2011-2012
Air Monitoring Network Plan

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City of Philadelphia
Department of Public Health
Air Management Services

July 1, 2011

Executive Summary

Philadelphia has an air monitoring network of eleven 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-Wilmington-Atlantic City, 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: www.epa.gov/epahome/rules.html#codified.

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, an Air Monitoring Network Plan (Plan) 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.

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:

- **Announcement of Future Changes to the Network -** This section provides information on how the public is made aware of the Plan and where it is available for review.

- **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.

- **Philadelphia's Meteorology and Topography -** This section describes the general meteorology relative to wind and air stagnation and the impact of topography on Philadelphia's meteorology

- **Current Network at a Glance -** This section shows the location of the monitoring sites and the pollutants measured at each site.

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- **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.

- **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.

- **Summary of NAAQS Implementation Timeline for Ambient Monitoring** - This section shows the affected criteria pollutant, date of proposed or final monitoring rule, summary of changes to monitoring, date monitoring must be operating by, and the effect on AMS.

- **Potential 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 Plan.

- **NCore Station** - Per 40 CFR part 58.10(a)(3), this section describes the reasons for an NCore multi-pollutant station in the network.

- **Changes to a Violating $PM_{2.5}$ Monitor** - Per 40 CFR part 58.10(c), this section documents changes to the $PM_{2.5}$ monitoring network that impact the location of a violating $PM_{2.5}$ monitor, including a description of the proposed use of spatial averaging for purposes of making comparisons to the annual $PM_{2.5}$ NAAQS as set forth in appendix N to 40 CFR part 50.

- **Lead Monitoring Sites** - Per 40 CFR part 58.10(a)(4), this section explains the reasons EPA requires monitoring near lead sources with emissions of 0.5 to 1.0 tons per year.

- **Detailed Information on Each Site -** This is the largest section of the Plan. 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.

- **Detailed Information by Pollutant -** The report is completed with detailed information for each the following pollutants: Ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, Lead, Particulate Matter, and Toxics. The monitoring of each pollutant is described by a map showing where the pollutant is monitored, National Ambient Air Quality Standard (if there is one) and a text description and trend graphs showing the concentration of the pollutant over a number of years.

- **Siting Criteria -** Appendix A summarizes the probe and monitoring path siting criteria.

AMS has provided a copy of the Plan for public inspection on the City's website at: http://www.phila.gov/health/airmanagement/index.html.

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Comments or questions concerning the air monitoring network or this Plan can be directed to:

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Announcement of Future Changes to the Network

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, a Plan assuring that the network stations continue to meet the criteria established by federal regulations. At least 30 days prior to July 1 of each year AMS announces to the public the availability of the Plan through notices published in the *Philadelphia Daily News* and the *Pennsylvania Bulletin*. Copies of the Plan are available for public inspection on the City's website under the Department of Public Health, Air Management Services at:
http://www.phila.gov/health/airmanagement/index.html and at the AMS office:

Air Management Services
321 University Avenue, 2nd Floor
Philadelphia, PA 19104
Phone – 215-685-7586

Provisions will be made to accommodate comments and questions concerning the air monitoring network or the Plan. If comments are received they will be considered for incorporation into the Plan.

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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 Plan, air monitoring sites and monitoring equipment are specifically identified relative to these air monitoring programs:

- **NAMS** - National Air Monitoring Stations. This network provides ambient levels of criteria air pollutants (carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate and lead). These sites are established with the intent that they will operate over many years and provide both current and historical information.
- **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 multipollutant 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 ($NO/NO_2/NO_y$), Pb, 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, and all other State or locally operated stations that have not been designated as SPM stations.
- **PAMS** - Photochemical Assessment Monitoring Stations.
- **STN** - A $PM_{2.5}$ speciation station designated to be part of the Speciation Trends Network. This network provides chemical species data of fine particulate. These sites are established with the intent that they will operate over many years and provide both current and historical information.
- **State speciation site** - A supplemental $PM_{2.5}$ speciation station that is not part of the speciation trends network.
- **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.

Measurement Methods

- **Approved regional method (ARM)** - A continuous $PM_{2.5}$ method that has been approved specifically within a State or Local air monitoring network for purposes of comparison to the NAAQS and to meet other monitoring objectives.
- **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

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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 the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- **Middle scale** - Defines the 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.

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 10,000 population, plus adjacent counties having a high degree of social and economic integration.

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- **Metropolitan Statistical Area (MSA)** - A Core-based statistical area (CBSA) associated with at least one urbanized area of 50,000 population or greater. The central county plus adjacent counties with a high degree of integration comprise the area.

Pollutants

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

- **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
  - **Lead (Pb)**
- **Volatile organic compounds** (VOC) - Approximately 56 of these compounds are monitored to assist in understanding the formation of ozone and how to control this pollutant.
- **Toxics** - Approximately 35 compounds, Carbonyls – 6 compounds, and metals - 6 elements are toxic and are measured to assess the risk of cancer and non cancer caused by these pollutants.
- **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.

Collection Methods

Particulate samples

- **BAM-Beta Attenuation Monitor Met One BAM-1020** - This instrument provides concentration values of particulate each hour. The BAM -1020 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.

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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. Without a size-selective inlet (SSI), all collected material is defined as total suspended (in the air) particulates (TSP), including lead (Pb) and other metals. A size-selective inlet is added for PM_{10} measurement. A Hi-Volume sampler consists of two basic components: a motor similar to those used in vacuum cleaners and an air flow control system.
- **Hi-Vol-SA/GMW-321-B -** High Volume Sierra Anderson or General Metal Works (GMW) model 321-B PM_{10} is a high volume air sampler system which has a selective inlet 203 cm x 254 cm filter.
- **Met One SASS -** Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **R & P $PM_{2.5}$ -** Rupprecht & Potashnick $PM_{2.5}$ monitors an air sample drawn through a Teflon filter for 24 hours.

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.
- **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.
- **BAM-Beta Attenuation -** The principle of beta ray attenuation to provide a simple determination of mass concentration. Instrumental – data is available in near real time.

Composition/make-up of particulates

- **Atomic Absorption -** This analysis measures the intensity of radiation of a specific wavelength that is absorbed by an atomic vapor.
- **Energy Dispersive XRF -** Energy dispersive x-Ray Fluorescence Spectrometer for the determination of metals including Lead concentration in ambient particulate matter. The method is collected on $PM_{2.5}$ filter samples.

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.
- **Carbon monoxide - Nondispersive infrared -** A nondispersive infrared (NDIR) gas analyzer is an instrument that measures air samples for CO content.

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- **Sulfur dioxide - Pulsed Fluorescent -** Pulsed fluorescence sulfur dioxide monitor where air is drawn from the outside and passes through the analysis cell, and a high intensity burst of UV light is emitted. The sulfur dioxide responds to the specific UV wavelength generated by absorbing the energy. When the flash lamp shuts off (in a fraction of a second) the SO_2 fluoresces giving off an amount of photons directly proportional to the concentration of sulfur dioxide in the air.
- **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 -180°C. 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 ^{o}C. 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, LN2) 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 (LN2) is also used to trap and concentrate sample components.
- **Thin Layer Chromatography -** TLC is a widely used chromatography technique used to separate chemical compounds. It involves a stationary phase consisting of a thin layer of adsorbent material, usually silica gel, aluminum oxide, or cellulose immobilized onto a flat, inert carrier sheet.
- **HPLC -** High Pressure Liquid Chromatography. 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.

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Philadelphia's Meteorology and Topography

Although Philadelphia is located less than 100 miles from the Atlantic Ocean, its climate is predominantly influenced by air masses and prevailing winds from an inland direction. The weather is highly variable, characterized by a succession of alternate high and low pressure systems moving, in general, from west to east with average velocities of 30 to 35 miles per hour (mph) in winter and 20 to 25 mph in summer.

The normal paths of practically all low pressure systems affecting weather in the United States are toward the northeast corner of the nation. About 40 percent of the low centers pass very close to Philadelphia and most of the others approach closely enough to exert some influence on Philadelphia weather, resulting in a regular change in weather patterns without any consistent periods of stagnation. The movement of high pressure centers is slowest in summer and early fall and, because the lower edge of the prevailing westerlies aloft is farthest north at the same time, high pressure centers sometimes become stationary for periods of several days near the Philadelphia area. The result is increasing atmospheric stability at such times. This condition is frequently broken up diurnally in the summer because of the length and intensity of the sun's heating during the day, but strongly stable conditions may persist for a number of successive days in almost any month. Persistent stability, lasting ten days or more, occurs infrequently: on the average, perhaps once in ten years, but it may possibly happen in successive years or more than once in the same year.

Stagnating high pressure systems which result in winds of less than seven mph for a period of seven or more days occur seldomly. Stagnation lasting four or more days occurred much more frequently and reached a maximum in fall.

During the spring, fall and winter, the weather is dominated by cold air masses of the continental Arctic or continental polar types. These air masses are extremely stable at their source, but are subjected to heating from below as they move across the land, thus generally becoming unstable in the lower few thousand feet by the time they reach Philadelphia. In the summer, the maritime tropical air mass plays as great a part in the weather as the continental air masses. Nocturnal cooling from below produces a high frequency of temperature inversions during the summer, but these are most often broken up or weakened by heating during the day, with ensuing turbulence and mixing at the atmosphere.

Philadelphia is located on the Atlantic Coastal Plain, some 50 miles or more from the nearest mountains (Appalachian) and large bodies of water (Atlantic Ocean and Delaware Bay). The land and sea breeze effect is practically never felt at Philadelphia and the mountain-valley circulation is non-existent.

Within the City itself there are very few marked extremes in topography. Elevations range from sea level at the southern and southwestern extremities of the City to 400 to 450 feet above sea level in the northwestern section (Chestnut Hill), about ten miles away. The Wissahickon Creek and the Schuylkill River flow through the northwestern part of the City, however, and along these two streams there are some rather sharp rises in elevation, as much as 100 to 200 feet in a horizontal distance of 500 feet. Such extremes are quite limited and would not influence the meteorological patterns which affect the City as a whole. They could, of course, contribute to

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increased air pollution problems in a small local area within the City under certain circumstances.

In general, the topography of the City and the immediate surrounding area is such that it would make no significant contribution to increased air stagnation and stability over and above that produced by the meteorological pattern.

(Taken from "The Atmosphere over Philadelphia, Its Behavior and Its Contamination" by Francis K. Davis Jr. Ph.D., Professor of Physics, Drexel Institute of Technology October, 1960)

Figure 1 on the next page - Philadelphia Wind Rose Plots (2002 – 2010) provides information on the frequency and strength of wind in Philadelphia over a nine year period. The "rays" that make up the graph point to the direction the wind comes from. For example, wind blows most often from West to East and least often from the Southeast.

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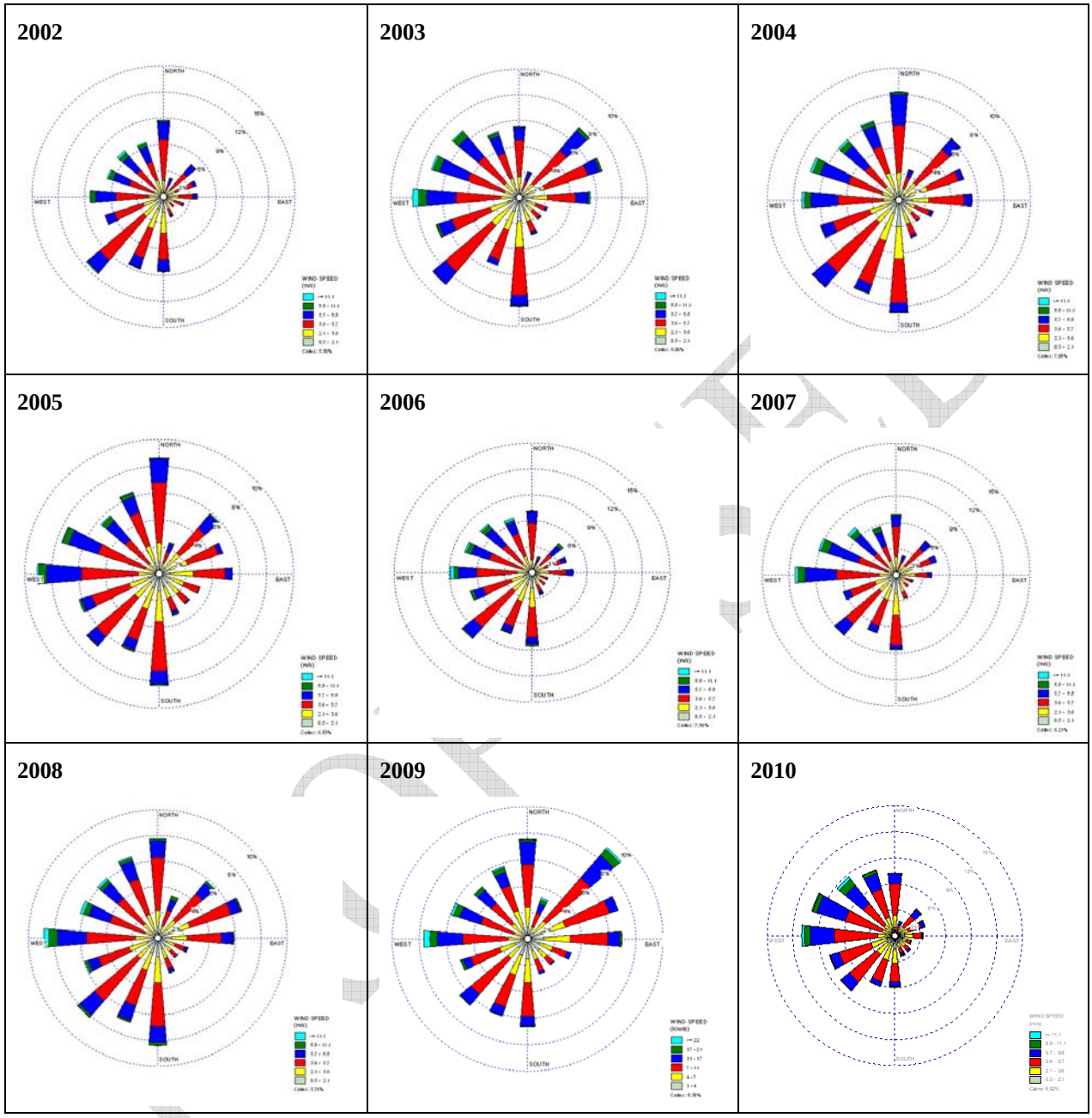
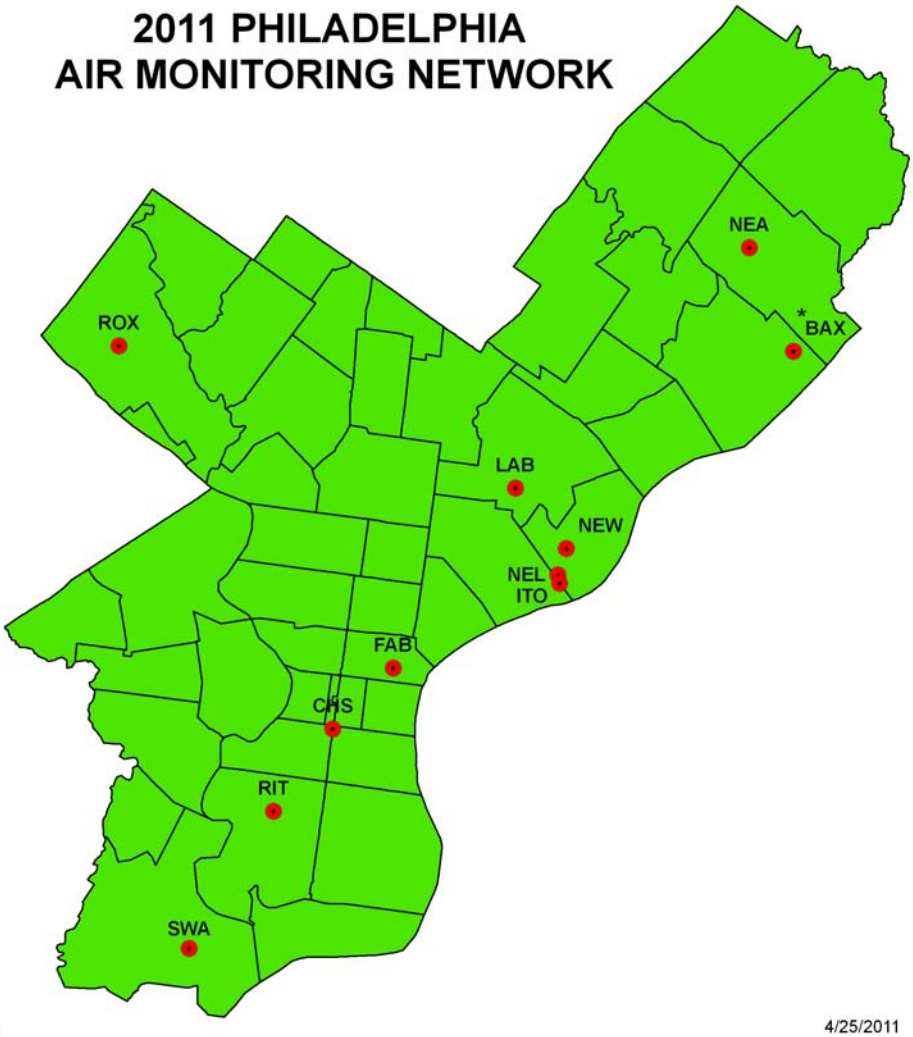
Figure 1 - Philadelphia Wind Rose Plots (2002 – 2010)



Current Network at a Glance

The City of Philadelphia is served by a network of eleven (11) air monitoring sites located throughout the City that measure the criteria pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead. Five 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.

