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May 23, 2021

VIA ELECTRONIC SUBMITTAL TO EPA DOCKET (www.regulations.gov)

Lynorae Benjamin
Chief
Air Planning and Implementation Branch
Air and Radiation Division
Region 4
United States Environmental Protection Agency
61 Forsyth Street SW
Atlanta, GA 30303-8960

Re: Docket ID Number EPA-R04-OAR-2019-0618 (Middle Tennessee Area) and Docket ID Number EPA-R04-OAR-2019-0619 (Hamilton County): Air Plan Approval; TN; Removal of Vehicle I/M Program; Middle Tennessee Area and Hamilton County: Comments Submitted by Opus Inspection, Inc. to EPA's Supplemental Notice of Proposed Rulemaking, 86 Fed. Reg. 21,248 (April 22, 2021)

Dear Ms. Benjamin:

Attached are comments prepared by Alpine Geophysics, LLC ("Alpine"), commissioned by Opus Inspection, Inc. ("Opus"). The document is entitled, "Comments Prepared in Response to U.S. EPA's Supplemental Notice of Proposed Rulemaking for Air Plan Approval of the Removal of Vehicle Inspection and Maintenance Programs from the Middle Tennessee Area and Hamilton County, Tennessee," dated May 2021. These comments modify and expand upon earlier comments prepared by Alpine and submitted by Opus to the two EPA dockets.

Opus endorses the Alpine comments and opposes removal of the I/M program requirement from the SIP. Please let me know if you have any questions or wish to discuss the comments. Thank you.

Very truly yours,

Michael K. Stagg

Michael K. Stagg

MKS:mcw
cc: Andy McIntosh, President, Opus
Jim Sands, Vice President, Business Development, Opus
Bill Dell, Executive Director, Business Development, Opus
Stephen L. Foster, III, Program Manager - Tennessee, Opus

Comments Prepared in Response to U.S. EPA's Supplemental Notice of Proposed Rulemaking for Air Plan Approval of the Removal of Vehicle Inspection and Maintenance Programs from the Middle Tennessee Area and Hamilton County, Tennessee

Prepared for:

Opus Inspection, Inc.

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via request from

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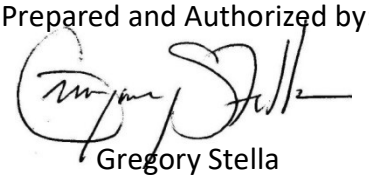


Gregory Stella

Managing Partner

May 2021

My name is Gregory Stella. I am currently a Managing Partner of Alpine Geophysics, LLC, ("Alpine") a firm that offers highly specialized research and engineering services in the atmospheric sciences.

From 1997 until 2003, I served as an emissions and modeling specialist at the U.S. Environmental Protection Agency ("EPA" or "Agency"), Office of Air Quality Planning and Standards, where I managed and prepared the emission inventories, control strategies, and associated temporal, spatial and speciation data for the Regional Transport NOx SIP Call, Section 126 rulemaking, Tier-2 tailpipe standards, 1-hour attainment demonstrations, Heavy-Duty Diesel Engine standards, Multi-Pollutant legislation, Clear Skies Analysis, and US/Canadian Air Quality Agreements. For my efforts while at EPA, I received two U.S. EPA Gold Medals, for the NOx SIP Call Rulemaking (1999) and the Tier-2 Tailpipe Standard (2001) as well as a U.S. Department of Justice Certificate of Commendation for working with the Environment and Natural Resources Division (2000) and multiple Bronze Medals for Commendable Service.

Since 2003, I have been with Alpine where I am internationally recognized as a technical authority in the planning, design, development, evaluation, application, and modeling of local, national, and international emission inventories. My focus is on the policy options used for the projection and control of ozone and particulate matter pollutants and precursors. I have coordinated with Federal, State, Regional, Local, International, Tribal, and private workgroups, modeling centers, and stakeholders to develop, evaluate, and apply alternative control measures and control program designs in support of emissions and air quality analyses.

In September 2011 and again in June 2018, I was invited by and provided testimony before the U.S. House of Representatives Committee on Space, Science and Technology regarding work conducted by Alpine in modeling U.S. air quality, including discussion of analyses related to recent technological and air quality changes, and corresponding attainment results for federal ozone and particulate matter standards.

I have been tasked by the law firm of Waller Lansden Dortch & Davis, LLP, on behalf of Opus Inspection, Inc., to prepare these comments in response to U.S. EPA's supplemental notice of proposed rulemaking (SNPR) titled "Air Plan Approval; TN; Removal of Vehicle I/M Program; Middle Tennessee Area and Hamilton County" (86 FR 21248).

These comments support earlier positions prepared by me for public hearings that had been called to consider TDEC's "Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance in the Middle Tennessee Area" and "Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance in Hamilton County, Tennessee" (Noninterference Demonstrations), which supported the removal of the program for Davidson, Williamson, Wilson, Sumner and Rutherford Counties' (Middle Tennessee area) and Hamilton County's inspection and maintenance (I/M) programs from the SIPs.

A report was originally submitted on November 21, 2019, in response to the Air Pollution Control Division's Notice of Hearing posted on its website on October 18, 2019, in which the Division requested comments on its Noninterference Demonstration regarding removal of the inspection and maintenance

(I/M) program requirement for Hamilton County and the Middle Tennessee area from the State of Tennessee's State Implementation Plans (SIPs). The Tennessee Air Pollution Control Board, at its meeting on January 8, 2020, voted to re-open the public comment period to allow Alpine to reply to the Division's responses to Alpine's original report, as well as to allow any other persons to submit comments on the Middle Tennessee Noninterference Demonstration. The public notice of the re-opening was issued on January 16, 2020, and the comment period closed on February 15, 2020. A revised report contained Alpine's eight original observations and recommendations for additional analyses, followed by the Air Division's responses, and Alpine's replies to the Air Division.

This document again brings forth many of those issues and observations, which are still relevant to the SNPR, and includes additional issues for consideration during this comment period. As can be seen in this document, I firmly stand by my original observations and recommendations, and as noted, provide additional information for examination and consideration.

TDEC Statement on the Importance of the I/M Program

The following statement has been taken from TDEC's website[1] as of the date of preparation of this document and stresses the importance of the current I/M program on maintaining clean air in Hamilton County, Tennessee today and in the future (emphasis added):

> *"The State of Tennessee developed more restrictive regulations to control air pollution from mobile sources in counties that were not meeting the new 8-hour ozone Federal Standards for air quality. As a result, certain vehicles registered in Hamilton, Davidson, Rutherford, Sumner, Williamson and Wilson counties are required to pass a vehicle emission test. Gasoline and diesel vehicles with a model year of 1975 and newer and a Gross Vehicle Weight Rate (GVWR) of 10,500 lbs or less must pass an emission test before the vehicle's registration can be renewed. Motorcycles are exempt.*
>
> *Inspection programs such as the one implemented in Tennessee have proven to be very beneficial in reducing harmful ozone air pollution. Emissions from an individual car are generally low, relative to the smokestack image many associate with air pollution. But in numerous cities across the country,* ***the personal automobile is the single greatest polluter, as emissions from millions of vehicles on the road add up****. Driving a private car is probably a typical citizen's most "polluting" daily activity. Ozone levels in many cities have been reduced with the introduction of lower volatility gasoline, and as newer cars with improved emission control systems replaced older models. There has been significant progress in reducing vehicle emissions, but the number of cars on the road and the miles they travel make mobile sources an ongoing problem. Unless we dramatically reduce the amount of pollution vehicles emit in actual use, or drastically cut back on the amount we drive, smog-free air may become a problem for many of our cities."*

[1] https://www.tn.gov/environment/program-areas/apc-air-pollution-control-home/apc/vehicle-inspection-program/important-information.html

With this statement, TDEC recognizes the importance of emission control programs in Tennessee for achieving the clean air quality objectives required by EPA and for ensuring that people of the state can breathe freely without fear of health issues resulting from these emission sources. Compromising resident's health and the current attainment status by removing the I/M programs in Hamilton County, Tennessee and the Middle Tennessee area is contrary to TDEC's objectives.

Summary of Observations

Based on my review of TDEC's proposed SIP changes, associated technical documentation[2], and the additional information provided in the SNPR, a summary of my observations follows. Justifications for the observations and recommendations for additional analyses are presented in this report.

1. EPA has recently released the MOVES3 version of the mobile source emissions model[3]. TDEC should consider the impact that changes in this model have on the assumptions included in the removal of the I/M program in the state, especially in light of EPA's findings that NOX emissions estimates were higher in future years in urban areas using MOVES3 compared to MOVES2014b.

2. TDEC bases both its base year and future year emission assumptions on a version of EPA's 2014 National Emission Inventory (NEI) that is now multi-versions old. TDEC should consider revising its analysis using the most current, more appropriate version of the NEI that is based on a 2016 calendar year and was developed with significant input from state and regional organizations.

3. 2014 was not a conducive year for ozone sensitivity simulations, nor did it contain high ozone periods that would adequately allow for the determination of impact of control strategies and associated air quality response.

4. TDEC has failed to simulate the impact of removal of the I/M program using air quality modeling. Ozone concentrations have non-linear correlation to NOx and VOC emission changes and cannot adequately be estimated exclusively using scaling ratios based on emission reduction sensitivities.

5. TDEC relies on a technical analysis completed in 2014 and that is based on inventories and assumptions from 2007 now considered aged in their application of ozone sensitivity factors to estimate the impact of the removal of the I/M program. The factors generated from that work were identified as being inappropriate for other simulations beyond the scope of the original work.

6. TDEC makes an assumption that each ton of a pollutant precursor emission has an equal impact on air quality as compared to every other ton of the same pollutant precursor, regardless of

[2] https://www.tn.gov/content/dam/tn/environment/boards/documents/apc-board/2019-meetings/september-11/APC_Board_Packet_Sept_11_2019.pdf
[3] 86 FR 1107

emission source and where in the state the emissions occur. Recent modeling on this subject demonstrates that local motor vehicle source emissions have significantly greater impact on local air quality compared to all other source categories and regions.

7. Category-specific source apportionment analyses conducted elsewhere indicate that NOx emissions from Tennessee's motor vehicle source category may have a much greater impact on local air quality than estimated by TDEC.

8. The SNPR invites comment on the impact of the removal of the I/M program and the influence the resulting emissions increase may have on the "good neighbor" provision of the CAA. EPA has recently identified that Tennessee is not a significant contributor to downwind ozone nonattainment or maintenance monitors under the 2008 ozone NAAQS using a *beta* version of an air quality model that includes an error in determining the significant contribution calculation.

9. 2020 air quality is unique in the fact that many areas of the U.S. experienced significant change in emissions-generating activities due to the COVID-19 pandemic. Some EPA staff have stated[4] that 2020 may not be representative of air quality in prior years. At a minimum, EPA should consider waiting until newer trends in air quality present themselves to determine whether the improvements seen in 2020 are just a blip in the trends or are what is to come.

10. The American Lung Association's (ALA) annual "State of the Air" report[5] shows a need for new federal policies to promote less-polluting energy sources.

11. TDEC includes in its assumptions that existing emission control programs will remain in force during the foreseeable future. As has been demonstrated by EPA, a significant number of federal air quality regulations have been "rolled back", removed from requirements, or are in the courts pending review and decision.

[4] https://cleanairact.org/wp-content/uploads/2021/04/OAQPS-Technical-Updates-Monitoring-Modeling-Emissions.pdf
[5] https://www.lung.org/research/sota/key-findings

1. **EPA Has Released MOVES3 Which Includes Higher Metro Area NOx Emission Estimates**

According to EPA, MOVES3 is the latest motor vehicle emissions model for state and local agencies to estimate volatile organic compounds (VOCs), nitrogen oxides (NOx), particulate matter (PM2.5 and PM10), carbon monoxide (CO), and other precursors from cars, trucks, buses, and motorcycles for SIP purposes and conformity determinations outside of California. The model is based on analyses of millions of emission test results and considerable advances in the Agency's understanding of vehicle emissions.

Based on the significant number of data, regulation simulation, and other updates associated with this model update, it is strongly recommended that TDEQ consider running the I/M removal analysis with the MOVES3 model.

Specifically, MOVES3 incorporates new regulations, features and significant new data. Notably, MOVES3 incorporates:

- Improvements to heavy-duty (HD) diesel running emission rates based on manufacturer in-use testing data from hundreds of HD trucks;
- Updated emission rates for HD gasoline and compressed natural gas (CNG) trucks;
- Updated light-duty (LD) vehicle emission rates for hydrocarbons (HC), CO and NOx-based on in-use testing data;
- Updated LD PM rates for Model Year (MY) 2004 and later, incorporating data on gasoline direct injection engines;
- New fuel characteristic data from EPA fuel compliance submissions;
- Updated fuel effect calculations to better characterize the base fuel used to develop LD base emission rates;
- The effects of the HD Phase 2 GHG rule;
- The effects of the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule on light-duty fuel economy;
- ''Off-network idle'' emissions beyond the idling that is already considered in the MOVES drive cycles; and
- Several improvements to the MOVES interface, user inputs and outputs.

