avalon monitor was moved to Lawrenceville the second quarter of 2011. The Natrona monitor was discontinued yearend 2014.

Site	3-Month Average Std. = 0.15 $\mu\text{g}/\text{m}^3$	
	2015 3-Month Average Maximum	2016 3-Month Average Maximum
Bridgeville	0.011	0.010
Lawrenceville	0.008	0.009

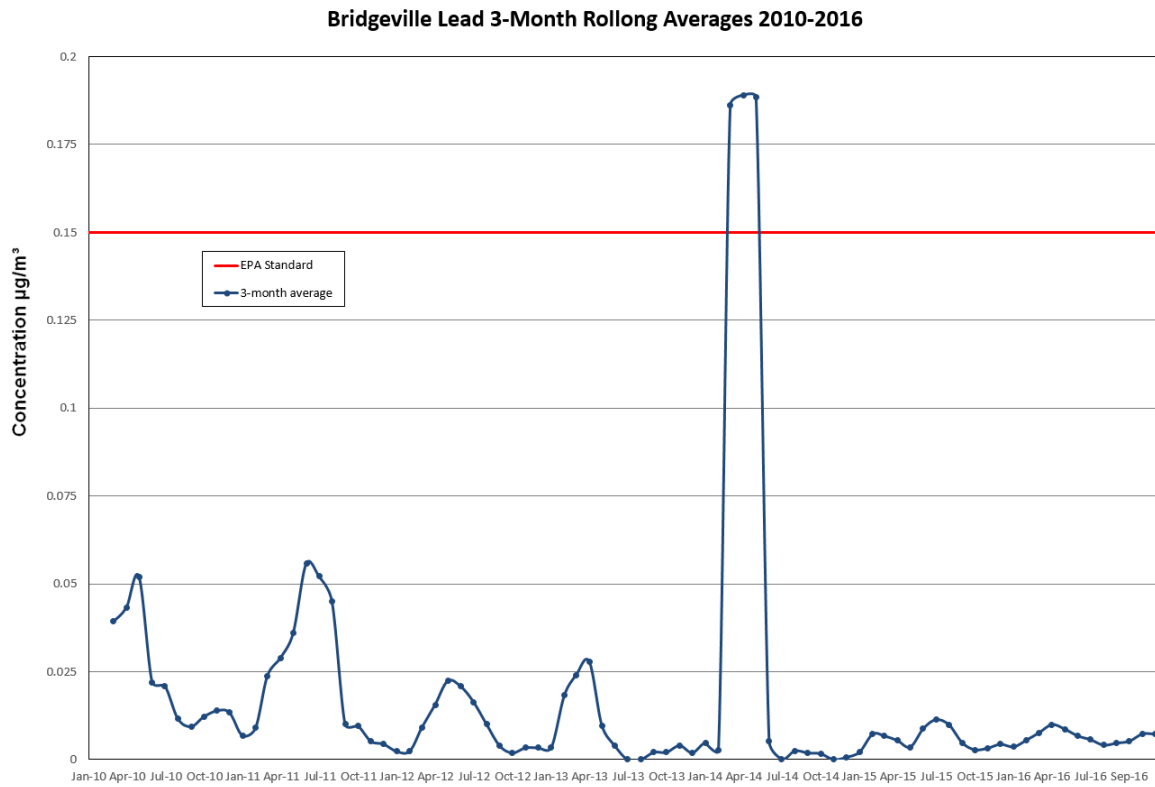
Below is a chart showing 1996-2016 trends of the quarterly or 3-month average maximum lead concentration per year. Several sites have monitored lead since 1986; the maximum concentration from all sites is shown for each given year. 2008 and prior years are quarterly maximums, while 2009 and future years are maximum 3-month averages.





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Below is a chart showing the 3-month rolling average for Bridgeville. Note the month at the bottom of the chart represents the last month in the 3-month rolling average. For example, January 2011 represents the 3-month average of November 2010, December 2010, and January 2011.





