



Philadelphia's Air Quality Report 2024



Executive Summary¹

This report focuses on the air quality of the City of Philadelphia, as presented by the Philadelphia Department of Public Health, Air Management Services (AMS), the local air pollution control agency for the City of Philadelphia. As an urban area, Philadelphia faces many of the same pollution challenges as other densely populated areas, such as emissions from vehicles and industries. The information contained in this report reviews Philadelphia's air quality for the calendar year 2024 and reports how the City's air compared with the National Ambient Air Quality Standards (NAAQS). This report covers the following criteria pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead. It also provides an overview of hazardous air pollutants (HAPs), also referred to as air toxics.

In general, long-term trends show that air pollutant concentrations in Philadelphia have decreased over the last several decades. In 2024, Philadelphia maintained the NAAQS for all pollutants except for ozone. For simplicity, impacts from each pollutant are compared and a generalized Air Quality Index (AQI) is used to report the air quality each day. In 2024, Philadelphia experienced a total of 173 Good days, 183 Moderate days, and 10 Unhealthy for Sensitive Groups (Code Orange) days. Philadelphia had no Unhealthy, Very Unhealthy, or Hazardous days recorded based on AQI values.

For further information, please visit the Air Management Services website at: <https://www.phila.gov/departments/departments-of-public-health/about-us/contact-us/> or contact us at: 215-685-7580.

Cherelle Parker, Mayor
Palak Raval-Nelson, Ph.D., M.P.H., Health Commissioner

¹ Cover photo by [Leo Serrat](#) on [Unsplash](#)

Table of Contents

Contents

Executive Summary	1
Introduction	4
Air Monitoring Network.....	5
Quality Assurance.....	8
Air Quality Index.....	9
National Ambient Air Quality Standards.....	13
The Pollutants AMS Measures	14
Ozone (O ₃)	15
Carbon Monoxide (CO)	20
Nitrogen Dioxide (NO ₂).....	22
Sulfur Dioxide (SO ₂).....	24
Lead (Pb).....	26
Particulate Matter (PM ₁₀ , PM _{2.5}).....	28
PM ₁₀	30
PM _{2.5}	32
Air Toxics	34
Philadelphia Air Quality Survey.....	39
Breathe Philly Project.....	41
Appendix A: Reference Websites.....	42
Appendix B: Air Quality Data Tables	43
Appendix C: History of the National Ambient Air Quality Standards	55

Tables

Table 1. Philadelphia AMS air monitoring sites, their locations, and the pollutants or parameters measured at each station.	6
Table 2. Philadelphia AMS air monitoring site locations and the purpose of each monitoring site.	7

Figures

Figure 1. Map of regulatory and non-regulatory air monitoring stations in Philadelphia 2024.....	6
Figure 2. Color Coded AQI	9
Figure 3. shows an annual summary of the number of good, moderate, and unhealthy air quality days in Philadelphia based on monitoring conducted by AMS since 1993 ⁶	11
Figure 4. Philadelphia Annual AQI Summary.....	12
Figure 5. Ozone Monitoring Map	15
Figure 6. Ozone forms when NO _x and VOCs react in sunlight.....	15
Figure 7. 2020 NO _x and VOC Emissions from All Sources ⁷	16
Figure 8. Ozone exposure affects both the heart and lungs.	17
Figure 9. Ozone Trends for the 4th Highest Daily Maximum 8-Hour Concentration for All Sites.	18
Figure 10. Ozone Design Value Across Three Monitoring Site.	18
Figure 11. CO Monitoring Map.....	20
Figure 12. CO Trends for the 2nd Highest 8-Hour Average Concentration.	21
Figure 13. CO Trends for the Highest 1-Hour Average Concentration.	21
Figure 14. NO ₂ Monitoring Map.	22

Figure 15. NO ₂ Trends for Annual Average Concentration.....	23
Figure 16. NO ₂ Trends for 98th Percentile Daily Maximum 1-Hour Concentration.	23
Figure 17. SO ₂ Monitoring Map.....	24
Figure 18. SO ₂ Trends for 99th Percentile Daily Maximum 1-Hour Average Concentration.	25
Figure 19. Lead Trends (Maximum) Rolling 3-Month Average.	27
Figure 20. Size Comparisons for PM Particles.....	28
Figure 21. PM ₁₀ Monitoring Map.....	30
Figure 22. PM ₁₀ Trends for the Highest 24-Hour Average Concentration for All Monitoring Sites.....	31
Figure 23. PM _{2.5} Monitoring Map.	32
Figure 24. PM _{2.5} Trends for 98th Percentile 24-Hour Concentration.	33
Figure 25. PM _{2.5} Trends for Annual Mean Concentration.....	33
Figure 26. Air Toxics Monitoring Map.....	34
Figure 27. Source Category Contribution to 2020 AirToxScreen Cancer Risk.....	36
Figure 28. 2020 AirToxScreen Cancer risk sources: Secondary dominates, followed by Nonpoint, Onroad; others minor.	36
Figure 29. HAP Contributions to 2020 AirToxScreen Cancer Risk.....	37
Figure 30. 2020 AirToxScreen Cancer risk by pollutant: Formaldehyde dominates, followed by Others, Carbon Tetrachloride, Benzene; rest minor.....	37
Figure 31. 2024 Mean Concentrations for Formaldehyde.	38
Figure 32. PAQS Site Map.....	40

Appendices

Appendix B. Table 1. Ozone 4th Highest Daily Maximum 8-Hour Concentrations (ppm).	44
Appendix B. Table 2. Carbon Monoxide 2nd Highest 8-Hour Average Concentrations (ppm).....	45
Appendix B. Table 3. Carbon Monoxide Highest 1-Hour Average Concentrations (ppm).....	46
Appendix B. Table 4. Nitrogen Dioxide Annual Average Concentrations (ppb).	47
Appendix B. Table 5. Nitrogen Dioxide 98th Percentile Daily Maximum 1-Hour Concentrations (ppb).....	48
Appendix B. Table 6. Sulfur Dioxide 99th Percentile Daily Maximum 1-Hour Average Concentrations (ppb).	49
Appendix B. Table 7. Lead (Maximum) Rolling 3-Month Averages (µg/m ³).....	50
Appendix B. Table 8. PM ₁₀ Highest 24-Hour Average Concentrations (µg/m ³).	51
Appendix B. Table 9. PM _{2.5} 98th Percentile 24-Hour Concentrations (µg/m ³).	52
Appendix B. Table 10. PM _{2.5} Annual Mean Concentrations (µg/m ³).	53
Appendix B. Table 11. AQS Site ID information. This table includes historical monitoring sites no longer in operation.....	54

Appendix C. Table. 1. History of the National Ambient Air Quality Standards for Carbon Monoxide ¹⁰	56
Appendix C. Table. 2. History of the NAAQS for Pb-TSP (Lead in total suspended particles) ¹¹	57
Appendix C. Table. 3. History of the NAAQS for Nitrogen Dioxide ¹²	58
Appendix C. Table. 4. History of the NAAQS for Ozone ¹³	59

Introduction

The Philadelphia Department of Public Health, Air Management Services (AMS) is responsible

for the prevention, abatement, and control of air pollution and air pollution nuisances; achieving and maintaining the National Ambient Air Quality Standards (NAAQS) in Philadelphia; and protecting the health and quality of life of the Philadelphia community from the adverse effects of air contaminants and noise.

AMS implements the environmental protection mandates contained in city, state, and federal regulations; reviews construction and operating permits for compliance with air regulations, standards, and guidelines; develops emission inventories for large stationary sources; operates and maintains a citywide air sampling network to continuously monitor Philadelphia's air; routinely inspects pollution sources; services citywide complaints of air pollution, asbestos, vibration, idling and noise; issues violations; conducts enforcement actions; and advances voluntary emissions reductions.

Air Monitoring Network

The City of Philadelphia operates a robust air monitoring network, consisting of nine EPA regulatory stations and one non-regulatory station, as depicted in Figure 1. An additional regulatory station (HUN) is scheduled to start operations in 2026, bringing the total number of regulatory stations to ten. These ten stations, strategically located across the city, measure criteria pollutants, including ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and particulate matter (PM₁₀ and PM_{2.5}). Four stations also monitor air toxics, such as formaldehyde, benzene, and carbon tetrachloride. Real-time measurements at many sites provide immediate data on pollution levels, enabling prompt responses. Figure 1 and Table 1 show the locations and pollutants measured at each station. AMS measures air quality for several reasons:

- To ensure that long-term goals and targets to reduce levels of air pollution are being met.
- To provide information to the public as to how good or bad the air quality is in Philadelphia.
- To ensure attainment with standards set forth by the United States Environmental Protection Agency (EPA).

An air monitoring network plan (AMNP) has been made available to the public annually starting in the year 2007. The most recent AMNP is located on the AMS reports and documents website: <https://www.phila.gov/documents/air-management-reports-and-documents/>.

This monitoring network is designed and established following requirements and protocols set forth by EPA, specified in Title 40 Part 58 of the Code of Federal Regulations.

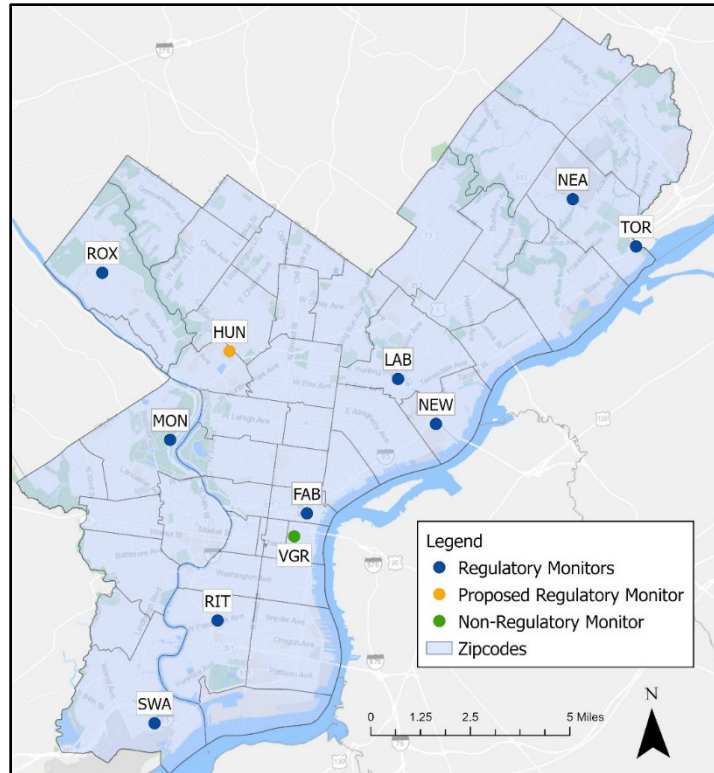


Figure 1. Map of regulatory and non-regulatory air monitoring stations in Philadelphia 2024

Table 1. Philadelphia AMS air monitoring sites, their locations, and the pollutants or parameters measured at each station.

			Parameter														
AQS Site Code	AMS Site	Address	CO	SO ₂	Ozone	NO ₂	NOy/NO	PM ₁₀	PM _{2.5}	Speciated PM _{2.5}	PM Coarse	Carbonyls	PAMS VOC	TSP Metals (Be, Cr, Mn, Ni, As, Cd, Pb)	Toxics TO15	MET	AMS Site
421010004	LAB	1501 E. Lycoming St			X				X								LAB
421010014	ROX	Eva & Dearnley Sts										X			X		ROX
421010024	NEA	Grant Ave & Ashton Rd			X												NEA
421010048	NEW	2861 Lewis St	X	X	X	X	X	X	X	X	X	X	X		X	X	NEW
421010055	RIT	24th & Ritner Sts		X					X	X		X		X	X		RIT
421010057	FAB	3rd & Spring Garden Sts							X								FAB
421010063	SWA	8200 Enterprise Ave										X			X		SWA
421010075	TOR	4901 Grant Ave & James St	X			X			X							X	TOR
421010076	MON	I-76 & Montgomery Drive	X			X			X					X			MON
(not in AQS)	VGR	6th & Arch Sts			X				X							X	VGR
421010068	HUN	5200 Wissahickon Ave *				X			X			X			X		HUN

*HUN is a new site proposed for 2025

Table 2. Philadelphia AMS air monitoring site locations and the purpose of each monitoring site.

AMS Site	Address	Statement of Purpose
LAB	1501 E. Lycoming St	Built in 1964, this monitor assesses the City's ozone and PM _{2.5} concentrations. New monitoring methods are often evaluated on this site because it is located at the AMS Laboratory.
ROX	Eva St & Dearnley St	As a periphery site, this site is used for measuring Air Toxics and Carbonyls.
NEA	Grant Ave & Ashton Rd	As a periphery site, this site is best for measuring ozone in the city, because as a secondary pollutant, ozone requires some time to form (longer time periods allow precursor emissions to distribute more uniformly across a region and thus allow ozone concentrations to develop more uniformly across subregions and even large-scale regions). There are fewer "hot spots" as ozone is not directly emitted from combustion activities as other pollutants are.
NEW	2861 Lewis St	This site was one of the few sites that was originally established to measure the impact of specific industrial facilities which are now closed. Today, the monitors conduct continuous particulate monitoring and provide information about the nearby wastewater treatment plant. As of October 2, 2013, the NCore site has been moved to this site from Baxter water treatment plant (BAX). NEW also serves as the city's Photochemical Assessment Monitoring Station (PAMS) which means it measure ozone precursors and meteorological conditions that can help predict ozone concentrations.
RIT	24 th St & Ritner St	This site was selected to help assess the impact of the petroleum refinery on the local community. The refinery is now closed, but other industrial work in the areas justifies the monitor location. The area was identified by air quality modeling.
FAB	3 rd St & Spring Garden St	This site was established to monitor high levels of fine particulates in the City based on EPA Region III's air quality modeling of air toxics in Philadelphia. It shows high levels of fine particulate created by vehicle traffic.
SWA	8200 Enterprise Ave	This site was established to measure air toxics, carbonyls, and metals. EPA Region III modeling analysis has shown that areas near the airport have high levels of aldehydes, a type of carbonyl.
TOR	4901 Grant Ave & James St.	This site was established as the 1 st near-road NO ₂ monitor in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area.
MON	I-76 & Montgomery Drive	This site was established as the 2 nd near-road monitor in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area.
VGR	6 th St & Arch St	EPA's Village Green Air Monitoring Station. Utilizes solar and wind turbine power as energy sources. This site was established to increase community awareness of environmental conditions.
HUN	5200 Wissahickon Ave	This site, proposed for operation in 2026, will monitor nitrogen dioxide (NO ₂), PM _{2.5} , carbonyls, and air toxics in western North Philadelphia. Its purpose is to ensure compliance with National Ambient Air Quality Standards and to protect public health by assessing key criteria pollutants and air toxics.

Quality Assurance

The AMS Laboratory's main responsibility is to provide accurate data on the quality of the City's air, as it can lead to various health concerns. Pollutants in the atmosphere are measured to answer several questions such as:

- Are the NAAQS being met in Philadelphia?
- How close or how far away is the city from achieving the projected goals for these standards?
- Which pollutants are getting worse (increasing in concentration) or improving (decreasing in concentration)?

Many of the measurements require detecting very small amounts of a pollutant, often expressed as parts per million (ppm) or parts per billion (ppb). To illustrate this, imagine a million yellow balls, all the same size, with several red balls in the middle of them; the challenge is to find those red balls and then be able to count them. The instruments used to measure air pollutants need to be reliable in identifying the pollutant and accurate in making the measurement every time. The primary way to check if the instruments are giving accurate measurements is to send a sample of air which has a known amount (concentration) of a pollutant and compare the instrument's concentration measurement to the known correct concentration. Adjustments (calibration) can then be made to an instrument to give a better measurement. If the equipment is off by a significant margin, the instrument needs to be repaired or replaced. The EPA and the AMS Laboratory have standard operating procedures on how accurate and reliable measures need to be to answer the necessary questions. The current instruments are much more reliable than those available many years ago. Steps to ensure good data quality include:

- Automated calibration,
- Manual calibration conducted by chemists,
- Review of the data by an experienced Quality Assurance (QA) engineer or scientist.

The system is geared towards public safety; for example, a few measurements can be enough to identify a problem in meeting the NAAQS, but many good measurements over a period of time (often three years) as well as additional types of analysis are needed to "demonstrate attainment" with the corresponding pollutant's standard on the NAAQS.

The EPA regulations on establishing an air monitoring network are found in Title 40 – Protection of Environment in the Code of Federal Regulations Part 58 – Ambient Air Quality Surveillance². A comprehensive technical systems audit (TSA) by EPA occurs at least once every three years to evaluate an ambient air quality monitoring program. AMS' last TSA occurred in September 2021 and was expected again in 2023. The TSA included on-site interviews with program personnel, evaluations of ambient air monitoring sites and laboratories operated by the agency, and a review of quality assurance and data processing procedures. AMS follows EPA guidance in the Quality

² https://www.ecfr.gov/cgi-bin/text-idx?SID=af0f262c08e4f8aad56a91c70e0ce294&mc=true&tpl=/ecfrbrowse/Title40/40cfr58_main_02.tpl

Assurance Handbook for Air Pollution Measurement Systems, Volume II³, dedicated to the Ambient Air Quality Surveillance Program and the data collection activities inherent to that program. Additionally, workshops are provided annually to staff as an opportunity to interact with and learn from nearby state and local monitoring agency program representatives as well as expert speakers. Participants share experiences meeting challenges with new air quality monitoring technology, updated data analysis and quality assurance methods, and revised regulatory requirements. AMS staff regularly attend training and workshops held by the Mid-Atlantic Regional Air Management Association (MARAMA).

Air Quality Index

The Air Quality Index (AQI) is a color-coding system for air quality used by government agencies across the United States. Daily pollution levels for five pollutants (ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide) are converted into a score ranging from 1 to >300. This scale helps communicate the impacts of air pollution to the public in a clear and simple way. A color coded AQI scale is shown in Figure 2. When the AQI is 100, it typically means that the pollutant is at the concentration of the NAAQS.

