

2023-2024 Air Monitoring Network Plan

City of Philadelphia
Department of Public Health
Air Management Services

July 1, 2023

Executive Summary

Philadelphia has an ambient air monitoring network of ten air monitoring stations that house instruments that measure ambient levels of gaseous, solid, and liquid aerosol pollutants. It is operated by the City of Philadelphia's Department of Public Health, Air Management Services (AMS), the local air pollution control agency for the City of Philadelphia. This network is part of a broader network of air monitoring operated by the states of Pennsylvania, New Jersey, Delaware and Maryland that monitor the air in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area (MSA).

The United States Environmental Protection Agency (US EPA) has promulgated regulations on how the air monitoring network is to be set up. These regulations can be found in Title 40 – Protection of Environment in the Code of Federal Regulations (CFR) Part 58 – Ambient Air Quality Surveillance (referred to as 40 CFR Part 58), located online at: <http://www.ecfr.gov/cgi-bin/text-idx?SID=86f79e0c1262e76604e10118aa3cc0ec&mc=true&node=pt40.6.58&rgn=div5>.

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, an Air Monitoring Network Plan (AMNP) which assures that the network stations continue to meet the criteria established by federal regulations.

Air monitoring provides critical information on the quality of air in Philadelphia. The objective for much of our network is to measure pollutants in areas that represent high levels of contaminants and high population exposure. Some monitoring is also done to determine the difference in pollutant levels in various parts of the City, provide long term trends, help bring facilities into compliance, provide real-time monitoring and provide the public with information on air quality.

Air monitoring data is submitted to the EPA on a quarterly basis. EPA's AirData website (<https://www.epa.gov/outdoor-air-quality-data>) provides access to air quality data collected at the monitors. On May 1st of the current year, AMS certifies the prior year's data. The annual data certification process is outlined in 40 CFR Part 58.15.

The proper siting of a monitor requires the specification of the monitoring objective, the types of sites necessary to meet the objective, and the desired spatial scale of representativeness. These are discussed in the section entitled "Definitions".

This Plan is composed of the following sections and appendices:

- 1. Public Participation** – This section provides information on how the public is made aware of the AMNP and where it is available for review.
- 2. Definitions** – This section describes the terms used for air monitoring programs, measurement methods, monitoring objectives, spatial scales, air monitoring areas, pollutants, collection methods, and analysis methods.

3. **Current Network at a Glance** – This section shows the location of the monitoring sites and the pollutants measured at each site.
4. **Current Sites Summary** – This section provides information applicable to our overall network such as population. It also provides a brief overall purpose for each monitoring site.
5. **Direction of Future Air Monitoring** – This section gives a perspective of the major areas and initiatives AMS will be considering during the next few years.
6. **Proposed Changes to the Network** – This section describes changes that may occur within the next 18 months that would modify the network from how it is currently described in the AMNP.
7. **NCore Monitoring Network** – This section documents the NCore monitoring network codified in 40 CFR Part 58.10(a)(3) and 40 CFR Part 58 Appendix D section 3.
8. **Pb Monitoring Network** – This section documents the Pb monitoring network codified in 40 CFR Part 58.10(a)(4) and 40 CFR Part 58 Appendix D section 4.5.
9. **NO₂ Monitoring Network** – This section documents the NO₂ monitoring network codified in 40 CFR Part 58.10(a)(5) and 40 CFR Part 58 Appendix D section 4.3.
10. **SO₂ Monitoring Network** – This section documents the SO₂ monitoring network codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.
11. **CO Monitoring Network** – This section documents the CO monitoring network codified in 40 CFR Part 58.10(a)(7) and 40 CFR Part 58 Appendix D section 4.2.
12. **PM_{2.5} Monitoring Network** – This section documents the PM_{2.5} monitoring network codified in 40 CFR Part 58.10(a)(8) and 40 CFR Part 58 Appendix D section 4.7.
13. **O₃ Monitoring Network** – This section documents the O₃ monitoring network codified in 40 CFR Part 58.10(a)(9) – (12) and 40 CFR part 58 Appendix D section 4.1.
14. **Detailed Information on Each Site** – This is the largest section of the AMNP. Each monitoring site is separately described in a table, complete with pictures and maps. The material is presented as:
 - A table providing information on the pollutants measured, sampling type, operating schedule, collection method, analysis method, spatial scale, monitoring objective, probe height, and begin date of each monitor;
 - Pictures taken at ground level of the monitoring station;
 - A map of the monitoring site complete with major cross streets and major air emission sources within 3000 meters (almost 2 miles); and
 - An aerial picture providing a north view of the site.

15. Appendix A – Philadelphia Air Quality Survey

16. Appendix B – 2020 Community-Scale Air Toxics Ambient Monitoring Grant

17. Appendix C – 2022 American Rescue Plan Grant Project

18. Appendix D – Proof of Public Notice Publication

19. Disclaimer of Endorsement

During the public comment period, AMS provides a copy of the proposed AMNP for public inspection on the City’s website at: <https://www.phila.gov/departments/air-pollution-control-board/air-management-notices/>. Comments or questions concerning this Plan can be directed to: Jason Li, Program Services Unit / 2023 AMNP, Air Management Services, 321 S. University Avenue, 2nd Floor, Philadelphia, PA 19104; E-mail: dphams_ps@phila.gov. See Public Participation section for more information.

When the AMNP is finalized after the public comment period, a copy of the final AMNP is posted on the City’s website at <https://www.phila.gov/documents/air-management-reports-and-documents/>.

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Public Participation

The Code of Federal Regulations (CFR) Title 40: Protection of Environment, Part 58: Ambient Air Quality Surveillance requires state and local air pollution control agencies to adopt and submit to the Environmental Protection Agency (EPA) Regional Administrator an annual Air Monitoring Network Plan (AMNP, or the Plan) by July 1, 2023. The AMNP provides for the establishment and maintenance of an air quality surveillance system that consists of a network of monitoring stations. A proposed AMNP must be made available for public inspection and comment for at least 30 days prior to submission to EPA.

Air Management Services (AMS) is the local air pollution control agency for the City of Philadelphia under the Department of Public Health. Philadelphia has an air monitoring network of 10 air monitoring stations that house instruments that measure ambient levels of air pollutants under the EPA regulatory monitoring requirements. AMS also operates additional air monitoring sites and equipment based on available funding, public input and other factors, as described in this Plan. AMS is committed to continuously improving air monitoring in Philadelphia neighborhoods, especially in communities with environmental justice concerns.

Before the AMNP is finalized, the proposed Plan is available for public inspection on the City's website at <https://www.phila.gov/departments/air-pollution-control-board/air-management-notices/> and at the office of Air Management Services, 321 S. University Avenue, 2nd Floor, Philadelphia, PA 19104, during normal business hours. For further information, contact Jason Li, Acting Chief of Program Services Unit, at dphams_ps@phila.gov.

Written comments on the proposed AMNP should be sent by mail to Jason Li, Program Services Unit / 2023 AMNP, Air Management Services, 321 S. University Avenue, 2nd Floor, Philadelphia, PA 19104; or via E-mail at dphams_ps@phila.gov, with "2023 Air Monitoring Network Plan" included in the subject line.

Only written comments by mail/email will be accepted. Comments received by facsimile or voice messages will not be accepted. Persons wishing to file comments on the proposed AMNP must submit comments by May 15, 2023.

Definitions

Air Monitoring Programs

EPA has established various air monitoring programs for the measurement of pollutants. Some of these are briefly described below. Later in this AMNP, air monitoring sites and monitoring equipment are specifically identified relative to these air monitoring programs:

- **CSN** – Chemical Speciation Network. It is a PM_{2.5} sampling network with sites located principally in urban areas.
- **NATTS** – National Air Toxics Trends Stations. This network provides ambient levels of hazardous air pollutants. These sites are established with the intent that they will operate over many years and provide both current and historical information.
- **NCore** – National Core multi-pollutant monitoring stations. Monitors at these sites are required to measure particles (PM_{2.5}, speciated PM_{2.5}, PM_{10-2.5}), O₃, SO₂, CO, nitrogen oxides (NO/NO₂/NO_y), and basic meteorology. They principally support research in air pollution control.
- **SLAMS** – State or Local Air Monitoring Stations. The SLAMS make up the ambient air quality monitoring sites that are primarily needed for NAAQS comparisons, but may serve other data purposes. SLAMS exclude special purpose monitor (SPM) stations and include NCore, PAMS, Near-road NO₂/CO and all other State or locally operated stations that have not been designated as SPM stations.
- **PAMS** – Photochemical Assessment Monitoring Station for the enhanced monitoring of ozone, oxides of nitrogen (NO_x), and volatile organic compounds (VOC) to obtain more comprehensive and representative data on ozone air pollution.
- **SPM** – Special Purpose Monitor. As the name implies these monitors are placed for purposes of interest to the city of Philadelphia. Often this monitoring is performed over a limited amount of time. Data is reported to the federal Air Quality System (AQS) and is not counted when showing compliance with the minimum requirements of the air monitoring regulations for the number and siting of monitors of various types.
- **Urban Air Toxics** – Urban Air Toxics (UAT) monitoring addresses toxic air pollutant emissions in urban areas. UAT air monitoring is regularly conducted for volatile organic compounds (VOCs).

Measurement Methods

- **Federal Equivalent Method (FEM)** – A method for measuring the concentration of an air pollutant in the ambient air that has been designated as an equivalent method in accordance with 40 CFR Part 53; it does not include a method for which an equivalent method designation has been canceled in accordance with 40 CFR Part 53.11 or 40 CFR Part 53.16.
- **Federal Reference Method (FRM)** – A method of sampling and analyzing the ambient air for an air pollutant that is specified as a reference method in an appendix to 40 CFR Part 50, or a method that has been designated as a reference method in accordance with this part; it does not include a method for which a reference method designation has been canceled in accordance with 40 CFR Part 53.11 or 40 CFR Part 53.16.

Monitoring Objectives

The ambient air monitoring networks must be designed to meet three basic monitoring objectives:

- Provide air pollution data to the general public in a timely manner.
- Support compliance with ambient air quality standards and emissions strategy development.
- Assist in the evaluation of regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality.

In order to support the air quality management work indicated in the three basic air monitoring objectives, a network must be designed with a variety of different monitoring sites. Monitoring sites must be capable of informing managers about many things including the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific sources.

Spatial Scales

The physical siting of the air monitoring station must be consistent with the objectives, site type and the physical location of a particular monitor.

The goal in locating monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring site type, air pollutant to be measured, and the monitoring objective.

The spatial scale results from the physical location of the site with respect to the pollutant sources and categories. It estimates the size of the area surrounding the monitoring site that experiences uniform pollutant concentrations. The categories of spatial scale are:

- **Microscale** – Defines concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- **Middle scale** – Defines concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
- **Neighborhood scale** – Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
- **Urban scale** – Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
- **Regional scale** – Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.
- **National and global scales** – These measurement scales represent concentrations characterizing the nation and the globe as a whole.

Air Monitoring Area

- **Core-Based Statistical Area (CBSA)** – Defined by the U.S. Office of Management and Budget, as a statistical geographic entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least a population of 10,000 people, plus adjacent counties having a high degree of social and economic integration.
- **Metropolitan Statistical Area (MSA)** – A Core-Based Statistical Area (CBSA) associated with at least one urbanized area of a population of 50,000 people or more. The central county plus adjacent counties with a high degree of integration comprise the area.

Pollutants and Parameters

Air Management Services monitors for a wide range of air pollutants and parameters:

- **Criteria Pollutants** are measured to assess if and how well we are meeting the National Ambient Air Quality Standards (NAAQS) that have been set for each of these pollutants. These standards are set to protect the public's health and welfare.
 - **Ozone (O₃)**
 - **Sulfur Dioxide (SO₂)**
 - **Carbon Monoxide (CO)**
 - **Nitrogen Dioxide (NO₂)**
 - NO means nitrogen oxide.
 - NO_x means oxides of nitrogen and is defined as the sum of the concentrations of NO₂ and NO.
 - NO_y means the sum of all total *reactive* nitrogen oxides, including NO, NO₂, and other nitrogen oxides referred to as NO_z.
 - **Particulate**
 - PM_{2.5} means particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
 - PM₁₀ means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
 - PM Coarse means particulate matter with an aerodynamic diameter greater than 2.5 micrometers and less than 10 micrometers.
 - Ultrafine Particulate Matter means particulate matter with an aerodynamic diameter less than 0.1 micrometers.
 - **Lead (Pb)**
- **Black Carbon** – Black Carbon is a major component of "soot", a complex and most strongly absorbing component of particulate matter (PM), that is formed by the incomplete combustion of fossil fuels, biofuels, and biomass.
- **MET** – Meteorology parameters that may include temperature, relative humidity, barometric pressure, wind speed, wind direction, mixing height, precipitation, solar and UV radiation.
- **Speciated PM_{2.5}** – PM_{2.5} particles are analyzed to identify their makeup (60 components including elements, radicals, elemental carbon, and organic carbon) and help assess the level of health risk and identify sources that are contributing to the levels of PM_{2.5} being measured.
- **Toxics** – Approximately 44 VOC compounds, 7 carbonyls, and 7 metal elements are measured as air toxics to assess the risk of cancer and non-cancer hazard caused by these

pollutants. The VOC compounds are analyzed by GC/MS (EPA Compendium Method TO-15); carbonyls are analyzed by HPLC or uHPLC, and metals by ICP-MS(WV).

- **PAMS Volatile Organic Compounds (VOC)** – Approximately 57 of these compounds are monitored to assist in understanding the formation of ozone and how to control this pollutant. These compounds are analyzed by Auto GC-FID.

Collection Methods

Particulate samples

- **Broadband Spectroscopy PM Mass Monitor** – This instrument provides continuous PM_{2.5} real-time mass measurements using broadband spectroscopy which combines advanced LED technology with light scattering theory. Certain PM Mass Monitor Models provide simultaneous, continuous PM₁₀ and PM_{2.5}, real-time PM mass measurements.

The following instruments provide concentration values of particulate over a 24-hour period. Laboratory analysis is required before the concentration of particulate can be determined.

- **Hi-Vol** – High-Volume Air Samplers (HVAS) are used to determine the concentration of particulate matter in the air. All collected material is defined as total suspended (in the air) particulates (TSP), including lead (Pb) and other metals. A Hi-Volume sampler consists of two basic components: a motor similar to those used in vacuum cleaners and an air flow control system.
- **Filter-based PM_{2.5}** – Filter-based PM_{2.5} monitors with air samples drawn through a Teflon filter for 24 hours.
- **Met One SASS** – Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **URG** – Filters used to collect PM measurement of organic and elemental carbon.

Gaseous / criteria pollutants

- **Instrumental - Data from these instruments is telemetered to a central computer system and values are available in near “real time”.** An analyzer used to measure pollutants such as: carbon monoxide, sulfur dioxide, nitrogen oxides and ozone.

Toxic and organic (VOC) pollutants

- **SS Canister Pressurized** – Ambient air is collected in stainless-steel canisters, cryogenically concentrated using liquid nitrogen and analyzed for target VOCs and other organic components by GC-FID and GC-MS.
- **Canister Sub Ambient Pressure** – Collection of ambient air into an evacuated canister with a final canister pressure below atmospheric pressure.
- **DNPH-Coated Cartridges** – Cartridges are coated with 2,4-dinitrophenylhydrazine (DNPH). This is used for carbonyl determination in ambient air. Ultra-High and High Performance Liquid Chromatography (uHPLC and HPLC) measures the carbonyl.

Analysis Methods

Particulate concentration

- **Gravimetric** – The determination of the quantities of the constituents of a compound, describes a set of methods for the quantitative determination of an analyte based on the weight of a solid. Laboratory analysis is needed.
- **Broadband Spectroscopy** – Broadband spectroscopy combines advanced LED technology with light scattering theory. Certain PM Mass Monitor Models provide simultaneous, continuous PM10 and PM2.5, real-time PM mass measurements.

Composition/make-up of particulates

- **Energy Dispersive XRF** – Energy dispersive x-Ray Fluorescence Spectrometer for the determination of species in ambient particulate matter.
- **Ion Chromatography** – Ion-exchange chromatography (or ion chromatography) is a chromatography process that separates ions and polar molecules based on their affinity to the ion exchanger for the determination of species in ambient particulate matter.
- **IMPROVE** – Thermal Optical Reflectance (TOR) analysis using the Interagency Monitoring of Protected Visual Environments (IMPROVE)_A protocol.

Gaseous / criteria pollutants

- **Nitrogen Oxides – Chemiluminescence** – Emission of light as a result of a chemical reaction at environmental temperatures. This analysis is used for NO, NO_x, and NO_y. NO₂ is calculated as NO_x - NO. True NO₂ monitoring technology provides a direct NO₂ measurement. The instrument utilizes a Cavity Attenuated Phase Shift (CAPS) technique.
- **Carbon Monoxide – Gas Filter Correlation** – Measures low ranges of carbon monoxide by comparing infrared energy absorbed by a sample to that absorbed by a reference gas according to the Beer-Lambert law. Using a Gas Filter Correlation Wheel, a high energy IR light source is alternately passed through a CO filled chamber and a chamber with no CO present. The light path then travels through the sample cell, which has a folded path of 14 meters. The energy loss through the sample cell is compared with the span reference signal provided by the filter wheel to produce a signal proportional to concentration.
- **Sulfur Dioxide – UV Fluorescent** – UV Fluorescence Sulfur Dioxide Analyzer is a microprocessor controlled analyzer that determines the concentration of sulfur dioxide (SO₂), in a sample gas drawn through the instrument's sample chamber where it is exposed to ultraviolet light, which causes any SO₂ present to fluoresce. The instrument measures the amount of fluorescence to determine the amount of SO₂ present in the sample gas.
- **Ozone – Ultra Violet** - A light, which supplies energy to a molecule being analyzed. Ozone is analyzed with UV.

Toxic and volatile organic pollutants

- **GC-MS** – Gas Chromatograph/Mass Spectrometer. Analysis of organic or VOC are conducted using a gas chromatograph (GC) with a mass spectrometer (MS) attached as the detector. Cryogenic preconcentration with liquid nitrogen (LN₂) is also used to trap and concentrate sample components.
- **Auto GC-FID** – Automated Gas Chromatograph. Continuous hourly analysis of VOC using airmoVOC C2-C6 (light volatile hydrocarbons) and airmoVOC C6-C12 (heavy volatile hydrocarbons) analyzers with Flame Ionization Detection.

- **Ultra-High Performance Liquid Chromatography (uHPLC)** – The analytical method used to analyze carbonyl compounds such as acetaldehyde and formaldehyde. Compared with traditional HPLC, uHPLC allows for faster analysis time as well as chromatograms with greater resolution.

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Current Network at a Glance

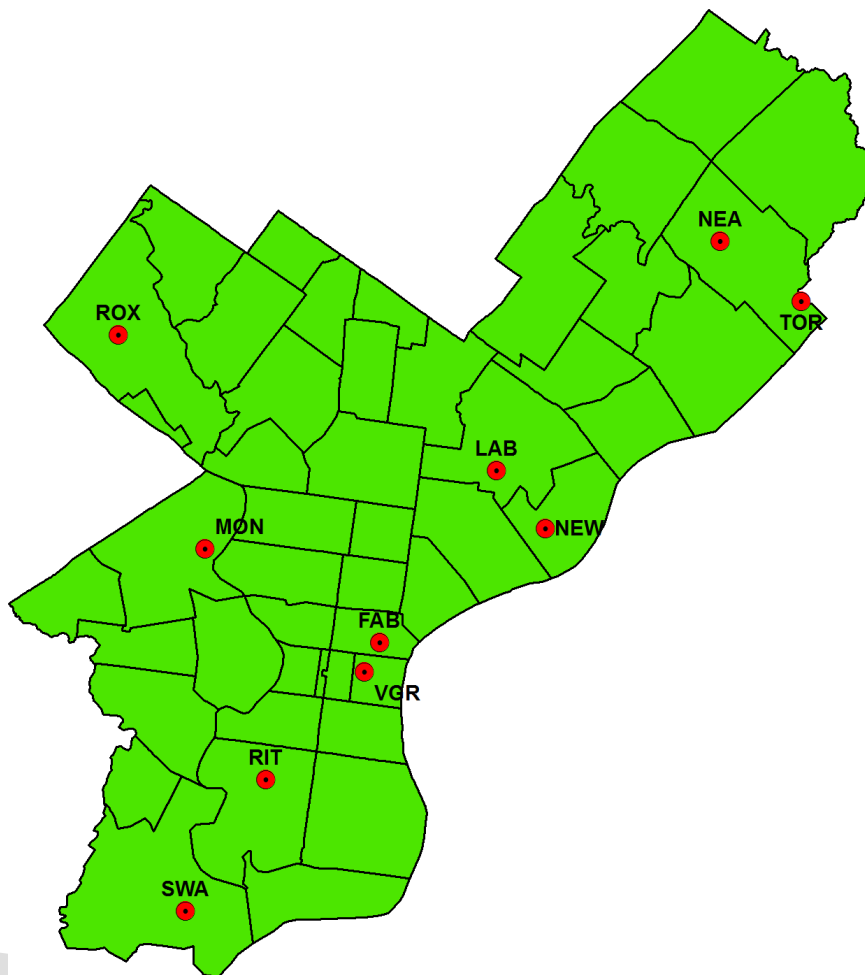
The City of Philadelphia is served by a network of ten air monitoring sites located throughout the City that measure the criteria pollutants (except lead ¹): ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and particulate matter (PM₁₀ and PM_{2.5}).

Four of the sites also measure air toxics, such as benzene, acetaldehyde, and formaldehyde. Figure 1 below shows the location of air monitors and the pollutants measured at each monitor location.

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¹ EPA waived monitoring lead since 2017 because the 2014-2016 design value in Philadelphia was 0.04 µg/m³, well below the National Ambient Air Quality Standards for lead.

Figure 1 - 2023 Philadelphia Air Monitoring Network as of July 1, 2023



			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	Black Carbon / Ultrafine PM	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			X			MON
(not in AQS)	VGR	6th & Arch Sts			X				X								X	VGR

Summary of Current Sites

All of our ten monitoring sites are located in Philadelphia, PA:

State: Pennsylvania

City: Philadelphia

County: Philadelphia

Metropolitan Statistical Area (MSA): Philadelphia-Camden-Wilmington, PA-NJ-DE-MD, consisting of 11 counties in the four states.

MSA number: 37980

MSA population: 6,245,051 (2020 census data)²

EPA Region: III (regional office located in Philadelphia)

Class I Area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ

Philadelphia County population: 1,567,258 (July 1, 2022 estimate)³

Time zone: EST

UTM zone: 18

The air monitoring requirements and protocols set forth in 40 CFR Part 58 are mostly based on MSA and/or CBSA, rather than an individual county or city.

Air monitors in this Plan are designed and located to fulfill the air monitoring requirements for the Philadelphia MSA, along with other air monitoring sites in the MSA operated by the states of Pennsylvania, New Jersey, Delaware and Maryland.

Table 1 is a summary of the current monitoring sites.

² Census data from <https://www.census.gov/library/visualizations/interactive/2020-population-and-housing-state-data.html>

³ 2022 Census Bureau estimates from <https://www.census.gov/quickfacts/fact/table/philadelphiacountypennsylvania,philadelphiacitypennsylvania,PA/PST045222>

Table 1 – Site Summary Table

AQS Site Code	AMS Site	Address	Statement of Purpose
421010004	LAB	1501 E. Lycoming St.	Built in 1964, is a good site to test new or complex monitoring methods as laboratory staff are readily available.
421010014	ROX	Eva & Dearnley Sts.	Periphery site.
421010024	NEA	Grant Ave & Ashton Rd.	Periphery site. High Ozone.
421010048	NEW	2861 Lewis St.	Originally sited to measure the impact of Franklin Smelting and Refining (now closed), MDC (now closed), and the waste water treatment plant. In 2013, the NCore site was re-located here and in 2017 is a designated PAMS site.
421010055	RIT	24 th & Ritner Sts.	This site was selected to help assess the impact of the petroleum refinery on the local community. The area was identified by air quality modeling.
421010057	FAB	3 rd & Spring Garden Sts.	This site was established to represent the highest levels of PM _{2.5} in the City based on EPA Region III's air quality modeling of air toxics in Philadelphia. It shows high levels of PM _{2.5} created by vehicle traffic.
421010063	SWA	8200 Enterprise Ave.	This site was established to measure air toxics, carbonyls, and metals. EPA Region III modeling analysis showed areas near the airport to have high levels of aldehydes.
421010075	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.
421010076	MON	I-76 & Montgomery Drive	This site was established as the 2nd near-road NO ₂ monitor in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area.
	VGR	6 th & Arch Sts.	Village Green Air Monitoring Station. Utilizes solar and wind turbine power as energy sources. Sited to increase community awareness of environmental conditions.

Direction of Future Air Monitoring

The agency will study and assess the overall monitoring program within the City to determine the course of future changes to the air monitoring network.

The agency will focus on the following:

- The agency will analyze monitoring data from the Philadelphia Air Quality Survey (PAQS) project, the Community-Scale Air Toxics Ambient Monitoring project, the mobile monitoring equipment, and other monitoring projects to evaluate concentrations of air pollutants throughout the city. Based on these results and funding, the agency plans to propose updates to FRM/FEM and air toxics monitoring locations if needed.
- The agency will work on Environmental Justice issues and enhanced public participation during the development of the Air Monitoring Network Plan and investigate pollutant concentrations in overburdened communities. The newly added mobile platform (monitoring van) may be deployed to these neighborhoods for enhanced air monitoring.
- The agency was awarded an American Rescue Plan (ARP) competitive monitoring grant from EPA in 2022. The project will focus on enhanced air monitoring in overburdened communities in Philadelphia.
- Improve the understanding of particulate and air toxic pollutants in Philadelphia.
 - The agency plans to pursue negotiations with the port entities in order to implement monitoring and emission inventory efforts in this location. AMS plans to assist EPA on a port air monitoring project.
- The agency would like to consider the establishment of an asset management framework for the monitoring system and develop an air quality monitoring modernization plan as opportunities for sustainability. This may include an asset inventory in the AirVision database system.
- The agency would like to better understand the performance and remedy the challenges in the use of low-cost sensors to provide real-time, local-scale air quality information. Challenges include: data quality and outlier concerns, data processing and validation, impact of humidity on instrument performance, data interpretation and publication, etc.
- The agency will seek other funding opportunities (e.g. grants issued by EPA and other funding sources) to further invest in air monitoring in communities with environmental justice concerns.

Proposed Changes to the Network

Below are changes that are anticipated or possible to occur over the next 18 ~ 22 months to the existing air monitoring network:

- March 2023 – December 2024
 - Philadelphia Air Quality Survey.
 - AMS will continue to maintain sites and sample ambient air as shown in Appendix A. When necessary, AMS may make adjustments to the site locations to provide better spatial coverage of air monitoring in overburdened communities.
 - AMS was awarded EPA's Community-Scale Air Toxics Ambient Monitoring grant for 2020.
 - See Appendix B for more information (this is not a part of the monitoring network shown in Figure 1).
 - Although experiencing supply chain difficulties, the project is ongoing and will continue into March 2023. A project report will be produced thereafter.
 - AMS was awarded an American Rescue Plan grant, Enhanced Air Monitoring in Communities, from EPA in 2022
 - See Appendix C for more information (this is not a part of the monitoring network shown in Figure 1).
 - This project will set up three air monitoring sites in overburdened communities.
 - A mobile monitoring platform was added in December 2022. It will measure BTEX (Benzene, Toluene, Ethylbenzene, m-, o-, and p-Xylene), NO, NO₂, SO₂, O₃, PM_{2.5}, meteorological data, CO, CO₂, CH₄, H₂O, and Total VOCs calibrated to Isobutylene. A modified Ford Transit 250 van includes GPS to track speed and location and can be used while the vehicle is in motion or stationary.
 - AMS proposes to re-start the air monitoring station on N. Broad Street, Philadelphia under an EPA Clean Air Act / Inflation Reduction Act grant project. With a grant award, AMS would monitor PM_{2.5}, ozone and NO₂ at this site. This would fill a gap in North Philadelphia where a large portion of the residents live in overburdened communities.

NCore Monitoring Network

The requirements for the NCore air monitoring network are codified in 40 CFR Part 58.10(a)(3) and 40 CFR Part 58 Appendix D section 3.

The NCore station is located at NEW.

As codified in 40 CFR Part 58 Appendix D section 5(a), PAMS measurements are required at NCore sites that are in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more. 40 CFR Part 58.13(h) requires the PAMS sites to be established and operating no later than June 1, 2021. AMS started the PAMS monitoring on schedule.

The PAMS Monitoring Implementation at this site started in June 2021.

Pb Monitoring Network

The requirements for the Pb air monitoring network are codified in 40 CFR Part 58.10(a)(4) and 40 CFR Part 58 Appendix D section 4.5.

Philadelphia County currently has no source oriented Pb monitoring because there are no sources that emit 0.50 or more tons per year.

DRAFT

NO₂ Monitoring Network

The requirements for the NO₂ air monitoring network are codified in 40 CFR Part 58.10(a)(5) and 40 CFR Part 58 Appendix D section 4.3.

AMS currently operates an NO₂ monitor that meets the area-wide monitoring requirements at the NEW site. The first near-road NO₂ monitor was established at TOR and started operation on January 1, 2014. The second near-road NO₂ monitor is located at MON and started operation on July 20, 2015.

DRAFT

SO₂ Monitoring Network

The requirements for the SO₂ air monitoring network are codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.

AMS currently monitors SO₂ at NEW and RIT in this Plan.

DRAFT

CO Monitoring Network

The requirements for the CO air monitoring network are codified in 40 CFR Part 58.10(a)(7) and 40 CFR Part 58 Appendix D section 4.2.

The Philadelphia-Camden-Wilmington, PA-NJ-DE-MD CBSA has a CO monitor collocated with the near-road NO₂ monitor at TOR and has been operational since January 1, 2014. AMS also monitors CO at the NEW and the MON (near-road) sites.

DRAFT

PM_{2.5} Monitoring Network

The requirements for the PM_{2.5} air monitoring network are codified in 40 CFR Part 58.10(a)(8) and 40 CFR Part 58 Appendix D section 4.7.

The requirement for at least one PM_{2.5} monitor to be collocated at a near-road NO₂ station for CBSAs with a population of 1,000,000 or more persons is met at the TOR monitoring site.

AMS also monitors PM_{2.5} at LAB, NEW, RIT, FAB, MON, and VGR (non-regulatory). AMS currently operates PM_{2.5} monitors beyond the minimum requirements.

DRAFT

O₃ Monitoring Network

The requirements for the O₃ air monitoring network are codified in 40 CFR Part 58.10(a)(9) – (12) and 40 CFR Part 58 Appendix D section 4.1.

AMS currently operates three O₃ monitors in this Plan.

Enhanced Monitoring Plan

40 CFR Part 58 Appendix D. 5(h) requires: “*States with Moderate and above 8-hour O₃ nonattainment areas and states in the Ozone Transport Region as defined in 40 CFR 51.900 shall develop and implement an Enhanced Monitoring Plan (EMP) detailing enhanced O₃ and O₃ precursor monitoring activities to be performed. The EMP shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above O₃ nonattainment, whichever is later. At a minimum, the EMP shall be reassessed and approved as part of the 5-year network assessments required under 40 CFR 58.10(d). The EMP will include monitoring activities deemed important to understanding the O₃ problems in the state. Such activities may include, but are not limited to, the following:*

- (1) Additional O₃ monitors beyond the minimally required under paragraph 4.1 of this appendix,*
- (2) Additional NO_x or NO_y monitors beyond those required under 4.3 of this appendix,*
- (3) Additional speciated VOC measurements including data gathered during different periods other than required under paragraph 5(g) of this appendix, or locations other than those required under paragraph 5(a) of this appendix, and*
- (4) Enhanced upper air measurements of meteorology or pollution concentrations.”*

Please note only States, not local counties, are required to submit an EMP to the EPA. AMS will work with the Pennsylvania Department of Environmental Protection (PA DEP) for enhanced O₃ and O₃ precursor monitoring.

Currently, AMS monitors the following beyond the minimum requirements:

- (1) Year-round ozone monitoring at four sites as shown in Figure 1.

Pending funding for EMPs, AMS cannot guarantee that year-round monitoring will continue.

Detailed Information on Each Site

The tables that follow provide detailed information for each of the 10 monitoring stations in Philadelphia County. As per 40 CFR Part 58.10(a)(1), the siting and operation of each monitor in the 2023-2024 AMNP meet the requirements of 40 CFR Part 58 and Appendices A, B, C, D, and E of this part where applicable.

The Major Emission Sources shown in Figures 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20 are those within 3000 meters from a monitoring site. These are facilities included in the 2021 stationary point source emission inventories.

Table 2 – Detailed LAB Information with Monitoring Station Picture

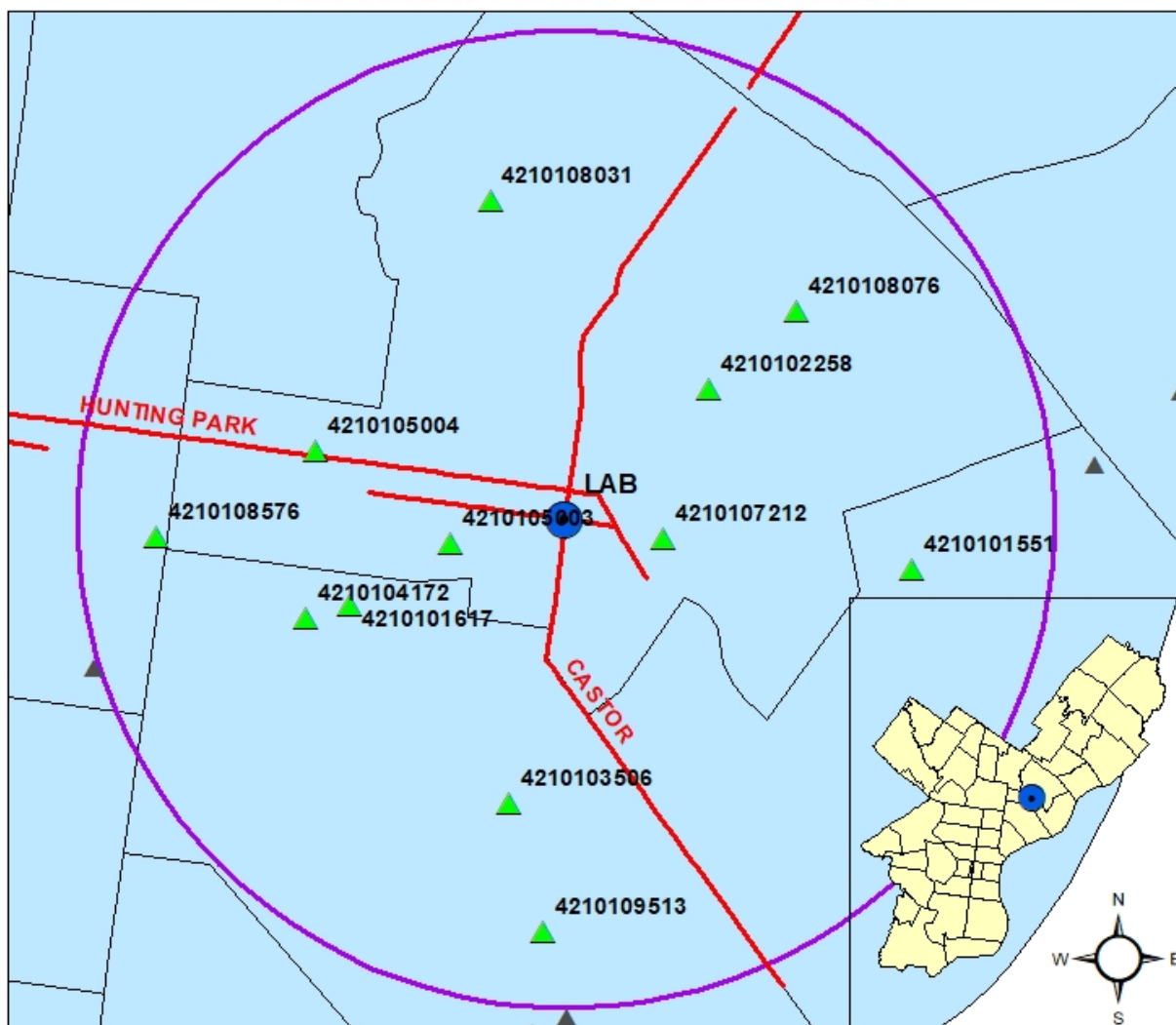
AMS SITE ID: LAB
AQS Site ID: 421010004
Street Address: 1501 E. Lycoming Street, 19124
Geographical Coordinates
Latitude: 40.008889
Longitude: -75.09778



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone	SLAMS		Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	2	087	Neighborhood	Population Exposure	7	1/1/2018
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	5	236	Neighborhood	Population Exposure	2	10/1/2021

Figure 2 – LAB Monitoring Site Map with Major Streets and Major Emission Sources

AMS LABORATORY - 1501 E. LYCOMING ST. EPA AIRS CODE: 421010004



LAB - Number of facilities within 3000 m radius: 12			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101551	ADVANSIX RESINS AND CHEMICALS LLC FRANKFORD PLT	4700 BERMUDA ST	79.17	0.00	263.58	64.45	51.09	24.13	114.27
4210101617	PUROLITE		2.28	0.00	2.71	0.21	0.21	0.02	1.71
4210102258	FRONTIDA BIOPHARM INC	1100 ORTHODOX ST	1.29	0.00	1.54	0.12	0.04	0.01	0.08
4210103506	PTR BALER & COMPACTOR	2207 E ONTARIO ST	0.34	0.00	0.40	0.03	0.03	0.00	19.23
4210104172	SEPTA BERRIDGE	200 W WYOMING AVE	1.25	0.00	3.27	1.10	1.10	0.01	4.24
4210105003	KINDER MORGAN LIQUIDS TERM LLC	3300 N DELAWARE AVE	3.11	0.00	3.54	0.26	0.20	0.03	29.33
4210105004	MIPC G STREET TERMINAL	4210 G ST	0.00	0.00	0.00	0.00	0.00	0.00	23.46
4210107212	DOMESTIC LINEN SUPPLY	4100 FRANKFORD AVE	0.26	0.00	0.33	0.53	0.53	0.01	4.71
4210108031	FRIENDS HOSP	4641 ROOSEVELT BLVD	1.40	0.00	1.73	0.04	0.04	0.03	0.09
4210108076	ARIA HEALTH/TORRESDALE CAMP	RED LION & KNIGHTS RD	4.14	0.00	5.90	0.31	0.30	0.04	0.38
4210108576	ST CHRISTOPHERS HOSP	ERIE AVE & FRONT ST	3.48	0.00	5.79	0.43	0.43	0.17	0.38
4210109513	CITY OF PHILA WATER DEPT	3899 RICHMOND ST	12.23	0.00	8.88	3.20	3.20	0.82	13.77

Figure 3 – LAB North Aerial View



Table 3 – Detailed ROX Information with Monitoring Station Picture

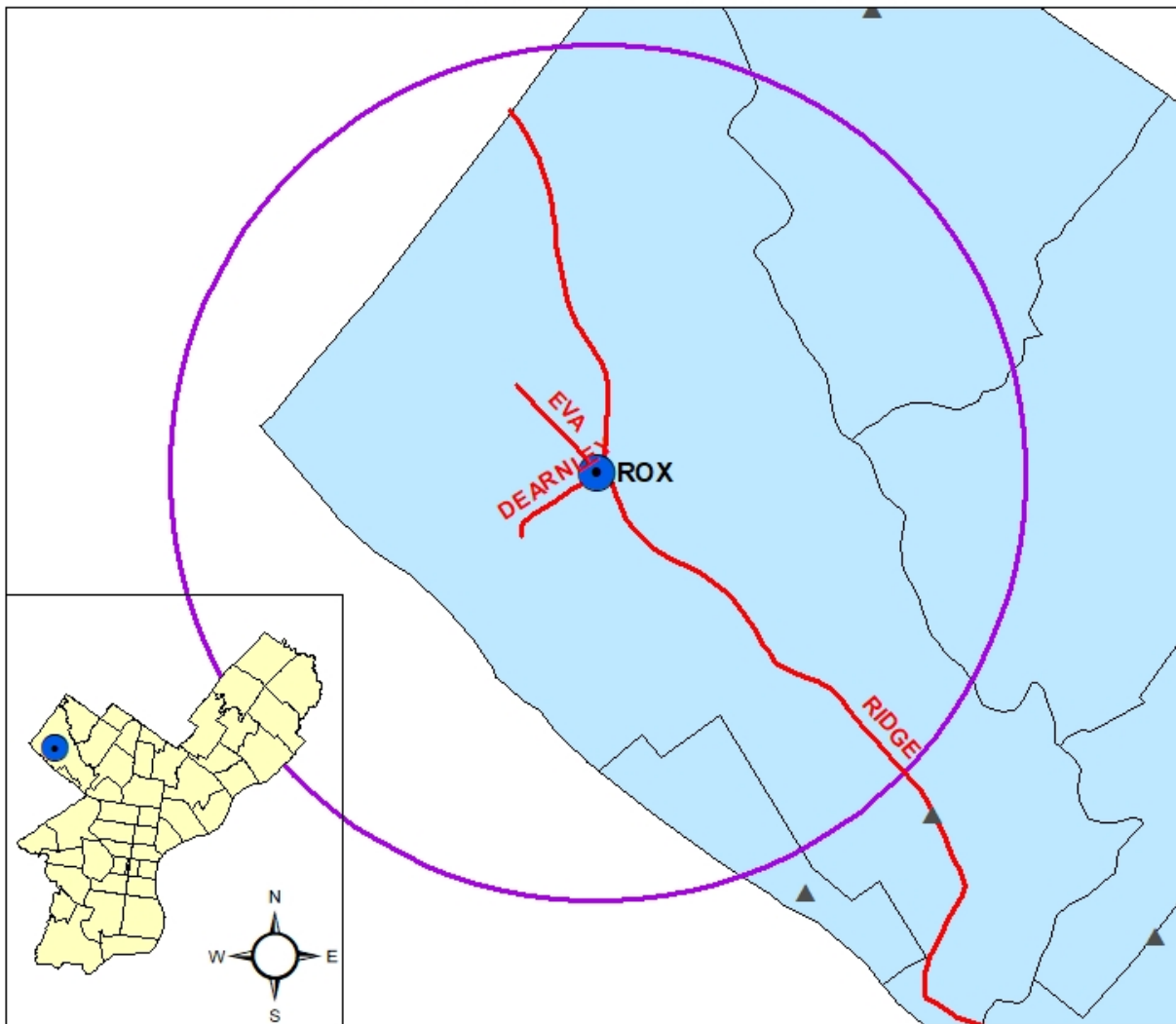
AMS SITE ID: ROX
AQS Site ID: 421010014
Street Address: Eva & Dearnley Streets
Geographical Coordinates
Latitude: 40.049604
Longitude: -75.241209



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC		Vary	2	102	Neighborhood	Population Exposure	4	5/7/2003
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	4,5	150	Neighborhood	Population Exposure	4	1/1/2004

Figure 4 – ROX Monitoring Site Map with Major Streets and Major Emission Sources

ROXBOROUGH - EVA & DEARNLEY STS. **EPA AIRS CODE: 421010014**



ROX - Number of facilities within 3000 m radius: 0			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC

Figure 5 – ROX North Aerial View



Table 4 – Detailed NEA Information with Monitoring Station Pict

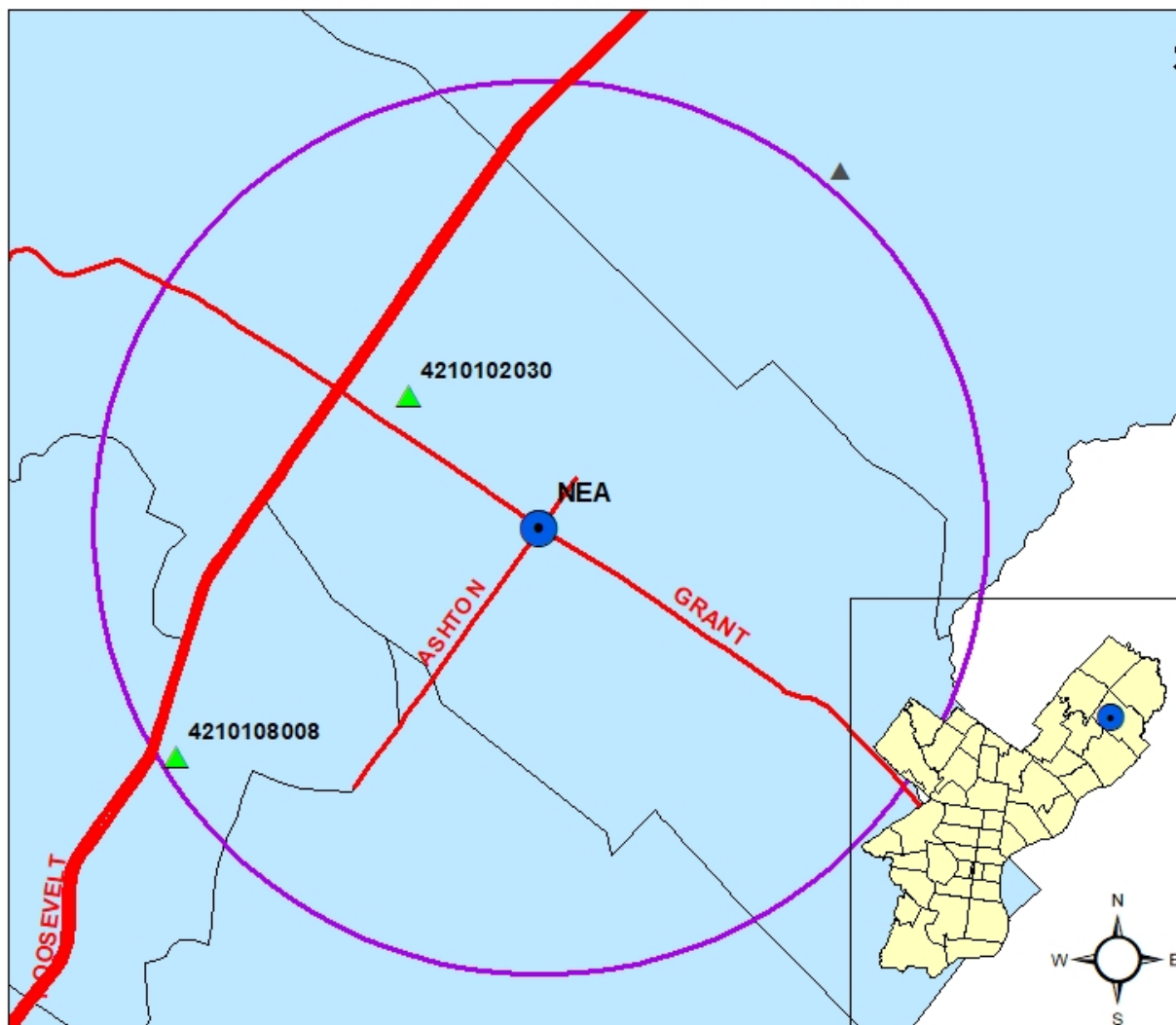
AMS SITE ID: NEA
AQS Site ID: 421010024
Street Address: Grant Ave & Ashton Rd
Geographical Coordinates
Latitude: 40.076389
Longitude: -75.011944



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone	SLAMS		Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	1	087	Urban	Highest concentration	6	1/1/1974

Figure 6 – NEA Monitoring Site Map with Major Streets and Major Emission Sources

NORTHEAST AIRPORT - GRANT AVE & ASHTON RD. **EPA AIRS CODE: 421010024**



NEA - Number of facilities within 3000 m radius: 2			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210102030	RYDER TRUCK RENTAL BLUEGRASS RD	9751 BLUE GRASS RD	0.02	0.00	0.09	0.00	0.00	0.00	0.15
4210108008	NAZARETH HOSP	2601 HOLME AVE	1.68	0.00	2.38	0.09	0.07	0.04	0.13

Figure 7 – NEA North Aerial View

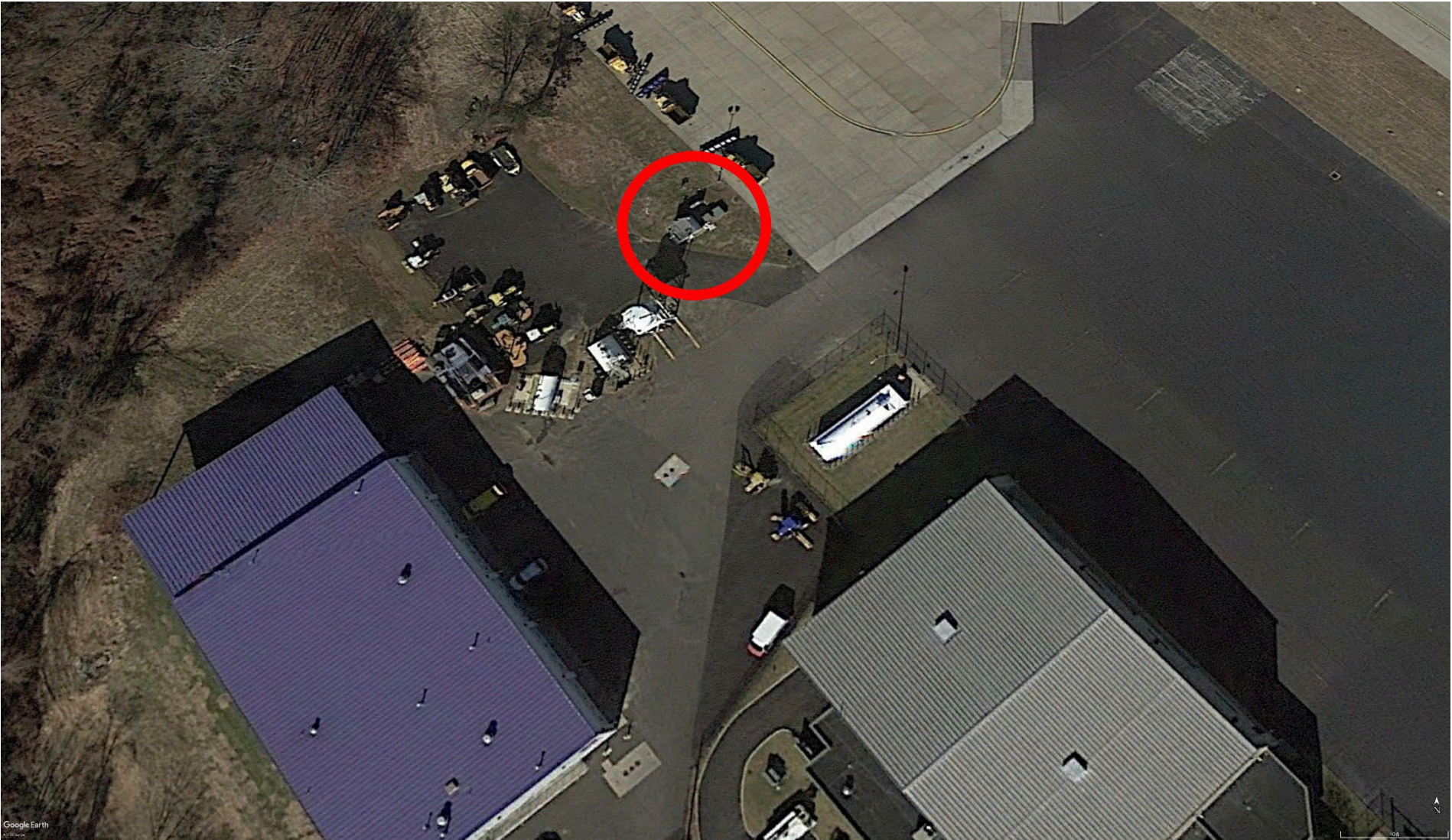


Table 5 – Detailed NEW information with Monitoring Station Picture

AMS SITE ID: NEW
AQS Site ID: 421010048
Street Address: 2861 Lewis Street
Geographical Coordinates
Latitude: 39.991389
Longitude: -75.080833

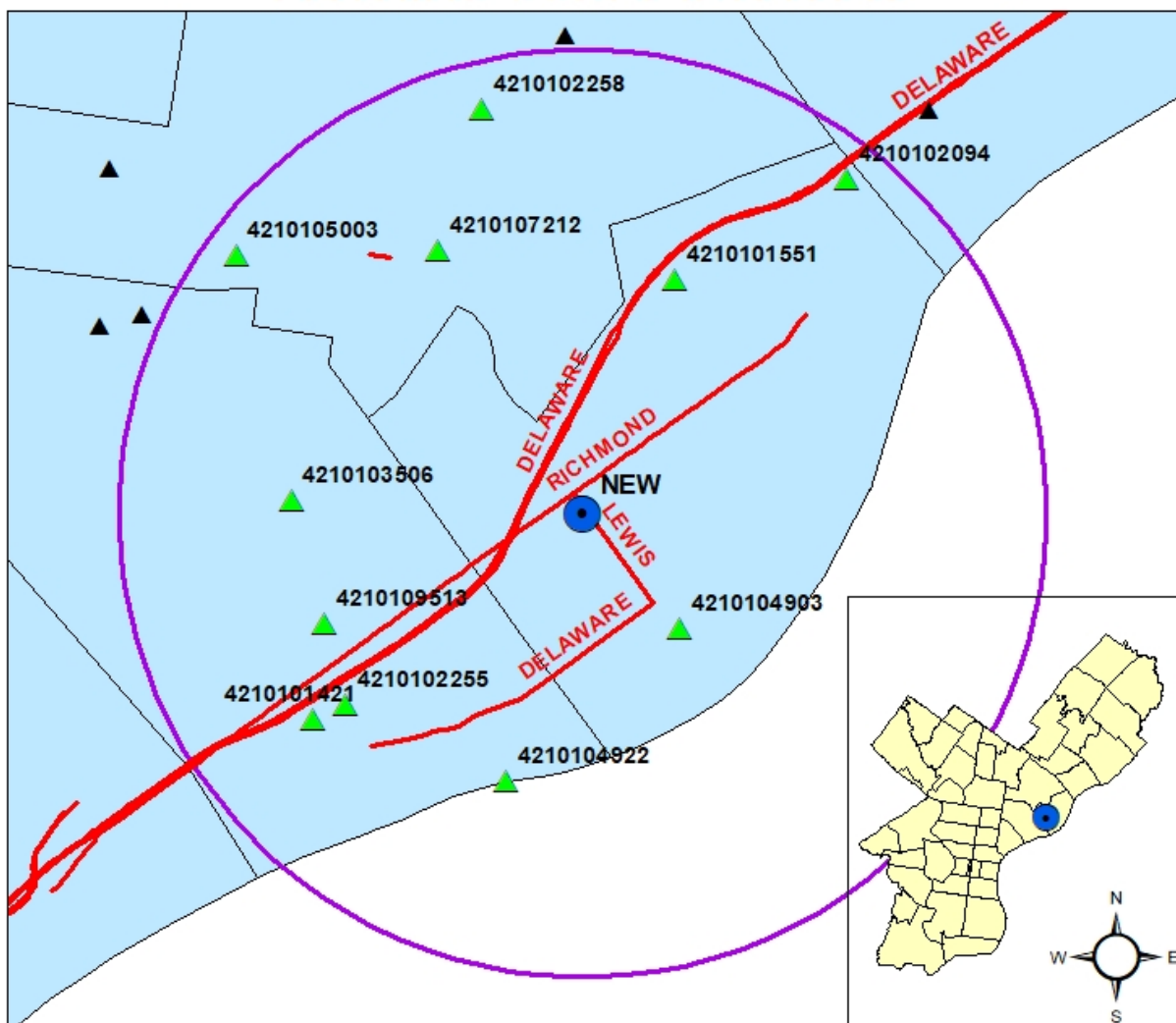


Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO (trace)	SLAMS	NCORE	Continuous	Instrumental	Gas Filter Correlation CO Analyzer	High sensitivity	42101	1	093	Neighborhood	Population Exposure	2	10/2/2013
SO2 (trace)	SLAMS	NCORE	Continuous	Instrumental	Ultraviolet Fluorescence	High sensitivity	42401	2	100	Neighborhood	Population Exposure	2	10/2/2013
Ozone	SLAMS	NCORE	Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	1	087	Neighborhood	Population Exposure	2	10/2/2013
NO	SLAMS	NCORE	Continuous	Instrumental	Chemiluminescence Teledyne	High sensitivity external converter mounted at 10m	42601	1	099	Neighborhood	Population Exposure	10	10/2/2013
NOy	SLAMS	NCORE	Continuous	Instrumental	Chemiluminescence Teledyne	High sensitivity external converter mounted at 10m	42600	1	699	Neighborhood	Population Exposure	10	10/2/2013
PM10 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		81102	2	239	Neighborhood	Population Exposure	2	1/1/2019
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640 at 5.00 LPM	Broadband Spectroscopy		88101	5	236	Neighborhood	Population Exposure	2	8/19/2020
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		88101	4	238	Neighborhood	Population Exposure	2	1/1/2020
PM2.5 Speciated	SLAMS	NCORE, CSN	1/3 days	Met One SASS (Nylon and Teflon) and URG	Energy Dispersive XRF, Ion Chromatography and IMPROVE	Analysis by EPA	Vary	5	Vary	Neighborhood	Population Exposure	2	10/2/2013
PM2.5 FRM	SLAMS	NCORE	1/3 days	R&P PM2.5	Gravimetric	NEW-D	88101	1	145	Neighborhood	Population Exposure	2	10/2/2013
PM10-2.5 (PM Coarse)	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		86101	4	240	Neighborhood	Population Exposure	2	1/1/2019
Meteorological	SLAMS	NCORE	Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure, rainfall, and solar		Vary	1	Vary	Neighborhood	Population Exposure	10	6/1/1993

					radiation								
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC	In addition to the 1-in-6 days UAT sampling, also sampling for three of 8-hour periods every 3rd day during PAMS season (June 1 - Aug 31)	Vary	1,3	102	Neighborhood	Population Exposure	7	10/14/2016
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	1,2	150	Neighborhood	Population Exposure	7	10/14/2016
PAMS VOC	SLAMS	PAMS	Continuous	CAS Auto GC		Operating during ozone season	Vary			Neighborhood	Population Exposure	5	6/1/2021
Cellometer	SLAMS	PAMS	Continuous	Vaisala									1/1/2018
Solar radiation	SLAMS	PAMS	Continuous	MetOne									
UV radiation	SLAMS	PAMS	Continuous	Eppley									
Precipitation	SLAMS	PAMS	Continuous	MetOne									
True NO2	SLAMS	PAMS	Continuous	Teledyne Model T500U	Cavity Attenuated Phase Shift Spectroscopy		42602	1	212	Neighborhood	Population Exposure		4/1/2019

Figure 8 – NEW Monitoring Site Map with Major Streets and Major Emission Sources

NORTHEAST WASTE - 2861 LEWIS ST. EPA AIRS CODE: 421010048



NEW - Number of facilities within 3000 m radius: 11			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101421	RIVERSIDE MATERIALS	2870 E ALLEGHENY AVE	2.22	0.00	2.60	0.94	0.27	0.31	1.62
4210101551	ADVANSIX RESINS AND CHEMICALS LLC FRANKFORD PLT	4700 BERMUDA ST	79.17	0.00	263.58	64.45	51.09	24.13	114.27
4210102094	DIETZ & WATSON	5701 TACONY ST	6.29	0.00	3.89	0.58	0.57	0.17	0.42
4210102255	SMITH EDWARDS DUNLAP	2867 E ALLEGHENY AVE	0.11	0.00	0.14	0.01	0.00	0.05	1.34
4210102258	FRONTIDA BIOPHARM INC	1100 ORTHODOX ST	1.29	0.00	1.54	0.12	0.04	0.01	0.08
4210103506	PTR BALER & COMPACTOR	2207 E ONTARIO ST	0.34	0.00	0.40	0.03	0.03	0.00	19.23
4210104903	EXELON RICHMOND GENERATING STA	3901 N DELAWARE AVE	0.02	0.00	2.74	0.05	0.02	0.01	0.00
4210104922	PHILA GAS WORKS RICHMOND PLT	3100 E VENANGO ST	1.88	0.00	3.33	0.16	0.16	0.01	0.20
4210105003	KINDER MORGAN LIQUIDS TERM LLC	3300 N DELAWARE AVE	3.11	0.00	3.54	0.26	0.20	0.03	29.33
4210107212	DOMESTIC LINEN SUPPLY	4100 FRANKFORD AVE	0.26	0.00	0.33	0.53	0.53	0.01	4.71
4210109513	CITY OF PHILA WATER DEPT	3899 RICHMOND ST	12.23	0.00	8.88	3.20	3.20	0.82	13.77

Figure 9 – NEW North Aerial View



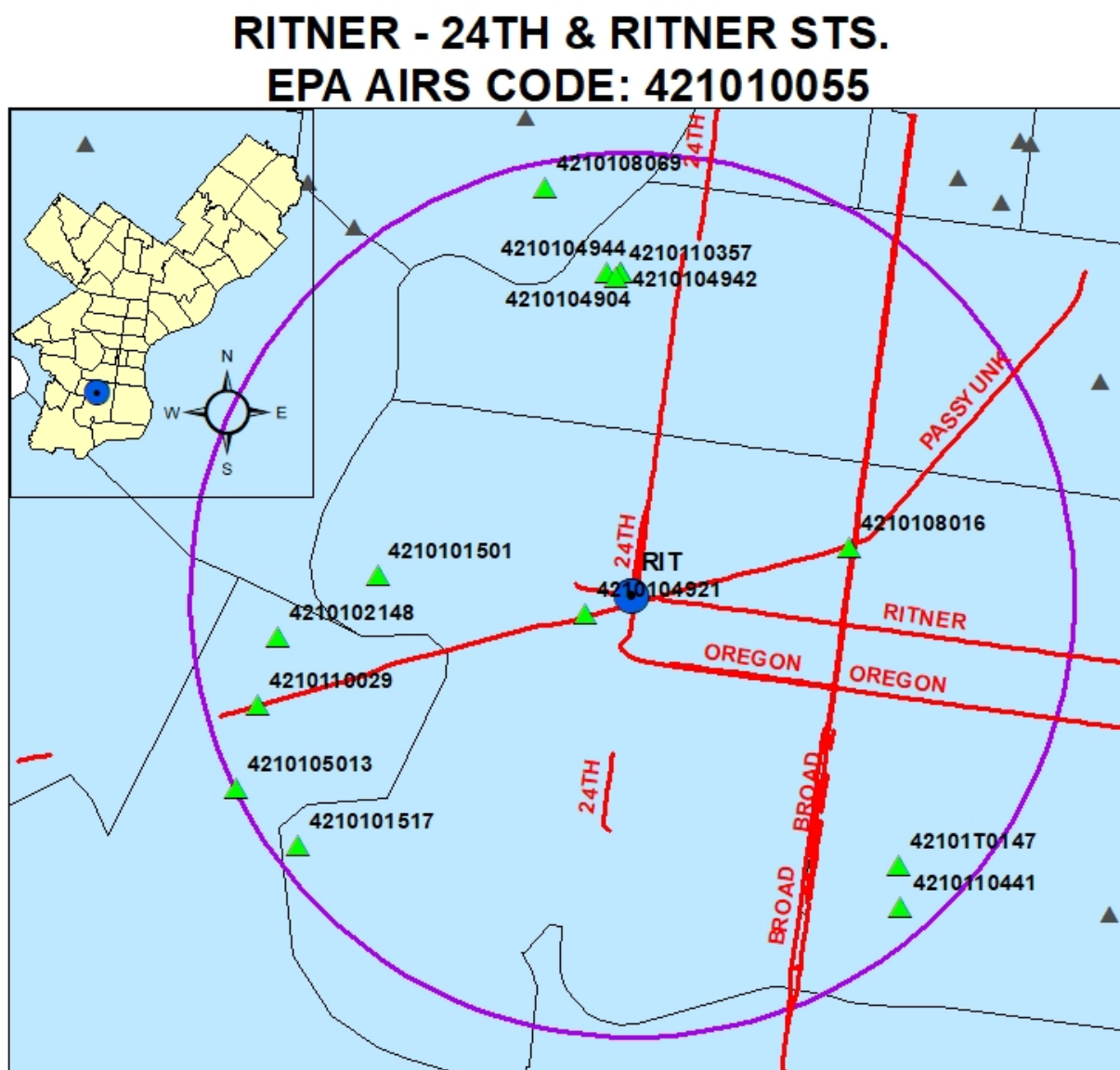
Table 6 – Detailed RIT Information with Monitoring Station Picture

AMS SITE ID: RIT
AQS Site ID: 421010055
Street Address: 24th & Ritner Streets
Geographical Coordinates
Latitude: 39.922867
Longitude: -75.186921



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
SO2	SLAMS		Continuous	Instrumental	Ultraviolet Fluorescence		42401	1	100	Neighborhood	Population Exposure	4	11/9/2004
PM2.5 Speciated	SLAMS	CSN	1/3 days	Met One SASS (Nylon and Teflon) and URG	Energy Dispersive XRF, Ion Chromatography and IMPROVE	Analysis by EPA contracted lab	Vary	5	Vary	Neighborhood	Population Exposure	2	9/1/2005
Metals	Other		1/6 days	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz)	Vary	1	089	Neighborhood	Population Exposure	4	8/31/2004
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC		Vary	2	102	Neighborhood	Population Exposure	4	Vary
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	4,5	150	Neighborhood	Population Exposure	4	11/1/2004
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	236	Neighborhood	Population Exposure	4	4/1/2020

Figure 10 – RIT Monitoring Site Map with Major Streets and Major Emission Sources



RIT- Number of facilities within 3000 m radius: 14			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101501	PHILA ENERGY SOL REF	3144 W PASSYUNK AVE	3.89	0	18.61	1.01	1.01	0.31	55.4
4210101517	PES/PHILA ENG SOL	3144 W PASSYUNK AVE	0.19	0	0.16	0.01	0.01	0.03	8.71
4210102148	CLEAN EARTH OF PHILA FAC	3201 S 61ST ST	0	0	0	0.04	0	0	2.86
4210104904	CONSTELLATION ENERGY GENERATION LLC SCHUYLKILL	2800 CHRISTIAN ST	0.13	0	0.85	0.03	0.02	0	0
4210104921	PHILA GAS WORKS PASSYUNK AVE PLT	3100 W PASSYUNK AVE	2.87	0	3.45	0.26	0.25	0.03	0.6
4210104942	VICINITY ENERGY PHILA	2600 CHRISTIAN ST	4.1	0	62.6	0.99	0.99	2.3	0.3
4210104944	GRAYS FERRY COGEN PROJ	2600 CHRISTIAN ST	15.66	0	202.1	13.99	13.99	3.4	0.56
4210105013	PBF LOGISTICS PRODUCTS TERMINALS LLC	6850 ESSINGTON AVE	1.45	0	1.73	0.13	0.13	0	51.83
4210108016	CONSTITUTION HEALTH PLAZA	1930 S BROAD ST	0.43	0	0.71	0.03	0.03	0.02	0.04
4210108069	CHILDRENS HOSPITAL OF PHILADELPHIA	34TH & CIVIC CENTER BLVD	8.38	0	12.69	1.38	1.38	0.26	1.02
4210110029	KINDER MORGAN POINT BREEZE TERM	6310 PASSYUNK AVE	0	0	0.01	0	0	0.02	15.79
4210110357	VEOLIA ENERGY EFFICIENCY	2600 CHRISTIAN ST	0.03	0	3.2	0.31	0.31	0.15	1.55
4210110441	LINCOLN FINANCIAL FIELD IMPROVEMENTS	1 LINCOLN FINANCIAL FIELD	1.09	0	2.32	0.1	0.1	0.01	0.13
4210110147	PHILA PHILLIES BALL PRK & PRKING AREAS	1001 PATTISON AVE	2.5	0	2.82	0.21	0.21	0.02	0.21

Figure 11 – RIT North Aerial View

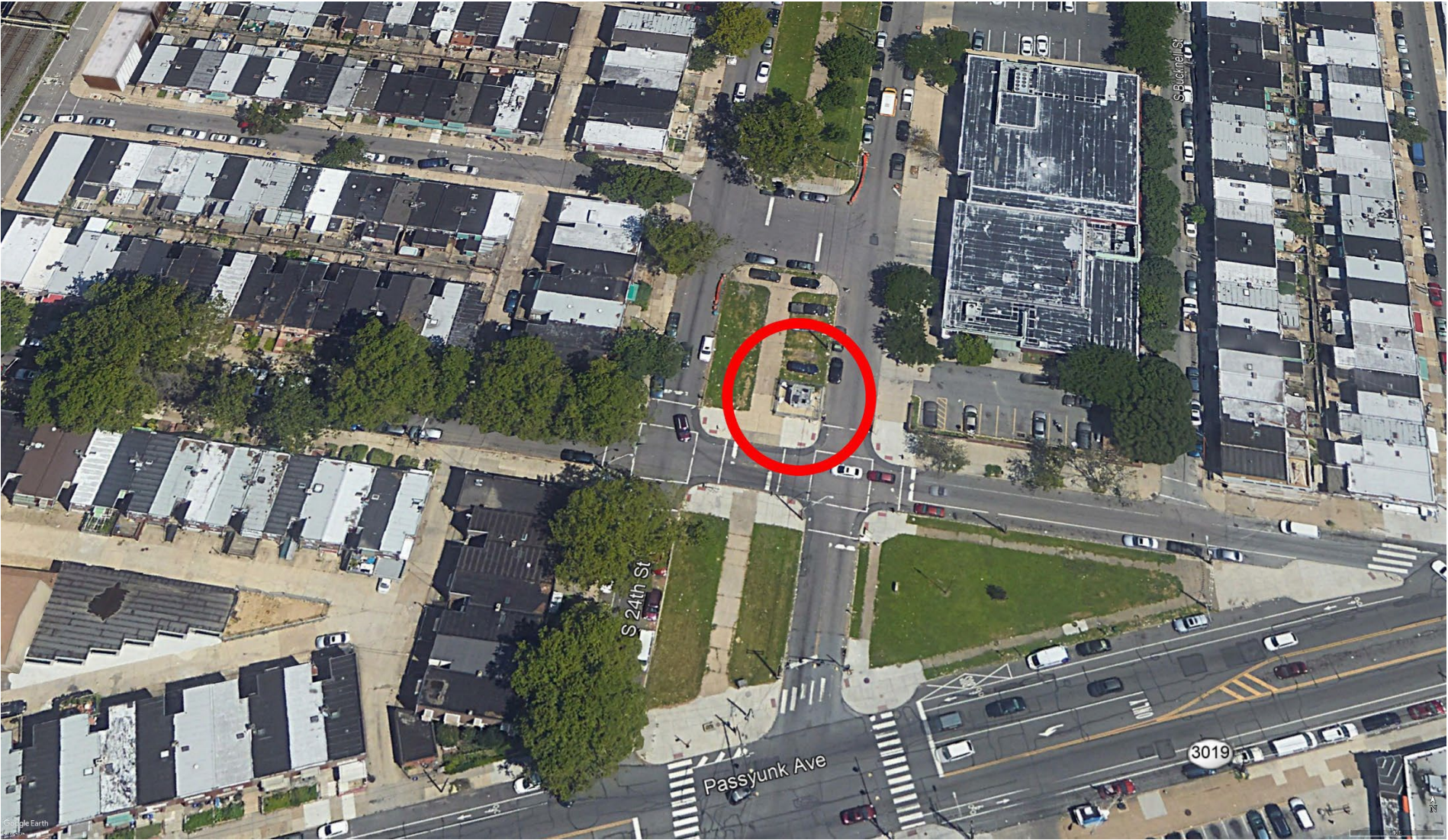


Table 7 – Detailed FAB Information with Monitoring Station Picture

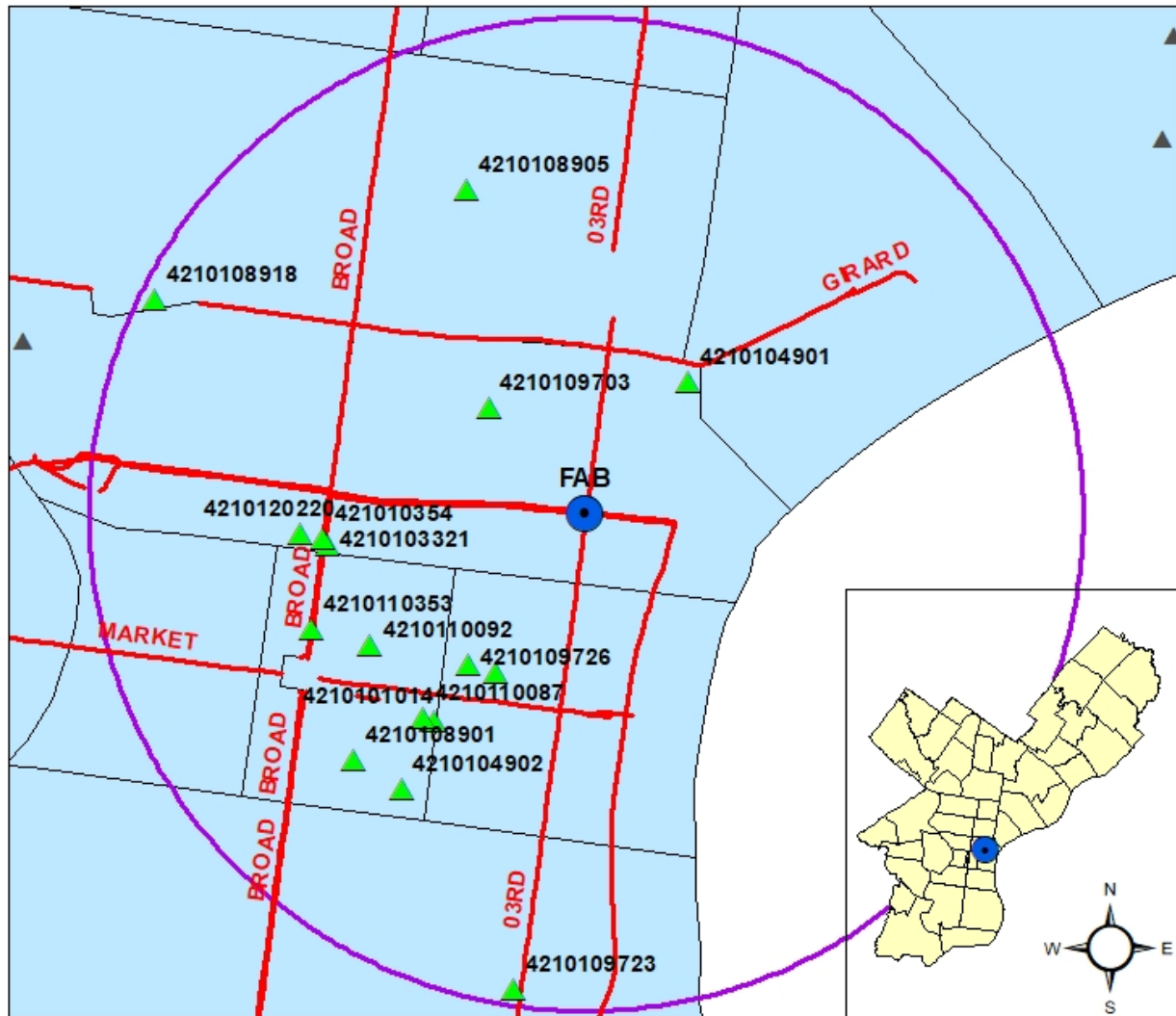
AMS SITE ID: FAB
AQS Site ID: 421010057
Street Address: 3rd and Spring Garden Sts.
Geographical Coordinates
Latitude: 39.960048
Longitude: -75.142614



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	236	Neighborhood	Highest Concentration	2	1/1/2020

Figure 12 – FAB Monitoring Site Map with Major Streets and Major Emission Sources

**FIRE ADMINISTRATION BUILDING - 3RD & SPRING GARDEN STS.
EPA AIRS CODE: 421010057**



FAB - Number of facilities within 3000 m radius: 16			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101014	VERIZON RACE ST	900 RACE ST	0.52	0	4.5	0.4	0.06	0.37	0.3
4210103321	SUNGARD AVAILABILITY SVC INC	401 N BROAD ST STE 600	0.19	0	0.44	0.02	0.02	0.01	0.02
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.08	0	0.41	0.02	0.01	0	0.02
4210104901	THE BATTERY	1325 N BEACH ST	0.28	0	1.96	0.07	0.01	0.03	0.01
4210104902	VEOLIA ENERGY EDISON PLT	908 SANSOM ST	1.32	0	12.81	2.3	1.16	19.8	0.07
4210106020	FEDERAL RESERVE BANK	100 N 6TH ST	2.18	0	3.26	0.24	0.24	0.16	0.18
4210108901	THOMAS JEFFERSON UNIV	11 & WALNUT ST	0.16	0	0.73	0.05	0.05	0.05	0.04
4210108905	TEMPLE UNIV MAIN CAMPUS	1009 W MONTGOMERY AVE	12.08	0	18.52	2.39	2.39	0.22	2.62
4210108918	GIRARD COLL	GIRARD & CORINTHIAN AVE	2.18	0	2.6	0.2	0.2	0.02	0.14
4210109703	US MINT	151 N INDEPENDENCE MALL	4.62	0	2.97	0.09	0	0.09	0.91
4210109723	WILLIAM J GREEN JR FED BLDG GSA	600 ARCH ST	2.07	0	3.66	0.21	0.21	0.22	0.19
4210109726	FED DETENTION CTR PHILA	700 ARCH ST	0.96	0	1.24	1.09	0.09	0.01	0.07
4210110087	HCP INC.	833 CHESTNUT ST	0.58	0	0.79	0.02	0.02	0.02	0.04
4210110092	PA CONVENTION CTR AUTH	1101 ARCH ST	1.72	0	1.79	0.07	0.07	0.03	0.1
4210110353	PA CONVENTION CTR EXPAN	111 N BROAD ST	0.64	0	0.92	0.04	0.04	0.02	0.05
4210120220	PHILADELPHIA PUBLIC SERVICE BUILDING		0.4	0	1.5	0.09	0.09	0.2	0.2

Figure 13 – FAB North Aerial View



Table 8 – Detailed SWA Information with Monitoring Station Picture

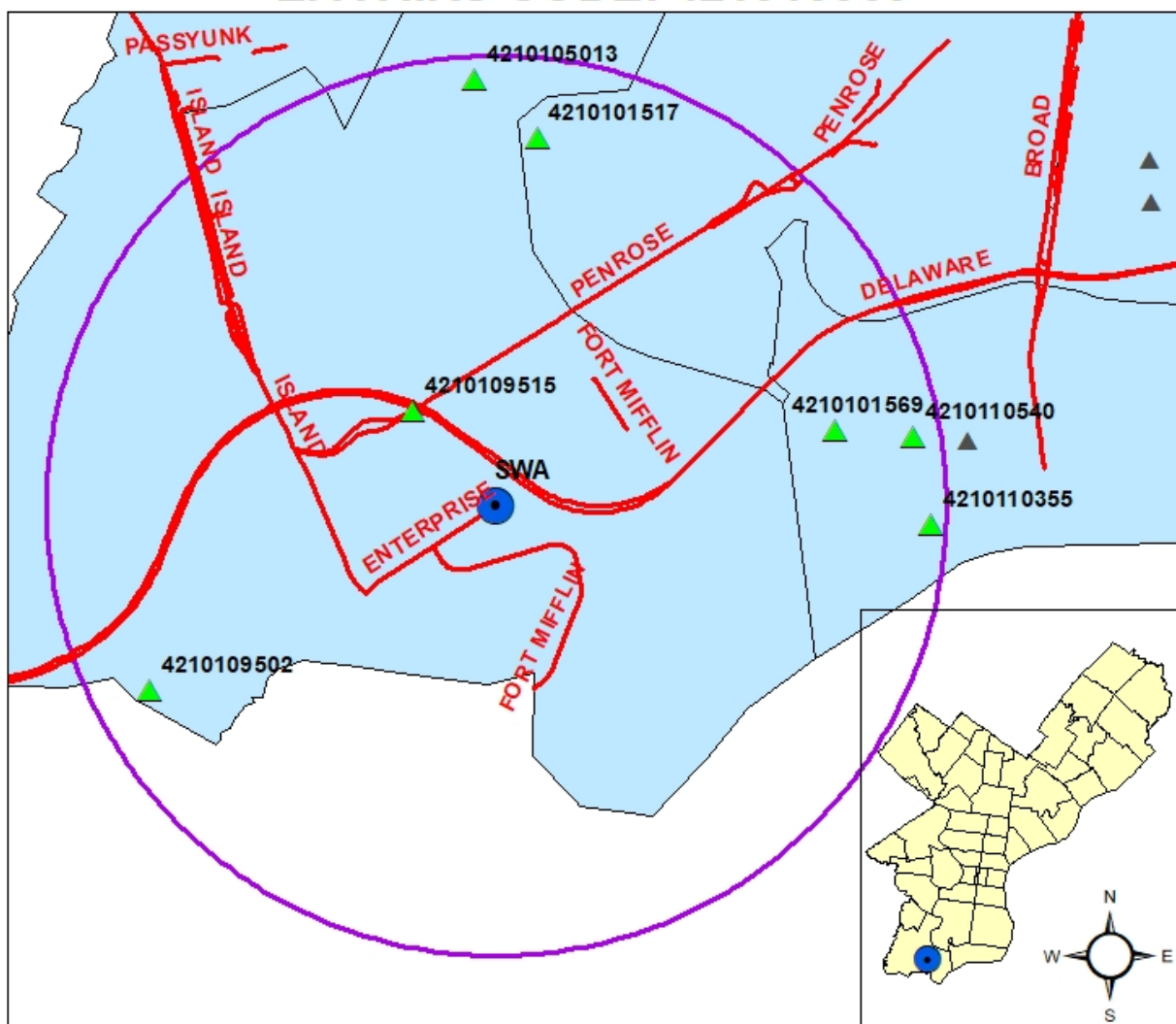
AMS SITE ID: SWA
AQS Site ID: 421010063
Street Address: 8200 Enterprise Avenue, 19153
Geographical Coordinates
Latitude: 39.88294
Longitude: -75.21965



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC		Vary	2	102	Neighborhood	Source-Oriented	4	9/10/2009
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	3,5	150	Neighborhood	Source-Oriented	4	9/10/2009

Figure 14 – SWA Monitoring Site Map with Major Streets and Major Emission Sources

PHILADELPHIA AIRPORT - 8200 ENTERPRISE AVE. EPA AIRS CODE: 421010063



SWA - Number of facilities within 3000 m radius: 7			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101517	PES/PHILA ENG SOL	3144 W PASSYUNK AVE	0.19	0	0.16	0.01	0.01	0.03	8.71
4210101569	PHILLY SHIPYARD INC	PHILA NAVAL BUS CTR	0.15	0	0.09	5.56	5.49	0	10.21
4210105013	PBF LOGISTICS PRODUCTS TERMINALS LLC	6850 ESSINGTON AVE	1.45	0	1.73	0.13	0.13	0	51.83
4210109502	PHILA INTL AIRPORT	INDUSTRIAL HWY	5.28	0	10.19	1.01	1.01	0.09	0.6
4210109515	PHILA WATER DEPT SW WPCP	8200 ENTERPRISE AVE	8.48	0	3.87	0.97	0.97	0.71	7.14
4210110355	PHILADELPHIA SHIP REPAIR	5195 S 19TH ST	5.76	0	12.7	1.82	0	0.01	9.85
4210110540	NAVY YARD PEAKER STATION	1901 KITTY HAWK AVE	8.52	0	4.7	0	0	0.02	3.45

Figure 15 – SWA North Aerial View



Table 9 – Detailed TOR Information with Monitoring Station Picture

AMS SITE ID: TOR
AQS Site ID: 421010075
Street Address: 4901 Grant Ave. & James St., 19114
Geographical Coordinates
Latitude: 40.054171
Longitude: -74.985166



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	SLAMS	Near Road	Continuous	Instrumental	Gas Filter Correlation CO Analyzer		42101	1	093	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NO2	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42602	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NO	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42601	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NOx	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42603	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
PM2.5 Continuous	SLAMS	Near Road	Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	236	Microscale	Highest Concentration, Source Oriented	5	4/1/2020
Meteorological	SLAMS	Near Road	Continuous		Vaisala 435C RH/AT Sensor		Vary	1	Vary	Microscale	Highest Concentration, Source Oriented	5	1/1/2014

Figure 16 – TOR Monitoring Site Map with Major Streets and Major Emission Sources

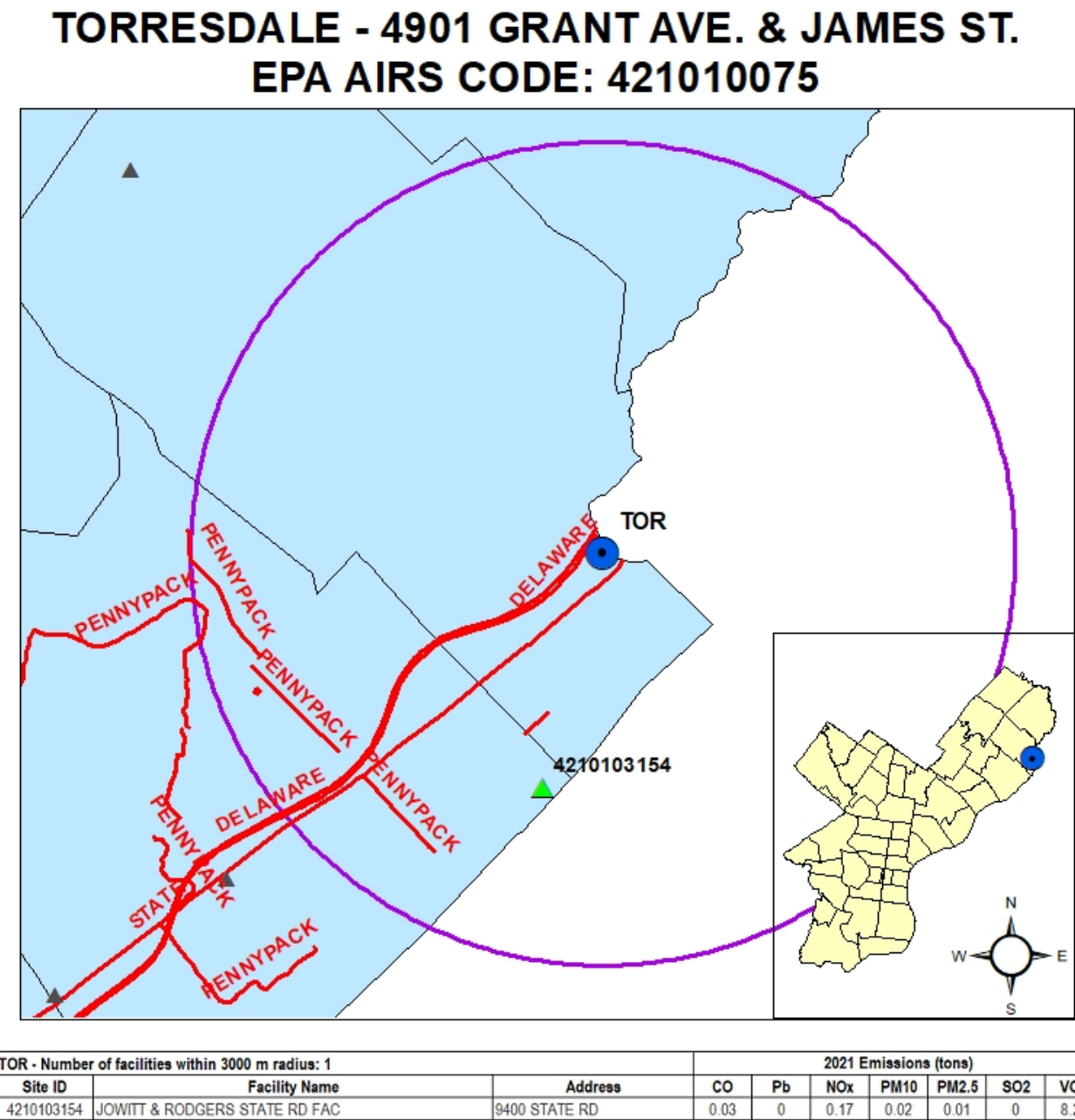


Figure 17 – TOR North Aerial View

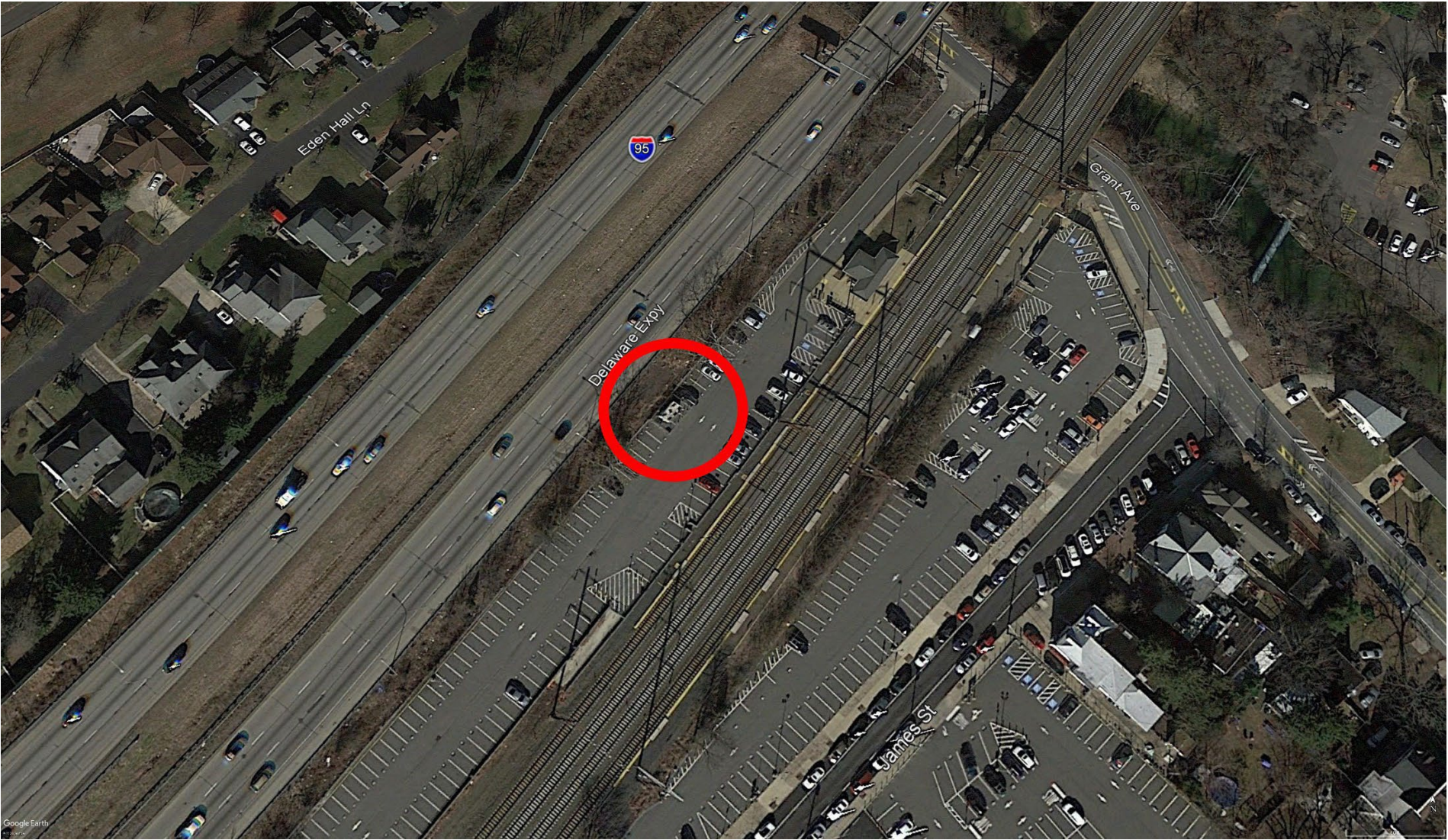


Table 10 Detailed MON Information with Monitoring Station Picture

AMS SITE ID: MON
AQS Site ID: 421010076
Street Address: I-76 & Montgomery Drive, Car Barn OFM Shop 282
Geographical Coordinates
Latitude: 39.988842
Longitude: -75.207205



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	SLAMS	Near Road	Continuous	Instrumental	Gas Filter Correlation CO Analyzer		42101	1	093	Microscale	Highest Concentration, Source Oriented	4	1/10/2017
NO2	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42602	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
NO	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42601	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
NOx	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42603	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
PM2.5 Continuous	SLAMS	Near Road	Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	236	Neighborhood	Highest Concentration, Source Oriented	4	6/1/2020
Black Carbon	SLAMS	Near Road	Continuous	Instrumental	Teledyne Model 633		88317	1	894	Microscale	Highest Concentration, Source Oriented	4	7/1/2015

Ultrafine Particulate	SLAMS	Near Road	Continuous	Instrumental	Teledyne Model 651		87101	1	173	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
Metals	Other	Near Road	1/6 days	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz)	Vary	1	089	Neighborhood	Population Exposure	4	7/1/2015

Figure 18 – MON Monitoring Site Map with Major Streets and Major Emission Sources

MONTGOMERY - INTERSTATE 76 & MONTGOMERY DR EPA AIRS CODE: 421010076



MON - Number of facilities within 3000 m radius: 3			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210102052	SUN CHEM HUNTING PARK AVE PLT	3301 W HUNTING PARK AVE	0.28	0	0.34	0.09	0.09	0	9.81
4210106512	PHILADELPHIAN CONDOMINIUMS	2401 PENNSYLVANIA AVE	1.96	0	2.44	0.19	0.19	0.01	0.13
4210108904	ST JOSEPHS UNIVERSITY	54TH & CITY AVE	4.64	0	6.15	0.48	0.48	0.11	0.36

Figure 19 – MON North Aerial View



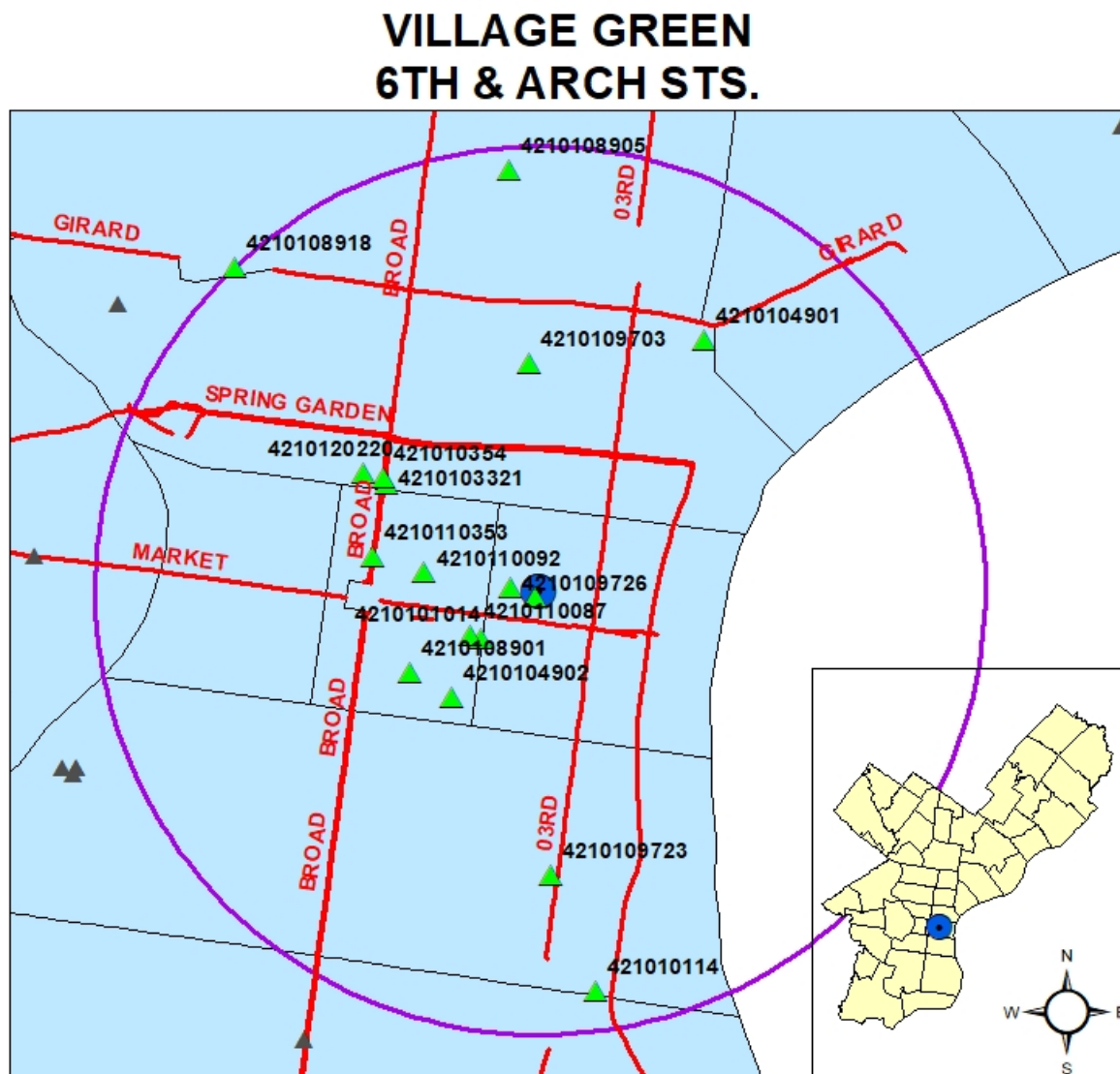
Table 11 – Detailed VGR Information with Monitoring Station Picture

AMS SITE ID: VGR
AQS Site ID:
Street Address: 6th & Arch Streets
Geographical Coordinates
Latitude: 39.952608
Longitude: -75.149704



Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone			Continuous	2B Technologies		Not in AQS							3/15/2015
PM2.5 Continuous			Continuous	Thermo		Not in AQS							3/15/2015
Meteorological			Continuous		Wind speed, wind direction, humidity, temperature	Not in AQS							3/15/2015

Figure 20 – VGR Monitoring Site Map with Major Streets and Major Emission Sources



VGR - Number of facilities within 3000 m radius: 17			2021 Emissions (tons)						
Site ID	Facility Name	Address	CO	Pb	NOx	PM10	PM2.5	SO2	VOC
4210101014	VERIZON RACE ST	900 RACE ST	0.52	0	4.5	0.4	0.06	0.37	0.3
4210101114	COATING & CONVERTING TECH CORP	80 E MORRIS ST	0.25	0	0.3	0.02	0.02	0	4.19
4210103321	SUNGARD AVAILABILITY SVC INC	401 N BROAD ST STE 600	0.19	0	0.44	0.02	0.02	0.01	0.02
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.08	0	0.41	0.02	0.01	0	0.02
4210104901	THE BATTERY	1325 N BEACH ST	0.28	0	1.96	0.07	0.01	0.03	0.01
4210104902	VEOLIA ENERGY EDISON PLT	908 SANSOM ST	1.32	0	12.81	2.3	1.16	19.8	0.07
4210106020	FEDERAL RESERVE BANK	100 N 6TH ST	2.18	0	3.26	0.24	0.24	0.16	0.18
4210108901	THOMAS JEFFERSON UNIV	11 & WALNUT ST	0.16	0	0.73	0.05	0.05	0.05	0.04
4210108905	TEMPLE UNIV MAIN CAMPUS	1009 W MONTGOMERY AVE	12.08	0	18.52	2.39	2.39	0.22	2.62
4210108918	GIRARD COLL	GIRARD & CORINTHIAN AVE	2.18	0	2.6	0.2	0.2	0.02	0.14
4210109703	US MINT	151 N INDEPENDENCE MALL	4.62	0	2.97	0.09	0	0.09	0.91
4210109723	WILLIAM J GREEN JR FED BLDG GSA	600 ARCH ST	2.07	0	3.66	0.21	0.21	0.22	0.19
4210109726	FED DETENTION CTR PHILA	700 ARCH ST	0.96	0	1.24	1.09	0.09	0.01	0.07
4210110087	HCP INC.	833 CHESTNUT ST	0.58	0	0.79	0.02	0.02	0.02	0.04
4210110092	PA CONVENTION CTR AUTH	1101 ARCH ST	1.72	0	1.79	0.07	0.07	0.03	0.1
4210110353	PA CONVENTION CTR EXPAN	111 N BROAD ST	0.64	0	0.92	0.04	0.04	0.02	0.05
4210120220	PHILADELPHIA PUBLIC SERVICE BUILDING		0.4	0	1.5	0.09	0.09	0.2	0.2

Figure 21 – VGR North Aerial View



Appendix A
Philadelphia Air Quality Survey

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Philadelphia Air Quality Survey (PAQS) Project Overview

Objectives

Although the City of Philadelphia has operated a network of EPA sponsored regulatory air monitoring stations for many years, the number of these stations is usually small, and the locations of the stations cannot reflect neighborhood level variances of air quality across the city. This project aims to fill the gap in air quality monitoring and achieve the following objectives:

1. Set up street-level, neighborhood-oriented air sampling sites throughout the city to sample the air for two years or more and capture seasonal changes and neighborhood-to-neighborhood spatial variances in air quality.
2. Measure air pollutants with significant health concerns, including PM_{2.5}, NO₂, ozone, SO₂, and black carbon.
3. Obtain quality assured data results that can serve as the basis for future work, including: provide policy recommendations to reduce pollution from congested city traffic, diesel vehicles and winter time fuel burning; analyze the relations between air quality and land use characters at neighborhood level; provide data for studying public health impact of air pollution in the city.

Project Design

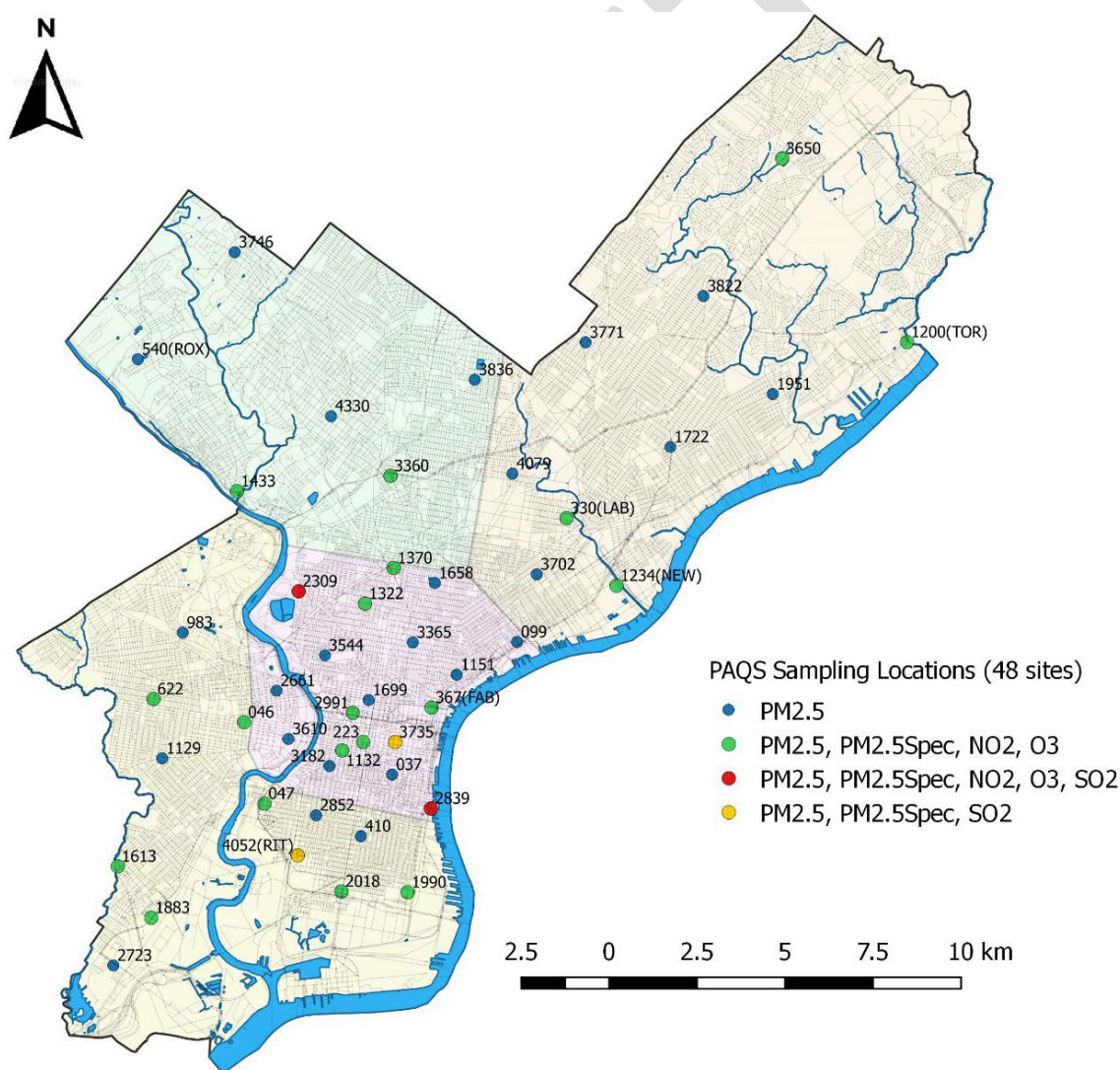
Monitoring Sites: A grid of 300m x 300m cells was created over the city map using GIS tools for the purposes of site selection, data processing, and possible air quality modeling in the future. A sampling site falls in one of these cells. The entire city was divided into four quadrants (areas): Central, Northeast, Northwest, and South/Southwest. The Central quadrant was given larger number of sites and higher site density, considering the high density of population, traffic and buildings, and potentially larger gradients of pollutant concentration variances. Originally 50 monitoring sites were selected. About 65% of the sites were randomly selected using GIS mapping techniques to make the air sampling statistically representative. About 35% of the sites were determined as "purposeful" sites. Their locations were selected to serve one or more particular purposes. At each monitoring site, a portable sampling unit is mounted on a utility pole about 10 – 11 feet above the ground.

Sampling Unit: The sampling unit contains a filter based PM_{2.5} sample collector. At some of the sites, the sampling unit also includes NO₂, SO₂, and/or O₃ passive samplers. The unit contains meteorological sensors as well and is powered by two batteries.

Sampling Operation: The sampling unit operates on 2-week sampling cycles. Four sites, known as "reference sites", are monitored with consecutive sampling periods throughout the year to provide a time series of pollutant concentrations. For the rest of the sites, sampling units are rotated to cover them in four operational sessions (2-week periods) during a season (a three-month period). In each session, the four reference sites plus 11 to 13 other sites are monitored. These 11 – 13 sites in each session are randomly selected across the city to avoid spatio-temporal confounding associated with different sites being monitored during different time windows.

Outputs

The air sampling operation started in May 2018 and is ongoing. The project outputs include measurements from the first ever citywide large scale street level air monitoring, demonstrating spatial variance of pollutant concentrations across the city. A project report⁴ based on the first two years' data has been produced. Based on data analysis of the first two years' measurements, adjustments have been made in the monitoring site network in order to: 1) add sampling sites where local communities had significant air quality concerns but monitoring data were unavailable or insufficient, and 2) discontinue sites where both the air pollution levels and the population density were relatively low. A sampling site was added in north Philadelphia (19th Street / Susquehanna Ave.) in 2020 to provide more monitoring in overburdened communities. After these adjustments, the PAQS project maintains 48 sampling sites starting September 2020. The map below shows the site locations and site IDs.



⁴ https://www.phila.gov/media/20210316150355/PAQS_Report_Sept4-2020_final.pdf

For more recent air sampling results, data during the 12-month period from December 1, 2021 to November 30, 2022 has been analyzed. For this 12-month period, the City-wide all-sites PM_{2.5} average concentration was 7.9 µg/m³, with the highest value being 9.3 µg/m³ at Site 223 (Center City).

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Appendix B
2020 Community-Scale Air Toxics Ambient Monitoring Grant

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2020 Community-Scale Air Toxics Ambient Monitoring Grant Project

Summary

In October 2020, AMS received an EPA grant award for Community-Scale Air Toxics Ambient Monitoring (RFP Number: EPA-OAR-OAQPS-20-05). This project will focus on monitoring the top six air toxics in Philadelphia: formaldehyde, benzene, carbon tetrachloride, naphthalene, acetaldehyde, and 1,3-butadiene.

Monitoring will be conducted in 4 areas and 5 sampling sites. See attached map for proposed site locations. All proposed monitoring areas are Environmental Justice areas.

1. South Philadelphia (at existing AMS RIT monitoring station)
2. South Philadelphia, south of RIT, east of the former PES Refinery
3. Eastwick neighborhood
4. Center City
5. Reference site, West Philadelphia

Rational

EPA's 2014 National Air Toxics Assessment (NATA) shows the above seven compounds contributed the most air toxics cancer risks in Philadelphia. The community surrounding the oil refinery complex in South Philadelphia has long been concerned about the impact of exposure to air toxics. This neighborhood has high poverty rates, lower-than-average education levels, and a large at-risk population. The Eastwick neighborhood is about 1.5 miles north of the Philadelphia International Airport and close to a Superfund site. According to a University of Pennsylvania study, a large percentage of residents in this neighborhood have complained about asthma and breathing problems. Also, parts of Center City are among the areas with the highest lifetime air toxics total cancer risks in Philadelphia.

Methods

Passive samplers will be used to continuously measure the air toxics. The sampling period will last at least 12 months. A weather-proof sampler housing will be installed at a height about 3 meters above the ground at each site (as illustrated below). EPA designated analytical methods (GC/MS and uHPLC) will be used in sample analysis.

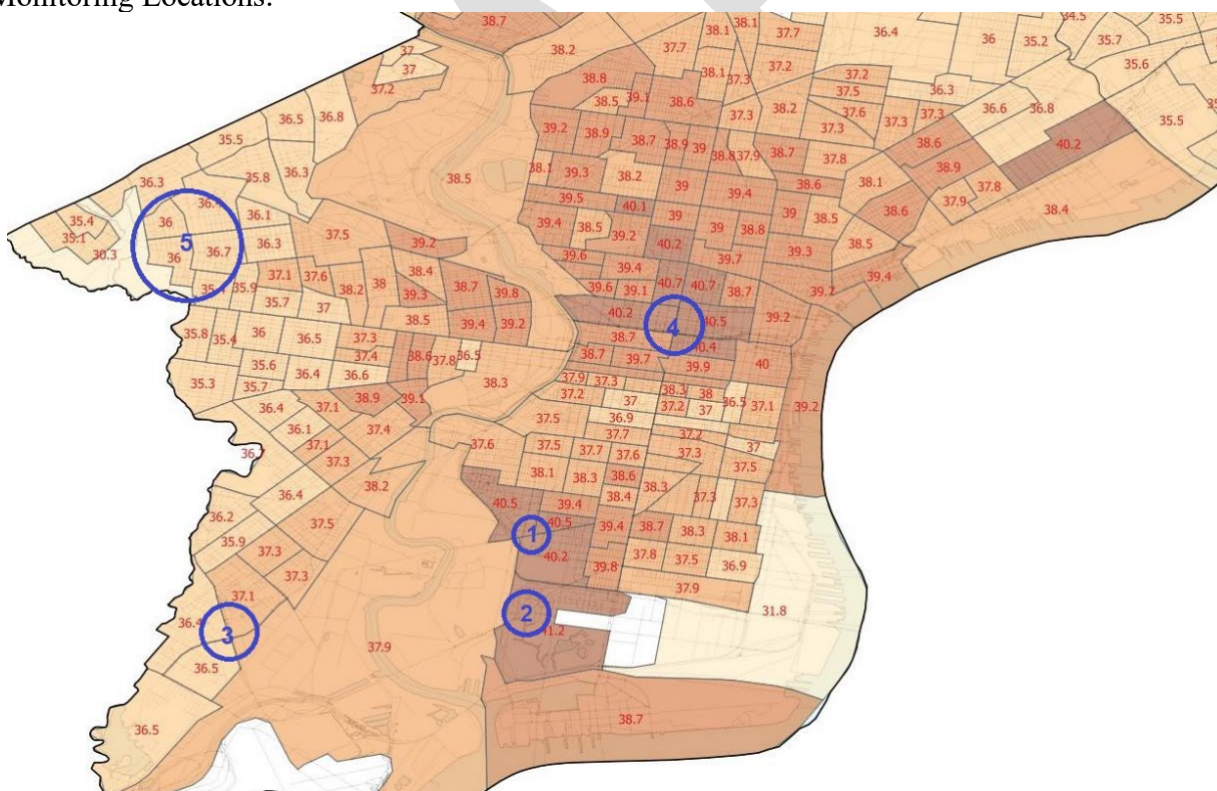


Planned Project Timeline (2 years in total, 1 year of air sampling operation)

Activity	Nov – Dec 2020	Jan – Mar 2021	Apr – Jun 2021	Jul – Sep 2021	Oct – Dec 2021	Jan – Mar 2022	Apr – Jun 2022	Jul – Oct 2022
Equipment purchase and testing, training	X	X	X					
Preparation for sites and field sampling		X	X					
Sampling intensives				X	X	X	X	
Data analysis / assessment					X	X	X	X
Preliminary assessment reports						X		
Final Report								X

Some tasks of this project had to be postponed due to supply delays. The sampling operation was re-scheduled accordingly and expected to continue through March 2023.

Monitoring Locations:



(Numbers in red indicate estimated air toxics cancer risk (per million population) by census tract according to EPA 2014 NATA study)

Appendix C
2022 American Rescue Plan Grant Project

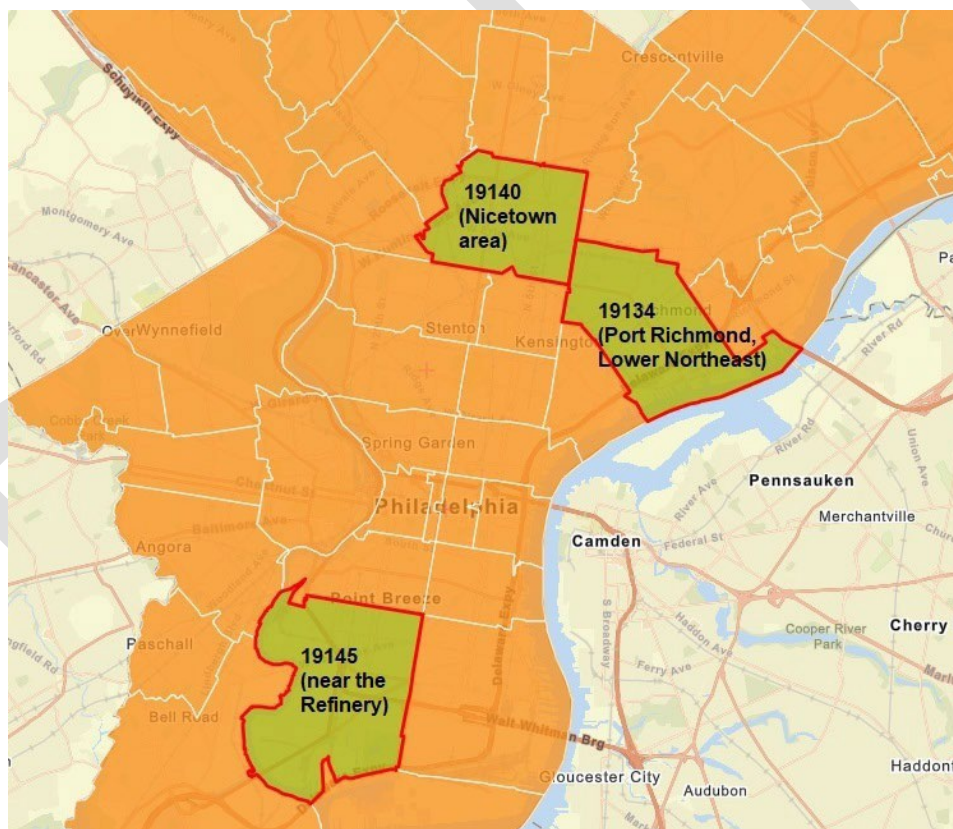
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Summary

In November 2022 AMS received an EPA grant award for Enhanced Air Monitoring in Communities (EPA-OAR-OAQPS-22-01) under the American Rescue Plan.

This project will deploy continuous air monitors at three sites in Philadelphia, which are located in Environmental Justice (EJ) areas near major emission sources including the former Philadelphia refinery complex, the Philadelphia International Airport, Kinder Morgan storage tanks, a US Postal processing center, major highways (I-95, I-76, Roosevelt Blvd.), etc. The project will produce results to fill gaps of air monitoring in these areas and help strategizing pollution reductions in overburdened communities.

Enhancing air monitoring capacity through latest technologies and participation of local communities is one of the objectives of AMS. This project will help AMS in assessing vulnerabilities of overburdened communities to air hazards by establishing three sites for continuous monitoring of criteria pollutants and VOCs/air toxics. The monitoring sites will be located in three Zip Code areas, 19140, 19134 and 19145, as shown in the map below.



Technical Approach

The overall approach to this project focuses on providing continuous monitoring near emission sources of concerns in overburdened communities. Medium-cost continuous monitors (such as the DustTrak™ 8540 Environmental Monitors) will be used for PM_{2.5} measurement. VOCs will be

monitored continuously using instruments such as the PID 112 Model VOC monitors. Canister samples of VOCs/air toxics (with EPA designated methods) will be used for quality assurance. Passive samplers will be used to collect O₃ and NO₂ samples at each site.

Timeframe

Air sampling operation is expected to start in mid-2023 and will last for 12 months. The entire project, including equipment acquisition, site preparation, training, air sampling, and data processing, will last 2 years in total. A final project report will be submitted to EPA in late 2024.

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Appendix D
Proof of Public Notice Publication

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DISCLAIMER OF ENDORSEMENT

Reference to any specific product, service, trade name, trademark, brand, provider or manufacturer in this document does not constitute recommendation or endorsement by Air Management Services, Department of Public Health, City of Philadelphia.

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