# 2019-2020
# Air Monitoring Network Plan



City of Philadelphia
Department of Public Health
Air Management Services

July 1, 2019

# Executive Summary

Philadelphia has an 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 our local states of Pennsylvania, New Jersey, Delaware and Maryland that make up the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area (MSA).

The United States Environmental Protection Agency (US EPA) created 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, 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 fourteen sections plus Appendix A, B, and C:

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 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 Appendix D section 4.5.

9. **$NO_2$ Monitoring Network** – This section documents the $NO_2$ monitoring network codified in 40 CFR Part 58.10(a)(5) and 40 CFR Appendix D section 4.3.

10. **$SO_2$ Monitoring Network** – This section documents the $SO_2$ monitoring network codified in 40 CFR Part 58.10(a)(6) and 40 CFR 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 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 Appendix D section 4.7.

13. **$O_3$ Monitoring Network** – This section documents the $O_3$ monitoring network codified in 40 CFR 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 – PAMS Monitoring Implementation Plan**

**16. Appendix B – Philadelphia Air Quality Survey & Quality Assurance Project Plan**

**17. Appendix C – Public Notice Proof of Publication**

AMS has provided a copy of the 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 the air monitoring network or this Plan can be directed to:

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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 Monitoring Network Plan (AMNP) by July 1, 2019. 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.

The proposed AMNP 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 University Avenue, 2nd Floor, Philadelphia, PA 19104, during normal business hours. For further information, contact Mr. Jason Li, Engineering Supervisor of Program Services at (215) 685-9440.

Written comments on the proposed AMNP should be sent to Mr. Jason Li, Engineering Supervisor of Program Services, Air Management Services, 321 University Avenue, 2nd Floor, Philadelphia, PA 19104 or via email at jiazheng.li@phila.gov. Use "2019 Air Monitoring Network Plan" as the subject line in written communication. Only written comments will be accepted. Comments received by facsimile will not be accepted. Persons wishing to file comments on the proposed AMNP must submit comments by June 11, 2019.

# 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 PM2.5 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 $PM_{2.5}$, $PM_{10-2.5}$), $O_3$, $SO_2$, CO, nitrogen oxides ($NO/NO_2/NO_y$), 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 $NO_2$/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 (NOx), 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 ($O_3$)**
  - **Sulfur Dioxide ($SO_2$)**
  - **Carbon Monoxide (CO)**
  - **Nitrogen Dioxide ($NO_2$)**
    - NO means nitrogen oxide.
    - $NO_X$ means oxides of nitrogen and is defined as the sum of the concentrations of $NO_2$ and NO.
    - $NO_y$ means the sum of all total *reactive* nitrogen oxides, including NO, $NO_2$, 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.
    - $PM_{10}$ 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)**
- **BaP** – means Benzo(a)Pyrene, a polycyclic aromatic hydrocarbon that is a product of incomplete combustion or burning organic (carbon-containing) items.
- **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 compounds, carbonyls – 7 compounds, and metals - 7 elements are toxic and are measured to assess the risk of cancer and non cancer caused by these pollutants. The VOC compounds are analyzed by GC/MS (EPA Compendium Method TO-15); carbonyls are analyzed by HPLC, 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 GC-FID.

## Collection Methods

**Particulate samples**

- **BAM-Beta Attenuation Monitor** – This instrument provides concentration values of particulate each hour. The BAM uses the principle of beta ray attenuation to provide a simple determination of mass concentration. Beta ray attenuation: A small $^{14}C$ element emits a constant source of high-energy electrons, also known as beta particles. These beta particles are efficiently detected by an ultra-sensitive scintillation counter placed nearby. An external pump pulls a measured amount of air through a filter tape. Filter tape, impregnated with ambient dust is placed between the source and the detector thereby causing the attenuation of the measured beta-particle signal. The degree of attenuation of the beta-particle signal may be used to determine the mass concentration of particulate matter on the filter tape and hence the volumetric concentration of particulate matter in ambient air.
- **Broadband Spectroscopy PM Mass Monitor** – This instrument provides continuous PM2.5 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 PM2.5, 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.
- **Met One SASS** – Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **Filter-based $PM_{2.5}$** – Filter-based $PM_{2.5}$ monitors an air sample drawn through a Teflon filter for 24 hours.
- **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. High Performance Liquid Chromatography (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.
- **Beta Attenuation** – The principle of beta ray attenuation to provide a simple determination of mass concentration. Instrumental – data is available in near real time.
- **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.
- **Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) –** Inductively Coupled Plasma/Mass Spectrometry for the determination of metals including Lead concentration in ambient particulate matter.

**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 $NO_y$. $NO_2$ 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**

- **Cryogenic Preconcentration GC/FID** – Cryogenic Preconcentration Gas Chromatograph/Flame Ionization Detector - air injection volume for capillary GC combined with low concentrations of analyte require that samples be preconcentrated prior to GC analysis. Sample preconcentration is accomplished by passing a known volume of the air sample through a trap filled with fine glass beads that is cooled to -180ºC. With this technique, the volatile hydrocarbons of interest are quantitatively retained in the trap, whereas the bulk constituents of air (nitrogen, oxygen, etc.) are not. The air sample is collected in a vessel of known volume. A portion of this volume is analyzed and used to calculate concentration of each compound in the original air sample after Gas Chromatographic (Flame Ionization Detector, GC-FID) analysis. The sample trapped cryogenically on the glass beads is thermally desorbed into a stream of ultra-pure helium and re-trapped on the surface of a fine stainless steel capillary cooled to -180 ºC. This second cryogenic trapping stage "focuses" the sample into a small linear section of tubing. The cold stainless steel capillary is ballistically heated (by electrical resistance) and the focused sample quickly desorbs into the helium stream and is transferred to the chromatographic column. Cryogen (liquid nitrogen, $LN_2$) is used to obtain sub ambient temperatures in the VOC concentration and GC. This analysis is used to determine the concentration of Benzene and other organic compounds and VOC in the atmosphere.
- **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 ($LN_2$) is also used to trap and concentrate sample components.
- **High Pressure Liquid Chromatography (HPLC)** – The analytical method used to analyze carbonyl compounds such as acetaldehyde and formaldehyde. Carbonyl compounds are collected on the sampling media as their 2,4-dinitrohydrazine derivatives. The derivatives are separated by liquid chromatography (LC) on a packed column by means of a solvent mixture under high pressure (HPLC) followed by UV detection of each carbonyl derivative.

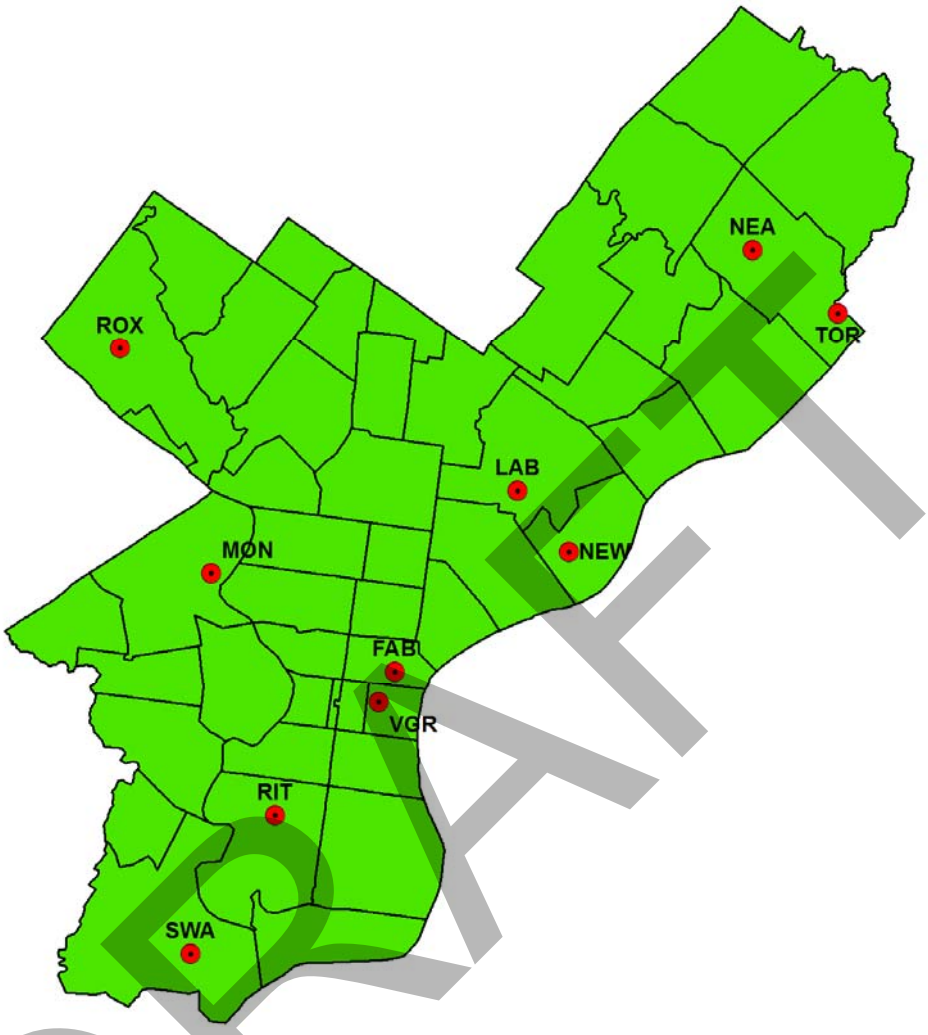
# Current Network at a Glance

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 ($O_3$), carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), and particulate matter ($PM_{10}$ and $PM_{2.5}$). Four of the sites also measure toxics, such as benzene, acetaldehyde, and formaldehyde. The map below shows the location of air monitors and the pollutants measured at each monitor location.



[1] EPA waved monitoring lead since 2017 because the 2014-2016 design value was 0.04 ug/$m^3$.

**Figure 1 - 2019 Philadelphia Air Monitoring Network as of July 1, 2019**




| | | | 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 | BaP | TSP Metals (Be, Cr, Mn, Ni, As, Cd, Pb) | Toxics TO15 | MET | AMS Site |
| 421010004 | LAB | 1501 E. Lycoming St | | | X | | | | | | | | | | | | | | LAB |
| 421010014 | ROX | Eva & Dearnley Sts | | | | | | | | | | | X | | | | X | | ROX |
| 421010024 | NEA | Grant Ave & Ashton Rd | | | X | | | | | | | | | | | | | | NEA |
| 421010048 | NEW | 2861 Lew is 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 | X | | X | MON |
| | 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
MSA number: 37980
Population: 6,096,372 (2018 annual estimate)[2]
EPA Region: III, Philadelphia
Class I area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ
City population: 1,584,138 (2018 annual estimate)[3]
Time zone: EST
UTM zone: 18



[2] MSA population estimates from:
https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html
[3] Philadelphia County population estimates from:
https://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-total.html

## 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.<br>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** | 24th & 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** | 3rd & 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 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 1st 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** | 6th & Arch Sts. | EPA's 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 re-evaluate the number and monitoring locations for toxics due to decreased EPA funding.

- 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.

- The agency would like to consider Environmental Justice during the development of the Air Monitoring Network Plan and look to investigate concentrations in these communities.

# Proposed Changes to the Network

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

- March 2019 – December 2020
    - Philadelphia Air Quality Survey (see Appendix B).
        - AMS will continue to maintain sites and sample ambient air as shown in Appendix B. A project report will be produced once sampling and data validation are completed.
    - PHA, which housed the open path monitor (toxics), shut down as of 1/1/2018.
    - PAMS
        - Refer to the PAMS Implementation Network Plan Equipment Inventory in Appendix A for the latest PAMS measurements.

# 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.

The recently revised monitoring rule (80 FR 65292) requires PAMS measurements June 1 through August 31 at NCore sites that are located in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more as codified in 40 CFR 58 Appendix D section 5(a).

PAMS Monitoring Implementation Network Plan is included in Appendix A.

