District of Columbia
Calendar Year 2023 Annual Ambient Air Monitoring Network Plan

DRAFT

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Air Monitoring Branch
Air Quality Division
Department of Energy & Environment
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Washington, DC 20002

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Acronyms and Definitions

AQI	Air Quality Index
AQS	Air Quality System
BAM	Beta Attenuation (Mass) Monitor – used for continuous measurements of particulate matter
CAA	Clean Air Act
CAPS	Cavity Attenuated Phase Shift
C.F.R.	Code of Federal Regulations
CSN	$PM_{2.5}$ Chemical Speciation Network
CO	Carbon Monoxide
DOEE	Department of Energy and Environment
EMP	Enhanced Monitoring Plan
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FID	Flame Ionization Detector
FRM	Federal Reference Method
GC	Gas Chromatograph
HAPs	Hazardous Air Pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	Infrared (radiation)
MSA	Metropolitan Statistical Area
NAA	Non-Attainment Area
NAAQS	National Ambient Air Quality Standard
NATTS	National Air Toxic Trends Stations
NAMS	National Air Monitoring Station
NCore	National Core Monitoring Network
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen (ozone precursor)
NOy	Total Reactive Nitrogen Species (ozone precursor)
O_3	Ozone
OC/EC	Organic Carbon/Elemental Carbon
PAHs	Polycyclic Aromatic Hydrocarbons
PAMS	Photochemical Assessment Monitoring network Stations
Pb	Lead
$PM_{2.5}$	Particulate matter with an equivalent diameter less than or equal to 2.5 µm
PM_{10}	Particulate matter with an equivalent diameter less than or equal to 10 µm
QA	Quality Assurance
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
SO_2	Sulfur Dioxide
TSP	Total Suspended Particles
TEOM	Tapered Element Oscillating Microbalance – used for continuous measurements of PM_{10} or $PM_{2.5}$
UV	Ultraviolet (radiation)
VOCs	Volatile Organic Compounds

Executive Summary

The Clean Air Act mandates an ambient air quality surveillance system in state and local jurisdictions including the District of Columbia (District). The U.S. Environmental Protection Agency (EPA) codified the national ambient air monitoring regulations in Title 40 Code of Federal Regulations (C.F.R.) Part 58. The regulations require state and local monitoring agencies to conduct a periodic assessment of ambient air monitoring networks and propose any changes in an annual ambient air monitoring network plan. Annual network plans need to be submitted to EPA by July 1st of every year. This document is the District's Annual Ambient Air Network Plan (Network Plan) for calendar year 2023.

The District of Columbia Department of Energy and Environment (DOEE) is proposing no changes to the District's existing five-station ambient air monitoring network in calendar year 2023. The District's existing ambient monitoring network will be maintained as described in the subsequent sections of this Network Plan.

DOEE is proposing to establish a new ambient monitoring station in an overburdened community in District's Ward 8. This new station is being funded by the federal American Rescue Plan (ARP) Direct Award Air Monitoring grant.

1.0 Introduction

In 1970, Congress passed the Clean Air Act (CAA) and authorized the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants that threaten human health and welfare. Primary standards are set according to criteria designed to protect public health, including sensitive populations such as children and the elderly. Secondary standards are set to minimize harm to public welfare and the environment (*e.g.*, decreased visibility, damage to crops, vegetation, and buildings).

Six pollutants currently have NAAQS: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (less than 10 microns, PM_{10}; and less than 2.5 microns aerodynamic diameter, $PM_{2.5}$), and lead (Pb). These are commonly known as "criteria" air pollutants. When air quality does not meet the NAAQS for one of the criteria pollutants, the area is said to be in "nonattainment" of the standard for that pollutant.

Air pollution comes from many sources including on-road vehicles (cars, trucks, buses, and motorcycles), off-road equipment (locomotives, boats, construction equipment, lawn mowers), area sources (small stationary sources that cumulatively impact air quality such as gas stations, auto maintenance facilities, painting operations, consumer products usage), large stationary sources (factories, power plants), and even fires. The CAA requires that state and local air agencies operate and maintain ambient air surveillance networks to measure pollutant concentrations. DOEE uses its ambient monitoring network to track changes in the District's ambient air and to evaluate the District's compliance with the NAAQS.

Ambient air quality monitoring in the District began in the late 1950s, prior to the establishment of EPA. The first monitors were simple mechanisms or passive collectors such as dust-fall buckets and tape samplers. These were followed in the 1960s by wet-chemistry instruments, which were soon replaced by more advanced electronic automated instruments. The addition of computer technology in the late 1970s and early 1980s to operate monitoring systems and collect air data was critical to the development of the core monitoring network that exists today.

Over the years, monitoring goals have shifted based on changes in the NAAQS. 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. EPA designated the District as a marginal nonattainment area for the 2015 ozone NAAQS, based on 2014-2016 air quality data. Formal attainment plans for the 2015 standards are due beginning in August 2020. Note that the District attained the old 2008 ozone NAAQS and submitted a redesignation request and maintenance plan for the old NAAQS to EPA, which have both been approved as of July 16, 2019.

In 2014, EPA redesignated the District from nonattainment to attainment of the 1997 annual NAAQS for $PM_{2.5}$ (15 $\mu g/m^3$), and also designated the District as an attainment area for the more stringent 2012 annual NAAQS (12 $\mu g/m^3$). 79 Fed. Reg. 60081 (October 6, 2014). The District is in compliance with the 2012 $PM_{2.5}$ NAAQS and continues to maintain the standards.

The Air Monitoring Branch (AMB) in DOEE's Air Quality Division (AQD) operates, maintains, and performs all functions of the ambient air monitoring program required by the CAA. As required by federal air monitoring regulations, the District's monitoring network is designed to study expected high pollutant concentrations, high population density, significant sources, general background concentrations, and regional transport.

In October 2006, EPA issued final regulations that require periodic assessment of monitoring networks. As described in 40 C.F.R. § 58.10, the following information for existing and proposed site(s) must be included in a Network Plan:

1. Air Quality System (AQS) site identification number;
2. Site location, including street address and geographical coordinates;
3. Sampling and analysis method(s) for each measured parameter;
4. Operating schedules for each monitor;
5. Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal;
6. Monitoring objective and spatial scale of representativeness for each monitor;
7. The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS or 24-hour $PM_{10-2.5}$ NAAQS as described in § 58.30;
8. Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA), or other area represented by the monitor;
9. The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 C.F.R. Part 58;
10. Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under § 4.5(a)(ii) of Appendix D to 40 C.F.R. Part 58;
11. Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM_{10} monitoring in lieu of Pb-TSP monitoring as allowed in § 2.10 of Appendix C to 40 C.F.R. Part 58; and
12. The identification of required NO_2 monitors as either near-road or area-wide sites in accordance with Appendix D, Section 4.3 of 40 C.F.R. Part 58.

This Annual Ambient Air Monitoring Network Plan for the District for calendar year 2023 contains a description of the District's monitoring program, various parameters within the network, and additional monitoring station information. It also confirms that the District's air monitoring program continues to meet federally established monitoring and data assessment criteria.

1.1 The District's Ambient Air Monitoring Strategy

Ambient air monitoring systems are a critical part of the District's air quality management program. Air quality management involves a cycle of monitoring the quality of the ambient air, setting air quality standards and objectives, identifying and implementing control strategies, and measuring progress. Air monitoring data is used throughout this process to help:

- Determine compliance with the NAAQS;
- Characterize air quality and pollutant trends;
- Estimate health risks and ecosystem impacts;
- Develop and evaluate emission control strategies;
- Evaluate source-receptor relationships;
- Provide input data for models and evaluating models;
- Measure overall progress of air pollution control programs; and
- Inform air quality forecasts and other public outreach air quality reports.

Over the last 25 years, ambient levels of criteria pollutants have decreased significantly in the District due to the implementation of various control measures. In the 1980s, the introduction of automobiles equipped with catalytic converters resulted in significant reductions in NO_2, carbon monoxide (CO), and volatile organic compounds (VOCs). The phasing out of leaded gasoline led to a significant drop in ambient lead (Pb) levels. Since then, various control strategies for stationary sources, on-road and off-road vehicles, and non-point area sources have reduced sulfur dioxide (SO_2), nitrogen oxide (NO_x), $PM_{2.5}$, and PM_{10} levels in the ambient air. There is also less formation of problematic ozone, although the District still remains in nonattainment of 8-hour ground-level ozone standards.

2.0 District's Ambient Air Network

The District's network currently consists of five (5) monitoring sites. DOEE is proposing to add a new monitoring station in an overburdened environmental justice (EJ) community in late-2023. Sampling covers criteria air pollutants, $PM_{2.5}$ mass and chemical speciation, and enhanced monitoring for ozone and its precursor pollutants with a photochemical assessment monitoring station (PAMS) for measuring speciated VOCs, NO_x, carbonyls, air toxics, and surface and meteorological parameters.

During the calendar year 2023, DOEE is planning to deploy a new ambient monitoring station in an EJ community in District's Ward 8. This new station is being funded by the federal ARP Direct Award Air Monitoring grant. Appendix A provides information about this new station.

One of the significant elements of the October 2006 monitoring regulations was the establishment of a multi-pollutant National Core (NCore) monitoring network to provide trace-level air quality measurements. The District launched an NCore station at its McMillan site (11-001-0043) in January 2011. Then, to fulfill the monitoring requirements of the 2008 Pb NAAQS, DOEE established an ambient Pb monitor at the NCore site in January 2012, which was later terminated at the end of 2016 after monitoring requirements were revised. In August 2017, a special purpose monitor was installed to determine $PM_{2.5}$ pollution at the King Greenleaf Recreation Center in the Buzzard Point community. The King Greenleaf Recreation Center site (11-001-0053) officially became part of the SLAMS network as of January 2018. The Hains Point monitor has been permanently shut down.

During the calendar year 2015, the District's network expanded with the addition of a new Anacostia Freeway Near-Road air monitoring station. Also, in early 2015, an experimental Village Green park-bench air monitoring station with low-cost emerging air sensor technology was established in the District. The park-bench air monitoring station is primarily for technology demonstration and public education purposes, and it is not part of the District's regulatory network of air monitoring stations.

Figure 2-1 and Tables 2-1 through Table 2-5 below include information about the District's existing five air monitoring sites (green points) used for regulatory purposes and the measured pollutant parameters.

