

CMAQ PROGRAM PERFORMANCE

- **DRAFT**

Performance-Based Planning and Programming

June 2022

Pictures on cover to be included in final version

CMAQ PROGRAM PERFORMANCE REPORT

June 3, 2022

ABOUT TPB

The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 24 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

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CMAQ PROGRAM PERFORMANCE

This report summarizes the federal requirements for the National Capital Region Transportation Planning Board (TPB), the Metropolitan Planning Organization (MPO) for the metropolitan Washington region, in the establishment of performance measure targets associated with the Congestion Mitigation and Air Quality (CMAQ) Program. This includes unified urbanized area targets for the performance measures of Peak Hour Excessive Delay (PHED) and Mode Share in the area of traffic congestion, and a quantifiable target for Emissions Reduction for applicable pollutants and precursors for the nonattainment/ maintenance areas within the TPB planning area boundary. The targets described in this report meet the joint planning regulations issued by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) and the performance-based planning and programming (PBPP) requirements.

The targets developed and adopted by the TPB are consistent with the target setting approaches of Maryland, Virginia, and the District of Columbia. These 2022 targets were approved by the National Capital Region Transportation Planning Board (TPB) at its regular meeting on June 15, 2022.

Overview of Performance-Based Planning and Programming Requirements

Under MAP-21 and reinforced in the FAST Act, federal surface transportation regulations require the implementation of performance management requirements through which States and MPOs will “transition to a performance-driven, outcome-based program that provides for a greater level of transparency and accountability, improved project decision-making, and more efficient investment of federal transportation funds.”

FHWA and FTA issued a set of rulemakings for the implementation of this process. Each rulemaking lays out the goals of performance for an area of transportation, establishes the measures for evaluating performance, specifies the data to be used to calculate the measures, and then sets requirements for the setting of targets.

Under the PBPP process, State Departments of Transportation (DOTs), MPOs, and providers of public transportation must link investment priorities to the achievement of performance targets in the following areas:

- Highway Safety;
- Highway Assets: Pavement and Bridge Condition;
- System Performance (Interstate and National Highway System, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program);
- Transit Safety; and
- Transit Asset Management.

The final Statewide and Metropolitan Planning Rule, published May 27, 2016, provides direction and guidance on requirements for implementation of PBPP, including specified measures and data sources, forecasting performance, target-setting, documentation in the statewide and metropolitan long-range transportation plans and Transportation Improvement Programs (TIPs), and reporting requirements. The PBPP process requires coordination and agreement on specific responsibilities for each organization in accordance with the planning rule.

MPO CMAQ PERFORMANCE PLANS

Per statute 23 USC 134 (h)(2) MPOs serving a large Transportation Management Area (TMA) must develop a MPO CMAQ Performance Plan. In the CMAQ Performance Plan and its biennial updates, these MPOs report 2 and 4-year targets, describe how they plan to meet their targets, and detail their progress toward achieving the targets over the course of the performance period.

TPB submitted its Baseline MPO CMAQ Performance Plan for 2018-2021 in September 2018, followed by a Mid-Period Plan in September 2020. For September 2022, a Final Period Plan for 2018-2021 must be submitted, as well as a Baseline Period Plan for 2022-2025. The Plans will be drafted, reviewed with State DOT staff, and submitted by each of the three State DOTs with their overall PBPP reports due to FHWA/FTA by October 1, 2022.

Overview of CMAQ Program Performance Measures

FHWA published the System Performance: Highway and Freight, Congestion Mitigation and Air Quality (CMAQ) Final Rule on January 18, 2017, with an effective date of May 20, 2017. The State Departments of Transportation (DOTs) then had one year until May 20, 2018 to set their initial targets. The rule requires States to set targets for four performance measures concerning Highway and Freight: 1) Interstate Travel Time Reliability (TTR), 2) National Highway System (NHS) TTR, 3) Greenhouse Gas Emissions, and 4) Freight Reliability. In addition, FHWA requires States to set three performance measures concerning CMAQ: 1) Peak Hour Excessive Delay (PHED), 2) Mode Share, and 3) Emissions Reduction.

This report covers the CMAQ Program: Traffic Congestion performance measures of PHED and Mode Share, and the CMAQ Program: Emissions Reductions performance measure. It provides an overview of the measures, data acquisition, and methodology used for developing targets for these performance measures. Additionally, information concerning the CMAQ Program in general is presented, as well as details concerning CMAQ project selection and programming by Virginia, Maryland, and the District of Columbia.