Figure 2 - 2011 Philadelphia Air Monitoring Network as of April 25, 2011



* NCore

4/25/2011

			Parameter																			
AQS Site Code	AMS Site	Address	CO	SO_2	Ozone	NO_2	NO	PM_{10} FEM	$PM_{2.5}$ FEM	Speciated $PM_{2.5}$ Analysis by EPA	$PM_{2.5}$ FRM	PM_{10} SSI (quartz filter)	PM Coarse	Metals Analysis by WV (TSP sampler with quartz filter)	TSP Lead	PAMS VOC	Carbonyls	Toxics TO14	BaP analysis by Allegheny County, PA	MET	AMS Site
421010004	LAB	1501 E. Lycoming	X	X	X	X	X		X	X		X		X		X	X	X			LAB
421010014	ROX	Eva & Dearnley												X			X	X			ROX
421010024	NEA	Grant & Ashton			X															X	NEA
421010047	CHS	500 S. Broad				X	X				X			X			X	X			CHS
421010048	NEW	3900 Richmond						X												X	NEW
421010649	NEL	3900 Richmond										X									NEL
421010449	ITO	Castor & Delaware										X							X		ITO
421010055	RIT	24th & Ritner		X						X	X			X			X	X		X	RIT
421010057	FAB	3rd & Spring Garden									X										FAB
421010063	SWA	8200 Enterprise												X			X	X			SWA
421011002	*BAX	5200 Pennypack	X	X	X		X		X	X	X		X		X					X	BAX

Summary of Current Sites

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

State: Pennsylvania
City: Philadelphia
County: Philadelphia
Metropolitan Statistical Area (MSA): Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD-
MSA number: 6160
Population: 3,849,647
EPA Region: III, Philadelphia
Class 1 area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ
City population: 1,500,000 as of 2000 census
Time zone: EST
UTM zone: 18

PROPOSED

Table 1 - Site Summary Table

AQS Site Code	AMS Site	Address	Statement of Purpose
42101 0004	**LAB**	1501 E. Lycoming	Built in 1964, a good site for the assessment of the City's impact on precursors to the formation of ozone and is a designated PAMS site. It is a good site to test new or complex monitoring methods as laboratory staff are readily available.
42101 0014	**ROX**	Eva & Dearnley	Periphery site
42101 0024	**NEA**	Grant & Ashton	Periphery site High Ozone
42101 0047	**CHS**	500 S. Broad	Traffic related, a site that indicates the impact of street traffic and pollutants that are transported into Center City
42101 0048	**NEW**	3900 Richmond	This site was located to measure the impact of the facilities Franklin Smelting and Refining and MDC, which are now closed and the waste water treatment plant. PM_{10} levels are continuously being monitored at this site which is used in reporting the Air Quality Index (AQI).
42101 0649	**NEL**	3900 Richmond	This site was located to measure the impact of the facilities Franklin Smelting and Refining and MDC, which are now closed and the waste water treatment plant. Monitoring of PM_{10} particulate continues at this site.
42101 0449	**ITO**	Castor & Delaware	This site was located to measure the impact of the facilities Franklin Smelting and Refining and MDC, which are now closed. Monitoring of lead continues at this site.
42101 0055	**RIT**	24th & Ritner	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.
42101 0057	**FAB**	3rd & Spring Garden	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.
42101 0063	**SWA**	8200 Enterprise	This site was established to measure toxics, carbonyls, and metals. $PM_{2.5}$ may also be monitored. EPA Region III modeling analysis showed areas near the airport to have high levels of aldehydes.
42101 1002	**BAX**	5200 Pennypack	This site was established as the NCore multi-pollutant station, one of 70 in the national network. NCore parameter requirements include measurements of $PM_{2.5}$ FRM, speciation, and continuous mass, coarse particles ($PM_{10-2.5}$), O_3, trace levels of CO, SO_2, NO, and NO_y, and surface meteorology including wind speed and direction, temperature, and relative humidity.

PROPOSED

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 improving the understanding of particulate and air toxic pollutants in Philadelphia. Model results from the EPA Region III Philadelphia Air Toxics Project were provided to AMS. The Philadelphia river ports and International Airport were identified as potential major contributors to health risk associated with air toxic emissions.

The agency will review the NO_2 network for the addition of near-roadway monitoring and maintenance of area-wide monitoring, in addition to the SO2 network and CO network.

The agency will continue to utilize $PM_{2.5}$ FEMs as replacements for FRMs.

The agency will review O3 data at BAX and NEA for comparison.

The agency will review the relocation of the BaP monitoring from ITO to another monitoring site.

PROPOSED

Table 2 - Summary of NAAQS Implementation Timeline for Ambient Monitoring

NAAQS **(Date of Proposed or Final Rule, if available)** • **Summary of changes to monitoring**	**Date Monitoring must be operating by**	**Impacts on AMS**
Lead – Monitoring (Final Rule – Published December 27, 2010) • Requires monitoring near lead sources with emissions of 0.50 to 1.0 tons per year (TPY). This is in addition to existing requirement above 1.0 TPY. • Addition of non-source lead monitors at NCore stations in CBSAs over 500,000 people. • Requires lead monitoring at 15 specified airports for at least one year. • http://epa.gov/air/lead/actions.html	Newly required monitoring to be operational by December 27, 2011	• As of 1/1/11, lead is being monitored at the NCore site, BAX.
NO2 – Primary NAAQS and Monitoring (Final rule -published February 9, 2010) • Addition of near-roadway monitoring. • Area-wide monitoring remains and becomes required. • Additional 40 monitors required to protect susceptible and vulnerable populations. • http://www.epa.gov/airquality/nitrogenoxides/actions.html#jan10	January 1, 2013	• The Philadelphia CBSA requires 2 near-roadway monitors and 1 community-scale monitor. • Does not apply to this plan.
SO2 – Primary NAAQS and Monitoring (Final Rule – published June 22, 2010) • Monitoring required in Core Based Statistical Areas (CBSA's) based on population size and SO2 emissions. • Additional monitoring would also be required based on the state's contribution to national SO2 emissions, which could be placed either within or outside a CBSA's. • Reporting requirement added to include maximum 5-minute block average of each hour. • http://www.epa.gov/airquality/sulfurdioxide/actions.html#jun10	January 1, 2013	• The Philadelphia CBSA requires 2 monitors. • The monitoring portion does not apply to this plan. • AMS is reporting the maximum 5-minute block average to AQS as of 9/2010.
Ozone - Primary and Secondary NAAQS (Proposed Rule – Published January 19, 2010) No specific changes for monitoring. A few more required monitors would be triggered by existing rules if more protective NAAQS is finalized.		

PROPOSED

Ozone – Monitoring (Proposed Monitoring Rule Published July 16, 2009; Final Monitoring Rule expected in 2011.) • Lengthening the ozone monitoring season where appropriate; addition of monitors in: (1) smaller urban areas not already required to monitor; (2) non-urban areas to characterize ozone in sensitive ecosystems and provide coverage in less populated areas. • http://www.epa.gov/air/ozonepollution/actions.html	Ozone monitoring season changes would take effect on the first day of the revised ozone monitoring season in 2012. Revisions to the ozone network would take place on the first day of the ozone monitoring season in 2013	• AMS currently monitors Ozone for the entire calendar year.
SO2 and NO2 – Secondary NAAQS and Monitoring (Proposal expected by July 12, 2011; Final Rule by March 20, 2012) • http://www.epa.gov/ttn/naaqs/standards/no2so2sec/index.html	NAAQS review on-going	
CO – Primary and Secondary NAAQS and Monitoring (Proposed rule expected by January 28, 2011. Final rule expected by August 12, 2011) • http://www.epa.gov/ttn/naaqs/standards/co/s_co_index.html	NAAQS review on-going	
PM – Primary and Secondary NAAQS and Monitoring (Proposal expected May 2011; Final rule expected February 2012) • http://www.epa.gov/air/particlepollution/	NAAQS review on-going. Review includes assessment of a potential separate secondary PM NAAQS for urban visibility.	

PROPOSED

Proposed Changes to the Network

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

- Calendar Year 2011, 3rd and 4th Quarters
  - AMS plans to utilize $PM_{2.5}$ FEMs as replacements for FRMs by deploying them alongside existing FRMs as co-located units.
    - RIT and CHS will have a $PM_{2.5}$ FEM monitor for a minimum of 6 months for data correlation and comparison.
    - The projected date to establish the FEM as the primary monitor at RIT and CHS is 1/1/12.
    - The projected start date for FAB has not been established.
  - PAC monitoring site to be established at Washington Ave & S. Columbus Blvd (behind Steel Worker's Union building).
    - A monitor to measure $PM_{2.5}$, PM_{10}, toxics, BaP, carbonyls, and metals will be placed to assess the river port.
      - AMS will run 6 $PM_{2.5}$ sites
    - Toxics, carbonyls, and metals will no longer be monitored at ROX and will move to PAC.
      - The ROX site will be temporarily shut down.
    - PM_{10} and BaP will no longer be monitored at ITO and will move to PAC.
      - The ITO site will be shut down.
  - Ozone may also be discontinued at NEA based on data comparison with BAX. The BAX site is located approximately 2.8 miles south of NEA.
  - CHS may shut down. Based on EPA Region III modeling results, FAB was established as an alternative site to CHS.
    - If CHS is shut down, NO_2 and NO would be moved to RIT.
- Calendar Year 2012
  - AMS plans to work with EPA and other state/local agencies located within the Philadelphia CBSA to determine potential monitoring sites for the NO2 and SO2 near-roadway monitors.
  - LAB $PM_{2.5}$ Speciation monitor may be discontinued based on data comparison with the speciation monitor at BAX.

PROPOSED

NCore Station

Starting July 1, 2009, states and delegated local monitoring agencies were required to submit Annual Monitoring Network Plans that included the plans for NCore multi-pollutant stations in their networks. The approval of NCore was handled differently than SLAMS (i.e, at the headquarters level rather than the Regional level.)

There are several "required" elements that are included for all stations documented in the Plan as described in §58.10(a)(1). These are the required elements:

- AQS site identification number
- Location, including street address and geographical coordinates
- Sampling and analysis methods for each measured parameter
- Operating Schedule for each monitor
- Spatial scale of representation for each monitor
- Applicability of $PM_{2.5}$ FRM/FEM measurements to each form of the NAAQS
- The MSA, CBSA, CSA or other area represented

January 1, 2011 was the start date for required NCore measurements.

The information on the NCore Station (BAX) can be found on page 51.

PROPOSED

Changes to a Violating $PM_{2.5}$ Monitor

Per 40 CFR Part 58.10(c), the Plan must document how AMS will provide for the review of changes to a $PM_{2.5}$ monitoring network that impact the location of a violating $PM_{2.5}$ monitor or the creation/change to a community monitoring zone, including a description of the proposed use of spatial averaging for purposes of making comparisons to the annual $PM_{2.5}$ NAAQS as set forth in appendix N to 40 CFR Part 50. AMS must document the process for obtaining public comment and include any comments received through the public notification process within their submitted Plan.

On May 31, 2008, a network plan was made available for public inspection and was also posted on the City of Philadelphia website. The 2008 plan documented changes to the PM2.5 monitoring network that impacted the location of a violating PM2.5 monitor at 500 S. Broad Street (CHS). FAB was established as an alternative to CHS, but CHS was not shutdown.

CHS may shut down by the end of calendar year 2011.

AMS plans to replace all primary $PM_{2.5}$ FRMS with $PM_{2.5}$ FEMs, starting with RIT, CHS, and FAB.

PROPOSED

Lead Monitoring Network

On December 27, 2010, EPA revised the ambient monitoring requirements for measuring airborne lead (Pb). EPA substantially strengthened the standards in a rule issued Oct. 15, 2008, revising the level of the primary (health-based) standard from 1.5 micrograms per cubic meter (µg/m3) to 0.15 µg/m3, measured as total suspended particles (TSP) and the secondary (welfare-based) standard was made to be identical in all respects to the primary standard. Philadelphia meets the new standard and is in attainment for Pb.

At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each Pb source that emits 0.5 or more tons per year, using the National Emission Inventory (NEI) or Toxics Release Inventory (TRI) to determine this. Philadelphia has no sources that emit 0.5 or more tons of Pb per year.

EPA is also requiring Pb monitoring in large urban areas (Core Based Statistical Areas, or CBSAs, with a population of 500,000 people or more). Monitors will be located along with multi-pollutant ambient monitoring sites (known as the "NCore network"). Lead monitoring at these sites are required to begin January 1, 2012. As of January 1, 2011, the NCore site, BAX, is monitoring Pb.

As of January 1, 2011, Pb is no longer being monitored at ITO.

PROPOSED

Detailed Information on Each Site

LAB

Table 3 - Detailed LAB Information

AMS Site

LAB

AQS Site Identification

421010004

Street Address

1501 E. Lycoming Street, 19124

Geographical Coordinates

Latitude:

40.008889

Longitude:

-75.09778

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	NAMS	Hourly	Instrumental	Nondispersive infrared		54	Neighborhood	Population Exposure	7	2/1/1966
SO2	NAMS	Hourly	Instrumental	Pulsed Fluorescent		60	Neighborhood	Population Exposure	7	2/1/1966
Ozone	PAMS	Hourly	Instrumental	Ultra Violet		47	Neighborhood	Population Exposure	7	1/1/1974
NO2	NAMS, PAMS	Hourly	Instrumental	Chemiluminescence	Area-wide Site	74	Urban	Population Exposure	7	1/1/1977
NOx	SLAMS		Instrumental	Chemiluminescence		74	Urban	Population Exposure	7	1/1/1977
NOy	SLAMS		Low Level Nox Instrumental	TECO 42S Chemiluminescence		75				
NO	PAMS									
PM2.5 Continuous	SPM	Continuous	BAM =Beta Attenuation Monitor Met One BAM - 1020			731				
PM2.5 Speciated	NAMS		Met One SASS	Energy Dispersive XRF	Analysis by EPA	811				
PM10 SSI	NAMS	Daily	Hi-Vol-SA/GMW-321-B	Gravimetric	NAAQS Compliance Monitoring - Annual and 24 hr	92	Neighborhood	Population Exposure	7	1/1/1999
Metals	SPM		Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz), Not reported to AQS	107				

Lab information continued on next page –

PROPOSED

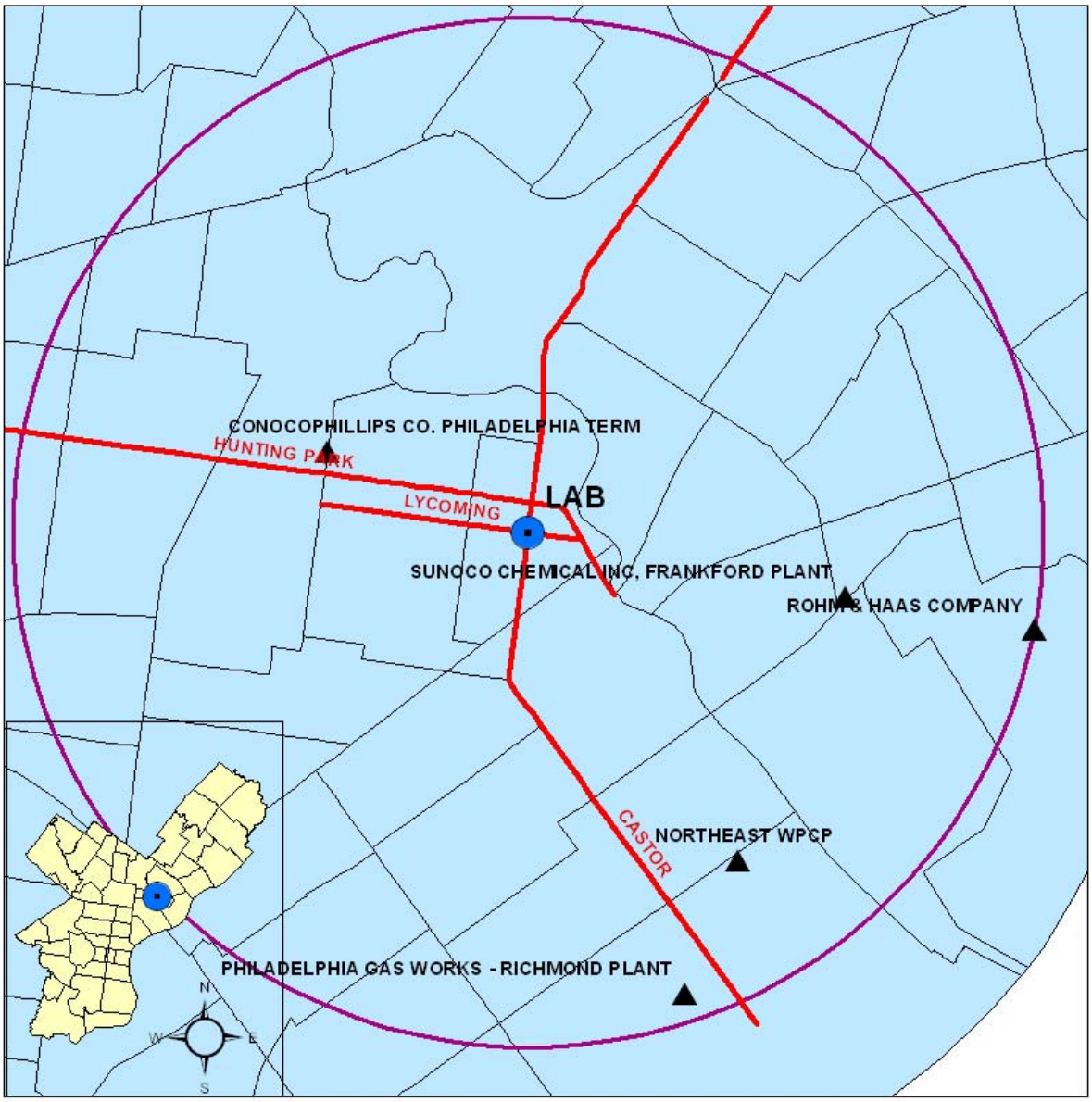
Table 2 – Detailed Lab Information continued from previous page –