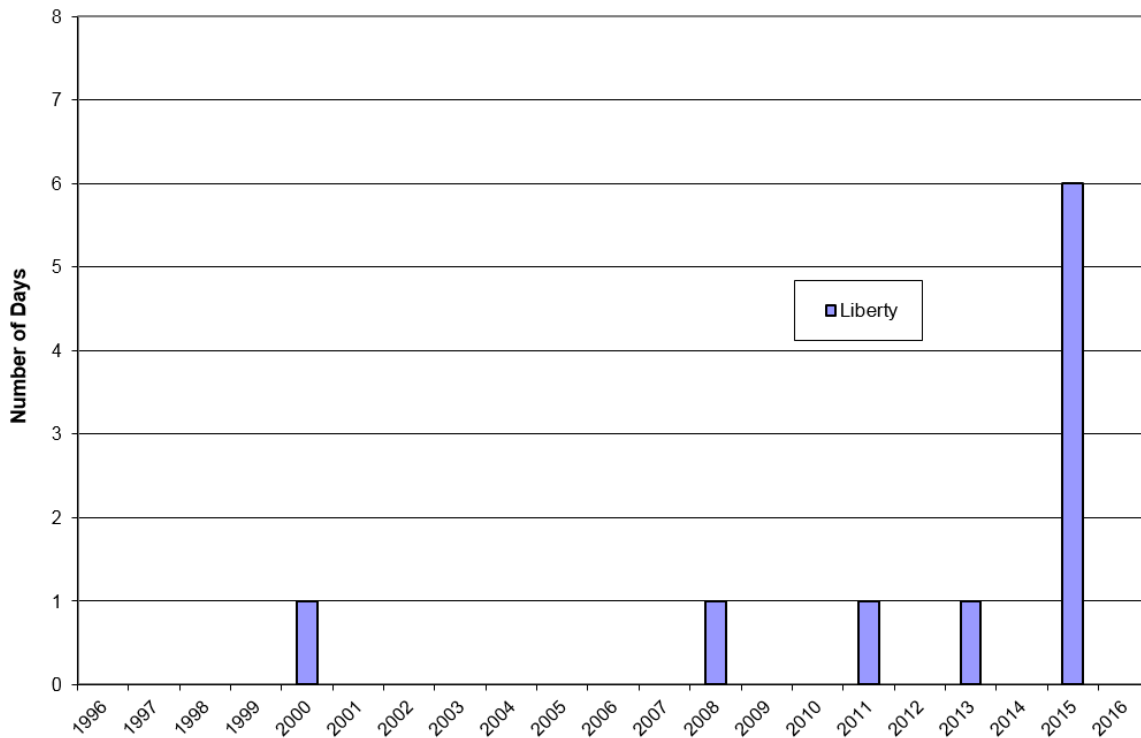
H. Hydrogen Sulfide (H₂S)

There are no federal standards for hydrogen sulfide. However, PA state standards for protection against odor nuisances are 0.1 ppm on a 1-hour basis and 0.005 ppm on a 24-hour average basis.

Hydrogen sulfide 1-hour concentrations for 2016 are given in the table below, with 2015 values shown in gray. 2016 1-hour concentrations that exceeded the standard are shown in red. Long-term exceedances for 1996-2016 are also given in the chart below. Liberty exceeded the 1-hour PA standard six times in 2015. The West Allegheny monitor started operation in May 2009 and was discontinued on 8/29/2014.

	1-Hour PA Standard = 0.1 ppm			
Site	2015 1-Hour Maximum	2016 1-Hour Maximum	2015 Exceedances	2016 Exceedances
Liberty	0.140	0.074	6	0
Avalon	0.016	0.013	0	0