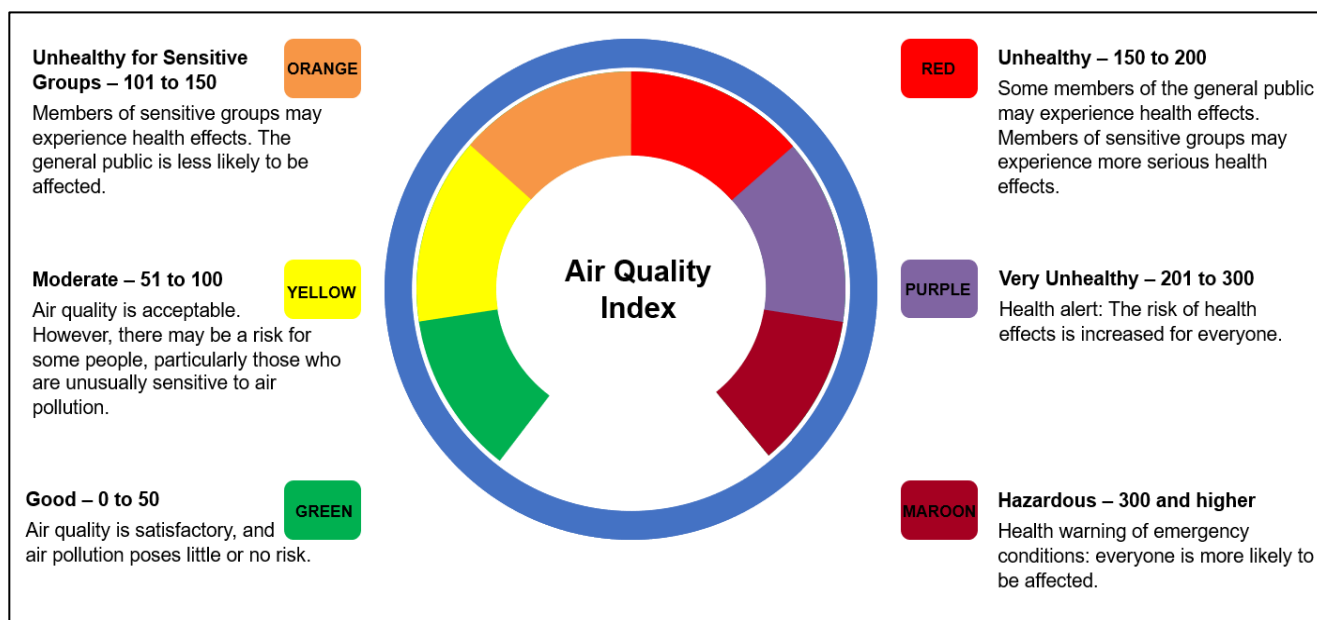


Figure 2. Color Coded AQI

³ https://www3.epa.gov/ttn/amtic/files/ambient/pm25/qa/Final%20Handbook%20Document%201_17.pdf

An “Action Day” (also Code Orange) occurs when the AQI for any pollutant exceeds 100, meaning some people should start to take actions to limit their pollution exposure. Action Days are more likely to occur in the summer months but can happen any time of the year. On these days, the public is advised to take precautions to protect themselves and their families from health effects and do their part to reduce pollution. For example, on a Code Orange Day, children, seniors, and those with respiratory ailments (sensitive groups) are advised to minimize prolonged outdoor exposure. On a Red or Purple day, all residents are advised to limit outdoor activity. Red and Purple days are uncommon. The AQI is calculated for each pollutant and the highest of the five pollutant scores is reported as the overall air quality rating for Philadelphia for a given day.

Action Days are reported through television, online media, and by local and regional air agencies. Current air quality conditions in Philadelphia can be found on the website: www.phila.gov/breathephilly or <https://www.phila.gov/services/mental-physical-health/environmental-health-hazards/air-quality/>.

The AQI values for each day of 2024, are shown in Figure 3⁴. In 2024, the EPA lowered the NAAQS for PM_{2.5}, resulting in changes to the AQI Breakpoints (concentrations that relate to green, yellow, etc.). This means that PM_{2.5} concentration that were considered Good in 2023, could now be considered Moderate. Figure 3 shows the daily AQI using the newest breakpoints from 2024. Additionally, these readings were retrieved from EPA database after the 2024 EPA update of PM_{2.5} FEM data.⁵

In 2024 Philadelphia experienced a total of 173 Good days by AQI value, 183 Moderate days, 10 Unhealthy for Sensitive Groups (Code Orange) days, and 0 Unhealthy days, Very Unhealthy days, or Hazardous days.

⁴ <https://www.epa.gov/outdoor-air-quality-data/air-data-tile-plot>. Downloaded August 4, 2025.

⁵ <https://www.federalregister.gov/documents/2024/05/16/2024-10750/update-of-pm25-data-from-t640t640x-pm-mass-monitors#:~:text=DATES%3A,Regional%20office%20with%20any%20questions.>

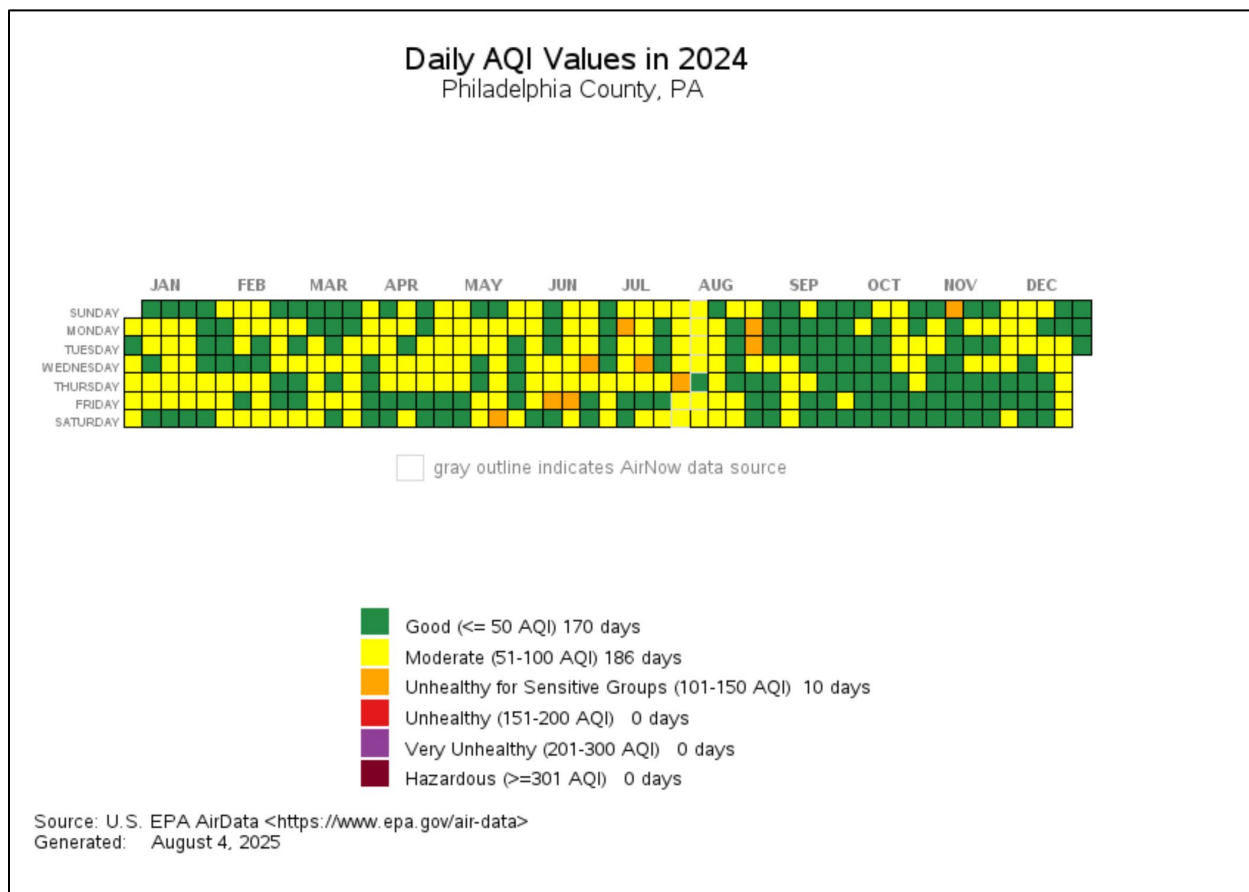


Figure 3. shows an annual summary of the number of good, moderate, and unhealthy air quality days in Philadelphia based on monitoring conducted by AMS since 1993 ⁶.

Figure 4 shows a summary of AQI for each year since 1993, and helps identify long term air quality trends. The figure shows that days with Unhealthy or worse AQI have decreased, but that days with Moderate AQI have increased recently.

Note that in this chart:

- 1) The AQI reflects the recent EPA update of PM_{2.5} FEM data (see Footnote 6).
- 2) All historic AQI values have been standardized with the current EPA AQI breakpoints and are consistent with the EPA 2015 ozone standards and the 2024 PM_{2.5} standards.
- 3) The 2023 AQI data reflects the tentative treatment of exceptional events data. This is subject to EPA approval.

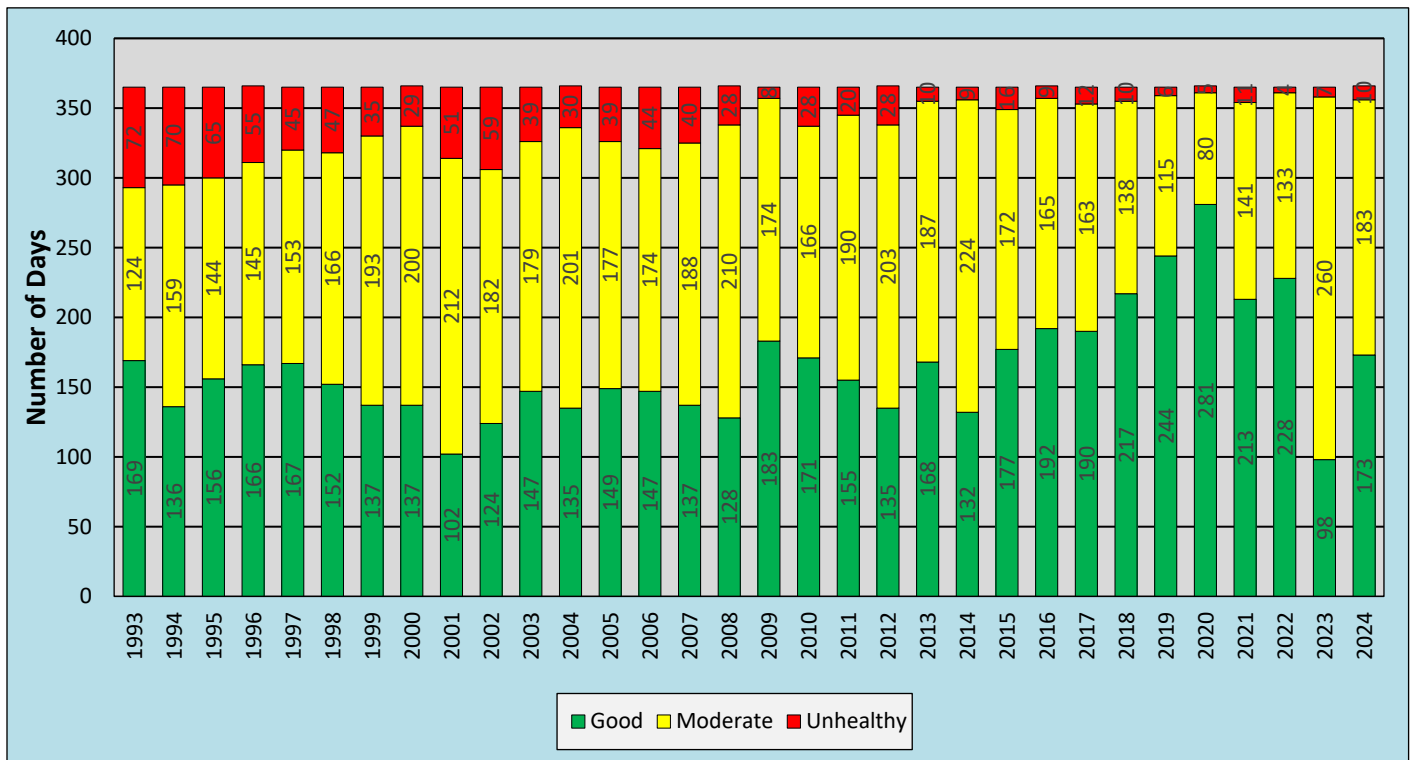


Figure 4. Philadelphia Annual AQI Summary

National Ambient Air Quality Standards

The Clean Air Act (CAA), which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The NAAQS is a pollutant concentration that is considered not healthy for the public to breathe. The goal is to keep pollutant concentrations below the NAAQS. The CAA identifies two types of NAAQS.

- Primary standards, which provide public health protection, including protecting the health of "sensitive" populations such as people with asthma, children, and the elderly.
- Secondary standards, which provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The EPA has set NAAQS for six criteria air pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, particulate matter (airborne particles), and ozone. Periodically, the standards are reviewed and may be revised. The current standards are listed here: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. A history of the standard for each criteria pollutant is shown in Appendix C. The standards are listed as pollutant concentrations in units of parts per million (ppm) by volume, parts per billion (ppb) by volume, or micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$).

State and local agencies throughout the country collect pollutant concentrations during the entire year. For each pollutant, there is a specific way to compare these concentrations to the NAAQS. Some pollutants take short-term concentrations like a day or 8 hours, while other pollutants are averaged over the entire year. Based on these specific averaging times and techniques, a value for each year is produced that can be compared to the NAAQS. However, concentrations can have large variations year-to-year, and the NAAQS are meant to evaluate pollution levels over a longer term. Therefore, most pollutant concentrations are averaged over 3 years and then compared to the NAAQS. This final concentration that is compared to the NAAQS is called a Design Value. Design Value specifications can be found in the EPA NAAQS table here: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.

In 2024, Philadelphia maintained attainment for all criteria pollutants, except for ozone. A new EPA PM_{2.5} standard⁶ set the annual average concentration standard at 9.0 $\mu\text{g}/\text{m}^3$. Current PM_{2.5} concentrations are above the new standard, but Philadelphia has until 2026 to get concentrations below the new standard. EPA will issue new determinations of PM_{2.5} attainment status by 2026 according to this standard. If Philadelphia remains above the standard in 2026, the city will no longer be in attainment for the PM_{2.5} standard.

⁶ <https://www.govinfo.gov/content/pkg/FR-2024-03-06/pdf/2024-02637.pdf>

The Pollutants AMS Measures

The following pages provide information on the health effects, sources, and trends of pollutants measured in Philadelphia. The sections include the six criteria pollutants, for which EPA has established NAAQS, as well as pollutants identified as being toxic or hazardous. Each of the criteria pollutants is graphed to show the historical trends compared with national standards. The graphs identify the range of values with the minimum and maximum (“MIN / MAX RANGE”) and with a solid black line for the mean (average) of all recorded levels each year. It is important to note the mean, as it factors out extreme levels, and thereby provides a better indication of general air quality levels. In addition, Appendix B provides tables of historical data downloaded from EPA’s Air Quality System data mart.

Ozone (O₃)

NAAQS

The 3-year average of the annual fourth-highest daily maximum 8-hour average O₃ concentration is less than or equal to 0.070 ppm

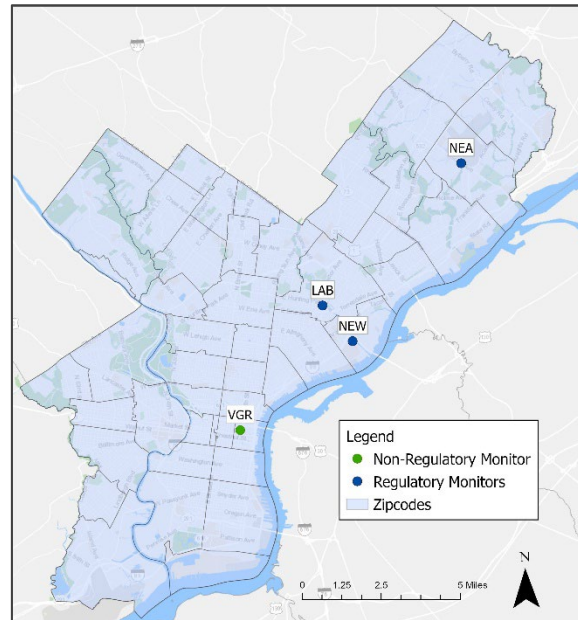


Figure 5. Ozone Monitoring Map

Ground level ozone (the primary constituent of smog) is one of the pollutants most commonly responsible for air that is Moderate and Unhealthy for Sensitive Groups in the Philadelphia region. Ozone is not emitted into the atmosphere directly but is formed by chemical reactions between other pollutants. Specifically, Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO_x) react to create ozone in the presence of heat and sunlight as shown in Figure 6. Ozone levels are consistently higher during the summer months because of the abundant heat and sunlight.



Figure 6. Ozone forms when NO_x and VOCs react in sunlight.

VOCs are organic (i.e., carbon-containing) compounds that evaporate readily, such as gasoline vapors, paint fumes, and many other chemicals. NO_x stands for two compounds, nitric oxide (NO) and nitrogen dioxide (NO₂). Some VOCs are considerably more reactive in the atmosphere than others, and the reactivity of a VOC influences how quickly ozone forms. A compound that reacts in a few minutes to produce ozone will have a much greater impact near its source than one that reacts more slowly. Thus, ozone can form at various distances downwind of a VOC source due to the speed of these chemical reactions.

There are four categories of emission sources from human activity that produce VOCs and NO_x:

- Point sources – Large utilities like powerplants, industrial facilities, and other operations.