Figure 2-1: The District's Ambient Air Monitoring Network

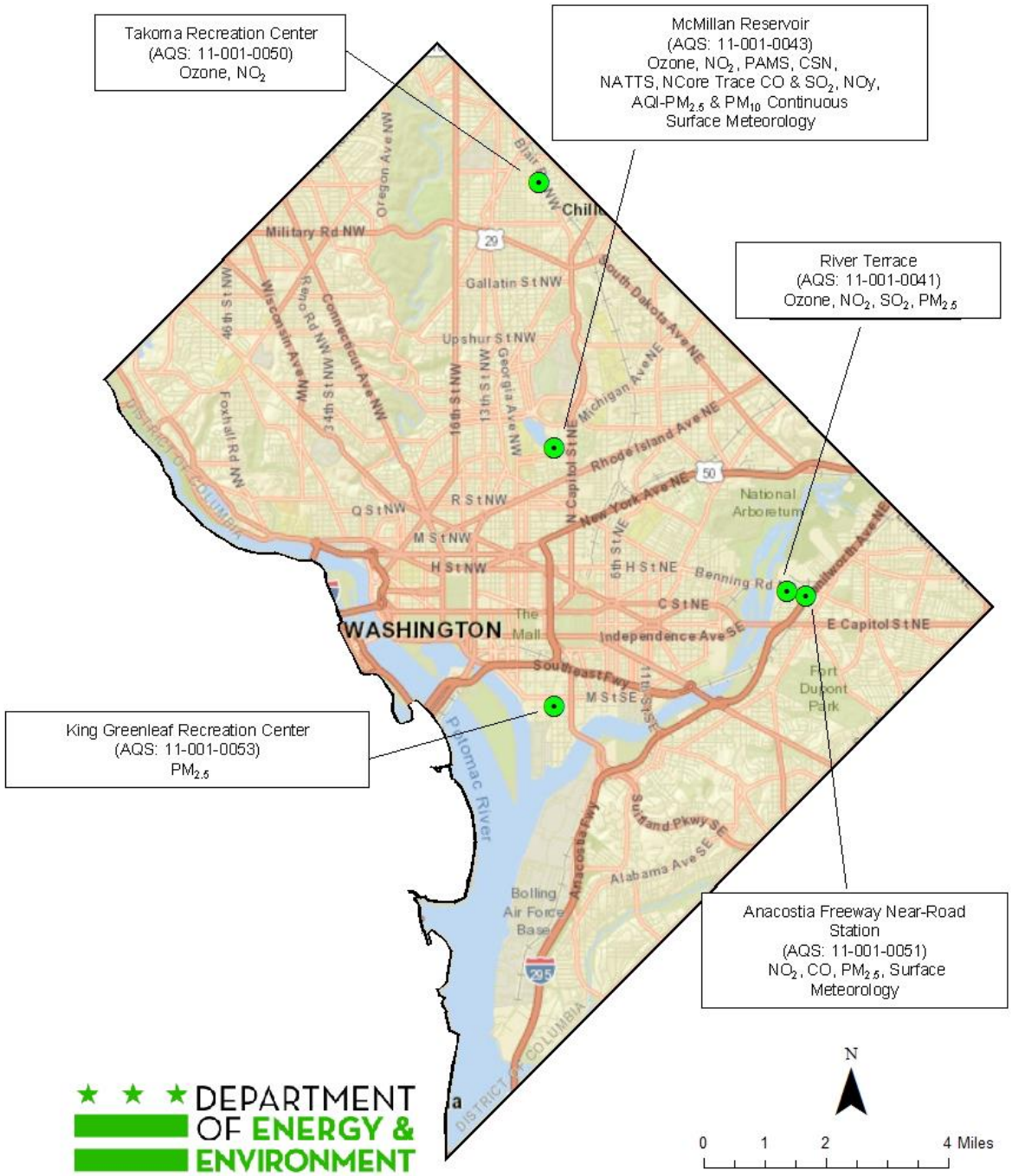


Table 2-1: Ambient Air Monitoring Network and Monitor Details

Site Name, AQS ID	Street Address	City, County, ZIP	Latitude, Longitude (UTM)	Location Setting	Nearest Road	Traffic Count	Traffic Count Year	Distance From nearest road (m)	Metro Statistical Area (MSA)
McMillan 11-001-0043	2500 1st St., N.W.	Washington DC 20001	+38.921847 -77.013178	Urban	Michigan Ave. NW	23,700	2015	100	DC-Arlington-Alexandria
River Terrace 11-001-0041	420 34th Street N.E.	Washington, DC 20019	+38.895572 -76.958072	Urban	Benning Rd.	35,200	2015	100	DC-Arlington-Alexandria
Takoma Recreation Center 11-001-0050	301 Van Buren St., N.W.	Washington, DC 20012	+38.970092 -77.016715	Urban	Blair Rd., N.W.	18,900	2015	200	DC-Arlington-Alexandria
Anacostia Freeway Near-Road Station 11-001-0051	3600 Benning Road N.E. @ Anacostia Freeway	Washington, DC 20019	+38.894770 -76.953426	Urban	Anacostia Freeway I-295	127,300	2015	10	DC-Arlington-Alexandria
King Greenleaf Recreation Center 11-001-0053	201 N St S.W.	Washington, DC 20024	+38.875161 -77.012816	Urban	South Capitol SW	45,500	2015	320	DC-Arlington-Alexandria

Table 2-2: Monitoring Sites and Parameters of Each Monitor

Site Name, AQS ID	Parameter	Start Date	Method Code	Probe Height (m)	Measurement Scale	Monitoring Objective	MonitorNetwork/ Type	Sample Schedule
McMillan 11-001-0043	Nitrogen Dioxide, Nitric Oxide	6/1/1994	074	3	Urban	Population Exposure/Max Precursor	SLAMS/PAMS	Hourly
	NOy (Total reactive nitrogen oxides)	1/1/2011	691	3	Urban	Population Exposure General/Background	SLAMS/NCore	Hourly
	True Nitrogen Dioxide	1/1/2020	212	3	Urban	General/Background Max Precursor	PAMS	Hourly
	SO2 (trace)	1/1/2011	592	3	Urban	Population Exposure General/Background	SLAMS/NCore	Hourly
	CO (trace)	1/1/2011	588	3	Urban	Population Exposure General/Background	SLAMS/NCore	Hourly
	$PM_{10-2.5}$ coarse	1/1/2011	185	3	Urban	General/Background	SLAMS/NCore	Hourly
	Type 2 PAMS	6/1/1994	126/142/ 102	3	Neighborhood/ Urban	General/Background, Max Precursor	PAMS	Hourly/ Every 6 Days
	Ozone	6/1/1994	047	3	Neighborhood/ Urban	Population Exposure/Highest Concentration	SLAMS/PAMS NCore	Hourly
	$PM_{2.5}$ Continuous	1/1/2003	209	4	Urban	Population Exposure	SLAMS	Hourly
	PM_{10} Continuous	1/1/2003	170/240	4	Urban	Population Exposure	SLAMS	Hourly
	$PM_{10-2.5}$ Continuous	1/1/2003	170/240	4	Urban	Population Exposure	SLAMS/NCore	Hourly
	$PM_{2.5}$	1/1/1999	145	4	Urban	Population Exposure	SLAMS/NCore	Every 6 Days
	$PM_{2.5}$ Chemical Speciation	1/1/2002	000	4	Urban	Population Exposure/Trends	CSN	Every 3 days

Site Name, AQS ID	Parameter	Start Date	Method Code	Probe Height (m)	Measurement Scale	Monitoring Objective	MonitorNetwork/ Type	Sample Schedule
	Air Toxics	1/1/2001	150	4	Urban	Population Exposure/Trends	NATTS	Every 6 Days
	PM_{10} High-Vol	1/1/2001	162	4	Urban	Population Exposure/Trends	NATTS	Every 6 Days
	Black Carbon	1/1/2001	894	4	Urban	Population Exposure/Trends	NATTS	Hourly
River Terrace 11-001-0041	Nitric Oxide	5/1/1993	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Nitrogen Dioxide	5/1/1993	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Oxides of Nitrogen	5/1/1993	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Ozone	5/1/1993	047	4	Neighborhood	Population Exposure/Highest Concentration	SLAMS	Hourly
	$PM_{2.5}$	1/1/1999	209	4	Neighborhood	Population Exposure	SLAMS	Hourly
Takoma Recreation Center 11-001-0050	Nitric Oxide	1/1/2013	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Nitrogen Dioxide	1/1/2013	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Oxides of Nitrogen	1/1/2013	074	4	Neighborhood	Population Exposure	SLAMS	Hourly
	Ozone	1/1/2013	047	4	Neighborhood	Population Exposure/Max Ozone Concentration	SLAMS	Hourly
Anacostia Freeway Near-Road Station 11-001-0051	Nitric Oxide	1/1/2015	599	4	Microscale	Source Oriented/Highest Concentration	Near-Road SLAMS	Hourly
	Nitrogen Dioxide	1/1/2015	599	4	Microscale	Source Oriented/Highest Concentration	Near-Road SLAMS	Hourly
	Oxides of Nitrogen	1/1/2015	599	4	Microscale	Source Oriented/Highest Concentration	Near-Road SLAMS	Hourly
	Carbon Monoxide	1/1/2015	593	4	Middlescale	Source Oriented/Highest Concentration	Near-Road SLAMS	Hourly
	$PM_{2.5}$	1/1/2015	209	4	Microscale	Source Oriented/Highest Concentration	Near-Road SLAMS	Hourly
King Greenleaf Recreation Center 11-001-0053	$PM_{2.5}$	1/1/2018	209	4	Urban	Population Exposure	SLAMS	Hourly

Table 2-3: Monitor Count for the District's Network

Pollutant Parameter/ Pollutant Group	Site					
	McMillan Reservoir	River Terrace School	Takoma Recreation Center	King Greenleaf Recreation Center	Anacostia Freeway Near-Road	Monitor Count Totals
CO					1	1
O3	1	1	1			3
$PM_{2.5}$ (FRM)	1					1
NO	1	1	1		1	4
NO2	1	1	1		1	4
NOx	1	1	1		1	4
NOy	1					1
True NO2	1					1
Trace CO	1					1
Trace SO2	1					1
$PM_{2.5}$ (Continuous)	1	1		1	1	4
PM_{10} (Continuous)	1					1
$PM_{10\text{-}2.5}$ (Continuous) PM_{coarse}	1					1
Speciated $PM_{2.5}$	1					1
$PM_{2.5}$ Black Carbon (OC/EC)-URG	1					1
Air Toxics	1					1
PAH Compounds (Air Toxics)	1					1
Air Toxics Metals (PM_{10})	1					1
OC/EC - Aethalometer	1					1
PAMS VOCs /Carbonyls	1					1
PAMS VOCs Continuous (Auto-GC)	1					1
Surface Meteorology	1				1	2
Ceilometer	1					1
Total	22	5	4	1	6	38

Table 2-4: Monitoring Methods and AQS Codes

Parameter	Method Code	Sample Analysis Description
Air Toxics	150	Cryogenic Pre-concentration: GC/MS Solid Phase Micro Extraction: GC/MS
Carbon Monoxide, Trace	588	Gas Filter correlation EcoTech EC9830T
Carbon Monoxide, Trace	593	Gas Filter correlation API T300U
Nitric Oxide and Nitrogen Dioxide	074	Chemiluminescence
Nitric Oxide and Nitrogen Dioxide	599	Chemiluminescence
Total Reactive Nitrogen Oxides	691/699	Chemiluminescence EcoTech EC9843 Chemiluminescene API T200U
True-Nitrogen Dioxide	212	API T500U - CAPS (Cavity Attenuated Phase Shift)
PAH	118	Tisch PUF
PAMS VOCs	142	Gas Chromatograph with Flame; GC FID
PAMS Carbonyls	102	High Performance Liquid Chromatography
PAMS VOCs	126	Cryogenic Pre-concentration Trap GC/FID
Ozone	047	Ultra Violet Photometry
PM_{10} Continuous	170	Beta Attenuation Mass Monitor – PM_{10} FEM with glass fiber filter tape
PM_{10} High-Vol	162	Gravimetric Hi Vol SSI EcoTech 3000
$PM_{2.5}$	145	Gravimetric R&P Model 2025
$PM_{2.5}$ Speciation: Trace Elements	811	Energy Dispersive XRF using Teflon Filter
$PM_{2.5}$ Species Constituents: Ions	812	Ion Chromatography using Nylon Filter
$PM_{2.5}$ Species Constituents: Organics	838	Thermo-Optical Transmittance using Quartz Filter
$PM_{10\text{-}2.5}$ Coarse	185	Paired Gravimetric difference, MET ONE BAM-1020 system
$PM_{2.5}$ Continuous	209	Met One BAM-1022 Monitor – $PM_{2.5}$ FEM
$PM_{2.5}$ – Black Carbon	894	McGee Scientific Model AE33-7 Dual Spot
Sulfur Dioxide, Trace	592	Ultraviolet Pulsed Fluorescence EC9850T
Sulfur Dioxide, Trace	600	Ultraviolet Fluorescence API 100 EU

