Virginia Ambient Air Monitoring 2015 Data Report

Department of Environmental Quality

Commonwealth of Virginia
Department of Environmental Quality

Office of Air Quality Monitoring

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This Ambient Air Monitoring Data Report is for the time period of January 1, 2015 to December 31, 2015.

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Introduction

The 2015 Virginia Ambient Air Monitoring Data Report is a compilation of air pollutant measurements made by the Virginia Department of Environmental Quality, the City of Alexandria, the U.S. Department of Agriculture Forest Service, and the National Park Service. Ambient air quality was measured at 39 locations within the Commonwealth during 2015. These monitoring sites were established in accordance with EPA's siting criteria contained in 40 CFR Part 58, Appendices D and E. Monitoring network operations conformed to EPA guidance documents and accepted air quality monitoring practices. All data reported for these monitoring sites were quality assured in accordance with requirements contained in 40 CFR Part 58, Appendix A. Ambient concentrations of carbon monoxide, nitrogen dioxide for both the hourly and annual standard, sulfur dioxide and PM10 were within the EPA's national ambient air quality standards (NAAQS) in 2015. Virginia experienced a moderate ozone season in 2015. There were three days in the Richmond area and ten days in Northern Virginia that exceeded the 0.070 ppm ozone standard. For the 3-year period from 2013 through 2015 all areas of the Commonwealth, including Northern Virginia are in compliance with the 0.070 ppm National Ambient Air Quality Standard (NAAQS) for ozone. For 2015, there were no exceedances of the 35 micrograms per cubic meter (µg/m3) 24 hour standard for PM2.5 (particulate matter less the 2.5 microns). The 2013 – 2015 design values for all sites in the Commonwealth for both the 24 hour and annual standard for PM2.5 are below the NAAQ standard.

Some significant changes that affected the air quality monitoring network in 2015 are:

- In November, 2015, the Page County monitoring station, located at the Luray Caverns Airport (EPA No. 51-139-0004), was removed from operation. This was due to proposed construction and expansion of the airport. This site contained both an ozone monitor and a PM2.5 sampler.

- In May of 2015, The Office of Air Quality Monitoring began operation of an additional PM10 monitor at the Fairfax Lee District Park site (EPA No. 51-059-0030). This sampler was added to address data capture issues of the PM10 sampler at the Tucker Elementary School monitoring site in the City of Alexandria (EPA No. 51-510-0020). Including the PM10 sampler at the Mercer Elementary School site in Fredericksburg (EPA No. 51-630-0004), DEQ now has three PM10 monitoring sites in the Northern Virginia Region.

- In 2015, based on EPA's review of the air quality criteria for ozone (O_3) and related photochemical oxidants, EPA revised the level of both the primary and secondary ozone standards. The form of the standard was retained continuing as the annual fourth-highest 8-hour average daily maximum averaged across 3 consecutive years.

AQM is responsible for seeing that the Virginia ambient air monitoring network is maintained and operated in accordance with state and federal guidelines. Personnel from the Department of Environmental Quality (DEQ) regional offices, the City of Alexandria, the National Park Service, and the U.S. Department of Agriculture Forest Service conduct the daily operations at these sites. One of AQM's primary jobs is to support these people in their air quality monitoring efforts. AQM does this by:

- calibrating air monitoring instrumentation and associated support equipment on a set schedule
- auditing the instrumentation to insure that it is operating within set standards
- troubleshooting instrumentation problems reported by the regional operators
- supplying field operators with necessary items so they can perform their job properly
- repairing malfunctioning sampling instrumentation and ancillary equipment

Other functions:

- respond to regional and locality requests for special sampling such as emergency response or to answer citizen complaints
- coordinate efforts with the regional offices and localities to determine new air monitoring site locations
- conduct AQM generated special sampling projects to characterize a community's air quality
- furnish ambient air data to the regional offices, localities, Central Office, EPA and the EPA database
- answer FOIA requests for ambient air sampling data
- work with the regions and the localities to see that area monitoring needs are met
- work with EPA to see that necessary state and federal monitoring needs are met
- support SESARM (Southeastern States Air Resource Managers, Inc.) and MARAMA (Mid-Atlantic Regional Air Management Association of the Southeast) on routine and special projects

Criteria Pollutant Monitoring:

A portion of the air monitoring network is made up of instruments that sample for the Criteria Pollutants. Sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead and particulate matter (PM10 & PM2.5) can injure health, harm the environment and cause property damage. EPA calls these pollutants criteria air pollutants because they have regulated them by first developing health-based criteria (science-based guidelines) as the basis for setting permissible limits. One set of limits (primary standard) protects health; another set of limits (secondary standard) is intended to prevent environmental and property damage

Special Monitoring:

In addition to overseeing the air sampling network for criteria pollutants, AQM conducts routine and short term sampling for VOCs (volatile organic compounds), Carbonyls, Toxic Metals and NOy (total reactive nitrogen). Sampled VOCs are made up of 58 HAPs (Hazardous Air Pollutants) and 56 Hydrocarbon Ozone Precursors.

1. **What is the Clean Air Act?**

The Clean Air Act is a federal law that provides for the protection of human health and the environment. The original Clean Air Act was passed in 1963, and the 1970 version of the law resulted in the creation of the U.S. Environmental Protection Agency (EPA), which was charged with setting and enforcing ambient air quality standards. The law was amended in 1977, and most recently in 1990. Most of the activities of the Virginia Department of Environmental Quality's Air Division come from mandates of the Clean Air Act, and are overseen by the EPA. More information on the 1990 amendments to the Clean Air Act can be found at: http://www.epa.gov/air/caa/.

2. **What is a criteria air pollutant?**

The Clean Air Act names six air pollutants that are commonly found in the air throughout the United States, and that can injure humans by causing respiratory and cardiovascular problems, and harm the environment by impairing visibility, and causing damage to animals, crops, vegetation and buildings. EPA has developed health-based criteria for these pollutants through scientific studies, and has established regulations setting permissible levels of these pollutants in the air. The "criteria" pollutants are: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter, and lead, and the limits that have been set for them are the National Ambient Air Quality Standards (NAAQS).

3. **What is the difference between a primary and secondary National Ambient Air Quality Standard?**

The National Ambient Air Quality Standards are divided into two types. The first type, the primary standard, is designed to protect human health, especially those who are most vulnerable such as children and the elderly, and people suffering from asthma, emphysema, chronic bronchitis, and heart ailments. The second type, the secondary standard, is designed to prevent damage to property and the environment. For a list of the primary and secondary National Ambient Air Quality Standards, see https://www.epa.gov/criteria-air-pollutants/naaqs-table or page 72 of this report.

4. **How is the location of an air monitoring station decided?**

Generally, the deciding factor in all Virginia air monitoring sampling is to determine where the highest pollutant concentrations will occur, and place the sampler as near as possible to that location. A wind rose is typically used to determine the prevailing wind direction for an area and identify the downwind direction from a probable source. A wind rose is a meteorological map showing the frequency and strength of winds from different directions at a specific location.

For typical criteria pollutant monitoring, the federal guidelines on siting an air monitor for measuring maximum concentrations are followed. These guidelines not only encourage siting in areas with free airflow and a minimum amount of obstructions, but they also give the height requirements for the sample inlet and the desired separation distances from obstructions such as tree lines, localized sources such as oil furnace flues, and other influences that can skew the data.

Other determining factors for placing air monitoring stations include:

- security of the site
- safety of the operator
- availability of electric power and communication service
- accessibility of the site

For more specific information, consult EPA's *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 6*, http://www.epa.gov/ttn/amtic/qalist.html

5. **How large of an area does an air monitoring station represent?**

The sampling area of a monitoring site is dependent on the parameters selected for representation, such as:

- type of pollutants being sampled
- rural vs. urban sampling
- source oriented, population oriented, or background oriented
- sampling for pollution transported from outside the Commonwealth

Many sites are also dependant on topography and meteorology of an area, which play an important role. Federal guidelines spell out the general area of representation. Some examples of varied air sampling sites are:

- A background research site in central Virginia may represent an area with a radius of 50 to 100 kilometers.
- An ozone or fine particulate site in the Shenandoah Valley may represent an elongated area with an axis running with the valley and is a hundred kilometers long but only twenty-five kilometers wide.
- A carbon monoxide sampling site in an urban street canyon setting may represent an area of only a few blocks in radius.
- A source oriented site in south central Virginia may represent an area from 0.5 to 4 kilometers in radius.

For more specific information, consult EPA's *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 6*, http://www.epa.gov/ttn/amtic/qalist.html

6. **What is a "nonattainment" area?**

A nonattainment area is a geographic area that has been determined by EPA as not meeting the air quality standards for one or more pollutants. Typically, an area is declared nonattainment based on data collected at one or more ambient air monitoring sites within the area. However, sometimes the nonattainment designation can be made based on the use of air quality models that use monitoring data from other areas. In Virginia, nonattainment areas are designated for two of the criteria pollutants, ozone and fine particulate matter ($PM_{2.5}$).

7. **How can I find out if I live in a nonattainment area?**

A list of nonattainment areas in Virginia can be found in this report on page 73. EPA has a list of all nonattainment areas in the country at https://www.epa.gov/green-book/green-book-national-area-and-county-level-multi-pollutant-information.

8. **What are the impacts of a nonattainment designation?**

To demonstrate how they plan to achieve federal air quality standards, states must draft a "State Implementation Plan," or SIP. This plan lists specific actions that the state will undertake to improve and maintain acceptable air quality, and a time frame for accomplishing these goals. The SIP may require new factories to install the newest and most effective air pollution control technologies. Other actions could be requiring older factories to retrofit their smokestacks with better pollution control devices, requiring an area to sell only reformulated gasoline during the summer months, requiring vapor recovery systems on gasoline pumps, and requiring vehicle exhaust emission checks, to name a few. SIP development is a lengthy process, and involves negotiation between the state and the EPA until it is finalized.

9. **What is a Maintenance Area?**

A maintenance area is an area that has formerly been designated nonattainment, but is now recognized by EPA as meeting the NAAQS. A maintenance area must have an approved "maintenance plan" to meet and maintain air quality standards.

10. **What is a design value?**

A design value is a statistic that describes the air quality status of a given area relative to the level of the National Ambient Air Quality Standards (NAAQS). Design values are typically used to classify nonattainment areas, assess progress towards meeting the NAAQS, and develop control strategies. Design values are expressed as concentrations in the ambient air and are calculated according to regulatory specifications to determine the highest monitored concentration in an attainment or non-attainment area.

11. **How can I get current or historical air quality data?**

Current ozone data for Virginia, as well as current AQI and air quality forecasts can be obtained at http://vadeq.tx.sutron.com/cgi-bin/aqi_rpt.pl. Summary air quality data PM2.5 can also be found at http://www.deq.virginia.gov/Programs/Air/AirMonitoring/ParticulateMonitoring.aspx. Annual monitoring data reports can be found at http://www.deq.virginia.gov/Programs/Air/AirMonitoring/Publications.aspx. EPA provides monitoring data, as well as maps, on the web at https://www.epa.gov/outdoor-air-quality-data and www.epa.gov/air/emissions. Detailed data for monitoring sites in Virginia can also be obtained by contacting the VA DEQ Office of Air Quality Monitoring, or from EPA's AQS Data Mart at https://aqs.epa.gov/aqsweb/documents/data_mart_welcome.html.

12. **What do I do if I have a complaint about air quality in my neighborhood?**

Contact the DEQ regional office in your area. To see a list of regional offices and phone numbers, see page 63 of this report, or visit http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness.aspx.

13. **Who can I call about an indoor air quality problem, such as mold or radon gas?**

Your local health department may be able to assist you with some indoor air quality problems. See http://www.vdh.virginia.gov/local-health-districts for the health department office in your area or the Division of Environmental Epidemiology at (804) 864-8182. Other excellent sources of information on indoor air quality can be found on EPA's website at www.epa.gov/iaq/index.html and through the American Lung Association website at www.lungusa.org.

Criteria Pollutants

PM2.5 Monitoring Network

$PM_{2.5}$ is particulate matter (PM) that is less than or equal to 2.5 micrometers (a micrometer is one millionth of a meter) in aerodynamic diameter. These particles are often called "fine particles" because of their small size. Fine particles originate from a variety of man-made stationary and mobile sources, such as factory smoke stacks and diesel engines, as well as from natural sources, such as forest fires and dust storms. These particles may be emitted directly into the air, or they may be formed by chemical reaction in the atmosphere from gaseous emissions of sulfur dioxide (SO2), nitrogen oxides (NOx), and volatile organic compounds (VOCs) and other chemicals.

Scientific research has linked fine particle pollution to human health problems. The particles are easily inhaled deep into the lungs, and can actually enter the bloodstream. Particle pollution is of particular concern to people with heart or lung disease, such as coronary artery disease, congestive heart failure, asthma, or chronic obstructive pulmonary disease (COPD). Older adults are at risk because they may have underlying, undiagnosed heart or lung problems. Young children are also at risk because their lungs are still developing, they are more likely to have asthma or acute respiratory disease, and they tend to spend longer periods of time at high activity levels, causing them to inhale more particles than someone at rest. Even otherwise healthy people may suffer short-term symptoms such as eye, nose, throat irritation, coughing, and shortness of breath during episodes of high particulate levels.

$PM_{2.5}$ air quality standards were implemented by EPA in 1997 to protect against the health effects of fine particle pollution. On December 14, 2012, EPA strengthened the nation's air quality standards for fine particle pollution to improve public health protection by revising the primary annual PM2.5 standard to 12.0 $\mu g/m^3$ and retaining the 24-hour fine particle standard of 35.0 $\mu g/m^3$. For more information, see http://www.epa.gov/sites/production/files/2016-04/documents/overview_factsheet.pdf.

In addition to health problems, fine particle pollution contributes to haze that causes deterioration of visibility in scenic areas, and also deposits harmful compounds on the soil and water. Unlike ozone, which is a seasonal pollutant in most areas of the country, particle pollution can occur year-round, and is monitored throughout the year in Virginia. The Virginia DEQ $PM_{2.5}$ monitoring network uses three different types of samplers to monitor fine particulate in the state:

$PM_{2.5}$ 24-hour Mass Sampler: This Federal Reference Method (FRM) sampler collects particulate matter on a stretched Teflon filter media. Four samplers (Henrico Co., Vinton, Virginia Beach, and Fairfax Co.) collect 24-hour samples every day. The rest of these samplers collect 24-hour samples on a one-in-three day schedule. The 3-day monitoring schedule can be found at http://www.epa.gov/ttn/amtic/calendar.html. Filters are retrieved from the field and shipped via courier to the Virginia Division of Consolidated Laboratory Services (DCLS) in Richmond. At the laboratory, the filters are equilibrated for a minimum of 24 hours prior to the final weighing.

$PM_{2.5}$ 24-hour Speciation: Speciated $PM_{2.5}$ data are collected at one site in Virginia, the MathScience Innovation Center in Henrico Co., using two co-located samplers that operate simultaneously. One sampler, the MetOne SASS, collects particulate matter on two filters, one nylon and the other Teflon. The second sampler, the URG 3000N carbon sampler, uses a quartz filter to collect particulate matter. The samplers run for 24 hours, on a one-in-three day sampling schedule. After the completion of a sample run, the instrument operator removes the exposed filters and ships them via refrigerated container to an EPA contract lab, where the filters are analyzed for the following:

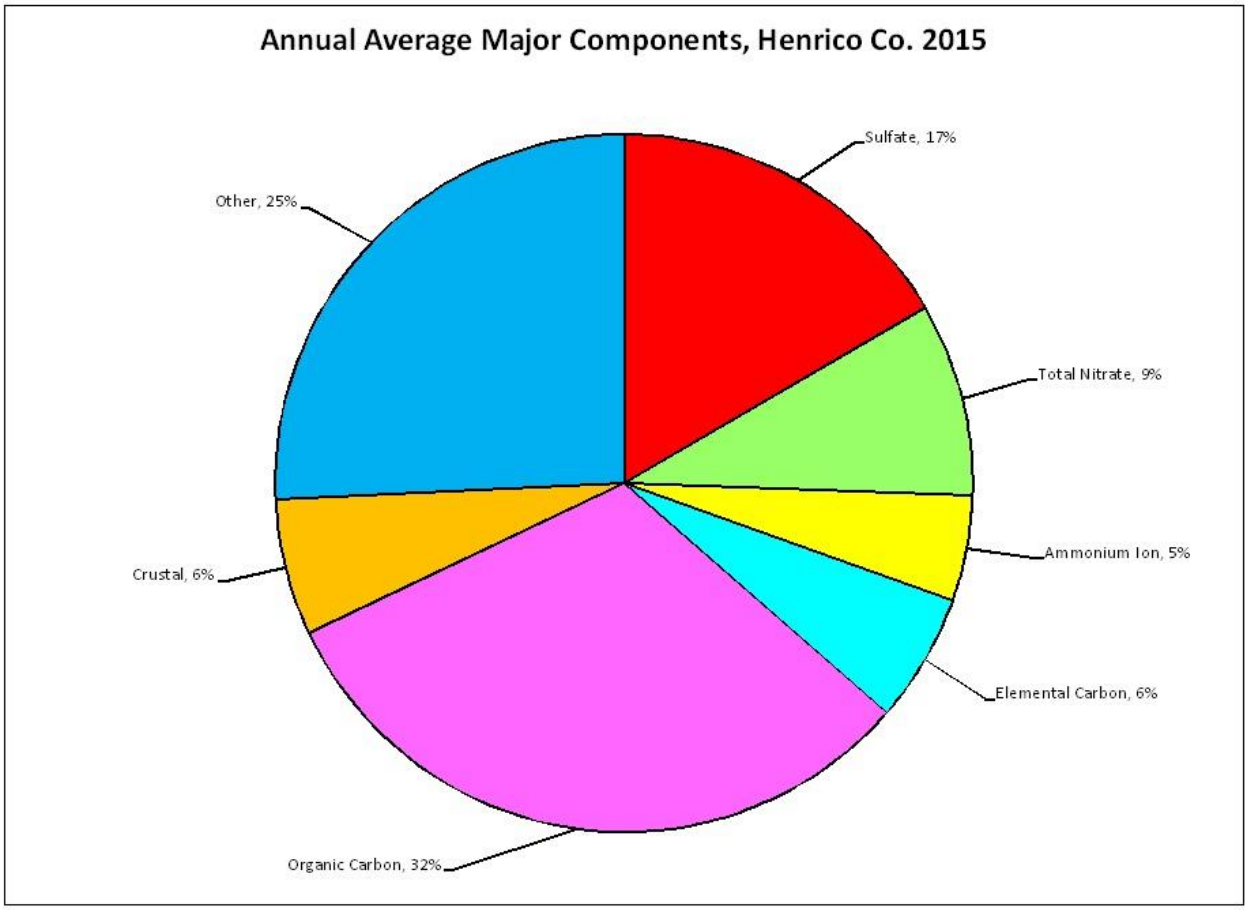
- Teflon filter: thirty-three trace elements including aluminum, antimony, arsenic, bromine, calcium, iron, lead, silicon, titanium, vanadium, and zirconium
- Nylon filter: cations (ammonium, potassium, sodium) and anions (nitrate, sulfate)
- Quartz filter: carbons (carbonate carbon, elemental carbon, organic carbon, total carbon)

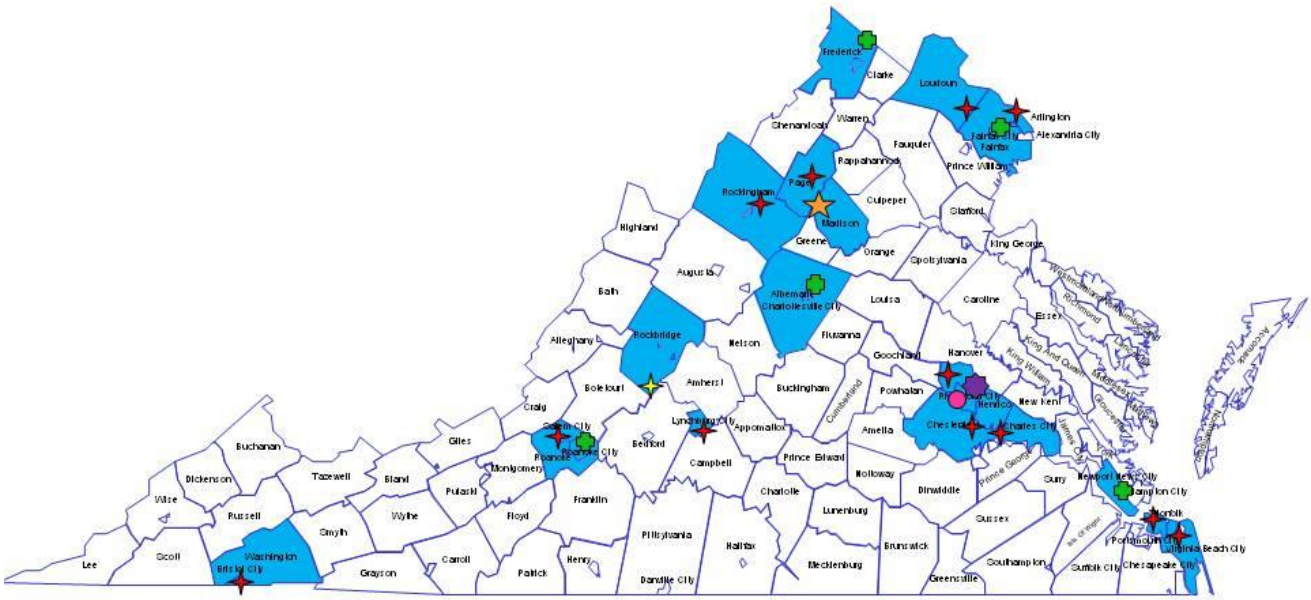
The resulting data provide a "chemical fingerprint" of air masses moving through the Richmond area. These data, in conjunction with historical data from other speciation sites, including those outside Virginia, give a representative picture of the constituents of the air samples, which help identify sources of high values and show how the air masses move over a broad area.

$PM_{2.5}$ Continuous: Unlike the $PM_{2.5}$ 24-hour sampler, these instruments collect particulate samples on a continuous basis, and data can be complied into hourly and 24-hour averages. $PM_{2.5}$ continuous samplers are operated in Henrico Co., Roanoke Co., Fairfax Co., Shenandoah National Park, Frederick Co., Albemarle Co., and the Cities of Richmond and Hampton. Some of these continuous monitors are designated as Federal Equivalent Method (FEM) monitors and others are used strictly for forecasting purposes only.

The purpose of each of the $PM_{2.5}$ samplers is determined by the type and designation of the sampler. The FRM and the FEM samplers collect data that are used to determine if the state is complying with the national ambient air quality standards (NAAQS) for particulate matter. The speciation sampler collects data about the composition of particulate matter in Virginia, and is useful for identifying potential sources of air pollution both within and outside the state boundaries. The FRM and speciation monitors are manual, filter-based methods, and the samples they collect must be transported to a laboratory for processing. Consequently, they are not useful for reporting real-time air quality conditions. Some of the continuous particulate monitors provide real-time data on fine particulate levels. The hourly average data are polled by a central computer, and then posted on the agency website at http://vadeq.tx.sutron.com/cgi-bin/select_curlev.pl?user_param=88502. The data are also simultaneously sent to EPA's national air quality website at www.airnow.gov.

In addition to the $PM_{2.5}$ network operated by the DEQ, the National Park Service and the USDA Forest Service operate $PM_{2.5}$ samplers at Big Meadows in Shenandoah National Park, and in Rockbridge Co. as part of the IMPROVE (Interagency Monitoring of Protected Visual Environments) network. This network employs different sampling methods than those used by the DEQ. Data for the IMPROVE network can be found on the internet at http://vista.cira.colostate.edu/improve.





- FRM Mass Sampler
- IMPROVE sampler
- FRM Mass and TEOM Samplers
- FRM Mass, Speciation, TEOM Sampler
- TEOM & IMPROVE sampler, Big Meadows, NPS
- FEM Continuous Sampler

National Ambient Air Quality Standards (NAAQS)

Primary Standard for $PM_{2.5}$:

- Annual Arithmetic Mean – the 3 year average of the weighted annual mean $PM_{2.5}$ concentration must not exceed 12.0 $\mu g/m^3$.
- 24-Hour concentration – the 3 year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$.

Secondary Standard for $PM_{2.5}$:

- Annual Arithmetic Mean – the 3 year average of the weighted annual mean $PM_{2.5}$ concentration must not exceed 15.0 $\mu g/m^3$.

2013-2015 $PM_{2.5}$ 24-hour Averages, 98th Percentile Values ($\mu g/m^3$, LC)				
Site	**2013**	**2014**	**2015**	**3-Year Average**
(101-E) **Bristol**	16.2	15.1	13.4	15
(26-F) **Rockingham Co.**	21.2	21.6	22.7	22
(28-J) **Frederick Co.**	23.5	24.2	23.0	24
(29-D) **Page Co.**	19.8	19.3	24.4	21
(33-A) **Albemarle Co.**	18.9	15.1	17.3	17
(19-A6) **Roanoke Co.**	18.9*	16.6	18.0	18
(110-C) **Salem**	18.7*	16.8	18.8	18
(155-Q) **Lynchburg**	18.2	16.5	15.0	17
(71-D) **Chesterfield Co.**	20.4*	16.0	16.8	18
(72-M) **Henrico Co.**	19.3	15.7	17.2	17
(72-N) **Henrico Co.**	18.5	16.0	15.6	17
(75-B) **Charles City Co.**	18.2	16.0	17.2	17
(179-K) **Hampton**	15.9	15.3	16.8	16
(181-A1) **Norfolk**	15.8	15.6	17.3	16
(184-J) **Va. Beach**	18.0	19.8	18.0	19
(38-I) **Loudoun Co.**	19.9	19.2	21.9	20
(47-T) **Arlington Co.**	21.2	19.2	20.9	20
(46-B9) **Franconia, Fairfax Co.**	21.0	18.0	19.7	20

* Annual value did not meet completeness criteria

NAAQS

Primary Standard for $PM_{2.5}$:

- Annual Arithmetic Mean – the 3 year average of the weighted annual mean $PM_{2.5}$ concentration must not exceed 12.0 $\mu g/m^3$.
- 24-Hour concentration – the 3 year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$.

Secondary Standard for $PM_{2.5}$:

- Annual Arithmetic Mean – the 3 year average of the weighted annual mean $PM_{2.5}$ concentration must not exceed 15.0 $\mu g/m^3$.