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PAMS VOC	PAMS	6th day	SS Canister Pressurized	Cryogenic Preconcentration GC/FID	continuous PAMS 3 hr, samples during summer	126				
Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges	HPLC	sampled for four 3-hour periods every 3rd day during PAMS season	102				
Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	GC/MS w/ Cryogenic (liquid nitrigen) Preconcentration		101				

Figure 3 - Ground Level LAB Monitoring Station Picture

Figure 4 - LAB Monitoring Site Map with Major Streets and Major Emission Sources

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



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1531	ROHM & HAAS COMPANY	5000 RICHMOND ST	2.83	11.09	0.00	0.58	0.58	0.69	0.64	8.00
1551	SUNOCO CHEMICAL INC, FRANKFORD PLANT	4700 BERMUDA ST	55.76	201.53	0.00	75.64	58.14	75.99	78.73	117.42
4922	PHILADELPHIA GAS WORKS - RICHMOND PLANT	3100 E VENANGO ST	0.84	3.24	0.00	0.09	0.09	0.09	0.01	0.11
5004	CONOCOPHILLIPS CO. PHILADELPHIA TERM	4210 G ST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.68
9513	NORTHEAST WPCP	3899 RICHMOND ST	28.99	5.97	0.00	1.76	0.00	1.76	6.03	13.83
		TOTAL	88.42	221.83	0.00	78.07	58.81	78.53	85.41	158.04

Figure 5 - LAB - North Aerial View

ROX

Table 4 - Detailed ROX Information

AMS Site

ROX

AQS Site Identification

421010014

Street Address

Eva & Dearnley

Geographical Coordinates

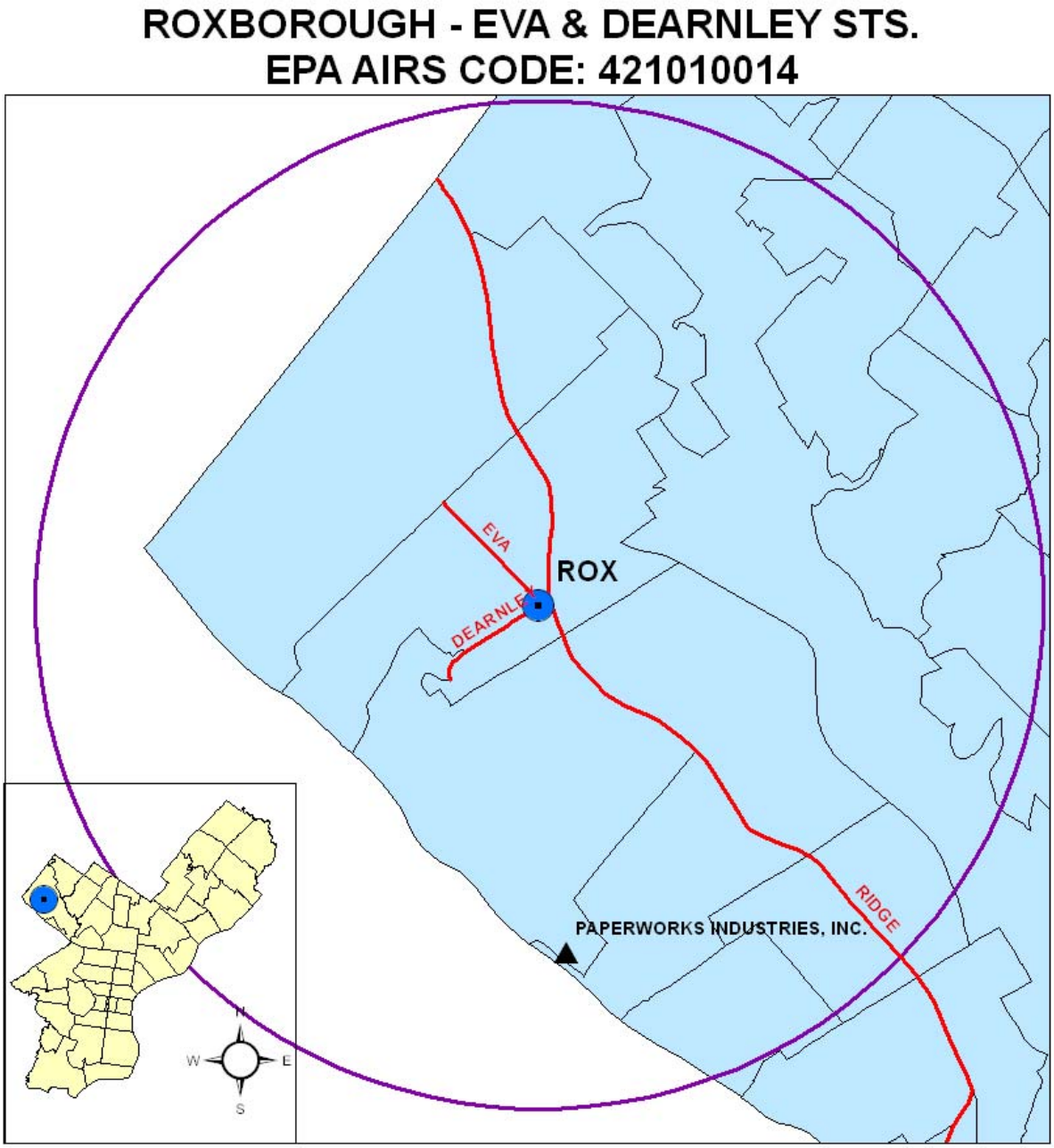
Latitude:
40.076389
Longitude:
-75.011944

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Metals	SPM	6th day	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz), Not reported to AQS	107				
Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges			102				
Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	Multi-Detector GC		101				

Figure 5 - Ground Level ROX Monitoring Station Picture

PROPOSED

Figure 6 - ROX Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1566	PAPERWORKS INDUSTRIES, INC.	5000 FLAT ROCK RD	44.96	140.15	0.00	1.56	1.02	4.07	0.32	19.78

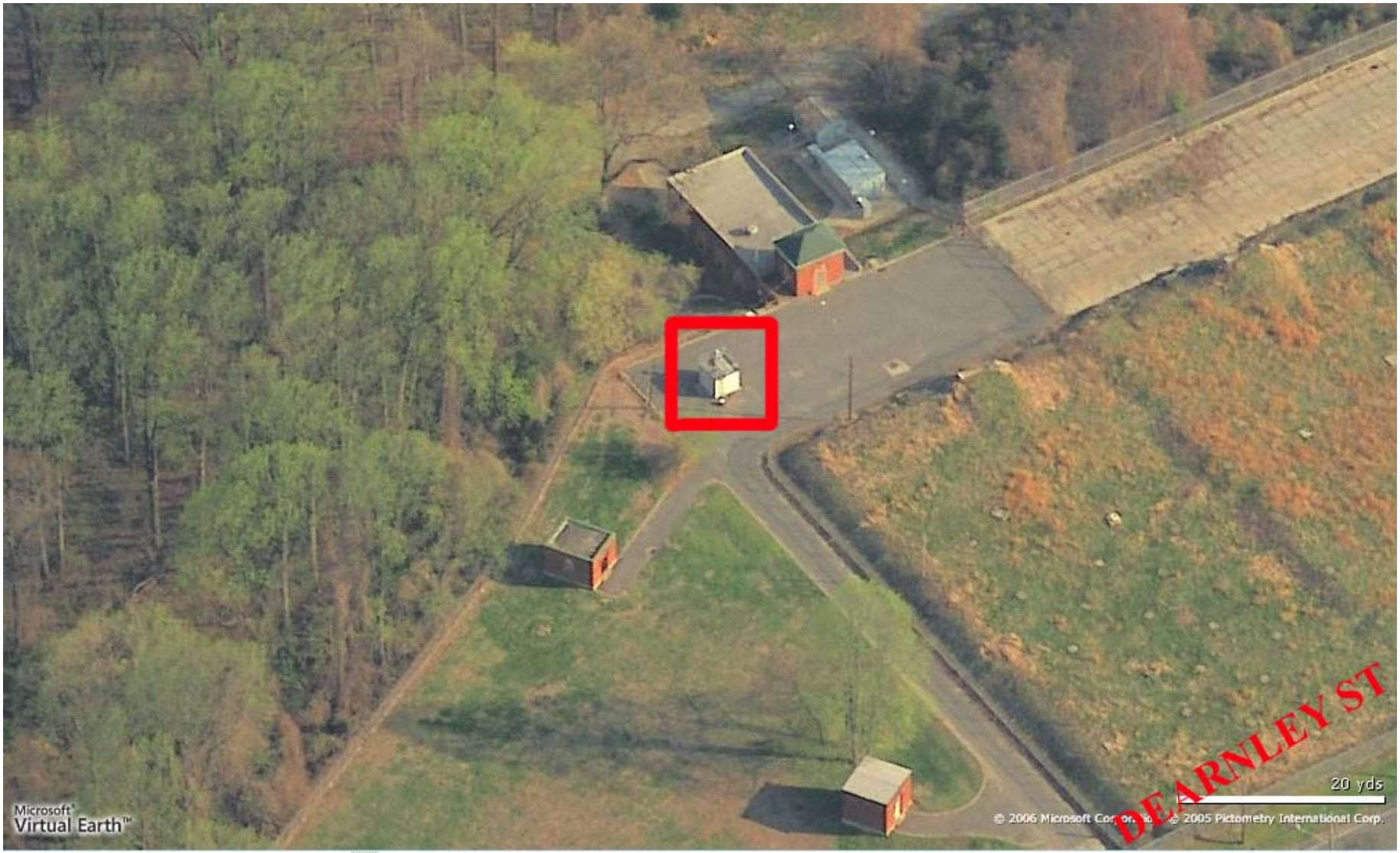


Figure 7 - ROX North Aerial View

NEA

Table 5 - Detailed NEA Information

AMS Site	Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
NEA	Ozone	NAMS	Hourly	Instrumental	Ultra Violet		47	Neighborhood	Population Exposure	6	1/1/1974
AQS Site Identification 421010024	MET	SLAMS									

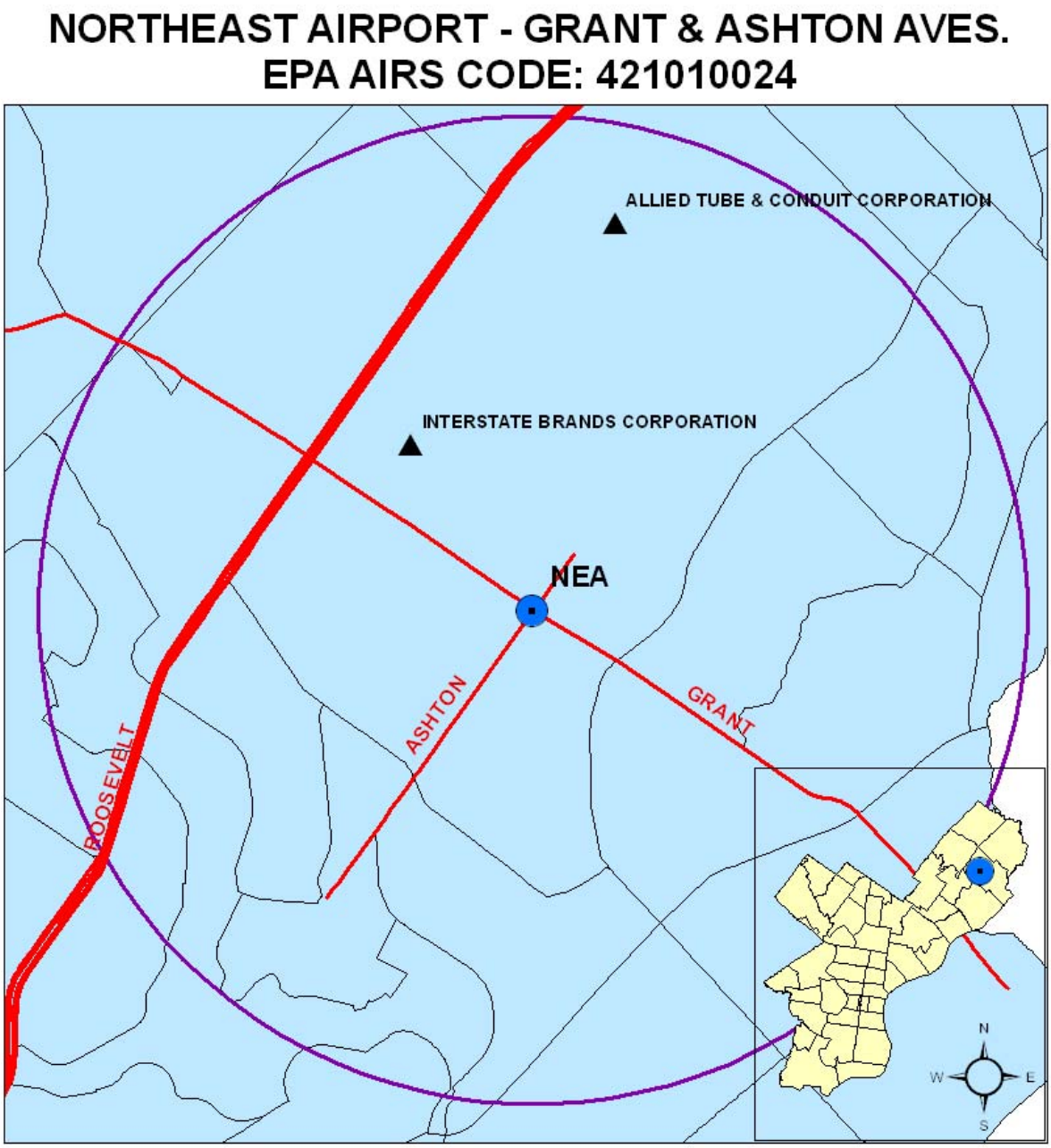
Street Address
Grant & Ashton

Geographical Coordinates
Latitude:
40.076389
Longitude:
-75.011944

Figure 8 - Ground Level NEA Monitoring Station Picture

PROPOSED

Figure 9 - NEA Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
3363	ALLIED TUBE & CONDUIT CORPORATION	11350 NORCOM RD	0.09	0.10	0.00	0.00	0.00	0.01	0.00	49.20
5811	INTERSTATE BRANDS CORPORATION	9801 BLUE GRASS RD	4.96	11.18	0.00	1.15	0.01	1.51	3.93	47.02
		TOTAL	5.05	11.28	0.00	1.15	0.01	1.52	3.93	96.22

Figure 10 - NEA North Aerial View

CHS

Table 6 - Detailed CHS Information

AMS Site	Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CHS	NO2	SLAMS	Hourly	Instrumental	Chemiluminescence	Area-wide site	74	Neighborhood	Population Exposure	11	1/1/1982
AQS Site Identification	NO	SPM									
421010047	PM2.5 FRM	SLAMS	Daily	R&P PM2.5	Gravimetric	NAAQS Compliance Monitoring - Annual and 24 hr	118	Middle	Highest Concentration	4	1/1/1999
Street Address	Metals	SPM	6th day	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz), Not reported to AQS	107				
500 S. Broad	Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges			102				
Geographical Coordinates	Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	Multi-Detector GC		101				

Latitude:
39.944722
Longitude:
-75.166111

Figure 11 - Ground Level CHS Monitoring Station Picture

PROPOSED

Figure 12 - CHS Monitoring Site Map with Major Streets and Major Emission Sources

COMMUNITY HEALTH CENTER #1 - 500 S. BROAD ST.
EPA AIRS CODE: 421010047

			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
4902	TRIGEN - EDISON	908 SANSOM ST	12.12	97.12	0.00	4.71	3.05	5.23	172.89	0.68
4904	EXELON GENERATION CO. - SCHUYLKILL STA.	2800 CHRISTIAN ST	2.89	24.76	0.00	2.97	2.15	4.23	42.54	0.43
4942	TRIGEN - SCHUYLKILL STATION	2600 CHRISTIAN ST	5.67	148.20	0.01	42.48	42.48	42.48	315.92	8.31
4944	GRAYS FERRY COGENERATION PARTNERSHIP	2600 CHRISTIAN ST	7.68	200.10	0.00	14.36	2.47	14.36	11.47	3.49
8069	THE CHILDREN'S HOSPITAL OF PHILADELPHIA	34TH AND CIVIC CENTER BLVD	22.80	28.72	0.00	2.63	2.55	3.05	1.06	2.33
8912	UNIVERSITY OF PENNSYLVANIA	3451 WALNUT ST	2.24	8.46	0.00	0.57	0.55	0.60	0.51	0.47
9703	UNITED STATES MINT	151 N INDEPENDENCE MALL EAST	1.30	0.80	0.00	0.06	0.06	0.06	0.02	4.21
		TOTAL	54.70	508.16	0.01	67.78	53.31	70.01	544.41	19.92

Figure 13 - CHS North Aerial View

NEW

Table 7 - Detailed NEW Information

AMS Site	Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)
NEW	PM10 Continuous	SPM	Continuous	BAM =Beta Attenuation Monitor Met One BAM -1020			731			
AQS Site Identification 421010048	MET									

