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TECHNICAL MEMORANDUM

DATE: October 20, 2022
TO: Boston Region Metropolitan Planning Organization
FROM: Michelle Scott, MPO Staff
RE: CMAQ Program Performance Targets—2022 Update

This memorandum discusses federally required performance measures, targets, and related requirements for the federal Congestion Mitigation and Air Quality Improvement (CMAQ) Program. CMAQ performance measures pertain to

- traffic congestion on the National Highway System (NHS);
- travel by modes other than single-occupancy vehicles (SOVs); and
- changes in mobile-source pollutants resulting from CMAQ-funded transportation projects in areas that do not meet US Environmental Protection Agency (EPA) air quality standards or have not met them in the past.

Boston Region Metropolitan Planning Organization (MPO) staff have collaborated with the Massachusetts Department of Transportation (MassDOT) and other planning entities in the Boston MA-NH-RI Urbanized Area to develop targets for the second federal performance period (federal fiscal years or calendar years 2022–25, depending on the performance measure). MPO staff requests that the Boston Region MPO take action to adopt the performance targets described herein at the October 20, 2022, MPO meeting. These target values are summarized in Table 1.

Civil Rights, nondiscrimination, and accessibility information is on the last page.

Table 1
CMAQ Performance Values and Targets for the Second Federal Performance Period

Performance Measure	Geographic Area	Baseline Value	Two-Year Target	Four-Year Target
Traffic Congestion: Percent of non-SOV travel	Boston MA-NH-RI UZA	36.9% ^a	38.8%	39.8%
Traffic Congestion: Annual hours of peak hour excessive delay (PHED) per capita for travel on the NHS system	Boston MA-NH-RI UZA	18.0 ^b	24.0	22.0
Emissions reduction: Total emissions reduction (expressed in kilograms per day) for applicable pollutants and precursors for CMAQ-funded projects in designated nonattainment and maintenance areas	Boston Region MPO (carbon monoxide emissions)	0 ^c	0.354	0.354

^a The baseline value for the percent of non-SOV travel measure was calculated using 2016–20 American Community Survey estimates.

^b The baseline value for the annual PHED per capita measure was calculated using 2021 travel-time data and 2020 Decennial census population data for the Boston MA-NH-RI UZA.

^c The baseline value is based on carbon monoxide emissions data for CMAQ-funded projects obligated in Waltham from Federal Fiscal Years 2018–21.

CMAQ = Congestion Mitigation and Air Quality. MA = Massachusetts. MPO = metropolitan planning organization. NH = New Hampshire. NHS = National Highway System. Non-SOV = non-single-occupancy vehicle. RI = Rhode Island. UZA = urbanized area.

Sources: US Census Bureau; the Massachusetts Department of Transportation; the New Hampshire Department of Transportation; and Boston Region MPO staff.

1 OVERVIEW OF CONGESTION MITIGATION AND AIR QUALITY PERFORMANCE MEASURES

A series of federal rules designed to focus the federal surface transportation program on achieving performance outcomes was initiated under the Moving Ahead for Progress in the 21st Century (MAP-21) legislation passed in 2012. This focus has continued under the Fixing America's Surface Transportation (FAST) Act and the Bipartisan Infrastructure Law (BIL). These rules identify performance measures that relate to goals for the nation's highway and transit systems and define state, MPO, and transit provider roles and responsibilities with respect to performance management.

The set of federally required performance measures for highway systems include a set of measures to be used to assess progress toward achieving the goals of the CMAQ Program. This federal funding program provides states and MPOs with funds for transportation investments that contribute to air quality improvements and provide congestion relief. CMAQ funds must be invested in projects that reduce ozone (O₃) precursors—volatile organic compounds (VOCs) and nitrogen oxides (NO_x)—carbon monoxide (CO), or particulate matter (both PM₁₀ and PM_{2.5}), and the applicable precursors from transportation sources.¹ Examples of CMAQ-funded projects include roadway and intersection improvements that address congestion chokepoints and help reduce vehicle idling, and bicycle and pedestrian paths that enhance travel for non-motorized modes. Projects in the MPO's Community Connections program, such as shuttle services and bikeshare stations, are also funded with CMAQ dollars.² The National Performance Management Measures rule—Title 23, part 490, of the Code of Federal Regulations (23 CFR 490)—identifies traffic congestion and emissions reduction performance measures that pertain to the CMAQ Program, which are referenced in listed in Table 1.

Based on a 2021 Federal Highway Administration (FHWA) applicability determination, the Boston Region MPO must participate in processes to set targets for and monitor all three CMAQ performance measures listed in Table 1.³ Table 2 identifies criteria for determining when a state or MPO is responsible for setting targets for the CMAQ performance measures, and how the Boston Region MPO meets those criteria.

¹ A precursor is a chemical compound that reacts with other chemical compounds in the presence of solar radiation to form pollutants.

² For more information, visit the Boston Region MPO's Community Connections webpage at <https://www.ctps.org/community-connections>.

³ Federal Highway Administration, Applicability Determination: CMAQ Traffic Congestion and CMAQ On-Road Mobile Source Emissions Measures (2021), pg. 21, accessed August 28, 2022 at https://www.fhwa.dot.gov/environment/air_quality/cmaq/measures/cmaq_applicability/october_2021.

Table 2
State and MPO Applicability Criteria for
CMAQ Performance Requirements (Second Federal Performance Period)

Criteria	Boston Region MPO Status (as of October 2021)	Impact
State or MPO contains an air quality nonattainment or maintenance area	Yes (Waltham CO limited maintenance area)	Boston Region MPO must meet CMAQ total emissions reduction performance requirements
State or MPO overlaps a UZA with (1) a nonattainment or maintenance area and (2) a population greater than 200,000	Yes (Boston MA-NH-RI UZA)	Boston Region MPO must meet CMAQ traffic congestion performance requirements

Note: UZAs are defined by the US Census Bureau and represent the urban cores of metropolitan areas. CMAQ = Congestion Mitigation and Air Quality Improvement. CO = carbon monoxide. MA = Massachusetts. NH = New Hampshire. MPO = metropolitan planning organization. RI = Rhode Island. UZA = urbanized area.

Sources: Title 23, part 490, of the Code of Federal Regulations and the Boston Region MPO.

When the FHWA made its most recent applicability determination in October 2021, the Boston region included an area (Waltham) designated as being in maintenance for air pollutant standards for carbon monoxide, one of the applicable EPA criteria pollutants. This designation as a maintenance area expired in April 2022; however, the Boston Region MPO must fulfill these performance requirements at least until the FHWA issues an updated applicability determination related to CMAQ performance requirements (expected in October 2023). The Boston region also includes part of the NHS network in the Boston MA-NH-RI UZA, which includes portions of neighboring MPOs in Massachusetts, New Hampshire, and Rhode Island and exceeds the 200,000 population threshold. Figure 1 is a map of the Boston MA-NH-RI UZA and lists the states and MPO areas that overlap the UZA.

While FHWA monitors actual performance with respect to targets for these measures, states and MPOs are not penalized if performance does not meet these targets.⁴ During quadrennial certification reviews, the FHWA will examine how MPOs are implementing performance-based planning and programming principles and working to make progress towards established targets.

