LONG-RANGE TRANSPORTATION PLAN

OF THE BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

destination 2050

BOSTON REGION MPO METROPOLITAN PLANNING ORGANIZATION

destination 2050

FEDERAL FISCAL YEAR 2024

Boston Region MPO

ENDROSED BY THE MPO, JULY 2023

Prepared by
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Staff to the Boston Region Metropolitan Planning Organization

Directed by the Boston Region Metropolitan Planning Organization, which is composed of the

Massachusetts Department of Transportation
Metropolitan Area Planning Council
Massachusetts Bay Transportation Authority
MBTA Advisory Board
Massachusetts Port Authority
Regional Transportation Advisory Council
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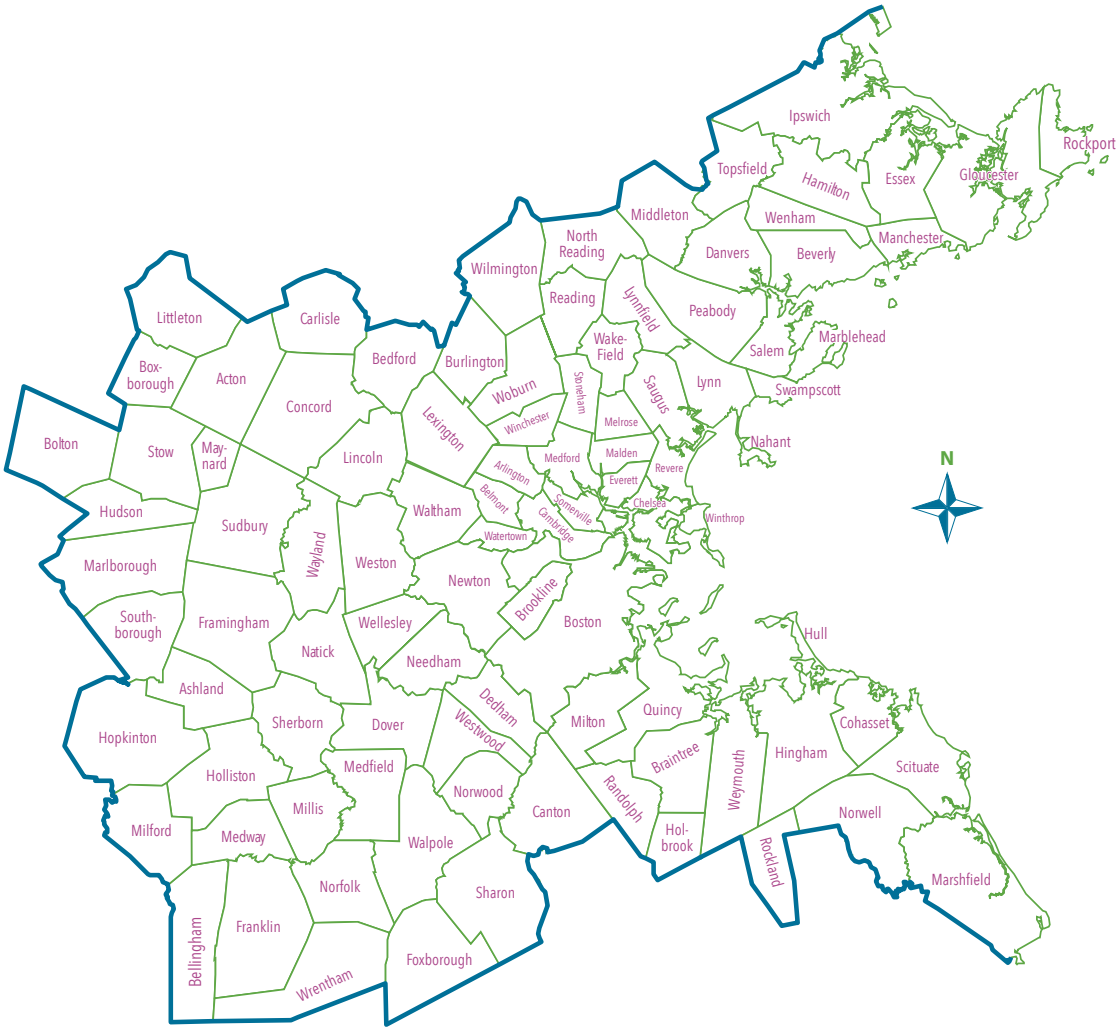