Street Address
3900 Richmond

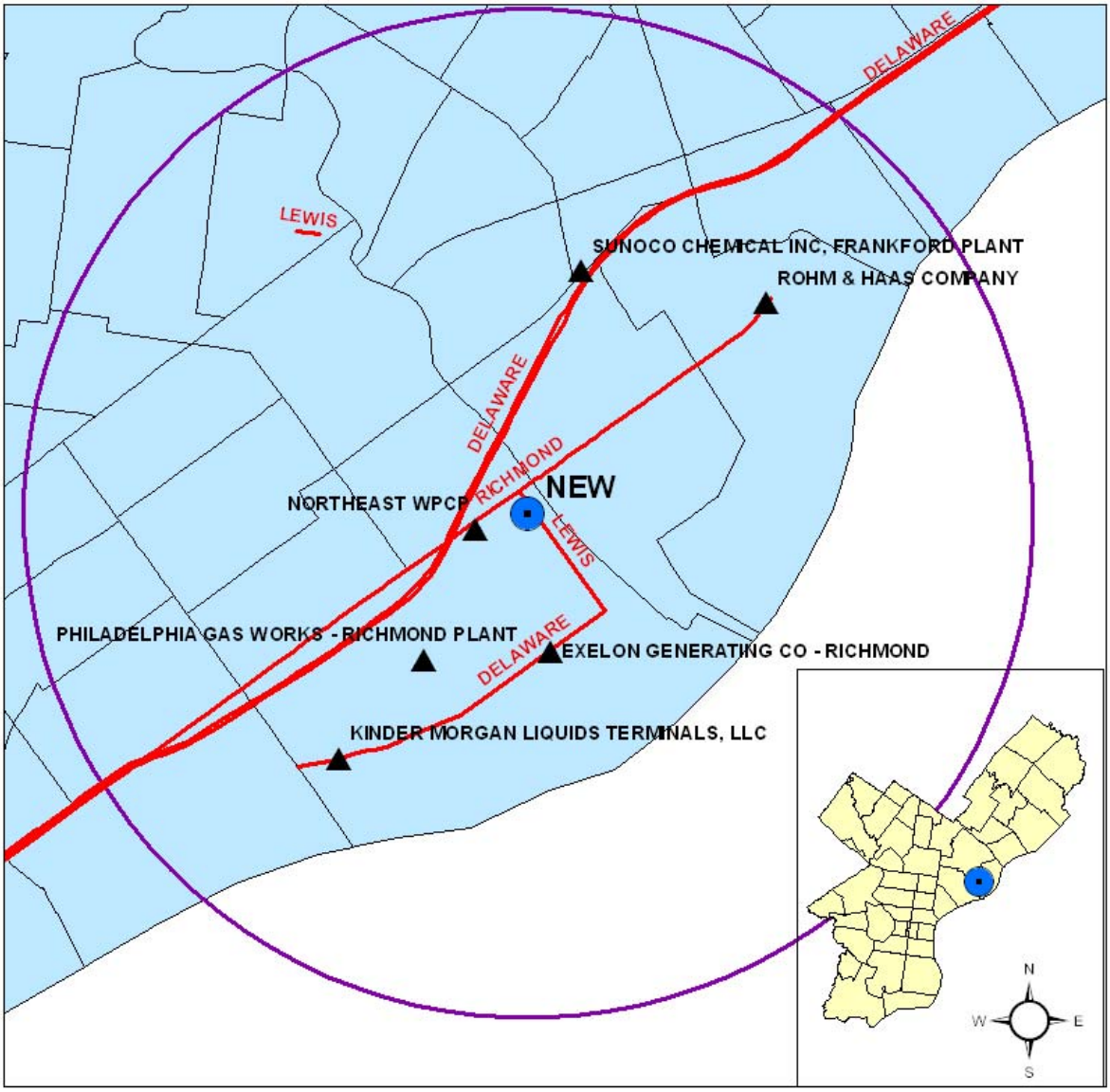
Geographical Coordinates
Latitude:
39.991389
Longitude:
-75.080833

Figure 14 - Ground Level NEW Monitoring Station Picture

PROPOSED

Figure 15 - NEW Monitoring Site Map with Major Streets and Major Emission Sources

NORTHEAST WASTE - LEWIS & RICHMOND STS.
EPA AIRS CODE:421010048



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1531	ROHM & HAAS COMPANY	5000 RICHMOND ST	2.83	11.09	0.00	0.58	0.58	0.69	0.64	8.00
1551	SUNOCO CHEMICAL INC, FRANKFORD PLANT	4700 BERMUDA ST	55.76	201.53	0.00	75.64	58.14	75.99	78.73	117.42
4903	EXELON GENERATING CO - RICHMOND	3901 N DELAWARE AVE	0.01	2.22	0.00	0.05	0.00	0.11	0.64	0.00
4922	PHILADELPHIA GAS WORKS - RICHMOND PLANT	3100 E VENANGO ST	0.84	3.24	0.00	0.09	0.09	0.09	0.01	0.11
5003	KINDER MORGAN LIQUIDS TERMINALS, LLC	3300 N DELAWARE AVE	1.15	4.62	0.00	0.23	0.06	0.46	6.55	61.46
9513	NORTHEAST WPCP	3899 RICHMOND ST	28.99	5.97	0.00	1.76	0.00	1.76	6.03	13.83
		TOTAL	89.58	228.67	0.00	78.35	58.87	79.10	92.60	200.82

Figure 16 - NEW North Aerial View

NEL

Table 8 - Detailed NEL Information

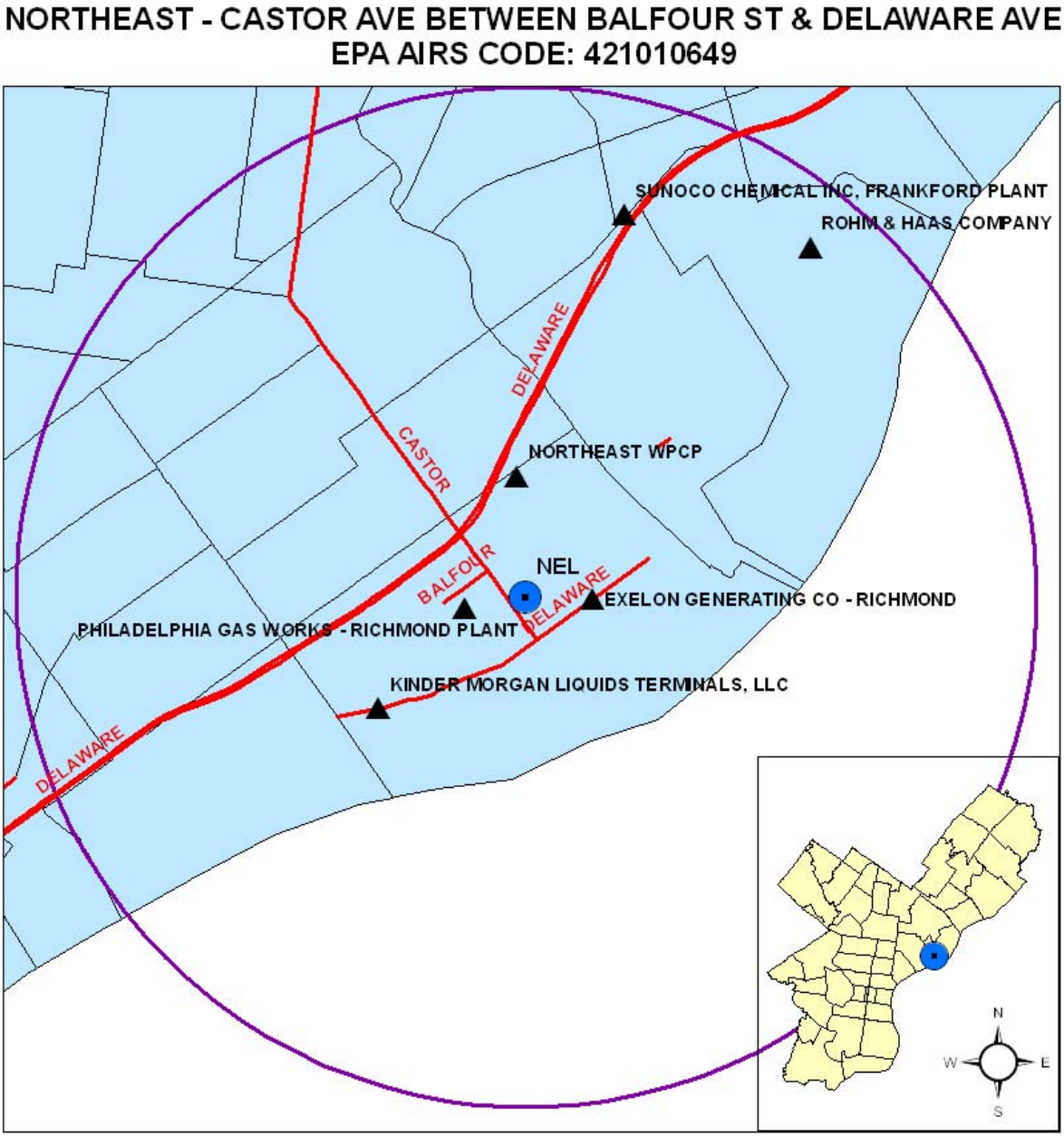
AMS Site
NEL
AQS Site Identification
421010649
Street Address
3900 Richmond
Geographical Coordinates
Latitude:
39.991389
Longitude:
-75.080833

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective
PM10 SSI	SLAMS	6th day	Hi-Vol-SA/GMW-321-B	Gravimetric	Quartz Filter co-located	64		

Figure 17 - Ground Level NEL Monitoring Station Picture

PROPOSED

Figure 18 - NEL Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_x	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1531	ROHM & HAAS COMPANY	5000 RICHMOND ST	2.83	11.09	0.00	0.58	0.58	0.69	0.64	8.00
1551	SUNOCO CHEMICAL INC, FRANKFORD PLANT	4700 BERMUDA ST	55.76	201.53	0.00	75.64	58.14	75.99	78.73	117.42
4903	EXELON GENERATING CO - RICHMOND	3901 N DELAWARE AVE	0.01	2.22	0.00	0.05	0.00	0.11	0.64	0.00
4922	PHILADELPHIA GAS WORKS - RICHMOND PLANT	3100 E VENANGO ST	0.84	3.24	0.00	0.09	0.09	0.09	0.01	0.11
5003	KINDER MORGAN LIQUIDS TERMINALS, LLC	3300 N DELAWARE AVE	1.15	4.62	0.00	0.23	0.06	0.46	6.55	61.46
9513	NORTHEAST WPCP	3899 RICHMOND ST	28.99	5.97	0.00	1.76	0.00	1.76	6.03	13.83
		TOTAL	89.58	228.67	0.00	78.35	58.87	79.10	92.60	200.82

Figure 19 - NEL North Aerial View

ITO

Table 9 - Detailed ITO Information

AMS Site	Parameter	Sampling Type	OperatingSchedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
ITO	PM10 SSI	SLAMS	6th day	Hi-Vol-SA/GMW-321-B	Gravimetric	Quartz Filter	64				
AQS Site Identification 421010449	BaP	Urban Air Toxics	6th day	Hi-Vol	Thin Layer Chromatography	Analysis by Allegheny County, PA	91				

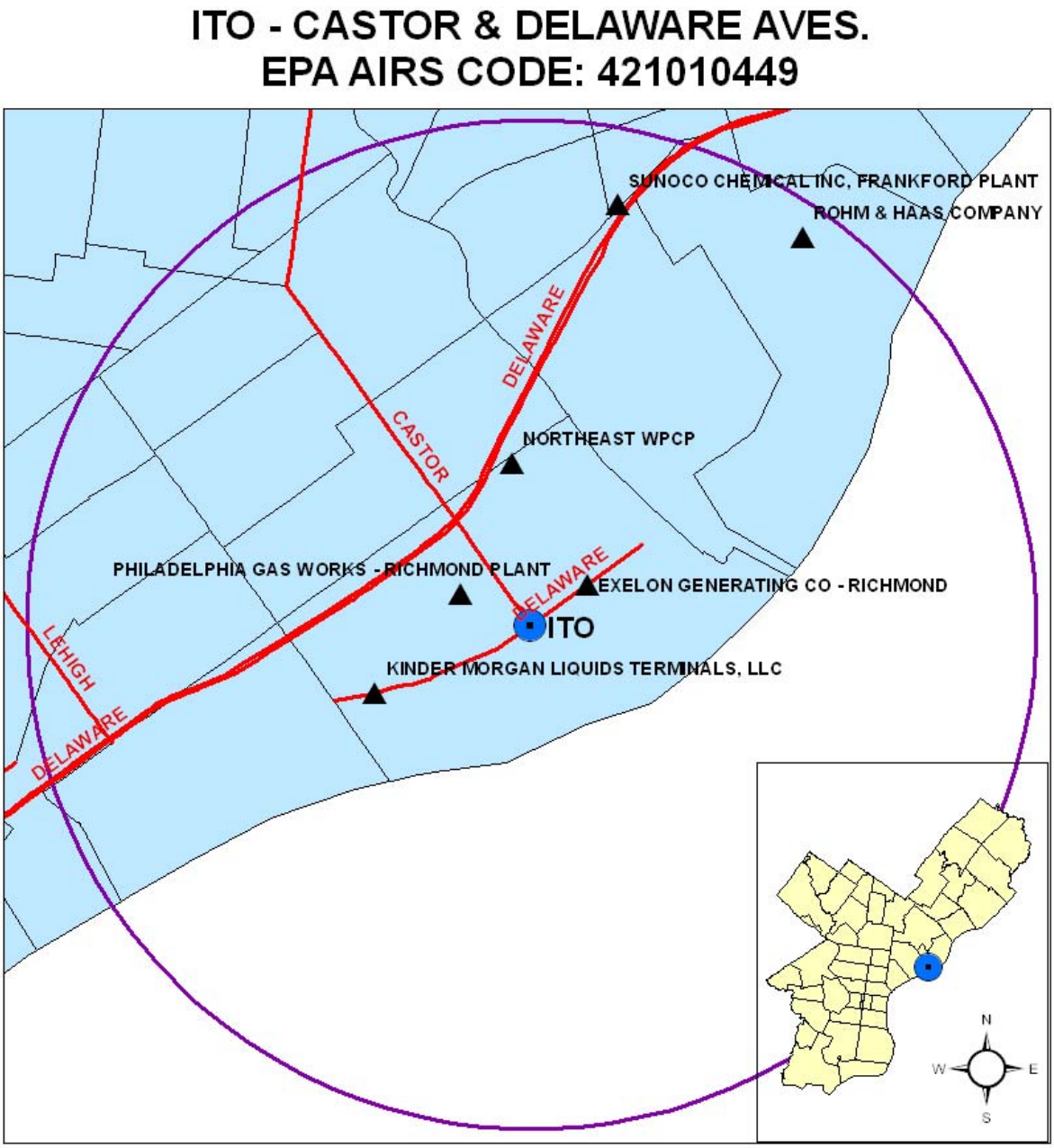
Street Address
Castor & Delaware

Geographical Coordinates
Latitude:
39.9824
Longitude:
-75.0838

Figure 20 - Ground Level ITO Monitoring Station Picture

PROPOSED

Figure 21 - ITO Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1531	ROHM & HAAS COMPANY	5000 RICHMOND ST	2.83	11.09	0.00	0.58	0.58	0.69	0.64	8.00
1551	SUNOCO CHEMICAL INC, FRANKFORD PLANT	4700 BERMUDA ST	55.76	201.53	0.00	75.64	58.14	75.99	78.73	117.42
4903	EXELON GENERATING CO - RICHMOND	3901 N DELAWARE AVE	0.01	2.22	0.00	0.05	0.00	0.11	0.64	0.00
4922	PHILADELPHIA GAS WORKS - RICHMOND PLANT	3100 E VENANGO ST	0.84	3.24	0.00	0.09	0.09	0.09	0.01	0.11
5003	KINDER MORGAN LIQUIDS TERMINALS, LLC	3300 N DELAWARE AVE	1.15	4.62	0.00	0.23	0.06	0.46	6.55	61.46
9513	NORTHEAST WPCP	3899 RICHMOND ST	28.99	5.97	0.00	1.76	0.00	1.76	6.03	13.83
		TOTAL	89.58	228.67	0.00	78.35	58.87	79.10	92.60	200.82

Figure 22 - ITO North Aerial View

RIT

Table 10 - Detailed RIT Information

AMS Site

RIT

AQS Site Identification

421010055

Street Address

24th & Ritner

Geographical Coordinates

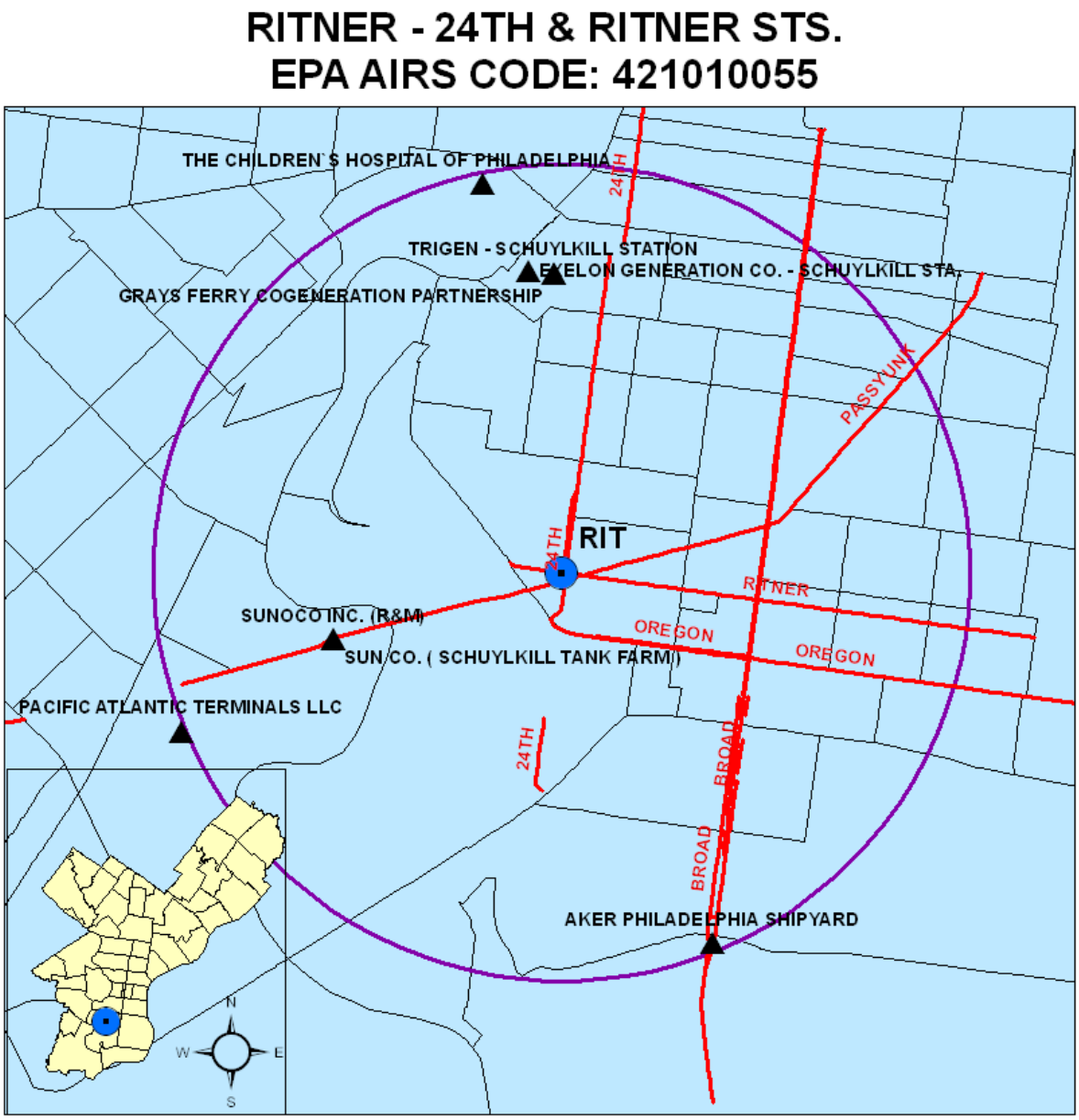
Latitude:
39.922517
Longitude:
-75.186783

