Congestion Mitigation and Air Quality Annual Report - Fiscal Year 2023

May 2024

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For: DelDOT Office of Planning

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REVISION HISTORY

ACRONYMS

ACS	American Community Survey
AADT	Average Annual Daily Traffic
AI	Artificial Intelligence
ATCMTD	Advanced Transportation and Congestion Management Technologies Deployment
BIL	Bipartisan Infrastructure Law
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CTP	Capital Transportation Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DART	Delaware Authority for Regional Transit
DECS	Delaware Commute Solutions
DelDOT	Delaware Department of Transportation
DTC	Delaware Transit Corporation
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FAST ACT	Fixing America's Surface Transportation Act
FY	Fiscal Year
IIJA	Infrastructure Investment and Jobs Act
ISTEA	Intermodal Surface Transportation Efficiency Act
ITMS	Integrated Transportation Management System
ITS	Intelligent Transportation System
MAP-21	Moved Ahead for Progress in the 21st Century Act
MPO	Municipal Planning Organization
MPH	Miles Per Hour
NAAQS	National Ambient Air Quality Standards
NHS	National Highway System
NO_x	Nitrogen Oxides
O_3	Ozone

PAS	FHWA's [CMAQ] Public Access System
Pb	Lead
PHED	Peak Hour Excessive Delay
$PM_{2.5}$	Particulate Matter <2.5 µm
PM_{10}	Particulate Matter <10 µm
SEPTA	Southeastern Pennsylvania Transportation Authority
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOV	Single Occupancy Vehicle
TMC	Transportation Management Center
TPM	Transportation Performance Management Program
USDOT	United States Department of Transportation
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

The Congestion Mitigation and Air Quality (CMAQ) program was established through the Intermodal Surface Transportation Efficiency Act (ISTEA) for the purpose of supporting the completion of surface transportation projects that would improve air quality and reduce congestion. As part of its Transportation Performance Management Program (TPM), FHWA requires that State Department of Transportation (DOT)'s and Municipal Planning Organizations (MPO)s receiving CMAQ funding, set two- and four-year targets for three performance measures:

- Peak Hour Excessive Delay (PHED),
- Non-Single Occupancy Vehicle (Non-SOV) Traffic, and
- Total Emissions Reductions.

Reporting on these targets is organized into four-year performance periods. The current performance period began in Fiscal Year 2022 (FY22) and will end in Fiscal Year 2025 (FY25). This report serves to document the efforts made by DelDOT to meet its total emission reduction performance targets over the past Fiscal Year, FY23. Based on the attainment status of the State of Delaware under the Environmental Protection Agency's National Ambient Air Quality Standards (NAAQS), DelDOT was required to establish emission reduction targets for two pollutants: Ozone (O_3) and particulate matter with aerodynamic diameter equal to and greater than 2.5 micrometers ($PM_{2.5}$). Ozone emissions are assessed using two precursors: Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOCs). DelDOT's baseline performance targets are presented in **Table ES-1**.

Table ES-1. Baseline Performance Period Total Emission Reduction Target

Compound	Total Emission Reductions *(kg/day)*		
	Pre-Performance Period Total (FY2018- FY2021)	*Two-Year Projection (FY2022-FY2023)*	*Four-Year Projection (FY2022-FY2025)*
VOC	251.922	2.700	6.300
NO_x	131.517	5.900	19.800
$PM_{2.5}$	6.936	3.600	12.400

In fiscal year FY23, DelDOT obligated CMAQ funds to nine[1] projects. Of these nine, five were not previously reported to FHWA and therefore required performance assessments (see **Table ES-2**). The emission benefits for these projects were calculated using a variety of references, including: FHWA's *Computation Guidance for Congestion Mitigation and Air Quality Improvement (CMAQ) Program Total Emissions Reduction Measure* (FHWA, 2018), FHWA's CMAQ toolkit (FHWA, 2020a), and the *Methodology for Assessing the Benefits of Active Transportation Projects* (Rose & Chose, 2016). The final emission reduction estimates or projections for the five projects being reported in FY23 are presented in **Table ES-3**. Based on the contributions of these projects and DelDOT's performance to date, DelDOT is expected to exceed its four-year performance targets.

[1] The FY23 CMAQ obligation list finalized in October (2024) included ten projects. One of these projects, T202401102 (SR 4 Shared Use Path ADA and Active Transportation Improvements, was later removed from the obligation list by DelDOT.

Table ES-2. FY2023 CMAQ Program Summary

Project Category	Project No.	Project Name
Bike and Pedestrian Improvements	T202301602	Milford US 113 Pathway – Phase 1
	T202301603	NW Front Street Pathway
	T202401201	South Little Creek Road Shared Use Path
Carpooling and Vanpooling	T202404801	RIDESHARE FY24
Travel Demand Management and ITS	T202404703	FY24 Transportation Management Improvements Statewide Projects

Table ES-3. FY2023 Total Emission Reduction Estimates

Project No.	Project Name	Estimated Emissions Benefits *(kg/day)*					
		CO	$PM_{2.5}$	PM_{10}	NO_x	VOC	CO_2e
T202301602	Milford US 113 Pathway – Phase 1	1.231	0.004	0.015	0.079	0.072	125.259
T202301603	NW Front Street Pathway	0.180	0.001	0.002	0.012	0.011	18.331
T202401201	South Little Creek Road Shared Use Path	0.998	0.003	0.013	0.063	0.058	106.109
T202404801	RIDESHARE FY24	3.746	0.196	0.015	0.067	0.093	562.855
T202404703	FY24 Transportation Management Improvements Statewide Projects	33.435	4.143	1.063	5.741	1.003	115.592
FY2023 Total		**39.590**	**4.347**	**1.108**	**5.962**	**1.237**	**928.146**

1.0 INTRODUCTION

The purpose of this report is to document the advancements made by the Delaware Department of Transportation's (DelDOT) Congestion Mitigation and Air Quality (CMAQ) Improvement Program in Fiscal Year 2023 (FY23). DelDOT's CMAQ Program is the product of a federal initiative to provide state and local transportation agencies funding for projects that will reduce on-road mobile source emissions. The Federal Highway Administration (FHWA) is responsible for distributing and assessing the use of CMAQ funding. This section of the report provides background information on the origin of the CMAQ program, and the criteria used to measure its performance. This section will cover:

- The CMAQ program's primary goals and components,
- The law's which authorize and direct FHWA's CMAQ program,
- The requirements which determine project eligibility, and
- The criteria FHWA uses to measure the effectiveness of the CMAQ program.

Many of the passages included in this report were written assuming a basic familiarity with transportation planning processes and air quality management strategies. More detailed information is available via the bibliography located at the end of this report. In addition, many of the citations used in the preparation of this document are public websites which provide educational and training materials.

1.1 WHAT IS THE CMAQ PROGRAM?

The Congestion Mitigation and Air Quality (CMAQ) program was created by the U.S. Congress for the purpose of supporting the completion of surface transportation projects that would improve air quality and reduce congestion. The CMAQ program achieves this goal by reimbursing state and regional transportation agencies for the cost of planning, design, and constructing eligible projects. Within DelDOT, the CMAQ program is comprised of the activities needed to:

- Determine which projects are eligible for reimbursement,
- Assess the air quality benefits likely to be generated by eligible projects,
- Coordinate with federal and regional stakeholders to determine funding priorities,
- Track the cumulative impact of CMAQ projects, and
- Set biennial and quadrennial emissions reduction targets.

Completing these activities requires the creation of interdisciplinary teams of transportation planners, environmental specialists, and project engineers.

1.2 WHICH LAWS AUTHORIZE AND DIRECT THE CMAQ PROGRAM?

Like many federal initiatives, the CMAQ program has been shaped by a series of laws and regulations. Full comprehension of the CMAQ program's requirements therefore requires not only an understanding of each of these laws, but also knowledge of how they interact. To date, the list of influential legislation includes:

- The Clean Air Act of 1970
- The Clean Air Act Amendments (1990)
- The Intermodal Surface Transportation Efficiency Act of 1991
- The Moving Ahead for Progress in the 21st Century Act (2012)
- The Fixing America's Surface Transportation Act (2015)
- The Bipartisan Infrastructure Law also known as the Infrastructure Investment and Jobs Act (2021)

1.2.1 The Clean Air Act of 1970

The Clean Air Act was created to address the growing concern that the regional nature of air pollution required federal regulation and support.[2] One of the Act's key measures was the creation of the National Ambient Air Quality Standards (NAAQS). NAAQS are pollution thresholds used to gauge air quality conditions and identify areas where interventions are needed. The Clean Air Act designates the Environmental Protection Agency (EPA) as the entity responsible for selecting and enforcing the NAAQS.

To date, the EPA has established NAAQS for six air pollutants. These substances are referred to as criteria pollutants (EPA, 2018) and are listed in **Table 1-1**. The EPA has determined that on-road mobile sources are major contributors to four criteria pollutants: carbon monoxide, ozone, nitrogen dioxide, and particulate matter (EPA, 2018). Ozone is unique in that it is not a pollutant emitted directly from vehicles, but instead is produced through the interactions of two precursors: nitrogen oxides (NO_x) and volatile organic compounds (VOCs) (EPA, 2020a).

Table 1-1. NAAQS Pollutants

Pollutant	Common Sources of Emissions
Carbon Monoxide (CO)	CO is released when something is burned. The greatest sources of CO to outdoor air are cars, trucks and other vehicles or machinery that burn fossil fuels.
Lead (Pb)	At the national level, major sources of lead in the air are ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other sources are waste incinerators, utilities, and lead-acid battery manufacturers.
Nitrogen Dioxide (NO_2)	NO2 primarily gets in the air from the burning of fuel. NO2 forms from emissions from cars, trucks and buses, power plants, and off-road equipment.
Ozone (O_3)	Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight.
Particulate Matter ($PM_{2.5}$, PM_{10})	Most particles form in the atmosphere because of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries, and automobiles.
Sulfur Dioxide (SO_2)	The largest source of SO2 in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities. Smaller sources of SO2 emissions include: industrial processes such as extracting metal from ore; natural sources such as volcanoes; and locomotives, ships and other vehicles and heavy equipment that burn fuel with a high sulfur content.

Source: (EPA, 2024)

Jurisdictions with air pollution levels above one or more of the NAAQS are designated as non-attainment areas. Once a non-attainment area reduces pollution levels below the target NAAQS, it is redesignated as a maintenance area. Jurisdictions with pollution levels consistently below the NAAQS are designated as attainment areas. The current attainment status of all portions of the United States is published through the EPA's Green Book.[3]

The attainment status of an area is important to the CMAQ program for two reasons. First, states are only permitted to obligate CMAQ funding to a project or program if it is in an area that is, or was designated as a nonattainment area for ozone, carbon monoxide, or particulate matter.[4] Secondly, the performance measures currently used to assess the efficacy of the CMAQ program (see **Section 1.2.3**) focus on traffic

[2] 42 U.S. Code § 7401(a)(4)

[3] https://www.epa.gov/green-book

[4] 23 U.S. Code § 149(b) - Congestion mitigation and air quality improvement program

congestion and air quality within areas that are, in all or part, designated as nonattainment or maintenance areas for ozone, carbon monoxide, or particulate matter.[5] The current attainment status of each of Delaware's counties is provided in **Table 1-2**.

Table 1-2. Delaware's NAAQS Attainment Status (as of 11.30.2023)

NAAQS (Year Created)	Delaware Counties		
	New Castle	*Kent*	*Sussex*
Carbon Monoxide *(1971)*	Attainment	Attainment	Attainment
Lead *(1978)*	Attainment	Attainment	Attainment
Lead *(2008)*	Attainment	Attainment	Attainment
Nitrogen Dioxide *(1971)*	Attainment	Attainment	Attainment
8-Hour Ozone[1] *(1997)*	Non-Attainment	Non-Attainment	Non-Attainment
8-Hour Ozone *(2008)*	Non-Attainment	Attainment	Non-Attainment
8-Hour Ozone *(2015)*	Non-Attainment	Attainment	Attainment
$PM_{2.5}$ *(2006)*	Maintenance*	Attainment	Attainment
$PM_{2.5}$ *(2012)*	Attainment	Attainment	Attainment
PM_{10} *(1987)*	Attainment	Attainment	Attainment
Sulfur Dioxide *(1971)*	Attainment	Attainment	Attainment
Sulfur Dioxide *(2010)*	Attainment	Attainment	Attainment

Source: (EPA, 2021)

[1]The 1997 8-hour Ozone standard was revoked by the EPA in March 2015 as part of its final rule for the 2008 Ozone standard. However, the revocation was challenged in court (South Coast Air Quality Management District v. EPA) and in February 2018, the U.S. Court of Appeals for the District of Columbia Circuit found that the EPA had exceeded its powers when it eliminated the transportation conformity requirement tied to the 1997 standard. Based on this ruling, Kent, New Castle, and Sussex Counties will be required to demonstrate transportation conformity for the 1997 8-Hour Ozone standard until 2038, As long as this requirement is in place, CMAQ funds can be used in Kent County.

**can still spend CMAQ money here because it was previously in non-attainment*

1.2.2 The Clean Air Act Amendments & The Intermodal Surface Transportation Efficiency Act of 1991

In 1990, the U.S. Congress updated the Clean Air Act of 1970 by passing the Clean Air Act Amendments. This piece of legislation instituted more stringent emission standards for on-road vehicles and stronger connections between transportation investments and air quality. In response, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 responded by creating a source of funding that state and local transportation agencies could use to complete projects capable of improving air quality. This funding source became known as the CMAQ Program.