Table 1: Summary of CMAQ Program: Traffic Congestion and Emissions Reductions Measures

| | Performance Measure |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| CMAQ Program: Traffic Congestion | Peak Hour Excessive Delay (PHED)– Annual hours of peak hour excessive delay per capita |
| | Mode Share – Percent of Non-SOV Travel on the NHS |
| CMAQ Program: Emissions Reduction | Emissions Reductions– CMAQ-funded projects on-road mobile source total emissions reduction for each applicable criteria pollutant and precursor |

TARGET SETTING AND COORDINATION

For the three CMAQ Program targets, State DOTs, in coordination with MPOs, must collectively establish a single, unified two-year and four-year target for each applicable measure. For the first four-year performance period (2018-2021) State DOTs had to set targets by May 20, 2018 and report targets to FHWA by October 1, 2018. For the second four-year period (2022-2025), targets must be set and reported by October 1, 2022.

MPOs have up to 180 days following State DOT adoption to set targets. However, in addition to the responsibility of MPOs to set targets, MPOs that have a population of over 1 million people within a nonattainment or maintenance area must prepare a CMAQ Performance Plan. The MPOs are required to prepare the CMAQ Performance Plans for inclusion with the Biennial Performance Reports submitted by State DOTs by October 1. Accordingly, TPB is adopting the 2022-2025 CMAQ Program targets in June 2022 to enable synchronization with the State DOTs agreeing to these targets and the information being included in the CMAQ Performance Plans.

With the mid-performance period progress report due by October 1, 2024 for the 2022-2025 performance period, progress against two-year targets will be reported and four-year targets may be adjusted. The CMAQ Performance Plan provides information on projects associated with the reduction of emissions and traffic congestion, as well as target and methodology information for the performance measures of PHED, Mode Share, and Emissions Reduction

PHED and Mode Share

Applicable State DOTs and MPOs must collectively establish a single, unified two-year and four-year target for each applicable urbanized area.

Emissions Reduction

State DOTs, with coordination from the MPO, must establish statewide two and four-year targets for total emissions reduction of on-road mobile source emissions for all nonattainment and maintenance areas within the state boundary, for applicable criteria pollutants and precursors. MPOs, with coordination from the State DOTs, must establish two and four-year targets for all nonattainment and maintenance areas within the metropolitan planning area. In both cases, the targets shall reflect the anticipated cumulative emissions reductions to be reported in the CMAQ Public Access System (PAS).

MPO Coordination with State DOTs

MPOs are required to establish their performance targets in coordination with their State partners. TPB staff have worked closely with the Virginia Department of Transportation (VDOT), the Maryland Department of Transportation (MDOT), and the District Department of Transportation (DDOT) in the development of these performance targets.

CMAQ Program: Traffic Congestion - PHED and Mode Share Performance Measures

PHED

PHED is based on the calculation of all segments of the National Highway System. PHED is defined as the extra amount of time spent in congested conditions defined by speed thresholds that are lower than a normal delay threshold. For this measure, the speed threshold is 20 mph or 60% of the posted speed limit, or whichever is greater. The FHWA requires that the data collected must occur during the weekdays (Monday through Friday), with a required morning peak timeframe of 6:00AM – 10:00AM, and a choice between two evening peak timeframes: 3:00PM – 7:00PM or 4:00PM – 8:00PM. TPB staff have used the earlier PM peak (3:00PM – 7:00PM) for all calculations; the same PM peak is also being used by the three State DOTs.

Data for all peak periods was collected for the region from the National Performance Management Research Data Set (NPMRDS), using a widget created by the Regional Integrated Transportation Information System (RITIS). RITIS is an automated data sharing, dissemination, and archiving system that includes many performance measure, dashboard, and visual analytics tools that help agencies to gain situational awareness, measure performance, and communicate. It is managed by the University of Maryland Center for Advanced Transportation Technology Laboratory (CATT Lab). The RITIS widget is designed to assist with performance measurement target creation using NPMRDS data.

