ALLEGHENY COUNTY HEALTH DEPARTMENT

AIR QUALITY ANNUAL REPORT 2021

ALLEGHENY COUNTY HEALTH DEPARTMENT AIR QUALITY ANNUAL REPORT, 2021

A publication of the
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Annual Report for 2021
with 2001-2021 Trends

April 2023

ACHD Mission
Protect, promote, and preserve the health and well-being of all Allegheny County residents, particularly the most vulnerable.

Pictured on the front cover…

A picture of a spectrometer that is designed to specifically look at levels of ozone, nitrogen dioxide and formaldehyde in the atmosphere. The ACHD Air Quality Program is operating this instrument as part of the NASA Pandora Project. This project uses spectroscopy to study ultraviolet (UV) and visible wavelengths of light to determine the composition of the atmosphere.

Below is a map of all monitoring locations in 2021. Downtown Pittsburgh comprises the Flag Plaza site.

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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 2021.

For comparison to previous years, this report also provides 2020 data and twenty-year trends. For pollutant standards that require averages over consecutive years, multi-year averages are also given. Multi-year values were 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 were calculated as such.

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

Official validated pollutant 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 2021 air quality data was submitted for certification in mid-2022.

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

Unofficial Air Quality Index (AQI) levels are also available hourly for SO_2, ozone and $PM_{2.5}$ that are continuously monitored, via the Allegheny County website: https://alleghenycounty.us/hd/AQIReport.XLS.

1. Executive Summary

All exceedances of the short-term standards in 2021 are shown in the table on the next page. All other criteria pollutants were below the annual and short-term federal standards in 2021.

Ozone: The County recorded one exceedance day for 8-hour ozone in 2021. The ACHD monitors showed attainment of the 8-hour standard of 0.070 ppm for the fifth time in six years (2015-2021). The 2016-2018 average concentration for the South Fayette monitor was 0.071 ppm. The 4th maximum concentration for 2019-2021 was 0.066 ppm.

$PM_{2.5}$: For particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), none of the eight monitoring sites was above the annual standard of 12.0 µg/m³ (micrograms/cubic meter): Liberty was 11.2 µg/m³ for the years 2019-2021.

In 2021, the Liberty FRM (Federal Reference Method) $PM_{2.5}$ monitor exceeded the 24-hour standard of 35 µg/m³ four times, leading to a 98th-percentile value of 30.4 µg/m³. Data from the Liberty $PM_{2.5}$ monitor in Allegheny County met attainment of this standard for the past four 3-year periods.

SO_2: The 1-hour federal standard of 75 ppb was promulgated in 2010 for SO_2. 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. Data from all ACHD monitors show attainment of the federal standard for the first time at yearend 2021.

NO_2: The 1-hour federal standard of 100 ppb was promulgated in 2010 for NO_2. 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. Data from all ACHD monitors show attainment of the federal standard.

In the following table, ozone short-term exceedances are for the 8-hour standard, the $PM_{2.5}$ short-term exceedances are for the 24-hour standard and the SO_2 short-term exceedances are for the 1-hour standard.

2021 Exceedances of the Short-Term Federal Standards

Pollutant	Site	Date	Concentration	Standard
Ozone	Harrison	8/24/2021	0.072 ppm	0.070 ppm
$PM_{2.5}$	Parkway East	2 Days	Max = 59.1 µg/m³	35 µg/m³
$PM_{2.5}$	Liberty	4 Days	Max = 51.5 µg/m³	35 µg/m³
$PM_{2.5}$	Lawrenceville	2 Days	Max = 46.7 µg/m³	35 µg/m³
$PM_{2.5}$	Avalon	1 Days	Max = 38.0 µg/m³	35 µg/m³

2. Attainment of the Federal Standards

8-Hour Ozone

Allegheny County and the surrounding six counties of the Pittsburgh-Beaver Valley Area were designated nonattainment of the previous 1997 and 2008 standards (0.08 ppm and 0.075 ppm, respectively) for 8-hour ozone. The Pittsburgh-Beaver Valley Area has since been in attainment of these standards. For the 1997 standard the EPA used the 2009-2011 values to determine attainment on May 6, 2013, and for the 2008 standard the EPA used the 2013-2015 values to determine attainment on January 5, 2017. Allegheny County and surrounding counties have not been designated under the 2015 standard (0.070 ppm). The monitor at Harrison had the highest 3-year average of 0.068 ppm for 2018-2020 in the area. The monitor at South Fayette had the highest ozone levels in Allegheny County for 2019-2021 at 0.066 ppm. Allegheny County is in attainment of the current 8-hour ozone standard of 0.070 ppm at all sites based on 2019-2021 data.

$PM_{2.5}$

For the 1997 and 2006 standards, Allegheny County had been designated nonattainment for $PM_{2.5}$ as part of a multi-county Pittsburgh-Beaver Valley Area. Additionally, a five-municipality Liberty-Clairton Area was designated nonattainment as a separate area within Allegheny County. These areas have since been in attainment of these standards. In 2015, Allegheny County was designated a nonattainment area for the 2012 standards, and a State Implementation Plan (SIP) was developed for the attainment of this standard to demonstrate attainment by the end of 2021. Monitored results for 2019-2021 show levels of attainment county-wide for the annual standard of 12.0 $\mu g/m^3$.

SO_2

The County has monitored attainment for the annual and 24-hour SO_2 standards for 22 consecutive years. In 2013, EPA designated a 22-municipality nonattainment area in the Monongahela Valley region of Allegheny County for the 2010 1-hour standard of 75 ppb, and a SIP has been developed for this area. The Liberty monitor is in attainment of the standard, with 2019-2021 results showing a 3-year average of
59 ppb.

Other Criteria Pollutants

For *PM_{10}* the County has monitored attainment for 27 consecutive years. EPA redesignated Allegheny County to attainment for PM_{10} in 2003.

For *1-hour ozone*, the County has monitored attainment for 24 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 34 consecutive years. EPA redesignated Allegheny County to attainment for CO in 2003.

For *NO_2*, the County has monitored attainment for more than 35 consecutive years and has been in attainment since the announcement of the standard.

For *Lead (Pb)*, in 2014 the County had monitored nonattainment for the first time in more than 25 years for the 0.15 $\mu g/m^3$ rolling 3-month average. The County has monitored attainment in 2015, 2016 and 2017.

3. Air Monitoring Results

A. Ozone (O_3)

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. Since 2016, the ozone season for Allegheny County extends from March 1 through October 31.

There was one exceedance day overall for 8-hour ozone in 2021. That day included an exceedance at only one monitor, Harrison Township.

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.

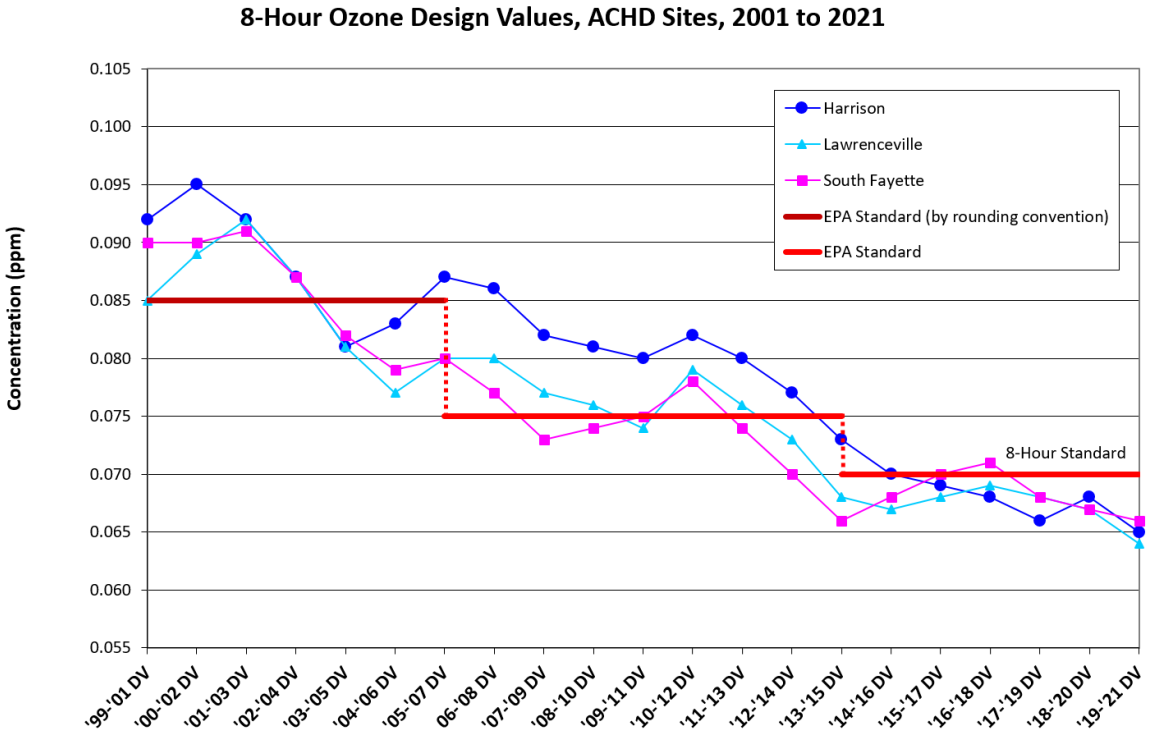
8-Hour Ozone Concentrations

Maximum 8-hour ozone concentrations and exceedance days are given below for 2021, with exceedance concentrations and days shown in red. The 2020 values are shown in gray for comparison.

8-Hour Standard = 0.070 ppm						
Site	2020 8-Hour Maximum (ppm)	**2021 8-Hour Maximum (ppm)**	2020 Exceedance Days	**2021 Exceedance Days**	2018-2020 8-Hour 3-Yr. Avg. of 4th Max. (ppm)	**2019-2021 8-Hour 3-Yr. Avg. of 4th Max. (ppm)**
South Fayette	0.071	0.070	2	0	0.067	0.066
Harrison	0.077	0.072	4	1	0.068	0.065
Lawrenceville	0.071	0.068	2	0	0.067	0.064

Note: 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.

Below is a chart showing the 8-hour design values for the three Allegheny County Health Department sites since 2001.



