
**AIR QUALITY AND AIR POLLUTION
CONTROL POLICIES OF THE
COMMONWEALTH OF VIRGINIA**

*A Report to the Honorable Ralph S. Northam, Governor
and the General Assembly of Virginia*

Virginia Department of Environmental Quality

October 2020

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Commonly Used Abbreviations

AQM	Office of Air Quality Monitoring	ORVR	On Board Refueling Vapor Recovery
CAA	Clean Air Act		
CMS	Compliance Monitoring Strategy	OTR	Ozone Transport Region
CO	Carbon monoxide	Pb	Lead
CSAPR	Cross State Air Pollution Rule	PCE	Partial Compliance Evaluation
CTG	Control Technique Guideline	PM ₁₀	Particulate matter not more than 10 micrometers in diameter
DEQ	Virginia Department of Environmental Quality	PM _{2.5}	Particulate matter not more than 2.5 micrometers in diameter
ECHO	Enforcement and Compliance History Online	ppb	Parts per billion
EPA	Environmental Protection Agency	ppm	Parts per million
FCE	Full Compliance Evaluation	PSD	Prevention of Significant Deterioration
GVWR	Gross Vehicle Weight Rating	RACT	Reasonably Available Control Technology
HAP	Hazardous Air Pollutant		
I/M	Motor Vehicle Inspection and Maintenance Program	RBIS	Risk Based Inspection System
MACT	Maximum Achievable Control Technology	SAPCB	State Air Pollution Control Board
MATS	Mercury and Air Toxics Standard	SBA	Small Business Assistance
µg/m ³	Micrograms per cubic meter	SIP	State Implementation Plan
MSOS	Mobile Source Operations Section	SO ₂	Sulfur dioxide
NAAQS	National Ambient Air Quality Standard	SOP	State Operating Permit
NO ₂	Nitrogen dioxide	tpy	Tons per year
NO _x	Nitrogen oxides	VDH	Virginia Department of Health
NSR	New Source Review	VOC	Volatile Organic Compounds
ORE	On-Road Emissions Program	VPM	Virginia Productivity Measurements

1. Executive Summary

This report was prepared by the Virginia Department of Environmental Quality (DEQ) on behalf of the State Air Pollution Control Board (SAPCB) for the Governor and General Assembly pursuant to § 10.1-1307 H of the Code of Virginia. This report details the status of Virginia's air quality, provides an overview of the air division programs, and briefly summarizes federal and state air quality programs.

1.1. Air Quality in the Commonwealth

Air quality in Virginia continues to improve. Ambient concentrations of fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), carbon monoxide (CO) and ozone in Virginia met United States Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS) in 2019. Ambient concentrations of sulfur dioxide (SO₂) near an emissions source located in Kimballton, Virginia, (Giles County) showed violations of the 2010 SO₂ NAAQS. DEQ is working with this facility to further reduce their SO₂ emissions and develop an attainment plan.

1.2. Air Quality Policies in the Commonwealth

Policy initiatives affecting Virginia in the near future include a new Regional Haze analysis, 2015 ozone NAAQS Good Neighbor provisions under the Clean Air Act (CAA), federal actions to update the 2015 ozone NAAQS and the 2012 PM_{2.5} NAAQS, and regulatory changes stemming from the *South Coast Air Quality Management District v. EPA* decision.¹ Other significant policy efforts include the implementation of Virginia's *Environmental Mitigation Trust Agreement for State Beneficiaries* (State Trust Agreement) that took effect October 2, 2017, in the case, *In Re: Volkswagen "Clean Diesel" Marketing, Sales Practices, and Products Liability Litigation*. Additionally, Virginia is joining the Regional Greenhouse Gas Initiative (RGGI) pursuant to the Clean Energy and Community Flood Preparedness Act (2020 Acts of Assembly ch. 1219 & 1280). RGGI is a market-based cap-and-trade program designed to reduce greenhouse gas emissions and other air pollutants from the power sector.

1.3. Summary of Annual Air Division Activities

Monitoring Locations:	36	On Site Inspections:	741
Monitoring Instruments:	111	Enforcement Actions:	341
Minor Source Permits Issued:	248	Vehicles Emission Inspections Performed:	850,304²
State Major Source Permits Issued:	2	Vehicles Emission Inspection Failures:	18,467
PSD Permits Issued:	0	Vehicle Emission Inspection Station Overt Audits:	475
General Permits Issued:	8	Vehicle Emission Inspection Station Covert Audits:	71
State Operating Permits Issued:	6	Consent Orders Issued:	38
Federal Operating Permits Issued:	3	Consent Order Civil Charges Collected:	\$1,164,155
Compliance Evaluations (all):	3987		

¹ [https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/\\$file/15-1115-1718293.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/$file/15-1115-1718293.pdf)

² Total includes tests performed at emissions inspection stations and on-road emissions (clean screen) tests.

2. Status of Air Quality in the Commonwealth of Virginia

DEQ monitors a variety of pollutants in the ambient atmosphere. A portion of Virginia's monitoring network measures concentrations of the criteria pollutants: ozone, PM_{2.5}, PM₁₀, NO₂, SO₂, Lead (Pb), and CO. Criteria pollutants are harmful to public health and the environment and EPA has set NAAQS for these pollutants to protect public health and welfare. The two criteria pollutants that have historically presented challenges in Virginia are ozone and PM_{2.5}. Air quality for both pollutants is improving. PM_{2.5} air quality is in the healthy range across Virginia and has been for the past several years. In 2019, air quality met federal ozone standards across the Commonwealth. However, the SO₂ monitoring site near Lhoist North America LLC, which began operations in 2017 as required by federal regulations, recorded data showing a violation of the SO₂ NAAQS for years 2017-2019. DEQ is continuing to work with the facility to further reduce SO₂ emissions and improve SO₂ air quality.

2.1. Criteria Pollutant Overview

Ozone is not generally emitted directly into the atmosphere. Rather, a photochemical reaction between volatile organic compounds (VOC) and oxides of nitrogen (NO_x) creates this pollutant when these precursors combine in the presence of sunlight. Ozone, the primary component of smog, is a lung irritant and interferes with the ability of plants to process food and ward off diseases.

Particulate Matter (PM), also referred to as particulate pollution, is a mixture of solid particles and liquid droplets found in the air. Some particles are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires. Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles. PM contains microscopic solids or liquid droplets that are so small that they can be inhaled and cause serious health problems. Particle pollution includes: PM₁₀ and PM_{2.5}.

PM₁₀ is an airborne particulate of solid or liquid matter that is less than or equal to 10 micrometers in diameter. PM₁₀ 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.

PM_{2.5} is an airborne particulate of solid or liquid matter that is less than or equal to 2.5 micrometers in diameter. Small particles less than 10 micrometers in diameter can get deep into the lungs, and may even get into the bloodstream. Exposure to such particles poses adverse health impacts to the human respiratory and cardiovascular systems. PM_{2.5} is the main cause of reduced visibility (haze) in parts of the United States, including many of our national parks and wilderness areas.

NO₂ is a gaseous air pollutant that forms when fossil fuels such as coal, oil, gasoline, or diesel burn at high temperatures. NO₂ contributes to the formation of particle pollution by converting in the atmosphere to nitrate aerosols, a component of PM_{2.5}. This gas is also a building block of ozone.

SO₂ is one of a group of highly reactive compounds known as "oxides of sulfur." The largest source of SO₂ emissions is fossil fuel combustion at power plants and at other types of industrial facilities. Smaller sources of SO₂ emissions include industrial processes such as extracting metal from ore and the combustion of sulfur-laden fuels by locomotives, large ships, and non-road equipment. Emissions of SO₂ also contribute to the formation of particle pollution by converting in the atmosphere to sulfate

aerosols, a major component of PM_{2.5}.

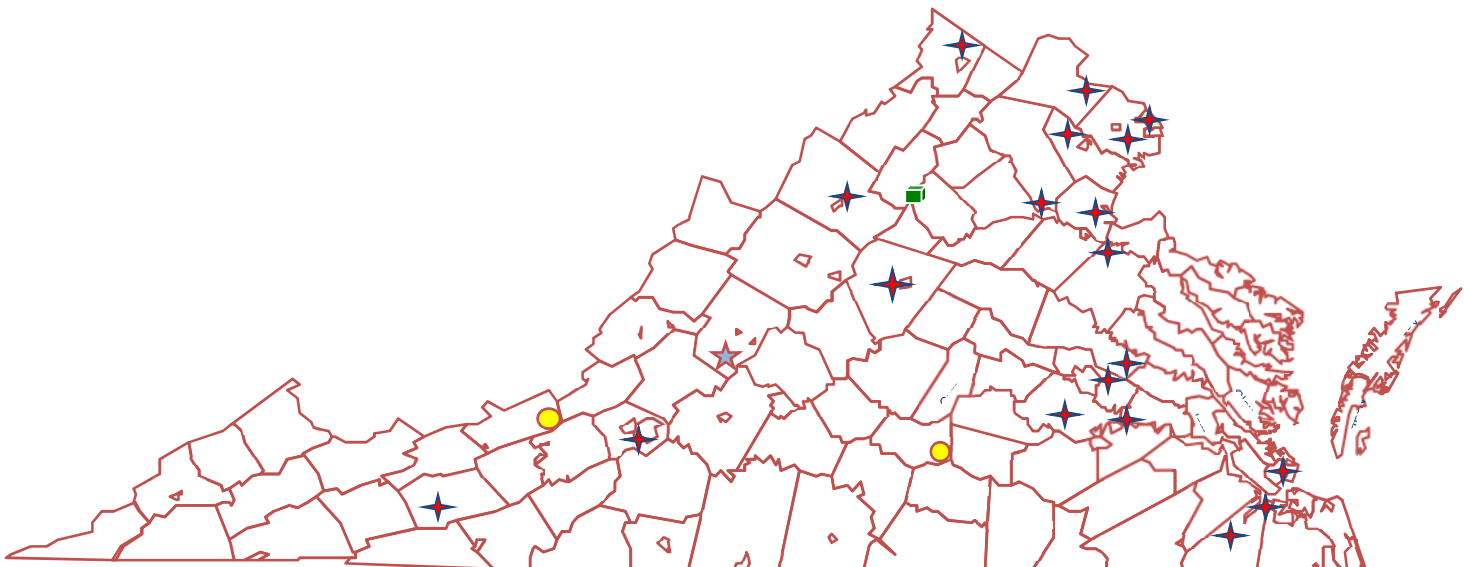
Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. In the past, emissions from cars and trucks using leaded gasoline were the primary sources of lead in the atmosphere. Efforts by EPA to remove lead from motor vehicle gasoline resulted in dramatic reductions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

CO is a colorless, odorless gas emitted from combustion processes. Particularly in urban areas, the majority of CO emissions to ambient air originate from mobile sources. CO can cause harmful health effects by reducing oxygen delivery to the body's organs.

2.2. Monitoring Network

DEQ's Office of Air Quality Monitoring (AQM) maintains an extensive air quality monitoring network throughout the Commonwealth. As of July 1, 2020, approximately 111 instruments at 36 sites monitored ambient air quality across Virginia. One SO₂ monitoring site that is part of DEQ's network is maintained by an independent company. There are two federal ozone monitors included as part of the DEQ network as well.

Figure 2.1 shows the various ozone monitoring sites in Virginia. All monitoring sites meet EPA's siting criteria (40 CFR Part 58, Appendices D and E), and all sites conform to EPA guidance documents and generally accepted air quality monitoring practices. AQM quality assures all data gathered from the Virginia air quality monitoring network in accordance with federal requirements (40 CFR Part 58, Appendix A). EPA performs the quality assurance at the two federal ozone sites. The data are published annually in the *Virginia Ambient Air Monitoring Data Report* and are available from the DEQ website at <http://www.deq.virginia.gov/Programs/Air/AirMonitoring/Publications.aspx>



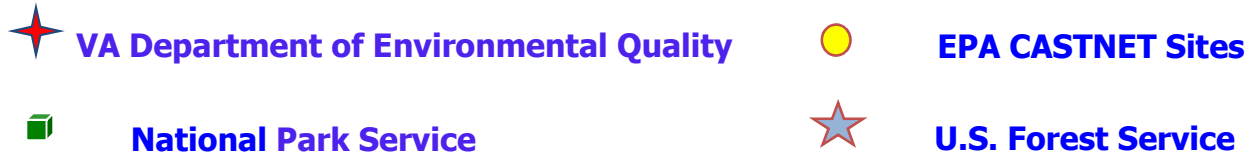


Figure 2-1: Virginia Ozone Monitoring Network

2.2.1. Near-Road Monitoring for NO₂

In February 2010, EPA promulgated a new NO₂ NAAQS, setting the standard at 100 parts per billion (ppb). This standard included a new requirement for the installation and operation of monitoring stations in close proximity to heavily traveled roadways. According to federal mandates, DEQ must install three such monitoring stations. DEQ has installed two of the three monitoring stations. The Richmond station at Bryan Park is adjacent to the I-95 and I-64 interchange and has been running since October 2013. The northern Virginia site, which is located in Springfield on Backlick Road, began sampling in April 2016. The data from these sites are available on DEQ's webpage. DEQ expects to install a similar station in the Tidewater area. This site is expected to be installed and operating by fall 2021.

2.3. Data Trends for Criteria Pollutants

Trends for most criteria pollutants across Virginia show significant improvements over the past decade. These improvements are the result of emission reductions associated with a variety of control programs. Emissions from nearby states also have decreased, so that less pollution is transported into the Commonwealth from upwind areas.

Figure 2-2 provides the three-year average ozone design value concentrations for monitors in the Hampton Roads, Richmond-Petersburg, Fredericksburg, Roanoke, and Northern Virginia areas. All areas demonstrate compliance with the 2008 ozone NAAQS of 0.075 ppm (75 ppb) as well as the 2015 ozone NAAQS of 0.070 ppm (70 ppb).

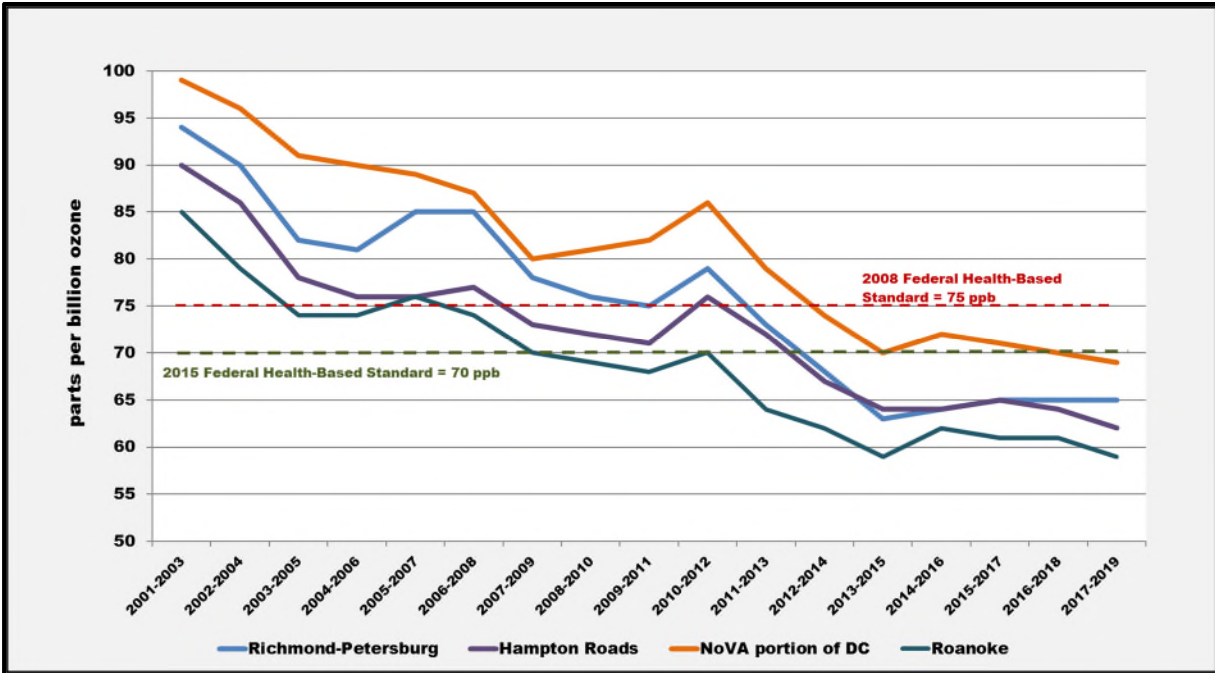


Figure 2-2: Ozone Concentrations, Three Year Average

Figure 2-3 provides the PM_{2.5} daily design value concentrations for Hampton Roads, Richmond-Petersburg, and Northern Virginia. Figure 2-4 provides the annual average PM_{2.5} design value concentrations for these three areas. Concentrations of PM_{2.5} follow these trends across the Commonwealth and comply with the 2006 PM_{2.5} daily NAAQS of 35 $\mu\text{g}/\text{m}^3$ and the 2012 PM_{2.5} annual NAAQS of 12.0 $\mu\text{g}/\text{m}^3$.

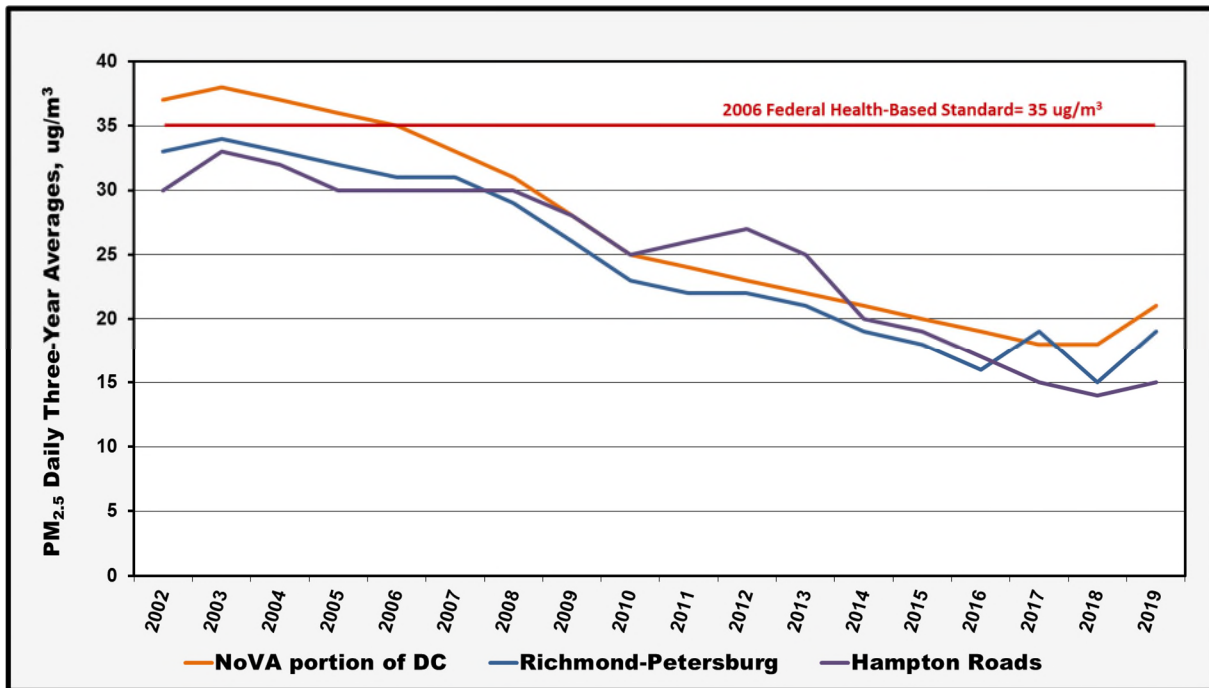


Figure 2-3: Daily PM_{2.5} Averages

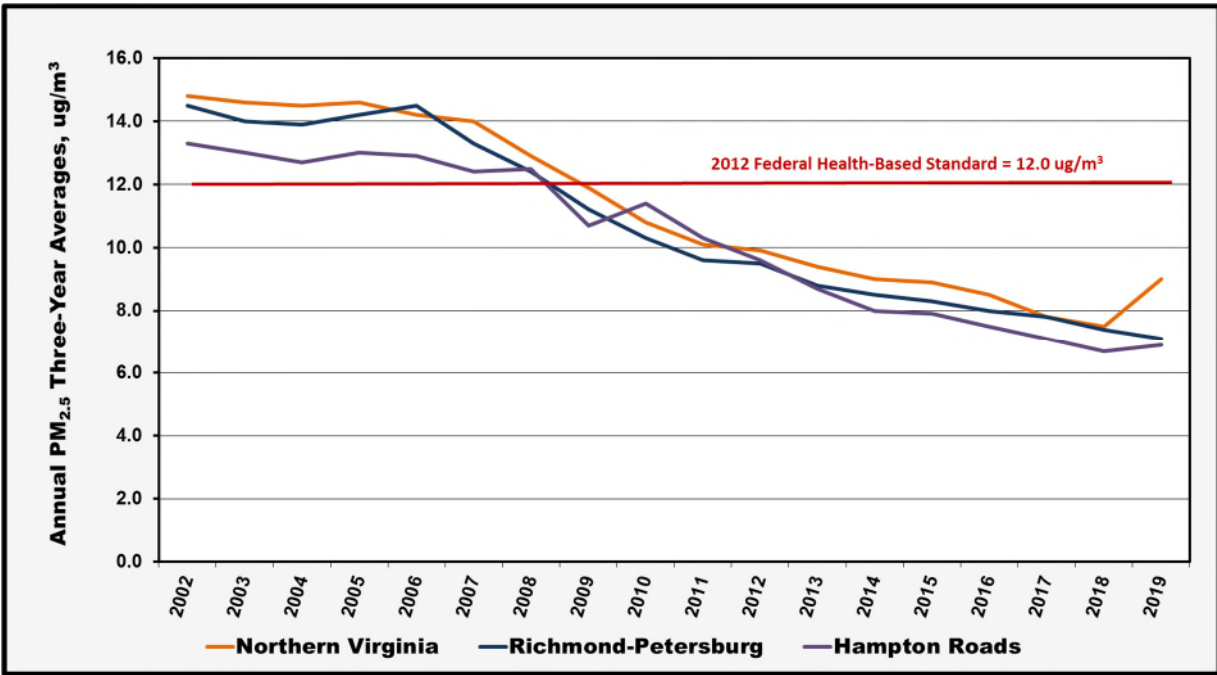


Figure 2-4: Annual PM_{2.5} Averages

Figure 2-5 provides NO₂ measurements and compares this data to the 2010 NO₂ NAAQS of 100 ppb.

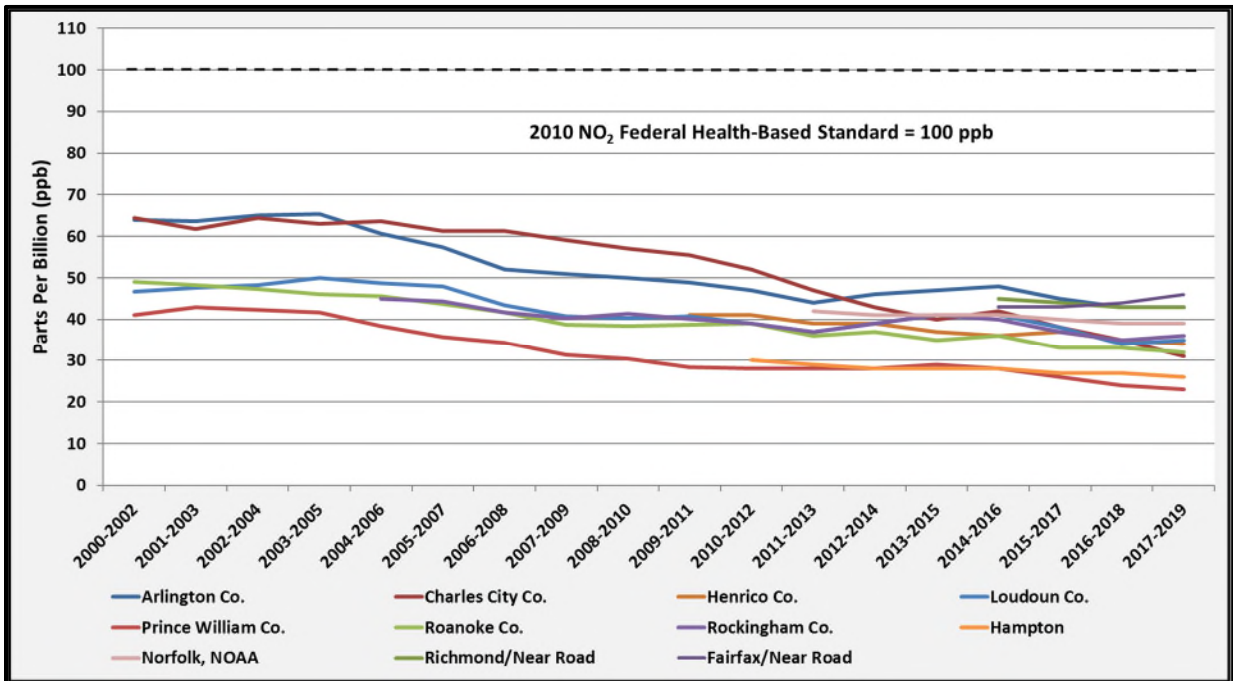


Figure 2-5: Virginia NO₂ Measurements

The 2010 SO₂ NAAQS federal implementation rule required certain facilities in Virginia to monitor the air quality near their property to determine if the facility's emissions caused SO₂ air quality violations. This approach stemmed from EPA's determination that ambient SO₂ concentrations were predominantly impacted by large industrial sources with high SO₂ emissions. These SO₂ monitors, which were installed in accordance with federal requirements and operated by the respective facility, have recorded three years of data from 2017 and 2019 and are therefore included in the Commonwealth's SO₂ monitoring network. Figure 2-6 provides SO₂ measurements for all monitors in the network including the facility-specific monitors and compares this data to the 2010 SO₂ NAAQS of 75 ppb. The facility-specific monitoring sites (Botetourt, Giles, and Covington) show data for a single point, 2017-2019. As shown in the figure, the Giles County three-year average for 2017-2019 of 203 ppb is above the health based standard of 75 ppb. These measured data resulted in the portion of Giles County around the Lhoist North America, LLC facility, the operator of the Giles County SO₂ monitor, to be designated nonattainment for the 2010 SO₂ NAAQS. See Section 3.1.6 for more information on this designation.

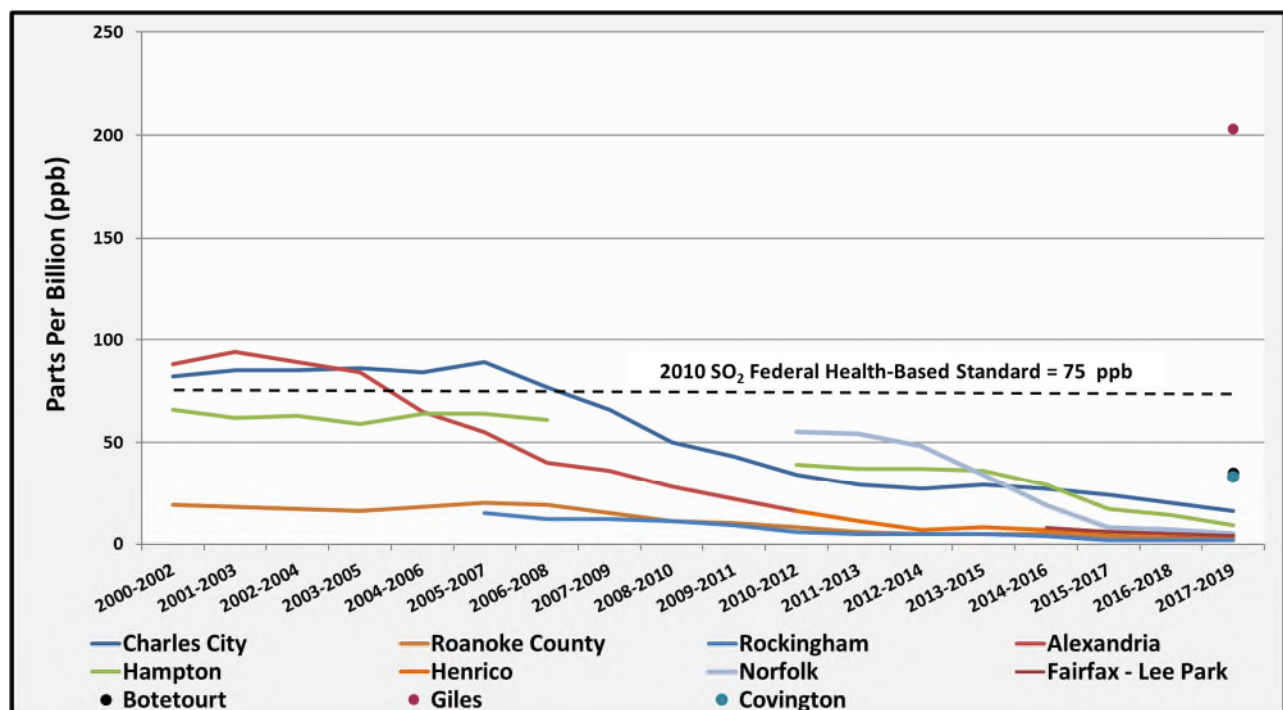


Figure 2-6: Virginia SO₂ Measurements

Figure 2-7 provides CO measurements for comparison against the 1971 CO NAAQS of 9 ppm. The downward trends shown in these figures should continue into the future due to emission reductions associated with implemented and new control programs.

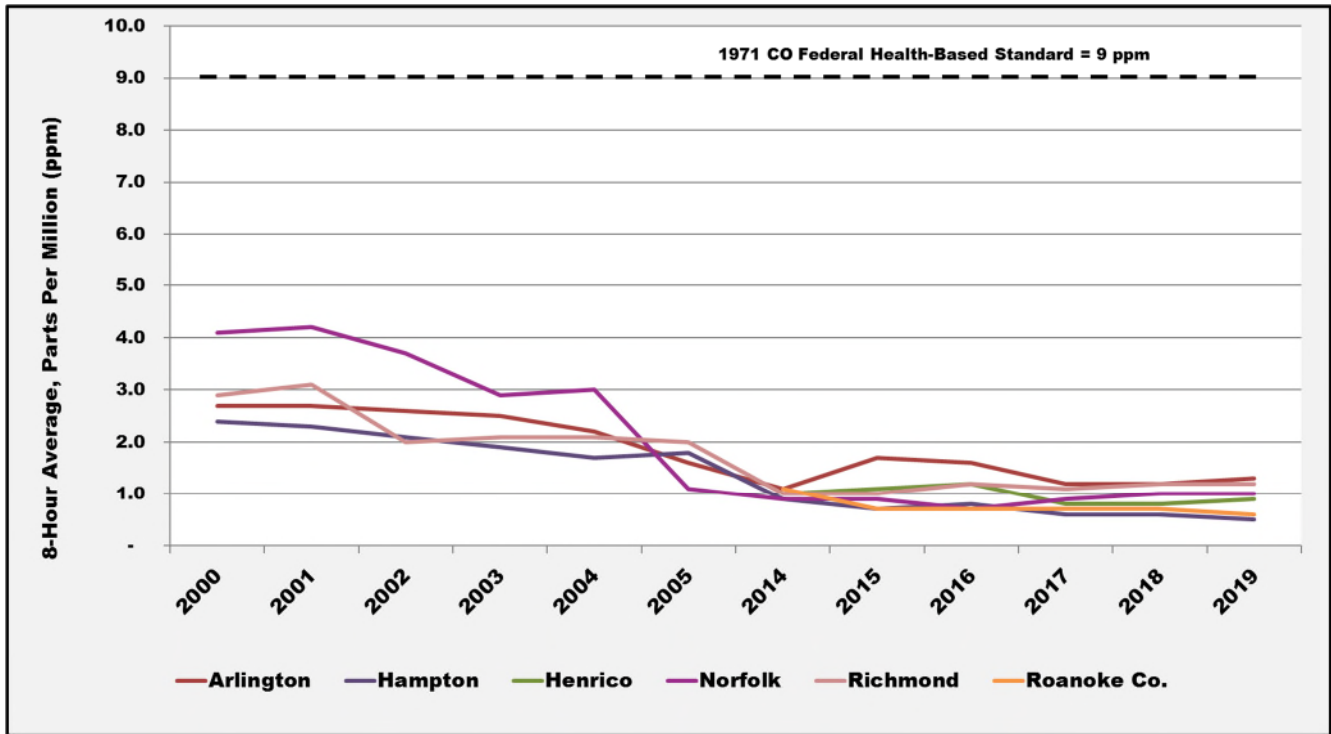


Figure 2-7: Virginia CO Measurements

3. Air Pollution Control Overview

This overview describes planning, permitting, compliance, enforcement, and other initiatives. Each section provides information on significant current policy issues related to each category.

3.1. Air Quality Planning and Regulatory Initiatives

Air quality planning strategies focus on meeting all federal requirements associated with current NAAQS and regional haze. DEQ also expends resources on improving the Virginia portion of EPA’s emissions inventory and modeling platforms and analyzing potential effects of proposed rules and federal guidance documents.

3.1.1. CO NAAQS

On August 31, 2011 (76 FR 54294), EPA issued a decision to retain the existing primary CO NAAQS, which were originally promulgated in 1971. The existing primary standards are 9 ppm measured over an eight-hour period and 35 ppm measured over a one-hour period. EPA revised the CO monitoring network requirements to include near-road CO monitoring sites in large urban areas. All jurisdictions within the Commonwealth are attaining these standards and are designated either attainment areas or attainment/maintenance areas for the 1971 CO NAAQS.

3.1.2. 2006 PM_{2.5} NAAQS

On October 17, 2006 (71 FR 61144), EPA promulgated a revised PM_{2.5} NAAQS. The 2006 standard revised the daily PM_{2.5} standard from 65 µg/m³ to 35 µg/m³ and retained the PM_{2.5} annual standard of 15.0 µg/m³. On November 13, 2009 (74 FR 58688), EPA published the final designations for the 2006

daily PM_{2.5} standard, and all areas of the Commonwealth were designated as attainment or unclassifiable. On April 30, 2020 (85 FR 24094), EPA published a proposal to retain the daily NAAQS for PM_{2.5}.

3.1.3. 2008 Ozone NAAQS

On March 27, 2008 (73 FR 16436), EPA revised both the primary and the secondary NAAQS for ozone to 0.075 ppm. EPA published the final area designations and classifications for this standard on May 21, 2012 (77 FR 30088). EPA designated all areas of the Commonwealth, with the exception of northern Virginia, as attaining this standard. EPA designated Northern Virginia as nonattainment, with a classification of marginal. On April 15, 2019 (84 FR 15108), EPA redesignated the Northern Virginia area as attainment/maintenance for this standard.

On February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit issued a decision in the *South Coast Air Quality Management District v. EPA* litigation. This decision vacated several key provisions contained in the 2008 ozone NAAQS implementation rule. These provisions include:

- Removal of New Source Review from certain nonattainment and maintenance areas,
- Use of redesignation substitutes for revoked standards,
- Elimination of transportation conformity in maintenance areas, and
- Second maintenance plan requirements.

DEQ continues to work in partnership with representatives from the Virginia Department of Transportation (VDOT) to ensure changes to transportation conformity requirements will not delay any transportation projects. DEQ is developing second maintenance plans to address the updated requirements as mandated by the court's decision and is working with EPA to evaluate other impacts on state programs.

3.1.4. 2008 Lead NAAQS

On November 12, 2008 (73 FR 66964), EPA strengthened the NAAQS for lead (Pb), revising the level of the health-based standard to 0.15 µg/m³. On November 22, 2011 (76 FR 72097), EPA published the final Pb designations for the 2008 NAAQS and designated the entire Commonwealth as attainment/unclassifiable since monitoring data showed compliance with the new standard.

3.1.5. 2010 NO₂ NAAQS

On February 9, 2010 (75 FR 6474), EPA revised the primary NO₂ NAAQS and set the standard at 100 ppb over a one-hour average. On February 17, 2012 (77 FR 9532), EPA classified all areas of the Commonwealth as attainment/unclassifiable for this standard. EPA may update these classifications once sufficient near-road NO₂ data are available.

3.1.6. 2010 SO₂ NAAQS

On June 22, 2010 (75 FR 35520), EPA finalized a new primary NAAQS for SO₂. This regulation significantly strengthened the short-term requirements by lowering the standard to 75 ppb on a one-hour basis. On January 9, 2018 (83 FR 1098), EPA designated all jurisdictions in Virginia as attaining this

standard with the exception of Buchanan County, Alleghany County, Botetourt County, Giles County and the City of Covington. Buchanan County was designated unclassifiable. EPA based these attainment designations on modeling outputs and data from the SO₂ monitoring network. EPA must publish designations by December 31, 2020, for Alleghany County, Botetourt County, Giles County and the City of Covington.

Virginia submitted updated recommendations for these designations to EPA on April 24, 2020. Virginia recommended that the City of Covington, Alleghany County, Botetourt County, and the majority of Giles County be designated attainment based on air quality monitoring data, inventory data, and air quality modeling analyses. Recorded air quality data for the monitors located in Botetourt County, Alleghany County, and the City of Covington show values well under the 2010 SO₂ NAAQS. The recorded values for Botetourt County are 44% of the standard and the recorded values for Alleghany County and the City of Covington are 47% of the standard. Federal regulations at 40 CFR 51.1203(c)(3) allow source-specific monitoring sites that are recording values equivalent to less than 50% of the standard to be discontinued upon approval from EPA. Virginia has requested, and EPA has approved, the discontinuation of these source-specific monitors.

Virginia also recommended that a portion of Giles County surrounding the Lhoist North America, LLC facility located in Kimballton be designated nonattainment for the 2010 SO₂ NAAQS. This recommendation was based on monitoring data showing a violation of the standard and modeling analyses that identified the perimeter of the nonattainment area. DEQ will continue to work with regulated facilities and EPA to meet all requirements pertaining to this standard in a timely manner.

3.1.7. 2012 PM_{2.5} NAAQS

On January 15, 2013 (78 FR 3086), EPA published a rule strengthening the NAAQS for PM_{2.5}. This rule left the daily value initially published in 2006 unchanged at 35 µg/m³ but reduced the annual threshold from 15 µg/m³ to 12 µg/m³. On January 15, 2015 (80 FR 2206), EPA designated all of Virginia unclassifiable/attainment for this standard. On April 30, 2020 (85 FR 24094), EPA proposed to retain the annual NAAQS for PM_{2.5}.

3.1.8. 2015 Ozone NAAQS

On October 26, 2015 (80 FR 65292), EPA revised the NAAQS for ozone. This revision lowered the standard from 0.075 ppm to 0.070 ppm. On June 4, 2018 (83 FR 25838), EPA designated all areas of the Commonwealth except nine jurisdictions in Northern Virginia as attaining this standard. The nine jurisdictions in Northern Virginia designated as nonattainment with a classification of marginal are the Counties of Arlington, Fairfax, Loudoun, and Prince William and the Cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park. The classification of marginal is the least stringent classification, indicating that EPA expects this area to comply with the standard by August 3, 2021, due to reductions in emissions from federal control measures. The Commonwealth is required under the Good Neighbor provisions of the CAA to address Virginia ozone precursor emission contributions to other states. The DEQ is in the process of evaluating these impacts and determining if any further controls are necessary and reasonable to meet this obligation. On July 13, 2020, EPA announced that the administrator will publish a proposal to retain the current standards without revision.³

³ <https://www.epa.gov/ground-level-ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs>

3.1.9. Regional Haze

Section 169 A of the Clean Air Act (CAA) mandates the protection of visibility in national parks, forests, and wilderness areas, referred to as Class I federal areas. The absorption and scattering of light by fine particles cause visibility impairment (haze) in these areas. Sources and activities that emit fine particles and their precursors, such as NO_x, SO₂, VOC, and ammonia, contribute to this problem. In 1999, EPA finalized the Regional Haze Rule, which requires that state, tribal, and federal agencies work together to improve visibility in 156 national parks and wilderness areas.

DEQ developed a state implementation plan (SIP) to address visibility impairment in the Commonwealth's two Class I areas, the Shenandoah National Park and the James River Face Wilderness Area, as well as a progress report showing visibility improvements achieved and expected future improvements in both areas. Figure 3-1 and Figure 3-2 provide measurements of visibility impairment based on Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data.⁴ Each figure shows tremendous progress towards improving visibility. This progress in visibility improvement is mainly due to the reduced emissions of SO₂ and sulfates from fuel combustion sources.

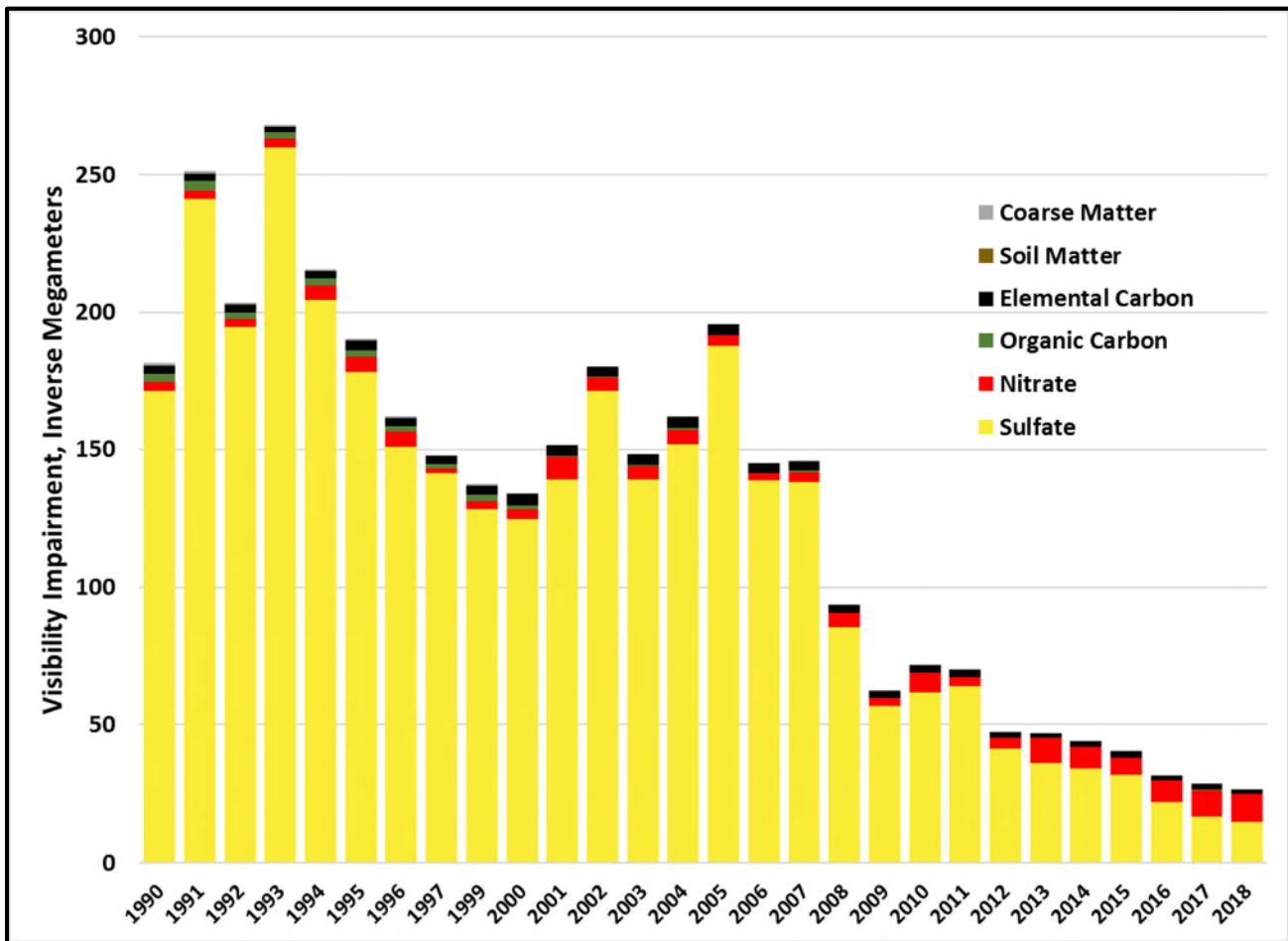


Figure 3-1: Annual Extinction, Most Impaired Days, Shenandoah National Park.

⁴ http://vista.cira.colostate.edu/IMPROVE/Data/NaturalConditions/NaturalConditionsII_Format2_v2.xls

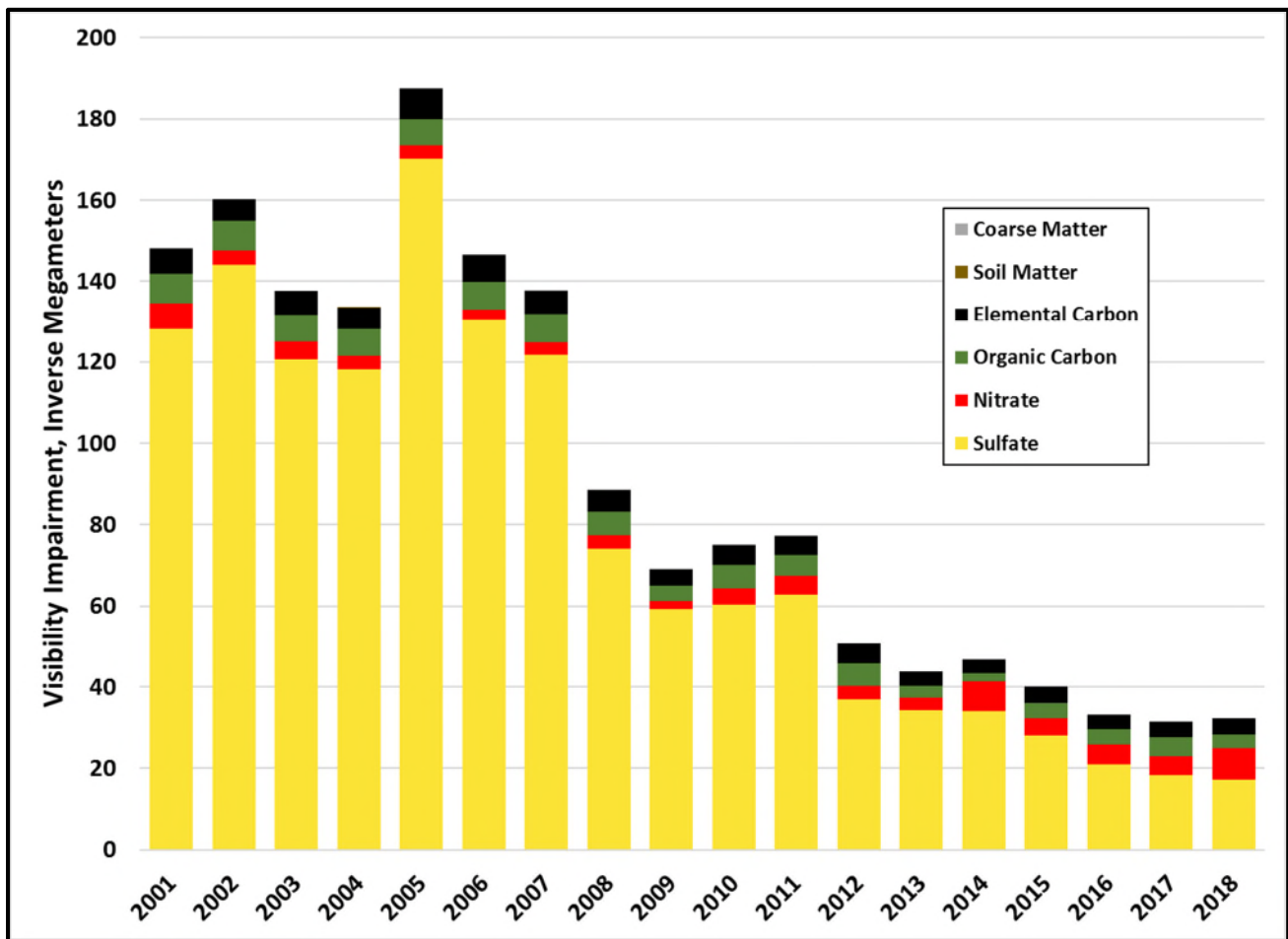


Figure 3-2: Annual Extinction, Most Impaired Days, James River Face Wilderness Area

In concert with other southeastern states, DEQ has begun working on the next Regional Haze SIP revision, which is due to EPA in 2021. As part of this submission, the CAA requires that DEQ undertake a four factor analysis for certain sources and emissions sectors to determine if reasonable controls are in place or available. The factors required to be considered are potential costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts of compliance, and remaining useful life of sources subject to this analysis.

3.2. Air Permitting Activities

DEQ issues two basic types of air permits: construction permits and operating permits. Construction permits, termed New Source Review (NSR) permits, apply to new facilities as well as existing facilities that undergo an expansion or modification. Operating permits apply to sources that are already in operation.

DEQ has three construction permit programs for criteria pollutants, as described below:

The Prevention of Significant Deterioration (PSD) major new source review program applies to major sources that are located in an area that is in attainment with the National Ambient Air Quality Standards

(NAAQS). Sources must apply Best Available Control Technology (BACT) as well as undergo a thorough air quality analysis demonstration (i.e., air modeling) to assure the new facility or major modification to an existing facility will not cause or contribute to a violation of the NAAQS or have an adverse impact on any Class I area. DEQ did not issue any PSD permits in fiscal year 2020.

The second program is the nonattainment major NSR program, which applies to major sources located in an area designated as nonattainment for one or more NAAQS. A facility in a nonattainment area must apply the Lowest Achievable Emission Rate (LAER), which is often more rigorous than BACT, and must obtain offsets for the pollutant for which the area is not in attainment. DEQ did not issue any nonattainment NSR permits in fiscal year 2020.

The third program is the minor NSR program. This program applies to new sources or existing sources that are undergoing a modification and are below major source emissions thresholds. During the 2020 fiscal year, DEQ issued 248 minor NSR permits. Additionally, the minor NSR program is used to issue state major source permits, which apply to those sources that have emissions greater than 100 tpy of a criteria pollutant but do not fit the criteria to be classified as PSD or nonattainment major NSR. DEQ issued 2 state major permits in fiscal year 2020. Virginia also has general permits (i.e., permits by regulation) for non-metallic mineral processors and distributed generation. If a facility meets the necessary requirements, the facility may use the general permit process instead of the normal minor NSR permitting process. DEQ issued 8 general permits during fiscal year 2020.

DEQ issues two types of operating permits: state operating permits (SOPs) and federal operating permits, including federal Title V operating permits and federal Acid Rain program permits, as described below:

SOPs are used primarily to cap a source's emissions to keep it below major source emissions thresholds and therefore exempt from a major source permitting program. Facilities often use SOPs to place federally and state enforceable limits on hazardous air pollutants (HAPs) to remain exempt from the federal HAP program. The federal HAP program generally requires the implementation of maximum achievable control technology (MACT) standards. A source may request SOPs at any time, and DEQ may issue SOPs as necessary (due to a modeled or actual exceedance of a NAAQS or to meet a CAA requirement). DEQ issued 6 SOPs during fiscal year 2020.

The federal operating permits issued by DEQ, include federal Title V operating permits as well as federal Acid Rain program permits. The Title V permit program applies to sources that meet the criteria for being "major" under Title V of the CAA. The purpose of a Title V permit is to compile all requirements from a source's multiple air permits and applicable regulations into one permit document. A newly constructed source that is large enough to qualify as a Title V source must apply for a Title V permit within one year of starting operation. Title V permits must be renewed every five years. Acid Rain permits also are considered federal operating permits. DEQ must issue these permits to sources that are subject to the federal Acid Rain program (CAA Title IV). DEQ issued 3 federal operating permits and 35 operating permit renewals during fiscal year 2020.

Information about air permitting activities at DEQ to the public on DEQ's website at <http://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Permitting.aspx>.

3.3. Air Compliance Activities

DEQ's air compliance program identifies and addresses potential violations of applicable regulations and laws to ensure compliance by facilities operating within the Commonwealth. The focus of the air compliance program is to return facilities to compliance expeditiously, supporting DEQ's mission to protect the environment and human health. To do so, air compliance personnel perform partial compliance evaluations (PCEs) and full compliance evaluations (FCEs). These actions include onsite inspections, test observations, and comprehensive evaluations of the facility records and equipment associated with pollutant emissions, including examination of documents detailing throughputs, emissions, testing, and reporting.

DEQ's air compliance program operates in accordance with EPA's 2016 Clean Air Act Stationary Source Compliance Monitoring Strategy (CMS). This strategy primarily identifies the largest potential emitters of air pollution for an FCE at a minimum recommended frequency of once every two years. Depending on available resources, DEQ's air compliance program also identifies smaller potential emitters under its Risk-Based Inspection Strategy (RBIS). This strategy allows flexibility during inspection planning, and DEQ regional offices may identify facilities for an FCE based on potential noncompliance or in response to sector initiatives.

Virginia has 3,766 registered air facilities, excluding gasoline service stations. For the 2019 federal fiscal year (October 1, 2018 through September 30, 2019), the air compliance program conducted 3,987 compliance evaluations, including 741 on-site inspections and 97 stack test observations. As a result, the air compliance program issued 341 enforcement actions. DEQ reports compliance and enforcement activities related to Virginia's regulated facilities to EPA on a weekly basis. This information is publicly available on EPA's Environmental Compliance and History Online (ECHO) website: <https://echo.epa.gov/>. Information about DEQ air compliance activities, including information on consumer products and environmental lab accreditation is available to the public on DEQ's website at <https://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Compliance.aspx>.

3.4. Air Enforcement Activities

The goal of enforcement is to take appropriate actions to address violations of environmental laws and return facilities to compliance with Virginia's statutory and regulatory requirements. The mechanism used by DEQ to achieve compliance is proportional to the violation, responsive to the facility's compliance history, and protective of human health and the environment. In addition, an appropriate enforcement action, which may include a civil charge and recovery of economic benefit, sends a message of deterrence to the regulated community. In federal fiscal year 2019, DEQ issued 38 consent orders and one unilateral order that resulted in a total of \$1,164,155 in civil charges collected.

3.5. Small Business Assistance

DEQ provides various forms of compliance assistance to potentially thousands of small businesses throughout the Commonwealth. DEQ provides these services at no cost to facilities in order to inform, educate, and assist small businesses in complying with environmental regulations. More generally, the Small Business Assistance (SBA) program conducts personal and web-based outreach to small businesses, providing access to various resources including regulatory updates, fact sheets, checklists, brochures, enforcement case assistance, and financial resources. DEQ maintains the SBA website at <http://deq.state.va.us/Programs/Air/SmallBusinessAssistance.aspx>.

3.6. Motor Vehicle Inspection and Maintenance Program

Virginia's motor vehicle inspection and maintenance (I/M) program improves air quality by identifying high-emitting vehicles in need of repair operating in the Commonwealth's nonattainment area, and requiring them to be fixed as a prerequisite to vehicle registration. The CAA mandates I/M for several areas across the country, including the Northern Virginia area, based upon criteria such as air quality classification, population, and geographic location.

DEQ's decentralized I/M program includes over 500 permitted emissions inspection stations and about 300 certified repair facilities. These stations and facilities use the latest accepted technology to determine which vehicles emit excessive pollutants. Gasoline-powered vehicles up to 10,000 pounds gross vehicle weight rating (GVWR) and newer than 25 model years and diesel-powered vehicles up to 8,500 pounds GVWR and 1997 model year and newer registered in the I/M area are required to pass an emissions test or receive a waiver every two years in order to obtain vehicle registration. In calendar year 2019, inspection stations performed 766,156 initial emissions inspections and over 19,000 retests, prompting these vehicles to receive repairs. DEQ maintains an extensive I/M program website at <http://www.deq.virginia.gov/Programs/AirCheckVirginia.aspx>.

3.6.1. Mobile Source Operations Section

The Mobile Source Operations Section (MSOS) of DEQ's Northern Regional Office monitors the performance of the various emissions inspection stations, certified emissions repair facilities, over 400 certified emissions repair technicians and over 1,500 licensed emissions inspectors within the I/M program. In calendar year 2019, MSOS personnel conducted 475 overt and 71 covert performance audits at emissions inspection stations.

3.6.2. On-Road Emissions Monitoring Program

Virginia's On-Road Emissions (ORE) program is designed to use on-road, remote sensing devices to identify both high-emitting and very clean vehicles. With few exceptions, gasoline-powered vehicles with a model year of 1968 and newer and 10,000 pounds GVWR or less registered or operated primarily (as defined by regulation) in the I/M area are subject to the ORE program. Emissions data are collected by the remote sensing devices as vehicles travel through designated on-road sites. These data are then used to determine whether the emissions meet applicable standards and if any owner notification is warranted. Data are also used for program evaluation purposes.

Owners of high-emitting vehicles are sent a Notice of Violation (NOV) and are prompted to receive a confirmation test and necessary repairs. Vehicles failing the confirmation test must be repaired and re-inspected until they pass or receive a DEQ-issued waiver. Low-income owners may be eligible for repair assistance. In 2019, DEQ issued 1,056 NOVs to owners of high-emitting vehicles. Of the 657 vehicles submitted for confirmation tests, 36% failed and an additional 34% had emissions control monitors "not ready" indicating issues with the vehicle's emissions control system. Repairs resulting from this program help improve air quality and allow DEQ to monitor program compliance of subject vehicles in between normal inspection cycles.

Owners of exceptionally clean vehicles subject to biennial inspections and meeting program requirements may receive a "clean screen" notice through the RAPIDPASS program and have the option

to redeem them in lieu of vehicle testing at a traditional emissions inspection station. Legislation passed in 2012 allows up to 30% of the eligible I/M fleet to be clean screened through the on-road program. In 2019, there were 84,148 clean screens redeemed, in addition to the 766,156 tests performed at stations.

Additionally, DEQ administers an evaporative emissions (“liquid leaker”) advisory program, which uses the remote sensing devices to identify vehicles with very high evaporative emissions, separate from tailpipe exhaust emissions. Since this is advisory only, vehicles do not need to be registered or operated primarily in the I/M area; all Virginia-registered vehicles meeting other ORE criteria are subject to the program. Vehicle owners are mailed advisory notices explaining on-road detection, the potential leak and actions that may be taken if the owner decides to have their vehicle examined. The advisory notice clearly explains that no action is required, but does request feedback should the owner choose to have the vehicle examined and/or repaired. Information provided to DEQ aids in evaluating air quality benefits associated with the identification and repair of evaporative emissions leaks. DEQ began sending these notices in June 2018. Of the 300 advisory notices sent in calendar year 2019, 25 responses were received, including five repair forms. DEQ will use this and subsequent years’ data to estimate the potential emissions reductions and benefits these types of repairs may provide in continuing efforts to improve the Commonwealth’s air quality.

4. Emission Estimates and Control Programs

Figure 4-1 provides Virginia emissions data and projections from a number of EPA sources. The emissions estimates from 2008, 2011, and 2014 are from EPA’s [National Emissions Inventory](#) (NEI). The data from 2016 and the projections to 2028 are taken from EPA’s [2016 emissions inventory modeling platform](#). The 2017 emissions data are taken from EPA’s version 1 of the [2017 NEI](#). As shown in Figure 4-1, anthropogenic emissions of NO_x, VOC, and SO₂ in Virginia have decreased significantly between 2008 and 2017. Projected emissions for 2028 continue these downward trends. Between 2008 and 2028, NO_x emissions are projected to drop 66%, VOC emissions are projected to drop 37%, and SO₂ emissions are projected to drop 90%. These emission estimates reflect forecasted growth in vehicle miles traveled, population, and industry through 2028. The reductions shown are the result of control programs implemented at the federal and state level as well as changing economic factors.

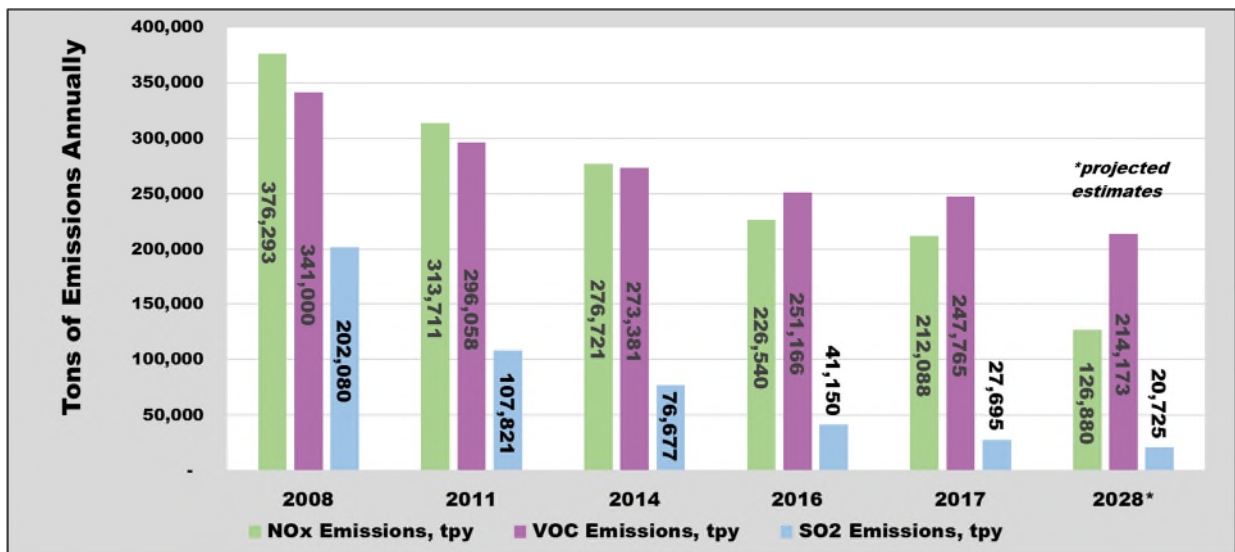


Figure 4-1: Anthropogenic Emission Estimates for Virginia

4.1. Emissions from Electrical Generation

Figure 4-2 provides the annual emissions of SO₂ and NO_x from Acid Rain Program electrical generating units located in Virginia. These units are the largest fossil fuel-fired equipment in the Commonwealth. Emission reductions from this source sector are attributable to a number of factors, including control programs such as the federal Mercury and Air Toxics Rule; retirement of older, high-emitting units; and the construction and operation of new, very low-emitting units. Between 2002 and 2019, Virginia emissions and emission rates decreased in this source sector even though fuel usage rates, depicted by the yellow line in Figure 4-2, have increased in recent years.

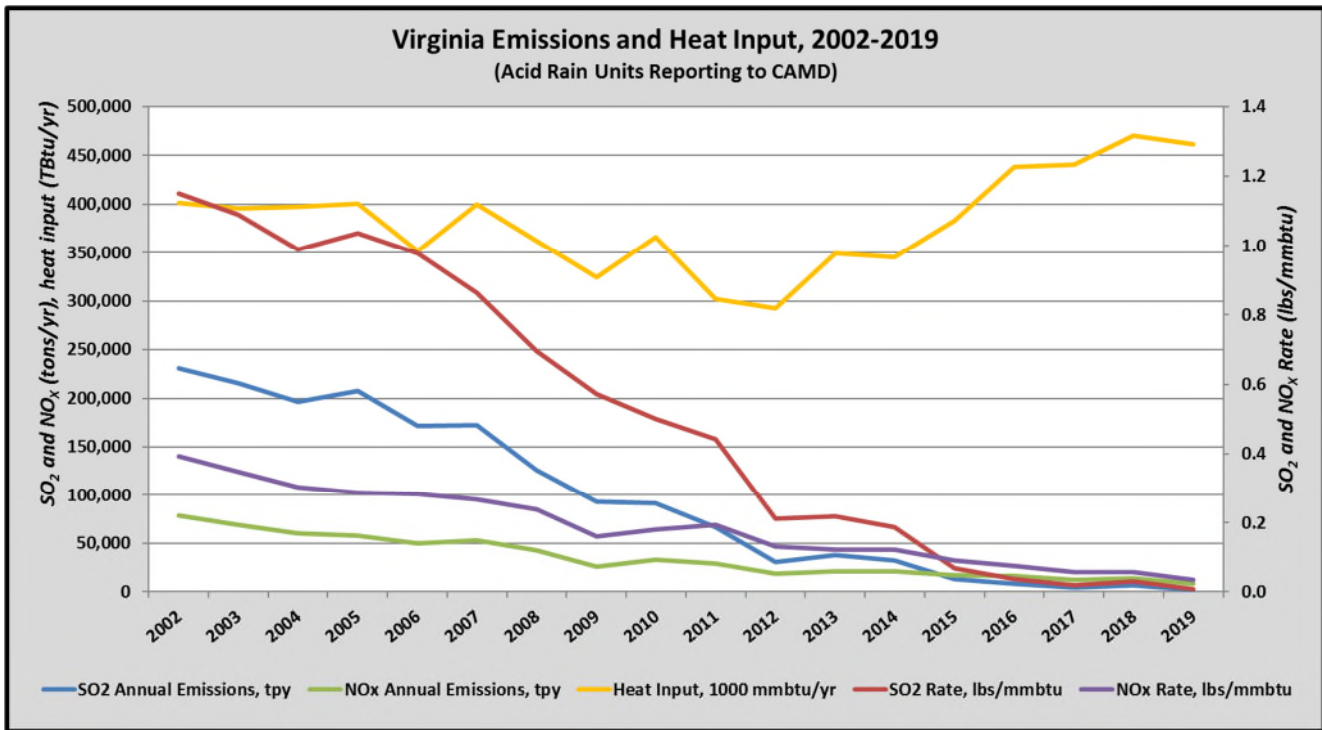


Figure 4-2: Virginia Acid Rain Unit Emissions

4.2. On Road Mobile Source Programs

On-road mobile sources include highway vehicles that use gasoline, diesel, and other fuels. These sources include both light duty and heavy duty vehicles. In EPA’s NEI data for 2008, 2011, 2014, and 2017, the on-road mobile source sector accounts for between 45% and 48% of Virginia’s entire anthropogenic NO_x inventory. NO_x is the predominant cause of ozone in this part of the United States and contributes to nitrogen deposition in the Chesapeake Bay. Analogous to the decline displayed in Figure 4-1, Virginia on-road mobile source NO_x emissions have steadily decreased from 2008 to 2017.

On April 28, 2014 (79 FR 23414), EPA finalized a new rule that lowers emissions standards from on-road gasoline engines beginning with model year 2017 vehicles. This rule, known as the Tier 3 standards, also reduced the amount of sulfur in gasoline beginning in 2017. Reducing the sulfur content of gasoline allowed manufacturers to equip vehicles with better emission controls so that new vehicles

meet lower engine standards. The cleaner fuel also reduced emissions from existing vehicles allowing them to operate more efficiently. EPA provides more information on this rule at <http://www.epa.gov/otaq/tier3.htm>.

On January 21, 2020 (85 FR 3306), EPA published an advanced notice of proposed rulemaking entitled, "[Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine Standards](#)." The purpose of this upcoming rule making is to decrease pollution emitted from highway heavy-duty trucks and engines since current standards are nearly 20 years old. EPA originally supplied a target date of September 2020 to publish the proposal. However, EPA has since decided to take more time to develop this regulatory proposal.

4.3. Reformulated Gasoline

Reformulated gasoline (RFG) is gasoline blended to burn more cleanly than conventional gasoline. Using this fuel reduces emissions of VOC, CO, and NO_x as well as some toxic pollutants like benzene. The CAA under § 211(k)(10)(D) mandated the use of RFG in certain large, metropolitan areas, including ten jurisdictions in the Northern Virginia area. Based on air quality, other Virginia areas opted into this program to garner reductions necessary to reduce ozone concentrations. Such areas in Virginia include seven jurisdictions in the Richmond-Petersburg area and 11 jurisdictions in the Hampton Roads area. Based on 2016 Virginia Department of Motor Vehicle data, these jurisdictions house 58% of all registered vehicles in Virginia. Based on Virginia Department of Transportation data, these jurisdictions account for 52% of all vehicle miles traveled in Virginia.

EPA estimates that RFG reduces mobile source emissions of VOC by 27% and NO_x by 7% as compared to emissions from conventional gasoline. Emission reductions occur for on-road use, such as in passenger vehicles and gasoline-powered trucks, and in other types of engines, such as lawn equipment, watercraft, and gasoline-powered generators. EPA also estimates that RFG emits 22% less toxic air pollutants than conventional gasoline. EPA provides more information on this program at <https://www.epa.gov/gasoline-standards/reformulated-gasoline>.

In 2017 DEQ evaluated the emissions benefits of this program using MOVES2014a and the 2011 input data for Virginia jurisdictions. This analysis estimated the daily and annual benefits achieved from implementation of the RFG program in 2011. **Error! Reference source not found.** summarizes these estimated 2011 reductions from the RFG program on a daily basis and on an annual basis.

Table 4-1: RFG Program - Emissions Benefit

Area	NO _x tons/day	NO _x tpy	VOC tons/day	VOC tpy	CO tons/day	CO tpy
Northern Virginia/D.C.	1.39	210.31	1.90	415.01	18.63	3,391.49
Richmond-Petersburg	1.13	162.50	1.64	321.52	14.35	2,575.94
Hampton Roads	1.49	187.94	2.05	347.49	19.75	2,665.26
Virginia Total	4.00	560.75	5.59	1,084.03	52.72	8,632.69

4.4. Non-Road Mobile Control Programs

Non-road mobile equipment includes off-road mobile sources that use gasoline, diesel, and other fuels. Source types include construction equipment, lawn and garden equipment, aircraft ground support

equipment, locomotives, and commercial marine vessels. In EPA’s NEI data for 2008, 2011, 2014, and 2017, the non-road mobile source sector accounts for between 19% and 24% of Virginia’s entire anthropogenic NOx inventory.

Federal regulations control emissions of various pollutants from these non-road mobile source categories. These federal regulations require manufacturers to build cleaner engines. Most of these regulations have phase-in periods, where standards are more stringent for equipment manufactured in later years. These federal standards address a range of non-road sources including recreational vehicles, marine vessels, locomotives, and lawn and garden equipment. For example, EPA estimates that the Clean Air Non-road Diesel rule will result in a 90% reduction in NOx and a 95% reduction in PM. Air pollution benefits are realized through the purchase of new equipment and the benefits to air quality continue until the entire equipment fleet is replaced. EPA provides more information about these standards at <https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-nonroad-vehicles-and-engines>.

4.5. Volkswagen Environmental Mitigation Trust Agreement for State Beneficiaries

The Commonwealth of Virginia’s Beneficiary Mitigation Plan (Plan) describes the range of eligible on road and non-road mobile source mitigation actions that Virginia may fund with the \$93.6 million allocated to it under the fully executed Environmental Mitigation Trust Agreement for State Beneficiaries (State Trust Agreement) that took effect October 2, 2017, in the case, *In Re: Volkswagen “Clean Diesel” Marketing, Sales Practices, and Products Liability Litigation*. The State Trust Agreement is an element of the settlements resolving allegations that Volkswagen (VW) violated the Clean Air Act by the sale of approximately 590,000 2.0 and 3.0 liter diesel engine motor vehicles (model year 2009 to 2016) equipped with “defeat devices” in the form of computer software designed to cheat on federal emissions tests including approximately 16,000 vehicles in Virginia. The Virginia Department of Environmental Quality (DEQ) is the designated Lead Agency acting on the State’s behalf as beneficiary to implement Virginia’s allocation of the \$2.95 billion Trust through a Beneficiary Mitigation Plan (Plan). The overall goal of the Plan is to permanently mitigate approximately 2,095 short tons of excess lifetime mobile NOx emitted in violation of federal emissions standards by more than 16,000 VW diesel vehicles registered in Virginia through transportation electrification projects. Transportation electrification projects also support other priorities delineated in the Plan, including reducing air pollution in disproportionately impacted areas of the state, attaining and maintaining federal air quality standards for ground-level ozone, improving visibility under the regional haze program, and reducing nitrogen loads to the Chesapeake Bay.⁵ The public can sign-up to receive updates and track progress on the implementation of the State Trust Agreement on DEQ’s VW Mitigation webpage at: <https://www.deq.virginia.gov/Programs/Air/VWMitigation.aspx#Timeline>.

⁵ DEQ collaborated with the U.S Environmental Protection Agency (EPA) to develop a white paper entitled *Influence of Volkswagen Settlement Agreements on Chesapeake Water Quality*, which provides a standard method for converting reductions in NOx emissions achieved through the implementation of VW mitigation to reduced nitrogen loads to the Bay. This standard method can be used by all Chesapeake Bay Partner states (https://www.chesapeakebay.net/channel_files/28679/influence_of_volkswagen_settlement_agreements_on_chesapeake_water_quality_final_8-20-18.pdf).