MOVES3 also includes a variety of activity updates, most notably:

- Vehicle start and idling activity patterns are based on real-world instrumented vehicle data collected by a telecommunications company for LD vehicles and the Department of Energy's (DOE) National Renewable Energy Lab (NREL) for HD vehicles;
- Default hotelling activity has been substantially reduced from what was included in MOVES2014 based on the NREL instrumented truck data;
- National vehicle miles travelled (VMT) and vehicle population inputs have been updated with newer historical data from the Federal Highway Administration (FHWA) and more recent forecasts from DOE; and

- National onroad vehicle default fuel, regulatory class, and age distributions are based on newer vehicle registration data.

While in general, compared to MOVES2014b, MOVES3 national emission estimates are reported to be slightly lower for most criteria pollutants in future years, in the two sample urban counties reported by EPA, NOX emissions estimates were higher in future years. Noting this potential increase in onroad mobile source emissions using EPA's latest state-of-science model, TDEQ would be remiss to omit an estimate of onroad emissions using this latest tool designed specifically for this purpose.

Furthermore, during the grace period offered by EPA with respect to initially using MOVES3 for SIP planning purposes, EPA notes that "areas should use interagency consultation to examine how MOVES3 will impact their future transportation plan and TIP conformity determinations, including regional emissions analyses. Isolated rural areas should also consider how future regional emissions analyses will be affected when the MOVES3 grace period ends. Areas should carefully consider whether the SIP and budgets should be revised with MOVES3 or if transportation plans and TIPs should be revised before the end of the conformity grace period, since doing so may be necessary to ensure conformity in the future."[6]

It is my recommendation that the most current emissions data and models, including MOVES3, be used to update the I/M analysis conducted by TDEC to account for improvements in emission estimates and to estimate the impact of removing the I/M programs from the Middle Tennessee area and Hamilton County.

2. Newer Modeling Platforms Are Available for Use

TDEC grounds both its base year and future year emission assumptions on a version of EPA's 2014 National Emission Inventory (NEI), version 2 that is now multi-versions old. TDEC should revise its analysis using the most current version of the NEI and associated projections that is based on a 2016 calendar year and that was developed with significant input from state and regional organizations.

Since the publication of EPA's 2014v2 NEI modeling platform used by TDEC, EPA has released three incrementally newer modeling platforms using national, state, and local data sources[7]. These updated platforms improve estimates for emissions activity, magnitude, and temporal and spatial distribution, and use newer emission factors, methods, and models to derive their values.

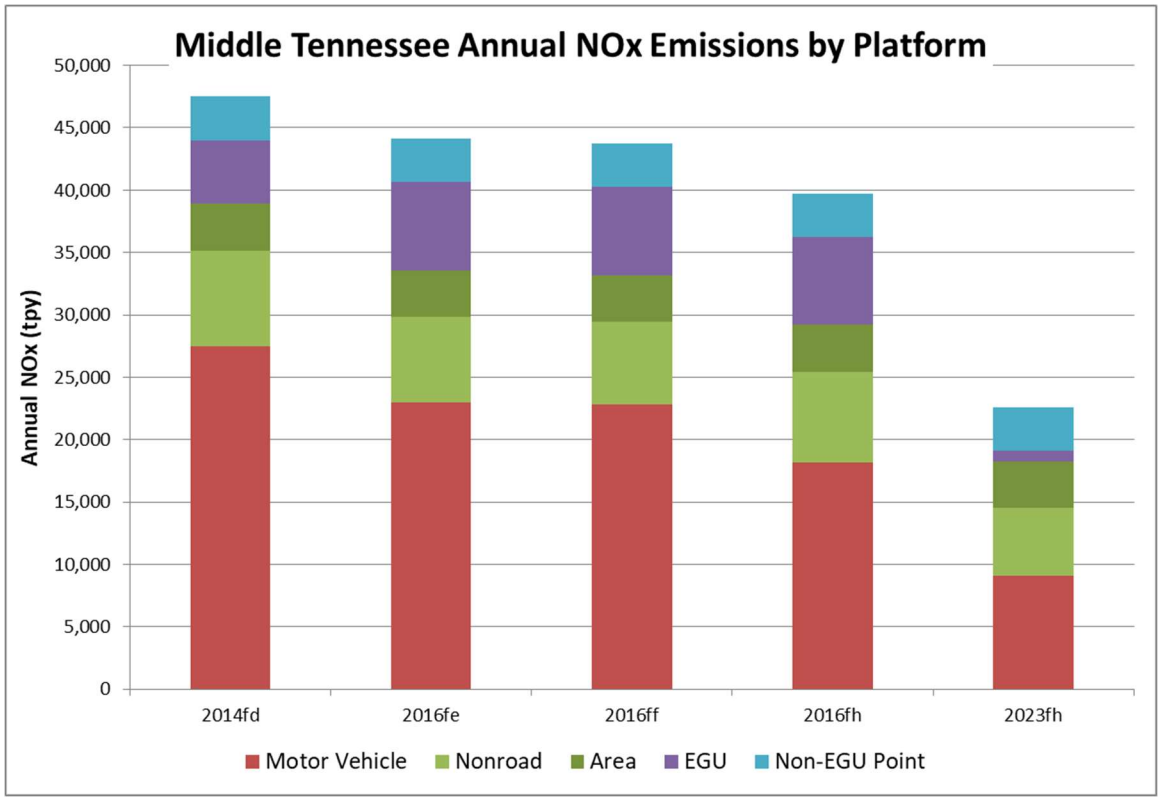
The most current version of EPA's modeling platform with projections is the 2016v1 platform that is described as a coordinated effort across over 245 state and regional air agency, EPA, and Federal Land Manager employees. The Figures below demonstrate the differences published in the Middle Tennessee area (Figure 1) and Hamilton County (Figure 2) annual emissions for NOx and VOC by major category across the multiple platforms and associated projections, including the two discussed above.

[6] 86 FR 1109

[7] https://www.epa.gov/air-emissions-modeling/2014-2016-version-7-air-emissions-modeling-platforms

The 2016fh platform and associated emission projections are demonstrably different in annual NOx and VOC from anthropogenic sources compared to the 2014fd platform cited by TDEC in its sensitivity analysis and likely contain updated emission estimates for both the Middle Tennessee area and Hamilton County (and regionally impacting) source categories.

Although TDEC-APC indicates they were using the most current version of the national emission inventory at the time its noninterference demonstrations were being prepared, based on the length of the regulatory process to remove the I/M programs from the Middle Tennessee area and Hamilton County, I recommend that a revised analysis should be conducted using the most current modeling platform, models, data, and methods, and associated emission projections available to account for improvements in emission estimates across all sectors.



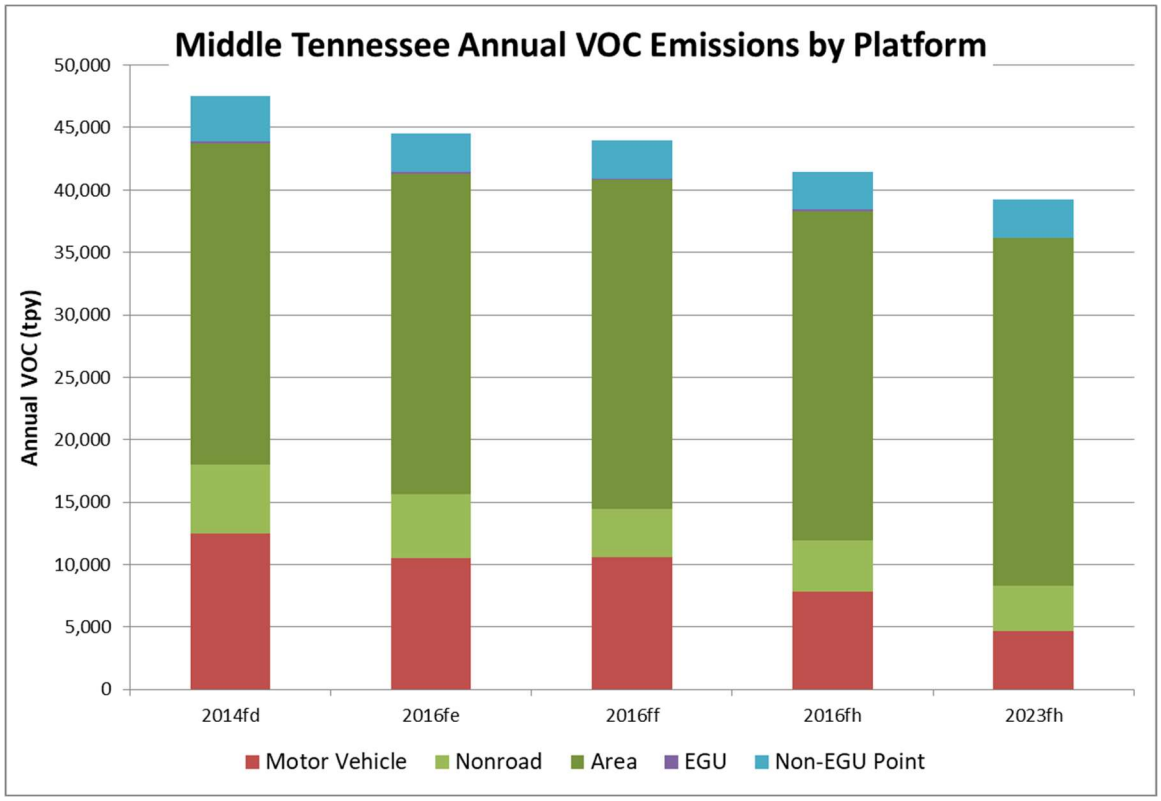
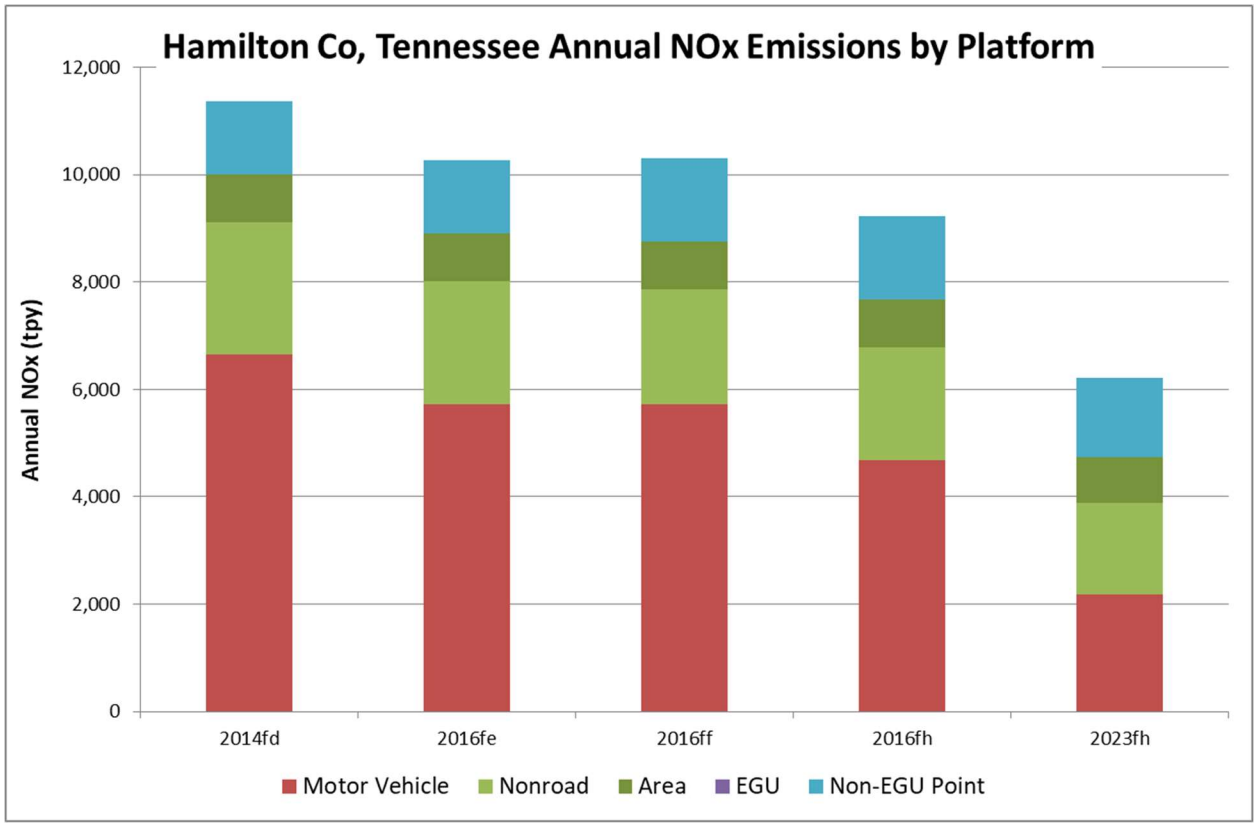


Figure 1. Annual emission summary of various EPA modeling platforms and associated projections for NOx (top) and VOC (bottom) Middle Tennessee counties.



