

Congestion Mitigation and Air Quality (CMAQ) Mid Performance Period Progress Report (2018-2019)



Lancaster County Metropolitan Planning Organization (MPO)
Lancaster County, Pennsylvania

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INTRODUCTION

Regulatory Requirements

The Federal Highway Administration (FHWA) final rule for the *National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program* was published in the Federal Register (82 FR 5970) on January 18, 2017 and became effective on May 20, 2017. This final rule (referred to as the PM-3 regulation) is the third in a series of three related rulemakings that together establishes a set of performance measures for State Departments of Transportation (State DOTs) and Metropolitan Planning Organizations (MPOs) to use as required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America’s Surface Transportation (FAST) Act.

For the purpose of carrying out the Congestion Mitigation and Air Quality Improvement (CMAQ) Program, USDOT has established performance measures to assess traffic congestion and on-road mobile source emissions. The congestion measures only apply to the National Highway System (NHS) mileage in urbanized areas with a population over one million for the first performance period (2018-2021) and a population of 200,000 for the second and all other subsequent performance periods. Table 1 lists the CMAQ performance measures associated with the PM-3 regulation.

Table 1: Performance Measures for the CMAQ Program

Subpart and Measure	Measure Description
Subpart G: Traffic Congestion	PHED Measure: Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita
	Percent of Non-SOV Travel Measure: Percent of Non-Single Occupancy Vehicle (SOV) Travel
Subpart H: On-Road Mobile Source Emissions	Total Emissions Reduction Measure: two- and four-year Total Emission Reductions for each applicable criteria pollutant and precursor for all projects funded with CMAQ funds

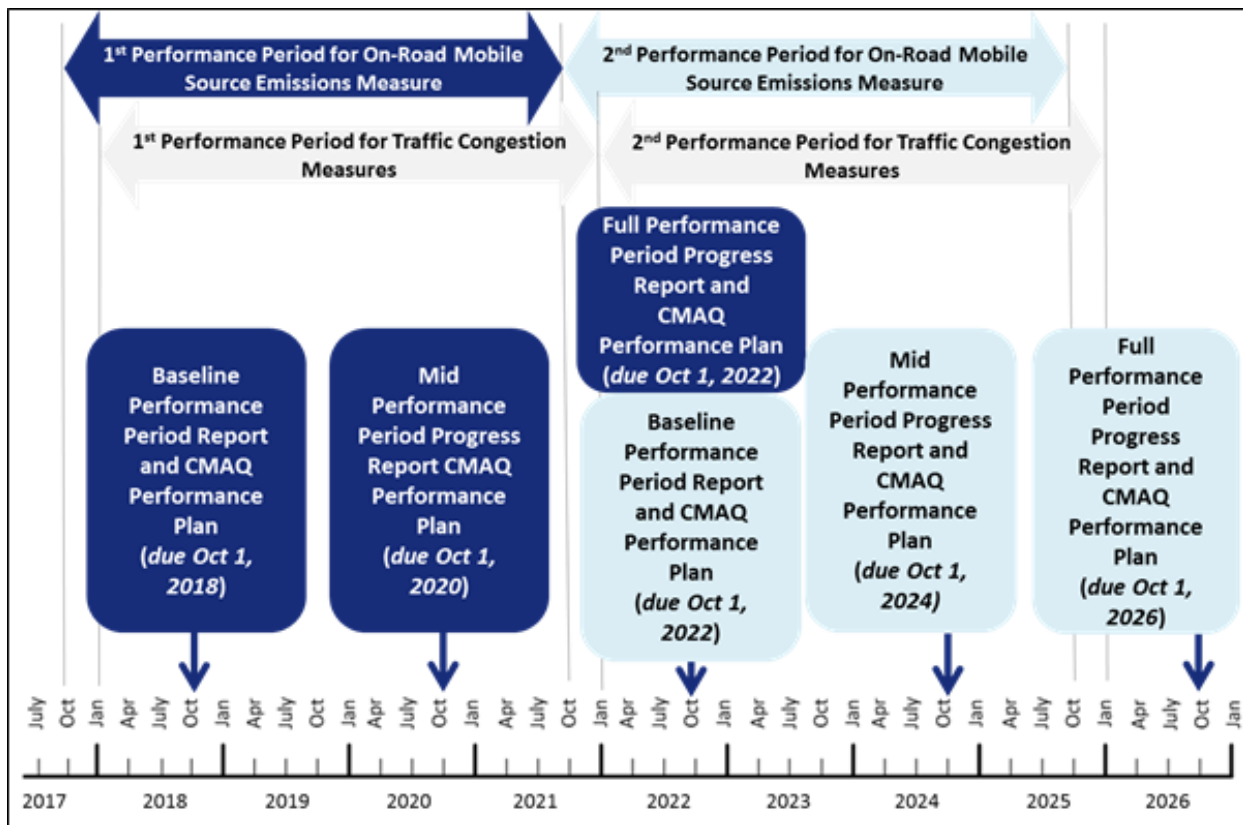
The Pennsylvania Department of Transportation (PennDOT) initially established targets for these measures by May 20, 2018. The baseline values and associated targets for each performance measure were formally submitted to FHWA as part of the State DOT baseline performance report submitted on October 1, 2018. In establishing the performance measure targets, PennDOT coordinated with applicable Metropolitan Planning Organizations (MPOs) to ensure consistency. State DOTs, in coordination with MPOs, are required to provide FHWA with biennial progress reports for the three CMAQ performance measures.