- Nonpoint sources – Commercial, solvent use, waste disposal, emissions from homes throughout the city, road paving, wildfires, and other smaller sources.
- Nonroad sources – Construction and agricultural equipment, ships, lawn equipment, airport and marine port ground vehicles, trains, and other mobile sources.
- Onroad sources – Cars, trucks, buses, and motorcycles.

Figure 7 shows NO_x and VOC emissions from all source categories for Philadelphia County for 2020. The EPA’s 2020 National Emission Inventory (NEI) is the most recent national air emissions inventory. The 2023 NEI is estimated for release in 2026. Gathering data, performing mathematical modeling, and time-consuming quality assurance result in the NEI getting released several years after the emission date.

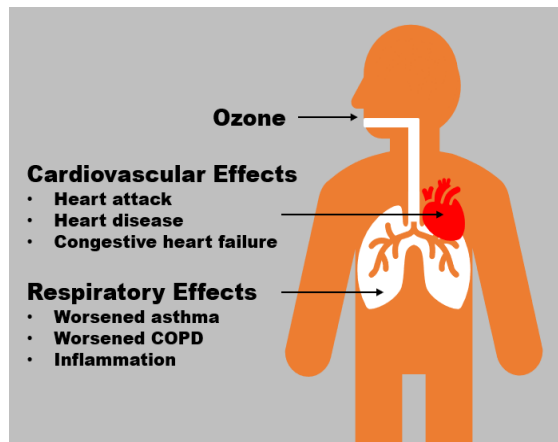
2020 NO _x Emissions in Philadelphia (tons):				2020 VOC Emissions in Philadelphia (tons):			
Total: 10,541				Total: 15,555			
Point	Nonpoint	Nonroad	Onroad	Point	Nonpoint	Nonroad	Onroad
957.8	4,783.9	1,112.0	3,687.7	530.6	11,375.2	1,194.4	2,454.8
9.1%	45.4%	10.5%	35.0%	3.4%	73.1%	7.7%	15.8%

Figure 7. 2020 NO_x and VOC Emissions from All Sources ⁷.

Over the years, NO_x and VOC emissions from point sources have been decreasing steadily, while nonpoint and onroad sources emit large percentages of NO_x and VOC in Philadelphia.

Emissions of VOC and NO_x may be carried by wind currents while reacting to produce high ozone levels hundreds of miles from their sources. In the eastern United States during the summer months, ground level ozone is frequently high over wide areas containing several states. This phenomenon is caused by ozone and its precursors traveling via wind currents across great distances. Therefore, high concentrations of ozone in Philadelphia could be partly caused by VOC and NO_x emissions in Wilmington, DE or Baltimore, MD. Likewise, high concentrations in New Jersey could be caused by VOC and NO_x emissions in Philadelphia.

In any discussion of ozone, it is important to distinguish between the effects of ozone on the ground and ozone high in the atmosphere. An advertisement might use the slogan “good up high, bad nearby,” to describe ozone. Up high, in what’s called the Ozone Layer (about 20 to 25 kilometers above sea level), ozone is essential to the health of nearly every living thing. The Ozone Layer protects the Earth from harmful ultraviolet (UV) light. Near the ground, ozone reacts with buildings, plants, animals, and people, and is one of the most irritating, harmful components of smog.



People who are very young, elderly, or those who have chronic lung problems such as asthma are particularly sensitive to ground level ozone. The EPA concluded that ozone pollution causes respiratory harm such as worsened asthma, worsened COPD, and inflammation as shown in Figure 8. Ozone can indicate the presence of other harmful gases which may cause reproductive and developmental harm as well as harm to the central nervous system; and could cause cardiovascular harm such as heart attacks, heart disease, and congestive heart failure.⁷

Figure 8. Ozone exposure affects both the heart and lungs.

In 2024, there were four ozone monitoring sites: LAB, NEA, NEW, and VGR as shown in Figure 5. The ozone monitor at VGR is used to demonstrate the capabilities of new real-time monitoring technology using solar power for residents and citizen scientists to learn about local air quality. The real-time data is available here: <http://villagegreen.airnowtech.org/welcome?siteID=24292>. Data from the VGR monitor is not used for comparison to the NAAQS or AQI. Real-time data from the other ozone monitors is available on the Breathe Philly online dashboard: www.phila.gov/breathephilly.

Figures 9 and 10, central to this 2024 report, illustrate ozone trends across all monitoring sites and the corresponding ozone design values, incorporating the most recent data through 2024. In 2024, the average of the 4th highest daily maximum 8-hour ozone concentrations across the three monitoring sites was 0.072 ppm. The ozone design values for the LAB, NEA, and NEW monitoring sites were 0.065 ppm, 0.070 ppm, and 0.070 ppm, respectively as shown in Figure 10. For historical context, extensive wildfires in 2023 led to elevated particulate matter and ozone levels, increasing the number of poor air quality days and influencing subsequent monitoring activities.

⁷ U.S. Environmental Protection Agency, Integrated Science Assessment for Ozone and Related Photochemical Oxidants, 2013. EPA/600/R-10/076F.

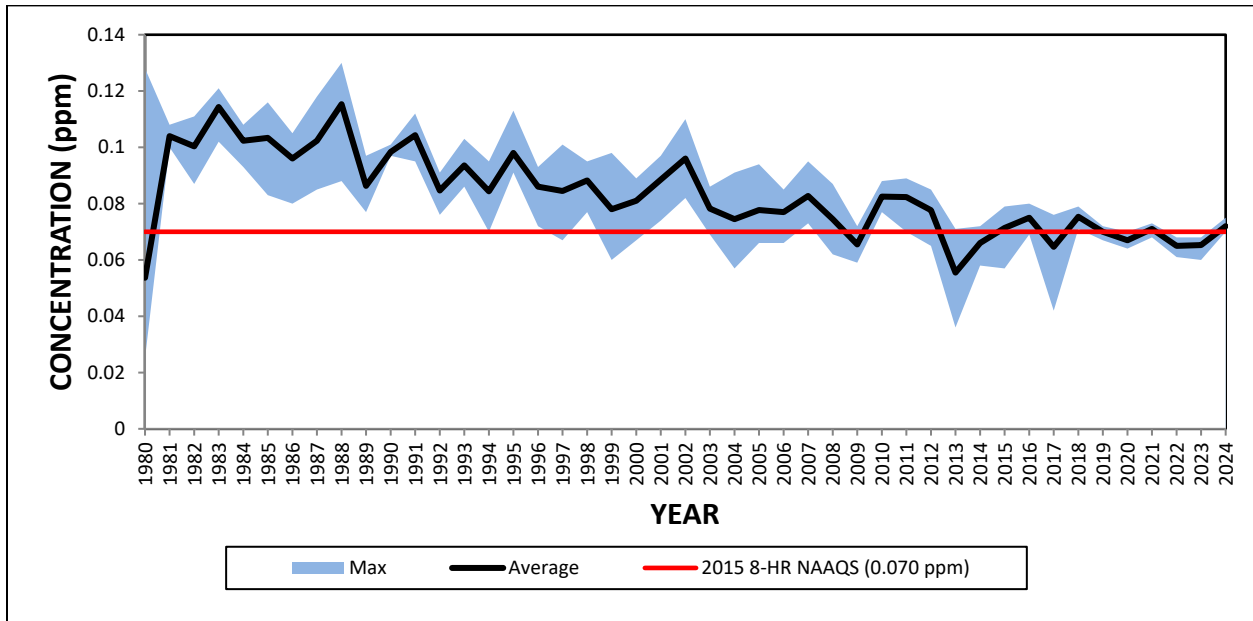


Figure 9. Ozone Trends for the 4th Highest Daily Maximum 8-Hour Concentration for All Sites.

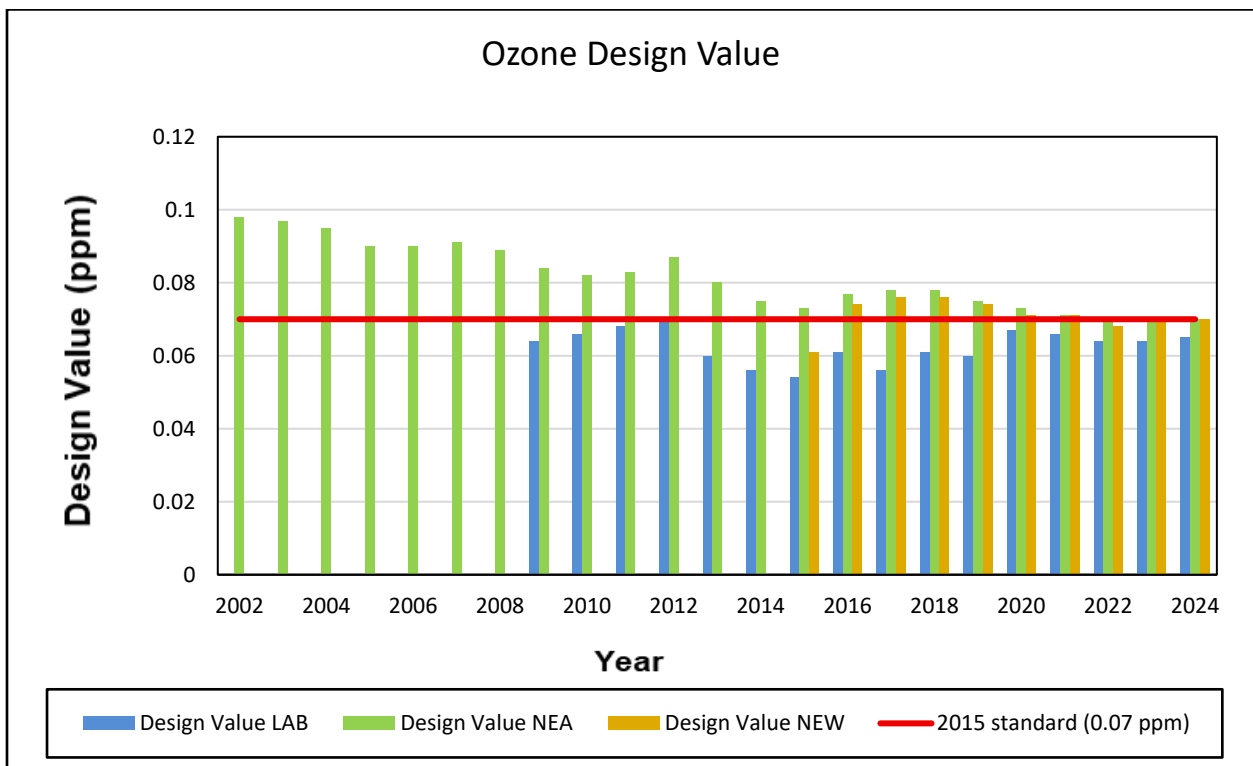


Figure 10. Ozone Design Value Across Three Monitoring Site.

While Figures 9 and 10 periodically show the ozone concentration below the NAAQS line. This does not mean Philadelphia attains the Ozone standard that year. As previously discussed, ozone takes time to form in the air and can create high ozone concentrations for from where the precursors chemicals were emitted. Therefore, ozone attainment is based on a larger area than just Philadelphia County. Every monitor in the larger area, called the Core Based Statistical Area (CBSA), must remain below the standard for the entire CBSA to attain the standard. Philadelphia is part of Philadelphia-Camden-Wilmington, PA, NJ, DE, MD CBSA. In this CBSA, typically the Bristol monitor in Bucks County, PA has a design value above the NAAQS. Therefore, the entire CBSA is nonattainment, including Philadelphia. Since ozone covers large areas, it is reasonable to assume that some emissions from Philadelphia contribute to the higher concentrations at the Bristol monitor.

Carbon Monoxide (CO)

NAAQS

9 parts per million for an 8-hour average concentration (2nd highest) not to be exceeded more than once per year.

35 parts per million for a 1-hour average concentration not to be exceeded more than once per year.

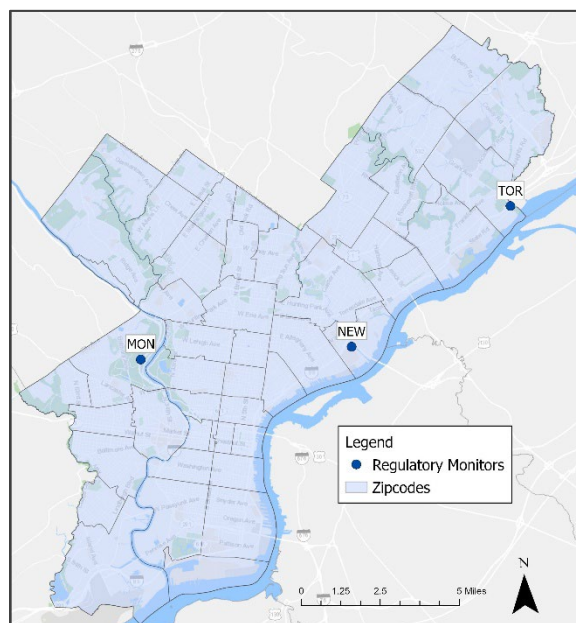


Figure 11. CO Monitoring Map.

Carbon monoxide (CO) is colorless, odorless gas that is poisonous at high concentrations. It is formed when the carbon in fuels is not burned completely. The major source of CO is motor vehicle emissions. Other sources of CO include residential, industrial, and natural processes. Weather greatly affects CO levels, and peak CO concentrations typically occur during the colder months of the year. While CO in the ambient outdoor air is rarely a concern, high CO concentrations are much more common indoors. Poorly ventilated gas appliances and furnaces can create CO that builds up within a home to dangerous levels.

Carbon monoxide enters the bloodstream and reduces oxygen delivery to the body's organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Exposure to elevated CO levels is associated with impairment of vision, reduced work capacity, reduced manual dexterity, poor learning ability, and difficulty in performing complex tasks. At very high levels, carbon monoxide can be fatal.

Over a forty-year period, there has been a continued reduction in CO levels. This is mainly the result of federal requirements for cleaner automobiles and fuel and state inspection/maintenance programs.

Figures 12 and 13 illustrate the trends in 8-hour and 1-hour CO concentrations, respectively, for Philadelphia. In 2024, the CO 8-hour concentration was 1.1 ppm, and the 1-hour concentration was 1.8 ppm reflecting current air quality conditions and remaining in compliance with national standards based on the latest monitoring data.

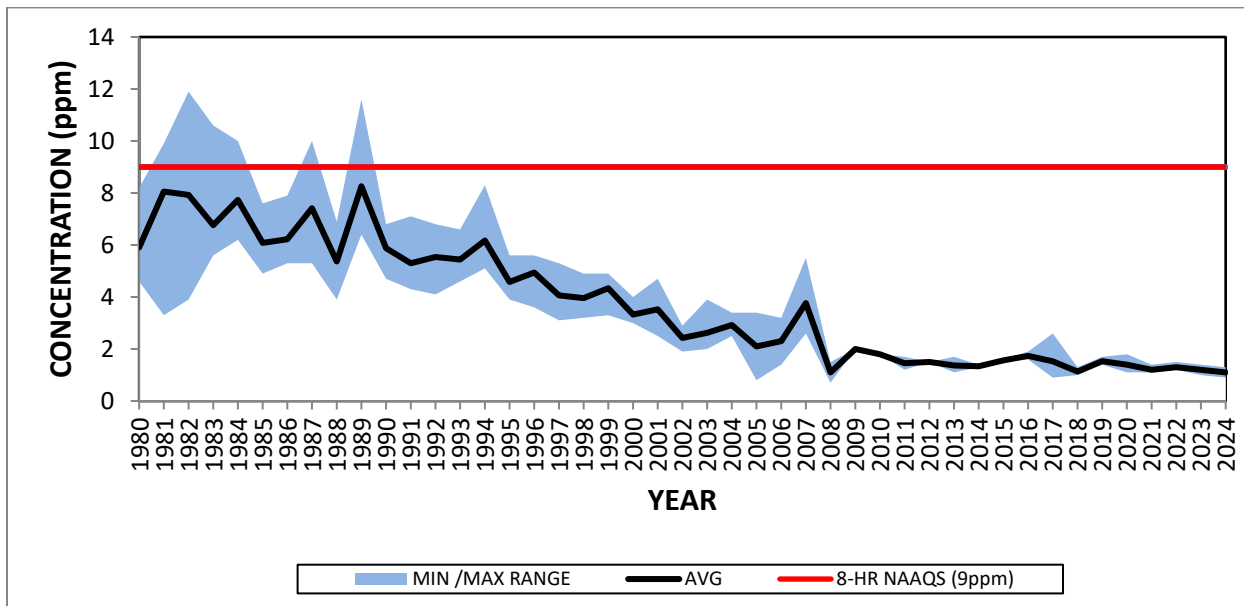


Figure 12. CO Trends for the 2nd Highest 8-Hour Average Concentration.