Table 2-5: Constituent Compounds and Species Measured in the District

Constituent Group	Compounds in the Constituent Group
Air Toxics	Dichlorodifluoromethane, Chloromethane, 1,2-Dichloro-1,1,2,2,tetrafluoroleth, Chloroethene, 1,3-Butadiene, Bromomethane, Chloroethane, Trichlorofluoromethane, Acrolein, Acetone, 1,1-Dichloroethene, Methylene Chloride, Carbon disulfide, Isopropyl Alcohol, 1,1,2-Trichloro-1,2,2-trifluoroethane, Trans-1,2-Dichloroethene, 1,1-Dichloroethane, 2-methoxy-2-methyl-Propane, Methyl ethyl Ketone (2-butanone), Cis-1,2-Dichloroethene, Hexane, Chloroform, Ethyl Acetate, Tetrahydrofuran, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Trichloroethylene, Heptane, Cis-1,3-Dichloro-1-Propene, Methyl Isobutyl Ketone , Trans-1,3-Dichloro-1-Propene, 1,1,2-Trichloroethane, Toluene, Dibrochloromethane, Methyl butyl Ketone, (2-Hexanone), 1,2-Dibromoethane, Tetrachloroethylene, Chlorobenzene, Ethyl benzene, m & p- Xylene, Bromoform (Tribromomethane), Styrene, 1,1,2,2-Tetrachloroethane, o-Xylene, 1-Ethyl-4-Methylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, Benzyl Chloride, 1,3-dichlorobenzene,1,4-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2,4-Trichlorobenzene, Hexachloro-1,3-Butadiene, and Ethylene Oxide
PAMS VOCs	Acetone, Ethane, Ethylene, Acetylene, Propane, 2,2-dimethylbutane, Benzene, i-Butane, n-Butane, i-Pentane, n-Pentane, 2,2,4-trimethylpentane, i-Propylbenzene, n-hexane, 2-methylpentane, 2,3-dimethylbutane, Cyclopentane, Ethylbenzene, n-Propylbenzene, 3-methylpentane, Toluene, Styrene, n-Heptane, 2-methylhexane, 2,4-dimethylpentane, 2,3,4-trimethylpentane, o-Xylene, 3-methylhexane, 2,3-dimethylpentane, Formaldehyde, n-Octane, 2-methylheptane, Cyclohexane, 3-methylheptane, n-Nonane, m&p-Xylenes, Methylcyclohexane, Methylcyclopentane, n-Decane, n-Undecane, Acetaldehyde, P-Ethyltoluene, M-Ethyltoluene, O-Ethyltoluene, 1,2,3-Trimethylbenzene, 1,2,4-Trimethylbenzene, 3-methyl-1-butene, 1-Butene, Propene, 1-Pentene, 1,3,5-Trimethylbenzene, 2-methyl-1-pentene, 2-methyl-2-butene, c-2-hexene, c-2-pentene, c-2-Butene, Cyclopentene, 4-methyl-1-pentene, t-2-hexene, t-2-Butene, t-2-pentene, Isoprene, 1,3 Butadiene, Alpha Pinene, Beta Pinene
PAMS Carbonyls	Acetaldehyde, Formaldehyde, Acetone,Methyl Isobutyl Ketone,Methyl Ethyl Ketone,Propionaldehyde, Benzaldehyde
Speciated $PM_{2.5}$ Mass	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

2.1 Ambient Air Monitoring Networks

Each of the District's monitoring stations is individually part of one or more of the national ambient air monitoring networks. The following sections describe each monitoring network type.

State and Local Air Monitoring Station (SLAMS):

SLAMS measure ambient levels of gaseous and particulate air pollutants. SLAMS represent the majority of all criteria pollutant (SO_2, NO_2, CO, O_3, Pb, $PM_{2.5}$, PM_{10}) monitoring across the nation. These stations use federal reference or federal equivalent methods (FRM/FEM) for direct comparison to the NAAQS to determine whether areas are in attainment or nonattainment of the air quality standards. There are approximately 4,000 SLAMS monitoring stations nationwide. The distribution of stations in the SLAMS Network is determined in large part by the needs of state and local air pollution control agencies to meet State Implementation Plan (SIP) requirements.

The District's network currently consists of five (5) SLAMS.

National Air Monitoring Station (NAMS) Network:

The NAMS network, developed in the 1970s, is a subset of the SLAMS network. NAMS stations use FRM/FEM for direct comparison to the NAAQS. In the early 1980s, the networks began to add PM_{10} monitors, and then expanded to include $PM_{2.5}$ monitors, beginning in 1999, to assess attainment with the 1997 $PM_{2.5}$ NAAQS. The network consists of ambient monitoring sites that measure $PM_{2.5}$ mass. The NAMS are designated as national trends sites and, in some cases, also serve as design value sites for Metropolitan Statistical Areas (MSAs).

Near-Roadway Monitoring Network:

The 2010 NO_2 NAAQS required establishment of a network with at least two (2) near-roadway NO_2 monitors in the Washington DC-MD-VA-WV MSA. Measurements for pollutants such as NO_2, CO, $PM_{2.5}$ and surface meteorological measurements for wind direction and wind speed are required at primary near-road sites.

The District established a near-road station along the Anacostia Freeway in River Terrace community (site ID: 11-001-0051) in April 2015. The near-road station consists of NO_2 and CO trace gas analyzers, BAM FEM continuous monitor to measure $PM_{2.5}$, and surface meteorological measurements for wind speed, wind direction, relative humidity, barometric pressure and ambient temperature.

NCore Monitoring Network:

In October 2006, EPA revised the national air quality monitoring regulations (40 C.F.R. Part 58). The most significant element of the revised regulations was to establish an NCore multi-pollutant monitoring network by January 1, 2011. Measurements for pollutants such as ozone, trace SO_2,

trace CO, total reactive nitrogen oxides (NO_y) and PM_{coarse} ($PM_{10-2.5}$; PM between 10 microns and 2.5 microns in diameter), and surface meteorological measurements for wind speed, wind direction, relative humidity, and ambient temperature are required at NCore sites. Ambient Pb monitoring was also required at NCore sites beginning in January 2012. In April 2016, EPA revised the national air quality monitoring regulations (40 C.F.R. Part 58 Appendix D) section 3(b) and section 4.5(b)(c) to remove the requirements for NCore sites to measure Lead (Pb) as well as the speciated components of PM_{coarse} ($PM_{10-2.5}$).

The District established an NCore station at the McMillan site (11-001-0043) in January 2011. The NCore station consists of SO_2 and CO trace gas analyzers, a NO_y analyzer, and a BAM FEM monitor to measure $PM_{10-2.5}$. A TSP-Pb FRM monitor was added at the McMillan NCore station in January 2012. DOEE shut down the Pb monitor under the provisions of the revised 40 C.F.R. Part 58, at the end of 2016 monitoring period.

Photochemical Assessment Monitoring Stations Network:

The Photochemical Assessment Monitoring Stations (PAMS) network was developed in the 1990s to provide an air quality database that will assist in evaluating and modifying control strategies for attaining the ozone NAAQS. The measured parameters include ozone, VOCs, carbonyls and NO_x. The national PAMS network consists of forty-three (43) sites in twenty-five (25) metropolitan areas. PAMS was a major addition to state and local networks, with near-research grade measurements for over 56 VOC compounds during the core part of the ozone season (June to August).

The District operates one (1) PAMS Type 2 station at the McMillan site. In 2011, DOEE deployed Vaisala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCore site. The District has since updated its suite of meteorological instruments to satisfy the 2015 PAMS monitoring requirements.

The 2015 amendments to the national ambient monitoring regulations (40 C.F.R. Part 58, Appendix D, Section 5) revised the PAMS monitoring requirements in conjunction with the promulgation of the 2015 8-hour ozone NAAQS of 70 ppb. These amendments require changes to PAMS monitoring and implementation of an enhanced monitoring plan (EMP) by 2021 in certain areas of the nation, including the District. The new requirements are as follows:

- Hourly averaged speciated volatile organic compounds (VOCs);
- Three 8-hour averaged carbonyl samples per day on a 1 in 3-day schedule;
- Hourly averaged Ozone (O_3), nitrogen oxide (NO), true nitrogen dioxide (NO_2), and total reactive nitrogen (NO_y);
- Hourly averaged of ambient temperature, vector-averaged wind direction and wind speed, atmospheric pressure, relative humidity, precipitation, solar radiation, and ultraviolet radiation; and
- Hourly averaged of mixing-height.

For the District, this requirement has been met by collecting PAMS measurements at the McMillan NCore station. This site is already designated as a PAMS site under the existing PAMS regulatory requirements. The District adopted the national PAMS QAPP and SOPs and

will follow the guidance presented in the PAMS TAD. These required DC-specific documents have been approved by EPA in July 2020.

Based on 40 C.F.R. part 58, Appendix D, state air monitoring agencies were initially required to begin making PAMS measurements at their NCore location(s) by June 1, 2019. The equipment needed to measure PAMS parameters were to be purchased by USEPA using a nationally negotiated contract and delivered to the monitoring agencies. USEPA has announced that due to contract delays, the necessary equipment would not be delivered in time to begin making PAMS measurements by June 1, 2019. USEPA finalized a rule on January 8, 2020 to extend the start date of PAMS measurements to June 1, 2021. The District was able to deploy the entire suite and make all PAMS measurements at the McMillan NCore site by January 2020. As part of the new requirements, DOEE also updated PAMS suite of meteorological instruments.

DOEE has started measurements at the District's PAMS site for the following PAMS compounds/parameters:

Ozone
Hourly averaged ozone is measured year round using a Thermo 49i.

Nitrogen Oxides
Hourly averaged NO, NOy and true NO_2 will be measured at a minimum, from June through August. True NO_2 will be measured using Teledyne API Model 500U CAPS NO2 analyzer. NO and NOy will be measured using a Teledyne API Model T200U.

Hourly Speciated VOCs
Hourly averaged speciated VOCs will be measured year-round with Markes-Agilent Auto GC system.

Carbonyls
Carbonyls will be sampled at a frequency of three 8-hour samples on a 1-in-3 day basis during the core ozone season (i.e., June through August) 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.

Meteorological Parameters
Hourly averages of ambient temperature and relative humidity are measured using the Vaisala HMP155; vector-averaged wind direction and wind speed are measured by the Vaisala WMT702; atmospheric pressure is recorded using the Vaisala PTB110;precipitation is measured using the Met One 385; solar radiation is measured by the Kipp and Zonen CMP6; ultraviolet A & B radiation is measured by the Kipp and Zonen SUV5; and the hourly averaged mixing layer height is measured using the Vaisala Model CL51 ceilometer.

As a jurisdiction in the Ozone Transport Region (OTR), the District is required to adopt an EMP no later than October 1, 2019. The District's EMP was approved by EPA on October 28, 2019. A Pandora spectrometer was deployed at McMillan PAMS site in August 2020. The Pandora instruments study the atmosphere by using spectroscopy, delivering total column profiles of the

atmosphere, including ozone, nitrogen dioxide and formaldehyde. Pandora spectrometer tracks either the sun or moon to collect light through the total atmospheric column at wavelengths between 291 nm to 523 nm; collected data gives information on the trace gases, specifically ozone, NO2 and formaldehyde.

Special Purpose Monitoring Networks:

Special Purpose Monitoring (SPM) networks include National Air Toxic Trends Stations (NATTS), $PM_{2.5}$ Chemical Speciation Network (CSN), and other special purpose monitors.

Currently, the District's SPM network consists of: one (1) NATTS, and one (1) CSN station at the McMillan site.

Through a partnership with DOEE, EPA installed a Village Green station at the Smithsonian National Zoological Park (National Zoo) in the District in 2015. The Village Green park bench stations are intended for research and education on air quality and they are not meant for use as regulatory monitors.

Interagency Monitoring of Protected Visual Environments Network:

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program was established in 1985 to help implement plans to reduce visibility impairment in Class I areas (large federally protected national parks and wilderness areas) as stipulated in the CAA. There are about 110 IMPROVE sites in Class I visibility protection areas. These sites collect aerosol samples and analyze the filters for trace elements, major ions, and carbon fractions. Most of the IMPROVE sites are operated by federal agencies within the U.S. Department of the Interior.

The U.S. National Park Service (NPS) operated one (1) IMPROVE site along with a nephelometer at the Hains Point station in the District until June of 2015.

2.2 Pollutant Parameters

DOEE operates a comprehensive air monitoring network covering a range of pollutants. This section presents descriptions segregated by pollutant parameter.

Fine Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ FEM Monitors: DOEE operates four (4) automated BAM 1022 $PM_{2.5}$ monitors in its air monitoring network – one (1) each at the Anacostia Freeway Near Road, River Terrace McMillan stations and the King Greenleaf Recreation Center site. The McMillan, Anacostia Freeway Near-Road, River Terrace and King Greenleaf Recreation Center primary monitors are continuous hourly sampling schedule. The required collocated secondary $PM_{2.5}$ FRM monitor at McMillan is operated on a 1-in-6 day sampling schedule.

DOEE replaced the $PM_{2.5}$ network FRM monitors with continuous FEM monitors beginning of the calendar year 2017.

Table 2-6: Number of $PM_{2.5}$ SLAMS Sites (based on Table D–5, Appendix D, 4.7.1(a) to 40 C.F.R. Part 58, $PM_{2.5}$ Minimum Monitoring Requirements)

MSA Name	Population	Annual Design Value 2016-2018	Daily Design Value 2016-2018	Required SLAMS Monitors	Monitors Active in DC/Total[A,B]	Required ≥ 85% NAAQS
Washington-Arlington-Alexandria, DC-VA-MD-WV	6,251,240	9.0	20	2	4/9	3

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.

$PM_{2.5}$ Chemical Speciation Network (CSN): DOEE currently operates one $PM_{2.5}$ CSN (MetOne SASS) monitor at the McMillan site. The District implemented the carbon channel upgrade (URG 3000N) for the CSN monitor in 2007. The CSN monitor at the McMillan site operates on a 1-in-3-day sampling schedule to measure $PM_{2.5}$ chemical species.