In addition to the reporting required by the PM-3 regulation, 23 United States Code (U.S.C) 149(l) requires each MPO serving a transportation management area (TMA) with a population over 1,000,000 that includes a nonattainment or maintenance area to develop a CMAQ Performance Plan to support the implementation of the CMAQ measures. MPOs subject to the CMAQ Performance Plan requirement must submit a plan at the beginning of a four-year performance period and subsequently update the plan

biennially through the performance period; once at the midpoint and again at the end of the performance period. In the CMAQ Performance Plan and its biennial updates, MPOs must report the two- and four-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. FHWA has prepared a guidebook to assist MPOs in preparing the CMAQ Performance Plan.¹

Figure 1 displays the performance periods for the measures and reporting timeline for the State Biennial Performance Report and the MPO CMAQ Performance Plans. The CMAQ Performance Plan is attached to the State DOT biennial performance reports.

Figure 1: Performance Periods for CMAQ Measures and Reporting Timeline



Source: FHWA 2018

Applicability

Per FHWA’s MPO applicability determination, the Lancaster County Transportation Coordinating Committee (LCTCC) is responsible for developing a CMAQ Performance Plan.² This requirement applies to the MPO since the Philadelphia, PA-NJ-DE-MD urbanized area extends into Lancaster County, and the County is classified as a nonattainment/maintenance area for the National Ambient Air Quality Standards (NAAQS). The Philadelphia urbanized area is one of two TMAs in the state with a population over 1 million. Figures 2-3 illustrate the urbanized area boundaries and Figures 4-5 highlight Lancaster County’s air quality status related to the ozone and fine particulate (PM_{2.5}) NAAQS.

¹ https://www.fhwa.dot.gov/environment/air_quality/cmaq/measures/performance_plan/

² https://www.fhwa.dot.gov/environment/air_quality/cmaq/measures/cmaq_applicability/page03.cfm