Hydrogen Sulfide 1-Hour Exceedances, 1996-2016



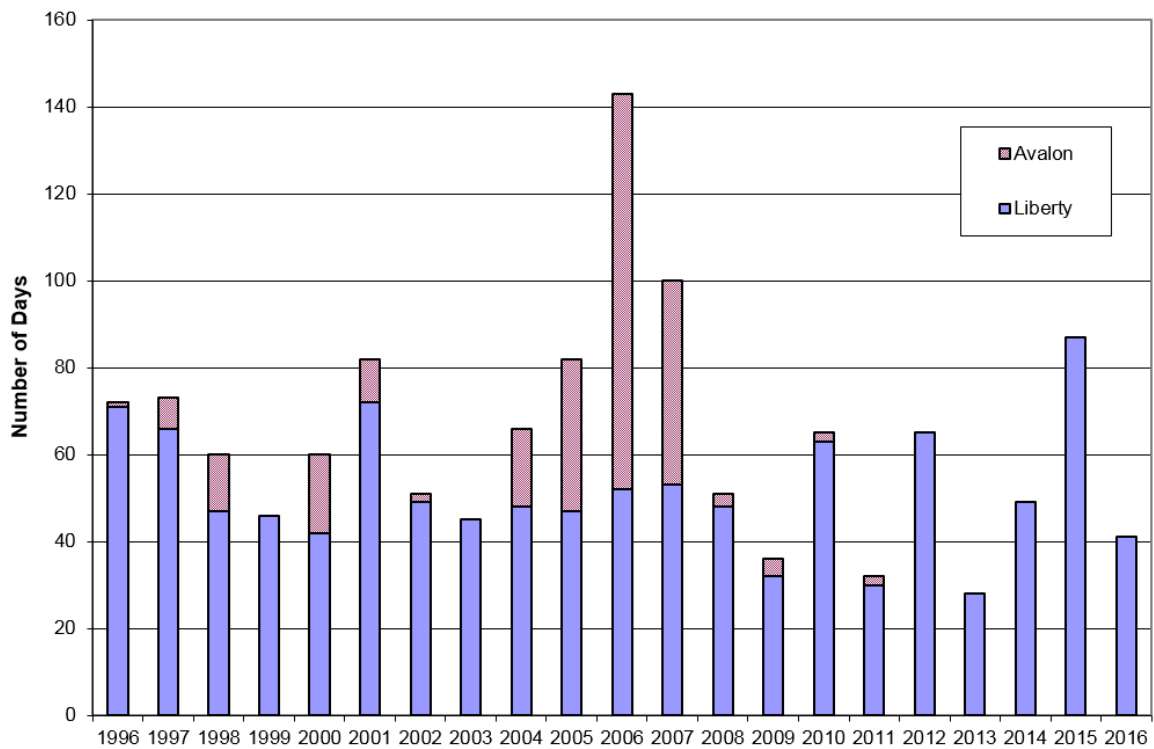


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Hydrogen sulfide 24-hour concentrations and exceedances for 2016 are next given in the following table, with 2015 values shown in gray. Long-term exceedances for 1996-2016 are also given in the chart below. Exceedances for 2016 are shown in red. Each exceedance constitutes a violation of the state H₂S standards.

	24-Hour PA Standard = 0.005 ppm			
Site	2015 24-Hour Maximum	2016 24-Hour Maximum	2015 Exceedances	2016 Exceedances
Liberty	0.027	0.017	87	41
Avalon	0.003	0.003	0	0

Hydrogen Sulfide 24-Hour Exceedances, 1996-2016





I. Dustfall

Dustfall (or total settled particulates) is more of a nuisance than a health hazard, in that the particles are too large to be inhaled into the respiratory system.

PA state standards for protection against dust nuisances are 23 tons/mile²/month on an annual average basis and 43 tons/mile²/month on a monthly basis.

Annual averages, monthly maximums, and exceedances for 2016 are shown in the table below, with 2015 values shown in gray. Exceedances for 2016 are shown in red. Each exceedance constitutes a violation of the state dustfall standards.

Only Collier, Natrona 8, and Natrona 9 dustfall collectors are in operation for 2009 and future years. North Braddock, Neville, Neville 2 and Forward dustfall collectors were discontinued year end 2008.

Site	Annual PA Standard = 23 tons/mile ² /month		Monthly PA Standard = 43 tons/mile ² /month		Monthly Exceedances	
	2015 Average	2016 Average	2015 Monthly Maximum	2016 Monthly Maximum	2015 Exceedances	2016 Exceedances
Natrona 9	19	20	31	35	0	0
Natrona 8	11	13	22	31	0	0
Collier	11	11	16	22	0	0



J. Benzo(a)pyrene (B(a)P)

Benzo(a)pyrene, or B(a)P, is a known carcinogen. There are no federal or state ambient standards for B(a)P.

24-hour maximums and annual averages for B(a)P in 2016 are shown below, with 2015 values shown in gray. Liberty typically shows the highest concentrations of B(a)P in Allegheny County.

No Ambient Standard				
<i>Concentrations given in ng/m³*</i>				
Site	2015 24-Hour Maximum	2016 24-Hour Maximum	2015 Average	2016 Average
Liberty	155	183	21	26
Avalon	3	2	1	0
South Fayette	4	2	0	0

Note: Nanograms/cubic meter (ng/m³) represents a smaller quantity than micrograms/cubic meter (µg/m³). There are 1000 nanograms in a microgram. Concentrations for B(a)P may therefore appear much greater than those for other compounds.



K. Hazardous Air Pollutants (HAPs)

Hazardous Air Pollutants (HAPs), or air toxics, are a group of 187 EPA-classified pollutants that can cause cancer or other serious health effects or adverse environmental and ecological effects. HAPs are sampled by various methods at several locations in the county. HAPs are not criteria pollutants, and there are no federal ambient standards for these compounds.