Particulate Matter (PM_{10})

DOEE operates one (1) continuous BAM PM_{10} FEM sampler at the McMillan site for reporting PM_{10} mass measurements. In 2013, EPA approved co-designation of the McMillan NCore station's BAM PM_{10} FEM automated sampler for PM_{10} network to fulfill the PM_{10} NAAQS monitoring requirements in the District. Subsequent to receiving EPA's approval, DOEE decommissioned the two (2) very old and aging filter-based manual PM_{10} FRM samplers (primary and secondary monitors) in January 2014.

Additionally, DOEE operates a High-Vol PM_{10} sampler for NATTS toxic metals analysis.

Ozone (O_3)

DOEE currently operates Thermo-49i series ozone analyzers at three (3) sites in the District: River Terrace, McMillan Reservoir, and Takoma Recreation Center.

Ozone is measured by ultraviolet absorption photometry. Air is drawn continuously through a sample cell where ultraviolet light passes through it. Ozone 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 electric signal related to the concentration of ozone in the sample cell.

Ozone season begins on March 1 and continues through October 31. DOEE already conducts year-round ozone measurements and collects ozone data on an hourly basis, so no additional changes are necessary.

Ozone monitoring requirements are determined by the MSA population and design value, as specified in Table D-2 of 40 C.F.R. Part 58 Appendix D. Table 2-1 shows that the DOEE monitoring network meets or exceeds the minimum requirements.

Table 2-7: Number of Ozone SLAMS Sites (based on Table D–2, Appendix D,4.1(a) to 40 C.F.R. Part 58, Ozone Minimum Monitoring Requirements)

MSA Name	Population	Monitors Deployed by State[A]						Total Monitors	Required ≥ 85% NAAQS
			DC	MD	VA	WV			
Washington-Arlington-Alexandria, DC-VA-MD-WV	6,251,240		3	7	7	0		17	3
Total			3	7	7	0		17	3

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 Washington-Arlington-Alexandria, DC-MD-VA-WV MSA, the ozone monitor at the Takoma Recreation Center site is assigned this designation for the District portion of the MSA.

Carbon Monoxide/Trace-CO

CO is measured by infrared absorption photometry. Air is drawn continuously through a sample cell where infrared light passes through it. CO 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 electric signal related to the CO concentration in the sample cell. The CO trace analyzer is designed to measure background concentrations of CO with a lower detection limit less than 4 ppb and uses a high-performance modified vacuum pump. CO concentrations are highest along heavily traveled roadways and decreases significantly with distance from traffic. Therefore, CO monitors are usually located close to roadways or in urban areas.

One CO monitor is required to be collocated with a near-road NO_2 monitor. EPA revised the minimum monitoring requirements for CO on August 12, 2011. Since one (1) CO monitor is collocated with a near-road NO_2 monitor as required, DOEE proposed to discontinue two CO monitors (one at the River Terrace station and one at the Verizon station) at the end of 2016 in

our 2017 network plan. DOEE's 2017 Annual Network Plan was approved by EPA on November 10, 2016. In January 2011, DOEE deployed an Ecotech EC9830T trace-CO analyzer at the McMillan Reservoir NCore station and in April 2015 deployed an API T300U trace CO analyzer at the Anacostia Freeway Near-Road station.

DOEE will continue maintaining two remaining CO monitors: one at the NCore station and one at the near-road station.

Nitrogen Dioxide (NO_2)

NO_2 is measured indirectly. First, nitrogen oxide (NO) is measured using the chemiluminescence reaction of NO with 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 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, NO_x is 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.

True NO_2 is a direct measurement of NO_2, which uses cavity-attenuated phase shift (CAPS) NO_2 monitors to provide a direct absorption measurement of nitrogen dioxide. Unlike standard chemiluminescence-based monitors, these instruments require no conversion of NO_2 to another species and thus are not sensitive to other nitrogen-containing species. The CAPS NO_2 monitor operates as an optical absorption spectrometer that yields both reliable and accurate measurements of ambient nitrogen dioxide down to sub ppb concentrations, with lower noise levels than chemiluminescence-based monitors.

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

DOEE currently operates NO_2 monitors at <u>four</u> (4) sites collocated with ozone measurement sensors. The NO-NO_2-NO_x Thermo-42i analyzers are operated year-round and are located at the River Terrace, McMillan, Near-road, and Takoma Recreation Center sites. The true-NO2 API model T500U-CAPS sampler has been deployed since January 2020 at McMillan.

RA-40: The monitoring regulations for the 2010 NO_2 NAAQS say that the EPA Regional Administrator can require a minimum of forty (40) monitors to be sited inside or outside of CBSAs nationwide in locations with "susceptible and vulnerable" populations. The community-level NO_2 network monitors are called "RA-40" designated monitors. DOEE and EPA assigned a RA-40 designation to the NO_2 monitor at the River Terrace station.

Total Reactive Nitrogen Oxides (NO_y): In January 2011, DOEE installed an Ecotech EC9843 model NO_y analyzer at the McMillan NCore station. DOEE replaced an EcoTech EC9843 analyzer with Teledyne API model T200U in July 2017. These samplers are a

chemiluminesence-based analyzers that uses a high-performance NO_y converter to measure trace levels of NO_y and NO.

Near-Road NO_2 Network: In January 2015, DOEE established one (1) NO_2 near-road monitoring station collocated with trace CO measurement along the Anacostia Freeway (Site: 11-001-0051). Valid data collection began in June 2015. Data is uploaded to EPA's AQS.

Sulfur Dioxide/Trace-SO_2

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 SO_2 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. The SO_2 trace analyzer is a high-performance UV fluorescence analyzer designed to measure background concentration of SO_2 with a lower detection limit less than 200 parts per trillion.

DOEE operates one (1) EcoTech EC9850T trace-SO_2 analyzer at the McMillan NCore station.

The District proposed to decommission the Thermo 43i continuous SO_2 monitor at the River Terrace station in the 2020 Network Plan. The monitor was redundant since the network already had the required number of SO_2 monitors. Once EPA approved the 2020 Network Plan on October 28, 2019, DOEE decommissioned the SO_2 monitor at River Terrace.

Air Toxics

DOEE operates one (1) NATTS station at the McMillan site. Air toxics samples are collected for 24 hours with a model 910A Environmental Systems Inc. canister sampler on a 1-in-6-day schedule.

NATTS monitors at the McMillan site capture PAH (Tisch PUF+ analyzer), toxic heavy metals (EcoTech 3000 PM_{10} High-Vol), and VOCs and carbonyls (Model 2200-22 Atmospheric Technology Inc. ATEC). The sampled canisters are returned to the laboratory for analysis on an Entech/Agilent gas chromatograph (GC) mass spectrometer system. The District's NATTS site also includes an Aethalometer (Magee Scientific) for continuous sampling of black carbon (OC/EC).

PAMS Ozone Precursors

DOEE operates one (1) PAMS Type 2 station at the McMillan site. The parameters measured are O_3, NO, NO_x, NO_2, Tru NO2, speciated VOCs, carbonyls and surface meteorology.

During the peak ozone season (June to August), 24-hour canister air samples are collected on a 1-in-6 day sampling schedule with a ATEC Model 2200-22 sampler. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system for speciated VOCs. During core ozone season, hourly measurements for a set of 56 target hydrocarbons are made on-site

using a Markes/Agilent VOC Air Analyzer with dual flame ionization detector (Markes Unity-xr with CIA Advantage ozone precursor sampler and Agilent 7890B PAMS Gas Chromatograph sampling system). The measurement method for carbonyls is based on EPA's Compendium Method TO-11A, which incorporates the use of sorbent cartridges coated with 2,4-dinitrophenylhydrazine and ATEC model 8000-3 for sample collection. The analyses are performed with high performance liquid chromatography.

DOEE also operates continuous O_3 and NO_x analyzers complemented with surface meteorological measurements at the McMillan PAMS site. In 2011, DOEE deployed Vaisala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCore site. DOEE has replaced the meteorological sensor with the Vaisala HMP155 temperature and humidity probe, the Vaisala WMT702 wind speed and direction sonic anemometer, the Vaisala PTB110 pressure sensor, the Met One 385 tipping bucket rain gauge, the Kipp and Zonen CMP6 solar radiation pyranometer, the Kipp and Zonen SUV5 ultraviolet radiation radiometer, and the Vaisala CL51 mixing layer height ceilometer.

Lead (Pb)

DOEE discontinued Pb sampling at the end of 2016, under the provisions of 40 C.F.R.
In January 2012, DOEE began operating a TSP-Pb monitor at its McMillan NCore site on a 1-in-6-day sampling schedule. Data collected for four years were measuring concentrations at about 4% of the NAAQS.

3.0 District of Columbia's Air Monitoring Stations

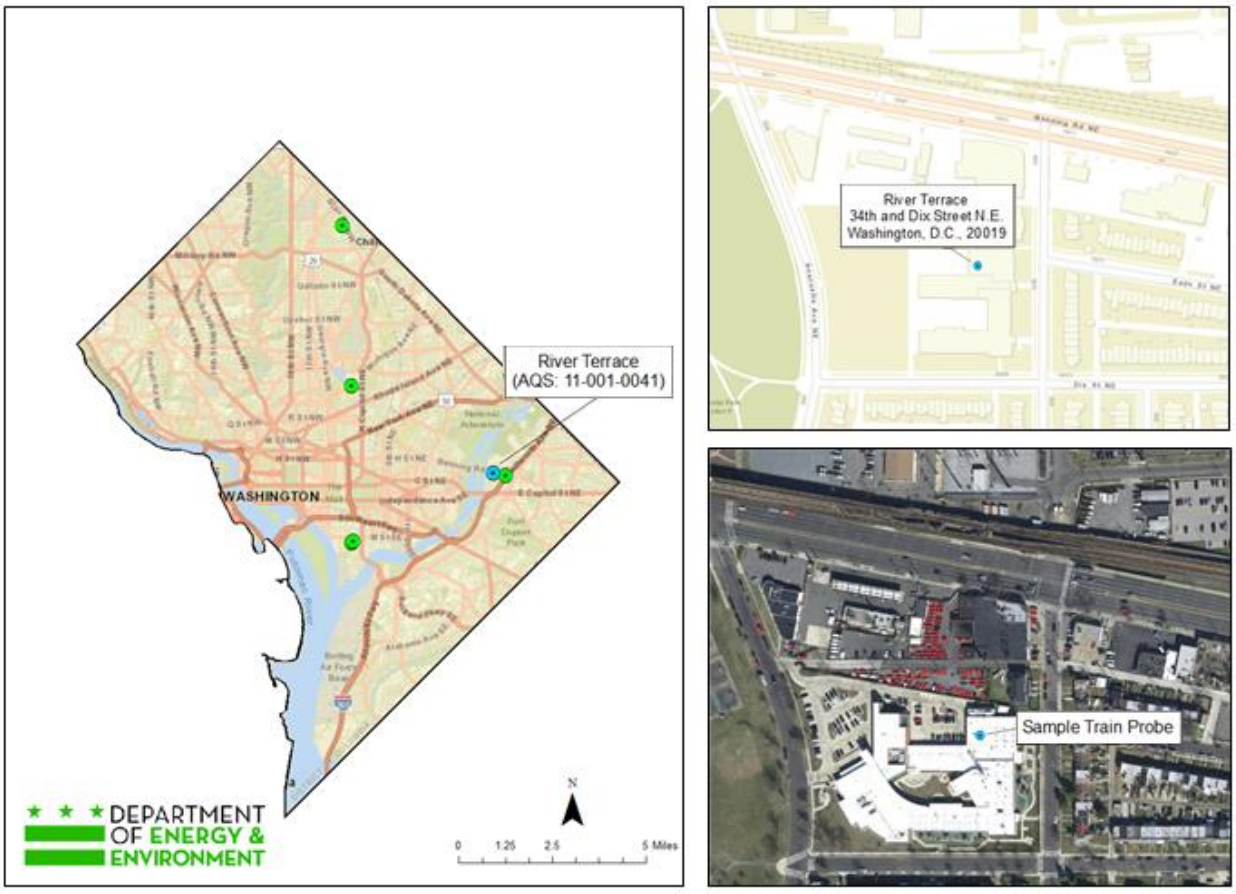
DOEE currently maintains a network of five (5) ambient air monitoring stations: River Terrace, McMillan, Takoma Recreation Center, Anacostia Freeway near-road and King Greenleaf Recreation Center station. The following sections provide additional information. Maps for the individual sites are shown in Figures 3-1 to 3-6.