Figure 2: Philadelphia Urbanized Area Boundary and Overlap with Lancaster County

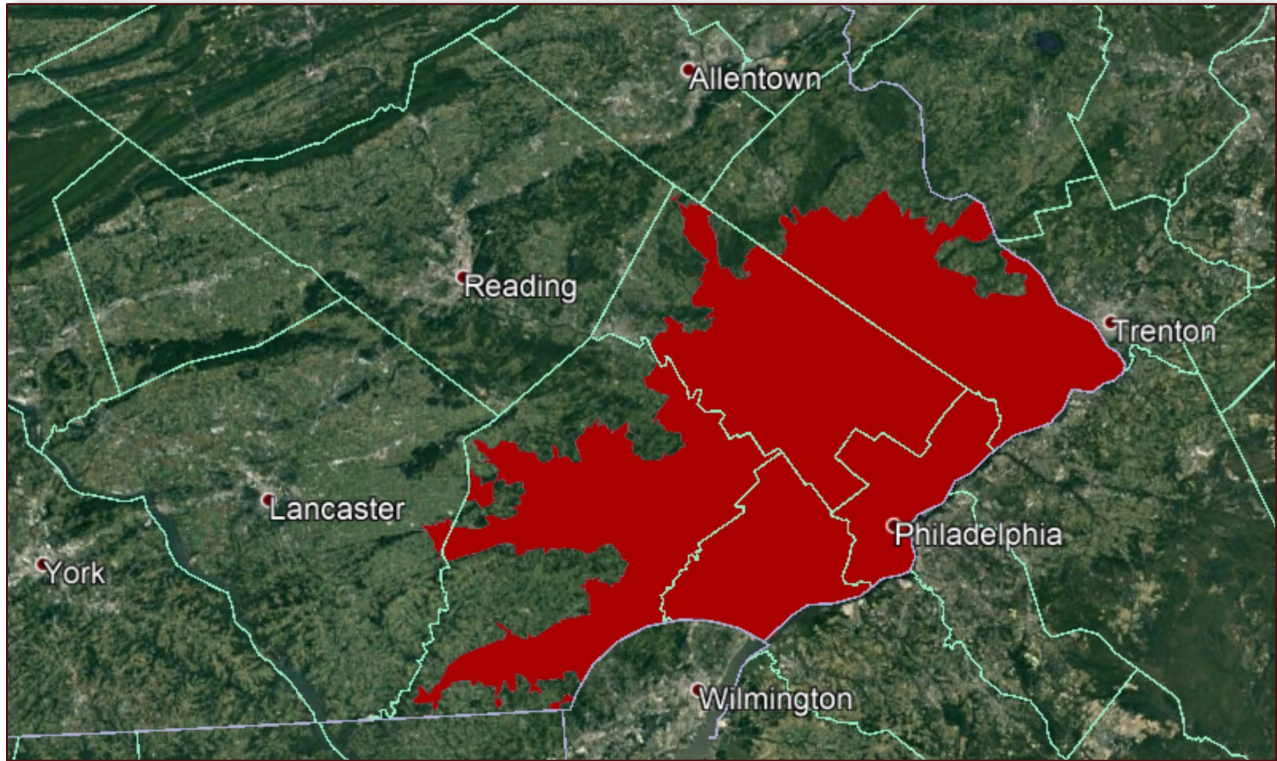
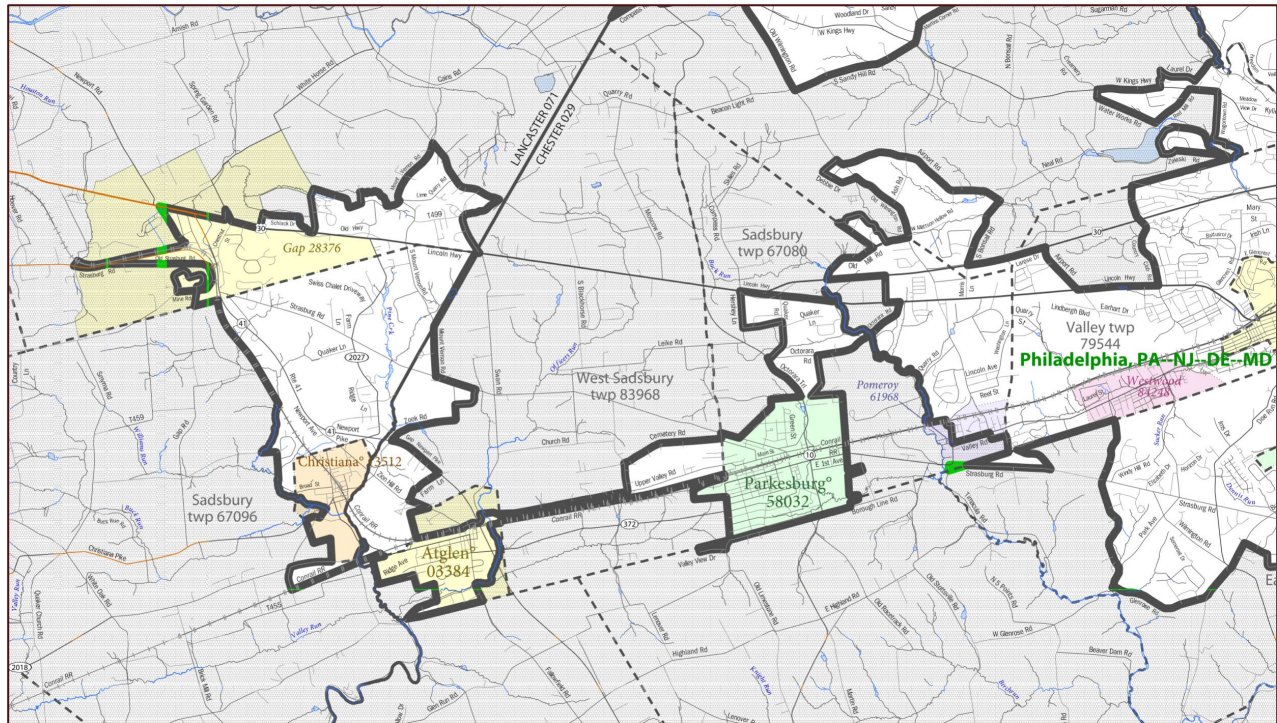
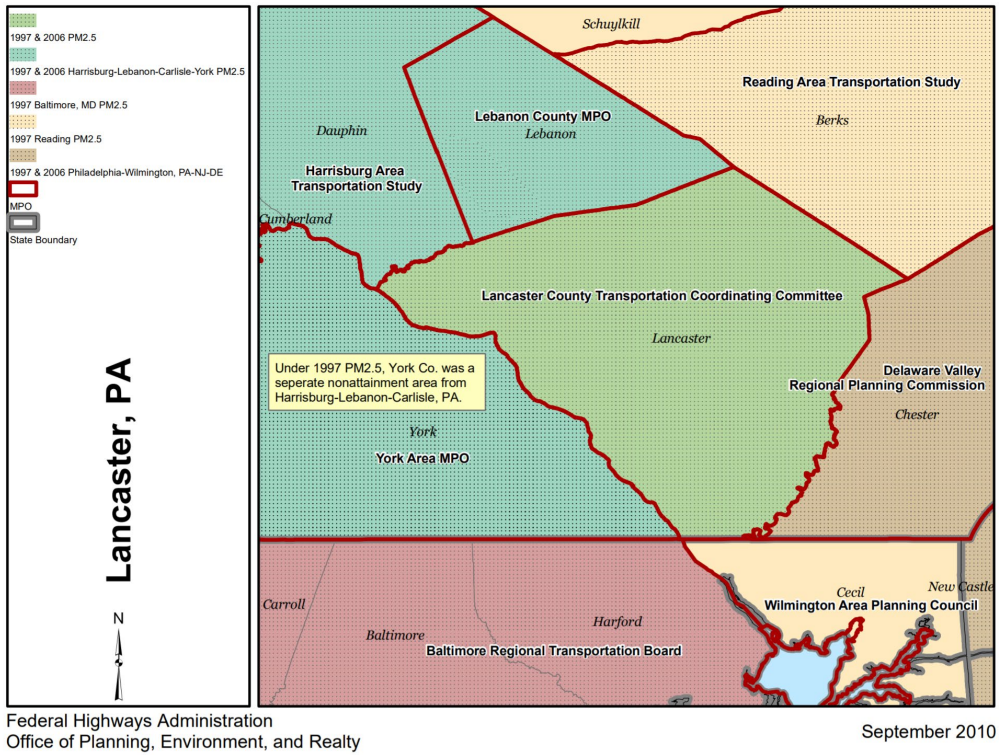


