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Regional Haze 5-Year Progress Report for the 2nd Planning Period (2018-2028)

Assessment of Reasonable Progress Goals and Adequacy of the Existing State Implementation Plan

XXXX, 2025

Prepared for:
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Maryland Department of the Environment Regional Haze 5-Year Progress Report for the 2nd Planning Period (2018-2028)

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Executive Summary

Regional haze is the degradation of visibility due to air pollution from both natural and anthropogenic sources, reducing the clarity and color of what we see in many of our national parks and wilderness areas. The Clean Air Act (CAA)[1] requires states to protect visibility in national parks and wilderness areas designated as Class I areas. CAA section 169A also requires the U.S. Environmental Protection Agency (EPA) to set regulations for the protection of the Class I areas. In 1999, the EPA finalized the Regional Haze Rule (RHR)[2], requiring states to develop plans to protect and improve visibility, in collaboration with Federal Land Managers. The overarching goal of the RHR is to achieve natural visibility conditions at Class I areas by 2064. The RHR was amended and revised in 2005 and 2017 and is codified under Code of Federal Regulations (CFR), Title 40, Part 51.[3]

The RHR requires states to submit: 1) regional haze State Implementation plans (SIPs), each of which covers a 10-year planning period; and 2) progress reports, which are typically submitted at the mid-point of each planning period and reflect the first 5 years of the planning period. This document is the mid-course progress report, as required by 40 CFR § 51.308(g) and is hereafter known as the *Maryland Department of the Environment Regional Haze 2nd Planning Period Progress Report* (or "progress report"). The purpose of this progress report is to review the adequacy of Maryland's second Regional Haze SIP[4] for meeting the ten-year visibility goals. The Maryland Department of the Environment (MDE) submitted Maryland's second Regional Haze SIP on February 8, 2022, and EPA approved the SIP effective May 1, 2024 in a final rule issued on April 1, 2024.[5] The approval signifies that the SIP revision satisfies the applicable requirements under the CAA and EPA's RHR for the program's second implementation period. Maryland's SIP submission also addresses the requirement that states must periodically revise their long-term strategies for making reasonable progress towards the national goal of preventing any future, and remedying any existing, anthropogenic impairment of visibility, including regional haze, in mandatory Class I Federal areas. Maryland is one of three states within the Mid-Atlantic/Northeast Visibility Union (MANE-VU) with a fully approved SIP for the second implementation period as of May 2024.

This progress report includes:

- The status of implementation measures;
- Emissions reductions achieved;
- Visibility conditions and changes;
- Changes in emissions;
- Assessment of significant changes in emissions;
- Assessment of current implementation plan elements and strategies; and
- Federal Land Management (FLM) coordination and public comment.

The status of the implemented measures are such that Class I areas affected by Maryland's visibility impairing pollutant emissions will continue to make reasonable progress towards the ultimate RHR goal of natural visibility conditions by 2064. This is evidenced by the improvements

[1] 42 U.S.C. 7401 et seq.
[2] 64 FR 35714, July 1, 1999
[3] 40 CFR § 51.300-309
[4] *State of Maryland Regional Haze State Implementation Plan for the Second Implementation Period 2018-2028*, Periodic Revision SIP Number 22-01, February 8, 2022.
[5] 89 FR 22337, April 1, 2024

in visibility and emissions reductions outlined in this report. Maryland made a robust assessment of its current plan elements and strategies, consulted extensively with the affected FLMs, and conducted a public review process. Based on the data provided throughout this document and its attachments, Maryland affirms that this progress report satisfies the requirements of RHR paragraphs (g), (h), and (i).

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ACRONYMS AND ABBREVIATIONS

CAA	Federal Clean Air Act
CAMPD	U.S. EPA Clean Air Markets Program Database
CDD	Clean Data Determination
CFR	U.S. Code of Federal Regulations
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
COMAR	Code of Maryland Regulations
CSNA	Climate Solutions Now Act
EGU	Electric Generating Unit
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
FED	Federal Land Manager Environmental Database
FLM	Federal Land Manager
FR	Federal Register
GGRA	Greenhouse Gas Reduction Act
HEDD	High Electric Demand Day
IMPROVE	Interagency Monitoring of Protected Visual Environments
LTS	Long Term Strategy
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MDE	Maryland Department of the Environment
Mm^{-1}	Inverse Megameters
MMBtu	Million British Thermal Units
NAAQS	National Ambient Air Quality Standard
NEI	National Emissions Inventory
NH_3	Ammonia
NO_x	Nitrogen Oxides
NPS	U.S. National Park Service
NSR	New Source Review
PM	Particulate Matter
PM10	Particulate Matter < 10 microns
PM2.5	Particulate Matter < 2.5 microns
PPM	Parts Per Million
RGGI	Regional Greenhouse Gas Initiative
RHR	Federal Regional Haze Rule
RPG	Regional Haze Reasonable Progress Goal
RPO	Regional Planning Organization
RPS	Renewable Portfolio Standard
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
USFS	U.S. Forest Service
VISTAS	Visibility State and Tribal Association of the Southeast
VOC	Volatile Organic Compounds

Introduction

Background

Section 169A of the Clean Air Act (CAA) "declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which [*sic*] impairment results from manmade air pollution." Mandatory Class I Federal areas (referenced hereinafter as Class I areas) consist of National Parks greater than 6,000 acres, wilderness areas & national memorial parks greater than 5,000 acres, and international parks, all of which were in existence as of August 7, 1977. Visibility was found to be an important value in 156 of these areas.

The CAA directed the U.S. Environmental Protection Agency (EPA) to promulgate regulations aimed at meeting the goals of Section 169A. To this end, EPA originally finalized the Regional Haze Rule (RHR) in 1999. The RHR was amended and revised in 2005 and 2017 and is codified under Code of Federal Regulations (CFR), Title 40, Part 51.[6] The overarching goal of the RHR is to achieve natural visibility conditions at Class I areas by 2064. The RHR requires states to submit two types of regional haze planning documents: regional haze State Implementation Plans (SIPs), each of which covers a 10-year planning period, and progress reports, which are typically submitted at the mid-point of each planning period (although noting that regional haze SIPs themselves must include the required information such that they also serve as progress reports; the mid-course progress reports, such as this one, are their own stand-alone documents).

Purpose

This document fulfills the requirements of paragraphs 40 CFR § 51.308(g), (h), and (i) of the RHR as a progress report for the second regional haze planning period, which covers the period from 2018 to 2028. In this progress report, Maryland affirms that its approved regional haze SIP for the second planning period is adequate for making reasonable progress towards the RHR goal of achieving natural visibility conditions at Class I areas by 2064.[7]

MDE has consulted with the Federal Land Managers (FLM) on the contents of this progress report and has made it available for public review prior to submission to EPA. However, per revisions made to the RHR in 2017, this progress report is not being submitted as a formal SIP revision.[8]

Maryland is a member of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) which is a regional planning organization (RPO). MANE-VU's voting membership includes 11 states, the District of Columbia, and two tribal nations: Penobscot Indian Nation and the St. Regis Mohawk Tribe. Additional MANE-VU members include EPA, the U.S. Fish and Wildlife Service (FWS), the U.S. Forest Service (USFS), and the U.S. National Park Service (NPS).
The MANE-VU Class I areas are listed below along with the state/province in which they are located. The names in parentheses indicate the larger area in which the Class I area is embedded.

- Acadia National Park, Maine
- Moosehorn Wilderness Area, Maine (Moosehorn National Wildlife Refuge)
- Roosevelt/Campobello International Park, New Brunswick Canada
- Great Gulf Wilderness Area, New Hampshire (White Mountain National Forest)

[6] 40 CFR § 51.300-309
[7] 89 FR 22337, April 1, 2024
[8] 82 FR 3078, January 10, 2017

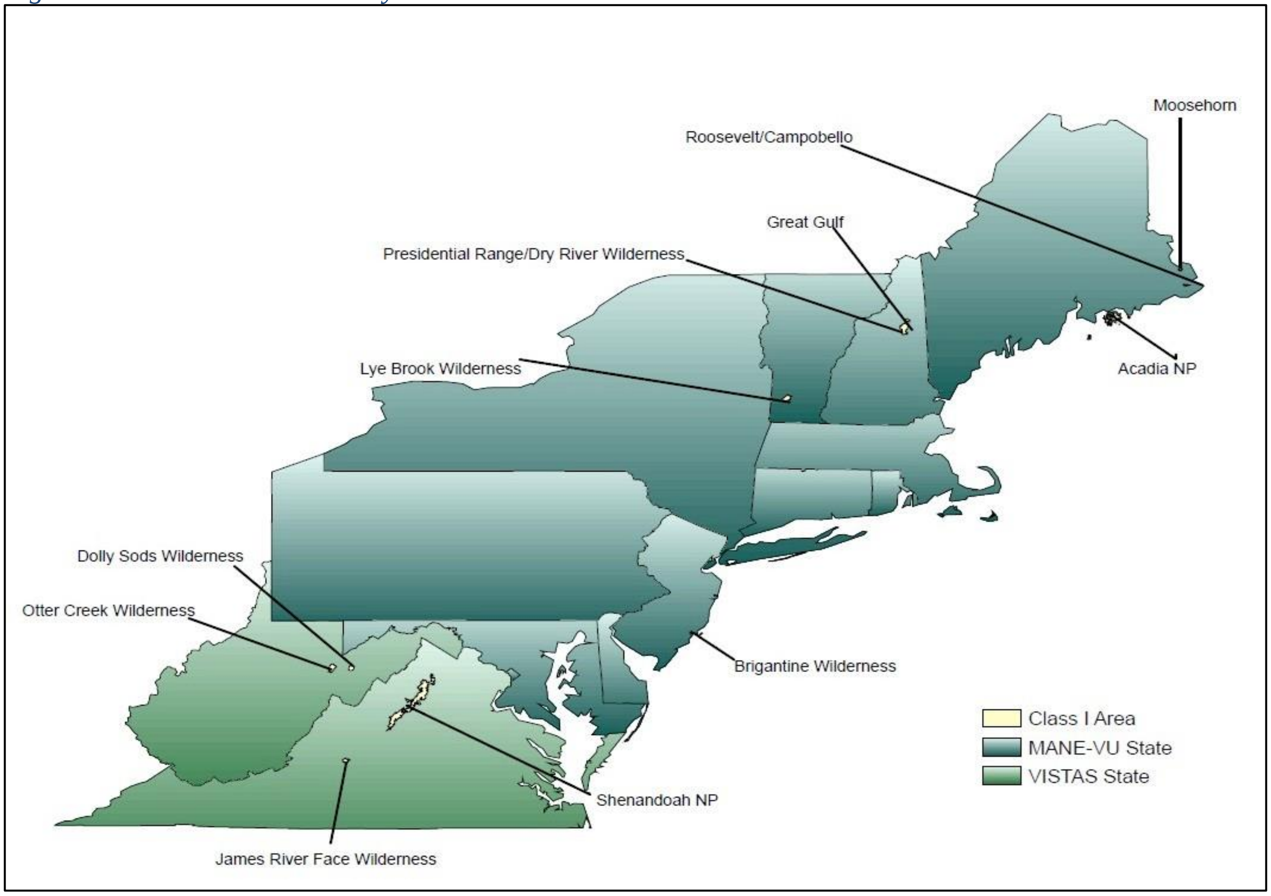
- Presidential Range - Dry River Wilderness Area, New Hampshire (White Mountain National Forest)
- Brigantine Wilderness Area, New Jersey (E.B. Forsythe National Wildlife Refuge)
- Lye Brook Wilderness, Vermont (Green Mountain National Forest)

Additionally, Maryland is within 186.4 miles (300 kilometers) of 4 nearby Class I areas outside of MANE-VU:

- Shenandoah National Park, Virginia
- James River Face Wilderness, Virginia (Jefferson National Forest)
- Dolly Sods Wilderness, West Virginia (Monongahela National Forest)
- Otter Creek Wilderness, West Virginia (Monongahela National Forest)

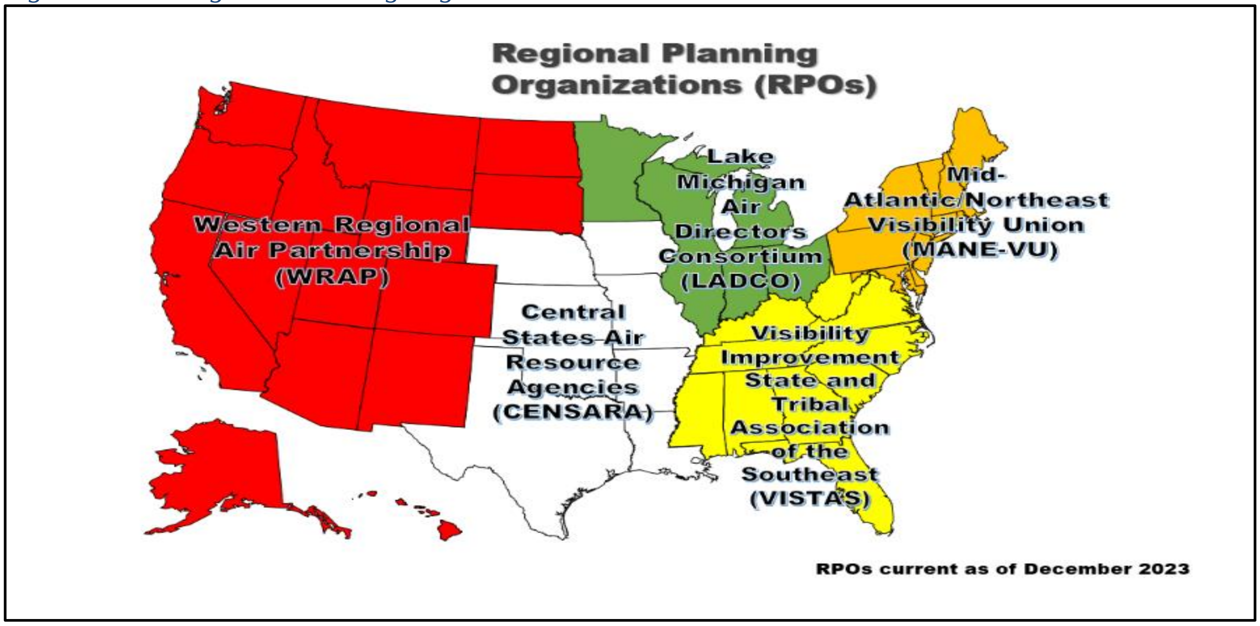
A map of the MANE-VU and the nearby southern region, including the Class I areas within, is provided in Figure 1.