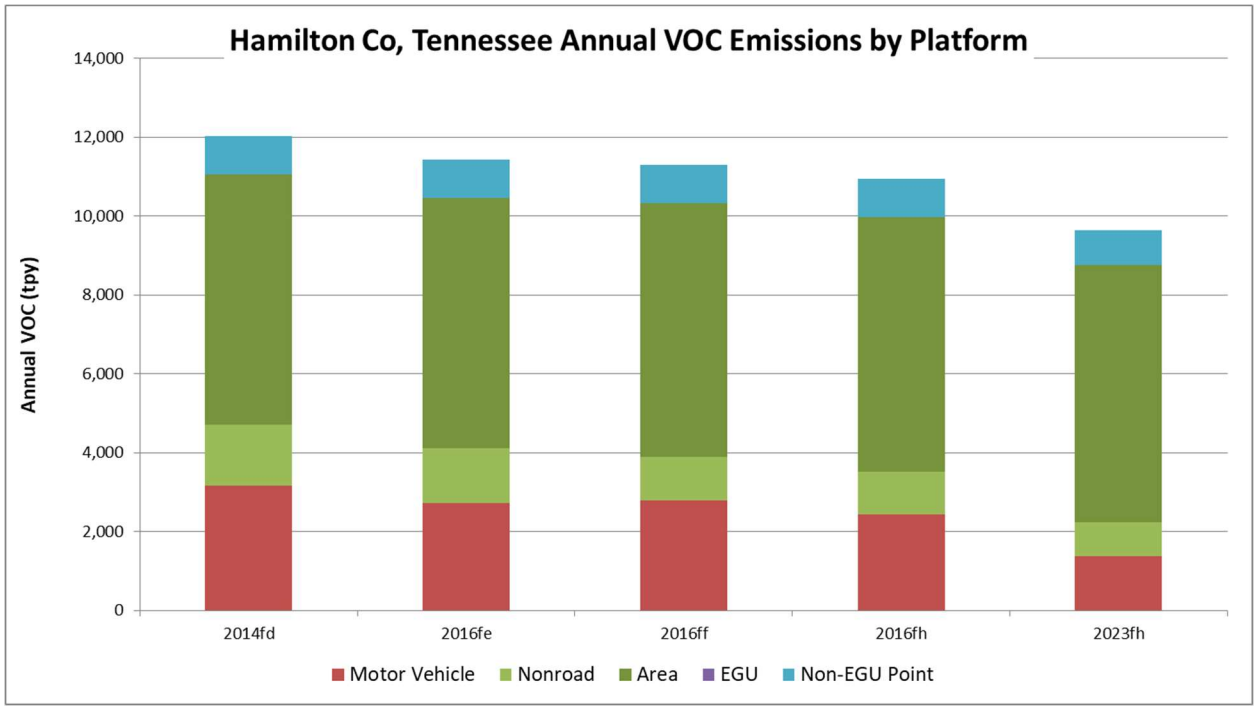


Figure 2. Annual emission summary of various EPA modeling platforms and associated projections for NOx (top) and VOC (bottom) Hamilton County, Tennessee.

3. 2014 Inventory Is A Bad Year For Sensitivity Analysis

As noted in TDEC's Noninterference Demonstrations, TDEC selected 2014 as a base year to develop estimated air quality impacts of the removal of the I/M program in both the Middle Tennessee area and Hamilton County.

Meteorological conditions including temperature, humidity, winds, solar radiation, and vertical mixing affect the formation and transport of ambient ozone concentrations. Ozone is more readily formed on warm, sunny days when the air is stagnant and/or when the winds are favorable for transport from upwind source areas. Conversely, ozone production is more limited on days that are cloudy, cool, rainy, and windy. In general, below average temperatures are an indication that meteorological conditions are unconducive for ozone formation, whereas above average temperatures are an indication that meteorology is conducive to ozone formation.

EPA notes in its ozone and PM modeling guidance document that the selection of a base year for SIP and sensitivity modeling is dependent on model performance evaluations and the response to emissions controls over time periods that include a ramp-up to a high ozone period and a ramp-down to cleaner conditions. This allows for a more complete evaluation of model performance under a variety of meteorological conditions. EPA recommends that one should choose time periods which reflect a variety of meteorological conditions that frequently correspond with observed 8-hour daily maximum concentrations greater than the level of the NAAQS at monitoring sites in the nonattainment area.

We note, as do EPA and others, that 2014 was not a conducive year for such an analysis, nor did it contain high ozone periods that would adequately allow for the determination of impact of control strategies and air quality response. In recent modeling documentation[8], EPA notes that the summer of 2014 was not particularly conducive for ozone formation in the Upper Midwest, Ohio Valley, South, and Southeast. EPA provides supporting information from NOAA's Temperature, Precipitation, and Drought website[9] that shows 2014 was a below average temperature year (Figure 3) and an above average precipitation year (Figure 4).

[8] http://www.midwestozonegroup.com/files/EPA_maintenance_flexibility_Oct_19_2018.pdf
[9] https://www.ncdc.noaa.gov/temp-and-precip/

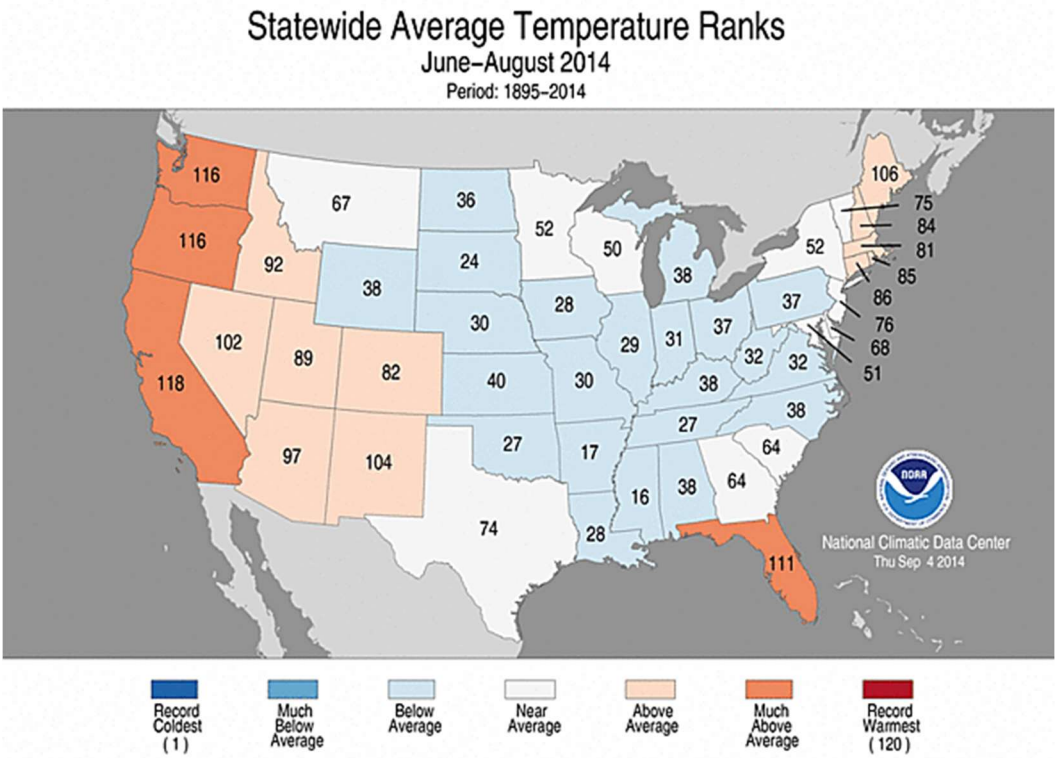


Figure 3. Statewide average temperature ranks, summer 2014.

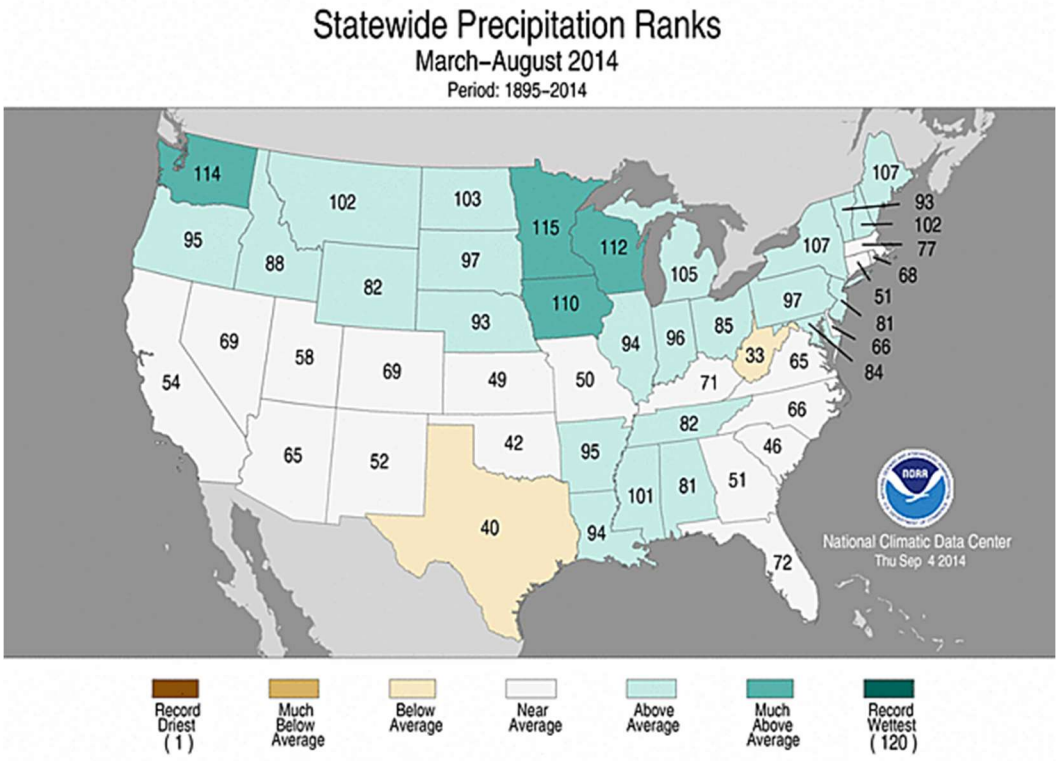


Figure 4. Statewide average precipitation ranks, summer 2014.

In contrast, 2016 was an abnormally above average temperature year (Figure 5) for Tennessee and the Southeast, providing an alternative base year for this type of sensitivity to be conducted. This year is also consistent with EPA's latest modeling platform that could be used for this purpose.

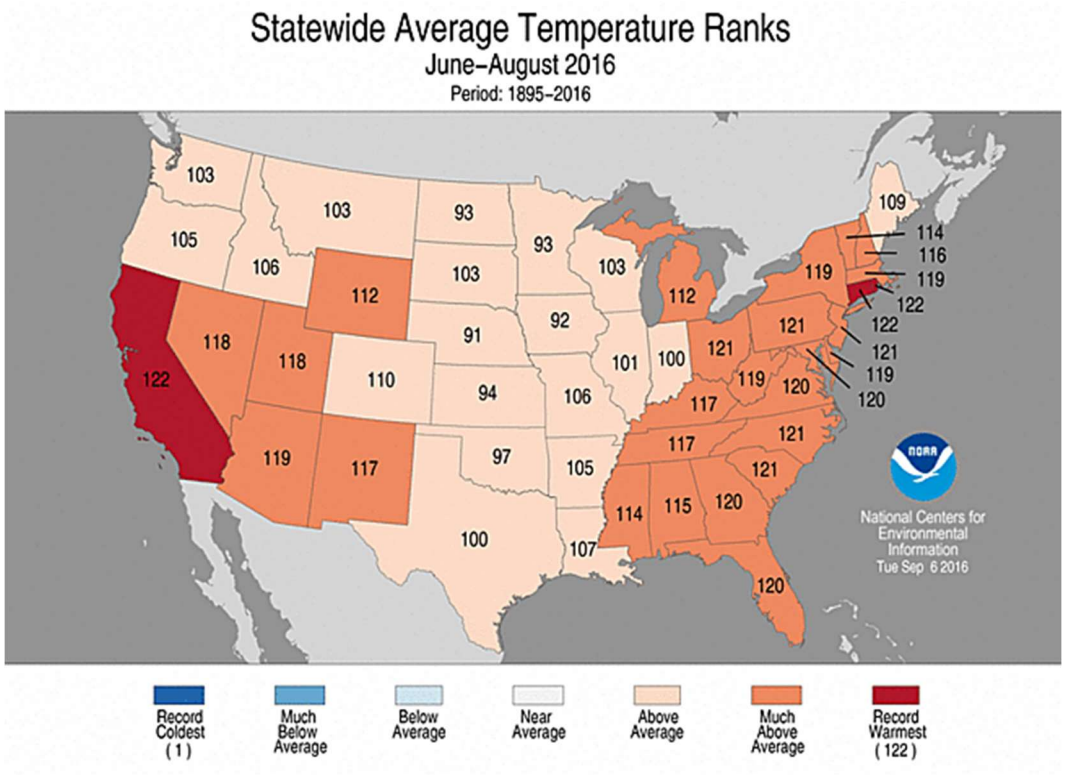


Figure 5. Statewide average temperature ranks, summer 2016.