PHED Forecasting and Target Setting

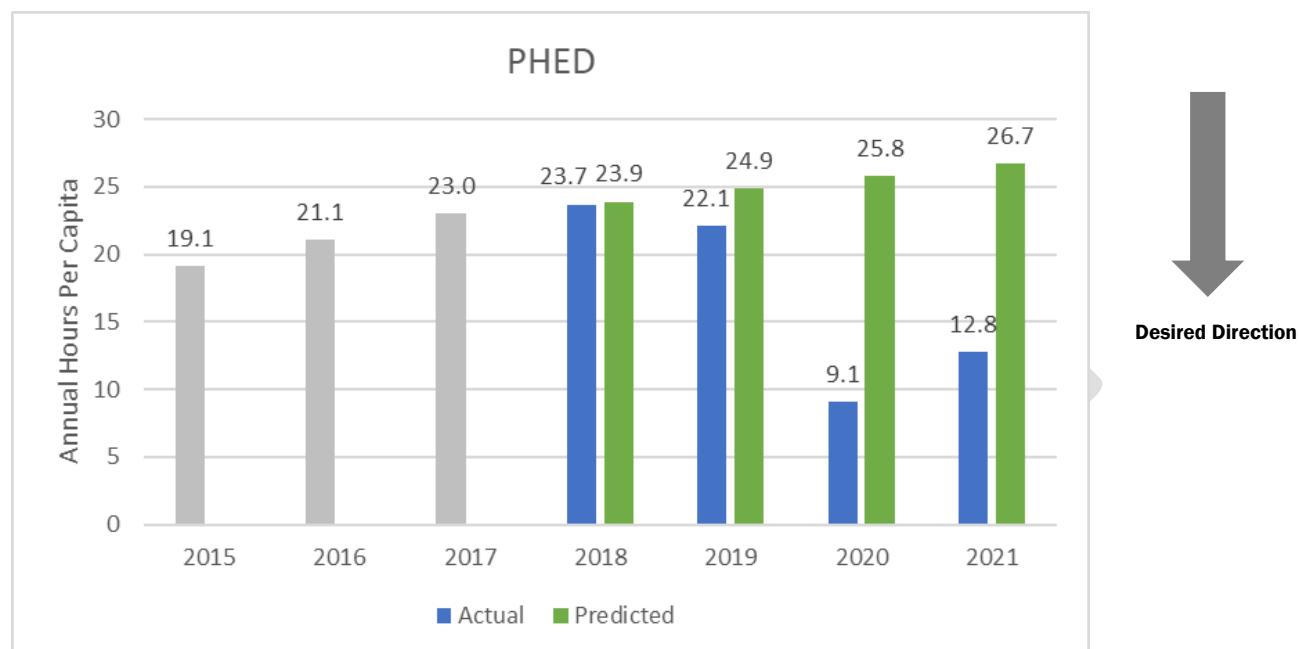
In 2018, TPB staff considered a number of methodologies for forecasting performance and setting targets. The choice was to average two approaches: the extrapolation of measured performance and the use of travel demand model data.

- Extrapolation of Measured Performance
 - For this approach, measured data for the recent years is extrapolated, via linear regression, for the next four years. This approach uses a best fit line to project performance.
 - The extrapolation method captures trends over time but depends upon consistent data.
- Travel Demand Model
 - The TPB uses a detailed travel demand model to meet air quality conformity requirements by modelling travel and emissions twenty or more years into the future as required for the region's long-range metropolitan transportation plan. As part of this process, results are generated for various modelled years, including current and near-term years. For the purposes of the CMAQ Traffic Congestion measures, forecasting uses an indicator output, the AM Peak Hour VMT estimate, to project change in congestion and applies the percentage change to measured performance.
 - Use of the travel demand model takes into account near-term predicted changes in population, employment and other factors that affect travel demand, as well as changes in the highway and transit network.

PHED Performance vs Targets

The forecasting of performance for the 2018-2021 period can now be compared with actual performance for that period. Figure 1 shows the predicted performance and the actual performance as obtained from the NPMRDS dataset. Performance was better than predicted in 2018 and 2019. The impact of the coronavirus pandemic that began in March 2020 is then evident. The four-year target was easily met.

Figure 1: PHED: Performance vs. Targets



Data previous to the four-year target period are shown in gray-colored bars. Actual performance data are shown in blue bars, with predictions from 2018 shown in green.

MODE SHARE

Mode Share is a calculation of the percent of Non-Single Occupant Vehicle (SOV) travel within the urbanized area. Non-SOV travel, defined by FHWA, applies to travel occurring on modes other than driving alone in a motorized vehicle and includes travel that is avoided by telecommuting. It is a measure of the percentage of all surface transportation occurring in the urbanized area. An urbanized area is defined as having a population of at least 1 million people in a nonattainment/maintenance area for any of the criteria pollutants under the CMAQ program. For the TPB region, this includes the Washington DC-MD-VA urbanized area (UZA).

The FHWA has provided three data collection models as a means of estimating the required performance targets. Model A allows use of the ACS data found in the table titled "Journey to Work." Model B allows for data collected from localized surveys. Model C involves estimating the percent of non-SOV based on volume measurements of actual use for each mode of transportation, including telework. In coordination with the State DOTs, the TPB chose to use Model A.