3.1 River Terrace Station (11-001-0041)

The River Terrace monitoring station has been in operation since 1993. The site consists of measurement analyzers for O_3, NO_x, and $PM_{2.5}$.

Starting calendar year 2017, the $PM_{2.5}$ FRM monitor was replaced with a FEM monitor and the CO monitor was discontinued. DOEE discontinued the SO_2 monitor in 2019 due to redundancy with the trace SO_2 monitor for NCore at the McMillan Reservoir monitoring site (11-001-0043).

Figure 3-1: River Terrace Site Locator Maps



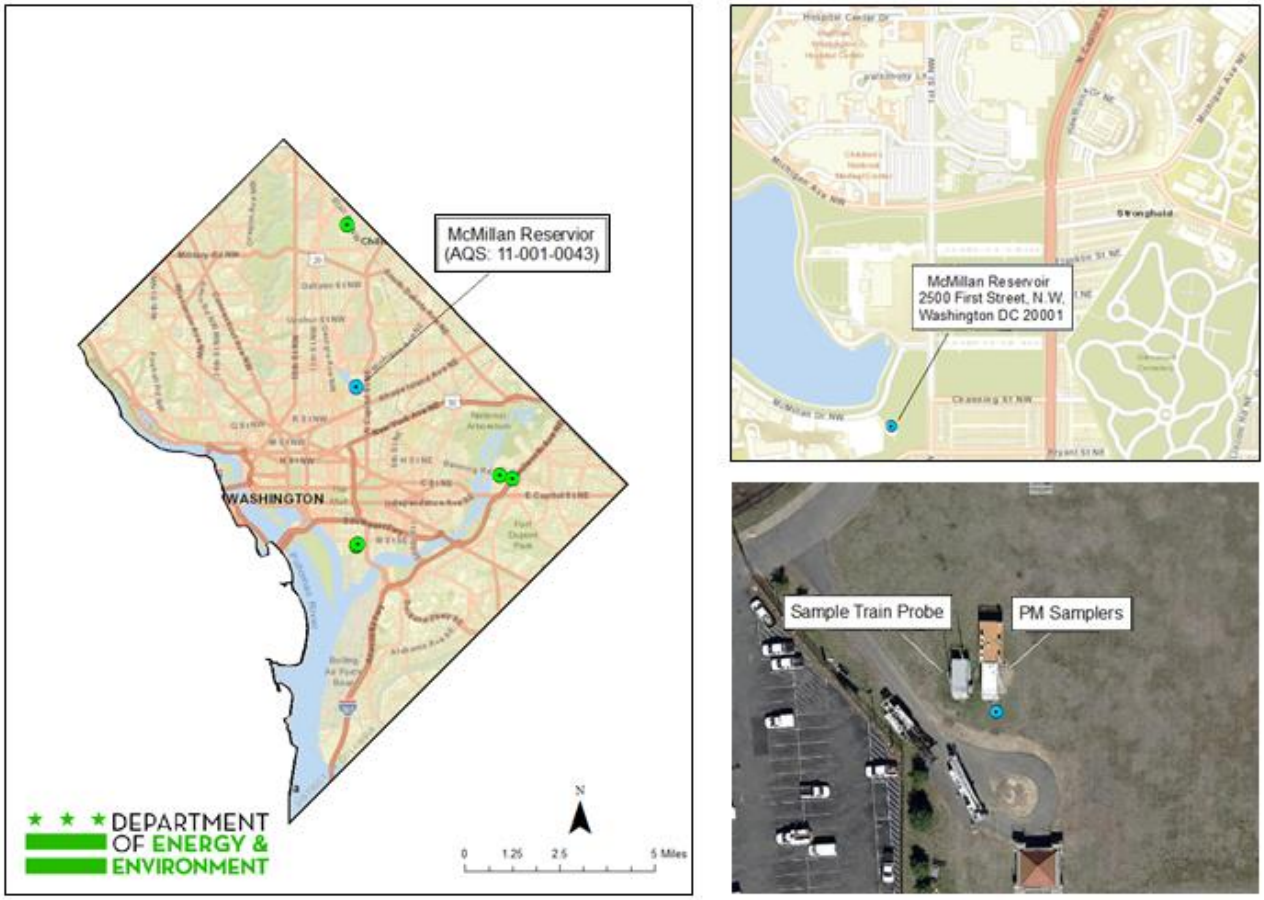
3.2 McMillan Station (11-001-0043)

The McMillan monitoring station is the most comprehensive ambient air station in the District. It was launched in 1994 as a PAMS Type 2 station. Measurements for 56 target hydrocarbons are conducted with a PAMS automatic GC ambient air sampling system. The station was expanded in 2000 and 2001 with the addition of $PM_{2.5}$ FRM, $PM_{2.5}$ CSN monitoring, $PM_{2.5}$ continuous, NATTS and BC/EC sensors. Surface meteorological measurements are carried out at the McMillan Reservoir site as part of PAMS monitoring.

Also, the McMillan site was the first NATTS site in EPA Region III. In January 2011, the McMillan site has expanded into an NCore network monitoring station. A TSP-Pb monitor was added in January 2012 and terminated at the end of 2016 after monitoring requirements were revised. Additionally, as part of the EPA Office of Air Quality Planning and Standards (OAQPS) national pilot study, a Sunset Model 4 Semi-Continuous OC/EC monitor was deployed at McMillan station from January 2012 to August 2016. A Vaisala CL51 ceilometer was deployed in January 2020 and a Pandora spectrometer was deployed in August 2020.

Starting calendar year 2017, the $PM_{2.5}$ FRM monitor was replaced with a FEM monitor.

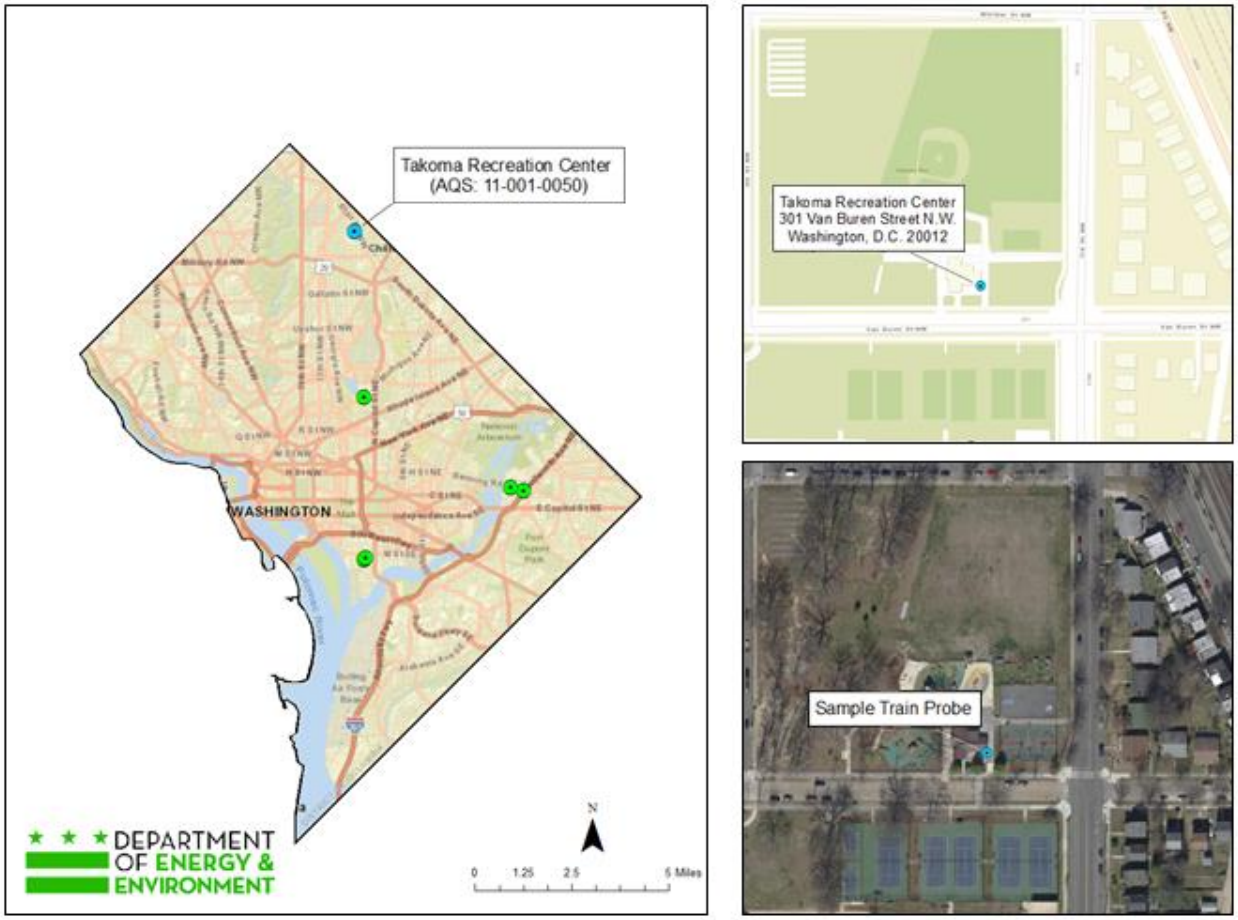
Figure 3-2: McMillan Reservoir Site Locator Maps



3.3 Takoma Recreation Center Station (11-001-0050)

The Takoma Recreation Center monitoring station has been in operation since January 2013. The station consists of measurement analyzers for O_3 and NO_x. This station was established as a replacement site for Takoma School station (11-001-0025), where operations ceased in 2011 because of a fire incident.

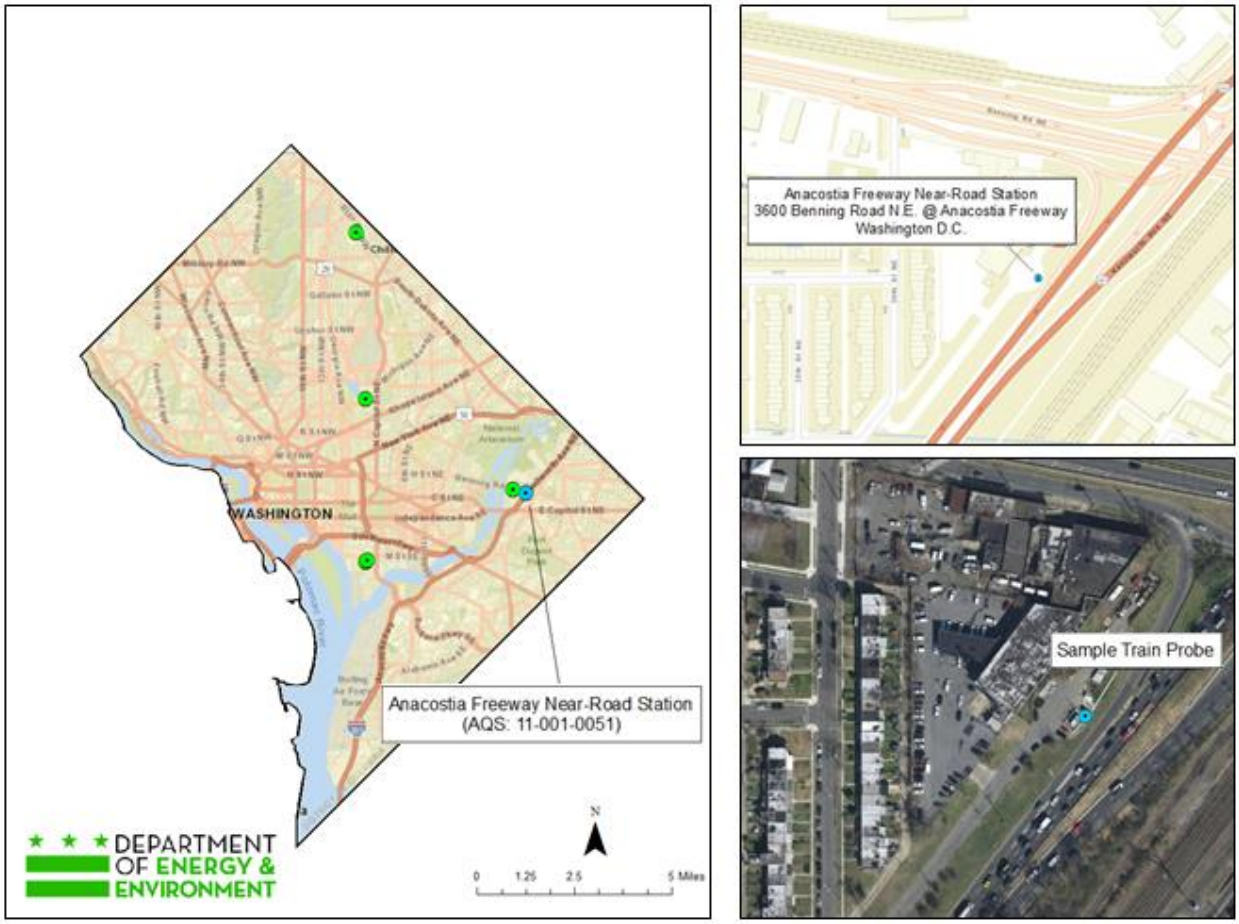
Figure 3-3: Takoma Recreation Center Site Locator Maps



3.4 Anacostia Freeway Near-Road Station (11-001-0051)

The Anacostia Freeway Near-Road Station was launched in January 2015 and it houses NO_2, CO, and $PM_{2.5}$ continuous measurement sensors. This station serves as an important and critical station in the metropolitan area and the District because of its location for capturing peak 1-hour NO_2 and CO concentrations expected in the near-road environment.