⁴ FHWA, FHWA Procedure for Determining Significant Progress toward the NHPP and NHFP Measures (2021), pg. 1, accessed October 14, 2022, at <https://www.fhwa.dot.gov/tpm/guidance/hif21030.pdf>.

2 TRAFFIC CONGESTION PERFORMANCE MEASURES

State departments of transportation (DOTs) and MPOs that meet the FHWA's applicability criteria for traffic congestion measures must coordinate with one another to set single, unified targets for the entire UZA—as opposed to targets for areas covered by individual states and MPOs—and they must report those single, unified targets consistently to the FHWA. Because the Boston Region MPO meets all relevant criteria, the MPO is required to participate in these target-setting processes. Other agencies in the Boston region that are required to participate in this traffic congestion target-setting process include MassDOT, the New Hampshire Department of Transportation (NH DOT), and the Northern Middlesex MPO. As shown in Figure 1, the Boston MA-NH-RI UZA includes other MPOs—FHWA encourages these entities to participate in target-setting processes for CMAQ traffic congestion measures but does not require them to establish or support targets.⁵ While a portion of Rhode Island falls within the Boston MA-NH-RI UZA boundary, it does not overlap the NHS within the UZA, so it is not required to establish or report targets for this UZA.

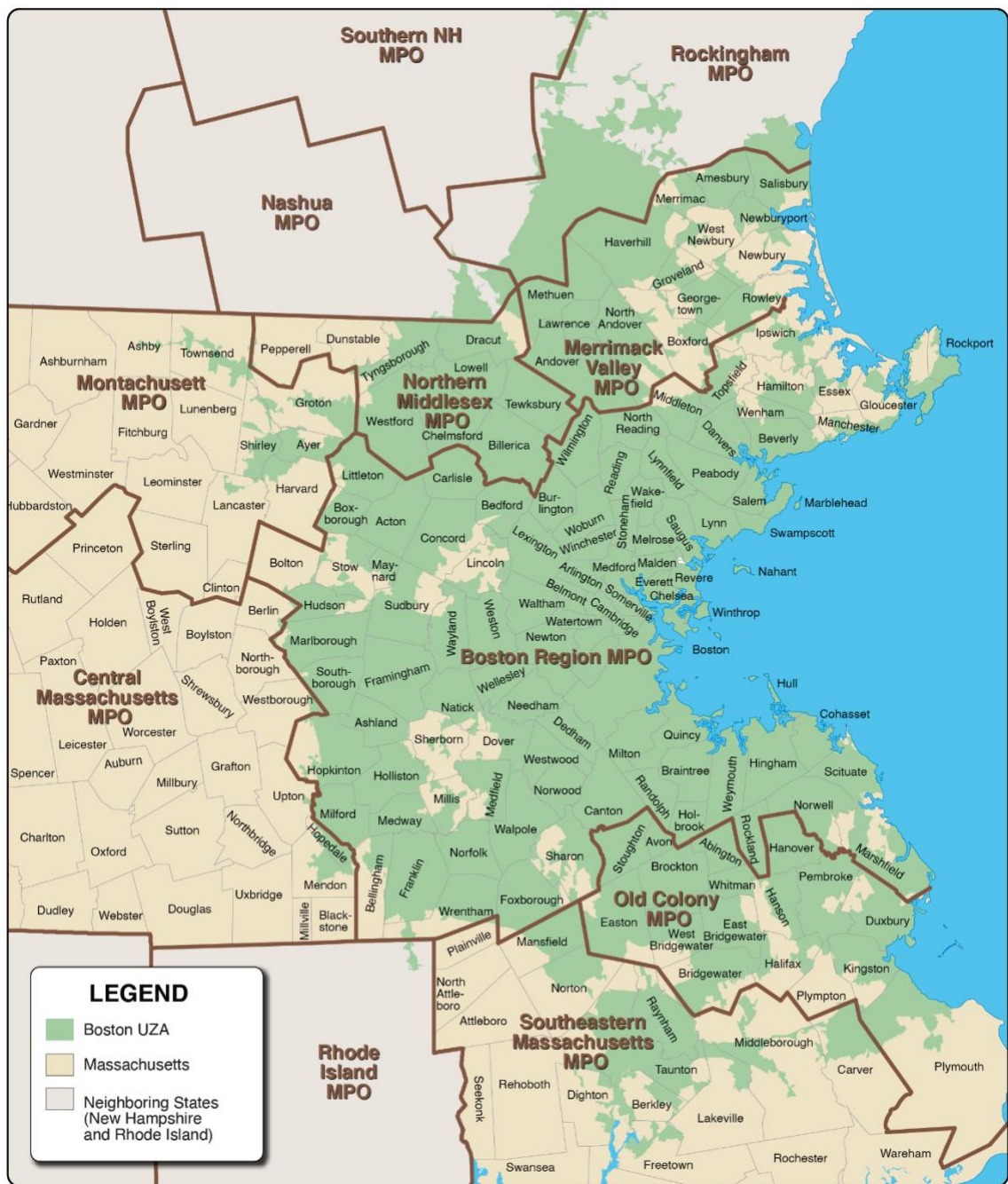
2.1 Percent of Non-SOV Travel Measure

2.1.1 Non-SOV Travel Measure Overview

The *percent of non-SOV travel performance measure* describes the extent to which people are using alternatives to single-occupancy vehicles. Greater use of alternatives to SOVs may help reduce traffic congestion and air pollution from

⁵ FHWA, Applicability Determination: CMAQ Traffic Congestion and CMAQ On-Road Mobile Source Emissions Measures (2021), pg. 50.

Figure 1
Boston MA-NH-RI UZA Boundaries and Overlapping States and MPOs



Note: UZAs are defined by the US Census Bureau and represent the urban cores of metropolitan areas. The Boston MA-NH-RI Census reflects boundaries defined as part of the 2010 Decennial Census.

MA = Massachusetts. NH = New Hampshire. MPO = Metropolitan Planning Organization. RI = Rhode Island. UZA = urbanized area.

Sources: US Census Bureau and the Boston Region MPO.

mobile sources. States and MPOs can measure non-SOV travel using one of three data sources:

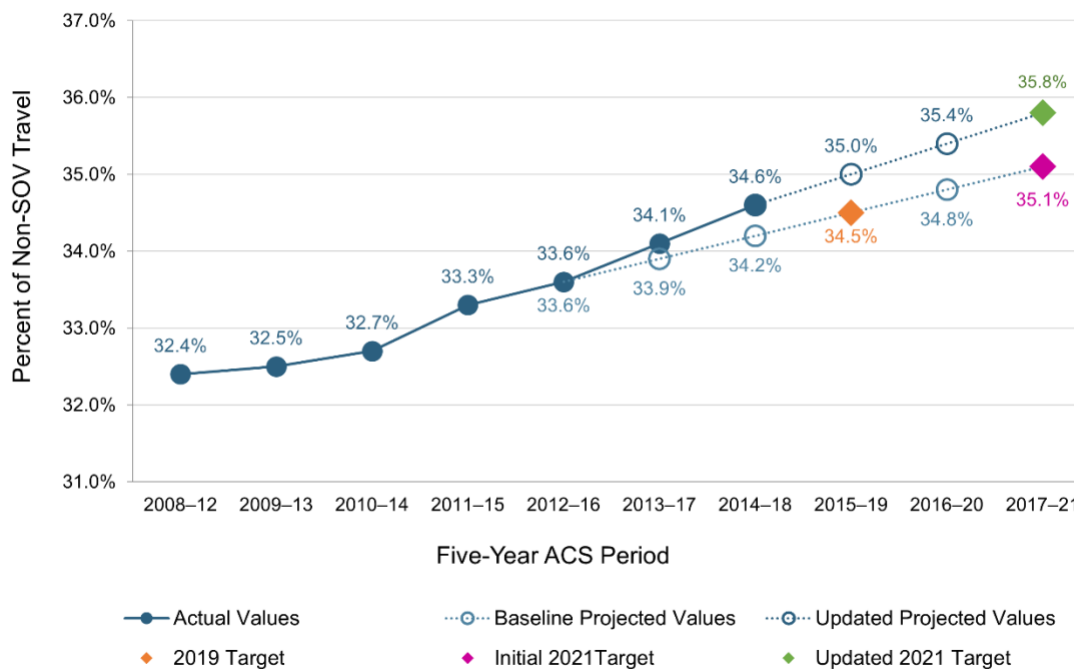
- US Census American Community Survey (ACS) estimates of the percentage of workers who commute to work using modes other than driving alone (such as taking a carpool, vanpool, or public transit; bicycling; walking; or telecommuting)
- travel surveys that reveal mode choices
- sample or continuous counts of travelers using different modes

2.1.2 Past Non-SOV Travel Performance Targets (First Federal Performance Period)

In 2018, MassDOT, NH DOT, the Boston Region MPO, and the Northern Middlesex MPO worked collaboratively to set initial targets for this performance measure for the Boston MA-NH-RI UZA using ACS five-year period estimates. At that time, these agencies examined changes in the percentage of workers using non-SOV commuting options in the Boston MA-NH-RI UZA between 2012 (2008–12 ACS estimate) and 2016 (2012–16 ACS estimate). These data showed an increase in use of non-SOV commuting options over time. MassDOT calculated a linear trend line for the Boston MA-NH-RI UZA and used that trend line to project expected values as of the end of calendar year (CY) 2019 (the expected 2015–19 ACS estimate) and CY 2021 (the expected 2017–21 ACS estimate).

In 2020, these agencies examined 2013–17 and 2014–18 ACS data and found these estimates were higher than the projections they made when setting initial targets. Because of this, they anticipated that estimates for CY 2019 and CY 2021 would exceed the performance targets established in 2018 and worked collaboratively to adjust the CY 2021 target (which reflects a 2017–21 estimate). Figure 2 shows the percent of non-SOV travel estimates available during this period, initial projections and performance targets, and updated projections and performance targets for this measure.

Figure 2
Estimates, Projected Values, and Targets for the
Percent of Non-SOV Travel in the Boston MA-NH-RI UZA
(First Federal Performance Period)



Note: Values in this figure reflect the five-year ACS estimate for the percent of non-SOV travel to work for workers ages 16 and older. The figure reflects data as of September 2020.

ACS = US American Community Survey. MA = Massachusetts. NH = New Hampshire. Non-SOV = non-single-occupancy vehicle. RI = Rhode Island. UZA = urbanized area.

Sources: US Census Bureau, ACS Five-Year Estimates (Table DP03, “Selected Economic Characteristics”); the Massachusetts Department of Transportation; the New Hampshire Department of Transportation; and Boston Region MPO staff.

2.1.3 Proposed Non-SOV Travel Targets (Second Federal Performance Period)

For this second FHWA-designated performance period, which lasts from CYs 2022 through 2025 for the percent of non-SOV travel measure, states and MPOs in the Boston UZA must set

- a two-year target, which reflects expected performance on this measure as of the end of CY 2023; and
- a four-year target which reflects expected performance on this measure as of the end of CY 2025.

As in the first performance period, staff from MassDOT, NH DOT, the Boston Region MPO, and the Northern Middlesex MPO approached setting *percent of non-SOV travel targets* for the second federal performance period using five-year ACS estimates reflecting the modes workers used to commute. These agencies experimented with creating trend lines using ACS estimates reflecting non-overlapping five-year periods, per US Census guidance.⁶ These trend lines would be used to project the share of non-SOV travel for years beyond 2020, the most recent year for which a five-year ACS estimate (2016–20) is available.

Staff from these agencies deliberated whether they should create a projected trend line reflecting non-SOV travel in the Boston MA-NH-RI UZA using 2016–20 ACS estimates, which would reflect some data from the COVID-19 pandemic. Comparisons of past five-year ACS estimates show that the share of non-SOV travel for trips to work has increased over time. However, there are noteworthy differences in the rates of change in non-SOV travel depending on which five-year ACS estimates are used for the calculations.

- The 2015–19 ACS estimate for the share of non-SOV travel in the Boston MA-NH-RI UZA (34.9 ± 0.3 percent) is approximately **seven percent** higher than the 2010–14 estimate (32.7 ± 0.2 percent).
- The 2016–20 ACS estimate for the share of non-SOV travel in the UZA (36.9 ± 0.3 percent) is approximately **11 percent** higher than the 2011–15 estimate (33.3 ± 0.3 percent).

The COVID-19 pandemic, along with related public and private sector responses, created noticeable impacts on travel patterns in 2020, and has sparked some uncertainty about what travel patterns in the UZA may look like in the future. For example, in spring 2020, telework rates in Massachusetts increased considerably while transit ridership and traffic volumes experienced a sharp decrease. Based on survey research conducted by MassDOT, in spring 2020 full-time telework increased from nine percent pre-pandemic (February 2020) to 24 percent (April/May 2020.) The level of part-time remote work remained at 23 percent during this period. Meanwhile, average weekday vehicle-miles traveled (VMT) in Massachusetts dropped by approximately 44 percent between early March 2020 and early May 2020.⁷ Weekday bus ridership on the MBTA, the largest transit system in the UZA, declined by approximately 77 percent between late February

⁶ US Census Bureau, “Comparing ACS Data” (July 8, 2022), accessed September 26, 2022, at <https://www.census.gov/programs-surveys/acs/guidance/comparing-acs-data.html>.

⁷ Source: MassDOT Mobility Dashboard (<https://mobility-massdot.hub.arcgis.com/>), Statewide Average Vehicle Miles Traveled (Daily) values for March 2, 2020, and May 4, 2020.

2020 and early May 2020, while weekday combined ridership for heavy rail, light rail, and the Silver Line declined by 91 percent during this same period.⁸ Throughout the remainder of 2020, 2021, and early 2022, traffic volumes and transit ridership began to increase, although patterns have fluctuated in response to changes in COVID-19 cases, outcomes, and related policies from government agencies and employers. Data for Massachusetts VMT as of early March 2022 indicates that VMT at that time was approximately 66 percent of what it was in mid-February 2020 (prior to the pandemic).⁹ Meanwhile, MBTA bus ridership in late February 2022 was about 63 percent of what it was in late February 2020, and combined weekday heavy rail, light rail, and Silver Line ridership in early March 2022 was about 23 percent of what it was in late February 2020.¹⁰ MassDOT's telework research found that as of November 2021, full-time telework dropped to 13 percent, though part-time telework had increased to 31 percent. Some uncertainty remains regarding the share of people that will be teleworking in the future as employers implement and adjust remote and hybrid workplace policies. However, based on their recent research into remote work activity, MassDOT staff anticipates a general trend towards higher rates of teleworking in the future.

