MARYLAND

DEPARTMENT OF THE ENVIRONMENT

AMBIENT AIR MONITORING NETWORK PLAN for CALENDAR YEAR 2018

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

Revised Table 3-4 on July 6, 2017

MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard | Baltimore, MD 21230 | www.mde.maryland.gov
410-537-3000 | 800-633-6101 | TTY Users: 800-735-2258
Lawrence J. Hogan, Jr., *Governor* | Boyd K. Rutherford, *Lt. Governor*
Ben Grumbles, *Secretary*

This page is intentionally blank.

TABLE OF CONTENTS

Section **Page**

TABLE OF FIGURES

Title **Page**

TABLE OF TABLES

Title **Page**

ACRONYMS AND DEFINITIONS

AADT	Annual Average Daily Traffic
AQS	Air Quality System
AQS ID	9-digit site identification number in AQS database
ARMA	MDE's Air and Radiation Management Administration
BAM	Beta Attenuation [Mass] Monitor-for measuring continuous particulate matter
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CASTNET	Clean Air Status and Trends Network
CBSA	Core Based Statistical Area
CFR	Code of Federal Regulations
CSA	Combined Statistical Area
CSN	Chemical Speciation Network
CO	Carbon Monoxide
DRR	Data Requirement Rule
EGU	Electrical Generating Unit
FE-AADT	Fleet Equivalent Annual Average Daily Traffic
FEM	Federal Equivalent Method-EPA approved method designated as equivalent to the Federal Reference Method (FRM) for a specific pollutant to compared to the applicable NAAQS
FID	Flame Ionization Detector
FRM	Federal Reference Method-EPA approved reference method necessary for a specific pollutant to be compared to the applicable NAAQS
GC	Gas Chromatograph
HAPS	Hazardous Air Pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	Infrared (radiation)
MDE	Maryland Department of the Environment
MSA	Metropolitan Statistical Area
NAA	Non-Attainment Area
NAAQS	National Ambient Air Quality Standards-used for determining attainment status
NCore	National Core multi-pollutant monitoring stations
NEI	National Emissions Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
nm	Nanometer, an SI unit for measuring length; 1 nm equals 10^{-9} meter.
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen (ozone precursor)
NO_y	Total Reactive Nitrogen Species (ozone precursor)
O_3	Ozone
OAQPS	EPA's Office of Air Quality Planning & Standards (Research Triangle Park, NC)
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 μm
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 μm

$PM_{10-2.5}$	Pronounced “PM coarse” - Particulate matter with an aerodynamic diameter less than or equal to 10 μm minus particulate matter with an aerodynamic diameter less than or equal to 2.5 μm
PQAO	Primary Quality Assurance Organization
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
SIP	State Implementation Plan
SLAMS	State or Local Air Monitoring Stations
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPM	Special Purpose Monitor
STN	$PM_{2.5}$ Speciation Trends Network
TSP	Total suspended particulate
μm	Micrometer (10^{-6} meter)
US EPA	United States Environmental Protection Agency
UV	Ultraviolet
VOCs	Volatile Organic Compounds

1. INTRODUCTION

In 1970, Congress passed the Clean Air Act (CAA) that authorized the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants shown to threaten human health and welfare. Primary standards were set according to criteria designed to protect public health, including an adequate margin of safety to protect sensitive populations such as children and asthmatics. Secondary standards were set according to criteria designed to protect public welfare (decreased visibility, damage to crops, vegetation, buildings, etc.). As part of the CAA, both local and state air quality agencies are required to maintain and operate ambient air quality monitoring networks.

The six pollutants that currently have NAAQS are: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead (Pb). They are commonly called the "criteria" pollutants. When air quality does not meet the NAAQS for one of the criteria pollutants, the area is said to be in “non-attainment” with the NAAQS for that pollutant.

On June 1, 2015, EPA made the determination that the Baltimore, Maryland Moderate Non-Attainment Area (Baltimore NAA) has attained the 2008 8-hour ozone NAAQS for ground-level ozone. On October 1, 2015, EPA strengthened the NAAQS for ground-level ozone to 70 parts per billion (ppb), based on extensive scientific evidence about ozone’s effects on public health and welfare. The updated standards will improve public health protection, particularly for at-risk groups including children, older adults, people of all ages who have lung diseases such as asthma, and people who are active outdoors, especially outdoor workers. They also will improve the health of trees, plants, and ecosystems. EPA anticipates making attainment/non-attainment designations for the 2015 ozone NAAQS, based on 2014-2016 air quality data, by late 2017. Formal attainment plans for the 2015 standards, if needed, are not anticipated to be due until 2020 or 2021.

On December 16, 2014, EPA approved Maryland's request to redesignate the Baltimore NAA to “Attainment” for the 1997 annual $PM_{2.5}$ NAAQS. The Baltimore NAA also attains the 2008 $PM_{2.5}$ annual standard and continues to attain that standard. The Baltimore NAA includes the following: Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties, and Baltimore City.

On June 30, 2016, the EPA designated portions of Maryland’s Anne Arundel County and Baltimore County as non-attainment for the 2010 1-hour SO_2 NAAQS. The NAA extends approximately 26.8 kilometers (16.6 miles) from the Herbert A. Wagner’s Unit 3 stack, which is located at 39.17765N latitude and 76.52752W longitude. Figure 1-1 shows the location of Wagner Unit 3, other power plant SO_2 emitters, and the NAA boundary. EPA designated Baltimore City as unclassifiable/attainment and thus is not part of the NAA.

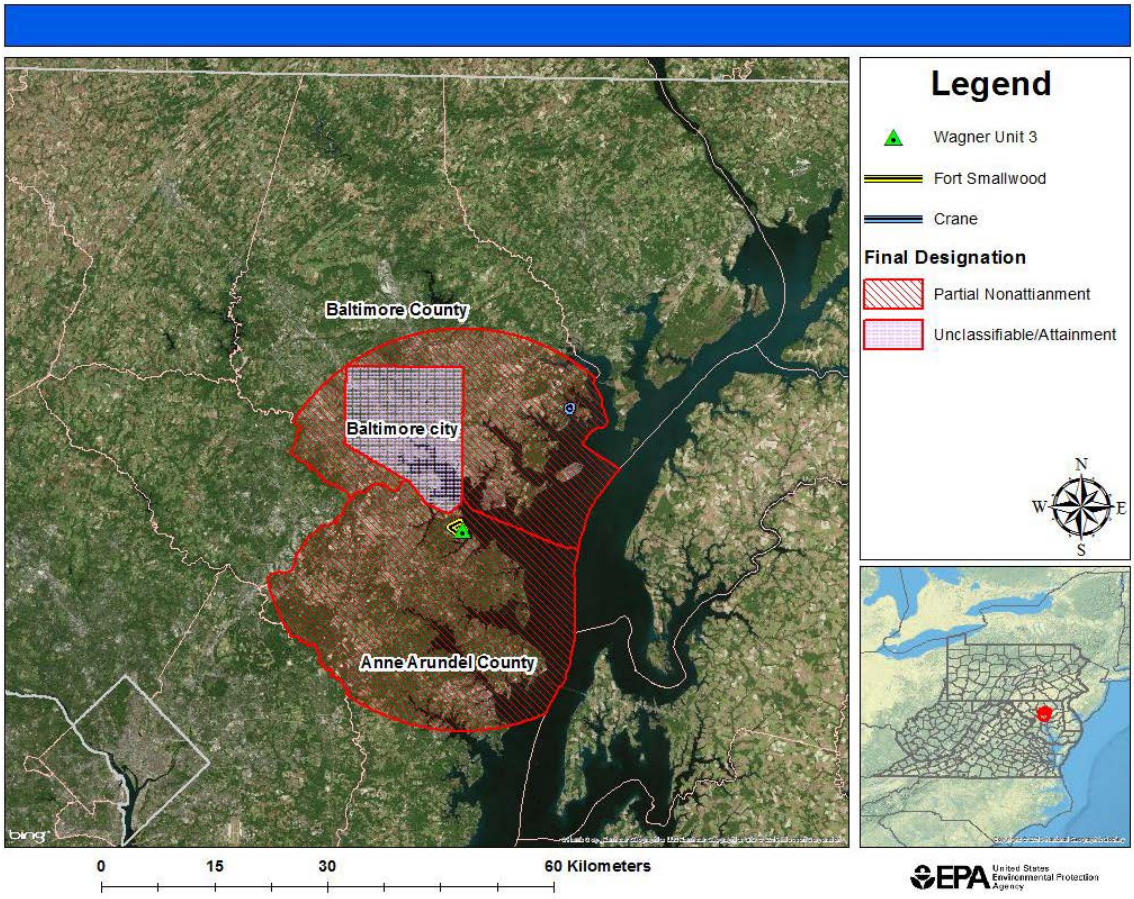

Figure 1-1 Map showing location for SO_2 non-attainment area in Anne Arundel and Baltimore Counties, Maryland.

A Core Based Statistical Area (CBSA) is a U.S. geographic area defined by the Office of Management and Budget (OMB) that centers on an urban center of at least 10,000 people and adjacent areas that are socioeconomically tied to the urban center by commuting. The term "CBSA" refers collectively to both metropolitan statistical areas (MSA's) and micropolitan statistical areas. The OMB released new standards based on the 2010 Census on February 28, 2013. For the purposes of the Maryland Air Monitoring Network, the terms CBSA and MSA are interchangeable. The names and boundaries of the MSA's in Maryland are shown in Table 1-1 and Figure 1-2. Counties outside of Maryland are included in the map because they are part of the MSA; however, this document will address only monitors in Maryland.

Table 1-1 Maryland's MSA's. Source: Maryland Dept. of Planning, 2012 estimates (http://www.mdp.state.md.us/msdc/census/cen2010/MetroAreaMap/table2.pdf)

MSA Name	Population	Maryland Counties in the MSA
Baltimore-Towson, MD	2,753,149	Carroll, Baltimore County, Baltimore City, Harford, Howard, Anne Arundel, Queen Anne's
Hagerstown-Martinsburg, MD-WV	256,278	Washington
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	Frederick, Montgomery, Prince George's, Charles, Calvert
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	Cecil
Salisbury, MD-DE	381,868	Somerset, Wicomico, Worchester

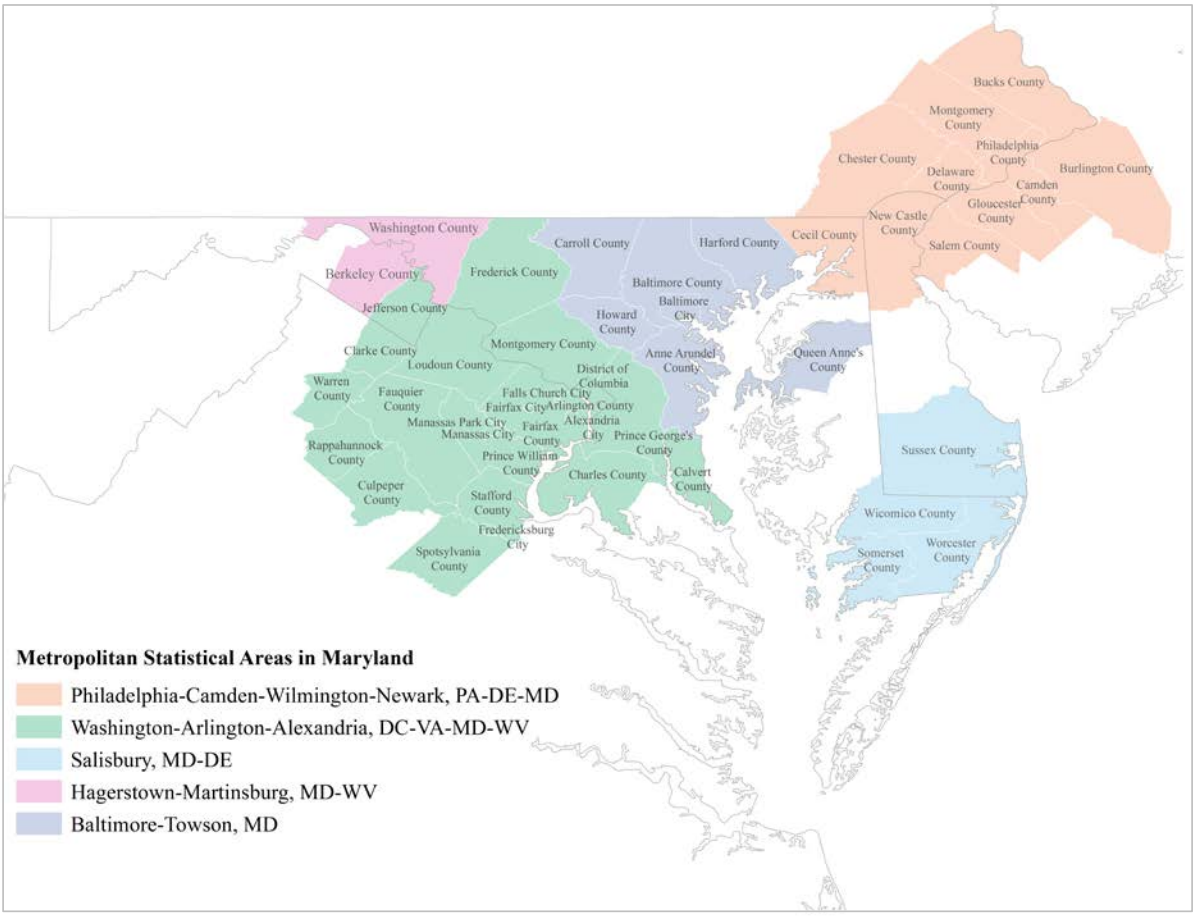

Figure 1-2 Map showing MSA's in Maryland.

The original EPA ozone precursor revisions to the air monitoring regulations (40 CFR Part 58) required by Title 1, Section 182 of the 1990 Clean Air Act Amendments (CAAA) were promulgated on February 12, 1993. The CAAA requires that the States incorporate enhanced monitoring for ozone, speciated volatile organic compounds (VOC's), oxides of nitrogen (NO_x), carbonyls, and surface as well as upper air meteorological parameters (MET) into their State Implementation Plan (SIP). The Part 58 regulations refer to these enhanced monitoring stations as photochemical assessment monitoring stations (PAMS). The PAMS monitoring rules were revised along with the new 2015 ozone NAAQS in 2015. States are required to comply with revised regulations by the 2019 ozone monitoring season. The final rule streamlines and modernizes the PAMS network to use monitoring resources most efficiently. There are no ambient standards for any of the VOC's.

Section 112 of the CAA currently identifies 187 hazardous air pollutants (HAPS), also referred to as air toxics, and requires EPA to regulate facilities that emit one or more of these air toxics. EPA Region III has developed a Cooperative Air Toxics Monitoring Program, and MDE operates several air toxics sites as part of the program. MDE also provides analytical support for other sampling sites in EPA Region III.

As part of the CAA, states are required to submit an annual network plan to the U.S. EPA for review and approval. Since 2007, EPA has required State and Local Air Pollution Control Agencies to make this plan available for public inspection at least thirty days prior to formal submission to EPA. This document will be available for public comment on the MDE website.

MDE is also required to certify the air quality monitoring data every May 1st for the previous calendar year's data. MDE's air quality monitoring data for 2015 were certified on May 1, 2016.

2. REQUIREMENTS FOR MONITORING NETWORK DESCRIPTIONS

In October 2006, the U.S. EPA issued final regulations concerning state and local agency ambient air monitoring networks. These regulations require an annual monitoring network plan including the information described below. The annual monitoring network plan as described in §58.10 must contain the following information for existing and proposed sites:

- The Air Quality System (AQS) site identification number
- The location, including street address and geographical coordinates
- The sampling and analysis method(s) for each measured parameter
- The operating schedules for each monitor
- Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal
- The identification of sites that are suitable and sites that are non-suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in §58.30
- The monitoring objective and spatial representative scale for each monitor
- The Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA) or other area represented by the monitor

3. MARYLAND AIR MONITORING NETWORK

Maryland currently operates 25 air monitoring sites around the state that measure ground-level concentrations of criteria pollutants, air toxics, meteorological parameters, and research-oriented parameters (Tables 3-1 and 3-2.) Two of the sites are 'Haze Cams', cameras exclusively used to monitor visibility. Although monitoring takes place statewide, most of the stations are concentrated in the urban/industrial areas that have the highest population and number of pollutant sources. This network is maintained and operated by the Ambient Air Monitoring Program, Air and Radiation Management Administration (ARMA), Maryland Department of the Environment (MDE). A comprehensive air monitoring network map is shown in Fig 3-1. Additional topographic and aerial maps and site descriptions are provided in Appendix A.

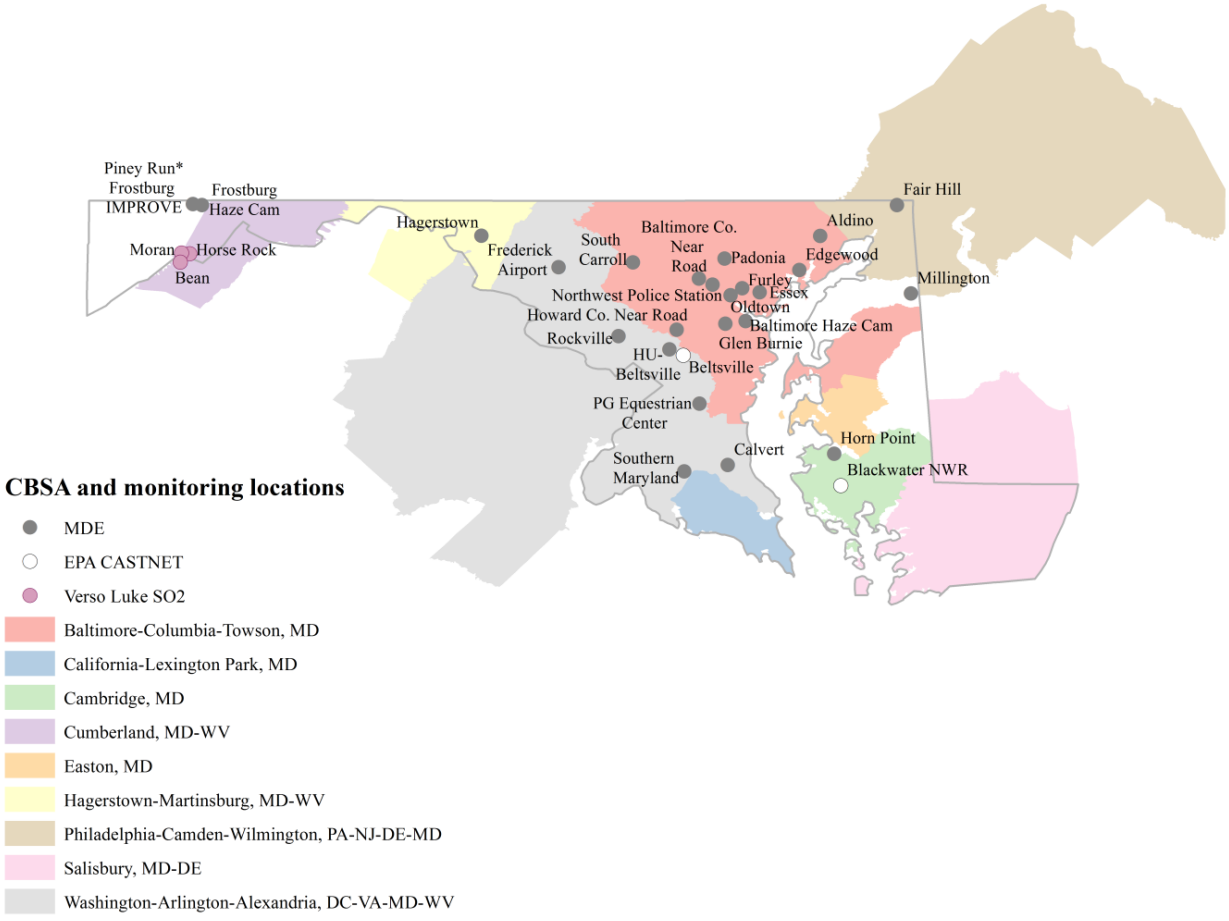

Figure 3-1 Maryland's Current Air Monitoring Network Map.

In addition to the 25 monitoring stations operated by MDE, two CASTNET sites are located in Maryland: Blackwater National Wildlife Refuge and Beltsville (Figure 3-1). CASTNET, the Clean Air Status and Trends Network, is a long-term environmental monitoring network with 90 sites located throughout the US and Canada. The sites are managed and operated by EPA's Clean Air Markets Division (CAMD) in cooperation with the National Parks Service (NPS) and other federal, state, and local partners. The network was established under the 1991 Clean Air Act Amendments (CAAA) to assess trends in acidic deposition due to emission reduction programs, such as the Acid Rain Program, NO_x Budget Trading Program, and the Clean Air Interstate Rule (CAIR). CASTNET measures ambient concentrations of sulfur and nitrogen species as well as rural ozone concentrations. Results from CASTNET are used to report on geographic patterns and temporal trends in acidic pollutants, deposition, and regional ozone concentrations. An IMPROVE (Interagency Monitoring of Protected Visual Environments) monitor is operated by IMPROVE staff near the Piney Run monitoring station (Figure 3-1). IMPROVE measures $PM_{2.5}$, PM_{10}, $PM_{10\text{-}2.5}$, and speciated $PM_{2.5}$.

In support of the SO_2 Data Requirements Rule (DRR), three new SO_2 monitors were deployed in January 2017 by Verso Luke Paper Mill in western Maryland: two in Allegany County, MD and one in Mineral County, WV (Figure 3-1; Tables 3-1 through 3-6). These sites are being operated by AECOM, under contract to Verso Luke Mill. MDE is the Primary Quality Assurance Organization (PQAO) for these sites, which includes performing additional semi-annual instrument audits and reporting the data to AQS.

Maryland's 2017 Annual Network Plan was approved by EPA on November 10, 2016 (Appendix B), and included the following changes:

- Two FRM $PM_{2.5}$ monitors in the Washington-Arlington-Alexandria MSA were terminated at the end of 2016: the two collocated monitors at the PG Equestrian Center.
- Two FRM $PM_{2.5}$ monitors in the Baltimore-Towson MSA were terminated at the end of 2016: one monitor at the Glen Burnie site and one at BCFD.
- Two FRM PM_{10} monitors were terminated: one from BCFD was terminated and moved to Oldtown at the end of 2016. By terminating and relocating the monitors from BCFD, the station was terminated. The collocated FRM PM_{10} at HU-Beltsville was also terminated.
- The NO_y instrument from Horn Point was terminated and moved to Piney Run to replace an aging instrument.
- The request to terminate the PM_{10} FEM BAM at Piney Run was approved by OAQPS on February 27, 2016. Since the IMPROVE station near Piney Run provides 1/3 day filter-based $PM_{10\text{-}2.5}$, OAQPS agreed that the continuous BAM $PM_{10\text{-}2.5}$ (and, by extension, the continuous BAM PM_{10}) is not needed at Piney Run.
- A portable ozone monitor was placed on a small island in the Chesapeake Bay to provide "ground truth" to model forecasts for ozone over the bay. The monitor is being run as a Special Purpose Monitor (SPM) in accordance with 40 CFR Part 58, Subpart C, and will be redeployed again this ozone monitoring season.

- In support of the SO_2 DRR, three new SO_2 monitors were deployed in January 2017 by Verso Luke Paper Mill in western Maryland: two in Allegany County, MD and one in Mineral County, WV

The 2018 Network Plan continues some of the changes begun in last year's plan, reflecting a shift in monitoring emphasis, with some pollutants becoming less of a concern and others becoming a higher priority. Detailed explanations of these proposals can be found in the "Changes Proposed" sections for the individual pollutants. This plan includes proposals for the following changes:

- Terminate one FRM $PM_{2.5}$ monitor: Northwest Police Station.
- Reduce the sampling frequency for several FRM $PM_{2.5}$ monitors:

  Essex – reduce from 1/3 days to 1/6 days

  Padonia collocated – reduce from 1/3 days to 1/12 days

  Oldtown – reduce from 1/1 days to 1/3 days
- Retrofit the PM_{10} FEM continuous BAM from Piney Run with a VSCC and add a $PM_{2.5}$ FEM continuous BAM to Furley, in Baltimore City.
- Terminate the lead (Pb) monitor at HU-Beltsville.
- Terminate the CO monitor at Horn Point.
- Continue running the O_3 Special Purpose Monitor at Hart-Miller Island.
- Move the Padonia shelter, where $PM_{2.5}$ and seasonal O_3 monitors are run from its current location at the Padonia International Elementary School due to construction activity, to the nearby Cockeysville Skate Park, approximately 300 meters west.
- Move the Furley O_3 monitor (seasonal) 1.5 miles East from its current location inside the Recreation Center due to limited access hours and unreliable temperature control.
- Request a waiver to terminate the collection of PAMS data at HU-Beltsville, in support of enhanced PAMS monitoring at Essex.

This list of proposed changes represents an ongoing realignment of resources to address changes in regulations and continued improvements in overall air quality. This network plan carefully balances Maryland's highest air quality priorities within the constraints of available resources.

3.1 General Network Information

The following tables include information required as part of the monitoring network description. General information (e.g. site name, AQS identification number, latitude, longitude, etc.) can be found in Table 3-1. Specific information related to each parameter measured at air monitoring sites is given in Tables 3-2 and 3-3. Meteorological parameters measured are included in Table 3-4. Monitoring method descriptions can be found in Table 3-5. Parameters measured as part of the air toxics, PAMS, IMPROVE, and speciated $PM_{2.5}$ mass are listed in Table 3-6.