1-Hour Ozone Concentrations

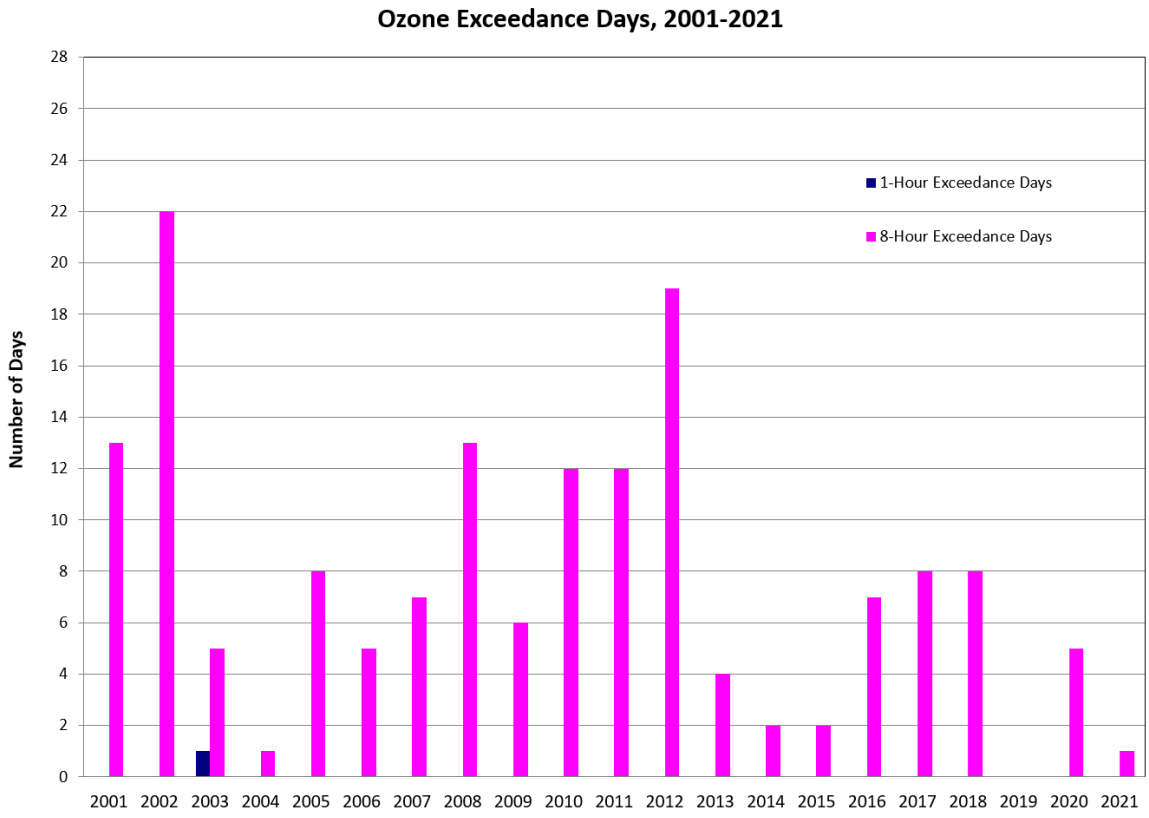
The 1-hour standard was revoked for the Pittsburgh-Beaver Valley Area in mid-2005. The former 1-hour standard of 0.12 ppm was not to be exceeded more than once a year, averaged over a 3-year period. The 1-hour ozone maximums and exceedances are given in this report for comparative purposes.

Maximum 1-hour concentrations for ozone are given in the table that follows for 2021, with 2020 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.

Former 1-Hour Standard = 0.12 ppm						
Site	2020 1-Hour Maximum (ppm)	**2021 1-Hour Maximum (ppm)**	2020 Exceedance Days	**2021 Exceedance Days**	2018-2020 Expected Exceedance Days	**2019-2021 Expected Exceedance Days**
Harrison	0.087	0.079	0	0	0.0	0.0
South Fayette	0.077	0.074	0	0	0.0	0.0
Lawrenceville	0.080	0.073	0	0	0.0	0.0

Note: 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 2001-2021. Exceedance days represent days when at least one site exceeded the standard.



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

$PM_{2.5}$ is sampled using both intermittent filter-based and continuous monitors throughout the county. Both types of $PM_{2.5}$ monitors can be used for comparison to the federal standard of 12.0 µg/m³ on an annual basis and 35 µg/m³ on a 24-hour basis.

$PM_{2.5}$ 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). The ACHD had six $PM_{2.5}$ monitors across the county and additional monitors at several sites for quality assurance. The North Park monitor was discontinued in the fourth quarter of 2020.

Annual averages for 2021 are given in the table below, with 2020 averages shown in gray. The annual and 3-year standards were met in 2021.

Annual Standard = 12.0 µg/m³				
Site	2020 Average	**2021 Average**	2018-2020 3-Year Average	**2019-2021 3-Year Average**
Liberty	9.8	11.8	11.1	11.2
North Braddock	9.0	10.7	9.7	9.9
Lawrenceville	7.7	9.8	8.5	8.8
Clairton	7.3	9.2	8.0	8.1
Harrison	7.3	8.2	8.4	8.1
South Fayette	6.6	7.8	7.4	7.3
North Park	5.7	--	6.6	6.3

Note: Starting 2017, the Avalon filter-based monitor is now a quality assurance monitor.

$PM_{2.5}$ Continuous Monitors, Annual

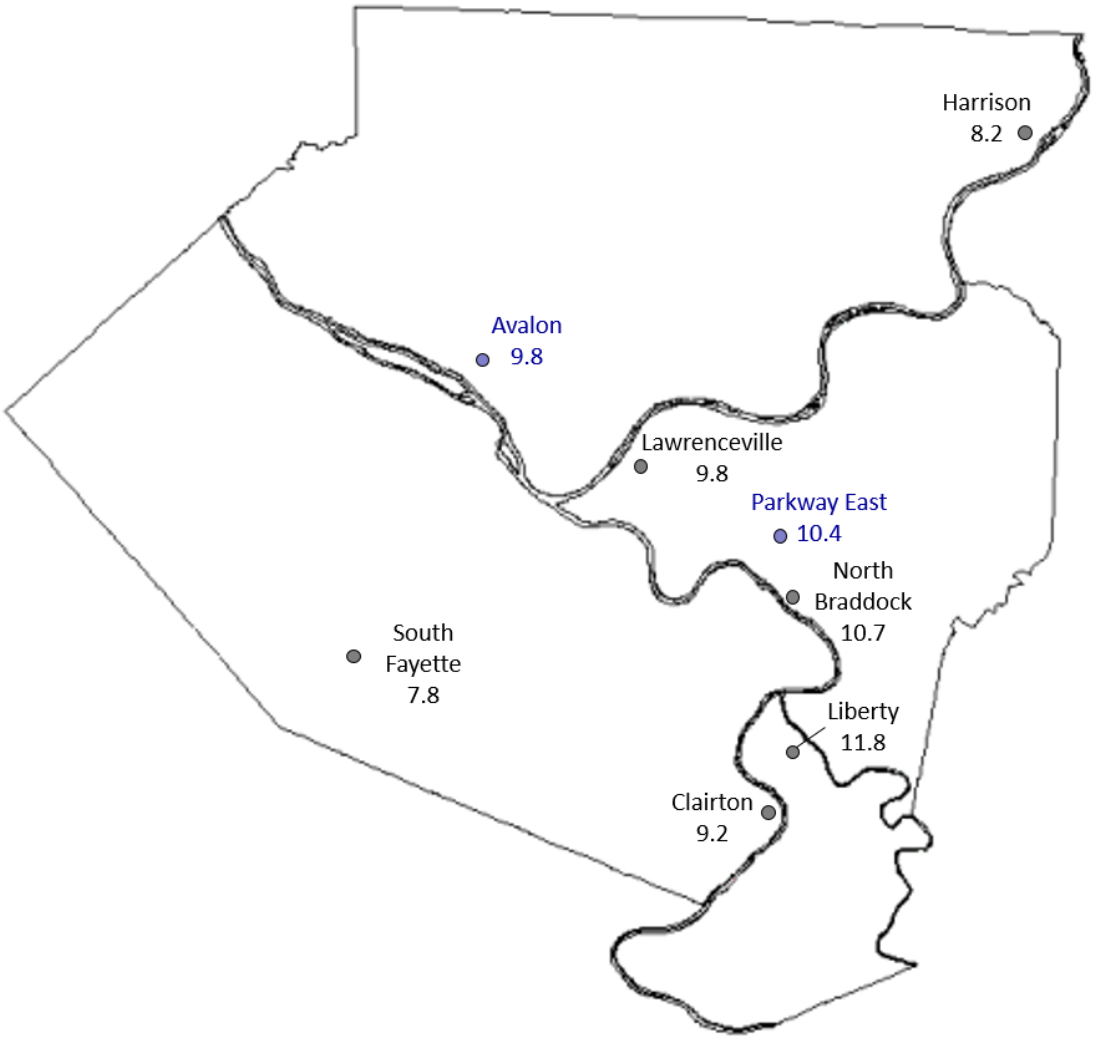
The ACHD's four continuous $PM_{2.5}$ monitors are used mainly for AQI reporting. The Parkway East monitor started operation in 2016 and the Avalon monitor started operation in 2017; both monitors are used to determine attainment of the federal standards.

Annual averages for 2021 are given in the table on the following page, with 2020 averages shown in gray. The annual and 3-year average standards were met in 2021.

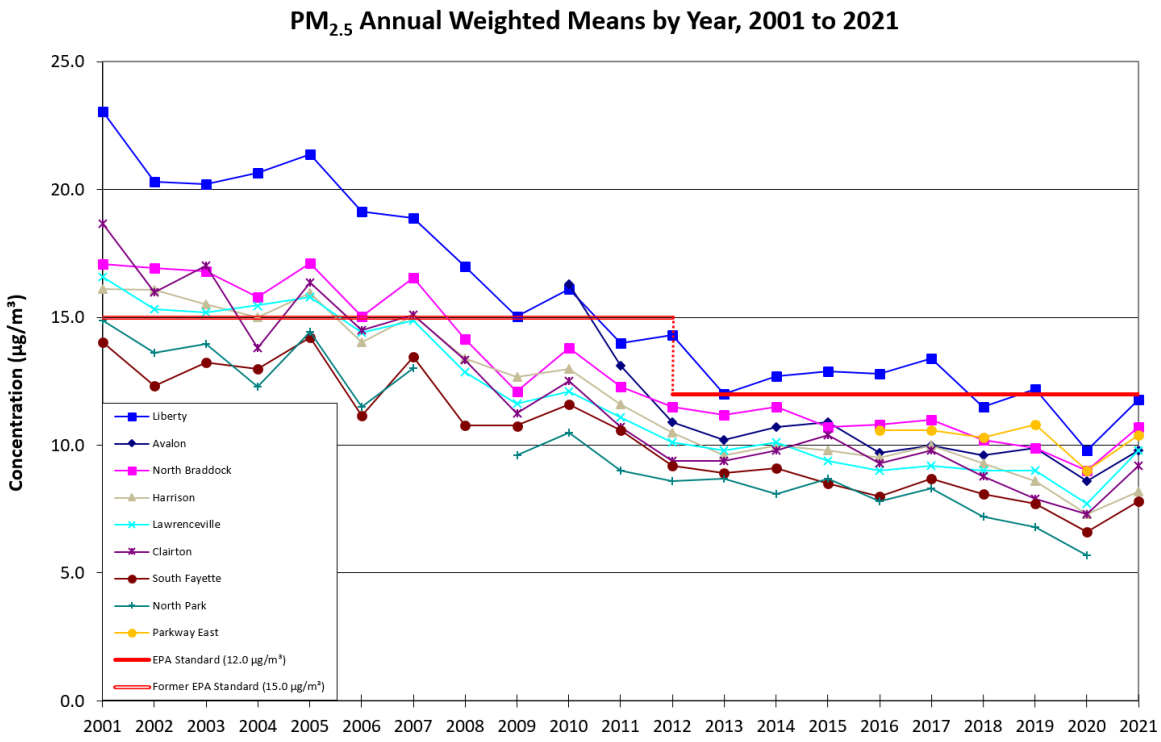
Annual Standard = 12.0 µg/m³				
Site	2020 Average	**2021 Average**	2018-2020 3-Year Average	**2019-2021 3-Year Average**
Parkway East	9.0	10.4	10.0	10.0
Avalon	8.6	9.8	9.4	9.4