The staff from MassDOT, NH DOT, the Boston Region MPO, and the Northern Middlesex MPO acknowledged that while investment and support for non-SOV travel will likely continue and grow, the UZA will not likely experience the rate of change seen between the 2011–15 and 2016–20 estimates. They decided to assume an approximate seven percent increase in non-SOV commute travel between 2020 and 2025 (based on the change in five-year ACS estimates between 2014 and 2019). This approach assumes that the UZA would retain the gains in non-SOV travel experienced during the pandemic, and that there would be a continued increase because of further investments in transit and other non-SOV options and continued telework practices. Staff from these agencies also considered upper and lower-bound projections, based on non-SOV travel to work, using estimated margins of error from the ACS. As previously mentioned, MassDOT anticipates that remote work will continue to increase. Therefore, staff

⁸ Source: MassDOT Mobility Dashboard (<https://mobility-massdot.hub.arcgis.com/>), Weekday System Bus Ridership: System Ridership by Week data for February 24, 2020, and May 4, 2020; and MBTA Validations by Rapid Transit Line (Daily) for February 25, 2020, and May 5, 2020.

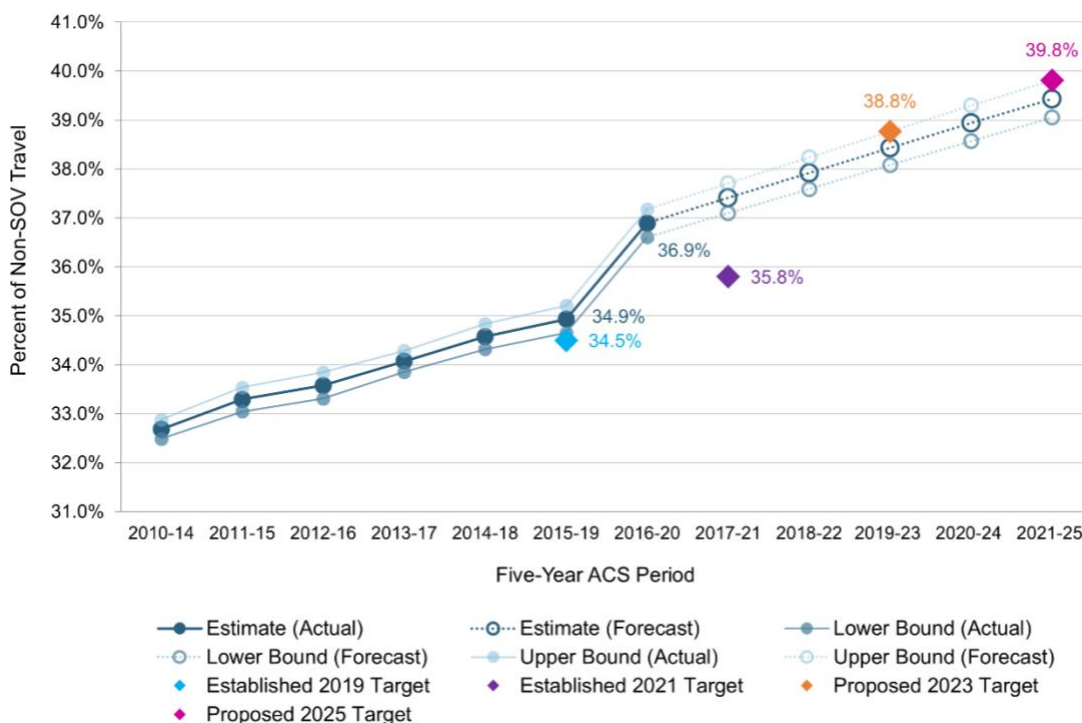
⁹ Source: MassDOT Mobility Dashboard (<https://mobility-massdot.hub.arcgis.com/>), Statewide Average Vehicle Miles Traveled (Daily) values for March 2, 2020, and March 6, 2022.

¹⁰ Source: MassDOT Mobility Dashboard (<https://mobility-massdot.hub.arcgis.com/>), Weekday System Bus Ridership: System Ridership by Week data for February 24, 2020, and February 28, 2022; and MBTA Validations by Rapid Transit Line (Daily) for February 25, 2020, and March 1, 2022.

from the four agencies chose a trend line for setting targets based on upper-bound estimates.

Figure 3 shows past non-SOV travel estimates, projections based on a trend line reflecting an approximately seven percent increase in non-SOV travel in the UZA between 2020 and 2025, and proposed targets. This figure also reflects upper- and lower-bound estimates and projections, based on estimated margins of error from the ACS. Based on this trend line, staff from these agencies propose a 2023 non-SOV travel target (reflecting a 2019–23 ACS estimate) of 38.8 percent and a 2025 target (reflecting a 2021–25 ACS estimate) of 39.8 percent. Table 3 also presents the second performance period baselines and targets.

Figure 3
Estimates, Projected Values, and Proposed Targets for the
Percent of Non-SOV Travel in the Boston MA-NH-RI UZA
(Second Federal Performance Period)



Note: Values in this figure reflect five-year ACS estimates for the percent of non-SOV travel to work for workers ages 16 and older.

ACS = US American Community Survey. MA = Massachusetts. NH = New Hampshire. Non-SOV = non-single-occupancy vehicle. RI = Rhode Island. UZA = urbanized area.

Sources: US Census Bureau, ACS Five-Year Estimates (Table DP03, “Selected Economic Characteristics”); the Massachusetts Department of Transportation; and Boston Region MPO staff.

Table 3
Baseline Value and Targets for the Percent of Non-SOV Travel in the Boston MA-NH-RI UZA (Second Federal Performance Period)

Performance Measure	Geographic Area	Baseline Value (2016-20 ACS estimate)	Two-Year Target (2019-23 ACS estimate)	Two-Year Target (2021-25 ACS estimate)
Traffic Congestion: Percent of non-SOV travel	Boston MA-NH-RI UZA	36.9%	38.8%	39.8%

Note: Values in this figure reflect five-year ACS estimates for the percent of non-SOV travel to work for workers ages 16 and older.

ACS = US American Community Survey. MA = Massachusetts. NH = New Hampshire. Non-SOV = non-single-occupancy vehicle. RI = Rhode Island. UZA = urbanized area.

Sources: US Census Bureau, ACS Five-Year Estimates (Table DP03, "Selected Economic Characteristics"); the Massachusetts Department of Transportation; and Boston Region MPO staff.

2.2 Annual Peak Hours of Excessive Delay Per Capita Measure

2.2.1 PHED per Capita Measure Overview

The *annual hours of PHED per capita* measure estimates the excessive delay experienced by a UZA's population from travel on the NHS during peak periods. States and MPOs calculate this measure using several component metrics and data sources:

- *Hours of excessive delay during peak periods.* For each NHS segment, states and MPOs determine a threshold speed and use this value and the segment length to establish an excessive delay threshold travel time (EDTTT).¹¹ They determine the amount of travel time for all vehicles that exceeded the EDTTT during weekday peak periods.¹² This remainder is the excessive delay for that NHS segment. Travel-time data for NHS segments must be derived by this calculation; these data are provided in the National Performance Monitoring Research Data Set (NPMRDS). This excessive delay value is calculated for peak periods for all NHS segments for a full year.
- *Number of travelers during peak periods.* To calculate this figure, states and MPOs use average annual daily traffic (AADT) estimates for NHS

¹¹ FHWA requires state DOTs and MPOs to use 60 percent of the posted speed limit for the segment or 20 miles per hour, whichever is greater, for the threshold speed.