Figure 3: Philadelphia Urbanized Area Boundary and Overlap with Lancaster County (Zoom)



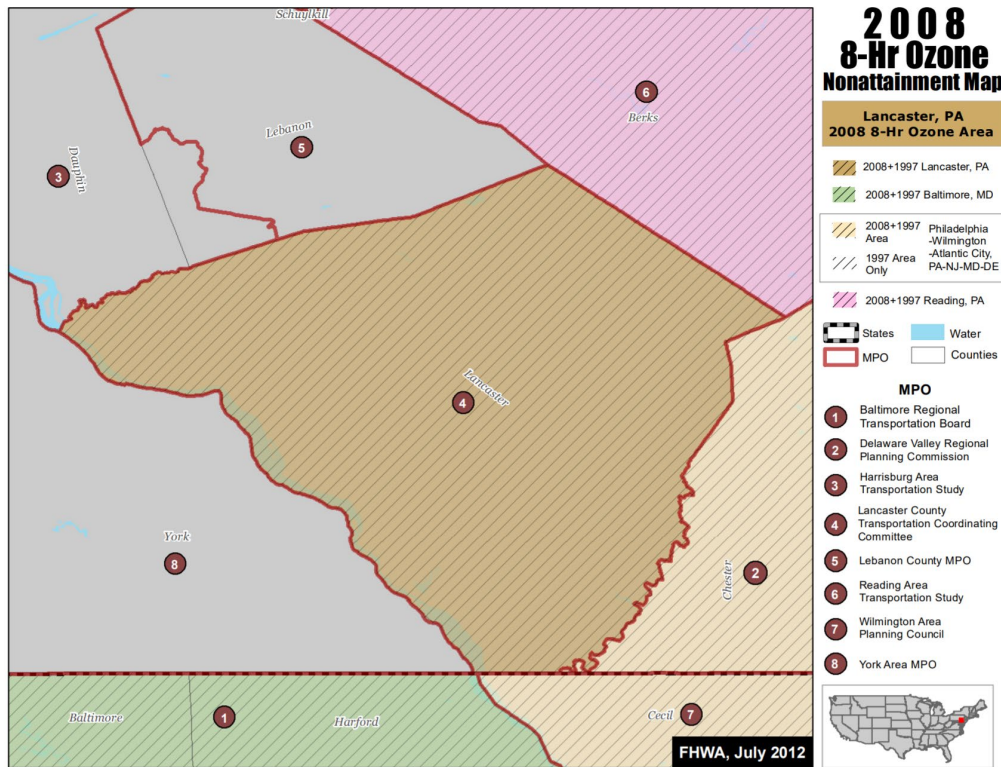
https://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/ua69076_philadelphia_pa--nj--de--md/DC10UA69076_005.pdf