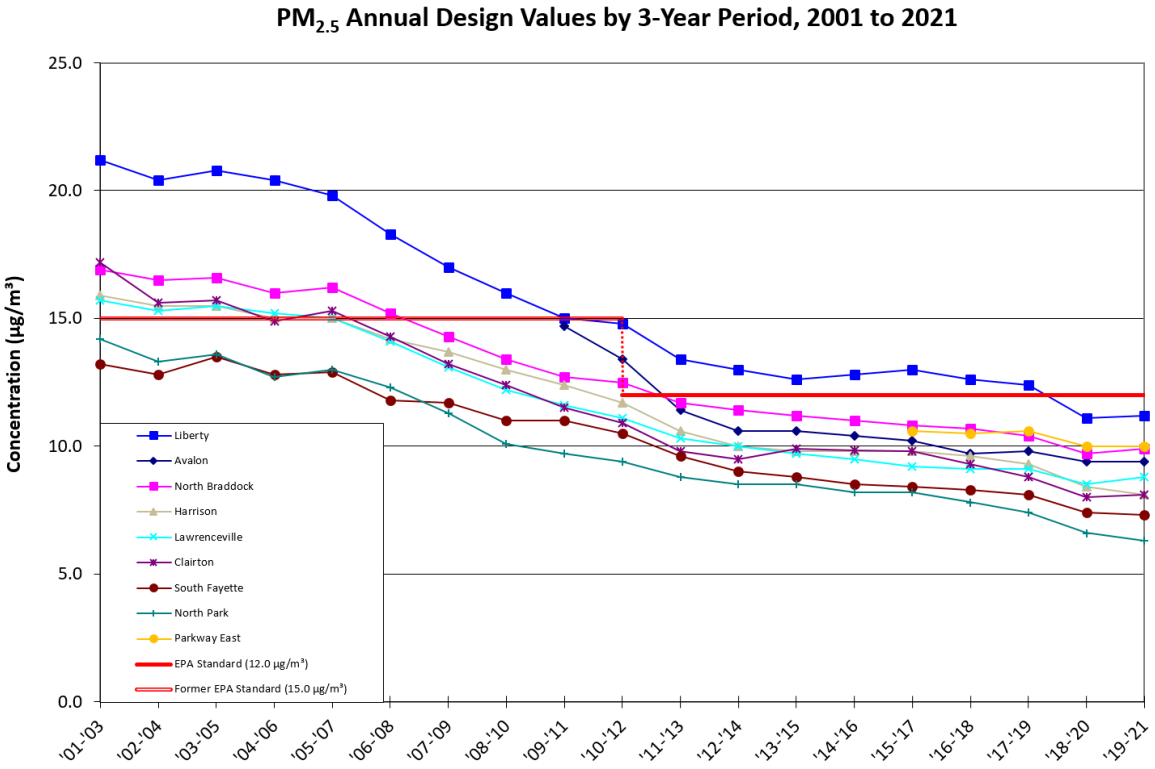
The 2021 FRM annual averages are shown on the map below. Sites that exceeded the standard are shown in red. The 2021 FEM annual averages are also shown on the map below in blue.

2021 $PM_{2.5}$ FRM/FEM Annual Averages by Site, in µg/m³



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





$PM_{2.5}$ 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 2021 24-hour concentrations and number of exceedance days are shown in the following table, with 2020 values shown in gray. The 98th-percentile values by year and by 3-year average are also shown. Exceedances in 2021 are shown in red.

24-Hour Standard = 35 µg/m³								
Site	2020 24-Hour Max.	**2021 24-Hour Max.**	2020 24-Hour Exceed.	**2021 24-Hour Exceed.**	2020 98th-Percentile Value	**2021 98th-Percentile Value**	2018-2020 3-Year Avg. of 98th-Percentile	**2019-2021 3-Year Avg. of 98th-Percentile**
Liberty	41.0	51.5	3	4	27.2	30.4	31.5	32.3
North Braddock	30.3	29.2	0	0	20.5	24.8	22.3	22.4
Lawrenceville	30.9	46.7	0	2	18.1	23.1	19.7	21.0
Clairton	24.7	20.7	0	0	18.9	19.5	18.8	19.5
Harrison	22.5	23.7	0	0	16.4	17.6	18.8	18.2
South Fayette	25.2	23.2	0	0	15.7	17.8	16.7	16.7
North Park	16.9	--	0	--	16.9	--	15.1	15.5

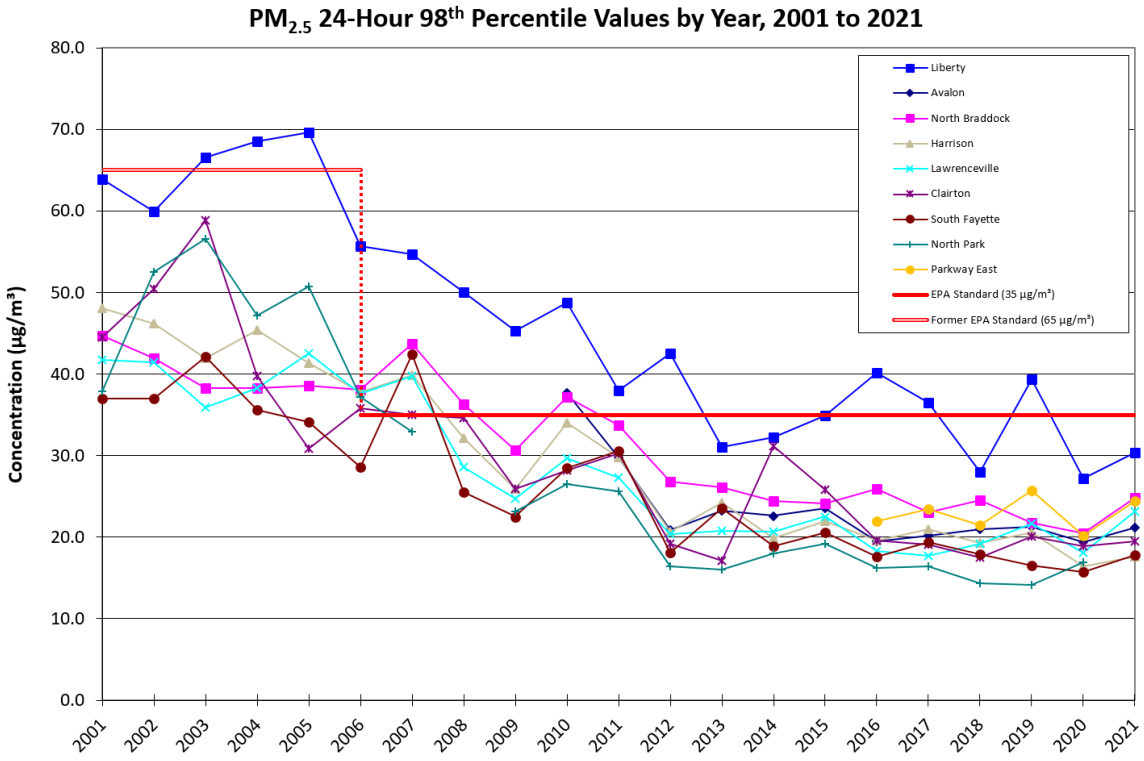
Note: Starting 2017, the Avalon filter-based monitor is now a quality assurance monitor.

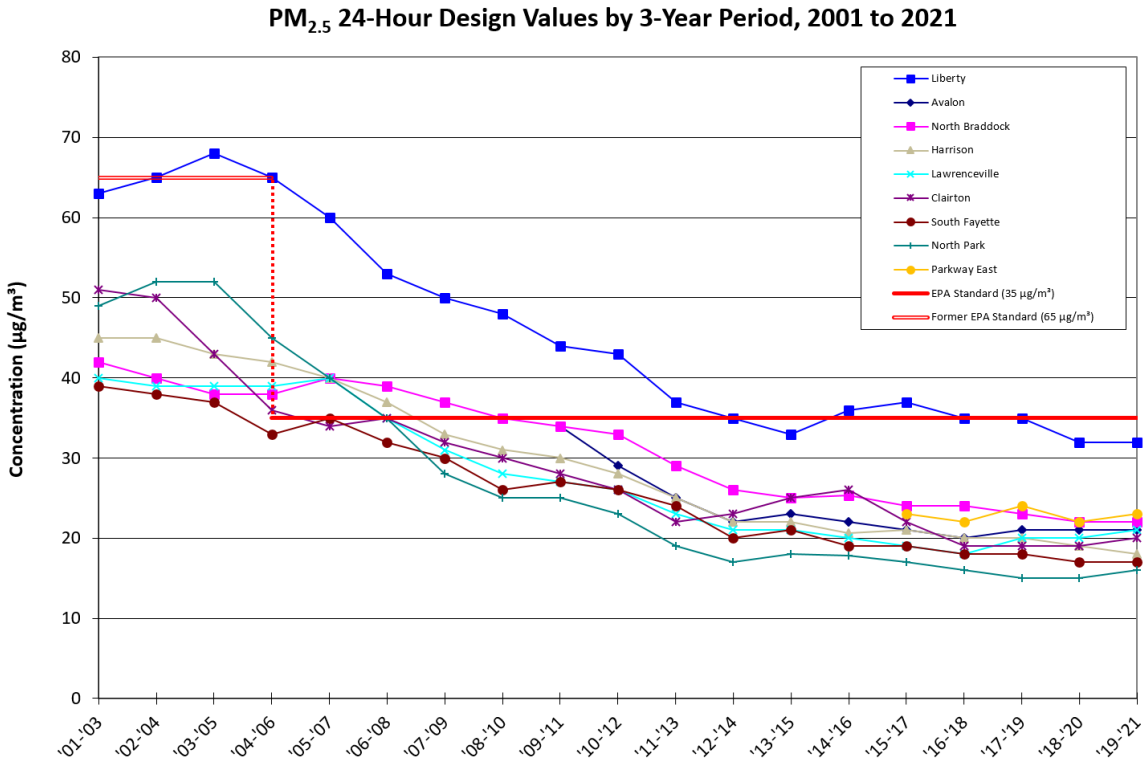
$PM_{2.5}$ Continuous Monitors, 24-Hour

The maximum 2021 24-hour concentrations and number of exceedance days are shown in the following table, with 2020 values shown in gray. The 98th-percentile values by year and by 3-year average are also shown. Exceedances in 2021 are shown in red.