¹² FHWA requires states and MPOs to use the period from 6:00 AM to 10:00 AM to represent the morning peak period, but it allows these agencies to choose either 3:00 PM to 7:00 PM or 4:00 PM to 8:00 PM to represent the evening peak period. MassDOT and NH DOT selected the period from 3:00 PM to 7:00 PM to represent the evening peak period for the Boston MA-NH-RI UZA.

segments and then apply factors to adjust these estimates to reflect weekday peak hours and average vehicle occupancies.

- *UZA Population.* Population figures are provided by the US Census Bureau.

The annual PHED per capita measure is calculated at the UZA level by multiplying the hours of excessive delay during peak periods by the number of travelers during peak periods, and then dividing that total by the UZA population. The measure is expressed in hours per capita, and the goal is to minimize this value.

2.2.2 Past Annual PHED Per Capita Performance and Targets (First Federal Performance Period)

Table 4 outlines the PHED and population values that underlie the 2017 baseline value for annual peak hours of excessive delay per capita in the Boston MA-NH-RI UZA.

**Table 4
2017 Baseline Value for Annual Hours of PHED Per Capita
in the Boston MA-NH-RI UZA**

MA and NH Annual Hours of PHED (CY 2017)	Boston MA-NH-RI UZA Population (MA and NH Only)*	Annual PHED Per Capita for the Boston MA-NH-RI UZA
80,053,183	4,371,476	18.3 hours per person

* Cambridge Systematics aggregated 2012–16 ACS population estimates at the block group level to estimate the population for the portion of the Boston MA-NH-RI UZA in Massachusetts and New Hampshire. This estimate was then inflated for 2017 by applying information on expected population growth in the Boston MSA between 2016 and 2017. Rhode Island is excluded from these metrics because no part of the NHS system in the Boston MA-NH-RI UZA passes through Rhode Island.

ACS = American Community Survey. CY = calendar year. FHWA = Federal Highway Administration. MA = Massachusetts. MSA = Metropolitan Statistical Area. NH = New Hampshire. NHS = National Highway System. RI = Rhode Island. PHED = peak hour excessive delay. UZA = urbanized area.

Sources: National Performance Management Research Data Set, US Census Bureau ACS, Cambridge Systematics, Federal Highway Administration, Massachusetts Department of Transportation, and New Hampshire Department of Transportation.

Based on FHWA’s 2017 applicability determination, MassDOT, NH DOT, the Boston Region MPO, and the Northern Middlesex MPO were required to establish a four-year target for the *annual hours of PHED per capita* measure, which reflects expected performance on this measure as of the end of CY 2021. These agencies also opted to report a two-year target for this measure, which reflects expected performance as of the end of CY 2019. As with the baseline value for the *annual hours of PHED per capita* measure, relevant states and

MPOs are required to report single, unified targets for the UZA and to identically report progress toward those targets.¹³

When setting targets, MassDOT and NH DOT only examined travel-time data from the NPMRDS for 2017 because of differences in features between the Version 1 (2016 and earlier) NPMRDS and Version 2 NPMRDS (2017 and later). During this process, these agencies considered guidance from FHWA to states and MPOs, which explains that because there are differences between Versions 1 and 2 of the NPMRDS, using multiple years of data to set targets may not be the best approach, especially for four-year targets.¹⁴ The four participating agencies—MassDOT, NH DOT, the Boston Region MPO, and the Northern Middlesex MPO—elected to set both a two-year target (reflecting performance as of the end of CY 2019) and a four-year target (reflecting performance as of the end of CY 2021) equal to the 2017 baseline value—18.3 annual hours of PHED per capita—and established these targets for the Boston MA-NH-RI UZA. These target values are summarized in Table 5. For more information, see [Boston Region MPO Baseline CMAQ Performance Plan \(2018\)](#).

Table 5
Baseline Value and Targets for the
Annual Hours of PHED per Capita in the Boston MA-NH-RI UZA (First
Federal Performance Period)

CMAQ Traffic Congestion Performance Measure	Baseline Value (CY 2017)	Two-Year Target (end of CY 2019)	Four-Year Target (end of CY 2021)
Annual hours of PHED per capita	18.3	18.3	18.3

CMAQ = Congestion Mitigation and Air Quality. CY = calendar year. MA = Massachusetts. NH = New Hampshire. PHED = peak hour excessive delay. RI = Rhode Island. UZA = urbanized area.

Sources: National Performance Monitoring Research Data Set, Federal Highway Administration, Massachusetts Department of Transportation, New Hampshire Department of Transportation, the US American Community Survey, and the Boston Region MPO.

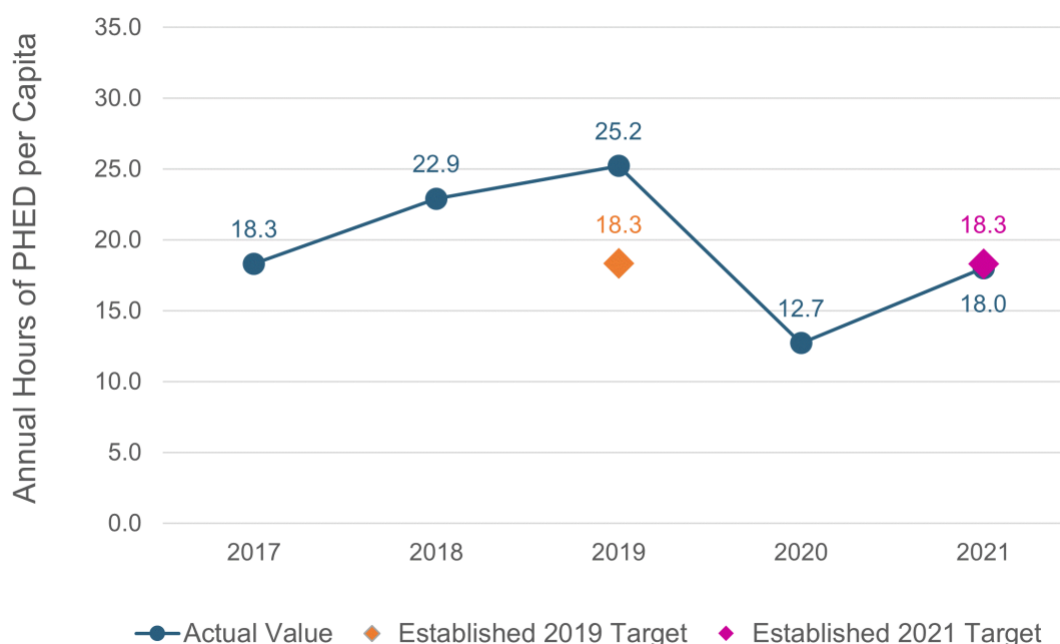
Figure 4 shows changes in performance in the annual PHED per capita measure for the Boston MA-NH-RI UZA over time. This measure increased in 2018 and 2019, reflecting increasing congestion on the NHS system in the UZA—as a result performance did not meet the two-year target (18.3). In 2020, MassDOT staff noted that several data-related factors may have affected the 2018 and 2019 estimates, which complicated the analysis of trends—as a result, the states and MPOs in the UZA did not elect to adjust their four-year target at that time. In

¹³ 23 CFR 490.105(e)(8)(iii), 23 CFR 490.107(c)(3)(iii)(A), and 23 CFR 490.107(b)(2)(ii)(A).