While TDEC-APC did not include photochemical modeling in their analysis and therefore contest that the selection of base year meteorology is irrelevant, they fail to note that onroad emissions and other category utilization (e.g., EGUs) and emissions are derived from calendar year-specific meteorological data. And so even though an air quality simulation was never conducted to support the removal of the I/M programs, estimating their removal from the Middle Tennessee area and Hamilton County is influenced and impacted by the meteorology of the inventory base year and associated projections.

It is my recommendation that TDEC conduct revised ozone sensitivity analyses using a meteorological base year and associated emissions inventory that meets the requirements of EPA guidance for the determination of impact of control strategies and air quality response.

4. Air Quality Modeling Is Absent in The Analysis

TDEC has failed to simulate the impact of removal of the I/M program using air quality modeling. Ozone concentrations have non-linear correlation to NOx and VOC emission changes and cannot adequately be estimated exclusively using scaling ratios based on emission reduction sensitivities.

EPA SIP modeling guidance[10] notes that "[t]he application of a chemical transport grid model on a regional or local scale is the best tool available to judge the impacts of changes in future year emissions on concentrations." It further goes on to say "[a]ir agencies should determine whether a control program scenario will provide sufficient emission reductions to demonstrate attainment of the NAAQS using the modeled attainment test. The modeled attainment test is a technical procedure in which an air quality model is used to simulate base year and future air pollutant concentrations for the purpose of demonstrating attainment of the relevant NAAQS."

Formulation of a successful strategy against ozone pollution requires knowledge of the chemical regime for ozone production. Successive generations of atmospheric chemistry models have been developed to address this issue. Generally, air quality models are regarded as the most appropriate tools for assessing the expected impacts of a change in emissions.

TDEC, however, has failed to simulate the impacts of the I/M program removal with any air quality modeling. Instead, it has chosen to use external ozone sensitivity factors (inappropriate for this purpose as discussed elsewhere in this document) to estimate the changes in Tennessee air quality relative to the removal of this program.

While it may be possible to evaluate progress towards or degradation away from attainment of the ozone or PM2.5 NAAQS based on measured historical trends of air quality and emissions, there are several elements to that type of analysis that are difficult to quantify. First, in most cases, the ambient data trends are best assessed by normalizing to account for year-to-year meteorological variations. Second, one must have an accurate accounting of the year-to-year changes in actual emissions (NOx, VOC, and/or SO2 and NH3) for the given area and any surrounding areas, the emissions from which may impact local concentrations. Third, one must have a solid conceptual model of how ozone or PM2.5 is formed in the local area (e.g., influence of meteorology, NOx-limited, ammonia limited, transport-influenced, etc.).

TDEC-APC notes that early in the process of developing their Noninterference Demonstrations, they consulted with the EPA on what information would be necessary to include in the demonstrations. The EPA advised the TDEC-APC that an emission inventory projected out to 2022 would be needed in the demonstrations, and the inventory should show two scenarios: (1) emissions with the I/M program and (2) emissions without the I/M program. Since the increase in emissions between the two scenarios was very small, the EPA advised the TDEC-APC that a full air quality photochemical modeling analysis was not required for the demonstrations. The TDEC-APC included the sensitivity analysis based on the SEMAP modeling in the Noninterference Demonstrations as a weight of evidence. The EPA's Noninterference Demonstration guidance (dated June 8, 2005) allows for the EPA to make case-by-case determinations on what is required to be included in a demonstration based on the current air quality in the region and the magnitude of the increase in emissions due to the removal of a control measure.

At the time of those discussions, the MOVES3 model was not yet available, temperature averages and maximums across most of the United States, including Tennessee, were not yet at the record high levels

[10] https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

now being recorded, wildfires were not significantly more prevalent and larger in both size and geographic impact, and other deregulatory actions (discussed elsewhere in this document) were not impacting air quality across the continent. As a result of these possibly unforeseen changes in emissions-generating activities and actions and their potential impact on emissions and air quality across Tennessee, it is still my recommendation that TDEC-APC simulate air quality changes resulting from the removal of the I/M program in the Middle Tennessee area and Hamilton County using a chemical transport grid model to ensure that increases in air pollutant concentrations do not exceed NAAQS and health-based recommendations.

Because TDEC has chosen to forego this most important step of simulating the removal of the I/M program with an air quality run, results presented in the noninterference demonstration cannot be considered technically complete.

5. Ozone Sensitivity Factors Are Based On 2007 Data Projected to 2018

TDEC relies on a technical analysis completed in 2014 that is based on inventories from 2007 and assumptions now considered aged in their application of ozone sensitivity factors to estimate the impact of the removal of the I/M program. The "brute force" factors generated from this work are not applicable to current emission conditions and to the mix of sources and emissions in the analyzed region and are based on a calculation of emission reductions across all source sectors (not just I/M impacted sources) and across the entire state of Tennessee (not just the impacted Middle Tennessee area and Hamilton County).

TDEC has relied on an analysis[11] conducted by Georgia Tech in 2014 (SEMAP) that is based on a 2007 base year emission inventory (and associated meteorology) with 2018 projections using assumptions considered "On The Way" or "On The Books" at that time. My review of this study and platform find the following issues related to the study's use in TDEC's ozone sensitivity analysis.

To start, total Tennessee annual anthropogenic NOx emissions projected to 2018 in the SEMAP analysis (267,700 tpy) are 25% greater than actual emissions currently reported in Tennessee in the 2016v1 platform (214,542 tpy). This direction is reversed for anthropogenic VOC emissions where EPA's 2016v1 platform is 7% higher than the SEMAP 2018 projection (227,090 tpy v 210,706 tpy). This initially complicates the ozone sensitivity factor, as the ratio of ozone to NOx and VOC used by TDEC is based on emission levels significantly different than actual, current conditions.

Furthermore, when looking at motor vehicle source emission comparisons exclusively, EPA estimates that in 2016, onroad annual NOx (106,069 tpy) comprises 49% of total anthropogenic emissions from Tennessee. The SEMAP analysis estimated a significantly lower composition (36%; 95,973 tpy) in its 2018 projections used to create the ozone sensitivy factors used by TDEC. Annual motor vehicle VOC emissions also differ in contribution with SEMAP estimating 19% of total anthropogenic VOC (40,676

[11] http://semap.ce.gatech.edu/sites/default/files/files/SEMAP-Revised-Final-Report_Final.pdf

tpy) in 2018 from motor vehicle sources compared to EPA's 24% (53,649 tpy) from this same category-state combination. Figure 6 and Figure 7 present this comparison for NOx and VOC, respectively.

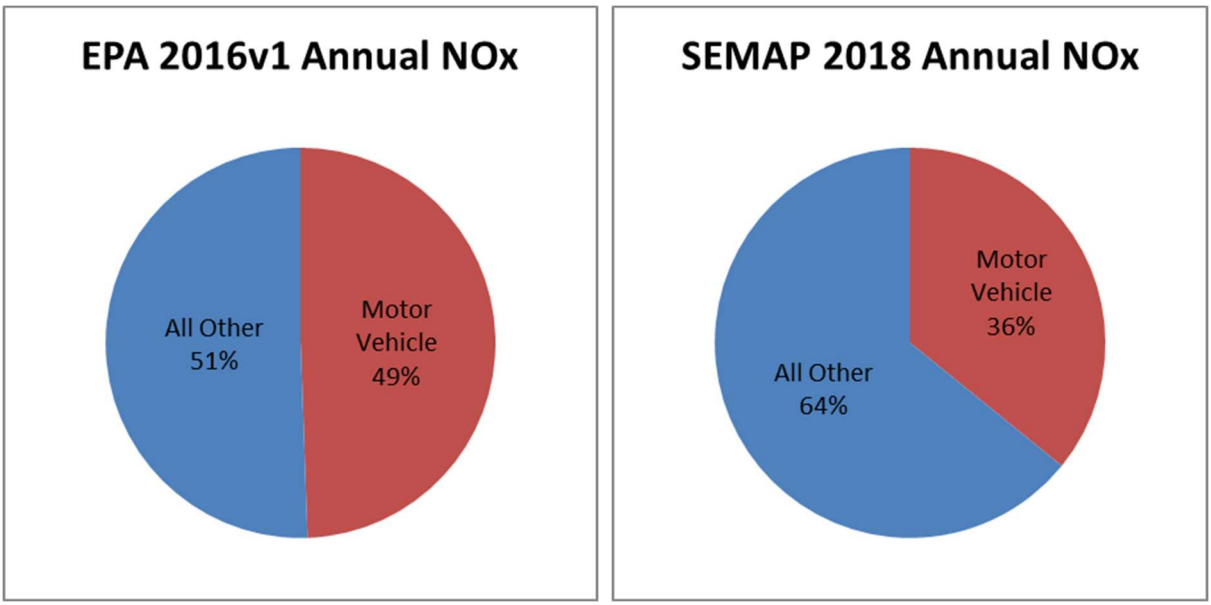


Figure 6. Comparison of annual NOx emissions from Tennessee motor vehicle sources as a percentage of total Tennessee NOx emissions.

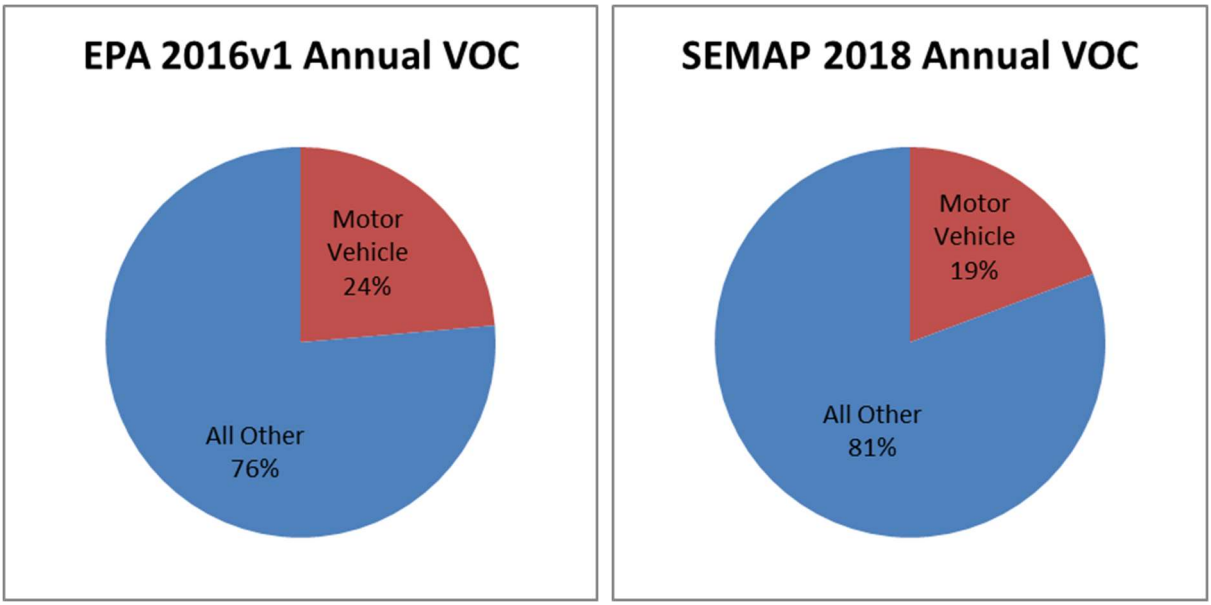


Figure 7. Comparison of annual VOC emissions from Tennessee motor vehicle sources as a percentage of total Tennessee VOC emissions.

As a result, the SEMAP calculated ozone sensitivity factor is based on an emissions magnitude AND a presumed source category emission ratio significantly different than today's actual distribution ratio as represented in the 2016v1 platform. This results in a sensitivity factor (ppb/ton reduced) calculated

from the SEMAP work that is not directly applicable to today's ozone conditions and that is likely not representative of the air quality change reflected in the removal of the I/M programs.

It is my recommendation that TDEC consider alternate methods and air quality modeling than using an outdated modeling platform and projections, with source category distribution assumptions, significantly different than today's actual category and emissions mix, to determine the air quality impact of removing Middle Tennessee and Hamilton County's I/M programs.