Figure 4: Lancaster 24-hour Fine Particulate Maintenance Area



https://www.fhwa.dot.gov/environment/air_quality/conformity/maps/pm25_2006/pdf/lancaster.pdf

Figure 5: Lancaster 8-hour Ozone Nonattainment Area



https://www.fhwa.dot.gov/environment/air_quality/conformity/maps/ozone_2008/lancaster_pa.pdf

TWO-YEAR PERFORMANCE AND TARGETS

Federal performance measure regulations (23 CFR 490.107) require that the MPO CMAQ Performance Plan includes the condition/performance and targets for each of the CMAQ traffic congestion and on-road mobile source emission measures. For the biennial updates to the plan, submitted at the midpoint and end of the performance period, MPOs must report condition/performance during the two- and four-year periods. This document includes the mid-point (or two-year) performance update for Lancaster County.

Congestion Measures – Philadelphia Urbanized Area

For the CMAQ congestion measures (PHED and Percent Single Occupant Vehicles), the LCTCC must address performance for the two- and four-year target values for the Philadelphia urbanized area. This requirement results from a portion of the urbanized area overlapping with Lancaster County. The congestion measures are reported for the entire urbanized area. All of the MPOs and state DOTs in the Philadelphia urbanized area adopted common baseline and performance targets for the congestion measures. The consensus on common baselines and targets was accomplished through a series of coordination meetings where the target-setting procedures, methodologies, and data sources were determined. The consensus two- and four-year congestion measure targets for the Philadelphia urbanized area were agreed upon by all partnering agencies and submitted to FHWA by PennDOT in May 2018.

Two-Year Performance for Peak-Hour Excessive Delay

The annual PHED per capita measure is calculated using the RITIS Probe Data Analytics (PDA) Suite. The PHED baseline year (2017) value was 16.8 annual hours per capita and the consultation partners agreed on a four-year (2021) target of 17.2 hours per capita. A two-year target is not required for the first performance period.

To measure progress, the annual hours of PHED per capita for the interim performance plan was calculated using the RITIS PDA Suite on June 11, 2020. The PHED two-year interim measurement value was 14.6. A linear trend line was created for the measured years (2016, 2017, 2018, and 2019) that resulted in a four-year target of 14.5 for 2021, which was lower than the previously adopted four-year target set in 2018 of 17.2 (a difference of 2.7), and exceeded target expectations. Although the difference of 2.7 is fairly significant and may have justified potentially adjusting the four-year target lower, there was consensus among the partners to not adjust the target due to some uncertainty with the RITIS PDA-Suite measured data, calculations, and NPMRDS road coverage, and uncertainty in travel patterns in the foreseeable future due to the COVID-19 pandemic. Table 2 presents the performance measure baseline, interim performance, and target values for the annual PHED measure.

Table 2: Baseline, Two-Year Performance and Target PHED Measures (Annual Hours per Capita) for the Philadelphia PA-NJ-DE-MD Urbanized Area

Measure	2017 Baseline	Two-Year Target (2018–2019)	Two-Year Performance (2018–2019)	Four-Year Target (2018–2021)
PHED	16.8	Not Required	14.6	17.2

Source: DVRPC 2020

Notes:

- The urbanized area boundary (UZA) and associated population were from the U.S. Census.
- Reporting segments and travel times (in 15-minute intervals) were derived from the National Performance Management Research Data Set (NPMRDS); Hourly traffic volumes and annual vehicle classifications for buses, trucks, and cars were derived from AADT reported to the HPMS.
- Annual Vehicle Occupancy (AVO) for cars, buses, and trucks was provided by FHWA.

Two-Year Performance for Percent Single Occupant Vehicles

The percent non-SOV travel measure was calculated using the U.S. Census American Community Survey (ACS) five-year estimates for the urbanized area. The 2017 baseline value was 27.9 percent and the consultation partners agreed on two-year (2018-2019) and four-year (2018-2021) targets of 28.0 percent and 28.1 percent, respectively. Table 3 presents the performance measure baseline, interim performance, and target values for the percent non-SOV measure.