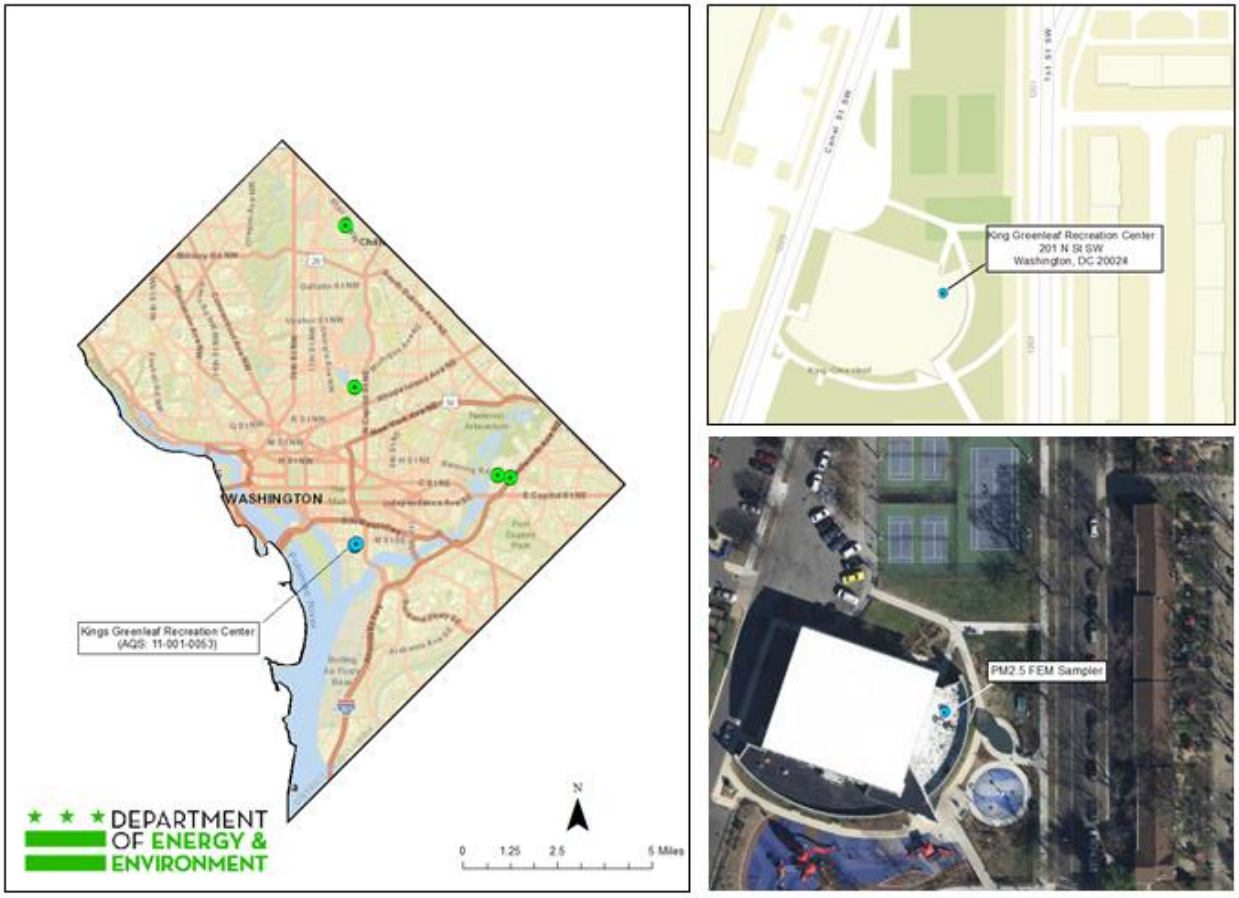
Figure 3-4: Anacostia Freeway Near-Road Site Locator Maps



3.5 King Greenleaf Recreation Center Station (11-001-0053)

The King Greenleaf monitoring station has been operational since August 2017, but was not added to the AQS until January 1, 2018. DOEE operates a $PM_{2.5}$ FEM monitor at this location on the rooftop of the recreation center. This station was first deployed as a special purpose monitor but was added on to the District's network in 2018.

Figure 3-5: King Greenleaf Recreation Center Site Locator Maps



4.0 Ozone and $PM_{2.5}$ Air Quality

Ambient data for criteria pollutants as given by design value concentrations are used to determine if the monitored air quality in the District is in compliance with the NAAQS. Design values (DV) are defined in CAA guidance and are often based on multiple years of data to ensure a stable indicator. Design value data is used to classify nonattainment areas, assess progress towards meeting the NAAQS, and develop control strategies. Design values are computed and published annually by EPA's OAQPS and reviewed in conjunction with the regional offices.

4.1 Annual $PM_{2.5}$ Design Concentrations

Figure 4-1 below gives the design concentrations for $PM_{2.5}$ at the District's sites for the recent period. The annual $PM_{2.5}$ design values were calculated using the average of the annual arithmetic mean for a consecutive three-year period. Design values based on 2014 to 2021 data indicate that the District is in attainment for the 2012 annual $PM_{2.5}$ NAAQS of 12 $\mu g/m^3$.

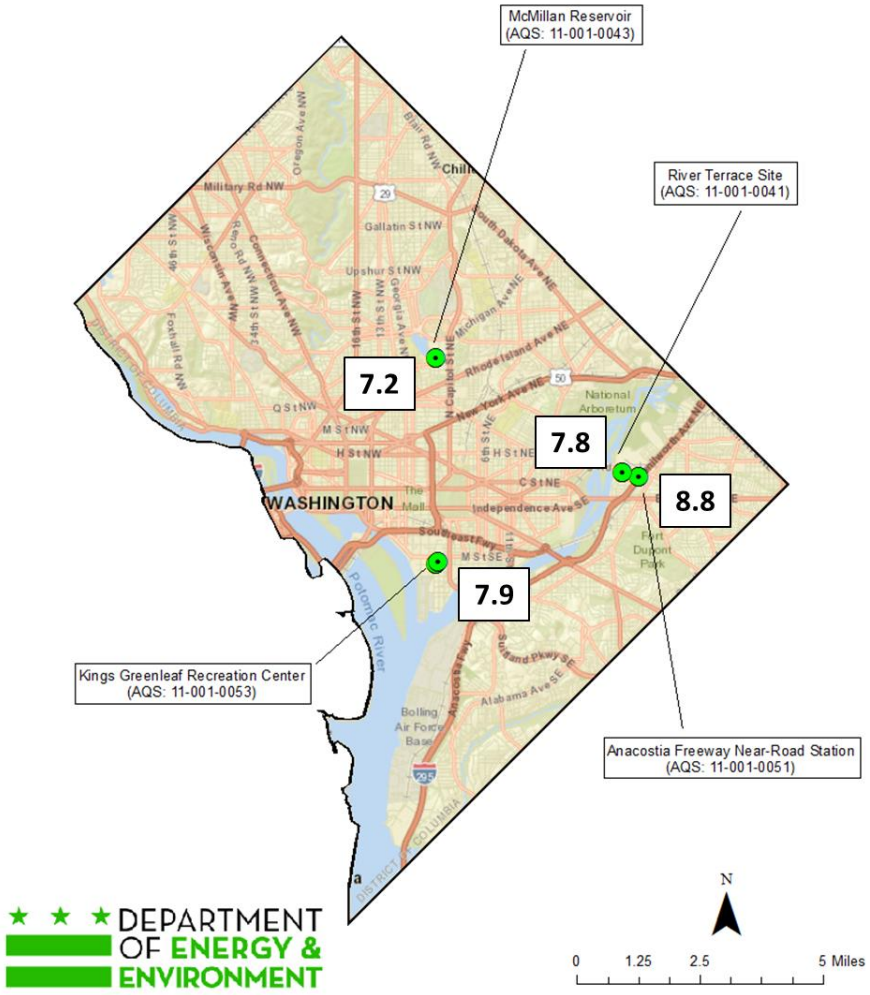
4.2 Daily $PM_{2.5}$ Design Concentrations

Daily $PM_{2.5}$ design concentrations are calculated using the 98^{th} percentile ambient concentration value from each year for a given consecutive three-year period. The design value is the average of the three 98^{th} percentile data. Figure 4-2 gives the design values for daily $PM_{2.5}$ using data from 2014 to 2021. Design values based on the recent data indicate that the District is in attainment for the 2006 daily $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$.

4.3 Ozone Design Concentrations

Figure 4-3 includes current design values for ground-level ozone using data from 2014 to 2021. The ozone design values are calculated by taking the three-year average of the annual 4^{th} highest daily maximum 8-hr average concentrations. The 2015 8-hr ozone NAAQS is 0.070 ppm, or 70 ppb. Monitored data indicate that the ambient air quality is in violation of the NAAQS at O_3 monitoring sites in the District. The Takoma Recreation Center O_3 monitoring site (11-001-0050) was deployed in January 2013.

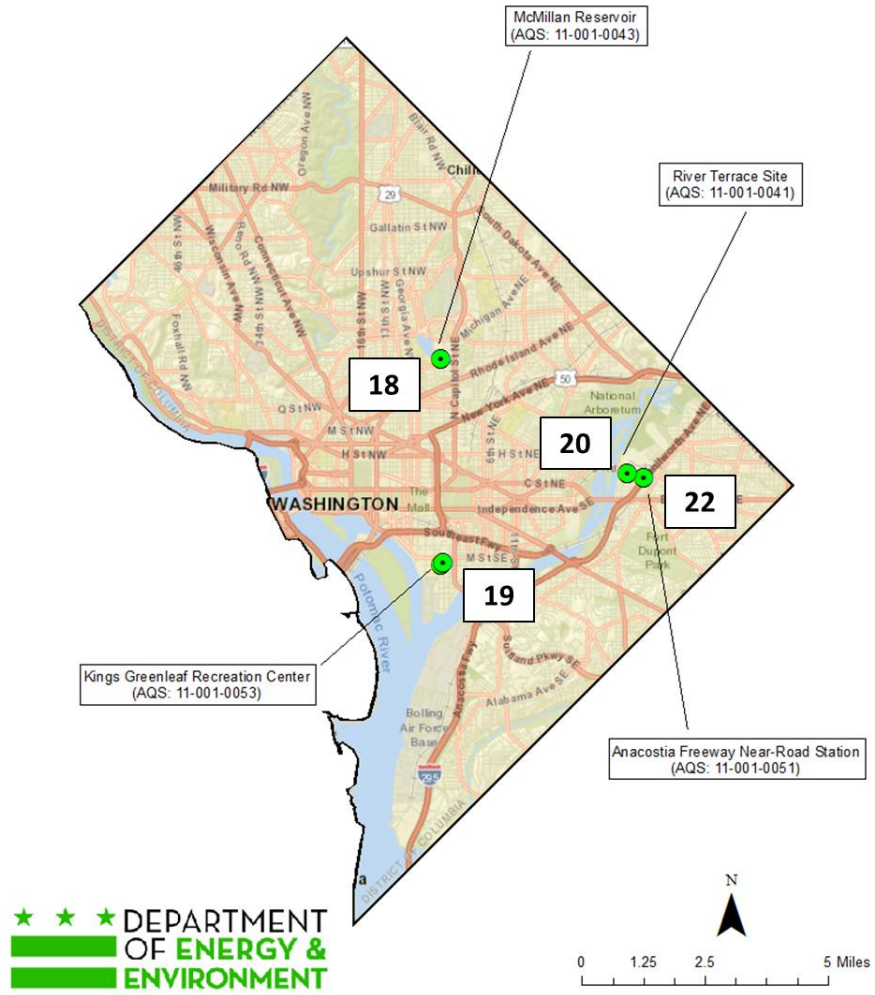
Figure 4-1: Annual $PM_{2.5}$ Design Values