6. TDEC's Misuse of the SEMAP Ozone Sensitivity Factor

TDEC notes in the Hamilton County Noninterference Demonstration document (page 14) that:

> *"Although the SEMAP study projected emissions and ozone concentrations in 2018, it is estimated that a similar response to NOx and VOC reductions would occur in 2022."*

In fact, the SEMAP report itself indicates the limitations of using these data for purposes other than identical to the conditions in that analysis. Specifically, the report notes[12]:

> *"Since ozone response is nonlinear the results are most accurate for the amount of reduction used here, i.e., 30% of either NOx or VOC emissions. Caution should be exercised if the results are used for other purposes, for example in attempts to calculate the responses to other levels of emission reductions, especially those larger than 30%, or responses to combined NOx and VOC reductions. An extreme attempt might be to extrapolate the results to 100% and calculate interstate contributions. The nonlinear nature of the relation between ozone and NOx or VOC emissions should be kept in mind in such interpretations of the results. Any such attempt can only be a first estimate and should be followed by simulations of the actual emission reduction case."*

This caveat to the SEMAP results is clear in noting that (1) the sensitivity factors generated from the analysis are most accurate for reducing NOx or VOC emissions across all categories across the entire state by 30%, (2) caution should be exercised if the results are to be used for purposes other than the original intent of the analysis, (3) using the sensitivity factors should only be considered a first estimate and not a final application of the emission change, and (4) an actual emission reduction scenario and air quality modeling simulation should be conducted with the strategy outlined.

TDEC has made no documented effort to follow this guidance from the SEMAP report and from where the ozone sensitivity factors were taken.

In response to earlier comments, TDEC-APC recognizes that its use of the scaling analysis would yield erroneous results but should be "adequate enough" for the agency to reconsider using its analysis as a weight-of evidence approach to removal of the I/M programs. Even though EPA approved a separate state's weight-of-evidence analysis for a totally different region and program removal, erroneous results

[12] Id. Page 5-1.

are erroneous results and should not be used to justify removal of an emissions reduction program that historically TDEC-APC felt so strongly to support and has impact on improving air quality in the region.

It is my recommendation that TDEC consider using alternate methods and air quality modeling to determine the air quality impact of removing the Middle Tennessee area and Hamilton County's I/M programs.

7. Calculations Show Onroad Emissions from Tennessee Have The Greatest Ozone Formation Potential

By using the SEMAP ozone sensitivity factors, TDEC makes an assumption that each ton of a pollutant precursor emission has an equal impact on air quality as compared to every other ton of the same pollutant precursor, regardless of emission source. Recent modeling on this subject demonstrates that local motor vehicle source emissions have significantly greater impact on local air quality compared to all other source categories and regions.

Assuming that non-linear ozone formation and the use of an older modeling platform and associated emission projections were to be acceptable approaches to reviewing the impact of air quality change resulting from removal of the I/M programs, recent category-specific source apportionment analyses conducted elsewhere by Alpine indicate that NOx emissions from Tennessee's motor vehicle source category have a much greater impact on local air quality than estimated by TDEC.

In the statement from TDEC's website presented above, the following sentence has significant relevance to the review here:

> *"But in numerous cities across the country, the personal automobile is the single greatest polluter, as emissions from millions of vehicles on the road add up."*

Using methods previously established under other work[13], Alpine has reviewed the recent EPA modeling platform used in the Cross-State Air Pollution Rule (CSAPR) Close-Out modeling and developed ozone source apportionment results and relationships between State-source category specific ozone source apportionment modeling and the seasonal NOx emissions used to develop the ozone concentrations. We used the **C**omprehensive **A**ir quality **M**odel with e**X**tensions/**O**zone **S**ource **A**pportionment **T**echnology[14] (CAMx/OSAT) technique to quantify the contribution of 2023 base case NOx and VOC emissions from anthropogenic source categories in each region to projected 2023 ozone concentrations at ozone monitoring sites based on EPA's CSAPR "Closeout" base case scenario from EPA's 2011/2023en modeling platform.

This analysis is important as the results provide indicators of relative contribution of source regions (states) and categories (e.g., motor vehicle) NOx and VOC emissions to downwind monitor ozone

[13] http://midwestozonegroup.com/files/RelativeImpactofStateandSourceCategoryNOxEmissionsonDownwindMonitorsIdentifiedUsingthe2017CrossStateAirPollutionRuleModelingPlatform.pdf

[14] http://www.camx.com/files/camxusersguide_v6-40.pdf

concentrations. Our findings for the 2023 simulation at Middle Tennessee area and Hamilton County monitors are presented in Figure 8 through Figure 13 below.

Each figure presents the relative contribution of NOx and VOC emissions to the modeled ozone concentration at the presented receptor. The relative height of the bars indicates the source region (x-axis) of contribution with taller bars indicating greater relative contribution. The individual colored segments of each bar (e.g., red indicating motor vehicles) indicate the relative contribution of source categories within each region to the monitor's modeled ozone concentration.

In all cases listed in the following Figures, emissions from motor vehicle sources contribute the greatest relative concentration from U.S. anthropogenic emissions to the monitors presented (e.g., red portion of bar from Tennessee). Based on the understanding of local impact from mobile sources, it could also be estimated that more localized reductions (e.g., Hamilton County only) would have an even greater relative impact on ozone concentrations per ton than a statewide estimation.

Note that the blue "BC" bar indicates contribution from emissions generated from boundary condition sources that include, but are not limited to, concentrations transported into the national modeling domain (e.g., international transport, stratospheric intrusion, domain initialization conditions) and are not controllable by U.S. regulation.

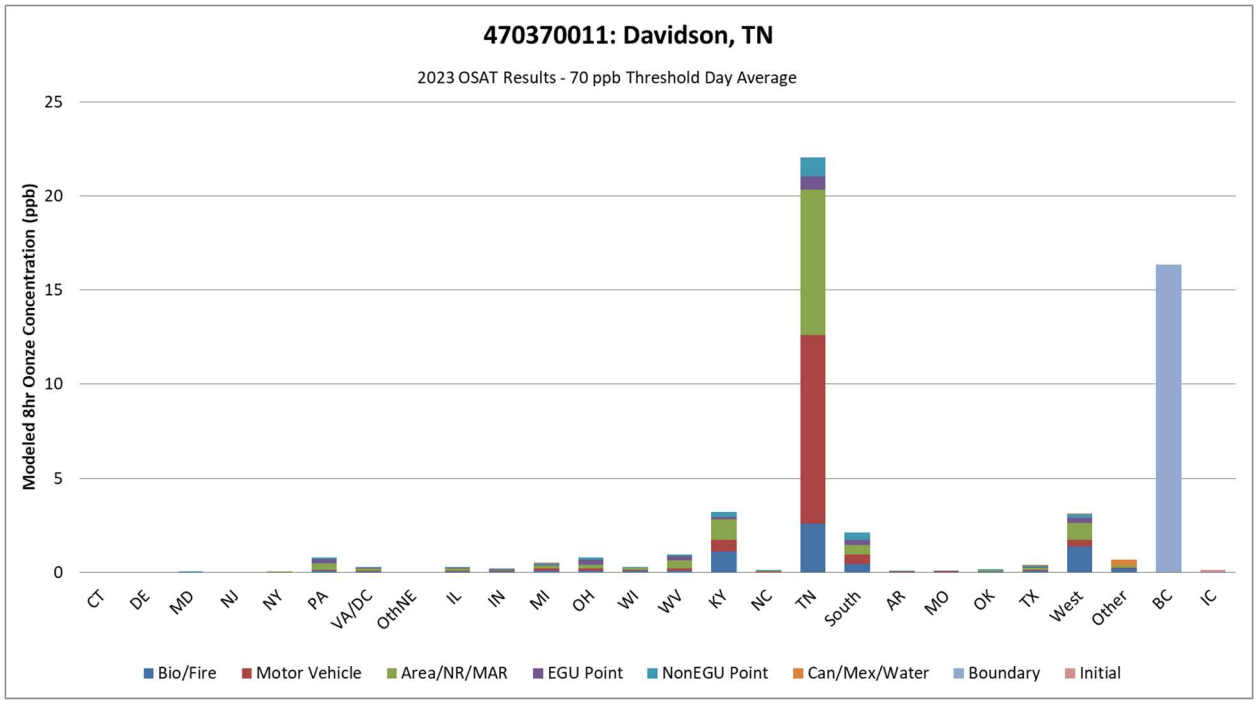


Figure 8. Relative contribution of ozone concentration (ppb) from source region and category combinations for East Health monitor.

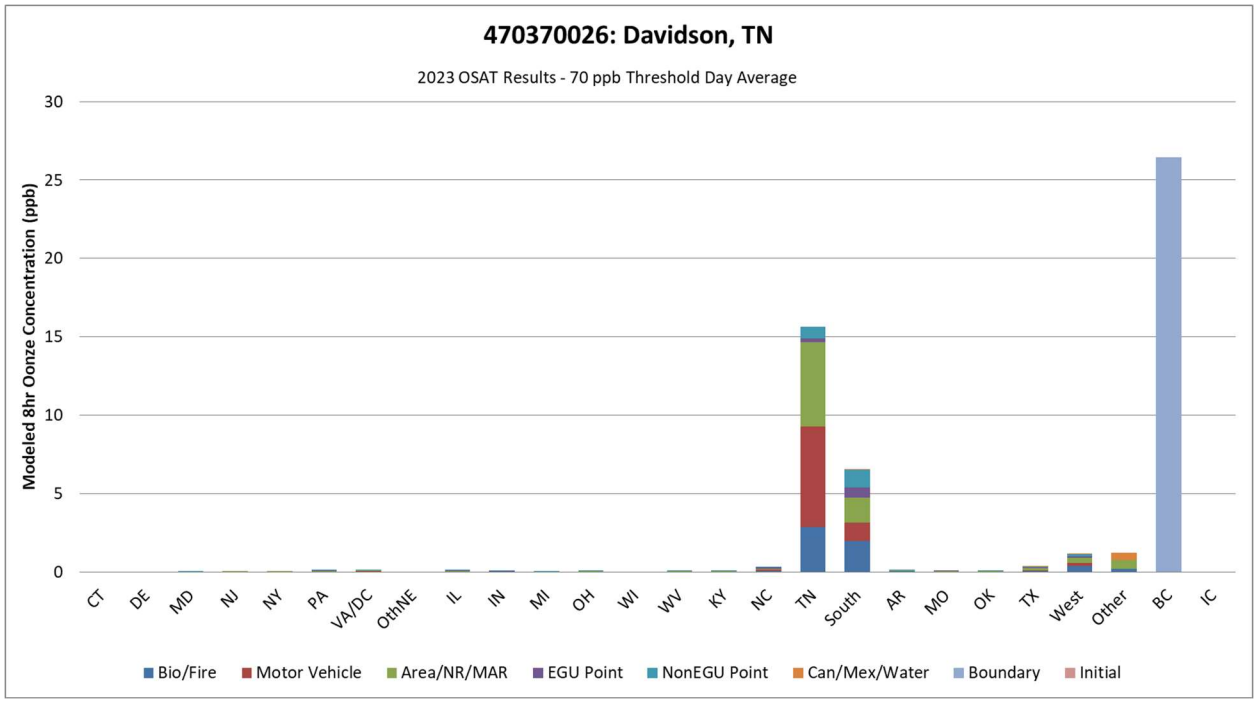


Figure 9. Relative contribution of ozone concentration (ppb) from source region and category combinations for Percy Priest Dam monitor.