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
SO2	NAMS	Hourly/minute	Instrumental	Pulsed Fluorescent	very high levels momentarily exceeding 0.5 ppm, Expected to begin operation	60	Neighborhood	Population Exposure	4	11/9/2004
PM2.5 Speciated	NAMS		Met One SASS	Energy Dispersive XRF	Analysis by EPA	811				
PM2.5 FRM	SPM	daily	R&P PM2.5	Gravimetric	NAAQS Compliance - SPM Short duration	118	Neighborhood	Population Exposure		
Metals	SPM	6th day	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz), Not reported to AQS	107				
Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges			102				
Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	Multi-Detector GC		101				
MET										

Figure 23 - Ground Level RIT Monitoring Station Picture

PROPOSED

Figure 24 - RIT Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_x	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
1501	SUNOCO INC. (R&M)	3144 PASSYUNK AVE	1613.39	1965.08	0.00	371.75	371.75	371.75	728.94	703.65
1517	SUN CO. (SCHUYLKILL TANK FARM)	3144 PASSYUNK AVE	4.32	0.80	0.00	0.00	0.00	0.00	0.00	90.41
1569	AKER PHILADELPHIA SHIPYARD	PHILA. NAVAL BUS CENTER	1.28	0.00	0.00	23.28	22.99	24.35	0.01	122.97
4904	EXELON GENERATION CO. - SCHUYLKILL STA.	2800 CHRISTIAN ST	2.89	24.76	0.00	2.97	2.15	4.23	42.54	0.43
4942	TRIGEN - SCHUYLKILL STATION	2600 CHRISTIAN ST	5.67	148.20	0.01	42.48	42.48	42.48	315.92	8.31
4944	GRAYS FERRY COGENERATION PARTNERSHIP	2600 CHRISTIAN ST	7.68	200.10	0.00	14.36	2.47	14.36	11.47	3.49
5013	PACIFIC ATLANTIC TERMINALS LLC	3400 S 67TH ST	0.48	0.58	0.00	0.01	0.00	0.04	0.00	37.20
8069	THE CHILDREN'S HOSPITAL OF PHILADELPHIA	34TH AND CIVIC CENTER BLVD	22.80	28.72	0.00	2.63	2.55	3.05	1.06	2.33
		TOTAL	1658.51	2368.24	0.01	457.48	444.39	460.26	1099.94	968.79

Figure 25 - RIT North Aerial View

FAB

Table 11 - Detailed FAB Information

AMS Site	Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
FAB	PM2.5 FRM	SPM	daily	R&P PM2.5	Gravimetric	NAAQS Compliance Monitoring - 24 hr	118	Middle	Population Exposure	2	9/2007 - Rooftop 1/1/2008 - Ground Level

AQS Site Identification

421010057

Street Address

3rd & Spring Garden

Geographical Coordinates

Latitude:

$39^0$57’36N

Longitude:

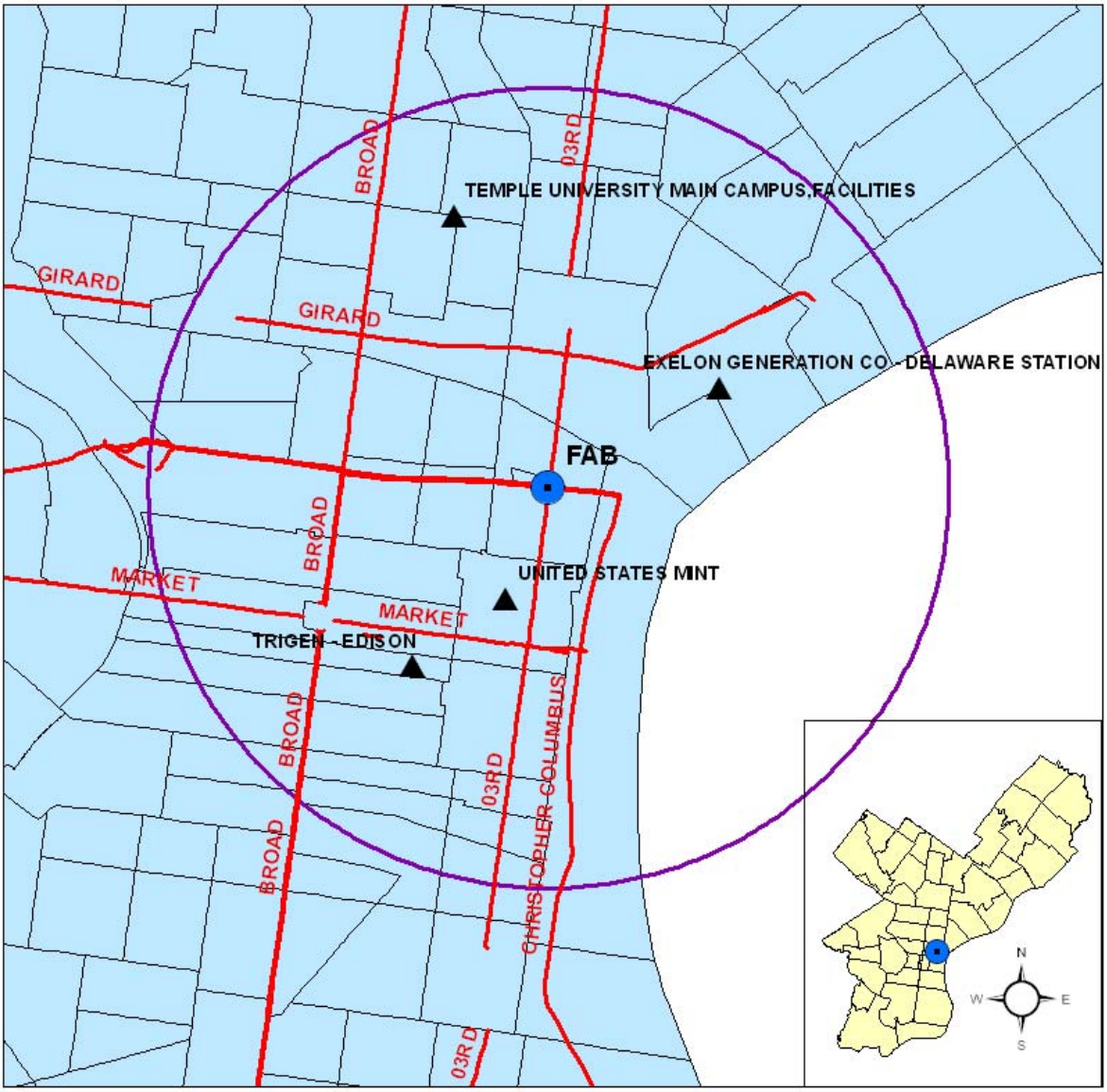
$075^0$08’34W

Figure 26 - Ground Level FAB Monitoring Station Picture

PROPOSED

Figure 27 - FAB Monitoring Site Map with Major Streets and Major Emission Sources

FIRESTATION (FAB) - 3RD & SPRING GARDEN STS.
EPA AIRS CODE: 421010057



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
4901	EXELON GENERATION CO - DELAWARE STATION	1325 N BEACH ST	0.12	0.86	0.00	0.05	0.00	0.08	0.22	0.00
4902	TRIGEN - EDISON	908 SANSOM ST	12.12	97.12	0.00	4.71	3.05	5.23	172.89	0.68
8905	TEMPLE UNIVERSITY MAIN CAMPUS,FACILITIES	1009 W MONTGOMERY AVE	33.61	64.71	0.00	1.97	1.97	7.03	37.56	4.03
9703	UNITED STATES MINT	151 N INDEPENDENCE MALL EAST	1.30	0.80	0.00	0.06	0.06	0.06	0.02	4.21
		TOTAL	47.15	163.49	0.00	6.79	5.08	12.40	210.69	8.92

Figure 28 - FAB North Aerial View

SWA

Table 12 - Detailed SWA Information

AMS Site

SWA

AQS Site Identification

421010063

Street Address

8200 Enterprise, 19153

Geographical Coordinates

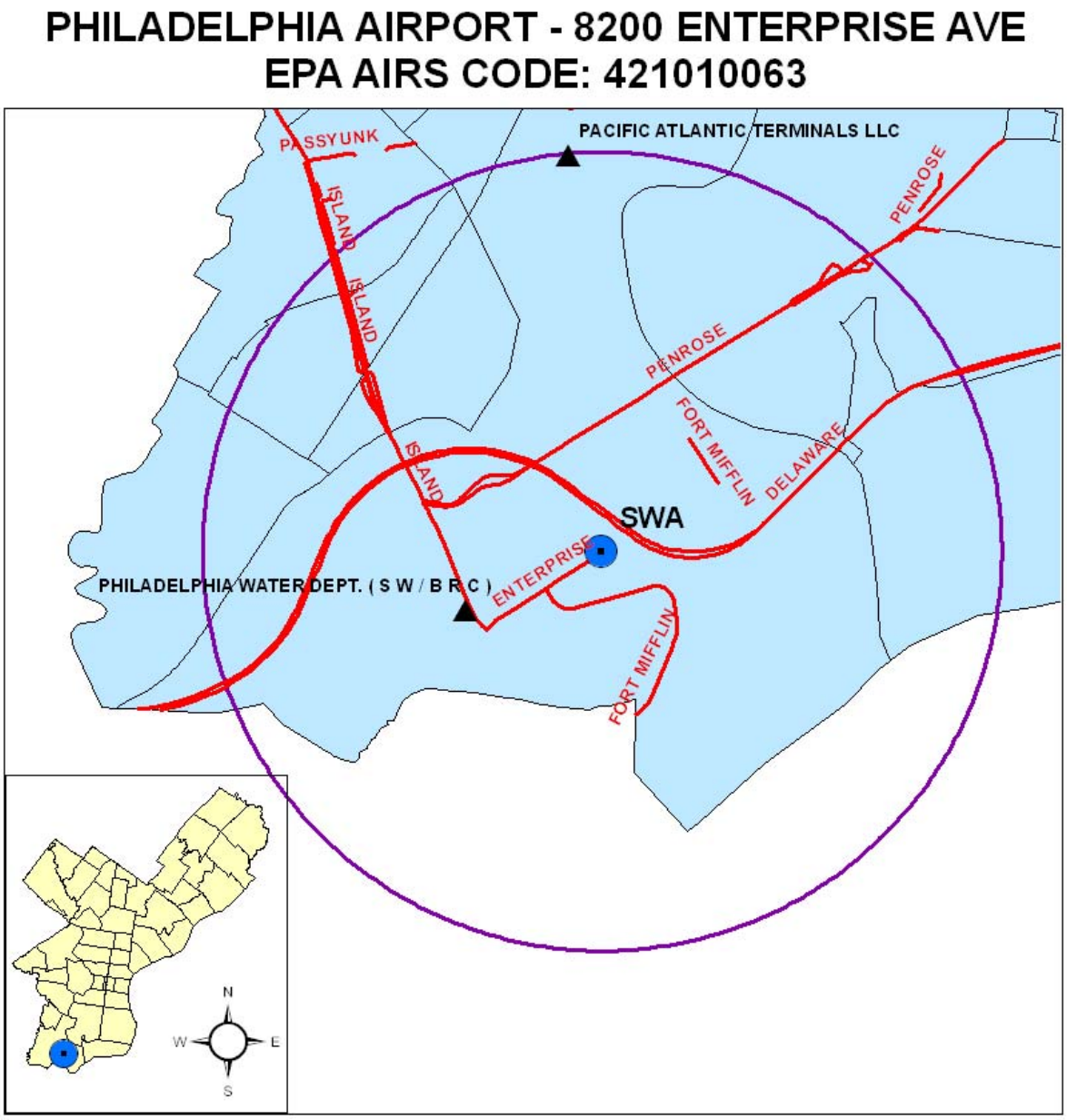
Latitude:
39.8844536
Longitude:
-75.2218221

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Metals	SPM	6th day	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz), Not reported to AQS	107				9/10/2009
Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges			102				9/10/2009
Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	Multi-Detector GC		101				9/10/2009

Figure 29 - Ground Level SWA Monitoring Station Picture

PROPOSED

Figure 30 - SWA Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
5013	PACIFIC ATLANTIC TERMINALS LLC	3400 S 67TH ST	0.48	0.58	0.00	0.01	0.00	0.04	0.00	37.20
9515	PHILADELPHIA WATER DEPT. (S W / B R C)	8200 ENTERPRISE/7800 PENROSE	28.36	9.14	0.00	2.74	0.00	2.79	5.74	20.98
		TOTAL	28.84	9.72	0.00	2.75	0.00	2.83	5.74	58.18

Figure 31 - SWA Aerial View

BAX

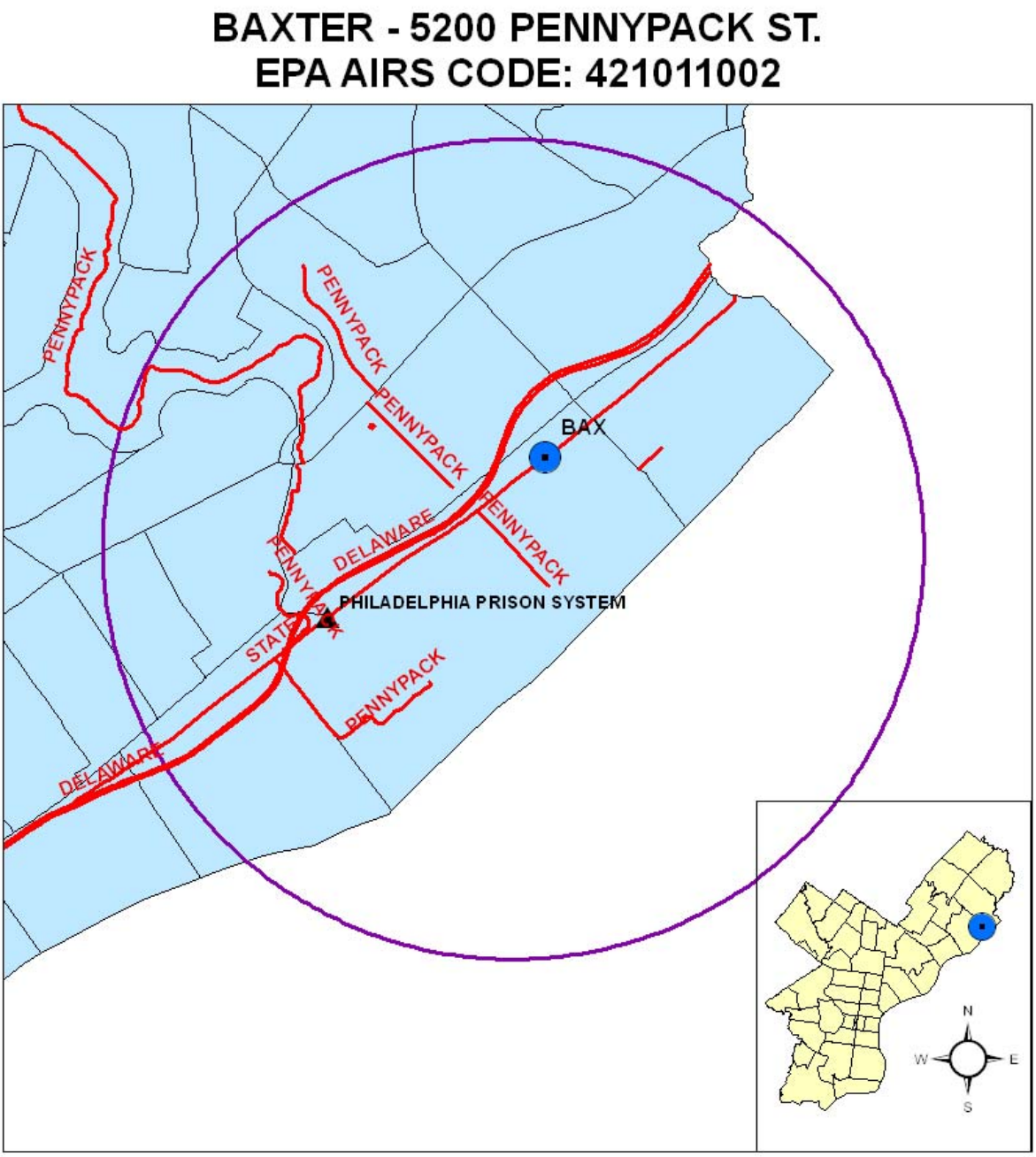
Table 13 - Detailed BAX Information

AMS Site	Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
BAX	CO (trace)	Ncore	Continuous	Instrumental	ARM utilizing trace level Non-dispersive infrared	High sensitivity	54				
AQS Site Identification	SO2 (trace)	NCore	Continuous	Instrumental	ARM utilizing trace level UV Flurorescence	High sensitivity	60				
421011002	Ozone	Ncore/AQI	Continuous	Instrumental	ARM utilizing Ultra Violet photomentry	Year-round operation	47				
	NO (trace)	Ncore									
Street Address	NOy (trace)	Ncore	Continuous	Instrumental	ARM utilizng chemilumines cence	High sensitivity external converter mounted at 10m	75				
5200 Pennypack Street, 19136	PM2.5 Continuous	Ncore/AQI	Continuous	BAM =Beta Attenuation Monitor Met One BAM -		FEM	731				
Geographical Coordinates	PM2.5 Speciated	Ncore	1/3 days	Met One SASS	Energy Dispersive XRF	Analysis by EPA	811				
Latitude:	PM2.5 FRM	Ncore	1/3 days	R&P PM2.5	Gravimetric		118				
40.035973	PM Coarse	Ncore	1/6 days	Hi-Vol-SA/GMW-321-	Gravimetric	Integrated samplers	92				
Longitude:	TSP Lead	Ncore	6th day	Hi-Vol	Atomic Absorption	Analysis by InterMountain Laboratory (IML)	92				
-75.002769	Meteorological	Ncore	Continuous		measurement s approved instrumentatio						

Figure 32 - Ground Level BAX Monitoring Station Picture

PROPOSED

Figure 33 - BAX Monitoring Site Map with Major Streets and Major Emission Sources



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
9519	PHILADELPHIA PRISON SYSTEM	8001 STATE RD	9.15	11.87	0.00	0.40	0.30	0.90	0.17	0.64

Figure 34 - BAX Aerial View

Detailed Information by Pollutant

Ozone (O_3)

Principle of Operation
The detection of ozone molecules is based on absorption of 254 nm UV light due to an internal electronic resonance of the O_3 molecule.