Annual $PM_{2.5}$ Design Values ($\mu g/m^3$)									
Site	**AQS ID**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
McMillan	11-001-0043	9.4	9.2	9.0	9.2	9.0	8.9	7.6	7.2
River Terrace	11-001-0041	9.8[A]	N/A	N/A	8.5	8.5[B]	8.6	8.0	7.8
Anacostia Freeway Near-Road	11-001-0051	-	-	10.1[C]	10.2	9.8	9.5	8.7	8.8
King Greenleaf	11-001-0053	-	-	-	-	8.2[D]	8.1[D]	7.6	7.9

[A]*River Terrace temporarily shut down from March 2014 to April 2016 for school renovation. The 2014 DV was based on two years of data (2012 and 2013). The 2015 and 2016 DVs were not available due to station temporarily shut down for renovation.*
[B]*The 2018 River Terrace DV is based on half of 2016 and complete years of 2017 and 2018.*
[C]*Near-Road 2016 DV was based on two years of data (2015 and 2016).*
[D]*Incomplete DVs. Based on data starting in January 2018.*

Figure 4-2: Daily $PM_{2.5}$ Design Values



Daily $PM_{2.5}$ Design Values ($\mu g/m^3$)									
Site	**AQS ID**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
McMillan	11-001-0043	22	22	21	21	20	20	19	18
River Terrace	11-001-0041	25[A]	N/A	N/A	17	18[B]	21	21	20
Anacostia Freeway Near-Road	11-001-0051	-	-	25[C]	23	21	21	22	22
King Greenleaf Recreation Center	11-001-0053	-	-	-	-	19[D]	18[D]	19	19

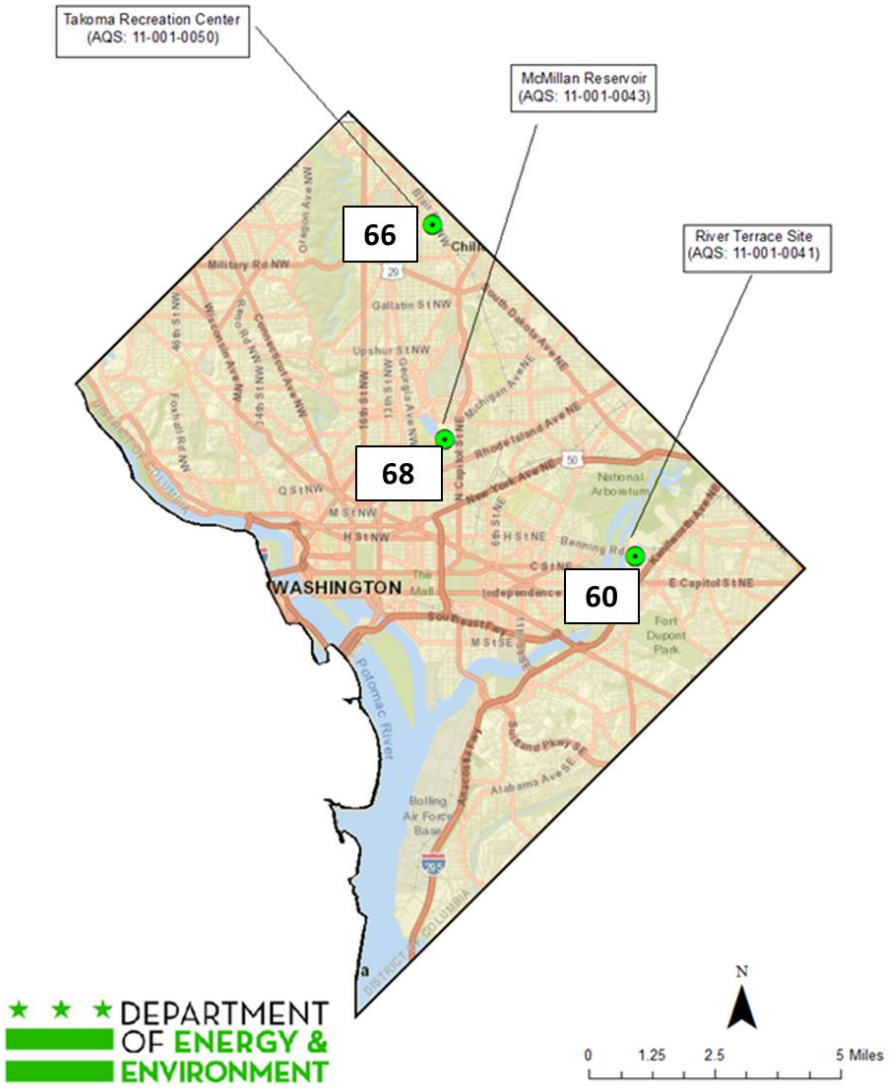
[A]*River Terrace temporarily shut down from March 2014 to April 2016 for school renovation. The 2014 Design Value was based on two years of data (2012 and 2013). The 2015 and 2016 Design Values were not available due to station temporarily shut down for renovation.*

[B]*The 2018 River Terrace DV is based on half of 2016 and complete years of 2017 and 2018.*

[C]*Near-Road 2016 DV was based on two years of data (2015 and 2016).*

[D]*Incomplete DVs. Based on data starting in January 2018.*

Figure 4-3: Ozone Design Values



Ground-level Ozone Design Values (ppb)									
Site	**AQS ID**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
McMillan	11-001-0043	73	65	70	71	72	71	69	68
River Terrace	11-001-0041	61	N/A[A]	N/A[A]	60[B]	57	56	55	60
Takoma Recreation Center	11-001-0050	67[C]	69	70	70	70	69	67	66

[A]*River Terrace temporarily shut down from March 2014 to April 2016 for school renovation. The 2015 and 2016 Design Values were not available due to station temporarily shut down for renovation.*
[B]*The 2017 Design Value was based on two years of data (2016 and 2017).*
[C]*Takoma Recreation Center station started in January 2013. The 2014 Design Value was based on two years of data (2013 and 2014).*

5.0 Network Changes and Upgrades

The District supports EPA's efforts to protect public health and natural resources under the CAA. DOEE is working with EPA Region III and EPA's OAQPS to evaluate potential modifications to the District's network, including changes to the monitoring sites, sampling schedules, sampling equipment, and technologies, to ensure that the District's ambient air monitoring program meets all regulatory requirements.

- DOEE is proposing to establish a **new ambient monitoring station in an overburdened EJ community** in the District with funding from the American Rescue Plan federal direct grant; this new station may start collecting ambient $PM_{2.5}$ data by late-2023.

- DOEE is proposing **no changes** at the District's **existing** ambient air monitoring network in calendar year 2023.

The sections below give additional information for the District's monitoring network in calendar year 2023. DOEE seeks EPA's concurrence and Region III Regional Administrator's approval for these proposed changes, if any.

5.1 River Terrace School (Site ID 11-001-0041)
- SLAMS O_3 and NO_2 monitors: No changes planned
- $PM_{2.5}$ FEM monitor: No changes planned
- SLAMS monitors: SO_2 monitor was shut down in October 2019 and CO monitor shutdown end of December 2016, as approved by EPA

5.2 McMillan (Site ID 11-001-0043)
- PAMS monitors: No changes planned
- NATTS monitors: No changes planned
- NCore monitors: No changes planned
- $PM_{2.5}$ monitors: No changes planned
- $PM_{2.5}$ CSN: No changes planned
- PM_{10} FEM Monitors: No changes planned

5.3 Takoma Recreation Center Site ID 11-001-0050)
- SLAMS O_3 and NO_2 monitors: No changes planned

5.4 Anacostia Freeway Near-Road station (Site ID 11-001-0051)
- NO_2 and CO monitors: No changes planned
- $PM_{2.5}$ FEM monitor: No changes planned

5.5 King Greenleaf Recreation Center (Site ID 11-001-0053)
- $PM_{2.5}$ FEM monitor: No changes planned

6.0 Air Monitoring Program and Data Contacts

The Air Monitoring Branch in DOEE's Air Quality Division maintains the District's ambient air monitoring network and quality assures and quality controls the ambient air quality data. Data is stored locally for use by staff and for preparation of special reports, data charts, and special requests such as Freedom of Information Act requests.

Data is delivered to EPA's AQS database and reported on a schedule set forth in 40 C.F.R. Part 58. EPA controls access to the raw ambient air quality data that DOEE transmits to the national database. Ambient air quality monitoring data must be certified on an annual basis as accurate and complete. The certification process begins with the complete submittal of all SLAMS data to the federal AQS for the calendar year. State and local air monitoring agencies are required to transmit and certify the collected data for the previous calendar year by May 1.

DOEE has developed ambient monitoring guidelines in order to ensure that ambient air quality data collected at the state's ambient monitors are of the highest quality and conform to federal requirements for quality assurance under 40 C.F.R. 58.3.

DOEE uploaded fully quality assured calendar year 2021 data for the District's network to EPA's AQS national database. Submittal of precise and accurate data into AQS was accomplished and a formal certification of calendar year 2021 data was transmitted to EPA on April 29, 2022.

Annual data reports are generated from AQS and data certifications are prepared by DOEE, according to the reporting requirements in 40 C.F.R. Part 58. Data requests can be directed via email to: berhan.teklu@dc.gov.

The main contact for the District's air monitoring program is:

Dr. Rama Seshu Tangirala
Branch Chief, Air Monitoring Branch
Air Quality Division
Department of Energy & Environment
1200 First Street, N.E., Fifth Floor
Washington, D.C. 20002
Phone: (202) 535-2989
E-mail: rama.tangirala@dc.gov

Appendix A: New Monitoring Station in Ward 8

DOEE is proposing to establish a new ambient monitoring station in an overburdened environmental justice (EJ) community and this new station is going to be funded by the American Rescue Plan direct award to the District's air program. DOEE is expected to deploy a new federal regulatory monitor in the historic neighborhood of Anacostia in Ward 8 of the District in 2023. DOEE will be responsible for the maintenance, operation, and data reporting to EPA. Upon initial deployment, $PM_{2.5}$ will be monitored at this site.

The Historic Anacostia neighborhood is located east of the Anacostia River as shown in Figure A-1. EPA considers this section of Ward 8, an EJ community where EJ is defined as the "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." EJ communities are overburdened communities that are disproportionally exposed to environmental hazards. These vulnerable communities are typically low-income communities of color experiencing socioeconomic stressors and more health ailments.

DOEE intends to place a monitoring site in the EJ community of Historic Anacostia to measure $PM_{2.5}$. Based on the EPA's EJScreen tool, Anacostia is a community comprised almost entirely of people of color. Approximately 64% of residents are considered low-income, and nearly one fifth of the population (18%) has less than a high school education. The unemployment rate of 17% is at the 95^{th} percentile in the entire country. Residents of this community are exposed to some of the highest daily traffic in this country, and high concentrations of carcinogens such as diesel particulate matter. Approximately 12% of the population are children under the age of 5 years old, thus making monitoring pollutants essential for the next generations of residents. To fulfill equity, so that all residents in the District thrive, monitoring pollutants in the historic EJ Anacostia community within Ward 8 is of high priority for DOEE.