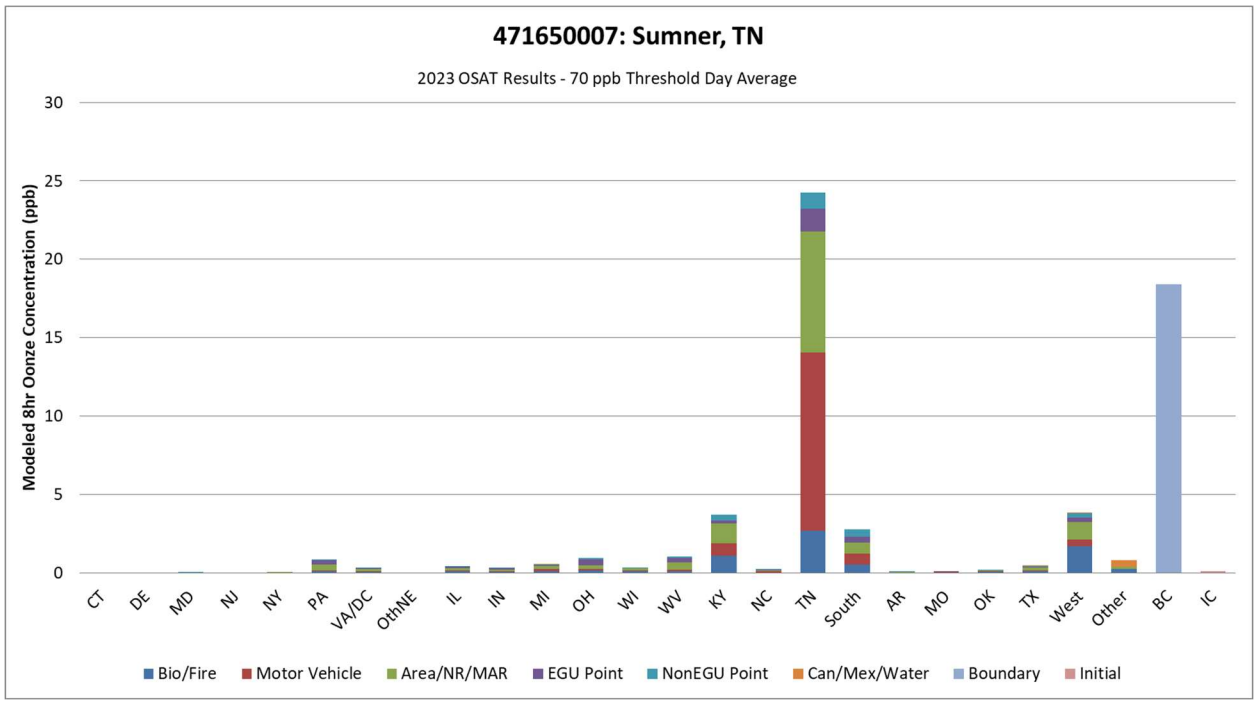


Figure 10. Relative contribution of ozone concentration (ppb) from source region and category combinations for Hendersonville Ozone Site at Old Hickory Dam.

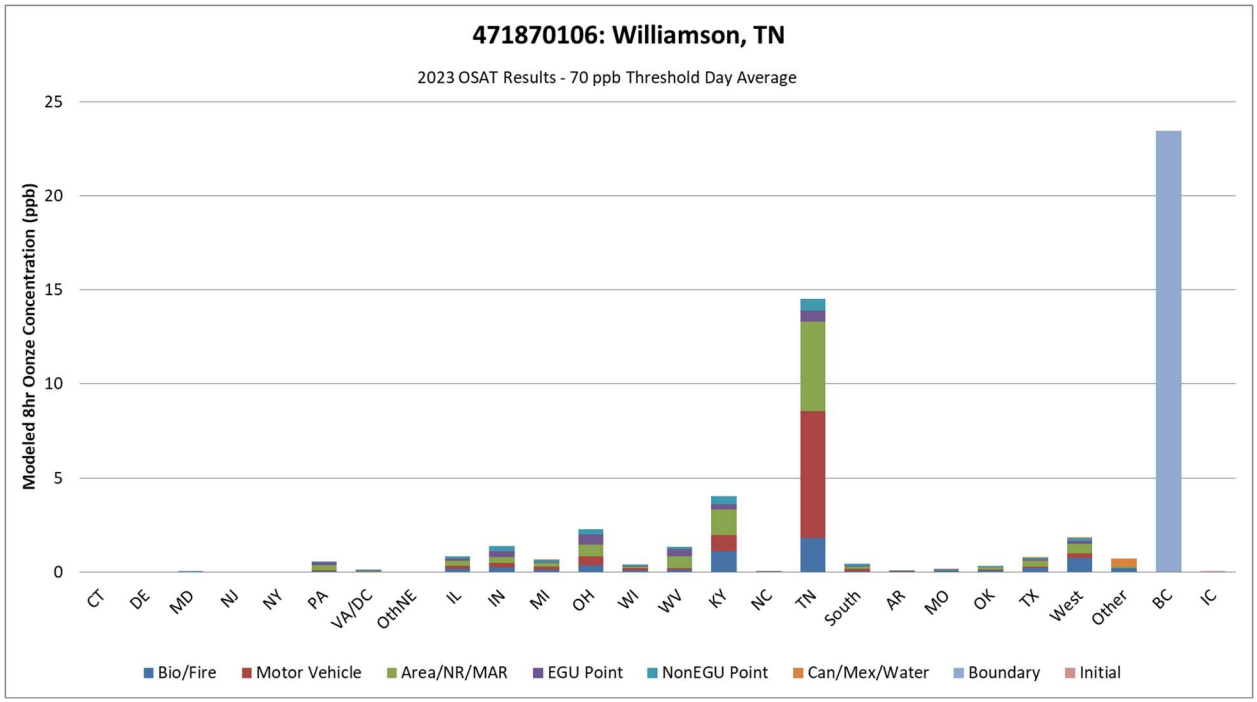


Figure 11. Relative contribution of ozone concentration (ppb) from source region and category combinations for Fairview Middle School monitor.

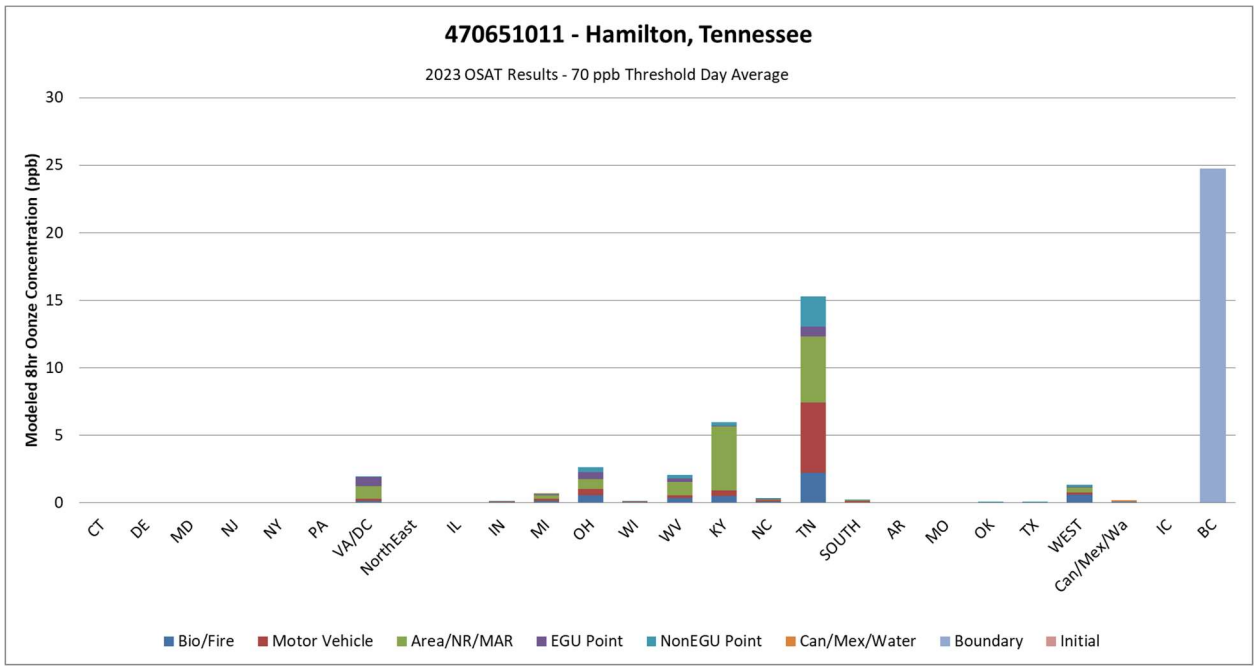


Figure 12. Relative contribution of ozone concentration (ppb) from source region and category combinations for Eastside monitor.

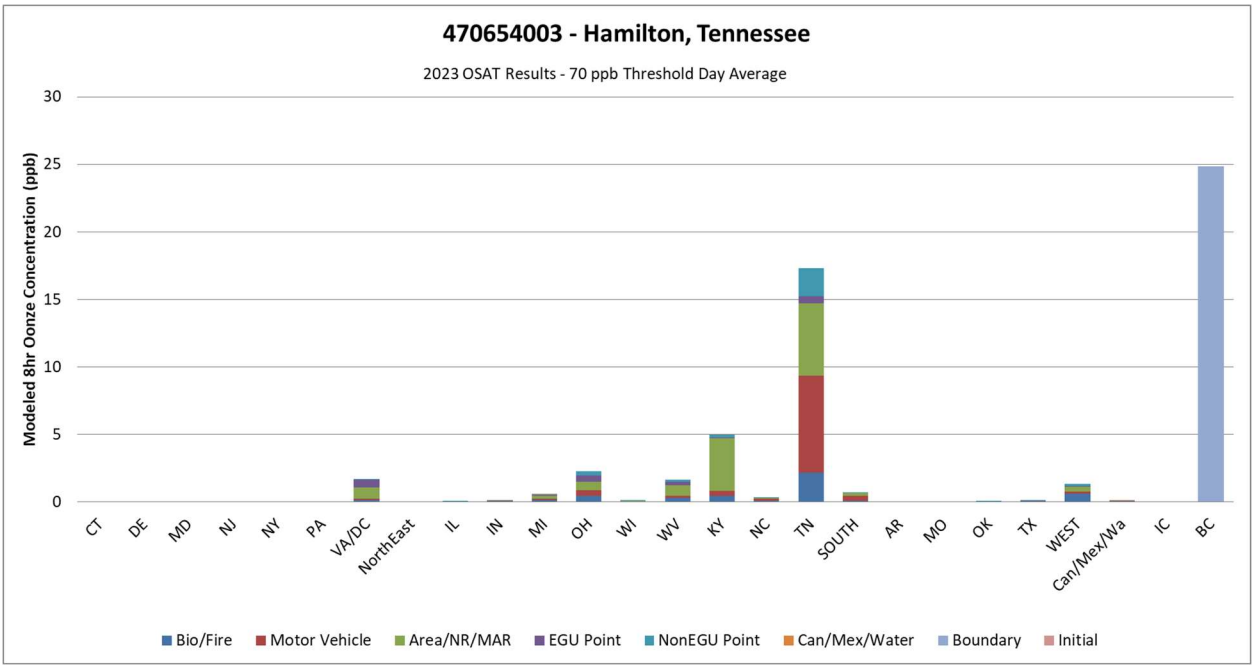


Figure 13. Relative contribution of ozone concentration (ppb) from source region and category combinations for Soddy Daisy monitor.

Furthermore, using these same source apportionment results and monthly, county, and source category specific emissions published by EPA, we developed relational "impact factors" (units of ppb/ton). We define this "impact factor" as representative of the relative contribution of modeled emissions (tons) to resultant ozone concentrations (in ppb), similar to TDEC's used SEMAP ozone sensitivity factor.

In Alpine's analysis, using updated emissions, projections, and models, we find that the relative impact of NOx emissions from mobile sources in Tennessee have factors significantly higher than most other regional-category combinations, leading us to conclude that motor vehicle and nonroad source emissions have the greatest impact on ozone concentrations in Middle Tennessee and Hamilton County at the monitors reviewed.

The following figures present the graphical results of our analysis for the monitors with representation by state and major source sector of the impact factor calculation for the 2023 projection simulation. In this case, the emissions from motor vehicle sources from Tennessee (red bar) or contributions from the nonroad mobile source sector (portion of green bar) are visibly greater in relative contribution impact than any other state or category.

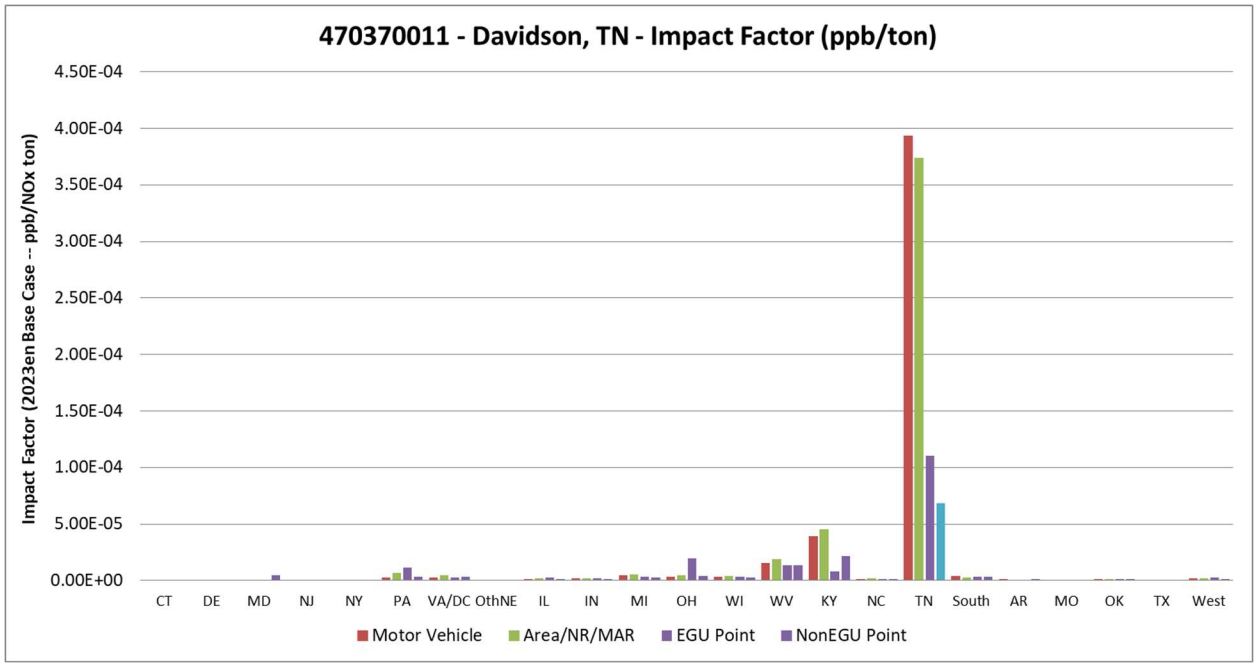


Figure 14. Impact factor calculation (ppb/ton) from source region and category combinations for East Health monitor.