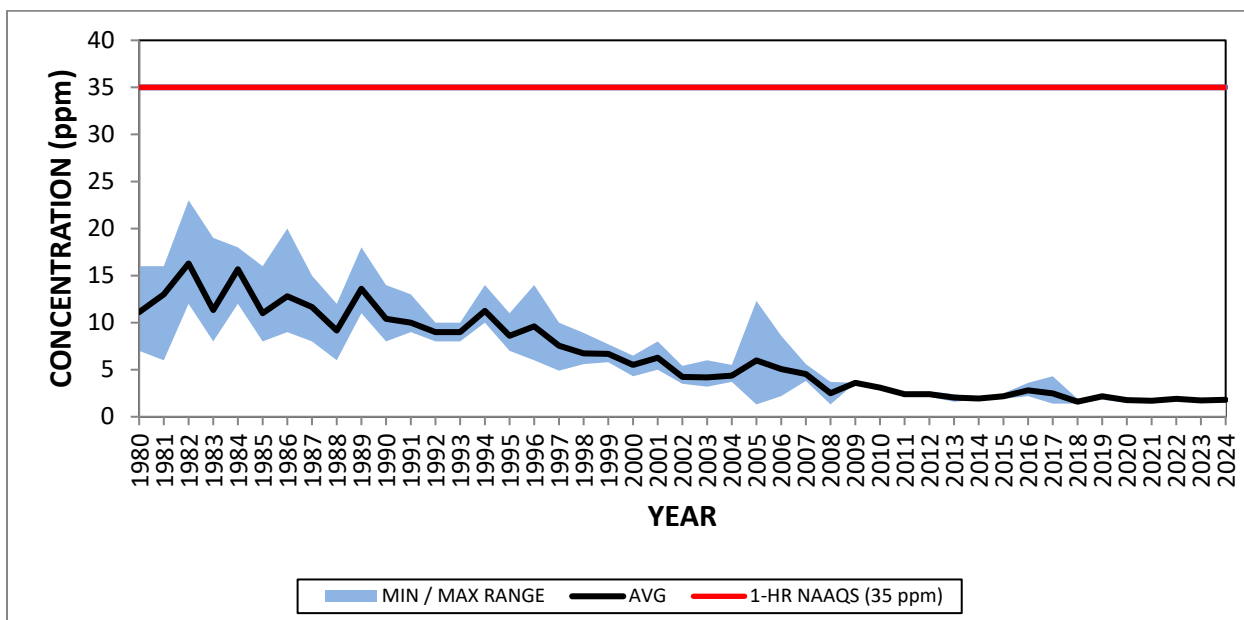


Figure 13. CO Trends for the Highest 1-Hour Average Concentration.

Nitrogen Dioxide (NO₂)

NAAQS

The annual average concentration is less than or equal to 53 ppb.
The 3-year average of the annual

98th percentile of the daily maximum 1-hour average concentration is less than or equal to 100 ppb.

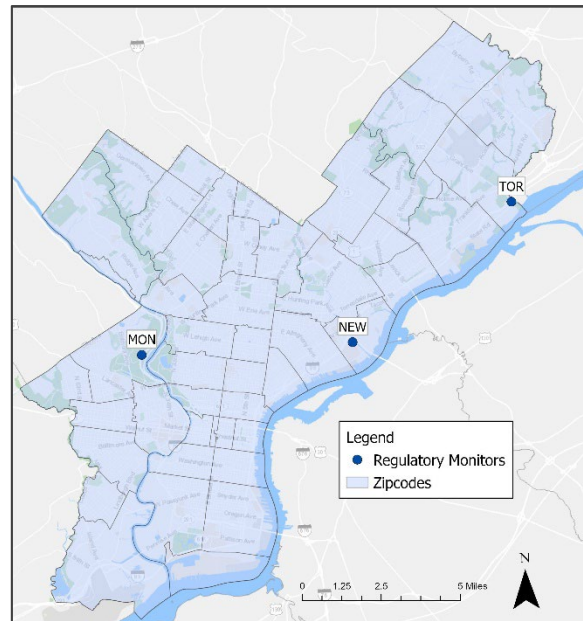


Figure 14. NO₂ Monitoring Map.

Nitrogen dioxide (NO₂) is a light brown gas that is an important component of urban haze. The compound is created primarily from fuel combustion in motor vehicles, utilities, and industrial sources.

NO₂ can irritate the lungs, cause and worsen asthma, and lower resistance to respiratory infections such as influenza. Nitrogen oxides (NO_x) are an important precursor to both ozone and acid rain and can affect both land and water ecosystems. They contribute to the formation of fine particulate matter, haze, and reductions in visibility.

Ambient levels of NO₂ in Philadelphia are significantly below the NAAQS, showing a sustained downward trend over time.

Figures 15 and 16 illustrate NO₂ trends for the annual average and the daily maximum 1-hour concentrations, respectively. In 2024, the annual average NO₂ concentration was 12.7 ppb, and the daily maximum 1-hour concentration was 46.7 ppb, reflecting current air quality conditions and remaining in compliance with national standards based on the latest monitoring data.

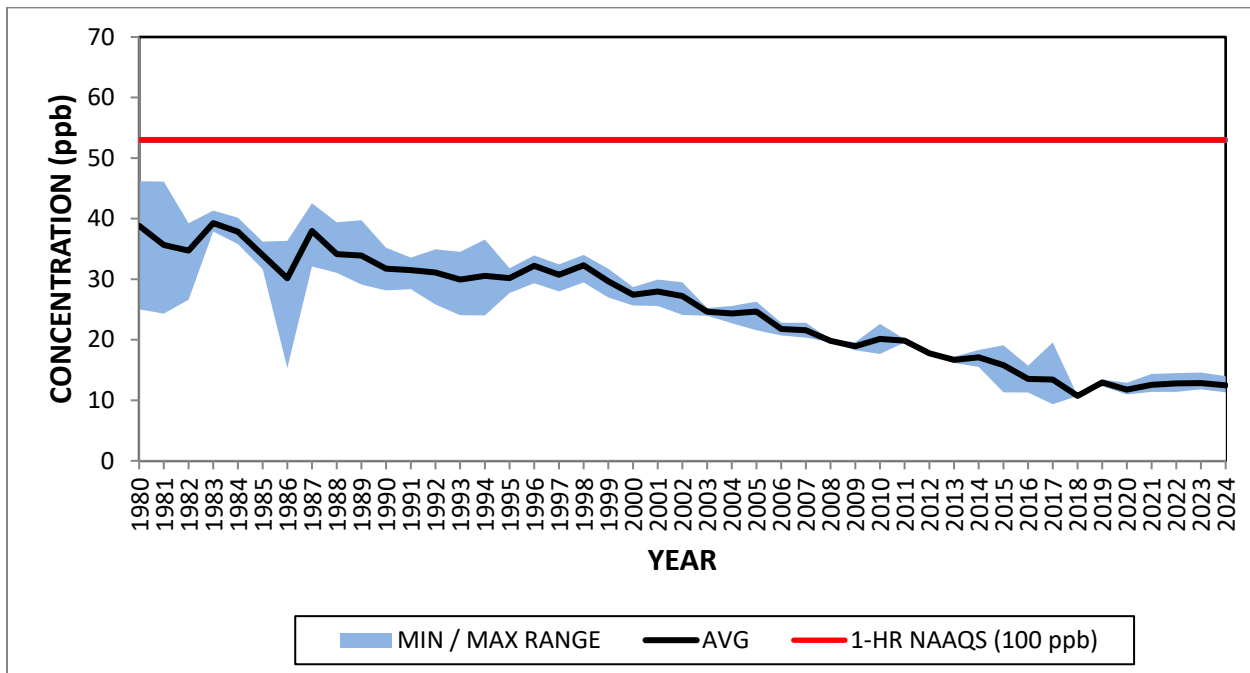


Figure 15. NO₂ Trends for Annual Average Concentration.

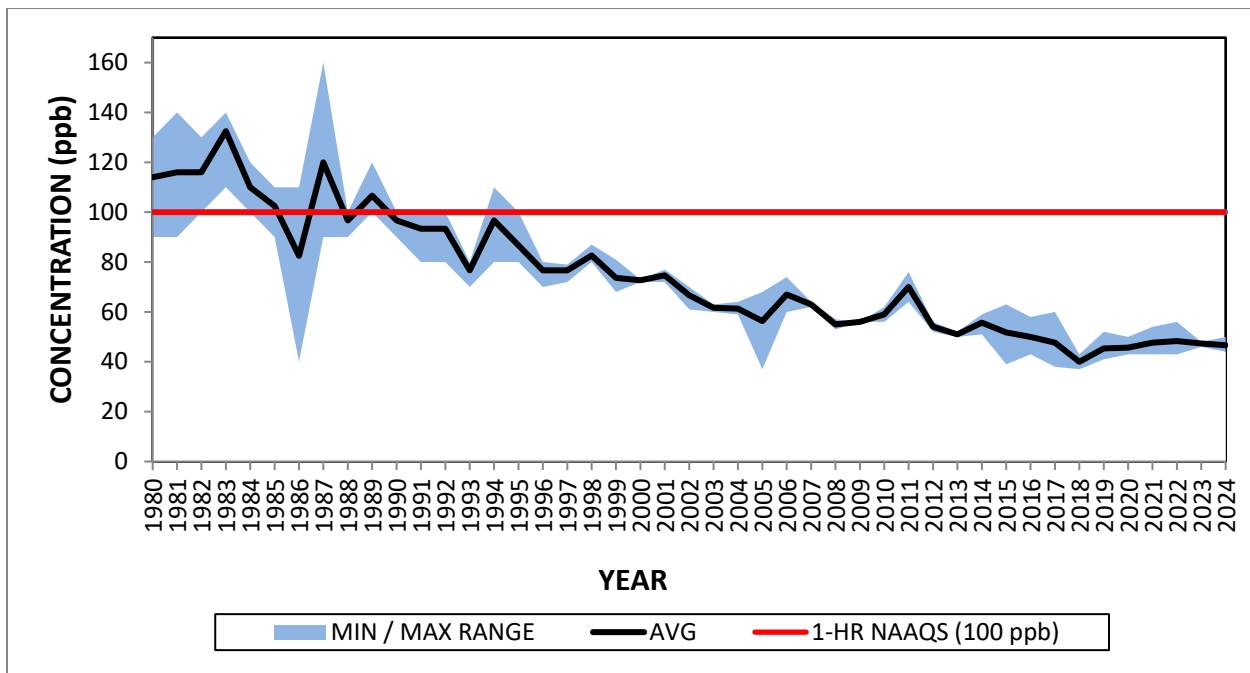


Figure 16. NO₂ Trends for 98th Percentile Daily Maximum 1-Hour Concentration.

Sulfur Dioxide (SO₂)

NAAQS

The 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations is less than or equal to 75 ppb.

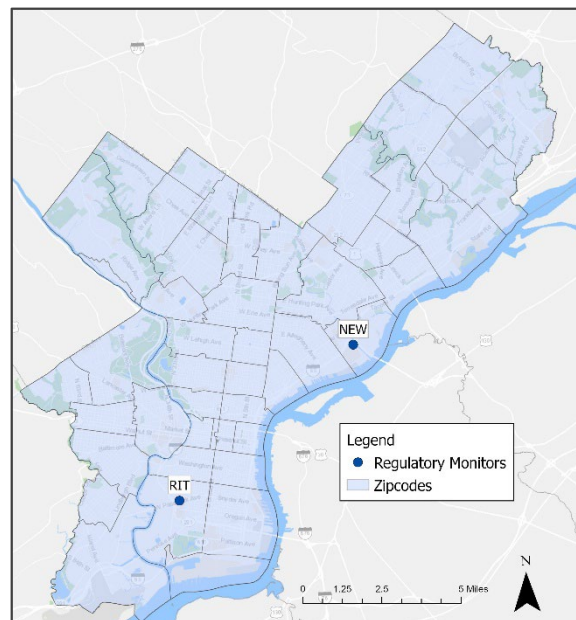


Figure 17. SO₂ Monitoring Map.

Sulfur dioxide (SO₂) is emitted from the burning of fuels that contain sulfur. Industrial grade fuel oils are the primary source in Philadelphia.

The major health concerns associated with exposure to high concentrations of SO₂ include effects on breathing, respiratory illness, alterations in the lungs' defenses, and aggravation of existing respiratory and cardiovascular disease. Together, SO₂ and NO_x are the major ingredients of acid rain. SO₂ also plays a significant role in the formation of fine particulate matter.

SO₂ levels in Philadelphia are well within air quality standards and show a slow, continued improvement over time. This is mainly due to industry, businesses, and homes changing to fuels with lower sulfur content such as natural gas.

In 2024, the NEW and RIT sites were operating as monitoring sites for SO₂ as seen in Figure 17.

Figure 18 illustrates the trend in the 1-hour sulfur dioxide (SO₂) concentration for Philadelphia. In 2024, the 1-hour SO₂ concentration was 5 ppb, reflecting current air quality conditions and remaining in compliance with national standards based on the latest monitoring data.

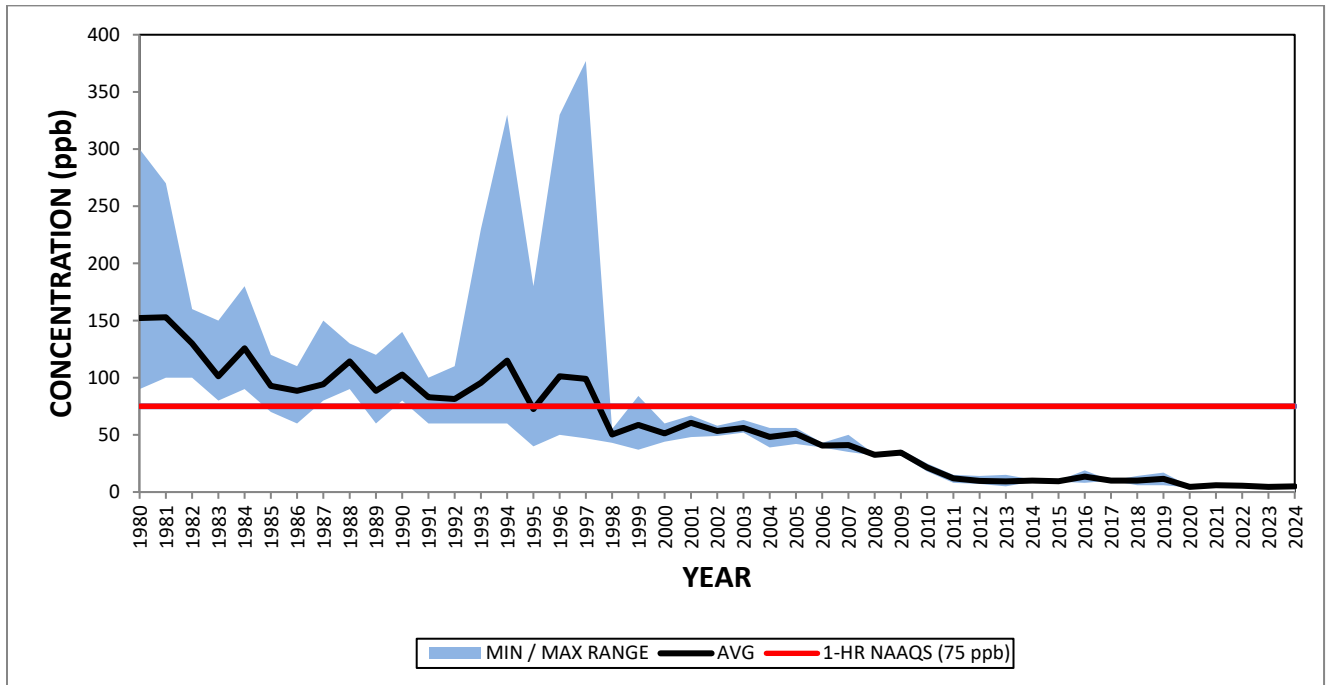


Figure 18. SO2 Trends for 99th Percentile Daily Maximum 1-Hour Average Concentration.

Lead (Pb)

NAAQS

The maximum arithmetic rolling 3-month mean concentration for a 3-year period is less than or equal to 0.15 $\mu\text{g}/\text{m}^3$ micrograms per cubic meter.

The processing of metals is the major source of lead emissions to the atmosphere. Philadelphia does not have any metal processing facilities, so lead is not a major concern. Lead does not travel over great distances in the air and so concentrations vary, with the highest levels near specific industrial sites.

Lead is a metal that is highly toxic when inhaled or ingested. Lead accumulates in the blood, bone, and soft tissue and may affect the kidneys, liver, nervous system, and other organs. It also can cause learning difficulties in children.

Ambient lead levels have been decreasing throughout the city due to the elimination of leaded gasoline and greater control of emissions from companies that produce, or process lead compounds.

Prior to 1998, lead levels in certain parts of the city were once extremely high due to the concentration of industries in the areas near Castor and Delaware Avenues. The levels of lead in these areas have drastically improved and are now comparable to the rest of the city.

On October 15, 2008, the EPA strengthened its regulation for lead. The standard was revised from the 1978 standard of 1.5 $\mu\text{g}/\text{m}^3$ to a level that is 10 times more stringent, 0.15 $\mu\text{g}/\text{m}^3$, with a different averaging time. For the previous standard, the averaging time used a quarterly average while the new standard used a rolling 3-month average. The revision is based on more than 6000 studies performed since 1990 on the health effects of high lead concentrations in the bloodstream.

The studies show that adverse effects from lead in the blood occur at a much lower level than previously thought. Figure 19 shows the trends for the lead standard for 2008.

Consistent monitoring of lead concentrations in the air showed that ambient air lead concentrations in Philadelphia were not a concern. On April 28, 2017, EPA approved Philadelphia AMS' waiver to end the requirement for a source-oriented Lead-TSP monitor in Philadelphia effective January 1, 2017. As of January 1, 2017, Total Suspended Particulate Lead monitor was shutdown at NEW site. Philadelphia has no sources that emit 0.5 or more tons of lead per year.