Table 3-1 General Information for Current Maryland Ambient Air Monitoring Sites

Site Name, AQS ID	Street Address	City, County	Zip Code	Latitude, Longitude (NAD83)	Location Setting	Nearest Road	Traffic Count (2013)	Distance from Nearest Road (m)	CBSA/MSA
Aldino, 240259001	3560 Aldino Rd.	Aldino, Harford	21028	39.563333, -76.203889	Suburban	Aldino Rd.	1553	14	Baltimore-Towson
Baltimore County Near Road 240050009	4380 Old Court Rd.	Pikesville, Baltimore County	21208	39.371679, -76.746814	Suburban	I-695/I-795	189380	20	Baltimore-Towson
Baltimore Haze Cam	Raven Power, 1000 Brandon Shores Dr.	Pasadena, Anne Arundel	21226	39.181513 , -76.537625	Urban	NA	NA	NA	NA
Beltsville CASTNET, 240339991	Powder Mill Rd.	Laurel, Prince George's	20708	39.0284, -76.8171	*	*	*	*	*
Blackwater NWR CASTNET, 240199991	Blackwater National Wildlife Refuge	Cambridge, Dorchester	21613	38.445, -76.1114	*	*	*	*	*
Calvert, 240090011	350 Stafford Rd.	Barstow, Calvert	20678	38.536722, -76.617194	Rural	Stafford Rd.	3265	53	Washington-Arlington-Alexandria
Edgewood, 240251001	Edgewood Chemical Biological Center (APG), Waehli Rd.	Edgewood, Harford	21010	39.410191, -76.296946	Rural	Waehli Rd.	4240	16	Baltimore-Towson
Essex, 240053001	600 Dorsey Ave.	Essex, Baltimore County	21221	39.310833, -76.474444	Suburban	Woodward Dr.	9521	5	Baltimore-Towson
Fair Hill, 240150003	Fair Hill Natural Resource Mgmt. Area 4600 Telegraph Rd.	Fair Hill, Cecil	21921	39.701444, -75.860051	Rural	Telegraph Rd. (RT 273)	7123	26	Philadelphia-Camden-Wilmington
Frederick Airport, 240210037	180 E. Airport Dr.	Frederick, Frederick	21701	39.422760, -77.375190	Suburban	Disposal Plant Rd.	2254	9	Washington-Arlington-Alexandria
Frostburg Haze-Cam	E. Garrett Co. Vol. Fire Dept. 401 Finzel Rd.	Finzel, Garrett	21532	39.686467, -78.966917	Rural	NA	NA	NA	NA
Frostburg IMPROVE	Frostburg Reservoir	Finzel, Garrett	21532	39.705896, -79.012117	Rural	Grantsville Rd.	1990	1441	NA
Furley, 245100054	Furley E.S. Rec. Ctr., 4633 Furley Ave.	Baltimore, City	21206	39.328807, -76.553075	Urban and Center City	Furley Ave.	2271	29	Baltimore-Towson
Glen Burnie, 240031003	AA Co. Public Works 7409 Balt-Annap. Blvd.	Glen Burnie, Anne Arundel	21061	39.169533, -76.627933	Suburban	Baltimore-Annapolis Blvd.	16591	42	Baltimore-Towson

Site Name, AQS ID	Street Address	City, County	Zip Code	Latitude, Longitude (NAD83)	Location Setting	Nearest Road	Traffic Count (2013)	Distance from Nearest Road (m)	CBSA/MSA
Hagerstown, 240430009	18530 Roxbury Rd.	Hagerstown, Washington	21740	39.564178, -77.720244	Rural	Roxbury Rd.	8870	49	Hagerstown-Martinsburg
Hart-Miller Island, 240053474	2024 A Riverview Rd.	Essex, Baltimore County	21221	39.254449, -76.424386	Rural	Back River Neck Road	NA	1	Baltimore-Towson
Horn Point, 240190004	University of Md - CES Horn Point Laboratory 2020 Horns Point Rd	Cambridge, Dorchester	21613	38.587525, -76.141006	Rural	Horns Point Rd.	4352	64	Cambridge (Micro)
Howard County Near Road, 240270006	I-95 S Welcome Center	Laurel, Howard	20723	39.143130 -76.846110	Suburban	I-95	192401	16	Baltimore-Towson
HU-Beltsville, 240330030	Howard University Beltsville Lab., 12003 Old Baltimore Pike	Beltsville, Prince George's	20705	39.055277, -76.878333	Suburban	Old Baltimore Pike	15692	385	Washington-Arlington-Alexandria
Millington, 240290002	Millington WMA-Massey-MD Line Rd.	Millington, Kent	21650	39.305021, -75.797317	Rural	RT 330, Massey-DE Line Rd.	971	121	NA
Northwest Police Station, 245100007	NW District Police Sta., 5271 Reisterstown Rd.	Baltimore, City	21215	39.344650, -76.685380	Urban	Reisterstown Rd.	14741	25	Baltimore-Towson
Oldtown, 245100040	Oldtown Fire Station, 1100 Hillen St.	Baltimore, City	21202	39.297733, -76.604603	Urban and Center City	Hillen St.	12392	7	Baltimore-Towson
Padonia, 240051007	Padonia E.S., 9834 Greenside Dr.	Cockeysville, Baltimore County	21030	39.462029, -76.631673	Suburban	Greenside Dr.	1841	46	Baltimore-Towson
PG Equestrian Center, 240338003	14900 Pennsylvania Ave.	Greater Upper Marlboro, Prince George's	20772	38.811940, -76.744170	Rural	Pennsylvania Ave.	52980	191	Washington-Arlington-Alexandria
Piney Run, 240230002	Frostburg Reservoir, Finzel	Frostburg, Garrett	21532	39.705950, -79.012000	Rural	Piney Run Rd.	1900	1141	NA
Rockville, 240313001	LE Smith Env Educ Ctr, 5110 Meadowside Ln.	Rockville, Montgomery	20855	39.114313, -77.106876	Rural	Meadowside Ln.	16981	77	Washington-Arlington-Alexandria
South Carroll, 240130001	South Carroll H.S. 1300 W Old Liberty Rd.	Sykesville, Carroll	21784	39.444294, -77.042252	Rural	Old Liberty Rd.	9473	248	Baltimore-Towson
Southern Maryland, 240170010	14320 Oaks Rd.	Charlotte Hall, Charles	20622	38.508547, -76.811864	Rural	Access Rd.	5100	16	Washington-Arlington-Alexandria
Verso Luke Mill: Moran Property 24-001-8881	Rock Street, SW	Westernport, Allegany	21562	39.4864, -79.0638	Rural	Rock Street		1	Cumberland, MD-WV

Site Name, AQS ID	Street Address	City, County	Zip Code	Latitude, Longitude (NAD83)	Location Setting	Nearest Road	Traffic Count (2013)	Distance from Nearest Road (m)	CBSA/MSA
Verso Luke Mill: Horse Rock 24-001-8882	Horse Rock Road	Westernport, Allegany	21562	39.483617, -79.026383	Rural	Minnetonka		1	Cumberland, MD-WV
Verso Luke Mill: Bean Property 54-057-8883	Old WV 46	Keyser, WV Mineral County	26726	39.4452, -79.0691	Rural	Hampshire Hill		1	Cumberland, MD-WV

Note: Blank cells indicate no data available. NA means not applicable. Traffic count data are AADT 2013, MD State Hwy Administration.

***** See EPA CASTNET Annual Network Plan *https://www.epa.gov/castnet/ozone*

Table 3-2 Monitor Information for Current Maryland Ambient Air Monitoring Sites

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Aldino, 240259001	Ozone (O_3)	04/20/1990	047	10	Urban	Highest Concentration	SLAMS	H, S
Baltimore County Near Road 240050009	Nitric Oxide (NO)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
	Nitrogen Dioxide (NO_2)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
Baltimore Haze Cam @ Brandon Shores	Visibility	04/01/2007	NA	NA	NA	Public Notification	NA	NA
Beltsville CASTNET, 240339991	Ozone (O_3)	04/01/2011	047	10	Regional	Highest Concentration	CASTNET	H
	Reactive Oxides of Nitrogen (NO_Y)	11/01/2012	699	10	Regional	Highest Concentration	CASTNET	H
	Sulfur Dioxide (SO_2)	04/01/2011	560	10	Regional	Highest Concentration	CASTNET	F
Blackwater NWR CASTNET, 240199991	Ozone (O_3)	01/01/2011	047	10	Regional	Highest Concentration	CASTNET	H
Calvert, 240090011	Ozone (O_3)	04/01/2005	087	4.6	Urban	Population Exposure	SLAMS	H, S
Edgewood, 240251001	Ozone (O_3)	03/10/1980	047	4.5	Urban	Highest Concentration	SLAMS	H, S
	$PM_{2.5}$ - Hourly	09/01/2011	170	5.1	Neighborhood	Population Exposure	SLAMS	H
Essex, 240053001	Air Toxics	01/01/1990	150	4	Neighborhood	Population Exposure	Other	6
	Carbon Monoxide (CO)	02/15/2006	593	4.4	Middle	Highest Concentration	SLAMS	H
	Nitric Oxide (NO)	01/01/1993	599	4.4	Neighborhood	Population Exposure, Max Precursor	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/1980	599	4.4	Neighborhood	Max Precursor	SLAMS	H
	Nitrogen Dioxide (NO_2)	01/01/1972	599	4.4	Neighborhood	Population Exposure	SLAMS	H
	Ozone (O_3)	01/01/1972	087	4.4	Neighborhood	Highest Concentration, Population Exposure	SLAMS	H
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	5.1	Neighborhood	Population Exposure	SLAMS	3
	$PM_{2.5}$ - Speciation	07/08/2004	812	5.0	Neighborhood	Population Exposure	Trends Speciation	6
	Sulfur Dioxide (SO_2)	07/01/2003	600	4.4	Neighborhood	Highest Concentration	SLAMS	R
	Type 2 PAMS VOCS	01/01/1992	126, 142, 102*	4	Neighborhood	Max Precursor, Highest Concentration	SLAMS/PAMS	H, 6, 12

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Fair Hill, 240150003	Ozone (O_3)	01/01/1992	087	4.5	Urban	Regional Transport	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	4.7	Neighborhood	Population Exposure	SLAMS	H
Frederick Airport, 240210037	Ozone (O_3)	07/09/1998	087	4.6	Urban	Population Exposure	SLAMS	H, S
Frostburg IMPROVE, 240239000	IMPROVE Parameters	03/01/2004	NA	4.0	Regional	Public Notification	NA	6
Frostburg Haze Cam	Visibility	10/01/2005	NA	NA	NA	Public Notification	NA	NA
Furley, 245100054	Ozone (O_3)	08/20/2006	087	7.5	Neighborhood	Population Exposure	SLAMS	H, S
Glen Burnie, 240031003	Ozone (O_3)	04/01/2016	087	5	Neighborhood	Population Exposure	SLAMS	H
	PM_{10} - STP	08/22/2008	127	4.7	Neighborhood	Population Exposure	SLAMS	6
	PM_{10} - STP	08/22/2008	127	4.7	Neighborhood	Population Exposure	QA-Collocated	6
Hagerstown, 240430009	Ozone (O_3)	04/01/1999	087	4.6	Urban	Highest Conc/ Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.09	Urban	Highest Conc	SLAMS	H
Hart-Miller Island, 240053474	Ozone (O_3)	04/01/2016	190	4	Neighborhood	General/Background	SPM	H
Horn Point, 240190004	Carbon Monoxide (CO)	04/01/2012	593	4	Regional	General/Background	SLAMS	H
	Ozone (O_3)	04/01/2012	087	4	Regional	General/Background	SLAMS	H
	$PM_{2.5}$ - Hourly	04/01/2012	170	4	Regional	General/Background	SLAMS	H
	Sulfur Dioxide (SO_2)	04/01/2012	600	4	Regional	General/ Background	SLAMS	R
Howard County Near Road, 240270006	Air Toxics	04/01/2014	150	4	Microscale	Source Oriented/Highest Conc	SLAMS	6
	Black Carbon	08/01/2015	894	4	Microscale	Source Oriented/Highest Conc	SPM	H
	Ultrafine Particle Counter	01/01/2017	173	4	Microscale	Source Oriented/Highest Conc	SPM	H
	Carbon Monoxide (CO)	04/01/2014	593	4	Middle Scale	Source Oriented/Highest Conc	SLAMS	H
	Nitric Oxide (NO)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	Nitrogen Dioxide (NO_2)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	Oxides of Nitrogen (NO_X)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	$PM_{2.5}$ - Hourly	04/01/2014	170	4.5	Microscale	Source Oriented/Highest Conc	SLAMS	H

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
HU-Beltsville, 240330030	Carbon Monoxide (CO)	01/01/2007	554	4.6	Urban	General/Background	SLAMS/NCore	H
	Air Toxics	05/05/2005	150	4	Neighborhood	Population Exposure	Other	6
	Lead (Pb)	12/12/2011	811	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	Nitric Oxide (NO)	05/28/2005	674	10	Urban	General/Background	SLAMS/NCore	H
	Nitric Oxide (NO)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	Nitrogen Dioxide (NO_2)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	NO_Y – NO	05/28/2005	674	10	Urban	General/Background	SLAMS/NCore	H
	Oxides of Nitrogen (NO_X)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	Ozone (O_3)	05/01/2005	087	4.6	Urban	Highest Conc./ Population Exposure	SLAMS/NCore	H
	$PM_{2.5}$ Speciation	12/05/2004	812	2.3	Urban	Population Exposure General/Background	SLAMS/NCore	3
	PM_{10} – STP	07/25/2010	127	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	$PM_{10-2.5}$ - Local Conditions	07/25/2010	176	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	$PM_{2.5}$ - Local Conditions	07/10/2004	145	2.3	Urban	Population Exposure	SLAMS/NCore	3
	$PM_{2.5}$ - Local Conditions	07/31/2010	145	2.3	Urban	Population Exposure	QA-Collocated	12
	$PM_{2.5}$ – Hourly	07/01/2010	170	4.5	Urban	Population Exposure	SLAMS/NCore	H
	Ultrafine Particle Counter	01/01/2017	173	4	NA	NA	SPM	H
	Black Carbon	12/01/2007	894	4	NA	NA	SPM	H
	Reactive Oxides of Nitrogen (NO_Y)	05/23/2008	674	10	Urban	General/Background	NCore	H
	Sulfur Dioxide (SO_2)	09/29/2006	560	4.6	Urban	General/Background	SLAMS/NCore	R
	TYPE 1/3 PAMS VOCS	05/05/2005	126	4	Urban	Upwind/Background	Unofficial PAMS/NCore	6, S: 3
Millington, 240290002	Ozone (O_3)	06/19/1989	087	4.5	Urban	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5	Neighborhood	Population Exposure	SLAMS	H
Northwest Police Station, 245100007	$PM_{2.5}$ - Local Conditions	01/01/1999	145	8.2	Neighborhood	Population Exposure	SLAMS	3

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Oldtown, 245100040	Air Toxics	01/01/1990	150	9	Neighborhood	Population Exposure	Other	6
	Nitric Oxide (NO)	01/01/1994	599	4.2	Middle	Highest Concentration	SLAMS	H
	Nitrogen Dioxide (NO_2)	11/05/1981	599	4.4	Middle	Highest Concentration	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/1982	599	4.4	Middle	Highest Concentration	SLAMS	H
	PM_{10} – STP	01/01/2017	127	4.9	Middle	Population Exposure	SLAMS	6
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	4.9	Middle	Highest Concentration	SLAMS	1
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.1	Middle	Highest Concentration	SLAMS	H
Padonia, 240051007	Ozone (O_3)	01/01/1979	087	4.2	Neighborhood	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	01/01/2016	170	4.8	Neighborhood	Population Exposure	SLAMS	H
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	4.8	Neighborhood	Population Exposure	SLAMS	12
PG Equestrian Center, 240338003	Ozone (O_3)	04/01/2002	087	4.4	Urban	Population Exposure	SLAMS	H, S
Piney Run, 240230002	Carbon Monoxide (CO)	09/01/2007	554	4.4	Regional	Regional Transport	SLAMS/NCore	H
	Nitric Oxide (NO)	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Nitric Oxide (NO)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	Nitrogen Dioxide (NO_2)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	Oxides of Nitrogen (NO_X)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	NO_Y - NO	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Ozone (O_3)	04/01/2004	087	4.4	Regional	Regional Transport	SLAMS/NCore	H
	$PM_{2.5}$ - Hourly	07/01/2010	170	4.9	Regional	Regional Transport	SLAMS/NCore	H
	Reactive Oxides of Nitrogen (NO_Y)	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Sulfur Dioxide (SO_2)	04/01/2004	560	4.4	Regional	Population Exposure	SLAMS/NCore	R
Rockville, 240313001	Ozone (O_3)	01/01/1980	087	4.6	Urban	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.3	Neighborhood	Population Exposure	SLAMS	H
South Carroll, 240130001	Ozone (O_3)	07/14/1983	087	4.5	Urban	Population Exposure	SLAMS	H, S
Southern Maryland, 240170010	Ozone (O_3)	10/02/1984	087	4.6	Regional	General Background	SLAMS	H, S

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Verso Luke Mill: Moran Property 240018881	Sulfur Dioxide (SO_2)	01/11/2017	560	5	Neighborhood	Highest Concentration	SLAMS	R
Verso Luke Mill: Horse Rock 240018882	Sulfur Dioxide (SO_2)	01/11/2017	560	5	Neighborhood	Highest Concentration	SLAMS	R
Verso Luke Mill: Bean Property 540578883	Sulfur Dioxide (SO_2)	02/24/2017	560	5	Neighborhood	Highest Concentration	SLAMS	R

Sampling Schedule is coded as follows: 1 – every day, 2 – every 2 hours, 3 – every 3rd day, 6 - every 6th day, 12 – every 12th day, H – every hour, every day, R – both every hour and every five minutes every day, S – seasonally measured only. F means passive filter collected every 2 weeks. NA means not applicable for the cell. *Method Code 102 refers to carbonyl analyses performed by AMS Lab Philadelphia.

Table 3-3 Monitor Counts by Site (Cross-reference to Table 3-2)

Site Name	HAPS / Air Toxics	Carbon Monoxide	IMPROVE Parameters	Lead (Pb)	Ultrafine Particle Counter	Nitric Oxide (NO)	Nitrogen Dioxide (NO2)	NOy - NO	Oxides of Nitrogen (NOX)	Reactive Oxides of N (NOy)	Ozone	PM2.5 – Hourly FEM BAM	PM10 - Hourly FEM BAM	PM10 STP	PM10-2.5 - Local Cond	PM2.5 - Local Conditions	PM2.5 Speciation	Sulfur Dioxide	Type 2 PAMS VOCS	TYPE 1 & 3 PAMS VOCS	Aethalometer	Camera	Total
Aldino											1												1
Baltimore Co. Near Rd						1	1		1														3
Baltimore Haze Cam																						1	1
Beltsville CASTNET						1		1		1	1							1					5
Blackwater NWR CASTNET											1												1
Calvert											1												1
Edgewood											1	1											2
Essex	1	1				1	1		1		1					1	1	1	1	1			11
Fair Hill											1	1											2
Frederick Airport											1												1
Frostburg Hazecam																						1	1
Frostburg Improve			1																				1
Furley											1												1
Glen Burnie											1			2									3
Hagerstown											1	1											2
Hart-Miller Island											1												1
Horn Point		1									1	1						1					4
Howard County Near Rd	1	1			1	1	1		1			1									1		8
HU-Beltsville	1	1		1	1	1	1	1	1	1	1	1		1	1	2	1	1		1	1		19
Millington											1	1											2
Northwest Police Station																1							1
Oldtown	1					1	1		1			1		1		1							7
Padonia											1	1				1							3
PG Equestrian Center											1												1
Piney Run		1				1	1	1	1	1	1	1						1					9
Rockville											1	1											2
South Carroll											1												1
Southern Maryland											1												1
Verso: Moran																		1					1
Verso: Horse Rock																		1					1
Verso: Bean																		1					1
Total	4	5	1	1	2	7	6	3	6	3	21	11	0	4	1	6	2	8	1	2	2	2	**98**

Table 3-4 Count of Meteorological Parameters Measured in the Maryland Network

AQS State County Site	Local Site Name	Barometric Pressure-64101	Temperature -62101	Rain - 65102	Relative Humidity - 62201	Solar Radiation-63301	Ultraviolet Radiation-63302	Wind Direction - 61104	Wind Speed - 61103	
240259001	Aldino	1	1	1	1			1	1	6
240050009	Baltimore County Near Rd	1	1	1	1			1	1	6
240251001	Edgewood	1	1	1	1			1	1	6
240053001	Essex	1	1	1	1	1	1	1	1	8
240150003	Fair Hill	1	1	1	1			1	1	6
240031003	Glen Burnie	1	1	1	1			1	1	6
240430009	Hagerstown	1	1	1	1			1	1	6
240053474	Hart-Miller Island	1	1	1	1			1	1	6
240190004	Horn Point	1	1	1	1			1	1	6
240270006	Howard County Near Rd	1	1	1	1			1	1	6
240330030	HU-Beltsville	1	1	1	1	1		1	1	7
240290002	Millington	1	1	1	1			1	1	6
240051007	Padonia	1	1	1	1			1	1	6
240338003	PG Equestrian Center	1	1	1	1			1	1	6
240230002	Piney Run	1	1	1	1			1	1	6
240313001	Rockville	1	1	1	1			1	1	6
240130001	South Carroll	1	1	1	1			1	1	6
Total		17	17	17	17	2	1	17	17	**105**

Table 3-5 Monitoring Methods and Associated AQS Codes used in the Maryland Ambient Air Monitoring Network

Parameter	Parameter Code	Method Code	Sample Analysis Description
HAPS / Air Toxics*	NA	150	Cryogenic Pre-concentration: GC/MS
Black Carbon	84313	894	API Teledyne 633 Aethelometer
Carbon Monoxide, trace	42101	554	Gas Filter Correlation Thermo Electron 48I-TLE
	42101	593	Gas Filter Correlation Teledyne API 300 EU
Lead	85129	811	X-RAY Fluorescence (EDXRF) FRM
Nitric Oxide and Nitrogen Dioxide	42601-2,42602, 42603	074	Chemiluminescence
Nitric Oxide and Reactive Oxides of Nitrogen (NOy – NO)	42601, 42612, 42600	674	Thermo 42i-Y Chemiluminescence for low level measurements
	42601, 42612, 42600	691	Chemiluminescence, Ecotech EC9843
	42601, 42612, 42600	699	Chemiluminescence, Teledyne API T200U-Y
	42601-2,42602, 42603	599	Gas Phase Chemiluminescence, Teledyne API T200U
PAMS VOCS*	NA	102	DNHP followed by HPLC (AMS Lab, Phila., PA)
	NA	126	Cryogenic Pre-concentration Trap GC/FID
	NA	142	Pre-concentration Trap/Thermal, Auto GC (PE Clarus 500 Dual COL)
	NA	150	SS 6L- Pressurized, Cryogenic Pre-concentration: GC/MS
Ozone	44201	047	Ultraviolet Photometry
	44201	087	Ultraviolet Radiation Absorption (API T400)
PM_{10}	81102	127	Gravimetric, R - P CO Partisol Model 2025
PM_{10}	85101	122	FEM, Beta Attenuation
$PM_{2.5}$	88101	145	Gravimetric, Partisol Plus 2025
$PM_{2.5}$ continuous	88101-3	170	FEM, Beta Attenuation
$PM_{10-2.5}$ (PM Coarse)	86101	176	PAIRED Gravimetric Difference, Partisol Plus 2025
$PM_{2.5}$ Species* Constituents: Trace elements	NA	811	Energy Dispersive XRF using Teflon filter
$PM_{2.5}$ Species* Constituents: Ions	NA	812	Ion Chromatography using Nylon filter
$PM_{2.5}$ Species* Constituents: Organics	NA	813	Thermo-Optical Transmittance using Quartz filter
$PM_{2.5}$ Speciation mass	88502-5	810	Gravimetric, Met One SASS using Teflon
IMPROVE Parameters*	NA	NA	Four module, Improve Protocol analysis
Sulfur Dioxide	42401	060	Pulsed Fluorescence
Sulfur Dioxide, trace	42401	560	Pulsed Fluorescence, 43C-TLE/43I-TLE
	42401	600	Ultraviolet Fluorescence API 100 EU
Ultrafine Particle Counter	87101	173	Ultrafine Particle Counter
Visibility	NA	NA	Camera (Haze Cam)

*See Table 3-6 for constituents belonging to these groups. NA means not applicable for the cell. Parameter occurrence code (POC) 1 unless otherwise noted.

Table 3-6 Constituent Compounds and Species Measured in Maryland

CONSTITUENT GROUP	COMPOUNDS IN THE CONSTITUENT GROUP
HAPS / Air Toxics	Dichlorodifluoromethane, Chloromethane, 1,2-Dichloro-1,1,2,2,tetrafluorolethane, Chloroethene, 1,3-Butadiene, Trichlorofluoromethane, Acrolein, Acetone, Methylene Chloride, 1,1,2-Trichloro-1,2,2-trifluoroethane, 2-methoxy-2-methyl-Propane, Hexane, Chloroform, Tetrahydrofuran, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, 1,2-Dichloropropane, Trichloroethene, Heptane, Cis-1,3-Dichloro-1-Propene, Trans-1,3-Dichloro-1-Propene, Toluene, 1,2-Dibromoethane, Tetrachloroethylene, Chlorobenzene, Ethylbenzene, m & p- Xylene, Styrene, 1,1,2,2-Tetrachloroethane, o-Xylene, 1-Ethyl-4-Methylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, 1,4-Dichlorobenzene
IMPROVE Parameters	Air temperature, Aluminum, Ammonium ion, Ammonium Nitrate, Ammonium sulfate, Arsenic, Bromine, Calcium, Chloride, Chlorine, Chromium, Copper, Elemental carbon, Humidity, Hydrogen, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrate, Nitrite, Organic carbon, Phosphorus, PM_{10}, $PM_{2.5}$, Potassium, Relative Humidity, Rubidium, Selenium, Silicon, Sodium, Strontium, Sulfate, Sulfur Dioxide, Sulfur, Titanium, Vanadium, Zinc, and Zirconium
PAMS VOC's	Acetaldehyde, Acetone, Acrolein, Formaldehyde, Methyl Ethyl Ketone, Methyl Isobutyle Ketone, Propionaldehyde, Ethene, Ethyne, Ethane, Propene, Propane, Isobutane, 1-Butene, Butane, T-2-Butene, C-2-Butene, Isopentane, 1-Pentene, Pentane, Isoprene, T-2-Pentene, C-2-Pentene, 2,2-Dimethylbutane, Cyclopentane, 2,3-Dimethylbutane, 2-Methylpentane, 3-Methylpentane, 1-Hexene, Hexane, Methylcyclopentane, 2,4dimethylpentane, Benzene, Cyclohexane, 2-Methylhexane, 2,3dimethylpentane, 3-Methylhexane, 2,2,4tmpentane, Heptane, Methylcyclohexane, 2,3,4-Tmpentane, Toluene, 2-Methylheptane, 3-Methylheptane, Octane, Ethylbenzene, M&P-Xylene, Styrene, O-Xylene, Nonane, Isopropylbenzene, Propylbenzene, 1-Ethyl-3-Mbenzene, 1-Ethyl-4-Mbenzene, 135tmbenzene, 1-Ethyl-2-Mbenzene, 124tmbenzene, Decane, 1,2,3-Trimbenzene, M-Diethylbenzene, P-Diethylbenzene, Undecane, Dodecane, Total HC, PAMSHC
$PM_{2.5}$ Chemical Species	Aluminum, Ammonium, antimony, Arsenic, Barium, Bromine, Cadmium, Calcium, Carbonate carbon, Cerium, Cesium, Chlorine, Chromium, Cobalt, Copper, Elemental carbon, Europium, Gallium, Gold, Hafnium, Indium, Iridium, Iron, Lanthanum, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Niobium, Nitrate, OCX, OCX2, Organic carbon, Phosphorus, Pk1_OC, Pk2_OC, Pk3_OC, Pk4_OC, Potassium, PyrolC, Rubidium, Samarium, Scandium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfate, Sulfur, Tantalum, Terbium, Tin, Titanium, Total carbon, Vanadium, Wolfram, Yttrium, Zinc, and Zirconium

4. SPECIFIC POLLUTANT NETWORK DESCRIPTIONS AND REQUIREMENTS

4.1 Carbon Monoxide (CO) – General Description and Sampling Method

Carbon monoxide is measured by infrared absorption photometry. Air is drawn continuously through a sample cell where infrared light passes through it. Carbon monoxide molecules in the air absorb part of the infrared light, reducing the intensity of the light reaching a light sensor. The light is converted into an electrical signal related to the concentration of carbon monoxide in the sample cell.

4.1.1 Monitoring Requirements

EPA revised the minimum monitoring requirements for CO on August, 12, 2011. One CO monitor is required to be collocated with a near-road NO_2 in urban areas having a population of 1 million or more. MDE added a CO monitor to the near road NO_2 monitoring site at the Interstate 95 South (I-95S) rest area between MD-32 and MD-216. This monitor began collecting data April 1, 2014. Operation of the existing CO sites in Maryland is required until MDE requests discontinuation of a site in the Annual Network Plan and the EPA Regional Administrator approves the request.

Table 4-1 CO Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in Maryland	Number of monitors active in Maryland
One CO monitor collocated with a Near Road NO_2 in urban area with a population >= 1 million	4.2.1	1	1
One CO monitor at each Type 2 PAMS site	5.3, Table D-6	1	1
One CO monitor at each NCore site	3(b)	2	2

In addition to the monitors required above, MDE operates a CO monitor at the Horn Point site (Tables 3-2 and 3-3).

4.1.2 Sources

CO is formed when carbon in fuel is not completely burned. The EPA estimates that approximately 60% of all CO emissions are from motor vehicle exhaust. Other sources include waste incinerators, wood stoves, furnaces, and some industrial processes. Concentrations are highest along heavily traveled highways, and decrease significantly the further away the monitor is from traffic. Therefore, CO monitors are usually located close to roadways or in urban areas.

4.1.3 Changes Planned for 2017-2018

MDE is proposing to discontinue CO monitoring at Horn Point. Concentrations are extremely low (2016 1-hr maximum was 1.8 ppm) at this location, so there is very little environmental information to be gained from this measurement given the operational resource requirements.

4.2 Lead (Pb) – General Description and Sampling Method

MDE collects lead by gravimetric PM_{10} samplers as described in Section 4.5; then the filters are sent to a lab to be analyzed for lead by the x-ray fluorescence method. If a lead-PM_{10} monitor measures three-month average levels greater than or equal to 0.10 $\mu g/m^3$, then MDE must install and operate a lead-TSP monitor within six months.

4.2.1 Monitoring Requirements

The latest revision to the lead (Pb) NAAQS was finalized on October 15, 2008, lowering the primary and secondary standards from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. Revisions to the lead monitoring regulations were finalized on December 27, 2010 as follows:

Table 4-2 Lead Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in MD	Number in MD
One source-oriented SLAMS site located to measure the maximum Pb concentration resulting from each non-airport Pb source which emits 0.50 or more tons per year	4.5(a)	0	0
One source-oriented SLAMS site located to measure the maximum Pb concentration resulting from airport which emits 1.0 or more tons per year	4.5(a)	0	0

On March 28, 2016, EPA published 40 CFR Part 58 Revisions to Ambient Monitoring Quality Assurance and Other Requirements; Final Rule. This rule revision eliminated the requirement in section 3 of appendix D to measure Pb at urban NCore sites either as Pb in Total Suspended Particles (Pb-TSP) or as Pb $PM_{10.}$ In order to discontinue Pb measurements at urban NCore sites, Part II.I Network Design Requirements of the publication states:

"With specific regard to Pb monitoring at urban NCore sites, monitoring agencies should request permission from the EPA Regional Administrator to discontinue non-source oriented monitoring following the collection of at least 3 years of complete data at each affected site."

4.2.2 Sources

Pb is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been motor vehicles and industrial sources. As a result of EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector dramatically declined by 95 percent between 1980 and 1999, and levels of lead in the air decreased by 94 percent between 1980 and 1999. Today, the highest levels of lead in air are usually found near lead smelters. Other stationary sources are waste incinerators, utilities, lead-acid battery manufacturers and general aviation airports. Soil can pick up lead from exterior paint, or other sources such as past use of leaded gas in cars.

There are no sources in Maryland that emit more than ½ ton (1,000 pounds) of lead per year. Table 4-3 shows Maryland 2015 lead emissions developed from data recently corrected to reflect new stack test data from the NRG Morgantown and Raven Power Fort Smallwood Road complex generation facilities. This table includes the basis of the emissions factors used in the companies' certification reports.

Table 4-3 2015 Maryland Lead Emissions

Premises ID	Company Name	Annual Emissions (TPY)	Annual Emissions (LBS/YR)	Source of Emission Factor Used for 2015
033-0014	NRG Chalk Point Generating Station	0.120	239.420	AP-42 Factor
017-0014	NRG Morgantown Generating Station	0.089	177.600	2015 Stack Test
510-1886	Wheelabrator Baltimore, LP	0.079	158.088	2015 Stack Test
005-0079	C P Crane Generating Station	0.058	116.030	AP-42 Factor
031-0019	NRG Dickerson Generating Station	0.048	95.840	AP-42 Factor
031-1718	Montgomery County Resource Recovery Facility (MCRRF)	0.046	92.668	2015 Stack Test
043-0008	Holcim (US), Inc	0.021	41.790	2014 Stack Test
013-0012	Lehigh Cement Company LLC	0.016	31.600	2011 Stack Test
001-0011	Luke Paper Company	0.016	31.210	Sara Handbook
003-0468	Fort Smallwood Road Complex	0.012	23.622	2010 Stack Test
025-0212	Harford County Resource Recovery Facility	0.007	13.464	Stack Test
005-2406	Maryland Recycle Company, Inc.	0.004	8.454	Industry Factor
043-0003	Redland Brick, Inc. - Cushwa Plant	0.004	7.290	
023-0042	Mettiki Coal, LLC	0.003	6.682	AP-42 Factor
510-2975	Curtis Bay Energy, LP	0.003	6.424	2015 Stack Test
033-0667	USDA Beltsville Agriculture Research Center	0.003	5.799	AP-42 Factor
001-0203	AES Warrior Run Inc	0.002	4.984	Stack Test
017-0040	Naval Support Facility Indian Head	0.002	4.804	Nat Gas in 2015
021-0027	Redland Brick, Inc. - Rocky Ridge	0.002	3.964	
510-1653	Baltimore Scrap	0.002	3.656	Stack Test
037-0017	Naval Air Station Patuxent River	0.002	3.328	
031-0324	National Institutes of Health	0.001	2.452	
021-0131	Fort Detrick - Area B & Main Post	0.001	2.184	2015 Stack Test
025-0024	Constellation Power - Perryman Generating Station	0.001	2.170	
041-0069	Easton Utilities - Airport Park	0.001	1.914	
043-0269	C. William Hetzer, Inc. - Beaver Creek West	0.001	1.860	
035-0033	David A. Bramble - Wye Mills Asphalt Plant	0.001	1.710	
019-0013	Vienna Power Station	0.001	1.680	
009-0021	Dominion Cove Point LNG, LP	0.001	1.314	
510-3032	University of Maryland at Baltimore	0.001	1.180	
033-0010	University Of Maryland	0.000	0.850	
041-0029	Easton Utilities - N. Washington Street	0.000	0.810	
031-0323	National Institute of Standards and Technology	0.000	0.546	
033-0675	NASA Goddard Space Flight Center	0.000	0.468	
003-0056	Erachem Comilog, Inc	0.000	0.462	
510-2796	Veolia Energy Baltimore Heating, LLP-Spring Gardens Plant	0.000	0.410	
510-0651	Veolia Energy Baltimore Heating, LLP-Central Ave	0.000	0.324	
031-1361	F. O. Day Bituminous Company	0.000	0.258	
003-0234	Bitumar USA, Inc.	0.000	0.242	
003-0043	Reliable Contracting Company, Inc.	0.000	0.228	
013-0102	C.J. Miller, LLC	0.000	0.208	
033-0002	Aggregate Industries - Kirby Road Asphalt Plant	0.000	0.200	

510-0171	P. Flanigan & Sons, Inc	0.000	0.198	
021-0444	Frederick National Laboratory for Cancer Research	0.000	0.198	
025-0056	Allan Myers Materials-Aberdeen Asphalt	0.000	0.194	
013-0110	Maryland Paving - Finksburg	0.000	0.192	
510-3078	Veolia Energy Baltimore Heating, LLP-Saratoga Plant	0.000	0.190	
510-0069	P. Flanigan & Sons, Inc	0.000	0.190	
031-1129	GSA Federal Research Center at White Oak	0.000	0.188	
013-0046	C.J. Miller, LLC	0.000	0.180	
005-2436	Maryland Paving - Texas Quarry	0.000	0.180	
510-2260	Clean Harbors of Baltimore	0.000	0.172	
017-0119	Charles County Asphalt	0.000	0.154	
003-0250	Northrop Grumman Systems Corporation	0.000	0.134	
021-0409	Miller Asphalt - Legore	0.000	0.128	
025-0031	Maryland Paving, Inc. - Aberdeen	0.000	0.118	
510-0106	United States Gypsum Company	0.000	0.114	
045-0309	Allan Myers Materials-Delmar Asphalt	0.000	0.106	
021-0459	MedImmune, LLC	0.000	0.104	
003-0826	Aggregate Industries - Severn Asphalt	0.000	0.104	
017-0150	Aggregate Industries - Waldorf	0.000	0.092	
003-0060	Reliable Contracting Company, Inc.	0.000	0.080	
005-0302	Galvco of Maryland, LLC, dba Baltimore Galvanizing	0.000	0.040	
027-0080	Precoat Metals	0.000	0.032	
013-0098	Maryland Paving Woodbine, LLC	0.000	0.024	
025-0558	Lifoam Industries, LLC	0.000	0.022	
005-0184	Noxell Corporation	0.000	0.022	
510-0918	Buckeye Terminals, LLC - Baltimore Terminal	0.000	0.012	
043-0114	Craig Paving, Inc	0.000	0.012	
003-0317	National Security Agency	0.000	0.006	
031-2164	MedImmune, Inc.- Gaithersburg	0.000	0.006	

4.2.3 Changes Planned for 2017-2018

MDE is proposing discontinuing the lead monitor at the HU-Beltsville NCore site because lead levels measured there are much lower than the lead NAAQS. Complete data were collected from November 1, 2012 through December 31, 2016. During this period, the largest 24-hour lead concentration measured at HU-Beltsville was 0.042 $\mu g\ m^{-3}$ (only 28% of the NAAQS) and the second largest concentration was 0.013 $\mu g\ m^{-3}$. These concentrations were collected with a PM_{10} monitor and the lead NAAQS is for PM total suspended particles (TSP). EPA allows PM_{10} monitors to be used as surrogates to measure lead as long as lead concentrations are below a certain limit. Specifically, 40CFR58 Appendix C 2.10.1.1 states:

"Pb-PM_{10} samplers can be approved for use at the non-source-oriented sites required under paragraph 4.5(b) of Appendix D to part 58 if there is no existing monitoring data indicating that the maximum arithmetic 3-month mean Pb concentration (either Pb-TSP or Pb-PM_{10}) at the site was equal to or greater than 0.10 micrograms per cubic meter during the previous 3 years."

This monitor adds minimal environmental information to the network. Termination will allow for more efficient allocation of existing resources.

4.3 Nitrogen Dioxide (NO_2) – General Description and Sampling Method

Nitrogen dioxide is produced during high-temperature burning of fuels. Sources include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial boilers. It is measured indirectly. First, nitrogen oxide (NO) is measured using the chemiluminescence reaction of nitric oxide (NO) with ozone (O_3). Air is drawn into a reaction chamber where it is mixed with a high concentration of ozone from an internal ozone generator. Any NO in the air reacts with the ozone to produce NO_2. Light emitted from this reaction is detected with a photomultiplier tube and converted to an electrical signal proportional to the NO concentration. Next, total nitrogen oxides (NO_x) are measured by passing the air through a converter where any NO_2 in the air is reduced to NO before the air is passed to the reaction chamber. By alternately passing the air directly to the reaction chamber, and through the converter before the reaction chamber, the analyzer alternately measures NO and NO_x. The NO_2 concentration is equal to the difference between NO_x and NO.

4.3.1 Monitoring Requirements

On December 30, 2016, EPA published 40 CFR Part 50 Revision to the Near-Road NO_2 Minimum Monitoring Requirements. This rule revision eliminated the requirement for a near-road monitoring station in CBSA's having populations between 500,000 and 1,000,000 persons. These stations were due by January 1, 2017. Maryland would have needed one new near-road NO_2 monitoring station to meet this requirement.

Table 4-4 NO_2 Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in Maryland	Number of monitors active in Maryland
Near Road NO_2 monitoring in CBSA with a population >= 2,500,000	4.3.2(a)	2	3 qualifying CBSA's
Area-wide monitoring in CBSA with population > 1 million	4.3.3	1	3 qualifying CBSA's
Regional Administrator required monitoring	4.3.4	Variable	0

Near Road Monitoring

There are three MSA's with populations greater than 2,500,000 that are either wholly in Maryland, or that Maryland is a part of, that each qualify for two near road NO_2 monitors (Table 1-1). For the Baltimore-Towson, MD MSA, MDE is currently operating two near road NO_2 monitoring stations: the Howard County Near Road site, located on I-95 S between Routes 32 and 216, and the Baltimore County Near Road site, located at the Maryland Transit Administration maintenance facility at the interchange of I-695 and I-795.

For the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA, the requirements will be met by monitors installed in Washington, DC by the District of Columbia Department of the Environment (DDOE) and in Virginia by the Virginia Department of Environmental Quality (VADEQ). For the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA, the requirements will be met by monitors installed by the Pennsylvania Department of Environmental Protection (PADEP).

Community Wide Monitoring

There are three MSA's with populations greater than 1,000,000 that are either wholly in Maryland, or that Maryland is a part of, that each qualify for one community wide NO_2 monitor (Table 1-1). MDE's NO_2 monitors at the Essex and Oldtown sites fulfill this requirement for the Baltimore-Towson, MD MSA.

For the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA, the requirements will be met by monitors installed in Washington, DC by the District of Columbia Department of the Environment (DDOE) and in Virginia by VADEQ. For the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA, the requirements will be met by monitors installed by PADEP.

Sensitive and Vulnerable Populations

EPA Region III has not required MDE to install any additional monitors to meet this requirement.

4.3.2 Sources

Oxides of nitrogen are produced during high-temperature burning of fuels. Sources of NO_x include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial boilers.

4.3.3 Changes Planned for 2017-2018

No changes planned.

4.4 Ozone (O_3) – General Description and Sampling Method

Ozone is measured by ultraviolet absorption photometry. Air is drawn continuously through a sample cell where ultraviolet light passes through it. O_3 molecules in the air absorb part of the ultraviolet light, reducing the intensity of the light reaching a light sensor. The light is converted into an electrical signal related to the concentration of O_3 in the sample cell.

On October 1, 2015, EPA strengthened the NAAQS for ground-level ozone to 70 parts per billion (ppb), based on extensive scientific evidence about ozone's effects on public health and welfare. The updated standard will improve public health protection, particularly for at-risk groups including children, older adults, people of all ages who have lung diseases such as asthma, and people who are active outdoors, especially outdoor workers. They also will improve the health of trees, plants and ecosystems. The implementation of the 2015 Ozone NAAQS includes expanding the ozone season in Maryland from March 1 through October 31, beginning March 1, 2017.

4.4.1 Monitoring Requirements

Ozone monitoring requirements are determined by the MSA population and design value, as specified in Table D-2 of 40 CFR Part 58 Appendix D. Table 4-5 shows that the MDE monitoring network meets or exceeds the minimum requirements. Since ozone levels decrease significantly in the colder periods of the year in many areas, ozone is only required to be monitored during the designated "ozone season". The implementation of the 2015 Ozone NAAQS includes expanding the ozone season in Maryland from March 1 through October 31 starting in 2017.

Table 4-5 Number of Ozone SLAMS Sites Required (based on Table D–2, Appendix D to 40 CFR Part 58, Ozone Minimum Monitoring Requirements)

MSA Name	Population	Monitors Deployed by State[A]						Total Monitors	Required >= 85% NAAQS
		DE	DC	MD	VA	WV	PA		
Baltimore-Towson, MD	2,753,149	0	0	8	0	0	0	8	4
Hagerstown-Martinsburg, MD-WV	256,278	0	0	1	0	1	0	2	1
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	0	3	7	7	0	0	17	3
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	4	0	1	0	0	8	13	3
Salisbury, MD-DE	381,868	2	0	0	0	0	0	2	2
Total		6	3	16	8	1	8	42	13

A - Based on tables available at https://www.epa.gov/air-trends/air-quality-design-values. All areas had their maximum site >= 85% Ozone NAAQS.

Within an O_3 network, at least one O_3 site for each MSA must be designed to record the maximum concentration for that particular metropolitan area. More than one maximum concentration site may be necessary in some areas. Since O_3 requires appreciable formation time, the mixing of reactants and products occurs over large volumes of air, and this reduces the importance of monitoring small-scale spatial variability. The appropriate spatial scales for O_3 sites are neighborhood, urban, and regional.

The prospective maximum concentration monitor site should be selected in a direction from the city that is most likely to observe the highest O_3 concentrations, more specifically, downwind during periods of photochemical activity. For the Baltimore-Towson, MD MSA, Essex, Edgewood, and Aldino are assigned this designation. For the Washington-Arlington-Alexandria, DC-MD-VA-WV MSA, HU-Beltsville, Beltsville-CASTNET and PG Equestrian Center are assigned this designation for the Maryland portion of the MSA. For the Martinsburg-Hagerstown, MD-WV MSA, Hagerstown is assigned this designation.

4.4.2 Sources

Ozone is not emitted directly from a pollution source but is formed in the lower atmosphere by the reaction of nitrogen oxides (NO_x) and volatile organic compounds (VOC's) in the presence of sunlight and warm temperatures. Sources of nitrogen oxides include automobiles, power plants and other combustion activities. VOC's can come from automobiles, gasoline vapors, and a variety of large and small commercial and industrial sources that use chemical solvents, paint thinners, and other chemical compounds. NO_x and VOC's or "precursors of ozone" can travel for many miles before chemical reactions in the atmosphere form O_3.

4.4.3 Changes Planned for 2017-2018

Hart-Miller Island

MDE deployed a portable ozone monitor to Hart-Miller Island within the Chesapeake Bay during the 2016 ozone season. It was included as an Addendum to Maryland's 2017 Air Monitoring Network Plan. This Special Purpose Monitor will again be deployed and operated on the island during the 2017 ozone season.

Furley

MDE is proposing to move the Furley ozone monitor (seasonal) 1.5 miles from its current location inside the Recreation Center due to limited access hours and unreliable temperature control. The proposed new location is in Baltimore City, in a neighborhood setting very much like the original Furley station location (Fig 4-1).

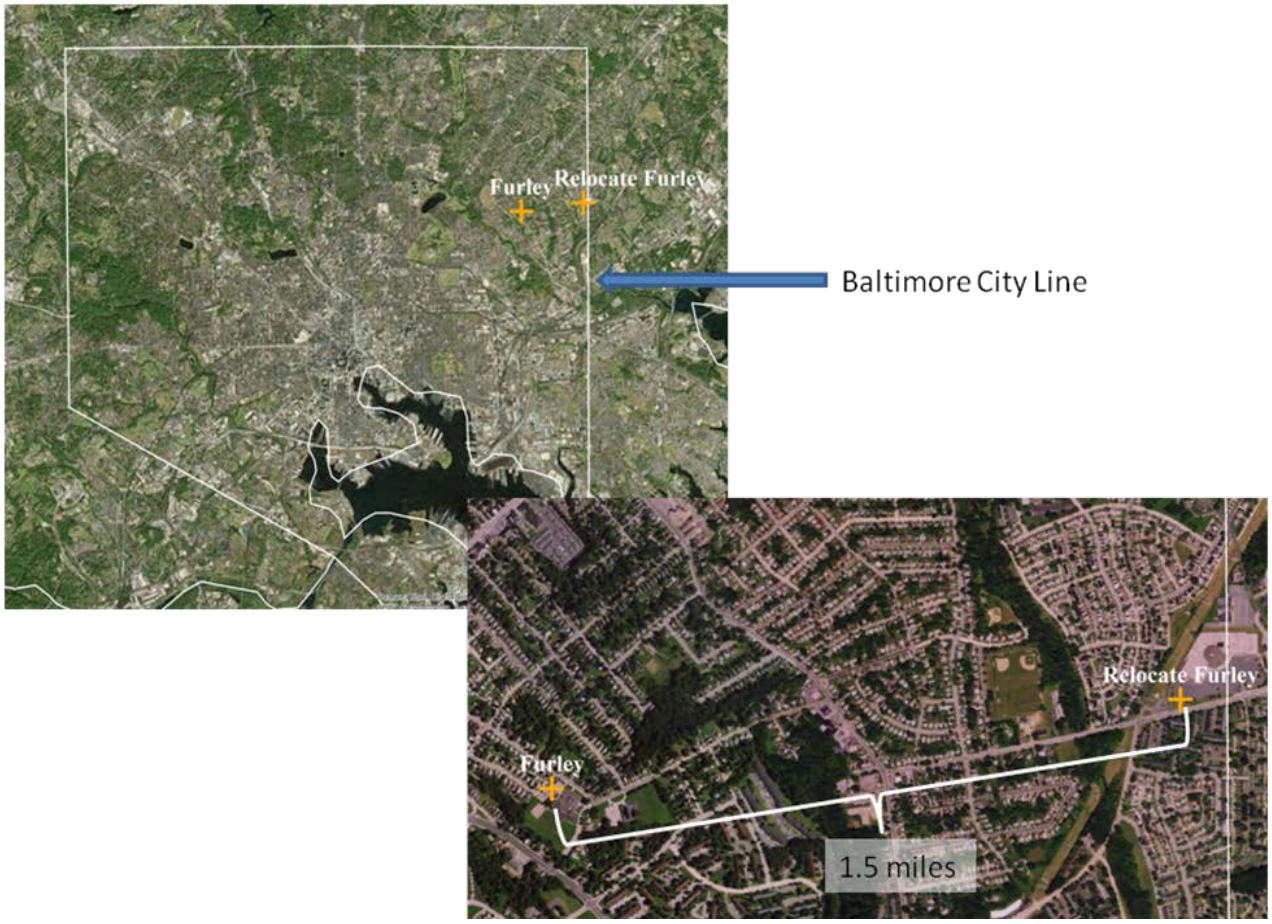

Figure 4-1 Map showing proposed new location for Furley monitoring station.

In addition to the seasonal O_3 monitor, MDE may retrofit the FEM PM_{10} BAM that was removed from Piney Run at the end of 2016 with a VSCC (very sharp cut cyclone) to convert it to an FEM $PM_{2.5}$ BAM, and install that at the new Furley site. This would act as a replacement for the proposed termination of the FRM $PM_{2.5}$ monitor at NWPS, which is also located in Baltimore City.

Padonia

One March 1, 2017, MDE was required to move the Padonia air monitoring station, which had $PM_{2.5}$ and seasonal O_3 monitors, from its current location at the Padonia International Elementary School due to construction activity (Appendix C – letter from BCPS). A new permanent site location has been identified at the adjacent Cockeysville Skate Park, about 300 meters from the site's original location (Fig 4-2). At the time of this writing, MDE is in the process of identifying a temporary location near the original site until a new lease agreement and power supply for the new permanent location can be finalized.

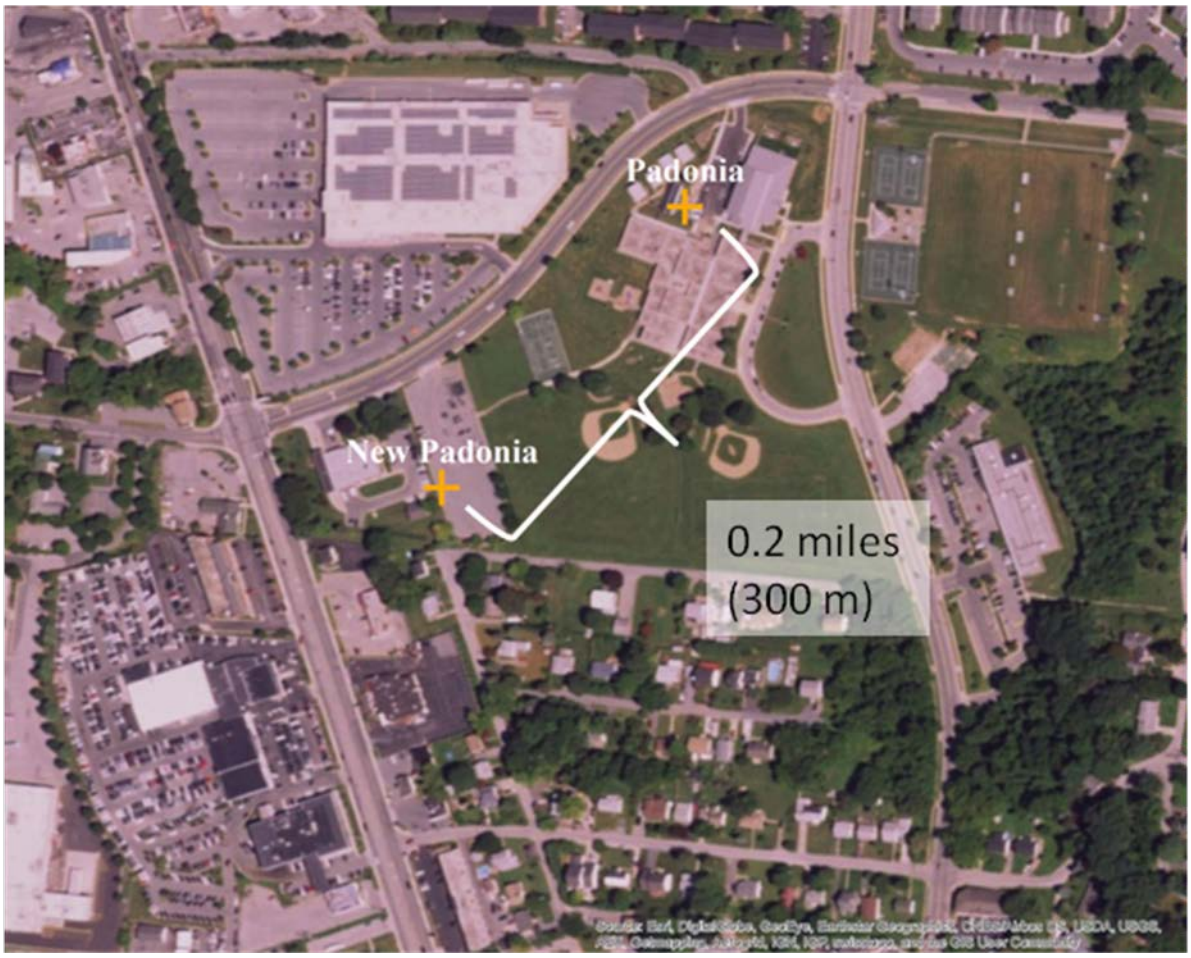

Figure 4-2 Map showing proposed new location for Padonia monitoring station.

4.5 Particulate Matter (PM_{10}) – General Description and Sampling Method

MDE uses both manual gravimetric and automated monitors to measure PM_{10} mass concentrations. The PM_{10} Beta Attenuation Monitor (BAM) automatically measures and records dust concentrations with built-in data logging. The principal of beta ray attenuation is used to provide a simple determination of mass concentration. An external pump pulls a measured amount of air through a filter tape for a one-hour period. The 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 is used to determine the mass concentration of particulate matter on the filter tape and hence the hourly volumetric concentration of particulate matter in the ambient air.

Gravimetric samplers draw air through a specially designed inlet that excludes particles larger than 10 microns in diameter for a period of 24 hours. The particles are collected on a Teflon filter that is weighed to determine the particulate mass. These samplers report the air volume measured during the sampling period allowing the concentration (mass/volume) to be calculated.

4.5.1 Monitoring Requirements

The number of required PM_{10} monitors in each CBSA is determined by the CBSA population and design value, as specified in Table D-5 of Appendix D to 40 CFR Part 58. Table 4-6 shows that the MDE monitoring network meets or exceeds the minimum requirements.

Table 4-6 Number of PM_{10} SLAMS Sites Required (based on Table D–4, Appendix D to 40 CFR Part 58, PM_{10} Minimum Monitoring Requirements)

MSA Name	Population	Monitors Required[A]	Active Monitors in MD/Total[B]
Baltimore-Towson, MD	2,753,149	2-4	3/3
Hagerstown-Martinsburg, MD-WV	256,278	0-1	0/0
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	2-4	1/7
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	2-4	0/4
Salisbury, MD-DE	381,868	0-1	0/0

A – All of the listed MSA's have PM_{10} ambient concentrations well below 80% of the PM_{10} NAAQS.
B –Based on tables available at http://www.epa.gov/airtrends/values.html.

Minimum Requirements for Collocated PM_{10}

A minimum of 15% (round up), or at least one, of the PM_{10} monitors must be collocated as specified in 40 CFR Part 58 Appendix A 3.3.1. MDE has 3 PM_{10} monitors and two are collocated, thereby meeting this requirement.

4.5.2 Sources

Major sources of PM_{10} include steel mills, power plants, motor vehicles, industrial plants, unpaved roads, and agricultural tilling. The wide variety of PM_{10} sources means that the chemical and physical composition of coarse particles is highly variable.

4.5.3 Changes Planned for 2017-2018

No changes planned.

4.6 Fine Particulate Matter ($PM_{2.5}$) – General Description and Sampling Method

MDE also uses both FRM manual gravimetric and FEM automated monitors (BAM's) to measure $PM_{2.5}$ mass concentrations. A filter attached to the inlets of these monitors excludes particles having diameters greater than 2.5 microns. Otherwise, the monitors work as described for PM_{10} gravimetric and automated monitoring. Some of the gravimetric monitors are specially equipped to collect $PM_{2.5}$ samples, which are later analyzed into concentrations of the samples' chemical constituents or species. See Table 3-6 for list of speciated $PM_{2.5}$ mass. MetOne Super SAAS samplers, URG 3000N, and IMPROVE samplers are used for the collection of samples for the chemical speciation of $PM_{2.5}$. The samplers collect 3 to 4 filter samples simultaneously every third or sixth day for a period of 24 hours. These samples are then sent to an EPA contract laboratory for chemical analyses. There are over 50 species consisting of ions, metals, and carbon species quantified by the analyses (Table 3-6).

4.6.1 Monitoring Requirements

The number of required $PM_{2.5}$ monitors in each MSA is determined by the MSA population and design value, as specified in Table D-5 of Appendix D to 40 CFR Part 58. Table 4-7 shows that the MDE monitoring network meets or exceeds the minimum requirements.

Table 4-7 Number of $PM_{2.5}$ SLAMS Sites Required (based on Table D–5, Appendix D to 40 CFR Part 58, $PM_{2.5}$ Minimum Monitoring Requirements)

MSA Name	Population	Annual Design Value ($\mu g/m^3$)	Daily Design Value ($\mu g/m^3$)	Required SLAMS Monitors	Monitors Active in MD/Total[A,B]	Required ≥ 85% NAAQS
Baltimore-Towson, MD	2,753,149	9.8	26	3	8/8	3
Hagerstown-Martinsburg, MD-WV	256,278	10.3	26	1	1/2	1
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	9.4	22	2	2/10	3
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	11.8	30	3	1/22	2
Salisbury, MD-DE	381,868	8.4	21	0	0/1	0

A - Based on tables available at https://www.epa.gov/air-trends/air-quality-design-values.
B- Total number of monitors includes those located in other States.

Minimum Requirements for Collocated $PM_{2.5}$

Collocation requirements for $PM_{2.5}$ are based on the number of $PM_{2.5}$ monitors within a Primary Quality Assurance Organization (PQAO) and by measurement method (FRM or FEM) as specified in 40 CFR Part 58 Appendix A 3.2.5 and Appendix D 4.7.2. MDE is its own PQAO so all monitors in Maryland are counted in the collocation requirements. A minimum of 15% (round up) of the monitors must be collocated. MDE has 13 $PM_{2.5}$ monitoring stations; therefore 2 must be collocated. MDE currently operates three collocated $PM_{2.5}$ monitors, one FRM-FRM (Howard U), one FRM-FEM (Oldtown), and one FEM-FRM (Padonia).

Requirements for Continuous $PM_{2.5}$ Monitoring

At least one-half (round up) of the minimum number of sites per MSA must operate continuous $PM_{2.5}$ monitors. MDE operates 11 continuous $PM_{2.5}$ monitors, four in the Baltimore-Towson, MD MSA; two in the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA; one in the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA; and one in the Hagerstown-Martinsburg, MD-WV MSA. The other three are in areas not designated as MSA's (Figure 3-1; Tables 3-1 and 3-2).

Requirements for Near Road $PM_{2.5}$ Monitoring

For MSA's with a population of one million or greater, at least one $PM_{2.5}$ monitor is to be located at a near road NO_2 station. The Howard County near road site fulfills this requirement for the Baltimore-Towson, MD MSA. MDE does not operate near road NO_2 stations in any other MSA (Section 4.3.1).

Requirements for $PM_{2.5}$ Chemical Speciation

Each state shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the $PM_{2.5}$ Speciation Trends Network (STN). MDE conducts chemical speciation monitoring at Essex and HU-Beltsville, but only HU-Beltsville is designated as part of the STN.

Other Requirements for $PM_{2.5}$ Monitoring

The required monitoring sites must be located to represent area-wide air quality. These will typically be either neighborhood or urban scale, although micro or middle scale may be appropriate in some urban areas. At least one monitoring site must be neighborhood scale or greater in an area of expected maximum concentration and one site must be sited in an area of poor air quality. Each State shall have at least one $PM_{2.5}$ site to monitor for regional background and at least one $PM_{2.5}$ site to monitor for regional transport. Each NCore station must operate a $PM_{2.5}$ monitor. Table 4-7 shows that MDE meets all of these additional requirements.

4.6.2 Sources

$PM_{2.5}$ pollution is emitted from combustion activities, such as industrial and residential fuel burning and motor vehicles. $PM_{2.5}$ can also form in the atmosphere from precursor compounds through various physical and chemical processes.

Table 4-8 Monitor Objective Types and Scales Assigned to Monitors in the Maryland $PM_{2.5}$

Site Name	Measurement Scale	Monitor Objective	MSA
Oldtown	Middle Scale	Highest Concentration	Baltimore-Towson, MD
Howard Co. Near Rd	Microscale	Highest Concentration/ Source Oriented	Baltimore-Towson, MD
Padonia	Neighborhood	Population Exposure	Baltimore-Towson, MD
Essex	Neighborhood	Population Exposure	Baltimore-Towson, MD
Edgewood	Neighborhood	Population Exposure	Baltimore-Towson, MD
NW Police Station	Neighborhood	Population Exposure	Baltimore-Towson, MD
Hagerstown	Urban Scale	Population Exposure/ Highest Concentration	Hagerstown-Martinsburg, MD-WV
Fair Hill	Regional Scale	Population Exposure	Philadelphia-Camden-Wilmington, PA-DE-MD
Rockville	Neighborhood	Population Exposure	Washington-Arlington-Alexandria, DC-VA-MD-WV
HU-Beltsville	Urban Scale	Population Exposure	Washington-Arlington-Alexandria, DC-VA-MD-WV
Horn Point	Regional Scale	Population Exposure	NA
Millington	Neighborhood	Population Exposure	NA
Piney Run	Regional Scale	Regional Transport	NA

4.6.3 Applicability of FEM Data for Comparison to the NAAQS and Reporting the AQI

MDE operates both FRM and FEM $PM_{2.5}$ monitors (Table 3-2). Pursuant to the January 15, 2013 revisions to $PM_{2.5}$ monitoring requirements, MDE recommends that all of the FEM monitors currently operating in the MDE monitoring network remain eligible for comparison to the $PM_{2.5}$ NAAQS and for reporting the AQI. This recommendation applies retrospectively to FEM data collected since the first quarter of 2012, and prospectively for data collected in 2017 and 2018. MDE will re-evaluate this recommendation for FEM data collected in the 36 months prior to January 1, 2016 and 2017 in next year's Annual Network Plan.

4.6.4 Changes Planned for 2017-2018

$PM_{2.5}$ monitoring with manual FRM methods is very labor and time intensive. Filters must be preconditioned and weighed in a humidity controlled laboratory environment prior to being installed in a filter cassette and transported to each monitoring location for placement in the monitor. Once a week, the exposed filters are collected, sampling is recorded on a hand-written data sheet, and the filters are transported back the lab for post-sampling conditioning and weighing. Because MDE is operating more $PM_{2.5}$ monitors than required by 40CFR58 Appendix D and measured concentrations are well below the NAAQS, there is an opportunity to improve efficiency and safety (through reduced operator travel time) of operations and reduce costs while still meeting EPA requirements.

MDE is proposing to discontinue the FRM $PM_{2.5}$ monitor located at the Northwest Police Station, in the Baltimore-Towson MSA. The loss of this urban $PM_{2.5}$ monitor may be offset by retrofitting the FEM PM_{10} BAM monitor from Piney Run with a VSCC (very sharp cut cyclone) to converting it to an FEM $PM_{2.5}$ BAM, and installing that at the new Furley site.

Table 4-9 shows that the annual and daily $PM_{2.5}$ design values for NW Police station have always been lower than those at Oldtown, which is 5.4 miles away. Since Oldtown measures higher $PM_{2.5}$ concentrations it is more protective of public health and discontinuing NW Police station would not influence the designation status of the Baltimore area.

Table 4-9 Daily and Annual $PM_{2.5}$ Design Values at Oldtown and NW Police Station.

	Daily Standard ($\mu g/m^3$)		Annual Standard ($\mu g/m^3$)	
Year	NW Police Station	Oldtown	NW Police Station	Oldtown
2011	23	29	10.2	11.3
2012	23	27	9.9	11.1
2013	22	26	9.3	10.5
2014	21	24	8.8	9.8
2015	22	26	8.8	9.6

MDE is also proposing to reduce the sampling frequency for three FRM $PM_{2.5}$ monitor in the Baltimore-Towson MSA. These are summarized in Table 4-10. The collocated FRM sampler at Padonia, which is paired with an FEM BAM primary instrument, is only required to be operated on a 1 in 12 day schedule (40 CFR Part 58, Appendix A, Section 3.2.3.4(d)).

Table 4-10 Current and proposed sampling schedules for FRM samplers.

Site	Current Schedule	Proposed Schedule
Essex	1/3	1/6
Padonia collocated	1/3	1/12
Oldtown	1/1	1/3

There is a known high bias of the continuous $PM_{2.5}$ FEM (federal equivalent method) compared to the FRM and this could result in a slightly higher design value at the Oldtown site (https://www.epa.gov/outdoor-air-quality-data/pm25-continuous-monitor-comparability-assessments). MDE estimates that annual and daily design values could increase by 1-2 $\mu g\ m^{-3}$ (Table 4-11 and Figure 4-3) if the sampling frequency was reduced, though the design value is still below the EPA standard.

Table 4-11 Changes in Design Value at Oldtown based on a change in sampling frequency.

	Annual Standard (µg/m^3)		Daily Standard (µg/m^3)	
Year	Current sampling frequency (1/3)	Estimate with reduced sampling frequency (1/6)	Current sampling frequency (1/3)	Estimate with reduced sampling frequency (1/6)
2011	11.3	12.4	29	29
2012	11.1	12.4	27	28
2013	10.5	11.9	26	28
2014	9.8	11.2	24	26
2015	9.6	10.9	26	28

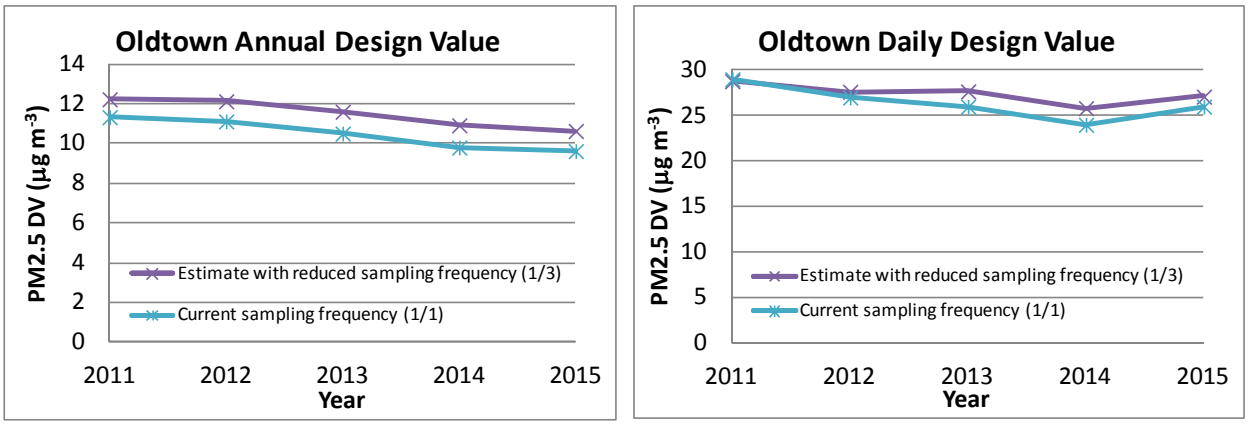

Figure 4-3 Changes in Design Value at Oldtown based on a change in sampling frequency.

4.7 Sulfur Dioxide (SO_2) – General Description and Sampling Method

Sulfur dioxide (SO_2) is measured with a fluorescence analyzer. Air is drawn through a sample cell where it is subjected to high intensity ultraviolet light. This causes the sulfur dioxide molecules in the air to fluoresce and release light. The fluorescence is detected with a photo multiplier tube and converted to an electrical signal proportional to the SO_2 concentration.

On August 10, 2015, the U.S. EPA finalized requirements for air agencies to monitor or model ambient SO_2 levels in areas with large sources of SO_2 emissions to help implement the 1-hour SO_2 NAAQS. This final rule establishes that, at a minimum, air agencies must characterize air quality around sources that emit 2,000 tons per year (tpy) or more of SO_2. On January 5, 2016, MDE notified EPA Region III of six SO_2 emissions sources located in Maryland for which air quality will be characterized. These sources are listed in Table 4-12, along with 2014 emissions data, which are the basis for the Rule.

Table 4-12 Maryland's List of Sources Subject to the Final, 1-hour SO_2 Data Requirements Rule.*

Facility Name	CAMD SO_2 (tons)	MDE Data System (TEMPO) SO_2 (tons)
Brandon Shores	3,145.09	12,757.31**
CP Crane	1,887.16	1,890.04
Chalk Point	3,928.48	3,933.20
Herbert A Wagner	9,610.26	12,757.31**
Verso Luke Mill	N/A	16,999.39
Morgantown	2,961.76	3,134.47

*Note that every other source in Maryland emits less than 1,000 tpy of SO_2, per TEMPO 2014 data.
** This is the total for Ft. Smallwood, including both Brandon Shores and HA Wagner
CAMD: Clean Air Markets Division

An air agency may avoid the requirement for air quality characterization near a source by adopting enforceable emission limits that ensure that the source will not emit more than 2,000 tpy of SO_2. This final rule gives air agencies the flexibility to characterize air quality using either modeling of actual source emissions or using appropriately sited ambient air quality monitors. At the time of this publication, all sources have completed modeling except Verso Luke Mill. Verso Luke Mill began monitoring SO_2 at two locations in Allegany County, Maryland in January 2017, with a third station location in Mineral County, WV (Tables 3-1 through 3-4; Appendix A Site locations Figure A-29) The three Verso Luke Mill stations, Moran, Horse Rock, and Bean, are being operated by Verso Luke Mill, to fulfill the SO_2 DRR. Verso Luke Mill is responsible for the collection of SO_2 ambient air monitoring data and will perform all required QC checks and audits. In addition, they will make the data available to MDE. MDE, as the PQAO, is responsible for reviewing the data for quality assurance purposes and delivering the data to AQS.

4.7.1 Monitoring Requirements

The minimum number of required SO_2 monitors in each MSA is proportional to the product of the total amount of SO_2 emissions in the MSA and its population, as specified in 40 CFR Part 58, Appendix D, Section 4.4. The resulting value is defined as the Population Weighted Emissions Index (PWEI). SO_2 emissions shown in Table 4-13 are from the 2011 National Emissions Inventory (NEI).

Table 4-13 Minimum SO_2 Monitoring Requirements

MSA Name	2016 Population Estimate[A]	2014 NEI SO_2 (tons/year)[B]	PWEI (millions of people-tons per year)	Monitors Required	Monitors Active in MD/Total[C]
Baltimore-Towson, MD	2,798,886	18,452	51,644	1	1/1
Hagerstown-Martinsburg, MD-WV	263,817	2,096	553	0	0/0
Washington-Arlington-Alexandria, DC-VA-MD-WV	6,131,977	13,237	81,170	1	1/4
Salisbury, MD-DE	400,200	1,252	501	0	0/1
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,070,500	12,934	78,518	1	0/10

[A]Population from US census https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
[B]NEI from 2014 Sector summaries https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data
[C]Total monitors in an MSA is based on tables available at https://www.epa.gov/air-trends/air-quality-design-values

Other SO_2 Monitoring Requirements

The Regional Administrator may require additional SO_2 monitoring stations above the minimum in areas where the minimum requirements are not deemed sufficient to meet monitoring objectives. There are no additional monitors required in Maryland by the Regional Administrator.

Each NCore station must operate a SO_2 monitor. This requirement is met at both the HU-Beltsville and Piney Run monitoring stations.

4.7.2 Sources

The main sources of SO_2 are combustion of coal and oil (mostly from electrical generating units (EGUs), refineries, smelters, and industrial boilers). Nationally, two-thirds of all SO_2 emissions are from EGUs. Coal operated EGUs account for 95% of these emissions.

4.7.3 Changes Planned for 2017-2018

No changes planned.

4.8 Photochemical Assessment Monitoring Stations (PAMS) – General Description and Sampling Method

The purpose of the PAMS program is to provide an air quality database that will assist in evaluating and modifying control strategies for attaining the ozone NAAQS. The selection of parameters to be measured at a PAMS site varies with the site's ozone nonattainment designation (moderate, serious, severe, or extreme) and whether the site is upwind or downwind of ozone precursor source areas. The parameters are O_3, NO, NO_x, NO_2, NO_y, and speciated volatile organic compounds (VOC's).

On October 1, 2015, the PAMS monitoring rule (40 CFR Part 58, Appendix D, Section 5) was revised in conjunction with the strengthening of the ozone NAAQS. States have until June 1, 2019 to meet these new requirements. MDE's plan to implement the new requirements is presented in Section 4.8.4 of this document. In the meantime, states with existing PAMS sites, like Maryland are obliged to continue operation under the pre-existing requirements.

Methods used to sample and analyze VOC's and NO_y follows (NO/NO_x and O_3 have already been described in Sections 4.3 and 4.4, respectively):

- Ambient air is collected in eight 3-hour canister samples every 3rd day(June – August) using a XonTech Model 910A Canister Sampler with a Model 912 multi-canister sampling adapter. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system.
- Ambient air is collected in 24-hour canister samples every sixth day using a XonTech Model 910A/Atec Model 2200 Canister Sampler. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system. These are the same canister samples listed in section 4.9 below but analyzed for the PAMS list of compounds.
- Ambient air is collected and analyzed on-site every hour (June – August) using a Perkin Elmer VOC Air Analyzer with dual flame ionization detectors.
- Ambient air is sampled hourly for NO_y using a TECO, Model 42C low level oxides of nitrogen analyzer.

4.8.1 Monitoring Requirements and Locations

Design criteria for the existing PAMS network are based on locations relative to ozone precursor source areas and predominant wind directions associated with high ozone events (40 CFR 58 Appendix D, 5.1). The overall design should enable characterization of precursor emissions sources within the ozone NAA's. There are specific monitoring objectives associated with each PAMS location: transport of ozone and its precursors, and the photochemical processes related to ozone non-attainment. These specific monitoring objectives associated with each of these sites result in four distinct site types and are as follows:

- Type 1 sites are intended to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to transport.

- Type 2 sites are intended to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions are expected to impact and are suited for the monitoring of urban air toxic pollutants.
- Type 3 sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions.
- Type 4 sites are intended to characterize the downwind transported ozone and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming transport in other areas.

A Type 2 site is required for each PAMS area. Only two sites are required for each area, providing all chemical measurements are made. The PAMS network for the Baltimore NAA is described in Table 4-14. There are two PAMS monitoring stations for the Baltimore, MD NAA: the HU-Beltsville Type 1 site and Essex Type 2 site. The HU-Beltsville station also doubles as a Type 3 site for the Washington, DC NAA PAMS network. Note that the HU-Beltsville PAMS station serves different objectives for the Baltimore and Washington NAA's. The required PAMS monitoring locations and frequencies from the PAMS monitoring rule (40 CFR 58, Appendix D, Table D-6) are provided in Table 4-15. The requirements are all being met.

Table 4-14 Monitoring Details for PAMS Network

Site Name	PAMS Type	Parameters Observed	Monitoring Objective
Essex	Type 2	O_3	Population exposure
		VOCs	Maximum precursor emissions impact Population exposure
		NO_x	Maximum precursor emissions impact Population exposure
		CO	Maximum precursor emissions impact Highest concentration Population exposure
HU-Beltsville	Type 1/3	O_3	Highest concentration
		VOCs	Upwind background / Population exposure
		NO_y, NOx	General/Background
		CO	General/Background

Table 4-15 Summary of Required PAMS Monitoring Locations and Frequencies

Measurement	Where required	Sampling frequency (all daily except for upper air meteorology)	Status
Speciated VOC's	Two sites per area, one of which must be a Type 2 site.	During the PAMS monitoring period: (1) Hourly auto GC, or (2) Eight 3-hour canisters, or (3) 1 morning and 1 afternoon canister with a 3-hour or less averaging time plus Continuous Total Non-methane Hydrocarbon measurement.	Met at Essex (Type 2, auto GC) and HU-Beltsville (Type 1/ 3, canisters).
Carbonyl sampling	Type 2 site in areas classified as serious or above for the 8-hour ozone standard.	3-hour samples every day during the PAMS monitoring period.	Met at Essex (Type 2).
NO_X	All Type 2 sites.	Hourly during the ozone monitoring season.	Met at Essex (Type 2) and HU-Beltsville (Type 1/3).
NO_y	One site per area at the Type 3 or Type 1 site.	Hourly during the ozone monitoring season.	Met at HU-Beltsville (Type 1/3).
CO (ppb level)	One site per area at a Type 2 site.	Hourly during the ozone monitoring season.	Met at Essex (Type 2) and HU-Beltsville (Type 1/3).
Ozone	All sites.	Hourly during the ozone monitoring season.	Met at Essex and HU-Beltsville.
Surface met	All sites.	Hourly during the ozone monitoring season.	Met at Essex and HU-Beltsville.
Upper air meteorology	One representative location within PAMS area.	Sampling frequency must be approved as part of the annual monitoring network plan required in 40 CFR 58.10.	Met at HU-Beltsville.

4.8.2 Sources

PAMS VOC's can come from automobiles, gasoline vapors, and a vast variety of large and small commercial, and industrial sources that use chemical solvents, paint thinners and other chemical compounds.

4.8.3 Changes Planned for 2017-2018

No changes planned.

4.8.4 Implementation Plan for Revised PAMS Monitoring Rule (October 1, 2015) Requirements

Under the October 1, 2015 revisions to the PAMS monitoring rule, state and local monitoring agencies are required to collect and report PAMS measurements at each NCore site with a population of 1,000,000 or more beginning June 1, 2019. PAMS measurements include:

(1) Hourly averaged speciated volatile organic compounds (VOCs);

(2) Three 8-hour averaged carbonyl samples per day on a 1 in 3 day schedule, or hourly averaged formaldehyde;

(3) Hourly averaged O_3;

(4) Hourly averaged nitrogen oxide (NO), true nitrogen dioxide (NO_2), and total reactive nitrogen (NO_y);

(5) Hourly averaged ambient temperature;

(6) Hourly vector-averaged wind direction;

(7) Hourly vector-averaged wind speed;

(8) Hourly averaged atmospheric pressure;

(9) Hourly averaged relative humidity;

(10) Hourly precipitation;

(11) Hourly averaged mixing-height;

(12) Hourly averaged solar radiation; and

(13) Hourly averaged ultraviolet radiation.

For Maryland, this requirement could be met by collecting PAMS measurements at the HU-Beltsville NCore station. This site is already designated as a PAMS site under the existing PAMS regulatory requirements. However, hourly averaged speciated VOC measurements are not currently made at this location. Rather, eight 3-hour canister samples are collected daily, June-August, and subsequently analyzed for speciated VOC's in MDEs analytical laboratory. Maryland's other existing PAMS site, located at the Essex station, does collect hourly speciated VOC measurements and has an historical record dating back to 1992.

The revised PAMS monitoring rule allows for the EPA Regional Administrator to grant a waiver for the collection of required PAMS measurements at an alternative location where the monitoring agency can demonstrate that the alternative location will provide representative data useful for regional or national scale modeling and the tracking of trends in ozone precursors (VOC's).

MDE has formally requested a waiver from the EPA Region III Administrator (see Appendix D) to collect the required PAMS measurements at the Essex site in lieu of the HU-Beltsville NCore site in order to maintain the 25 year historical record of ozone precursor trends collected at the Essex site. An additional rationale for this waiver request is that the HU-Beltsville NCore site is located in the Washington-Arlington-Alexandria, DC-VA-MD-WV CBSA and there is another NCore site located approximately 17 miles to the south in Washington, D.C., at McMillan Reservoir, where required PAMS measurements are and will continue being made. The Essex site is in the Baltimore-Towson, MD CBSA and this is the only other CBSA in Maryland with a population greater than 1,000,000. The Baltimore-Towson, MD CBSA also has a current ozone design value above the 2015 ozone NAAQS. Therefore, the Essex site will better meet the distribution of PAMS sites intended in the revised PAMS monitoring rule.

As of the time of this Network Plan's publication, it is MDE's intention to adopt the national PAMS Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOP's) and to follow the guidance presented in the PAMS Technical Assistance Document. These documents have not been published yet and MDE reserves the right to implement deviations or procedural differences upon review of the completed documents, subject to EPA approval. Any such deviations or procedural differences will be addressed in subsequent amendments to this plan or future Annual Network Plans and supporting documentation (e.g., MDE-specific QAPP's, SOP's, etc.).

With respect to PAMS instrumentation at the Essex site, beginning no later than June 1, 2019, MDE intends to utilize the following:

<u>Hourly Speciated VOC's</u>
Hourly averaged speciated VOC's will be measured, at a minimum, from June through August with a Markes-Agilent Auto GC.

<u>Carbonyls</u>
Carbonyl sampling will be made at a frequency of three 8-hour on a one-in-three day basis from June through August annually using an ATEC Model 8000-2 Eight Channel Automated Carbonyl sampler with co-located independent channel. Samples will be analyzed by EPA Method TO-11A, as used in the National Air Toxics Trends (NATTS) program.

<u>Nitrogen Oxides</u>
Hourly averaged NO, NO_y and true NO_2 will be measured, at a minimum, from June through August. True NO_2 will be measured with a TeledyneAPI Model T500U CAPS NO_2 analyzer. NO and NOy will be measured using a Thermo 42i-Y.

<u>Meterological Parameters</u>
Hourly averaged temperature, vector-averaged wind speed, vector-averaged wind direction, atmospheric pressure, relative humidity and precipitation will be measured with a Vaisala Model WXT520.

Hourly averaged solar radiation will be measured with Kipp and Zonen SPLite instrument. Hourly averaged ultraviolet radiation will be measured with an Eppley Labs TUVR instrument. Hourly averaged mixing height will be measured with a Viasala Model CL51 ceilometer.

4.9 Air Toxics – General Description and Sampling Method

Air toxics, or hazardous air pollutants (HAPS), are those pollutants which are known or suspected to cause cancer or other serious health effects, such as reproductive or birth defects, or adverse environmental effects. MDE's air toxics network measures the toxic VOCs listed in Table 3-6. Air toxics samples are collected for 24 hours in canisters with a XonTech 910A or Atec 2200 canister sampler on an every sixth day schedule. The canisters are returned to the MDE laboratory for analysis on an Entech/Agilent gas chromatograph mass spectrometer system.

4.9.1 Monitoring Requirements

As part of the EPA Region III Cooperative Toxic Monitoring Program, MDE operates four air toxic monitoring stations to assess general urban levels. Toxics are sampled every sixth day year-round.

4.9.2 Monitoring Locations

There are four monitors measuring air toxics in Maryland: Essex, Baltimore County; Oldtown, Baltimore City; Howard County Near Road, Howard County; and HU-Beltsville, Prince George's County. Refer back to Table 3-2 Monitor Information for Current Maryland Ambient Air Monitoring Sites, for parameter information and monitoring objective at each monitoring site. For a map of monitoring locations in Maryland refer to Figure 3-1.

4.9.3 Sources

Toxics can come from automobiles, gasoline vapors, and a large variety of large and small commercial and industrial sources that use chemical solvents, paint thinners and other chemical compounds.

4.9.4 Changes Planned for 2017-2018

No changes planned.

4.10 NCore – General Description and Sampling Method

NCore, or National Core multi-pollutant monitoring stations, is the National monitoring network required in the October 17, 2006 revisions to the air monitoring regulations (40 CFR, Part 58). NCore sites are required to measure, at a minimum, $PM_{2.5}$ particle mass using continuous and integrated/filter-based samplers, $PM_{10-2.5}$ particle mass, O_3, SO_2, CO, NO/NO_y, wind speed, wind direction, barometric pressure, rain, relative humidity, and ambient temperature.

Sampling methods for $PM_{2.5}$, O_3, SO_2, NO/ NO_y are described under the individual pollutant sections throughout this document. Trace level measurement of CO and SO_2 is performed at NCore sites. $PM_{10-2.5}$ is determined by the difference between collocated PM_{10} and $PM_{2.5}$ FRM samplers.

The meteorological parameters (Table 3-4) are measured as follows:

- The Vaisala WXT520 PTU module contains separate sensors for pressure, temperature and humidity measurements. The measurement principle of the pressure, temperature and humidity sensors is based on an advanced RC oscillator and two reference capacitors against which the capacitance of the sensors is continuously measured. The microprocessor of the transmitter performs compensation for the temperature dependency of the pressure and humidity sensors.
- The Vaisala WXT520 uses RAINCAP Sensor 2- technology in precipitation measurement. The precipitation sensor comprises a steel cover and a piezoelectrical sensor mounted on the bottom surface of the cover. The precipitation sensor detects the impact of individual raindrops. Hence, the signal of each drop can be converted directly to accumulated rainfall. An advanced noise filtering technique is used to filter out signals originating from other sources and not raindrops.
- The Vaisala WXT520 uses WINDCAP sensor technology in wind measurement. The wind sensor has an array of three equally spaced ultrasonic transducers on a horizontal plane. Wind speed and wind directions are determined by measuring the time it takes the ultrasound to travel from each transducer to the other two. The wind sensor measures the transit time (in both directions) along the three paths established by the array of transducers. This transit time depends on the wind speed along the ultrasonic path. For zero wind speed, both the forward and reverse transit times are the same. With wind along the sound path, the up-wind direction transit time increases and the down-wind transit time decreases.

MDE operates other meteorological parameters not required by the NCore network, and they are measured as follows:

- MetOne's Model 092 instrument is used to measure barometric pressure. The instrument directly senses the weight of the air column or the atmospheric pressure.
- The Kipp and Zonen SPLite instrument is used to measure solar radiation at Essex and HU-Beltsville. It uses a photodiode detector, which creates a voltage output that is proportional to the incoming radiation. Ultraviolet (UV) radiation is measured at Essex using an Eppley Labs TUVR instrument.

4.10.1 Monitoring Requirements

Each State is required to operate one NCore site. Urban NCore stations are to be located at the urban or neighborhood scale to provide representative concentrations of exposure expected throughout the metropolitan area. Rural NCore stations are to be located to the maximum extent practicable at a regional or larger scale away from any large local emission source so that they represent ambient concentrations over an extensive area.

4.10.2 Monitoring Locations

MDE operates two NCore stations, at HU-Beltsville and Piney Run. The HU-Beltsville site is considered an Urban NCore site and Piney Run, a Rural NCore site. Refer to Table 3-2 for parameter information and monitoring objective at each site. For a map of monitoring locations in Maryland, refer to Figure 3-1.

4.10.3 Sources

Sources have already been addressed under the individual pollutant sections throughout this document.

4.10.4 Changes Planned for 2017-2018

No changes planned for 2018. However, in conjunction with the waiver request to have the PAMS measurements at Essex rather than HU-Beltsville (see Section 4.8.4), MDE has formally requested a waiver from the EPA to discontinue NOy monitoring at the HU-Beltsville NCore site beginning January 1, 2019. The waiver request letters and the EPA approval to move the NOy monitor from HU-Beltsville to Essex are contained in Appendix D. MDE plans to move the NOy monitor to the Essex site as part of the full suite of required PAMS measurements.

The rationale for this waiver request is twofold. First, under 40 CFR Part58, Appendix D, 3.(1), the Administrator may allow for waivers that permit NOx monitoring to be substituted for the required NOy monitoring at NCore sites where there is little difference in the measurement of NOy compared to the conventional NOx measurement. As shown in the waiver request (see Appendix D), this is the case for the HU-Beltsville NCore site. MDE will continue conventional NO_2/NOx monitoring at this location. Second, MDE does not have sufficient resources to operate and maintain an additional NOy monitor at the Essex PAMS site along with the HU-Beltsville NCore site and to process and validate the data generated.

MARYLAND

DEPARTMENT OF THE ENVIRONMENT

APPENDIX A

TOPOGRAPHIC MAP AND AREAL MAPS with SITE DESCRIPTIONS of AIR MONITORING STATIONS IN MARYLAND

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

This page is intentionally blank.

TABLE of FIGURES

Title **Page**

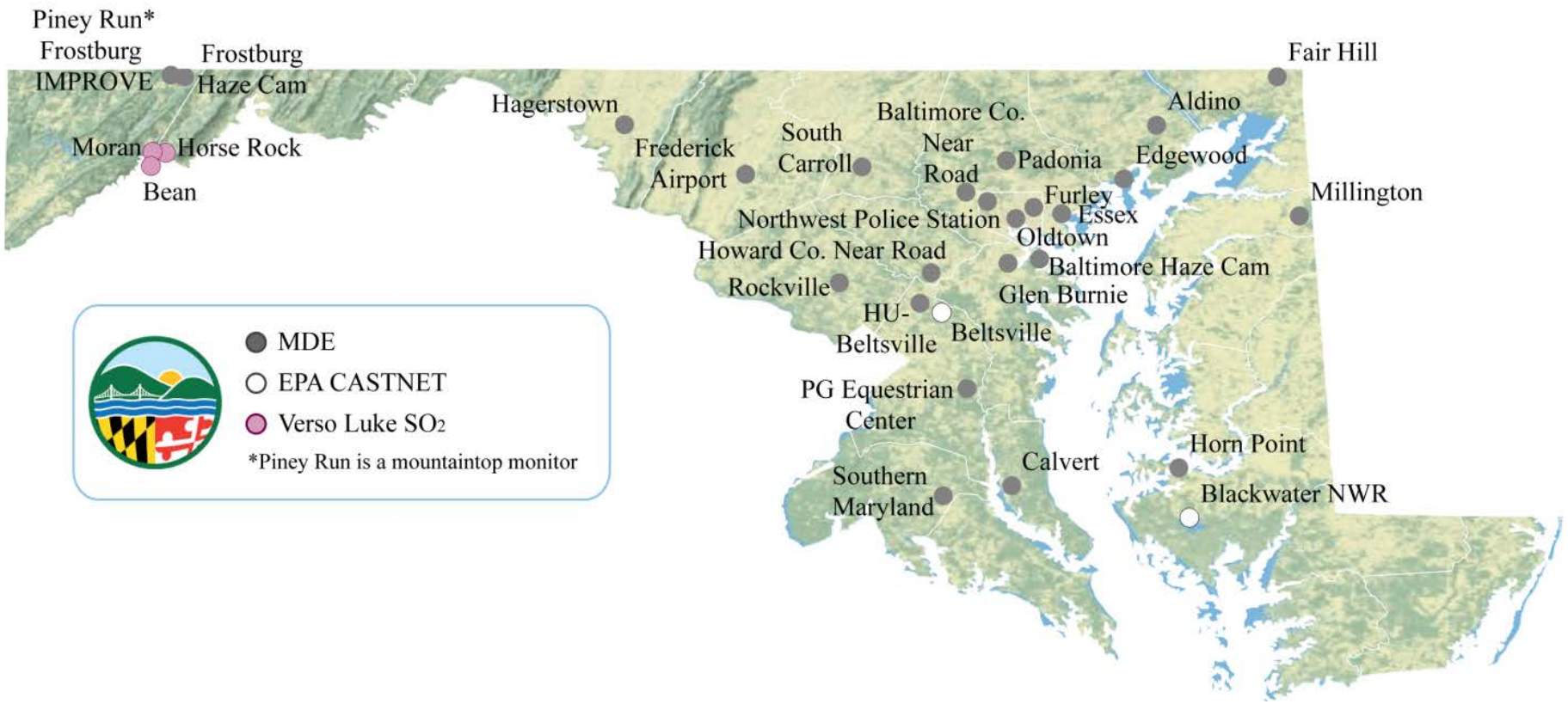

Figure A- 1. Topographic map of air monitoring sites in Maryland.

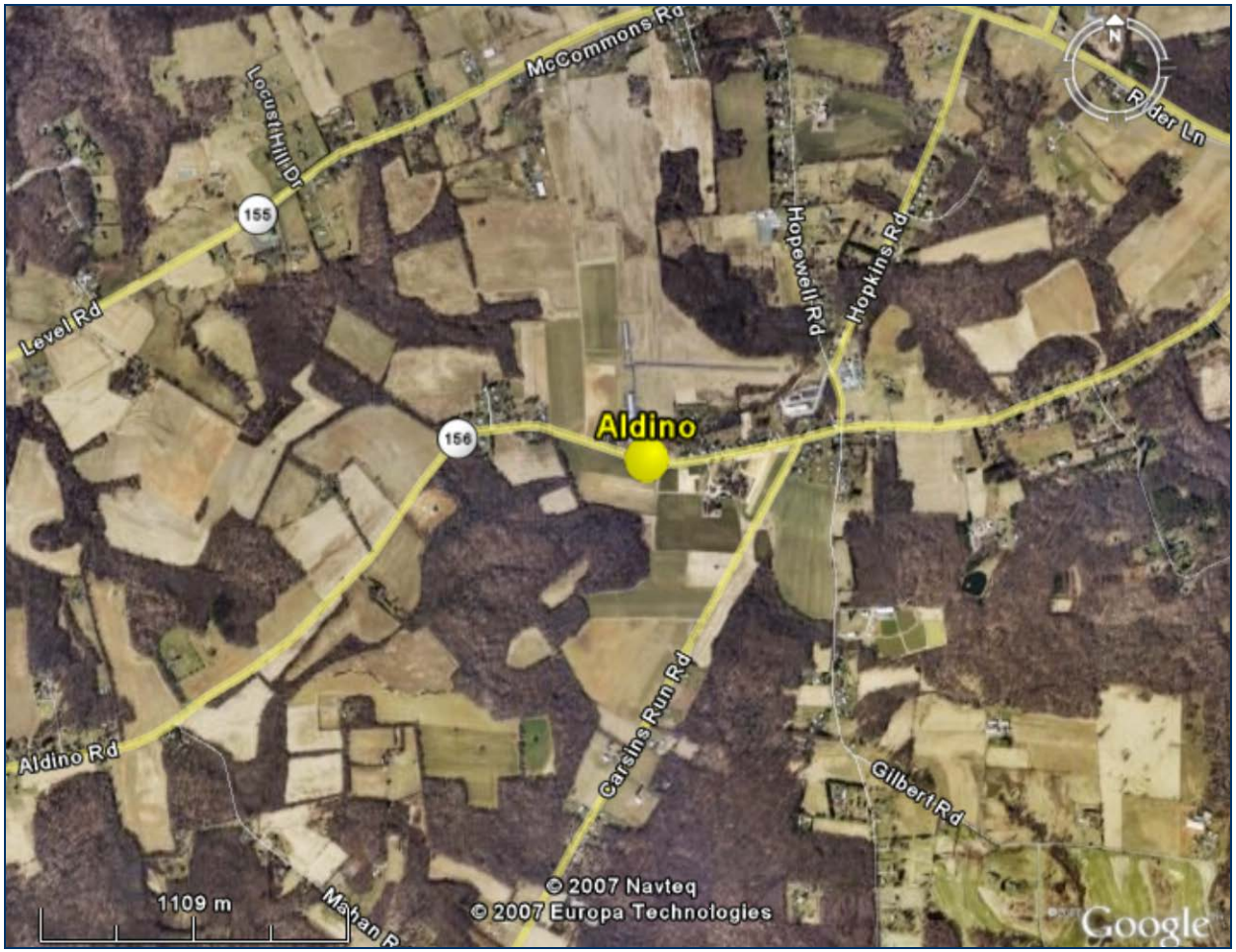

Figure A- 2. Areal map of Aldino air monitoring site in Harford County, MD. Aldino was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration of ozone at an urban measurement scale in a suburban setting. To the north of the Aldino monitoring site lies a two lane road, Aldino Road, about 20 feet from the side of the shelter, with a couple of telephone poles and a sod field on the far side of the road. To the east and directly next to the shelter is a parking lot to hold a single row of about 20 cars. At the far end of the parking lot is a one-story office building belonging to Harford Air Services. There are several small airplanes and several hangars behind the office building. To the south is a large flat grassy field containing a grass/dirt runway and another small hangar. To the west is the end of the runway, a house just past the runway, and the continuation of Aldino Road and the sod farm.

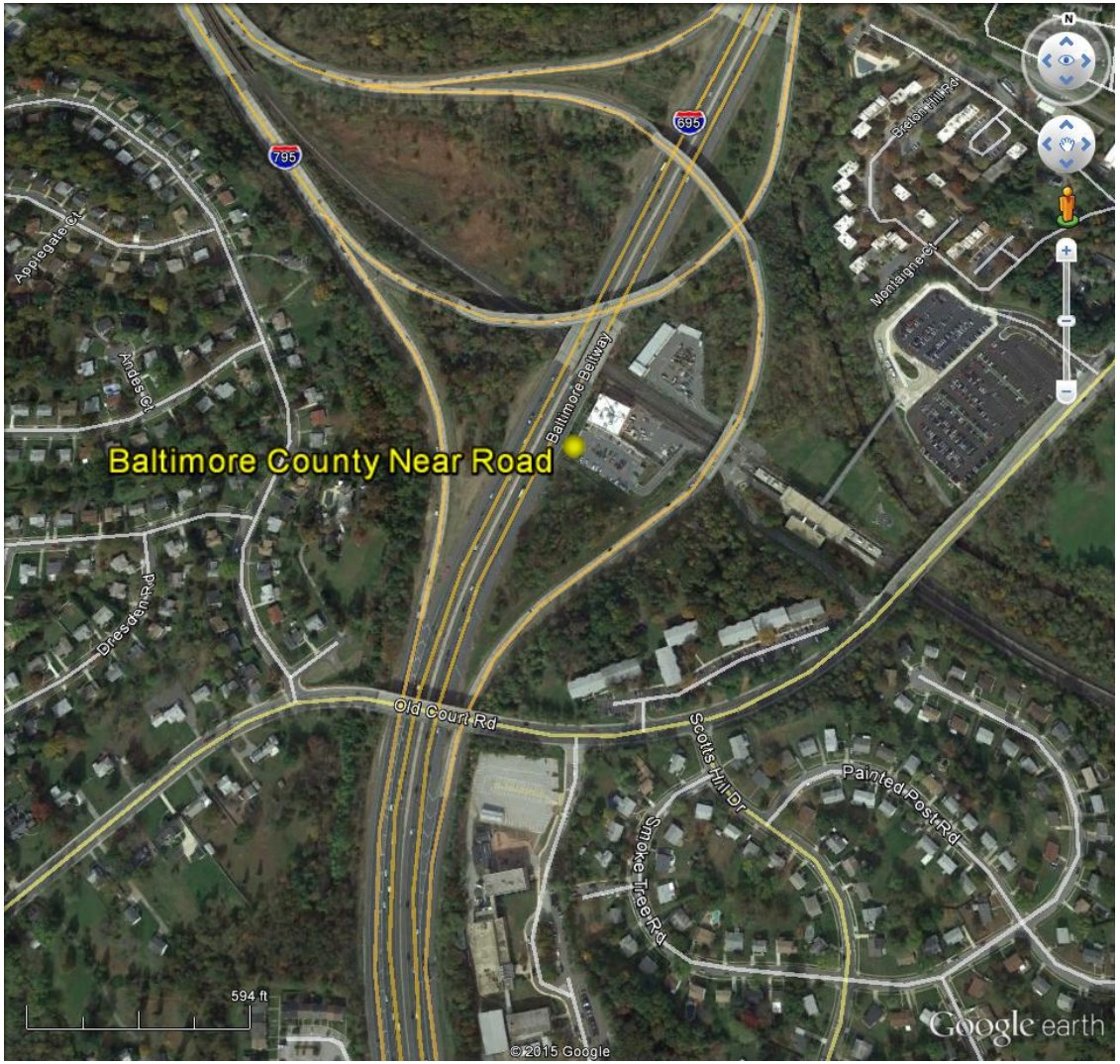

Figure A- 3. Areal map of the Baltimore County Near Road air monitoring site in Baltimore County, MD. BCNR, located in a suburban setting, was chosen as a site for monitoring air quality near roads, including NO, NO_2, and NO_x, source-oriented/highest concentration at the microscale. The BCNR site is in the back left corner of a Metro Station parking lot next to a gazebo that is to the left of the site.

Figure A- 4. Areal map of Baltimore Haze Cam site at Brandon Shores in Anne Arundel County, MD. Brandon Shores was chosen as a Haze Cam site for the purpose of providing public notification of visibility in an urban setting. The location provides an excellent vista of downtown Baltimore City.

Figure A- 5. Areal map of Beltsville CASTNET air monitoring site in Prince George's County, MD. Beltsville was chosen as an ozone monitoring site in the CASTNET network because of the potential to measure the highest concentration of ozone at a regional measurement scale.

Figure A- 6. Areal map of Blackwater NWR CASTNET air monitoring site in Dorchester County, MD. Blackwater was chosen as an ozone monitoring site in the CASTNET network because of the potential to measure the highest concentration of ozone at a regional measurement scale.

Figure A- 7. Areal map of Calvert air monitoring site in Calvert County, MD. Calvert was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale in a rural setting. The site is located at a recycling facility on a paved parking lot adjacent to a large radio tower that is several hundred feet high.

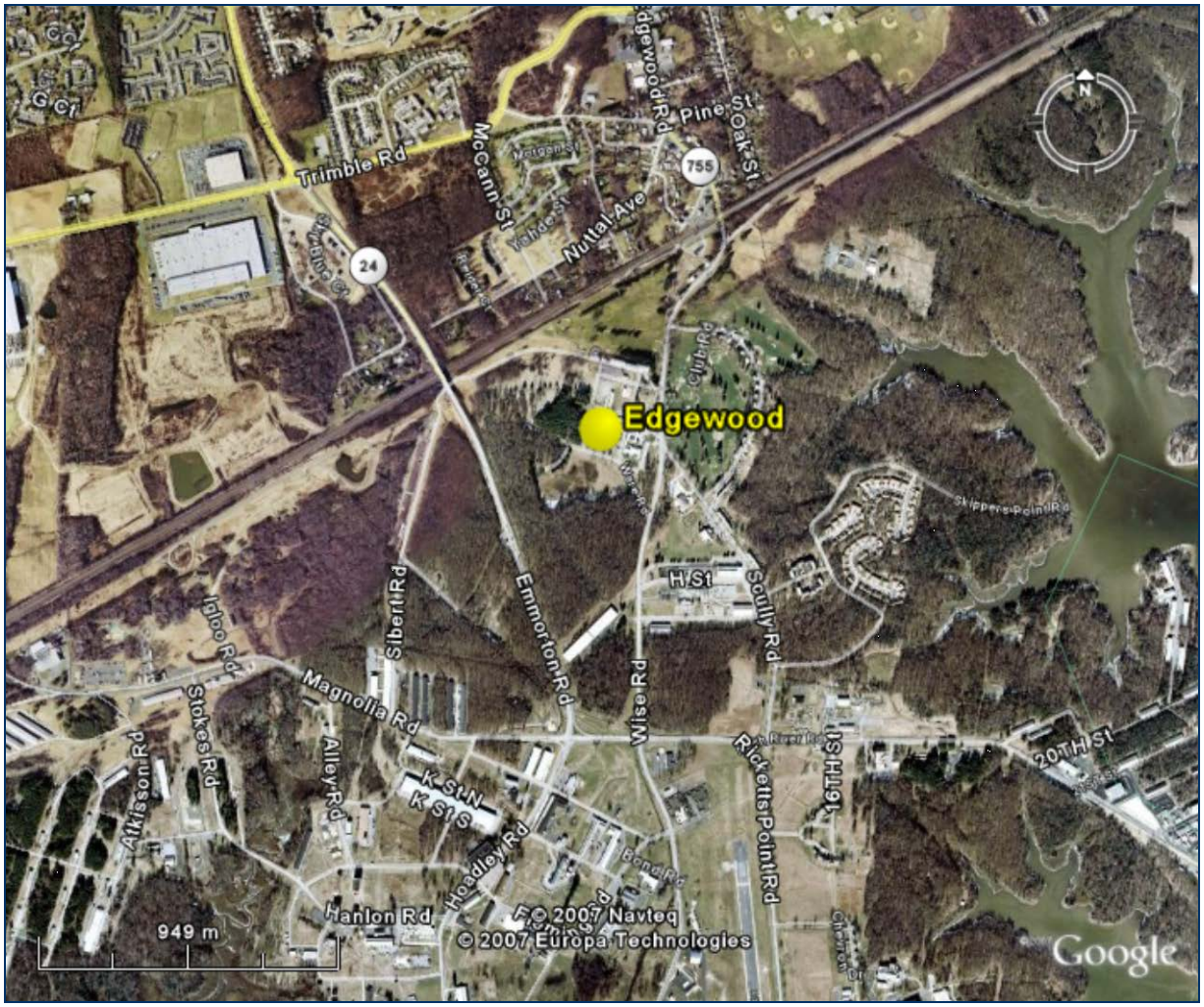

Figure A- 8. Areal map of Edgewood air monitoring site in Harford County, MD. Edgewood was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration of ozone at the urban measurement scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to PM at the neighborhood scale. It is located in a rural setting. The site is located within the Aberdeen Proving Grounds. Adjacent to the site are woods, a few small buildings, and mobile units that the Army uses as storage for their own ambient air monitoring equipment. The site is several miles west of the Chesapeake Bay.

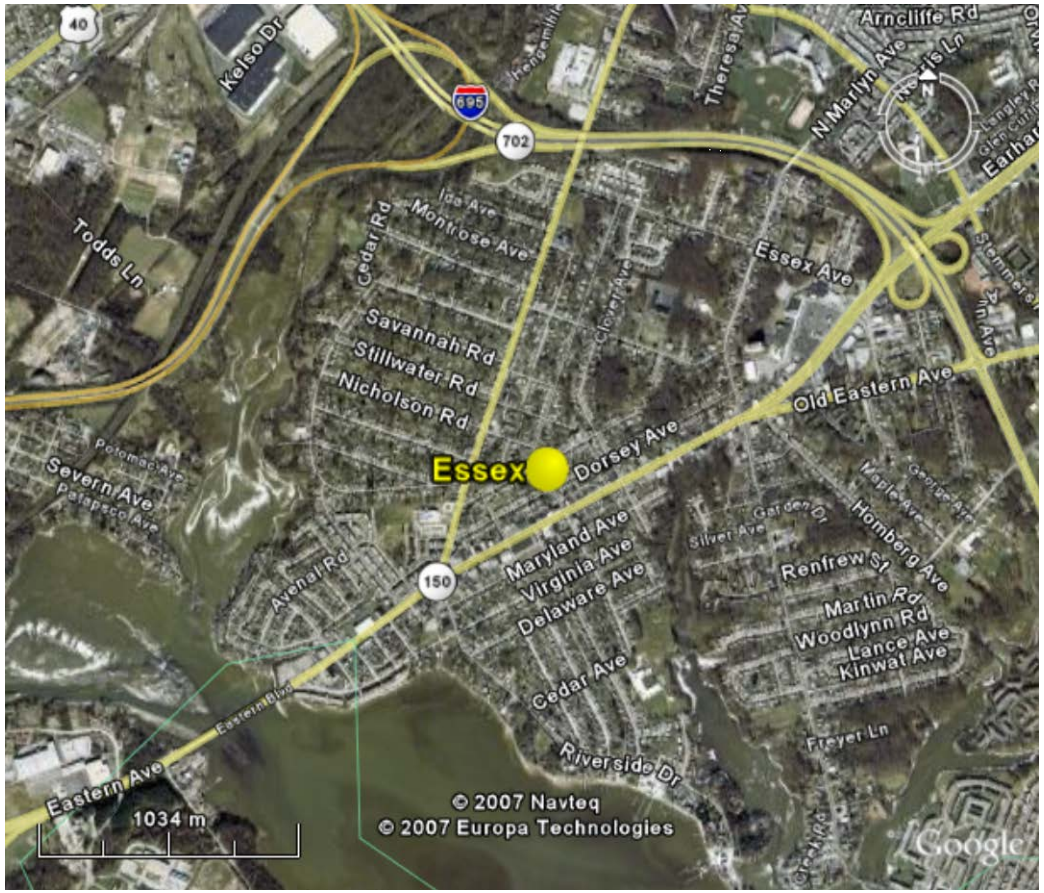

Figure A- 9. Areal Map of the Essex air monitoring site in Baltimore County, MD. Essex, located in a suburban setting, was chosen as a site for monitoring air toxics population exposure at the neighborhood scale; CO highest concentration at the middle scale; NO population exposure and maximum precursor at the neighborhood scale; NO_x and NO_2 maximum precursor at the neighborhood scale; year-round ozone highest concentration and population exposure at the neighborhood scale; $PM_{2.5}$ (local conditions and hourly) population exposure at the neighborhood scale; SO_2 highest concentration at the neighborhood scale; and Type 2 PAMS VOC's maximum precursor and highest concentration at the neighborhood scale. Essex is located in the parking lot of the Essex Senior Center, two blocks from a four-lane road going through the town. To the north of the monitoring station is a small patch of grass, a sidewalk, and Woodward Road, a two-lane road. To the south and west of the monitoring shelter is parking lot for the senior center, which can hold about 50 cars. The senior center is located just beyond the parking lot. The surrounding area is a neighborhood with one or two-story houses on less than quarter acre lots, power lines, and sparse trees.

Figure A- 10. Areal map of Fair Hill air monitoring site in Cecil County, MD. Fair Hill was chosen as a seasonal ozone monitoring site because of the potential to measure the regional transport of ozone at the urban measurement scale. It was chosen as a PM2.5 monitoring site because of the potential to measure general/background PM at the regional scale. It is located in a rural setting. To the north of the Fair Hill monitoring site lies a flat grass field, a single paved lane, and a steeplechase and turf track beyond the lane. In the far distance are a few single story office buildings, and a riding ring with bleachers. To the east continues the grass field and single paved lane. The steeplechase and turf track also continue this direction until meeting with several mature trees and a barn in the distance. To the south passes Rt. 273, a two lane road, just behind the shelter. Past the road is a grass field leading to several racing barns and a couple of mature trees with a training track in the background. To the west continues Rt. 273. Just beyond the road is a gravel parking lot for day horse trailer parking. On the near side of the road in the distance are several one story office and land management buildings.

.

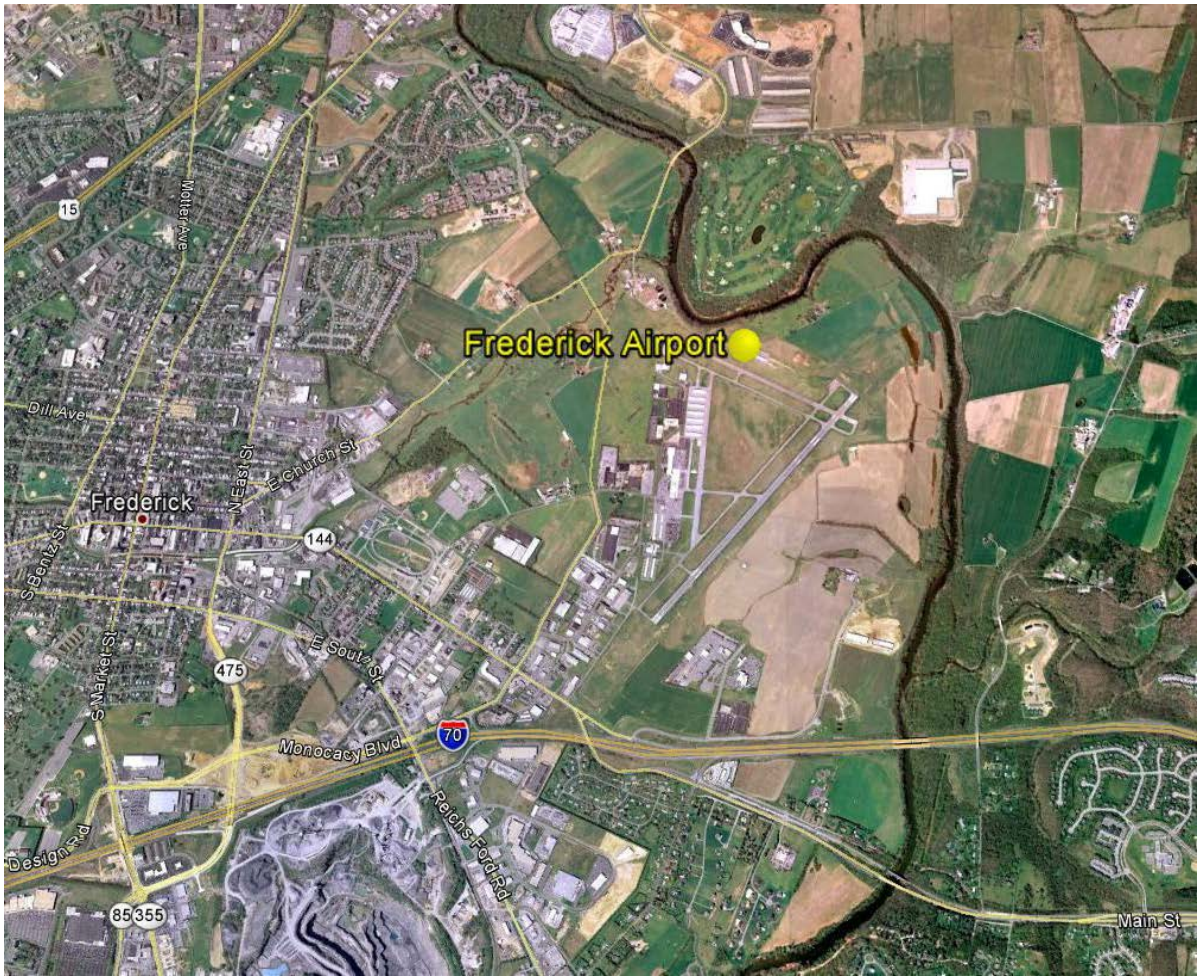

Figure A- 11. Areal map of Frederick Airport air monitoring site in Frederick County, MD. Frederick was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at an urban measurement scale in a suburban setting. The Frederick trailer sits off to the side of a road that passes through a Wastewater Treatment Facility. The trailer sits a few feet from a building and airplanes can frequently be observed taking off from the airport in the distance.

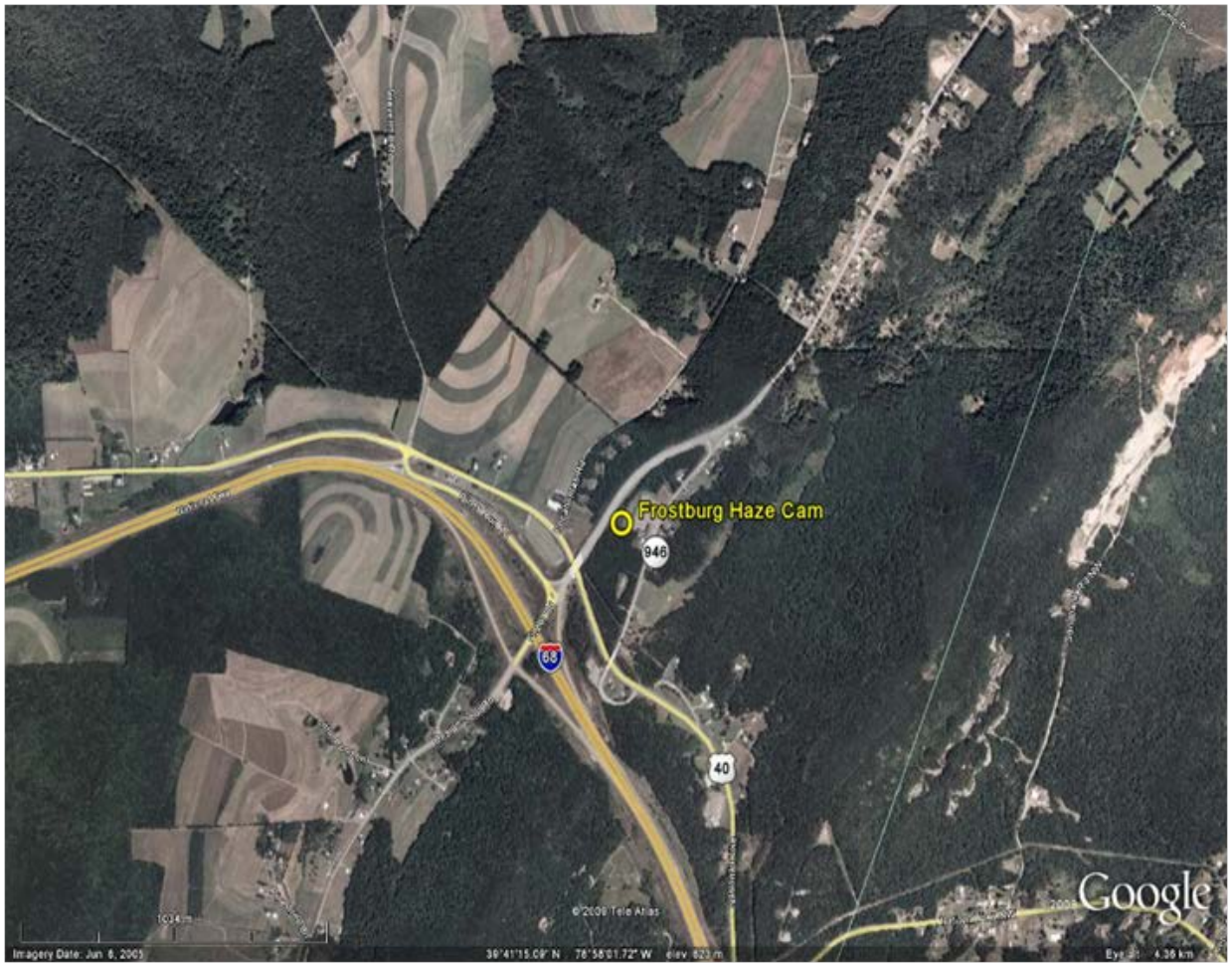

Figure A- 12. Areal map of Frostburg Haze Cam site in Garrett County, MD. Frostburg was chosen as a Haze Cam site for the purpose of providing public notification of visibility in a rural setting. The location provides a view of the Piney Run air monitoring station.

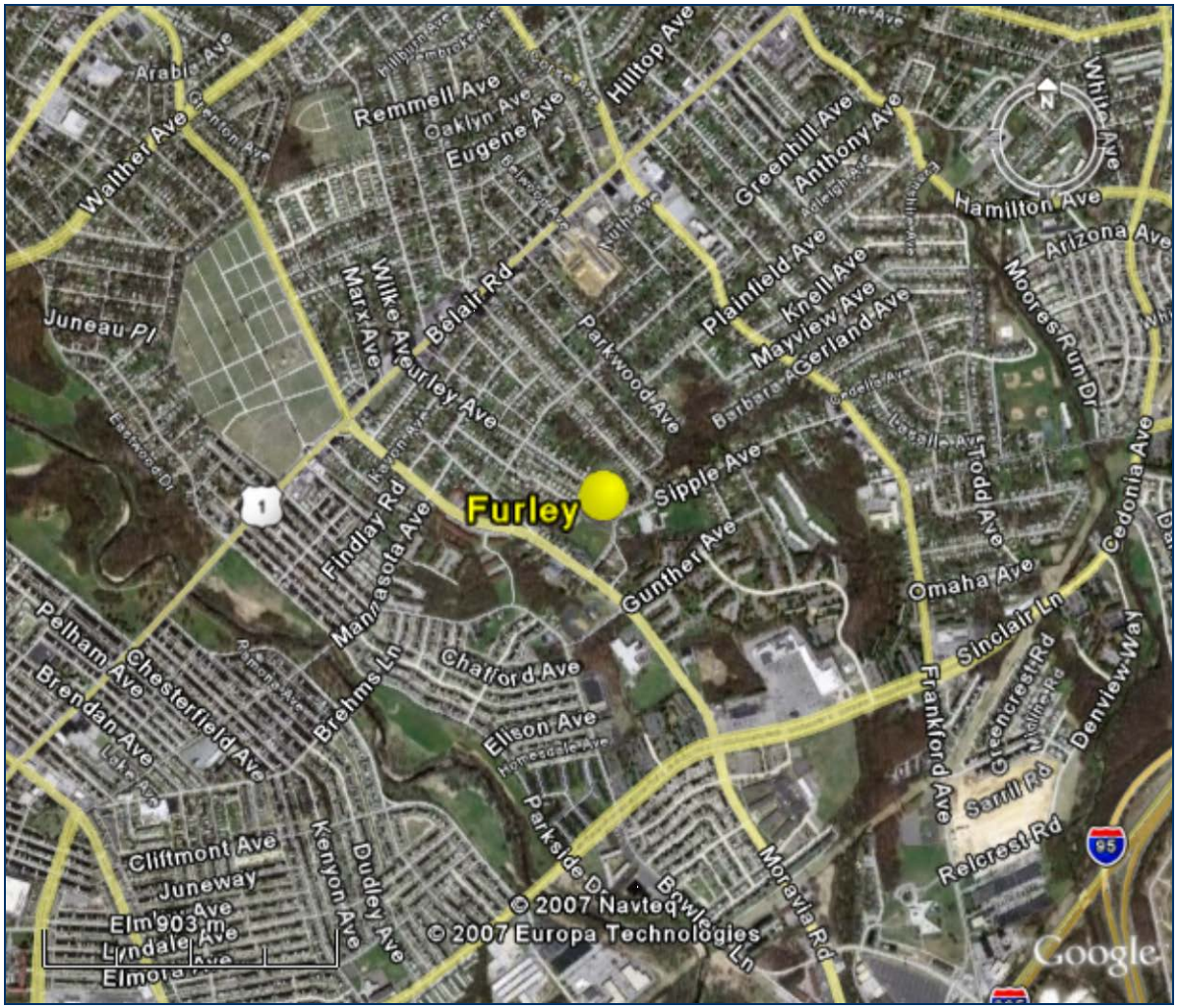

Figure A- 13. Areal map of Furley air monitoring site in Baltimore City, MD. Furley was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the neighborhood measurement scale in an urban, city center setting. The Furley site is located within one of the cafeterias of Furley Elementary school (which is a pretty big school if you ever get lost in the hallways). The instruments are located in a cabinet (kind of like a rack) in the back left corner of the cafeteria.

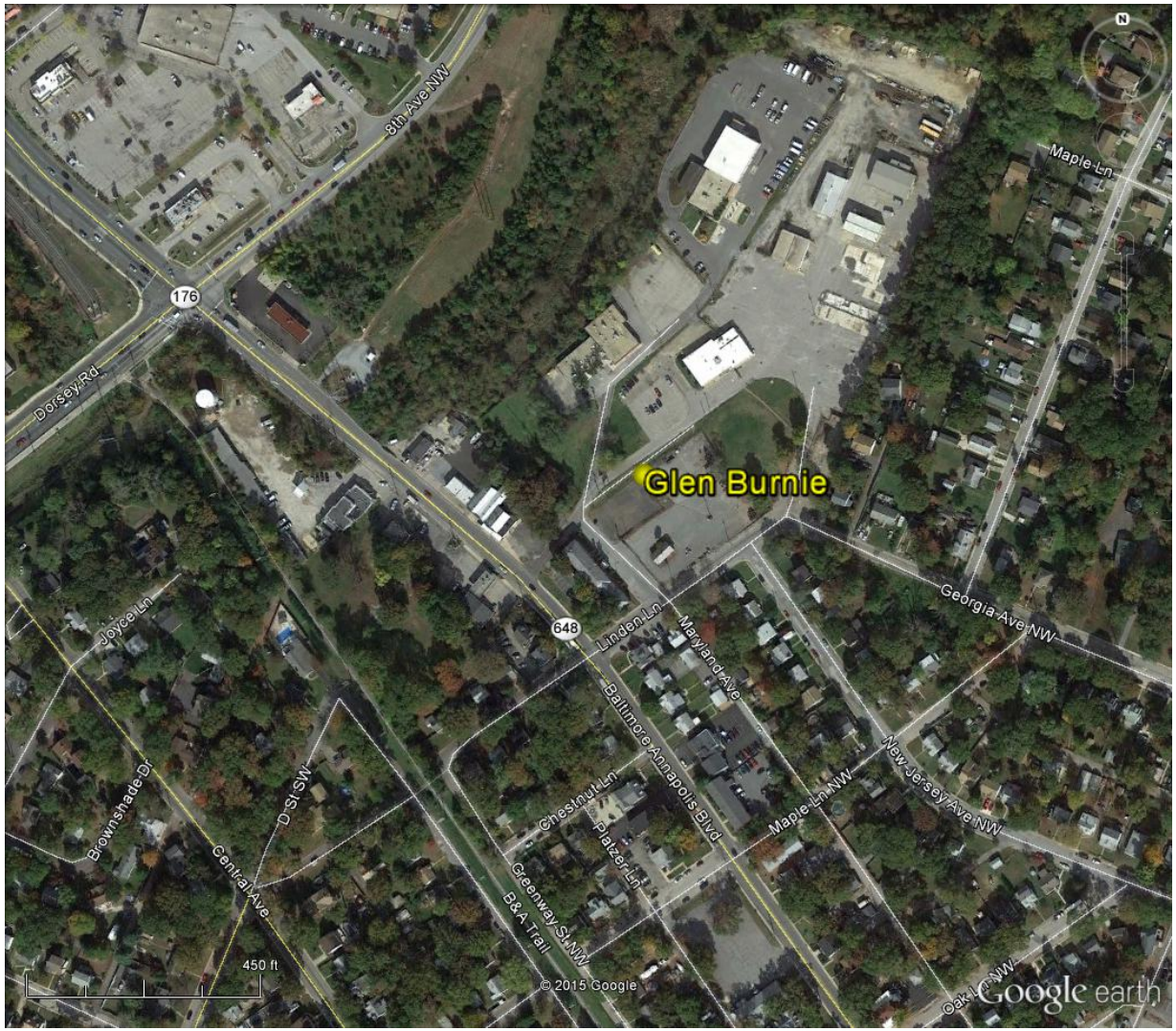

Figure A- 14. Areal map of Glen Burnie air monitoring site in Anne Arundel County, MD. Glen Burnie was chosen as a PM and seasonal ozone monitoring site because of the potential to measure the population exposure of PM_{10} and O_3 at the neighborhood scale in a suburban setting.

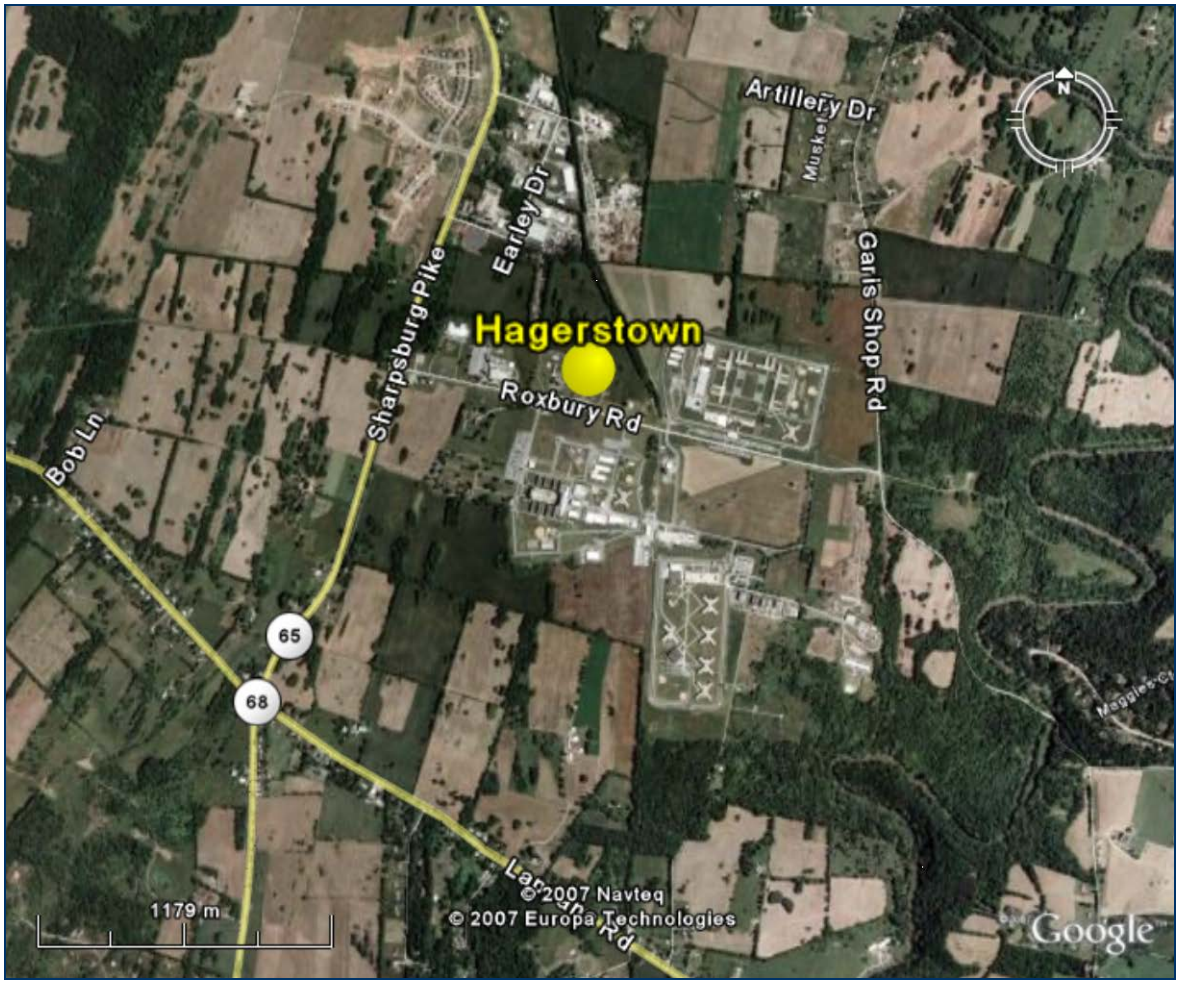

Figure A- 15. Areal map of Hagerstown air monitoring site in Washington County, MD. Hagerstown was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration and population exposure of ozone at the urban scale. It was chosen as a $PM_{2.5}$ monitoring site because of the potential to measure population exposure to $PM_{2.5}$ at the urban scale. It is located in a rural setting. The Hagerstown trailer sits right by a blue water tower on rolling hills a few hundred feet from a correctional facility. You can see two parking lots - one lot that is passed to get to the trailer and one lot that is across the road from the trailer.

Figure A-16 Areal map of Hart-Miller Island air monitoring site in Baltimore County, MD. Hart-Miller Island was chosen as a seasonal ozone monitoring site in an effort to verify ozone concentrations over the Chesapeake Bay as predicted by air quality models. An ozone monitor in the Bay will provide "ground truth" to model forecasts. The monitor will be run as a Special Purpose Monitor (SPM) in accordance with 40 CFR Part 58, Subpart C. Hart-Miller Island State Park is a state-owned, public recreation area located on Hart-Miller Island, a man-made landfill linking three natural Chesapeake Bay islands—Hart, Miller, and Pleasure—near the mouth of Middle River in Maryland. The state park is accessible only by boat.

Figure A- 17. Areal map of the Horn Point air monitoring site in Dorchester County, MD. Horn Point, located in a rural setting, was chosen as a site for monitoring CO population exposure at the regional scale; NO population exposure at the regional scale; NO_y-NO population exposure at the regional scale; year-round ozone population exposure at the regional scale; $PM_{2.5}$ (hourly) population exposure at the regional scale; Reactive oxides of Nitrogen (NO_y) population exposure at the regional scale; and SO_2 population exposure at the regional scale. The site is located on the lower eastern shore and sits in an open field with pine trees in the distance surrounding the site. The University of Maryland Center for Environmental and Estuarine Studies is next door to the site.

Figure A- 18. Areal map of the Howard County Near Road air monitoring site in Howard County, MD. HCNR, located in a suburban setting, was chosen as a site for monitoring air quality near roads, including air toxics, CO, NO, NO2, NOx, and PM2.5 source-oriented/highest concentration at the microscale. To the north of the Howard County Near Road monitoring site is a small grassy area with a few trees along with a gravel access road and the Rest Stop just beyond. The Rest Stop accommodates many tractor trailers and cars. To the east the grassy patch continues and acts as storm water management for the parking area and just beyond is the on-ramp to access the parking area. To the south just behind the trailer is interstate 95 spanning 8 lanes with a good size grass median. On the far side of the road is the rest stop for north bound traffic. To the west the interstate continues and is joined by the exit ramp from the rest area. There are trees and woods on the far side of the exit ramp.

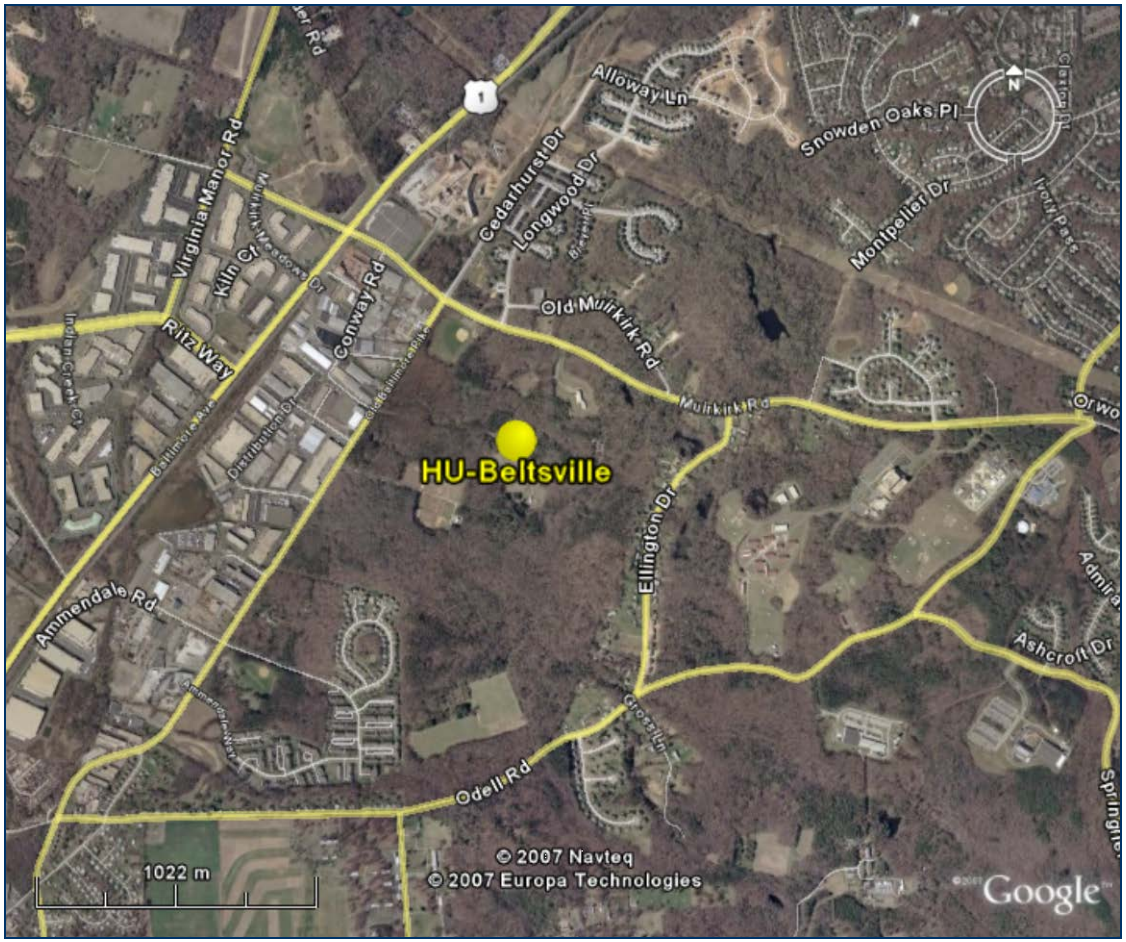

Figure A- 19. Areal map of HU-Beltsville air monitoring site in Prince George's County, MD. HU-Beltsville, an NCore station located in a suburban setting, was chosen as a site for monitoring air toxics population exposure at the neighborhood scale; CO, NO, NO_2, NO_y-NO, NO_x, and NO_y general/background at the urban scale; year-round ozone highest concentration and population exposure at the urban scale; PM population exposure at the urban scale for $PM_{2.5}$ and neighborhood scale for PM_{10}; SO_2 general/background at the urban scale; and Type 3 PAMS VOC's upwind/background at the urban scale. The site is in an open yard surrounded by trees.

Figure A- 20. Areal map of Millington air monitoring site in Kent County, MD. Millington was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to $PM_{2.5}$ at the neighborhood scale. It is located in a rural setting. The site is located on the upper eastern shore in a wildlife management area and is adjacent to fields and woods. A few hundred yards away is a small use airport.

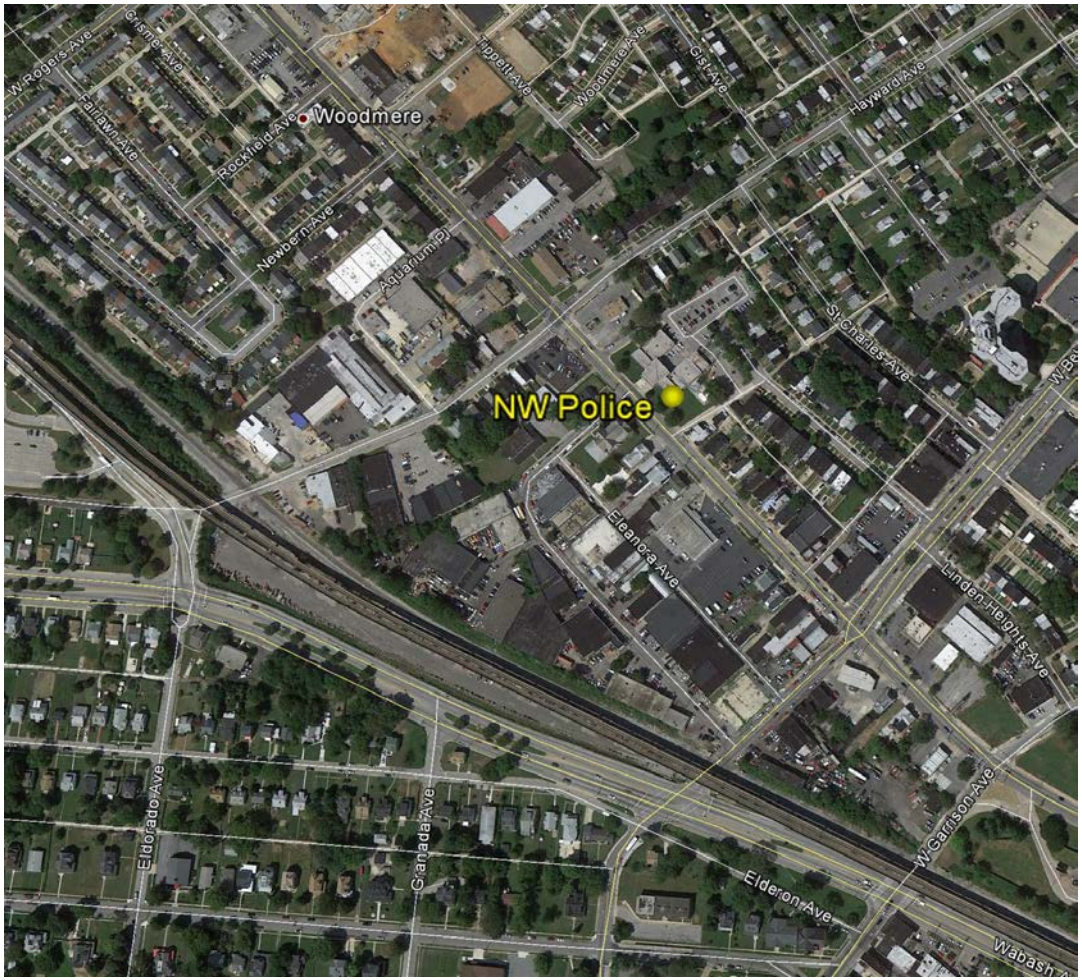

Figure A- 21. Areal map of Northwest Police Station air monitoring site in Baltimore City, MD. NWPS was chosen as a $PM_{2.5}$ monitoring site because of the potential to measure the population exposure of $PM_{2.5}$ at the neighborhood scale in an urban setting.

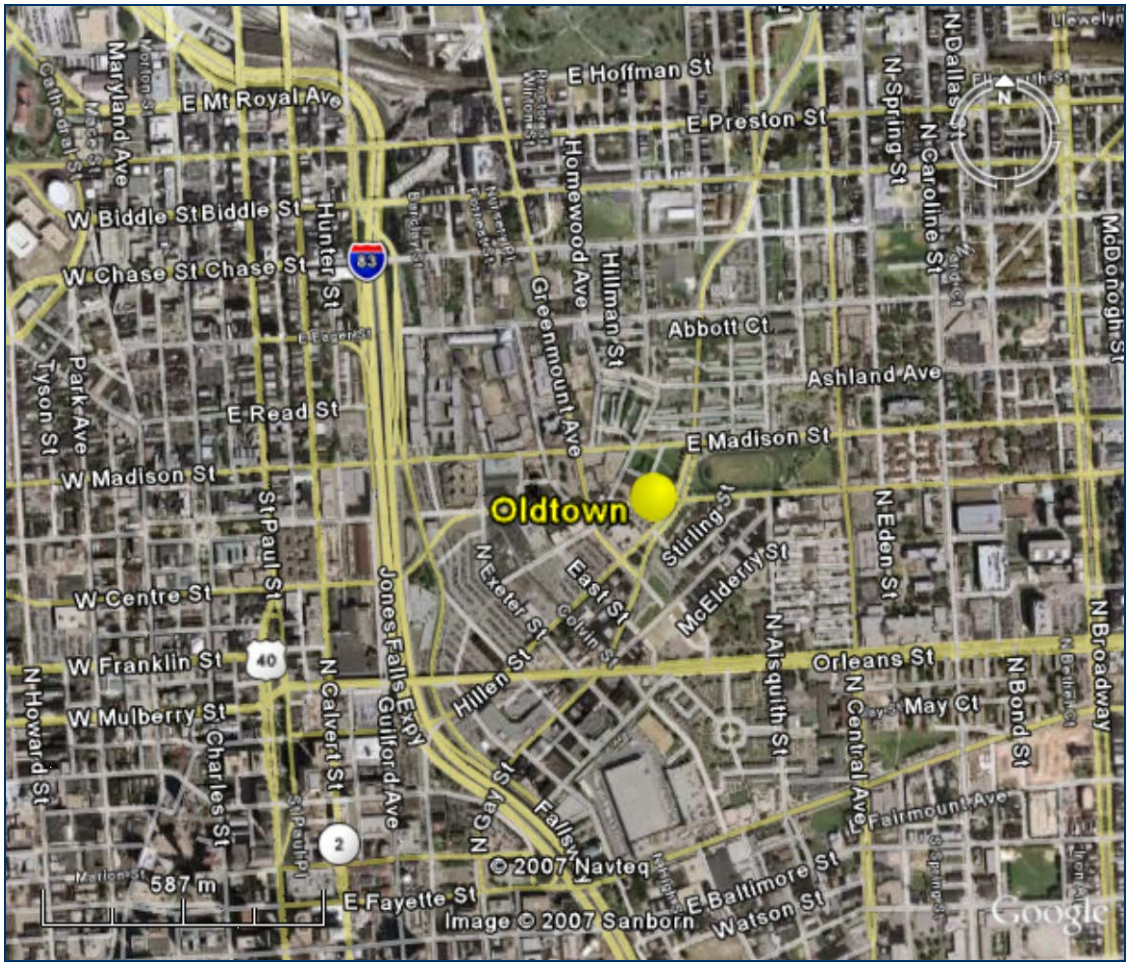

Figure A- 22. Areal map of Oldtown air monitoring site in Baltimore City, MD. Oldtown, located in an urban and center city setting, was chosen as a site for monitoring air toxics, CO, NO, NO2, NOx, and PM2.5 highest concentration at the middle scale, and air toxics population exposure at the neighborhood scale. The Oldtown trailer sits in a parking lot off to the side of a very busy four-way intersection right by a bus stop where buses stop often. There is also a fire station within a couple hundred feet of the trailer and nearby sidewalks by the bus stop and along the street next to the trailer.

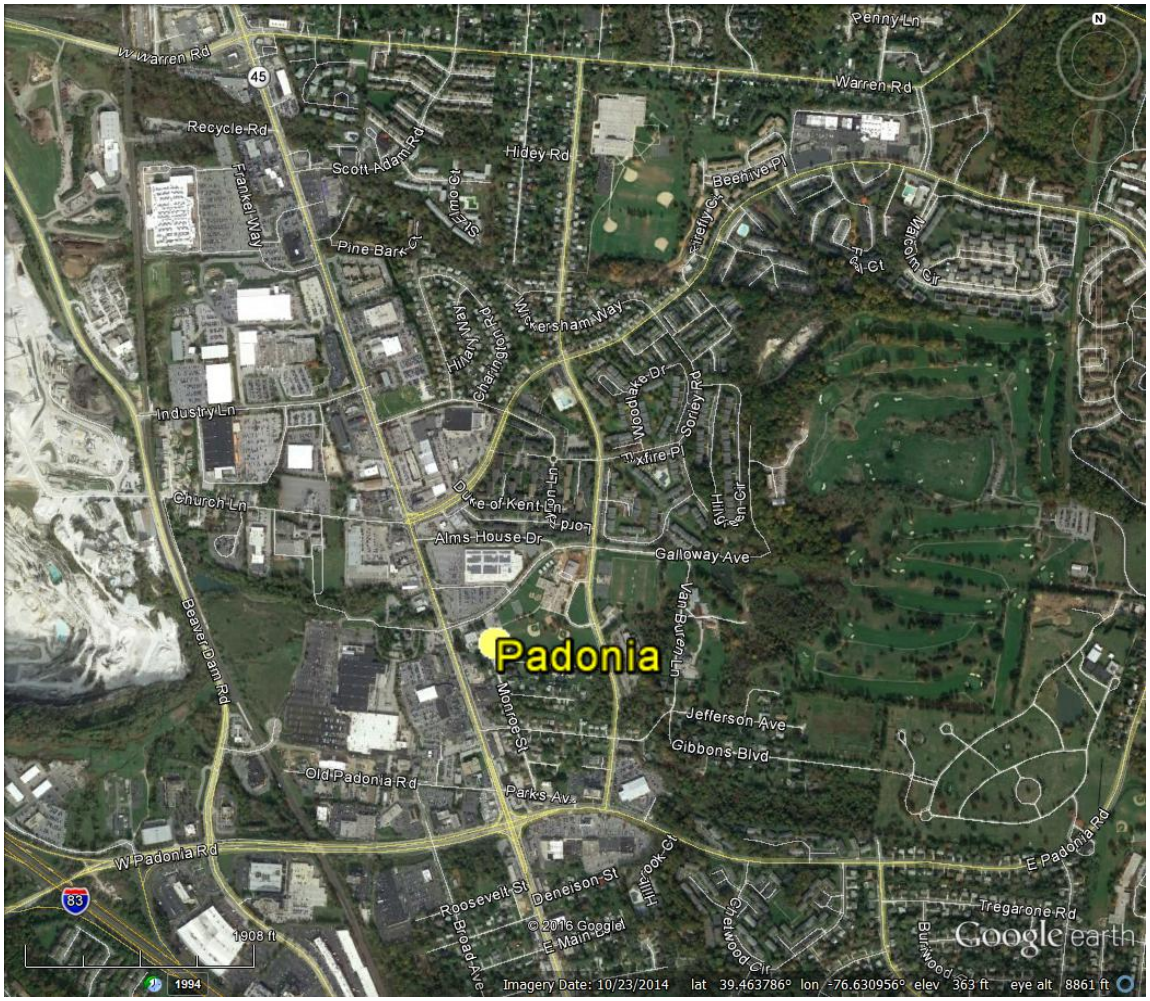

Figure A- 23. Areal map of new Padonia air monitoring site in Baltimore County, MD. Padonia was chosen as a seasonal ozone and $PM_{2.5}$ monitoring site because of the potential to measure the population exposure of ozone and $PM_{2.5}$ at the neighborhood scale. It is located in a suburban setting. The Padonia trailer was on an elementary school grounds near a small parking lot until March 1, 2017, when MDE was forced by the school to remove it due to construction activities (Appendix C). The station will be restarted at the new location, about 300 meters away from the previous spot as soon as electricity and other logistics are finalized. There is a gravel pit, a landfill, and a spice company all off Beaver Dam Road, to the west and slightly north of the site.

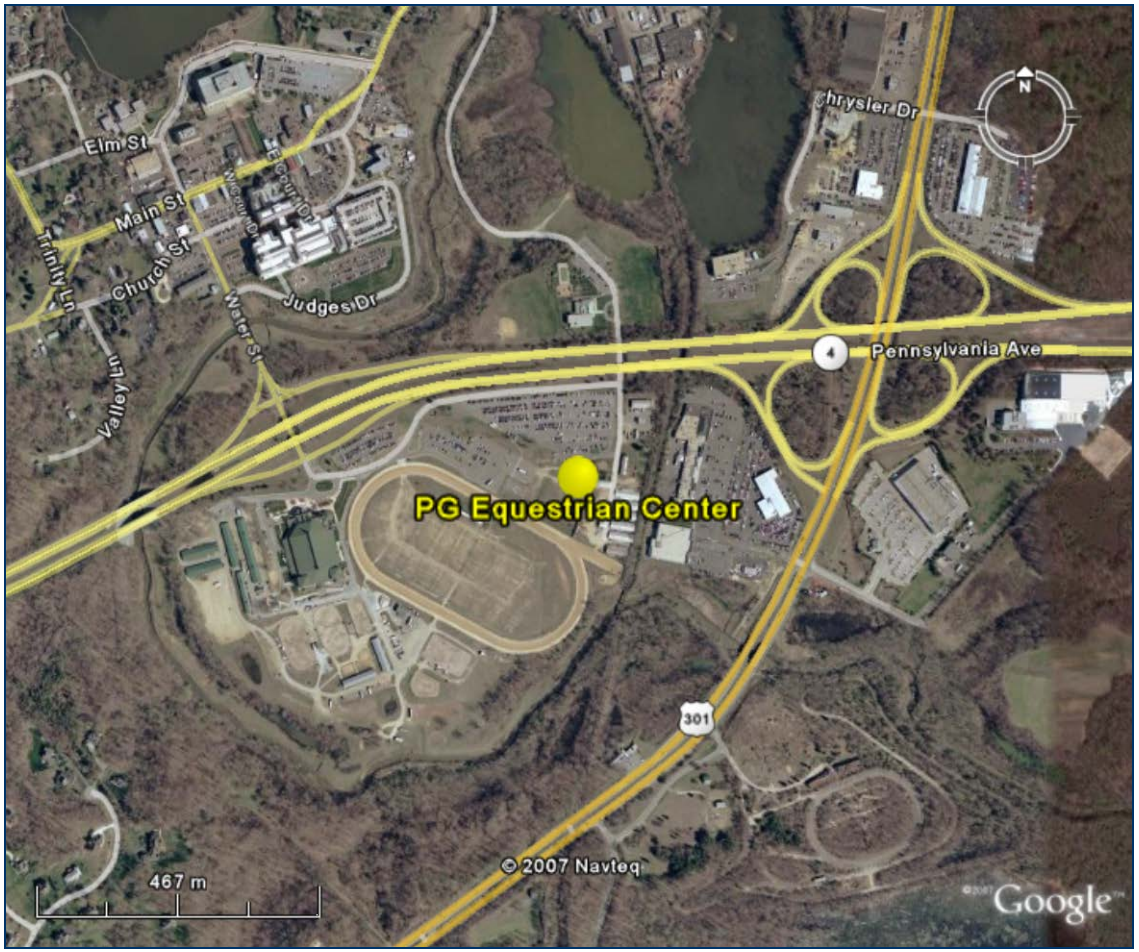

Figure A- 24. Areal map of PG Equestrian Center air monitoring site in Prince George's County, MD. PG Equestrian Center was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to $PM_{2.5}$ at the neighborhood scale. It is located in a rural setting. The site sits in the parking lot of the Ranger office. Surrounding the site are parking lots and a horse track.

Figure A- 25. Areal map of Piney Run air monitoring site in Garrett County, MD. Piney Run, an NCore station located in a rural setting, and is located on a mountain top at an elevation of 777 meters (2,548 feet). It was chosen as a site for monitoring year-round ozone, CO, NO, NO_2, NO_y-NO, NO_x, NO_y, SO_2, and $PM_{2.5}$ regional transport at the regional scale.

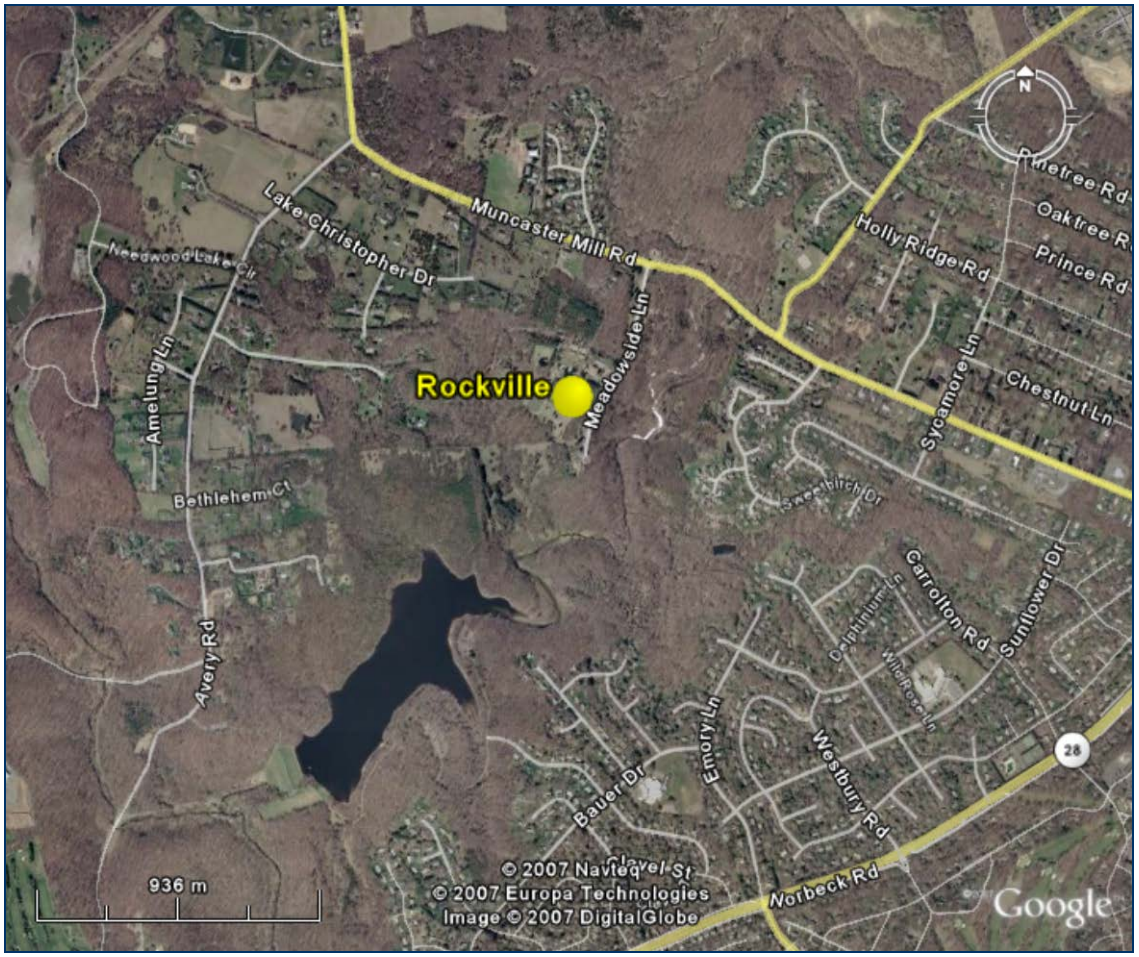

Figure A- 26. Areal map of Rockville air monitoring site in Montgomery County, MD. Rockville was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to PM at the neighborhood scale. It is located in a rural setting.

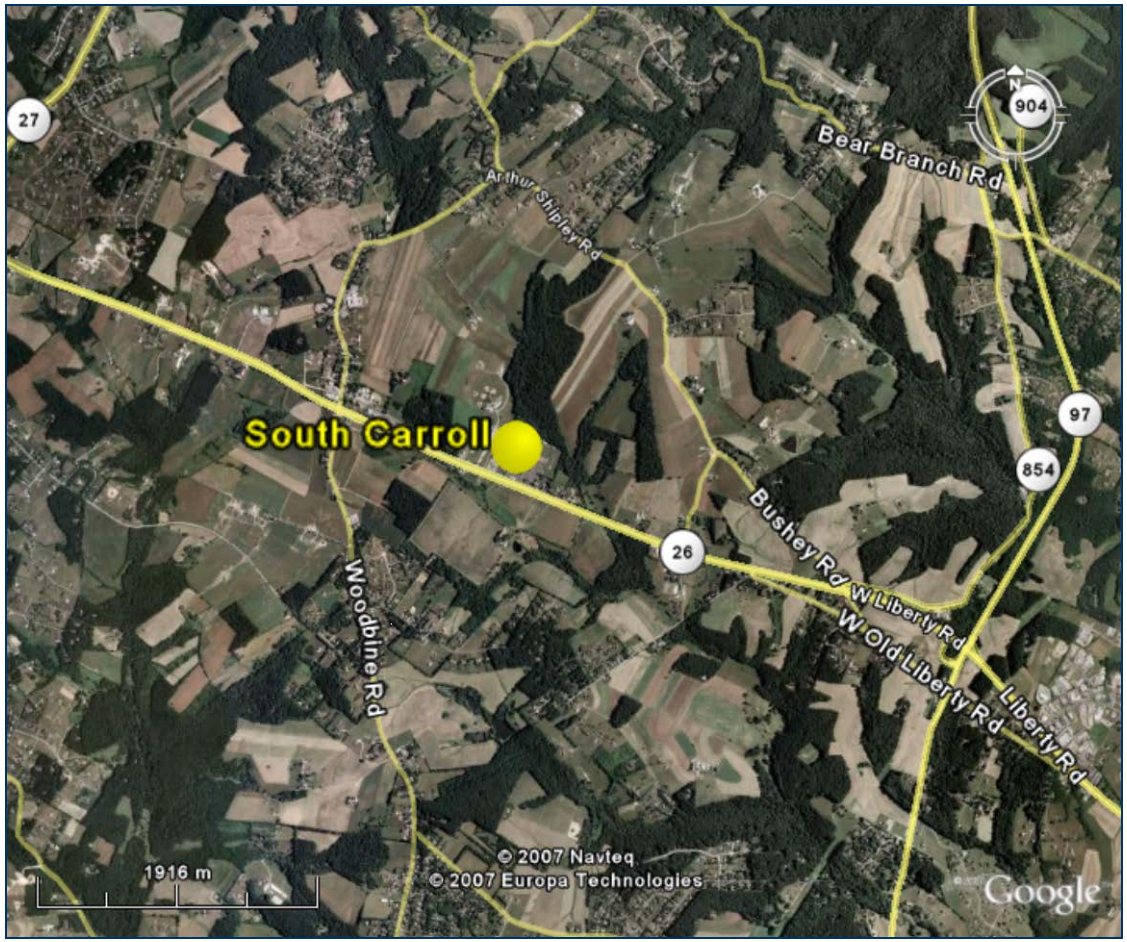

Figure A- 27. Areal map of South Carroll air monitoring site in Carroll County, MD. South Carroll was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale. It is located in a rural setting. The South Carroll trailer sits a few yards from South Carroll High School on the grounds of the school. There is a fence right alongside the trailer as well as ball playing fields within sight of the trailer.

Figure A- 28. Areal map of Southern Maryland air monitoring site in Charles County, MD. Southern Maryland was chosen as a seasonal ozone monitoring site because of the potential to measure the general background ozone at the regional measurement scale. It is located in a rural setting. This site is our most southern site and is located in the yard of a pre-release prison surrounded by fields and woods.

Figure A- 29. Areal map of Verso Luke Mill SO_2 monitoring sites in Allegany Co., MD and Mineral Co., WV. The three Verso Luke Mill stations, Moran, Horse Rock, and Bean, are being operated by Verso Luke Mill, in support of the SO_2 DRR.

MARYLAND
DEPARTMENT OF THE ENVIRONMENT

APPENDIX B
EPA Approval Letter (Nov. 10, 2016)
for the 2017 Air Monitoring Annual Network Plan

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

This page is intentionally blank.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

NOV 10 2016

The Honorable Benjamin H. Grumbles, Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230

Dear Secretary Grumbles: Ben

By letter and enclosures dated May 19, 2016, the Maryland Department of Environmental (MDE) submitted to the U. S. Environmental Protection Agency (EPA) an annual ambient air monitoring network plan in accordance with the regulatory requirements of 40 CFR Part 58 - Ambient Air Quality Surveillance. Based on our review, EPA Region III hereby approves MDE's May 19, 2016 annual ambient air monitoring network plan on the basis that the plan meets the requirements of 40 CFR Part 58.10.

Additionally, 40 CFR Section 58.11(c) requires any changes to the air monitoring network or design of the following air monitoring systems be approved by the EPA Administrator:

a) Photochemical Assessment Monitoring Systems (PAMS)
b) Particulate Matter Speciation Trends Network (STN)
c) The National Core Monitoring Network (NCore)

EPA determined that MDE's May 19, 2016 annual ambient air monitoring network plan does require approval from the EPA Administrator because there is a request to terminate PM_{10} monitoring at the Piney Run rural NCore location. A copy of this letter and MDE's ambient air monitoring network plan have been forwarded to EPA's Office of Air Quality Planning and Standards (OAQPS) for determination of final approval.

If you have any questions please do not hesitate to contact me or have your staff contact Ms. Linda Miller, EPA's Maryland Liaison, at (215) 814-2068 or Ms. Cristina Fernandez, Director, Air Protection Division, at (215) 814-2178.

Sincerely,

Shawn M. Garvin
Regional Administrator

MARYLAND

DEPARTMENT OF THE ENVIRONMENT

APPENDIX C

Baltimore County Public Schools Letter
Re: Padonia Monitoring Station
Re-location Notice (March 2, 2017)

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

This page is intentionally blank.

BALTIMORE COUNTY PUBLIC SCHOOLS
S. Dallas Dance, Ph.D., Superintendent 6901 Charles Street Towson, MD • 21204-3711

March 2, 2017

Mr. David Krask, Program Manager
Maryland Department of Environment
ARMA/Air Monitoring Program
1800 Washington Blvd.
Baltimore, MD 21230-1720

Re: Padonia International Elementary School
Addition/Renovations Project/Weather Shelter Re-location

Dear Mr. Krask:

This letter is to inform you that the above referenced construction project has been awarded and the contractor will be mobilizing to start the work. As we discussed in our meeting, we will be expanding the existing parking lot and we will require the removal of the weather shelter to expand the parking lot and other construction activities. The shelter must be re-located at your earliest convenience to avoid any delays to the construction project. Thank you very much for your cooperation in this matter.

Should you have any questions please contact our office at 443-809-6301.

Sincerely,

Merril E. Plait, P.E., Director
Office of Engineering and Construction

mp/mm/tm
Enclosures
Copies to: Mr. Michael Archbold, Senior A/E Supervisor, Office of Engineering and Construction
Mr. Robert Maddox, Senior Supervisor, Office of Engineering and Construction
Mr. Mohammed Mufti, Project Manager, Office of Engineering & Construction
Mr. Tom Haller, Project Manager, Office of Engineering & Construction
File

S:\Physical Facilities\E&C\Schools\Padonia International ES\2018 Renovation Project\WEATHER-TRAILER\Letter-MDE.doc

MARYLAND

DEPARTMENT OF THE ENVIRONMENT

APPENDIX D

PAMS and NCore Waiver Letters (April 19, 2017) and NCore Approval Letter (May 31, 2017)

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

This page is intentionally blank.

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

April 25, 2017

Mr. Richard A. Wayland, Director
Air Quality Assessment Division
109 T.W. Alexander Drive
Mail Code: C304-02
Research Triangle Park, NC 27709

Dear Mr. Wayland:

Maryland Department of the Environment (MDE) is formally requesting a waiver of the requirement to collect and report NO_y measurements (NO_y is the sum of all total reactive nitrogen oxides, including NO, NO_2, and other nitrogen oxides referred to as NO_z) at the HU-Beltsville NCore site (AQS ID 240330030). This requirement is specified in paragraph 3(b) of Appendix D to 40CFR Part 58.

This waiver request is made in conjunction with a separate waiver request (Attachment 1) to the EPA Region III Administrator to locate Maryland's required PAMS site at Essex (AQS ID 240053001), in the Baltimore-Towson, CBSA rather than at the HU-Beltsville NCore site, which is in the Washington-Arlington-Alexandria, DC-VA-MD-WV CBSA. MDE seeks to move the NOy monitor currently operated at HU-Beltsville to the Essex site as part of the full PAMS measurement suite.

Paragraph 3(b)(1) of Appendix D to 40CFR Part 58 allows for the Administrator to grant a waiver for the NCore NO_y monitoring requirement in areas with relatively fresh sources of nitrogen emissions where there is negligible expected differences between NO_y and NO_x measured concentrations. MDE has operated a conventional chemiluminescence NO_x monitor at HU-Beltsville since January 2012. A scatter plot of hourly concentrations of NO_x vs. NO_y, 2012-1015, is presented in Figure 1 of attachment 2. While there are rare large hourly excursions, for the most part, there is very good agreement between NO_y and NO_x.

While MDE recognizes that the periods where the greatest differences are likely to be observed are during high ozone and $PM_{2.5}$ episodes, we still feel there is greater value to be gained by relocating the existing NO_y monitor to the Essex PAMS site where there will be a CAPS true NO_2 monitor along with hourly speciated ozone precursor measurements. In addition, NO_y monitors are operationally complex and MDE believes that operating one NO_y at the Essex site represents the most efficient use of limited existing resources.

Other factors to take into consideration with this waiver request include the close proximity of the EPA Beltsville CASTNET site (AQS ID 240339991) approximately 5 miles to the east southeast of HU-Beltsville), which also has NO_y and ozone monitors, and the lower NO_x point source emissions density at both the CASTNET and Essex sites when compared to the HU-Beltsville site (Figures 2 and 3, Attachment 2).

If you have any questions regarding this waiver request, please contact Tad Aburn, Director, Air and Radiation Management Administration at 410-537-3201, or by email at *tad.aburn@maryland.gov*. Thank you for consideration of this request.

Sincerely,

Ben Grumbles
Secretary

cc: Alice Chow, EPA Region III

Attachment 1

To the NOy - NCore Waiver request letter
Addressed to Chet Wayland on April 25, 2017

PAMS Waiver request letter to Cecil Rodrigues,
Acting Regional Administrator for EPA Region III

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

April 25, 2017

Mr. Cecil A. Rodrigues
Acting Regional Administrator
U.S. Environmental Protection Agency
Region III-Middle Atlantic Region
1650 Arch Street (3RA00)
Philadelphia, PA 19103-2029

Dear Mr. Rodrigues:

Maryland Department of the Environment (MDE) is formally requesting a waiver of the requirement to collect and report Photochemical Assessment Monitoring Stations (PAMS) measurements at each NCore site located in a Core Based Statistical Area (CBSA) with a population of 1,000,000 or more beginning June 1, 2019. This requirement is specified in the revised PAMS monitoring rule (6/16/16), paragraph 5(a) of Appendix D to 40CFR Part 58.

For Maryland, this requirement could be met by collecting PAMS measurements at the HU-Beltsville NCore station (AQS ID 240330030). This site is already designated as a PAMS site under the existing PAMS regulatory requirements, however, hourly averaged speciated VOC measurements are not currently made at this location. Rather, eight 3-hour canister samples are collected daily, June-August, and subsequently analyzed for speciated VOCs in the MDE analytical laboratory. Maryland's other existing PAMS site, located at the Essex station (AQS ID 240053001), does collect hourly speciated VOC measurements and has an historical record dating back to 1992.

Paragraph 5(c) of Appendix D to 40CFR part 58 allows for the EPA Regional Administrator to grant a waiver for the collection of required PAMS measurements at an alternative location where the monitoring agency can demonstrate that the alternative location will provide representative data useful for regional or national scale modeling and the tracking of trends in ozone precursors (VOC's). The alternative location can be outside of the CBSA where the NCore site is located.

MDE's waiver request is to collect and report the required PAMS measurements, beginning June 1, 2019, at the Essex site in place of the HU-Beltsville site. The basis for MDE's waiver request is to maintain the 25 year historical record of ozone precursor trends at the existing Essex PAMS site. This data has also been consistently utilized in ozone attainment modeling demonstrations for the Baltimore-Towson CBSA.

An additional rationale for this waiver request is that the HU-Beltsville NCore site is located in the Washington-Arlington-Alexandria, DC-VA-MD-WV CBSA and there is another NCore site located

approximately 17 miles to the south in Washington, D.C., located at McMillan Reservoir, where required PAMS measurements will be made. The Essex site is in the Baltimore-Towson, MD CBSA and this is the only other CBSA in Maryland with a population greater than 1,000,000. The Baltimore-Towson, MD CBSA also has a current ozone design value above the 2015 ozone NAAQS. Therefore, the Essex site will better meet the distribution of PAMS sites intended in the revised PAMS monitoring rule.

If you have any questions regarding this waiver request, please contact Tad Aburn, Director, Air and Radiation Management Administration at 410-537-3201, or by email at *tad.aburn@maryland.gov*. Thank you for consideration of this request.

Sincerely,

Ben Grumbles
Secretary

cc: Alice Chow, EPA Region III

Attachment 2

To the NOy - NCore Waiver request letter
Addressed to Chet Wayland on April 25, 2017

NOy v. NOx graph
NOx Emissions maps

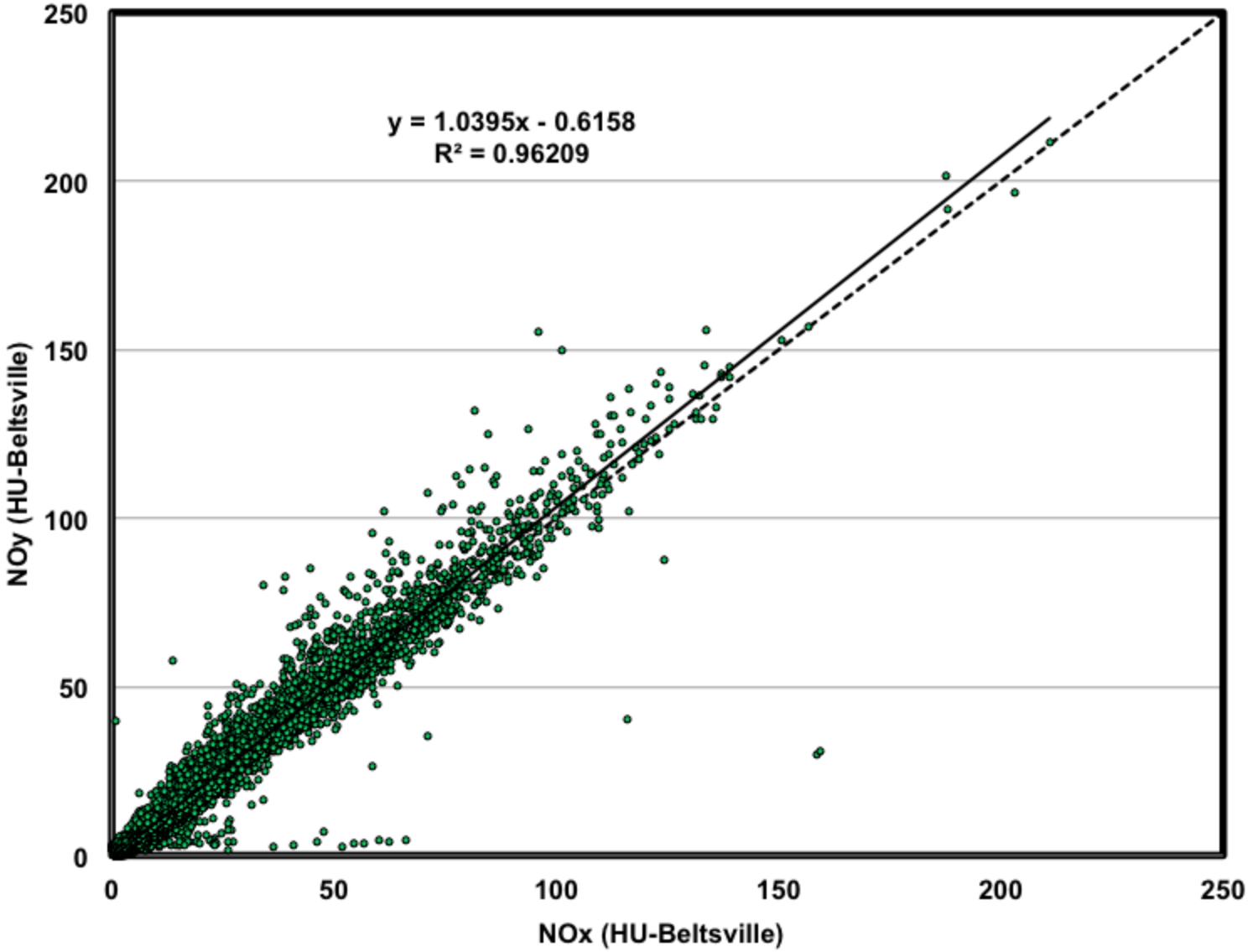

Figure 1. Hourly NOx versus NOy at HU-Beltsville from 2012-2015.

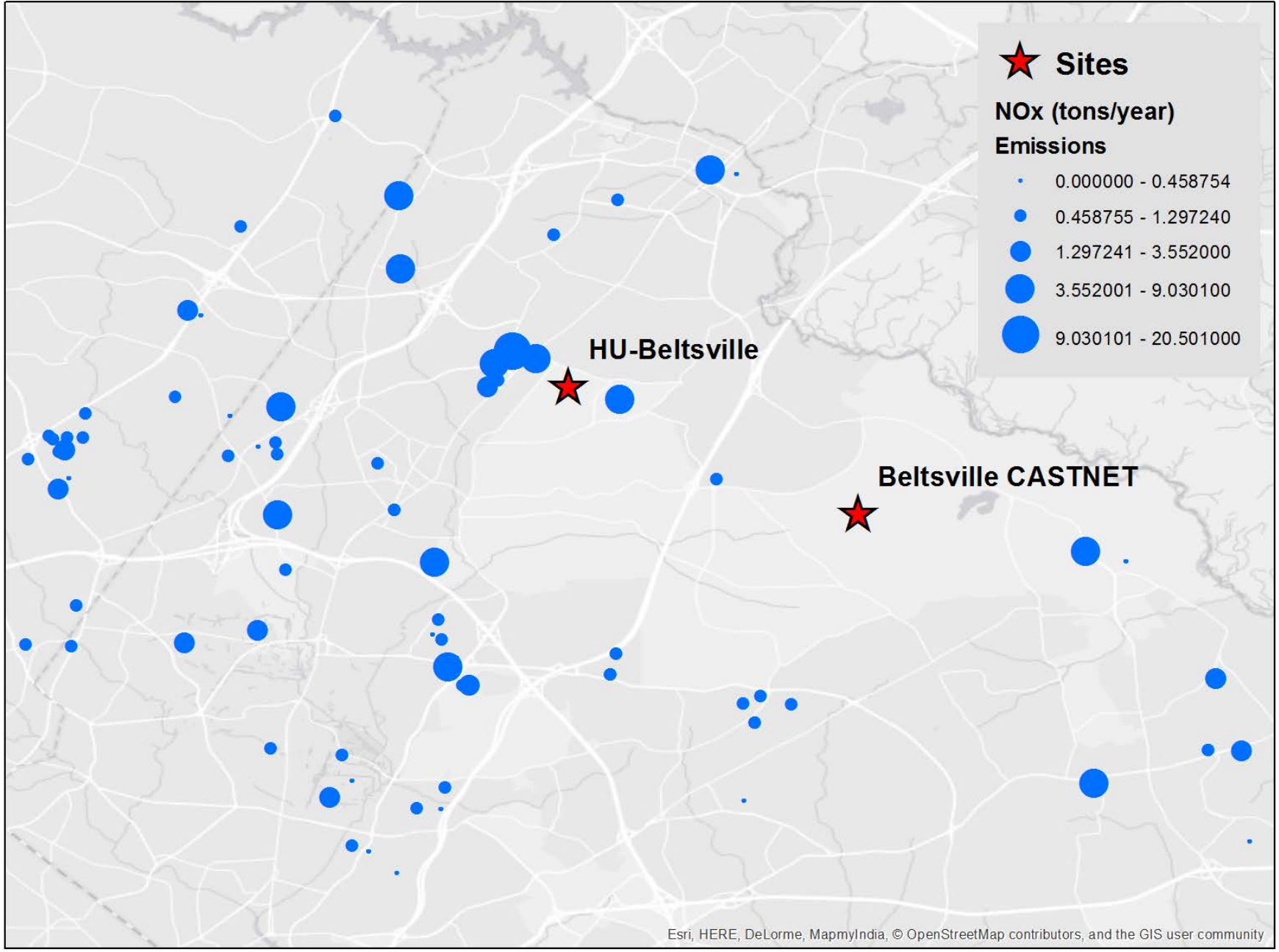

Figure 2. 2015 NOx emissions near HU-Beltsville.

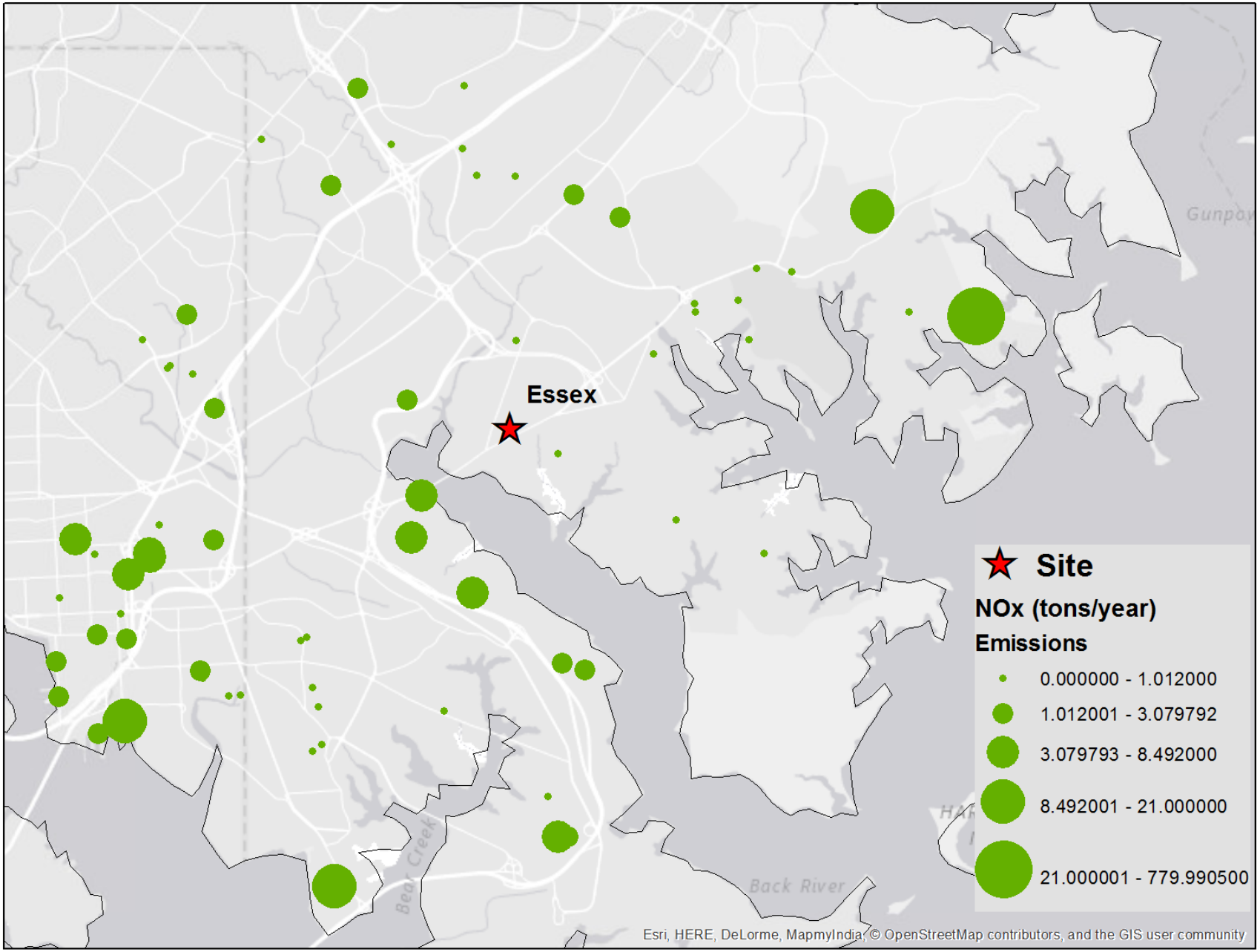

Figure 3. 2015 NOx emissions near Essex.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAY 3 1 2017

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Ben Grumbles
Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Dear Secretary Grumbles:

This letter transmits our approval of the Maryland Department of the Environment request to shut down the agencies' NOy monitor in concert with continued operation of a NOx monitor at the Howard University (HU) Beltsville NCore station (AQS site ID: 24-033-0030). This request is being made so that the NOy monitor can be installed and operated at the proposed PAMS station in Essex, Maryland (AQS site ID: 24-005-3001). According to these rules, a waiver for measuring NOx in lieu of NOy must be approved by the Environmental Protection Agency's (EPA) Administrator. This authority has been delegated to the Director of the Air Quality Assessment Division in EPA's Office of Air Quality Planning and Standards.

In considering your request to operate NOx in lieu of NOy at the HU-Beltsville NCore station, we worked with EPA Region 3 on an evaluation of the NOy and NOx data at the HU-Beltsville station and a review of the rationale for why the proposed PAMS stations is better suited for NOy measurements. After careful consideration of your request to move the NOy monitor to the proposed PAMS station at Essex and operate NOx at HU-Beltsville we are pleased to approve the shut-down of NOy at the HU-Beltsville NCore station. Approving this waiver is all the easier to support given the long history of the Maryland Department of the Environment in operating state of the art monitoring programs with high data completeness. We note that PAMS measurements are required to operate minimally during June, July, and August, while NCore measurements are required to operate year-round. Since the Essex site would be the only Maryland location with both NOy and true NO_2, we expect that you will operate these measurements year-round; let us know if this is not possible.

The strength of your rationale to prioritize operation of NOy at Essex over HU-Beltsville is that it allows for collocating NOy with a true NO_2 monitor at Essex. This collocation of NOy and true NO_2 will ensure that calculations of NOz are made with the most appropriate monitoring technologies. This is consistent with our authority to allow such a waiver since differences between NOy and true NO_2 + NO are expected to be larger than differences between

NOy and NOx chemiluminescence monitors, as is the case for the existing monitors at HU-Beltsville. You also offer additional reasons to support your request to prioritize operation of NOy at Essex such as better siting with regard to being further away from fresh sources of NOx emissions and the operational complexity of the NOy analyzer and we concur with these points.

We have a few related notes to share with you. As you describe in your letter to us, there is an NOy monitor at the CASTNET station in Beltsville, Maryland. However, we have learned that the NOy monitor at the Beltsville CASTNET station was recently shut down so that the monitoring equipment could be made available for a year-long field study in another state. We expect to revisit the availability of NOy at the CASTNET Station in 2018. Finally, regarding the operational complexity of the NOy analyzer, we note that we have been working with our EPA-ORD colleagues on ways to minimize such complexities. EPA-ORD shared some of this work at last year's monitoring conference in St. Louis and additional NOy method optimization work is occurring in a field study now in EPA Region 5.

Thank you for your program's efforts in working through the issues of having to optimize your network to meet multiple needs at NCore and PAMS. For any technical questions on NCore, you may contact Tim Hanley at hanley.tim@epa.gov and 919-541-4417. For technical questions on PAMS, you may contact Kevin Cavender at cavender.kevin@epa.gov and 919-541-2364.

Sincerely,

Richard A. Wayland

Richard A. Wayland
Director
Air Quality Assessment Division

cc: Alice Chow, EPA Region 3

MARYLAND

DEPARTMENT OF THE ENVIRONMENT

APPENDIX E

Summary of Public Comments (received May 28, 2017) and MDE Response to Comment (June 20, 2017)

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

June 20, 2017

This page is intentionally blank.

Summary of Public Comments on 2018 Air Monitoring Network Plan
Received May 28, 2017

A commenter requested "that air quality monitoring be installed in the village of Brandywine Md., possibly at the Brandywine Elementary School and nearby in the Brandywine North Keys Park" to assess "the impact that existing and future industrial projects may have on [the] region." The commenter also requested that monitoring be done before and after new industrial projects are installed. A second commenter (responding to the first commenter) requested monitoring specifically for ultra-fine particulates, PM2.5, nitrogen dioxide, carbon monoxide and meteorological measurements

The commenter is concerned that the air quality in the area does not comply with EPA ozone standards and discussed the following industrial activities currently in the area as well as plans for additional industrial activities.

- Caulk Point Power Plant in Aquasco
- Panda Brandywine on Cedarville Rd. in Brandywine.
- New power plant nearby in Charles Co.
- Compressor station and gas pipelines being planned for the area.
- Owners of a Fly Ash Dump next to the Brandywine North Keys Park and residences were convicted and fined for contamination of ground water with heavy metals leaching from the fly ash.
- Sand and gravel mining operations.
- Diesel truck traffic
- Two new fossil fueled power plants have been approved for Brandywine less than a mile apart. These plants are close to existing and planned neighborhoods, elementary school, medical center, churches, post office, local businesses, senior housing, parks etc."

The commenter was not aware of testing for fugitive dust blowing into the air from the fly ash dump.

MDE Response to Comment on Air Monitoring Network Plan for 2018 – received May 28, 2017

The purpose of Maryland's ambient air quality network is to monitor the air that most Maryland residents and visitors are breathing. Ambient air monitoring is not typically used to address near-source compliance issues, with the exception of large industrial sources of SO_2 and Pb. Air quality measurements obtained from the ambient monitoring network provide the basis for making determinations for whether broad areas of the state meet or fail to meet the federal ambient air quality standards that have been established for six pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter, and particulate lead.

MDE feels confident that the existing air monitoring network adequately characterizes the air quality throughout the state of Maryland and has no plans to expand the current network at this time. The federal network design guidance and constraints allow for the assumption that monitors will not operate in every time and space. A best effort is made to sample according to prescribed scales of space and population density. This rests on the concept of "representativeness." The premise is that if the network design criteria are followed closely, then ideally a thorough cross-section of the state is monitored including a mix of:

- high pollution areas
- low pollution areas
- areas under the immediate influence of significant sources
- areas that make up the other site types and spatial scales as prescribed in 40CFR58, Appendix D

Monitors located in areas with similar population densities, similar emission source characteristics, and similar meteorological conditions should measure similar concentrations of air pollution.

The existing network exceeds the minimum requirements for monitoring ambient levels for the six pollutants for which the federal government has established public health based standards, with the exception of particulate lead, which meets the minimum network design requirements contained in Title 50, Part 58, Appendix D of the Code of Federal Regulations.

It is important to note that the air quality in Maryland is cleaner than it has ever been since measurements began in the 1960's, as Maryland monitors attainment for all criteria pollutants except ozone and continues to make dramatic progress in cleaning up the air. Ground level ozone, or smog, has been Maryland's most challenging air pollution problem for the past 30 years. Much of this ozone problem on certain days is a result of pollution from other states being transported into the state. Maryland's problem was so challenging that, for the 2008 ozone standard, the U.S. Environmental Protection Agency (EPA) designated Maryland as having the worst ozone anywhere east of the Mississippi.

That has all changed. In 2016, the Baltimore and Washington, D.C. ozone nonattainment areas continued to meet the 2008 health-based ozone standard, and are extremely close to meeting the new, more-stringent, 2015 ozone standard that begins to be implemented in late 2018. The other ozone area that Maryland is part of is the Wilmington-Philadelphia area, which includes Cecil County. Ozone in this area is slightly higher, but the area continues to see lower ozone levels each year, is very close to meeting the 2008 standard and is working to meet the 2015 ozone standard.

There are no PM-2.5, CO or NO_2 monitors anywhere in Maryland that violate their respective NAAQS. PM-2.5 concentrations are very consistent regionally and are generally slightly higher in urban and heavily populated areas. In fact, east of the Mississippi River, there are only three PM-2.5 monitors that violate the NAAQS, two of those are in Ohio and one is in Alleghany County in Pennsylvania. There are no CO or NO_2 monitors that violate the NAAQS anywhere in the United States.

Criteria pollutant monitoring for NAAQS compliance is very resource intensive and requires specialized instrumentation and strict adherence to rigorous quality control and quality assurance measures. In addition, MDE does not have sufficient resources to respond to local, near-source air pollution complaints, such as fugitive dust, by conducting ambient air monitoring studies. This would simply be overwhelming. These types of complaints should be addressed by calling (866) 663-4686. The Air Quality Compliance Program will respond as appropriate and assure that the proper dust control measures are implemented.

While the commenter has expressed concern about the air quality impact of diesel truck traffic in the greater Brandywine area, MDE operates a monitoring station less than 20 meters from the nearest traffic lane of Interstate 95-South between Routes 32 and 216. This is the most heavily traveled road segment in the state with an Annual Average Daily Traffic (AADT) count of 195,030 vehicles with over 12,000 of these being diesel trucks. Additionally, the monitoring site sits between rest areas on each side of the highway where dozens of diesel trucks idle all night long, on many nights spilling well out onto the entrance and exit ramps of the rest areas. Parameters measured at this site include PM-2.5, CO and NO_2. No violations of the respective NAAQS have been recorded at this location, nor have any measured concentrations ever exceeded the level of their respective NAAQS. It is reasonable to conclude that in areas of lower traffic volume, pollutant concentrations would even be lower than those measured at this location.

Additionally, as of August 2016, there are 69 operational near-road monitoring sites located throughout the United States and currently no area of the country in violating the NO_2 NAAQS. There is not enough complete data (requires 3 years) as of August 2016 to evaluate compliance with CO and PM-2.5 NAAQS at all sites, but those sites with complete data for CO show no violations. For PM-2.5, a one year snapshot of 2015 data shows only one near-road site, in Riverside, California, measuring levels exceeding the NAAQS. The Riverside site has an AADT in excess of 300,000 vehicles. A review of the status and data from the National near-road monitoring network, as of August 2016, can be found here: https://www.epa.gov/sites/production/files/2016-09/documents/near-road_air_quality_monitoring.pdf

With respect to the issue of new natural gas power plants approved for the Brandywine area, it should be noted that because all of the new power plants in the southern PG County region triggered major New Source Review (NSR) for Prevention of Significant Deterioration (PSD), MDE is fully cognizant of the air quality impacts associated with the construction of those projects. The newest power plants include CPV St. Charles, Keys Energy Center, and Mattawoman Energy. As part of the PSD program, those projects were required to conduct a very rigorous cumulative modeling impact analysis for all criteria pollutants discharged in significant levels and demonstrate via modeling that ground-level concentrations resulting from the projected emissions would not cause or contribute to a violation of the NAAQS. The cumulative modeling impact demonstration requires the consideration of background concentrations as well as developing an inventory of significant sources to be included in the modeling analysis. The criteria pollutants most commonly evaluated for these projects included nitrogen oxides (NOx), particulate matter (both PM2.5 and PM10), and carbon monoxide (CO). For each of these projects, the appropriate state agencies reviewed the modeling demonstrations for accuracy. In addition, the state agencies conduct a joint independent modeling analysis to verify the impacts. In every instance, the project developers were able to demonstrate compliance with the applicable NAAQS and the state agencies were able to confirm that there would be no adverse impact to public health. Upon making an adequate demonstration of compliance with all federal and state regulatory requirements, the state agencies provided an affirmative recommendation to the Public Service Commission (PSC) for issuing the Certificate of Public Convenience and Necessity (CPCN). It is important to note that by law, neither the MDE nor the PSC can issue a construction permit or approval for a project that has the potential to violate the NAAQS. Finally, for any future project contemplating a site location in the general region of concern, the project will undergo the appropriate level of review to ensure that local air quality is not degraded or public health is put at risk.