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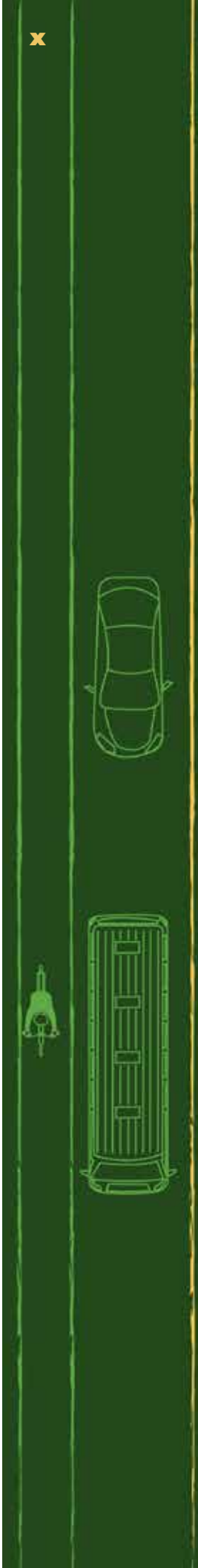
[CERTIFICATION LETTER]

Abbreviations

Abbreviation	Term
3C	continuous, comprehensive, cooperative [metropolitan transportation planning process]
ABP	Accelerated Bridge Program [MassDOT program]
ACS	American Community Survey [US Census Bureau data]
ADA	Americans with Disabilities Act of 1990
BIL	Bipartisan Infrastructure Law
BFP	Bridge Formula Program [federal funding program]
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CATA	Cape Ann Transportation Authority
CECP	Massachusetts Clean Energy and Climate Plan
CFR	Code of Federal Regulations
CIP	Capital Investment Plan [MassDOT]
CMAQ	Congestion Mitigation and Air Quality [federal funding program]
CMR	Code of Massachusetts Regulations
CMP	Congestion Management Process
CO	carbon monoxide
CO_2	carbon dioxide
CPT–HST	Coordinated Public Transit–Human Services Transportation Plan
CRRSAA	Coronavirus Response and Relief Supplemental Appropriations Act
CTPS	Central Transportation Planning Staff

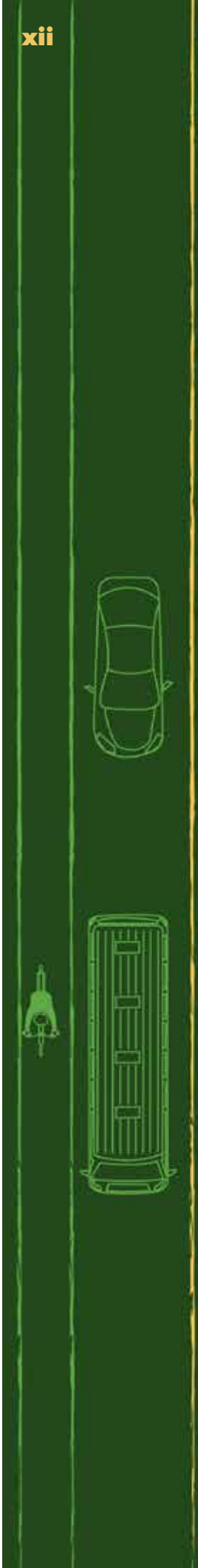
Abbreviation	Term
CY	calendar year
DEP	Department of Environmental Protection [Massachusetts]
DI/DB	Disparate Impact and Disproportionate Burden
DOD	United States Department of Defense
DOT	department of transportation
EB	eastbound
EDTTT	excessive delay threshold travel time
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EJ	environmental justice
EO	executive order
EPA	United States Environmental Protection Agency
EPDO	equivalent property damage only [a traffic-related index]
EV	electric vehicle
FAST Act	Fixing America's Surface Transportation Act
FEMA	Federal Emergency Management Agency
FFY	federal fiscal year
FHWA	Federal Highway Administration
FMLA	Federal Land Management Agency
FR	Federal Register
FTA	Federal Transit Administration
GANS	grant anticipation notes [municipal bond financing]
GHG	greenhouse gas