HAPs monitoring methods and locations are summarized below:

Canister Toxics

SUMA canisters are in operation at Flag Plaza, Avalon, Stowe, and South Fayette. Canister concentrations represent 24-hour samples, collected every six days, which are analyzed at an out-of-County lab (Maryland). Canister toxics monitoring at Flag Plaza has been in operation for several years, while monitoring at Avalon, Stowe, and South Fayette is part of an ACHD in-house air toxics study started in 2006 and discontinued year end 2007.

Cartridge Toxics

Cartridge (carbonyl) monitoring is conducted at all the canister sites at every-six-day intervals, and samples are analyzed at an out-of-County lab (Philadelphia). Cartridge toxics monitoring at Flag Plaza has been in operation for several years, while monitoring at Avalon, Stowe, and South Fayette is part of an ACHD in-house air toxics study started in 2006 and discontinued year end 2007.

Benzene

The HAP compound benzene was measured continuously at Liberty through 2013. ACHD started monitoring benzene at Liberty in January and Avalon in April of 2014 using charcoal tubes on a 24-hour basis. However, the benzene monitor was inoperative in most of 2006 and 2007.

Results from the various techniques and sites are given below and on the following pages. Several additional compounds that are analyzed simultaneously with the canister and cartridge samples, but are not classified as HAPs, are also provided.



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Flag Plaza - Canister and Cartridge

Annual averages and 24-hour maximums for Flag Plaza canister and cartridge HAPs in 2016 are shown below, with 2015 values shown in gray. Several years of toxics data are available for Flag Plaza, and multi-year trends for selected compounds may be included in future reports.

Notes: Concentrations are given below in units of parts-per-billion (ppb) by volume; one ppb is equal to 1/1000th parts-per-million (ppm) by volume.

Flag Plaza				
HAP	2015 Average (ppb)	2015 24-Hour Maximum (ppb)	2016 Average (ppb)	2016 24-Hour Maximum (ppb)
Carbon disulfide	0.00	0.00	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) [†]	0.14	0.76	0.11	0.16
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114) [†]	0.04	0.17	0.02	0.05
Ethyl acetate [†]	--	--	--	--
1,3-Butadiene	0.02	0.18	0.05	0.13
Hexane	0.17	1.00	0.18	0.71
Heptane [†]	0.11	0.47	0.14	0.52
Cyclohexane [†]	0.02	0.19	0.07	0.64
Isopropyl alcohol [†]	--	--	--	--
Methyl tert-butyl ether (MTBE, 2-methoxy-2-methyl-Propane)	0.00	0.00	0.00	0.02
Acetone ^{*†}	1.57	3.62	1.42	3.33
Methyl ethyl ketone (MEK, 2-Butanone) [*]	0.35	0.71	0.31	0.88
Methyl butyl ketone (2-Hexanone) [†]	0.01	0.08	--	--
Methyl isobutyl ketone (MIK, 4-Methyl-2-pentanone) [*]	0.03	0.34	0.02	0.10
Chloromethane	0.64	0.82	0.73	0.94
Methylene chloride (Dichloromethane)	0.13	0.66	0.15	0.39
Chloroform	0.07	2.00	0.05	0.39
Carbon tetrachloride	0.09	0.11	0.10	0.11
Bromoform (Tribromomethane)	0.00	0.00	--	--
Trichlorofluoromethane (Freon 11) [†]	0.28	0.36	0.30	0.47
Chloroethane	0.00	0.10	--	--
1,1-Dichloroethane	0.00	0.00	--	--
1,1,1-Trichloroethane (Methyl chloroform)	0.01	0.05	0.02	0.04
1,2-Dichloroethane (Ethylene dichloride)	0.00	0.00	0.02	0.06
Tetrachloroethylene	0.02	0.14	0.03	0.14
1,1,2,2-Tetrachloroethane	0.00	0.01	0.00	0.02
Bromomethane	0.00	0.00	--	--
1,1,2-Trichloroethane	0.00	0.00	--	--
Dichlorodifluoromethane (Freon 12) [†]	0.55	0.75	0.55	0.74
Trichloroethene (-ethylene, TCE)	0.00	0.09	0.01	0.05