24-Hour Standard = 35 µg/m³								
Site	2020 24-Hour Max.	**2021 24-Hour Max.**	2020 24-Hour Exceed.	**2021 24-Hour Exceed.**	2020 98th-Percentile Value	**2021 98th-Percentile Value**	2018-2020 3-Year Avg. of 98th-Percentile	**2019-2021 3-Year Avg. of 98th-Percentile**
Parkway East	26.5	59.1	0	2	20.2	24.4	22.5	23.4
Avalon	41.0	38.0	1	1	19.4	21.2	20.6	20.6

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.


PM2.5 24-Hour 98th Percentile Values by Year, 2001 to 2021
Concentration (µg/m³)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Liberty
Avalon
North Braddock
Harrison
Lawrenceville
Clairton
South Fayette
North Park
Parkway East
EPA Standard (35 µg/m³)
Former EPA Standard (65 µg/m³)


PM2.5 24-Hour Design Values by 3-Year Period, 2001 to 2021
Concentration (µg/m³)
80
70
60
50
40
30
20
10
0
'01-'03
'02-'04
'03-'05
'04-'06
'05-'07
'06-'08
'07-'09
'08-'10
'09-'11
'10-'12
'11-'13
'12-'14
'13-'15
'14-'16
'15-'17
'16-'18
'17-'19
'18-'20
'19-'21
Liberty
Avalon
North Braddock
Harrison
Lawrenceville
Clairton
South Fayette
North Park
Parkway East
EPA Standard (35 µg/m³)
Former EPA Standard (65 µg/m³)

$PM_{2.5}$ Continuous Monitors

The ACHD's four continuous $PM_{2.5}$ monitors are used mainly for AQI reporting. The Parkway East monitor started operation in 2016 and the Avalon monitor started operation in 2017; both monitors are used to determine attainment of the federal standards. Liberty and Lawrenceville 24-hour values are only used in determining the federal standards, if the FRM sample(s) from that day is(are) voided. The Liberty continuous monitor was not used in determining attainment of the federal standards until 2019.

	Annual Standard = 12.0 µg/m³ [FRM]			24-Hour Standard = 35 µg/m³ [FRM]		
Site	**2020 Average**	**2021 Average**	**2019-2021 3-Year Average**	**2020 24-Hour Maximum**	**2021 24-Hour Maximum**	**2019-2021 3-Year Avg. of 98th-Percentile**
Parkway East	9.0	10.4	10.0	26.5	59.1	23.4
Avalon	8.6	9.8	9.4	41.0	38.0	20.6
Lawrenceville	9.4	10.3	N/A	33.5	46.7	N/A
Liberty	11.1	12.9	N/A	46.5	53.7	N/A

$PM_{2.5}$ Speciation Monitors

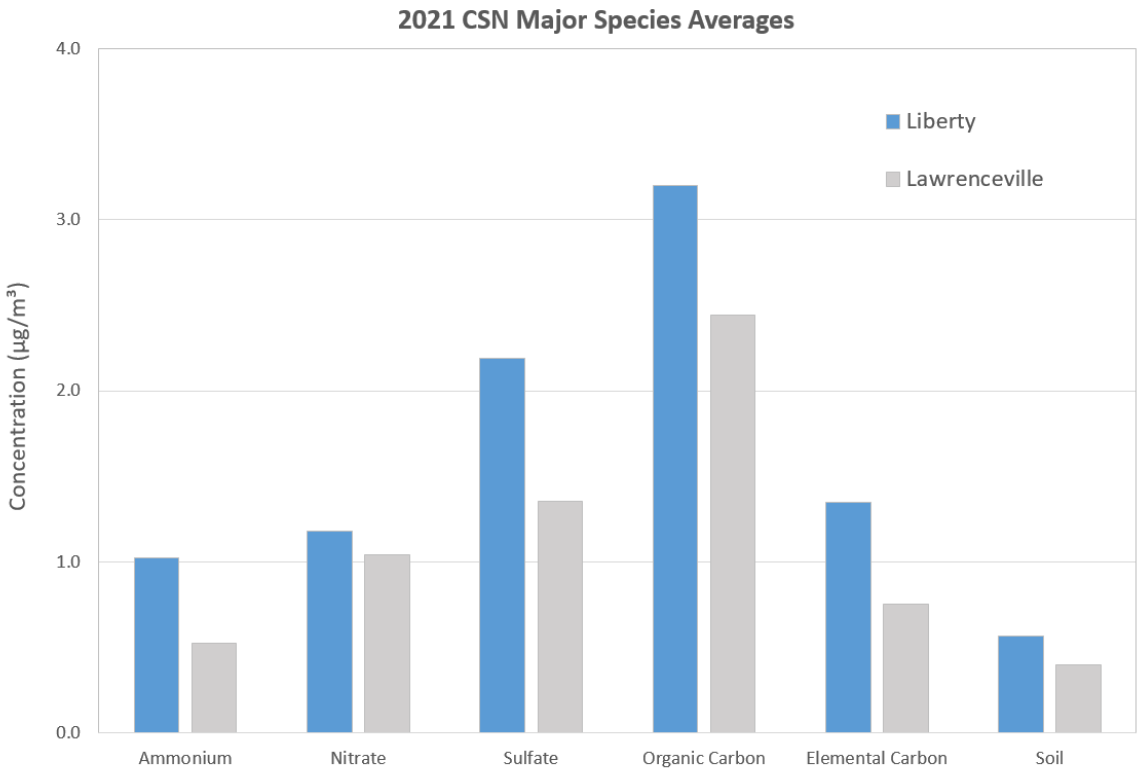
Physically, $PM_{2.5}$ is any particle that is 2.5 microns or less in diameter. Chemically, $PM_{2.5}$ is composed of many different chemical compounds. In addition to the FRM and continuous $PM_{2.5}$ monitors, the county operates two $PM_{2.5}$ speciation monitors that are used to measure specific 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 unspeciated material.

Annual averages for major species at Lawrenceville and Liberty for 2021 are given below in µg/m³.

Site	Ammonium	Nitrate	Sulfate	Organic Carbon	Elemental Carbon	Soil
Liberty	1.024	1.182	2.189	3.200	1.351	0.566
Lawrenceville	0.523	1.042	1.355	2.443	0.753	0.396

The 2021 major species averages are also shown in the column chart below.



C. Particulate Matter - 10 microns or less (PM_{10})

PM_{10} is sampled using both intermittent filter-based and continuous monitors throughout the county. Both types of PM_{10} monitors can be used for comparison to the federal standard 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 PM_{10} 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. The Avalon filter-based monitor was discontinued after the first quarter of 2017. The Manchester, South Fayette, and Liberty filter-based monitors and the Lincoln continuous monitor were discontinued in 2020.

The 2021 maximums and averages are shown in the tables below, with 2020 values shown in gray. There were no exceedances in 2021.

PM_{10} Filter-Based Monitors

	24-Hour Standard = 150 µg/m³		Former Annual Standard = 50 µg/m³	
Site	2020 24-Hour Maximum	**2021 24-Hour Maximum**	2020 Average	**2021 Average**
Clairton	31	24	10.9	12.3
Liberty	39	--	13.8	--
Manchester	38	--	12.3	--
South Fayette	20	--	9.3	--

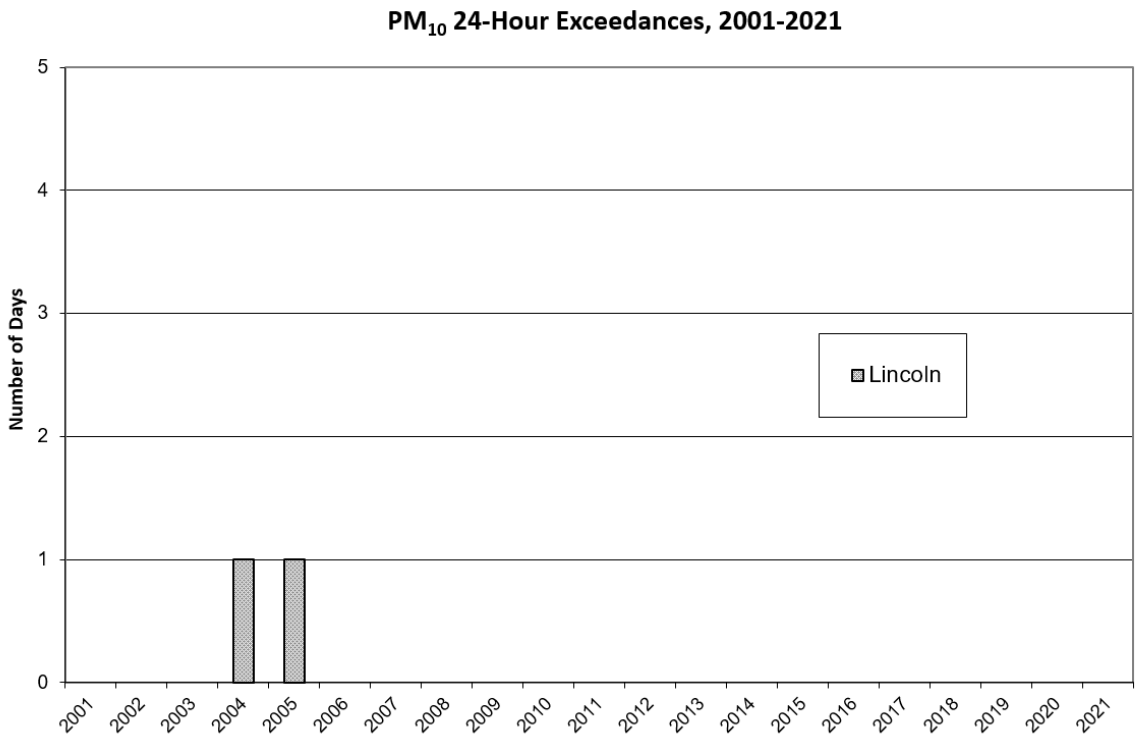
Note: Liberty was discontinued in November 2020; Manchester was discontinued in October 2020; and South Fayette was discontinued in July 2020

PM_{10} Continuous Monitors

	24-Hour Standard = 150 µg/m³		Former Annual Standard = 50 µg/m³	
Site	2020 24-Hour Maximum	**2021 24-Hour Maximum**	2020 Average	**2021 Average**
North Braddock	81	82	24.7	27.9
Glassport	46	58	13.0	15.6
Flag Plaza	64	58	13.2	15.1
Liberty	49	57	14.6	17.7
Lincoln	73	--	17.3	--

Note: Lincoln was discontinued yearend 2020

The following chart shows PM_{10} 24-hour exceedances for the period 2001-2021. For sites with both filter-based and continuous monitors, data for only the filter-based monitors are shown.