¹⁴ FHWA, “Frequently Asked Questions: Target Setting,” (November 5, 2021), accessed August 28, 2022, at <https://www.fhwa.dot.gov/tpm/faq.cfm>.

2020, the number of annual hours of PHED per capita decreased considerably in response to the COVID-19 pandemic, along with related public and private sector responses, as discussed in Section 2.1. In 2021, as travel increased, the annual hours of PHED per capita increased such that it approached the baseline value established in 2017. Despite this increase, performance for 2021 was better than the four-year target (18.3).

Figure 4
Estimates and Targets for Annual Hours of PHED Per Capita in the Boston MA-NH-RI UZA (First Federal Performance Period)



HPMS = Highway Performance Monitoring System. MA = Massachusetts. NH = New Hampshire. NHS = National Highway System. PHED = peak hour excessive delay. RI = Rhode Island. UZA = urbanized area. Sources: HPMS data for Massachusetts and New Hampshire, US American Community Survey, Massachusetts Department of Transportation, New Hampshire Department of Transportation, the Center for Advanced Transportation Technology Laboratory (CATT Lab) at the University of Maryland, INRIX, and Boston Region MPO staff.

2.2.3 Proposed Annual PHED Per Capita Performance and Targets (Second Federal Performance Period)

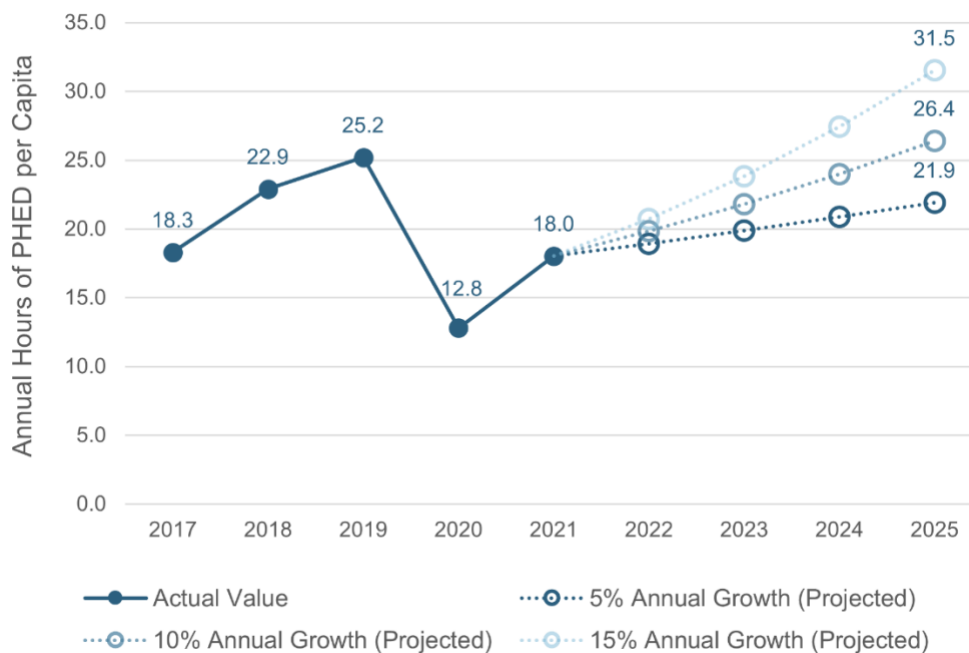
For this second FHWA-designated performance period, which lasts from CYs 2022 through 2025, states and MPOs in the Boston MA-NH-RI UZA must set the following targets for the *annual PHED per capita* measure:

- A two-year target, which reflects expected performance on this measure as of the end of CY 2023

- A four-year target which reflects expected performance on this measure as of the end of CY 2025

When proposing targets, MassDOT and NH DOT reviewed NPMRDS travel time data, speed data, and AADT information for NHS roadways. These agencies also reviewed population data from the ACS and the 2020 Decennial Census. As previously discussed, changes in travel patterns in response to the COVID-19 pandemic and related public and private sector responses caused fluctuations in annual hours of PHED. When creating projections for this measure, MassDOT and NH DOT created an initial trend line based on a five percent growth rate, which reflects half of the rate of increase in PHED per capita between 2018 and 2019 (prior to the COVID-19 pandemic). This five percent growth rate accounts for the fact that traffic has not yet returned to pre-pandemic levels. However, MassDOT and NH DOT acknowledge the large degree of uncertainty surrounding future demand for travel, including on the NHS. Travel activity for 2021, the most recent full year of data, is still heavily influenced by the pandemic and public and private sector responses, and the future growth rate of PHED per capita may be larger than anticipated. Figure 5 shows past annual PHED per capita values and projections based on various growth rates.

Figure 5
Estimates and Projected Growth Rates for
Annual Hours of PHED Per Capita in the Boston MA-NH-RI UZA

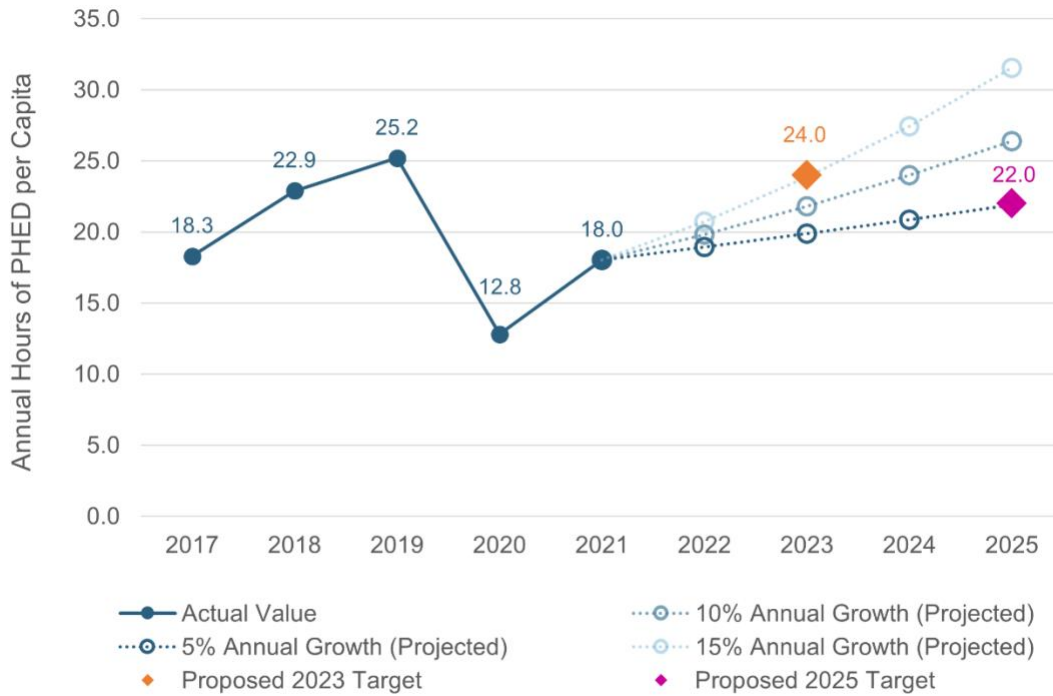


HPMS = Highway Performance Monitoring System. MA = Massachusetts. NH = New Hampshire. PHED = peak hour excessive delay. RI = Rhode Island. UZA = urbanized area.