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Flag Plaza				
HAP	2015 Average (ppb)	2015 24-Hour Maximum (ppb)	2016 Average (ppb)	2016 24-Hour Maximum (ppb)
1,1-Dichloroethylene (-ethene, DCE, Vinylidene chloride)	0.00	0.00	--	--
Bromodichloromethane [†]	0.00	0.00	--	--
1,2-Dichloropropane	0.00	0.02	0.01	0.03
trans-1,3-Dichloro-1-propene (-propylene)	0.00	0.01	0.00	0.03
cis-1,3-Dichloro-1-propene (-propylene)	0.00	0.02	0.00	0.02
Dibromochloromethane [†]	0.00	0.00	--	--
trans-1,2-Dichloroethene [†]	0.00	0.00	--	--
cis-1,2-Dichloroethene [†]	0.00	0.00	--	--
1,2-Dibromoethane (Ethylene dibromide)	0.00	0.00	0.00	0.04
Hexachloro-1,3-butadiene (Hexachlorobutadiene)	0.00	0.00	--	--
Chloroethene (Vinyl chloride)	0.00	0.04	0.01	0.04
m & p- Xylene	0.14	0.43	0.15	1.09
Benzene	0.79	1.95	0.72	2.80
Toluene	0.42	1.69	0.48	2.88
Ethylbenzene	0.04	0.14	0.06	0.34
o-Xylene	0.05	0.15	0.06	0.37
1,3,5-Trimethylbenzene [†]	0.00	0.03	0.04	1.00
1,2,4-Trimethylbenzene [†]	0.04	0.17	0.13	3.08
1-Ethyl-4-methylbenzene (4-Ethyltoluene) [†]	0.01	0.09	0.05	0.62
Styrene	0.02	0.17	0.08	0.41
Chlorobenzene	0.00	0.01	0.01	0.06
1,2-Dichlorobenzene [†]	0.00	0.00	--	--
1,3-Dichlorobenzene [†]	0.00	0.00	--	--
1,4-Dichlorobenzene	0.00	0.02	0.03	0.21
Benzyl chloride	--	--	--	--
1,2,4-Trichlorobenzene	0.00	0.00	--	--
1-Bromopropane (<i>n</i> -propylbromide, nPB)	0.01	0.04	--	--
Tetrahydrofuran [†]	0.01	0.09	0.05	0.12
Acetaldehyde*	0.91	1.86	0.86	2.05
Acrolein*	0.03	0.09	0.03	0.10
Formaldehyde*	1.99	4.76	1.96	4.47
Propionaldehyde*	0.16	0.32	0.15	0.40
Benzaldehyde* [†]	0.13	0.42	0.06	0.15
Acrylonitrile	--	--	--	--
Acetonitrile	--	--	--	--

*Value measured by cartridge (carbonyl) method. All other values are as measured by SUMA canister.

[†]Compound is not an official EPA-classified HAP.