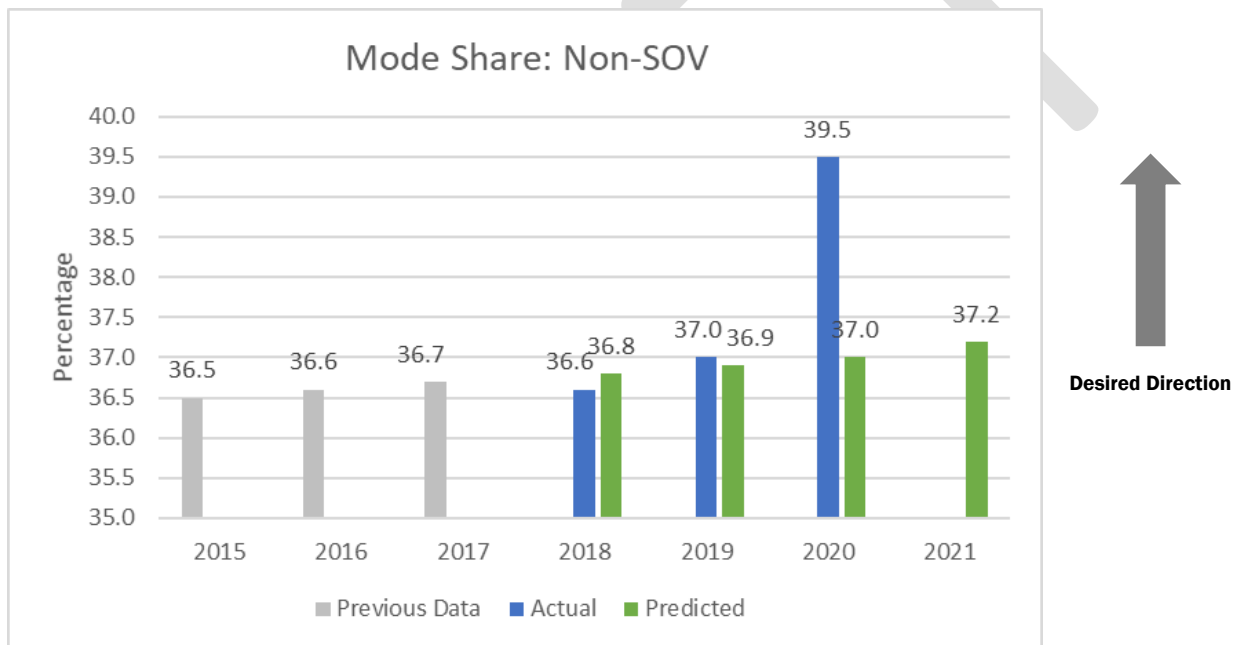
For Model A, explicit guidelines are provided on how to utilize the ACS data. Data is to be obtained from the "Journey to Work" dataset, labeled *DPO3*. These data sets contain the five-year estimates of

the economic characteristics of those surveyed. Within this dataset is a breakdown on how people commute to work, either by driving alone (SOV) or car-pooling, public transportation, walking, other means, or working at home, all collectively added to produce the Non-SOV percentage.

The TPB is responsible for setting both two-year and four-year unified targets with VDOT, MDOT, and DDOT. In determining the unified targets for both two and four years there is no formula or calculation specified. The FHWA only requires estimations for target projections. Accordingly, there are several methodologies that can be used by the TPB to develop targets. The approach selected was a straight-line projection and use of data from the travel demand model.

The data in Figure 2 was created from the “Journey to Work” DP03 dataset. Until the 2016-2020 dataset, there had not been significant change in the rate of SOV or Non-SOV travel within the Washington UZA. The impact of the pandemic on travel in 2020 is the most likely factor in the observed change below. It will not be until early 2023 when the 2021 five-year dataset is published that it will be known how actual performance compares to the target established in 2018.

Figure 2: Mode Share: Performance vs. Targets



Data previous to the four-year target period are shown in gray-colored bars. Actual performance data are shown in blue bars, with predictions from 2018 shown in green.

Development of the 2022-2025 CMAQ: Traffic Congestion Targets

For forecasting for the new four-year performance period, TPB staff decided to use methodologies similar to that for the previous performance period. The PHED measure was forecast using the average of the trendline and an indicator output from the near-term years of the Travel Demand Model for both two-year and four-year targets. The Mode Share (Non-SOV) target was forecast using only the trendline. The developed targets are presented in Table 2.

Table 2: 2022-2025 CMAQ Program Regional Targets: Mode Share and PHED

CMAQ Program: Traffic Congestion

| Performance Measure for the Washington DC-MD-VA Urbanized Area | 2-year Target 2022 - 2023 | 4-year Target 2022 - 2025 |
|------------------------------------------------------------------------------------------------|---------------------------|---------------------------|
| Peak Hour Excessive Delay (PHED) – Annual hours of peak hour excessive delay per capita | 22.5 Hours | 22.7 Hours |
| Mode Share - Percent of Non-SOV Travel on the National Highway System (NHS) | 37.4% | 37.7% |