# 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 has no source oriented Pb sources that emit 0.50 or more tons per year.

# $NO_2$ Monitoring Network

The requirements for the $NO_2$ 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 $NO_2$ monitor that meets the area-wide monitoring requirements. The first near-road $NO_2$ monitor was established at TOR and started operation on January 1, 2014. The second near-road $NO_2$ monitor is located at MON and started operation on July 20, 2015.

# $SO_2$ Monitoring Network

The requirements for the $SO_2$ air monitoring network are codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.

# 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 $NO_2$ monitor at TOR and has been operational since January 1, 2014.

# $PM_{2.5}$ 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 $NO_2$ station for CBSAs with a population of 1,000,000 or more persons is met at the TOR monitoring site.

# $O_3$ Monitoring Network

The requirements for the $O_3$ air monitoring network are codified in 40 CFR Part 58 Appendix D section 4.1.

AMS currently operates three $O_3$ monitors.

**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 $O_3$ 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 PADEP for enhanced $O_3$ and $O_3$ precursor monitoring.

Currently, AMS monitors the following beyond the minimal requirements:

(1) Year round ozone monitoring at all sites.

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

PAMS Monitoring Implementation Network Plan is included in Appendix A.

# Detailed Information on Each Site

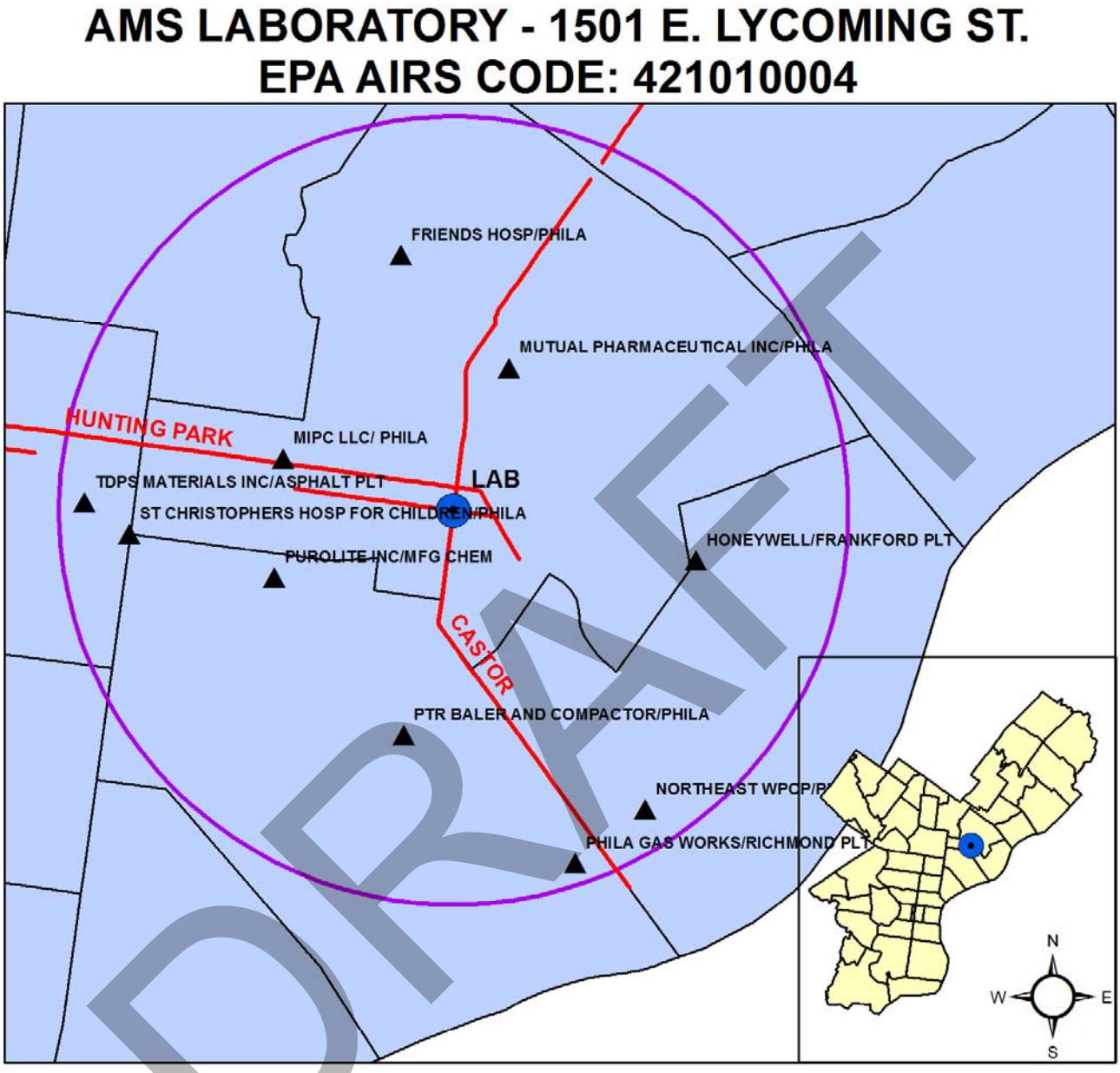
The tables that follow provide detailed information for each of the 10 monitoring stations in Philadelphia County. As per 40 CFR § 58.10(a)(1), the siting and operation of each monitor in the 2019-2020 AMNP meets the requirements of 40 CFR 58 and Appendices A, B, and C of this part where applicable.

## 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 (O3 Season 2019: March - October) | 44201 | 2 | 087 | Neighborhood | Population Exposure | 7 | 1/1/2018 |

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




| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210104922 | PHILA GAS WORKS/RICHMOND PLT | 3100 E VENANGO ST | | 2.28 | 4.98 | 0.25 | 0.21 | 0.04 | 0.19 |
| 4210109513 | NORTHEAST WPCP/PHILA | 3899 RICHMOND ST | | 3.07 | 5.82 | 3.70 | 3.70 | 0.45 | 5.31 |
| 4210103506 | PTR BALER AND COMPACTOR/PHILA | 2207 E ONTARIO ST | | 0.15 | 0.18 | 0.01 | 0.01 | 0.00 | 22.14 |
| 4210101617 | PUROLITE INC/MFG CHEM | 3620 G ST | | 2.12 | 2.53 | 0.19 | 0.19 | 0.02 | 1.99 |
| 4210101551 | HONEYWELL/FRANKFORD PLT | 4700 BERMUDA ST | | 67.29 | 261.14 | 68.80 | 54.93 | 42.25 | 110.11 |
| 4210108576 | ST CHRISTOPHERS HOSP FOR CHILDREN/PHILA | ERIE AVE & FRONT ST | | 3.08 | 4.34 | 0.33 | 0.33 | 0.08 | 0.26 |
| 4210101416 | TDPS MATERIALS INC/ASPHALT PLT | 3870 N 2ND ST | | 12.02 | 2.40 | 2.13 | 0.27 | 0.31 | 2.96 |
| 4210105004 | MIPC LLC/ PHILA | 4210 G ST | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24.68 |
| 4210102258 | MUTUAL PHARMACEUTICAL INC/PHILA | 1100 ORTHODOX ST | | 1.38 | 1.73 | 0.13 | 0.05 | 0.02 | 3.41 |
| 4210108031 | FRIENDS HOSP/PHILA | 4641 ROOSEVELT BLVD | | 1.86 | 2.24 | 0.17 | 0.17 | 0.02 | 0.12 |

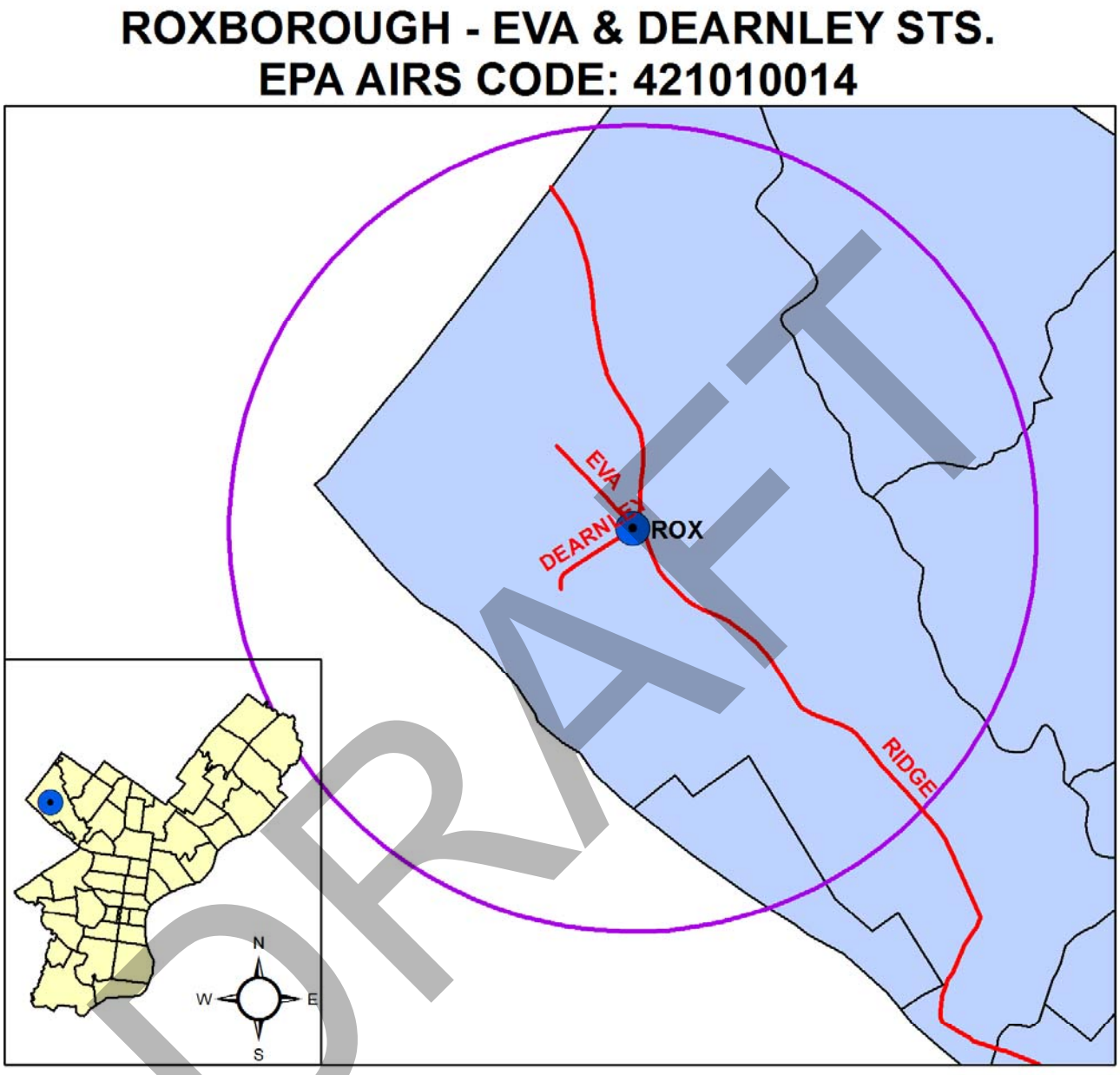
**Figure 3 – LAB North Aerial View**

## 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 | 7 | 5/7/2003 |
| Toxics | Other | Urban Air Toxics | 1/6 days | Canister Subambient Pressure | Multi-Detector GC | | Vary | 4,5 | 150 | Neighborhood | Population Exposure | 7 | 1/1/2004 |

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




| Site ID | Facility Name | Address | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |

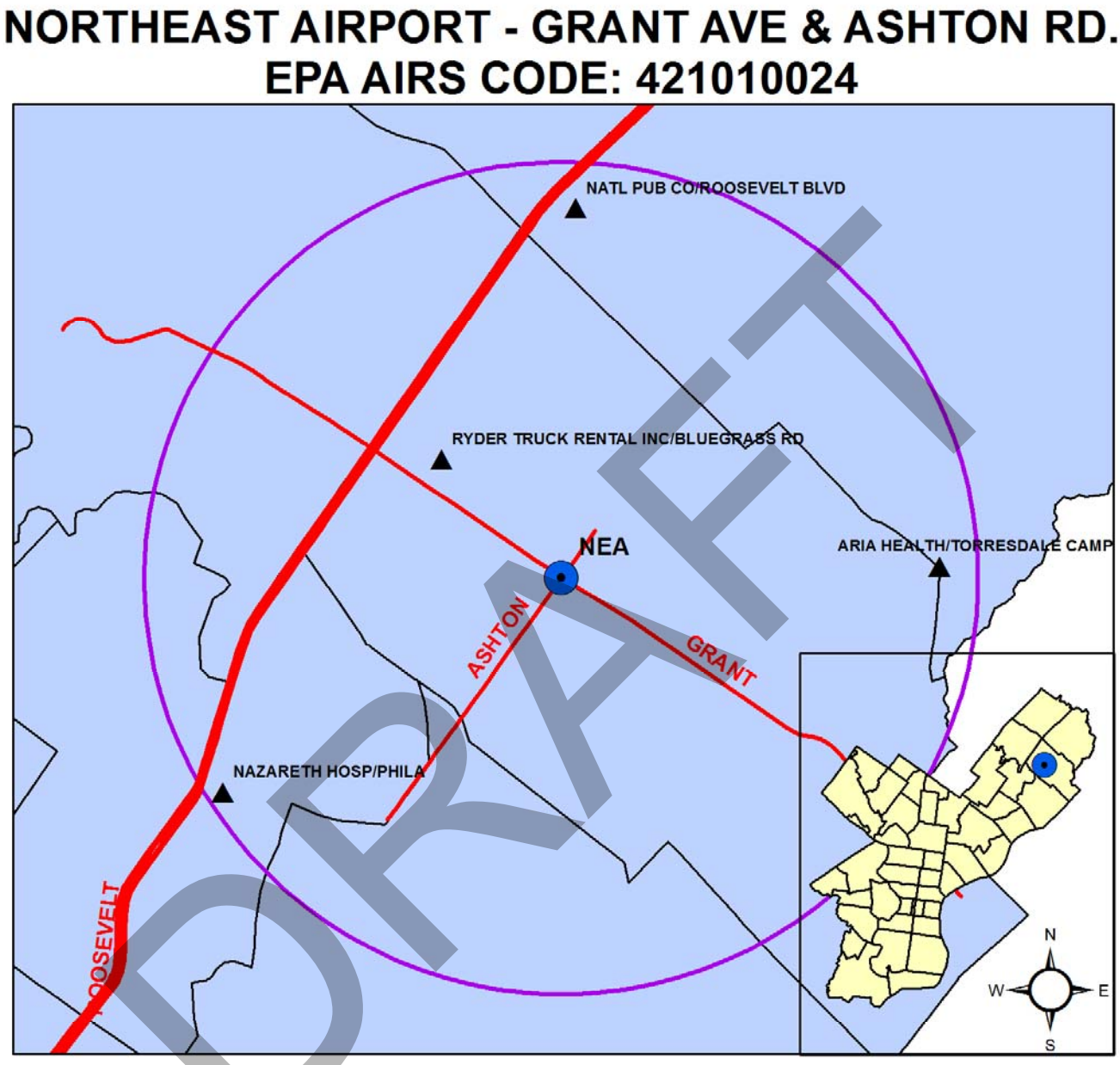
**Figure 5 – ROX North Aerial View**

## Table 4 – Detailed NEA Information with Monitoring Station Picture

| |
|---|
| **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 (O3 Season 2016: April - October; O3 Season 2017: March - October) | 44201 | 1 | 087 | Neighborhood | Highest concentration | 6 | 1/1/1974 |

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




| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210108008 | NAZARETH HOSP/PHILA | 2601 HOLME AVE | | 1.81 | 2.50 | 0.18 | 0.18 | 0.04 | 0.14 |
| 4210108076 | ARIA HEALTH/TORRESDALE CAMP | RED LION & KNIGHTS RD | | 7.40 | 10.86 | 0.52 | 0.00 | 0.17 | 0.87 |
| 4210102030 | RYDER TRUCK RENTAL INC/BLUEGRASS RD | 9751 BLUE GRASS RD | | 0.02 | 0.08 | 0.00 | 0.00 | 0.00 | 0.47 |
| 4210103846 | NATL PUB CO/ROOSEVELT BLVD | 11311 ROOSEVELT BLVD | | 0.51 | 0.60 | 0.05 | 0.05 | 0.00 | 3.33 |

**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 | 1/1/2011, moved 10/2/13 |
| SO2 (trace) | SLAMS | NCORE | Continuous | Instrumental | Ultraviolet Fluorescence | High sensitivity | 42401 | 2 | 100 | Neighborhood | Population Exposure | 2 | 1/1/2011, moved 10/2/13 |
| Ozone | SLAMS | NCORE | Continuous | Instrumental | Ultraviolet Absorption | Year-round operation (O3 Season 2016: April - October; O3 Season 2017: March - October) | 44201 | 1 | 087 | Neighborhood | Population Exposure | 2 | 1/1/2011, moved 10/2/13 |
| NO | SLAMS | NCORE | Continuous | Instrumental | Chemilumine scence Teledyne | High sensitivity external converter mounted at 10m | 42601 | 1 | 099 | Neighborhood | Population Exposure | 10 | 1/1/2011, moved 10/2/13 |
| NOy | SLAMS | NCORE | Continuous | Instrumental | Chemilumine scence Teledyne | High sensitivity external converter mounted at 10m | 42600 | 1 | 699 | Neighborhood | Population Exposure | 10 | 1/1/2011, moved 10/2/13 |
| 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 | Instrumental | BAM =Beta Attenuation Monitor Met One BAM - 1020 | | 88101 | 3 | 170 | Neighborhood | Population Exposure | 2 | 1/1/2011, moved 10/2/13 |
| PM2.5 Continuous | SLAMS | NCORE | Continuous | Teledyne API T640X at 16.67 LPM | Broadband Spectroscopy | To replace existing PM2.5 BAM | 88101 | 4 | 238 | Neighborhood | Population Exposure | 2 | 4/1/2019 |
| 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 | 1/1/2011, moved 10/2/13 |
| PM2.5 FRM | SLAMS | NCORE | 1/3 days | R&P PM2.5 | Gravimetric | NEW-D | 88101 | 1 | 145 | Neighborhood | Population Exposure | 2 | 1/1/2011, moved 10/2/13 |
| PM10-2.5 (PM Coarse) | SLAMS | NCORE | Continuous | Teledyne API T640X at 16.67 LPM | Broadband Spectroscopy | To replace existing PMcoarse (method code: 185) | 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 radiation | | Vary | 1 | Vary | Neighborhood | Population Exposure | Vary | 6/1/1993 |
| 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 | 1/6 days (March-Oct) - 24-Hr Collocated | SS Canister Pressurized. | Cryogenic Preconcentration GC/FID. | | Vary | 1,2 | 101 | Neighborhood | Population Exposure | 7 | 4/1/2017 |
| PAMS VOC | SLAMS | PAMS | Continuous | CAS Auto GC | | To run year around | Vary | | | Neighborhood | Population Exposure | | |
| Ceilometer | 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**


| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210105003 | KINDER MORGAN LIQUIDS TERM/PHILA | 3300 N DELAWARE AVE | | 4.76 | 5.20 | 0.37 | 0.30 | 0.08 | 26.67 |
| 4210101421 | RIVERSIDE MATERIALS INC/ASPHALT PLT | 2870 E ALLEGHENY AVE | | 23.66 | 4.91 | 2.41 | 0.97 | 0.60 | 8.55 |
| 4210102255 | SMITH EDWARDS DUNLAP CO/ALLEGHENY AVE | 2867 E ALLEGHENY AVE | | 0.11 | 0.14 | 0.01 | 0.01 | 0.03 | 3.85 |
| 4210104903 | EXELON GENERATING CO/RICHMOND | 3901 N DELAWARE AVE | 0.0002 | 0.05 | 9.55 | 0.27 | 0.06 | 0.60 | 0.01 |
| 4210104922 | PHILA GAS WORKS/RICHMOND PLT | 3100 E VENANGO ST | | 2.28 | 4.98 | 0.25 | 0.21 | 0.04 | 0.19 |
| 4210109513 | NORTHEAST WPCP/PHILA | 3899 RICHMOND ST | | 3.07 | 5.82 | 3.70 | 3.70 | 0.45 | 5.31 |
| 4210103506 | PTR BALER AND COMPACTOR/PHILA | 2207 E ONTARIO ST | | 0.15 | 0.18 | 0.01 | 0.01 | 0.00 | 22.14 |
| 4210101551 | HONEYWELL/FRANKFORD PLT | 4700 BERMUDA ST | | 67.29 | 261.14 | 68.80 | 54.93 | 42.25 | 110.11 |
| 4210102094 | DIETZ & WATSON INC/PHILA | 5701 TACONY ST | | 5.78 | 3.56 | 0.53 | 0.52 | 0.11 | 0.39 |

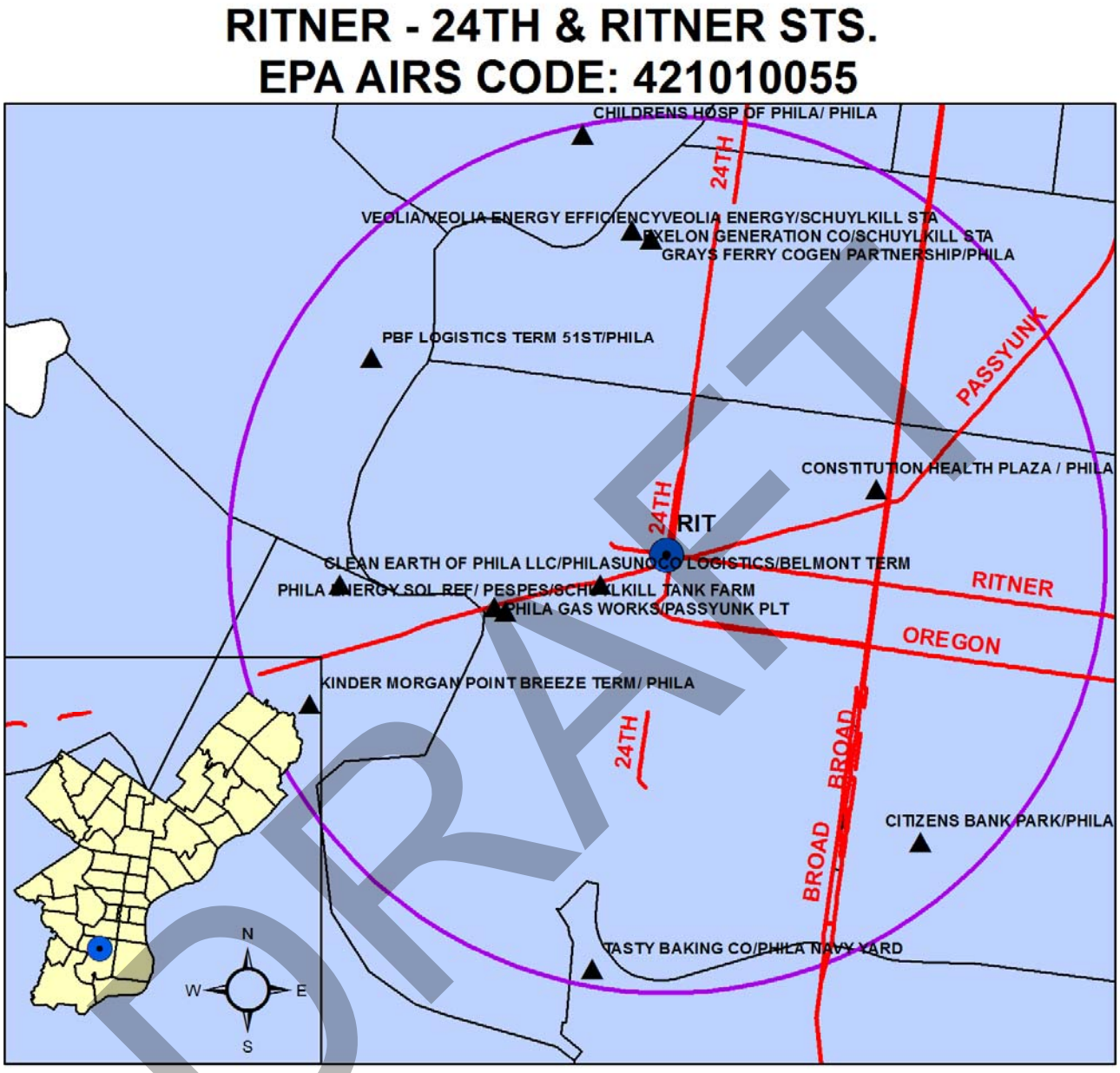
**Figure 9 – NEW North Aerial View**

## 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 | Vary | 5 | Vary | Neighborhood | Population Exposure | N/A | 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 | 7 | 8/31/2004 |
| Carbonyls | Other | Urban Air Toxics | 1/6 days | DNPH-Coated Cartridges | HPLC | | Vary | 2 | 102 | Neighborhood | Population Exposure | 7 | Vary |
| Toxics | Other | Urban Air Toxics | 1/6 days | Canister Subambient Pressure | Multi-Detector GC | | Vary | 4,5 | 150 | Neighborhood | Population Exposure | 7 | 11/1/2004 |
| PM2.5 Continuous | SLAMS | | Continuous | Instrumental | BAM =Beta Attenuation Monitor Met One BAM - 1020 | | 88101 | 3 | 170 | Neighborhood | Population Exposure | 4 | 6/1/2011 |
| PM2.5 Continuous | SLAMS | | Continuous | Teledyne T640 at 5.0 LPM | Broadband Spectroscopy | To replace existing MetOne BAM | 88101 | | 236 | Neighborhood | Population Exposure | | |

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




| Site ID | Facility Name | Address | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210110236 | TASTY BAKING CO/PHILA NAVY YARD | 4300 S 26TH ST | | 2.77 | 3.31 | 0.34 | 0.31 | 0.00 | 0.46 |
| 42101T0147 | CITIZENS BANK PARK/PHILA | 1001 PATTISON AVE | | 4.53 | 3.35 | 0.21 | 0.21 | 0.06 | 0.83 |
| 4210110029 | KINDER MORGAN POINT BREEZE TERM/ PHILA | 6310 PASSYUNK AVE | | 0.44 | 0.53 | 0.04 | 0.04 | 0.01 | 14.58 |
| 4210101501 | PHILA ENERGY SOL REF/ PES | 3144 W PASSYUNK AVE | | 1089.77 | 1290.92 | 248.43 | 248.43 | 192.51 | 689.26 |
| 4210101517 | PES/SCHUYLKILL TANK FARM | 3144 W PASSYUNK AVE | | 1.10 | 0.26 | 0.00 | 0.00 | 0.00 | 76.45 |
| 4210104921 | PHILA GAS WORKS/PASSYUNK PLT | 3100 W PASSYUNK AVE | | 1.72 | 3.11 | 0.25 | 0.21 | 0.07 | 0.25 |
| 4210101507 | SUNOCO LOGISTICS/BELMONT TERM | 2700 W PASSYUNK AVE | | 21.17 | 8.49 | 0.26 | 0.00 | 0.09 | 36.99 |
| 4210102148 | CLEAN EARTH OF PHILA LLC/PHILA | 3201 S 61ST ST | | 0.05 | 0.17 | 0.24 | 0.06 | 0.61 | 2.47 |
| 4210108016 | CONSTITUTION HEALTH PLAZA / PHILA | 1930 S BROAD ST | | 1.23 | 1.62 | 0.12 | 0.12 | 0.02 | 0.09 |
| 4210105009 | PBF LOGISTICS TERM 51ST/PHILA | 1630 S 51ST ST | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.62 |
| 4210104942 | VEOLIA ENERGY/SCHUYLKILL STA | 2600 CHRISTIAN ST | 0.0003 | 4.68 | 58.00 | 3.16 | 3.16 | 0.54 | 0.37 |
| 4210104944 | GRAYS FERRY COGEN PARTNERSHIP/PHILA | 2600 CHRISTIAN ST | 0.0009 | 4.53 | 238.50 | 23.79 | 23.79 | 4.30 | 8.51 |
| 4210110357 | VEOLIA/VEOLIA ENERGY EFFICIENCY | 2600 CHRISTIAN ST | 0.0002 | 0.02 | 3.40 | 0.30 | 0.30 | 1.88 | 1.13 |
| 4210104904 | EXELON GENERATION CO/SCHUYLKILL STA | 2800 CHRISTIAN ST | | 0.33 | 2.44 | 0.13 | 0.01 | 0.01 | 0.01 |
| 4210108069 | CHILDRENS HOSP OF PHILA/ PHILA | 34TH & CIVIC CENTER BLVD | | 12.04 | 33.67 | 3.20 | 3.20 | 1.29 | 2.96 |

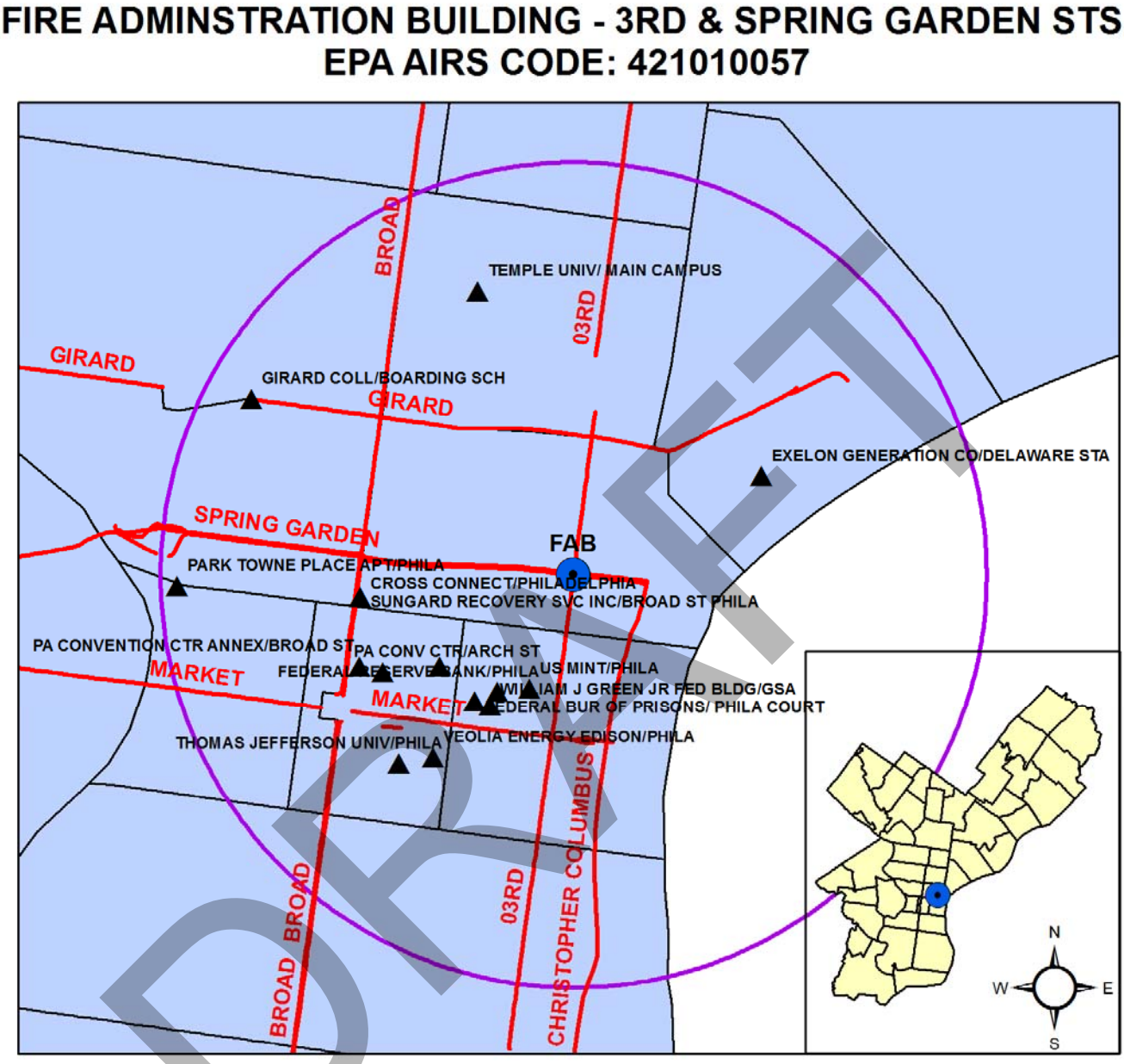
**Figure 11 – RIT North Aerial View**

## 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 | Instrumental | BAM =Beta Attenuation Monitor Met One BAM - 1020 | | 88101 | 3 | 170 | Neighborhood | Highest Concentration | 2 | 10/1/2012 |
| PM2.5 Continuous | SLAMS | | Continuous | Teledyne T640 at 5.0 LPM | Broadband Spectroscopy | To replace existing MetOne BAM | 88101 | | 236 | Neighborhood | Highest Concentration | | |

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




| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210108901 | THOMAS JEFFERSON UNIV/PHILA | 11 & WALNUT ST | | 0.22 | 0.82 | 0.07 | 0.07 | 0.07 | 0.05 |
| 4210104902 | VEOLIA ENERGY EDISON/PHILA | 908 SANSOM ST | | 1.69 | 16.22 | 2.75 | 1.49 | 26.32 | 0.18 |
| 4210109723 | WILLIAM J GREEN JR FED BLDG/GSA | 600 ARCH ST | | 2.41 | 3.09 | 0.22 | 0.22 | 0.04 | 0.16 |
| 4210109726 | FEDERAL BUR OF PRISONS/ PHILA COURT | 700 ARCH ST | | 1.42 | 1.79 | 0.54 | 0.00 | 0.02 | 0.10 |
| 4210106020 | FEDERAL RESERVE BANK/PHILA | 100 N 6TH ST | | 1.92 | 2.63 | 0.20 | 0.00 | 0.03 | 0.12 |
| 4210109703 | US MINT/PHILA | 151 N INDEPENDENCE MALL E | | 3.71 | 2.50 | 0.08 | 0.00 | 0.02 | 1.12 |
| 4210110092 | PA CONV CTR/ARCH ST | 1101 ARCH ST | | 1.57 | 2.43 | 0.10 | 0.00 | 0.06 | 0.13 |
| 4210101014 | VERIZON MKT CTRL OFC/RACE ST | 900 RACE ST | | 0.21 | 1.76 | 0.16 | 0.03 | 0.15 | 0.12 |
| 4210110353 | PA CONVENTION CTR ANNEX/BROAD ST | 111 N BROAD ST | | 0.63 | 0.88 | 0.03 | 0.00 | 0.02 | 0.05 |
| 4210103321 | SUNGARD RECOVERY SVC INC/BROAD ST PHILA | 401 N BROAD ST STE 600 | | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 421010354 | CROSS CONNECT/PHILADELPHIA | 401 N BROAD ST | | 0.05 | 0.28 | 0.01 | 0.00 | 0.01 | 0.02 |
| 4210106526 | PARK TOWNE PLACE APT/PHILA | 2200 BENJAMIN FRANKLIN PKWY | | 3.73 | 21.97 | 0.22 | 0.22 | 0.02 | 0.91 |
| 4210104901 | EXELON GENERATION CO/DELAWARE STA | 1325 N BEACH ST | | 0.69 | 4.76 | 0.33 | 0.03 | 0.29 | 0.02 |
| 4210108918 | GIRARD COLL/BOARDING SCH | GIRARD & CORINTHIAN AVE | | 2.11 | 2.52 | 0.19 | 0.19 | 0.02 | 0.14 |
| 4210108905 | TEMPLE UNIV/ MAIN CAMPUS | 1009 W MONTGOMERY AVE | 0.0002 | 20.40 | 29.88 | 1.28 | 1.24 | 3.69 | 1.92 |

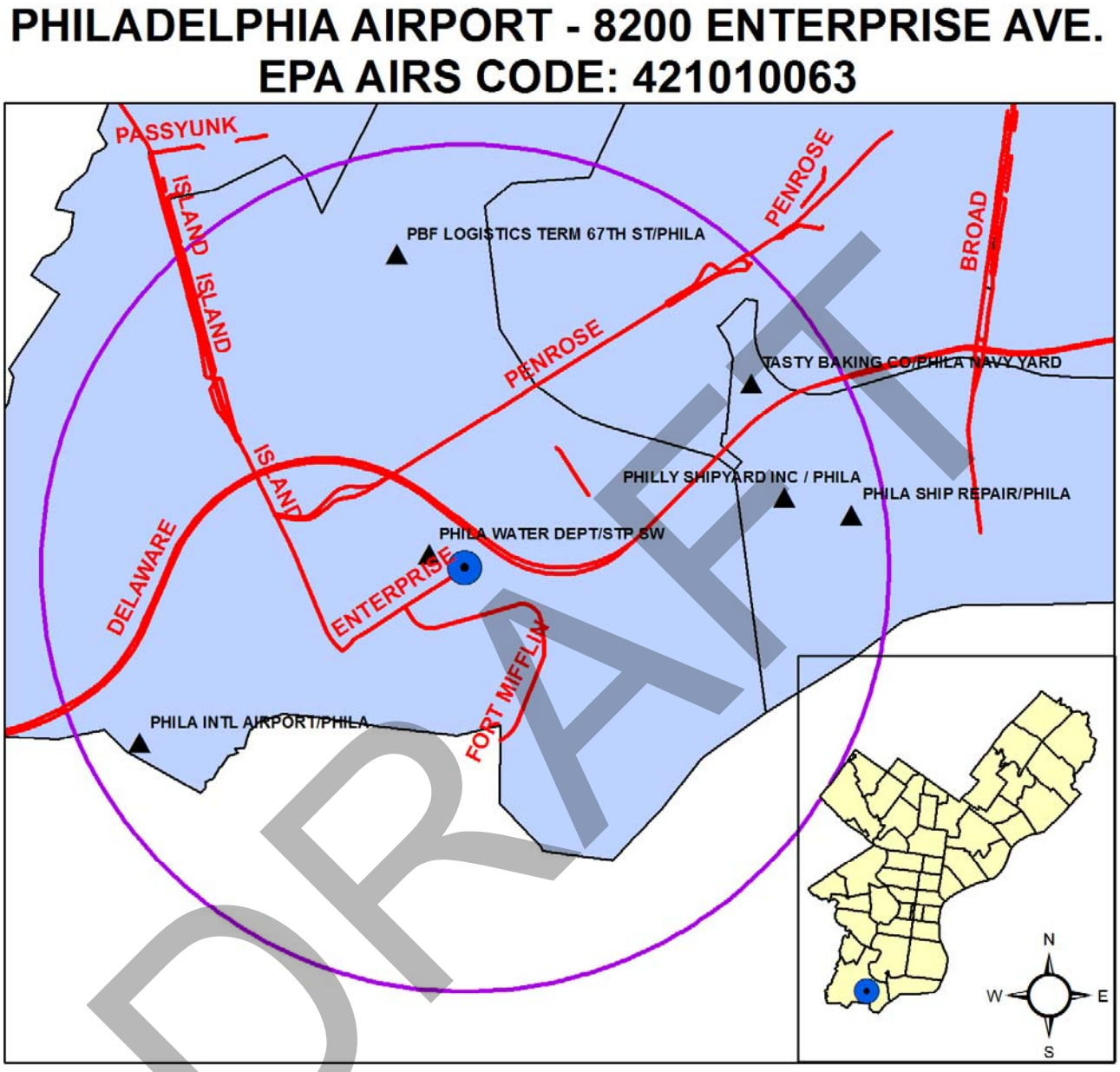
**Figure 13 – FAB North Aerial View**

## 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 | N/A | 9/10/2009 |
| Toxics | Other | Urban Air Toxics | 1/6 days | Canister Subambient Pressure | Multi-Detector GC | | Vary | 3,5 | 150 | Neighborhood | Source-Oriented | N/A | 9/10/2009 |

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






| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210109502 | PHILA INTL AIRPORT/PHILA | INDUSTRIAL HWY | | 6.48 | 13.05 | 1.28 | 1.28 | 0.11 | 0.77 |
| 4210109515 | PHILA WATER DEPT/STP SW | 8200 ENTERPRISE AVE | | 9.85 | 4.38 | 1.09 | 1.09 | 0.82 | 4.76 |
| 4210110355 | PHILA SHIP REPAIR/PHILA | 5195 S 19TH ST | | 1.18 | 5.40 | 0.78 | 0.00 | 0.00 | 4.46 |
| 4210101569 | PHILLY SHIPYARD INC / PHILA | PHILA NAVAL BUS CTR | | 0.18 | 0.11 | 24.54 | 24.31 | 0.00 | 126.07 |
| 4210110236 | TASTY BAKING CO/PHILA NAVY YARD | 4300 S 26TH ST | | 2.77 | 3.31 | 0.34 | 0.31 | 0.00 | 0.46 |
| 4210105013 | PBF LOGISTICS TERM 67TH ST/PHILA | 6850 ESSINGTON AVE | | 1.42 | 1.98 | 0.13 | 0.13 | 0.01 | 54.76 |

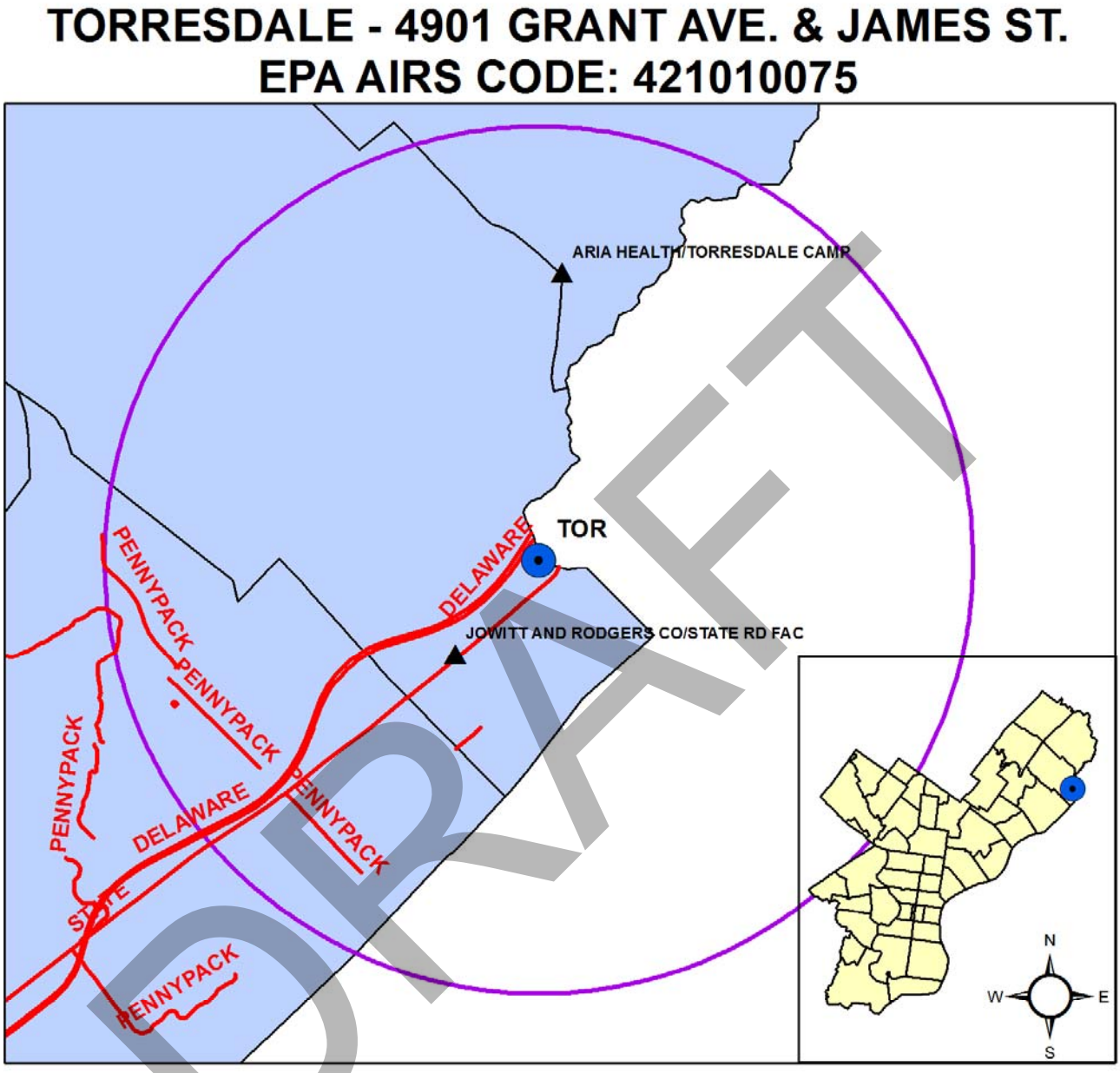
**Figure 15 – SWA North Aerial View**

## Table 9 – Detailed TOR Information with Station Monitoring 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 | Instrumental | BAM =Beta Attenuation Monitor Met One BAM - 1020 | | 88101 | 1 | 170 | Microscale | Highest Concentration, Source Oriented | 5 | 1/1/2014 |
| PM2.5 Continuous | SLAMS | Near Road | Continuous | Teledyne T640 at 5.0 LPM | Broadband Spectroscopy | To replace existing MetOne BAM | 88101 | | 236 | Microscale | Highest Concentration, Source Oriented | | |
| Meteorological | SLAMS | Near Road | Continuous | | Vaisala 435C RH/AT Sensor | | Vary | 1 | Vary | Microscale | Highest Concentration, Source Oriented | 5 | 1/1/2014 |

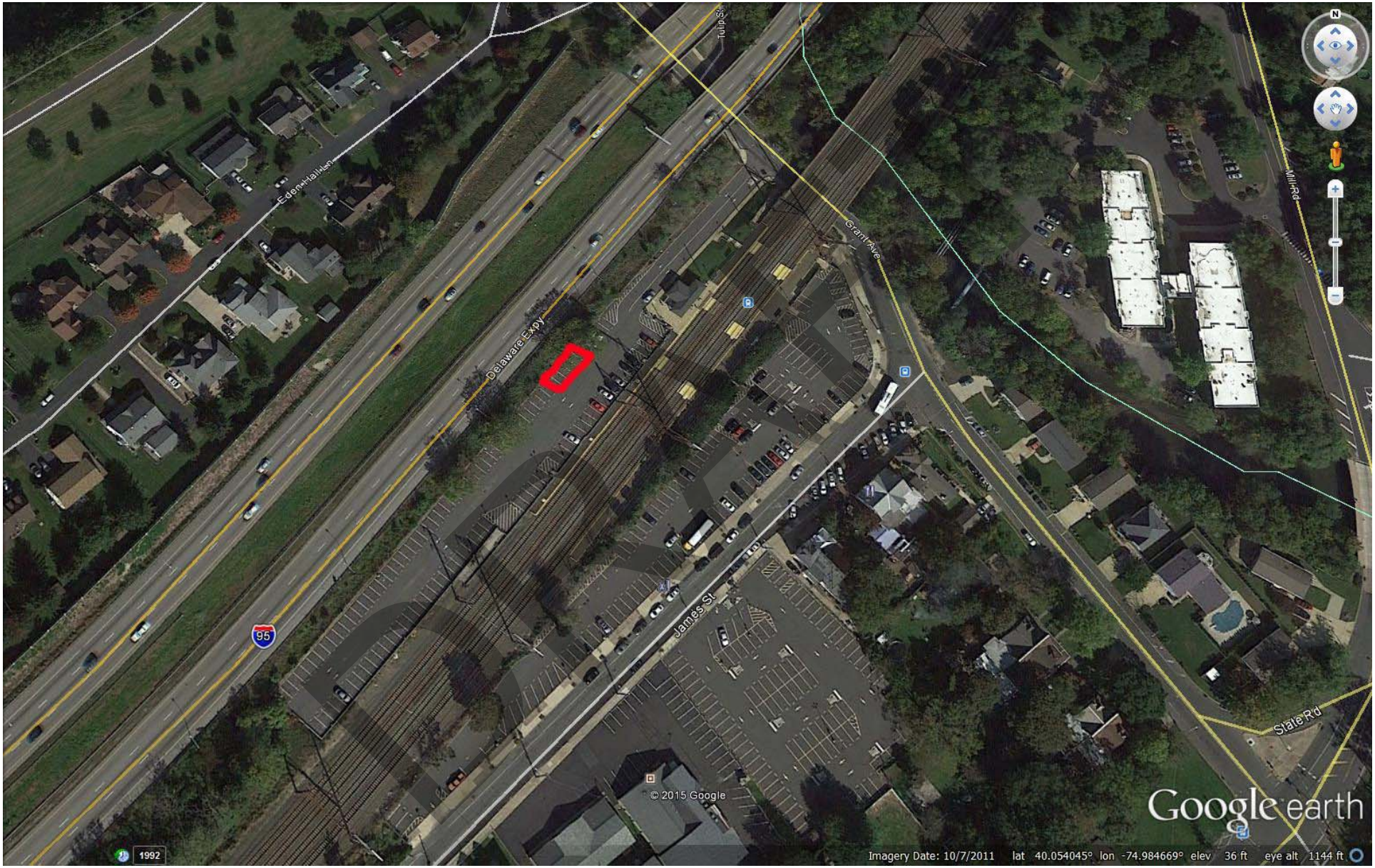
**Figure 16 – TOR Monitoring Site Map with Major Streets and Major Emission Sources**






| | | | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site ID | Facility Name | Address | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210103154 | JOWITT AND RODGERS CO/STATE RD FAC | 9400 STATE RD | | 0.05 | 0.27 | 0.03 | 0.02 | 0.00 | 7.48 |
| 4210108076 | ARIA HEALTH/TORRESDALE CAMP | RED LION & KNIGHTS RD | | 7.40 | 10.86 | 0.52 | 0.00 | 0.17 | 0.87 |

**Figure 17 – TOR North Aerial View**



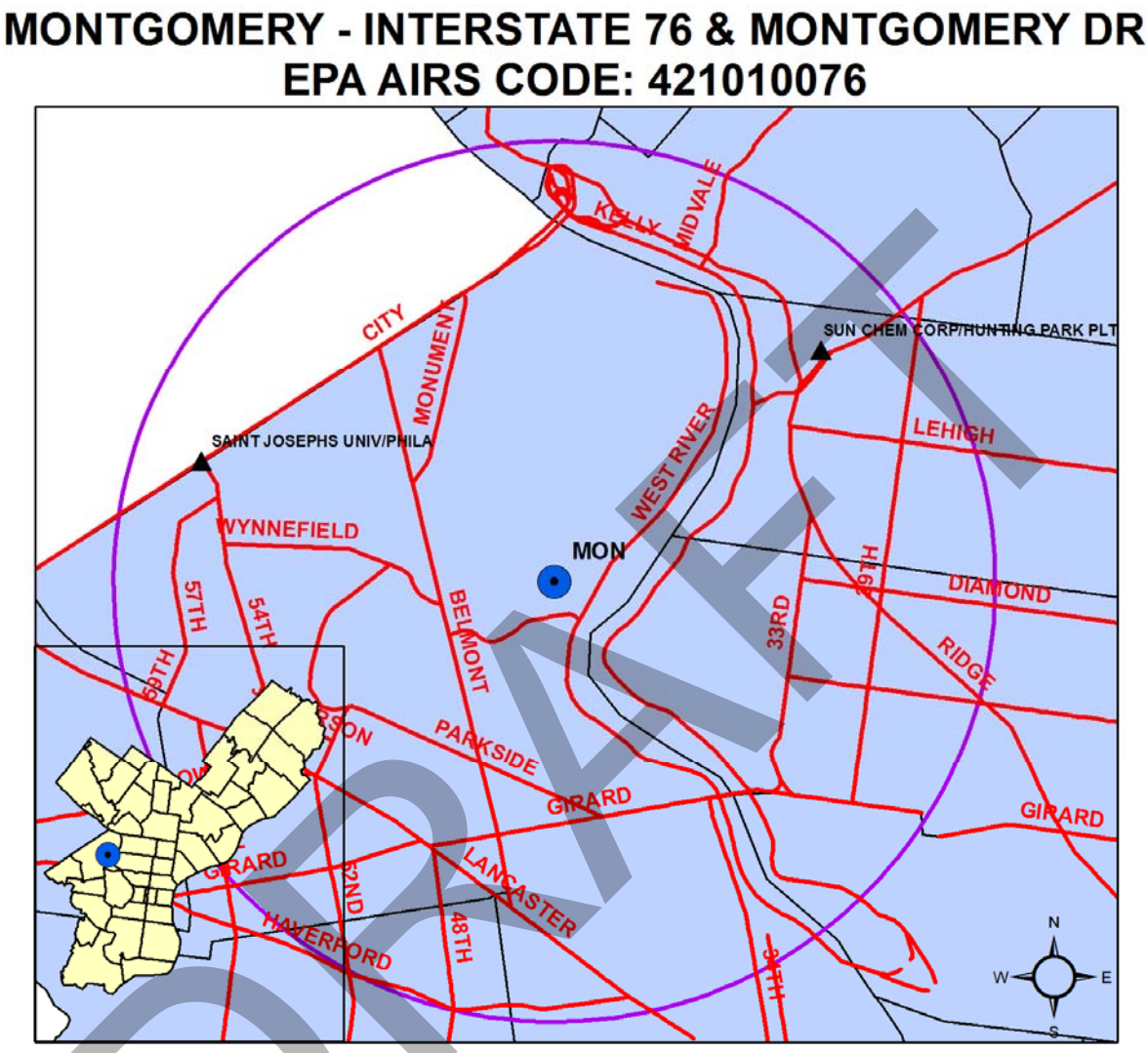
## Table 10 Detailed MON Information with Monitoring Station Picture

| |
|---|
| **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 | 5 | 1/10/2017 |
| NO2 | SLAMS | Near Road | Continuous | Instrumental | Gas Phase Chemiluminescence | | 42602 | 1 | 099 | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| NO | SLAMS | Near Road | Continuous | Instrumental | Gas Phase Chemiluminescence | | 42601 | 1 | 099 | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| NOx | SLAMS | Near Road | Continuous | Instrumental | Gas Phase Chemiluminescence | | 42603 | 1 | 099 | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| PM2.5 Continuous | SLAMS | Near Road | Continuous | Instrumental | BAM =Beta Attenuation Monitor Met One BAM - 1020 | | 88101 | 1 | 170 | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| PM2.5 Continuous | SLAMS | Near Road | Continuous | Teledyne T640 at 5.0 LPM | Broadband Spectroscopy | To replace existing MetOne BAM | 88101 | | 236 | Neighborhood | Highest Concentration, Source Oriented | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Black Carbon | SLAMS | Near Road | Continuous | Instrumental | Teledyne Model 633 | | | 1 | | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| Ultrafine Particulate | SLAMS | Near Road | Continuous | Instrumental | Teledyne Model 651 | | | 1 | | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |
| BaP | SLAMS | Near Road | 1/6 days | Hi-Vol-SA/GMW-321-B | Gravimetric | Integrated samplers. Weighed by AMS. Analysis by Allegheny County, PA | 17242 | 1 | 091 | Microscale | Highest Concentration, Source Oriented | 5 | 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 | 7 | 7/1/2015 |
| Meteorological | SLAMS | Near Road | Continuous | | Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure rainfall and solar radiation | | Vary | 1 | Vary | Microscale | Highest Concentration, Source Oriented | 5 | 7/1/2015 |

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




| Site ID | Facility Name | Address | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210108904 | SAINT JOSEPHS UNIV/PHILA | 54TH & CITY AVE | | 4.99 | 6.04 | 0.46 | 0.46 | 0.10 | 0.35 |
| 4210102052 | SUN CHEM CORP/HUNTING PARK PLT | 3301 W HUNTING PARK AVE | | 0.27 | 0.32 | 0.11 | 0.11 | 0.00 | 11.46 |