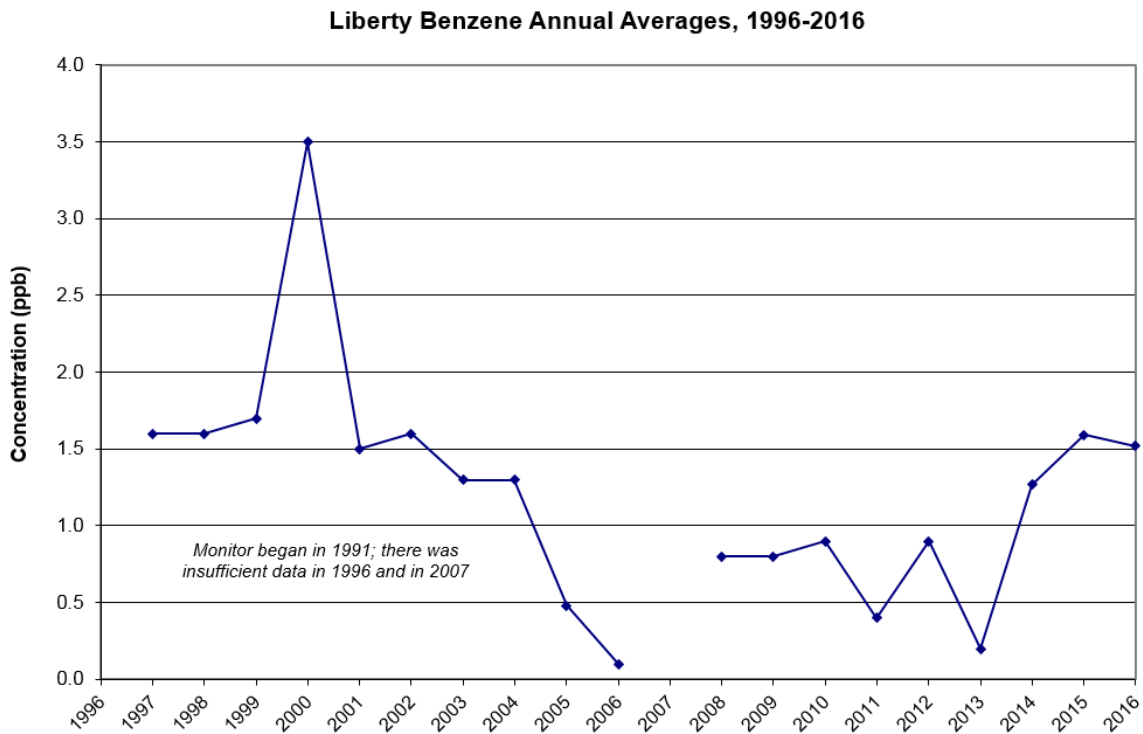


Benzene

Additionally, benzene was measured continuously at Liberty through 2013. ACHD started monitoring benzene at Liberty in January and Avalon in April of 2014 using charcoal tubes on a 24-hour basis. The annual average and 24-hour maximum for benzene in 2016 are shown below, with 2015 values shown in gray.

Site	2015 Average (ppb)	2015 24-Hour Maximum (ppb)	2016 Average (ppb)	2016 24-Hour Maximum (ppb)
Liberty	1.59	11.54	1.52	10.40
Avalon	0.27	1.43	0.10	1.24

A chart showing Liberty benzene annual averages for 1996-2016 is shown below. The continuous monitor began operation in 1991 and was not operational in 1996, most of 2006, 2007, and portions of 2011, 2012 and 2013.





4. Short-Term Exceedances

Exceedances of the federal short-term primary standards are listed below for the years 2001 through 2016 for each standard. Exceedances are given by year, site, number of exceedances, and maximum concentration.

Standard	Year	Site	Number of Exceedances	Maximum Concentration
24-Hour PM _{2.5} 65 µg/m ³	2001	Liberty	5	99 µg/m ³
	2002	Liberty	1	70 µg/m ³
	2003	Liberty	9	102 µg/m ³
	2004	Liberty	7	94 µg/m ³
	2005	Liberty	10	100 µg/m ³
	2006	Liberty	3	101 µg/m ³
35 µg/m ³	2007	Liberty	46	61.7 µg/m ³
	2007	Lawrenceville	12	50.7 µg/m ³
	2007	N. Braddock	6	50.0 µg/m ³
	2007	Harrison	5	51.8 µg/m ³
	2007	South Fayette	4	43.6 µg/m ³
	2007	Moon	1	40.7 µg/m ³
	2007	Clairton	1	40.4 µg/m ³
	2007	North Park	1	39.6 µg/m ³
	2008	Liberty	31	70.8 µg/m ³
	2008	N. Braddock	4	38.4 µg/m ³
	2008	Harrison	2	41.3 µg/m ³
	2008	Clairton	1	40.6 µg/m ³
	2008	Lawrenceville	1	39.7 µg/m ³
	2009	Liberty	12	92.1 µg/m ³
	2009	Harrison	1	43.5 µg/m ³
	2010	Liberty	25	69.9 µg/m ³
	2010	N. Braddock	3	40.6 µg/m ³
	2010	Lawrenceville	2	41.5 µg/m ³
	2010	Harrison	2	39.7 µg/m ³
2010	Clairton	1	37.0 µg/m ³	
2011	Liberty	10	59.0 µg/m ³	
2011	Avalon	1	35.6 µg/m ³	
2011	N. Braddock	1	35.5 µg/m ³	
2012	Liberty	9	54.7 µg/m ³	
2013	Liberty	6	43.6 µg/m ³	