Abbreviation	Term
GWSA	Global Warming Solutions Act of 2008 [Massachusetts]
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program [federal funding program]
HTF	Highway Trust Fund
I	Interstate
ICC	Inner Core Committee [MAPC municipal subregion]
IRI	International Roughness Index
ITS	intelligent transportation systems
LEP	limited English proficiency
LOTTR	level of travel time ratio
LRTP	Long-Range Transportation Plan [MPO certification document]
MAGIC	Minuteman Advisory Group on Interlocal Coordination [MAPC municipal subregion]
MAP-21	Moving Ahead for Progress in the 21st Century Act
MAPC	Metropolitan Area Planning Council
MARPA	Massachusetts Association of Regional Planning Agencies
MassDOT	Massachusetts Department of Transportation
Massport	Massachusetts Port Authority
MBTA	Massachusetts Bay Transportation Authority
MHS	Metropolitan Highway System
MI	major infrastructure
MPO	metropolitan planning organization

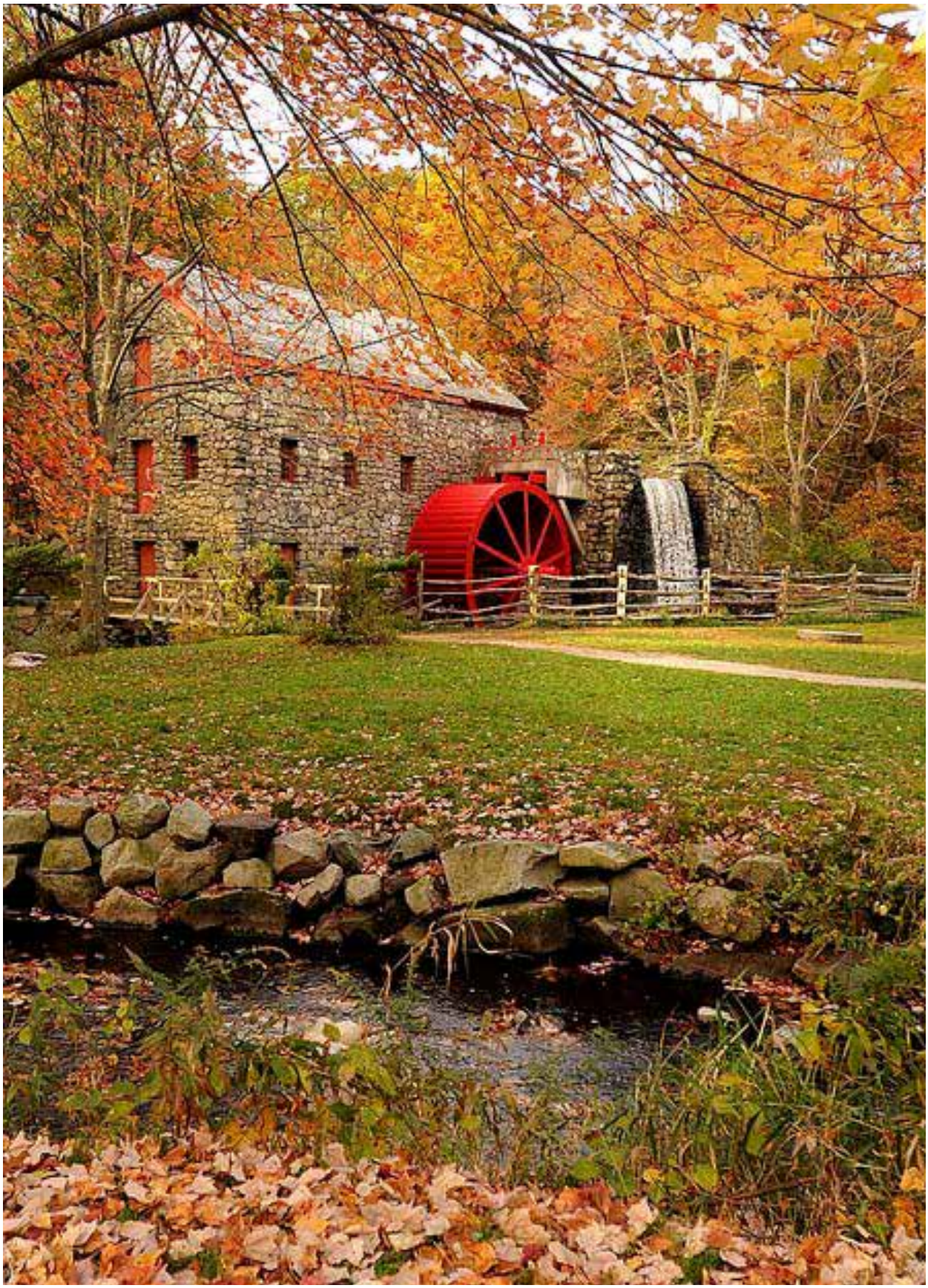


Abbreviation	Term
MOU	memorandum of understanding
MVP	Municipal Vulnerability Preparedness [Massachusetts grant program]
MWRC	MetroWest Regional Collaborative [MAPC municipal subregion]
MWRTA	MetroWest Regional Transit Authority
NAAQS	National Ambient Air Quality Standards
NB	northbound
NEPA	National Environmental Policy Act
NEVI	National Electric Vehicle Infrastructure Program [federal funding program]
NGBP	Next Generation Bridge Program [MassDOT program]
NH DOT	New Hampshire Department of Transportation
NHFP	National Highway Freight Program [federal funding program]
NHPP	National Highway Performance Program [federal funding program]
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
NOx	nitrogen oxides
NPMRDS	National Performance Measure Research Data Set [FHWA]
NSPC	North Suburban Planning Council [MAPC municipal subregion]
NSTF	North Shore Task Force [MAPC municipal subregion]