Sources: HPMS data for Massachusetts and New Hampshire, US American Community Survey, Massachusetts Department of Transportation, New Hampshire Department of Transportation, the Center for Advanced Transportation Technology Laboratory (CATT Lab) at the University of Maryland, INRIX, and Boston Region MPO staff.

Given the uncertainty in terms of travel demand, particularly in the near term, MassDOT and NH DOT proposed a target of 24 annual hours of PHED per capita for the end of CY 2023. Staff from these agencies considered this target value be attainable under a range of potential PHED growth rates. Staff from MassDOT and NH DOT proposed a target of 22 hours of PHED per capita for the end of CY 2025, which assumes that strategies and policies are implemented to mitigate growth in congestion over this four-year period. Figure 6 shows the past annual PHED per capita values and projected growth rates included in Figure 5, along with the proposed target values. Table 6 summarizes the proposed target values.

Figure 6
Estimates, Projected Growth Rates, and Proposed Targets
for Annual Hours of PHED Per Capita in the Boston MA-NH-RI UZA



HPMS = Highway Performance Monitoring System. MA = Massachusetts. NH = New Hampshire. PHED = peak hour excessive delay. RI = Rhode Island. UZA = urbanized area.

Sources: HPMS data for Massachusetts and New Hampshire, US American Community Survey, Massachusetts Department of Transportation, New Hampshire Department of Transportation, the Center for Advanced Transportation Technology Laboratory (CATT Lab) at the University of Maryland, INRIX, and Boston Region MPO staff.

Table 6
Baseline Value and Proposed Targets for the
Annual Hours of PHED per Capita Measure in the Boston MA-NH-RI UZA

CMAQ Traffic Congestion Performance Measure	Baseline Value (CY 2017)	Two-Year Target (end of CY 2023)	Four-Year Target (end of CY 2025)
Annual hours of PHED per capita	18.0	24.0	22.0

CMAQ = Congestion Mitigation and Air Quality. CY = calendar year. MA = Massachusetts. NH = New Hampshire. PHED = peak hour excessive delay. RI = Rhode Island. UZA = urbanized area.

Sources: National Performance Monitoring Research Data Set, Federal Highway Administration, Massachusetts Department of Transportation, New Hampshire Department of Transportation, the US American Community Survey, and the Boston Region MPO.

3 EMISSIONS REDUCTION PERFORMANCE MEASURE

3.1 Emissions Reduction Measure Overview

The CMAQ emissions reduction performance measure focuses specifically on the impacts of CMAQ investments in areas that do not meet air quality standards (nonattainment areas), or that have not met them in the past (maintenance areas). This measure examines the total daily kilograms of emissions reduction of mobile source pollutants or precursors for CMAQ-funded projects in nonattainment and maintenance areas. It is desirable to increase the value of this measure because it reflects the amount of pollution expected to be reduced.

State DOTs and MPOs set targets for the emissions reduction performance measure using estimated daily emissions reductions for transportation projects in nonattainment or maintenance areas that are reported in the CMAQ Public Access System for a given set of federal fiscal years (FFYs). MPO staff generate these estimates using standard air quality analysis spreadsheets provided by MassDOT's Office of Transportation Planning (OTP), and these estimates are used as part of Massachusetts' CMAQ consultation process. The resulting estimates are used to determine if a project will generate an air quality benefit and thereby be eligible for CMAQ funding.

As previously mentioned, when the FHWA made its 2021 applicability determination for this performance measure, the Boston region included an area (Waltham) designated as being in maintenance for air pollutant standards for carbon monoxide (CO). This maintenance area expired as of April 2022; however, the Boston Region MPO must fulfill these performance requirements at least until the FHWA issues an updated applicability determination in October 2023.

3.2 Past Emissions Reduction Performance Targets (First Federal Performance Period)

Performance targets for the CMAQ emissions reduction measure focus on the pollutants or precursors for which designated areas in a state or MPO region are in nonattainment or maintenance status. Table 7 shows the CO emissions reduction targets the MPO adopted in September 2018 for the first federal performance period (FFYs 2018–21). These performance targets reflect that there were no CMAQ-funded projects expected to be obligated in the Waltham CO limited maintenance area between FFYs 2014–17 (baseline) or between FFYs 2018–21.¹⁵ As a result, there were no CO emissions reduced from CMAQ projects.

¹⁵ Obligated projects are those that have been approved by the federal government for reimbursement. Source: Denver Regional Council of Governments, "Transportation

**Table 7
Baseline Value, Estimates, and Targets for the Total Emissions Reduction Measure (Boston Region, First Federal Performance Period)**

Performance Measure	Baseline Years and Data	Baseline Value	Two-Year Target (FFYs 2018–19)	Two-Year Actual Value (FFYs 2018–19)	Four-Year Target (FFYs 2018–21)	Four-Year Actual Value (FFYs 2018–21)
Daily kilograms of CO emissions reduction from CMAQ projects in Boston region nonattainment or maintenance areas	FFYs 2014-17 data on obligated projects with CMAQ funding	0	0	0	0	0

Note: A maintenance area for carbon monoxide was located in Waltham until April 2022. CMAQ = Congestion Mitigation and Air Quality. CO = carbon monoxide. FFY = federal fiscal year. Source: Boston Region MPO.

3.3 Proposed Emissions Reduction Performance Targets (Second Federal Performance Period)

For the second federal performance-monitoring period, applicable states and MPOs must set these targets:

- A two-year target reflecting anticipated daily emissions reduction from applicable projects in the CMAQ Public Access System for FFY 2022 and 2023
- A four-year target reflecting anticipated daily emissions reduction from applicable projects in the CMAQ Public Access System for FFYs 2022–25

The FHWA requires states and MPOs to establish a baseline value for this measure by identifying the emissions reductions for applicable pollutants and precursors that are associated with CMAQ-funded projects obligated for funding in nonattainment or maintenance areas between FFYs 2018 and 2021. For the Boston Region MPO, applicable projects would include obligated CMAQ-funded projects in or overlapping the MPO’s carbon monoxide limited maintenance area in Waltham. The Boston Region MPO and MassDOT have not programmed any CMAQ-funded projects in Waltham in the Transportation Improvement Program (TIP) and State Transportation Improvement Program (STIP), respectively,

Improvement Program,” accessed October 12, 2022, at <https://drcog.org/planning-great-region/transportation-planning/transportation-improvement-program>.

between FFYs 2018 and 2021. As a result, the baseline amount of carbon monoxide reduced by CMAQ-funded projects in this limited maintenance area during this period is zero (0) kilograms per day.