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Standard	Year	Site	Number of Exceedances	Maximum Concentration
	2014	Liberty	4	63.8 µg/m ³
	2015	Liberty	7	58.1 µg/m ³
	2016	Liberty	13	56.0 µg/m ³
24-Hour PM ₁₀	2004	Lincoln	1	162 µg/m ³
150 µg/m ³	2005	Lincoln	1	157 µg/m ³
8-Hour Ozone	2001	Harrison	8	0.101 ppm
0.08 ppm	2001	Lawrenceville	4	0.095 ppm
	2001	South Fayette	7	0.098 ppm
	2002	Harrison	14	0.105 ppm
	2002	Lawrenceville	16	0.107 ppm
	2002	South Fayette	17	0.110 ppm
	2003	Harrison	2	0.121 ppm
	2003	Lawrenceville	5	0.122 ppm
	2003	South Fayette	4	0.111 ppm
	2004	South Fayette	1	0.089 ppm
	2005	Harrison	6	0.107 ppm
	2005	Lawrenceville	1	0.085 ppm
	2005	South Fayette	4	0.103 ppm
	2006	Harrison	4	0.093 ppm
	2006	Lawrenceville	2	0.086 ppm
	2006	South Fayette	1	0.087 ppm
	2007	Harrison	4	0.099 ppm
	2007	Lawrenceville	3	0.092 ppm
	2007	South Fayette	1	0.087 ppm
0.075 ppm	2008	Harrison	10	0.091 ppm
	2008	Lawrenceville	7	0.084 ppm
	2008	South Fayette	3	0.079 ppm
	2009	Harrison	6	0.084 ppm
	2009	Lawrenceville	1	0.077 ppm
	2010	Harrison	6	0.105 ppm
	2010	Lawrenceville	7	0.087 ppm
	2010	South Fayette	5	0.089 ppm



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Standard	Year	Site	Number of Exceedances	Maximum Concentration
8-Hour Ozone 0.075 ppm	2011	Harrison	10	0.085 ppm
	2011	Lawrenceville	3	0.095 ppm
	2011	South Fayette	6	0.086 ppm
	2012	Harrison	16	0.094 ppm
	2012	Lawrenceville	7	0.089 ppm
	2012	South Fayette	6	0.085 ppm
	2013	Harrison	4	0.085 ppm
	2013	Lawrenceville	1	0.095 ppm
	2013	South Fayette	2	0.089 ppm
	2014	Harrison	2	0.076 ppm
	2015	Harrison	2	0.084 ppm
	0.070 ppm	2016	Harrison	1
2016		Lawrenceville	3	0.077 ppm
2016		South Fayette	4	0.081 ppm
1-Hour Ozone 0.12 ppm	2003	Lawrenceville	1	0.130 ppm
	2003	South Fayette	1	0.132 ppm
1-Hour SO ₂ 75 ppb	2010	Liberty	34	215 ppb
	2010	South Fayette	1	108 ppb
	2010	Avalon	2	97 ppb
	2010	Stowe Township	3	93 ppb
	2011	Liberty	45	450 ppb
	2012	Liberty	43	199 ppb
	2013	Liberty	9	99 ppb
	2013	Lawrenceville	2	100 ppb
	2014	Liberty	14	122 ppb
	2014	North Braddock	5	126 ppb
	2015	Liberty	17	244 ppb
	2015	North Braddock	1	80 ppb
	2016	Liberty	4	171 ppb



5. Air Quality Index

The Air Quality Index (AQI) is a method of quantifying air quality on any given day according to the highest measurements. EPA's AQI scale is shown below:

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>...air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

The Pennsylvania Department of Environmental Protection (PA DEP) forecasts daily AQI levels for PM_{2.5} (year-round) and for ozone (March through Oct.) for Southwestern Pennsylvania.

Allegheny County AQI levels based upon actual monitored results for 2001-2016 are shown in the table below, by number of days.

Year	<i>Good Days</i>	<i>Moderate Days</i>	<i>Unhealthy for Sensitive Groups Days</i>	<i>Unhealthy Days</i>
2001	123	192	45	5
2002	144	172	44	5
2003	156	172	28	9
2004	141	182	36	7
2005	136	182	36	11
2006	156	173	32	4
2007	136	174	47	8
2008	187	157	20	2
2009	214	136	14	1
2010	146	163	48	8



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Year	<i>Good Days</i>	<i>Moderate Days</i>	<i>Unhealthy for Sensitive Groups Days</i>	<i>Unhealthy Days</i>
2011	176	156	30	3
2012	136	183	46	1
2013	175	175	15	0
2014	169	179	16	1
2015	166	181	16	2
2016	177	168	20	1

The Unhealthy for Sensitive Groups range represents an exceedance level for criteria pollutants.

In Allegheny County, unhealthy days can occur during different air quality scenarios. Elevated PM_{2.5} days can be either widespread or localized and can also coexist with elevated ozone concentrations in summer months.

Days in the unhealthy ranges are shown below for 2016, broken down by air quality scenario.