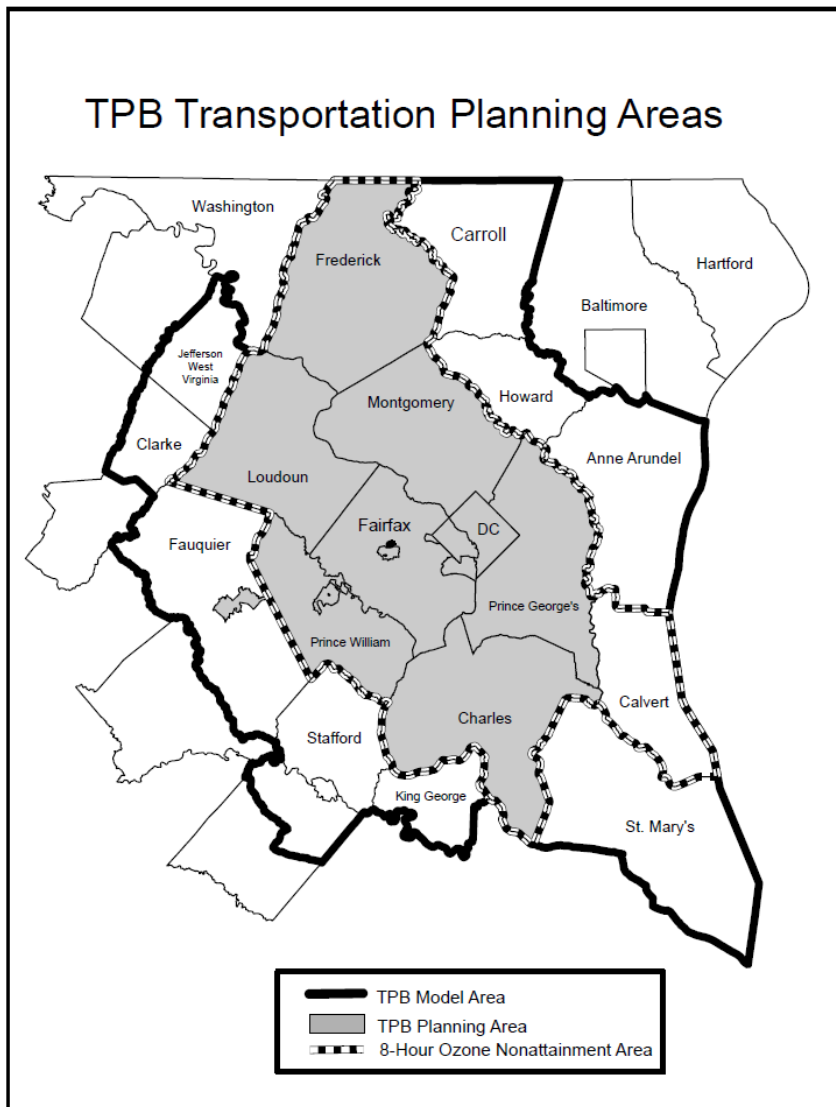
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CMAQ Program: Emissions Reduction

Emissions reduction is defined as the total on-road mobile source emissions reductions for each applicable criteria pollutant and precursor for a nonattainment area. For the nonattainment area in the TPB region, the applicable criteria pollutants are Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NOx). This performance measure applies to projects that receive or are programmed for CMAQ funding. Data was collected from the CMAQ Public Access System (PAS), as specified in the federal rulemaking.

It should be noted that the regional nonattainment area includes Calvert County, Maryland; however, this county is not part of the TPB planning area. MDOT and Calvert County conduct a separate performance measure process for emissions reduction for that part of the nonattainment area.

Figure 3: Map of TPB Planning Area and Regional Nonattainment Area



FEDERAL REQUIREMENTS FOR CMAQ PROJECT FUNDING

The CMAQ Program supports two important goals of the U.S. Department of Transportation: improving air quality and relieving congestion. While these goals are not new elements of the program, they were strengthened in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and further bolstered in provisions added to MAP-21. Highway congestion continues to rise at a faster rate than transportation investments. Reducing congestion is a key objective of federal surface transportation policy, and one that has gathered increasing importance over time. The costs of congestion can be an obstacle to economic activity. In addition, congestion can hamper quality of life through diminished air quality, lost personal time, and other negative factors. Accordingly, the CMAQ Program includes federal funds programmatically allocated to each state for funding applicable projects.

A CMAQ project must meet three basic criteria: it must be a transportation project, it must generate an emissions reduction, and it must be in or benefit a nonattainment or maintenance area. Additionally, as with all Federal-aid projects, CMAQ projects must be included in the MPO's current metropolitan transportation plan and TIP (or the current Statewide TIP in areas without an MPO). In nonattainment and maintenance areas, the project also must meet the conformity provisions contained in section 176(c) of the CAA and the transportation conformity regulations. Lastly, all CMAQ-funded projects need to complete National Environmental Policy Act (42 U.S.C. 4321 et seq.) (NEPA) requirements and satisfy the basic eligibility requirements under titles 23 and 49 of the United States Code.

DDOT, MDOT, and VDOT each receive CMAQ funding and allocate it annually to fund applicable projects. Each state follows its own selection process for identifying and funding CMAQ projects are selected on various criteria, only one of which is estimated emissions reduction benefits. Projects are not required to have quantifiable emissions reduction benefits; a qualitative assessment is sufficient. All projects awarded annually must be entered into the CMAQ PAS. Data for the CMAQ Emissions Reduction performance measure for the region is taken from the quantified benefits included in the projects listed in the PAS that have been funded in the region.