[5] 23 Code of Federal Regulations § 490.807

1.2.3 The Moving Ahead for Progress in the 21st Century Act, the Fixing America's Surface Transportation Act, & the Bipartisan Infrastructure Law

The Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law in 2012. Its passage is important because it directed the U.S. Department of Transportation (USDOT) to establish performance metrics for the federal-aid highway program (FHWA 2018b). In response, FHWA created the TPM Program.

The TPM program allows state DOTs to publish and track the metrics for five performance categories:

- Highway Safety,
- Infrastructure Condition (*i.e.,* pavement and bridge),
- Highway Performance & Reliability,
- Freight Movement, and
- CMAQ.

The metrics assigned to the CMAQ program are discussed in **Section 1.7**.

The Fixing America's Surface Transportation (FAST) Act became law in 2016. It influenced the CMAQ program in two important ways. First, it assured the continuation of the CMAQ program by reauthorizing its funding. Second, the FAST Act updated the list of projects eligible to receive CMAQ funding to include emerging technologies, such as vehicle to infrastructure communications systems and equipment. The FAST Act had an extension of one year, which carried it to 2021.

After the FAST Act extension, the Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act (IIJA), was signed into legislation for the fiscal years 2022-2026. This bill provides $550 billion to be used for bridges, road, climate resiliency, safety, mass transit and more. Along with this funding authorization, the BIL designated climate change, sustainability, and equity as national strategic priorities.

1.3 WHAT TYPES OF PROJECTS ARE ELIGIBLE FOR CMAQ FUNDING?

The CMAQ program's funding is distributed as reimbursements for individual projects. To be eligible for reimbursement, a project must satisfy three requirements.

- First, as noted in **Section 1.2.1**, states may only receive reimbursement for projects in areas that are designated as a non-attainment or maintenance areas (areas previously designated at non-attainment) for carbon monoxide, ozone, nitrogen dioxide, and particulate matter.6
- Next, the project must be included in a State Implementation Plan (SIP) that has been approved by the EPA.[7]
- Finally, the project must be likely to contribute to the attainment or maintenance of a NAAQS, whether through the reduction of vehicle miles traveled (VMT), fuel consumption, or other factors.[8]

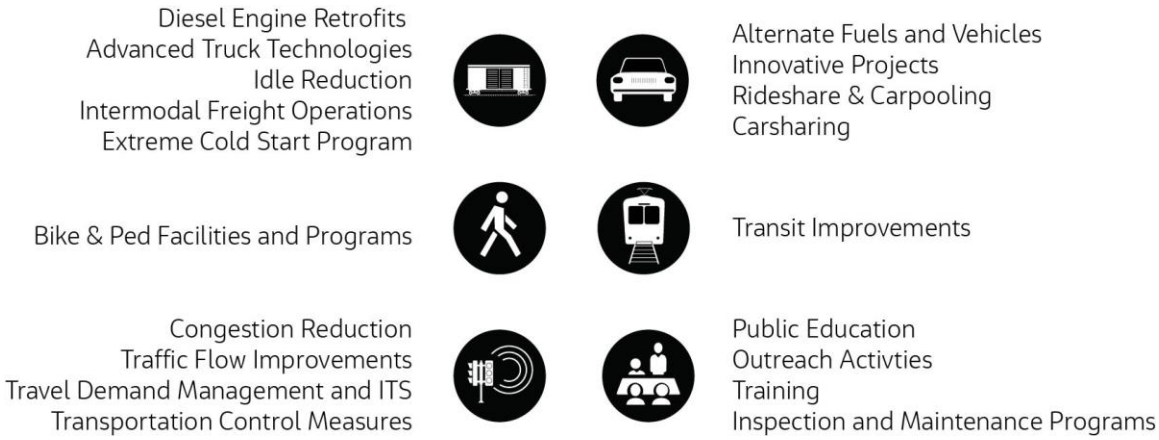
To simplify this screening process, types of projects which meet this requirement are provided in 23 U.S.C. §149 and in FHWA guidance documents. A summary of project categories that are eligible is shown in **Figure 1-1**.

[6] See 23 U.S.C. §149 (b)(1)(A)(i)

[7] See 23 U.S.C. §149 (b)(2)

[8] See 23 U.S.C. §149 (b)(3)

Figure 1-1. Project & Programs Eligible for CMAQ Funding



In its *Congestion Mitigation and Air Quality Improvement (CMAQ) Program 2020 Cost-Effectiveness Tables Update*, FHWA provided additional guidance by identifying and assessing the performance of 21 project types (see **Table 1-3**).

Table 1-3. Project Types Assessed by FHWA for Cost Effectiveness

Project Types	
Park and Ride	Transit Amenity Improvements
Rideshare Programs	Intersection Improvements
Employee Transit Benefits	Roundabouts
Carsharing	Traffic Signal Synchronization
Bikesharing	Incident Management
Electric Vehicle Charge Stations	Heavy-Duty Vehicle Replacements
Idle Reduction Strategies	Diesel Engine Retrofit Technologies
Bicycle and Pedestrian Improvements	Extreme Temperature Cold-Start Technologies
Intermodal Freight Facilities and Programs	Dust Mitigation
Subsidized Transit Fares	Natural Gas Refueling Infrastructure.
Transit Service Expansion	

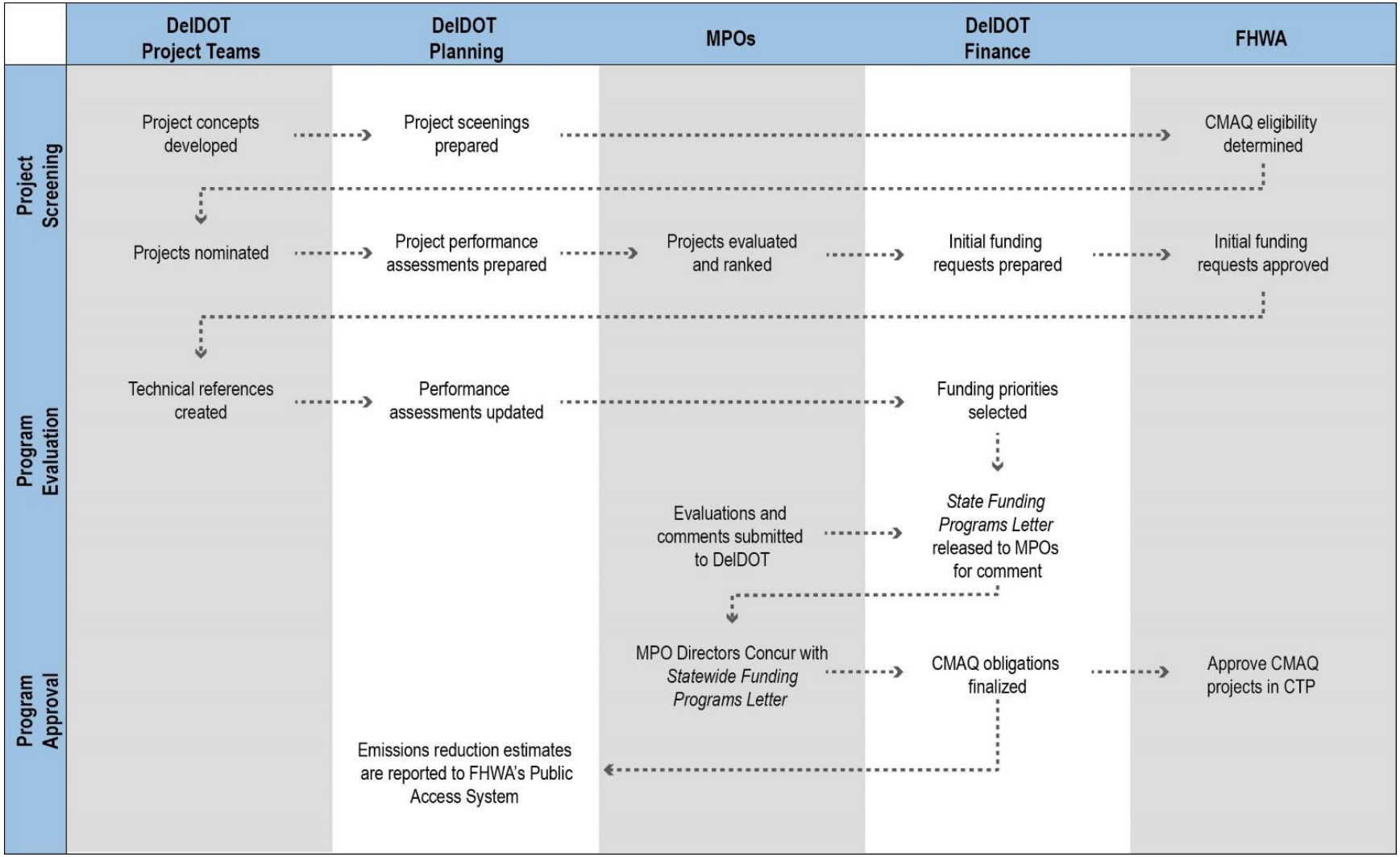
1.4 How Are Projects Selected to Receive CMAQ Funding?

The CMAQ program's funding is distributed as reimbursements for individual projects. For a project to be eligible for reimbursement it must go through a three-step process:

- *Project Screening* – This step involves determining if a project meets the federal requirements for receiving CMAQ funding.
- *Program Evaluation* – This step involves assessing the performance of projects competing for CMAQ funding, gauging the preferences of stakeholders, and selecting funding priorities
- *Program Approval* – This step involves organizing funding priorities into a multi-year sequence that is submitted each year to FHWA for approval.

The steps required to complete each of these steps is shown in **Figure 1-2**.

Figure 1-2. CMAQ Project Selection Process



1.4.1 Project Screening

The project screening process begins when a DelDOT project team meets with staff from DelDOT's Office of Planning. The primary purpose of the meeting is to confirm that the proposed project meets FHWA's three minimum requirements (see **Section 1.3**). Once eligibility has been confirmed, DelDOT's planning staff can work with the project team to prepare a preliminary performance assessment. This preliminary assessment is then paired with an eligibility letter that is transmitted to the Delaware Division of FHWA. The project screening process is complete when FHWA's representative confirms that the proposed project is eligible for CMAQ funding, usually by email. Project screenings are prepared throughout the fiscal year, on as needed basis.

1.4.2 Program Evaluation

The program evaluation process begins when DelDOT project teams prepare the technical references needed for CMAQ performance assessments. CMAQ performance assessments are prepared by DelDOT planners and designed to explain how a proposed project would reduce the emission of air toxins from on-road mobiles sources (*i.e.,* passenger vehicles, buses, and trucks). The content of performance evaluations varies based on the type of project being proposed. Common elements include:

- Maps identifying the project's location,
- A description of the project's scope of work and eligibility for CMAQ funding,
- A prediction of how the proposed project would change traffic characteristics, and
- An emissions reduction estimate.

Once the performance evaluations are complete, they are sent back to DelDOT's Office of Finance and the project teams so that they can be referred to during the remainder of the program evaluation process.

The goal of the program evaluation process is to determine which set of proposed projects should be funded during the next fiscal year. One of the most crucial issues is a project's relationship to other DelDOT actions. For example, the construction of roundabouts and intersection improvements are both project types that are CMAQ eligible and relatively easily integrated into roadway improvement efforts. As a result, both project types can be more efficiently delivered as part of larger facility renovations or capital projects. The installation of transit amenities (*e.g.,* station upgrades and passenger shelters), transit service expansion, and park and ride project types are good examples of actions that can be efficiently integrated into larger transit projects, such as the renovation or expansion of a station or the creation of a new service route.

Two other critical factors are the overall cost of the proposed project and the availability of other funding source. Each fiscal year, the total cost of all the Department's CMAQ eligible project greatly exceeds its annual budget. To focus spending, DelDOT prioritizes projects without other funding options and actions that can be fully funded through the CMAQ program. For example, the cost of replacing heavy-duty vehicles (*e.g.,* snowplows and dump trucks) and transit vehicles often exceeds DelDOT's overall annual CMAQ budget. As a result, DelDOT favors the use of state funds for the purchase of heavy equipment and the Federal Transit Administration's (FTA) Urbanized Area Formula Grants program to support the purchase of new transit vehicles. If the project being considered would take place in New Castle County, DelDOT's prioritization will also consider the air quality score and rank assigned to the action by WILMAPCO's Air Quality Subcommittee. Once all the factors have been considered, DelDOT completes the program evaluation process by releasing the *State Funding Program Letter* to the MPOs each year.

1.4.3 Program Approval

The program approval process begins when the directors of Delaware's MPOs receive the *State Funding Program Letters*. Once they have completed their review, the directors then submit their recommendations to DelDOT for consideration. Once these comments have been reviewed, DelDOT revises the list of proposed CMAQ obligations as needed. This list is then re-circulated to the MPOs. If the MPOs concur with DelDOT's recommended CMAQ obligations for the upcoming fiscal year, DelDOT will prepare the final list of proposed obligations and submits the list to FHWA for approval.

1.5 WHICH TYPES OF CMAQ ELIGIBLE PROJECTS DOES DELDOT FUND?

Over the past decade, DelDOT has invested in 15 project types currently considered eligible for reimbursement through the CMAQ program (see **Table 1-4**).