2016 Unhealthy Scenarios	<i>Unhealthy for Sensitive Groups Days</i>	<i>Unhealthy Days</i>
Elevated PM _{2.5} - Liberty Only	12	1
Elevated PM _{2.5} - Widespread	0	0
Elevated Sulfur Dioxide Only	1	0
Elevated Ozone Only	7	0
Elevated PM _{2.5} with Elevated Sulfur Dioxide	0	0
Elevated PM _{2.5} with Elevated Ozone	0	0
Elevated Ozone with Elevated Sulfur Dioxide	0	0
Elevated PM _{2.5} , Elevated Ozone and Elevated Sulfur Dioxide	0	0



6. Pollutants, Sources, and Health Effects

EPA promulgated the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants. In addition, the State of Pennsylvania has also adopted standards for hydrogen sulfide (H₂S) and dustfall (total settled particulate matter). The Clean Air Act also defines Hazardous Air Pollutants (HAPs) but does not address specific ambient limits for these compounds.

<i>Pollutant</i>	<i>Primary Sources</i>	<i>Health Effects</i>
<u><i>Criteria Pollutants</i></u>		
Ozone – O ₃ (colorless gas)	Formed in hot, sunny conditions from vehicle, commercial, and industrial emissions	Respiratory problems; eye, nose, and throat irritation
Particulate Matter – PM (solid or liquid particles)	Coke plants, steel mills, power plants, road dust, vehicles	Respiratory problems; small particles may also aggravate heart conditions
Sulfur Dioxide – SO ₂ (colorless gas)	Power plants, coke plants	Respiratory problems
Carbon Monoxide – CO (colorless, odorless gas)	Motor vehicles, especially congested areas	Heart or lung disease; headache; fatigue; impaired reflexes and alertness
Nitrogen Dioxide – NO ₂ (colorless, odorless gas)	Power and industrial plants, motor vehicles	Respiratory problems; eye irritation
Lead – Pb (in particulates)	Incinerators, glass making, metallurgical facilities	Headache; fatigue; sleep and digestive disorders



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<i>Pollutant</i>	<i>Primary Sources</i>	<i>Health Effects</i>
	<u><i>Other</i></u>	
Hydrogen Sulfide – H ₂ S (colorless, pungent gas)	Coke plants, waste treatment plants	Respiratory problems; eye irritation; malodorous
HAPs (often carcinogens)	Various, including motor vehicles, chemical and power plants, steel mills, dry cleaners, print shops	Can be carcinogenic; can cause birth defects
Benzo(a)pyrene – B(a)P	Coke plants	Carcinogen



7. Air Monitoring Network

Below is a table of monitor sites corresponding to pollutant types, current through 2016. Meteorological monitors (wind and temperature) are also included.

	SO ₂	CO	NO _x	O ₃	PM ₁₀	PM _{2.5}	Pb	H ₂ S	HAPs	Dustfall	Met
Flag Plaza		C			C				I(6), I(6)		
Manchester					I(6)						
Lawrenceville	C(T)	C(T)		C		C, I(1) I(6) SPC(3)	I(6) I(6)		I		C
North Park						I(6)					
Avalon	C				I(6)	I(3)		C	I		C
Bridgeville							I(3)				
Harrison			C	C		I(3)					
Natrona										I, I	
N. Braddock	C				C	I(3)					C
Liberty	C				C, I(3) I(6)	C, I(1) I(6) SPC(6)		C	I		C
Glassport					C						
Lincoln					C						
Clairton					I(6)	I(6)					
South Fayette	C			C(S)	I(6)	I(3)					C
Collier										I	
Parkway East		C(T)	C(T)			C			BC		C
Total	C = 5	C = 3	C = 2	C = 3	C = 5 I = 6	C = 3 I = 10 SPC = 2	I = 3	C = 2	C = 1 I = 5	I = 3	C = 6

KEY C = Continuous; I = Intermittent or Filter-Based; BC = Black Carbon (Aethalometer, Continuous data)
 (1), (3), or (6) = Sampling Frequency [for example, (3) means every third day]
 SPC = Speciation; (S) = Seasonal Continuous Monitor; (T) = Trace Level Monitor



Additional Information

For more information concerning Allegheny County air quality data, contact the ACHD Air Quality Program, Planning and Data Analysis Section, at 412-578-8120, or at Shaun.Vozar@AlleghenyCounty.US.

For information concerning Pennsylvania Air Quality, visit: www.dep.state.pa.us/dep/deputate/airwaste/ag/default.htm.

For information about national air quality, visit EPA's website: www.epa.gov.

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