Figure 1: MANE-VU and Nearby Class I Areas



MANE-VU provides technical assistance, facilitates discussion, and encourages coordinated action among its member agencies. It also fosters communication with other RPOs that engage in planning activities related to regional haze. These RPOs are shown in Figure 2.

Figure 2: U.S. Regional Planning Organizations



Requirement for Periodic Progress Reports

The following sections of this document are organized to follow the structure of the progress report requirements of the RHR, as shown in Table 1 below.

Table 1: Organization of Progress Report

40 CFR § 51.308	Report Section	Description
(g)(1)	1	Status of control measures in the Regional Haze State Implementation Plan
(g)(2)	2	Emissions Reductions for the Regional Haze State Implementation Plan Strategies
(g)(3)	3	Visibility Progress
(g)(4)	4	Emissions Progress
(g)(5)	5	Assessment of Changes Impeding Visibility Progress
(g)(6)	6	Assessment of Current Strategy
(g)(7)	Not Applicable	Review of visibility monitoring strategy for the first regional haze planning period
(g)(8)	Not Applicable	Long-Term Strategy Containing a Smoke Management Plan
(h)	7	Determination of Adequacy
(i)	8	Consultation with Federal Land Managers

1. STATUS OF CONTROL MEASURES IN THE REGIONAL HAZE STATE IMPLEMENTATION PLAN

40 CFR § 51.308(g)(1) requires "A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory class I Federal areas both within and outside the state." States without Class I areas are responsible for establishing a long-term strategy so that the Class I areas affected by emissions from the state can make reasonable progress towards natural conditions.

Maryland does not have any Class I areas within its borders so it only must address sources that affect Class I areas located outside of Maryland in its long-term strategy (LTS). 40 CFR § 51.308(f)(2) requires Maryland to ensure that its long-term strategy includes the enforceable emission limitations, compliance schedules, and other measures necessary to make reasonable progress goals established by states with Class I areas.

In its regional haze SIP for the second planning period, Maryland determined that the following measures were necessary for making reasonable progress at all nearby Class I Areas and responding to MANE-VU's six "Asks"[9]:

1. Running nitrogen oxide (NO_x) and sulfur dioxide (SO_2) Post-Combustion Controls on Coal-Fired Electric Generating Units (EGUs) Year Round
2. Four factor analysis for facilities with an impact of 3 Inverse Megameters (Mm^{-1}) or more on nearby Class I areas
3. Adopting ultra-low sulfur fuel oil regulations
4. Updating permits at facilities larger than 250 Million British Thermal Units (MMBtu) Heat Input
5. Addressing High Electricity Demand Day (HEDD) Units
6. Increasing energy efficiency, combined heat and power, and clean distributed generation

These measures were adopted into Maryland's long-term strategy (LTS)[10] as permanent and enforceable measures. These measures and their original implementation are described in detail in Section 2.5.1 - 2.5.6 of Maryland's approved regional haze SIP for the second planning period (or "Second RH SIP"). All these enforceable measures remain fully implemented and there has been no change in implementation status since the time that Maryland's Second RH SIP and associated rulemaking were formally adopted. The current implementation of these measures is described below.

1.1 Year Round Running of NO_x and SO_2 Post-Combustion Controls

EGUs with a nameplate capacity larger than or equal to 25 megawatts with already installed NO_x and/or SO_2 controls should ensure the most effective use of control technologies on a year-round basis to consistently minimize emissions of haze precursors, or obtain equivalent alternative emission reductions.

NO_x emissions are regulated by COMAR (Code of Maryland Regulations) 26.11.27[11] which caps NO_x emissions on an ozone season and annual basis for each coal-fired EGU in Maryland.

[9] Maryland Department of the Environment, State of Maryland Regional Haze State Implementation Plan for the Second Implementation Period 2018–2028, Appendix 1. (2022). pp. 23-42.
[10] Maryland Department of the Environment, State of Maryland Regional Haze State Implementation Plan for the Second Implementation Period 2018–2028, Appendix 1. (2022). p. 8.
[11] *Emission Limitations for Power Plants* (Maryland Healthy Air Act)

Additionally, COMAR 26.11.40[12] assures optimization of post-combustion ((Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR)) NO_x controls on coal-fired EGUs and sets NO_x Indicator Rates for each unit to assure optimization. Further details on Maryland's NO_x and SO_2 controls can be found in Maryland's approved Second RH SIP along with NO_x and SO_2 emission reduction tables.[13] NO_x reductions for 2018-2022, and thus the first portion of the 2nd regional haze planning period reflected in this progress report are outlined in section 2 of this report (see Table 4). The total annual NO_x emissions data shows continued annual reductions from the sources. When compared to the 2002 base year levels NO_x emissions dropped from 94% in 2017 to 97% in 2022.

SO_2 emissions are also regulated by COMAR 26.11.27[14] which caps SO_2 emissions on an annual basis for each coal-fired EGU in Maryland as well as the consent order provisions for the 2010 SO_2 National Ambient Air Quality Standards (NAAQS)[15] SIP covering the Anne Arundel and Baltimore County SO_2 Nonattainment Area. The nonattainment area covers three coal-fired power-generating facilities (Brandon Shores, H.A. Wagner and C.P. Crane (shutdown in 2018 and demolished in 2019). The main coal-fired EGU associated with the Anne Arundel County and Baltimore County SO_2 nonattainment area is H.A. Wagner Unit 3. MDE estimates a 20-45% reduction in SO_2 emissions based on dispersion modeling and the permit limits in the federally enforceable consent order.[16] EPA has finalized a Clean Data Determination (CDD) for the SO_2 nonattainment area that demonstrates that the area has met the standard.[17] SO_2 reductions for 2018-2022 (the time period of the first half of the 2nd regional haze planning period) are outlined in section 2 of this report (see Table 3). The total annual SO_2 emissions data shows continued annual reductions from the sources. When compared to the 2002 base year levels SO_2 emissions dropped from 96.8% in 2017 to 98.6% in 2022 (see Table 3).

1.2 Four factor analysis for facilities with an impact of 3 Mm^{-1} or more on nearby Class I areas

Emission sources modeled by MANE-VU that have the potential for 3.0 Mm^{-1} or greater visibility impacts at any MANE-VU Class I area, as identified by MANE-VU contribution analyses[18], must perform a four-factor analysis for reasonable installation or upgrade to emission controls. As outlined in section 2.5.2 of Maryland's Second RH SIP,[19] the H.A. Wagner Generating Facility located in Anne Arundel County, Maryland and the Verso Luke Paper Company located in Allegany County, Maryland were identified by MANE-VU as having units with the potential for 3.0 Mm^{-1} or greater visibility impacts at any MANE-VU Class I area and by the Visibility State and Tribal Association of the Southeast (VISTAS) as potentially impacting Class I areas in West Virginia and Virginia (see Figures 1 and 2).

The Luke Paper Company ceased operations and relinquished their air permits in June of 2019, with official documentation sent to the EPA on May 29, 2020, as outlined in the Second RH SIP.[20]

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12 *NO_x Ozone Season Emission Caps for Non-trading Large NO_x Units*

13 89 FR 22337, April 1, 2024

14 *Emission Limitations for Power Plants* (Maryland Healthy Air Act)

15 *Primary National Ambient Air Quality Standard for Sulfur Dioxide; Final Rule*. 75 Fed. Reg. 35520. June 22, 2010.

16 Additional details on Maryland's NO_x and SO_2 controls can be found in Maryland's regional haze SIP for the second planning period (89 FR 22337).

17 https://www.govinfo.gov/content/pkg/FR-2022-11-02/pdf/2022-23709.pdf

18 *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028*. Maryland Department of the Environment. (2022) Appendix 3: Periodic Revision MANE-VU Updated Q/d*C Contribution Assessment. https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

19 *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028*. Maryland Department of the Environment. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

20 *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028. Section 2.5.2*. Maryland

The facility is currently undergoing a massive demolition project. No further action is necessary.

H. A. Wagner Generating Station agreed to and signed a legally binding consent order to cease the combustion of coal by 2026 that was included in the Second RH SIP[21] and is reflected in 89 FR 22341. Talen Energy, the owner of the H. A. Wagner Generating Facility has publicly committed to eliminating coal use at the facility by January 1, 2026. As outlined in the Second RH SIP, Maryland agrees that further control of the coal-fired Unit 3 at the H. A. Wagner Generating Station is not reasonable because the remaining useful life of the unit was approximately 4½ years as of February 1, 2022. In addition, Talen Energy has committed to re-powering Unit 3 on oil. No further action is necessary.

1.3 Adopting ultra-low sulfur fuel oil regulations

Maryland adopted amendments to COMAR 03.03.05.04, Specifications for No. 1 and No. 2 Fuel Oil in 2014. The amendments lowered the maximum allowable amount of sulfur in two stages. The first stage reduced the maximum No. 1 and No. 2 fuel oil sulfur levels from 3,000 parts per million (ppm) to 2,000 ppm in 2014. The second stage reduced sulfur levels further to a level of 500 ppm in 2016. The third stage reduced sulfur levels further for No. 1 and No. 2 fuel oil to the MANE-VU Ask level of 15 ppm in 2019.

The amount of No. 4 or No. 6 residual oil combusted in Maryland is minimal (less than 0.2% of national total consumption) and sources that utilize residual oil are uncommon in Maryland. Maryland has started the regulatory process to examine the state's sulfur in residual oil standards and address any deficiencies identified by the examination, as expeditiously as possible. The MDE planning program is considering lowering the limits for sulfur content in No. 4 and No. 6 residual oil. Data is being collected on the current sulfur content of oil used at facilities to help determine how a lower limit might impact facilities and what regulations are needed.

1.4 Updating permits at facilities larger than 250 MMBtu Heat Input

Maryland EGUs and other large point emission sources that have switched operations to lower emitting fuels are already locked into the lower emission rates for SO_2, NO_x and PM by permits, enforceable agreements and/or rules. These units are required to amend their permits through the New Source Review (NSR) process if they plan to switch back to coal or fuel that will increase emissions. A change in fuel, unless already allowed in the permit, would be a modification. COMAR 26.11.02.02 specifies that a permit to construct and an approval from MDE is required before construction or modification of a source can occur.

1.5 Addressing High Electricity Demand Day (HEDD) units

A four-factor analysis approach was utilized to analyze potential HEDD control options and is outlined in Maryland's Second RH SIP.[22] MDE evaluated several controls, including adding SCR or water/steam injection. Due to the high cost and low NO_x reductions from these units, MDE has determined that it is not feasible to implement any controls on HEDD units at this time.

1.6 Energy efficiency, combined heat and power, and clean distributed generation

The electricity generation strategy in Maryland's 2030 Greenhouse Gas Reduction Act (GGRA)

Department of the Environment. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

[21] *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028.* Maryland Department of the Environment. (2022) Appendix 19: Consent Order. https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

[22] *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028. Section 2.5.5.* Maryland Department of the Environment. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

Plan[23] has been updated through the Climate Solutions Now Act of 2022 (CSNA)[24] with a call for 100% of the electricity consumed in-state to be clean by 2035 by deploying energy through the existing Renewable Portfolio Standard (RPS), capping and reducing emissions through the Regional Greenhouse Gas Initiative (RGGI), and through implementation of the CSNA.

Achieving 100% clean electricity is an essential part of the economy-wide decarbonization and electrification strategy, as it will not only reduce emissions from Maryland power plants, but also provide carbon-free energy to decarbonize the building and transportation sectors by replacing fossil-fuel powered systems with electric systems that run on increasingly clean and renewable electricity.

Maryland's RPS[25] requires Maryland electric utilities to purchase increasingly large proportions of Maryland's electricity from renewable energy sources like solar, wind, hydropower, and qualifying biomass. The current RPS goal is for 50% of Maryland's electricity to come from renewable sources by 2030 through substantial increases in solar power and deployment of new offshore wind energy off the Atlantic coast. The CSNA calls for Maryland to reduce emissions by 60% (2006 baseline) by 2031, with reductions to net-zero emissions by 2045. As part of CSNA, MDE published the "Maryland Climate Pollution Reduction Plan"[26] in December of 2023, and the "Priority Climate Action Plan State of Maryland"[27] in March of 2024. Maryland is considering additional measures in response to CSNA to develop additional energy efficiency and clean energy strategies to meet the updated timelines.

Capping and Reducing Fossil Energy through the Regional Greenhouse Gas Initiative (RGGI)
The RGGI program is a regional cap and trade program designed to reduce carbon dioxide (CO_2) emissions from power plants and other large industrial sources. By participating in RGGI, Maryland has accrued significant co-benefits in SO_2 and NO_x emissions.

As part of RGGI, Maryland committed to promoting Combined Heat and Power. The Combined Heat and Power (CHP) Grant Program was designed to further encourage CHP growth in the State and was a first-come-first-served program that targeted eligible commercial, industrial, institutional, and critical infrastructure facilities (including healthcare, wastewater treatment, and essential state and local government facilities). The program ended at the end of 2023 as a large portion of the eligible facilities had adopted that technology and the complexity and time needed to implement CHP conflicted with the long-term goal of converting primarily to cleaner energy to meet the CSNA goals. The Maryland Energy Administration decided to redirect those funds towards renewable energy, energy storage and other energy efficiency efforts through the Resilient Maryland Program[28] and the Commercial, Industrial and Agricultural Grant Program[29].
Several other energy efficiency and renewable energy programs and efforts supported by RGGI are key components of Maryland's strategy to reduce pollutants, including the Maryland Smart

[23] Greenhouse Gas Reduction Act (MD. Environment Code Ann. § 2-1204.1 (2021))
[24]https://lpdd.org/resources/marylands-proposed-climate-solutions-now-act-2022/#:~:text=In%20March%202022%2C%20both%20houses,net%2Dzero%20emissions%20by%202045.
[25] https://www.psc.state.md.us/electricity/maryland-renewable-energy-portfolio-standard-program-frequently-asked-questions/
[26] *Maryland Climate Pollution Reduction Plan. Pages 4-5.* MDE. December 28, 2023. https://mde.maryland.gov/programs/air/ClimateChange/Maryland%20Climate%20Reduction%20Plan/Maryland%27s%20Climate%20Pollution%20Reduction%20Plan%20-%20Final%20-%20Dec%2028%202023.pdf
[27] *Priority Climate Action Plan State of Maryland*, MDE, March 1, 2024.
[28] Resilient Maryland Program: https://energy.maryland.gov/business/pages/ResilientMaryland.aspx
[29] Commercial, Industrial and Agricultural Grant Program https://energy.maryland.gov/business/Pages/incentives/empowermdcigp.aspx

Energy Communities Program[30] and the Community Solar LMI-PPA Program[31].

Clean Distributed Generation
Maryland COMAR 26.11.36.03[32] was updated to reflect changes in the federal regulations for stationary engines. These engines are now subject to the requirements in 40 CFR Part 63, Subpart ZZZZ, 40 CFR Part 60, Subpart IIII or JJJJ. These federal restrictions on engine use are intended to prevent certain older, less-controlled engines from running on hot days, in order to reduce the amount of ozone-forming emissions.

Maryland has three natural gas combined cycle power plants. These are very efficient, state of the art power units, and they are assuming generating capacity of less efficient units.

[30] Maryland Smart Energy Communities Grant Program https://energy.maryland.gov/govt/Pages/smartenergycommunities.aspx
[31] Community Solar LMI-PPA Grant Program https://energy.maryland.gov/residential/Pages/CommunitySolarLMI-PPA.aspx
[32] *Requirements for Stationary Engines*, February 12, 2018

2. EMISSIONS REDUCTIONS FROM REGIONAL HAZE STATE IMPLEMENTATION PLAN STRATEGIES

40 CFR § 51.308(g)(2)[33] requires "A summary of the emissions reductions achieved throughout the state through the implementation of the measures described in paragraph (g)(1) of this section." Therefore, this section of the progress report gives a description of some of the emissions reductions associated with the measures described above in Section 1.

2.1 Low sulfur fuel oil standard

Table 2 below compares past, and recent sulfur dioxide (SO_2) emissions associated with the combustion of fuel oils in Maryland and the MANE-VU region. The emissions data are taken from the 2017 and 2020 National Emissions Inventories (NEI)[34].

The 2017 NEI represents the most recent data that was available at the time that the second implementation period regional haze SIPs were being drafted. Many states and jurisdictions had not adopted low sulfur fuel oil standards at the time that the 2017 NEI was compiled. The 2020 NEI is reflective of all MANE-VU states and jurisdictions having adopted the low sulfur fuel oil standards as was requested of all MANE-VU jurisdictions in the MANE-VU Intra-RPO "Ask".[35]

Table 2: 2017 and 2020 Fuel Oil SO_2 Emissions in Maryland and the MANE-VU Region (Tons)

	Maryland SO_2 (Tons)			MANE-VU Total SO_2 (Tons)		
Sector	2017	2020	Difference	2017	2020	Difference
Electricity Generation	117	36	81	9,395	6,804	2,591
Industrial	23	12	11	3,769	2,142	1,627
Commercial/Institutional	31	36	-5	3,995	1,847	2,148
Residential	347	6	341	9,805	215	9,590
Total	518	90	428	26,964	11,008	15,956

In general, SO_2 emissions from fuel oil combustion in Maryland and in the MANE-VU region are lower for 2020 than for 2017. This is likely due in large part to the enforceable MANE-VU-wide adoption of the low sulfur fuel standards, but economics, supply availability, and market forces likely also contribute to the differences.

2.2 SO_2 and NO_x emission reductions

Maryland has been an early implementer of NO_x and SO_2 post-combustion controls on coal-fired EGUs. No additional coal-burning units necessitated controls after 2017 due to early implementation. Maryland's SIP for the RHR 2nd implementation period[36] outlines the regulations implemented and technologies installed and their efficacy in reducing SO_2 levels by

[33] 40 CFR § 51.300-309

[34] *Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) States Concerning a Course of Action within MAN-VU Toward Assuring Reasonable Progress for the Second Regional Haze Implementation Period (2018-2028).* https://www.epa.gov/air-emissions-inventories/emissions-inventory-system-eis-gateway

[35] https://otcair.org/MANE-VU/Upload/Publication/Formal%20Actions/MANE-VU%20Intra-Regional%20Ask%20Final%208-25-2017.pdf

[36] *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028.* Maryland Department of the Environment. Pages 28-29. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

over 95% from 2002 to 2017 and NO_x levels by almost 95% during that same period. Maryland's SO_2 and NO_x emissions have continued to decrease in the interim. From 2017 until the end of the 5-year progress report period (2022) the emissions have continued to decrease. In 2022, the annual SO_2 mass emissions have reduced by almost 98.62% from 2002 levels and 57.13% from 2017 levels as seen in Table 3. The 2022 annual NO_x mass emissions have reduced by around 77% from 2017 levels and 50.62% from 2017 levels as seen in Table 4.

SO_2 emission reductions

Maryland's SIP for the RHR second implementation period[37] outlines the large reduction in SO_2 from coal-fired EGUs from 2002 to 2017. Table 3 and Figure 3 below show the overall decline during the 2002 to 2022 period. Table 3 also shows the continued decline in SO_2 emissions from 2017 to 2022 for Maryland's remaining coal-fired EGUs.[38]

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[37] *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028.* Maryland Department of the Environment. Pages 28-29. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

[38] Emissions Data from EPA Clean Air Markets Program Data (CAMPD): https://campd.epa.gov/data/custom-data-download

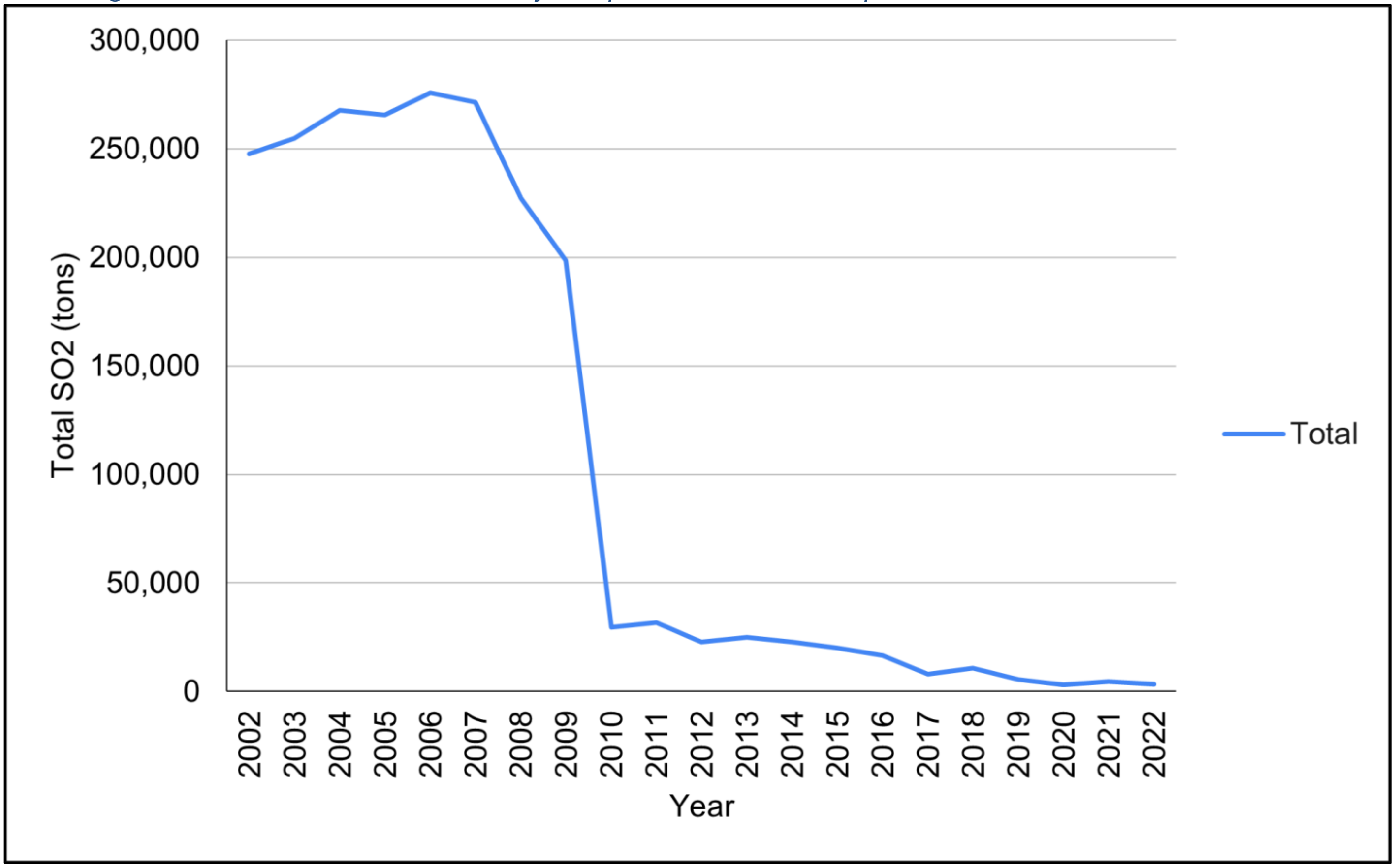
Table 3 below updates “Table 2-7” from the approved Maryland Regional Haze SIP revision for the 2nd Implementation period to include the five additional years required for this update.

Table 3: Updated Annual SO_2 Emissions (tons) – Coal-fired EGU[39]

Year	AES Warrior Run 1	Brandon Shores 1	Brandon Shores 2	C.P. Crane 1	C.P. Crane 2	Chalk Point 1	Chalk Point 2	Dickerson 1	Dickerson 2	Dickerson3	H.A. Wagner 2	H.A. Wagner 3	Morgantown 1	Morgantown 2	R. Paul Smith 3	R. Paul Smith 4	Total	Reduction from 2002 (tons)	% Reduction from 2002
2002	1,165	20,476	19,498	17,971	14,415	23,528	25,203	10,225	11,100	12,580	6,428	10,096	37,757	32,587	820	3,768	247,617	0	0.00%
2003		18,153	22,614	15,420	16,841	19,550	22,116	9,928	9,190	10,988	7,121	13,783	43,039	42,301	829	2,921	254,794	7,177	2.90%
2004		21,144	20,147	14,860	14,182	27,181	27,332	12,817	13,125	12,857	7,635	12,694	40,085	40,915	333	2,467	267,774	20,157	8.14%
2005		18,876	22,822	15,445	17,586	25,244	22,854	11,434	13,250	13,043	6,698	15,480	38,552	40,930	812	2,547	265,573	17,956	7.25%
2006	1,110	20,498	19,969	14,770	13,111	23,358	25,196	11,888	10,301	13,763	6,492	12,860	50,019	48,054	926	3,462	275,777	28,160	11.37%
2007	1,206	17,323	24,718	13,537	17,094	22,879	21,907	11,041	11,316	11,476	6,219	14,040	45,270	47,798	1,335	4,201	271,360	23,743	9.59%
2008	1,151	21,194	18,730	12,833	11,519	21,089	21,611	8,378	10,382	11,064	5,889	9,117	39,695	30,864	848	2,851	227,215	20,402	8.24%
2009	1,045	12,527	20,293	6,960	5,517	19,937	20,960	9,271	7,362	9,040	4,359	10,734	32,914	36,637	141	822	198,519	49,098	19.83%
2010	1,247	540	720	1,315	4,274	1,219	1,254	875	823	877	3,176	5,852	3,029	2,229	425	1,641	29,496	218,121	88.09%
2011	1,709	1,323	1,506	2,597	3,085	1,651	4,018	261	424	439	2,994	6,013	3,252	1,926	115	533	31,846	215,771	87.14%
2012	1,235	1,547	1,301	1,212	961	2,510	2,136	265	259	293	2,513	4,960	1,232	1,699	33	526	22,682	224,935	90.84%
2013	1,236	1,389	1,481	831	2,140	3,203	1,240	243	262	345	1,551	8,554	1,374	1,048			24,897	222,720	89.95%
2014	1,167	1,670	1,475	573	1,314	1,310	2,540	211	214	200	1,939	7,276	1,342	1,538			22,769	224,848	90.80%
2015	1,090	1,310	1,643	381	944	826	647	127	125	147	1,187	8,751	1,214	1,521			19,913	227,704	91.96%
2016	891	1,449	1,269	411	637	496	407	124	149	152	163	7,571	1,437	1,357			16,513	231,104	93.33%
2017	1,023	1,097	1,417	378	449	309	216	51	64	69	116	1,243	613	906			7,951	239,666	96.79%
5-Year Update																			
2018	1,086	1,746	1,785	391	475	393	320	41	53	63	229	2,730	696	809			10,816	236,801	95.63%
2019	1,027	546	953			176	223	23	26	25	89	1,122	439	783			5,432	242,185	97.81%
2020	922	420	267			192	22	67	46	16	0	602	270	390			3,212	244,405	98.70%
2021	1,173	758	719			357	235				0	642	479	382			4,746	242,871	98.08%
2022	1,194	549	496								1	457	382	343			3,423	244,194	98.62%

[39] All C.P. Crane units shut down in 2018. H.A. Wagner Unit 1 converted to fuel oil in 2019. Chalk Point coal units shut down in 2021. Dickerson coal units shut down in 2020. Morgantown coal units shut down in 2022.

Figure 3: Total SO_2 Reductions in Maryland for Coal-Fired EGUs for the Years 2002-2022



NO_x emission reductions

Maryland's SIP for the RHR 2nd implementation period[40] outlines the large reduction in NO_x from coal-fired EGUs from 2002 to 2017. Table 4 and Figure 4 below show the overall decline during the 2002 to 2022 period.[41]

Table 4 below updates "Table 2-8" from the approved Maryland Regional Haze SIP revision for the 2nd Implementation period to include the five additional years required for this update.

[40] *Regional Haze State Implementation Plan for the Second Implementation Period 2018 – 2028.* Maryland Department of the Environment. Pages 28-29. (2022) https://mde.maryland.gov/programs/air/airqualityplanning/pages/index.aspx

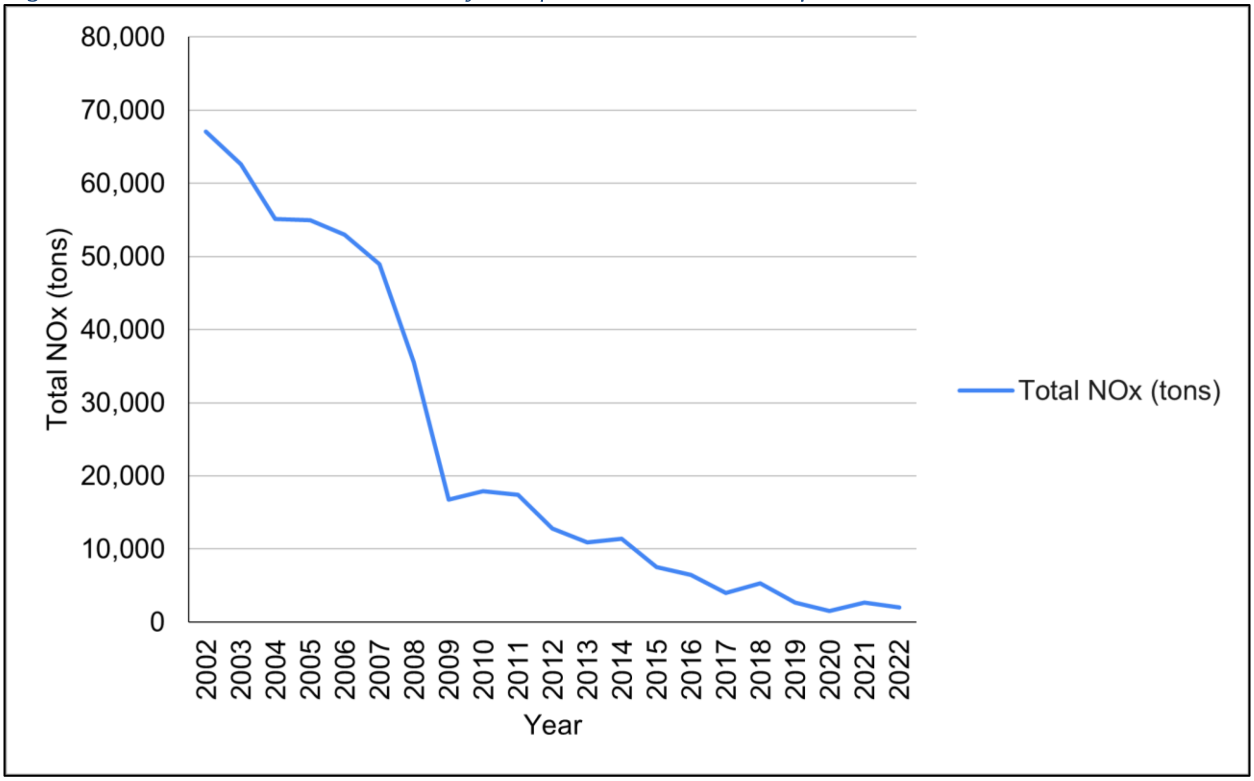
[41] Emissions Data from EPA Clean Air Markets Program Data (CAMPD): https://campd.epa.gov/data/custom-data-download

Table 4: Updated Annual NO_X Emissions (tons)- Coal-fired EGU (Tons) [42]

Year	AES Warrior Run 1	Brandon Shores 1	Brandon Shores 2	C.P. Crane 1	C.P. Crane 2	Chalk Point 1	Chalk Point 2	Dickerson 1	Dickerson 2	Dickerson3	H.A. Wagner 2	H.A. Wagner 3	Morgantown 1	Morgantown 2	R. Paul Smith 3	R. Paul Smith 4	Total	Reduction from 2002 (tons)	% Reduction from 2002
2002	418	6,040	5,629	6,419	4,323	6,337	6,755	2,121	2,444	2,661	2,310	1,735	10,014	8,605	248	1,011	67,070	0	0.00%
2003	483	5,419	7,624	5,253	5,597	4,432	5,133	1,905	1,269	1,811	2,434	2,488	9,066	8,726	232	757	62,629	4,442	6.62%
2004	554	6,215	5,678	3,974	3,729	5,174	5,198	1,914	1,947	1,819	2,392	2,114	7,097	6,606	97	655	55,163	11,907	17.75%
2005	592	4,347	7,378	3,983	4,223	5,085	4,601	1,668	1,987	1,947	2,036	2,770	6,737	6,698	244	678	54,974	12,097	18.04%
2006	460	5,867	6,097	2,898	2,410	4,590	5,029	1,649	1,401	1,926	2,015	2,075	8,030	7,415	279	867	53,008	14,062	20.97%
2007	541	4,120	8,732	2,682	3,093	4,885	4,835	1,645	1,644	1,658	2,062	2,210	3,097	6,321	402	996	48,923	18,147	27.06%
2008	491	5,686	5,907	2,908	2,170	3,169	3,513	1,266	1,546	1,604	1,906	1,535	1,020	1,820	267	686	35,494	31,576	47.08%
2009	407	1,052	2,421	1,211	911	1,564	2,146	1,175	964	1,071	1,073	602	842	1,044	44	195	16,722	50,348	75.07%
2010	611	1,853	1,913	986	1,463	1,497	2,038	1,215	1,337	1,255	1,043	355	1,059	710	132	397	17,864	49,206	73.36%
2011	1,220	2,355	2,467	1,195	1,302	1,435	2,601	531	690	666	990	594	635	560	36	129	17,406	49,664	74.05%
2012	580	1,405	2,735	946	871	1,095	1,245	487	435	517	980	503	343	458	12	155	12,767	54,303	80.96%
2013	560	1,030	1,495	694	1,174	1,154	1,487	541	449	587	473	568	323	342			10,877	56,194	83.78%
2014	550	1,136	1,396	444	780	974	2,489	550	574	491	496	386	547	584			11,397	55,674	83.01%
2015	444	759	1,312	339	732	655	814	246	269	254	259	593	380	465			7,521	59,549	88.79%
2016	357	1,021	983	270	384	581	742	230	255	285	51	395	471	423			6,448	60,623	90.39%
2017	452	637	999	208	326	205	246	84	106	110	36	81	223	281			3,994	63,076	94.05%
5-Year Update																			
2018	513	905	1,077	244	454	407	526	99	125	137	73	131	308	309			5,308	61,762	92.09%
2019	463	341	658			178	351	56	63	59	31	64	172	257			2,692	64,378	95.99%
2020	360	312	191			85	34	125	92	23	0	31	146	158			1,557	65,513	97.68%
2021	563	553	551			296	300				1	58	233	136			2,691	64,380	95.99%
2022	555	508	555								2	41	191	129			1,981	65,090	97.05%

[42] All C.P. Crane units shut down in 2018. H.A. Wagner Unit 1 converted to fuel oil in 2019. Chalk Point shut down in 2021. Dickerson coal units shut down in 2020. Morgantown coal units shut down in 2022.

Figure 4: Total NO_X Reductions in Maryland for Coal-Fired EGUs for the Years 2002-2022



3. VISIBILITY PROGRESS

Per 40 CFR § 51.308(g)(3), states with Class I areas must assess the visibility conditions and changes described in items i through iii below, expressed in terms of five-year averages of the annual haze index values, in deciviews, for the 20% "Most Impaired and Clearest days". Although Maryland does not have a Class I area, visibility conditions are presented here for all the MANE-VU Class I areas and for the VISTAS Class I areas in proximity to Maryland that the state's emissions might impact. The applicable period to assess for current conditions is the most recent five-year period preceding the required date of the progress report for which data are available six months preceding the required date of the progress report. Based on this criterion, the most recent five-year period for this progress report submission is 2018 - 2022.

i. Current visibility conditions
ii. The difference between current conditions and baseline conditions
iii. The change in visibility impairment over the period since the period addressed in the most recent plan required under § 51.308(f)

To satisfy items i. and ii., current conditions, baseline conditions, and the difference between the two are shown in Tables 5 and 6 for the 20% Most Impaired and the 20% Clearest days respectively. For item iii., Tables 7 and 8 repeat the current conditions and present the conditions that were most recent at the time that the second implementation period regional haze SIPs were drafted (these are labeled as "Most Recent Plan"). All the haze indexes presented below are based on data that was measured and analyzed as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program.[43]. The data was accessed via the Federal Land Manager Environmental Database (FED).[44]

Table 5: Baseline and Current Conditions for MANE-VU Class I Areas, 20% Most Impaired Days (deciviews)

Class I Area	State/Province	Baseline 2000-2004	Current 2018-2022	Difference
Acadia National Park	Maine	22.01	13.84	-8.17
Moosehorn Wilderness Area	Maine	20.65	12.86	-7.79
Roosevelt Campobello Int'l Park	New Brunswick, Canada			
Great Gulf Wilderness Area	New Hampshire	21.88	11.82	-10.06
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	27.43	16.91	-10.52
Lye Brook Wilderness Area	Vermont	23.57	13.34	-10.23

43 http://vista.cira.colostate.edu/IMPROVE/Default.htm
44 http://views.cira.colostate.edu/fed/

Class I Area	State/Province	Baseline 2000-2004	Current 2018-2022	Difference
VISTAS Class I Areas that are Adjacent to MANE-VU				
Dolly Sods Wilderness Area	West Virginia	28.29	15.37	-12.92
Otter Creek Wilderness Area				
James River Face Area	Virginia	28.08	16.18	-11.9
Shenandoah National Park	Virginia	28.32	14.27	-14.05

Note: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline.

Table 6: Baseline and Current Conditions for MANE-VU Class I Areas 20% Clearest Days (deciviews)

Class I Area	State/Province	Baseline 2000-2004	Current 2018-2022	Difference
Acadia National Park	Maine	8.78	6.20	-2.58
Moosehorn Wilderness Area	Maine	9.16	6.10	-3.06
Roosevelt Campobello Int'l Park	New Brunswick, Canada			
Great Gulf Wilderness Area	New Hampshire	7.65	4.53	-3.12
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	14.33	9.97	-4.36
Lye Brook Wilderness Area	Vermont	6.37	4.41	-1.96
VISTAS Class I Areas that are Adjacent to MANE-VU				
Dolly Sods Wilderness Area	West Virginia	12.28	6.15	-6.13
Otter Creek Wilderness Area				
James River Face Area	Virginia	14.21	8.50	-5.71
Shenandoah National Park	Virginia	10.96	6.42	-4.54

Note: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline

Tables 5 and 6 show that current five-year haze indexes for all MANE-VU Class I areas and VISTAS Class I areas that are adjacent to MANE-VU are lower than those from the time of baseline, meaning that visibility has improved since the time of baseline for both the 20% Most Impaired and the 20% Clearest days.

Table 7: Most Recent Plan and Current Conditions for MANE-VU Class I Areas, 20% Most Impaired Days (deciviews)

Class I Area	State/Province	Most Recent Plan 2015-2019	Current 2018-2022	Difference
Acadia National Park	Maine	14.24	13.84	-0.40
Moosehorn Wilderness Area	Maine	12.99	12.86	-0.13
Roosevelt Campobello Int'l Park	New Brunswick, Canada			
Great Gulf Wilderness Area	New Hampshire	12.33	11.82	-0.51
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	18.53	16.91	-1.62
Lye Brook Wilderness Area	Vermont	14.06	13.34	-0.72

Note: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of the second implementation period regional haze SIPs.

Table 8: Most Recent Plan and Current Conditions for MANE-VU Class I Areas, 20% Clearest Days (deciviews)

Class I Area	State/Province	Most Recent Plan 2015-2019	Current 2018-2022	Difference
Acadia National Park	Maine	6.36	6.20	-0.16
Moosehorn Wilderness Area	Maine	6.48	6.10	-0.38
Roosevelt Campobello Int'l Park	New Brunswick, Canada			
Great Gulf Wilderness Area	New Hampshire	4.69	4.53	-0.16
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	10.81	9.97	-0.84
Lye Brook Wilderness Area	Vermont	4.88	4.41	-0.47

Note: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of the second implementation period regional haze SIPs.

Tables 7 and 8 show that current five-year haze indexes at all MANE-VU Class I areas are lower than those that were current at the time of the second implementation period regional haze SIPs, meaning that there have been similar improvements in visibility since the time of the second implementation period regional haze SIPs.

Tables 9 and 10 reiterate the current conditions and compare them with the modeled 2028 reasonable progress goals (RPG). Table 9 presents those for the 20% Most Impaired days and Table 10 addresses the 20% Clearest days.

Table 9: Modeled 2028 RPGs and Current Conditions for MANE-VU Class I Areas, 20% Most Impaired Days (deciviews)

Class I Area	State/Province	RPG 2028	Current 2018-2022	Difference
Acadia National Park	Maine	13.35	13.84	0.49
Moosehorn Wilderness Area	Maine	13.12	12.86	-0.26
Roosevelt Campobello Int'l Park	New Brunswick, Canada			
Great Gulf Wilderness Area	New Hampshire	12.00	11.82	-0.18
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	17.97	16.91	-1.06
Lye Brook Wilderness Area	Vermont	13.68	13.34	-0.34
VISTAS Class I Areas that are Adjacent to MANE-VU				
Dolly Sods Wilderness Area	West Virginia	15.09	15.37	0.28
Otter Creek Wilderness Area				
James River Face Area	Virginia	15.31	16.18	0.87
Shenandoah National Park	Virginia	14.25	14.27	0.02

Note: Difference = Current minus RPG; therefore, negative differences indicate that current conditions are lower (i.e., better) than the 2028 RPGs.

Table 10: Modeled 2028 RPGs and Current Conditions for MANE-VU Class I Areas 20% Clearest Days (deciviews)

Class I Area	State/Province	RPG 2028	Current 2018-2022	Difference
Acadia National Park	Maine	6.33	6.20	-0.13
Moosehorn Wilderness Area	Maine	6.45	6.10	-0.35
Roosevelt Campobello Int'l Park	New Brunswick,			

	Canada			
Great Gulf Wilderness Area	New Hampshire	5.06	4.53	-0.53
Presidential Range - Dry River Wild. Area	New Hampshire			
Brigantine Wilderness Area	New Jersey	10.47	9.97	-0.50
Lye Brook Wilderness Area	Vermont	3.86	4.41	0.55
VISTAS Class I Areas that are Adjacent to MANE-VU				
Dolly Sods Wilderness Area	West Virginia	7.27	6.15	-1.12
Otter Creek Wilderness Area				
James River Face Area	Virginia	9.36	8.50	-0.86
Shenandoah National Park	Virginia	6.83	6.42	-0.41

Note: Difference = Current minus RPG; therefore, negative differences indicate that current conditions are lower (i.e., better) than the 2028 RPGs.

Finally, Tables 9 and 10 show that current five-year haze indexes are below the modeled 2028 RPGs at most MANE-VU Class I areas. Tables 9 and 10 also show that all VISTAS Class I areas that are adjacent to MANE-VU are either below or less than 1 deciview more than the modeled 2028 RPGs as of 2022. With the closing of Luke Paper in 2019, Maryland no longer has any major sources that contribute to visibility impairment in the VISTAS region.

The visibility metrics for these Class I areas, the MANE-VU Class I areas, and the MANE-VU and nearby IMPROVE Protocol sites are presented in the MANE-VU Technical Support Committee's 2023 Visibility Data Report[45] which is provided as Attachment A.

[45] *Mid-Atlantic/Northeast U.S. Visibility Data (2nd RH SIP Metrics)*, Mid-Atlantic/Northeast Visibility Union (MANE-VU) Technical Support Committee Visibility Data Workgroup, October 17, 2023.

4. EMISSIONS PROGRESS

40 CFR § 51.308(g)(4) requires an analysis tracking the change in emissions of pollutants contributing to visibility impairment from all sources in the state. The emissions changes should be identified by source type or activity. The emissions analysis should cover the time frame since the previous regional haze SIP implementation period. 40 CFR § 51.308(g)(4) has two distinct requirements that revolve around two separate sets of emissions inventory data as described below:

i. Emissions from all sources and activities: The primary source of this data is the NEI, which is compiled and released on a triennial basis by the EPA. The NEI is made up of emissions estimates submitted by state, local, and tribal air agencies supplemented with EPA's own estimates. For the § 51.308(g)(4) requirement, the analysis must extend at least through the most recent NEI year for which data is available six months prior to the required date of the progress report. Information and data for the NEI can be found at https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei.
ii. Emissions from sources that report to a centralized EPA database: There are many individual emissions sources that are required to report their emissions directly to EPA because of their participation in an air quality program such as Cross-State Air Pollution Rule, the Acid Rain Program, and the Regional Greenhouse Gas Initiative, to name a few. Most of the sources that report in this manner are large stationary sources such as EGUs and large industrial facilities. These data are readily obtainable through EPA's Clean Air Markets Program Database (CAMPD) at https://campd.epa.gov/. For purposes of § 51.308(g)(4), the analysis must extend through the most recent year available six months prior to the required date of the progress report.

The subsections below detail the change in emissions since the time of the second implementation period regional haze SIPs for all emissions sources and CAMPD emissions sources respectively. The following visibility impairing pollutants are covered in the summaries:

- Ammonia (NH_3)
- Nitrogen Oxides (NO_x)
- Particulate Matter < 10 microns (PM10)
- Particulate Matter < 2.5 microns (PM2.5)
- Sulfur Dioxide (SO_2)
- Volatile Organic Compounds (VOC)

All Emissions Sources and Activities

As described above, the source of this data is EPA's NEI. The most recent NEI available six months prior to the due date of the second implementation period progress reports (i.e., this submittal) is the 2020 NEI. The figures below compare emissions estimates from the 2020 NEI with those from the 2017 NEI, which was the most recently available NEI at the time of the second implementation period regional haze SIPs. To provide a broader trend, emissions estimates from prior NEIs are also shown. Emissions estimates are provided for Maryland as well as the other MANE-VU states. The state-specific charts are broken down into the following emissions source categories:

- <u>Point</u> sources represent large sources of emissions located at a discrete geographic point. Examples include power plants, factories, industries, and large institutional facilities. Point sources typically hold a federal/state/tribal/local air permit and report their emissions to the state/tribal/local air agency and/or EPA directly. For NO_x and SO_2, the state-specific charts further divide point sources into those that report to

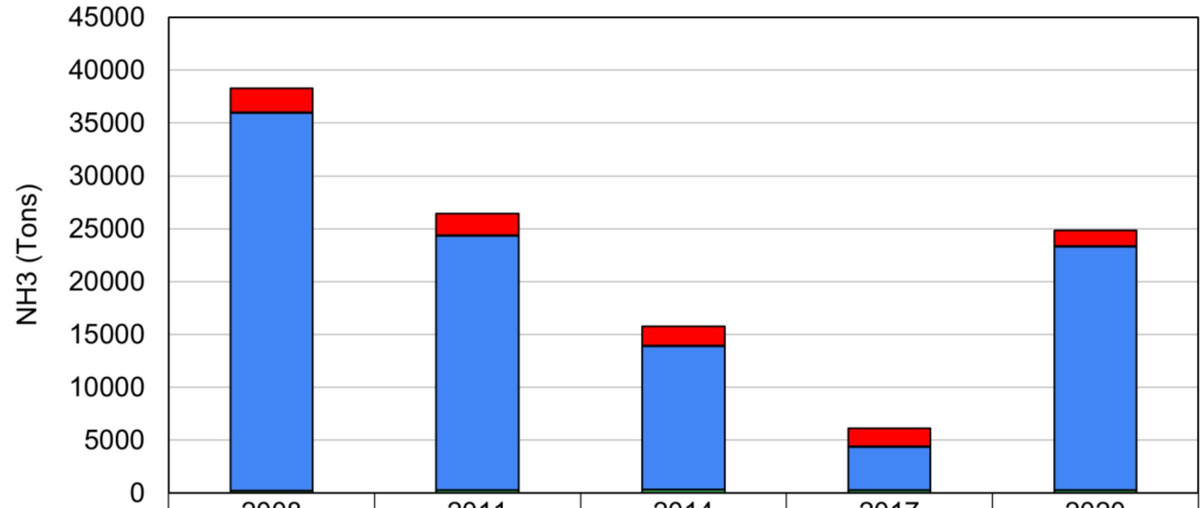
CAMPD and those that do not.

- Nonpoint sources (also called area sources) are those that are too widespread or numerous to be accounted for individually. There are many nonpoint subcategories, but a handful of examples include residential fuel combustion, consumer solvent use, commercial cooking, and agricultural tilling.
- Nonroad sources are equipment and vehicles that do not primarily travel on roadways. Examples include construction equipment, recreational vehicles, and lawn & garden equipment.
- Onroad sources are vehicles that primarily travel on roadways such as cars, trucks, buses, and motorcycles.

4.1 Ammonia

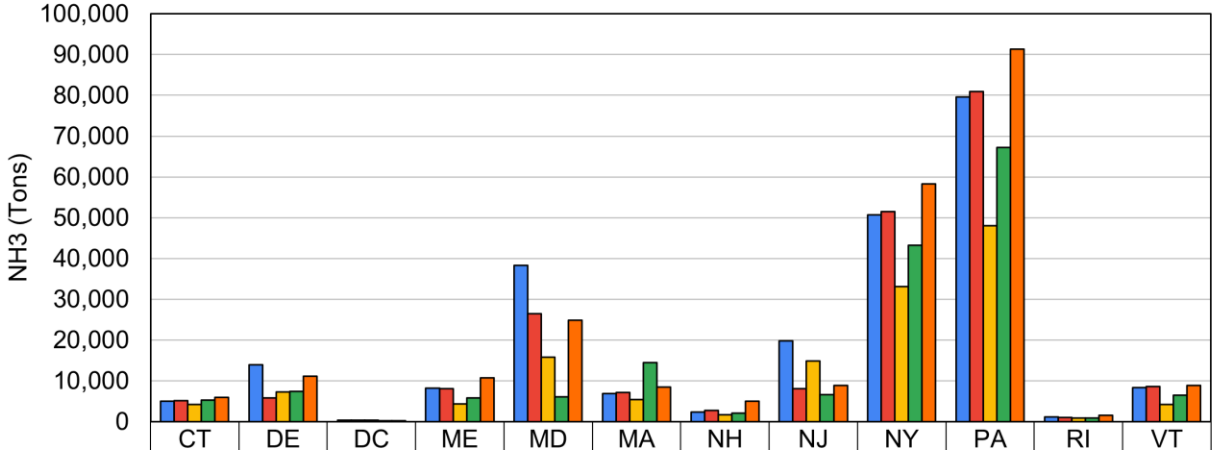
NH_3 emissions for Maryland and the MANE-VU region are shown in Figures 5 and 6 below.

Figure 5: 2008 to 2020 Ammonia Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
Onroad	2,282	2,058	1,792	1,706	1,465
Nonroad	31	32	34	23	24
Nonpoint	35,773	24,045	13,596	4,086	23,039
Point	202	295	324	293	294

Figure 6: 2008 to 2020 Ammonia Emissions for MANE-VU (Tons)



	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	4,989	13,975	354	8,207	38,288	6,929	2,311	19,804	50,737	79,588	1,092	8,379
2011	5,200	5,771	330	8,024	26,429	7,177	2,684	8,049	51,487	80,871	1,075	8,567
2014	4,194	7,252	317	4,356	15,746	5,411	1,645	14,895	33,110	48,000	862	4,148
2017	5,296	7,353	263	5,765	6,108	14,492	2,122	6,642	43,180	67,183	873	6,490
2020	5,930	11,119	236	10,795	24,822	8,477	4,959	8,875	58,297	91,288	1,542	8,879

MANE-VU State

NH_3 emissions in Maryland are dominated by the nonpoint source category. NH_3 emissions have generally trended downwards based on this data up until the 2020 NEI data, although there is some year-to-year variability.

Figures 5 and 6 show an increase in NH_3 emissions between the 2017 and 2020 NEI data in both Maryland and the MANE-VU region. The 2020 NEI shows significantly higher levels of NH_3 emissions from 2017 to 2020 across the US. EPA explains these increases in the "2020 NEI Updates" section of their "2020 National Emissions Inventory and Trends Report". The report details how the combination of major changes to the methodology of calculating Agricultural Fertilizer Application emissions and the addition of NH_3 from "open burning" in the waste disposal category "contributed to NH_3 emissions increasing from 4.3M tons in 2017 to 5.5M tons in 2020".[46] The report acknowledges that the cause of the large increase is primarily the change in methodology and not a true increase in emissions during the 2017-2020 timeframe.
NH_3 emissions from fertilizer application increased in 2020 over 2017 levels by about 90% due to methods updates made to the model used to estimate these emissions. While there may have been some localized changes in NH_3 emissions, this overall increase is primarily the result of the improvements EPA has made to methodologies for estimating these emissions.[47]

The changes in emissions calculation methodology make it challenging to calculate the actual change in NH_3 emissions during the first half of the RH 2nd planning period during the timeframe for this progress report. This is compounded by the fact that 2017 NEI NH_3 emissions were "incorrectly estimated in "tons Nitrogen" not NH_3."[48] A better understanding of changes in NH_3 emissions will be possible once the 2023 NEI data has been compiled, certified and released.

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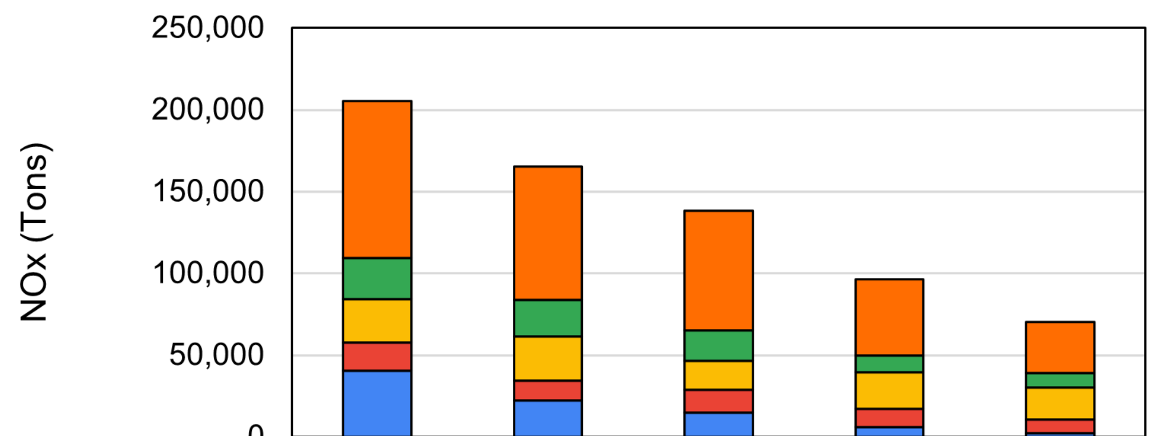
[46] https://storymaps.arcgis.com/stories/d7d730f974c6474190b142a49ae8d3bd
[47] https://storymaps.arcgis.com/stories/d7d730f974c6474190b142a49ae8d3bd
[48] https://storymaps.arcgis.com/stories/d7d730f974c6474190b142a49ae8d3bd

4.2 Nitrogen Oxides

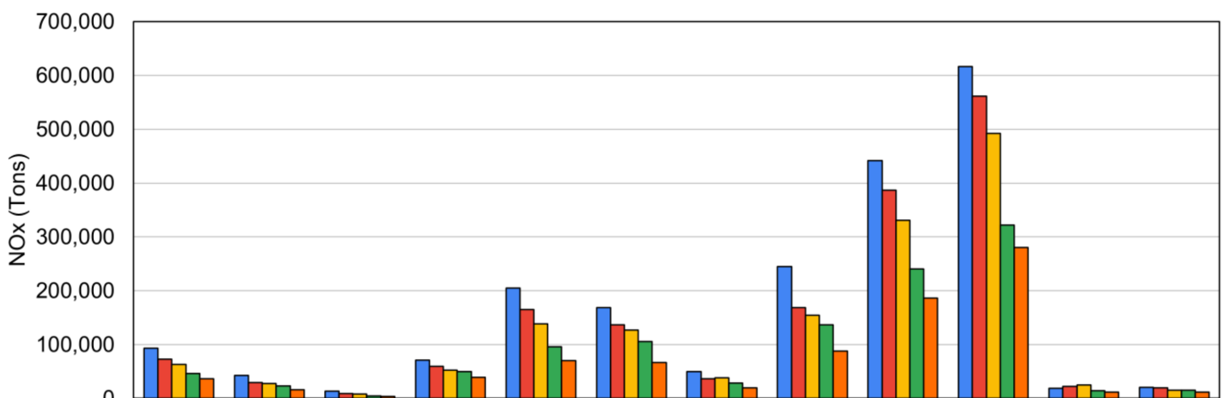
Figures 7 and 8 below show NO_x emissions in Maryland and the MANE-VU region respectively. Note that Figure 7 breaks point sources further down into CAMPD and non-CAMPD sources.

Figure 7: 2008 to 2020 NO_X Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
Onroad	95,785	81,572	73,232	46,616	30,919
Nonroad	25,064	22,050	18,740	10,317	8,866
Nonpoint	26,542	27,128	17,700	22,043	19,796
Non-CAMPD Point	17,521	11,898	13,771	11,207	8,239
CAMPD Point	40,327	22,536	15,053	6,127	2,408

Figure 8: 2008 to 2020 NO_X Emissions for MANE-VU (Tons)



	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	93,080	42,790	13,189	71,606	205,239	168,599	50,267	244,552	442,093	616,320	18,963	20,903
2011	72,828	29,436	9,403	59,785	165,185	136,892	36,566	168,297	387,262	561,928	22,489	19,635
2014	63,003	27,684	8,566	52,346	138,496	127,304	38,093	154,655	330,782	492,755	24,716	15,697
2017	46,575	22,882	4,780	49,890	96,310	105,860	28,533	136,961	240,411	321,900	14,865	15,311
2020	36,778	16,532	3,553	38,936	70,228	66,773	19,515	88,163	186,182	280,834	12,052	11,854

MANE-VU States

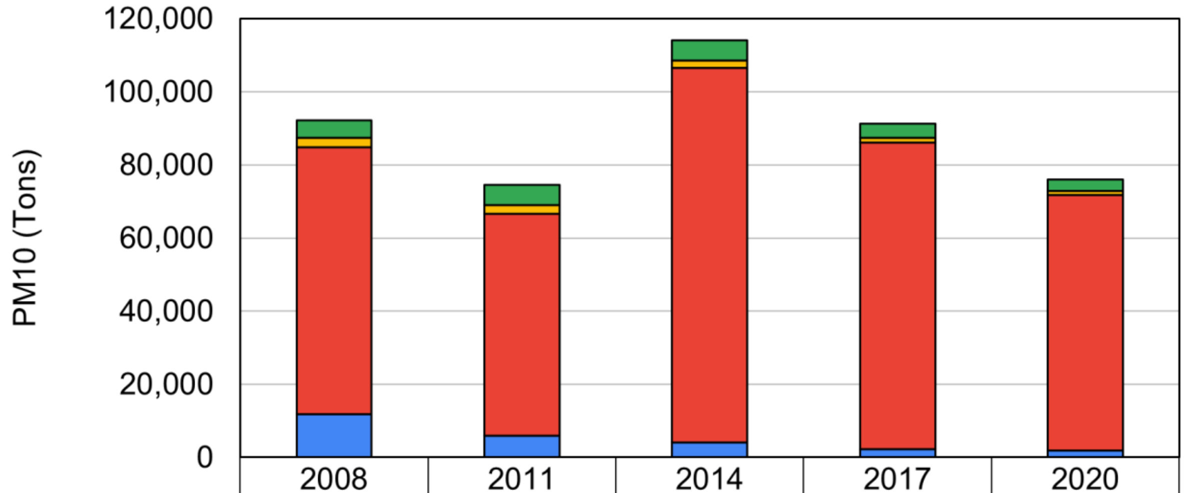
2008 2011 2014 2017 2020

NO_x emissions in Maryland are primarily dominated by the onroad mobile category, followed by the nonpoint category. There has been a steep decline in onroad mobile NO_x emissions due to federal control programs for diesel and gasoline vehicles. Onroad emissions decline as older, more polluting vehicles are retired and newer, cleaner vehicles are phased into the fleet. Some of the year-to-year variability in the NO_x emission trends are due to updated models and methodologies for estimating nonpoint and onroad emissions. Point source NO_x emissions have also declined due to the permanent and enforceable measures described earlier in Sections 1 and 2 as well as other state and federal programs aimed at maintaining the ozone NAAQS. Figure 8 shows that NO_x emissions have declined sharply in other MANE-VU states as well.

4.3 Particulate Matter <10 Microns (PM10)

PM10 emissions for Maryland and for the MANE-VU region are shown in Figures 9 and 10 respectively.

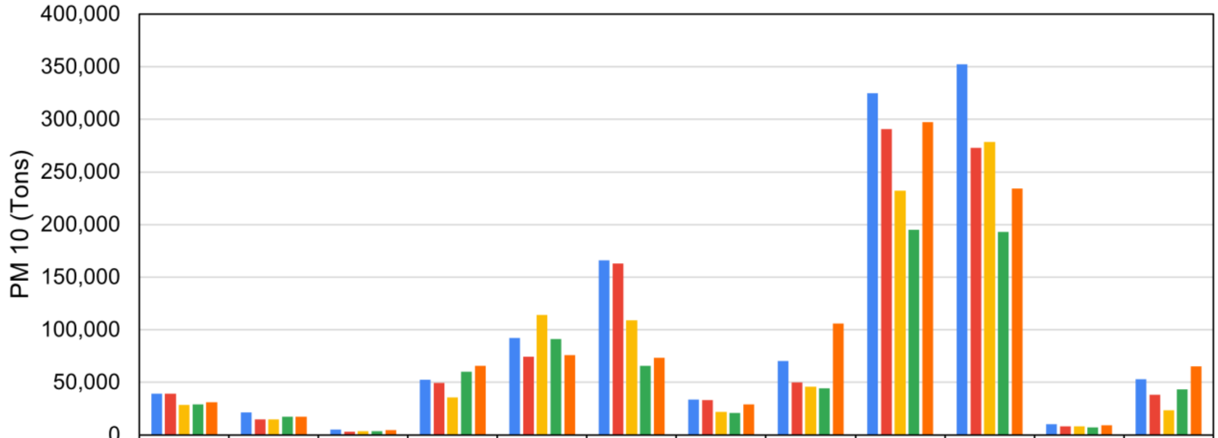
Figure 9: 2008 to 2020 PM10 Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
MD Onroad	4,730	5,534	5,511	3,973	3,006
MD Nonroad	2,563	2,342	2,101	1,304	1,149
MD Nonpoint	73,000	60,711	102,303	83,896	69,979
MD Point	11,863	5,935	4,181	2,193	1,842

Sector

Figure 10: 2008 to 2020 PM10 Emissions for MANE-VU (Tons)



	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	39,048	21,544	5,211	52,311	92,156	165,801	33,814	70,431	325,041	352,392	10,267	53,130
2011	39,097	15,071	3,410	49,526	74,522	162,952	33,379	49,742	290,566	273,067	8,387	38,373
2014	28,842	14,896	3,865	35,606	114,097	109,218	21,985	45,946	232,441	278,725	8,400	23,422
2017	29,058	17,213	3,771	60,347	91,366	65,922	21,142	44,487	195,140	193,114	7,148	43,618
2020	31,279	17,567	4,525	65,977	75,977	73,575	29,167	106,187	297,593	234,247	9,141	65,031

MANE-VU State

PM10 emissions in Maryland are largely dominated by the nonpoint category. Specific nonpoint contributors to PM10 emissions include residential fuel combustion (especially wood), paved and unpaved road dust, agricultural tilling, and construction dust. Figure 10 shows that PM10 emissions have continued to trend downward in Maryland. Some of this improvement is due to the particulate matter co-benefits of Maryland's and other MANE-VU states' implementation of the low sulfur fuel rules described in Sections 1 and 2 of this report.

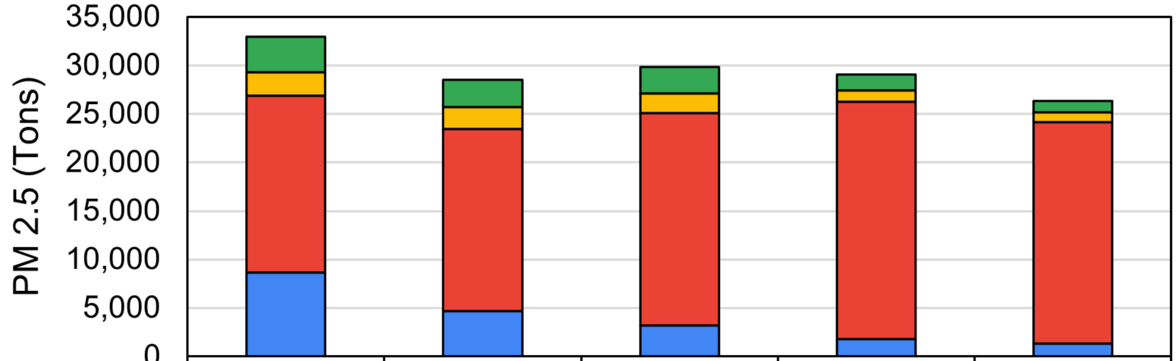
An increase in PM10 emissions in the 2020 NEI data is seen in all MANE-VU states except Maryland for the 2017-2020 period. This is likely due in large part to changes in methodology in the 2020 NEI from past NEI years. The decrease in Maryland’s PM10 emissions despite these methodology changes highlights the efficacy of Maryland’s efforts to reduce PM10 emissions.

4.4 Particulate Matter <2.5 Microns (PM2.5)

Figures 11 and 12 show PM2.5 emissions for Maryland and for MANE-VU respectively.[49]

[49] Data from the National Emissions Inventory (NEI): https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei

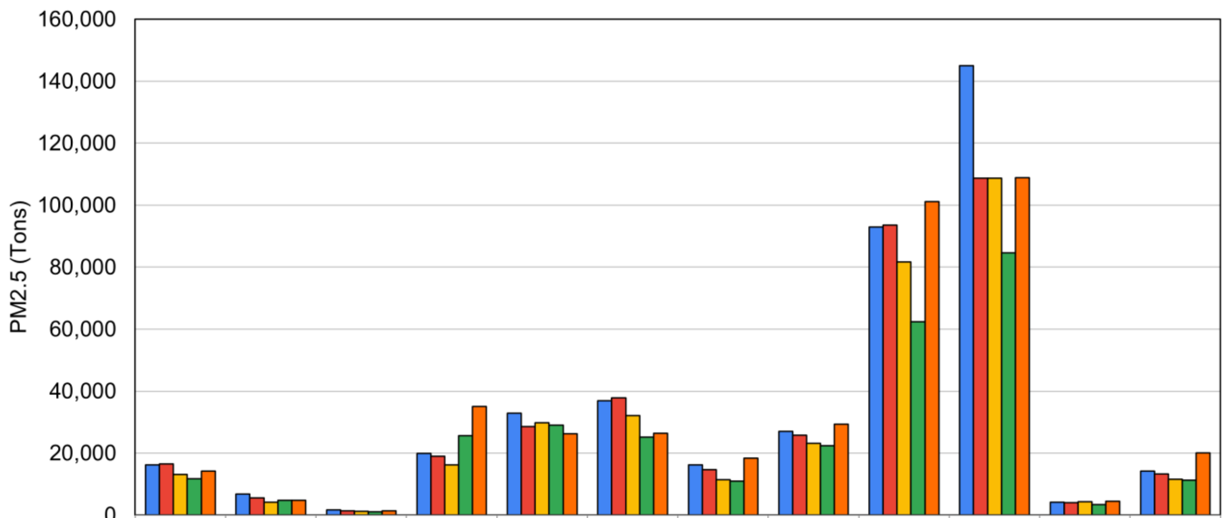
Figure 11: 2008 to 2020 PM2.5 Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
Onroad	3,619	2,811	2,744	1,607	1,107
Nonroad	2,433	2,223	1,989	1,227	1,077
Nonpoint	18,277	18,804	21,935	24,446	22,784
Point	8,618	4,661	3,181	1,783	1,331

Year

Figure 12: 2008 to 2020 PM2.5 Emissions for MANE-VU (Tons)



	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	16,190	6,838	1,694	19,930	32,947	36,965	16,257	26,966	93,027	145,016	4,163	14,280
2011	16,545	5,549	1,361	19,045	28,499	37,770	14,710	25,785	93,611	108,748	3,949	13,351
2014	13,088	4,174	1,263	16,270	29,848	32,192	11,358	23,197	81,699	108,665	4,310	11,593
2017	11,723	4,761	1,047	25,681	29,063	25,209	10,921	22,427	62,387	84,590	3,441	11,283
2020	14,221	4,773	1,387	35,097	26,300	26,419	18,371	29,316	101,178	108,812	4,408	20,089

MANE-VU States

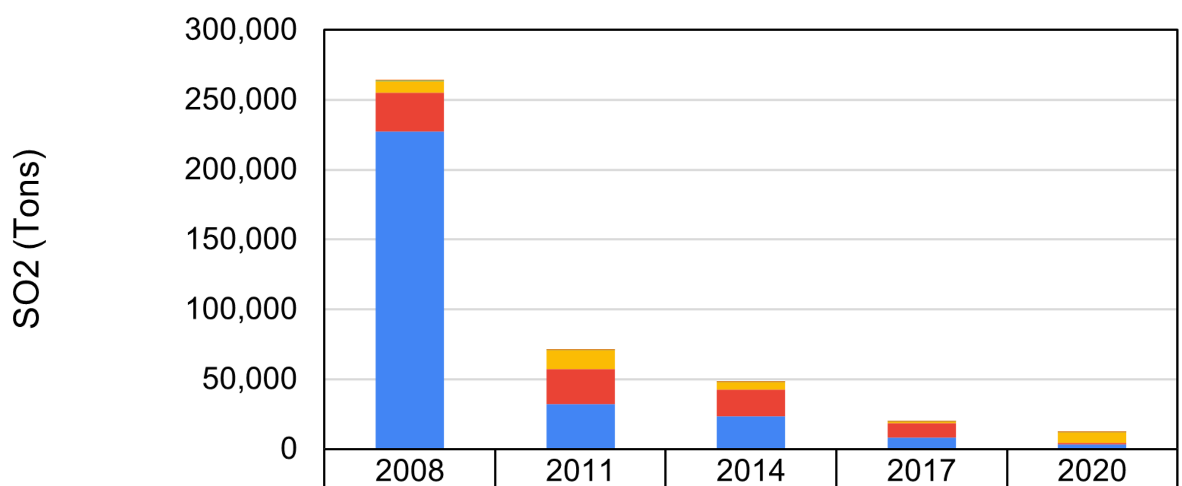
The emissions patterns and trends for PM2.5 are largely similar to those described above for PM10. As with PM10, PM2.5 emissions are dominated by the nonpoint category. In general, PM2.5 emissions have trended downwards for Maryland and other states in MANE-VU. As with other pollutants, some of the variability is also due to changes in emissions estimation tools and methodologies.

An increase in PM 2.5 emissions in the 2020 NEI data is seen in all MANE-VU states except Maryland for the 2017-2020 period. This is likely due in large part to changes in methodology in the 2020 NEI from past NEI years.

4.5 Sulfur Dioxide

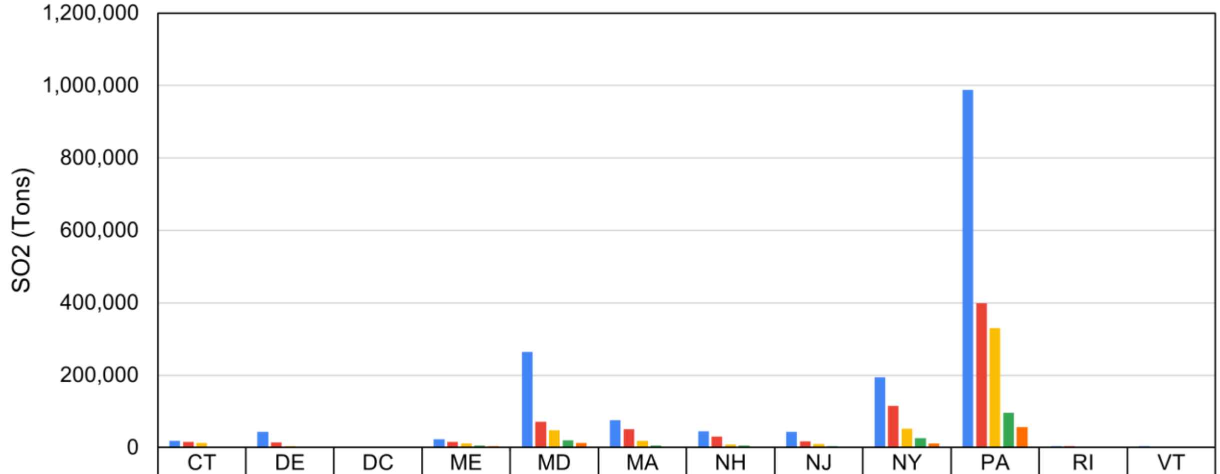
SO_2 emissions for Maryland and for MANE-VU are shown in Figures 13 and 14. Similar to NO_x, point source SO_2 emissions are further broken down in Figure 13 into the CAMPD and non-CAMPD categories.

Figure 13: 2008 to 2020 SO_2 Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
Onroad	631	545	537	572	159
Nonroad	450	62	49	27	11
Nonpoint	8,224	13,632	5,049	955	7,848
Non-CAMPD Point	27,984	25,237	19,303	10,456	993
CAMPD Point	227,198	32,275	23,553	8,121	3,279

Figure 14: 2008 to 2020 SO_2 Emissions for MANE-VU (Tons)



	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	19,443	44,282	1,273	23,362	264,487	76,256	45,666	44,370	193,703	987,671	4,345	4,044
2011	15,334	13,883	1,829	15,528	71,751	51,338	31,257	17,907	114,940	398,497	4,689	3,445
2014	12,445	4,330	252	11,242	48,490	18,890	8,554	9,781	52,857	329,804	3,406	1,503
2017	2,692	1,448	90	5,762	20,130	6,256	5,972	4,483	25,988	96,263	816	743
2020	923	973	39	4,175	12,290	2,095	1,398	2,965	11,436	56,330	396	655

MANE-VU States

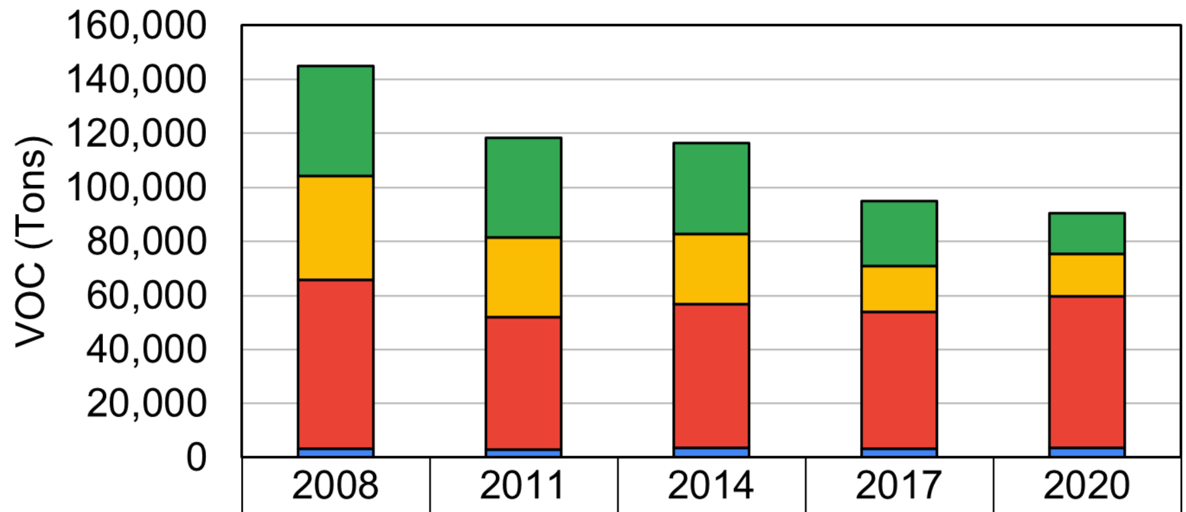
As shown in Figure 13, SO_2 emissions in Maryland have been historically dominated by the point source category, the CAMPD sources in particular. The nonpoint category also makes a fairly significant contribution. In general, nonroad and onroad sources are not major contributors to SO_2 emissions. The dramatic decrease in point source SO_2 emissions in Maryland is due to the extensive control programs that have been implemented to control SO_2 from coal-fired power plants. Although it should also be noted that market forces and increased use of lower cost natural gas have also contributed to the decline. As shown in Figure 14, all the MANE-VU states have seen similar steep declines in SO_2 emissions.

4.6 Volatile Organic Compounds (VOCs)

Figures 15 and 16 show VOC emissions for Maryland and MANE-VU respectively.[50]

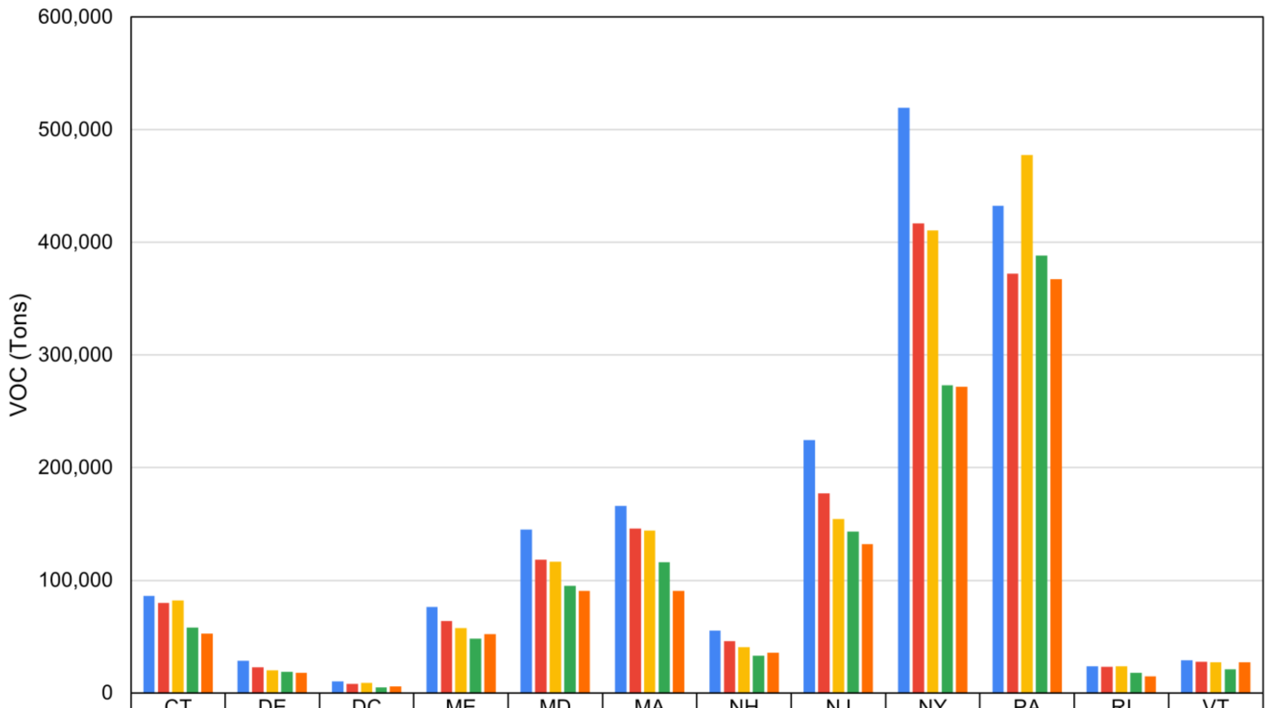
[50] Data from the National Emissions Inventory (NEI): https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei

Figure 15: 2008 to 2020 VOC Emissions for Maryland (Tons)



	2008	2011	2014	2017	2020
Onroad	40,821	36,719	33,808	24,088	15,164
Nonroad	38,532	29,451	25,859	17,199	15,629
Nonpoint	62,589	49,213	53,198	50,574	56,236
Point	3,196	2,926	3,647	3,225	3,406

Figure 16: 2008 to 2020 VOC Emissions for MANE-VU (Tons)



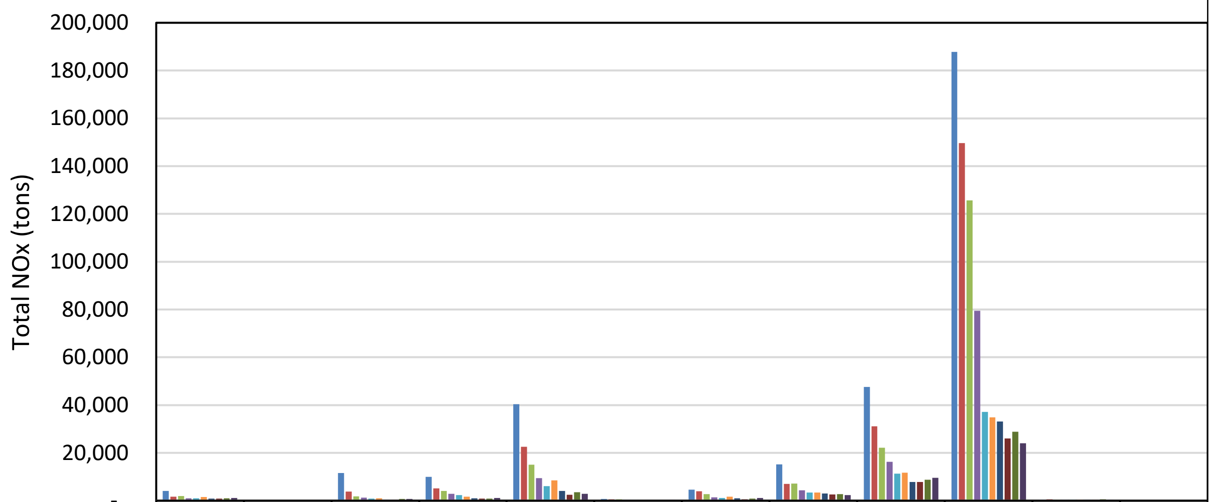
	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT
2008	86,024	28,705	10,467	76,423	145,138	166,086	55,344	224,688	519,566	432,590	23,770	29,131
2011	79,809	22,830	7,950	64,086	118,309	146,068	45,884	177,043	416,915	372,135	23,186	27,869
2014	82,350	20,153	8,939	57,527	116,512	144,016	40,767	154,589	410,573	477,338	23,499	27,366
2017	58,059	18,682	5,165	48,454	95,087	116,269	33,088	143,384	273,152	388,427	17,965	20,922
2020	52,578	17,820	5,845	52,408	90,435	90,781	35,572	132,243	271,757	367,378	14,927	27,389

VOC emissions in Maryland are generally dominated by the nonpoint, nonroad, and onroad categories. Overall, point sources are generally not a major contributor to VOC emissions. Figure 15 shows that there has been a modest decline in Maryland VOC emissions between 2008 and 2020. Figure 16 shows that VOC emissions have declined in most MANE-VU states over the 2008 to 2020 period, with some year-to-year variability. As with other pollutants, some of the variability may be due to changes in emissions estimation methodologies.

4.7 Emissions from Sources that Report to a Centralized EPA Database

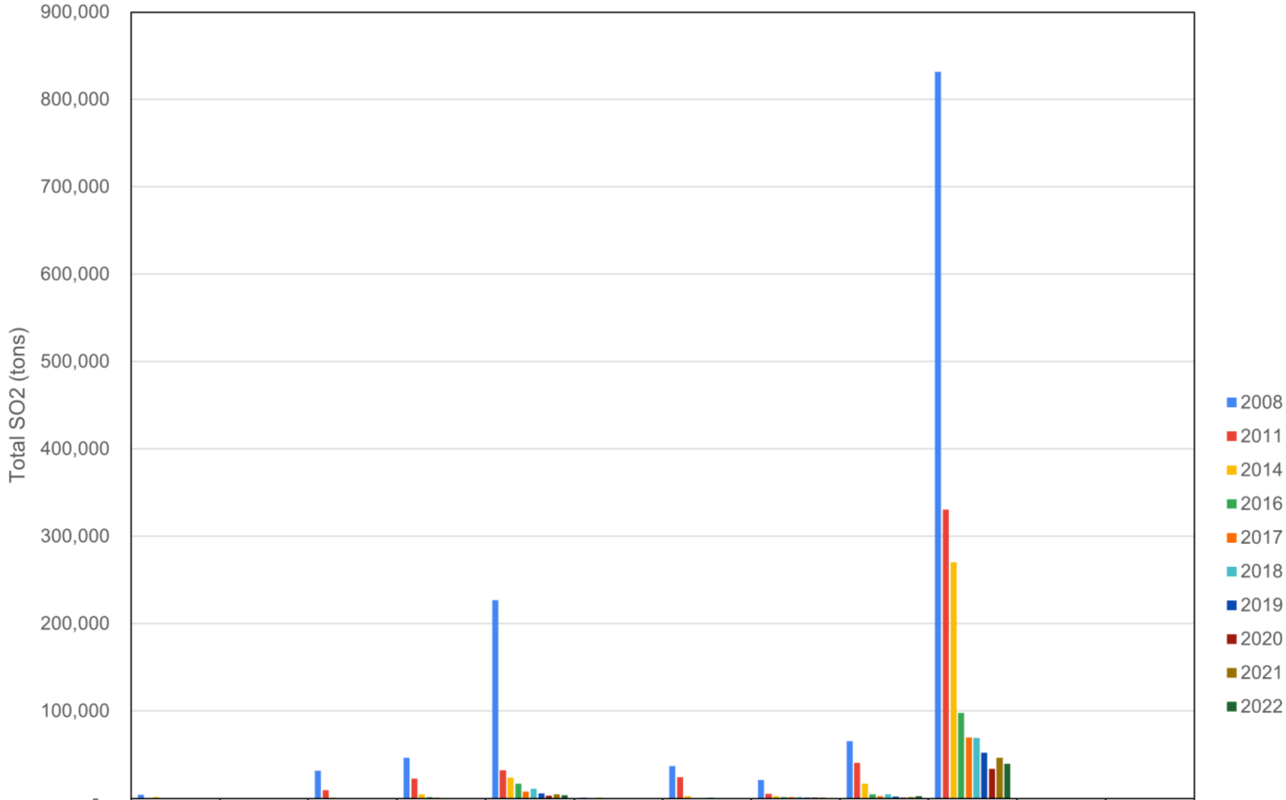
Figures 17 and 18 show NO_x and SO_2 emissions, respectively, in Maryland and the other MANE-VU states for those sources that report to EPA's CAMPD. As described earlier, sources that report to CAMPD are those facilities that participate in an EPA air program and generally include EGUs and very large industrial facilities.

Figure 17: NOx Emissions for CAMPD Sources in Maryland and all MANE-VU States (Tons)



	CT	DC	DE	MA	MD	ME	NH	NJ	NY	PA	RI	VT
2008	4,133	291	11,545	10,002	40,327	680	4,650	15,147	47,556	187,77	462	296
2011	1,667	320	3,748	5,111	22,536	575	3,951	7,040	31,062	149,62	630	117
2014	1,955	108	1,791	4,108	15,053	539	2,753	7,096	22,214	125,61	518	161
2016	1,058	68	1,308	2,883	9,405	288	1,336	4,382	16,222	79,450	448	167
2017	1,052	67	889	2,372	6,127	263	1,070	3,443	11,253	37,148	470	139
2018	1,492	96	948	1,646	8,431	327	1,695	3,408	11,702	34,928	513	142
2019	801	76	496	1,007	4,019	138	1,018	2,949	7,844	33,132	453	133
2020	923	66	524	864	2,408	144	590	2,575	7,763	26,019	484	124
2021	1,043	62	708	826	3,513	208	845	2,687	8,748	28,786	543	149
2022	1,073	50	745	1,181	2,917	446	1,088	2,401	9,584	24,092	440	124

Figure 18: SO_2 Emissions for CAMPD Sources in Maryland and all MANE-VU States (Tons)



	CT	DC	DE	MA	MD	ME	NH	NJ	NY	PA	RI	VT
2008	3,955	261	31,808	46,347	227,198	1,041	36,895	21,204	65,427	831,915	18	2
2011	752	723	9,306	22,701	32,275	470	24,445	5,414	40,756	330,539	20	1
2014	1,478	-	829	4,670	23,553	856	2,636	2,655	16,676	270,332	17	2
2016	362	-	513	1,717	16,754	369	573	1,725	4,533	98,006	14	1
2017	421	-	545	1,083	8,121	444	473	1,722	2,561	69,790	18	1
2018	690	-	644	742	11,325	643	1,197	1,433	4,889	69,018	22	1
2019	132	-	279	194	5,572	50	417	1,250	1,972	52,394	16	1
2020	131	-	296	62	3,279	53	152	1,082	975	33,602	18	1
2021	409	-	663	141	4,847	34	279	1,031	1,573	46,407	19	1
2022	565	-	478	577	3,632	658	493	571	2,662	39,709	17	1

Figures 17 and 18 show significant declines in NO_x and SO_2 emissions for Maryland. These are due in large part to the enforceable measures described in Sections 2 and 3, as well as measures aimed at maintaining the ozone and SO_2 NAAQS. Some of the declines are also due to market forces and the shift from coal to low-cost natural gas. Declines in NO_x and SO_2 emissions are also evident for most other MANE-VU states, with some year-to-year variability. Like Maryland, most of the declines in MANE-VU are due to the enforceable measures that MANE-VU states have adopted as part of their long-term strategies for making reasonable progress as well as the measures that states have adopted to maintain the ozone and SO_2 NAAQS.

5. ASSESSMENT OF CHANGES IMPEDING VISIBILITY PROGRESS

40 CFR § 51.308(g)(5) requires an assessment of any significant changes in anthropogenic emissions within or outside the state since the period addressed in the most recent plan (in this case, the regional haze SIPs for the second planning period), including whether those changes were anticipated in the most recent plan and whether they have limited or impeded in reducing pollutant emissions and improving visibility.

An examination of Figures 5 through 18 in the section above show that emissions for visibility-impairing pollutants have declined for almost every pollutant and for almost every state in MANE-VU. Examination of the figures also shows that, although there is some year-to-year variability, there are no emissions increases in Maryland or in MANE-VU that are unexpected or large enough that they would limit or impede visibility improvement.

Tables 11 through 16 below reprint some of the information that was presented above in Section 4 with a specific focus on 2017, which was the NEI year that was current at the time of the second implementation period regional haze SIPs, and 2020, which is the most recently available complete NEI. For each visibility impairing pollutant, the tables show total emissions for Maryland and the other MANE-VU states and the difference and percent difference between 2017 and 2020 emissions.

Table 11: 2017 and 2020 Total Ammonia Emissions for Maryland and MANE-VU (Tons)

State	2017	2020	Difference (2017–2020)	Percent Difference (2017–2020)
Connecticut	5,296	5,930	-634	-12%
Delaware	7,353	11,119	-3,766	-51%
District of Columbia	263	236	27	10%
Maine	5,765	10,795	-5,030	-87%
Maryland	6,108	24,822	-18,714	-306%
Massachusetts	14,492	8,477	6,015	42%
New Hampshire	2,122	4,959	-2,837	-134%
New Jersey	14,976	8,875	6,101	41%
New York	43,180	58,297	-15,117	-35%
Pennsylvania	67,183	91,288	-24,105	-36%
Rhode Island	873	1,542	-669	-77%
Vermont	6,490	8,879	-2,389	-37%
Total	**174,101**	**235,218**	**-61,117**	**-35%**

Table 12: 2017 and 2020 Total NOx Emissions for Maryland and MANE-VU (Tons)

State	2017	2020	Difference (2017– 2020)	Percent Difference (2017– 2020)
Connecticut	46,575	36,778	-9,797	-21%
Delaware	22,882	16,532	-6,350	-28%
District of Columbia	4,780	3,553	-1,227	-26%
Maine	49,890	38,936	-10,954	-22%
Maryland	96,310	70,228	-26,082	-27%
Massachusetts	105,860	66,773	-39,087	-37%
New Hampshire	28,533	19,515	-9,018	-32%
New Jersey	136,961	88,163	-48,798	-36%
New York	240,411	186,182	-54,229	-23%
Pennsylvania	321,900	280,834	-41,066	-13%
Rhode Island	14,865	12,052	-2,813	-19%
Vermont	15,311	11,854	-3,457	-23%
Total	**1,084,279**	**831,399**	**-252,880**	**-23%**

Table 13: 2017 and 2020 Total PM10 Emissions for Maryland and MANE-VU (tons)

State	2017	2020	Difference (2017– 2020)	Percent Difference (2017– 2020)
Connecticut	29,058	31,279	-2,221	-8%
Delaware	17,213	17,567	-354	-2%
District of Columbia	3,771	4,525	-754	-20%
Maine	60,347	65,977	-5,630	-9%
Maryland	91,366	75,977	15,389	17%
Massachusetts	65,922	73,575	-7,653	-12%
New Hampshire	21,142	29,167	-8,025	-38%
New Jersey	44,487	106,187	-61,700	-139%
New York	195,140	297,593	-102,453	-53%
Pennsylvania	193,114	234,247	-41,133	-21%
Rhode Island	7,148	9,141	-1,993	-28%
Vermont	43,618	65,031	-21,413	-49%
Total	**772,327**	**1,010,267**	**-237,940**	**-31%**

Table 2: 2017 and 2020 Total PM2.5 Emissions for Maryland and MANE-VU (tons)

State	2017	2020	Difference (2017 – 2020)	Percent Difference (2017 – 2020)
Connecticut	11,723	14,221	-2,498	-21%
Delaware	4,761	4,773	-12	0%
District of Columbia	1,047	1,387	-340	-32%
Maine	25,681	35,097	-9,416	-37%
Maryland	29,063	26,300	2,763	10%
Massachusetts	25,209	26,419	-1,210	-5%
New Hampshire	10,921	18,371	-7,450	-68%
New Jersey	22,427	29,316	-6,889	-31%
New York	62,387	101,178	-38,791	-62%
Pennsylvania	84,590	108,812	-24,222	-29%
Rhode Island	3,441	4,408	-967	-28%
Vermont	11,283	20,089	-8,806	-78%
Total	**292,531**	**390,371**	**-97,840**	**-33%**

Table 15: 2017 and 2020 Total SO_2 Emissions for Maryland and MANE-VU (tons)

State	2017	2020	Difference (2017– 2020)	Percent Difference (2017 – 2020)
Connecticut	2,692	923	-1,769	-66%
Delaware	1,448	973	-475	-33%
District of Columbia	90	39	-51	-56%
Maine	5,762	4,175	-1,587	-28%
Maryland	20,130	12,290	-7,840	-39%
Massachusetts	6,256	2,095	-4,161	-67%
New Hampshire	5,972	1,398	-4,574	-77%
New Jersey	4,483	2,965	-1,518	-34%
New York	25,988	11,436	-14,552	-56%
Pennsylvania	96,263	56,330	-39,933	-41%
Rhode Island	816	396	-420	-52%
Vermont	743	655	-88	-12%
Total	**170,645**	**93,674**	-76,971	**-45%**

Table 16: 2017 and 2020 Total VOC Emissions for Maryland and MANE-VU (tons)

State	2017	2020	Difference (2017– 2020)	Percent Difference (2017– 2020)
Connecticut	58,059	52,578	-5,481	-9%
Delaware	18,682	17,820	-862	-5%
District of Columbia	5,165	5,845	680	13%
Maine	48,454	52,408	3,954	8%
Maryland	95,087	90,435	-4,652	-5%
Massachusetts	116,269	90,781	-25,488	-22%
New Hampshire	33,088	35,572	2,484	8%
New Jersey	143,384	132,243	-11,141	-8%
New York	273,152	271,757	-1,395	-1%
Pennsylvania	388,427	367,378	-21,049	-5%
Rhode Island	17,965	14,927	-3,038	-17%
Vermont	20,922	27,389	6,467	31%
Total	**1,218,654**	**1,159,134**	-59,520	**-5%**

Tables 11 to 16 show a decrease in emissions from 2017 to 2020 for almost every pollutant and every state in MANE-VU. SO_2 had the most dramatic decreases, with a reduction of 66% for the total MANE-VU region. There are two exceptions, however, to these declining trends. First, ammonia emissions increased between 2017 and 2020 for many of the MANE-VU states, and the total MANE-VU region showed an increase of 24%. Second, PM10 and PM2.5 emissions increased for a handful of states. However, despite these individual state increases, total MANE-VU PM10 and PM2.5 emissions decreased by 16% and 13% respectively. As described in earlier sections, some variability in emissions estimates for ammonia, PM, and other pollutants may be due to changes in estimation models and methodologies. In particular, in recent years, EPA has been improving and refining its methodologies and input data for several ammonia-related categories such as agricultural and animal feeding operations.

In summary, emissions for Maryland and MANE-VU have decreased significantly between 2017 and 2020, with the exceptions for ammonia and PM noted above. When looking at 2020 emissions versus those from earlier years (please see Section 4), the decreases are even more dramatic. The ammonia and PM increases are not unexpected, given the likely influence of changes in estimation methodologies, and these increases are not expected to limit or impede visibility improvement in Maryland, MANE-VU, or any other region that may be influenced by Maryland's emissions.

6. ASSESSMENT OF CURRENT STRATEGY

40 CFR § 51.308(g)(6) requires an assessment of whether current plan elements and strategies are sufficient to enable the state, or states with Class I areas affected by emissions from the state, to meet all established RPGs for the period covered by the most recent plan. Maryland affirms that the elements and strategies in its regional haze SIP for the second implementation period are sufficient to meet the criteria of § 51.308(g)(6). Maryland makes this affirmation based on the following assessment of the information and data presented in this progress report:

- There has been no change in the implementation of the measures deemed necessary in Maryland's second implementation period regional haze SIP for making reasonable progress at Class I areas that may be affected by Maryland's emissions. Please see Section 1 above. In addition, there have been verifiable emissions reductions from these measures since the time of the second implementation period regional haze SIP; please see Section 2.
- Current haze indexes for all the MANE-VU Class I areas are lower than those for the time of the second implementation period regional haze SIPs, and significantly lower than baseline, for the 20% Most Impaired and 20% Clearest days. Please see Section 3. These trends are indicative that all MANE-VU Class I areas are on track to meeting the RPGs established in the second implementation period regional haze SIPs.
- Except for PM in a handful of states and ammonia, emissions for visibility impairing pollutants have trended downward for Maryland and for other states in MANE-VU. Please see Section 4. Further, with the exceptions noted above, currently available emissions of visibility impairing emissions are lower than those at the time of the second implementation period regional haze SIPs. Please see Section 5.

7. DETERMINATION OF ADEQUACY

40 FR § 51.308(h) requires the state to take one of the following actions:

- The state may declare that no further revision of the existing plan is needed at this time. This is commonly referred to as a "negative declaration".
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from another state, or states, which participated in a regional planning process, the state must notify EPA and the applicable state(s). The state must collaborate with the state(s) through the regional planning process to develop additional strategies for addressing the plan's deficiencies.
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from another country, the state must notify the EPA and provide any available relevant information.
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from within the state, then that state must revise its plan within one year to address the deficiencies.

Based on the information and data presented in this progress report, Maryland declares that no further revision of the existing plan is needed at this time.

8. CONSULTATION WITH FEDERAL LAND MANAGERS AND PUBLIC INSPECTION AND COMMENT

40 CFR § 51.308(i), opportunity for FLM consultation on a progress report must be provided no less than 60 days prior to the public hearing or public comment opportunity on the progress report. The consultation must include the opportunity for the FLM to discuss their:

- Assessment of visibility impairment in the Class I area
- Recommendations on the development and implementation of strategies to address visibility impairment

Although this progress report is not being submitted as a formal SIP revision, Maryland published a notice on 01/07/2025 inviting public review and comment. This notice is provided as Attachment B. A summary of the comments received, and Maryland's responses is provided in Attachment C. Prior to the public comment period, Maryland consulted extensively with [FWS, the USFS, and/or the NPS]. Table 17 below provides a summary of the specific consultation activities that were held. Specific notes and minutes from the consultation activities shown in Table 17 are provided in Attachment D.

Table 17: Summary of Maryland's Consultation with the FLM

Date	Summary of Activity
01/24/2023	Kickoff conference call held between Maryland, other MANE-VU states, the FLMs, and EPA to discuss second implementation period progress report expectations.
09/19/2024	Draft was made available to FLM, [FWS, the USFS, and/or the NPS] for a period of 90 days to allow for comments.
1/7/2025	Maryland publishes notice inviting public comment on progress report.

9. SUMMARY AND CONCLUSIONS

As described above in Section 9, Maryland declares that no further revision of its second implementation period regional haze SIP is required at this time. The status of implemented measures, as described in Section 1, are such that Class I areas affected by Maryland's emissions will continue to make reasonable progress towards the ultimate RHR goal of natural visibility conditions by 2064. This is evidenced by the improvements in visibility described in Section 3 and Attachment A and further evidenced by the emissions reductions outlined in Sections 4 and 5. Maryland made a robust assessment of its current plan elements and strategies (Section 6), consulted extensively with the affected FLM, and made this progress report available for public review and comment (Section 8 and Attachments B through D). Based on this information, and the data provided throughout this document and its attachments, Maryland affirms that this progress report satisfies the requirements of RHR paragraphs (g), (h), and (i).