Table 1-4. CMAQ Project Types Funded by DelDOT

Project Type	Description
Idle Reduction Strategies	These projects involve installing technologies or creating programs which reduce emissions from idling vehicles. In many cases, the effort is focused on reducing the need for heavy trucks to idle at rest areas, travel plazas, and similar facilities.
Diesel Engine Retrofit Technologies	These projects involve installing emission reduction technologies on older diesel engines.
Intermodal Freight Facilities and Programs	These projects that reduce the need for heavy-duty truck trips at freight facilities.
Carsharing	These projects help individuals access vehicles owned and maintained by third parties for intermittent trips.
Incident Management	These projects involve installing equipment or creating programs which allow transportation agencies to re-route drivers when vehicle collisions occur.
Transit Service Expansion	These projects involve expanding the availability of transit services.
Traffic Signal Synchronization	These projects involve adding traffic signals or taking actions which synchronize the operation of existing signals.
Park and Ride	These projects involve constructing parking facilities which can be used by commuters to access transit facilities or participate in ridesharing groups.
Electric Vehicle Charging Stations	These projects involve the construction of facilities that allow electric light duty vehicles to recharge.
Transit Amenity Improvements	These projects involve the installation of equipment that make transit services more attractive to travelers.
Rideshare Programs	These projects involve actions which make rideshare programs more attractive to travelers.
Roundabouts	These projects involve the design and construction of roundabouts.
Bicycle and Pedestrian Improvements Projects	These projects involve the construction of paths, bike parking, crosswalks, and other facilities that support bike and pedestrian travel.
Intersection Improvements	These projects involve improving traffic circulation through an intersection by modifying its physical configuration and signalization.
Employee Transit Benefits & Subsidized Transit Fares	These projects involve incentivizing the use of transit by providing financial incentives directly to travelers. These incentives can come through re-imbursement or reduced fares.
Heavy-Duty Vehicle Replacements	These projects involve the purchase of new heavy-duty vehicles to replace older vehicles with higher emissions rates.

In most cases, the funds used to support these projects are derived from a variety of state and federal sources. Since DelDOT's 2017-2021 Capital Transportation Program (CTP) was published, DelDOT has committed between $396,000,000 to $594,000,000 on projects eligible for reimbursement under the CMAQ program on each of its CTPs (see **Table 1-5**). Note there is some overlap in these figures as each CTP spans multiple years.

Table 1-5. Estimated Expenditures on CMAQ Eligible Projects

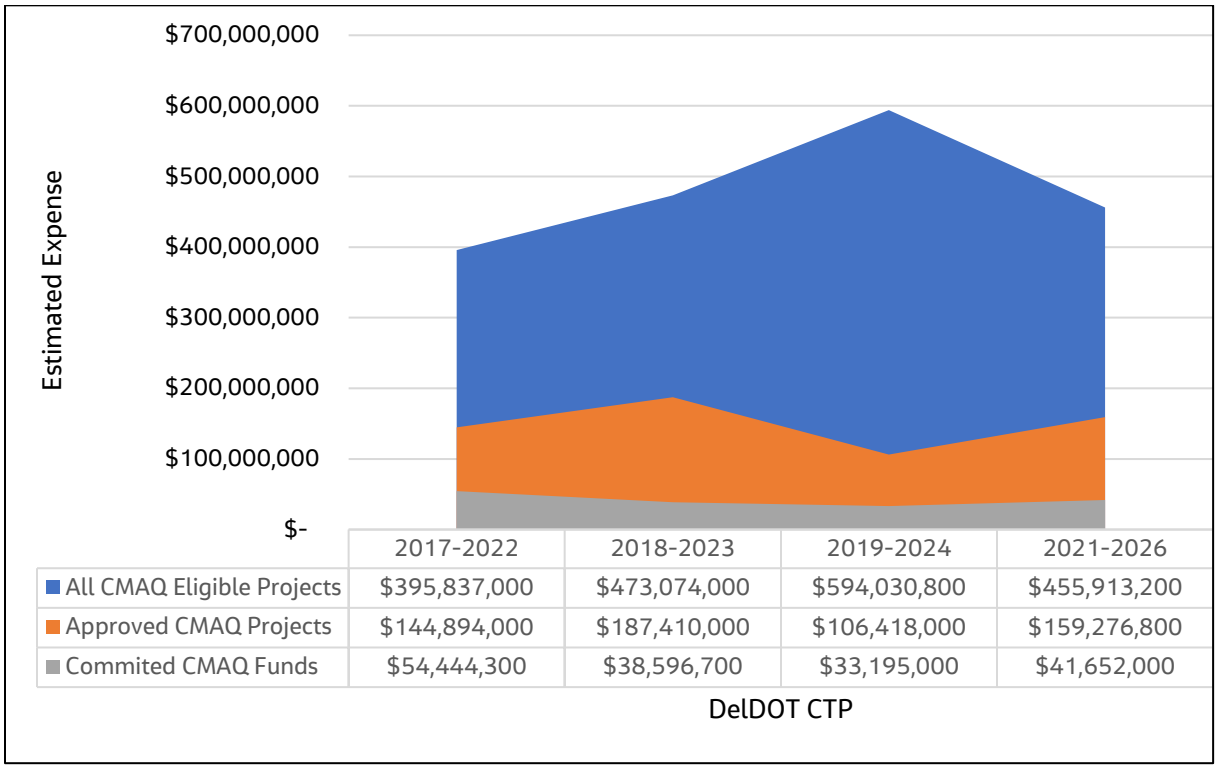
Project Type	Spending on CMAQ Eligible Projects BY CTP (USD)			
	2017-2022	*2018-2023*	*2019-2024*	*2021-2026*
Bicycle and Pedestrian Improvements Projects	132,583,000	189,627,000	166,541,000	200,717,900
Electric Vehicle Charging Stations	-	-	-	1,738,000
Heavy-Duty Vehicle Replacements	142,881,000	171,521,000	115,078,800	86,581,200
Incident Management / Traffic Signal Synchronization	70,000,000	36,875,000	36,875,000	53,868,900
Intersection Improvements	11,900,000	13,550,000	178,583,000	65,336,200
Park and Ride	21,599,000	26,919,000	19,220,000	37,529,000
Rideshare Programs	3,390,000	3,150,000	3,660,000	3,660,000
Roundabouts	7,184,000	9,212,000	-	1,000,000
Traffic Signal Synchronization	3,300,000	3,300,000	3,300,000	-
Transit Amenity Improvements	-	-	70,773,000	1,200,000
Transit Service Expansion	3,000,000	18,920,000	-	4,282,000
TOTAL	**395,837,000**	**473,074,000**	**594,030,800**	**455,913,200**

On average, CMAQ funds accounts for approximately 9.15% of the total funds spent on CMAQ eligible projects (see **Figure 1-3**). These funds have historically been used to support four classes of CMAQ projects:

- Bicycle and Pedestrian Improvements Projects,
- Incident Management and Traffic Signal Synchronization,
- Park and Ride Facilities, and
- Rideshare Programs

The following types of DelDOT projects fall under the above listed classes – Bicycle and Pedestrian improvement projects, Travel Demand Management (TDM) and Intelligent Transportation Systems (ITS), Congestion Reduction and Traffic Flow Improvements, Park and Ride facilities, and Rideshare/Carpool programs. Of the sixteen project types listed in **Table 1-4**, eleven have received funding or are programmed to receive funding through the CMAQ program between fiscal years 2017 to 2026 (see **Table 1-5**).

Figure 1-3. DelDOT Project Expenses for CMAQ Eligible Projects by Funding Source



	2017-2022	2018-2023	2019-2024	2021-2026
All CMAQ Eligible Projects	$395,837,000	$473,074,000	$594,030,800	$455,913,200
Approved CMAQ Projects	$144,894,000	$187,410,000	$106,418,000	$159,276,800
Commited CMAQ Funds	$54,444,300	$38,596,700	$33,195,000	$41,652,000

1.5.1 Bicycle and Pedestrian Improvements

The State of Delaware is committed to promoting walking and cycling as a means of transportation by developing a complete and comfortable network of active transportation facilities. Increasing the availability of multi-use paths, sidewalks, and bike lanes not only helps reduce vehicular traffic (through induced mode-shift), but also supports community building and reduces the number of on-road bicycle accidents.

1.5.2 Travel Demand Management (TDM) and Intelligent Transportation Systems (ITS)

A major part of managing congestion and reducing impacts to air quality is monitoring and managing traffic on the roads. As part of its Integrated Transportation Management System (ITMS) program, DelDOT integrates technology, infrastructure, and people to achieve efficiency and safety goals. By installing equipment, devices, software, and telecommunications systems through innovative ITS strategies, DelDOT can consistently collect data to monitor and direct traffic operations. Travel demand management (TDM) and ITS directly supports the CMAQ Category of Traffic Synchronization and Incident management. These projects consistently support congestion reduction and therefore are a respected and reliable way to reduce emissions throughout the state.

By using technology to monitor and exchange real-time information, DelDOT has developed the ability over the past 25+ years to manage the statewide network through the Transportation Management Center (TMC). The statewide ITS monitoring system collects data that feeds directly to the TMC. This data stream allows extensive information sharing and is used to develop and implement traffic mitigation solutions. Additionally, the agency is home to a connected traffic signal system that has been made possible through fiber optics and telecommunications at all signalized intersections. The system relies on a robust, state-

owned telecommunications network which provides enhanced control of the system and allows for optimization of traffic signal timing for optimum flow. By reducing the amount of stop and go movements and thus creating a more consistent traffic flow, emissions are reduced.

DelDOT's Artificial Intelligence-enhanced Integrated Transportation Management System (AI-ITMS) plays a critical role in mitigating congestion and the impacts of mobile source emissions on Delaware's air-quality. The state-of-the-art system, developed in part using funding awarded by the Advanced Transportation and Congestion Management Technologies Deployment program, uses AI to enable Delaware's traffic signals and traveler information system to detect incidents and changes in traffic volumes and respond in real-time. Deployment of the AI-enhanced system has been focused on three study-corridors; however, continued investment into the program will allow all of Delaware's roads to reap the benefits that come with the predictive transportation management system, including reduced delays, improved reliability, and lowered emissions.

DelDOT continues its research, development, and deployment of the AI-ITMS using both state and federal dollars and was awarded a $5 million grant from the Advanced Transportation Technologies and Innovative Mobility Development (ATTIMD) / Advanced Transportation Technology and Innovation (ATTAIN) programs, created as the successor to the ATCMTD program in the BIL, passed in 2021. The money awarded from the ATTAIN program will be used to help reduce the impact of flooding to Delaware's transportation systems and proactively create plans to respond to flooding. As a coastal state that lies at low elevation, roadway flooding occurs frequently and results not only in damage to facilities but also increased delays and emissions due to lane and road closures.

1.5.3 Congestion Reduction and Traffic Flow Improvements

Another important part of reducing roadway emissions is through the use of traffic flow improvements to reduce congestion. Some examples of traffic flow improvement projects include new traffic signalization, intersection improvements, freeway management and high occupancy lanes. Traffic signalization and intersection projects that reduce vehicle delay can include interconnection and modernization of signals, safety modification improvements to intersection geometry and the installation of fiber optics. In Delaware this is done through traffic signal optimization, signal coordination along corridors and the installation of fiber optics. Each year corridors are prioritized and systemically improved based on recent volumes and roadway conditions. At DelDOT, signal timing timesheets are continuously updated based on ongoing SYNCHRO modeling as well as recent volume and capacity conditions.

1.5.4 Park And Ride Facilities

Park and Ride facilities and enhancements throughout Delaware are funded through the Delaware Authority of Regional Transit (DART) and the Delaware Transit Corporation (DTC). These facilities are located throughout the state to encourage use of transit and/or to meet a carpool or vanpool. As of March 2022, there were approximately 38 Park and Ride facilities located throughout the state and 12 Park and Pool lots. Park and Pool lots are often located at existing parking lots to encourage carpool or vanpools, while Park and Ride lots are often parking lots associated with specific transit routes. Additional information including locations of Park and Ride facilities and their associated transit routes are available on DART's website.[9] Although there were no CMAQ obligated Park and Ride projects during Fiscal Year 2023, Park and Ride projects have been present in the CTP throughout the past five years funded with both state and federal dollars.

[9] https://dartfirststate.com/RiderInfo/park-and-ride/pdfs/pnr_current.pdf?050820

1.5.5 Rideshare & Carpooling

The rideshare and carpooling initiatives funded through DelDOT's CMAQ program are administered by Delaware Commute Solutions (DECS). DECS is a branch of DART focused on reducing the number of single occupancy vehicles (SOVs) on Delaware's highways. DECS works towards this goal by promoting "clean commuting" practices. These practices include:

- Utilizing local or regional transit services,
- Carpooling & vanpooling,
- Walking or biking to work,
- Teleworking, and
- Adopting alternative works schedules (*i.e.* a compressed work week and flexible start times)

DECS promotes the adoption of clean commuting practices by helping commuters find rideshare partners, arranging rides home in the case of unexpected events, and providing rewards to participants who record their trips. In addition, DECS conducts targeted worksite-based outreach and offers an employer partnership program. The partnership program assists employers by scheduling on-site promotional events for DECS, helping employees identify commuting options, and establishing pre-tax transit and vanpool benefit programs. To learn more about DECS and the full scope of services it provides, please visit https://delawarecommutesolutions.org/.