The Percent Non-SOV Travel measure was calculated for the interim performance period using the most recent U.S. Census ACS five-year estimates (2014-2018) with a result of 28.2 percent. The four-year linear trend value was based on the most recent non-overlapping five-year ACS estimates (2009-2013 and 2014-2018), that resulted in 28.5 percent, which was higher than the previously adopted four-year target set in 2018 of 28.1 percent (a difference of 0.4 percent), and exceeded target expectations. Since the four-year target and trend value were fairly close (0.4 percent), and because of the uncertainty in travel patterns in the foreseeable future due to the COVID-19 pandemic, there was consensus among the partners to not adjust the target.

Table 3: Baseline and Target Percent Non-SOV Travel Measure for the Philadelphia PA-NJ-DE-MD Urbanized Area

Measure	2017 Baseline	Two-Year Target (2018–2019)	Two-Year Performance (2018–2019)	Four-Year Target (2018–2021)
% Non-SOV Travel	27.9%	28.0%	28.2%	28.1%

Source: DVRPC 2020

Notes:

- Travel trends show slight increases in Percent Non-SOV travel from five-year ACS (2009-2013) to five-year ACS (2014-2018). A linear trend was used to help decide whether to adjust the four-year target.
- The 2017 baseline refers to five-year ACS (2012-2016) values.
- There is a two-year lag in the availability of ACS data.

On-road Mobile Emissions Measures

Federal regulations require that the on-road mobile source emission measure baseline and targets are established for the state and MPO jurisdictions where there are nonattainment and maintenance areas. Lancaster county is a nonattainment area for the 2008 8-hour ozone NAAQS and a maintenance area for the 2006 24-hour PM_{2.5} NAAQS. PennDOT established statewide and nonattainment/maintenance area targets for the emissions measure by May 2018. The LCTCC supported the Lancaster County targets established by PennDOT.

Two-Year Performance for On-road Mobile Emissions Measures

Each year Lancaster County receives a CMAQ funding allocation from PennDOT to apply to projects that improve congestion and reduce on-road mobile source emissions. PennDOT submits an annual report to FHWA that includes the emissions reductions from CMAQ-funded projects in the state. The data from these reports is also entered into the FHWA Public Access System (PAS), where the public can view the emissions reductions attributable to CMAQ-funded projects.

The two-year performance values for the CMAQ emissions measure were extracted from the FHWA CMAQ Database³, which houses the approved CMAQ projects and emission benefits by year. The two-year performance and targets are summarized in Table 4. Only “new” projects funded during the two-year performance period are counted towards the performance targets. Other ongoing or “continuing” projects that use CMAQ funding are only counted for the first-year they are entered into the system.

Lancaster County has outperformed the established 4-year NO_x and PM_{2.5} pollutant targets at the mid-point of the performance period. However, the expected CMAQ project benefits for VOC remain much lower than the established target. During the performance period there were only two new CMAQ-funded projects within Lancaster County that counted towards the performance targets.

Table 4: On-road Emissions Reductions Targets for Lancaster County

Pollutant	Emissions Reduction (Kg/day)		
	FY2018-2019 Two-year Target	FY2018-2019 Two-year Performance	FY2018-2021 Four-year Target
VOC Emissions		0.250	3.600
NO_x Emissions	Not Required*	1.160	1.030
PM_{2.5} Emissions		0.060	0.040

* MPOs with populations <1 million are not required to report 2-year emission targets.

Source PennDOT 2020

³ https://fhwaapps.fhwa.dot.gov/cmaq_pub/

ADJUSTMENTS TO FOUR-YEAR TARGETS

The interim performance plan offers an opportunity for the MPOs and state DOTs to review and revise the four-year targets for each of the CMAQ Performance Measures. Target revisions for the CMAQ measures were coordinated between LCTCC, DVRPC, PennDOT and other relevant partners in the Philadelphia urbanized area through a series of meetings in September of 2020 in advance of PennDOT's mid-term performance report and LCTCC's CMAQ Performance Plan.