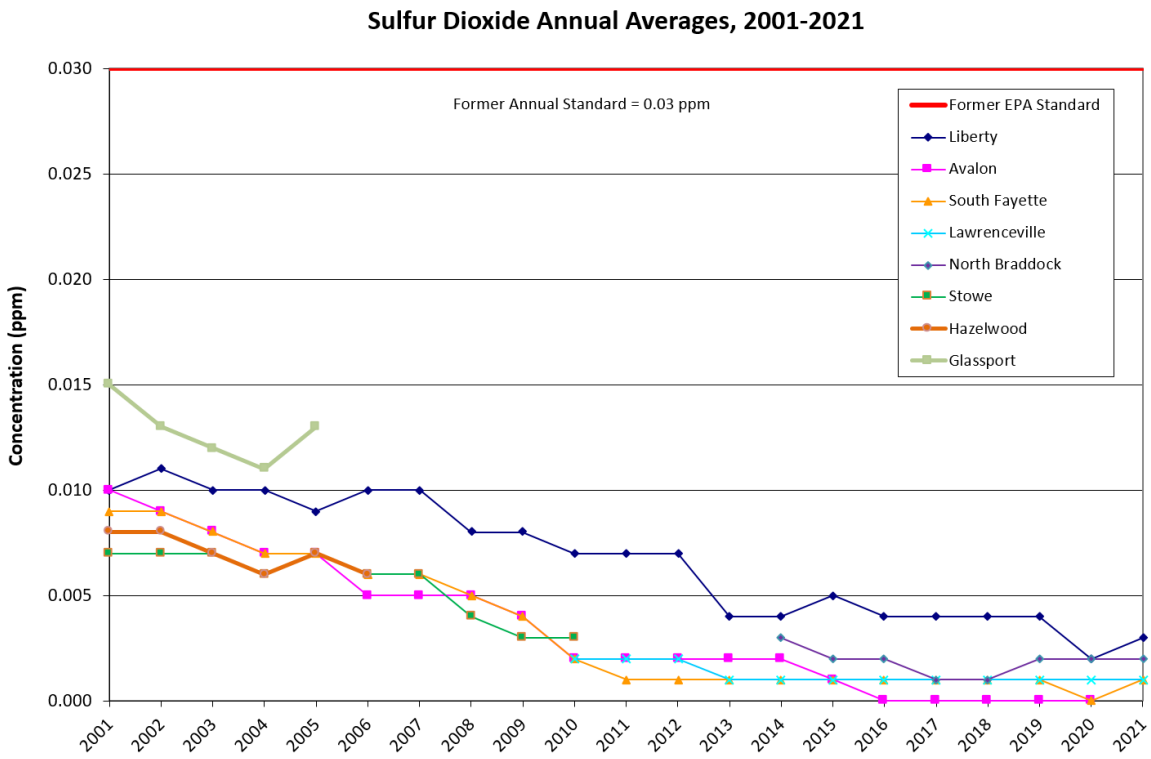
D. Sulfur Dioxide (SO_2)

Sulfur dioxide is monitored at four sites in the county, mostly in industrial areas. The South Fayette monitor is used as a background monitor, providing a measurement of SO_2 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 promulgated 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 2021 are shown in the table below, with 2020 values shown in gray. There were no exceedances in 2021. The Avalon SO_2 gas analyzer was discontinued in November 2020.

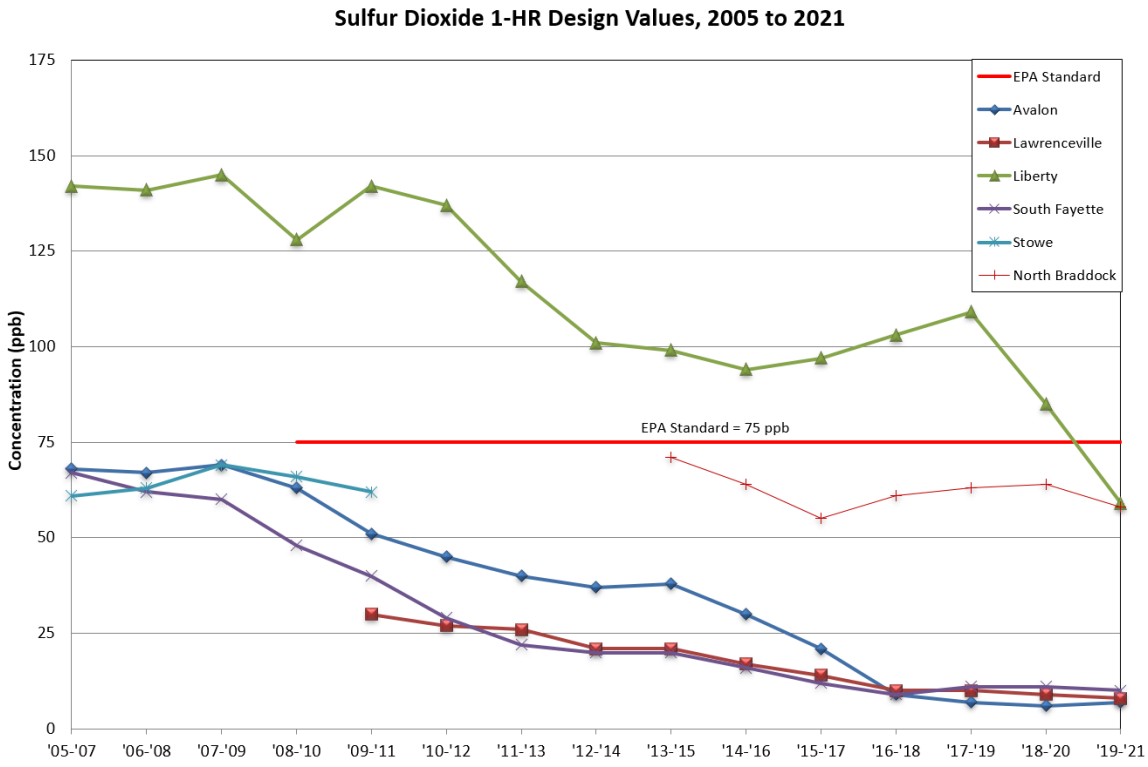
	Former 24-Hour Std. = 0.14 ppm		Former Annual Std. = 0.03 ppm	
Site	2020 24-Hour Maximum	**2021 24-Hour Maximum**	2020 Average	**2021 Average**
Liberty	0.018	0.021	0.002	0.003
North Braddock	0.019	0.011	0.002	0.002
Lawrenceville	0.003	0.004	0.001	0.001
South Fayette	0.003	0.003	0.000	0.001
Avalon	0.002	--	0.000	--

	1-Hour Standard = 75 ppb				
Site	2020 1-Hour Maximum	**2021 1-Hour Maximum**	2018-2020 99th percentile	**2019-2021 99th percentile**	**2021 Exceedances**
North Braddock	105	69	64	58	0
Liberty	57	60	85	59	0
Lawrenceville	7	15	9	8	0
South Fayette	16	10	11	10	0
Avalon	5	--	6	7	--

The former 24-hour standard can be exceeded once per year. Glassport was the last site to exceed the 24-hour standard in 1999. The SO_2 annual average trends are shown on the following page for 2001-2021.



The SO_2 one-hour design value trends are shown below for 2005-2021.

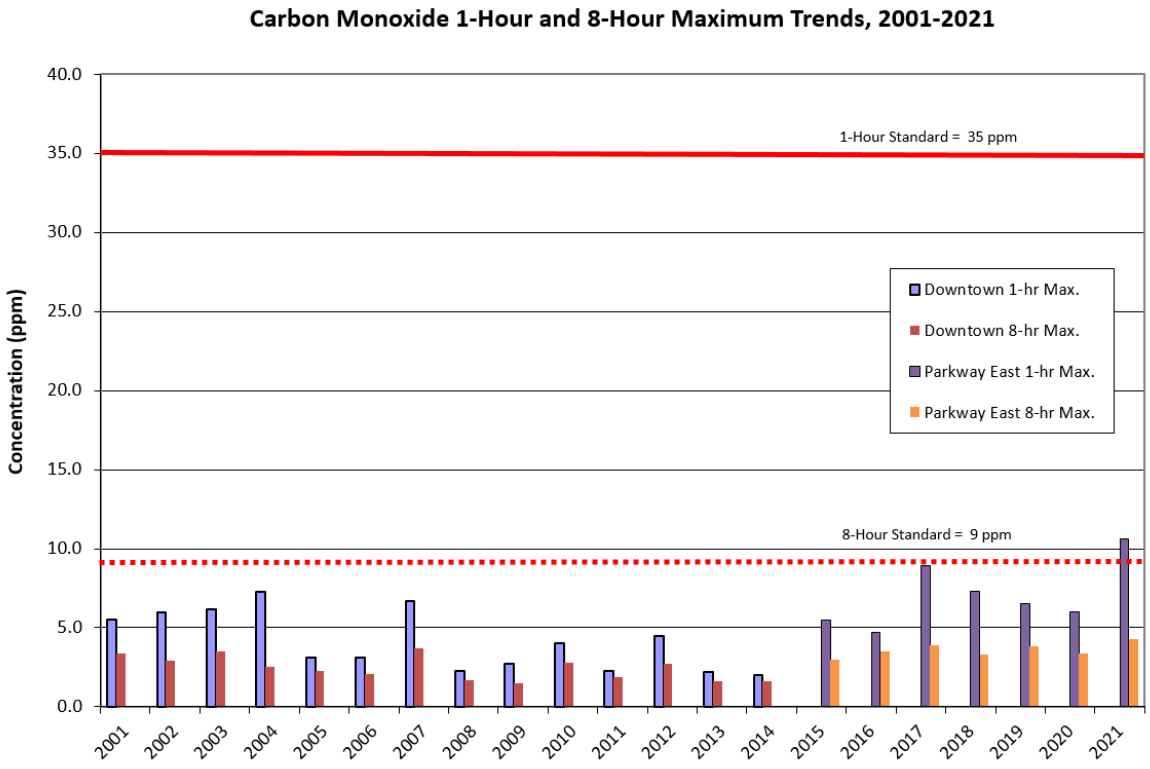


E. Carbon Monoxide (CO)

The county operates two carbon monoxide (CO) monitors. The Lawrenceville trace gas analyzer for CO started operation in 2010. The Parkway East, Near Road, trace gas analyzer for CO started operation on September 1, 2014, and the Downtown CO monitor was discontinued on August 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 2021 are shown in the table below, with 2020 values shown in gray. The Flag Plaza CO gas analyzer was discontinued in 2020.

	1-Hour Standard = 35 ppm		8-Hour Standard = 9 ppm	
Site	2020 1-Hour Maximum	**2021 1-Hour Maximum**	2020 8-Hour Maximum	**2021 8-Hour Maximum**
Parkway East	6.0	10.6	3.4	4.3
Lawrenceville	1.9	2.3	1.4	1.1
Flag Plaza	1.8	--	1.3	--

Carbon monoxide maximum trends are shown below for 2001-2021. The county has not exceeded the 8-hour standard since 1987.