1.6 How Does DelDOT Decide Which Projects to Support Using CMAQ Funding?

The process of determining which project types receive CMAQ funding is governed by many factors, including their relationship to other DelDOT actions, the availability of alternative funding sources, the program's overall annual budget and other benefits such as reduction in fuel consumption and improving safety. In some cases, the individual project or program cost are well above the yearly CMAQ apportionment, therefore CMAQ funds are used for other projects that can cover the cost of complete projects. Roundabouts and intersection improvements are often an eligible CMAQ category that can be easily integrated into DelDOT's roadway improvement efforts, and therefore are often funded as part of larger facility renovations or capital projects. The transit amenity improvement, transit service expansion, and park and ride project types are good examples of actions that can be efficiently integrated into larger transit projects, such as the renovation or expansion of a station or the creation of a new service route. Diesel engine retrofit technologies and heavy-duty vehicle replacement are both project types consistently funded using state funds based on part by elected officials including Delaware's legislature.

When CMAQ eligible projects are developed that are not funded by separate initiatives or sources, DelDOT works with Delaware MPOs to determine which project should seek reimbursement through the CMAQ Program. This process is illustrated in **Figure 1-2**.

The process begins with DelDOT project managers and group leaders identifying high priority projects and providing references materials which describe: the proposed scope of work, cost to construct, and project delivery timelines. The project materials are then submitted to DelDOT's Office of Finance so that preliminary programming sequences (*i.e.*, expense forecasts) can be developed. The ranking of projects located in New Castle County is informed by the results of the WILMAPCO Air Quality Subcommittee prioritization process. Kent County is currently updating their long-range plan and is hoping to identify CMAQ eligible projects in this plan. At present, Sussex County does not generate a list of projects seeking CMAQ funding. While the funding sequences are being developed, the list of projects being assessed is transmitted to the MPOs for their review. The initial programming sequence is then refined to ensure successful initiation and completion of projects. The Statewide Funding Program letter is then issued

(typically in May or June) by the Director of Finance to each MPO's executive director. Final coordination then occurs between DelDOT and the executive directors to obtain concurrence for final statewide funding.

1.7 How Does FHWA Measure the Performance of the CMAQ Program?

FHWA uses three criteria to measure the efficacy of the CMAQ Program: Peak Hour Excessive Delay (PHED), Non-Single Occupancy Vehicle (Non-SOV) Travel, and Total Emissions Reduction. Every four years, FHWA requires that states use these metrics to establish baseline, two-year, and four-year performance targets for their CMAQ programs. These measures apply only to those roadways which fall within the jurisdiction of the FHWA's National Performance Measure program. 23 CFR 490.503 defines these roadways as "those portions of the mainline highways on the NHS [National Highway System]". The extent of the National Highway System in Delaware is shown in **Figure 1-4** .

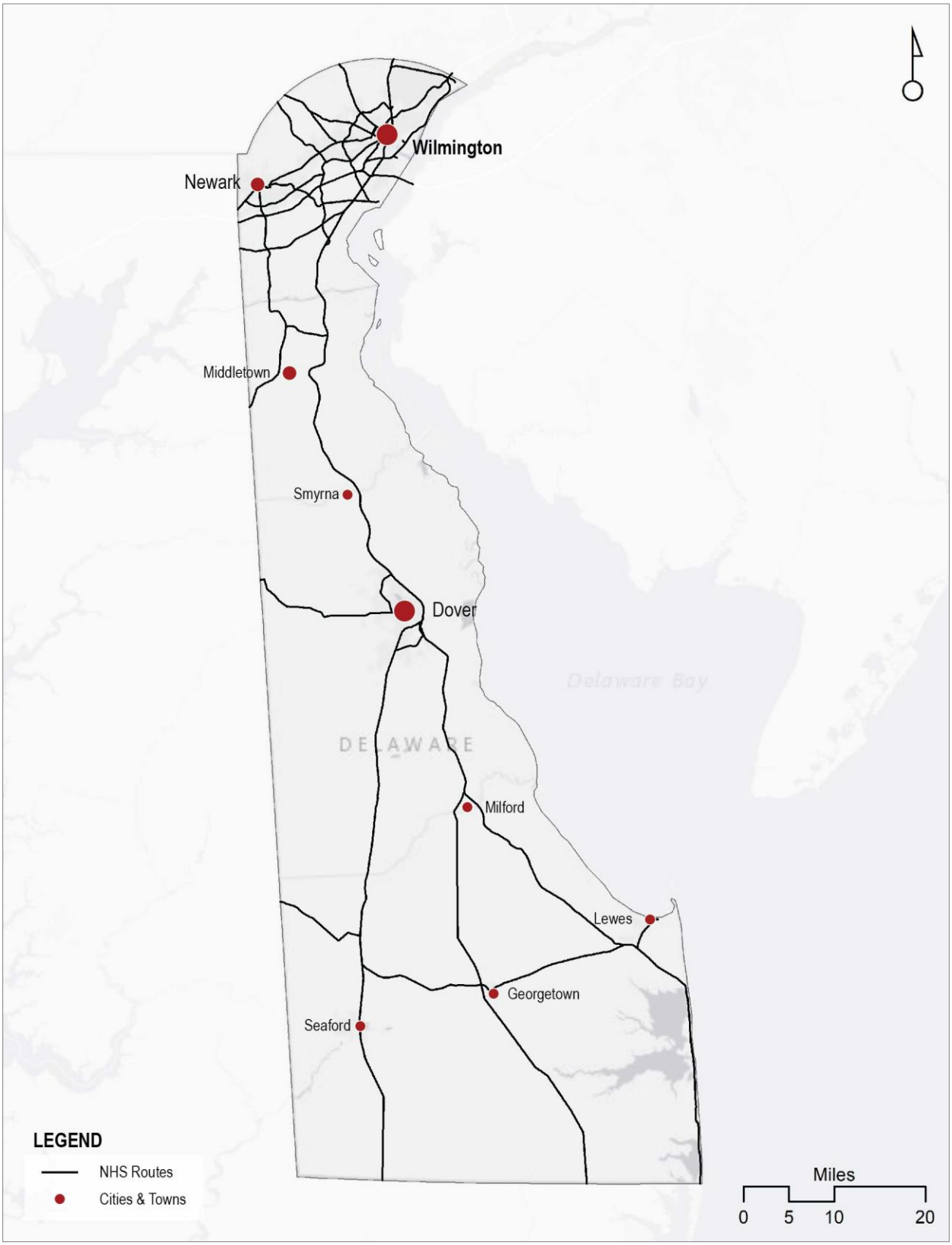
1.7.1 PHED (Peak Hour Excessive Delay)

23 CFR 490.705 defines excessive delay as "*the extra amount of time spent travelling through the National Highway System when speeds dip below a normal delay threshold during peak travel demand periods*." This metric is important because congestion exacerbates the air quality impacts typically generated by on-road vehicles.

For the purposes of this rule, the normal delay threshold is specified as either 20 miles per hour (MPH) below or 60 percent of the posted speed limit (whichever is greater). The peak period is defined in 23 CFR 490.705 CFR as weekdays from 6 AM to 10 AM, and either 3 PM to 7 PM, or 4 PM to 8 PM. State DOTs may choose either. This performance metric is applicable only to urbanized areas that:

- Include portions of the NHS,
- Have a population of at least 200,000 persons, and
- Are designated as non-attainment or maintenance areas for the NAAQS associated with on-road mobile source emissions.

Figure 1-4. NHS Routes in Delaware



The term urbanized area refers to urban areas with populations greater than 50,000 (USCB 2019). [10] Since the urbanized areas delineated by the U.S. Census Bureau often cross state and local government boundaries, the PHED performance measure is often set and assessed cooperatively by multiple agencies. Based on the 2020 Decennial Census, Delaware contains three urban areas: Dover, Salisbury, and Philadelphia. Of these three, only the Philadelphia Urbanized Area meets the population criterion. Currently the Philadelphia Urbanized Area is in nonattainment for ozone and is designated as a maintenance area for $PM_{2.5}$ under the 1997 and 2006 standards (EPA, 2020b).

1.7.2 Non-SOV Travel

23 CFR 490.101 defines non-SOV travel as "*any travel mode other than driving alone in a motorized vehicle (i.e., single occupancy vehicle or SOV travel), including travel avoided by telecommuting*". This metric is important because it allows agencies to measure the effectiveness of actions taken to promote ridesharing and travel demand management.

1.7.3 Total Emissions Reduction

23 CFR 490.807 defines the total emission reduction measure as the "*cumulative reported emission reductions, for all projects funded by CMAQ funds, of each criteria pollutant and applicable precursors under the CMAQ program for which the area is designated nonattainment or maintenance*." This metric is important because it directly assesses air quality conditions. Currently, all three counties in Delaware (New Castle, Sussex, and Kent) are designated as nonattainment or maintenance areas under the NAAQS (See Table 1-2). All three are in non-attainment for the 1997 8-hour ozone standard. New Castle County is in non-attainment for 8-hour ozone levels under the 2008 and 2015 standards, and in maintenance for $PM_{2.5}$ under the 2006 standard. Sussex County is in non-attainment for 8-hour ozone levels under the 2008 standard.

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[10] In the 2020 decennial census, the urbanized area geography was abandoned in favor of a more inclusive geography referred to as urban area. The urban area geography includes any jurisdiction or conglomeration of multiple jurisdictions that contain a population of 5,000 persons or more. Since 23 CFR § 490.703 stats that the PHED measure only applies to urbanized areas with populations of at least 200,000, the Census Bureau's adoption of the urban area geography does not change DelDOT's reporting requirements.

2.0 METHODS – PERFORMANCE BASELINE AND TARGETS

This section of the Annual CMAQ Report discusses the process DelDOT used to calculate its baseline, two-year, and four-year performance targets. In addition to key technical procedures, this discussion reviews some of the finer details of CMAQ's regulatory and programmatic context. This section will help define:

- Regulations which guide the goal setting process,
- The steps taken to calculate the PHED, non-SOV, and Total Emissions Reductions performance targets, and
- How DelDOT's performance goals are reported to FHWA and the public.

2.1 How Did DelDOT Calculate its Baseline Performance Estimates?

Each of the CMAQ performance measures are identified directly in FHWA's TPM regulations (23 CFR 490). These regulations describe the procedures that state and local agencies should follow to set its baseline estimates and future performance targets. The baseline performance estimates are meant to reflect existing network conditions, regardless of the funding sources used to create the facilities. Conversely, the two- and four-year performance targets should reflect only the changes in network conditions caused by CMAQ - funded projects.

2.1.1 PHED

As required in 23 CFR 490.105, the baseline PHED target was established cooperatively by all the State DOTs and MPOs which contain any portion of the Philadelphia Urbanized Area's highway system. The group includes the following agencies:

- Pennsylvania Department of Transportation (PennDOT)
- Delaware Department of Transportation (DelDOT)
- New Jersey Department of Transportation (NJDOT)
- Maryland Department of Transportation (MDOT)
- The four associated FHWA field offices (one for each state) and
- seven MPOs (DVRPC, NJTPA, SJTPO, WILMAPCO, LVTS, RATS and LCTCC)[11]

The PHED measure requires that agencies use five statistics to describe the level of delay experienced on each segment of the NHS that fall within their jurisdiction. These statistics are:

- Length of each roadway segment,
- Time it takes to travel through each segment during the peak demand period (reported in 15-minute increments),
- Number of vehicles travelling through each segment (reported in 60-minute increments),
- Daily average classification of vehicles travelling through each segment, and
- Annual average vehicle occupancy rate for cars, busses, and trucks travelling through.

The travel time statistic must be reported for all segments of the NHS regardless of the level of congestion they experience. The traffic volume, classification, and vehicle occupancy statistics are reported for those segments of the NHS where excessive delay occurs. The formula for determining the occurrence of excessive delay is established in 23 CFR 490.711 and is shown below in **Equation 1**.

[11] DVRPC (Delaware Valley Regional Planning Commission), NJTPA (New Jersey Transportation Planning Authority), SJTPO (South Jersey Transportation Organization), WILMAPCO (Wilmington Area Planning Council), LVTS (Lehigh Valley Transportation Study), RATS (Reading Area Transportation Study) and LCTCC (Lancaster County Transportation Coordinating Committee)

Equation 1. Excessive Delay Threshold

$$\text{Excessive Delay Threshold Travel Times} = \left(\frac{\text{Travel Time Segment Length}_s}{\text{Threshold Speed}_s}\right) \times 3{,}600$$

Where:

Excessive Delay Threshold Travel Times = the time of travel, to the nearest whole second, to traverse the Travel Time Segment at which any longer measured travel times would result in excessive delay for the travel time segment

Travel Time Segment Lengths = total length of travel time segment to the nearest thousandth of a mile for travel time reporting segment; and

Threshold Speeds = the speed of travel at which any slower measured speeds would result in excessive delay for travel time reporting segment "s" As defined in § 490.705, the speed threshold is 20 miles per hour (mph) or 60 percent of the posted speed limit travel time reporting segment "s," whichever is greater.

The baseline PHED performance target was calculated using existing traffic operation datasets collected by DelDOT and the other transportation agencies in the working group. The two- and four-year performance targets were calculated by multiplying the baseline performance estimate by an annual growth rate of 0.06%.

2.1.2 Non-SOV

As is the case for PHED, the Non-SOV travel performance measure is only calculated for urbanized areas that meet two criteria. They must contain at least a million people and be designated (in part or wholly) as nonattainment or maintenance areas for the NAAQS associated with on-road mobile source air pollution. As noted previously, the Philadelphia Urbanized Area is the only one within Delaware that meets these criteria. The interagency working group for the non-SOV measure is identical to the one listed in **Section 2.1.1**.

23 CFR 490.713 provides reporting agencies three methods for calculating the non-SOV travel performance measure:

- Method A – American Community Survey
- Method B – Local Survey, and
- Method C – System Use Measurement

From this list, the interagency working group selected Method A. The American Community Survey (ACS) is an ongoing program administered by the U.S. Census Bureau that collects demographic information on a wide variety of subjects, including employment, educational attainment, housing, and commuting practices.

The ACS estimates the number of persons who commute alone by asking persons of working age (at least 16 years old) how they commute to work. This statistic is reported in *Census Table B08301: Means of Transportation to Work*.[12] The DelDOT Non-SOV Performance Measure is calculated from the statistics reported in this table using **Equation 2**.

[12] Census Table B08301 can be retrieved from https://data.census.gov

Equation 2. Non-SOV Percentage

$$\text{Percent of Non-SOV Travel} = 100\% - \%\ \text{SOV}$$

Where:

Percent of Non-SOV Travel = percent of the commuting working population, to the nearest tenth of a percent, that predominantly does not commute by driving alone in a car, van, or truck, including travel avoided by telecommuting.

% SOV = percent estimate for "Car, truck, or van - drive alone" as identified in Census Table B08301

The baseline rate of non-SOV travel with this geography was established using commuting statistics provided by the 2012-2016 ACS 5-year dataset. The two- and four-year performance targets were established cooperatively by the interagency working group identified in **Section 2.1.1**.

2.1.3 Total Emissions Reduction

Unlike the PHED and Non-SOV measures, the total emissions reduction measure is focused exclusively on changes in air quality conditions caused be CMAQ projects. As a result, the regulations which guide the reporting process do not lay out a process of establishing baseline performance estimates. Instead, states are only required to set two- and four-year performance targets.[13] The process for calculating these targets includes two steps. First, the emission reduction generated by individual CMAQ-funded projects is estimated by determining how vehicular traffic characteristics would change after the proposed improvements are completed. These estimates are then completed using a mix of statistical tools, including the FHWA's CMAQ Emission Calculator Toolkit. The Toolkit is comprised of a series Microsoft Excel © workbooks which allow users to generate emission reduction estimates with a small set of data inputs. Currently, DelDOT uses the workbooks developed for bicycle & pedestrian improvements, carpooling & vanpooling, and adaptive traffic control systems. For more information how the components of the CMAQ Emission Calculator Toolkit were created and how they work, please refer to the training materials provided by FHWA at: https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/. The second involves calculating the Total Emission Reduction Measure. This is done by summing the emissions generated by individual CMAQ-funded projects. The formula used to complete this calculation is shown in **Equation 3**.

[13] See 23 CFR §490.15(e)(9)

Equation 3. Sum of Total Emission Reductions

$$\text{Total Emission Reduction}_p = \sum_{i=1}^{T} \text{Daily Kilograms of Emission Reductions}_{p,i}$$

Where:

i = applicable projects reported in the CMAQ Public Access System for the first two Federal fiscal years of a performance period and for the entire performance period

p = criteria pollutant or applicable precursor: $PM_{2.5}$, PM_{10}, CO, VOC, or NO_x;

Daily Kilograms of Emission Reductions$_{p,i}$ = total daily kilograms, to the nearest one thousandth, of reduced emissions for a criteria pollutant or an applicable precursor "p" in the in the first year the project is obligated.

T = total number of applicable projects reported to the CMAQ Public Access System during the reporting period.

Total Emission Reduction$_p$ = cumulative reductions in emissions over two and four Federal fiscal years, total daily kilograms, to the nearest one thousandth, of reduced emissions for criteria pollutant or precursor "p."

This summation is calculated for each fiscal year, and then for the two- and four-year targets.

2.2 How Did DelDOT Report its Performance Baselines and Targets?

The performance assessment framework established through MAP-21 requires reporting agencies to set goals for themselves at the onset of each four-year performance period.[14] The current CMAQ performance cycle goes from FY22-FY25. DelDOT has submitted their Baseline Targets for the current CMAQ period with last cycle's Full Performance Period Progress Report in October of 2022. Their next submission will be the Mid Period Performance Report due on October 1st, 2024, as per the recent 23 CFR 490.107 requirements. The targets set by DelDOT can be accessed through FHWA's TPM reporting dashboard (https://www.fhwa.dot.gov/tpm/reporting/state/), which shows the performance and target data from all 50 states, Washington D.C., and Puerto Rico. More recently, DelDOT republished the baseline and performance targets through the Mid-Period Performance Report. The following section discusses the targets DelDOT established in its current Baseline Performance Period Report for the CMAQ program.

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[14] See 23 CFR 490.105.

3.0 METHODS – PROJECT LEVEL EMISSION REDUCTION ESTIMATES

As noted in **Section 2.1.3**, the total emission reduction performance targets are calculated by estimating the benefits of individual CMAQ funded projects. To simplify the tracking of these projects, FHWA has created the CMAQ Public Access System (PAS).[15] 23 CFR § 409.809 requires that each state "*enter project information into the CMAQ project tracking system for CMAQ project funded in the previous fiscal year by March 1st of the following fiscal year; and extract the data necessary to calculate the total emissions reduction measure as it appears in the CMAQ Public Access System on July 1st for projects obligated in the prior fiscal year*."

The projects reported to CMAQ PAS are organized by state and year. Individual project records store a variety of project data-fields, regarding project location, description, duration, and reporting category. Every project submitted to PAS must be classified as either a qualitative or quantitative entry. Projects that are reported as quantitative assessments also contain emission benefits estimates (expressed in kilograms per day). The following section describes the methods used by DelDOT to date, which describes the methods used by DelDOT to estimate the benefits of bike and pedestrian improvements.

3.1 BICYCLE AND PEDESTRIAN IMPROVEMENTS

3.1.1 CMAQ Emissions Calculator Toolkit – Data Collection

DelDOT's process of estimating the emission reductions generated by bicycle and pedestrian improvements is based on FHWA's Bicycle and Pedestrian Improvements Workbook (a component of the CMAQ Toolkit). To complete the Workbook, technicians must enter or select four variables. These variables are listed and described in **Table 3-1**.

Table 3-1. Inputs for Bicycle and Pedestrian Improvements Workbook

User Input	Units	Description
Project evaluation year	-----	The year the project is fully implemented. For example, if construction begins in 2023 and concludes in 2025, the evaluation year is 2025.
Daily individual motorized trips by mode	One-way trips	This variable represents the number of trips taken by passenger vehicles before and after the project. The difference represents the number of diverted trips (shift from motorized vehicle trips to non-motorized trips) because of the project.
One-way trip distance type	-----	This drop-down menu allows the user to select either "Average" or "Distribution" as the one-way trip distance type used to derive subsequent VMT estimates. Selecting the "Average" option means that the workbook will calculate the emission benefit assuming a uniform distance for all the trips converted from vehicular travel to active travel. Selecting the "Distribution" option means that the workbook will calculate the emission benefit assuming the distance for the converted trips varies according to a distribution entered in field 3b.
Typical trip distance	Miles	If the user selected "Average" in field 3a, the user must either enter their own mean trip distance or select the national average. If the user selected "Distribution" in field 3a, the user could enter their own distribution or use the national average trip distribution provided by the tool.

Sources: (FHWA, 2020c)

[15] The CMAQ PAS can be accessed through this url: https://fhwaapps.fhwa.dot.gov/cmaq_pub/

The national average trip distance provided in the workbook as a default value for item 3a is 2.494 miles. The national average trip distribution provided as a default setting for item 3b is provided in **Table 3-2**.

Table 3-2. Distribution of Trip Distances

Trip Distance Range (miles)	% of All Trips
x < 1	19.90
1 ≤ x < 2	20.40
2 ≤ x < 3	21.30
3 ≤ x < 4	17.20
4 ≤ x ≤ 5	21.20
Total	100.00

Source: (FHWA, 2019b)

As indicated in **Table 3-1**, the evaluation year was selected for each project based on when construction is predicted to end. If construction has already been completed, then 2021 was selected as the evaluation year. The daily individual motorized trips by mode were defined using DelDOT's 2019 annual average daily traffic (AADT) estimates (DelDOT, 2019).[16] Parallel routes were selected based on their proximity and orientation to the project limits. The reduction in AADT caused by the project was estimated using the *Methodology for Assessing the Benefits of Active Transportation Projects* published by the Trust for Public Lands (Rose & Chose, 2016) and is described in **Section 3.1.2**.

3.1.2 AADT Reduction Estimation Method

The Trust for Public Land's method uses a combination of transportation and land use characteristics to estimate the number of vehicular trips that will be completed on foot or on a bicycle per year after a proposed project is completed. This conversion of trips from one form of transportation to another is referred to as mode-shift. The conversion is calculated based on the formula shown in **Equation 4**.

Equation 4. Induced Mode-Shift from Vehicular Travel to Active Transportation

$$VT_{B,P} = (BIKE \times D \times AADT \times [A+C]) + (PED \times D \times AADT \times [A+C])$$

Where:

$VT_{B,P}$ = The annual vehicle trips reduced due to bicycling and walking

AADT = The average annual daily traffic (2019), as reported in DelDOT's ArcGIS online statewide traffic database

D = the number of days a year when the facility would be open per year.

A = *Mode Shift Adjustment Factor*. This variable is used to determine what percentage of the AADT will be converted into pedestrian and cyclist trips. Technicians determine the value of *A* by estimating the existing AADT on the parallel route, the length of the proposed facility, and the presence of a university nearby (see **Table 3-3**).

BIKE = A binary variable used to indicate if the project has as bicycle component

PED = A binary variable used to indicate if the project has a pedestrian component

C = *Activity Center Credit*. The value of the credit is determined by the number of activity centers within a 0.25 and 0.50-mile buffer around the project limits (see **Table 3-4**).

[16] The 2019 dataset is still being utilized because the emergence of the COVID-19 Pandemic altered traffic patterns to a degree that DelDOT has determined that counts taken during that period are not reliable estimates of typical traffic conditions.

The possible values for the mode-shift adjustment factor (*A*) are show in **Table 3-3**. The Trust for Public Land recommends classifying a project as being in a university area if the surrounding town or city has a population under 250,000. Since the method does not establish a maximum distance from university facilities or housing, this active transportation trend article published by the Transportation Research Board (Kuzmyak & Dill, 2012) was referenced. This article discusses the results of the 2009 National Household Transportation Survey which found that pedestrian and bicycle trips to school averaged between 0.6 and 1.6 miles in length, respectively. Based on these findings, DelDOT defined the university areas as lands within 1 mile of a primary university facility (*e.g.,* student housing, an instructional building, or a recreational facility).

Table 3-3. Adjustment Factor (A) by AADT, Facility Length, and Presence of University Area.

AADT on Parallel Roadway	Facility Length (mi)		
	x < 1	1 ≤ x ≤ 2	2 < x
Non- University Area			
12,000	0.0019	0.0029	0.0038
24,000	0.0014	0.002	0.0027
30,000	0.001	0.0014	0.0019
University Area			
12,000	0.0104	0.0155	0.0207
24,000	0.0073	0.0109	0.0145
30,000	0.0052	0.0078	0.0104

The possible values for the activity center credit (*C*) are shown in **Table 3-4**. The *Methodology for Assessing the Benefits of Active Transportation Projects* provides a list of facilities that qualify as an activity centers. This list includes banks, churches, health-care centers, transit stations, offices[17], post offices, public libraries, shopping areas[18], grocery stores, and colleges, as well as other significant destinations (Rose & Chose, 2016). Maps were created for each project to show the 0.25- and 0.5-mile buffers and the location of the activity center within them. Online listings and aerial imagery were used to identify activity centers.

Table 3-4. Activity Center Credits (C) by Number of Activity Centers and Distance from the Project Limits

Number of Activity Centers	Within 0.5 mile of the Project	Within 0.25 mile of the Project
<3	0.000	0.000
3	0.0005	0.001
4-6	0.001	0.002
>6	0.0015	0.003

Once the values of each of the six variables were defined and the annual vehicle trips reduced due to bicycling and walking was calculated, one final conversion was needed. Since the CMAQ Toolkit uses changes in AADT, the total annual trips reduced was divided by 365 to obtain the value of AADT reduction. Once all the user inputs identified in **Table 3-1** were collected, the values were entered into a copy of the CMAQ Toolkit.

[17] Major employment centers, such as warehouses, factories, and processing plants were classified as offices.

[18] The identification of shopping areas varied based on the surrounding level of development. In urban areas with numerous commercial districts, a development needed to contain a shopping mall or at least two large anchor tenants (i.e. big-box stores, such as Lowe's or Walmart) to be considered a shopping area. In rural areas with very few commercial retailers, smaller "strip malls" (*i.e.* retail developments composed of two or more small venues) were classified shopping areas.

3.2 CARPOOLING AND VANPOOLING

3.2.1 CMAQ Emissions Calculator Toolkit – Data Collection

The process of estimating the emission reductions generated by its rideshare program is based on FHWA's Carpooling and Vanpooling Workbook. The Workbook is comprised of two parts, one for assessing carpooling programs and one for vanpooling programs. Since Delaware Commute Solutions (DECS) is designed to support ridesharing amongst individuals driving their own personal vehicles, only the carpooling component was utilized for this annual report. To complete the carpooling component of the Workbook, technicians must enter values for nine variables. These variables are listed and described in **Table 3-5**. The steps to generate the input values is discussed in **Section 3.2.2**.

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Table 3-5. Inputs for Carpooling Workbook

User Input	Units	Default Value	Description	Data Source
Project evaluation year	-----	-----	This variable is the fiscal year associated with the program statistics being reported.	AgileMile Report Term
Are the pick-up/drop-off locations centralized?	Yes / No	-----	This variable indicates if the rideshare trip program operated between designated origins and destinations (See Item 2a).	None; this variable was not used
Average distance participants drive to central pick-up/drop off locations	Miles	-----	This variable is used if the technician selects "Yes" to Workbook Item 2. It captures the roundtrip distance between the centralized pick-up and drop-off locations.	None; this variable was not used
Population of Commuting workers	Commuters	-----	This variable is used to assess the rideshare program based on the number of participants. The estimate entered for this field can be a state-wide statistic or a count which reflects a certain subset of the population (*i.e.,* an employer's workforce)	FY2023 AgileMile Enrollment[1]
Number of Participating Vehicles	Vehicles	-----	This variable is used if the technician wishes to assess the program based on the number of vehicles participating in the program.	None; this variable was not used
Percent of Commuters Participating in the Program	% of Commuters	9.4%	This variable is used to estimate the total number of program participants based on an estimated participation rate. The default value is a national average.	FY2023 AgileMile Enrollment[2]
Average number of persons per carpool vehicle	Vehicles	1	This variable represents the average number of persons riding in each carpool vehicle, other than the driver.	AgileMile - Average Vehicle Occupancy Statistic[3]
Average Commute Distance	Miles	36.8	This variable represents the average distance travelled by carpool vehicles over the course of a working day (*i.e.* daily roundtrip mileage).	AgileMile - Average Trip Distance Statistic[4]

Sources: (FHWA, 2020c)

[1]Enrollment refers to the number of persons who signed up as new members from July 2022 through June 2023, and reported rideshare trips

[2]Since the population of commuting workers included only known program participants,100% was entered into this field.

[3]AgileMile's vehicle occupancy statistic does not count the driver.

[4]AgileMile's average trip distance statistic reflects one-way travel

3.2.2 Rideshare Program Statistics

The statistics entered into the Carpooling and Vanpooling Workbook were derived from the Delaware Commute Solutions' program tracking application. The application is hosted by AgileMile, a company which specializes in software for administering public travel demand management programs. [19] To participate in the program, individuals must download the application onto their smartphones and enter basic information about their commuting habits. Once enrolled, program participants can use the application to log their commutes statistics (including the number of persons travelling with them).

The AgileMile platform provides a dashboard which allows clients to examine the activity of the program's participants, track enrollment, and generate program summaries. The rideshare portion of these summaries provides statistics on the:

- Number of trips recorded
- Average trip distance
- Average vehicle occupancy
- Reduced trips and
- Reduced VMT.

Since the Total Emissions Reduction Performance Measure is focused on the air quality improvements generated by new efforts (rather than pre-existing or baseline conditions), the performance assessment is based on only those users who enrolled during July 2022 to June 2023. **Table 3-5** identifies how the performance characteristics of this group were used to generate the inputs discussed **Section 3.2.1**.

3.3 ITS STATISTICS

DelDOT's process of estimating the emission reductions generated by its FY23 transportation management improvement projects is based on FHWA's Adaptive Traffic Control Systems (ATCS) Workbook. Although the ITS devices being deployed will not be utilized to establish ATCS, the workbook was designed to allow an estimate of the emission reductions generated when devices are deployed with the goal of travel delay across the corridor. It is important to note that the devices being deployed will not be utilized to establish ATCS but will be used to collect and transmit information to increase device connectivity and support programs such as the AI-ITMS program. This program is designed to analyze the transportation network data in real-time, predict and detect traffic anomalies, alert operators, and automate the best response to incidents statewide. Faster response time will result in better roadway operations which will reduce overall emissions. This workbook was chosen since the input parameters used to estimate emission reductions are identical to those needed to assess the proposed ITS investments. A list of the input parameters is provided in **Table 3-6**.

[19] https://agilemile.com/

Table 3-6. Inputs for ATCS Workbook

User Input	Units	Description	Data Source
Project Evaluation Year	-----	The year the project is fully implemented. For example, if construction begins in 2023 and concludes in 2025, the evaluation year is 2025.	Current project schedule
Area Type	-----	This variable is used to define the development environment surrounding the target roadway	DelDOT Gateway – Urbanized Area Layer [1]
Corridor Length	Miles	This variable establishes the length of the corridor being affected by the proposed improvements	DelDOT Gateway – Traffic Counts Layer [1]
Number of Signalized Intersections	-----	This variable is used to determine the number of intersections affected by the proposed system. This field is only needed if there is no estimated delay reduction. Since the estimated delay reduction values for the target corridors have been determined, this field was not utilized.	None; this field was not used
Total Peak Hours per Day (AM+PM)	-----	Since DelDOT's delay reduction estimates were based on average daily conditions, 24 hours were assigned to the peak traffic field.	Based on August 2023 Funding request[2]
Free-Flow Speed or Posted Speed Limit	MPH	This variable is used to define the speed at which vehicles operate during normal conditions.	DelDOT Gateway – Speed Limits Layer [1]
Total Volume on Corridor	Vehicles / Hour	This variable defines the average hourly traffic during peak and non-peak travel demand hours.	DelDOT Gateway – Traffic Counts Layer [1]
Existing Corridor Delay	Seconds / Vehicle	This variable is used to define the average amount of delay during peak and non-peak conditions. Since DelDOT's delay reduction estimates were based on average daily conditions, only the peak traffic field was used.	Existing sensors and traffic simulations [2]
Truck Percentage	-----	This variable defines the average number of heavy trucks which are traveling through the target roadway during peak and non-peak periods however, due to the nature of this analysis, a 24 hour average was used. Since DelDOT's delay reduction estimates were based on average **daily** conditions, only the peak traffic field was used. based on the TPG type identified in DelDOT's Gateway system.	DelDOT 2022 Vehicle Volume Summary [3]
Custom Delay Reduction Option	-----	This field is a checkbox that allows the user the option of overriding the workbook's average delay reduction formulas and enter their own estimate.	None
Corridor Delay Reduction Per Vehicle	Seconds / Vehicles	This field allows the technician to define the amount of average travel delay that will be eliminated because of the proposed improvement	Based on August 2023 Funding request [2]

Sources: (FHWA, 2020c)

[1] https://deldot.gov/Programs/gate/index.shtm

[2] *FY23 CMAQ Funding Request (08.27.2021) which used delay from existing sources.*

[3] https://deldot.gov/Publications/manuals/traffic_counts/pdfs/2020/2020%20Vehicle%20Volume%20Summary%20Book%20Introduction.pdf?cache=1644246310483

Adapting the ATCS Workbook to support DelDOT's ITMS program required a shift from the standard use in in two ways:

- Average hourly traffic volumes were used in lieu of non-peak and peak hour estimates; and
- Separate workbooks were created for each direction of travel.

Average hourly traffic conditions were used in lieu of peak and non-peak estimates because the predicted delay reduction due to the ITS system is based solely on average daily conditions. Separate workbooks were created for direction of travel because, on many of the target corridors, the existing travel delay varied substantially depending on the direction of travel. Creating separate worksheets was therefore seen as a way to increase the accuracy of the emission reduction estimate.

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4.0 RESULTS

DelDOT's FY2023 CMAQ program included five obligated programs (see **Table 4-1**). This section presents the results of the assessments conducted for each of these projects. All five were reported as quantitative entries. The benefit estimates for these projects are presented in **Table 4-2**.

Table 4-1. FY2023 CMAQ Program Summary

Project Category	Project No.	Project Name
Bike and Pedestrian Improvements	T202301602	Milford US 113 Pathway – Phase 1
	T202301603	NW Front Street Pathway
	T202401201	South Little Creek Road Shared Use Path
Carpooling and Vanpooling	T202404801	RIDESHARE FY24
Travel Demand Management and ITS	T202104703	FY24 Transportation Management Improvements Statewide Projects

After reviewing this section, readers should be able to identify the projects administered through DelDOT's FY2023 CMAQ program and understand how they are expected to improve air quality within the State.

Table 4-2. FY2023 Estimated Emission Reductions

Project No.	Project Name	Estimated Emissions Benefits *(kg/day)*					
		CO	$PM_{2.5}$	PM_{10}	NO_x	VOC	CO_2e
T202301602	Milford US 113 Pathway – Phase 1	1.231	0.004	0.015	0.079	0.072	125.259
T202301603	NW Front Street Pathway	0.180	0.001	0.002	0.012	0.011	18.331
T202401201	South Little Creek Road Shared Use Path	0.998	0.003	0.013	0.063	0.058	106.109
T202104801	RIDESHARE FY24 (projected)	3.746	0.196	0.015	0.067	0.093	562.855
T202104703	FY24 Transportation Management Improvements Statewide Projects (projected)	33.435	4.143	1.063	5.741	1.003	115.592
FY2023 Total		**39.590**	**4.347**	**1.108**	**5.962**	**1.237**	**928.146**

4.1 MILFORD US 113 PATHWAY – PHASE 1

Table 4-3 provides background information on the project, including a detailed description of the improvements constructed. This project was reported to PAS as a quantitative entry. **Table 4-4** presents DelDOT's emissions reduction estimate. The estimated mode-shift statistics are presented in **Table 4-5**. **Figure 4-1** provides a map of the project's location and setting.

Table 4-3. Milford US113 Pathway – Phase 1 - Background

Project No.	T202301602
Evaluation Year	2027
Project Name	Milford US113 Pathway – Phase 1
Parallel Route	US 113
Limits	Buccaneer Street to The Plaza at Milford
Length (mi)	0.75
Description	The US 113 Pathway will be constructed in Milford, Kent County, Delaware. The limits of the work are from Buccaneer Street to the Plaza at Milford. The primary scope of work includes installing a continuous pathway along US 113 that would accommodate non-motorized travel such as walking and biking, as well as a perpendicular pathway and signalized pedestrian crossing directly connecting Milford Square and the Plaza at Milford shopping centers. There is another optional connection to the municipality-maintained sidewalks connecting across Mullet Run. The proposed facility is expected to be open to the public in 2027.

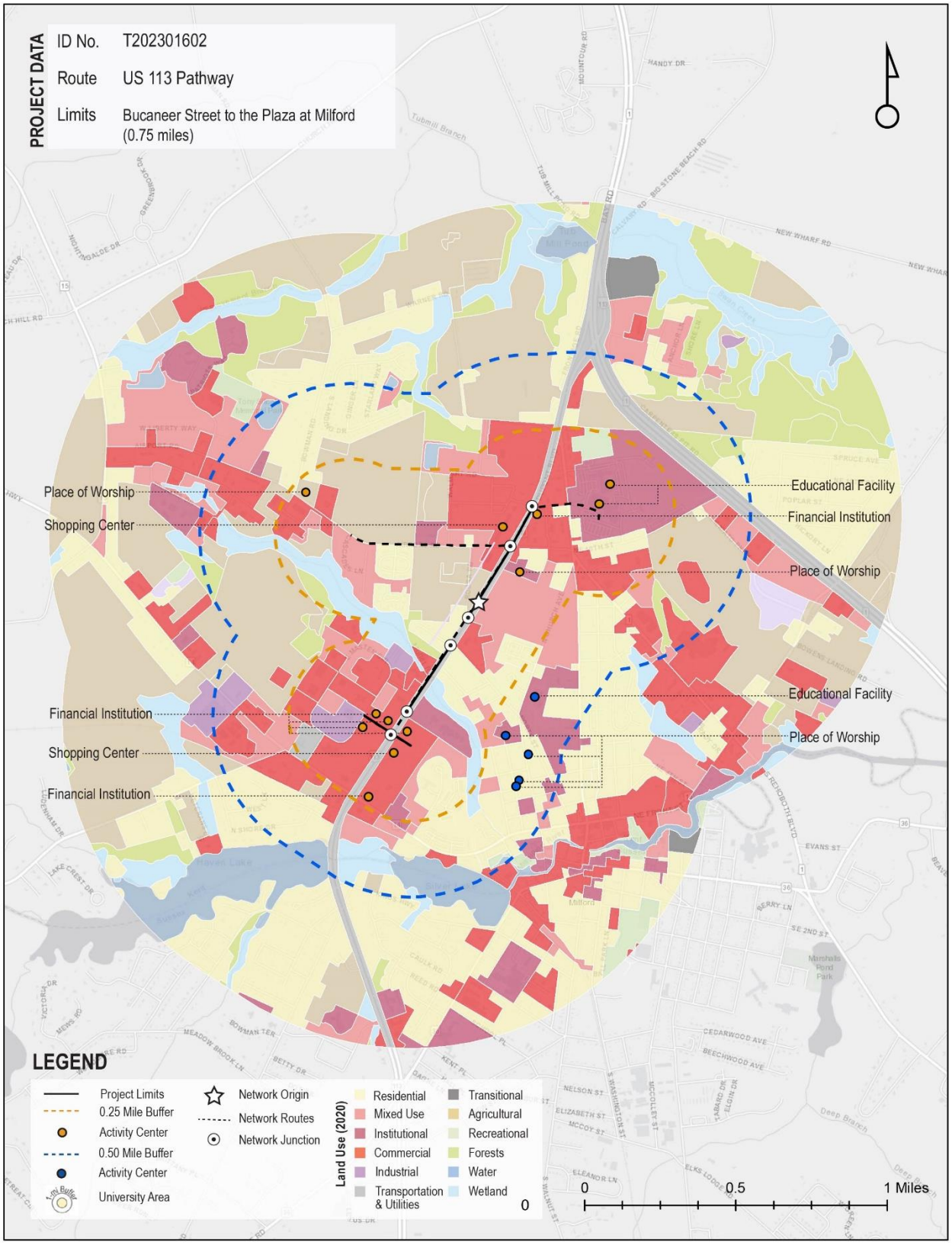
Table 4-4. Milford US113 Pathway – Phase 1 – Emissions Reduction Estimate

Pollutant Reductions (kg/day)	*CO*	1.231
	$PM_{2.5}$	0.004
	PM_{10}	0.015
	NO_x	0.079
	VOC	0.072
	CO_2e	125.259

Table 4-5. Milford US113 Pathway – Phase 1 – Mode-Shift Estimate

Mode-Shift Calculations	*Parallel Route AADT*	27,256
	Parallel Route Total Annual Traffic	9,948,440
	Total Annual Trips reduced from Bike Improvements	29,982
	Total Annual Trips reduced from Ped Improvements	29,982
	Total Annual Trips Reduced	59,963
	Avg. Reduction in Daily Passenger Trips	164
	Projected AADT	27,092

Figure 4-1. Milford US113 Pathway – Phase 1 – Project Datasheet



4.2 NW Front Street Pathway

Table 4-6 provides background information on the project, including a detailed description of the improvements constructed. This project was reported to PAS as a quantitative entry. **Table 4-7** presents DelDOT's emissions reduction estimate. The estimated mode-shift statistics are presented in **Table 4-8**. **Figure 4-2** provides a map of the project's location and setting.

Table 4-6. NW Front Street Pathway - Background

Project No.	T202301603
Evaluation Year	2027
Project Name	NW Front Street Pathway
Parallel Route	NW Front Street
Limits	Maple Ave to before US 113
Length (mi)	0.40
Description	The NW Front Street Pathway will be constructed in Milford, Kent County, Delaware. The limits of the work are from Maple Ave to just before US 113 where it would meet the existing side path. The primary scope of work includes installing a non-motorized, multi-modal facility that would accommodate walking and biking. The proposed facility is expected to be open to the public in 2027.

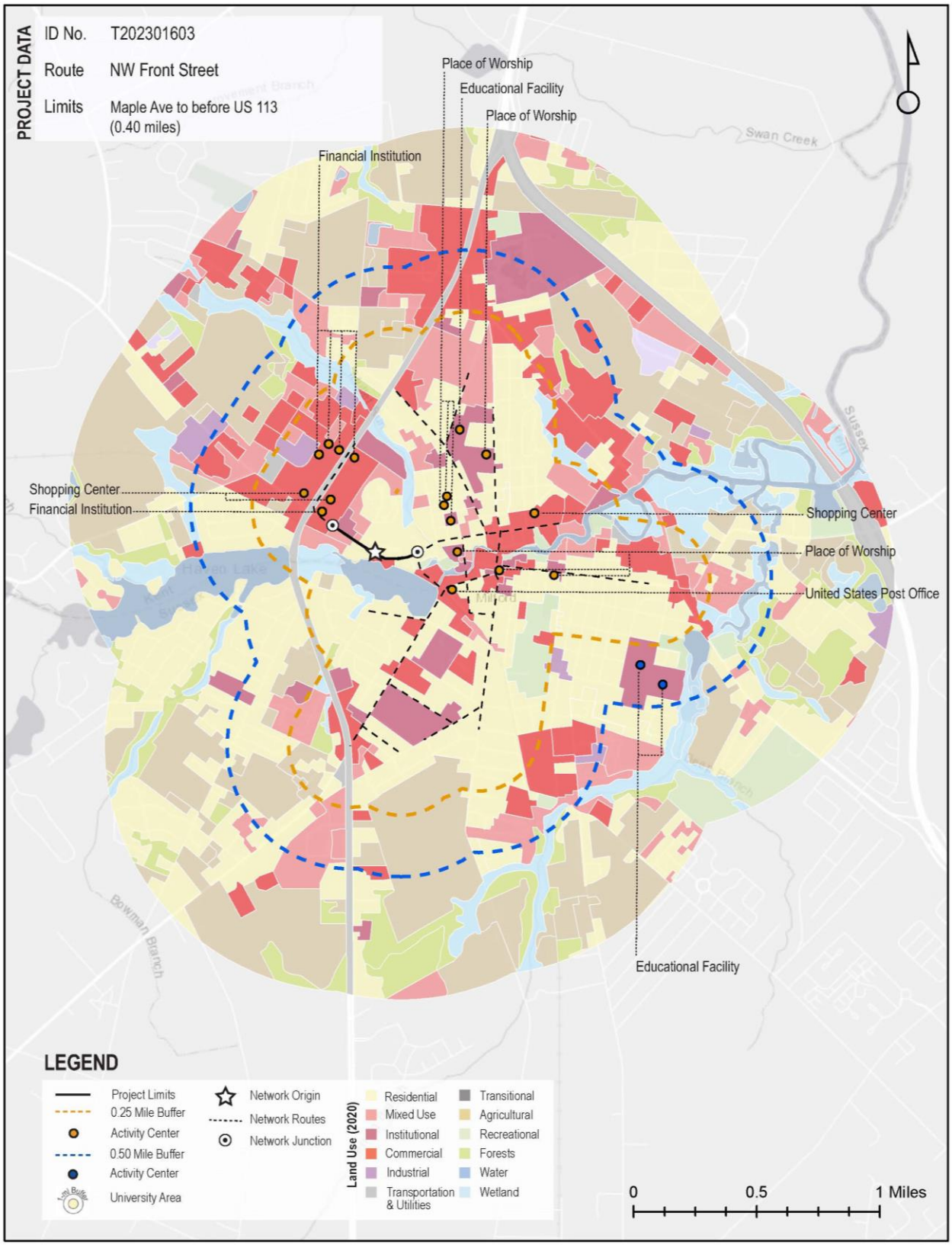
Table 4-7. NW Front Street Pathway – Emissions Reduction Estimate

Pollutant Reductions (kg/day)	*CO*	0.180
	$PM_{2.5}$	0.001
	PM_{10}	0.002
	NO_x	0.012
	VOC	0.011
	CO_2e	18.331

Table 4-8. NW Front Street Pathway – Mode-Shift Estimate

Mode-Shift Calculations	*Parallel Route AADT*	7,088
	Parallel Route Total Annual Traffic	2,587,120
	Total Annual Trips reduced from Bike Improvements	8,683
	Total Annual Trips reduced from Ped Improvements	-
	Total Annual Trips Reduced	8,683
	Avg. Reduction in Daily Passenger Trips	24
	Projected AADT	7,064

Figure 4-2. NW Front Street Pathway – Project Datasheet



4.3 SOUTH LITTLE CREEK ROAD SHARED USE PATH

Table 4-9 provides background information on the project, including a detailed description of the improvements constructed. This project was reported to PAS as a quantitative entry. **Table 4-7** presents DelDOT's emissions reduction estimate. The estimated mode-shift statistics are presented in **Table 4-11**. **Figure 4-3** provides a map of the project's location and setting.

Table 4-9 S. Little Creek Road Shared Use Path - Background

Project No.	T202401201
Evaluation Year	2028
Project Name	South. Little Creek Road Shared Use Path
Parallel Route	S. Little Creek Road
Limits	Horsepond Road to Babb Drive
Length (mi)	1.8
Description	The South Little Creek Road Pathway will be constructed in Dover, Kent County, Delaware. The limits of the work are from Horsepond Road to US 13, with a leg extending north along US 13 to E. Loockerman Street. The primary scope of work includes installing a continuous shared-use pathway along S. Little Creek Road that would accommodate non-motorized travel such as walking and biking. This is a continuation of the S. Bay Road pathway concept which would connect into the Capital City Trail at US 13 and MLK Boulevard. The proposed facility is expected to be open to the public in 2028.

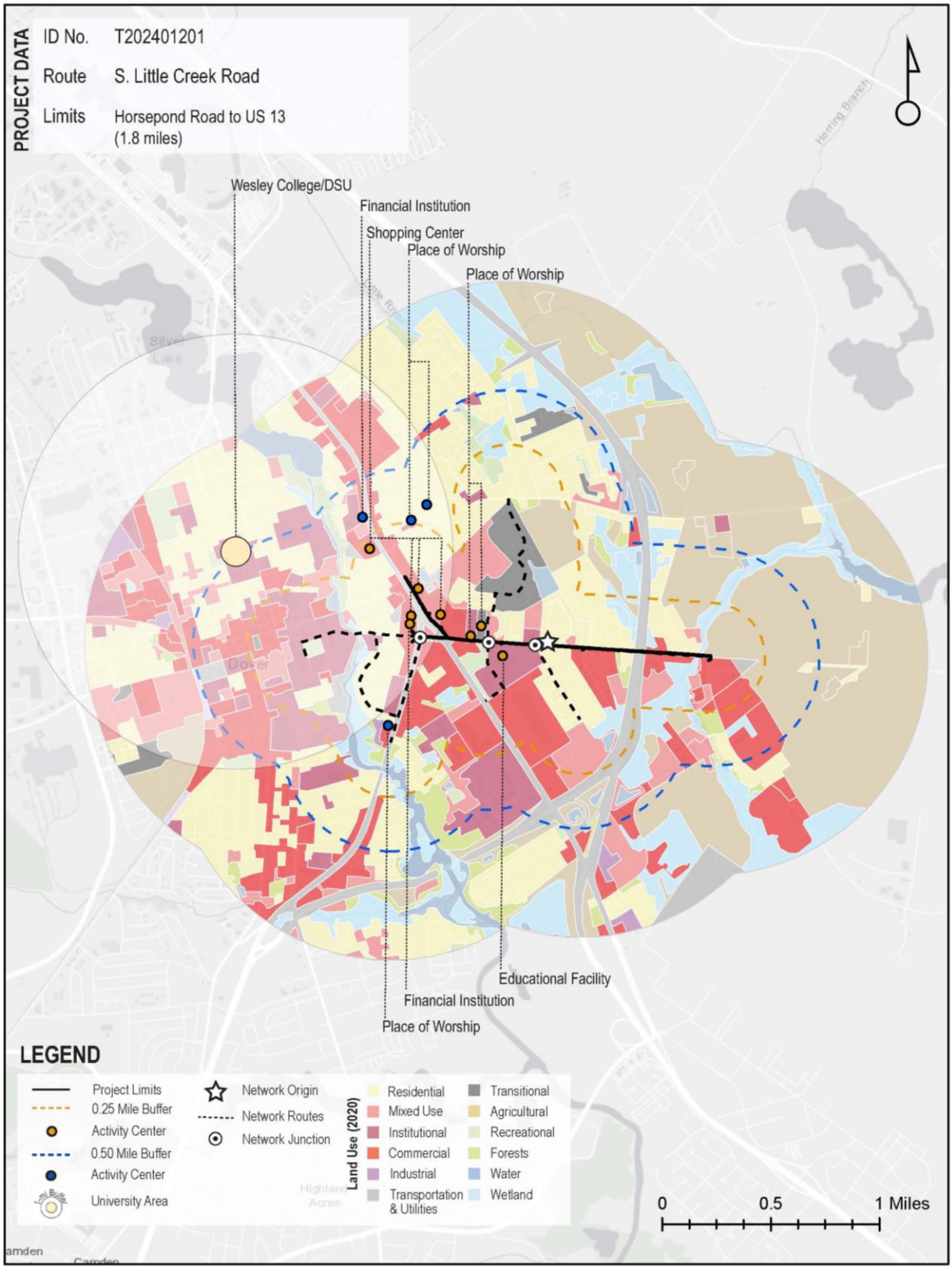
Table 4-10 S. Little Creek Road Shared Use Path – Emissions Reduction Estimate

Pollutant Reductions (kg/day)	*CO*	0.998
	$PM_{2.5}$	0.003
	PM_{10}	0.013
	NO_x	0.063
	VOC	0.058
	CO_2e	106.109

Table 4-11 S. Little Creek Road Shared Use Path – Mode-Shift Estimate

Mode-Shift Calculations	*Parallel Route AADT*	11,319
	Parallel Route Total Annual Traffic	4,131,435
	Total Annual Trips reduced from Bike Improvements	52,350
	Total Annual Trips reduced from Ped Improvements	-
	Total Annual Trips Reduced	52,350
	Avg. Reduction in Daily Passenger Trips	143
	Projected AADT	11,176

Figure 4-3 S. Little Creek Road Shared Use Path – Project Datasheet



4.4 FY24 RIDESHARE

Table 4-12 provides background information on the project, including a detailed description of the purpose and expectations, as well as a note regarding how the benefit was quantified. **Table 4-13** presents DelDOT's emissions reduction estimate. The daily emission reduction was estimated by averaging the performance of DelDOT's rideshare projects from FY20 through FY23.[20] The average was generated in two steps. The first step involved dividing each program's daily emission reduction by its total CMAQ obligation. The second step involved using these four sets of cost effectiveness rates (*i.e.*, dollars spent per KG of daily emission reduction) to calculate a mean cost effectiveness rate. The daily emission reduction estimate for the FY24 rideshare program was then projected by multiplying its CMAQ obligation by the FY20-FY23 mean cost effectiveness rate.