To set targets MPO staff reviewed the MPO's FFYs 2022–26 and FFYs 2023–27 TIPs to identify any projects that

- will be partially or fully funded with CMAQ dollars;
- are expected to be obligated between FFYs 2022–25; and
- will be in or that will serve Waltham.

Staff identified one project that meets these three criteria: the NewMo Microtransit Service Expansion Project, which is funded through the MPO's Community Connections program and is scheduled to receive funding in FFYs 2023–25.

NewMo uses on-demand, dynamically routed microtransit technology operated by Via to serve residents, students, and employees in Newton The City of Newton's first application to the Community Connections program focused on building on an existing microtransit service for seniors to provide shared first- and last-mile rides between the Wells Avenue Business District and three MBTA lines (including access to the Needham Heights commuter rail station in Needham), before expanding citywide. The MPO has provided CMAQ funding for this service through the Community Connections program in FFY 2021 and 2022 and will provide additional funding in FFY 2023, per the FFYs 2023–27 TIP. During this phase, the City's operating partner, Via, has started to transition the vehicle fleet from hybrid to all-electric vehicles. For the purposes of managing funding and performing air quality analysis, this NewMo citywide expansion project is considered Phase 1.¹⁶

The City of Newton has more recently applied to the Community Connections program for funding for the NewMo Microtransit Service Expansion Project.¹⁷ This expansion, which is considered Phase 2 for MPO air quality analysis and funding purposes, will provide service to the Moody Street and MBTA commuter rail station area in Waltham as well as stops in Watertown, Wellesley, Weston, and potentially Boston. This Phase 2 project will add additional drivers and complete the fleet transition to electric vehicles, which will help meet increasing demand and provide zero-emission service.

¹⁶ In the FFYs 2023–27 TIP, this project was assigned number S12125.

¹⁷ In the FFYs 2023–27 TIP, this project was assigned number S12694.

When applying for funds for the Community Connections program, project proponents provide expected values for service-related metrics based on available information and projections. MPO staff use these values and other assumptions to conduct an air quality analysis that estimates the expected air quality benefits of the service, including anticipated reductions in CO emissions. These calculations use estimates of the following information:

- CO emissions from the expanded service
- Days of operation per year
- Anticipated ridership and number of trips
- Average trip distance and service mileage
- CO emissions associated with replaced SOV trips

MPO staff calculated the air quality benefits for the Phase 1 project, which serves Newton and the Needham Heights commuter rail station, separately from Phase 2, which will provide service to Waltham, Watertown, Weston, and Wellesley (and possibly Boston). Both phases of the project demonstrated air quality benefits, which were calculated for CO, CO₂, NO_x, and VOCs. For the NewMo Phase 2 project, these calculations (performed in May 2022) resulted in an estimated average of 1.417 kilograms of CO reduced per day. In advance of the NewMo Phase 2 service beginning operation and generating ridership and trip statistics for further analysis, MPO staff assume that the four municipalities that are confirmed to have connecting service—Waltham, Watertown, Weston, and Wellesley—will receive an equal share of the air quality benefits. As a result, MPO staff estimate that the NewMo Phase 2 project will reduce 0.354 kilograms of CO per day in Waltham (the MPO's now expired limited maintenance area).

MPO staff recommend that the MPO adopt this value—0.354 kilograms of CO reduced per day in Waltham—for both its two-year and four-year emissions reduction target, as shown in Table 8. As previously discussed, the NewMo Phase 2 project is the only CMAQ-funded project programmed in the MPO's TIP for FFYs 2022–25 that would serve Waltham.

Table 8
Baseline Value and Proposed Targets for the Total Emissions Reduction Measure (Boston Region, Second Federal Performance Period)

Performance Measure	Baseline Years and Data	Baseline Value	Two-Year Target (FFYs 2022–23)	Four-Year Target (FFYs 2022–25)
Daily kilograms of CO emissions reduction from CMAQ projects in Boston region nonattainment or maintenance areas	FFYs 2018-21 data on obligated projects with CMAQ funding	0	0.354	0.354

Note: A maintenance area for carbon monoxide was located in Waltham until April 2022.

CMAQ = Congestion Mitigation and Air Quality. CO = carbon monoxide. FFY = federal fiscal year.

Source: Boston Region MPO.

Because the expansion (Phase 2) portion of the NewMo Service is not yet operating, MPO staff must rely on these expected values and assumptions to estimate CO reductions from this project, particularly for service to Waltham. Under current Community Connections program guidelines, project proponents are required to report certain metrics after each year of funding received so that the project's continuing air quality benefit can be confirmed. In future years, MPO staff will be able to access details from actual NewMo Phase 2 operations, which will improve estimates of air quality benefits.

4 REQUESTED ACTION AND NEXT STEPS

MPO staff recommends that the Boston Region MPO vote to support the proposed CMAQ traffic congestion and emissions reduction performance targets, which are summarized in Table 1, at its October 20, 2022, meeting. MPO staff have had opportunities to inform these targets throughout their development. For the traffic congestion targets, this approach ensures that these UZA-level targets are reported consistently by all relevant states and MPOs in the Boston MA-NH-RI UZA, per CMAQ Program performance requirements. Next steps related to federally required CMAQ performance measures include the following:

- **December 2022:** MPO staff will incorporate established targets and baseline information into a CMAQ Performance Plan that will be included in the Commonwealth's submittal of performance baseline and target information to FHWA. Examples of past MPO CMAQ Performance Plans are available on the MPO's Performance-based Planning and Programming web page (bostonmpo.org/performance).
- **April 2023:** MPO staff will incorporate these CMAQ Program performance targets and related baseline information into performance reports that will be included in the MPO's next Long-Range Transportation Plan (LRTP),

Destination 2050, and its FFYs 2024–28 TIP. In the TIP, staff will provide information on how programmed projects may address these performance measures.

- **October 2023:** MPO staff expects that the FHWA will reassess the applicability of the CMAQ measures to determine if the MPO is still subject to the annual hours of PHED per capita, percent non-SOV travel, and emissions reduction measure requirements for the remainder of the performance period. At that time, the FHWA may determine that the MPO may no longer need to meet several CMAQ performance requirements because of the expiration of the Waltham limited maintenance area for carbon monoxide.

During the second federal performance period, the Boston Region MPO can coordinate with MassDOT, other state DOTs and MPOs, and other transportation planning partners to refine and improve coordination processes for setting targets and monitoring congestion. It can also work with these partners to identify and invest in projects, programs, and studies that reduce congestion, support mode shift, or improve air quality. For example, MPO staff is updating the LRTP Needs Assessment, which will identify roadway bottlenecks and congested locations, needs related to non-SOV options, and recommended studies and investments to address these issues. The MPO can choose to fund these recommendations and related projects when developing future LRTPs, TIPs, and Unified Planning Work Programs (UPWPs). In future years, the MPO can monitor its progress using both federally required measures as well as other performance measures related to congestion and air quality.

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To request this information in a different language or in an accessible format, please contact

Title VI Specialist
Boston Region MPO
10 Park Plaza, Suite 2150
Boston, MA 02116
civilrights@ctps.org

By Telephone:

857.702.3700 (voice)

For people with hearing or speaking difficulties, connect through the state MassRelay service:

- **Relay Using TTY or Hearing Carry-over:** 800.439.2370
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