Adopted targets reflect the anticipated cumulative emissions reduction to be reported in the CMAQ PAS for new projects over the next four years.

MARYLAND CMAQ PROJECT PROGRAMMING

The Maryland Consolidated Transportation Program (CTP) is a six-year capital budget for transportation projects, where CMAQ programming is determined during the one-year development process. CMAQ projects selected for programming are done so based on criteria provided by the CTP. Projects should: meet all federal and legal requirements; support departmental program priorities; meet all federal match requirements to maximize federal revenue; support State plans and objectives; support existing project commitments and uphold intergovernmental agreements; and support alternative modes of transportation (transit, bike, pedestrian). Projects selected for programming must also be consistent with local plans and be included in the regional MPO long-range plan.

A majority of the CMAQ funding in Maryland is used for transit projects (bus replacements, MARC, and light rail), which historically have been focused on the Baltimore region. CMAQ monies have also funded some signal synchronization projects and part of the CHART program; one of the signal projects was responsible for approximately eighty percent of the emission reductions calculated for the 2018-2021 performance period.

The Maryland CMAQ projects are programmed through MDOT's Maryland Transit Administration (MTA) and State Highway Administration (SHA). The target setting methodology FFY 2022 through 2025 utilized a combined approach of historic project selection and anticipated CMAQ projects programmed over the next four years.

- i. MDOT MTA programming in FFY 2022 through 2025 includes:
 - Battery Electric Buses (BEBs) will be added to the transit bus fleet.
 - Charging infrastructure will be constructed in support of a transition to a BEB fleet.
 - Construction of the Purple Line Capital Crescent Trail (3.3-mile trail length).
 - LOTS Ridesharing Program. Benefits are quantified once during the performance period and assigned to the Baltimore region.
 - LOTS Guaranteed Ride Home Program. Benefits are quantified once during the performance period and reported for the Baltimore and Washington regions separately.
- ii. MDOT SHA CMAQ projects in FFY 2022 through 2025 include sidewalk improvements and pedestrian facilities in Cecil, Frederick, Prince George's and Montgomery counties, Smart Signal projects, park and ride facility improvements, and congestion mitigation measures.
- iii. Continued funding will be assigned to projects for which emissions were quantified in prior years. These include: transit bus procurement under multi-year contracting arrangements and replacement of Metro fleet and train control equipment

MDOT primarily uses three analysis tools for estimating emissions benefits of CMAQ projects: 1) The Maryland Air Quality Off-Network Estimator (MAQONE), a Maryland specific tool for analyzing off-network projects that uses Maryland Motor Vehicle Emissions Simulator (MOVES) emission rates and is populated with county-level defaults; 2) the FHWA Emissions Calculator Toolkit, which supports a number of project types developed by FHWA to analyze CMAQ projects; and 3) TRIMMS (Trip Reduction Impacts of Mobility Management Strategies), which estimates the impacts of a broad range of transportation demand initiatives.

The 2022-2025 targets were developed using historic emissions reductions in the FFYs 2018-2021 and 2014-2017 performance periods. The targets were adjusted to omit outlier projects that will not be replicated and accounted for programs where utilization is depressed due to altered commute patterns and COVID rebound. Forecasts are adjusted to represent light-duty vehicle average emission rates which decline over time due to the federal vehicle and fuel standards, along with vehicle fleet turnover.

VIRGINIA CMAQ PROJECT PROGRAMMING

Within the region, the Northern Virginia Transportation Alliance (NVTA) coordinates Northern Virginia's annual programming of federal CMAQ projects as well as Regional Surface Transportation (RST) funds. The recommendation for programming is done through the Regional Jurisdiction and Agency Coordinating Committee (RJACC). Final approval is given by the Commonwealth Transportation Board (CTB). VDOT provides local matches for approved CMAQ projects, but only if the project utilizes the funds within an established timeline. Recipients have 24 months to obligate the funds and then 48 months to expend the funds. CMAQ projects are eligible for potential funding after an application submission, a Transportation Emissions Estimation Models (TEEM) worksheet submittal for air quality benefit calculation, and a resolution of support from the respective governing bodies.

DISTRICT OF COLUMBIA CMAQ PROJECT PROGRAMMING

The District of Columbia programs CMAQ projects annually. A majority of the CMAQ funding in the District has historically been used for bike lanes and Travel Demand Management (TDM) projects.

TPB METHODOLOGY FOR TARGET SETTING

TPB staff conducted several coordination calls with the State DOTs, proposing and reviewing multiple target setting methodologies. The State DOTs then each selected their preferred method, as described above, and reported their targets to the TPB. The TPB staff summed the emissions reduction benefits forecast by each DOT to create the two-year and four-year targets for the TPB's nonattainment area.