Table 4-12. FY24 Rideshare Program - Background

Project No.	T202404801
Evaluation Year	2024
Project Name	Rideshare
Limits	Statewide
Description	The purpose of this project is to increase the use of shared ride modes. This effort is part of an ongoing program administered by the Delaware Department of Transportation through Delaware Transit Corporation (DTC) Delaware Commute Solutions (DECS) program to reduce the occurrence of single occupancy vehicle trips. During FY23, the Rideshare program provided the following services: business community outreach; carpool and vanpool matching and formation; employee transit benefit program promotion. Specific worksite services include carpool and vanpool formation activities; tax benefits services; alternative work hour programs (e.g., compressed work weeks and flex time). The administration of these programs is expected to reduce the emission of air pollution by reducing the demand for vehicular travel during peak demand periods.

Table 4-13. FY24 Rideshare Program – Emissions Reduction Estimate

Pollutant Reductions (kg/day)	*CO*	3.746
	$PM_{2.5}$	0.196
	PM_{10}	0.015
	NOx	0.067
	VOC	0.093
	CO_2e	562.855

[20] The referenced projects were assigned the following state project identification numbers: T202004802, T202104801, T202204802, and T202304802.

4.5 FY24 Transportation Management Improvements Statewide Projects

Table 4-14 provides background information on the project, including a detailed description of the improvements constructed. This project will be reported to PAS as a quantitative entry. **Table 4-15** presents DelDOT's emissions reduction estimate. The estimated delay reduction statistics are presented in. **Figure 4-4** provides a map of the project's location and setting.

Table 4-14. FY24 Transportation Management Improvements Statewide Projects - Background

Project No.	T202404703
Evaluation Year	2024
Project Name	FY24 Transportation Management Improvements Statewide Projects
Limits	Statewide
Description	This effort is part of a larger, multi-year initiative administered by Delaware's Department of Transportation to continually invest in the Integrated Traffic Management Systems (ITMS) throughout the State of Delaware. They FY24 iteration includes the following: *ITMS Fiber Installation* – Three separate installations to fill in gaps in existing fiber optic communications backbone. The three installation locations are Loockerman Street in Dover, I-95 between the Talley Maintenance Yard and the bridge over Brandywine Creek, and US 13 from Tybouts Corner to Seienni Boulevard. The completion of these fiber gaps will provide for a more reliable and robust connection between ITMS devices in the field and the Transportation Management Center, and overall network redundancy. *ITMS Wireless Installation* – Three separate initiatives to expand DelDOT's wireless communications network to improve system reliability and move away from leased communications services, which are unreliable. The first initiative is the installation of 4.9 GHz point-to-multipoint access points at five existing camera poles. The installation of these devices will allow the connection of 29 traffic signals and other ITMS devices into the DelDOT network. Second is the 900 MHz wireless hub on Loockerman Street in Dover into the DelDOT fiber backbone, which will eliminate existing signal interference issues. Third is to build a 11GHz point to point link to the I-95 Toll Plaza tower. This will ensure long-term connectivity and allow the integration of new ITMS devices through the toll plaza. Fourth is the installation of six access points on the Lewis Division of Communications Tower. This will ensure long-term connectivity and allow the integration of new ITMS devices in the Lewes area. *AI-TOMS* – DelDOT will build upon the work recently completed in the development of the AI-TOMS platform, which uses artificial intelligence and machine learning algorithms to assist in traffic response and operations activities to expand AI-TOMS to additional signal corridors within the three project areas (I-95 corridor in New Castle County, US 13 in the Symrna/Dover area, and SR 1 corridor in the Beach resort area in Sussex County). This will include the continued integration of Unix traffic signal controllers into AI-TOMS and implementation of automated signal timing and control functions within the platform. *Indian River Inlet Bridge (IRIB) Variable Message Signs (VMS)* – Includes the installation of two VMS approaching the Indian River Inlet Bridge from the north and south in advance of major detour routes. The use case for these two devices is to provide general traveler information and to alert motorists of any closure or other impacts to the IRIB and divert them to secondary routes. These actions are expected to reduce the emission of air pollution by reducing traffic congestion and improving traffic flow by allowing DelDOT to better detect and respond to day-to-day congestion and incidents on the roadway.

Table 4-15. FY24 Transportation Management Improvements Statewide Projects – Emissions Reduction Estimate (Projection)

Pollutant Reductions (kg/day)	*CO*	33.435
	$PM_{2.5}$	4.143
	PM_{10}	1.063
	NOx	5.741
	VOC	1.003
	CO_2e	115.592

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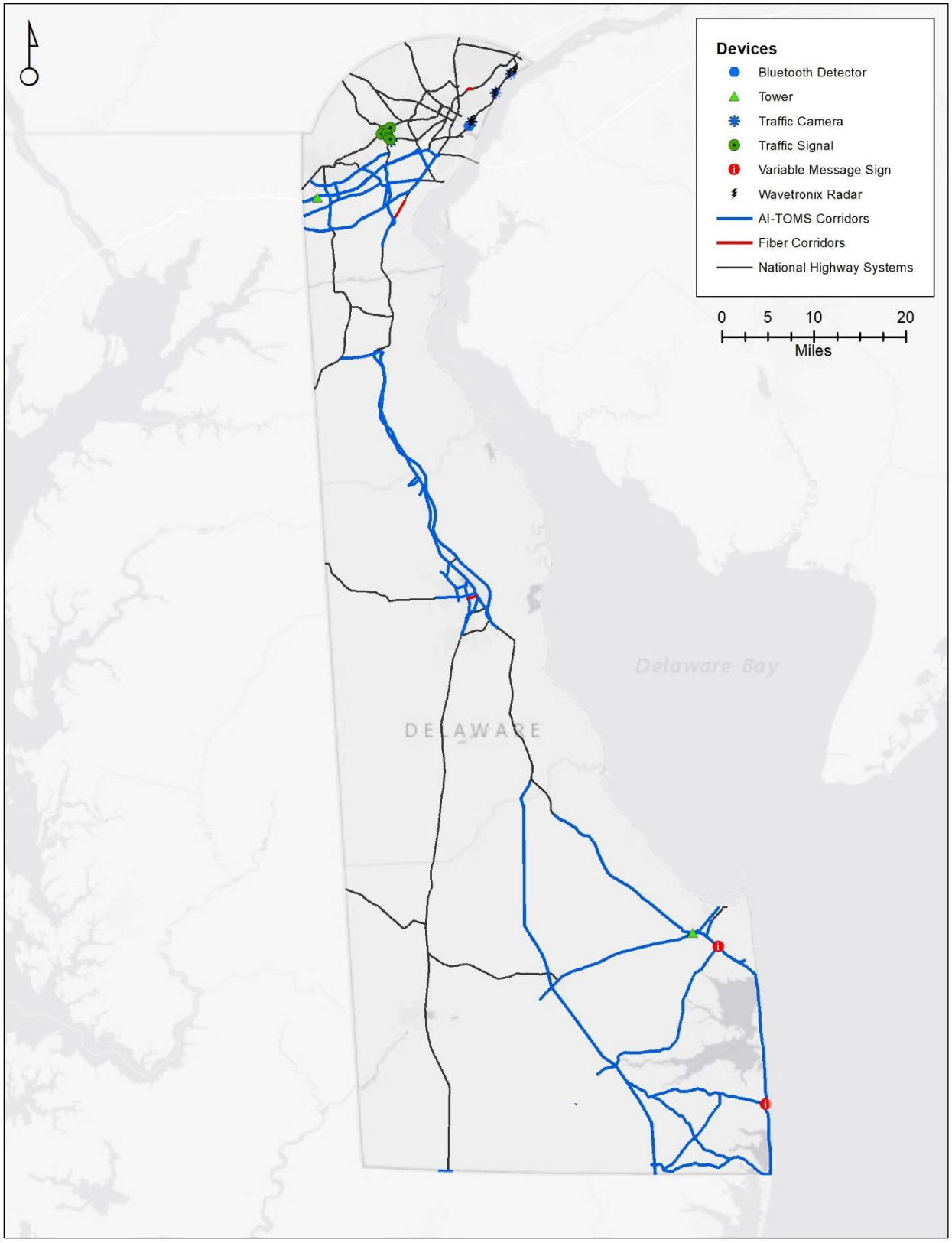
Figure 4-4. FY24 Transportation Management Improvements Statewide Projects



5.0 PERFORMANCE TARGET REVIEW

The performance assessment framework established through MAP-21 requires reporting agencies to set goals for themselves at the onset of each four-year performance period (23 CFR 490.105). The agencies are required to release these goals to FHWA and to the public through their Baseline Performance Period reports. The following section discusses the targets DelDOT established in its current Baseline Performance Period Report for the CMAQ program. This section will review:

- Baseline two- and four-year performance targets established for the PHED, Non-SOV, and Total Emissions Reductions Performance Measures and
- DelDOT's progress to date towards these targets.

5.1 WHAT WERE DELDOT'S CMAQ BASELINE PERFORMANCE TARGETS?

For most of FHWA's Transportation Performance Measures, including the PHED and Non-SOV Measures, the current performance period began in January 2022 and ends in December 2025. For the Total Emission Reduction Performance Measure, however, the performance period began in October 2021 and will close in September 2025.[21]

5.1.1 PHED

In its *2022-2025 Baseline Performance Period Report*, the DVRPC and the interagency working group established a baseline per capita PHED value of 13.1 hours. The two-year target is 15.2 hours. The four-year target is 15.1 hours.

5.1.2 Non-SOV Travel

In its 2022-2025 Baseline Performance Period Report, the DVRPC and the interagency working group established a baseline Non-SOV travel rate of 30.6%. The two-year target is 30.0%. The four-year target is 30.0%.

5.1.3 Total Emissions Reduction

The Total Emission Reduction baseline two-year and four-year performance targets for the State of Delaware are presented in **Table 5-1**.

Table 5-1. Baseline Performance Period Total Emission Reduction Target

Compound	Total Emission Reductions *(kg/day)*		
	Pre-Performance Period Total (2018-2021)	*Two-Year Target (2022-2023)*	*Four-Year Target (2022-2025)*
VOC	251.922	2.700	6.300
NO_x	131.517	5.900	19.800
$PM_{2.5}$	6.936	3.600	12.400

5.2 DID DELDOT MEET ITS TWO-YEAR PERFORMANCE TARGETS?

In October 2024, DelDOT will release CMAQ Mid-Performance Period Report. This report will contain quantitative assessments of the CMAQ projects DelDOT funded in FY2022 and FY2023. The results of

[21] See 23 CFR 490.105(e)(4)

these assessments are presented in **Table 5-2** and **Table 5-3**. As shown in **Table 5-4**, DelDOT has exceeded its two-year performance targets for NO_X and $PM_{2.5}$ and is approximately 10 grams beneath its VOC target. **Table 5-5** provides a summary of DelDOT's progress towards its four-year targets.

Table 5-2. FY2022 CMAQ Quantitative Emissions Reduction Estimates

Project No.	Project Name	Project Type	Total Emissions Reductions *(kg / day)*		
			VOC	*NOx*	*PM2.5*
T201830001	Capital City Trail Phase III, South State St. To US 13	Bike and Ped Facility	0.053	0.059	0.003
T201801701	Munchy Branch Multi-Use Trail	Bike and Ped Facility	0.006	0.007	0.000
T202201701	Cedar Neck Road Pathway	Bike and Ped Facility	0.037	0.042	0.002
T202204802	Rideshare FY2022	Carpooling & Vanpooling	0.187	0.558	0.140
T202230001	Georgetown to Lewes Trail – Fisher Rd to Airport Rd	Bike and Ped Facility	0.058	0.066	0.003
T202301501	Old Baltimore Pike – Phase II	Bike and Ped Facility	0.084	0.095	0.004
T202301502	East Coast Greenway, SR 4 Shared-Use Path Gap	Bike and Ped Facility	0.092	0.104	0.004
T202301601	West Street Pathway	Bike and Ped Facility	0.031	0.035	0.001
T202304703	FY23 Transportation Management Improvements Statewide Projects	Congestion Reduction and Traffic Flow Improvements	0.729	5.112	3.005
T202304802	Rideshare FY2023	Carpooling & Vanpooling	0.174	0.126	0.281
Fiscal Year 2022 Total			**1.451**	**6.204**	**3.303**

Table 5-3. FY2023 CMAQ Quantitative Emissions Reduction Estimates

Project No.	Project Name	Total Emissions Reductions *(kg / day)*		
		VOC	*NO_x*	*$PM_{2.5}$*
T202301602	Milford US 113 Pathway – Phase 1	0.072	0.079	0.004
T202301603	NW Front Street Pathway	0.011	0.012	0.001
T202401201	South Little Creek Road Shared Use Path	0.058	0.063	0.003
T202404801	RIDESHARE FY24	0.093	0.067	0.196
T202404703	FY24 Transportation Management Improvements Statewide Projects	1.003	5.741	4.143
FY 2023 Total		**1.237**	**5.962**	**4.348**

Table 5-4. Two-Year Performance Target Comparison

Compound	Total Emission Reductions *(kg/day)*		
	Two-Year Target (2022-2023)	*CMAQ Program Performance (2022 & 2023)*	*Difference*
VOC	2.700	2.688	-0.012
NO_x	5.900	12.166	6.266
$PM_{2.5}$	3.600	7.651	4.051

Table 5-5. Four-Year Performance Target Comparison

Compound	Total Emission Reductions *(kg/day)*		
	Four-Year Target (2022-2025)	*CMAQ Program Performance (2022-2023)*	*Difference*
VOC	6.300	2.688	3.612
NO_x	19.800	12.166	7.634
$PM_{2.5}$	12.400	7.651	4.749

6.0 REFERENCES

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