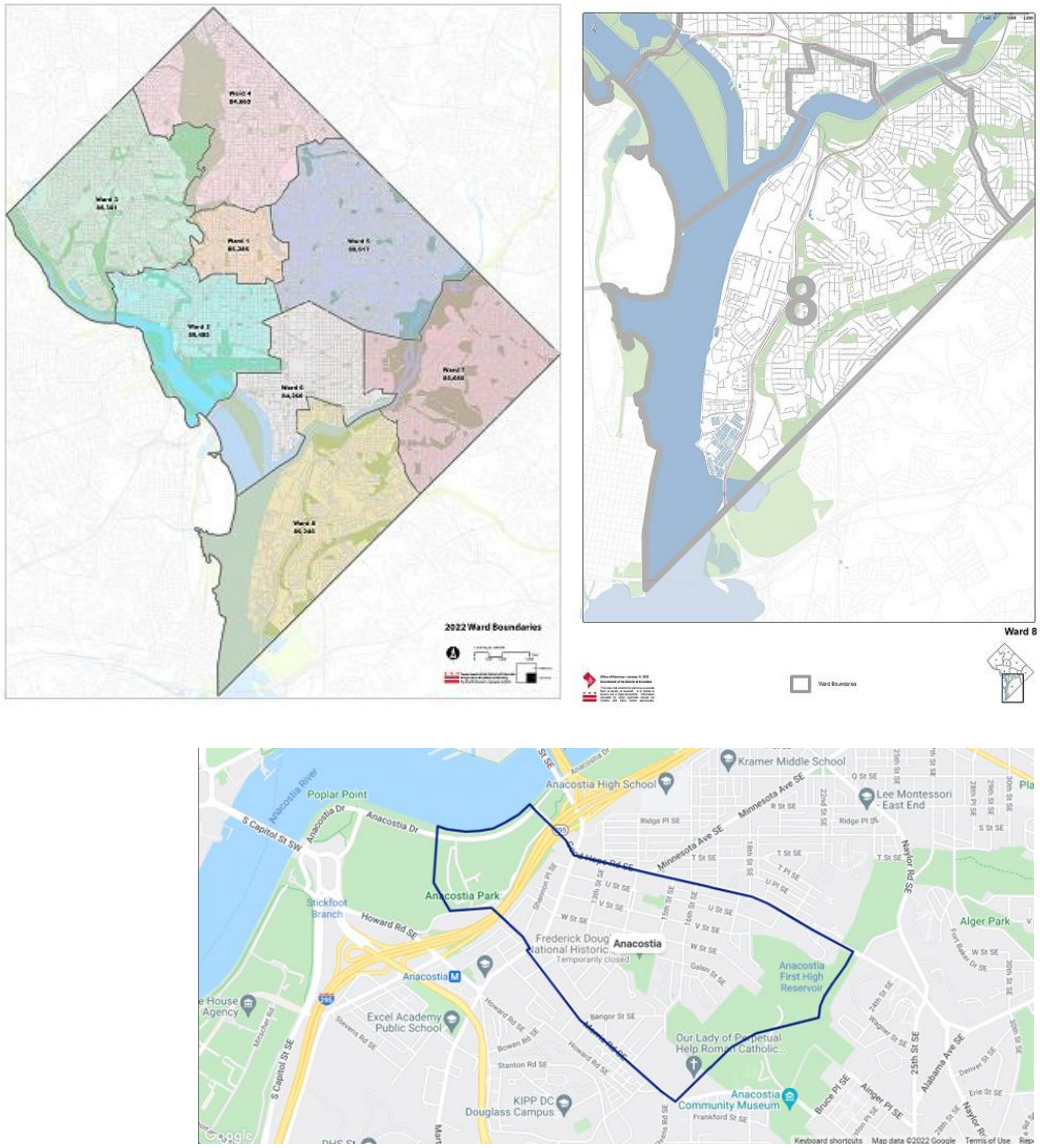


Figure A-1: Map of the District's Historic Anacostia neighborhood where the new air monitoring station will potentially be placed.

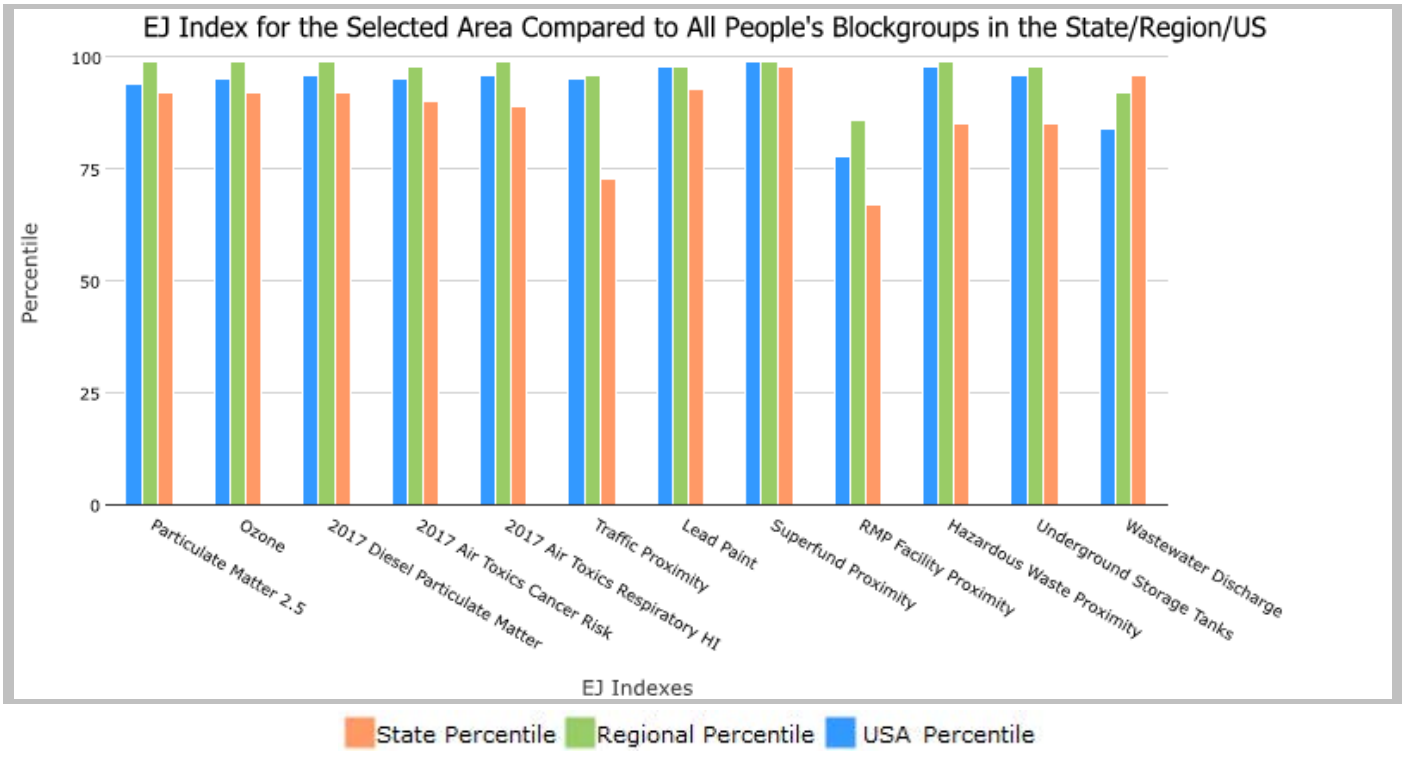
EJScreen Report (Version 2.0)

the User Specified Area, DISTRICT OF COLUMBIA, EPA Region 3

Approximate Population: 5,735

Input Area (sq. miles): 0.58

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	92	99	94
EJ Index for Ozone	92	99	95
EJ Index for 2017 Diesel Particulate Matter*	92	99	96
EJ Index for 2017 Air Toxics Cancer Risk*	90	98	95
EJ Index for 2017 Air Toxics Respiratory HI*	89	99	96
EJ Index for Traffic Proximity	73	96	95
EJ Index for Lead Paint	93	98	98
EJ Index for Superfund Proximity	98	99	99
EJ Index for RMP Facility Proximity	67	86	78
EJ Index for Hazardous Waste Proximity	85	99	98
EJ Index for Underground Storage Tanks	85	98	96
EJ Index for Wastewater Discharge	96	92	84



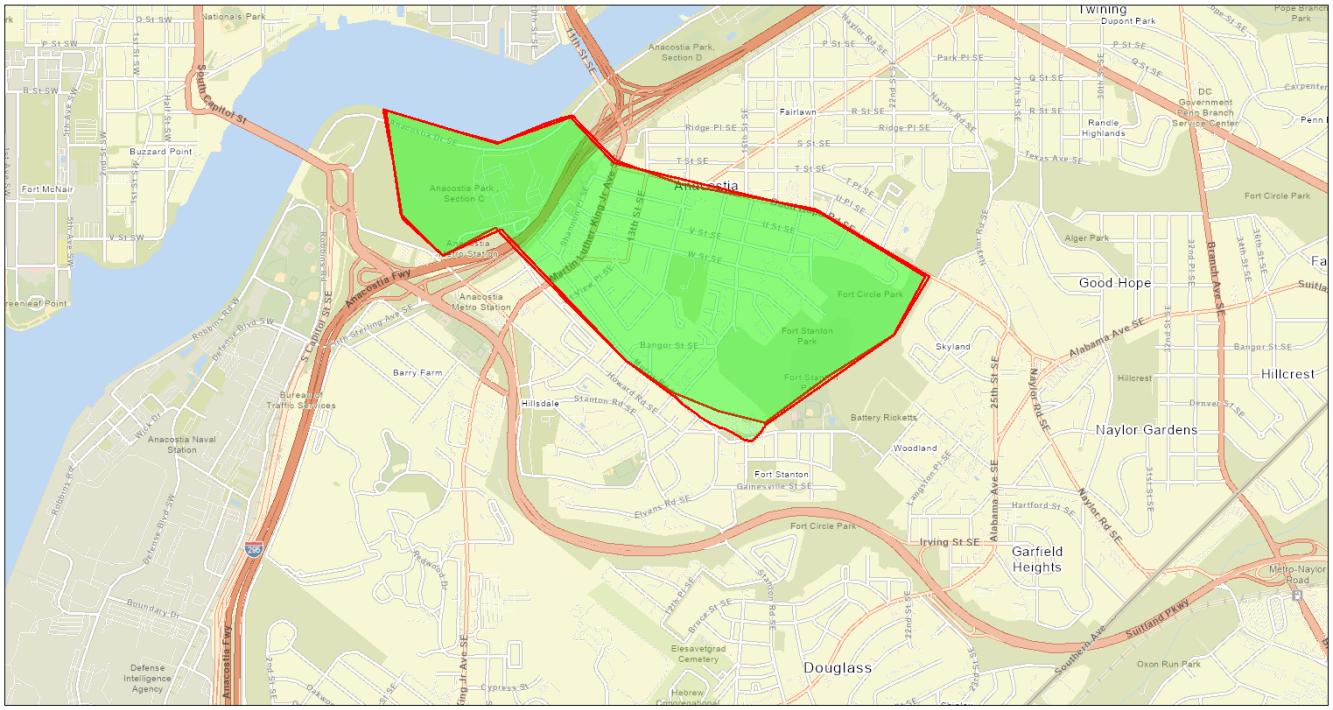
This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJScreen Report (Version 2.0)

the User Specified Area, DISTRICT OF COLUMBIA, EPA Region 3

Approximate Population: 5,735

Input Area (sq. miles): 0.58



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJScreen Report (Version 2.0)

the User Specified Area, DISTRICT OF COLUMBIA, EPA Region 3

Approximate Population: 5,735

Input Area (sq. miles): 0.58

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 (µg/m^3)	8.54	8.62	14	8.2	62	8.74	48
Ozone (ppb)	42	42.9	15	41.9	50	42.6	48
2017 Diesel Particulate Matter* (µg/m^3)	0.468	0.534	22	0.267	90-95th	0.295	80-90th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	30	36	37	30	80-90th	29	80-90th
2017 Air Toxics Respiratory HI*	0.45	0.47	61	0.34	95-100th	0.36	80-90th
Traffic Proximity (daily traffic count/distance to road)	1900	3600	37	680	91	710	91
Lead Paint (% Pre-1960 Housing)	0.54	0.58	38	0.35	73	0.28	80
Superfund Proximity (site count/km distance)	0.69	0.24	96	0.15	96	0.13	96
RMP Facility Proximity (facility count/km distance)	0.16	0.65	4	0.63	35	0.75	30
Hazardous Waste Proximity (facility count/km distance)	7.3	17	21	1.9	94	2.2	92
Underground Storage Tanks (count/km^2)	11	12	54	2.7	94	3.9	90
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.0022	0.0014	81	33	62	12	56
Socioeconomic Indicators							
Demographic Index	80%	46%	91	30%	97	36%	95
People of Color	96%	63%	77	33%	95	40%	93
Low Income	64%	28%	93	27%	94	31%	91
Unemployment Rate	17%	7%	85	5%	95	5%	95
Linguistically Isolated	0%	3%	44	3%	56	5%	46
Less Than High School Education	18%	9%	83	10%	84	12%	76
Under Age 5	12%	7%	88	6%	93	6%	92
Over Age 64	8%	12%	33	16%	16	16%	19

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice