Appendix F-4b

NC's Response to New Jersey's Comments on NC's Pre-hearing Draft RH SIP

This page intentionally left blank.

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MICHAEL ABRACZINSKAS
Director

NORTH CAROLINA
Environmental Quality

March 2, 2022

Sharon Davis, Chief
Bureau of Evaluation and Planning
Division of Air Quality
Department of Environmental Protection
401 East State Street
P.O. Box 420, Mail Code 401-02
Trenton, New Jersey 08625

Subject: Response to Comments on North Carolina's Pre-Hearing Draft Regional Haze State Implementation Plan (SIP) for North Carolina Class I Areas for the Second Planning Period (2019-2028), August 30, 2021

Dear Ms. Davis:

Thank you for your letter dated October 15, 2021, providing comments on *North Carolina's Pre-Hearing Draft Regional Haze State Implementation Plan (SIP) for North Carolina Class I Areas for the Second Planning Period (2019-2028)*. In this letter I am responding to the comments New Jersey submitted on North Carolina's draft SIP. I am also responding to New Jersey's response to North Carolina's October 22, 2019, comments on New Jersey's draft regional haze SIP dated August 2019.

I. Response to New Jersey Comments on North Carolina's Draft Regional Haze SIP

I am pleased that you recognize that North Carolina's SIP addresses "emission management" strategies #1, #4, and #5 identified in the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Inter-Regional Planning Organization (RPO) Ask, and that MANE-VU has determined that North Carolina does not have any emissions sources with a ≥3.0 inverse megameter (Mm^{-1}) impact at MANE-VU Class I areas (strategy #2). You provided the following comment regarding adoption of an ultra-low sulfur fuel (ULSF) oil standard.

> ***"Emission Management Strategy #3: Ultra-low sulfur fuel oil standard***
> *North Carolina did not address this MANE-VU Ask. North Carolina should adopt an ultra-low fuel oil standard consistent with the MANE-VU Ask as part of its long-term strategy (LTS) or demonstrate in its SIP why it would not be reasonable to do so. For distillate oil, this would be essentially the equivalent of on-road diesel, which is already widely available. It should be noted that all MANE-VU states have successfully adopted low sulfur fuel oil standards."*

For emission management strategy #3, the Inter-RPO Ask states that:

> "States *should pursue an ultra-low sulfur fuel oil standard similar to the one adopted by MANE-VU states in 2007 as expeditiously as possible and before 2028, depending on supply availability, where the standards are as follows:*
> *a. distillate oil to 0.0015% sulfur by weight (15 ppm),*
> *b. #4 residual oil to 0.5% sulfur by weight,*
> *c. #6 residual oil to 0.5% sulfur by weight.*"

The North Carolina Division of Air Quality (DAQ) has reviewed this request and evaluated residual and distillate oil use in the state. Based on this evaluation, North Carolina concludes that adopting an ULSF standard would yield very little reduction in sulfur dioxide (SO_2) emissions or any noticeable improvement in visibility in Class I areas in North Carolina and in downwind states for the following reasons:

- Residual oil sales in North Carolina for 2019 were very low in comparison to distillate oil. The only uses for this fuel are industrial and large marine vessel bunkering. From 2005 through 2019, overall residual oil usage has been in sharp decline, particularly in the industrial sector where usage has dropped 98%.[1] Residual oil usage in North Carolina is less than 2% of that of the MANE-VU region.[2]
- Distillate oil sales in North Carolina have been relatively steady from 2014-2019, and ULSF for highway and off-highway use make up the majority of the distillate oil used in North Carolina.[3] When considering distillate oil usage aside from highway and off-highway transportation (which is already using ULSF), North Carolina uses roughly 5% of the amount used by the MANE-VU region and less than 4% of all non-transportation distillate oil on the East Coast.[4]
- Residential heating oil use in North Carolina has never been considerable, and it has continued to decline over time.[5] Less than 3% of homes in North Carolina are heated with oil, as of 2019.[6] The U.S. Energy Information Administration (EIA) data for 2019 shows that 86% of residential heating oil in the United States is consumed by states within the MANE-VU RPO.[7]

As such, it is completely reasonable to include a requirement in the Intra-RPO Ask for the MANE-VU states to restrict the sulfur content in fuel oil sales. However, to extend this requirement to an Inter-RPO Ask of North Carolina where the use of residual and distillate oil is significantly lower relative to the use of these fuels in the MANE-VU states is not reasonable. In addition, as shown in Table 1, ULSF already makes up 95-98% of the distillate oil supplied to the east coast in 2019 and 2020, the latest year for which data are available. This percentage has been above 85% since 2015 and is trending toward 100%.[8] Based on this information and the continued trend toward the use of ULSF, the DAQ concludes that adopting an ULSF standard for North Carolina will not provide any additional SO_2 emission reductions above and beyond what would occur in the absence of a standard.

---

[1] https://www.eia.gov/dnav/pet/pet_cons_821rsda_dcu_SNC_a.htm
[2] https://www.eia.gov/dnav/pet/pet_cons_821rsda_a_EPPR_VAA_Mgal_a.htm
[3] https://www.eia.gov/dnav/pet/pet_cons_821dst_dcu_SNC_a.htm
[4] https://www.eia.gov/dnav/pet/pet_cons_821dsta_a_EPD0_VAA_Mgal_a.htm
[5] https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SNC_a.htm
[6] https://www.eia.gov/state/print.php?sid=NC
[7] https://www.eia.gov/energyexplained/heating-oil/use-of-heating-oil.php
[8] https://www.eia.gov/dnav/pet/pet_cons_psup_dc_r10_mbbl_a.htm

Table 1. Distillate Fuel Oil Supplied to East Coast by Sulfur Content, Past 10 Years

Year	Total Distillate Fuel Oil Thousand Barrels	0 to 15 ppm Sulfur Thousand Barrels (% of Total)	15 to 500 ppm Sulfur Thousand Barrels* (% of Total)	Greater Than 500 ppm Sulfur Thousand Barrels (% of Total)
2011	421,189	310,672 (73.8%)	-1,480 (-0.4%)	111,997 (26.6%)
2012	396,682	309,666 (78.1%)	-2,348 (-0.6%)	89,364 (22.5%)
2013	430,636	342,427 (79.5%)	-2,064 (-0.5%)	90,273 (21.0%)
2014	453,617	380,239 (83.8%)	1,820 (0.4%)	71,558 (15.8%)
2015	452,928	395,670 (87.4%)	3,467 (0.8%)	53,792 (11.9%)
2016	430,349	378,159 (87.9%)	3,194 (0.7%)	48,996 (11.4%)
2017	435,768	382,973 (87.9%)	2,645 (0.6%)	50,150 (11.5%)
2018	461,109	426,126 (92.4%)	7,353 (1.6%)	27,630 (6.0%)
2019	452,565	431,424 (95.3%)	1,660 (0.4%)	19,481 (4.3%)
2020	425,050	415,098 (97.7%)	450 (0.1%)	9,502 (2.2%)

* Amounts shown are net volumes supplied to the region. Negative values represent years when various factors, including exports, have resulted in net negative volumes supplied.

II. Response to New Jersey's Response to North Carolina's Comments on New Jersey's Draft Regional Haze SIP

On October 22, 2019, I submitted comments on New Jersey's Proposed Regional Haze SIP (2018-2028) addressing North Carolina's position regarding the MANE-VU Inter-RPO Ask. In that letter I articulated the reasons why the DAQ disagrees with MANE-VU's assessment that North Carolina is reasonably anticipated to contribute to visibility impairment in MANE-VU Class I areas including the Brigantine Wilderness Area. New Jersey responded to my comments in Appendix K of its final SIP submittal to the U.S. Environmental Protection Agency (EPA). The remainder of this letter provides additional information supporting the technical basis for the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) emissions inventory and modeling analysis for 2028 upon which North Carolina's regional haze SIP is based.

A. Use of 2028 Emissions Projections

> Appendix K, Page 19:
> "*New Jersey disagrees with using 2028 estimates because they assume emissions reductions based on control measures that are not currently enforceable. Including 2028 reductions at the starting point distorts results if economic factors change prior to 2028.*"

VISTAS used the Comprehensive Air Quality Model with Extensions (CAMx) and Particulate Source Apportionment Technology (PSAT) to model the most recent emissions inventory for 2011 and 2028 available at the beginning of the VISTAS regional haze work in late 2017. The analysis calculates 2028 impacts as recommended on page 17 of EPA's August 20, 2019, guidance memorandum which states:[9]

> *"All of the techniques described above require estimates of source emissions. Generally, we recommend that states use estimates of 2028 emissions (resolved by day and hour, as*

[9] U.S. EPA, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period," EPA-457/B-19-003, August 20, 2019, page 17, accessed from https://www.epa.gov/visibility/guidance-regional-haze-state-implementation-plans-second-implementation-period.

appropriate) to estimate visibility impacts (or related surrogates) when selecting sources, rather than values of recent year emissions."

The DAQ disagrees with New Jersey's assessment that the 2028 estimates "assume emissions reductions based on control measures that are not currently enforceable" and that "including 2028 reductions at the starting point distorts results if economic factors change prior to 2028." Sulfates from SO_2 emissions and nitrates from nitrogen oxide (NO_x) emissions are the most impactful visibility impairing pollutants followed by organic matter from volatile organic compounds. Emissions of SO_2 and NO_x are decreasing in part due to the closure of coal-fired electricity generating units (EGU) in North Carolina and other states. These closures are not temporary, and the resulting emission reductions do not distort the 2028 emission estimates. All evidence, from data reported to the National Emissions Inventory to the Clean Air Markets Division, show that emissions of SO_2 and NO_x in North Carolina are decreasing. For North Carolina, SO_2 and NO_x emission reductions from coal-fired EGUs have been driven initially by the emissions caps required by the State's Clean Smokestacks Act and subsequently permanent replacement of coal units with natural gas units and renewable resources. Further, restarting or rebuilding coal-fired facilities in North Carolina would trigger prescriptive New Source Review permitting requirements that would undoubtedly require state-of-the-art controls for SO_2 and NO_x emissions. Emissions of NO_x are also decreasing due to stringent control programs applicable to nonroad and on-road engines. These control programs are not economic factors but rather federal and state requirements.

In addition, North Carolina (as well as the other VISTAS states) included only emission reductions in its 2028 emission estimates that are based on on-the-books or on-the-way controls and emission reductions that can be supported by existing documentation, permits, laws, and regulations.[10] For North Carolina, the DAQ also applied growth factors to 2016 base year emissions for point sources to account for economic growth.[11] The 2028 projected emissions do not include speculative reductions such as unsubstantiated EGU shutdowns predicted by the Integrated Planning Model (IPM) or emission reductions from control programs listed in the MANE-VU Ask. This approach is consistent with the EPA's guidance for preparing emissions inventories to support regional haze modeling.[12,13] Therefore, it is completely reasonable for North Carolina to base its analysis on 2028 emissions that align with establishment of RPGs for 2028 and to incorporate permanent emission reductions that have occurred since 2015 (i.e., the year used by MANE-VU for its screening analysis).

B. CAMx – Model Performance

Appendix K, Page 19:
"*While CAMx has a robust chemistry, it still struggles in model performance for ammonium nitrate concentrations which is critical to regional haze.*"

CAMx and PSAT have been the models of choice by EPA starting with the release of its preliminary regional haze modeling in 2017.[14] Thus, VISTAS followed suit in selecting the CAMx/PSAT modeling platform to support development of the regional haze plans for the Southeastern states for the second

---

[10] Documentation of the 2028 emissions inventory (Task 2) and processing of the emissions for input to CAMx and PSAT modeling (Task 3) is provided on the VISTAS website at https://www.metro4-sesarm.org/content/vistas-regional-haze-program.
[11] Documentation of North Carolina's methods for projecting point source emissions from 2016 to 2028 is provided in Appendix B3 of the North Carolina reginal haze SIP.
[12] See reference 9.
[13] U.S. EPA, "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations," EPA-454/B-17-002, May 2017, https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf.
[14] U.S. EPA, "Documentation for the EPA's Preliminary 2028 Regional Haze Modeling," Office of Air Quality Planning and Standards, October 2017.

planning period. Although CAMx/PSAT is not perfect, it is regarded as the state-of-the-art for regional haze modeling. Model performance evaluations, which compare modeled concentrations to observed concentrations, are important for demonstrating confidence in the air quality modeling system. VISTAS followed EPA's 2018 modeling guidance in conducting model performance evaluations which states the following:[15]

> "*…there is no single definitive test for evaluating model performance. All of the tests mentioned here have strengths and weaknesses. Further, even with a single performance test, it is not appropriate to assign "bright line" criteria that distinguish between adequate and inadequate model performance. In this regard, the EPA recommends that a "weight of evidence" approach be used to determine whether a particular modeling application is valid for assessing the future attainment status of an area. The EPA recommends that air agencies conduct a variety of performance tests and weigh them qualitatively to assess model performance.*"

For the VISTAS project, extensive model performance evaluations were conducted to compare modeled 2011 ozone and particulate matter (PM) species (including nitrate) concentrations, and wet and dry deposition fluxes, to observed concentrations and deposition fluxes collected from 2011 monitoring data including the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. The statistical metrics evaluated suggest satisfactory model performance for regulatory applications. Further, as part of this modeling performance analysis, it was demonstrated that CAMx model performance statistics for nitrates across the VISTAS and non-VISTAS states were within suggested criteria, as given by Emery et al (2017),[16] and similar to EPA's regional haze modeling.[17] In addition, VISTAS used the relative response approach to estimate visibility impairment in 2028 for Class I areas. This approach uses modeled base and future year values and then applies the percentage difference between the two to observed base-year values, thus reducing "*…problems posed by imperfect model performance on individual days...*"[18] Bias errors in particular are reduced using the relative response approach to estimate PM-species specific future year concentrations.

Figure 1 presents a soccer plot illustrating model performance for the Brigantine Wilderness Area for the 20% most impaired days. The recommended goal performance is defined by the blue dotted line and the recommended criteria performance is defined by the red dotted line. The error is plotted on the y-axis and the bias plotted on the x-axis. The plot is a convenient way to visualize both bias and error model performance on a single plot. As bias and error approach zero, the points are plotted closer to or within the "goal" represented by the dashed boxes. The size of the goal is developed from historical values of the metric for each variable from comparable modeling studies. The results illustrate that nitrates (denoted by the blue triangle) were well within recommended normalized mean bias and normalized mean error criteria.

---

[15] U.S. EPA, "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5 and Regional Haze, EPA 454/R-18-009," November 2018, https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf. Section 3.1 (Overview of Model Performance Evaluation), pages 68 and 69.

[16] Emery, C., Liu, z., Russell, A.G., Odman, M.T., Yarwood, G., Kumar, N., (2017), Recommendations on Statistics and Benchmarks to Assess Photochemical Model Performance, Journal of the Air and Waste Management Association, 67:5, 582-598, https://www.tandfonline.com/doi/full/10.1080/10962247.2016.1265027.

[17] U.S. EPA, "Technical Support Document for EPA's Updated 2028 Regional Haze Modeling," Office of Air Quality Planning and Standards, September 2019, https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling. See Appendix A of the document (pp. 76-191).

[18] U.S. EPA, Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5 and Regional Haze, EPA 454/R-18-009, November 2018, https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf. See Section 4.1 (Overview of Modeled Attainment Test), pages 99-100.

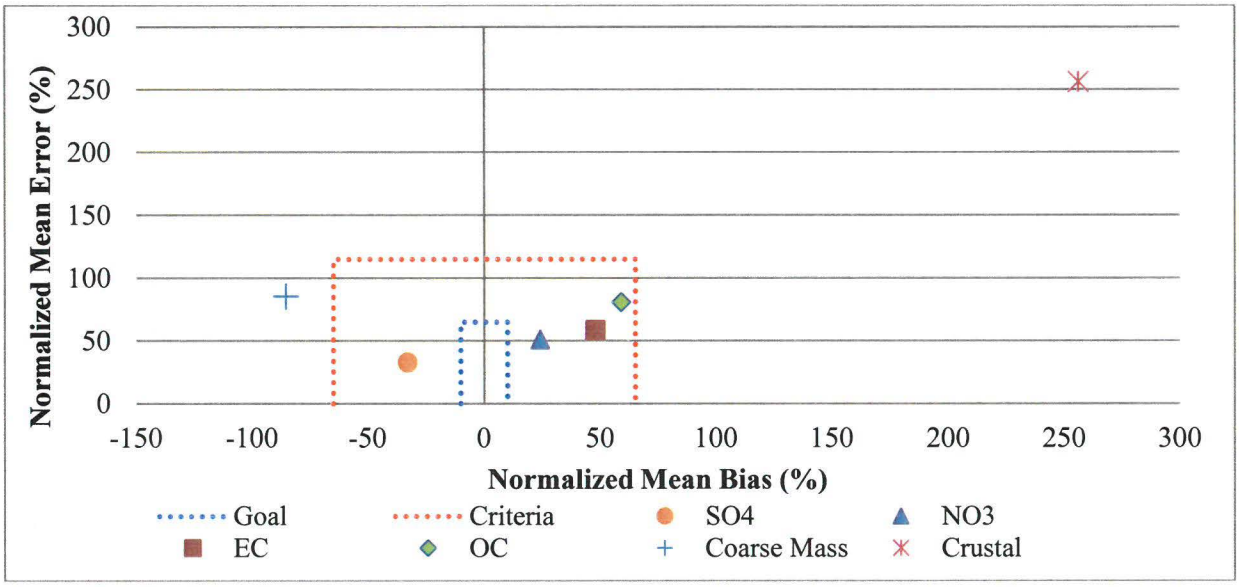

Figure 1. VISTAS Model Performance Evaluation for the Brigantine Wilderness Area in 2011 for 20% Most Impaired Days[19]

C. Impact of Meteorology on 2028 RPGs

Appendix K, Page 19:
"One weakness that regional models, such as CAMx, have is that they normally only consider one year of meteorology, in the case of current VISTAS modeling, 2011. MANE-VU's analysis considers three years of meteorology."

Base-year and future-year photochemical grid modeling (e.g., CAMx) only relies on one year of meteorological data to properly prepare the relative response factors for the base year and future year. It is inappropriate to model multiple base years of meteorology into multiple future years with the same future year's projected emissions. The EPA's 2018 modeling guidance specifically calls for -- and considers sufficient -- one year of meteorological data to be used in performing base and future-year photochemical grid modeling for regional haze planning purposes.[20] Further, when using the relative response approach as detailed in the 2018 modeling guidance,[21] the relative response factors that are computed from the modeled base and future years are applied to a five-year average of IMPROVE monitor data for each visibility-impairing pollutant to compute what that future five-year average for the given pollutant may be.

In addition, for the 20% most impaired days, Table 2 compares the 2028 uniform rate of progress (URP) for the Brigantine Wilderness Area to the regional haze photochemical grid modeling results from VISTAS and MANE-VU (each using a 2011 base year and meteorology) and EPA and LADCO (each using a 2016 base year and meteorology). The four modeling studies predict impacts below the URP for

---

[19] VISTAS, Appendix C - IMPROVE Data - Scatter, Soccer, and Bugle Plots Example (.xlsx), file named "APP_C_maps_pred_obs_mpe_results_station_all_dates_improve.xlsx", spreadsheet named "Soccer Plots," select monitor = BRIG and quar = I20 to generate the plot for the Brigantine Wilderness Area, https://www.metro4-sesarm.org/content/task-8-model-performance-evaluations.

[20] U.S. EPA, "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5 and Regional Haze," EPA 454/R-18-009, November 2018, https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf. See page 20: "Choose time periods that reflect the variety of meteorological conditions that represent visibility impairment on the 20% clearest and 20% most impaired days in the Class I areas being modeled (high and low concentrations necessary). This is best accomplished by modeling a full year."

[21] See reference 18, see Section 5.3.

the Brigantine Wilderness Area in 2028. VISTAS modeling shows an impact that is 0.24 deciview (dv) above the MANE-VU RPG estimate when using 2011 meteorology. When compared to the LADCO and EPA modeling using 2016 meteorology, the VISTAS modeling was 0.05 dv and 0.18 dv less than the LADCO and EPA RPGs, respectively. The modeling results are reasonably close given the different modeling platforms and year of meteorology data used in these studies. These results suggest that EPA's methodology to account for multiple years of monitoring data in developing the relative response factors used to calculate the 2028 RPGs mitigates the limitations of using a single year of meteorology.

Table 2. Comparison of URP and Photochemical Grid Modeling of Visibility Impairment for the Brigantine Wilderness Area in 2028 for 20% Most Impaired Days

Conditions	Deciviews
Unadjusted Uniform Rate of Progress for 2028[22]	20.73
Modeled RPGs for 2028	
MANE-VU/OTC – CMAQ/2011 Meteorological Data[23]	18.16
VISTAS – CAMx/2011 Meteorological Data[24]	18.40
EPA – CAMx/2016 Meteorological Data[25]	18.45
LADCO – CAMx/2016 Meteorological Data[26]	18.58

D. North Carolina Contribution to Visibility Impairment at the Brigantine Wilderness Area

After reviewing New Jersey's response to my comments, the DAQ still disagrees with New Jersey's analysis indicating that North Carolina's statewide contribution to visibility impairment to a MANE-VU Class I area is ≥2%.[27] Table 3 summarizes the final PSAT modeling results for North Carolina.[28] North Carolina's total sulfate plus nitrate contribution to total sulfate plus nitrate visibility impairment in 2028 for the Brigantine Wilderness Area is about 0.335 Mm^{-1} (0.98%) for the 20% most impaired days and 0.051 Mm^{-1} (0.55%) for the 20% clearest days. Thus, consistent with the draft results provided in my previous comments, these contributions illustrate that it is highly unlikely that North Carolina contributes ≥2% of the visibility impairment at the Brigantine Wilderness Area which MANE-VU used as the only criterion for including North Carolina in the Inter-RPO Ask. Attachment 1 provides the final PSAT modeling results associated with anthropogenic and natural sources contributions from each of the VISTAS' states, other RPOs, and boundary conditions to the Brigantine Wilderness Area.

---

[22] From Table 3-1 of New Jersey's State Implementation Plan for Regional Haze, March 2020 (file named " NJ Regional Haze SIP - Final March 2020.pdf").

[23] Modeled without the MANE-VU Ask measures, see Table 3-1 of New Jersey's State Implementation Plan for Regional Haze, March 2020 (file named " NJ Regional Haze SIP - Final March 2020.pdf").