Congestion Measures – Philadelphia Urbanized Area

MPOs and DOTs that share an urbanized area boundary are charged with developing common congestion measures for the urbanized area. In the case of the Philadelphia PA-NJ-DE-MD area, this means that DVRPC, LCTCC, North Jersey Transportation Planning Authority (NJTPA), South Jersey Transportation Planning Organization (SJTPO), Wilmington Area Planning Council, PennDOT, New Jersey Department of Transportation (NJDOT), Delaware Department of Transportation, and Maryland Department of Transportation (MDOT) must agree on target adjustments for the Philadelphia urbanized area. For the interim performance plan, two meetings were held between the MPOs and state DOTs that contain portions of the Philadelphia urbanized area to review performance over the two-year period for the CMAQ congestion measures and to discuss whether the four-year targets should be adjusted. On June 11, 2020, the relevant MPOs and State DOTs agreed that the four-year congestion measure targets would not be revised.

On-road Mobile Emissions Measures

As discussed in the two-year performance section of this report, Lancaster County is not currently on track to meet the area's four-year target for the CMAQ VOC emissions measure as established in May of 2018. LCTCC and PennDOT have coordinated on potential updates to the target to better reflect the anticipated level of CMAQ-funding over the next two years and associated emission benefits that can be expected from those projects. The original target was established based on a four-year trend of benefits originally reported in the CMAQ database for FY2014-2017 funded projects in Lancaster County. Only three projects were included in those projections. At that time, the available modeling and emission factors produced higher benefits for VOC emissions. CMAQ project analysis tools have been updated to reflect the Environmental Protection Agency (EPA's) latest emission factor model and include new procedures provided in FHWA's CMAQ Emissions Calculator Toolkit⁴. These tools produce lower estimates of VOC pollutant-levels than past tools. As such, PennDOT and LCTCC have agreed to revise the four-year target for VOC as shown in Table 5.

Table 5: Adjusted Lancaster County CMAQ Emissions Target

Measure	Emissions Reduction (Kg/day)	
	FY2018-2021 Original Four-year Target	FY2018-2021 Adjusted Four-year Target
VOC Emissions	3.600 kg/day	0.400 kg/day

⁴ https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/

ACHIEVING THE TARGETS

CMAQ Projects in Lancaster County

PennDOT administers the overall CMAQ project selection process through its Center for Program Development and Management, including central office staff (MPO/RPO liaisons in the Transportation Program Development Division, the Air Quality and Federal Initiatives Section, and the Funding and Twelve-Year Program Division) and District offices. Lancaster County receives CMAQ funding through formulas based upon the Federal transportation authorization bill (FAST Act) and PennDOT defined allocation guidelines. A further description of the CMAQ project selection process is discussed in the following section.

Lancaster County's portion of the Philadelphia urbanized area is small. As such, the completed and planned CMAQ-funded projects in Lancaster County are not expected to have significant impacts in achieving the overall Philadelphia area CMAQ targets as established by DVRPC. However, Lancaster's CMAQ-funded projects have provided significant progress in meeting the established regional targets established by PennDOT for the CMAQ emissions measure. This includes already meeting the four-year target for the NO_x and PM_{2.5} pollutants at the mid-point period. Table 6 highlights the 2018-2019 funded CMAQ projects that count towards the Lancaster County target for emissions. In addition, other "continuing" projects have been funded over the two-year timeframe including the PA 23 Transportation System Management improvements and multiple intersection improvement projects. Note that "continuing" projects don't provide benefits against the existing targets but do provide significant congestion and air quality benefits within the County. The benefits for these projects were credited before the current four-year performance period started.

As Lancaster County strives to meet the adjusted VOC emission target, additional CMAQ projects will be required that provide benefits to air quality and congestion. Table 7 highlights additional Transportation Improvement Program (TIP) projects that are anticipated to use CMAQ funding over the next two years. The projects are expected to provide significant improvements to traffic congestion and air quality, and are projected to provide the additional VOC credits needed to meet the established target.

The LCTCC will continue to collaborate with PennDOT to program CMAQ-funded projects that improve congestion and reduce on-road mobile emissions in a cost-effective manner.

Table 6: CMAQ-Funded Projects in Lancaster County (FY2018-2019)

MPMS #	Project Name	Description	Potential Benefit to CMAQ Performance Measures
83617	Lancaster Intelligent Transportation System (ITS) Phase 1	Installation of Highway Advisory Radio (HAR), Closed Circuit Television Video (CCTV), or equivalent technology at key highway interchange locations.	Reduce traffic congestion related to highway incidents.
104473	PA 23 Transportation System Management (TSM) Improvements	Install center left turn lane along corridor.	Reduce traffic congestion at multiple intersections along the corridor.