2013-2015 $PM_{2.5}$ Weighted Annual Arithmetic Means ($\mu g/m^3$, LC)				
Site	**2013**	**2014**	**2015**	**3-Year Average**
(101-E) **Bristol**	8.5	8.6	7.4	8.2
(26-F) **Rockingham Co.**	8.4	8.7	8.3	8.5
(28-J) **Frederick Co.**	8.8	9.0	9.0	9.0
(29-D) **Page Co.**	7.2	8.0	7.6	7.6
(33-A) **Albemarle Co.**	7.6	7.4	7.2	7.4
(19-A6) **Roanoke Co.**	8.5*	8.1	7.7	8.1
(110-C) **Salem**	8.6*	8.5	8.5	8.5
(155-Q) **Lynchburg**	7.4	7.6	7.1	7.4
(71-D) **Chesterfield Co.**	8.2*	8.4	8.3	8.3
(72-M) **Henrico Co.**	8.1	8.1	7.7	8.0
(72-N) **Henrico Co.**	7.8	8.2	7.7	7.9
(75-B) **Charles City Co.**	7.6	7.9	7.5	7.7
(179-K) **Hampton**	7.1	7.6	7.2	7.3
(181-A1) **Norfolk**	7.5	8.0	7.7	7.7
(184-J) **Va. Beach**	7.7	8.1	7.8	7.9
(38-I) **Loudoun Co.**	8.5	8.5	9.0	8.7
(47-T) **Arlington Co.**	8.9	8.7	9.1	8.9
(46-B9) **Franconia, Fairfax Co.**	8.3	8.2	8.0	8.2

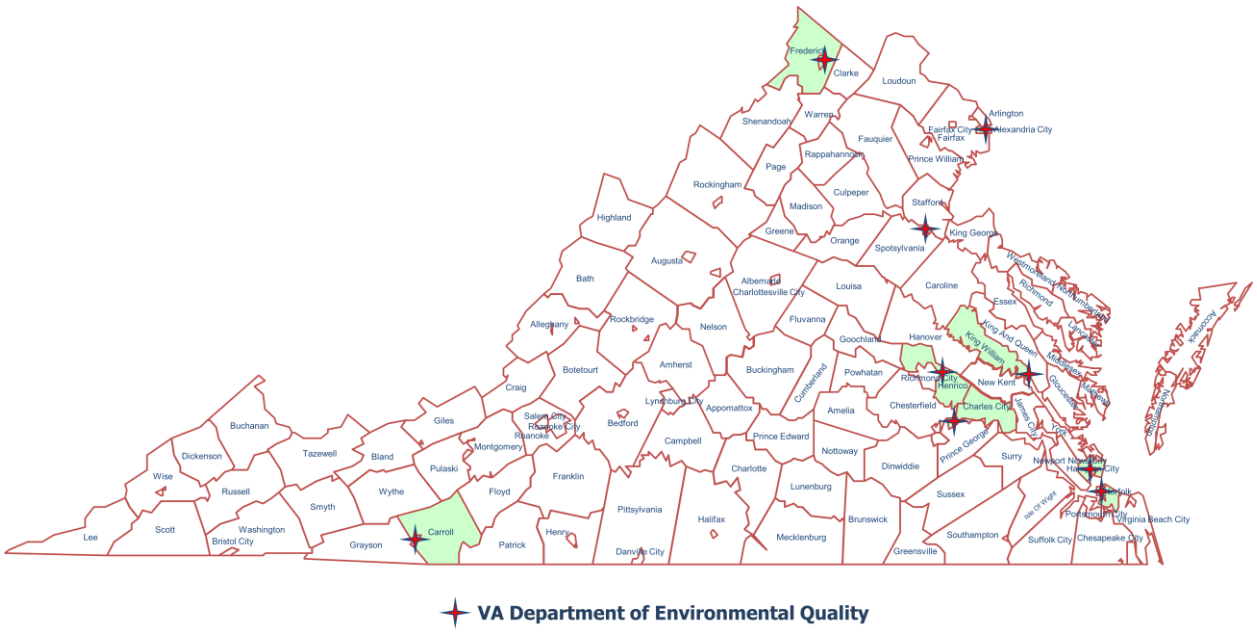
* Annual value did not meet completeness criteria.

PM_{10} is particulate matter comprised of solid particles or liquid droplets with an aerodynamic diameter of less than or equal to 10 micrometers, and is sometimes referred to as "coarse particles." PM_{10} particles are larger than $PM_{2.5}$, but are still in a size range that can pose health problems because they can be inhaled, and retained in the human respiratory system, causing breathing difficulties, and eye, nose and throat irritation. In addition to the health effects of PM_{10}, these particles can impair visibility, can contribute to climate change, and result in "acidic dry deposition." Acidic dry deposition occurs when particles containing acidic compounds fall to the ground. The acidic particles can corrode surfaces that they settle on, and can increase the acidity of the soil and water.

The National Ambient Air Quality Standards, or NAAQS, for particulate matter were revised in September 2006. EPA changed the existing standards for PM_{10} by revoking the annual standard of 50 micrograms per cubic meter, because current scientific evidence did not support a link between long-term exposure to coarse particles and health problems. However, the 24-hour PM_{10} standard was retained to protect citizens from effects of short-term exposures. For additional information on the revised particulate matter standards, see https://www.epa.gov/pm-pollution.

To measure $PM_{10,}$ ambient air is drawn into a sampler that uses a particle size discrimination inlet. The inlet is designed so that particles in the size range of 10 micrometers (also called microns) or below stay suspended in the air stream, while larger particles settle out. The sample air flows across an 8 x 10 inch micro-quartz filter at a rate of 40 cubic feet per minute for a 24-hour period. The particles are captured on the filter, which is weighed before and after sampling, and the PM_{10} concentration is determined by dividing the change in filter mass by the volume of sampled air. The resulting PM_{10} concentration is reported as micrograms per cubic meter ($\mu g/m^3$). The filters are processed at the DEQ Office of Air Quality Monitoring. The normal sampling schedule is once every sixth day from midnight to midnight. The 6-day monitoring schedule can be found at http://www.epa.gov/ttn/amtic/calendar.html.

PM10 Monitoring Sites



National Ambient Air Quality Standards (NAAQS)

Primary Standard for PM_{10}:

- 24- hour concentration not to exceed 150 $\mu g/m^3$ more than once per year averaged over three years. An exceedance means a 24-hour average value that is above the level of the 24-hour standard after rounding to the nearest 10 $\mu g/m^3$.

Secondary Standard for PM_{10}:

- Same as Primary.

2013-2015 PM_{10} 24-Hour Average Concentrations (units in $\mu g/m^3$ STD)							
Site	**2013**		**2014**		**2015**		**>150 $\mu g/m^3$**
	1st Max	**2nd Max**	**1st Max**	**2nd Max**	**1st Max**	**2nd Max**	
(23-A) **Carroll Co.**	34	22	19	19	38	26	0
(134-C) **Winchester**	21	19	19	17	33	23	0
(72-M) **Henrico Co.**	26	22	26	23	40	27	0
(154-M) **Hopewell**	23	19	26	22	25	22	0
(82-C) **King William Co.***	27	22	29	24	32	27	0
(179-K) **Hampton**	22	19	25	18	27	26	0
(181-A1) **Norfolk**	29	21	45**	23	24	24	0
(130-E) **Fredericksburg**	29	21	26	21	29	27	0

* Did not meet completeness criteria for 2014

** Max influenced by construction activity

PM10 Monitoring Sites

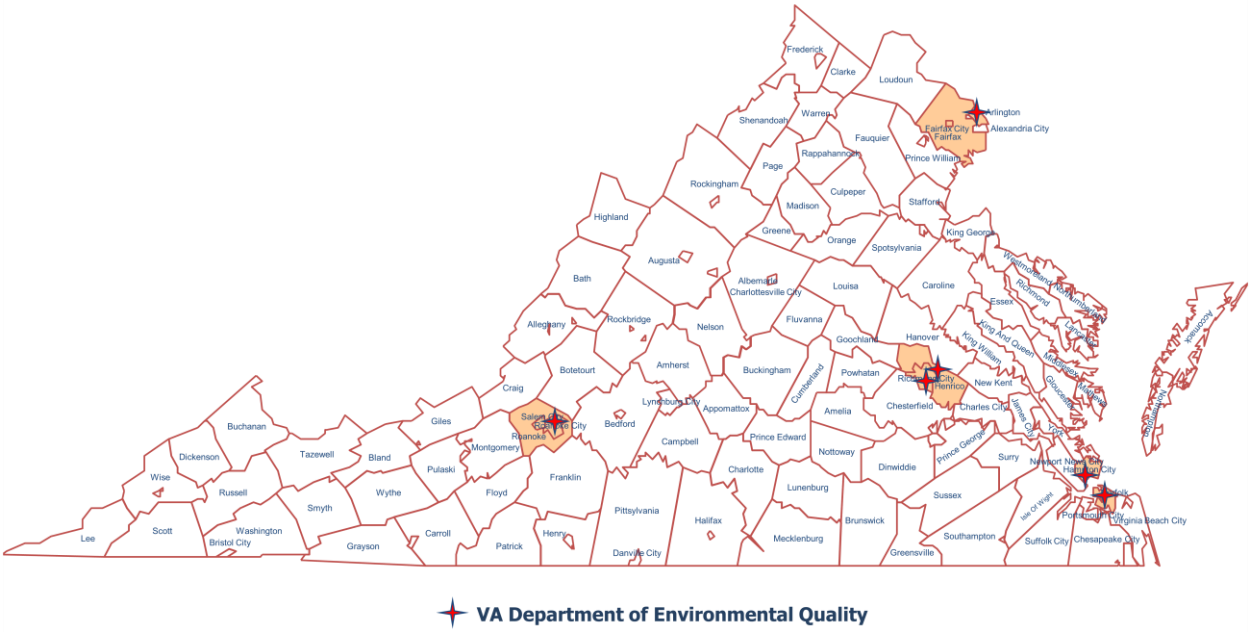
CO Monitoring Network

Carbon monoxide (CO) is a colorless, odorless gas that is produced by incomplete burning of carbon compounds in fossil fuels (gasoline, natural gas, coal, oil, etc.). Over half of the CO emissions in the country come from motor vehicle exhaust. Other sources include construction equipment, boats, lawnmowers, woodstoves, forest fires, and industrial manufacturing processes.

CO concentrations are higher in the vicinity of heavily traveled highways, and drop rapidly the further the distance from the road. Ambient levels of carbon monoxide tend to be higher in the colder months due to "thermal inversions" that trap pollutants close to the ground. A thermal inversion occurs when the temperature of the air next to the ground is colder than air above it. When this happens, the air resists vertical mixing that can help the pollutants to disperse, forming a layer of smog close to the ground.

Carbon monoxide is harmful because it reacts in the bloodstream, reducing the amount of oxygen that is supplied to the heart and brain. CO can be harmful at lower levels to people who suffer from cardiovascular disease, like angina, arteriosclerosis, or congestive heart failure. At high levels, CO can impair brain function, causing vision problems, reduce manual dexterity, and reduce ability to perform complicated tasks. At very high levels, carbon monoxide can be deadly.

Carbon monoxide in the ambient air is measured continuously with an electronic instrument that uses NDIR, "non-dispersive infrared" photometry. The instrument has a pump that continuously draws air through a sample chamber that contains an infrared light source and a detector. Any CO molecules that are present in the sample air absorb some of the infrared light, reducing the intensity of the light reaching the detector. The portion of the infrared light absorbed by the CO molecules is converted into an electrical signal corresponding to the CO concentration, and stored in the instrument computer.



National Ambient Air Quality Standards (NAAQS)

Primary Standard for CO:

- 8-hour average not to exceed 9 ppm (10 mg/m^3) more than once per year.
- 1-hour average not to exceed 35 ppm (40 mg/m^3) more than once per year.

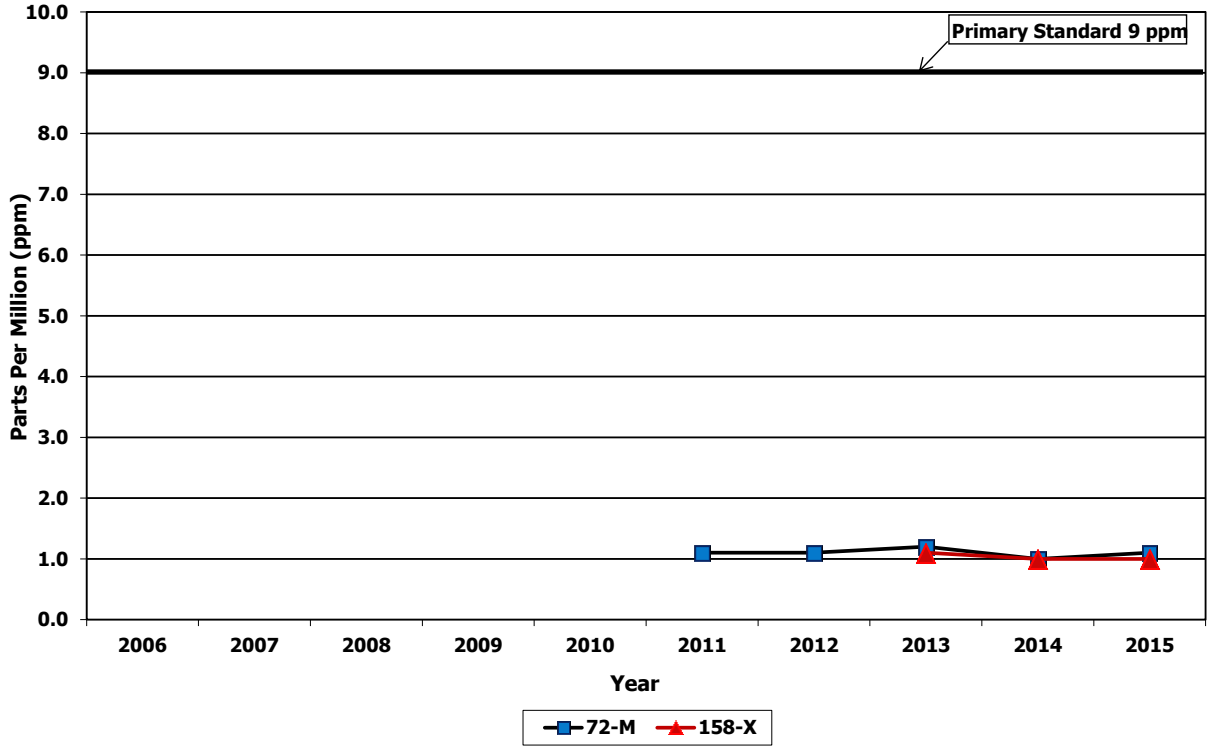
There are no Secondary Standards for CO because it does not harm vegetation or buildings.

Site	2015			
	1-Hour Avg. (ppm)		8-Hour Avg. (ppm)	
	1st Max.	2nd Max.	1st Max.	2nd Max.
(19-A6) **Vinton**	1.1	1.1	.7	.7
(72-M) **Henrico**	1.6	1.5	1.1	1.1
(158-X) **Richmond**	1.2	1.2	1.0	1.0
(179-K) **Hampton**	.9	.9	.9	.7
(181-A1) **Norfolk**	1.5	1.4	1.0	.9
(47-T) **Arlington Co.**	1.9	1.9	1.8	1.7

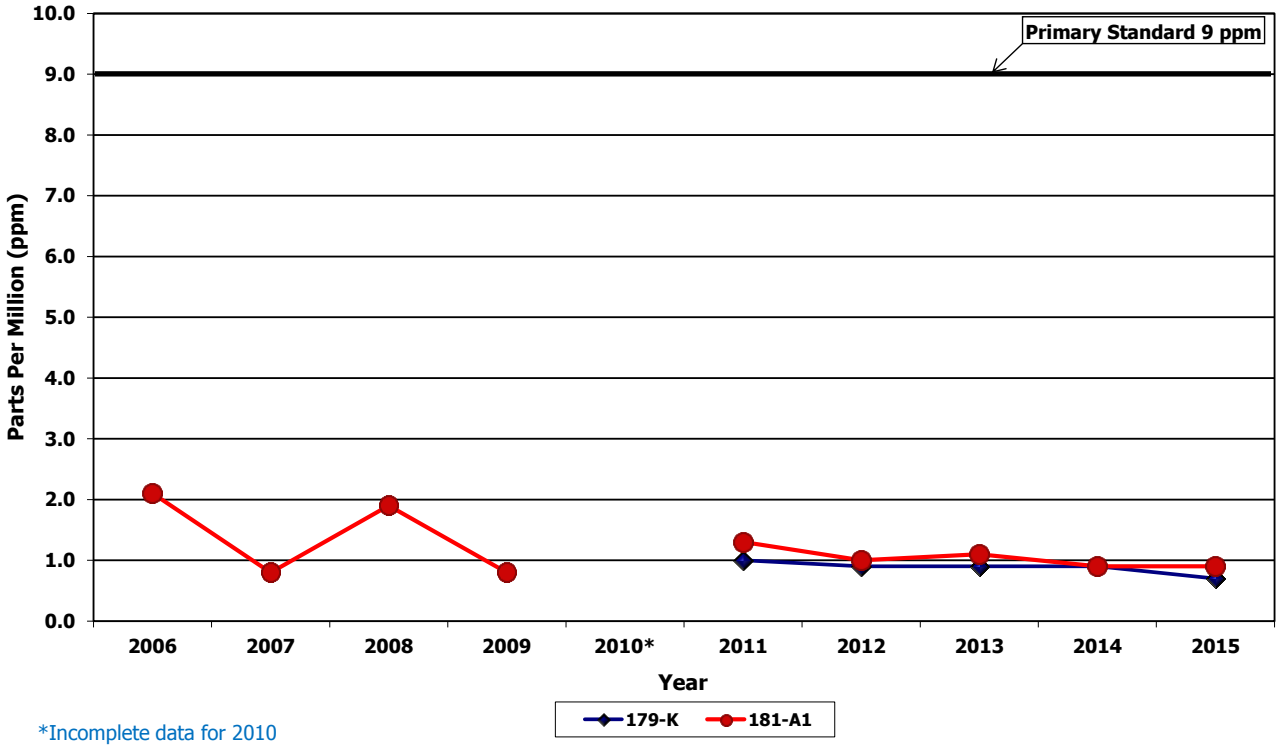
Eight Hour Averages stated as Ending Hour

CO Monitoring Network

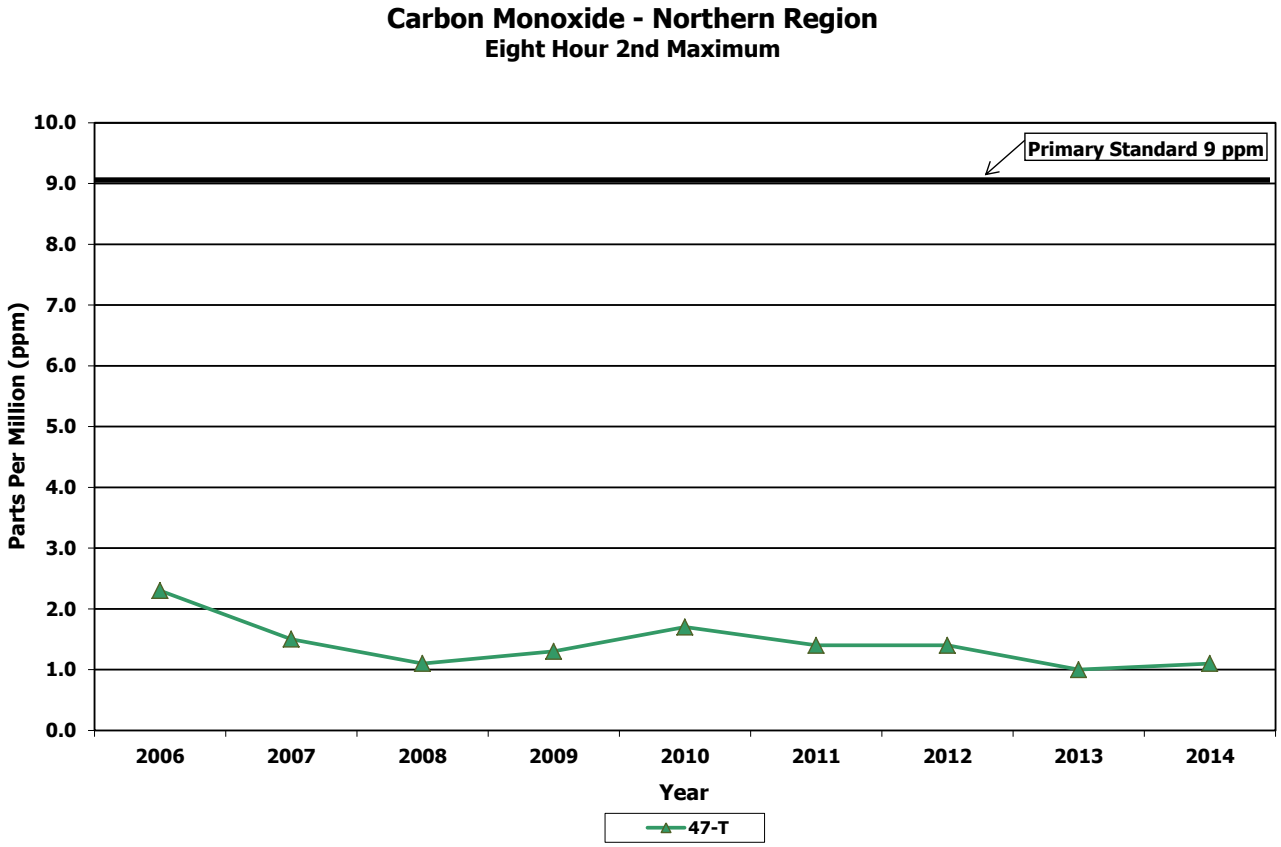
Carbon Monoxide - Piedmont Region
Eight Hour 2nd Maximum



Carbon Monoxide - Tidewater Region
Eight Hour 2nd Maximum



*Incomplete data for 2010


Carbon Monoxide - Northern Region
Eight Hour 2nd Maximum
Primary Standard 9 ppm
Parts Per Million (ppm)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
Year
47-T

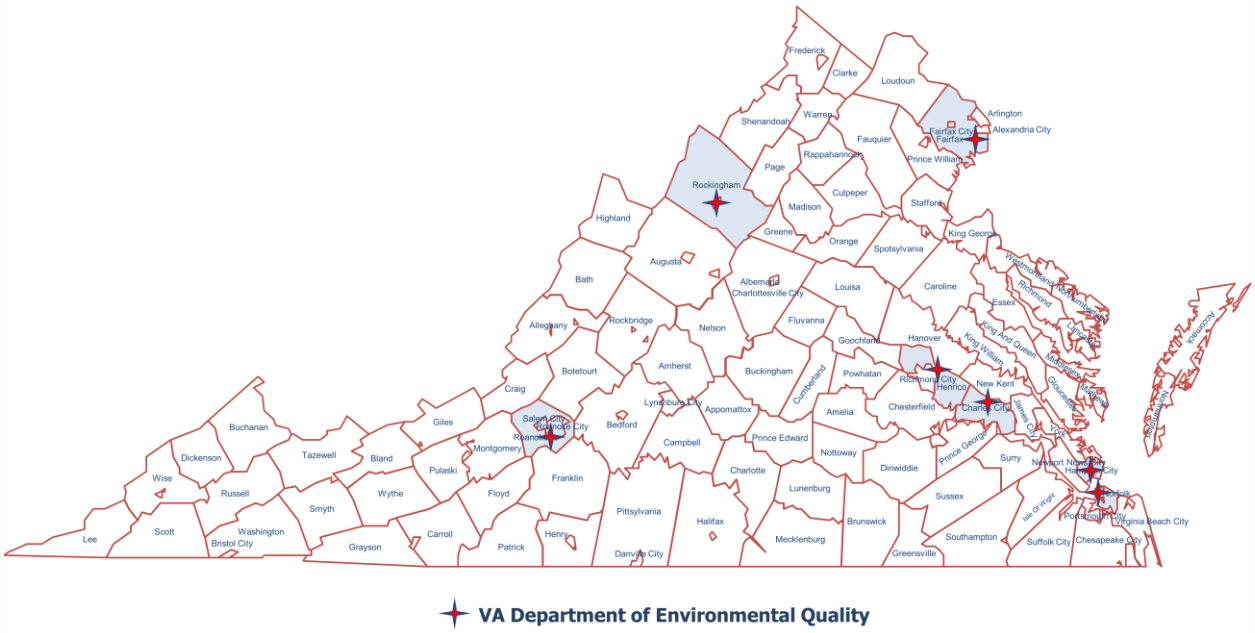
Sulfur dioxide (SO_2) is a colorless gas that has a strong odor. It results from burning of fuels containing sulfur (such as coal and oil), petroleum refining, and smelting (extracting metals from ore), and it also occurs naturally from volcanic eruptions. SO_2 can dissolve in water vapor to produce sulfuric acid, and it can also interact with other gases and particles in the air to produce sulfate aerosols that are capable of traveling long distances in the atmosphere.

EPA has developed primary and secondary air quality standards for SO_2. The primary standards are designed to protect people from the health effects of sulfur dioxide gas, which include respiratory problems for people with asthma and for those who are active outdoors. Long-term exposure to high concentrations of sulfur dioxide gas can cause respiratory illness and aggravate existing heart conditions. Sulfate particles that are formed from SO_2 gas can be inhaled, and are associated with increased respiratory symptoms and disease.

Secondary standards for sulfur dioxide protect against damage to vegetation and buildings, and against decreased visibility. The acids that can form from SO_2 and water vapor contribute to acid deposition (commonly called "acid rain") which causes damage to the leaves of plants and trees, making them vulnerable to disease, and can increase the acidity of lakes and streams, making them unsuitable for aquatic life. Acid deposition also causes deterioration of materials on buildings, monuments, and sculptures. Finally, small sulfate particles, formed when SO_2 gas reacts with other gases and particles in the air, contribute to haze that causes decreased visibility in many areas of the country.

Sulfur dioxide is monitored continuously with an electronic instrument using ultraviolet fluorescence detection. The instrument has a pump that pulls outside air into a sample chamber containing a high intensity ultraviolet (UV) light. Any SO_2 molecules in the sample air absorb some of the UV light, become excited, and then fluoresce, releasing light characteristic of SO_2. The fluorescence is detected with a photomultiplier tube (a tube that detects very small amounts of light and multiplies the signal many times), and the resulting signal, which corresponds to the amount of SO_2 in the sample, is converted to an SO_2 concentration by the instrument computer.

SO2 Monitoring Network



VA Department of Environmental Quality

National Ambient Air Quality Standards (NAAQS)

Primary Standards for SO_2:

- 3-year average of the 99th percentile 1-hour daily maximum values not to exceed 75 ppb.

Secondary Standard for SO_2:

- 3-Hour concentration not to exceed 0.5 ppm (500 ppb) more than once per year.

Sulfur Dioxide 99th Percentile 1-Hour Daily Maximum Values (ppb)					
Site ID	**City/County**	**2013**	**2014**	**2015**	**3-Yr Avg Design Value 2013-2015**
26-F	Rockingham Co.	4	7	3	5
19-A6	Roanoke Co.	6*	6	5	5
72-M	Henrico Co.	6	8	8	8
75-B	Charles City Co.	30	29*	29	29
179-K	Hampton	38	41	30	36
181-A1	Norfolk	52	36	13	34
46-B9	Fairfax Co.	--	11	9	NA

* Did not meet completeness criteria

SO2 Monitoring Network

National Ambient Air Quality Standards (NAAQS)

Primary Standards for SO_2:

- 3-year average of the 99th percentile 1-hour daily maximum values not to exceed 75 ppb.

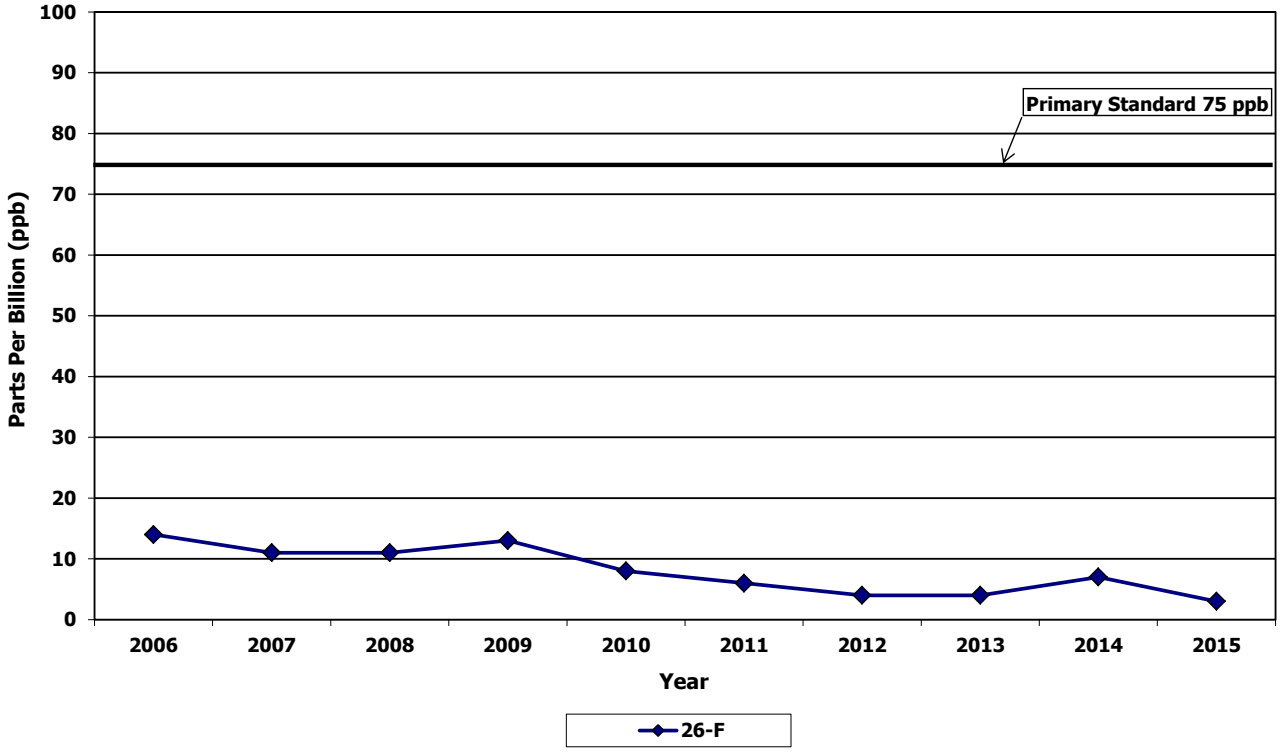
Secondary Standard for SO_2:

- 3-Hour concentration not to exceed 0.5 ppm (500 ppb) more than once per year.

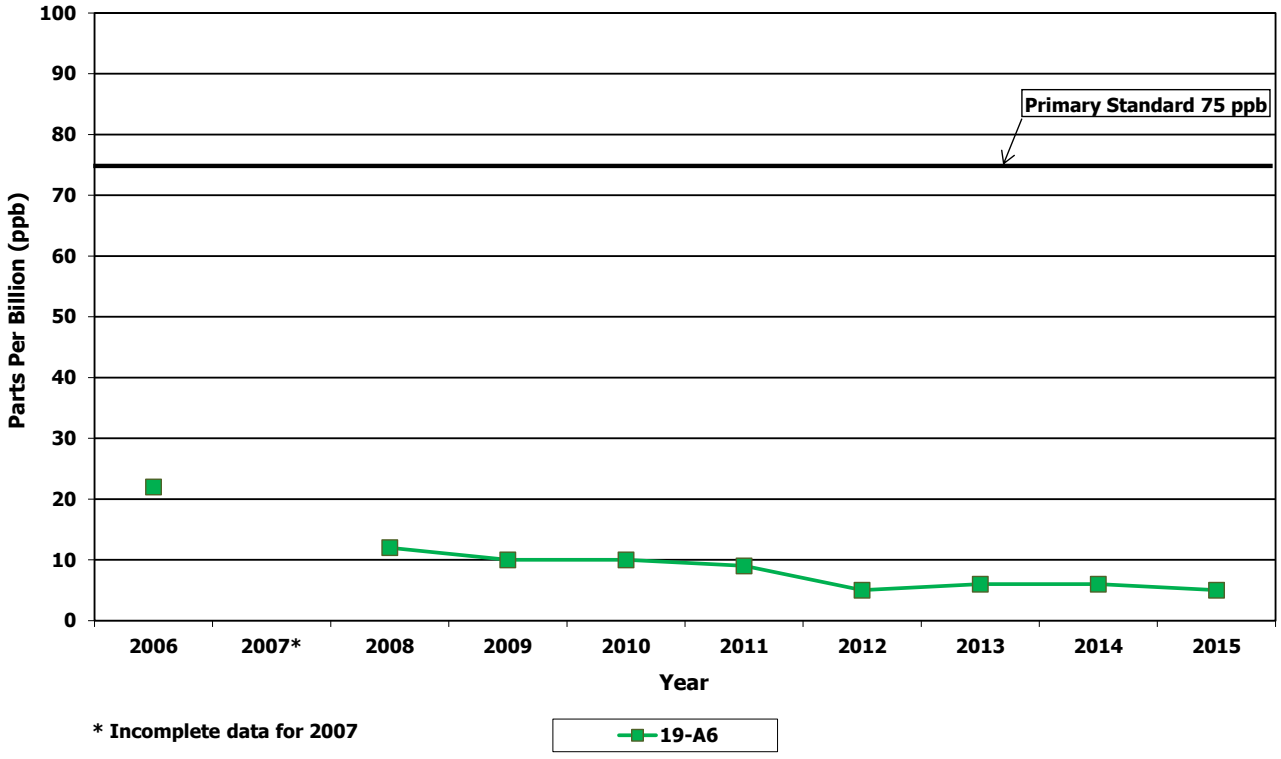
Sulfur Dioxide 3-Hour Block Average Maximum Values (ppb)					
Site ID	**City/County**	**2013**	**2014**	**2015**	**Number Obs. > 500 ppb**
26-F	Rockingham Co.	6	7	5	0
19-A6	Roanoke Co.	6	6	7	0
72-M	Henrico	5	10	7	0
75-B	Charles City Co.	23	27	37	0
179-K	Hampton	37	29	28	0
181-A1	Norfolk	51	25	16	0
46-B9	Fairfax Co.	NA	13	10	0

SO2 Monitoring Network

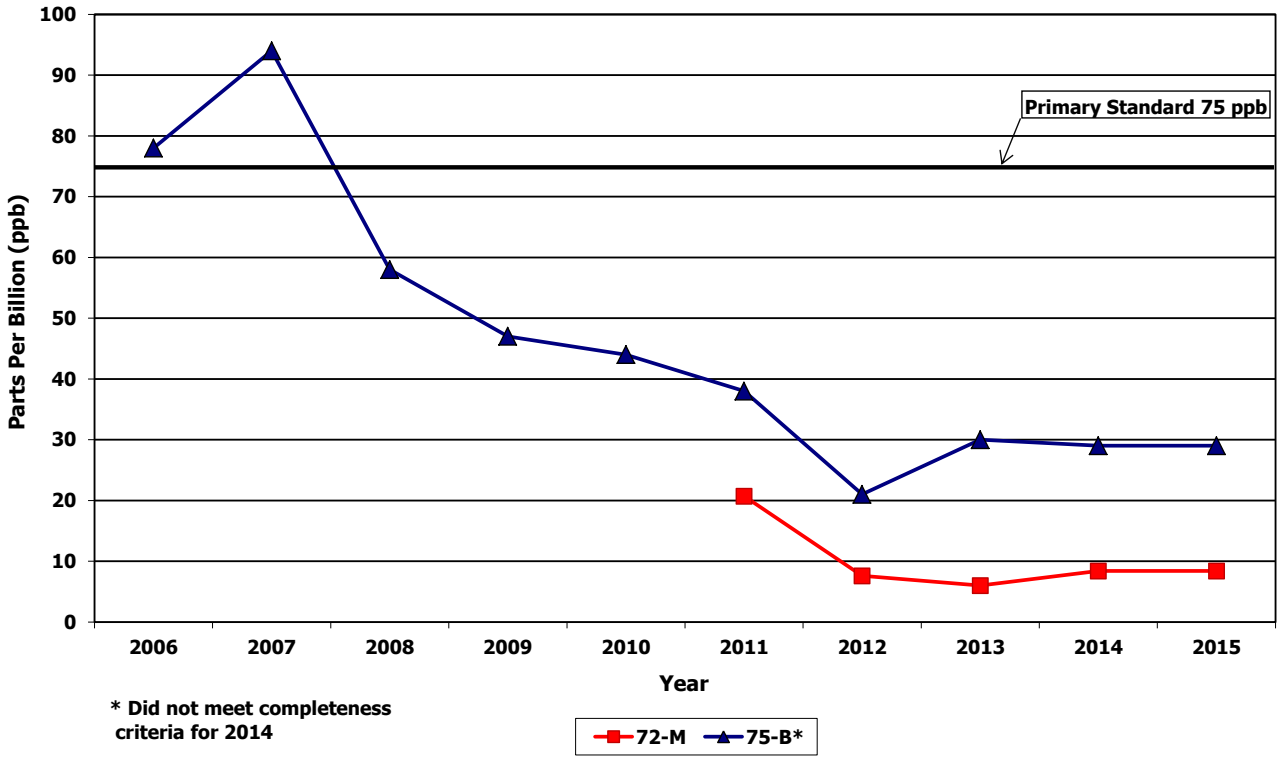
Sulfur Dioxide - Valley Region
99th Percentile 1-Hour Daily Maximum



Sulfur Dioxide - Blue Ridge Region
99th Percentile 1-Hour Daily Maximum

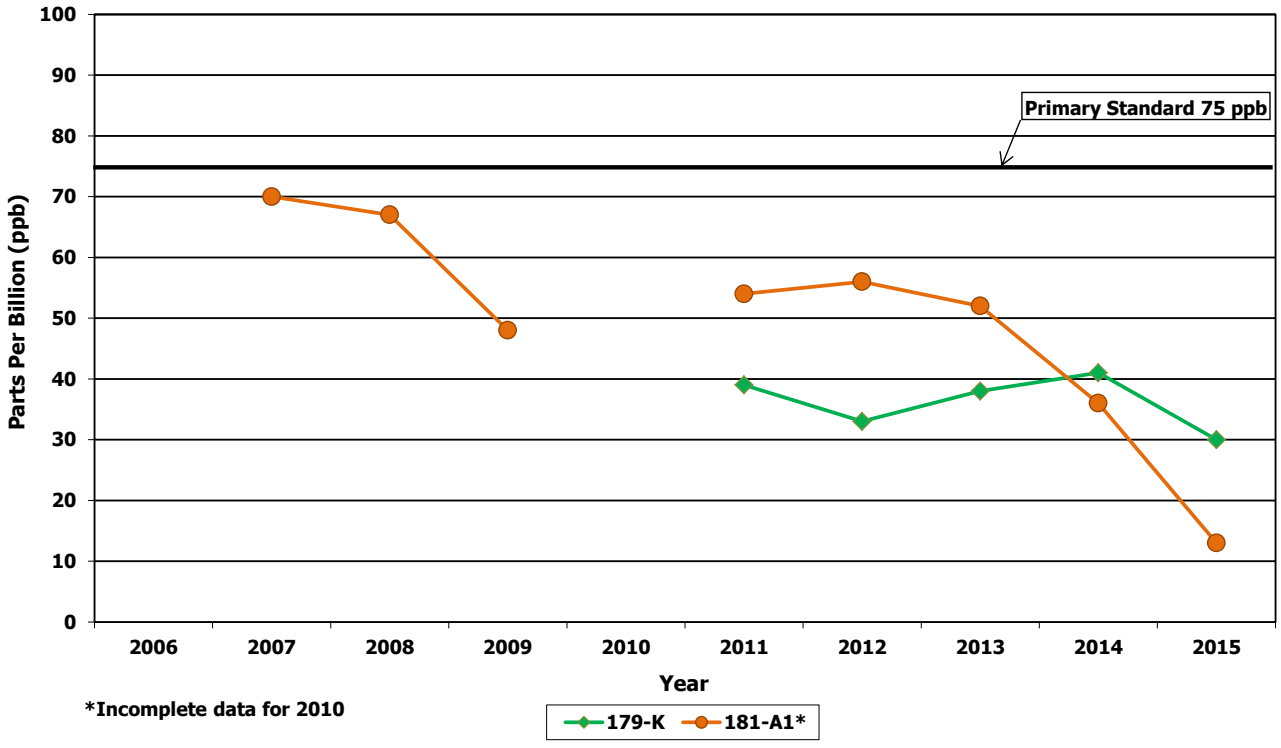


Sulfur Dioxide - Piedmont Region
99th Percentile 1-Hour Daily Maximum



* Did not meet completeness criteria for 2014

Sulfur Dioxide - Tidewater Region
99th Percentile 1-Hour Daily Maximum



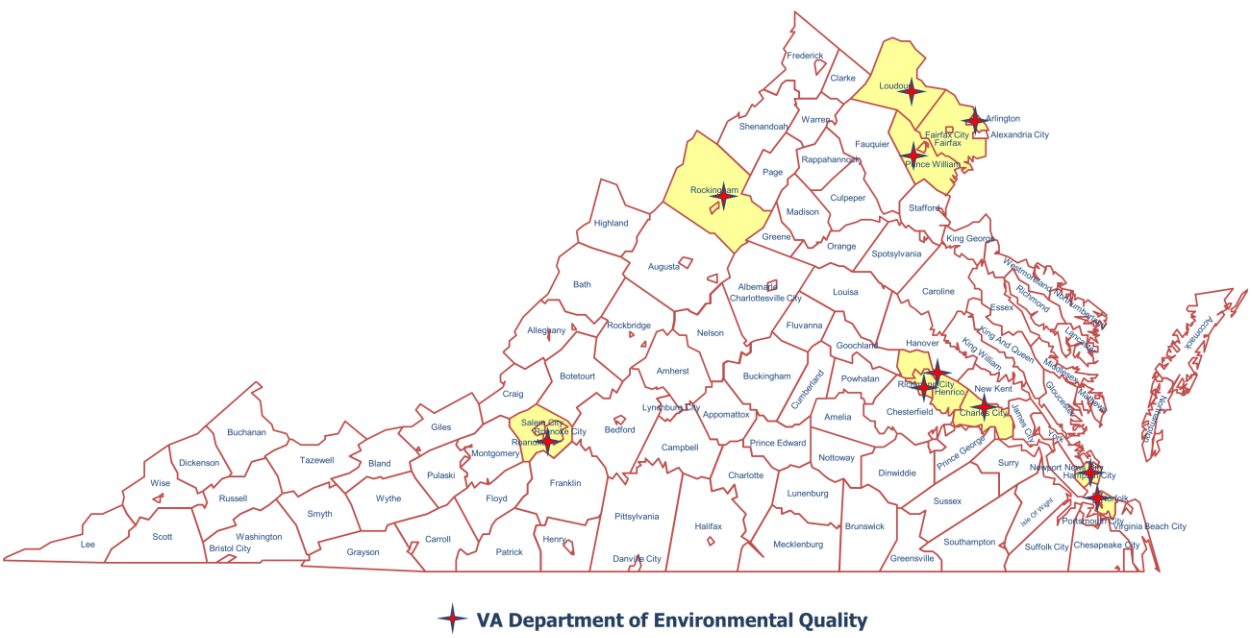
*Incomplete data for 2010

Nitrogen dioxide (NO_2) is one in a group of gases referred to as oxides of nitrogen (NO_X). Nitrogen dioxide, which is characterized by a reddish-brown color and pungent odor, along with the other NO_X gases, results from high-temperature burning of fossil fuels in automobiles, power plants, and other industrial, commercial, and residential sources. NO_X can occur naturally from lightning, forest fires, and bacterial processes that take place in soil.

NO_X pollution contributes to a wide range of problems in the environment. Ground-level ozone, a major component of "smog", forms when NO_X and volatile organic compounds (VOCs) react in the presence of sunlight. NO_X also reacts with other gases and particles in the air to form acids that contribute to acid deposition, and to form small particles that can be inhaled into the lungs. NO_X contributes to water quality deterioration by depositing nitrogen into water bodies, upsetting the nutrient balance and causing oxygen depletion in the water so that fish and other aquatic life cannot survive. Nitrate particles and nitrogen dioxide also contribute to visibility impairment by blocking light transmission.

EPA has established primary and secondary air quality standards for NO_2 because it can cause lung irritation and respiratory problems in humans. Small particles formed from reaction of NO_X gases with other compounds can be inhaled deep into the lungs and cause or worsen respiratory conditions such as emphysema and bronchitis, and can aggravate existing heart conditions.

Nitrogen oxides are measured continuously with electronic instruments using the "gas phase chemiluminescence" method. The instrument has a pump that draws ambient air into a reaction chamber. Inside the chamber, the air is mixed with a high concentration of ozone (O_3). Any nitric oxide (NO) present in the sample air reacts with O_3 to produce NO_2. The NO_2 molecules created by the reaction are in an excited state, and emit light characteristic of NO_2 – this is called "chemiluminescence." The light produced in the reaction is detected with a photomultiplier tube, and the resulting signal is converted to a number reflecting the concentration of NO in the ambient air by the instrument computer. The instrument then activates a valve that diverts incoming ambient air into a "converter", which converts any NO_2 in the ambient air to NO by reduction reaction. After the air passes through the converter, it is sent to the reaction chamber where the NO and O_3 react to produce NO_2. The chemiluminescence produced by the reaction is converted to a signal that reflects the concentration of NO_X in the ambient air. The instrument then calculates the NO_2 concentration using the difference between the measured NOx and NO concentrations.



National Ambient Air Quality Standards (NAAQS)

Primary Standard for NO_2:

- 3-year average of the 98th percentile 1-hour daily maximum values not to exceed 100 ppb.
- Annual Arithmetic Mean not to exceed 53 ppb (100 $\mu g/m^3$).

Secondary Standard for NO_2:

- Same as primary.

Nitrogen Dioxide 98th Percentile 1-Hour Daily Maximum Values (ppb)				
Site City/County	**2013**	**2014**	**2015**	**3-Yr Avg. Design Value 2013-2015**
(26-F) **Rockingham Co.**	40	42	42	41
(19-A6) **Roanoke Co.**	35	39	31	35
(72-M) **Henrico Co.**	38	37	35	37
(75-B) **Charles City Co.**	39	44	38	40
(158-X) **Richmond**	NA	45*	47	NA
(179-K) **Hampton**	28	29	28	28
(181-A1) **Norfolk**	41	42	41	41
(38-I) **Loudoun Co.**	37	43*	45	41*
(45-L) **Prince William Co.**	29	31	26	29
(47-T) **Arlington Co.**	43*	50	49	47*

* Did not meet completeness criteria

NO2 Monitoring Network

National Ambient Air Quality Standards (NAAQS)

Primary Standard for NO_2:

- 3-year average of the 98th percentile 1-hour daily maximum values not to exceed 100 ppb.
- Annual Arithmetic Mean not to exceed 53 ppb (100 $\mu g/m^3$).

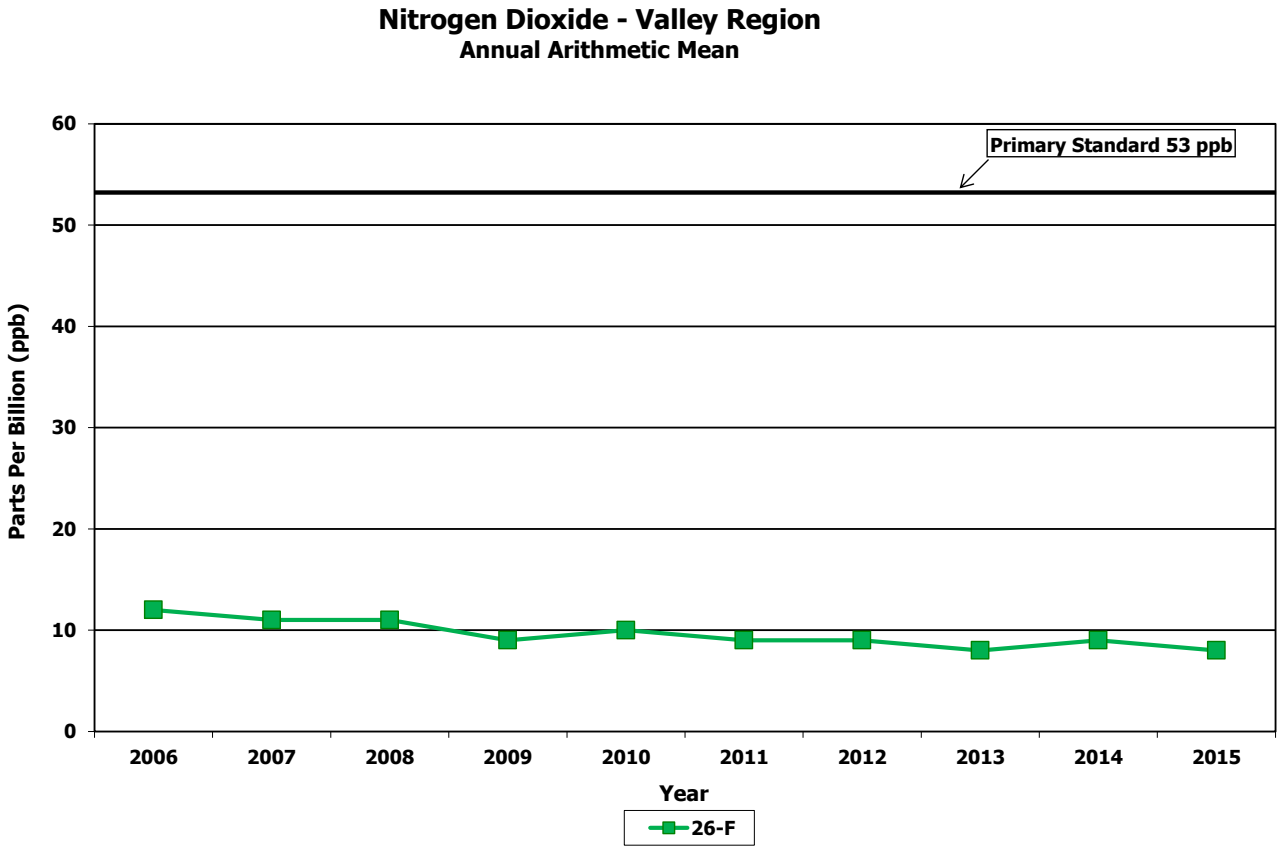
Secondary Standard for NO_2:

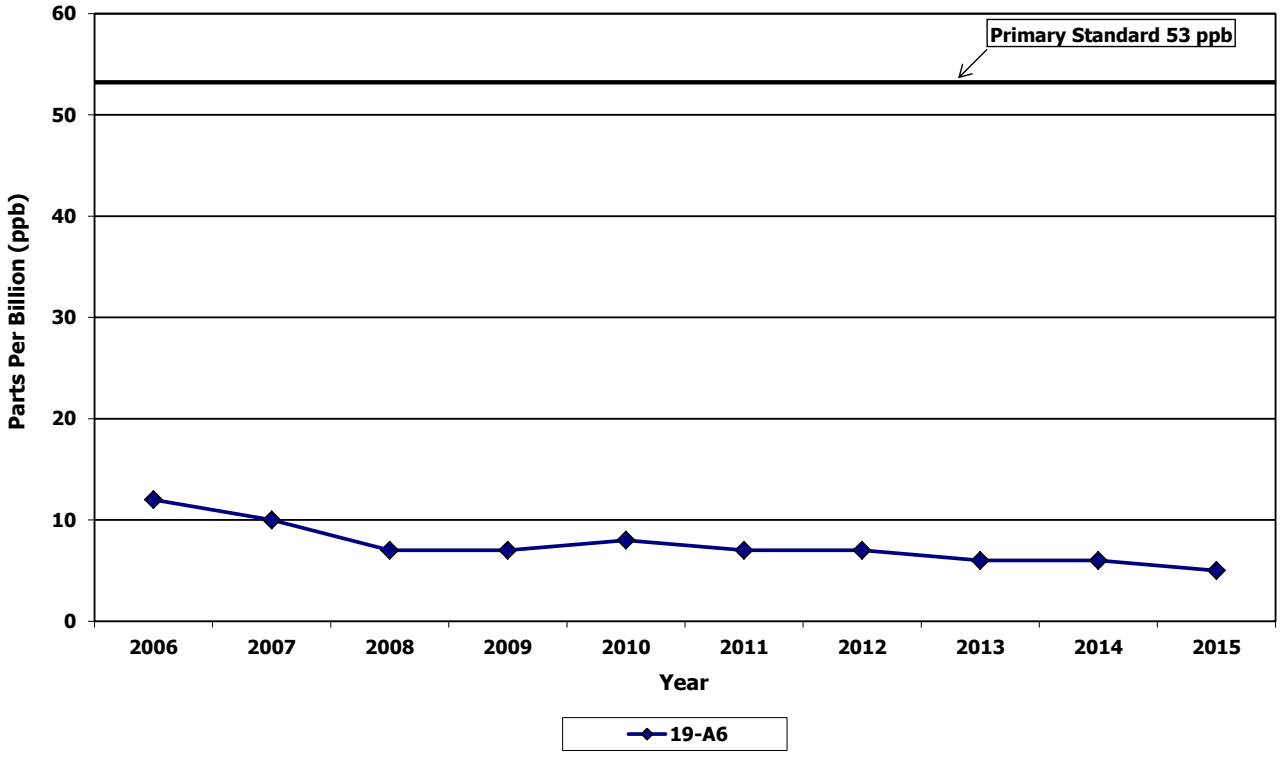
- Same as primary.

Site	Annual Arithmetic Mean (ppb)		
	2013	2014	2015
(26-F) **Rockingham Co.**	8	9	8
(19-A6) **Roanoke Co.**	6	6	5
(72-M) **Henrico Co.**	8	8	8
(75-B) **Charles City Co.**	4	5	4
(158-X) **Richmond**	NA	14*	14
(179-K) **Hampton**	4	4	4
(181-A1) **Norfolk**	8	8	8
(38-I) **Loudoun Co.**	7	7	8
(45-L) **Prince William Co.**	5	5	5
(47-T) **Arlington Co.**	11	11	11

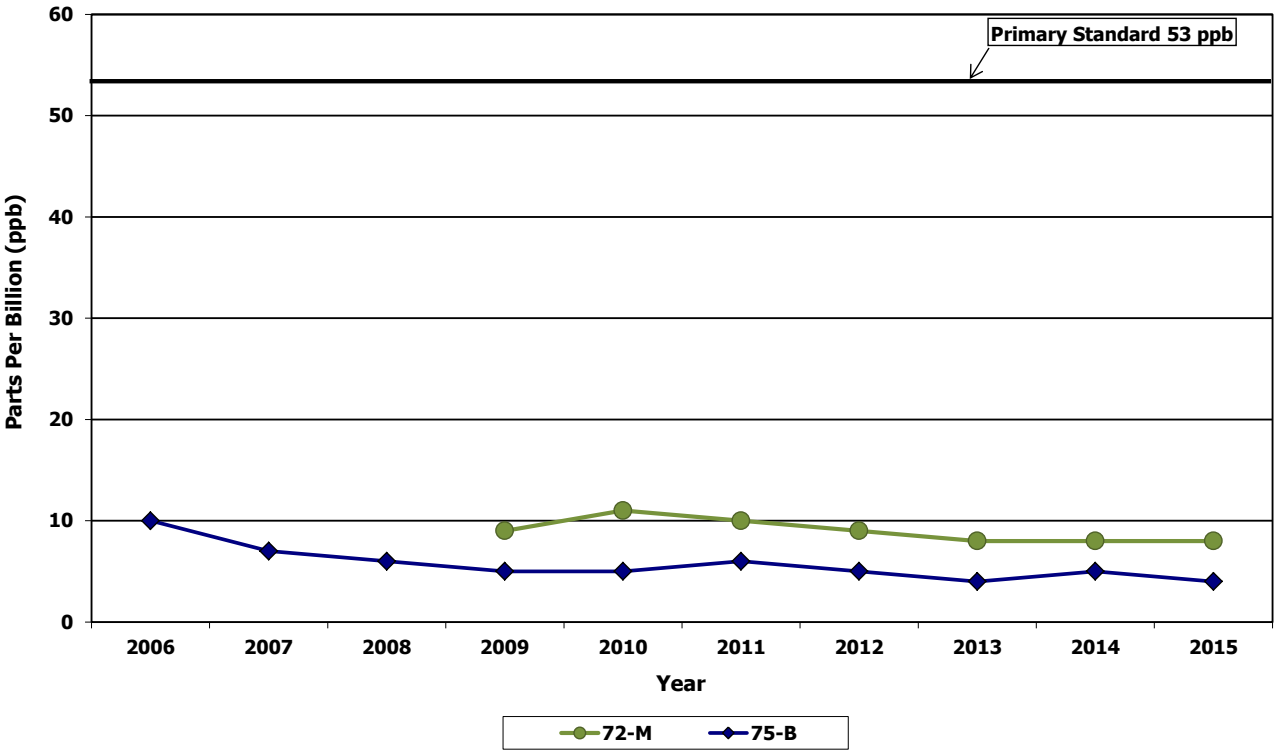
* Did not meet completeness criteria

NO2 Monitoring Network

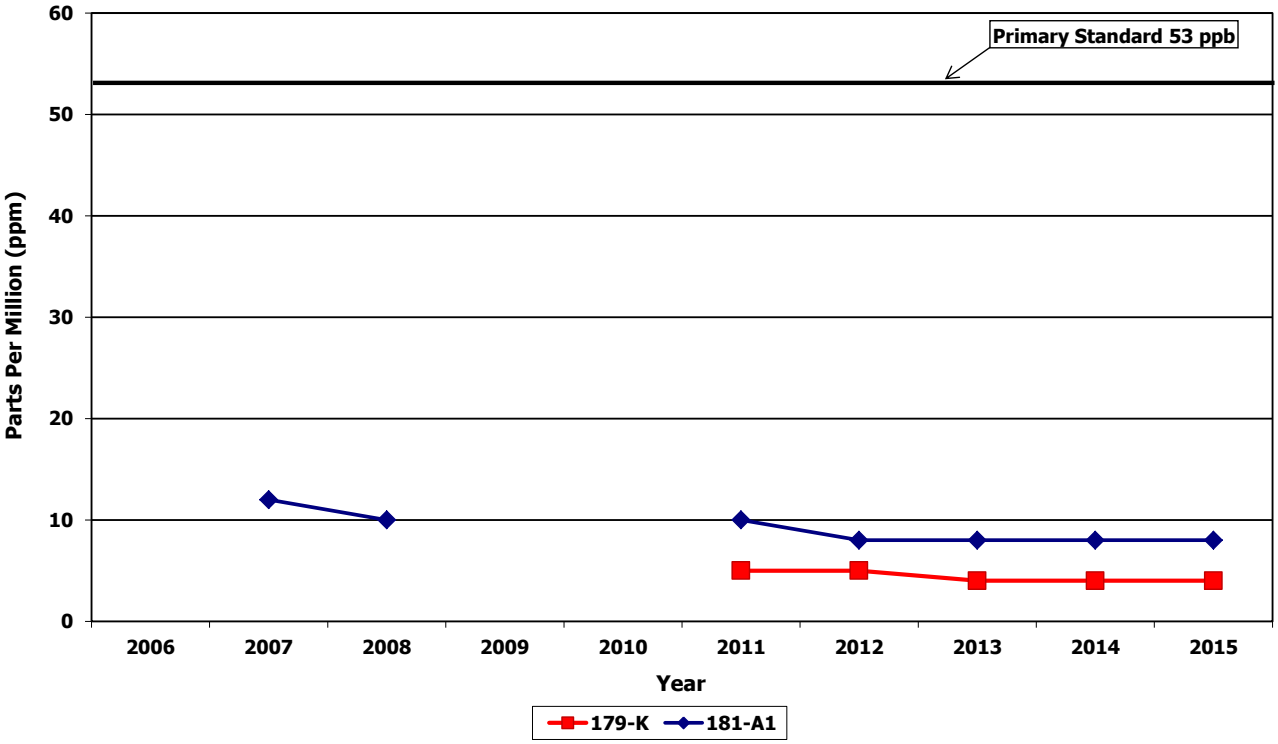

Nitrogen Dioxide - Valley Region
Annual Arithmetic Mean
Primary Standard 53 ppb
Parts Per Billion (ppb)
60
50
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
26-F


Nitrogen Dioxide - Blue Ridge Region
Annual Arithmetic Mean
Primary Standard 53 ppb
Parts Per Billion (ppb)
60
50
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
19-A6

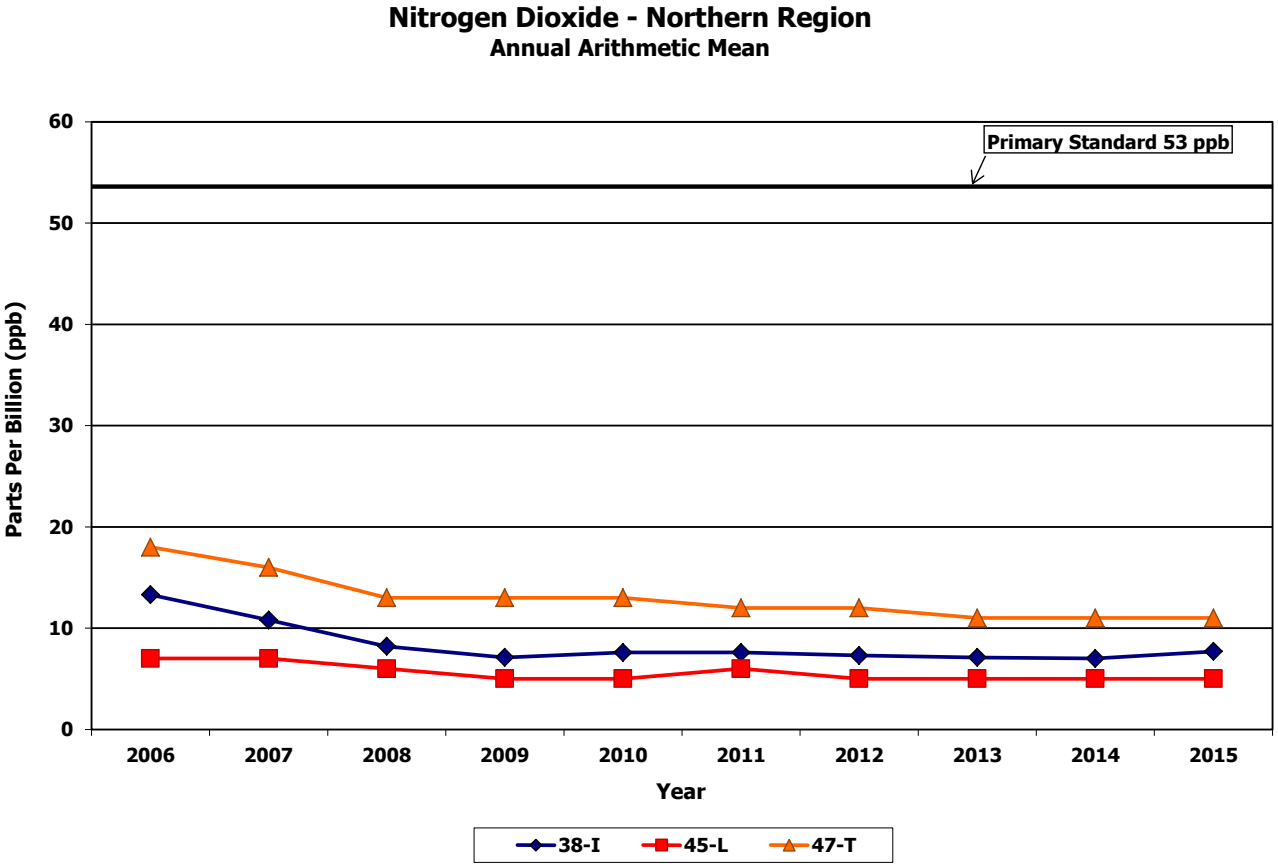
Nitrogen Dioxide - Piedmont Region
Annual Arithmetic Mean



Nitrogen Dioxide - Tidewater Region
Annual Arithmetic Mean



***Incomplete data in 2009 & 2010**


Nitrogen Dioxide - Northern Region
Annual Arithmetic Mean
Primary Standard 53 ppb
Parts Per Billion (ppb)
60
50
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
38-I
45-L
47-T

Ozone (O_3) is a gas comprised of three oxygen atoms. It is unstable, and a strong oxidizing agent, and will react readily with other compounds to decay to the more stable diatomic oxygen (O_2).

Ozone is a gas that occurs both in the Earth's upper atmosphere and at ground level. Ozone can be "good" or "bad" for people's health and for the environment, depending on its location in the atmosphere. "Good" ozone occurs naturally in the stratosphere, about 10-30 miles above the earth's surface, where it forms a layer that filters the sun's ultraviolet rays before they reach the surface where they can cause harm to people, animals, and plants. "Bad" ozone, or ground-level ozone, occurs when chemicals found in the atmosphere at earth's surface react in the presence of intense sunlight. Ozone at ground level is harmful because it can cause a variety of health problems, as well as damage to plants and materials. Since ground-level ozone is not emitted directly, it is called a "secondary" pollutant. The chemicals needed to form ozone, NOx and hydrocarbons (also called volatile organic compounds, or VOCs), can come from motor vehicle exhaust, power plants, industrial emissions, gasoline vapors, chemical solvents, as well as natural sources such as lightning, forest fires, and plant decomposition. Ozone, and the chemicals that produce ozone, can travel hundreds of miles from their sources, so that even rural areas with few pollutant emissions can occasionally experience high ozone levels. Efforts to control ground-level ozone involve limiting emissions of NOx and VOCs, or "ozone precursors," that are necessary for ozone production.

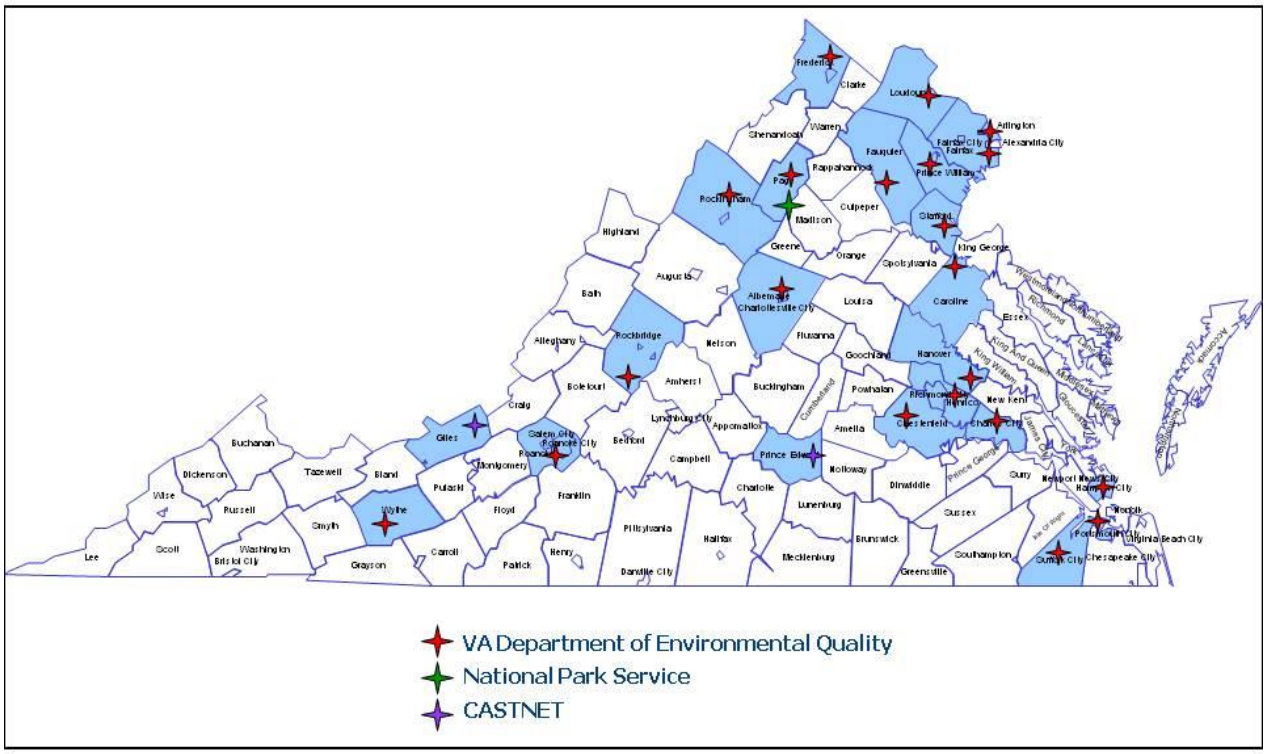
Ground-level ozone is a seasonal pollutant, and the length of the ozone season varies across the country. In some areas, the season may last most of the year, but in Virginia it is usually only a problem during the late spring to summer months when the sunlight is most intense. For 2015, Virginia was required to operate its ozone monitors from the months of April to October. In addition to the seasonal pattern, ozone also has a strong diurnal (daily) pattern at low altitudes, so that it is usually depressed at night, but begins to build during the day after the sun rises.

EPA has created primary and secondary air quality standards for ground-level ozone because of its adverse effects on public health and welfare. In humans, ozone can irritate lung airways, causing sunburn-like inflammation, and can induce symptoms such as wheezing, coughing, and pain when taking a deep breath. Although people with existing respiratory problems, such as asthma and emphysema, are most vulnerable, young children and otherwise healthy people can also suffer respiratory problems from ozone exposure. Scientific studies have shown that even at low levels, ozone can trigger breathing problems for sensitive individuals. In addition to human health problems, ozone can damage the leaves of plants and trees, making them susceptible to disease, insects, and harsh weather. Ozone can also cause rubber to harden and crack, and some painted surfaces to fade more quickly.

Ozone is measured continuously with electronic instruments using "ultraviolet (UV) absorption photometry." The method is based on the principle that ozone strongly absorbs UV light at 254 nanometers (a nanometer is equal to a distance of one billionth of a meter). The ozone monitor has a sample pump that draws ambient air into it and splits the air into two gas streams. In one stream, the air passes through an "ozone scrubber", which cleanses the sample air of any ozone. Then the clean air passes through a sample cell that contains a UV light source and a detector. The detector measures the intensity of the light in the sample cell, providing a zero reference. The second air stream is sent straight into the sample cell, bypassing the scrubber. Any ozone present in the incoming air will absorb some of the UV light in the sample cell, reducing the amount of light reaching the detector. The instrument then calculates the ozone concentration of the ambient air from the difference in the light intensities measured between the scrubbed, or "zero" air, and the unscrubbed air.

Daily ozone forecasts for selected metropolitan areas and hourly ozone values for all Virginia ozone monitoring sites can be viewed for the months of April to October on the DEQ web page at http://vadeq.tx.sutron.com/cgi-bin/aqi_rpt.pl. In addition, animated ozone maps for Virginia and other parts of the United States are available at http://www.airnow.gov/.

The National Park Service operated one ozone monitor at Big Meadows in Shenandoah National Park in 2015. Daily data from this site are available at the DEQ website, and historical data may be obtained on the internet at http://ard-request.air-resource.com or at EPA's AirData website. EPA also maintains Ozone monitoring sites in Giles and Prince Edward counties as part of the CASTNET program. Data from these sites can be viewed at https://www.epa.gov/castnet.



National Ambient Air Quality Standards (NAAQS)

Primary Standard for O_3:

- Maximum 8-hour average concentration of 0.070 ppm (157 $\mu g/m^3$), effective October 1, 2015, based on 3-year average of the annual fourth highest daily maximum 8-hour averages.

- Secondary Standard for O_3:

  Same as primary

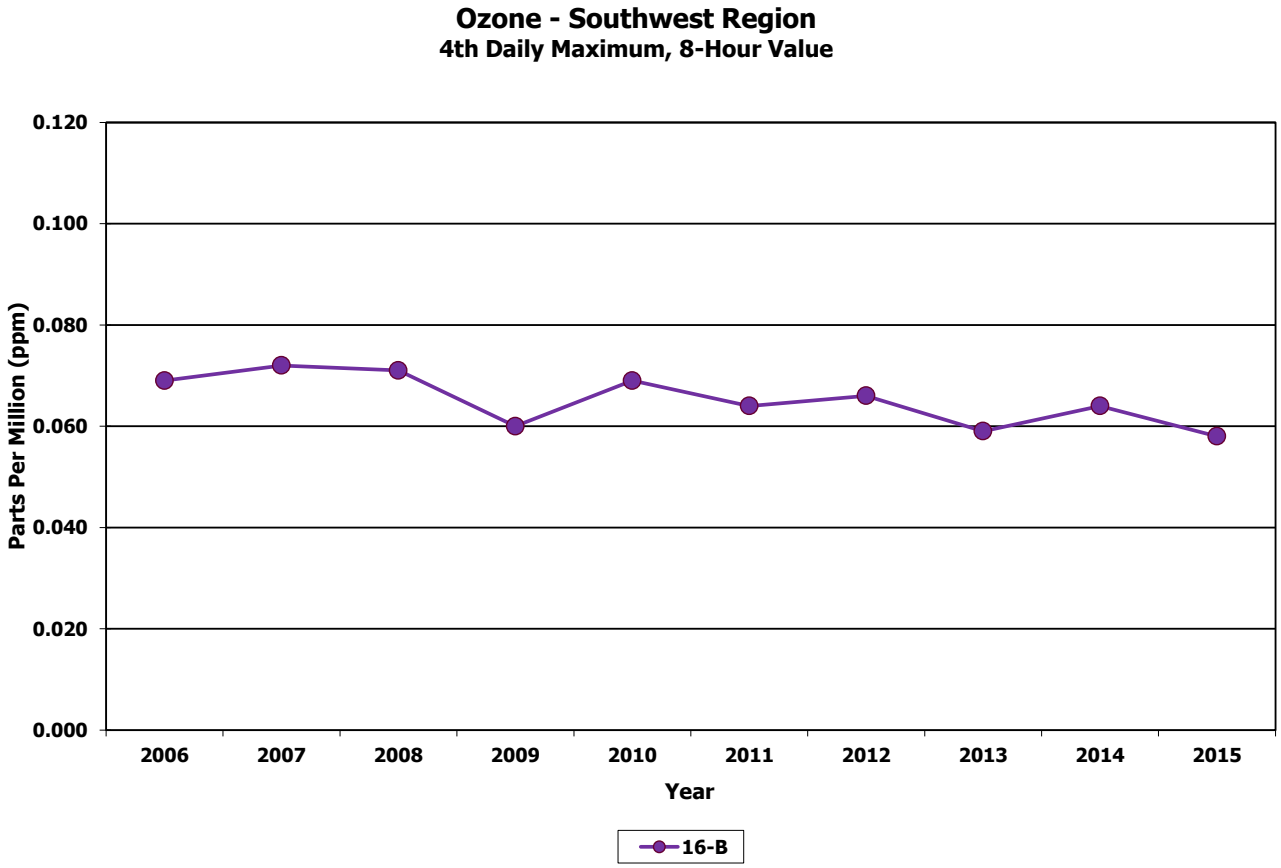
The standard is attained at a monitoring site when the 3-year average of the fourth highest daily maximum 8-hour average for each of the three most recent years is less than or equal to 0.070 ppm.

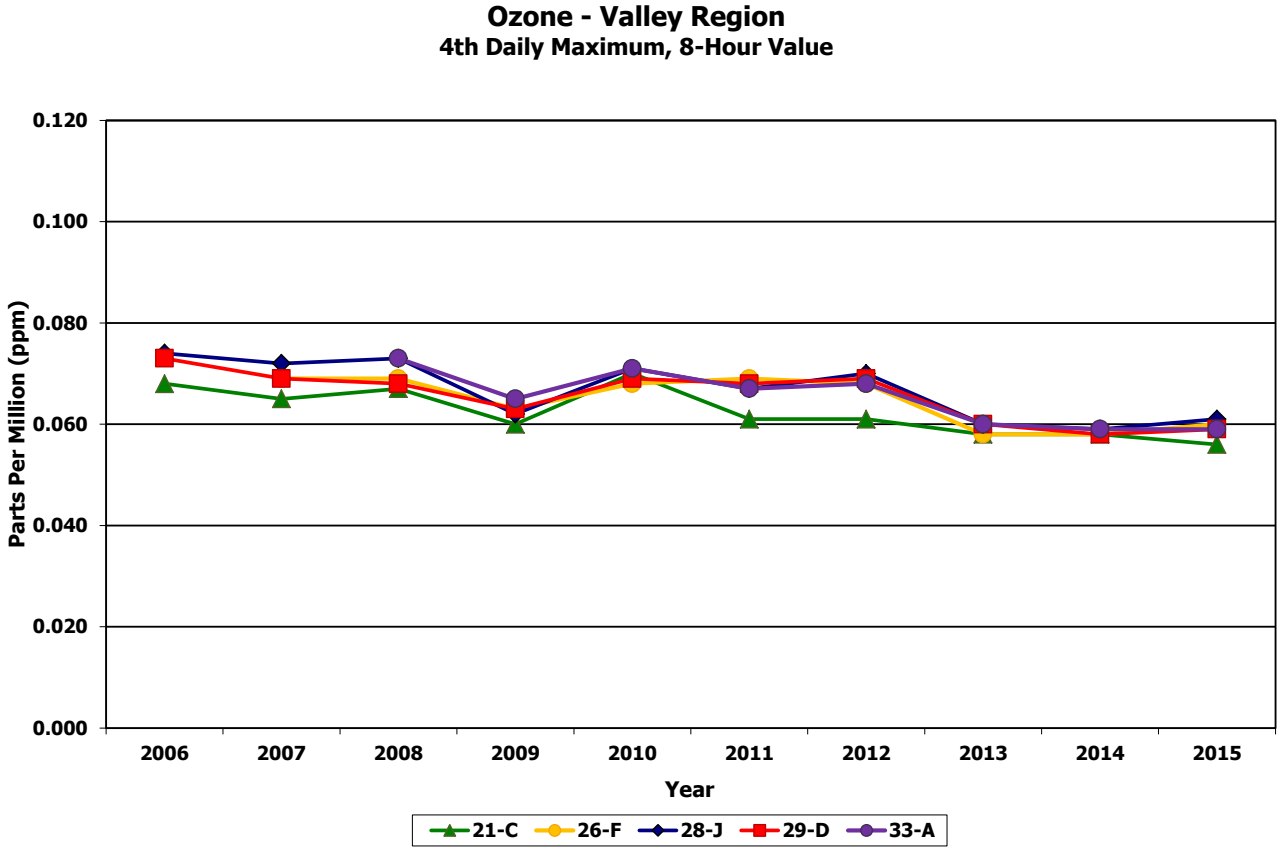
Site	Days Exceeded 0.070 ppm	2015 Highest Daily Maximum 8-Hour Avg.			
		1st Max.	2nd Max.	3rd Max.	4th Max.
(16-B) **Wythe Co.**	0	.062	.060	.058	.058
(26-F) **Rockingham Co.**	0	.067	.063	.063	.060
(28-J) **Frederick Co.**	0	.062	.062	.061	.061
(29-D) **Page Co.**	0	.064	.061	.060	.059
(33-A) **Albemarle Co.**	0	.062	.061	.060	.059
(19-A6) **Roanoke Co.**	0	.067	.064	.064	.062
(21-C) **Rockbridge Co.**	0	.060	.059	.057	.056
(71-H) **Chesterfield Co.**	0	.070	.064	.063	.063
(72-M) **Henrico Co.**	3	.076	.072	.071	.064
(73-E) **Hanover Co.**	0	.062	.061	.061	.061
(75-B) **Charles City Co.**	1	.074	.066	.062	.059
(179-K) **Hampton**	0	.067	.066	.065	.065
(183-E) **Suffolk**	0	.068	.066	.062	.061
(183-F) **Suffolk**	0	.067	.063	.063	.060
(37-B) **Fauquier Co.**	0	.058	.058	.056	.056
(38-I) **Loudoun Co.**	4	.075	.073	.072	.071
(44-A) **Stafford Co.**	0	.069	.064	.064	.063
(45-L) **Prince William Co.**	0	.068	.067	.067	.067
(46-B9) **Fairfax Co.**	4	.076	.073	.072	.072
(47-T) **Arlington Co.**	6	.078	.077	.075	.073
(48-A) **Caroline Co.**	0	.066	.065	.063	.062

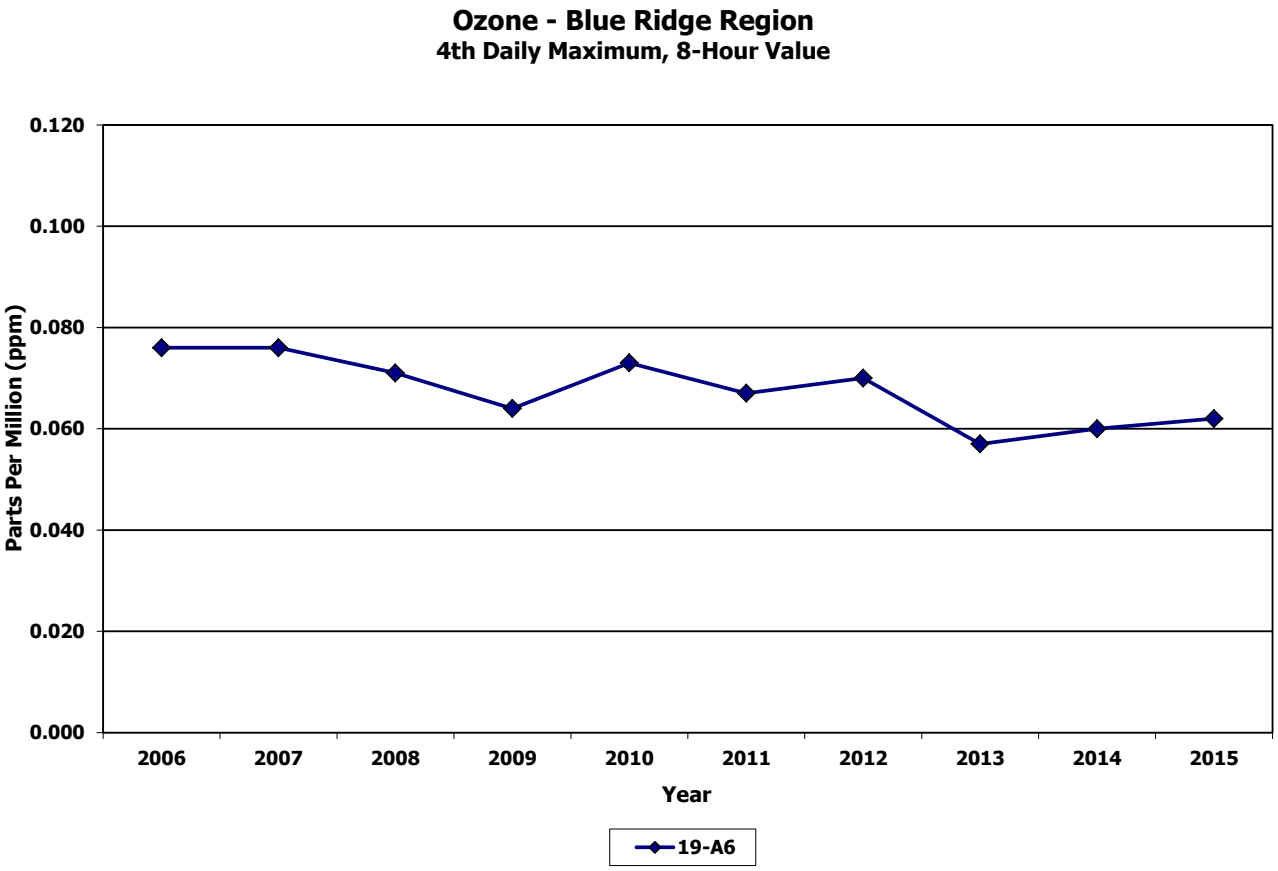
2013-2015 Fourth-Highest Daily Maximum 8-Hour Ozone Averages (units parts per million)					
	Monitor Location (County/City)	**2013**	**2014**	**2015**	**3-Year Average (NAAQS = .070 ppm)**
Richmond Maintenance Area	Chesterfield Co.	.063	.061	.063	.062
	Henrico Co.	.065	.062*	.064	.063
	Hanover Co.	.066	.062	.061	.063
	Charles City Co.	.061	.066	.059	.062
Hampton Roads Maintenance Area	Hampton City	.068	.061	.065	.064
	Suffolk City (TCC)	.065	.058	.061	.061
	Suffolk City (Holland)	.065	.063	.060	.062
Fredericksburg Maintenance Area	Stafford Co.	.064	.062	.063	.063
Northern Virginia Nonattainment Area	Loudoun Co.	.066	.063	.071	.066
	Prince William Co.	.066	.062	.067	.065
	Arlington Co.	.067	.071	.073	.070
	Fairfax Co. (Lee Park)	.067	.065	.072	.068
Shenandoah National Park Maintenance Area	Madison Co. (Big Meadows)	.063	.060	.063	.062
Areas Currently Designated Attainment	Wythe Co.	.059	.064	.058	.060
	Rockbridge Co.	.058	.058	.056	.057
	Rockingham Co.	.058	.058	.060	.058
	Frederick Co.	.060	.059	.061	.060
	Page Co.	.060	.058	.059	.059
	Albemarle Co.	.060	.059*	.059	.059
	Roanoke Co.	.057	.060	.062	.059
	Fauquier Co.	.059	.059	.056	.058
	Caroline Co.	.065	.061	.062	.062

* Did not meet completeness criteria

A 3-year average of .070 ppm or above exceeds the 8-hour NAAQS for ozone.


Ozone - Southwest Region
4th Daily Maximum, 8-Hour Value
Parts Per Million (ppm)
0.120
0.100
0.080
0.060
0.040
0.020
0.000
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
16-B


Ozone - Valley Region
4th Daily Maximum, 8-Hour Value
Parts Per Million (ppm)
0.120
0.100
0.080
0.060
0.040
0.020
0.000
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
21-C
26-F
28-J
29-D
33-A


Ozone - Blue Ridge Region
4th Daily Maximum, 8-Hour Value
Parts Per Million (ppm)
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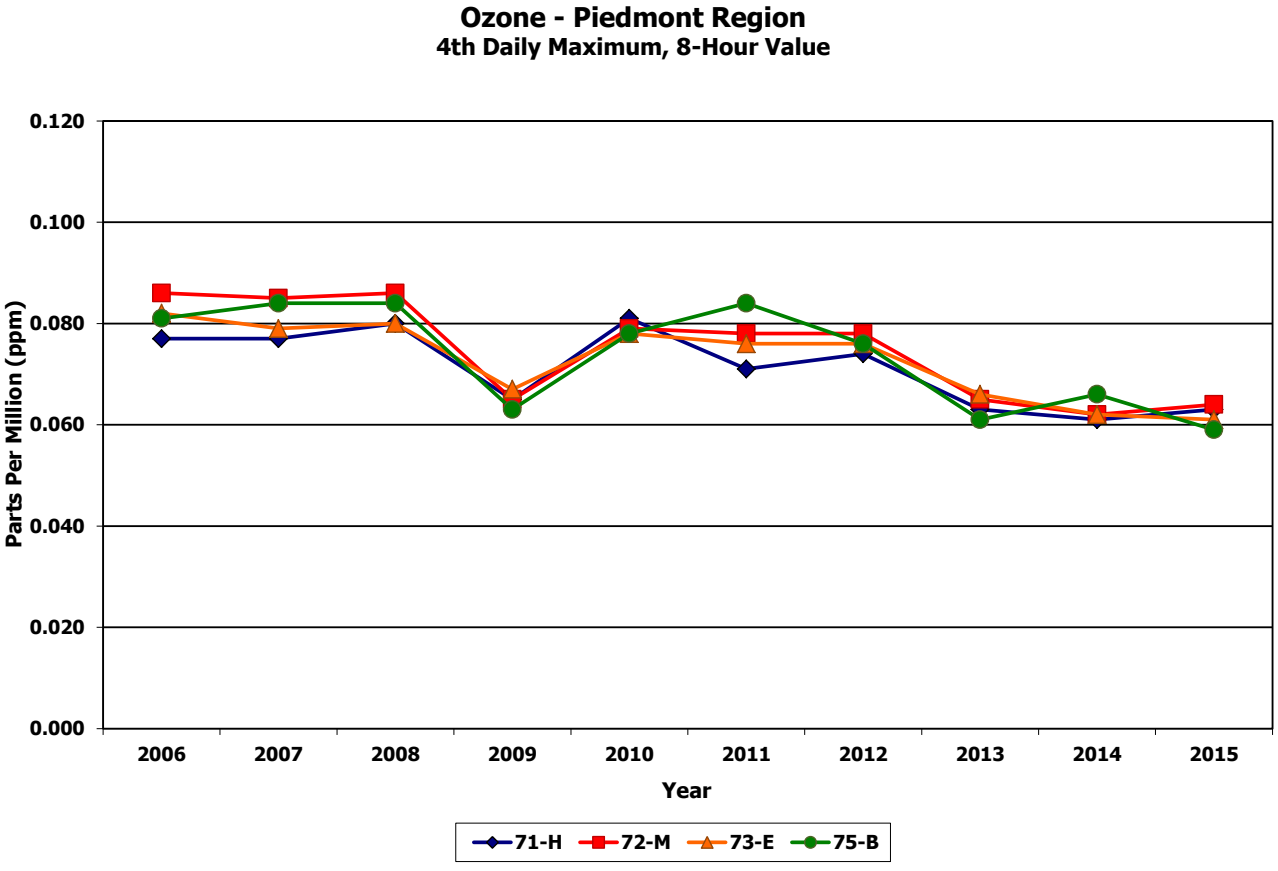
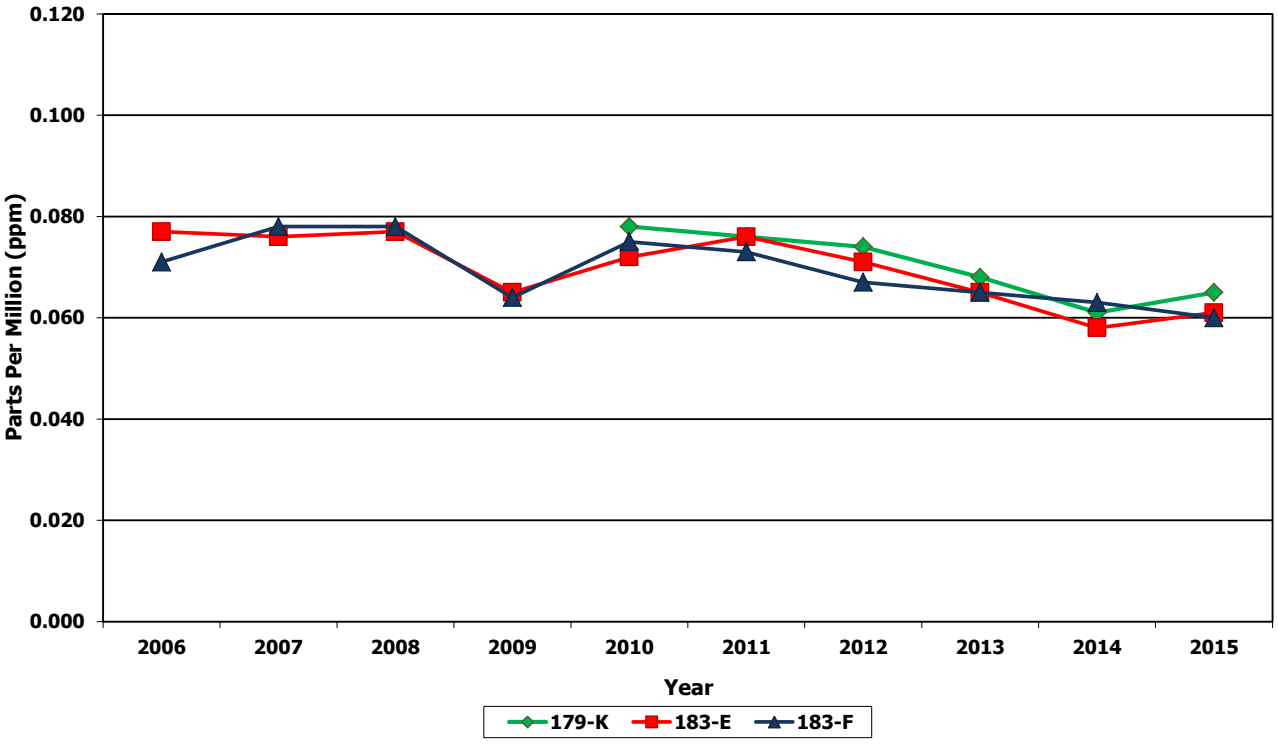
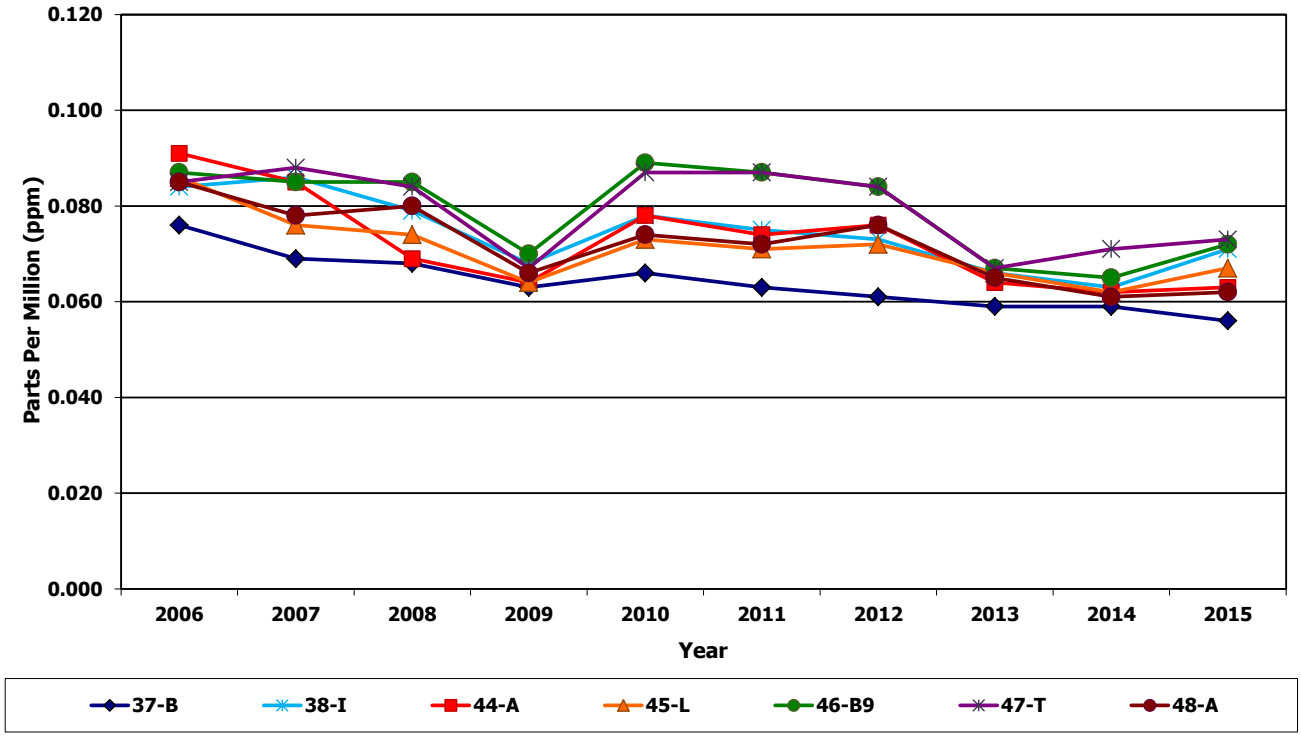
0.100
0.080
0.060
0.040
0.020
0.000
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
19-A6


Ozone - Piedmont Region
4th Daily Maximum, 8-Hour Value
Parts Per Million (ppm)
0.120
0.100
0.080
0.060
0.040
0.020
0.000
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
71-H
72-M
73-E
75-B

Ozone - Tidewater Region
4th Daily Maximum, 8-Hour Value



Ozone - Northern Region
4th Daily Maximum, 8-Hour Value



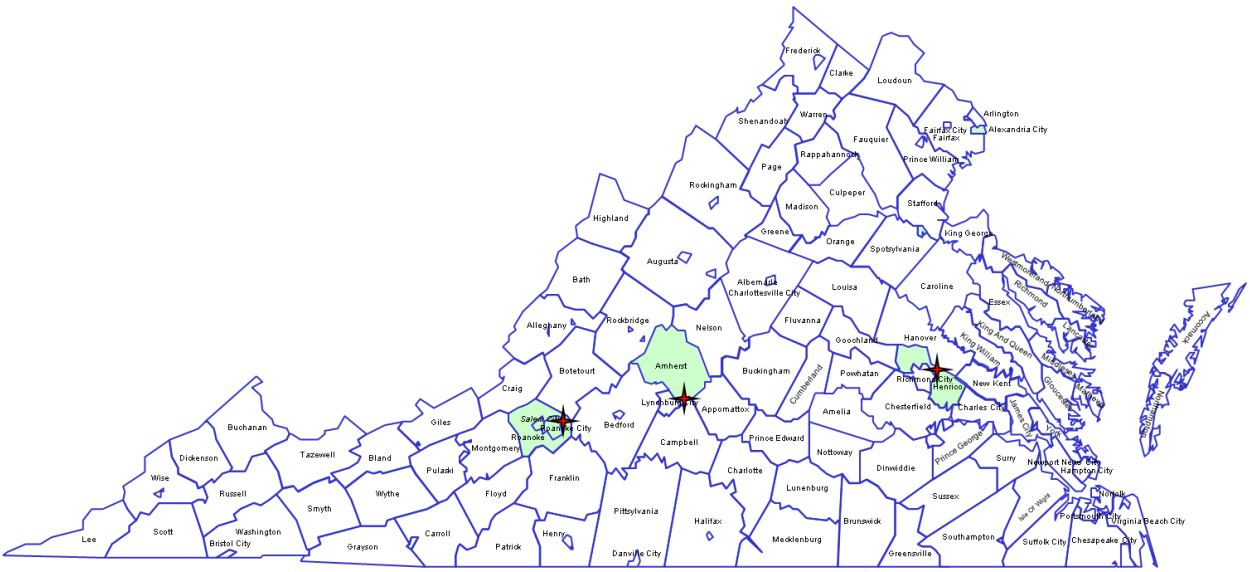
Lead Monitoring Sites

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. In the past, emissions from cars and trucks using leaded gasoline were the primary sources of lead in the atmosphere. Efforts by EPA to remove lead from motor vehicle gasoline resulted in dramatic reductions of lead in the ambient air from 1980 to 1999. Now the major sources of lead in the air are ore and metals processing and piston-engine aircraft operating on leaded aviation gasoline.

Particles containing lead can be inhaled, or lead can be ingested from drinking water or through contaminated food as a result of deposition of leaded particles onto the ground or in the water. In the body, lead can accumulate in the bones; affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Young children are particularly vulnerable to the effects of lead, where it can contribute to behavioral problems, learning deficits and lowered IQ. Lead can stay in the environment for a long time, causing adverse effects to plants and animals.

The National Ambient Air Quality Standards, or NAAQS, for lead were revised in October 2008. At that time, EPA reduced the level of the standard from 1.5 micrograms per cubic meter to 0.15 micrograms per cubic meter. The secondary standard was also reduced to the level of the new primary standard. Virginia DEQ received a waiver from EPA in 1997 to discontinue lead monitoring because Virginia had no major lead sources. However, when the new standards were promulgated, the emission threshold that agencies were required to use for determining if a lead monitor was needed near a source also changed. As a result, Virginia had to resume monitoring for lead in a few areas, and AQM began installing the lead monitors in late 2009 and completed installation in October 2010. For additional information on the revised lead standards, see https://www.epa.gov/lead-air-pollution/national-ambient-air-quality-standards-naaqs-lead-pb .

To measure lead, ambient air is drawn into a high volume sampler. The sample air flows across an 8 x 10 inch glass fiber filter at a rate of 39-60 cubic feet per minute for a 24-hour period. The filter is sent to the Division of Consolidated Laboratories, where a small portion of it is analyzed using inductively coupled plasma – mass spectrometry (ICP-MS). The resulting lead concentration is reported as micrograms per cubic meter ($\mu g/m^3$). The normal sampling schedule is once every sixth day from midnight to midnight. The lead sampling schedule for 2015 can be found at http://www.epa.gov/ttn/amtic/calendar.html.



VA Department of Environmental Quality

National Ambient Air Quality Standards (NAAQS)

Primary Standard for Pb:

- 0.15 µg/m^3 three-month rolling average

Secondary Standard for Pb:

- Same as Primary

2015 Pb 3-Month Averages (units in µg/m^3, LC)				
Site	**No. 24-Hour Observations**	**1st Max**	**2nd Max**	**>0.15 µg/m^3**
(53-G) **Amherst Co.**	60	0.01	0.01	0
(72-M) **Henrico Co.**	58	0.00	0.00	0
(109-N) **Roanoke**	58	0.01	0.01	0

Lead Monitoring Sites

Acid Deposition Program

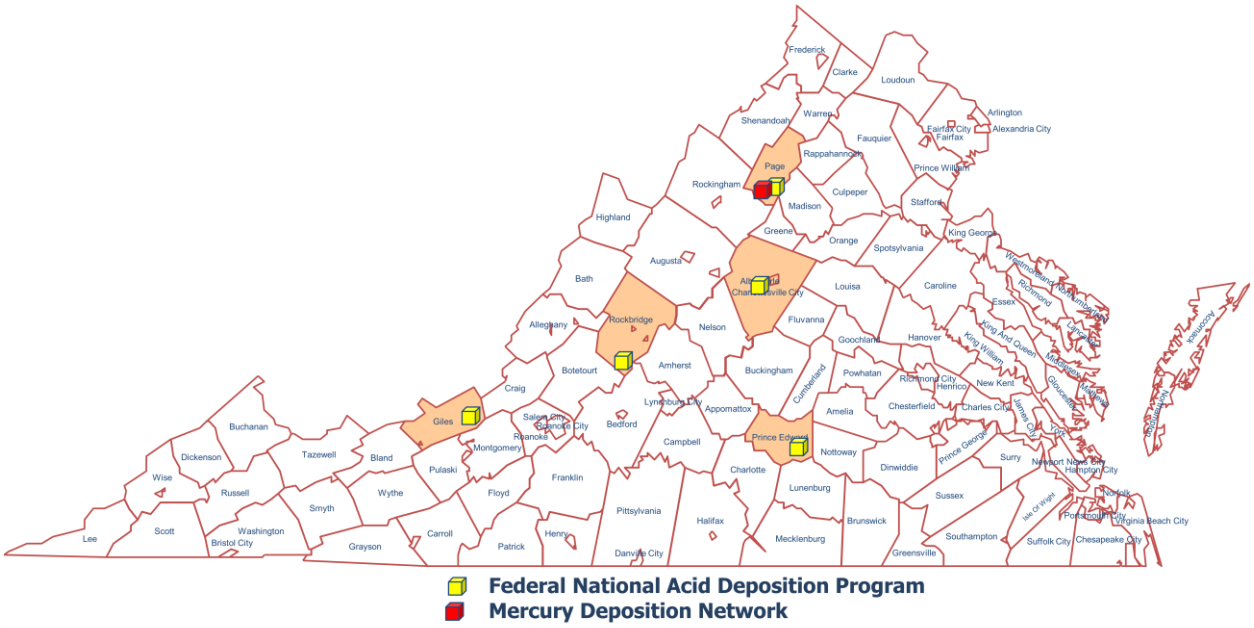
Photochemical Assessment Monitoring Stations

Air Toxics Monitoring Network

Acid Precipitation Monitors

The National Acid Deposition Program (NADP) had five monitoring sites in Virginia in 2015: Big Meadows (Shenandoah National Park), Hortons Station (Giles County), Charlottesville, Prince Edward County, and Natural Bridge Station (Rockbridge County). NADP site information and data are available on-line at http://nadp.sws.uiuc.edu/ntn in the NTN (National Trends Network) section.

In addition to the five acid deposition monitors, there was one NADP Mercury Deposition Network (MDN) site in Virginia: Big Meadows (Shenandoah National Park). MDN site information and data are available on-line at http://nadp.sws.uiuc.edu/MDN/.



Photochemical Assessment Monitoring Network

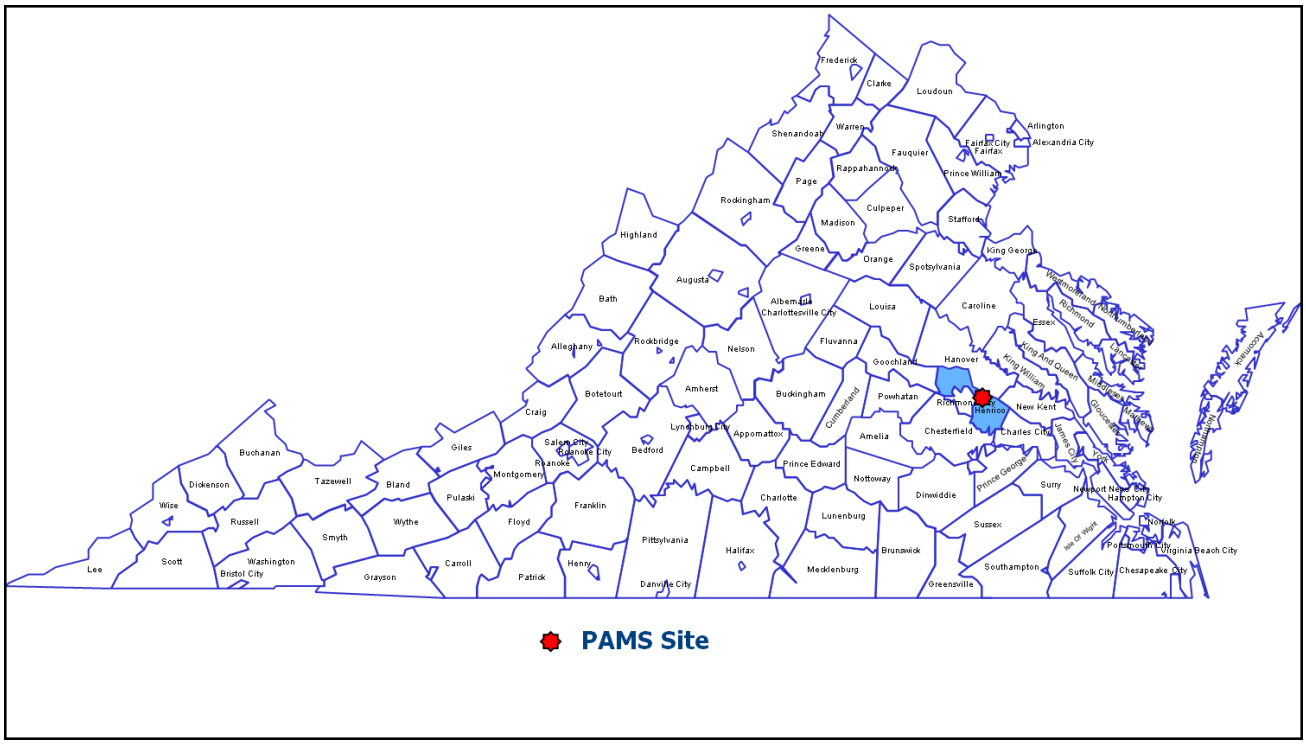
In 2015, the Office of Air Quality Monitoring (AQM) program of the Department of Environmental Quality collected 24-hour Photochemical Assessment Monitoring Station (PAMS) Volatile Organic Compounds (VOC) samples from MathScience Innovation Center (MSIC) in Henrico. Samples were collected using a one-in-six day sampling schedule.

The MSIC site is considered a Type II PAMS site. A type II site measures maximum ozone precursor concentrations in the primary downwind direction for the Richmond area. MSIC collected 24-hour VOC samples on an every six day schedule.

AQM used the manual method for collecting ambient air samples. This method involves the collection of integrated, whole samples by using evacuated Summa^{T} or Silco^{T} canisters and Xonteck, Inc. air samplers. Each VOC sample from MSIC was analyzed by the Division of Consolidated Laboratory Services (DCLS) using a Gas Chromatograph/Flame Ionization Detector (FID) designated as TO-12. All VOC samples were analyzed for the presence of fifty-six target volatile organic precursors, and the measured concentration of Total Nonmethane Organic Compounds (TNMOC).

Detailed PAMS data are available upon request to the Virginia Department of Environmental Quality, Office of Air Quality Monitoring.

Photochemical Assessment Monitoring Network



2015 Average Concentration of Detectable Volatile Ozone Precursors Photochemical Assessment Monitoring Station (PAMS) Type II – MathScience Innovation Center

Concentrations are in ppbC

(non detects are counted as zeros for statistical purposes)

Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
43141	n-dodecane	60	0.00	0.76	0.00	0.089	0.177
43202	Ethane	60	1.86	49.93	7.75	11.886	11.425
43203	Ethylene	60	0.00	10.66	1.68	2.119	1.627
43204	Propane	60	0.95	20.71	4.89	5.417	3.422
43205	Propylene	60	0.00	2.97	0.62	0.742	0.470
43206	Acetylene	60	0.29	8.22	1.35	1.618	1.260
43212	n-butane	60	0.36	23.25	3.30	4.327	3.691
43214	Isobutane	60	0.21	5.56	1.18	1.398	0.943
43216	t-2-butene	60	0.00	0.28	0.00	0.011	0.053
43217	c-2-butene	60	0.00	1.42	0.00	0.085	0.278
43220	n-pentane	60	0.26	13.00	1.90	2.561	2.138
43221	Isopentane	60	0.69	11.32	2.98	3.425	1.982
43224	1-pentene	60	0.00	2.45	0.35	0.493	0.512
43226	t-2-pentene	60	0.00	2.28	0.20	0.347	0.478
43227	c-2-pentene	60	0.00	0.54	0.00	0.034	0.096
43230	3-methylpentane	60	0.00	2.51	0.64	0.747	0.448
43231	n-hexane	60	0.00	2.86	0.73	0.836	0.481
43232	n-heptane	60	0.00	1.46	0.38	0.414	0.240
43233	n-octane	60	0.00	0.78	0.18	0.162	0.166
43235	n-nonane	60	0.00	0.68	0.14	0.121	0.136
43238	n-decane	60	0.00	0.78	0.24	0.231	0.172
43242	Cyclopentane	60	0.00	1.49	0.17	0.189	0.230
43243	Isoprene	60	0.00	12.80	1.02	2.520	3.103
43244	2,2-dimethylbutane	60	0.00	0.63	0.16	0.148	0.129
43245	1-Hexene	60	0.00	0.54	0.00	0.131	0.192
43247	2,4-dimethylpentane	60	0.00	0.75	0.21	0.209	0.173
43248	Cyclohexane	60	0.00	1.15	0.13	0.156	0.216
43249	3-methylhexane	60	0.00	1.83	0.44	0.524	0.321
43250	2,2,4-trimethylpentane	60	0.00	3.85	1.02	1.196	0.761
43252	2,3,4-trimethylpentane	60	0.00	1.46	0.36	0.408	0.282
43253	3-methylheptane	60	0.00	0.42	0.00	0.081	0.117
43261	Methylcyclohexane	60	0.00	0.84	0.18	0.177	0.165
43262	Methylcyclopentane	60	0.00	1.47	0.41	0.467	0.270
43263	2-methylhexane	60	0.00	1.63	0.38	0.444	0.304
43280	1-butene	60	0.00	1.64	0.37	0.429	0.259
43284	2,3-dimethylbutane	60	0.00	1.17	0.32	0.337	0.219
43285	2-methylpentane	60	0.18	4.03	0.94	1.107	0.655
43291	2,3-dimethylpentane	60	0.00	0.80	0.20	0.199	0.175
43954	n-undecane	60	0.00	0.72	0.20	0.185	0.193
43960	2-methylheptane	60	0.00	0.52	0.00	0.058	0.101
45109	m/p-xylene	60	0.00	1.94	0.72	0.793	0.490
45201	Benzene	60	0.36	2.94	0.91	1.007	0.463
45202	Toluene	60	0.35	7.60	1.93	2.280	1.280
45203	Ethylbenzene	60	0.00	1.38	0.38	0.407	0.284
45204	o-xylene	60	0.00	1.28	0.31	0.317	0.238
45207	1,3,5-trimethylbenzene	60	0.00	0.82	0.00	0.107	0.193
45208	1,2,4-trimethylbenzene	60	0.00	2.26	0.54	0.574	0.392
45209	n-propylbenzene	60	0.00	0.58	0.00	0.039	0.117
45210	Isopropylbenzene	60	0.00	0.33	0.00	0.010	0.050
45211	o-ethyltoluene	60	0.00	3.56	0.32	0.369	0.526
45212	m-ethyltoluene	60	0.00	1.59	0.30	0.342	0.315
45213	p-ethyltoluene	60	0.00	2.01	0.00	0.163	0.312
45218	m-diethylbenzene	60	0.00	0.46	0.00	0.035	0.113
45219	p-diethylbenzene	60	0.00	0.33	0.00	0.021	0.073
45220	Styrene	60	0.00	1.07	0.00	0.257	0.331
45225	1,2,3-trimethylbenzene	60	0.00	1.40	0.00	0.118	0.277
43000	**PAMHC**	60	7.97	192.42	45.94	52.641	29.531
43102	**TNMOC**	60	13.44	289.02	60.01	72.895	48.799

In 2015, the Office of Air Quality Monitoring (AQM) of the Department of Environmental Quality (DEQ) operated an Air Toxics Monitoring Network (ATMN). The ATMN consists of three separate monitoring programs. The Urban Air Toxics Monitoring Program (UATM), The National Air Toxics Trend Stations Program (NATTS), and The Community Air Toxics Assessment Monitoring Program (CAMP).

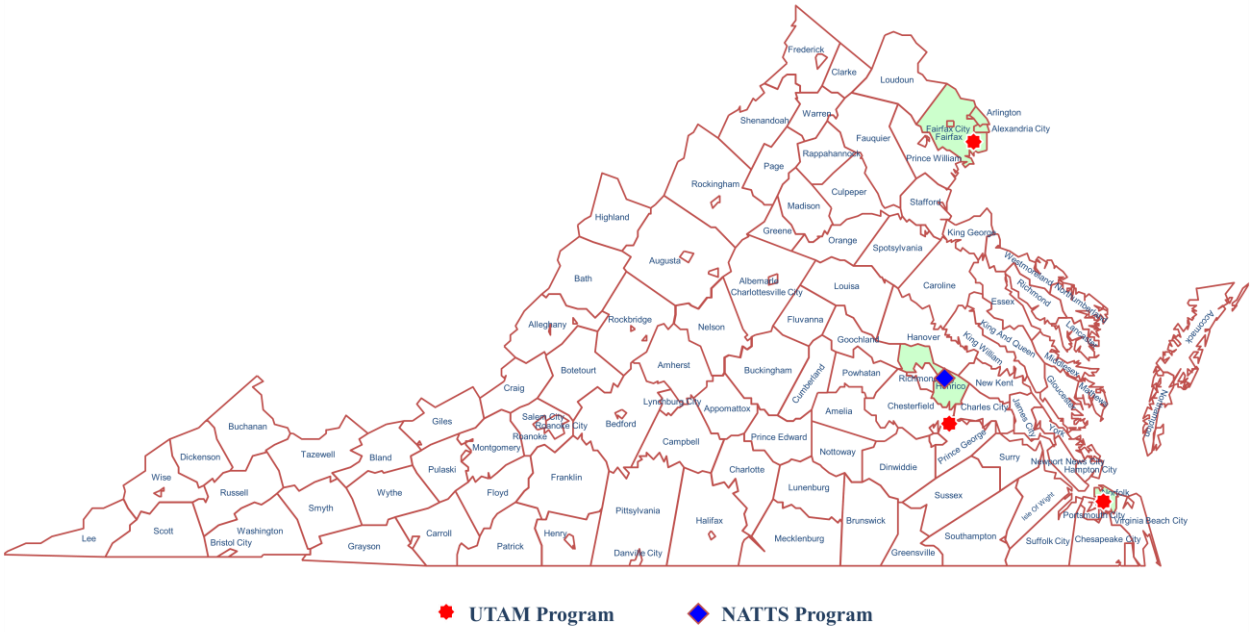
The UATM program consisted of three sites that were located at: the Carter G. Woodson Middle School in Hopewell; DEQ Tidewater Regional Office (TRO) in Virginia Beach; and Lee District Park in Fairfax County. Sampling at these sites consisted of Volatile Organic Compounds (VOC), Carbonyls, and Total Suspended Particulate (TSP) Metals. Each of the UATM sites had a sampling schedule consisting of 24-hour samples collected every 6th day. Data from these sites will be used to characterize air toxics concentrations in the respective urban areas.

AQM used the manual method for collecting ambient air samples for VOC analysis. Whole air samples were collected using evacuated Silco^{T} or SUMMA^{T} canisters and RMESI (RM Environmental Systems, Inc.) air samplers. Samples were analyzed by the Division of Consolidated Laboratory Services (DCLS), the Virginia state laboratory. DCLS used a Gas Chromatograph equipped with a Mass Selective Detector and method TO15. Carbonyls were collected on DNPH (2,4-Dinitrophenylhydrazine) treated sorbent tubes using ATEC 8000 cartridge samplers. Samples taken were analyzed by the DCLS, using a Liquid Chromatographic procedure designated as method TO11A. Metals samples were collected using a high volume Total Suspended Particulate (TSP) sampler and were analyzed by the DCLS. Analysis utilized inductively coupled plasma mass spectrometry (ICP-MS) using method IO-3.1 and IO-3.5.

The NATTS program operated one station located at the MathScience Innovation Center (MSIC) in Henrico County. The NATTS site had a sampling schedule consisting of 24-hour samples collected every 6th day. Data from this site will be evaluated along with data from all of the NATTS sites nationally. AQM used the manual method for collecting ambient air samples for VOC analysis. Whole air samples were collected using evacuated Silco^{T} canisters and RMESI (RM Environmental Systems, Inc.) air samplers. Each sample was analyzed by the DCLS, using a Gas Chromatograph equipped with a Mass Selective Detector, utilizing method TO15. Carbonyls were collected on DNPH (2,4-Dinitrophenylhydrazine) treated sorbent tubes using ATEC 8000 cartridge samplers. Samples were analyzed by DCLS using a Liquid Chromatographic procedure, and the TO11A method. The Metals samples were collected using a high volume 10 micron Particulate Matter (PM10) sampler and analyzed by the DCLS. Analysis utilized Inductively Coupled Plasma Mass Spectrometry (ICP-MS) using method IO-3.1 and IO-3.5.

Air Toxics Monitoring Network

Air Toxics Monitoring Network



Detectable VOC in 24-Hour Canister Samples
GC/MSD - MathScience Innovation Center (NATTS Site), Henrico County, VA
January 1 to December 31, 2015- Concentrations are in ppbV

(non detects are counted as zeros for statistical purposes)

Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
43205	Propylene	60	0.00	1.91	0.00	0.082	0.310
43207	Freon 113	60	0.00	0.13	0.08	0.079	0.015
43208	Freon 114	60	0.00	0.00	0.00	0.000	0.000
43209	Ethyl Acetate	60	0.00	0.68	0.00	0.029	0.117
43218	1,3-Butadiene	60	0.00	0.00	0.00	0.000	0.000
43231	Hexane	60	0.00	0.44	0.11	0.113	0.095
43232	Heptane	60	0.00	0.17	0.04	0.042	0.040
43248	Cyclohexane	60	0.00	0.18	0.00	0.009	0.026
43372	MTBE	60	0.00	0.00	0.00	0.000	0.000
43441	Methyl Methacrylate	60	0.00	0.00	0.00	0.000	0.000
43505	Acrolein	60	0.00	2.38	0.00	0.151	0.408
43702	Acetonitrile	60	0.00	27.10	0.00	3.453	4.865
43704	Acrylonitrile	60	0.00	0.00	0.00	0.000	0.000
43801	Chloromethane	60	0.39	0.87	0.58	0.585	0.074
43802	Dichloromethane	60	0.07	1.71	0.16	0.274	0.302
43803	Chloroform	60	0.00	0.04	0.02	0.020	0.008
43804	Carbon Tetrachloride	60	0.00	0.10	0.08	0.076	0.013
43806	Bromoform (Tribromomethane)	60	0.00	0.00	0.00	0.000	0.000
43811	Trichlorofluoromethane	60	0.20	18.88	0.25	0.570	2.405
43812	Chloroethane	60	0.00	0.00	0.00	0.000	0.000
43813	1,1-Dichloroethane	60	0.00	0.00	0.00	0.000	0.000
43814	Methyl chloroform	60	0.00	0.00	0.00	0.000	0.000
43815	Ethylene dichloride	60	0.00	0.02	0.01	0.009	0.010
43817	Tetrachloroethylene	60	0.00	0.09	0.02	0.019	0.017
43818	1,1,2,2-Tetrachloroethane	60	0.00	0.00	0.00	0.000	0.000
43819	Bromomethane	60	0.00	0.00	0.00	0.000	0.000
43820	1,1,2-Trichloroethane	60	0.00	0.00	0.00	0.000	0.000
43823	Dichlorodifluoromethane	60	0.43	15.12	0.53	0.779	1.884
43824	Trichloroethylene	60	0.00	0.00	0.00	0.000	0.000
43826	1,1-Dichloroethylene	60	0.00	0.00	0.00	0.000	0.000
43828	Bromodichloromethane	60	0.00	0.01	0.00	0.000	0.001
43829	1,2-Dichloropropane	60	0.00	0.05	0.00	0.002	0.008
43830	trans-1,3-Dichlopropylene	60	0.00	0.03	0.00	0.001	0.004
43831	cis-1,3-Dichlopropylene	60	0.00	0.05	0.00	0.001	0.007
43832	Dibromochloromethane	60	0.00	0.00	0.00	0.000	0.000
43838	Trans-1,2-Dichloroethene	60	0.00	0.03	0.00	0.001	0.004
43839	cis-1,2-Dichloroethene	60	0.00	0.00	0.00	0.000	0.000
43843	Ethylene Dibromide	60	0.00	0.00	0.00	0.000	0.000
43844	Hexachlorobutadiene	60	0.00	0.00	0.00	0.000	0.000
43860	Vinyl Chloride	60	0.00	0.00	0.00	0.000	0.000
45109	m/p-Xylene	60	0.00	0.31	0.07	0.081	0.050
45201	Benzene	60	0.00	0.50	0.15	0.164	0.081
45202	Toluene	60	0.04	1.07	0.21	0.254	0.167
45203	Ethylbenzene	60	0.00	0.10	0.04	0.038	0.022
45204	o-Xylene	60	0.00	0.12	0.03	0.033	0.022
45207	1,3,5-Trimethylbenzene	60	0.00	0.04	0.00	0.004	0.008
45208	1,2,4-Trimethylbenzene	60	0.00	0.18	0.00	0.015	0.033
45213	p-Ethyltoluene	60	0.00	0.05	0.00	0.010	0.014
45220	Styrene	60	0.00	0.12	0.03	0.035	0.032
45801	Chlorobenzene	60	0.00	0.00	0.00	0.000	0.000
45805	1,2-Dichlorobenzene	60	0.00	0.02	0.00	0.003	0.006
45806	1,3-Dichlorobenzene	60	0.00	0.02	0.00	0.003	0.006
45807	1,4-Dichlorobenzene	60	0.00	0.04	0.00	0.008	0.012
45810	1,2,4-Trichlorobenzene	60	0.00	0.06	0.00	0.005	0.014
46401	Tetrahydrofuran	60	0.00	0.07	0.00	0.003	0.013

Detectable VOC in 24-Hour Canister Samples
GC/MSD - Carter G. Woodson Middle School (UATM Site), Hopewell, VA
January 1 to December 31, 2015 - Concentrations are in ppbV

(NonDetects are considered zeros for statistical purposes. Results below MDLs and/or Reporting Limits are reported.)

Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
43205	Propylene	59	0.00	3.37	0.00	0.084	0.452
43207	Freon 113	59	0.07	0.17	0.08	0.084	0.017
43208	Freon 114	59	0.00	0.00	0.00	0.000	0.000
43209	Ethyl Acetate	59	0.00	0.28	0.00	0.012	0.043
43218	1,3-Butadiene	59	0.00	0.00	0.00	0.000	0.000
43231	N-Hexane	59	0.00	0.57	0.07	0.093	0.102
43232	N-Heptane	59	0.00	0.63	0.04	0.066	0.104
43248	Cyclohexane	59	0.00	0.08	0.00	0.006	0.015
43372	Methyl Tert-Butyl Ether	59	0.00	0.00	0.00	0.000	0.000
43441	Methyl Methacrylate	59	0.00	0.00	0.00	0.000	0.000
43505	Acrolein	59	0.00	2.98	0.00	0.382	0.647
43702	Acetonitrile	59	0.00	4.42	0.00	1.045	1.306
43704	Acrylonitrile	59	0.00	0.03	0.00	0.001	0.004
43801	Chloromethane	59	0.26	0.77	0.59	0.587	0.078
43802	Dichloromethane	59	0.05	0.16	0.08	0.082	0.019
43803	Chloroform	59	0.00	0.05	0.02	0.023	0.008
43804	Carbon Tetrachloride	59	0.04	0.10	0.07	0.072	0.011
43806	Bromoform	59	0.00	0.00	0.00	0.000	0.000
43811	Trichlorofluoromethane	59	0.00	0.30	0.24	0.242	0.040
43812	Ethyl Chloride	59	0.00	0.00	0.00	0.000	0.000
43813	1,1-Dichloroethane	59	0.00	0.00	0.00	0.000	0.000
43814	Methyl Chloroform	59	0.00	0.01	0.00	0.000	0.001
43815	1,2-Dichloroethane	59	0.00	0.02	0.00	0.009	0.010
43817	Tetrachloroethylene	59	0.00	0.06	0.01	0.013	0.015
43818	1,1,2,2-Tetrachloroethane	59	0.00	0.01	0.00	0.000	0.001
43819	Bromomethane	59	0.00	0.00	0.00	0.000	0.000
43820	1,1,2-Trichloroethane	59	0.00	0.00	0.00	0.000	0.000
43823	Dichlorodifluoromethane	59	0.27	0.64	0.52	0.520	0.052
43824	Trichloroethylene	59	0.00	0.12	0.00	0.002	0.016
43826	1,1-Dichloroethene	59	0.00	0.00	0.00	0.000	0.000
43828	Bromodichloromethane	59	0.00	0.00	0.00	0.000	0.000
43829	1,2-Dichloropropane	59	0.00	0.04	0.00	0.002	0.007
43830	trans-1,3-Dichloropropylene	59	0.00	0.03	0.00	0.001	0.004
43831	Cis-1,3-Dichloropropylene	59	0.00	0.04	0.00	0.001	0.006
43832	Dibromochloromethane	59	0.00	0.00	0.00	0.000	0.000
43838	trans-1,2-Dichloroethene	59	0.00	0.00	0.00	0.000	0.000
43839	cis-1,2-Dichloroethene	59	0.00	0.00	0.00	0.000	0.000
43843	1,2-Dibromoethane	59	0.00	0.00	0.00	0.000	0.000
43844	Hexachloro-1,3-Butadiene	59	0.00	0.02	0.00	0.000	0.003
43860	Vinyl Chloride	59	0.00	0.00	0.00	0.000	0.000
45109	m & p- Xylene	59	0.02	0.44	0.07	0.090	0.073
45201	Benzene	59	0.05	0.73	0.14	0.166	0.103
45202	Toluene	59	0.05	1.23	0.14	0.206	0.178
45203	Ethylbenzene	59	0.00	0.13	0.02	0.029	0.023
45204	o-Xylene	59	0.00	0.17	0.03	0.038	0.028
45207	1,3,5-Trimethylbenzene	59	0.00	0.05	0.00	0.005	0.011
45208	1,2,4-Trimethylbenzene	59	0.00	0.23	0.00	0.018	0.045
45213	4-Ethyltoluene	59	0.00	0.20	0.00	0.014	0.032
45220	Styrene	59	0.00	0.68	0.02	0.036	0.092
45801	Chlorobenzene	59	0.00	0.04	0.00	0.001	0.005
45805	1,2-Dichlorobenzene	59	0.00	0.12	0.00	0.005	0.017
45806	1,3-Dichlorobenzene	59	0.00	0.14	0.00	0.006	0.020
45807	1,4-Dichlorobenzene	59	0.00	0.19	0.00	0.012	0.031
45810	1,2,4-Trichlorobenzene	59	0.00	0.34	0.00	0.012	0.046
46401	Tetrahydrofuran	59	0.00	0.06	0.00	0.001	0.008

Detectable VOC in 24-Hour Canister Samples
GC/MSD - Tidewater Regional Office (UATM Site), Va. Beach, VA
January 1 to December 31, 2015 – Concentrations are in ppbV

(NonDetects are considered zeros for statistical purposes. Results below MDLs and/or Reporting Limits are reported.)

Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
43205	Propylene	57	0.00	2.46	0.00	0.095	0.351
43207	Freon 113	57	0.06	0.09	0.08	0.077	0.007
43208	Freon 114	57	0.00	0.00	0.00	0.000	0.000
43209	Ethyl Acetate	57	0.00	0.15	0.00	0.014	0.036
43218	1,3-Butadiene	57	0.00	0.00	0.00	0.000	0.000
43231	N-Hexane	57	0.00	0.38	0.10	0.107	0.077
43232	N-Heptane	57	0.00	0.15	0.04	0.044	0.039
43248	Cyclohexane	57	0.00	0.07	0.00	0.012	0.016
43372	Methyl Tert-Butyl Ether	57	0.00	0.00	0.00	0.000	0.000
43441	Methyl Methacrylate	57	0.00	0.00	0.00	0.000	0.000
43505	Acrolein	57	0.00	3.21	0.00	0.626	0.909
43702	Acetonitrile	57	0.00	4.23	0.00	0.349	0.894
43704	Acrylonitrile	57	0.00	0.00	0.00	0.000	0.000
43801	Chloromethane	57	0.45	0.77	0.62	0.624	0.073
43802	Dichloromethane	57	0.06	0.16	0.09	0.088	0.019
43803	Chloroform	57	0.00	0.05	0.02	0.023	0.011
43804	Carbon Tetrachloride	57	0.03	0.10	0.07	0.068	0.016
43806	Bromoform	57	0.00	0.00	0.00	0.000	0.000
43811	Trichlorofluoromethane	57	0.00	0.31	0.24	0.243	0.040
43812	Ethyl Chloride	57	0.00	0.00	0.00	0.000	0.000
43813	1,1-Dichloroethane	57	0.00	0.00	0.00	0.000	0.000
43814	Methyl Chloroform	57	0.00	0.00	0.00	0.000	0.000
43815	1,2-Dichloroethane	57	0.00	0.02	0.00	0.009	0.010
43817	Tetrachloroethylene	57	0.00	1.37	0.05	0.150	0.242
43818	1,1,2,2-Tetrachloroethane	57	0.00	0.01	0.00	0.000	0.001
43819	Bromomethane	57	0.00	0.00	0.00	0.000	0.000
43820	1,1,2-Trichloroethane	57	0.00	0.00	0.00	0.000	0.000
43823	Dichlorodifluoromethane	57	0.44	0.67	0.52	0.534	0.051
43824	Trichloroethylene	57	0.00	0.02	0.00	0.001	0.004
43826	1,1-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43828	Bromodichloromethane	57	0.00	0.00	0.00	0.000	0.000
43829	1,2-Dichloropropane	57	0.00	0.02	0.00	0.000	0.003
43830	trans-1,3-Dichloropropylene	57	0.00	0.00	0.00	0.000	0.000
43831	Cis-1,3-Dichloropropylene	57	0.00	0.00	0.00	0.000	0.000
43832	Dibromochloromethane	57	0.00	0.00	0.00	0.000	0.000
43838	trans-1,2-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43839	cis-1,2-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43843	1,2-Dibromoethane	57	0.00	0.01	0.00	0.000	0.001
43844	Hexachloro-1,3-Butadiene	57	0.00	0.03	0.00	0.001	0.004
43860	Vinyl Chloride	57	0.00	0.00	0.00	0.000	0.000
45109	m & p- Xylene	57	0.02	0.25	0.07	0.083	0.051
45201	Benzene	57	0.06	0.72	0.14	0.165	0.104
45202	Toluene	57	0.05	0.97	0.18	0.216	0.151
45203	Ethylbenzene	57	0.00	0.07	0.02	0.027	0.018
45204	o-Xylene	57	0.00	0.10	0.03	0.034	0.019
45207	1,3,5-Trimethylbenzene	57	0.00	0.04	0.00	0.006	0.009
45208	1,2,4-Trimethylbenzene	57	0.00	0.11	0.00	0.010	0.020
45213	4-Ethyltoluene	57	0.00	0.10	0.00	0.015	0.022
45220	Styrene	57	0.00	0.30	0.02	0.033	0.059
45801	Chlorobenzene	57	0.00	0.08	0.00	0.003	0.013
45805	1,2-Dichlorobenzene	57	0.00	0.09	0.00	0.005	0.014
45806	1,3-Dichlorobenzene	57	0.00	0.10	0.00	0.006	0.016
45807	1,4-Dichlorobenzene	57	0.00	0.13	0.00	0.010	0.022
45810	1,2,4-Trichlorobenzene	57	0.00	0.11	0.00	0.007	0.021
46401	Tetrahydrofuran	57	0.00	0.00	0.00	0.000	0.000

Detectable VOC in 24-Hour Canister Samples
GC/MSD - Lee District Park (UATM Site), Fairfax County, VA
January 1 to December 31, 2015 - Concentrations are in ppbV

(NonDetects are considered zeros for statistical purposes. Results below MDLs and/or Reporting Limits are reported.)

Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
43205	Propylene	57	0.00	1.18	0.00	0.090	0.261
43207	Freon 113	57	0.06	0.09	0.08	0.076	0.007
43208	Freon 114	57	0.00	0.00	0.00	0.000	0.000
43209	Ethyl Acetate	57	0.00	0.58	0.00	0.022	0.108
43218	1,3-Butadiene	57	0.00	0.00	0.00	0.000	0.000
43231	N-Hexane	57	0.00	0.41	0.07	0.081	0.080
43232	N-Heptane	57	0.00	0.17	0.00	0.028	0.040
43248	Cyclohexane	57	0.00	0.04	0.00	0.003	0.009
43372	Methyl Tert-Butyl Ether	57	0.00	0.00	0.00	0.000	0.000
43441	Methyl Methacrylate	57	0.00	0.00	0.00	0.000	0.000
43505	Acrolein	57	0.00	5.45	0.00	0.648	1.068
43702	Acetonitrile	57	0.00	1.60	0.00	0.080	0.252
43704	Acrylonitrile	57	0.00	0.00	0.00	0.000	0.000
43801	Chloromethane	57	0.38	0.77	0.57	0.584	0.077
43802	Dichloromethane	57	0.06	0.39	0.09	0.101	0.052
43803	Chloroform	57	0.00	0.06	0.02	0.022	0.013
43804	Carbon Tetrachloride	57	0.02	0.11	0.07	0.070	0.017
43806	Bromoform	57	0.00	0.00	0.00	0.000	0.000
43811	Trichlorofluoromethane	57	0.19	0.31	0.24	0.246	0.025
43812	Ethyl Chloride	57	0.00	0.00	0.00	0.000	0.000
43813	1,1-Dichloroethane	57	0.00	0.00	0.00	0.000	0.000
43814	Methyl Chloroform	57	0.00	0.00	0.00	0.000	0.000
43815	1,2-Dichloroethane	57	0.00	0.02	0.01	0.009	0.010
43817	Tetrachloroethylene	57	0.00	0.10	0.02	0.019	0.018
43818	1,1,2,2-Tetrachloroethane	57	0.00	0.00	0.00	0.000	0.000
43819	Bromomethane	57	0.00	0.00	0.00	0.000	0.000
43820	1,1,2-Trichloroethane	57	0.00	0.02	0.00	0.000	0.003
43823	Dichlorodifluoromethane	57	0.44	0.65	0.52	0.526	0.048
43824	Trichloroethylene	57	0.00	0.04	0.00	0.002	0.009
43826	1,1-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43828	Bromodichloromethane	57	0.00	0.00	0.00	0.000	0.000
43829	1,2-Dichloropropane	57	0.00	0.03	0.00	0.001	0.006
43830	trans-1,3-Dichloropropylene	57	0.00	0.00	0.00	0.000	0.000
43831	Cis-1,3-Dichloropropylene	57	0.00	0.00	0.00	0.000	0.000
43832	Dibromochloromethane	57	0.00	0.00	0.00	0.000	0.000
43838	trans-1,2-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43839	cis-1,2-Dichloroethene	57	0.00	0.00	0.00	0.000	0.000
43843	1,2-Dibromoethane	57	0.00	0.03	0.00	0.001	0.004
43844	Hexachloro-1,3-Butadiene	57	0.00	0.00	0.00	0.000	0.000
43860	Vinyl Chloride	57	0.00	0.00	0.00	0.000	0.000
45109	m & p- Xylene	57	0.01	0.26	0.05	0.058	0.039
45201	Benzene	57	0.04	0.31	0.13	0.143	0.059
45202	Toluene	57	0.05	0.62	0.13	0.155	0.098
45203	Ethylbenzene	57	0.00	0.08	0.02	0.020	0.015
45204	o-Xylene	57	0.00	0.11	0.02	0.022	0.019
45207	1,3,5-Trimethylbenzene	57	0.00	0.03	0.00	0.001	0.005
45208	1,2,4-Trimethylbenzene	57	0.00	0.13	0.00	0.008	0.020
45213	4-Ethyltoluene	57	0.00	0.07	0.00	0.008	0.014
45220	Styrene	57	0.00	0.25	0.00	0.023	0.044
45801	Chlorobenzene	57	0.00	0.05	0.00	0.001	0.007
45805	1,2-Dichlorobenzene	57	0.00	0.11	0.00	0.005	0.016
45806	1,3-Dichlorobenzene	57	0.00	0.15	0.00	0.006	0.021
45807	1,4-Dichlorobenzene	57	0.00	0.19	0.00	0.011	0.029
45810	1,2,4-Trichlorobenzene	57	0.00	0.16	0.00	0.007	0.025
46401	Tetrahydrofuran	57	0.00	0.06	0.00	0.002	0.011

24 Hour Carbonyl Sampling 2015 Summary Statistical Analysis

Concentrations are in ug/m^3

(non detects are counted as zeros for statistical purposes)

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Carter G. Woodson Middle School	43502	Formaldehyde	59	0.72	7.48	2.09	2.422	1.101
	43503	Acetaldehyde	59	0.51	3.12	1.38	1.373	0.471
	43504	Propionaldehyde	59	0.00	0.62	0.00	0.036	0.134
	43551	Acetone	59	0.71	12.10	3.73	4.066	2.155
	43552	Methyl Ethyl Ketone	59	0.00	0.78	0.48	0.407	0.268
	43560	Methyl Isobutyl Ketone	59	0.00	0.00	0.00	0.000	0.000

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Tidewater Regional Office	43502	Formaldehyde	57	0.56	5.73	1.61	1.743	0.807
	43503	Acetaldehyde	57	0.49	2.06	0.96	1.020	0.343
	43504	Propionaldehyde	57	0.00	0.56	0.00	0.043	0.143
	43551	Acetone	57	0.42	5.72	2.20	2.430	1.422
	43552	Methyl Ethyl Ketone	57	0.00	0.80	0.00	0.250	0.279
	43560	Methyl Isobutyl Ketone	57	0.00	0.00	0.00	0.000	0.000

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Lee Park	43502	Formaldehyde	58	0.54	4.80	1.98	2.234	1.001
	43503	Acetaldehyde	58	0.49	1.99	1.27	1.244	0.372
	43504	Propionaldehyde	58	0.00	0.60	0.00	0.095	0.201
	43551	Acetone	58	1.43	7.29	3.34	3.723	1.430
	43552	Methyl Ethyl Ketone	58	0.00	1.08	0.54	0.482	0.285
	43560	Methyl Isobutyl Ketone	58	0.00	0.00	0.00	0.000	0.000

NATTS Carbonyl Sampling 2015 Summary Statistical Analysis

Concentrations are in ug/m^3

(non detects are counted as zeros for statistical purposes)

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
MathScience Innovation Center	43502	Formaldehyde	59	0.56	8.63	2.47	2.89	1.60
	43503	Acetaldehyde	59	0.40	2.71	1.48	1.44	0.47
	43504	Propionaldehyde	59	0.00	0.90	0.00	0.15	0.27
	43551	Acetone	59	1.40	7.85	3.94	4.13	1.56
	43552	Methyl Ethyl Ketone	59	0.00	1.02	0.62	0.59	0.23
	43560	Methyl Isobutyl Ketone	59	0.00	0.00	0.00	0.00	0.00

TSP Metals Sampling 2015 Summary Statistical Analysis

Concentrations are in ng/m^3

(non detects are counted as zeros for statistical purposes)

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Carter G. Woodson Middle School	12103	Arsenic	60	0.05	3.87	0.74	0.857	0.629
	12105	Beryllium	60	0.00	0.04	0.00	0.002	0.005
	12110	Cadmium	60	0.00	0.43	0.09	0.102	0.073
	12112	Chromium	60	1.13	3.75	1.88	1.949	0.515
	12128	Lead	60	0.28	5.28	2.32	2.389	1.074
	12132	Manganese	60	0.76	25.54	6.94	8.460	5.674
	12136	Nickel	60	0.30	2.78	0.71	0.857	0.505

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Tidewater Regional Office	12103	Arsenic	53	0.16	5.62	0.79	1.091	0.941
	12105	Beryllium	53	0.00	0.02	0.00	0.002	0.004
	12110	Cadmium	53	0.00	0.25	0.04	0.043	0.046
	12112	Chromium	53	1.15	2.33	1.66	1.710	0.293
	12128	Lead	53	0.54	5.20	1.82	1.988	0.976
	12132	Manganese	53	0.80	18.30	4.54	5.584	3.877
	12136	Nickel	53	0.33	2.72	0.72	0.782	0.397

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
Lee Park	12103	Arsenic	60	0.12	3.32	0.68	0.844	0.546
	12105	Beryllium	60	0.00	0.03	0.00	0.002	0.004
	12110	Cadmium	60	0.00	0.19	0.06	0.065	0.039
	12112	Chromium	60	1.12	4.83	1.76	1.887	0.586
	12128	Lead	60	0.44	8.14	1.97	2.282	1.236
	12132	Manganese	60	1.33	35.72	5.00	6.461	5.191
	12136	Nickel	60	0.34	1.53	0.70	0.736	0.252

NATTS PM10 Metals Sampling 2015 Summary Statistical Analysis

Concentrations are in ng/m^3

(non detects and negative values are counted as zeros for statistical purposes)

Site	Parameter	Compound Name	Num	Minimum	Maximum	Median	Average	StDev
MathScience Innovation Center	82103	Arsenic	59	0.08	3.49	0.69	0.836	0.574
	82105	Beryllium	59	0.00	0.02	0.00	0.001	0.003
	82110	Cadmium	59	0.00	2.07	0.05	0.094	0.264
	82112	Chromium	59	1.36	4.49	1.80	1.831	0.411
	82128	Lead	59	0.28	7.70	2.08	2.260	1.356
	82132	Manganese	59	0.18	18.70	2.38	2.800	2.508
	82136	Nickel	59	0.28	1.48	0.59	0.616	0.233

AQI (Air Quality Index)

What is the AQI?

The air quality index (AQI) is a measurement designed to indicate how clean the air is in an area, and it also provides information about health effects associated with air pollution. The index is reported daily, or in some cases continuously, and calculated from measured concentrations of five major pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. EPA has established national ambient air quality standards (NAAQS) for each of these pollutants to protect public health, and the index is derived from the NAAQS. State and local agencies are required to report the AQI in areas where the population is 350,000 or more, although it is often reported in additional areas as a public service.

How does the AQI work?

The AQI range is from 0 to 500, with the low numbers representing good air quality and the high numbers indicating unhealthy or even hazardous air quality. The index is divided into six categories with coordinating color codes. In addition, each category has a health-related message associated with it, to inform the public of possible health effects that may arise as a result of breathing polluted air.

Generally, an index of 100 corresponds to the national air quality standard for the pollutant, which is the level that EPA has established to protect public health. Levels below 100 are considered satisfactory, while numbers above 100 are considered unhealthy, first for sensitive groups, and then for the general public as the index value increases.

How is the AQI calculated?

The AQI is calculated from air pollution measurements collected at monitoring sites across the country. The reporting agency must calculate an index for each pollutant from the measured concentrations at all monitoring sites in an area using a standard formula developed by EPA. The pollutant with the highest index is reported as the "primary pollutant", and the highest index is reported as the AQI for the area. If the AQI is above 100, then the agency must report which groups may be sensitive to the primary pollutant. If two or more pollutants have indexes above 100, then the agency must report all groups that may be affected by those pollutants.

How do I find the AQI for my area?

DEQ reports the air quality index for Roanoke, Winchester, Richmond, Hampton Roads, and Northern Virginia on the internet at http://vadeq.tx.sutron.com. Air quality forecasts and current air quality data can be obtained at the DEQ site, as well as links to other air quality websites. EPA also reports air quality conditions for the United States at www.airnow.gov.

In addition to the internet, current and forecasted AQI levels are broadcast on local television and radio weather reports in many areas, as well as printed in newspapers. By reaching out to the public using these different media, individuals can plan their activities to reduce exposure during episodes of poor air quality, and they can also take steps to reduce pollution.

For detailed information about the AQI, and on health effects of the pollutants that are included in the AQI, visit www.airnow.gov.

Air Quality Index (0-500)	Levels of Health Concern	Meaning
(0-50)	Good	Air quality is considered satisfactory, and air pollution poses little or no risk.
(51-100)	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
(101-150)	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
(151-200)	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
(201-300)	Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.
(301-500)	Hazardous	Health alert: everyone may experience more serious health effects.

Note: Values above 500 are considered Beyond the AQI. Follow recommendations for the "Hazardous category." Additional information on reducing exposure to extremely high levels of particle pollution is available "here"

How OZONE IS FORMED

NOx + VOCs + Heat & Sunlight = Ozone

Ground level or "bad" ozone is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (N0x) and volatile organic compounds (VOCs) in the presence of heat and sunlight.

Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors and chemical solvents are some of the major sources of NOx and VOCs.

For more information, please visit these sites:
www.airnow.gov/index.cfm?action=resources.whatyoucando

Key Facts to Know About Ozone:

- Ozone in the air we breathe can cause serious health problems, including breathing difficulty, asthma attacks, lung damage, and early death.
- Ozone forms in the sun, usually on hot summer days. Ozone is worse in the afternoon and early evening, so plan outdoor activities for the morning.
- You can reduce your exposure to ozone and still get exercise! Use the Air Quality Index (AQI) at www.airnow.gov to plan your activity.

What is ozone?

Ozone is a colorless gas that can be good or bad, depending on where it is. Ozone in the stratosphere is good because it shields the earth from the sun's ultraviolet rays. Ozone at ground level, where we breathe, is bad because it can harm human health.

Ozone forms when two types of pollutants (VOCs and NOx) react in sunlight. These pollutants come from sources such as vehicles, industries, power plants, and products such as solvents and paints.

Why is ozone a problem?

Ozone can cause a number of health problems, including coughing, breathing difficulty, and lung damage. Exposure to ozone can make the lungs more susceptible to infection, aggravate lung diseases, increase the frequency of asthma attacks, and increase the risk of early death from heart or lung disease.

Do I need to be concerned?

Even healthy adults can experience ozone's harmful effects, but **some people may be at greater risk.** They include:

- People with lung disease such as asthma
- Children, including teenagers, because their lungs are still developing and they breathe more air per pound of body weight than adults
- Older adults
- People who are active outdoors, including outdoor workers

How can I protect myself?

Use the Air Quality Index (AQI) to plan outdoor activities. To keep the AQI handy, sign up for EnviroFlash emails, get the free AirNow app, or install the free widget on your website. Find all of these tools at www.airnow.gov.

Stay healthy: exercise, eat a balanced diet, and keep asthma under control with your asthma action plan.

When you see that the AQI is unhealthy, take simple steps to reduce your exposure:

- Choose a less-strenuous activity
- Take more breaks during outdoor activity
- Reschedule activities to the morning or to another day
- Move your activity inside where ozone levels are usually lower

Can I help reduce ozone?

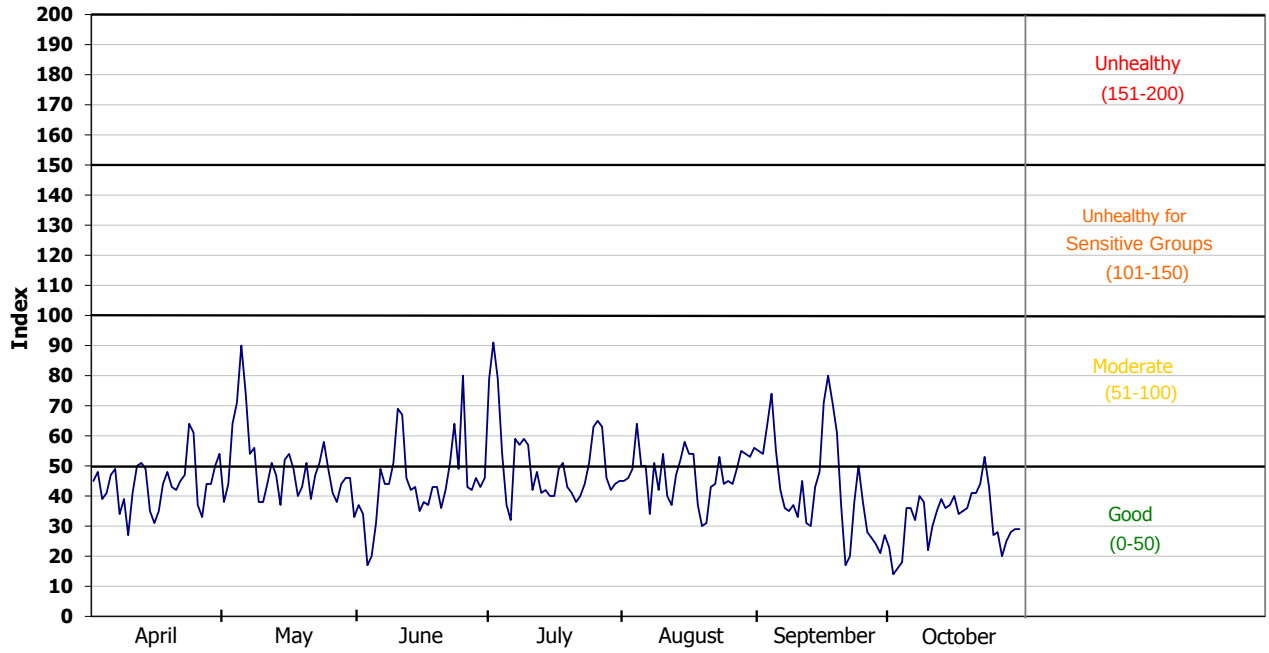
Yes! Here are a few tips.

- Turn off lights you are not using
- Drive less: carpool, use public transportation, bike or walk
- Keep your engine tuned, and don't let your engine idle
- When refueling: stop when the pump shuts off, avoid spilling fuel, and tighten your gas cap
- Inflate tires to the recommended pressure
- Use low-VOC paint and cleaning products, and seal and store them so they can't evaporate
- Watch for Air Quality Action Days in your area

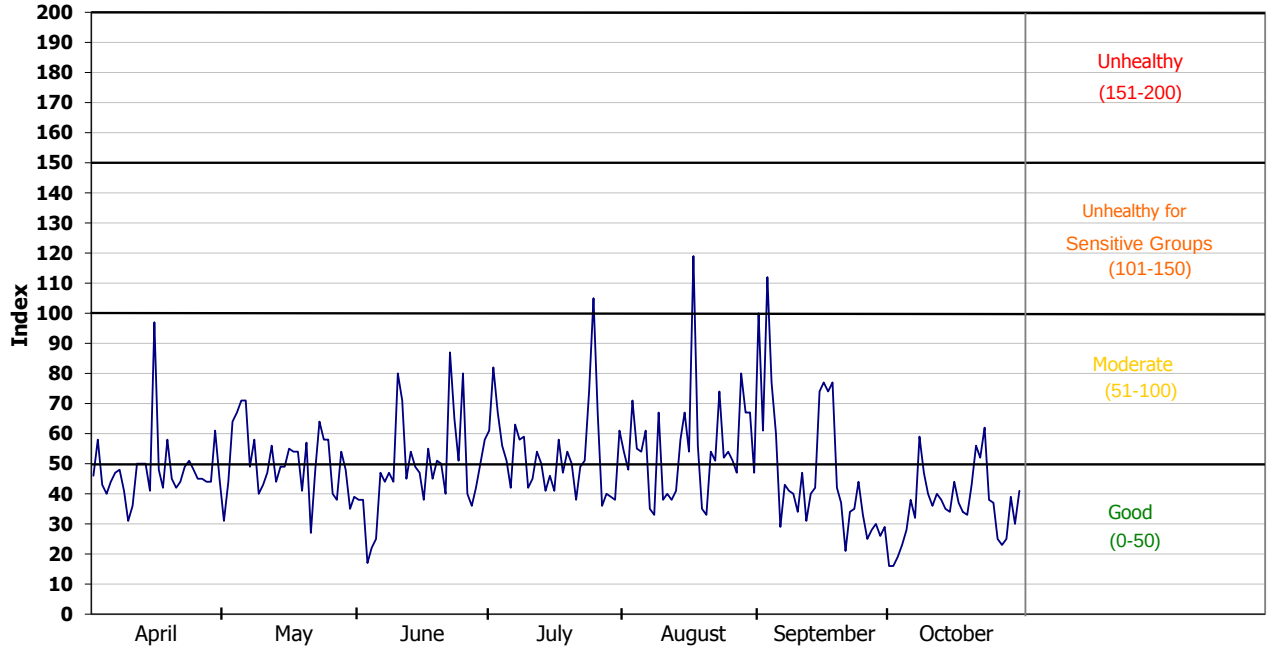
EPA United States Environmental Protection Agency

Office of Air Quality and Radiation EPA-456/F-15-002 www.airnow.gov

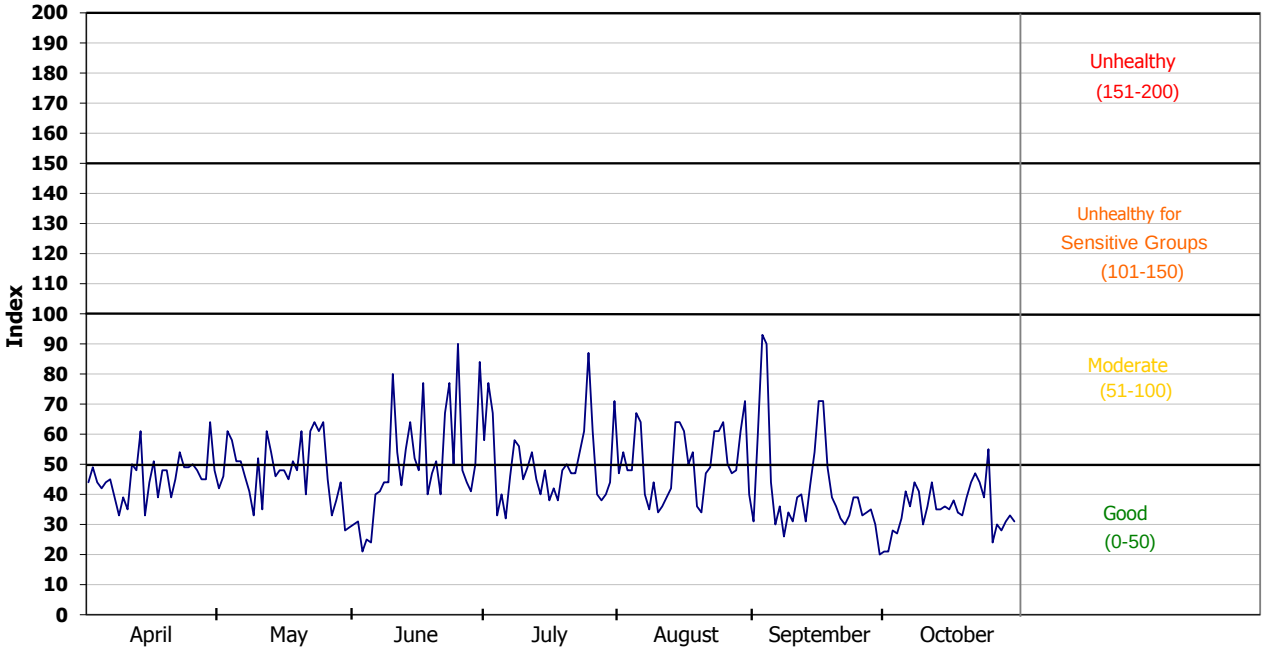
Ozone Air Quality Index
Roanoke Area
2015



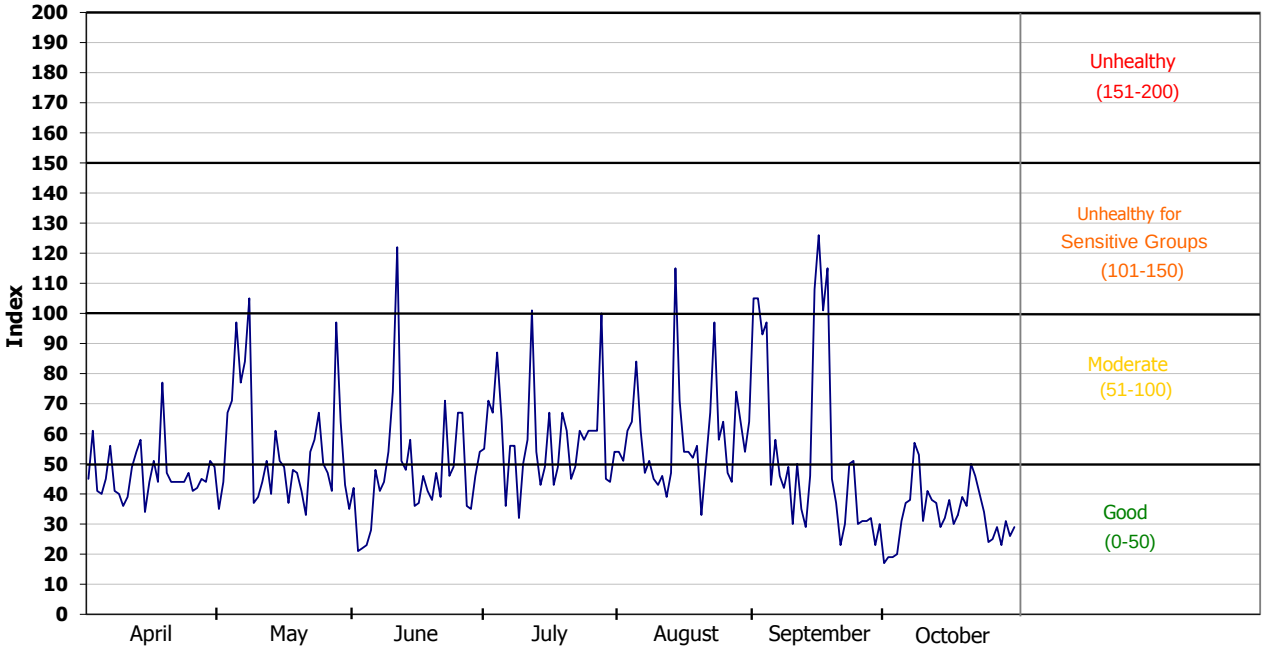
Ozone Air Quality Index
Richmond - Petersburg Areas
2015



Ozone Air Quality Index
Norfolk - Virginia Beach - Newport News Areas
2015



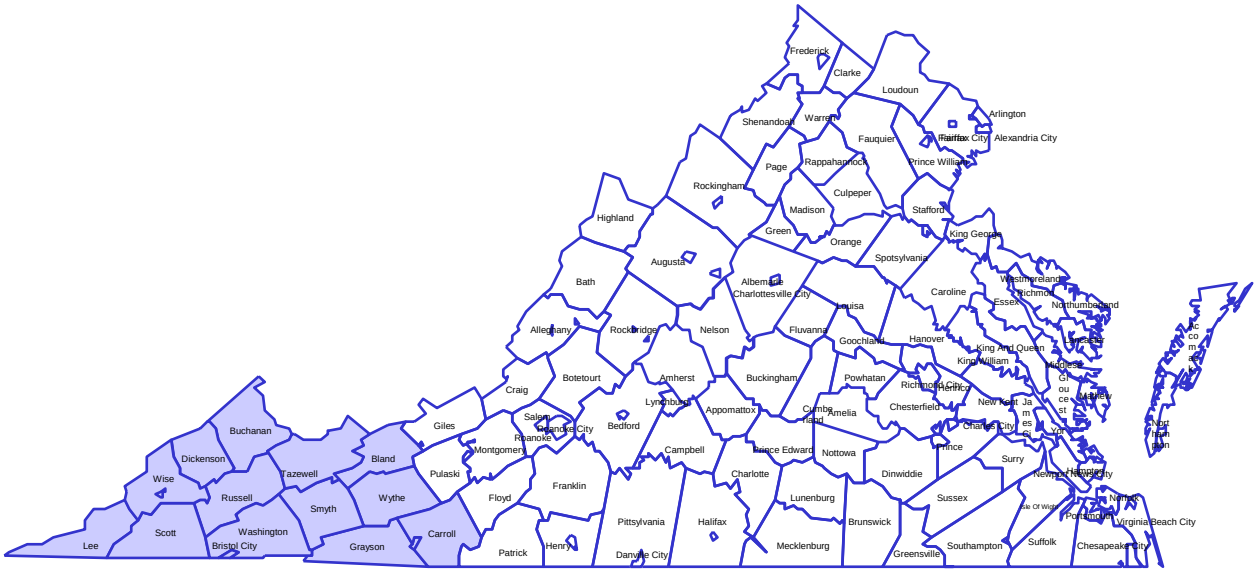
Ozone Air Quality Index
Washington, DC Area
2015



Appendix A

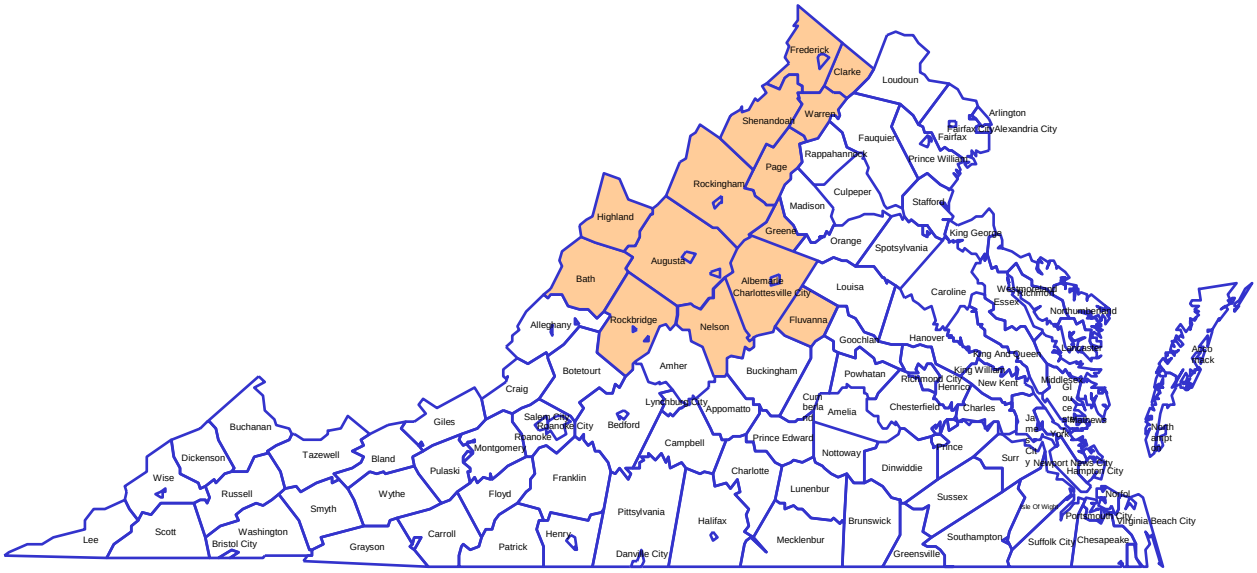
Abbreviation Table

AQM	Air Quality Monitoring
AQCR	Air Quality Control Region
ATMN	Air Toxics Monitoring Network
Avg.	Average
CAMP	Community Air Toxics Assessment Monitoring Program
CASTNET	Clean Air Status and Trends Network
CO	Carbon Monoxide
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
IMPROVE	Interagency Monitoring of Protected Visual Environments
LAT	Latitude
LC	Local Conditions
LONG	Longitude
MARAMA	Mid-Atlantic Regional Air Management Association
MET.	Meteorological Instrumentation
MSA	Metropolitan Statistical Area
NA	Not Available
NAMS	National Air Monitoring Stations
NATTS	National Air Toxics Trend Stations
NMOC	Non-Methane Organic Compounds
NO_2	Nitrogen Dioxide
NUM	Number of Samples
O_3	Ozone
PAMHC	Total PAMS Hydrocarbon
PAMS	Photochemical Assessment Monitoring Station
PM_{10}	Particulate Matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter less than or equal to 2.5 microns
POLLUT.	Pollutant
ppbC	Part Per Billion of Carbon
ppbv	Part Per Billion by volume
ppm	Part Per Million
SESARM	Southeastern States Air Resource Managers, Inc.
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
STD	Standard
STDEV	Standard Deviation
TEOM	Tapered Element Oscillating Microbalance (a method for continuously measuring $PM_{2.5}$ in ambient air)
TNMOC	Total Nonmethane Organic Compound
UATM	Urban Air Toxics Monitoring Program
ug/m^3	Micrograms per cubic meter
VOC	Volatile Organic Compounds



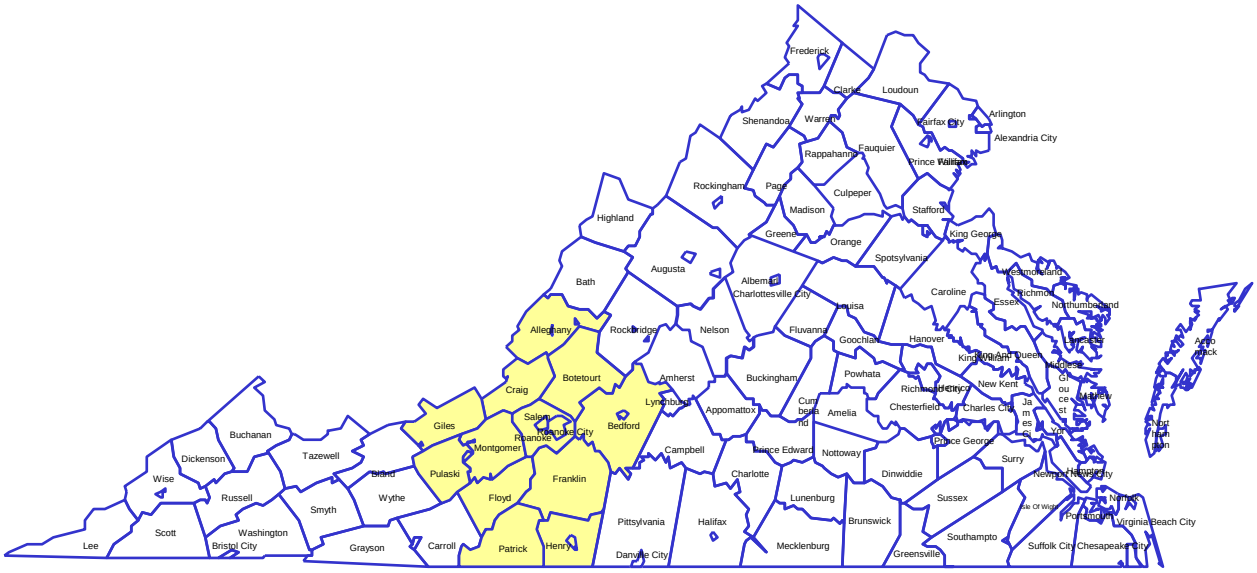
STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
16-B	O_3	Sewage Disposal Plant	51-197-0002	Rural Retreat Wythe Co.	36.89117 -81.25423
23-A	PM_{10}	Gladeville Elementary School	51-035-0001	Galax Carroll Co.	36.70067 -80.87978
101-E	$PM_{2.5}$	Highland View Elementary School	51-520-0006	Bristol	36.60800 -82.16410

Contact Information for this Region:
Southwest Regional Office
Allen Newman, Director
355-A Deadmore Street
Abingdon, VA 24210
(276) 676-4800



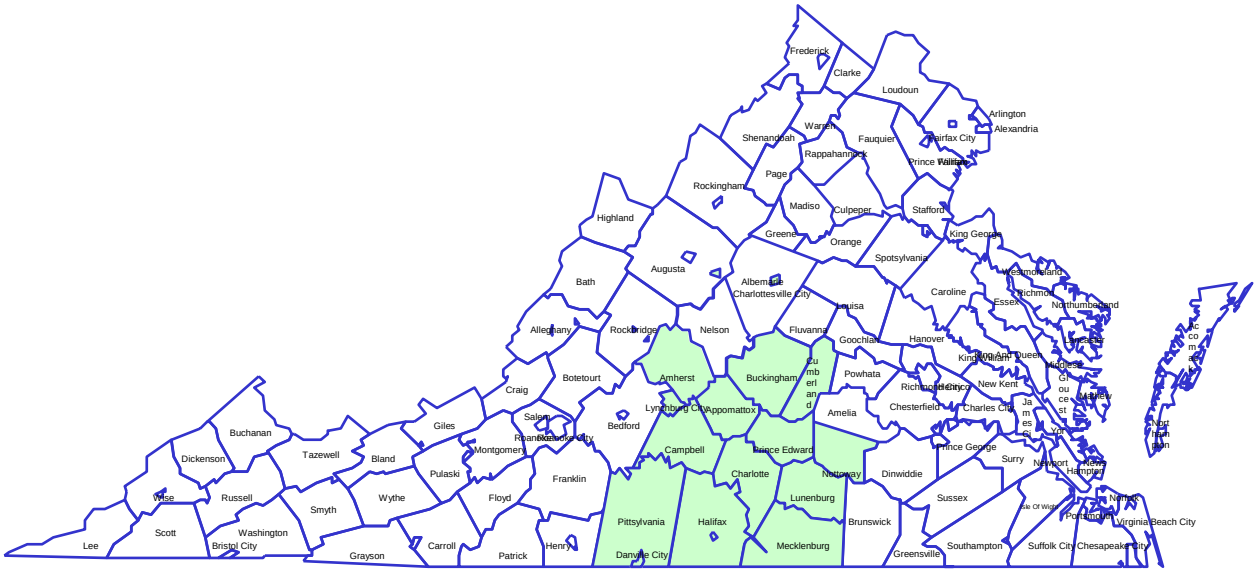
STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
21-C	O_3, IMPROVE	Natural Bridge Ranger Station	51-163-0003	Rockbridge Co.	37.62668 -79.51257
26-F	$PM_{2.5}$, SO_2, NO_2,O_3	Rockingham VDOT	51-165-0003	Harrisonburg Rockingham Co.	38.47753 -78.81952
28-J	O_3, $PM_{2.5}$, TEOM	Woodbine Road Lester Building Systems	51-069-0010	Rest Frederick Co.	39.28102 -78.08157
29-D	O_3, $PM_{2.5}$	Luray Caverns Airport	51-139-0004	Page Co.	38.66373 -78.50442
33-A	O_3, $PM_{2.5}$, TEOM	Albemarle High School	51-003-0001	Albemarle Co.	38.07657 -78.50397
134-C	PM_{10}	Winchester Courts Building	51-840-0002	Winchester	39.18397 -78.16308

Contact information for this Region:
Valley Regional Office
Amy T. Owens, Director
P.O. Box 3000
4411 Early Road
Harrisonburg, VA 22801
(540) 574-7808



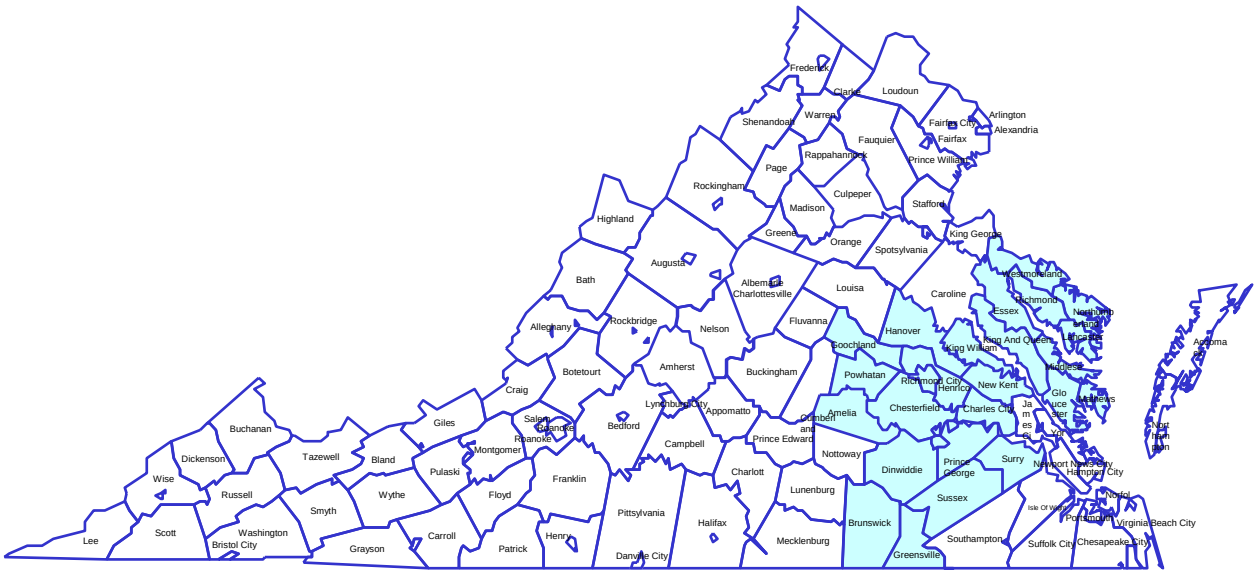
STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
19-A6	CO,SO_2, NO_2, O_3, $PM_{2.5}$, TEOM	East Vinton Elementary School Ruddell Road	51-161-1004	Vinton Roanoke Co.	37.28342 -79.88452
109-N	Lead	Mario Industries	51-770-0016	Roanoke	37.27494 -79.98567
110-C	$PM_{2.5}$	Salem High School	51-775-0011	Salem	37.29788 -80.08102

Contact information for this Region:
Blue Ridge Regional Office
Robert Weld, Director
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6870



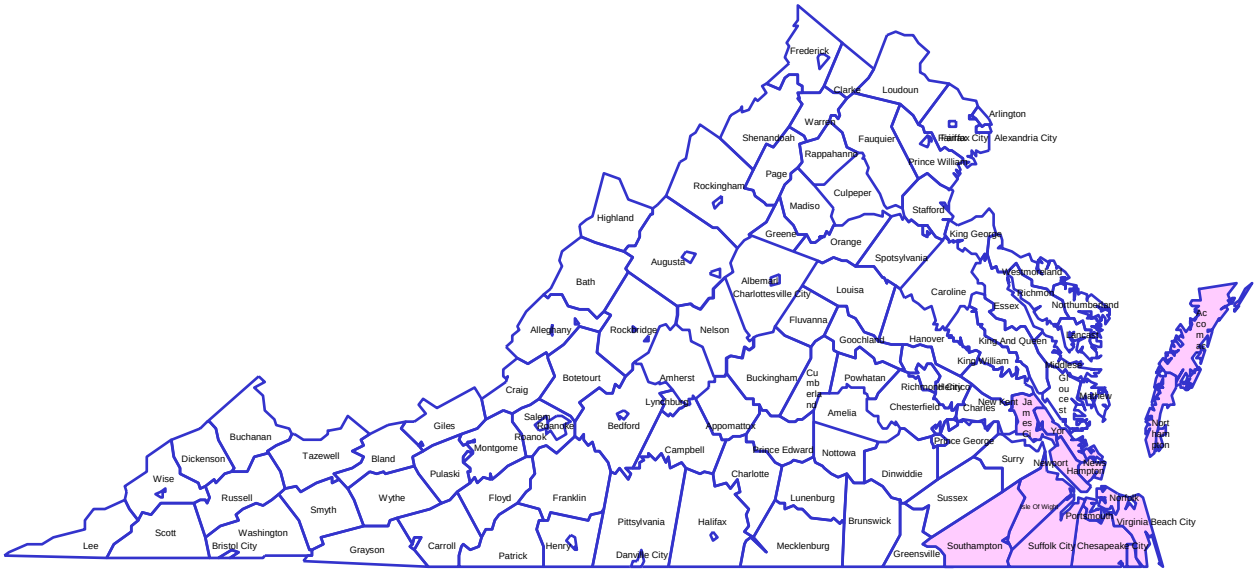
STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
155-Q	$PM_{2.5}$	Leesville Hwy. & Greystone Dr.	51-680-0015	Lynchburg	37.33175 -79.21478
53-G	Lead	Central Virginia Training Center	51-009-0007	Madison Heights, Amherst County	37.41222 -79.11623

Contact information for this Region:
South Central Regional Office
Robert Weld, Director
7705 Timberlake Road
Lynchburg, VA 24502
(434) 582-5120



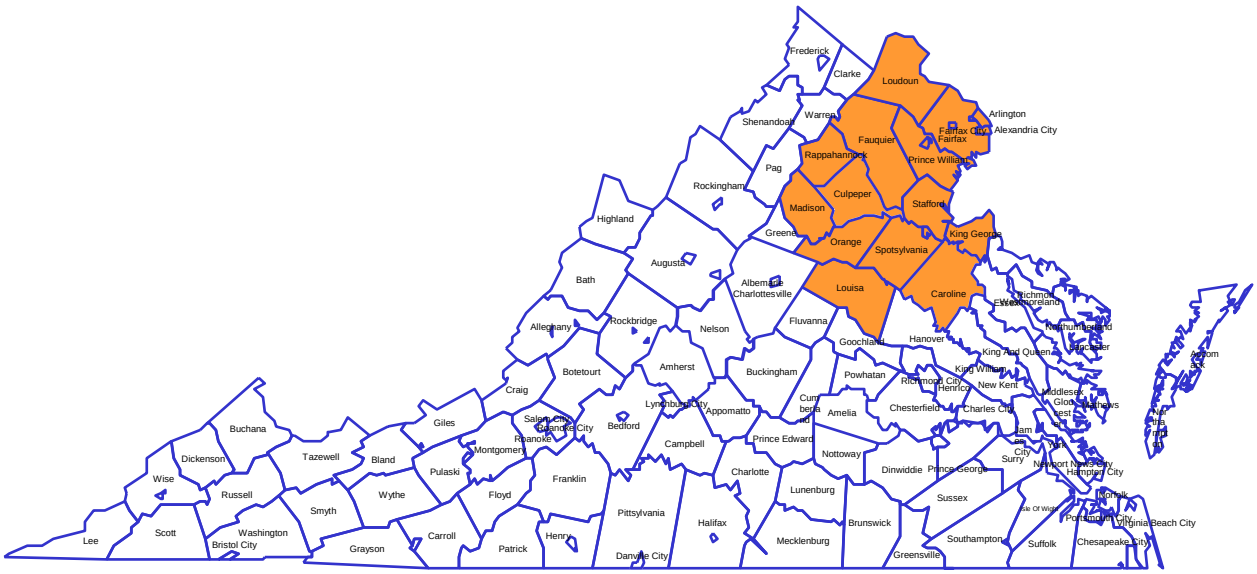
STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
71-D	$PM_{2.5}$	Bensley Armory	51-041-0003	Chesterfield Co.	37.43467 -77.45118
71-H	O_3	Beach Road Highway Shop	51-041-0004	Chesterfield Co.	37.35748 -77.59355
72-M	O_3, VOC, $PM_{2.5}$, TEOM, Speciation, Toxics, Lead, Met, NCore, NATTS, PAMS	MathScience Innovation Center 2401 Hartman Street	51-087-0014	Henrico Co.	37.55652 -77.40027
72-N	$PM_{2.5}$	DEQ-Piedmont Regional Office 4949-A Cox Road	51-087-0015	Henrico Co.	37.67132 -77.56640
73-E	O_3	McClellan Road	51-085-0003	Hanover Co.	37.60613 -77.21880
75-B	O_3, NO_2, SO_2, $PM_{2.5}$	Charles City County Route 608	51-036-0002	Charles City Co.	37.34438 -77.25925
82-C	PM_{10}	West Point Elementary School Thompson Ave. & Chelsea Rd.	51-101-0003	West Point King William Co.	37.55793 -76.79540
154-M	PM_{10}, Toxics	Carter G. Woodson Middle School 1000 Winston Churchill Dr.	51-670-0010	Hopewell	37.28962 -77.29182
158-X	CO, NO2, $PM_{2.5}$ cont.	Joseph Bryan Park	51-760-0025	Richmond	37.59088 -77.46925

Contact Information for this Region:
Piedmont Regional Office
Michael Murphy, Director
4949-A Cox Road
Glen Allen, VA 23060
(804) 527-5053



STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
179-K	CO, SO_2, NO_2, O_3, $PM_{2.5}$, PM_{10}, TEOM	NASA Langley Research Center	51-650-0008	Hampton	37.10373 -76.38702
181-A1	CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$	NOAA Property 2nd and Woodis Avenue	51-710-0024	Norfolk	36.85555 -76.30135
183-E	O_3	Tidewater Community College Frederick Campus	51-800-0004	Suffolk	36.90118 -76.43808
183-F	O_3	Tidewater Research Station	51-800-0005	Suffolk	36.66525 -76.73078
184-J	$PM_{2.5}$, Toxics	DEQ – Tidewater Regional Office 5636 Southern Blvd.	51-810-0008	Va. Beach	36.84188 -76.18123

Contact information for this Region:
Maria Nold, Director
5636 Southern Blvd.
Virginia Beach, VA 23462
(757) 518-2000



STATION NUMBER	POLLUT.	LOCATION	EPA ID	CITY/COUNTY	LAT/LONG
37-B	O_3	Phelps Wildlife Area Route 651	51-061-0002	Sumerduck Fauquier Co.	38.47367 -77.76772
38-I	O_3, NO_2, $PM_{2.5}$	Broad Run High School Route 641	51-107-1005	Ashburn Loudoun Co.	39.02473 -77.48925
44-A	O_3	Widewater Elementary School Den Rich Road	51-179-0001	Widewater Stafford Co.	38.48123 -77.37040
45-L	O_3, NO_2	Long Park Route 15	51-153-0009	Prince William Co.	38.85287 -77.63462
46-B9	SO_2, O_3, $PM_{2.5}$, PM10, TEOM, Toxics	Lee District Park Telegraph Road	51-059-0030	Franconia Fairfax Co.	38.77335 -77.10468
47-T	CO, NO_2, O_3, $PM_{2.5}$	Aurora Hills Visitors Center 18th and Hayes Streets	51-013-0020	Arlington Co.	38.85770 -77.05922
48-A	O_3	U.S.G.S. Geomagnetic Center	51-033-0001	Corbin Caroline Co.	38.20087 -77.37742
130-E	PM_{10}	Hugh Mercer Elementary School 2100 Cowan Boulevard	51-630-0004	Fredericksburg	38.30225 -77.48712
L-126-I*	CO, NO_2	Alexandria T&ES 3200 Colvin Street	51-510-0021	Alexandria	38.80650 -77.08640
L-126-H	PM_{10}	435 Ferdinand Day Drive	51-510-0020	Alexandria	38.80493 -77.12687
N-35-A	O_3, TEOM, IMPROVE	Big Meadows, National Park Service	51-113-0003	Madison Co.	38.52280 -78.43487

*Data from this Alexandria site is not included in the report. The site was reclassified as a Special Purpose Site and did not meet capture requirements.

Contact Information for this Region:
Northern Regional Office
Thomas Faha, Director
13901 Crown Court
Woodbridge, VA 22193
(703) 583-3810

Minimum Number of Observations	
3-Hour Average	3 Consecutive Hourly Observations
8-Hour	6 Hourly Observations
24-Hour	18 Hourly Observations
Quarterly Averages & 3-month Averages	75% of Scheduled Samples
Yearly Averages	75% of Total Possible Observations
Annual Weighted Means	Four Complete Quarterly Averages

Data Capture Criteria

National Ambient Air Quality Standards

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		Primary and Secondary	Rolling 3 month average	0.15 µg/m^3 [(a)]	Not to be exceeded
Nitrogen Dioxide		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	Annual	53 ppb [(b)]	Annual Mean
Ozone		Primary and Secondary	8-hour	0.070 ppm [(c)]	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	**$PM_{2.5}$**	Primary	Annual	12 µg/m^3	Annual Mean, averaged over 3 years
		Secondary	Annual	15 µg/m^3	Annual Mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		Primary	1-hour	75 ppb [(d)]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

[(a)] In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

[(b)] The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

[(c)] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[(d)] The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Please see https://www.epa.gov/criteria-air-pollutants/naaqs-table for additional information concerning NAAQS.

NCore/SLAMS 2015

REGION	$PM_{2.5}$	PM_{10}	Pb	CO	SO_2	NO_2	O_3	TOTAL
Southwest	1	1	---	---	---	---	1	3
Valley	4	1	---	---	1	1	5	12
Blue Ridge	3	---	2	1	1	1	1	9
Piedmont	5	3	1	2	2	3	4	20
Tidewater	3	2	---	2	2	2	3	14
***Northern**	3	3	---	1	1	3	8	19
TOTAL	**19**	**10**	**3**	**6**	**7**	**10**	**22**	**77**

* *This region's sites are operated by DEQ, Alexandria, and NPS*

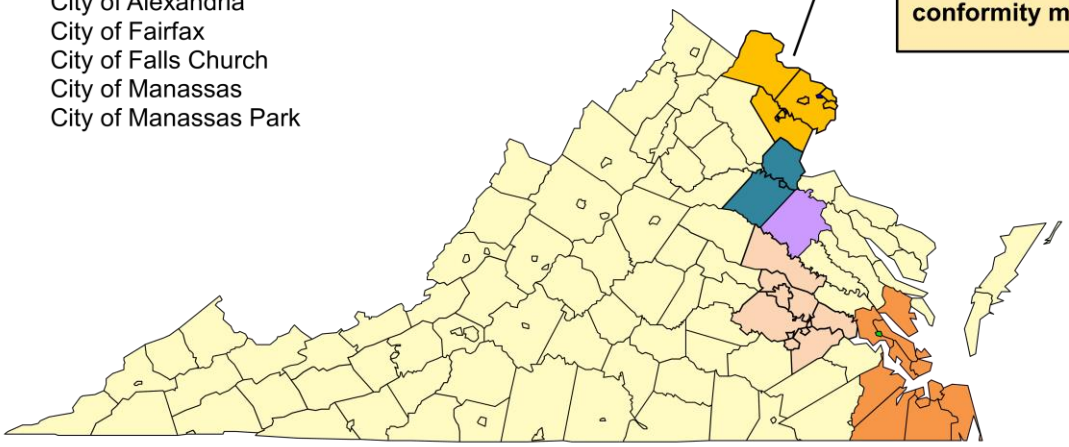
Number of Criteria Pollutant Monitoring Sites

Air Quality Planning Areas for the Commonwealth of Virginia

Northern VA/DC/MD 2008 Ozone NAAQS Nonattainment Area & 1997 $PM_{2.5}$ NAAQS Attainment/Maintenance Area

Arlington County*
Fairfax County
Loudoun County
Prince William County
City of Alexandria*
City of Fairfax
City of Falls Church
City of Manassas
City of Manassas Park

Activities within Northern VA (orange shaded areas) must comply with CAA conformity mandates.



**Alexandria and Arlington are also attainment/maintenance for the 1985 CO NAAQS.*

Hampton Roads Attainment Area/ Voluntary Ozone Advance Action Plan

Gloucester County
Isle of Wight County
James City County
York County
City of Chesapeake
City of Hampton
City of Newport News
City of Norfolk
City of Poquoson
City of Portsmouth
City of Suffolk
City of Virginia Beach
City of Williamsburg

Richmond-Petersburg Attainment Area/ Voluntary Ozone Advance Action Plan

Charles City County
Chesterfield County
Hanover County
Henrico County
Prince George County
City of Colonial Heights
City of Hopewell
City of Petersburg
City of Richmond

Fredericksburg Attainment Area/ Voluntary Ozone Advance Action Plan

Spotsylvania County
Stafford County
City of Fredericksburg

Caroline County Attainment Area/ Voluntary Ozone Advance Action Plan

Updated 07-07-2015

http://www.deq.virginia.gov/programs/air/airqualityplans/ozoneandpm25regionalplanningactivities.aspx

Appendix B

AIRSData – Access to national and state air pollution concentrations and emissions data
https://www.epa.gov/outdoor-air-quality-data

Air Emission Sources
https://www.epa.gov/air-emissions-inventories/air-emissions-sources

Air Now – Ozone mapping, AQI, and real time data
http://www.airnow.gov

Air Now – Air Quality Index Information
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

American Lung Association:
http://www.lungusa.org/

AQS Data Mart (AQS data for the scientific and technical community):
https://aqs.epa.gov/aqsweb/documents/data_mart_welcome.html

CASTNET (Clean Air Status and Trends Network)
http://www.epa.gov/castnet

Department of Environmental Quality link:
http://www.deq.virginia.gov/

Education for teachers and children:
http://airnow.gov/index.cfm?action=learning.forteachers
http://airnow.gov/index.cfm?action=student.teachers

EPA Popular Resources
https://www.epa.gov/learn-issues

EPA's Technology Transfer Network (TTN) – Ambient Monitoring Technology Information Center (AMTIC)
https://www.epa.gov/amtic

IMPROVE
http://vista.cira.colostate.edu/improve

MARAMA
http://www.marama.org/homepage

Nonattainment area descriptions:
https://www.epa.gov/green-book/green-book-national-area-and-county-level-multi-pollutant-information

U.S. EPA:
http://www.epa.gov

2015 3-Day Monitoring Schedule for PM2.5 and 6-Day Monitoring Schedule for PM10:
https://www3.epa.gov/ttn/amtic/files/ambient/pm25/calendar_2015.pdf

Air Quality Internet Links

Code of Federal Regulations – 40 CFR 50 & 58
http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl

Virginia Ambient Air Monitoring Data Reports
http://www.deq.virginia.gov/Programs/Air/AirMonitoring/Publications.aspx

Air Quality System (AQS)
https://www.epa.gov/aqs

References