[24] VISTAS, Task 9 Future Year Projections, Appendix C - Example URPs - Great Smoky Mountains and All Class I Area Modeled Visibility and Extinction Data (.xlsx), file named "APP_C_SESARM_2028elv5_URP_20200903.xlsx", spreadsheet named "SESARM URP 2028elv5 - Table," Column J, https://www.metro4-sesarm.org/content/task-8-model-performance-evaluations.

[25] U.S. EPA, "Technical Support Document for EPA's Updated 2028 Regional Haze Modeling," Office of Air Quality Planning and Standards, September 2019, https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling. See Table 3-3.

[26] Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 - 2028 Planning Period, Technical Support Document, LADCO, June 17, 2021, Section 8.1 PSAT Post-processing for Source Contribution Estimates, pages 98-100, link to "LADCO 2016-based 2028 Class I Area Visibility Forecasts," spreadsheet containing IMPROVE ambient data and model outputs from LADCO's CAMx_2016abc -2028abc PSAT regional haze modeling (May 2021), https://www.ladco.org/wp-content/uploads/Projects/Regional-Haze/Round2/LADCO_RegionalHaze_2016_28abc_PSAT_Charts_05June2021.xlsx.

[27] State of New Jersey, Department of Environmental Protection, State Implementation Plan (SIP) for Regional Haze, Appendix K (Public Participation), March 2020.

[28] Sulfate and nitrate were evaluated because these two pollutants currently account for most of the visibility impairment associated with anthropogenic sources in the VISTAS and MANE-VU regions.

Table 3. North Carolina Sulfate and Nitrate Statewide Contribution from All Sources in 2028 to the Brigantine Wilderness Area for 20% Most Impaired Days (Mm^{-1})

	Total Impairment	Total Sulfate	Total Nitrate	Total Sulfate + Nitrate	Percentage of Total
20% Most Impaired Days					
Total for Brigantine Wilderness Area*	63.051	21.114	12.943	34.057	
North Carolina - Final	Not available	0.201	0.134	0.335	0.98%
20% Clearest Days					
Total for Brigantine Wilderness Area*	17.172	6.948	2.266	9.213	
North Carolina - Final	Not available	0.035	0.016	0.051	0.55%

* Total impairment represents the contribution from all pollutants and all emissions sources within the VISTAS modeling domain plus boundary contributions. The total sulfate and nitrate contribution is associated with all SO_2 and nitrogen oxide (NO_x) emissions sources within the VISTAS modeling domain plus boundary contributions.

III. Conclusions

Based on the information provided in this and my previous 2019 letter, North Carolina has fulfilled its obligations under the MANE-VU Ask. Going forward, I would appreciate the opportunity for North Carolina and other VISTAS states to share methodologies and data during development of future regional haze SIPs with a goal to be as consistent as possible before MANE-VU states prepare an Ask of upwind states. Doing so will avoid inconsistencies between methodologies and data sets, ensure that the best data are used to support modeling and decision making, and enable states to focus on sectors and emission sources for further analysis that will benefit improvements in visibility in all Class I areas in North Carolina and MANE-VU Class I areas.

Thank you for your comments on North Carolina's pre-hearing draft SIP. I hope this response is helpful, and I look forward to continuing to work with New Jersey and the other MANE-VU states to develop reasonable regional haze SIPs in the future. If you have any questions regarding this submittal, please contact Randy Strait of my staff at (919) 707-8721 or randy.strait@ncdenr.gov.

Sincerely,

Michael A. Abraczinskas, Director
Division of Air Quality, NCDEQ

MAA/rps

Attachment

cc: Mr. Michael Pjetraj, NCDAQ
Ms. Tammy Manning, NCDAQ
Mr. Randy Strait, NCDAQ

Attachment 1

2028 Contribution to Light Extinction of All Anthropogenic and Natural Sources to the Brigantine Wilderness, NJ from Sulfate + Nitrate (Mm-1) from Final VISTAS Regional Haze Modeling Analysis