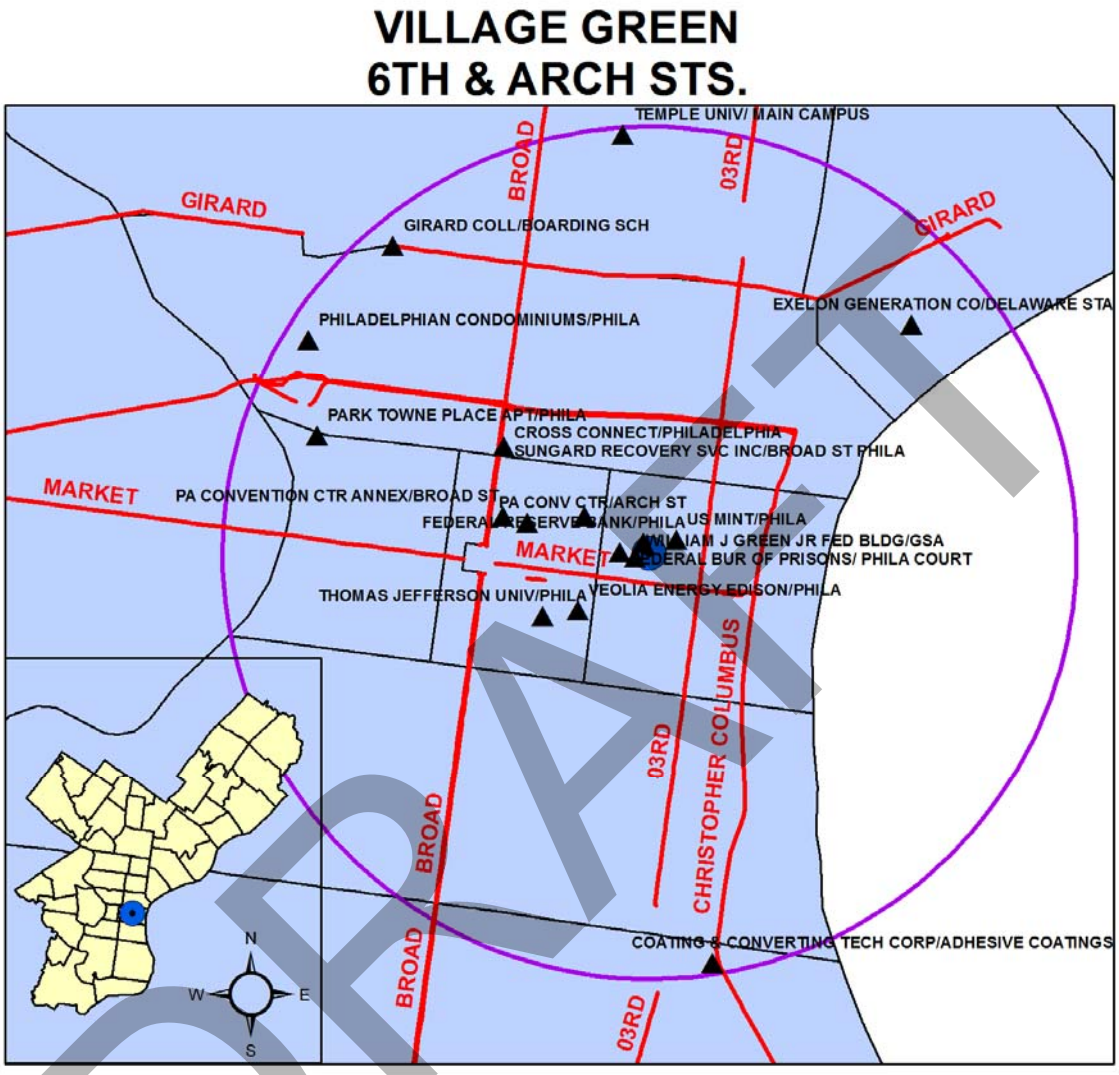
**Figure 19 – MON North Aerial View**

## 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** |

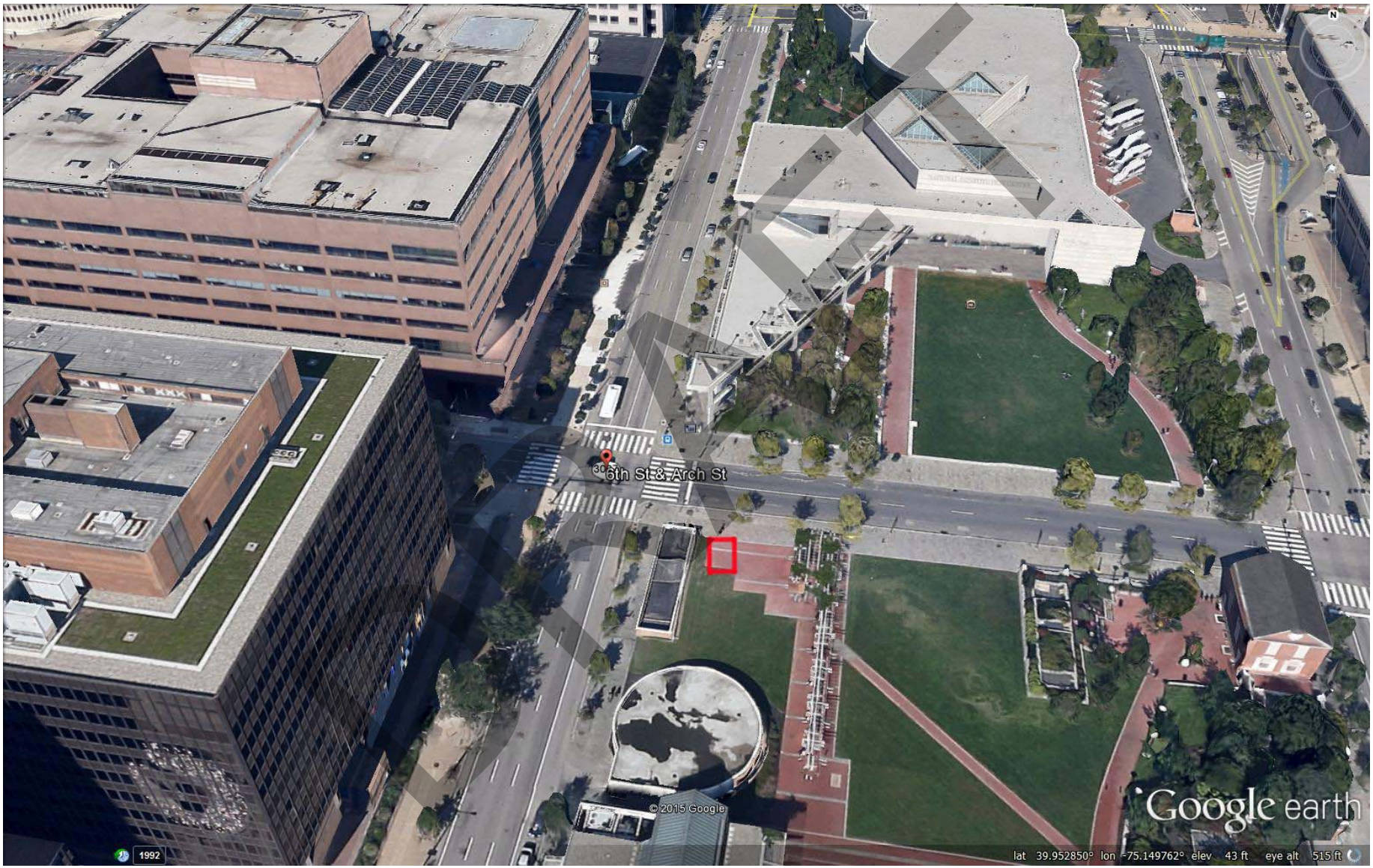
| PARAMETER | MONITORING TYPE | MONITOR NETWORK AFFILIATION | OPERATING SCHEDULE | COLLECTION METHOD | ANALYSIS METHOD | COMMENTS | PARAMETER CODE | POC | AQS METHOD | SPATIAL SCALE | MONITORING OBJECTIVE | PROBE HEIGHT (m) | BEGIN DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ozone | | | 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**




| Site ID | Facility Name | Address | 2017 Emissions (tons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PB | CO | NOX | PM10 | PM25 | SO2 | VOC |
| 4210170114 | COATING & CONVERTING TECH CORP/ADHESIVE COATINGS | 80 E MORRIS ST | | 0.29 | 0.35 | 0.03 | 0.03 | 0.00 | 3.89 |
| 4210108901 | THOMAS JEFFERSON UNIV/PHILA | 11 & WALNUT ST | | 0.22 | 0.82 | 0.07 | 0.07 | 0.07 | 0.05 |
| 4210104902 | VEOLIA ENERGY EDISON/PHILA | 908 SANSOM ST | | 1.69 | 16.22 | 2.75 | 1.49 | 26.32 | 0.18 |
| 4210109723 | WILLIAM J GREEN JR FED BLDG/GSA | 600 ARCH ST | | 2.41 | 3.09 | 0.22 | 0.22 | 0.04 | 0.16 |
| 4210109726 | FEDERAL BUR OF PRISONS/ PHILA COURT | 700 ARCH ST | | 1.42 | 1.79 | 0.54 | 0.00 | 0.02 | 0.10 |
| 4210106020 | FEDERAL RESERVE BANK/PHILA | 100 N 6TH ST | | 1.92 | 2.63 | 0.20 | 0.00 | 0.03 | 0.12 |
| 4210109703 | US MINT/PHILA | 151 N INDEPENDENCE MALL E | | 3.71 | 2.50 | 0.08 | 0.00 | 0.02 | 1.12 |
| 4210110092 | PA CONV CTR/ARCH ST | 1101 ARCH ST | | 1.57 | 2.43 | 0.10 | 0.00 | 0.06 | 0.13 |
| 4210101014 | VERIZON MKT CTRL OFC/RACE ST | 900 RACE ST | | 0.21 | 1.76 | 0.16 | 0.03 | 0.15 | 0.12 |
| 4210110353 | PA CONVENTION CTR ANNEX/BROAD ST | 111 N BROAD ST | | 0.63 | 0.88 | 0.03 | 0.00 | 0.02 | 0.05 |
| 4210103321 | SUNGARD RECOVERY SVC INC/BROAD ST PHILA | 401 N BROAD ST STE 600 | | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 421010354 | CROSS CONNECT/PHILADELPHIA | 401 N BROAD ST | | 0.05 | 0.28 | 0.01 | 0.00 | 0.01 | 0.02 |
| 4210106526 | PARK TOWNE PLACE APT/PHILA | 2200 BENJAMIN FRANKLIN PKWY | | 3.73 | 21.97 | 0.22 | 0.22 | 0.02 | 0.91 |
| 4210104901 | EXELON GENERATION CO/DELAWARE STA | 1325 N BEACH ST | | 0.69 | 4.76 | 0.33 | 0.03 | 0.29 | 0.02 |
| 4210106512 | PHILADELPHIAN CONDOMINIUMS/PHILA | 2401 PENNSYLVANIA AVE | | 1.72 | 2.09 | 0.16 | 0.16 | 0.01 | 0.11 |
| 4210108918 | GIRARD COLL/BOARDING SCH | GIRARD & CORINTHIAN AVE | | 2.11 | 2.52 | 0.19 | 0.19 | 0.02 | 0.14 |
| 4210108905 | TEMPLE UNIV/ MAIN CAMPUS | 1009 W MONTGOMERY AVE | 0.0002 | 20.40 | 29.88 | 1.28 | 1.24 | 3.69 | 1.92 |

**Figure 21 – VGR North Aerial View**



# Appendix A
# PAMS Implementation Network Plan

## PAMS Monitoring Implementation Network Plan

## Monitoring Organizations Required To Operate At NCore Sites

Philadelphia Air Management Services operates one Photochemical Assessment Monitoring Stations (PAMS) site in the air monitoring network, at the NEW site, per the monitoring rule (80 FR 65292; October 26, 2015) which requires PAMS measurements June 1 through August 31 at NCore sites that are located in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more.

Based on 40 CFR part 58, Appendix D, State and Local air monitoring agencies are required to begin making PAMS measurements at their NCore location(s) by June 1, 2019. For many State and Local air monitoring agencies, the equipment needed to measure PAMS parameters were to be purchased by USEPA using a nationally negotiated contract and delivered to the monitoring agencies. USEPA has announced that due to contract delays, the necessary equipment will not be delivered in time to begin making PAMS measurements by June 1, 2019. USEPA has indicated that it is working on a proposed rule to extend the start date of PAMS measurements and expects that this proposed rule change will be signed by June 1, 2019. As a result of the delay many State and Local air monitoring agencies will not begin making PAMS measurements at their NCore locations in 2019, and will work with EPA to begin measurements on or before the final revised start date for this network.

### Network Decision

The NCore site located at NEW serves as the location of the required PAMS site and measures the following parameters described below. An Inventory of equipment used at the site(s) is provided in Attachment 2.

### Auto GC Decision

**Volatile organic compounds (VOCs) –** A complete list of the targeted compounds are found in Table 1.

We will measure hourly speciated VOC concentrations with an auto-gas chromatograph (GC) using the Consolidated Analytical Systems (CAS). Prior to operation and reporting from this system, we will analyze 24 hours canisters collected on a sixth day basis from March through October at the NCore site by traditional PAMS Cryo-GC.

### Meteorology Measurements Decision

We have elected to use the following instrumentation to measure mixing height: Vaisala CL51 Ceilometer.

### Other Required Measurements

- **Carbonyls -** Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three day basis (~90 samples per PAMS sampling season) using ATEC Sampler and Waters HPLC equipment for analysis. A complete list of the target carbonyl compounds may be found in Table 1. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program[4] will be used.
- **Nitrogen Oxides -** Will monitor for NO and $NO_y$ (total oxides of nitrogen) in addition to true $NO_2$. The true $NO_2$ is required to be measured with a direct reading $NO_2$ analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter $NO_x$ analyzer. We use Teledyne T500U for the true NO2 measurement. NO and NOy will be measured using Teledyne.

**Table 1 PAMS Target Compound List**

| Priority Compounds | | | | Optional Compounds | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1,2,3-trimethylbenzene [a] | 19 | n-hexane [b] | 1 | 1,3,5-trimethylbenzene | 19 | m-diethlybenzene |
| 2 | 1,2,4-trimethylbenzene [a] | 20 | n-pentane | 2 | 1-pentene | 20 | methylcyclohexane |
| 3 | 1-butene | 21 | o-ethyltoluene [a] | 3 | 2,2-dimethylbutane | 21 | methylcyclopentane |
| 4 | 2,2,4-trimethylpentane [b] | 22 | o-xylene [a,b] | 4 | 2,3,4-trimethylpentane | 22 | n-decane |
| 5 | acetaldehyde [b,c] | 23 | p-ethyltoluene [a] | 5 | 2,3-dimethylbutane | 23 | n-heptane |
| 6 | acetone [c,d] | 24 | Propane | 6 | 2,3-dimethylpentane | 24 | n-nonane |
| 7 | benzene [a,b] | 25 | propylene | 7 | 2,4-dimethylpentane | 25 | n-octane |
| 8 | c-2-butene | 26 | styrene [a,b] | 8 | 2-methylheptane | 26 | n-propylbenzene [a] |
| 9 | ethane [d] | 27 | toluene [a,b] | 9 | 2-methylhexane | 27 | n-undecane |
| 10 | ethylbenzene [a,b] | 28 | t-2-butene | 10 | 2-methylpentane | 28 | p-diethylbenzene |
| 11 | Ethylene | | | 11 | 3-methylheptane | 29 | t-2-pentene |
| 12 | formaldehyde [b,c] | | | 12 | 3-methylhexane | 30 | α/β-pinene |
| 13 | Isobutane | | | 13 | 3-methylpentane | 31 | 1,3 butadiene [b] |
| 14 | Isopentane | | | 14 | Acetylene | 32 | benzaldehyde [c] |
| 15 | Isoprene | | | 15 | c-2-pentene | 33 | carbon tetrachloride [b] |
| 16 | m&p-xylenes [a,b] | | | 16 | cyclohexane | 34 | Ethanol |
| 17 | m-ethyltoluene [a] | | | 17 | cyclopentane | 35 | Tetrachloroethylene [b] |
| 18 | n-butane | | | 18 | isopropylbenzene [b] | | |

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List. U.S. EPA, November 20, 2013

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds
[b] HAP (Hazardous Air Pollutant) Compounds
[c] Carbonyl compounds
[d] Non-reactive compounds, not considered to be VOC for regulatory purposes

[4] See NATTS Technical Assistance Document for TO-11A method.

## Attachment 2 Equipment Inventory

| | |
|---|---|
| Region | 3 |
| State | PA |
| Local | Philadelphia |
| AQS ID | 42-101-0048 |
| MSA | Philadelphia- Camden- Wilmington, PA-NJ-DE-MD |

| Parameter | Category | Detail |
|---|---|---|
| **Site** | Is the AQS site ID listed above the expected PAMS Core site location? | Yes |
| | What is the status of the decision for the expected PAMS Core site location (not started, draft, or final)? | Final |
| | Is there an alternate PAMS Core site location selected? | No |
| | Identify type of alternative site (existing PAMS, NATTS, etc) | N/A |
| | Alternate site AQS ID (if known) | N/A |
| **Mixing Height** | Is there an existing functional ceilometer or other similar instrument available for use? | Yes |
| | current location (at future PAMS Core site, at other site, not applicable) | Final |
| | instrument type (ceilometer, radar profiler, etc) | Ceilometer |
| | manufacturer | Vaisala |
| | model | CL51 |
| | date purchased | December 2017 |
| | comments | Data not in AirVision |
| **Auto GC** | Is there an existing Auto GC available for use? | No, installed 3/19/19, training scheduled April 2019 |
| | current location (at future PAMS Core site, at other site, not applicable) | Final |
| | manufacturer | Consolidated Analytical Systems (CAS) |
| | model | INT-PAMS-01 |
| | date purchased | 2017 |
| | Does it have a service contract? | Yes |
| | comments | Installed 3/19/19, training scheduled April 2019 |
| **True NO2** | Is there an existing true NO2 instrument available for use? | Yes |

| | | |
|---|---|---|
| | current location (at future PAMS Core site, at other site, not applicable) | Final |
| | instrument type (photolytic conversion, cavity ringdown, CAPS, etc) | Photolytic Conversion |
| | manufacturer | Teledyne |
| | model | T500U |
| | date purchased | December 2017 |
| | comments | NO, NOy at site |

| | | |
|---|---|---|
| **Carbonyls Sampling** | Is there an existing sequential carbonyls sampling unit or similar instrument available for use? | Yes |
| | current location (at future PAMS Core site, at other site, not applicable) | PAMS Core site |
| | manufacturer | ATEC |
| | model | 8000 |
| | date purchased | 2016 |
| | comments | |
| **Carbonyl Analysis** | Does the site currently have a support laboratory for carbonyls or plans to use a support laboratory? | Yes |
| | laboratory name | Philadelphia Air Management Services Laboratory |
| | comments | Waters HPLC |
| **Barometric Pressure** | instrument type (aneroid barometer, etc) | Yes - Electronic |
| | manufacturer | Vaisala |
| | model | WXT520 |
| | date purchased | 2013 |
| | comments | |
| **UV Radiation** | instrument type (UV radiometer, etc) | Radiometer |
| | manufacturer | EPLAB |
| | model | TUVR |
| | date purchased | |
| | comments | In process |
| **Solar Radiation** | instrument type (pyranometer, etc) | Pyranometer |
| | manufacturer | Met-One |
| | model | 095 |
| | date purchased | |
| | comments | In process |
| **Precipitation** | instrument type (tipping bucket, weighing, etc) | Tipping Bucket |
| | manufacturer | Met-One |
| | model | 375C |
| | date purchased | |

| | | |
|---|---|---|
| | comments | In Process |

# Appendix B
# Philadelphia Air Quality Survey

## Philadelphia Air Quality Survey 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 the neighborhood-to-neighborhood variances of air quality across the city. This project aims to fill the gap in air quality monitoring as mentioned above, and achieve the following objectives:

1) Set up street-level, neighborhood-oriented air sampling sites throughout the city to sample the air for about two years, and capture the seasonal changes and neighborhood-to-neighborhood spatial variances in air quality.
2) Measure the types of air pollution with major concerns, including $PM_{2.5}$, $NO_2$ (as vehicle emission indicator and ozone precursor), diesel vehicle emissions (using black carbon as indicator), and residual oil burning (using indicators such as $SO_2$, nickel, and vanadium).
3) Obtain quality assured and reliable data results that can serve as the basis for future work, including: provide policy recommendations for reducing 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 and build a Land Use Regression model to predict air pollution levels and spatial variances in different neighborhoods; provide a basis for studying public health impact of air pollution in the city.

The site setup work (Objective 1 above) was finished in 2018. AMS will continue to maintain the sites and sample the ambient air at these locations.

### Outputs

The project outputs will include data from the first ever city-wide street level air monitoring, which will indicate spatial variances of pollutant ($PM_{2.5}$, $NO_2$, $SO_2$, $O_3$) concentrations across different areas of the city.

### Project Time Frame

The research and preparation work for the project have been ongoing since July 2016. The city-wide air sampling operation started in May 2018, and will last about 24 months. A project report will be produced after at least 12 months' sampling results are obtained.

### Project Design

Monitoring Sites

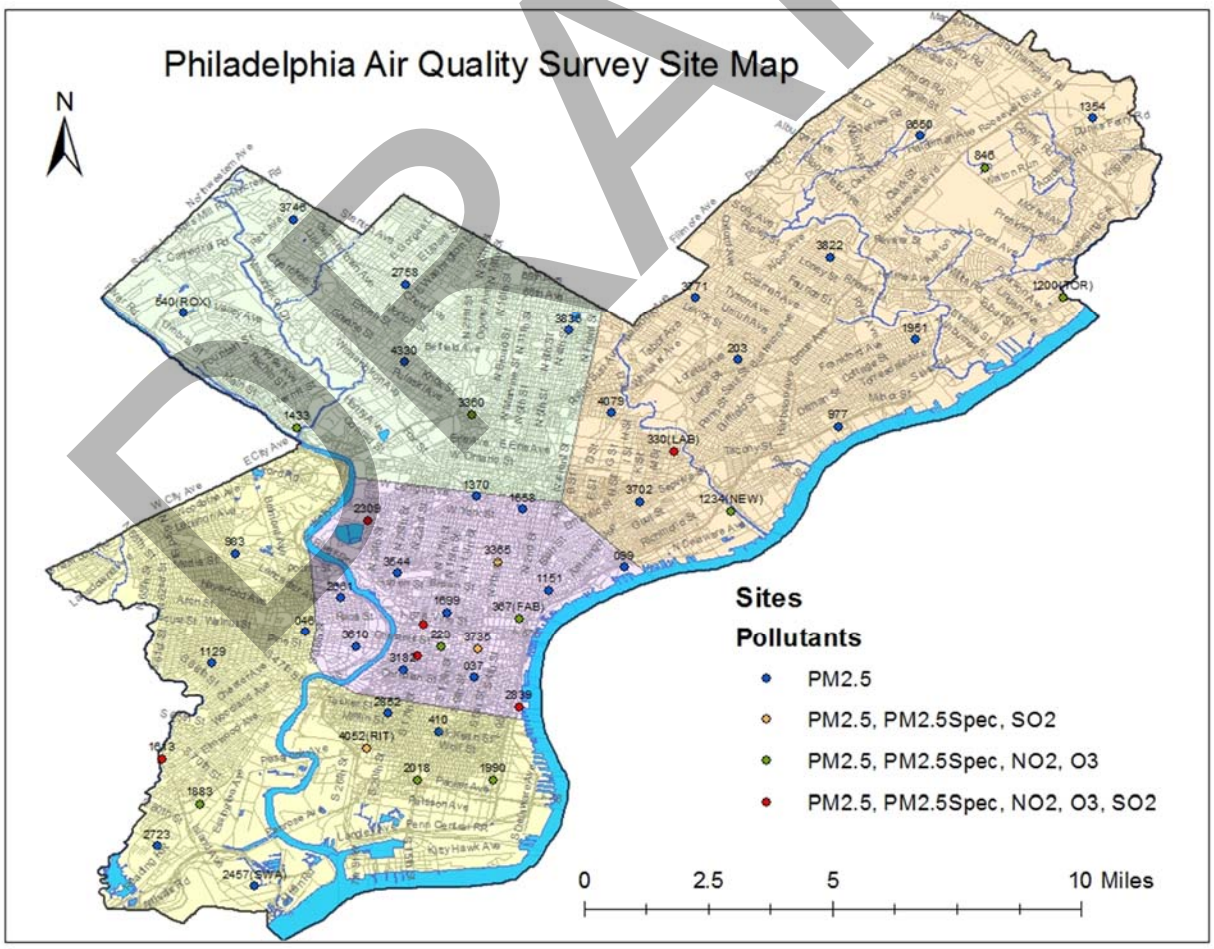
A grid of 300m x 300m cells are created over the city map using ArcGIS for the purposes of site selection, data processing, and air quality modeling in the future. A sampling site falls in one of these cells. 50 monitoring sites have been selected across the city (see the attached map). The entire city is divided into four quadrants (areas): Central, Northeast, Northwest, and South/Southwest. The Central Area is 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. Within each area, about 70% of the sites are randomly selected using GIS mapping techniques to make the data statistically representative. About 30% of the sites are determined as "purposeful" sites. Their locations are determined to serve one or more particular purposes. At each monitoring site, a portable sampling unit will be mounted on a utility pole about 10 - 12 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 will also include $NO_2$, $SO_2$, and/or $O_3$. passive samplers. The unit contains meteorological sensors as well.

Sampling Operation

The sampling unit operates on 2-week sampling cycles. Four sites, called "reference sites", will operate with consecutive 2-week sampling periods throughout the year. For the rest of the monitoring sites, sampling units will be rotated to cover the 46 sites in four operational sessions (batches) during a season, a three-month period. In each session of a season, 11 to 12 sites will be monitored at a time for a two-week sampling period. Then the sampling units will be moved to the next session of 11 to 12 sites. To avoid spatio-temporal confounding associated with different sites being monitored during different time windows, the sites in each operational session will be randomly selected.



# Appendix C
# Public Notice Proof of Publication