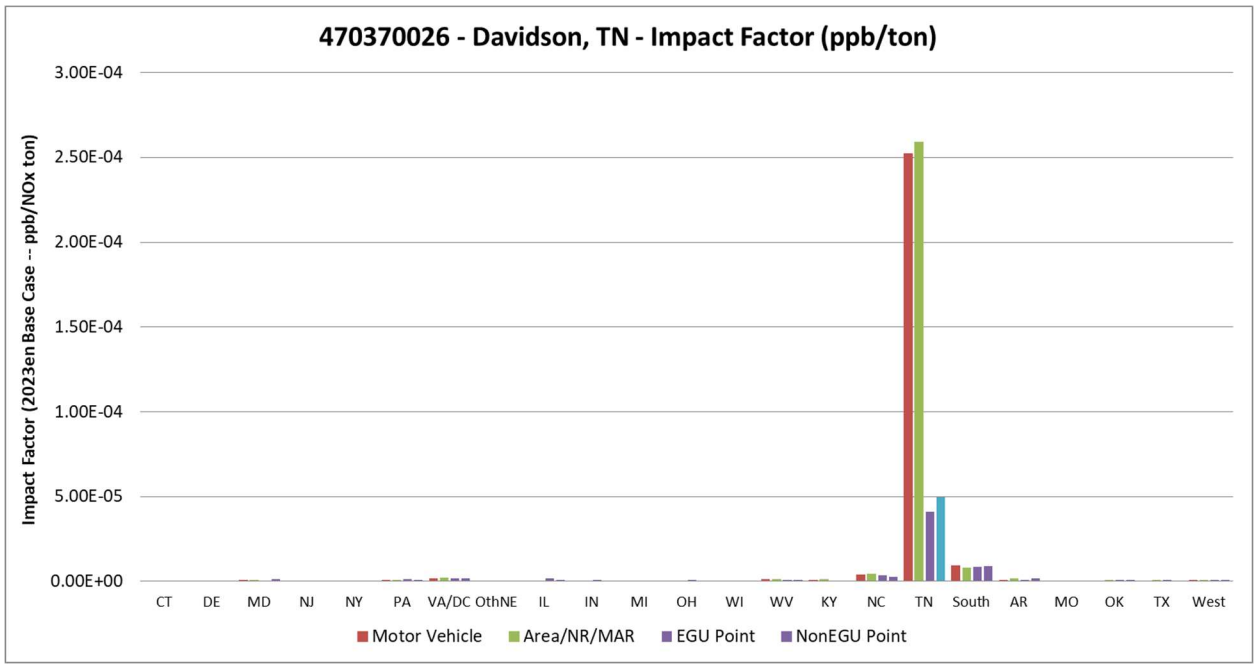


Figure 15. Impact factor calculation (ppb/ton) from source region and category combinations for Percy Priest Dam monitor.

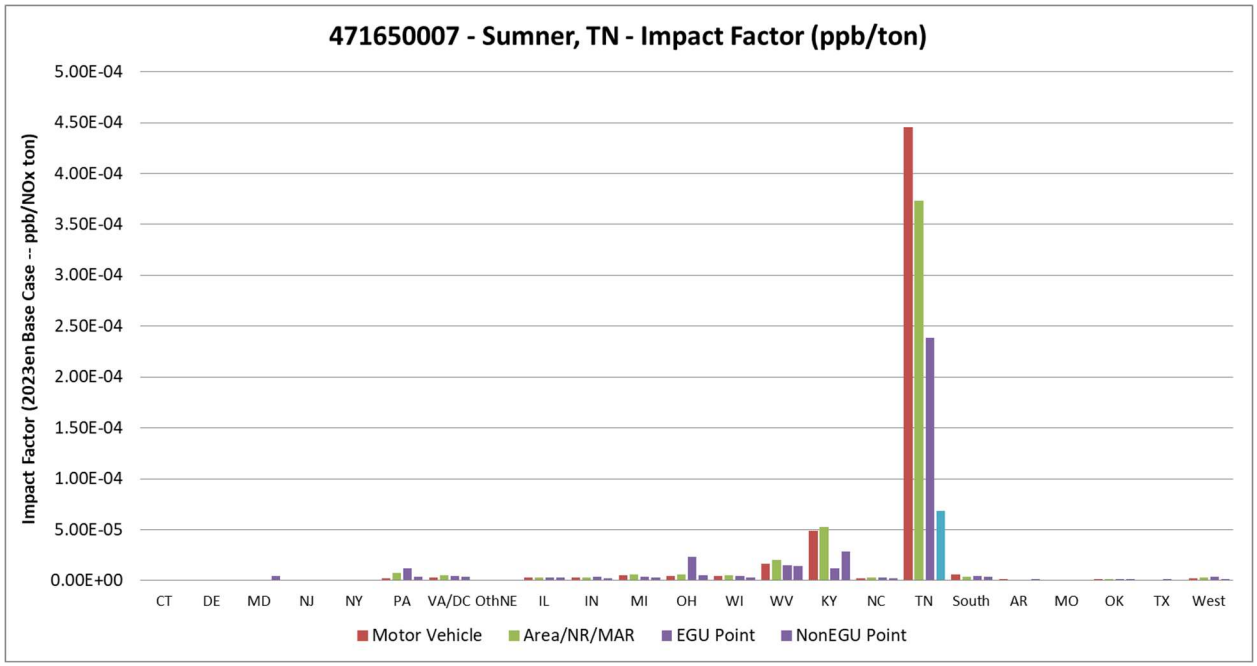


Figure 16. Impact factor calculation (ppb/ton) from source region and category combinations for Hendersonville Ozone Site at Old Hickory Dam.

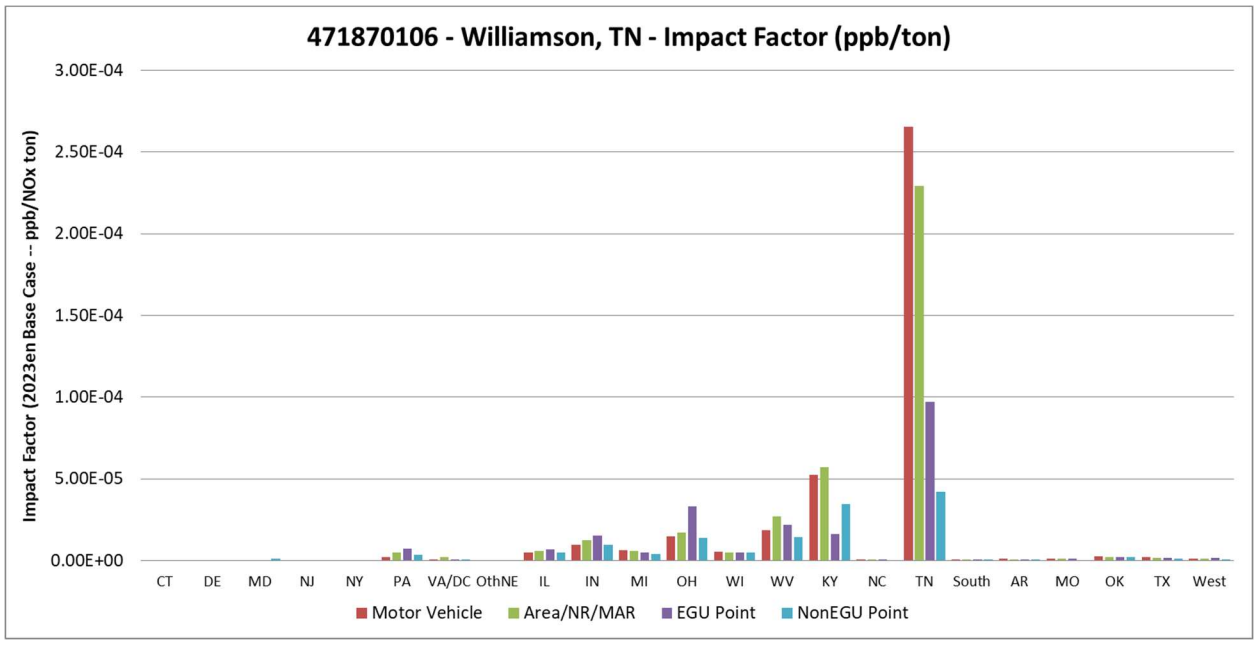


Figure 17. Impact factor calculation (ppb/ton) from source region and category combinations for Fairview Middle School monitor.

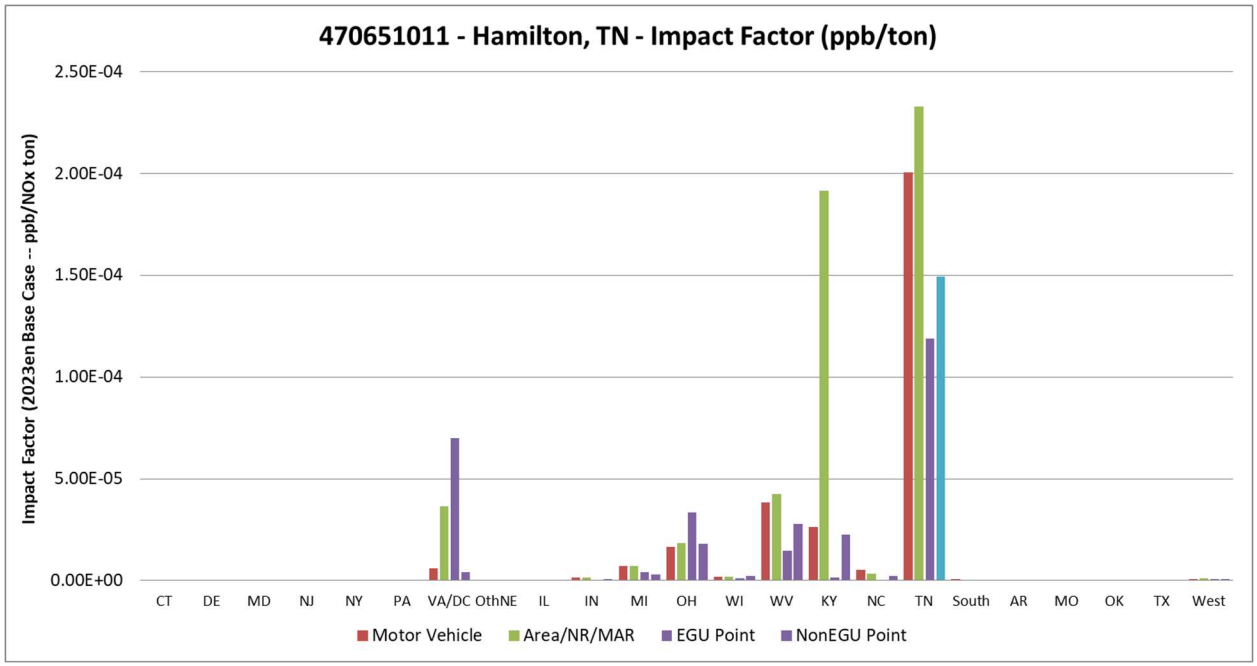


Figure 18. Impact factor calculation (ppb/ton) from source region and category combinations for Eastside monitor.