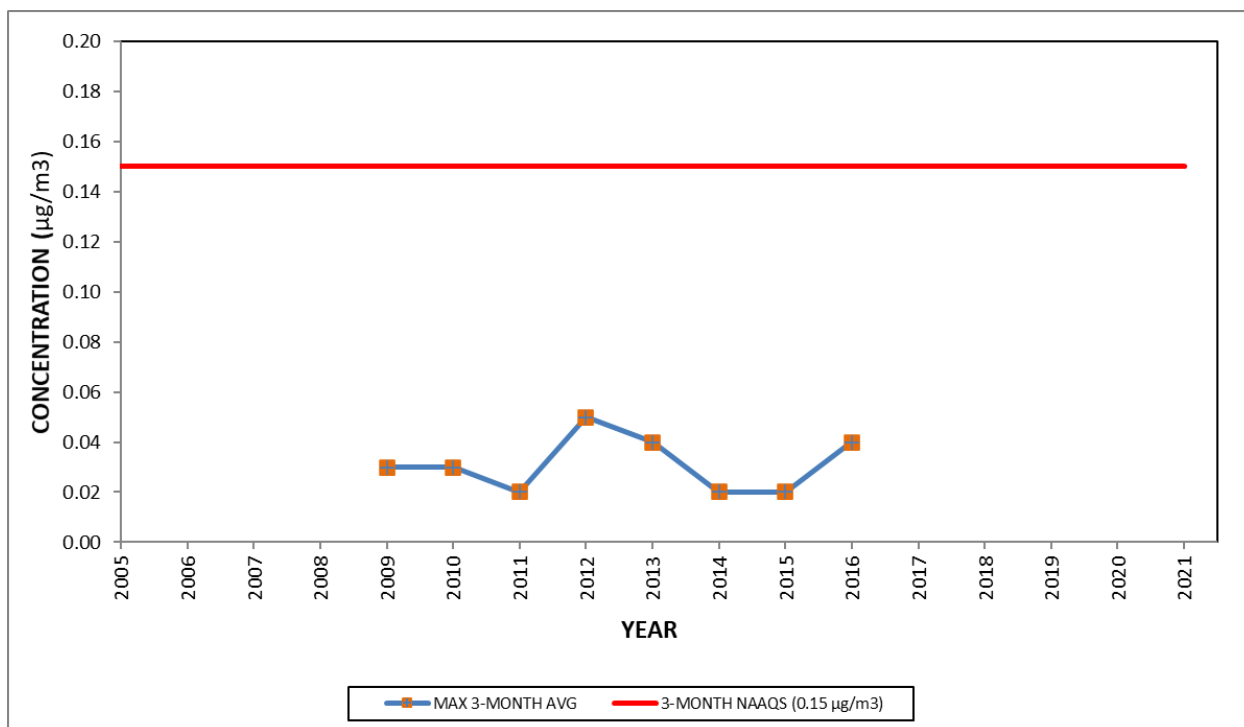


Figure 19. Lead Trends (Maximum) Rolling 3-Month Average.

Particulate Matter (PM₁₀, PM_{2.5})

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. These particles come in a wide range of sizes and originate from stationary, mobile, and natural sources.

PM₁₀ and PM_{2.5} refer to small particulates that measure less than 10 micrometers (0.00001 meters) and 2.5 micrometers (0.0000025 meters) in diameter, respectively. In addition to health problems, particulate matter can cause reduced visibility, soiling, and damage to materials such as buildings. Particles of this size remain airborne for long periods of time and disperse in uniform concentrations across wide areas, crossing geographic boundaries ⁸.

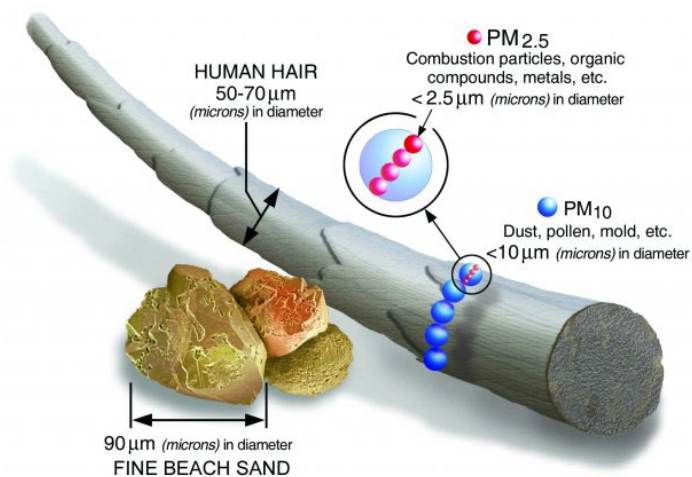


Figure 20. Size Comparisons for PM Particles.

In 1997, the EPA set a separate standard for PM_{2.5}. Particles in the PM_{2.5} size range can travel deeply into the respiratory tract, reaching the lungs. Exposure to fine particles can cause short-term health effects such as eye, nose, throat, and lung irritation, coughing, sneezing, runny nose, and shortness of breath. Exposure to fine particles can also affect lung function and worsen medical conditions such as asthma and heart disease. Scientific studies have linked increases in daily PM_{2.5} exposure with increased respiratory and cardiovascular hospital admissions, emergency department visits and deaths. Recent studies suggest that long term exposure to particulate matter may be associated with increased rates of bronchitis and reduced lung function.

Particles come in a wide variety of shapes and sizes, which affect their impact on human health and the environment. Bigger particles, such as dust, are easier to see and can cause problems, but smaller particles are likely to be worse for our health.

Fine particles are treated as though they are a single pollutant, but fine particles come from many different sources and are composed of many different compounds. Fortunately, these compounds fall into a few dominant categories: sulfates, nitrates, ammonium compounds, soil, organic carbon compounds, and elemental carbon. Water is nearly always an important and variable part of PM, and sea salt is often significant near the coast. Given the complex composition of PM, it is no surprise that its chemistry is also complex. Particles may be dry or wet. When the wind blows hard enough, soil, silt, and sand can be lifted from the surface. Human activities such as mining, construction, plowing, and driving on unpaved roads also lift particles into the air. Soot, also

⁸ EPA: www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM

referred to as black carbon or elemental carbon, is emitted directly by diesel engines and forest fires, among other sources. Most individual particles are likely mixtures of different substances, produced by collisions with other particles and by taking on gases.

In Philadelphia, recent air monitoring data provides an overview of 2024 particulate matter conditions. Figure 22 in this report shows the trends for the maximum 24-hour average PM₁₀ concentration, which reached 52 µg/m³ in 2024, reflecting current air quality conditions. Figures 24 and 25 illustrate the trends for PM_{2.5}, with the citywide highest 98th percentile 24-hour average of 20.12 µg/m³ and an annual mean of 8.4 µg/m³. These levels represent the most recent air quality status for Philadelphia, remaining in compliance with national standards based on the latest monitoring data.

PM₁₀

NAAQS

150 µg/m³ for a daily 24-hour average concentration not to be exceeded more than once per year on average over a 3-year period.

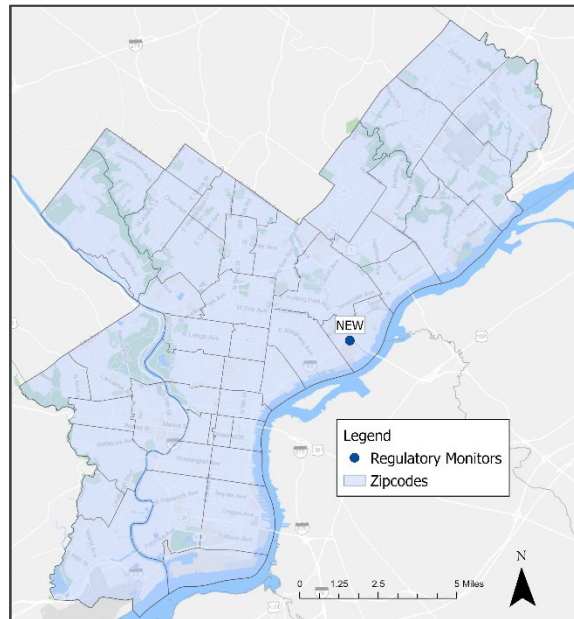


Figure 21. PM₁₀ Monitoring Map.

Particulate matter levels have been decreasing due to regulations limiting the amount of emissions allowed and the change to cleaner fuels, for example, switching from oil to natural gas by industry, businesses, and homes.

During the mid-1990s, particulate emissions from several sources around Castor and Delaware Avenues caused extremely high, localized measurements and the levels were many times higher than those measured at other city locations. Specific actions to abate these sources have resulted in air quality that now meets the NAAQS and is now comparable to levels in the rest of the city.

The EPA revoked the annual standard for PM₁₀ on December 17, 2006, due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution.

Philadelphia currently has one PM₁₀ monitoring site, NEW. See Figure 22.

Figure 22, key to this 2024 report, illustrates trends for the maximum 24-hour average PM₁₀ concentration in the city. The highest 24-hour average PM₁₀ concentration in 2024 is 52 µg/m³, reflecting current air quality conditions and remaining in compliance with national standards based on the latest monitoring data. For historical context, the large-scale wildfires in 2023 significantly increased bad air quality days for particulate matter and ozone, with the highest 24-hour average PM₁₀ concentration reaching 281 µg/m³ on June 7, 2023.

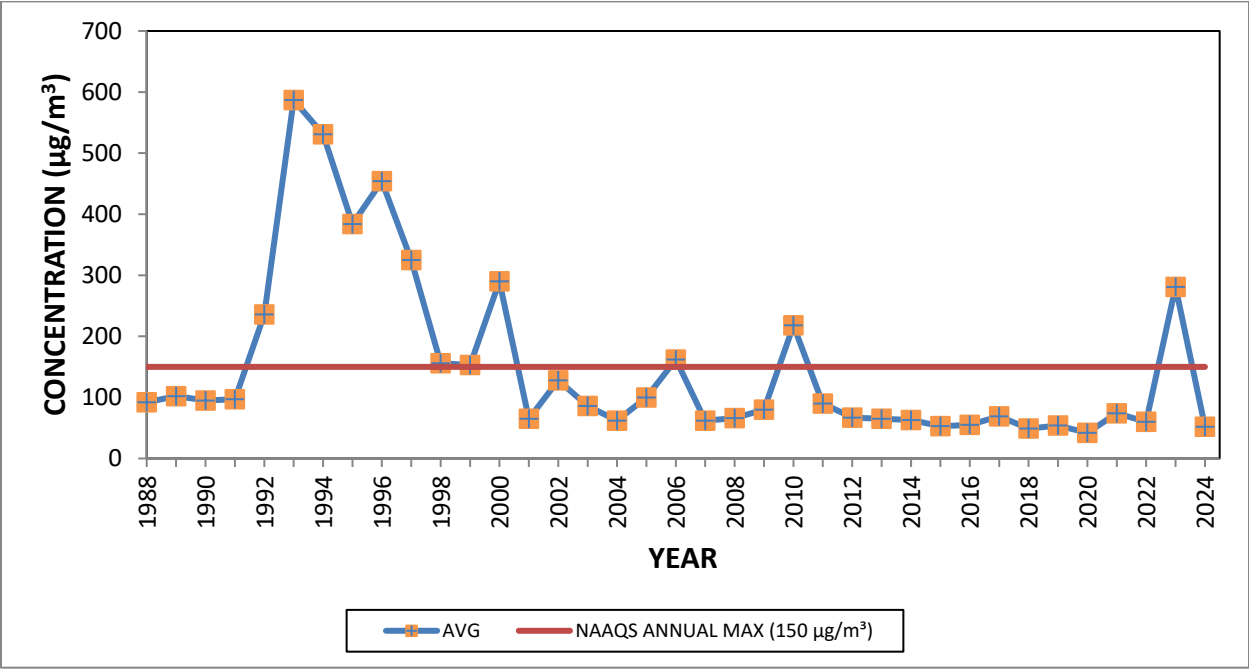


Figure 22. PM₁₀ Trends for the Highest 24-Hour Average Concentration for All Monitoring Sites.

PM_{2.5}

NAAQS

The 3-year average of the annual arithmetic mean concentration is less than or equal to 9.0 µg/m³.

The 3-year average of the 98th percentile 24-hour concentration is less than or equal to 35 µg/m³.

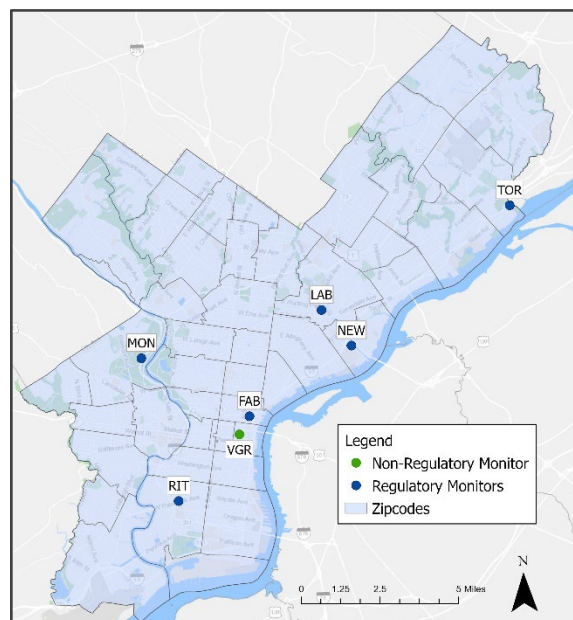


Figure 23. PM_{2.5} Monitoring Map.

PM_{2.5} consists of those particles that are less than 2.5 micrometers in diameter. They are also referred to as "fine" particles. Fine particles result from fuel combustion from motor vehicles, power generation, and industrial facilities, as well as from residential fireplaces and wood stoves. A significant amount of fine particles are also formed in the atmosphere by the transformation of gaseous emissions such as SO₂, NO_x, VOCs, and ammonia.

Fine particles can accumulate in the respiratory system and are associated with numerous health effects such as premature death, respiratory symptoms and disease, and decreased lung function. Sensitive groups that appear to be at the greatest risk for such effects include children, seniors, and individuals with cardiopulmonary disease or respiratory ailments such as asthma.

In 2024, there were seven PM_{2.5} monitoring sites in the network. Data from the VGR site is not used in comparison with the NAAQS. An additional regulatory station (HUN), scheduled to commence PM_{2.5} measurements in 2026, will enhance the network's coverage.

Figures 24 and 25, central to this 2024 report, illustrate trends for the 24-hour concentration and the annual mean of PM_{2.5}, respectively. The citywide highest 98th percentile average 24-hour PM_{2.5} concentration in 2024 is 20.12 µg/m³, with a citywide annual mean of 8.4 µg/m³, reflecting current air quality conditions and remaining in compliance with national standards based on the latest monitoring data. For historical context, wildfires significantly increased the number of bad air quality days for particulate matter and ozone, with 2023 data used without excluding air quality impacts from the wildfires.

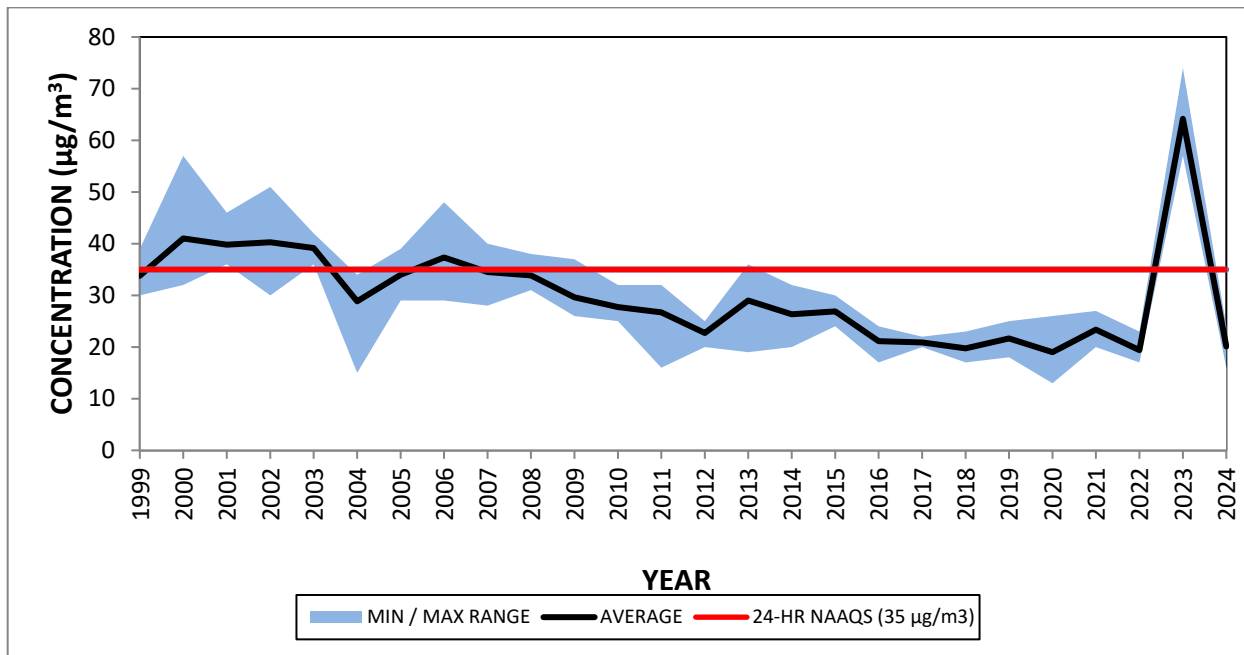


Figure 24. PM_{2.5} Trends for 98th Percentile 24-Hour Concentration.

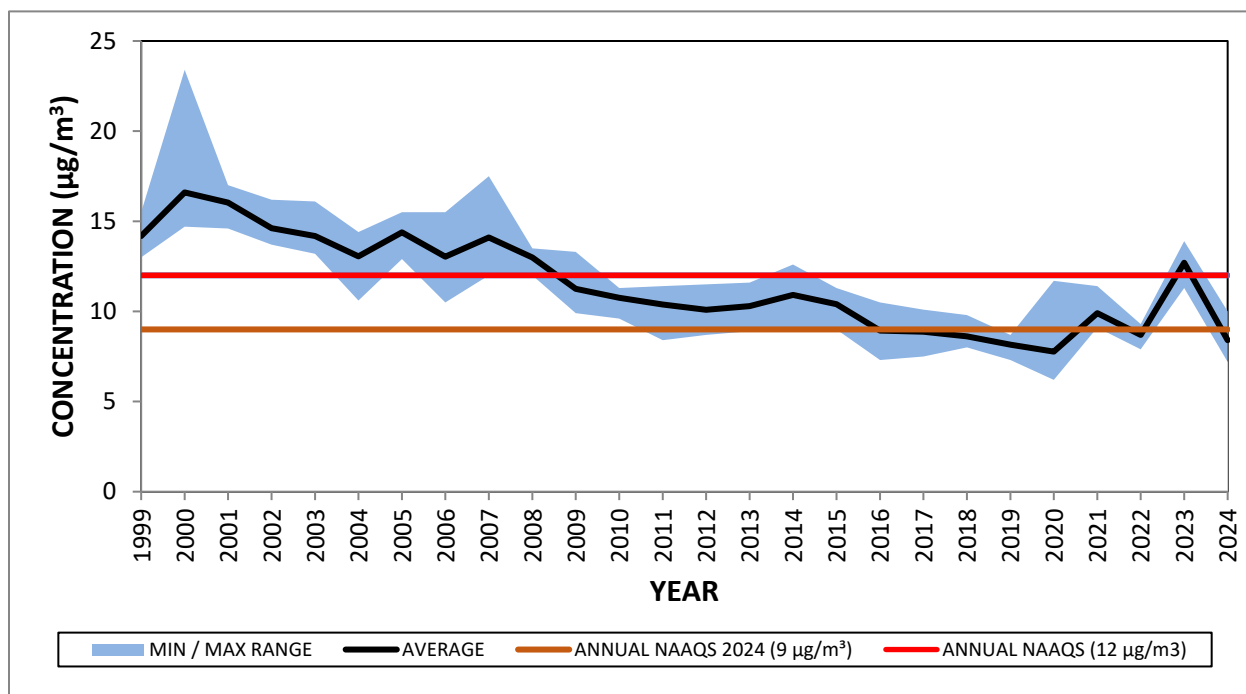


Figure 25. PM_{2.5} Trends for Annual Mean Concentration.

Air Toxics

Air toxics, also referred to as toxic air contaminants or hazardous air pollutants (HAPs), are substances that cause adverse health effects or environmental damage. The Federal Clean Air Act Amendments (CAAA) of 1990 list 188 pollutants or chemical groups as HAPs. Examples of air toxics include heavy metals (such as beryllium), organic chemicals (such as formaldehyde), polycyclic organic matter (POM, which are formed primarily by combustion), benzene (which is found in gasoline), pesticides, and asbestos. HAPs are emitted from stationary sources (large industrial facilities), nonpoint sources (dry cleaners, gas stations, and other small facilities), as well as mobile sources (cars, trucks and buses).

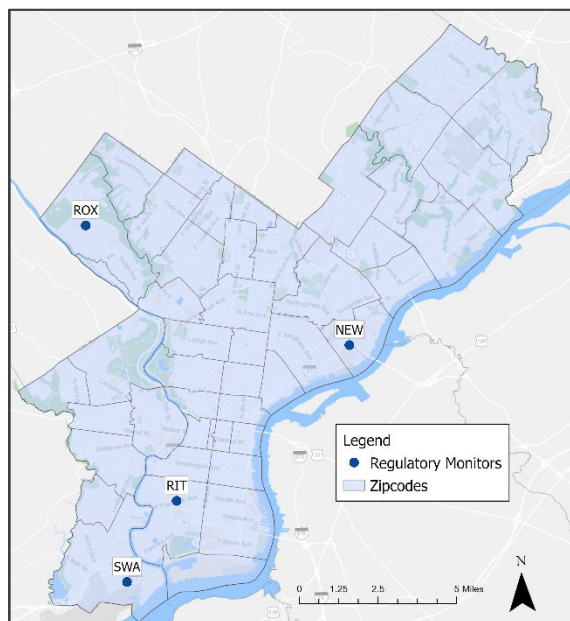


Figure 26. Air Toxics Monitoring Map.

In 2024, AMS monitored air toxics at 4 locations as seen in Figure 26. AMS monitors approximately 61 VOCs, 7 carbonyl compounds, 59 hydrocarbons and 7 metal elements. An additional regulatory station (HUN), scheduled to commence air toxics measurements in 2026, will enhance the network's coverage.

Three different sampling methods are employed to obtain their concentrations in ambient air. VOCs are collected in 6-liter stainless steel canisters every six days and analyzed via Gas Chromatography/Mass Spectrometry. The carbonyls are also collected every six days on a cartridge and analyzed using an Ultra High Performance Liquid Chromatograph. The hydrocarbons are collected and analyzed hourly every day via auto-Gas Chromatography.

There is less information known about the health impact from the 188 HAPs than there are for criteria pollutants, and no national ambient air quality standards exist for them. However, a number of these pollutants are known or suspected to be carcinogenic, and there is no known “safe concentration.” The danger posed by toxics is often referred to in terms of risk. Risk is defined as the likelihood of a negative outcome from a certain level of a specific chemical, or the measure of a chance that health problems will occur. For example, many toxics cause cancer, while others cause respiratory problems, birth defects, neurological or immune response problems, and other health concerns. Toxics have varying degrees of danger, and some will cause harm with a very small amount of the substance while others require large amounts to have a negative effect. A cancer risk level of “one in a million” implies a likelihood that up to one person out of one million equally exposed people would contract cancer if exposed continuously (24 hours per day) to the specific concentration over 70 years (an assumed lifetime). This risk is calculated as additional (or incremental) to those cases of cancer that would usually occur in an unexposed population of one million people.

AMS is helping to reduce HAPs in Philadelphia by enforcing Federal, State, and locally mandated programs that limit emissions from stationary and area sources. Many toxic emissions have been reduced by regulations designed to bring Philadelphia into compliance with the NAAQS for Ozone. In addition, Philadelphia enforces the National Emission Standards for Hazardous Air Pollutants (NESHAPs), a program designed to reduce emissions from existing major and area sources, as well as New Source Performance Standards (NSPS), which limit toxic emissions from new sources. In 2010, Air Management Regulation XIV – Control of Emissions from Dry Cleaning Facilities was promulgated. This regulation restricted the use of perchloroethylene (PERC) in dry cleaning facilities that share a common wall with businesses or residences. Since 2010, ambient concentrations of PERC have been decreasing.

Air Management Regulation VI (AMR VI), Philadelphia’s local regulation for the control of toxic air contaminants, was amended and finalized in 2023 and went into effect on January 1, 2024. The updated rule includes a list of 217 toxic air contaminants (TACs), closely aligned with the 187 hazardous air pollutants (HAPs) identified by the U.S. Environmental Protection Agency (EPA) under Section 112 of the Clean Air Act. Under this regulation, facilities seeking new installation permits, plan approvals, or Title V Operating Permit renewals are required to conduct a health risk screening if their potential emissions exceed pollutant-specific reporting thresholds defined in the Technical Guidelines. This process is designed to ensure that new or modified sources do not pose unacceptable health risks to surrounding communities and that the city’s air quality continues to improve through proactive risk-based management of air toxics.

In addition, AMS is currently working with other City departments to enforce Mayor's Executive Order 1-07 which requires all public works and demolition contracts to use clean diesel technology. This program is expected to significantly reduce particulate matter, hydrocarbons, and carbon monoxide from diesel vehicles contracted by the City, resulting in substantial annual health benefits.

The EPA’s Air Toxics Screening Assessment (AirToxScreen) is a screening tool to provide communities with information about health risks from air toxics. AirToxScreen is EPA's ongoing comprehensive evaluation of air toxics in the U.S. The activities include expansion of air toxics monitoring, improving and periodically updating emission inventories, improving national- and local-scale modeling, continued research on health effects and exposures to both ambient and indoor air, and improvement of assessment tools. The latest version of the tool is the 2020 AirToxScreen. Air toxics were assessed for either lifetime cancer risk or non-cancer hazard due to inhalation at census tract level.

The goal of AirToxScreen is to identify air toxics which are of greatest potential concern, in terms of contribution to population risk. The results are used to establish strategies, priorities, and programs to reduce air toxics emissions.

The results of the 2020 AirToxScreen for Philadelphia County are summarized below:

- Total air toxics cancer risk was approximately 30 in one million population.
- By source category, secondary formation accounted for 51.2% of cancer risk and onroad mobile sources accounted for 9.4%. Point sources accounted for just 3.5% (see Figure 27).

- The pollutants contributing most to cancer risk were formaldehyde (57.9%), carbon tetrachloride (8.8%), and benzene (7.1%) (see Figure 29).

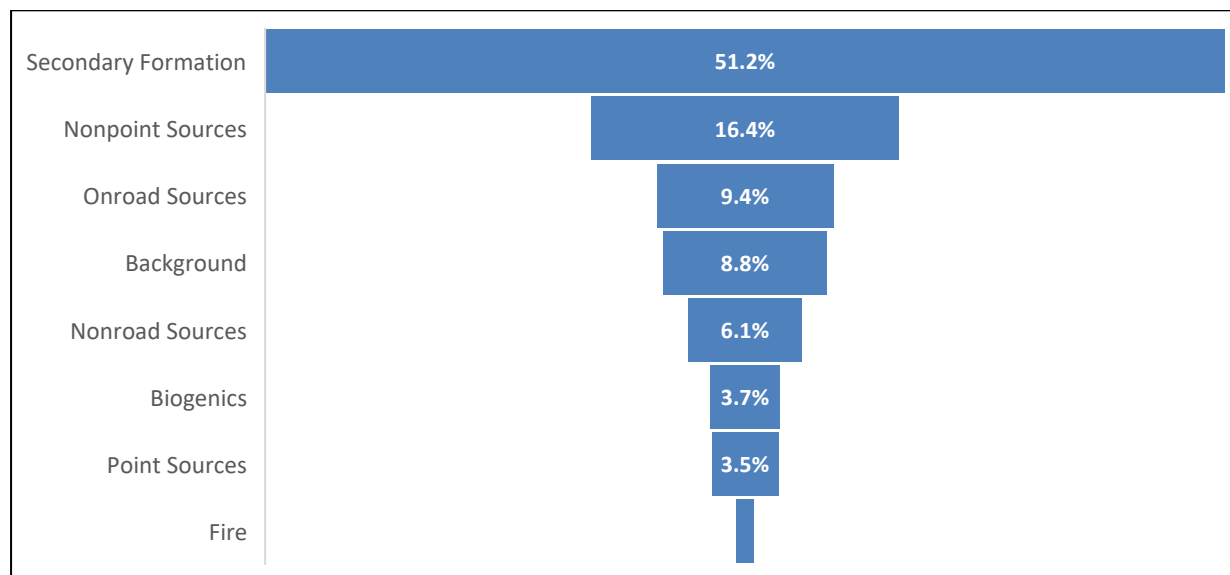


Figure 27. Source Category Contribution to 2020 AirToxScreen Cancer Risk.

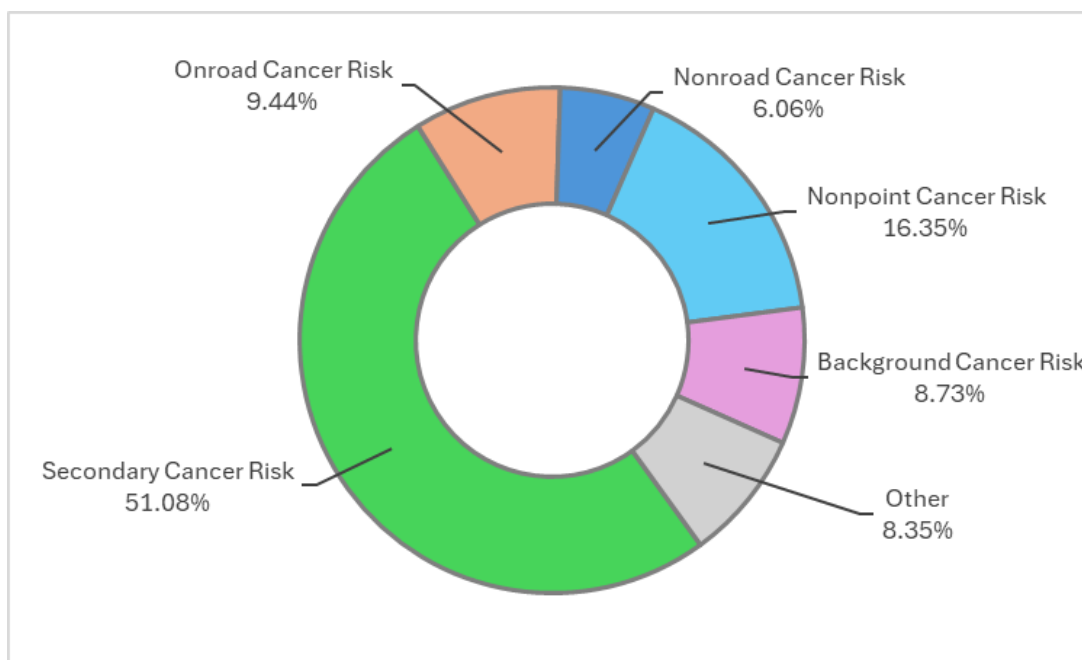


Figure 28. 2020 AirToxScreen Cancer risk sources: Secondary dominates, followed by Nonpoint, Onroad; others minor.

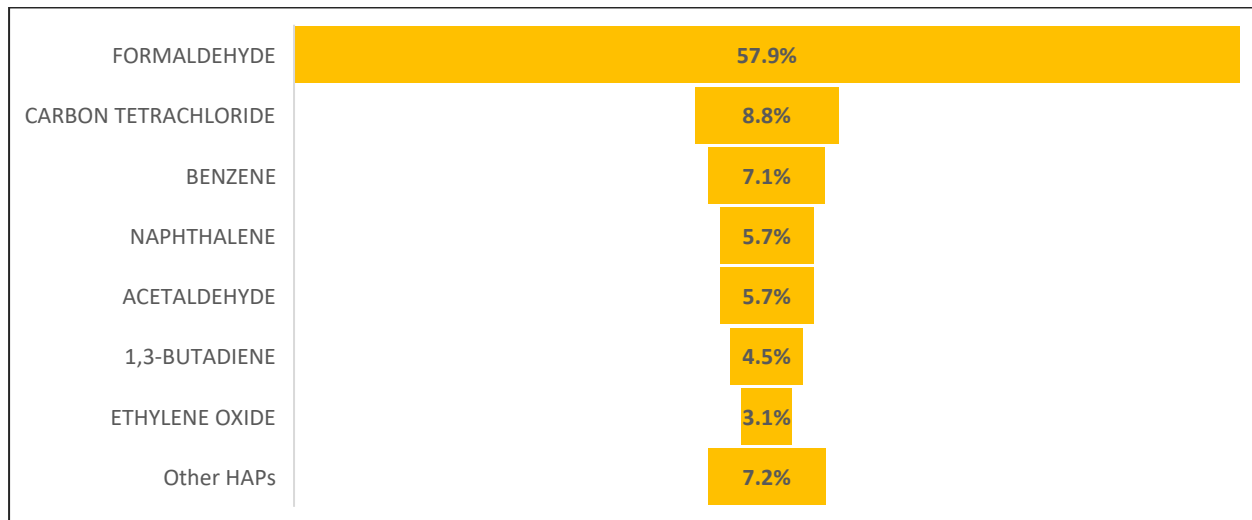


Figure 29. HAP Contributions to 2020 AirToxScreen Cancer Risk.

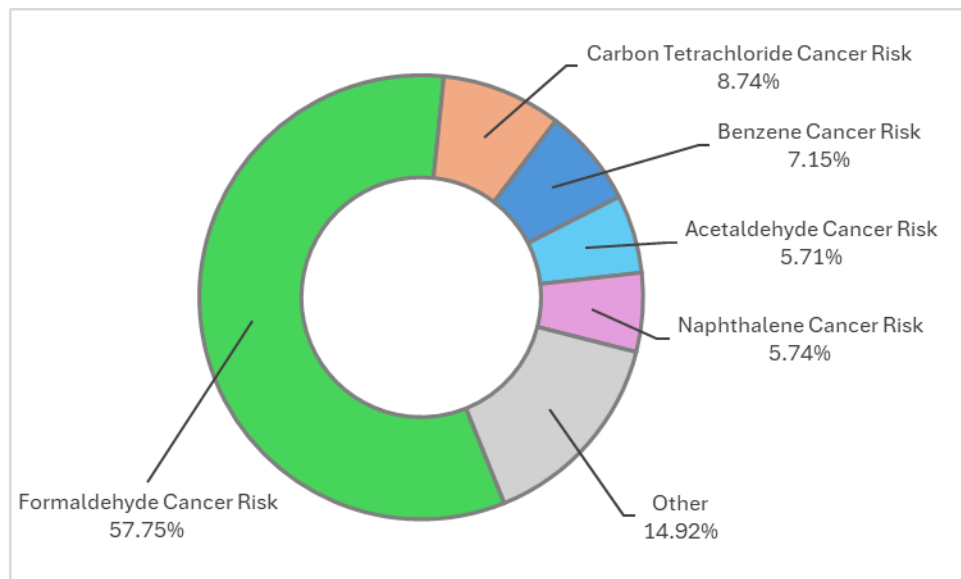


Figure 30. 2020 AirToxScreen Cancer risk by pollutant: Formaldehyde dominates, followed by Others, Carbon Tetrachloride, Benzene; rest minor.

Additional information for the 2020 EPA AirToxScreen can be found here:

<https://www.epa.gov/AirToxScreen/2020-airtoxscreen-assessment-results>

Figure 31 shows the 2024 annual mean concentrations for formaldehyde measured by AMS at four monitoring sites (ROX, NEW, RIT, and SWA). Formaldehyde had the highest contribution to air toxics cancer risk in Philadelphia according to the 2020 AirToxScreen assessment.

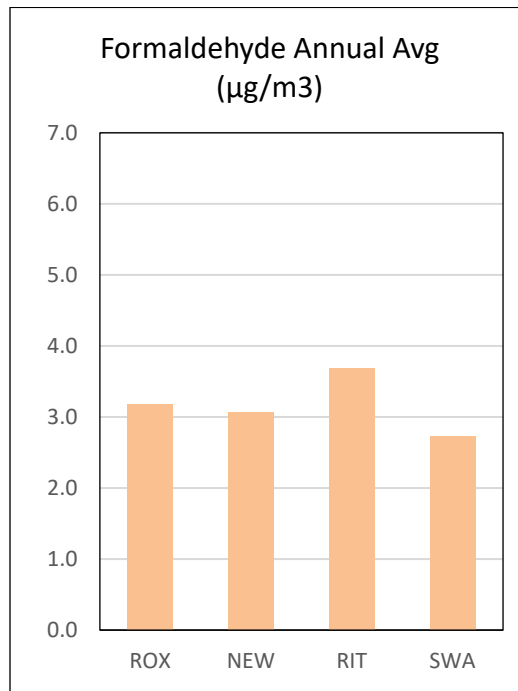


Figure 31. 2024 Mean Concentrations for Formaldehyde.

Data for air toxics can be found on the EPA websites <https://www.epa.gov/outdoor-air-quality-data/monitor-values-report-hazardous-air-pollutants> or https://aqs.epa.gov/aqsweb/airdata/download_files.html.

Philadelphia Air Quality Survey

The Philadelphia Air Quality Survey (PAQS), managed by Air Management Services (AMS), operated from 2018 through 2023 and has now been phased out, with a final comprehensive report scheduled for release in 2026. Launched in May 2018, the program established 50 street-level monitoring sites across the city to measure fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and ozone (O₃). By 2019, the network was optimized to 48 sites, as shown in Figure 32, and equipped with meteorological sensors to capture both seasonal and spatial variations in air quality across diverse neighborhoods.

Over its operational period, PAQS completed 90 two-week sampling sessions, generating a robust dataset for assessing local pollution trends and supporting policy development. The data have been used to guide strategies aimed at reducing emissions from congested traffic corridors, diesel-powered vehicles, and wintertime fuel combustion. The dataset also provides valuable input for ongoing studies related to land use, public health impacts, and neighborhood-level exposure differences.

During the 2024 analysis period, AMS evaluated the final round of PAQS-collected samples for PM_{2.5} and NO₂. The citywide all-site average NO₂ concentration was 15.9 parts per billion (ppb), well below the annual NAAQS of 53 ppb. The corresponding PM_{2.5} average concentration was 8.21 µg/m³, also below the annual NAAQS of 12 µg/m³. These results indicate that air quality levels across the PAQS sites remained within federal standards during the final monitoring phase. Although the PAQS program has concluded, the information it produced continues to serve as a foundation for future analyses and air quality improvement initiatives. Historical data from PAQS, including the 2023 period influenced by North American wildfire smoke, are archived and publicly available through the Philadelphia Air Monitoring Network Plan and the PAQS Project Report at ([Air Management Services reports and documents | Department of Public Health | City of Philadelphia](#))

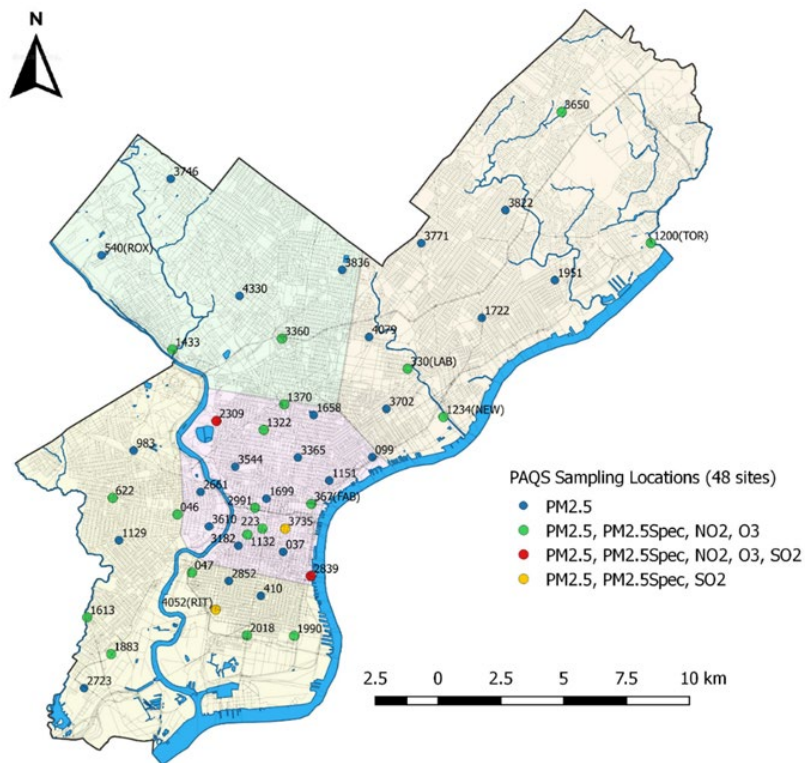


Figure 32. PAQS Site Map.

Breathe Philly Project

During 2024 and 2025, Air Management Services (AMS) finalized plans to replace the Philadelphia Air Quality Survey (PAQS) with a modern network of Clarity Node-S real-time air quality sensors. This transition marks a shift from the filter-based PAQS monitoring approach to continuous, real-time measurement technology that will provide faster, and more accessible information on air quality across Philadelphia.

To evaluate the suitability of this technology, AMS conducted a pilot study in 2024 using Clarity Node-S PM_{2.5} and NO₂ sensors. The pilot involved locating Clarity sensors with AMS Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors to assess accuracy and performance under local conditions. The study demonstrated strong agreement between the Clarity sensors and the FRM/FEM instruments, confirming that the Clarity network is appropriate for use in public air quality reporting and community awareness applications.

Based on the success of this evaluation, AMS initiated procurement and planning activities in late 2024 for the installation of approximately 76 Clarity sensors throughout Philadelphia. Installation is scheduled to begin in June 2025, with completion expected by December 2025. The network will include coverage across all neighborhoods, including those with environmental justice concerns, insuring more equitable access to air quality information.

The Clarity network represents a major advancement in Philadelphia's local-scale air quality monitoring capability. Unlike the PAQS program, which relied on two-week integrated filter samples requiring laboratory analysis, Clarity sensors deliver continuous real-time data accessible online. This improvement will allow residents, researchers, and policymakers to view current air quality conditions and trends as they occur.

The Clarity network will enhance AMS's ability to monitor localized pollution events, evaluate community exposure, and support rapid public health and policy responses. The new system will complement Philadelphia's existing FRM/FEM regulatory network and will serve as a valuable tool for advancing transparency, public engagement, and environmental equity in air quality management.

In addition to installing the Clarity sensors, an important aspect of the Breathe Philly project was to make air quality information available to the public. AMS created the Breathe Philly online tool to pair with the new sensors network, available here: www.phila.gov/breathephilly. The online tool shows hourly data from real-time monitors in Philadelphia, provides information about air pollutants, shows recent and historical air quality trends, and provides a resource center to get additional air quality information. The Breathe Philly project represents a huge step towards transparency and will help build trust between Philadelphians and the government agencies that work to protect them.

Appendix A: Reference Websites

- Appendix A.1. <https://www.airnow.gov/> - The AQI (Air Quality Index) tells you how clean the air is and whether it will affect your health. Through AirNow, EPA, NOAA, NPS, state, and local agencies work together to report current and forecast conditions for ozone and particle pollution.
- Appendix A.2. www.airqualitypartnership.org – Ground level ozone and particle pollution forecasts.
- Appendix A.3. www.atsdr.cdc.gov – Agency for Toxic Substances and Disease Registry: public health statements on specific toxics and the effects of exposure.
- Appendix A.4. <https://www.enviroflash.info/> – Sign up for air quality forecasts.
- Appendix A.5. <https://www.dep.pa.gov/> - Pennsylvania Department of Environmental Protection.
- Appendix A.6. www.epa.gov – U.S. Environmental Protection Agency.
- Appendix A.7. <https://www.epa.gov/outdoor-air-quality-data> – EPA’s AQS (Air Quality System) database for air monitoring data.
- Appendix A.8. <https://echo.epa.gov/> – EPA’s ECHO (Enforcement & Compliance History Online) database for compliance inspections conducted by EPA or state/local government, violations, enforcement actions, and penalties assessments in response to environmental law violations.
- Appendix A.9. www.lungusa.org – American Lung Association website: Information on lung health, air pollution, and related matters.
- Appendix A.10. <https://www.phila.gov/departments/departments-of-public-health/about-us/contact-us/> – Philadelphia Department of Public Health, Air Management Services.
- Appendix A.11. <https://www.phila.gov/services/mental-physical-health/environmental-health-hazards/air-quality/> – Philadelphia's Air Quality Website, provides the most up-to-date information about the air quality in Philadelphia and lets you know what you should do to protect your health if the air quality is unhealthy.

Appendix B: Air Quality Data Tables⁹

⁹ Data downloaded from EPA's AirData website (<https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>).

Appendix B. Table 1. Ozone 4th Highest Daily Maximum 8-Hour Concentrations (ppm).

Year	AQS SITE ID - POC												
	421010004-1	421010004-2	421010014-1	421010019-1	421010021-1	421010023-1	421010024-1	421010026-1	421010027-1	421010029-1	421010048-1	421010136-1	421011002-1
1980	0.032		0.113	0.037	0.032	0.062	0.128	0.025	0.026	0.028			
1981			0.1				0.108						
1982			0.111			0.087	0.103						
1983			0.12			0.102	0.121						
1984			0.106			0.093	0.108						
1985			0.111			0.083	0.116						
1986			0.103			0.08	0.105						
1987			0.104			0.085	0.118						
1988			0.13			0.088	0.128						
1989			0.085			0.097	0.077						
1990			0.097			0.097	0.101						
1991			0.106			0.095	0.112						
1992			0.087			0.076	0.091						
1993	0.086		0.092			0.09	0.097					0.103	
1994	0.08		0.095			0.07	0.092					0.085	
1995	0.091		0.096				0.113					0.092	
1996	0.087		0.093				0.092					0.072	
1997	0.067		0.096				0.101					0.074	
1998	0.077		0.095				0.093					0.088	
1999	0.073		0.081				0.06					0.098	
2000	0.067		0.086				0.089					0.082	
2001	0.074		0.097				0.097					0.086	
2002	0.082		0.098				0.11					0.094	
2003	0.069		0.084				0.086					0.074	
2004	0.057		0.077				0.091					0.073	
2005	0.066		0.083				0.094					0.068	
2006	0.066		0.076				0.085					0.081	
2007	0.073		0.081				0.095					0.082	
2008	0.062						0.087						
2009	0.059						0.072						
2010	0.077						0.088						
2011	0.07						0.089						0.088
2012	0.065						0.085						0.083
2013	0.047						0.068				0.036		0.071
2014	0.058						0.072				0.068		
2015	0.057						0.079				0.078		
2016	0.069						0.08				0.076		
2017	0.042						0.076				0.076		
2018		0.071					0.079				0.076		
2019		0.067					0.071				0.072		
2020		0.064					0.070				0.067		
2021		0.068					0.073				0.073		
2022		0.061					0.068				0.066		
2023*		0.060					0.068				0.068		
2024		0.072					0.070				0.075		

*(2023 Exceptional Events data tentatively excluded, pending EPA approval)

Appendix B. Table 2. Carbon Monoxide 2nd Highest 8-Hour Average Concentrations (ppm).

Year	AQS SITE ID - POC																		
	421010004-1	421010004-2	421010014-1	421010019-1	421010021-1	421010024-1	421010026-1	421010026-2	421010027-1	421010029-1	421010029-2	421010045-1	421010046-1	421010047-1	421010048-1	421010051-1	421010075-1	421010076-1	421011002-1
1980	7.1	4.6		4.9	6.8	5.5		5.3	5.8		5	8.2							
1981	9.9		3.3				7.4		9.3	9.4		9.5	7.6						
1982	9.9		3.9						11.9	7		7.9	7.6	7.3					
1983	6.6								10.6	6.1		6.1	5.6	5.6					
1984	9.5								10	6.3		7.8	6.6	6.2					
1985	6.8								7.6	5.1		6.3	4.9	5.8					
1986	6.3								7.9	5.3			5.3	6.3					
1987	7.8								10	7.3			5.3	5.4		8.7			
1988	5.9								6.3	4.9			3.9	4.3		6.9			
1989	11.6								6.4	6.9				6.9		9.5			
1990	6.8								6.4	4.7				5.4		6.1			
1991	5.6								7.1	4.4				4.3		5.1			
1992	6.4								6.8	5				4.1		5.4			
1993	6.6								4.6	5.6				5		5.4			
1994	8.3									5.1				5.4		5.9			
1995	4.5								4.8	4.1				3.9		5.6			
1996	5.6								5.4	4.5				3.6		5.6			
1997	5.3								5	3.3				3.1		3.6			
1998	4.6								4.9	3.2				3.3		3.8			
1999	4.9								4.9	4.4				3.3		4.2			
2000	3.3								4	3				3					
2001	4								4.7	2.9				2.5					
2002	2.9								2.9	2				1.9					
2003	2.4								3.9	2.2				2					
2004	3.1								3.4	2.5				2.7					
2005	2.1								3.4	0.8				2.1					
2006	2.3								3.2					1.4					
2007	2.6								3.2					5.5					
2008	1.5													0.7					
2009	2																		
2010	1.8																		
2011	1.7																		1.2
2012	1.5																		1.5
2013	1.7														1.1				1.3
2014	1.3														1.3		1.4		
2015	1.6														1.5		1.6		
2016	1.9														1.7		1.6		
2017	0.9														1.4		1.2	2.6	
2018															1		1.3	1.1	
2019															1.7		1.5	1.4	
2020															1.1		1.8	1.3	
2021															1.1		1.4	1.1	
2022															1.2		1.5	1.2	
2023															1		1.4	1.2	
2024															0.9		1.3	1.2	

Appendix B. Table 3. Carbon Monoxide Highest 1-Hour Average Concentrations (ppm).

Year	AQS SITE ID - POC																		
	421010004-1	421010004-2	421010014-1	421010019-1	421010021-1	421010024-1	421010026-1	421010026-2	421010027-1	421010029-1	421010029-2	421010045-1	421010046-1	421010047-1	421010048-1	421010051-1	421010075-1	421010076-1	421010082-1
1980	14	8		7	11	8		11	15		10	16							
1981	14		6				12		16	15		16	12						
1982	18		12						23	14		15	13	19					
1983	10								19	11		11	9	8					
1984	17								17	18		18	12	12					
1985	12								16	11		10	8	9					
1986	10								12	13			9	20					
1987	12								15	13			8	9		13			
1988	9								12	8			6	9		11			
1989	18								11	12				11		16			
1990	10								11	8				9		14			
1991	10								13	9				9		9			
1992	9								10	8				8		10			
1993	9								9	10				8		9			
1994	14									11				10		10			
1995	8								7	8				9		11			
1996	10								10	8				6		14			
1997	10								10	6.4				4.9		6.4			
1998	7.6								8.9	5.8				5.8		5.6			
1999	7.7								6.9	6				5.8		7			
2000	6.5								6.5	4.3				4.7					
2001	5.7								8	6.4				5					
2002	5.4								4.5	3.5				3.5					
2003	3.7								6	3.8				3.2					
2004	4.6								5.5	3.7				3.7					
2005	3.8								6.5	1.3				12.3					
2006	4.4								8.6					2.2					
2007	3.8								4.2					5.6					
2008	3.7													1.3					
2009	3.6																		
2010	3.1																		
2011	2.6																		2.2
2012	2.7																		2.1
2013	2.4														2.1				1.6
2014	2														1.8		2		
2015	2.1														2.5		1.9		
2016	3.6														2.6		2.2		
2017	1.4														2.3		1.9	4.3	
2018															1.4		1.9	1.5	
2019															2.3		2.4	1.8	
2020															1.5		2	1.8	
2021															1.7		1.8	1.5	
2022															2.2		1.8	1.8	
2023															1.7		1.8	1.7	
2024															2		1.8	1.7	

Appendix B. Table 4. Nitrogen Dioxide Annual Average Concentrations (ppb).

Year	AQS SITE ID - POC										
	42101 0004-3	42101 00022-1	42101 00023-2	42101 00024-1	42101 00026-2	42101 00027-1	42101 00029-2	42101 00047-1	42101 00048-1	42101 00075-1	42101 00076-1
1980	40.89			25.02	46.18	45.82	36.19				
1981	37.4	34.24		24.32	46.12		36.19				
1982	33.05	37.1		26.62			39.23	37.64			
1983	38.15	41.34					39.7	37.87			
1984	38.1	35.82					37.34	40.16			
1985	33.71	31.67					34.34	36.21			
1986	33.28		15.32				36.34	35.67			
1987	32.12						39.28	42.55			
1988	31.06						31.93	39.41			
1989	29.11						32.86	39.74			
1990	28.14						31.91	35.19			
1991	28.35						32.59	33.55			
1992	25.82						32.55	34.93			
1993	24.06						31.22	34.51			
1994	24.01						31.06	36.56			
1995	27.73						31.01	31.81			
1996	29.34						33.35	33.92			
1997	27.99						32.44	31.76			
1998	29.47						33.37	34			
1999	26.99						30.23	31.75			
2000	25.66						27.94	28.69			
2001	25.59						28.32	29.95			
2002	24.09						28.1	29.48			
2003	23.97						24.69	25.23			
2004	22.73						24.69	25.58			
2005	21.57						26.11	26.29			
2006	20.72							22.81			
2007	20.35							22.8			
2008	19.6							20.03			
2009	18.25							19.59			
2010	17.66							22.61			
2011	20.12							19.56			
2012	17.91							17.6			
2013	16.18							17.17			
2014	17.45							18.31		15.51	
2015	18.15							19.07		14.69	11.32
2016	15.73									13.55	11.28
2017	19.55									11.35	9.36
2018										10.69	10.76
2019									12.32	13.43	13.11
2020									10.98	12.89	11.45
2021									11.39	14.36	11.93
2022									11.38	14.47	12.57
2023									11.81	14.58	12.12
2024									11.32	13.99	12.08

Appendix B. Table 5. Nitrogen Dioxide 98th Percentile Daily Maximum 1-Hour Concentrations (ppb).