CMAQ Emissions Reductions Performance vs. Targets

It is important to note that in contrast to all other performance measures and targets, the emissions reductions targets are measured by federal fiscal year (October 1 – September 30) to align with the data in the CMAQ PAS and that emissions reductions performance is measured additively, with two-year performance summing all emissions reductions achieved across two years and four-year performance summing all emissions reductions achieved across the full four years of the performance period. The same applies for targets, which forecast all predicted emissions reductions expected to be achieved across the two-year and four-year periods respectively.

Figures 4 and 5 include the data submitted in the CMAQ PAS by the three State DOTs as of the time of this report for VOCs and NOx emissions reduced. CMAQ emissions reductions are cumulative. The projects submitted into the CMAQ PAS for the past three years have quantitative estimates that considerably exceed the two-year and four-year targets set in 2018.

Figure 4: 2018-2021 CMAQ Emissions Reduction Performance for VOCs

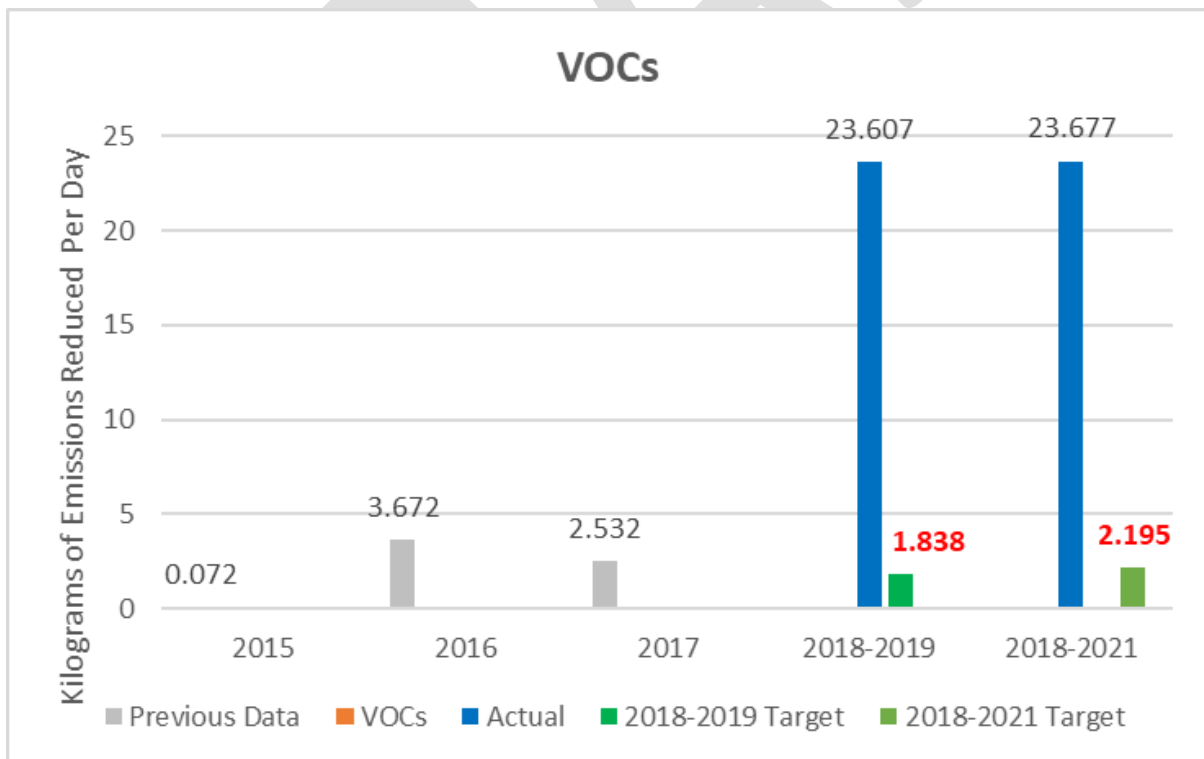
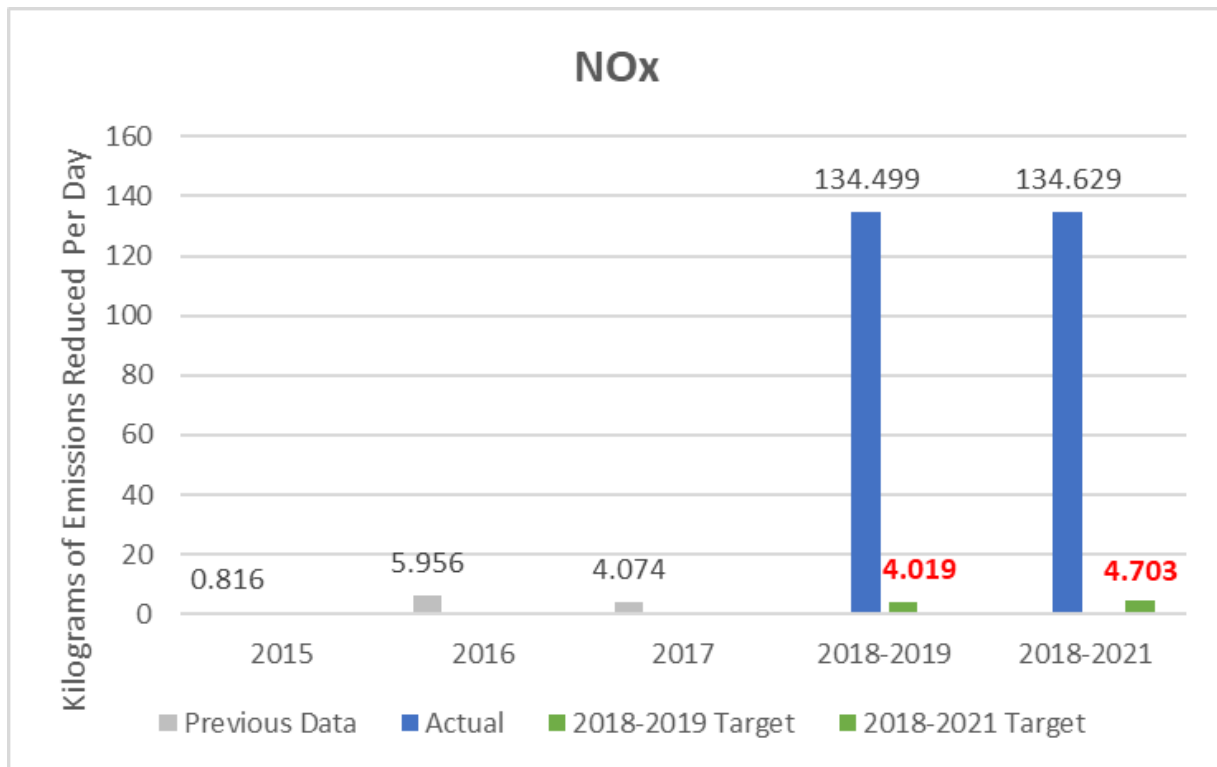