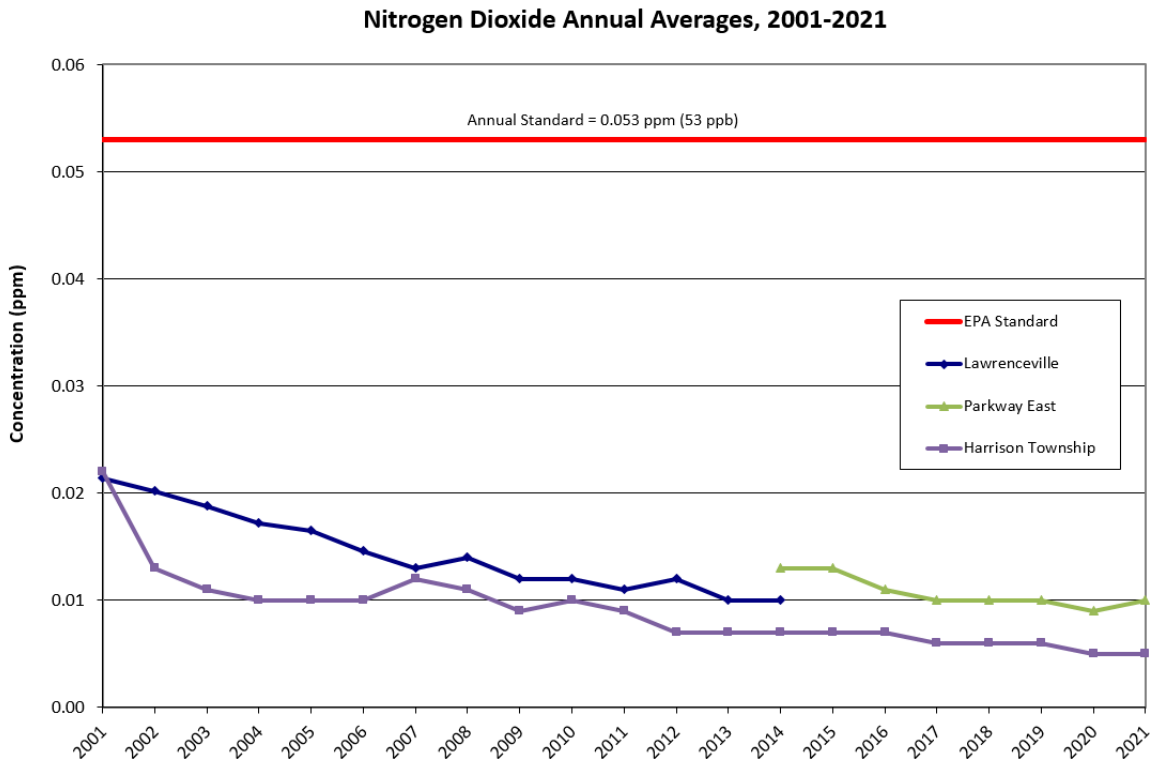


F. Nitrogen Dioxide (NO_2)

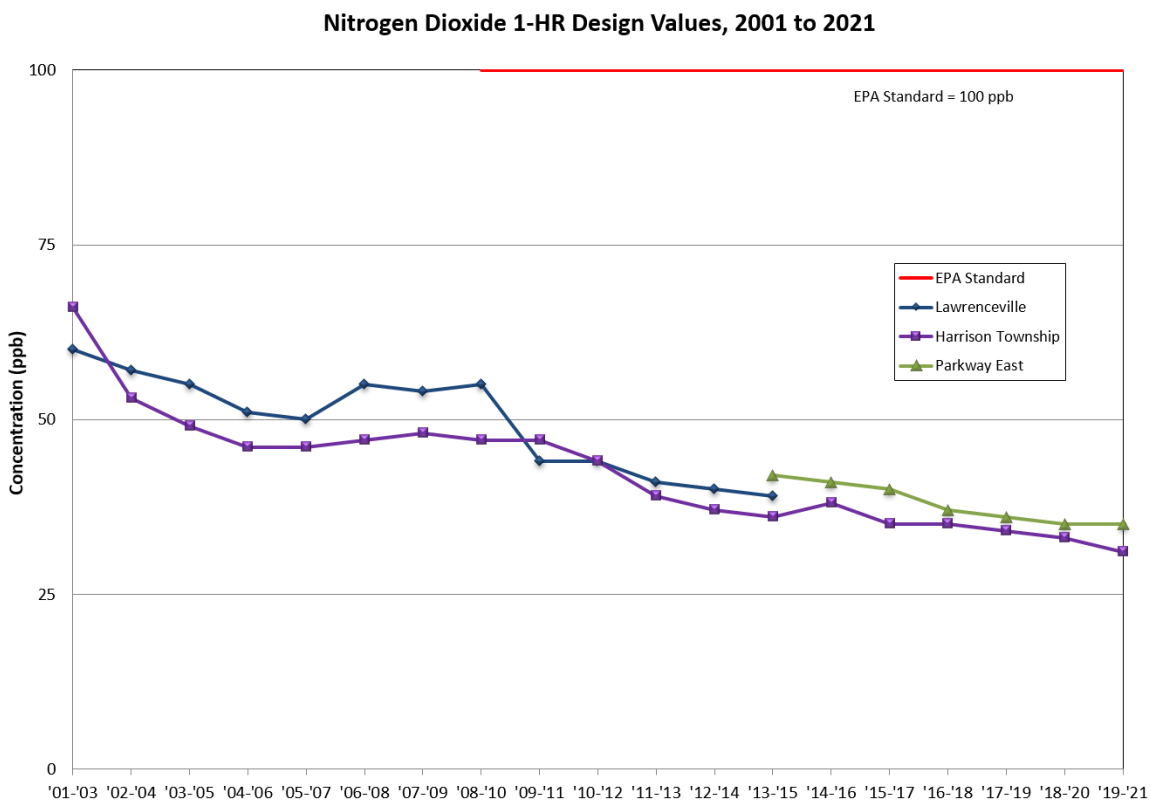
Nitrogen oxides are monitored at two sites in the county. Nitrogen dioxide (NO_2) is calculated each hour by subtracting nitrogen oxide (NO) from the total nitrogen oxides (NO_x) concentration. Since 2010, the standard for NO_2 is 0.053 ppm (53 ppb) on an annual average basis. A new 1-hour federal standard 100 ppb was promulgated 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. The 2021 averages are shown in the table below, with 2020 values shown in gray. The Parkway East, Near Road, trace gas analyzer for NO_2 started operation on September 1, 2014, and the Lawrenceville NO_2 monitor was discontinued on August 25, 2014.

	Annual Std. = 53 ppb		**1-Hour Standard = 100 ppb**			
Site	2020 Average	**2021 Average**	2020 1-Hour Maximum	**2021 1-Hour Maximum**	2018-2020 98th percentile	**2019-2021 98th percentile**
Parkway East	9	10	51	46	35	35
Harrison	5	5	44	42	33	31

Long-term trends for NO_2 annual averages are shown on the following page for 2001-2021.



The NO_2 one-hour design value trends are shown below for 2001-2021.

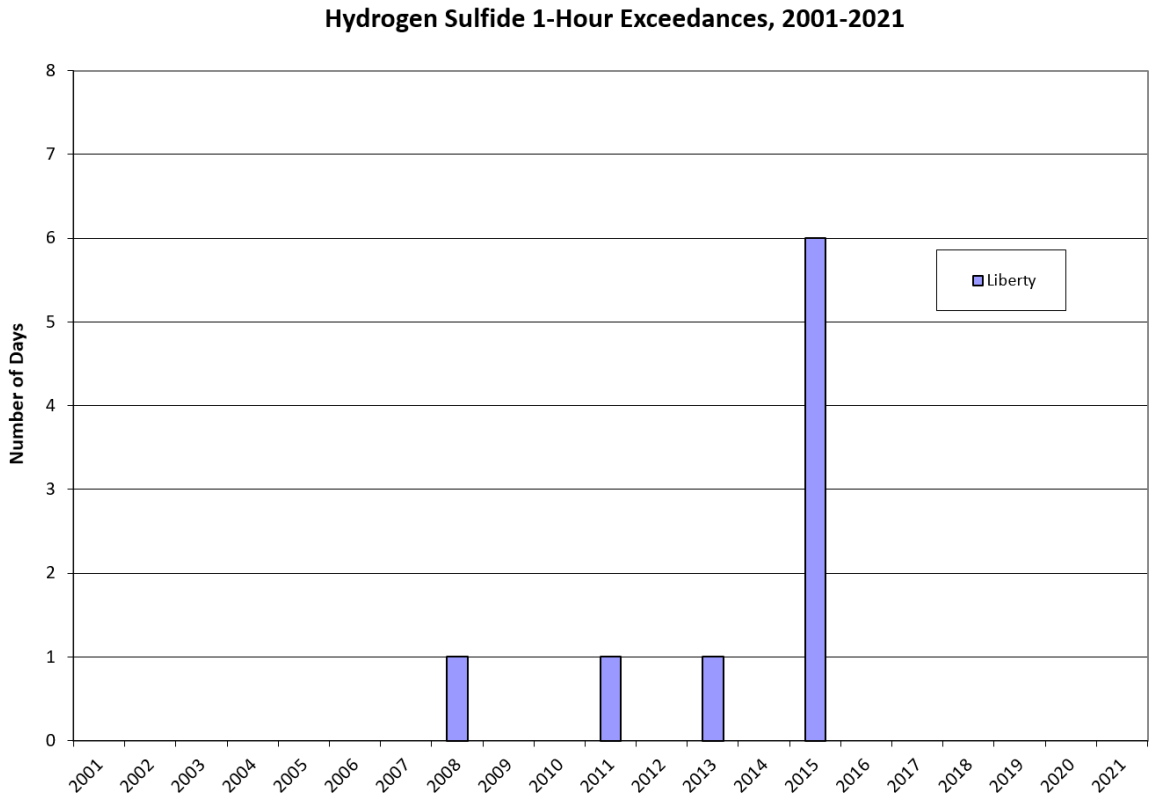


G. Hydrogen Sulfide (H_2S)

There are no federal standards for hydrogen sulfide. The Pennsylvania 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.