Table 7: Future TIP CMAQ-Funded Projects in Lancaster County (FY2020–2021)

MPMS #	Project Name	Description	Potential Benefit to CMAQ Performance Measures
106587	Lancaster Intelligent Transportation System (ITS) Phase 4	Installation of Highway Advisory Radio (HAR), Closed Circuit Television Video (CCTV), or equivalent technology at key highway interchange locations.	Reduce traffic congestion related to highway incidents.
110502	30/462 Interchange Improvements	Improvements at the US30/PA462 interchange	Reduce regional congestion and incident delays at or near the interchange.
110507	PA 324 / US 222 Intersection Improvements	Installation of a roundabout replacing the existing signalized intersection	Reduce traffic congestion at the current intersections.
114324	Main Street Traffic Signal improvements	Traffic signal improvements at the intersection of PA 72/Manheim Pike and PA 722	Reduce vehicle idling delay.
114325	Fruitville Pike Intersection Improvements	Intersection improvements at the intersections of Fruitville Pike and Temperance Hill Road and Fruitville Pike and Holly Tree Road	Reduce vehicle idling delay.

In addition to the CMAQ-funded projects, other regional highway improvement projects are expected to provide benefits to the CMAQ performance measures. Some of these benefits may not be realized until future performance periods when these projects are completed. These include the Centerville Road Interchange, US 222 Reconstruction and Widening, US 222/30 Interchange Improvements, and the Strasburg Pike Improvements.

CMAQ Program Administration Process

The following is a synopsis of the process used by PennDOT and Pennsylvania MPOs and Rural Planning Organizations (RPOs) to administer the CMAQ program. Most CMAQ-funded projects are identified as such on the TIP.

- All Pennsylvania CMAQ funds are sub-apportioned by PennDOT to the recipient MPOs and RPOs with eligible nonattainment or maintenance areas, per designations by the U.S. Environmental Protection Agency (EPA). All funds are sub-apportioned per the federal formula that determined funding to the state.
- The Air Quality and Federal Initiatives Section has primary DOT responsibility regarding project eligibility for CMAQ funds per MPO and RPO-requested projects, and the regional transportation conformity process (including project classification and coding, emissions analyses of prospective CMAQ-funded and other projects), and the annual federal CMAQ report.
- The MPOs, RPOs and PennDOT District office liaisons participate in TIP and Plan development, including overall project identification, evaluation and selection (per FHWA and FTA regulations); fiscal restraint; and all other relevant facets of TIP and Plan development and amendments. These personnel are responsible for ensuring that CMAQ projects are selected in accordance

with federal requirements. District offices play a larger role in this process for the smaller MPOs and all RPOs. A more robust CMAQ project identification and selection process has recently been integrated into the TIP development process. This process includes more coordination between PennDOT/MPOs and considerations for project prioritization based on the air quality benefits of the project.

- Projects advanced for CMAQ funding are required to have a PennDOT CMAQ Project Eligibility Form to verify, within PennDOT, the relevant MPO/RPO and with the FHWA Division Office, that the project is eligible for CMAQ funding.
- Projects with proposed CMAQ funding are coded as such into the computerized Multimodal Project Management System (MPMS) and identified accordingly throughout the project selection and TIP and Plan development processes. Any project not in the MPMS database is identified and tracked separately. Coding is finalized concurrent with final project funding decisions.
- PennDOT requires a quantitative analysis for each CMAQ project nominated for consideration. Several tools and technical assistance are provided by PennDOT to accomplish a project analysis. PennDOT originated and maintains the Pennsylvania Air Quality Off Network Evaluator (PAQONE) software. PAQONE is provided to PennDOT, PaDEP, MPOs and RPOs, and others who request it as a key means of evaluating the transportation and emissions impacts of prospective CMAQ-funded projects. Projects not suitable for analysis through PAQONE are required to be analyzed through other means. This may include use of a regional travel demand model, non-computerized methodologies or other means to estimate travel impacts.
- PennDOT's Air Quality and Federal Initiatives section prepares the annual report to FHWA from automated records drawn from the MPMS system. This system automatically generates the project listing and data required by the FHWA report system. It is also a cross-check to ensure that all CMAQ-funded projects are properly documented, specifically including an emissions analysis and CMAQ Project Eligibility Form, and to ensure that only projects accepted by FHWA CMAQ funding are included for this funding category.
- Projects scheduled for CMAQ funding are re-evaluated for eligibility if there is a change in scope, project sponsor or schedule.

The above processes also apply to FHWA CMAQ funds transferred to FTA or FRA (referred to as Flex-funded projects) for a transit or rail-related project. CMAQ is an explicit part of PennDOT Planning Partner reviews, and is part of the normal project development process for smaller MPOs and RPOs.