Figure 5: 2018-2021 CMAQ Emissions Reduction Performance for NOx



DEVELOPMENT OF THE 2022-2025 CMAQ: EMISSIONS REDUCTIONS TARGETS

For forecasting for the new four-year performance period, TPB staff used a methodology consistent with that for the previous performance period, working with the State DOTs to collect their predicted emissions from programmed or likely CMAQ funded projects. The developed regional targets for VOC and NOx are presented in Table 3.

Table 3: 2022-2025 CMAQ Program Regional Targets: On-Road Mobile Emissions Reductions

| Total Emissions Reductions for the TPB portion of the Washington DC-MD-VA nonattainment area | 2-year Target FFY 2022 - 2023 | 4-year Target FFY 2022 - 2025 |
|----------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|
| Volatile Organic Compounds (VOCs) | 0.610 Kg/Day | 9.408 Kg/Day |
| Nitrogen Oxides (NOx) | 2.830 Kg/Day | 21.117 Kg/Day |

APPENDIX

The CMAQ Performance Plan must include a description of the projects identified for CMAQ funding and how these particular projects will aid in the achievement of the set targets concerning traffic congestion and emissions reduction. On the following pages, Table A-1, illustrates the CMAQ projects projected to be completed within the next four years. With the completion of these listed projects, all provided by the state DOTs, the established targets will be achieved. Table A-1 provides a description of the project, the anticipated year of CMAQ obligation, the benefits by pollutant and precursors, as well as the traffic congestion benefits. Those cells within Table A-1 that are blank represent information that is not available.

For the 2022-2025 period, only VDOT provided a CMAQ project list.

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Table A-1: Description of CMAQ Projects

| DOT | Project Title | Year Anticipated for CMAQ Obligation | NOx Benefit (kg/day) | VOC Benefit (kg/day) |
|------|---------------------------------------------------------------------------|--------------------------------------|----------------------|----------------------|
| VDOT | VRE WOODBRIDGE PLATFORM IMPROVEMENTS - New Continuation | 2022 | 0.046 | 0.007 |
| VDOT | VRE MANASSAS PARK STATION SECOND PLATFORM - New Project | 2022 | 0.541 | 0.086 |
| VDOT | PRINCE WILLIAM PARKWAY SIDEWALK - New Project | 2023 | 0.025 | 0.029 |
| VDOT | HERNDON METRORAIL INTERMODAL ACCESS IMPROVEMENTS PH II - New Project | 2023 | 0.000 | 0.201 |
| VDOT | JOHN MARSHALL HIGHWAY(RTE. 55) SIDEWALK - New Project | 2024 | 0.055 | 0.030 |
| VDOT | WEST END TRANSITWAY OPERATIONS - New Project | 2024 | 1.948 | 2.080 |
| VDOT | MANASSAS TRAFFIC SIGNAL OPTIMIZATION & S/WARE EQUIP UPGRADE - New Project | 2025 | 2.296 | 0.580 |