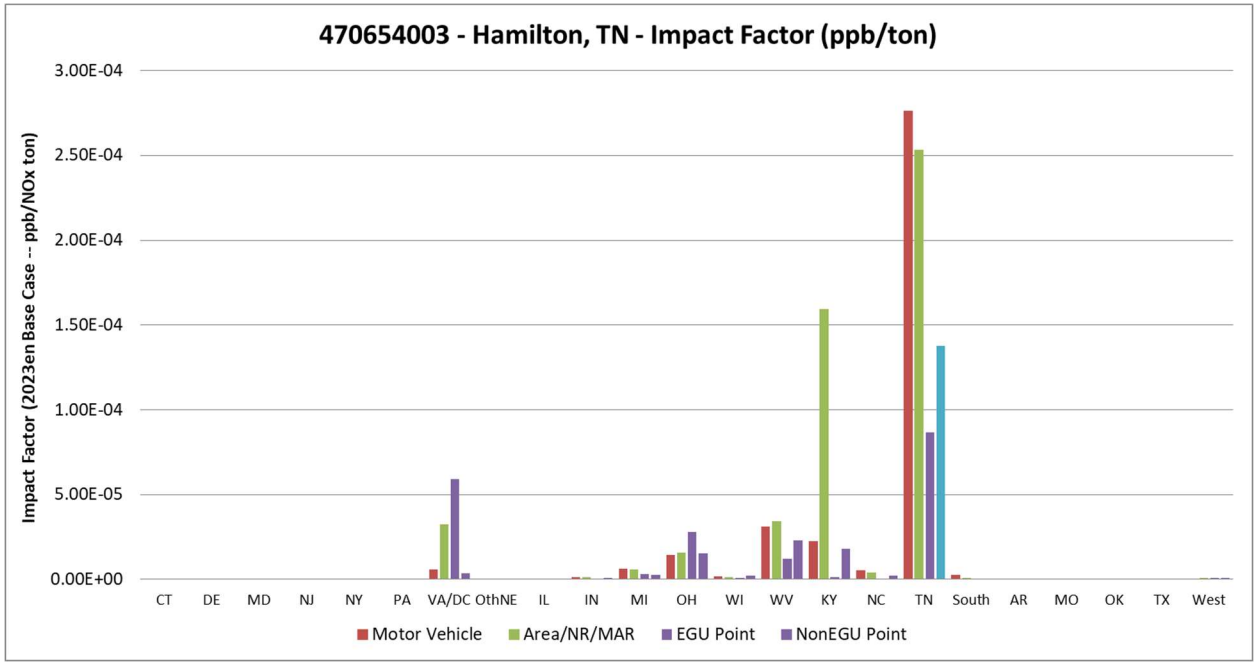


Figure 19. Impact factor calculation (ppb/ton) from source region and category combinations for Soddy Daisy monitor.

Using the results of these recent state and source category specific source contribution modeling analyses, I believe that the ozone sensitivity factors used by TDEC to estimate the impacts of the removal of the I/M programs in the Middle Tennessee area and Hamilton County are inapplicable to

current conditions based on TDEC's generic calculation and brute force application, and that actual air quality modeling is necessary to estimate the air quality impact of this action.

It is my recommendation that TDEC consider using alternate methods and air quality modeling to determine the air quality impact of removing the Middle Tennessee and Hamilton County's I/M programs. Absent the decision to run an air quality simulation, it is my recommendation that should TDEC consider using an "impact factor"-like application to determine the impact of the removal of the I/M programs in Middle Tennessee and Hamilton County, it should use county and motor vehicle specific factors with most current emission platforms to make this first step assessment.

8. EPA's CSAPR Modeling that Identifies Tennessee as not Being a Significant Contributor to Downwind Monitors is in Error Based on Modeling Code Associated with the Contribution Calculation

In the SNPR, EPA is "further proposing to conclude that the removal of the I/M program will not interfere with other states' ability to attain and maintain the 2008 ozone NAAQS under the good neighbor provision of the Clean Air Act (CAA or Act) and providing additional information related to that conclusion."[15] Under the Revised Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS[16], EPA used an air quality modeling-based technique to quantify the contributions in 2021 from upwind states to ozone concentrations at individual monitoring sites. States with contributions that equal or exceed 1 percent (0.75 ppb) of the NAAQS were identified as warranting further analysis for significant contribution to nonattainment or interference with maintenance. States with contributions below 1 percent of the NAAQS were considered to not significantly contribute to nonattainment or interfere with maintenance of the NAAQS in downwind states.

In December 2020, an error in the source apportionment model used by EPA in determining the significant contribution calculation was discovered. Contact with EPA has yielded information that the Agency does not know whether the specific *beta* version of the model used in their analysis contained the bug and associated source apportionment error. No known quantification of the error has been calculated and therefore it is unknown just how significant a change might be seen in the upwind state contribution to downwind receptors under the 2008 Ozone NAAQS or in potential application for future consideration of significant contribution under the 2015 Ozone NAAQS.

I recommend that EPA consider correcting the source apportionment results and significant contribution calculations with the corrected version of the air quality model before deciding that removal of the I/M programs in the Middle Tennessee area and Hamilton County will have no impact on downwind monitor nonattainment or maintenance issues.

[15] 86 FR 21248
[16] 86 FR 23054

9. Due to the Impact of COVID-19, 2020 Air Quality Observations May Not Be Representative of Future Years

The response to the COVID-19 pandemic has resulted in unprecedented reductions in economic activity. It is reported that after accounting for meteorological variations, lockdown events have reduced the population-weighted concentration of nitrogen dioxide (NO2) and particulate matter levels by about 60% and 31% across multiple countries, with mixed effects on ozone[17,18, 19]. Reductions in transportation sector emissions are largely responsible for the NO2 anomalies observed during this time.

The declines in emissions and improvements in air quality are sure to be only temporary. There is no doubt the pandemic-driven clearing of the air will be short-lived, with emissions sure to return to, if not surpass, their usual levels whenever businesses start up again and people get back to driving. To get healthier air for the longer term, it is exactly the wrong time to remove controls that are already in place, regardless how clean the air is currently. On the contrary, it is likely the time to be considering whether the controls in place prior to the pandemic should be maintained until a time is determined that we are on the right path to cleaner air. We do not need to contribute to increased levels of air pollution by removing programs like I/M in the Middle Tennessee area or in Hamilton County until we are sure it is appropriate.

It is my recommendation, that at a minimum, Tennessee should consider waiting until newer trends in air quality present themselves to determine whether the improvements seen in 2020 are just a blip in the trends or are what is to come. And if the improvements are short lived, removal of controls are not what Tennessee needs.

10. The American Lung Association's (ALA) Annual "State of the Air" Report Shows the Need for Additional Emission Reduction Programs, Not A Rollback of Existing Ones

The American Lung Association's (ALA) annual "State of the Air" report[20] shows a drop in unhealthy levels of ozone but also finds that levels of harmful fine particulate matter (PM2.5) are rising because of climate change-driven wildfires, with ALA saying the study shows a need for new federal policies to promote less-polluting energy sources. Considering these findings and recent trends in more acres burned and more extreme wildfire seasons and associated emissions, Tennessee should reconsider removing any on-the-book regulation when control and cleaner air is what is really needed to offset these events.

[17] https://www.nasa.gov/feature/goddard/2020/nasa-model-reveals-how-much-covid-related-pollution-levels-deviated-from-the-norm
[18] PNAS August 11, 2020 117 (32) 18984-18990
[19] https://cen.acs.org/environment/atmospheric-chemistry/COVID-19-lockdowns-had-strange-effects-on-air-pollution-across-the-globe/98/i37
[20] https://www.lung.org/research/sota/key-findings

11. EPA Is Rolling Back Other Regulations That Will Likely Increase Emissions

TDEC includes in its assumptions that existing non-mobile control programs will remain in force during the foreseeable future. As has been demonstrated by EPA, a significant number of federal air quality regulations have been "rolled back", removed from requirements, or are in the courts pending review and decision. Should these regulations be stricken from the list of required control programs, assumptions included that assume emission decreases and associated air quality improvements will be invalidated.

Multiple sources, including EPA itself, have summarized the dozens of air quality related regulatory programs that have been "rolled back", challenged in the courts, or are no longer being enforced in the past few years and that have demonstrated negative impact on air quality progress. These rules, whether related to motor vehicle and nonroad mobile sources (proposing weakening existing fuel economy standards, lifting summertime ban on ethanol-based fuel blends, etc.), electric generating utilities (Power Plant Startup, Shutdown, and Malfunction Rule; etc.), or other categories and emission sources that impact air quality in the Middle Tennessee area and Hamilton County have all been part of earlier improvements in ozone and PM concentration observations in the region.

However, now that these rules have been and continue to be eliminated, air quality in the region has shown deterioration and movement towards nonattainment of the various NAAQS. Removal of yet another regional rule like the I/M program will only work to worsen air quality for the population of Tennessee.

Based on research from Harvard Law School, Columbia Law School, and other sources, a list of thirty (30) recent environmental rollbacks initiated under the direction of the last administration were identified that could significantly increase greenhouse gas emissions and lead to thousands of extra deaths from poor air quality every year. From that list of thirty policy changes, seven could be considered to have an impact on the Tennessee airshed.

1. Eliminated Obama-era methane emissions standards for oil and gas facilities and narrowed standards limiting the release of other polluting chemicals known as "volatile organic compounds" to only certain facilities[21].

2. Revised a program designed to safeguard communities from increases in pollution from new power plants to make it easier for facilities to avoid emissions regulations[22].

3. Overturned Obama-era guidance meant to reduce emissions during power plant start-ups, shutdowns and malfunctions[23].

[21] https://www.nytimes.com/2020/08/13/climate/trump-methane.html
[22] https://eelp.law.harvard.edu/2018/12/new-source-review/
[23] https://www.law360.com/articles/1319518/epa-rolls-back-startup-shutdown-exemption-prohibition

4. Released new guidance that allows upwind states to contribute more ozone pollution to downwind states than during the Obama-era[24].

5. Repealed a requirement that state and regional authorities track tailpipe emissions from vehicles on federal highways[25].

6. Lifted a summertime ban on the use of E15, a gasoline blend made of 15 percent ethanol. (Burning gasoline with a higher concentration of ethanol in hot conditions increases smog.)[26]

7. Withdrew a proposed rule aimed at reducing pollutants, including air pollution, at sewage treatment plants[27].

It is my recommendation that TDEC collectively consider all programs that impact the airshed in either Middle Tennessee or Hamilton County when estimating what the incremental impacts of the removal of the I/M program would have on ozone concentrations. EPA has shown that air packets from as far away as California or New York can have impact on air quality in Tennessee[28]. As a result, any regulation that has an impact to increase emissions could have an impact on Middle Tennessee or Hamilton County air quality.

[24] https://eelp.law.harvard.edu/2020/01/clean-air-act-section-126-petitions/
[25] https://usa.streetsblog.org/2018/05/31/trump-admin-snuffs-out-climate-progress-at-u-s-dot/
[26] https://www.nytimes.com/2019/05/31/climate/trump-ethanol-fuel-ban.html
[27] https://www.govinfo.gov/content/pkg/FR-2017-10-26/pdf/2017-23067.pdf
[28] https://www.epa.gov/interstate-air-pollution-transport/what-interstate-air-pollution-transport

Summary of Recommendations

The Tennessee Department of Environment and Conservation, Air Pollution Control Division has requested that the United States Environmental Protection Agency remove the requirement for an Inspection and Maintenance program for both the Middle Tennessee area and Hamilton County from Tennessee's State Implementation Plans. To support this request, TDEC has conducted a demonstration designed to show that removing the I/M program from Tennessee's SIP will not interfere with attainment or maintenance of various air quality NAAQS.

Based on a technical review conducted of the request for removal and associated documentation, I have concluded that the Noninterference Demonstrations are inadequate to support the conclusion that removal of the I/M program from the SIP will not interfere with attainment of the NAAQS and that the supporting information in the SNPR do not significantly change this conclusion. In addition, I have made the following recommendations that are further detailed above.

- It is my recommendation that TDEC should regenerate its I/M removal analysis using the most current version of the mobile source emissions model, MOVES3, especially considering EPA's determination of higher NOx emissions in urban areas.
- It is my recommendation that the most current modeling platform and associated emission projections be used in this air quality simulation to update the I/M analysis conducted by TDEC to account for improvements in emission estimates.
- It is my recommendation that TDEC conduct this air quality modeling using a meteorological and associated base year inventory that meets the requirements of EPA guidance for the determination of impact of control strategies and air quality response.
- It is my recommendation that TDEC conduct a full air quality simulation of the impact of removal of the I/M program in the Middle Tennessee area and Hamilton County before making any determination of its interference effect.
- It is my recommendation that should TDEC still consider alternate methods to air quality modeling, that it use sensitivity factors based on source category distribution assumptions consistent with today's most current inventory-based category and emissions mix to estimate the impact of removing the Middle Tennessee area and Hamilton County's I/M program.
- It is my recommendation that EPA regenerate significant contribution calculations under the 2008 Ozone NAAQS "good neighbor provision" to ensure erroneous versions of the air quality modeling code were not misidentifying significant impact of Tennessee's emissions on downwind nonattainment or interfering with maintenance at downwind monitors.
- It is my recommendation that TDEC consider waiting for post-COVID ozone observations and trends to demonstrate that 2020 was an anomalous dip in measurements and that removal of the I/M programs will not have additional, significant impact on Tennessee's ability to attain the NAAQS.
- It is my recommendation that TDEC consider the collective impact of additional regulations currently rolled back or in courts pending rollback decisions, before removing the I/M programs from the Middle Tennessee area and Hamilton County.