NAAQS:
Highest 4th daily maximum 8-hour concentration = 0.075 ppm

Ground level ozone (the primary constituent of smog) is the pollutant most often responsible for unhealthy air quality in the Philadelphia region. Ozone is not emitted into the atmosphere directly but is formed by reactions of other pollutants. Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO_x) react to create ozone in the presence of heat and sunlight.

Unlike the oxygen that we breathe, which has only two atoms of oxygen (O_2), ozone has an additional oxygen atom, making it very reactive. This is why ozone is said to burn or irritate the lungs. People who are very young or very old, or who have chronic lung problems such as asthma are particularly sensitive to ground level ozone.

In any discussion of ozone, it is important to distinguish between the effects of ozone at the ground and ozone high in the atmosphere, several miles above our heads. An advertisement might use the slogan "good up high, bad nearby," to describe ozone. Regardless of where it is, no one would want to breathe it. However, up high in what's called the ozone layer, ozone is essential to the health of nearly every living thing, since it protects the Earth from harmful ultraviolet (UV) light. If not for this natural layer, UV light would sterilize the Earth's surface, and life as we know it would cease to exist. Near the ground, ozone reacts with buildings, plants, animals, and people, and is one of the most irritating, harmful components of smog. Smog refers to the whole mixture of air pollution in an area, and may include ozone, a whole host of other gases, and fine particles and the hazy conditions they cause. Ozone levels are consistently higher during the summer months.

NO_x are from burning of fuel in industry and motor vehicles. A significant amount of NO_x that are emitted during fossil fuel combustion is Nitrogen Oxide (NO). NO reacts quickly with ozone to form oxygen (O_2) and nitrogen dioxide (NO_2). For this reason ozone levels are depressed in urban areas and increase downwind in more rural areas where there are emissions of NO. NEA was placed to indicate O_3 levels coming into the City and leaving the City.

VOCs are organic compounds that evaporate readily, such as gasoline vapors and paint fumes. VOCs that come from human activities are called anthropogenic VOCs. Some anthropogenic VOCs, such as benzene, are themselves toxic and may increase risks of cancer or lead to other adverse health effects in addition to helping form ozone. Some VOCs are considerably more reactive in the atmosphere than others, and the reactivity of a VOC influences how quickly ozone forms. A compound that reacts quickly to produce ozone will have a much greater impact near its source than one that reacts more slowly.

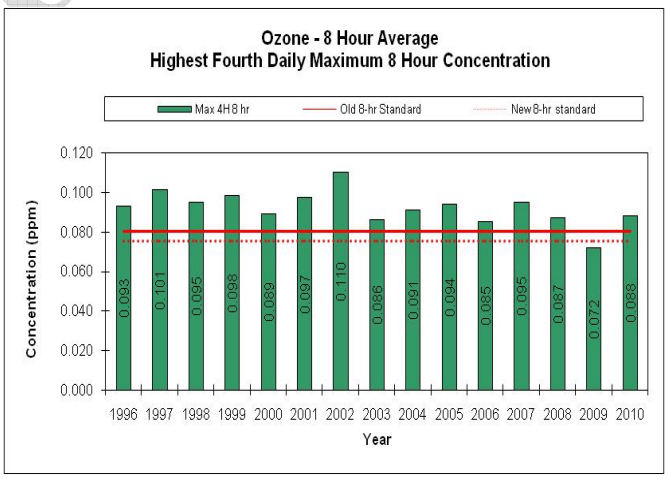
PROPOSED

Philadelphia and the surrounding counties are in nonattainment for the 8-hr ozone standard. This means that the standards set by the EPA for ozone are being exceeded. AMS continues efforts with surrounding agencies to get into compliance for ozone. A State Implementation Plan (SIP) is a plan which identifies how a State will attain the standard. Each State is required to have a SIP which contains control measures and strategies which demonstrate how each area will attain and maintain the NAAQS. These plans are developed through a public process, formally adopted by the State, and submitted by the Governor's designee to EPA. The graph below shows ozone trends just for Philadelphia.

On March 12, 2008, EPA revised the level of the primary and secondary 8-hour ozone standards to 0.075 ppm from 0.08 ppm. EPA is reconsidering the level as the NAAQS is not as protective as recommended by EPA's panel of science advisers, the Clean Air Scientific Advisory Committee. In the NAAQS final rule, EPA committed to issue a separate rule to address monitoring requirements necessary to implement the new standards. On July 8, 2009, the EPA proposed to revise the ozone air quality monitoring network design requirements (Federal Register - July 16, 2009.) Presently, states are required to operate a minimum numbers of EPA-approved ozone monitors based on the population of each of their MSA and the most recently measured ozone levels for each area. States also operate additional ozone monitors to meet objectives including assessment of compliance with the NAAQS, investigation of ozone transport issues, calculations of the Air Quality Index, verification of photochemical modeling efforts, and assessment of ozone-related effects on ecosystems with natural plants sensitive to air pollution damage. EPA is proposing to lengthen the required ozone monitoring season in many states to account for the tightened level of the revised NAAQS and require ozone monitors operated as part of a new multi-pollutant network to operate on a year-round schedule when the network is fully operational in 2011. EPA is proposing that the revised ozone monitoring season for existing monitors be effective for the 2011 monitoring season. This does not affect Philadelphia because our ozone monitors run all year long.

In 2010, Philadelphia and the surrounding counties were in nonattainment for the 8-hour ozone standard. This means that the standard set by the EPA for ozone was exceeded. This standard was exceeded 19 times in 2010. AMS, along with other local and regional air quality agencies, continues to work towards compliance with ozone standards.

Figure 35 - O_3 Trends



PROPOSED

Carbon Monoxide (CO)

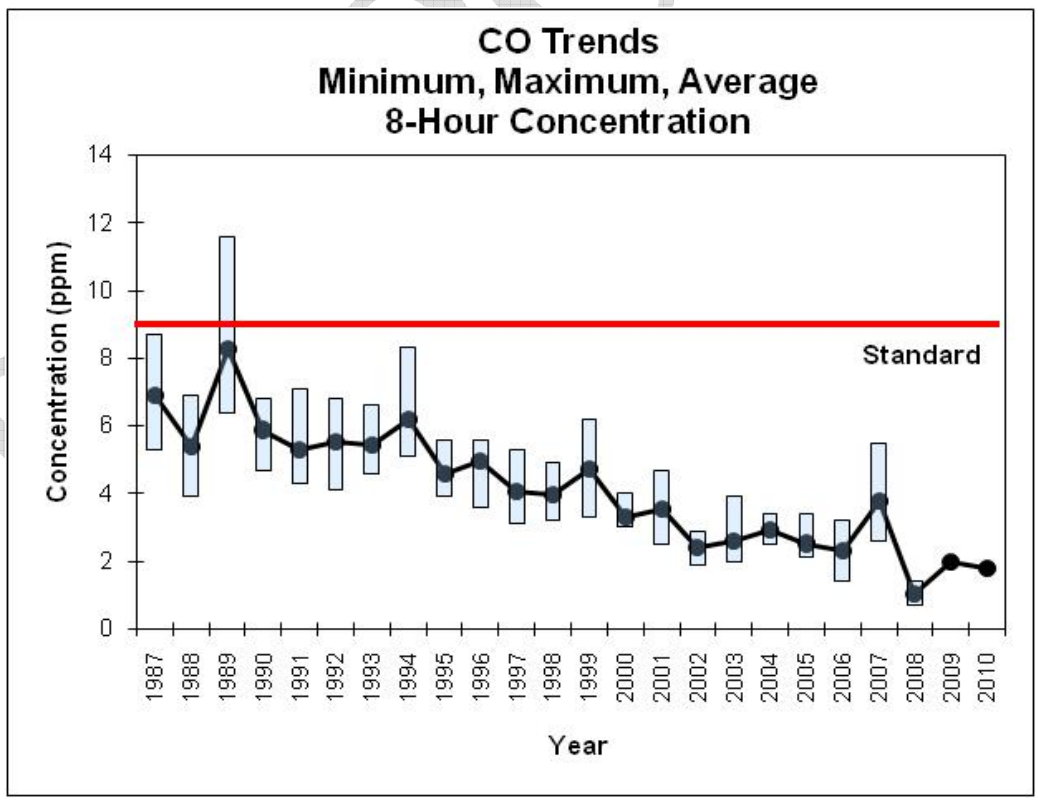
Principle of Operation
The basic principle by which the analyzer works is called Beer's Law. It defines the concentration of carbon monoxide by the amount of light of a specific wavelength that is absorbed by the carbon monoxide molecules over a fixed distance.

NAAQS:
Highest 2nd maximum 8-hour concentration = 9 ppm

Carbon monoxide (CO) is colorless, odorless, and at high concentrations is a poisonous gas. It is formed when carbon in fuels are not burned completely. By far the largest source of CO is motor vehicle emissions. It is for this reason that a monitor located at LAB is near roadways. Weather greatly affects CO levels, and peak CO concentrations typically occur during the colder months of the year.

Over the last two decades, there has been a continued reduction in carbon monoxide levels. This is mainly the result of federal requirements for cleaner automobiles and fuel and state inspection/maintenance programs.

Figure 36 - CO Trends



Nitrogen Dioxide (NO_2)

Principle of Operation
The concentration of nitric oxide [NO], total oxides of nitrogen [NO_X] and, by calculation, nitrogen dioxide [NO_2] is determined in a single instrument. The chemical reaction between nitric oxide [NO] and ozone [O_3] produces light (chemiluminescence). The concentration of nitric oxide is determined by the intensity of the light.

NAAQS:
Highest Annual Arithmetic Mean concentration = 0.053 ppm
Highest 98th percentile daily 1-hour concentration = 100 ppb

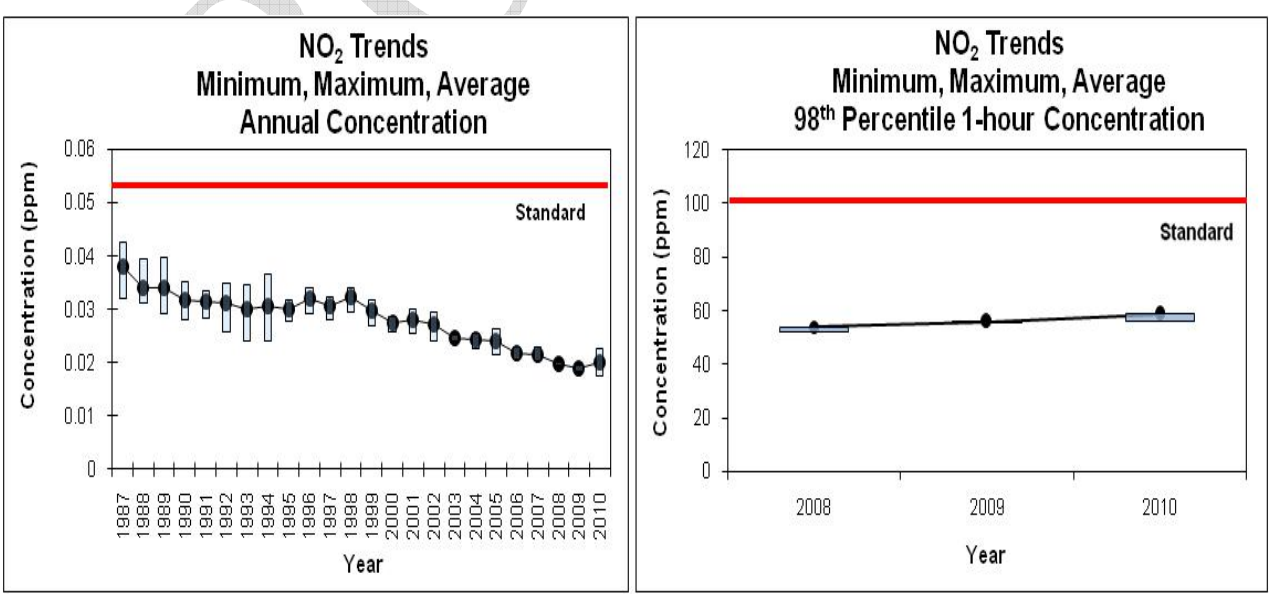
Nitrogen dioxide is a light brown gas that is an important component of urban haze. The compound is created primarily from fuel combustion in motor vehicles, utilities, and industrial sources.

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

Ambient levels of nitrogen dioxide in Philadelphia are better than the NAAQS showing a sustained downward trend over time for the annual standard.

On January 25, 2010, EPA added the primary 1-hour NO_2 standard of 100 ppb, to protect against short-term exposures, typically near major roads. Trends are shown for Philadelphia over the last few years. Any new monitors must be in operation by January 1, 2013.

Figure 37 - NO_2 Trends



Sulfur Dioxide (SO_2)

Principle of Operation
The concentration of SO_2 is based upon the measurement of fluorescence of SO_2 when it is exposed to Ultra Violet (UV) light (absorption of UV energy).

NAAQS:
Highest Annual Mean Concentration = 0.03 ppm
Highest Second Maximum 24 Hour Concentration = 0.14 ppm
Highest 99th percentile daily 1-hour concentration = 75 ppb*

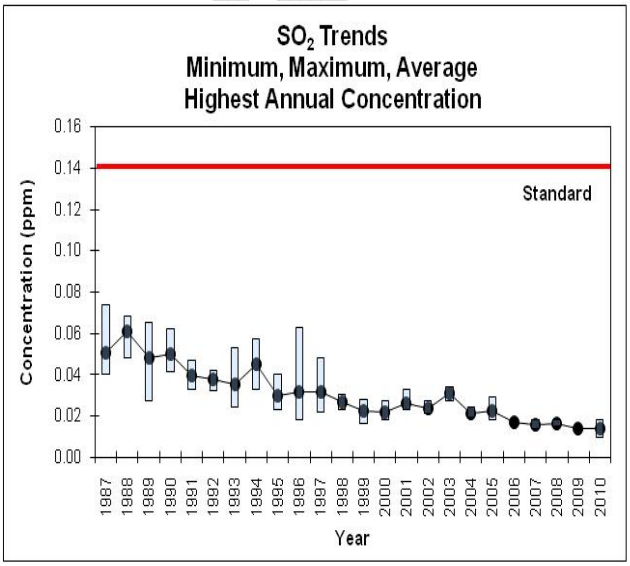
SO_2 is emitted from the burning of fuels that contain sulfur. Industrial grade fuel oils are the primary source in Philadelphia.

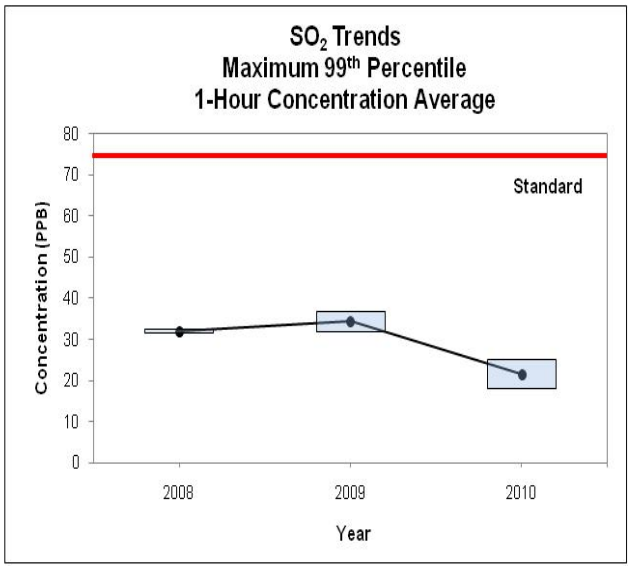
The major health concerns associated with exposure to high concentrations of SO_2 include effects on breathing, respiratory illness, alterations in the lungs' defenses, and aggravation of existing respiratory and cardiovascular disease. Together, SO_2 and NO_X are the major ingredients of acid rain. SO_2 also plays a significant role in the formation of fine particulate matter. Monitors are placed to better understand the impact of the City's major emitters of SO_2.