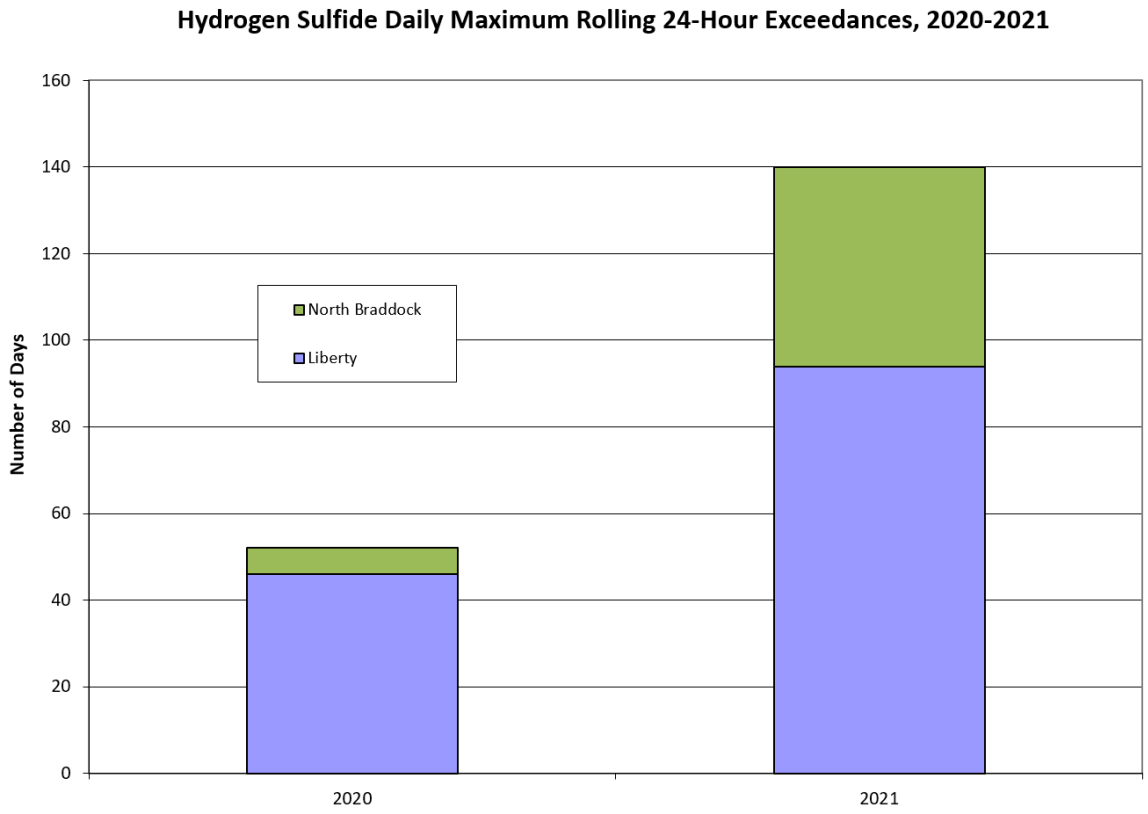
Hydrogen sulfide 1-hour concentrations for 2021 are given in the table below, with 2020 values shown in gray. Long-term exceedances for 2001-2021 are also given in the chart below. Liberty last exceeded the 1-hour PA standard six times in 2015. The West Allegheny monitor started operation in May 2009 and was discontinued on August 29,2014. The Avalon monitor was discontinued on September 15, 2020 and was installed in North Braddock on December 9, 2020.

	1-Hour PA Standard = 0.1 ppm			
Site	2020 1-Hour Maximum	**2021 1-Hour Maximum**	2020 Exceedances	**2021 Exceedances**
Liberty	0.056	0.053	0	0
North Braddock	0.060	0.081	0	0
Avalon	0.002	--	0	--



Hydrogen sulfide 24-hour concentrations and exceedances for 2021 are given in the following table, with 2020 values shown in gray. Long-term exceedances for 2020-2021 are also given in the chart below; these exceedances are daily maximum rolling 24-Hour averages. Exceedances for 2021 are shown in red. Each exceedance constitutes a violation of the state 24-Hour H_2S standard. The Avalon monitor was discontinued on September 15, 2020 and was installed in North Braddock on December 9, 2020.

	24-Hour PA Standard = 0.005 ppm			
Site	2020 Rolling 24-Hour Maximum	**2021 Rolling 24-Hour Maximum**	2020 Daily Exceedances	**2021 Daily Exceedances**
Liberty	0.016	0.019	46	94
North Braddock	0.011	0.015	6	46
Avalon	0.001	--	0	--



H. 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.

The Pennsylvania state standards for protection against dust nuisances are 0.8 $mg/cm^2/month$ (formerly 23 $tons/mile^2/month$) on an annual average basis and 1.5 $mg/cm^2/month$ (formerly 43 $tons/mile^2/month$) on a monthly basis.

Annual averages, monthly maximums, and exceedances for 2021 are shown in the table below, with 2020 values shown in gray. Exceedances for 2021 are shown in red. Each exceedance constitutes a violation of the state dustfall standards.

Collier, Natrona 8, and Natrona 9 dustfall collectors were in operation for 2009 and future years. North Braddock, Neville, Neville 2 and Forward dustfall collectors were discontinued year end 2008. West Deer and Russellton began operation in April 2018 and were discontinued in November 2020. The Braddock dustfall collector started operation in May of 2021.

	Annual PA Standard = 0.8 $mg/cm^2/month$		**Monthly PA Standard = 1.5 $mg/cm^2/month$**		**Monthly Exceedances**	
Site	2020 Average	**2021 Average**	2020 Monthly Maximum	**2021 Monthly Maximum**	2020 Exceedances	**2021 Exceedances**
Natrona 9	0.76	0.84	1.26	1.58	0	1
Braddock	--	0.83	--	1.12	--	0
Collier	0.47	0.58	1.69	1.55	1	1
Natrona 8	0.50	0.42	0.91	1.17	0	0
West Deer	0.45	--	0.71	--	0	--
Russellton	0.28	--	0.57	--	0	--

I. Hazardous Air Pollutants (HAPs)

Hazardous Air Pollutants (HAPs), or air toxics, are a group of 188 EPA-classified pollutants that can cause cancer or other serious health effects or adverse environmental and ecological effects. HAPs have been 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.

The ACHD has monitored HAPs previously for several consecutive years at Flag Plaza using canister and cartridge methods (refer to previous reports for concentrations through 2020). This site was discontinued August 13, 2020, with the HAPs monitoring redeployed to the Lawrenceville site August 19, 2020.

The Lawrenceville HAPs monitoring was expanded to include additional air toxics compounds. As a result, Lawrenceville has been included as part of EPA's National Air Toxics Trends Stations (NATTS) network. Starting in January 2021, Eastern Research Group, Inc. (ERG) has provided most of the lab analysis of the HAPs, with metals analyzed from PM_{10} filters provided by the WV Department of Environmental Protection (WV DEP).

Because of the switch in labs to ERG in 2021 for the NATTS analysis, some of the compounds are different in 2021 are different from those analyzed in 2020 and are also given in different units. The Lawrenceville NATTS results for partial year 2020 have therefore not been given in this report for comparison to 2021 values and are available by request. Multi-year trends for selected NATTS compounds may be included in future reports.

The groups of Lawrenceville NATTS compounds and methods for 2021 are described below, along with tables of annual average and 24-hour concentrations. Each method collects a 24-hour (midnight-to-midnight) sample once every six calendar days.

Some compounds included in this section are not classified as HAPs but are included as part of the lab analysis. The list of HAPs, with modifications since 1990, can be found at EPA's web site: https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications.

Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) are collected by SUMMA canister via EPA Method TO-15. The compounds measured by this method include benzene, 1,3-butadiene, perchloroethylene, vinyl chloride, and others. These compounds are given below in units of parts per billion.

Compound	2021 Average	2021 24-Hour Maximum
Carbon disulfide	0.057	0.501
Propylene	0.818	1.850
Acetylene	0.812	7.970
1,2-Dichloro-1,1,2,2,tetrafluorolethane	0.015	0.019
1,3-Butadiene	0.020	0.079
n-Octane	0.031	0.092
2-methoxy-2-methyl-propane	0.000	0.000
Tert-amyl methyl ether	0.000	0.000
Tert-butyl ethyl ether	0.000	0.003
Ethyl acrylate	0.000	0.000
Methyl methacrylate	0.000	0.027
Acrolein - Verified	0.432	0.954
Methyl Isobutyl Ketone	0.060	0.218
Ethylene oxide	0.152	0.456
Acetonitrile	33.602	129.000
Acrylonitrile	0.010	0.162
Chloromethane	0.528	0.736
Methylene Chloride	0.169	0.581
Chloroform	0.027	0.056
Carbon tetrachloride	0.076	0.105
Bromoform	0.001	0.003
Trichlorofluoromethane	0.238	0.310
Chloroethane	0.019	0.105
1,1-Dichloroethane	0.000	0.002
1,1,1-Trichloroethane	0.002	0.005
1,2-Dichloroethane	0.013	0.026
Tetrachloroethylene	0.023	0.058
1,1,2,2-Tetrachloroethane	0.000	0.003
Bromomethane	0.009	0.015
1,1,2-Trichloroethane	0.000	0.000
1,1,2-Trichloro-1,2,2-trifluoroethane	0.075	0.098
Dichlorodifluoromethane	0.505	0.656
Trichloroethene	0.009	0.043
1,1-Dichloroethylene	0.000	0.000
Bromodichloromethane	0.001	0.006

Compound	2021 Average	2021 24-Hour Maximum
1,2-Dichloropropane	0.000	0.008
trans-1,3-Dichloropropene	0.000	0.000
cis-1,3-Dichloropropene	0.000	0.000
Dibromochloromethane	0.000	0.004
Chloroprene	0.000	0.000
Bromochloromethane	0.000	0.001
trans-1,2-Dichloroethylene	0.002	0.018
cis-1,2-Dichloroethene	0.000	0.000
1,2-Dibromoethane	0.000	0.001
Hexachlorobutadiene	0.000	0.004
Chloroethene	0.000	0.002
m- & p-Xylene	0.154	0.462
Benzene	0.230	0.656
Toluene	0.439	1.230
Ethylbenzene	0.047	0.134
o-Xylene	0.064	0.170
1,3,5-Trimethylbenzene	0.014	0.042
1,2,4-Trimethylbenzene	0.041	0.175
Styrene	0.022	0.077
Chlorobenzene	0.002	0.012
1,2-Dichlorobenzene	0.010	0.045
1,3-Dichlorobenzene	0.000	0.006
1,4-Dichlorobenzene	0.008	0.029
1,2,4-Trichlorobenzene	0.002	0.033

Carbonyls

Carbonyl compounds are collected by DNPH cartridge via EPA Method TO-11A. The compounds measured by this method include acetaldehyde, formaldehyde, and others. These compounds below are given in units of micrograms/cubic meter (µg/m³) at standard ambient temperature (25 °C).

Compound	2021 Average	2021 24-Hour Maximum
Formaldehyde	3.352	27.600
Acetaldehyde	1.751	5.590
Propionaldehyde	0.273	0.748
Butyraldehyde	0.236	0.921
Hexanaldehyde	0.291	3.300
Valeraldehyde	0.163	0.728
Crotonaldehyde	0.051	0.523
Acetone	1.589	4.550
Methyl Ethyl Ketone	0.298	0.966
Benzaldehyde	0.142	0.648

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are collected by glass cartridge PUF sampling via EPA Method TO-13A. The compounds measured by this method include benzo(a)pyrene, naphthalene, and others. These compounds are often referred to as Semi-Volatile Organic Compounds (SVOCs) because they are less volatile than VOCs. These compounds are given below in units of nanograms/cubic meter (ng/m³) at standard ambient temperature (25 °C).