Year	AQS SITE ID - POC										
	421010004-3	421010022-1	421010023-2	421010024-1	421010026-2	421010027-1	421010029-2	421010047-1	421010048-1	421010075-1	421010076-1
1980	130			90	120	130	100				
1981	110	140		90	130		110				
1982	110	120		100			130	120			
1983	140	140					140	110			
1984	120	100					100	120			
1985	100	110					110	90			
1986	90		40				110	90			
1987	90						160	110			
1988	100						90	100			
1989	100						100	120			
1990	100						90	100			
1991	100						80	100			
1992	80						100	100			
1993	70						80	80			
1994	80						100	110			
1995	80						80	100			
1996	70						80	80			
1997	72						79	79			
1998	80						87	81			
1999	68						81	72			
2000	73						72	73			
2001	72						77	75			
2002	61						70	69			
2003	62						63	60			
2004	64						59	61			
2005	64						37	68			
2006	74							60			
2007	62							64			
2008	57							53			
2009	56							56			
2010	62							56			
2011	76							64			
2012	56							52			
2013	52							50			
2014	59							57		51	
2015	63							56		49	39
2016	58									49	43
2017	60									45	38
2018										37	43
2019									41	43	52
2020									43	44	50
2021									43	46	54
2022									43	46	56
2023									46	48	48
2024									44	46	50

Appendix B. Table 6. Sulfur Dioxide 99th Percentile Daily Maximum 1-Hour Average Concentrations (ppb).

	AQS SITE ID - POC																					
Year	421010004-4	421010004-5	421010014-1	421010019-1	421010020-1	421010021-1	421010022-1	421010022-2	421010023-2	421010023-3	421010024-1	421010026-2	421010026-3	421010027-1	421010029-2	421010029-3	421010047-1	421010048-1	421010048-2	421010055-1	421010136-1	421011002-1
1980	160		120	150	120	90	300	180	160	140	110	170	110	150	170							
1981	140	120					270		100				140	130	170							
1982	120						130		100					120	160		150					
1983	90						130		80		80			80	150	100	100					
1984	120						180		90		100			130	140		120					
1985	100						100		70		70			100	90		120					
1986	80						110		80		60			100	90		100					
1987	90						150		80		80			90	90		80					
1988	100						130		110		90			110	130		130					
1989	80						100		80		60			80	100		120					
1990	90						110		90		80			100	110		140					
1991	70						100		90		60			70	100		90					
1992	80						100		60		60			80	110		80					
1993	80						110		60		70			60	90		80	230			80	
1994	80						90		80		60				100		90	330			90	
1995	60						80				50			50	60		60	180			40	
1996	60						100				50			60	70		90	330			50	
1997	54						87				56			47	65		54	377			52	
1998	53						53				48			48	55		52	43			50	
1999	58						73				37			51	54		84	53			60	
2000	44						56								60						45	
2001	48						60								67						67	
2002	49														58						53	
2003	52														63						53	
2004	47														56					39	51	
2005	51														55					42	56	
2006	40																			43	39	
2007	38																			35	50	
2008	33																			32		
2009	37																			32		
2010	18																			25		
2011	13																			15		8
2012	7																			14		8
2013	8																	15	9			5
2014	11																		9	10		
2015																			9	10		
2016																			19	8		
2017																			10	10		
2018																			14	6		
2019																			17	6		
2020																			5	4		
2021																			6	6		
2022																			4	7		
2023																			5	4		
2024																			6	4		

Appendix B. Table 7. Lead (Maximum) Rolling 3-Month Averages (µg/m3).

Year	AQS SITE ID - POC									
	421010004-5	421010014-1	421010047-1	421010048-1	421010055-1	421010063-1	421010076-1	421010136-1	421010449-1	421011002-1
2009									0.03	
2010									0.03	
2011									0.02	0.02
2012										0.05
2013				0.02						0.04
2014				0.02						
2015				0.02						
2016				0.04						
2017										
2018										
2019										
2020										
2021										
2022										
2023										
2024										

Appendix B. Table 8. PM₁₀ Highest 24-Hour Average Concentrations (µg/m3).

Year	AQS SITE ID - POC														
	421010003-1	421010004-1	421010004-2	421010037-1	421010038-1	421010047-1	421010048-1	421010048-2	421010049-1	421010136-1	421010149-1	421010449-1	421010449-2	421010649-1	421010649-2
1988	65	83		76	92	91									
1989		96		97	102	96									
1990		72		79	95	87									
1991		85	87	76	97	84									
1992		54		59	101	129					236				
1993		81		59	105	116			103		587	162			
1994		95		83	94	84			143	83	531	186			
1995		64		68		82			90	107	384	233			
1996		87		54		86			129	63	454	247			
1997		76		117		136			78	113	308	325		288	
1998		60		130		82			63	104	73	130		156	
1999		73		57		24			36	45	111	153		56	
2000		43		73						36	165	290		44	
2001		61		62						61	65	61	64	61	
2002		66		128						72	122	68	99	106	
2003		82		86						63		86		77	
2004		62		55						52		58		52	
2005		57		67						48		79		100	
2006		132								37		93		162	161
2007		44										37		61	62
2008		53										43		64	66
2009		49										41		80	78
2010		57										67		218	151
2011		46										59		64	90
2012		67										61			
2013		29					65					36			
2014							63					30			
2015							53								
2016							55								
2017							69								
2018							49								
2019								54							
2020								42							
2021								74							
2022								60							
2023*								100							
2024								52							

*(2023 Exceptional Events data tentatively excluded, pending EPA approval)

Appendix B. Table 9. PM_{2.5} 98th Percentile 24-Hour Concentrations (µg/m³).

Year	AQS SITE ID - POC																															
	421010003-1	421010004-1	421010004-2	421010004-5	421010014-1	421010020-1	421010024-1	421010027-1	421010047-1	421010047-3	421010047-4	421010048-1	421010048-3	421010048-4	421010048-5	421010048-6	421010052-1	421010055-1	421010055-2	421010055-3	421010056-1	421010057-1	421010057-2	421010057-3	421010057-4	421010075-1	421010075-2	421010076-1	421010076-2	421010136-1	421011002-1	421011002-3
1999		39				30	33		33																					34		
2000		41				32	38	57	39																					39		
2001		40				36	37		40																					46		
2002		41			30	40	38		39								51													43		
2003		40			39	39	39		42																					36		
2004		34			15	29	33		32																					30		
2005	29	36				33	36		39																					31		
2006	29	38	36				35		48												0									38		
2007		35	36				34		40		38											33			28					32		
2008		35	33				31		38		33						35					33			33							
2009		26	34				26		37		29						29					28			28							
2010		28	25				25		32		27						29					28										
2011			24						32		28						31					31									25	16
2012			21						24		22						25					23									20	24
2013			35						26	22	34	36	35				35		25		19		33							24	24	
2014		20	25						28	26		26	28							31				32		21						
2015		25	27							24		26	26							30			27		27		30					
2016		17	24									19	22							22			22		22		21					
2017		22	21									22	20							20				20		22		20				
2018		19	21									17	20							21			18		23		19					
2019												25	23							22				18		22		20				
2020												19	14	26	23	13			18	18		20	17				19	25	16	19		
2021				20								21		27	24				25				25				23	22				
2022				20								18		20	20				17				17				23	20				
2023*				26								20			28				28				24					29	24			
2024																																

*(2023 Exceptional Events data tentatively excluded, pending EPA approval)

Appendix B. Table 10. PM_{2.5} Annual Mean Concentrations (µg/m³).

Year	AQS SITE ID - POC																							
	421010003-1	421010004-1	421010004-2	421010004-5	421010014-1	421010020-1	421010024-1	421010027-1	421010047-1	421010047-3	421010047-4	421010048-1	421010048-3	421010048-4	421010048-5	421010048-6	421010052-1	421010055-1	421010055-2	421010055-3	421010056-1	421010057-1	421010057-2	421010057-3
	421010057-4	421010075-1	421010075-2	421010076-1	421010076-2	421010136-1	421011002-1	421011002-3																
1999	0				0	0		0																0
2000	0				0	0	0	0																0
2001	16.5				0	14.6		17																16.7
2002	14.8			0	14.4	14.3		0								0								14.4
2003	14.8			0	13.7	0		0																0
2004	13.9			0	0	12.8		0																12.7
2005	0	0			0	0		0																0
2006	0	0	13.2			0		0												0				0
2007	13.7	0				0	14.4		0												0		0	0
2008	13	12.5				12	13.5		13.2								13.5				13.3		12.9	
2009	10.9	11.3				9.9	11.1		11.1								11.3				11.1		0	
2010	10.7	0				9.6	10.9		10.9								11.3				10.9			
2011		8.9					11.3		11.4								11.4				11.4			
2012		0					10.2		10.1								10.3				10.1			
2013		0					0	0	0	0	0	0					0				0			0
2014	0	0					0	11.3		0	11.1						0					12.1	0	
2015	0	10.3						0		10.3	10.1						11.2					11	10.7	0
2016	0	0								0	9.8						10.5					9.4	9.4	8.2
2017	0	0								0	9						10					0	0	0
2018	8.1	0								8	0						9.8				8	9.7	8.7	
2019										7.9	8.3						8.4					7.3	8.7	8.3
2020										7.1	0	0	0	0		0	0			0	0		0	0
2021			0							9.1		0	9.6				10.1				9.7		10	9.3
2022			8.8							8.4		9	9.5				7.9				0		9.3	8.6
2023*			11.0							9.7			10.6				10.3				9.4		11.8	8.8
2024			10							7.5		7.9	7.2				8.3				8.9		9.4	8

*(2023 Exceptional Events data tentatively excluded, pending EPA approval)

Appendix B. Table 11. AQS Site ID information. This table includes historical monitoring sites no longer in operation.

AQS Site ID	Address
421010003	Community Health Services; 500 S Broad Street
421010004	1501 E. Lycoming Ave.
421010014	Roxy Water Pump Station; Eva & Dearnley Streets
421010019	Fire Boat Station; Allegheny Ave & Del River
421010020	Ford Rd-Belmont Ave Water Treat Plant
421010021	Island Rd, East of Airport Circle PHL Int Airport
421010022	Defense Support Center; 20th & Oregon Ave
421010023	SE Sewage Plant; Front & Packer Streets
421010024	Grant & Ashton Roads; Phila NE Airport
421010026	Broad & Spruce Streets; Mobile Trailer
421010027	S W Corner Broad & Butler
421010029	20th & Race Streets
421010037	13th Street & Montgomery Avenue
421010038	4415 Almond (Near Orthodox Street)
421010045	1421 Arch Street
421010046	1206 Chestnut Street
421010047	500 South Broad Street-Parking Lot (CHS)
421010048	3000 Lewis St. (Near Bath St.), Philadelphia, Pa. 19137
421010049	Richmond St. & Wheatsheaf Lane
421010051	323 Race Street
421010052	1439 East Passyunk Avenue
421010055	24th & Ritner Streets
421010056	2851 Island Ave, Eastwick Free Library
421010057	240 Spring Garden Street
421010063	8200 Enterprise Ave
421010075	4901 Grant Avenue & James Street, Philadelphia, Pa. 19114
421010076	4100 Montgomery Drive
421010136	Amtrak, 5917 Elmwood Avenue
421010149	Castor & Carbon Streets on PGW Property
421010449	Castor & Delaware Avenues
421010649	Water Dept. Newpcp Lagoon Area (NEL)
421011002	5200 Pennypack Park, Philadelphia, Pa. 19136

(

Appendix C: History of the National Ambient Air Quality Standards

Appendix C. Table. 1. History of the National Ambient Air Quality Standards for Carbon Monoxide¹⁰.

Final Rule/Decision	Primary/Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 Apr 30, 1971	Primary and Secondary	CO	1-Hour period	35 ppm	Maximum, not to be exceeded more than once in a year ¹⁰
			8-hour period	9 ppm	Maximum, not to be exceeded more than once in a year
1985 50 FR 37484 Sept 13, 1985	Primary standards retained, without revision; secondary standards revoked.				
1994 59 FR 38906 Aug 1, 1994	Primary standards retained, without revision.				
2011 76 FR 54294 Aug 31, 2011	Primary standards retained, without revision.				

¹⁰ Second highest, non-overlapping 8-hour average concentration.

Appendix C. Table. 2. History of the NAAQS for Pb-TSP (Lead in total suspended particles) ¹¹.

Final Rule/Decision	Primary/Secondary	Indicator	Averaging Time	Level	Form
1978 43 FR 46246 Oct 5, 1978	Primary and Secondary	Pb-TSP	Calendar Quarter	1.5 µg/m ³	Not to be exceeded
1991	Agency released multimedia " Strategy for Reducing Lead Exposures "				
2008 73 FR 66964 Nov 12, 2008	Primary and Secondary	Pb-TSP	3-month period	0.15 µg/m ³	Not to be exceeded
2016 81 FR 71906 Oct 18, 2016	Primary and secondary standards retained, without revision.				

Appendix C. Table. 3. History of the NAAQS for Nitrogen Dioxide¹².

Final Rule/Decision	Primary/Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 Apr 30, 1971	Primary and Secondary	NO ₂	Annual	53 ppb ¹¹	Annual arithmetic average
1985 50 FR 25532 Jun 19, 1985	Primary and secondary NO ₂ standards retained, without revision.				
1996 61 FR 52852 Oct 8, 1996	Primary and secondary NO ₂ standards retained, without revision.				
2010 75 FR 6474 Feb 9, 2010	Primary	NO ₂	1 hour	100 ppb	98th percentile, 1-hour daily maximum, averaged over 3 years ¹²
		Primary annual NO ₂ standard retained, without revision.			
2012 77 FR 20218 April 3, 2012	Secondary	Existing secondary NO ₂ standard (annual) retained, without revision.			
2018 83 FR 17226 April 18, 2018	Primary	Existing primary NO ₂ standards retained, without revision.			

¹¹ The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

¹² The form of the 1-hour standard is the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO₂ concentrations.

Appendix C. Table. 4. History of the NAAQS for Ozone¹³.

Final Rule/Decision	Primary/Secondary	Indicator	Averaging Time	Level	Form
1971 36 FR 8186 Apr 30, 1971	Primary and Secondary	Total photochemical oxidants	1 hour	0.08 ppm	Not to be exceeded more than one hour per year
1979 44 FR 8202 Feb 8, 1979	Primary and Secondary	O ₃	1 hour	0.12 ppm	Attainment is defined when the expected number of days per calendar year, with maximum hourly average concentration greater than 0.12 ppm, is equal to or less than 1
1993 58 FR 13008 Mar 9, 1993	EPA decided that revisions to the standards were not warranted at the time				
1997 62 FR 38856 Jul 18, 1997	Primary and Secondary	O ₃	8 hours	0.08 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
2008 73 FR 16483 Mar 27, 2008	Primary and Secondary	O ₃	8 hours	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
2015 80 FR 65292 Oct 26, 2015	Primary and Secondary	O ₃	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years

Appendix C. 1. History of the NAAQS for Particulate Matter¹⁶.

Final Rule/Decision	Primary/Secondary	Indicator ¹³	Averaging Time	Level	Form
1971 36 FR 8186 Apr 30, 1971	Primary	TSP	24 hour	260 µg/m ³	Not to be exceeded more than once per year
1971 36 FR 8186 Apr 30, 1971	Primary	TSP	Annual	75 µg/m ³	Annual geometric mean
1971 36 FR 8186 Apr 30, 1971	Secondary	TSP	24 hour	150 µg/m ³	Not to be exceeded more than once per year
1971 36 FR 8186 Apr 30, 1971	Secondary	TSP	Annual	60 µg/m ³	Annual geometric mean
1987 52 FR 24634 Jul 1, 1987	Primary and Secondary	PM ₁₀	24 hour	150 µg/m ³	Not to be exceeded more than once per year on average over a 3-year period
1987 52 FR 24634 Jul 1, 1987	Primary and Secondary	PM ₁₀	Annual	50 µg/m ³	Annual arithmetic mean, averaged over 3 years
1997 62 FR 38652 Jul 18, 1997	Primary and Secondary	PM _{2.5}	24 hour	65 µg/m ³	98th percentile, averaged over 3 years
1997 62 FR 38652 Jul 18, 1997	Primary and Secondary	PM _{2.5}	Annual	15.0 µg/m ³	Annual arithmetic mean, averaged over 3 years ^{3,4}
1997 62 FR 38652 Jul 18, 1997	Primary and Secondary	PM ₁₀	24 hour	150 µg/m ³	Initially promulgated 99th percentile, averaged over 3 years; when 1997 standards for PM ₁₀ were vacated, the form of 1987 standards remained in place (not to be exceeded more than once per year on average over a 3-year period) ⁵

¹³ TSP = Total Suspended Particles

1997 62 FR 38652 Jul 18, 1997	Primary and Secondary	PM ₁₀	Annual	50 µg/m ³	Annual arithmetic mean, averaged over 3 years
2006 71 FR 61144 Oct 17, 2006	Primary and Secondary	PM _{2.5}	24 hour	35 µg/m ³	98th percentile, averaged over 3 years ⁶
2006 71 FR 61144 Oct 17, 2006	Primary and Secondary	PM _{2.5}	Annual	15.0 µg/m ³	Annual arithmetic mean, averaged over 3 years ^{2, 7}
2006 71 FR 61144 Oct 17, 2006	Primary and Secondary	PM ₁₀	24 hour	150 µg/m ³	Not to be exceeded more than once per year on average over a 3-year period
2012 78 FR 3085 Jan 15, 2013	Primary	PM _{2.5}	Annual	12.0 µg/m ³	Annual arithmetic mean, averaged over 3 years ^{2, 7}
2012 78 FR 3085 Jan 15, 2013	Secondary	PM _{2.5}	Annual	15.0 µg/m ³	Annual arithmetic mean, averaged over 3 years ^{2, 7}
2012 78 FR 3085 Jan 15, 2013	Primary and Secondary	PM _{2.5}	24 hour	35 µg/m ³	98th percentile, averaged over 3 years ⁶
2012 78 FR 3085 Jan 15, 2013	Primary and Secondary	PM ₁₀	24 hour ⁸	150 µg/m ³	Not to be exceeded more than once per year on average over a 3-year period
2024	Primary	PM _{2.5}	Annual	9.0 µg/m ³	Annual arithmetic mean, averaged over 3 years ^{2, 7}