SO_2 levels are well within air quality standards and show a slow, continued improvement over time. This is mainly due to industry, businesses, and homes changing to fuels with lower sulfur content such as natural gas. In October 2006, ultra low sulfur diesel (ULSD) came on line for on-road vehicles producers were required to begin producing ultra ULSD to comply with new requirements that 80% of diesel fuel used for on-road vehicles must be ULSD.

On June 2, 2010, EPA revoked the primary annual and 24-hour SO_2 standards from 30 ppb and 140 ppb, respectively, to a 1-hour standard of 75 ppb.* Any new monitors must be in operation by January 1, 2013.

Figure 38 - SO_2 Trends





PROPOSED

Lead (Pb)

NAAQS:
Highest Rolling 3-Month Average Concentration = 0.15 μg/m^3

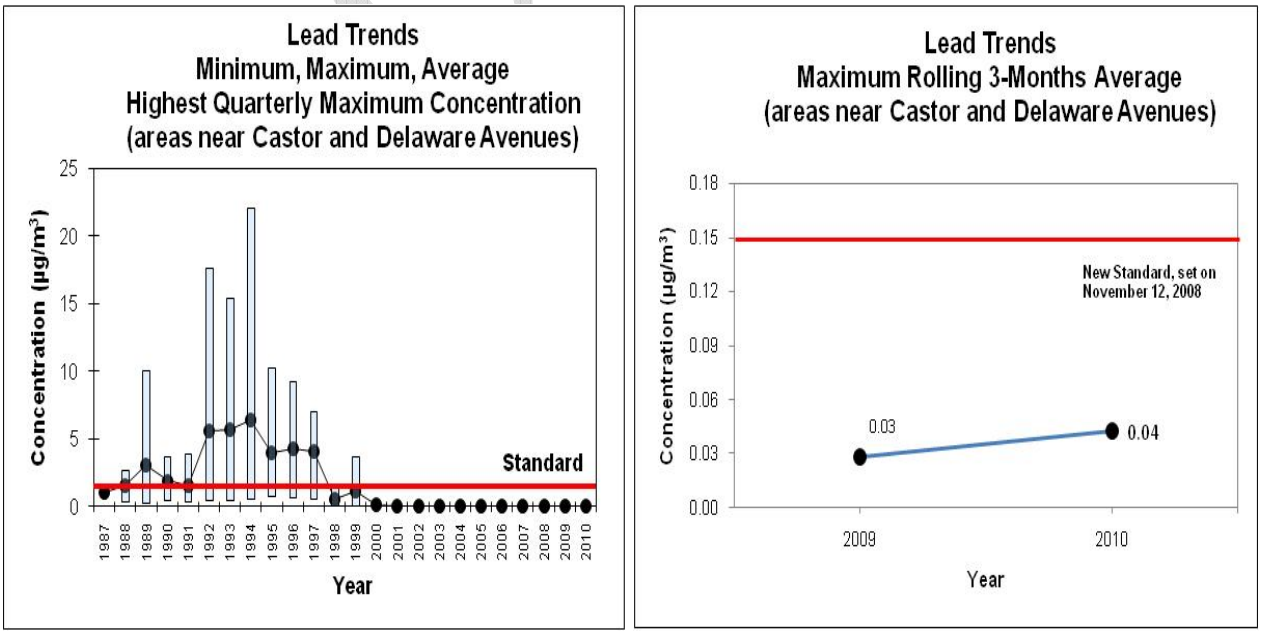
The processing of metals is the major source of lead emissions to the atmosphere. It does not travel over great distances in the air and so concentrations vary, with highest levels near particular industrial sites.

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

Ambient lead levels decreased significantly throughout the City due to the use of unleaded gasoline and greater control of emissions from companies that produce or process lead compounds. Lead levels in certain parts of the City were extremely high in the 1980's and 1990's due to the concentration of particular industries in the area. This is reflected in the previously high readings for monitors near Castor and Delaware Avenues. The levels of lead in these areas have drastically improved, and are now comparable to the rest of the City. Currently, AMS measures for ambient lead only at the BAX location.

On November 12, 2008, EPA strengthened the lead NAAQS standard from 1.5 μg/m^3 to 0.15 μg/m^3, measured as total suspended particles (TSP). AMS meets the new standard. EPA requires monitoring near lead sources with emissions of 0.5 to 1.0 tons per year. Philadelphia has no sources that emit 0.5 or more tons of Pb per year.

Figure 39 - Lead (Pb) Trends



Particulate Matter

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

PM_{10} and $PM_{2.5}$ are small particulate matter that measure less than 10 micrometers (0.00001 meters) and 2.5 micrometers (0.0000025 meters) respectively (1/30 thickness of human hair). These small particles penetrate deeply into the respiratory system and can have adverse health effects. In addition to health problems, particulate matter can cause reduced visibility, soiling, and damage to materials.

In 1997, the EPA revised the National Ambient Air Quality Standards to include fine particulate. Fine particles are made up of both primary (combustion) and secondary (formed in the air) sources. Particles remain airborne for long periods of time and disperse in uniform concentrations across wide areas, crossing geographic boundaries.

Fine particles are treated as though they are a single pollutant, but fine particles come from many different sources and are composed of thousands of different compounds. Fortunately, these compounds fall into a few dominant categories: sulfates, nitrates, ammonium compounds, soil, organic carbon compounds, and elemental carbon. Soot, also referred to as black carbon or elemental carbon, is emitted directly by diesel engines and forest fires, among other sources. Most individual particles are likely mixtures of different substances, the products of growing by collisions with other particles and by taking on gases.

Particulate Matter of less than 10 microns (PM_{10})

PM_{10}

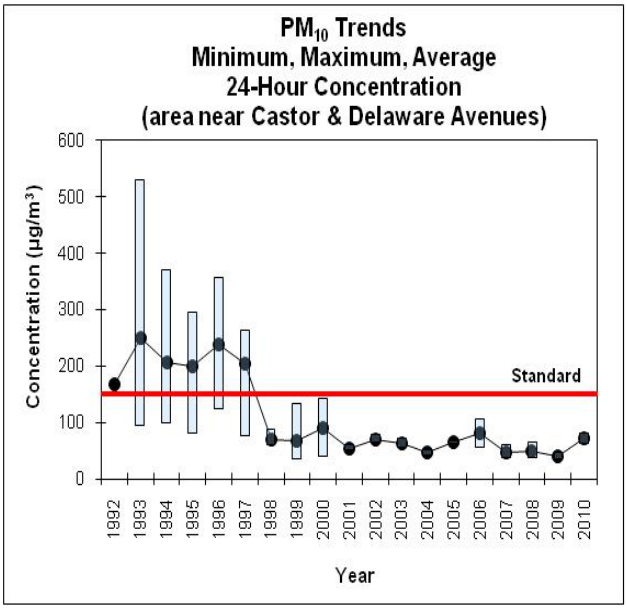
NAAQS:
Highest Second Maximum 24-Hour Concentration = 150 $\mu g/m^3$

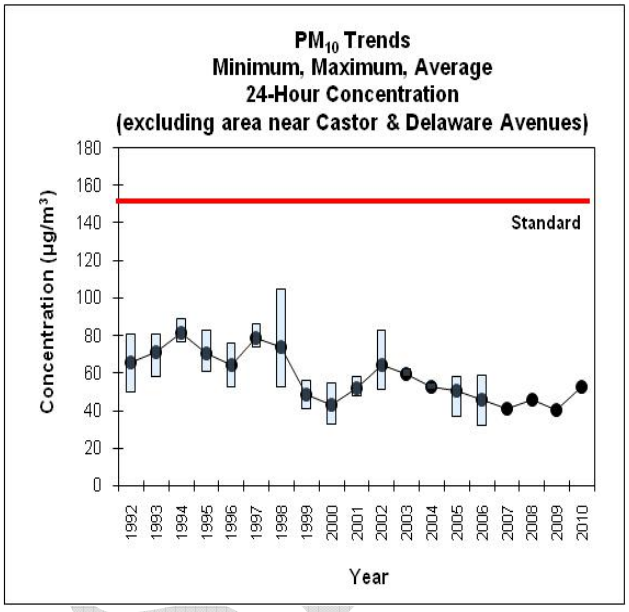
Particulate matter levels have been decreasing due to regulations limiting the amount of emissions allowed and the change to cleaner fuels such as natural gas by industry, businesses and homes.

There are two sets of trend charts shown for this pollutant. During the mid 1990s, particulate emissions from several sources in the area of Castor and Delaware Avenues caused extremely high localized measurements. In fact, the levels were many times higher than those measured at other City locations. Because the impact was not widespread, the additional chart is presented to highlight that fact. Specific action to abate these sources have resulted in air quality that now meets the national standards and are now comparable to levels in the rest of the City. Continuous PM_{10} data is used in the Air Quality Index. The graphs on the following page show PM_{10} trends.

PROPOSED

Figure 40 - PM_{10} Trends





Particulate Matter of less than 2.5 microns ($PM_{2.5}$)

$PM_{2.5}$

NAAQS:
Highest Annual Mean Concentration = 15 µg/m^3
Highest 98th Percentile 24 Hour Concentration = 35 µg/m^3

$PM_{2.5}$ consists of those particles that are less than 2.5 micrometers in diameter. They are also referred to as "fine" particles. Fine particles result from fuel combustion from motor vehicles, power generation, and industrial facilities, as well as from residential fireplaces and wood stoves. A significant amount of fine particles are also formed in the atmosphere by the transformation of gaseous emissions such as SO_2, NO_X, VOCs, and ammonia.

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

Revisions to the primary (health-based) NAAQS added the two new $PM_{2.5}$ standards, set at 15 µg/m^3 (annual standard) and 35 µg/m^3 (daily standard). Effective December 18, 2006, EPA strengthened the 24-hour $PM_{2.5}$ standard from the 1997 level of 65 µg/m^3 to 35 µg/m^3.

Measuring $PM_{2.5}$ requires highly sensitive equipment under tight temperature and humidity control. Philadelphia is in nonattainment for the 24-hour $PM_{2.5}$ standard, but is now in attainment for the annual $PM_{2.5}$ standard.

Monitors are placed to assess public exposure high levels. Continuous $PM_{2.5}$ data is used in the Air Quality Index. Speciation shows the make-up of $PM_{2.5}$ in the City in general and the impact of large sources of emissions.

Figure 41 shows we met the $PM_{2.5}$ 24-hour standard in 2008, 2009, and 2010. The Design Value, which is used to demonstrate attainment, is based on a 3-year average of annual 98th percentile values. Figure 42 shows Philadelphia and the surrounding areas met the annual $PM_{2.5}$ standard for Years 2008 - 2010. The Design Value is based on a 3-year average of annual averages.

Figure 41 - $PM_{2.5}$ Trends

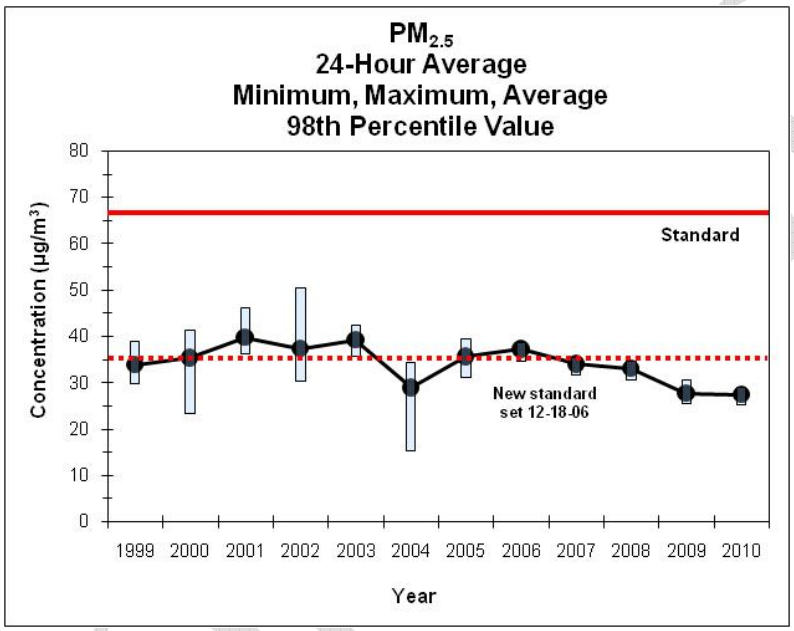
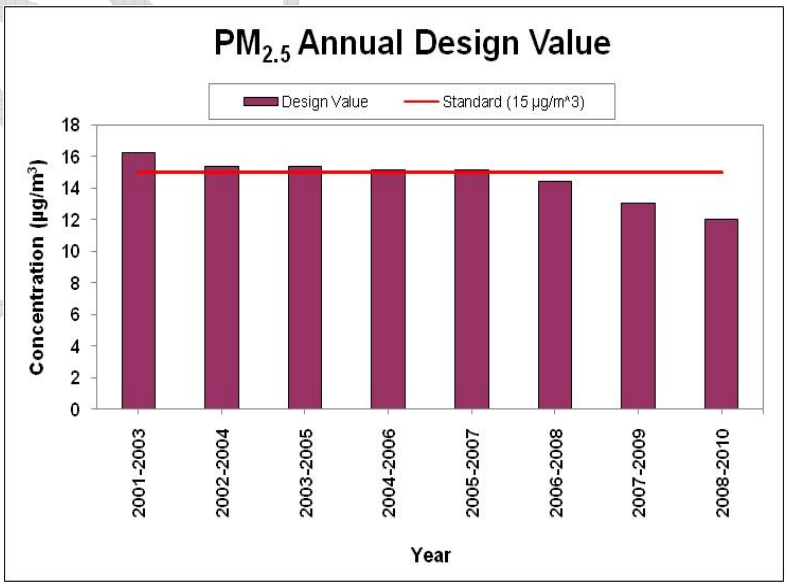


Figure 42 - $PM_{2.5}$ Design Values



Toxics

Air toxics, also referred to as toxic air pollutants or hazardous air pollutants (HAPs), are substances that cause adverse health effects or environmental damage. The Federal Clean Air Act Amendments (CAAA) of 1990 lists 187 pollutants or chemical groups as HAPs. Examples of air toxics include heavy metals (such as beryllium), organic chemicals (such as formaldehyde), polycyclic organic matter (POM, which are formed primarily by combustion), benzene (which is found in gasoline), and pesticides, fine mineral fibers, and asbestos. HAPs are emitted from stationary sources (large industrial facilities), area sources (dry cleaners and household uses), as well as mobile sources (trucks and buses).

The mix of monitor locations provides information on public exposure from major industry, road traffic, and background.

There is less information known about the health impact from the 187 HAPS than there are for criteria pollutants, and no national standards exist for them. However, a number of these pollutants are known or suspected to be carcinogenic, and there is no known "safe concentration." The danger posed by toxics is often referred to in terms of risk. Risk is defined as the likelihood of a negative outcome from a certain level of a specific chemical, or the measure of a chance that health problems will occur. For example, many toxics cause cancer, while others cause respiratory problems, birth defects, neurological or, immune response problems, and other health concerns. Toxics have varying degrees of danger, and some will cause harm with a very small amount of the substance while others require large amounts to have a negative effect. Risk is often expressed as the additional number of deaths that would occur over 70 years (a lifetime) than would have occurred without that ambient concentration of that pollutant. For example, one in a million implies that one person out of every million people would live longer without that amount of that pollutant in the air.

AMS is helping to reduce HAPs in Philadelphia by enforcing Federal, State, and locally mandated programs that limit emissions from stationary and area sources. Many toxic emissions have been reduced by regulations designed to bring Philadelphia into compliance with the NAAQS for Ozone. In addition, Philadelphia enforces the National Emission Standards for Hazardous Air Pollutants (NESHAP), a program to reduce emissions from existing major and area sources, as well as New Source Performance Standards (NSPS), which limit toxic emissions from new sources.

Since diesel emissions are a significant, but not quantified, contributing factor to health risks from toxic emissions, AMS continues working to promote voluntary emissions reductions from diesel vehicles and to bring clean diesel technology to the Philadelphia area. The Philadelphia Diesel Difference Working Group, a coalition of diverse stakeholders whose primary purpose is to reduce the air pollutants associated with diesel-powered engines in the greater Philadelphia area, meets on a monthly basis. The group is currently compiling lists of diesel fleets interested in initiating retrofit or clean fuel projects. The list may help position the Philadelphia area for anticipated Federal funding. More information on this program can be found at www.cleanair.org/dieseldifference.

PROPOSED

AMS has historically measured toxic pollutants at the Laboratory (LAB) and more recently at the Community Health Services (CHS), Roxborough (ROX), Ritner (RIT) and PHL Airport (SWA) monitoring sites.

As part of EPA's National Air Toxics Assessment (NATA) activities, the latest, the 2005 NATA, was made available to the public in March of 2011. 180 of the 187 Clean Air Act air toxics plus diesel particulate matter were assessed for either lifetime cancer risk or noncancer hazard due to inhalation. NATA is EPA's ongoing comprehensive evaluation of air toxics in the U.S. These activities include expansion of air toxics monitoring, improving and periodically updating emission inventories, improving national- and local-scale modeling, continued research on health effects and exposures to both ambient and indoor air, and improvement of assessment tools. The goal of NATA is to identify those air toxics which are of greatest potential concern, in terms of contribution to population risk. The results will be used to establish strategies to reduce emissions and these set priorities or programs and the collection of additional air toxics data.

The assessment includes four steps:

- Compiling a national emissions inventory of air toxics emissions from outdoor sources.
- Estimating ambient concentrations of air toxics across the contiguous United States.
- Estimating population exposures across the contiguous United States.
- Characterizing potential public health risk due to inhalation of air toxics including both cancer and noncancer effects.

The 2005 NATA indicated high health risks in the City. Philadelphia ranked 87th in the country based on average risk. To better understand the air toxic problem and promote actions to reduce the risks caused by these pollutants, the Philadelphia Air Toxic Project was initiated by EPA Region III and Air Management Services to develop a more accurate emission inventory, develop modeling systems, identify sources, identify stakeholders and gather background information so a process can be developed to reduce emissions. Activities associated with the river ports and the airport appear to be a significant source of diesel particulate.

AMS has determined health risks associated with the concentrations of air toxics measured at the City's air toxic monitoring sites. Annual averages for each of the compounds at each monitoring site were calculated and used to estimate the risk from inhalation exposure to ambient air for cancer and non-cancer health effects.

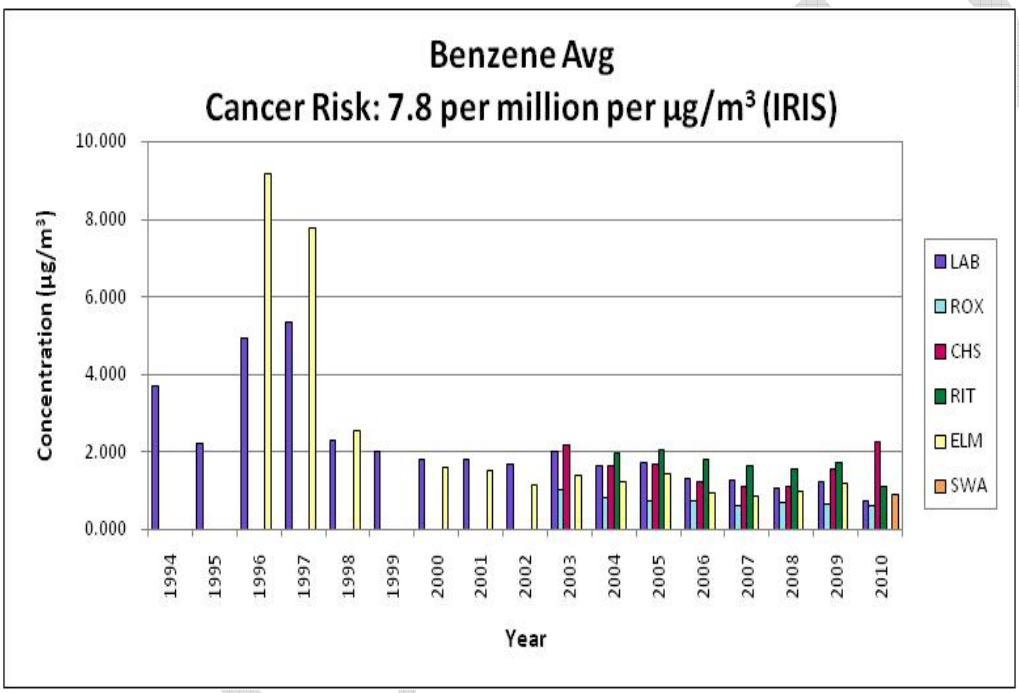
The risk calculation is based upon the standard methodology used by EPA. The excess lifetime cancer risk for each of the chemical compounds was calculated using unit risk factors (URFs). The URF is the measure of the probability of developing cancer from exposure over a lifetime to a specified concentration of a given chemical. Air toxics that are being measured in Philadelphia that show an excess lifetime cancer risk of 1 or more out of a million are:

1,3-butadiene (Cas RN 106-99-0) - A colorless, non-corrosive gas with a mild aromatic or gasoline-like odor, used primarily as a monomer to manufacture many different types of polymers and copolymers.
acetaldehyde (Cas RN 75-07-0) - A colorless liquid or gas with a fruity odor. It is used to manufacture many other chemicals.
benzene (Cas RN 71-43-2) - A colorless liquid with a pleasant odor. It is used mainly in making other chemicals and plastics, as a solvent, and is found in trace amounts of gasoline.

carbon tetrachloride (Cas RN 56-23-5) - A colorless liquid with an ether-like odor. It is used as a solvent and in making fire extinguishers, refrigerants, and aerosols.
formaldehyde (Cas RN 50-00-0) - a colorless, flammable gas that has a distinct, pungent smell. It is used in the production of fertilizer, paper, plywood and urea-formaldehyde resins.
tetrachloroethylene (Cas RN 127-18-4) - A clear liquid with a sweet, chloroform-like odor. It is used in dry cleaning and metal degreasing. Its other common name is perchloroethylene.

Below is a graph of benzene trends over time.

Figure 43 - Benzene Trends



Appendix A: Probe and Monitoring Path Siting Criteria

Below is a summary of the general requirements for probe and monitoring path siting criteria.

Table 14 - Table E-4 of Appendix E to 40 CFR Part 58 - Summary of Probe and Monitoring Path Siting Criteria

Pollutant	**Scale (maximum monitoring path length, meters**	**Height from ground to probe, inlet or 80% of monitoring path \1**	**Horizontal and vertical distance from supporting structures \2\ to probe, inlet or 90% of monitoring path \1\ (meters)**	**Distance from trees to probe, inlet or 90% of monitoring path \1\ meters**	**Distance from roadways to probe, inlet or monitoring path \1\ (meters)**
SO_2 \3\,\4\,\5\,\6\	Middle (300 m) Neighborhood, Urban and Regional (1 km)	2-15	> 1	10	N/A
CO \4\,\5\,\7\	Micro, middle (300 m) Neighborhood (1 km)	3 +/-\1/2\:2-15	> 1	10	Table E-2 of 40 CFR 58 Appendix E for middle and neighborhood scales
NO_2, O_3 \3\,\4\,\5\	Middle (300 m) Neighborhood, Urban, and Regional (1 km)	2-15	> 1	10	Table E-1 of 40 CFR 58 Appendix E for all scales
O_3 precursors (for PAMS) \3\,\4\,\5\	Neighborhood and Urban (1 km)	2-15	> 1	10	Table E-1 of 40 CFR 58 Appendix E for all scales
PM, Pb \3\,\4\,\5\,\6\,\8\	Micro: Middle, Neighborhood, Urban and Regional	2-7 (micro); 2-7 (middle $PM_{10-2.5}$); 2-15 (all other scales)	> 2 (all scales, horizontal distance only)	10 (all scales)	2-10 (micro), Figure E-1 40 CFR 58 for all other scales

PROPOSED

N/A_Not applicable.
\1\ Monitoring path for open path analyzers is applicable only to middle or neighborhood scale CO monitoring and all applicable scales for monitoring SO_2,O_3, O_3 precursors, and NO_2.
\2\ When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.
\3\ Should be >20 meters from the dripline of tree(s) and must be 10 meters from the dripline when the tree(s) act as an obstruction.
\4\ Distance from sampler, probe, or 90% of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path. Sites not meeting this criterion may be classified as middle scale (see text).
\5\ Must have unrestricted airflow 270 degrees around the probe or sampler; 180 degrees if the probe is on the side of a building.
\6\ The probe, sampler, or monitoring path should be away from minor sources, such as furnace or incineration flues. The separation distance is dependent on the height of the minor source's emission point (such as a flue), the type of fuel or waste burned, and the quality of the fuel (sulfur, ash, or lead content). This criterion is designed to avoid undue influences from minor sources.
\7\ For microscale CO monitoring sites, the probe must be >10 meters from a street intersection and preferably at a midblock location.
\8\ Collocated monitors must be within 4 meters of each other and at least 2 meters apart for flow rates greater than 200 liters/min or at least 1 meter
apart for samplers having flow rates less than 200 liters/min to preclude airflow interference.

Table 15 - Table E-2 to Appendix E of Part 58. Minimum Separation Distance Between Roadways and Probes or Monitoring Paths for Monitoring Neighborhood Scale Carbon Monoxide

Roadway average daily traffic, vehicles per day	Minimum distance \9\ (meters)
[le]10,000	10
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
>=60,000	150

\9\ Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table.

PROPOSED

Table 16 - Table E-1 to Appendix E of Part 58. Minimum Separation Distance Between Roadways and Probes or Monitoring Paths for Monitoring Neighborhood and Urban Scale Ozone (O_3) and Oxides of Nitrogen (NO, NO_2, NO_X, NO_y)

Roadway average daily traffic, vehicles per day	Minimum distance \10\ (meters)	Minimum distance 10, 11 (meters)
[le]1,000	10	10
10,000	10	20
15,000	20	30
20,000	30	40
40,000	50	60
70,000	100	100
>=110,000	250	250

\10\ Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.
\11\ Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

Values based on the actual traffic count.

Figure 44 - Figure E-1, 40 Part 58 App. E – Distance of PM Samplers to Nearest Traffic Lane (meters)

PROPOSED

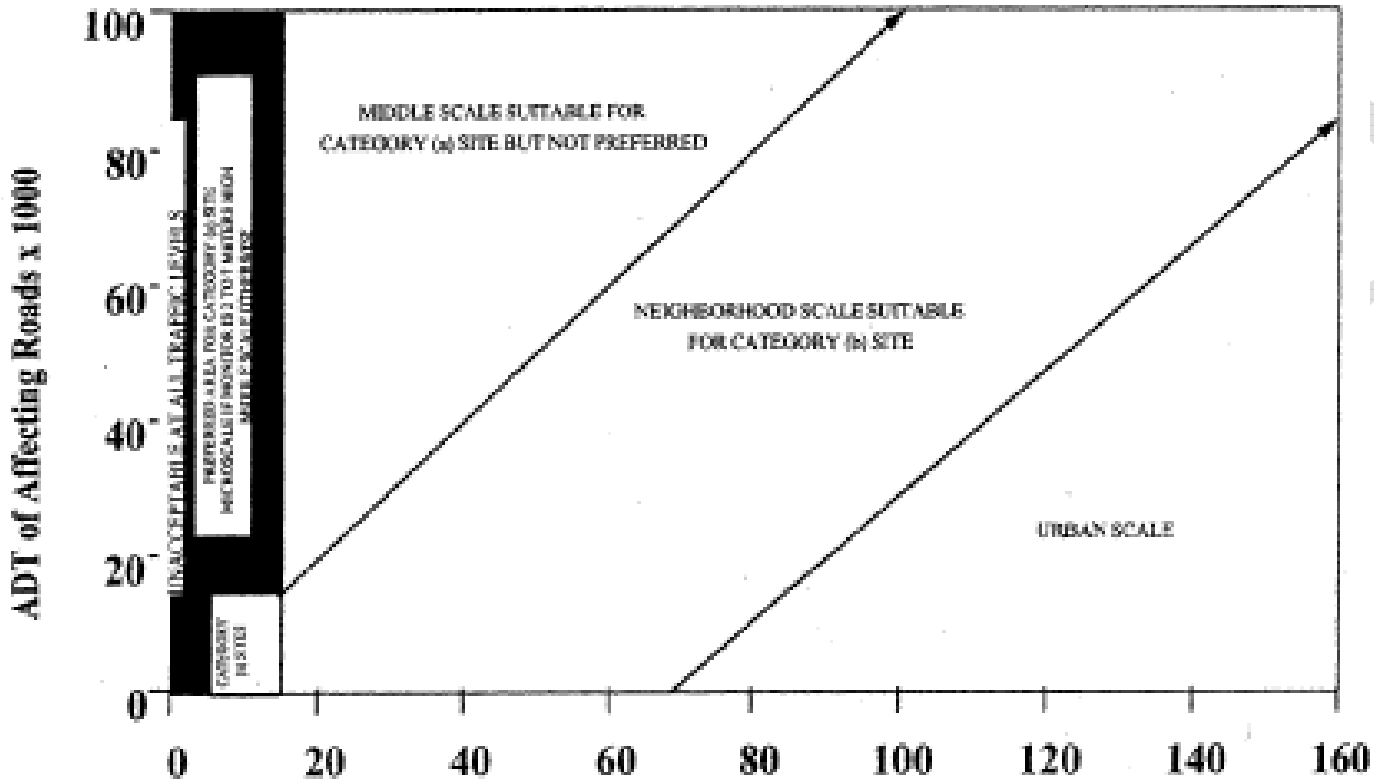


Figure E-1. Distance of PM samplers to nearest traffic lane (meters)

Appendix B: PAC Proposed Site

Table 17 - Detailed PAC Information

AMS Site

PAC

AQS Site Identification

421010065

Street Address

Washington Ave & S. Columbus Blvd

Geographical Coordinates

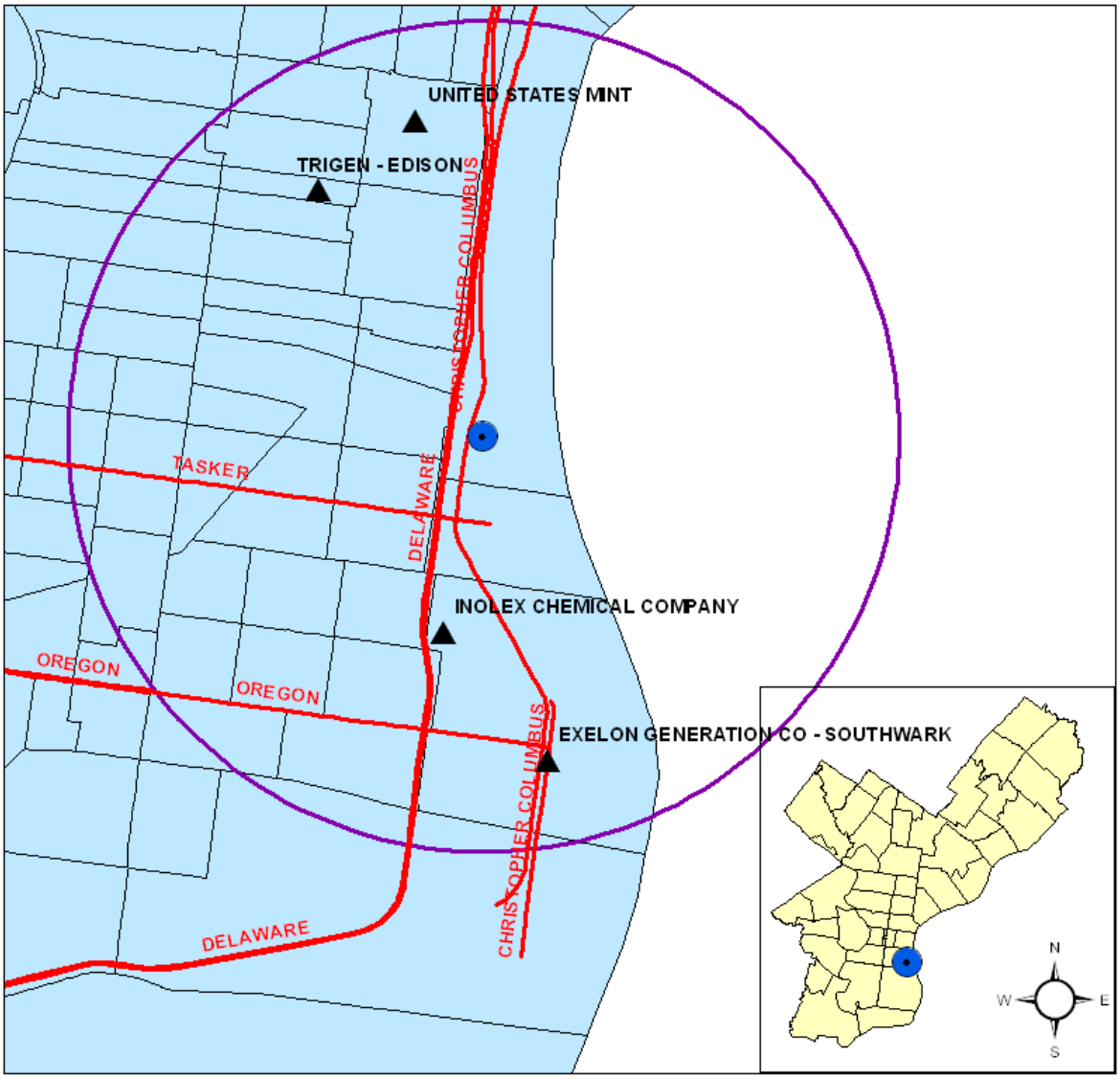
Latitude:
39.93273
Longitude:
-75.142445

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PM2.5 FRM	SLAMS	3rd day	R&P PM2.5	Gravimetric	NAAQS Compliance	118	Neighborhood	Population Exposure		
TSP Metals	SLAMS	6th day	Hi-Vol	Atomic Absorption	Analysis by AMS inludes lead, co-located, lead is reported to AQS	92				
Carbonyls	Urban Air Toxics	6th day	DNPH-Coated Cartridges			102				
Toxics	Urban Air Toxics	6th day	Canister Subambient Pressure	Multi-Detector GC		101				
PM10 SSI	SLAMS	6th day	Hi-Vol-SA/GMW-321-B	Gravimetric	Quartz Filter	64				
BaP	Urban Air Toxics	6th day	Hi-Vol	Thin Layer Chromatography	Analysis by Allegheny County, PA	91				

PROPOSED

Figure 45 - PAC Monitoring Site Map with Major Streets and Major Emission Sources

PACKER AVE SITE - WASHINGTON AVE & S. COLUMBUS BLVD
EPA AIRS CODE:421010065



			2009 EMISSIONS (IN TONS/YR)							
PLID	NAME	STREET	CO	NO_2	PB	PM_{10}	$PM_{2.5}$	PT	SO_2	VOC
2059	INOLEX CHEMICAL COMPANY	JACKSON AND SWANSON STS	9.67	17.48	0.00	1.48	1.14	2.07	11.59	6.13
4902	TRIGEN - EDISON	908 SANSOM ST	12.12	97.12	0.00	4.71	3.05	5.23	172.89	0.68
4905	EXELON GENERATION CO - SOUTHWARK	2501 S DELAWARE AVE	0.11	0.80	0.00	0.14	0.00	0.14	0.23	0.00
9703	UNITED STATES MINT	151 N INDEPENDENCE MALL EAST	1.30	0.80	0.00	0.06	0.06	0.06	0.02	4.21
		TOTAL	23.20	116.20	0.00	6.39	4.25	7.50	184.73	11.02

Figure 46 - PAC Aerial View