Compound	2021 Average	2021 24-Hour Maximum
Naphthalene	59.909	206.000
Acenaphthene	3.702	22.700
Acenaphthylene	0.346	2.720
Fluorene	4.578	21.500
Phenanthrene	9.177	31.800
Anthracene	0.224	0.679
Fluoranthene	2.376	7.120
Pyrene	1.234	3.060
Chrysene	0.000	0.000
Coronene	0.072	0.353
Perylene	0.009	0.111
Benzo(a)anthracene	0.114	0.569
Benzo(b)fluoranthene	0.382	1.700
Benzo(k)fluoranthene	0.099	0.534
Benzo(e)pyrene	0.152	0.778
Dibenz(a,h)anthracene	0.015	0.158
Benzo(g,h,i)perylene	0.134	0.739
Benzo(a)pyrene	0.124	0.704
Indeno(1,2,3-c,d)pyrene	0.146	0.752

Metals (from PM_{10})

Metals are collected by Hi-Vol PM_{10} samplers and quartz fiber filters via EPA Method IO-3.5. The metals measured by this method include arsenic, lead, manganese, and others. These compounds are given below in units of nanograms/cubic meter (ng/m^3) at local conditions (LC).

Compound	2021 Average	2021 24-Hour Maximum
Arsenic	1.250	6.067
Beryllium	0.004	0.012
Cadmium	0.170	0.565
Chromium	1.601	3.640
Lead	4.574	31.733
Manganese	6.782	22.400
Nickel	0.608	1.587

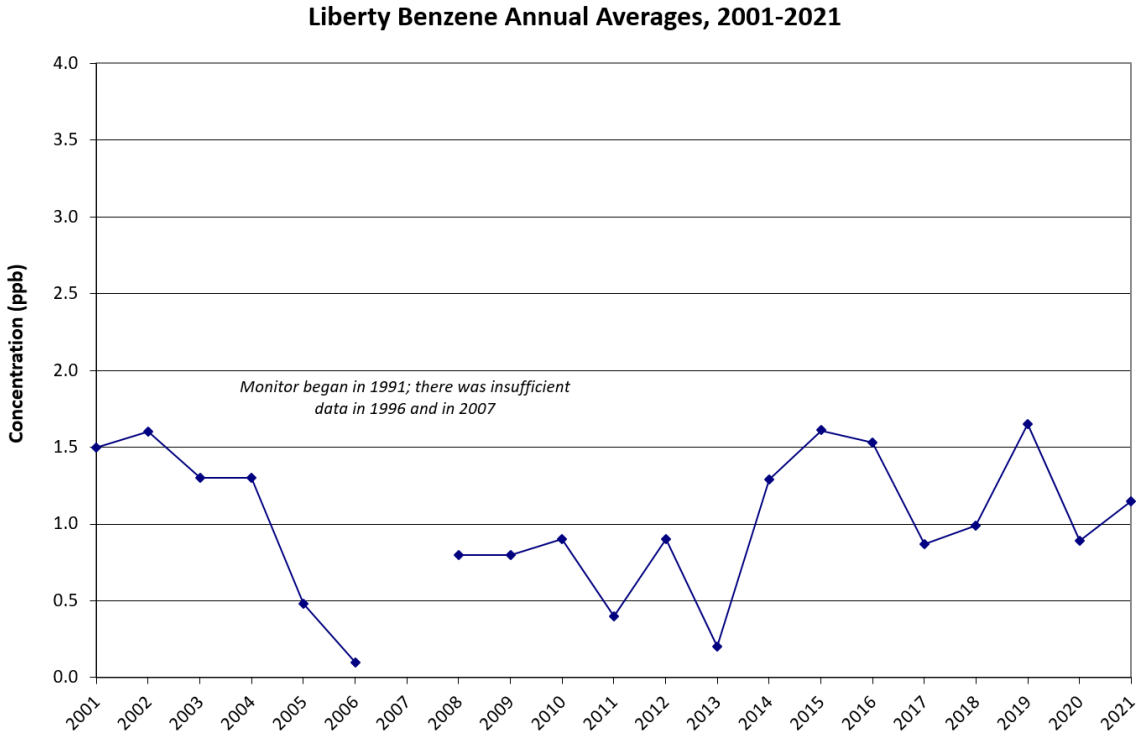
Benzene

Additionally, benzene was measured continuously at Liberty through 2013. The ACHD started monitoring benzene at Liberty in January and Avalon in April of 2014 using charcoal tubes on a 24-hour basis. Monitoring of benzene at Avalon was discontinued in 2018 but continues at Liberty. The annual average and 24-hour maximum for benzene in 2021 are shown below, with 2020 values shown in gray.

Site	2020 Average (ppb)	2020 24-Hour Maximum (ppb)	2021 Average (ppb)	2021 24-Hour Maximum (ppb)
Liberty	0.89	8.66	1.15	6.48

Note: Also, data below the Method Detection Limit (MDL) is reported as the (MDL/2); formerly zero for years 2014-2019.

A chart showing Liberty benzene annual averages for 2001-2021 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 2008 through 2021 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 $PM_{2.5}$	2008	Liberty	31	70.8 µg/m³
35 µg/m³	2008	N. Braddock	4	38.4 µg/m³
	2008	Harrison	2	41.3 µg/m³
	2008	Clairton	1	40.6 µg/m³
	2008	Lawrenceville	1	39.7 µg/m³
	2009	Liberty	12	92.1 µg/m³
	2009	Harrison	1	43.5 µg/m³
	2010	Liberty	25	69.9 µg/m³
	2010	N. Braddock	3	40.6 µg/m³
	2010	Lawrenceville	2	41.5 µg/m³
	2010	Harrison	2	39.7 µg/m³
	2010	Clairton	1	37.0 µg/m³
	2011	Liberty	10	59.0 µg/m³
	2011	Avalon	1	35.6 µg/m³
	2011	N. Braddock	1	35.5 µg/m³
	2012	Liberty	9	54.7 µg/m³
	2013	Liberty	6	43.6 µg/m³
	2014	Liberty	4	63.8 µg/m³
	2015	Liberty	7	58.1 µg/m³
	2016	Liberty	13	56.0 µg/m³
	2017	Liberty	10	77.7 µg/m³
	2017	Parkway East	1	44.9 µg/m³
	2017	N. Braddock	1	41.6 µg/m³
	2018	Liberty	2	43.8 µg/m³
	2019	Liberty	9	66.4 µg/m³
	2020	Liberty	3	41.0 µg/m³
	2020	Avalon	1	41.0 µg/m³

Standard	Year	Site	Number of Exceedances	Maximum Concentration
24-Hour $PM_{2.5}$	2021	Parkway East	2	59.1 µg/m³
35 µg/m³	2021	Liberty	4	51.5 µg/m³
	2021	Lawrenceville	2	46.7 µg/m³
	2021	Avalon	1	38.0 µg/m³
8-Hour Ozone	2008	Harrison	10	0.091 ppm
0.075 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
	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	0.076 ppm
	2016	Lawrenceville	3	0.077 ppm
	2016	South Fayette	4	0.081 ppm
	2017	Harrison	1	0.071 ppm
	2017	South Fayette	8	0.082 ppm
	2018	Harrison	5	0.087 ppm
	2018	Lawrenceville	6	0.079 ppm
	2018	South Fayette	3	0.078 ppm

Standard	Year	Site	Number of Exceedances	Maximum Concentration
8-Hour Ozone	2020	Harrison	4	0.077 ppm
0.070 ppm	2020	Lawrenceville	2	0.071 ppm
	2020	South Fayette	2	0.071 ppm
	2021	Harrison	1	0.072 ppm
1-Hour SO_2	2010	Liberty	34	215 ppb
75 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
	2017	Liberty	18	163 ppb
	2017	North Braddock	3	127 ppb
	2018	Liberty	11	155 ppb
	2018	North Braddock	3	113 ppb
	2019	Liberty	5	85 ppb
	2019	North Braddock	2	83 ppb
	2020	North Braddock	2	105 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. The EPA's AQI scale is shown below:

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
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 October) for Southwestern Pennsylvania.

Allegheny County AQI levels based upon actual monitored results for 2008-2021 are shown in the table below, by number of days.

Year	*Good Days*	*Moderate Days*	*Unhealthy for Sensitive Groups Days*	*Unhealthy Days*
2008	187	157	20	2
2009	214	136	14	1
2010	146	163	48	8
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
2017	161	173	30	1

Year	*Good Days*	*Moderate Days*	*Unhealthy for Sensitive Groups Days*	*Unhealthy Days*
2018	159	183	22	1
2019	138	212	11	4
2020	213	141	12	0
2021	177	181	6	1

The Unhealthy for Sensitive Groups range represents an exceedance level for criteria pollutants (meaning for $PM_{2.5}$ above the 24-Hour Standard of 35 µg/m³). 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 2021, broken down by air quality scenario.

2021 Unhealthy Scenarios	*Unhealthy for Sensitive Groups Days*	*Unhealthy Days*
Elevated $PM_{2.5}$ - Liberty Only	4	0
Elevated $PM_{2.5}$ - Widespread	1	1
Elevated Sulfur Dioxide Only	0	0
Elevated Ozone Only	1	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

The EPA promulgated the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants. In addition, the Commonwealth of Pennsylvania has also adopted standards for hydrogen sulfide (H_2S) 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.

Pollutant	*Primary Sources*	*Health Effects*
	Criteria Pollutants	
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

Pollutant	*Primary Sources*	*Health Effects*
	Other	
Hydrogen Sulfide – H_2S (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 2021. Meteorological monitors (wind and temperature) are also included.

	SO_2	CO	NO_x	O_3	PM_{10}	$PM_{2.5}$	H_2S	HAPs	Dustfall	Met
Flag Plaza					**C**					
Lawrenceville	**C**(T)	**C**(T)		**C**		**C**, **I**(3) **SPC**(3)		**I**(6) **NATTS**(6)		**C**
Avalon						**C**				
Harrison			**C**	**C**		**I**(3)				
Natrona									**I**, **I**	
N. Braddock	**C**				**C**	**I**(3)	**C**			**C**
Liberty	**C**				**C**	**C**, **I**(1) **I**(12) **SPC**(6)	**C**	**I**		**C**
Glassport					**C**					
Clairton					**I**(6)	**I**(6)				
South Fayette	**C**			**C**		**I**(3)				
Collier									**I**	
Braddock									**I**	
Parkway East		**C**(T)	**C**(T)			**C, I**(12)		**BC**		**C**
Total	C = 4	C = 2	C = 2	C =3	C = 4 I = 1	C = 4 I = 8 SPC = 2	C = 2	C = 1 I = 3	I = 4	C = 4

KEY C = Continuous; I = Intermittent or Filter-Based; BC = Black Carbon (Aethalometer, Continuous data)
(1), (3), (6), or (12) = Sampling Frequency [for example, (3) means every third day]
SPC = Speciation; (S) = Seasonal Continuous Monitor; (T) = Trace Level Monitor
NATTS = National Air Toxics Station: PM10 metals, volatile organic compounds, carbonyls, polycyclic aromatic hydrocarbons

Additional Information

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

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

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

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