NTD	National Transit Database
PBPP	performance-based planning and programming
PEP	Public Engagement Program [MPO]

Abbreviation	Term
PHED	peak hours of excessive delay
PM	particulate matter
PMT	Program for Mass Transportation [MBTA}
ppm	parts per million
PRC	Project Review Committee [MassDOT]
PS&E	Plans, Specifications, and Estimates
PSI	Pavement Serviceability Index
PTASP	Public Transportation Agency Safety Plan
RCC	Regional Coordinating Councils
RTA	regional transit authority
RTAC	Regional Transportation Advisory Council [of the Boston Region MPO]
RTP	Regional Transportation Plan (aka Long-Range Transportation Plan)
SB	southbound
SFY	state fiscal year
SGR	state of good repair
SHSP	Strategic Highway Safety Plan
SIP	State Implementation Plan
SOV	single-occupant vehicle
SSC	South Shore Coalition [MAPC municipal subregion]
STRAHNET	Strategic Highway Network
STBG	Surface Transportation Block Grant Program [federal funding program]
STIP	State Transportation Improvement Program



Abbreviation	Term
SWAP	South West Advisory Planning Committee [MAPC municipal subregion]
TAM	Transit Asset Management Plan
TAMP	Transportation Asset Management Plan
TAZ	transportation analysis zone
TBD	to be determined
TCM	transportation control measure
TE	transportation equity
TERM	Transit Economic Requirements Model [FTA]
TIP	Transportation Improvement Program [MPO certification document]
TMC	traffic messaging channel
TRIC	Three Rivers Interlocal Council [MAPC municipal subregion]
TTTR	Truck Travel Time Reliability Index
ULB	useful life benchmark
UPWP	Unified Planning Work Program [MPO certification document]
USC	United States Code
USDOT	United States Department of Transportation
UZA	urbanized area
WB	westbound
V/C	volume-over-capacity ratio
VMT	vehicle-miles traveled
VOCs	volatile organic compounds
VRM	vehicle revenue-miles



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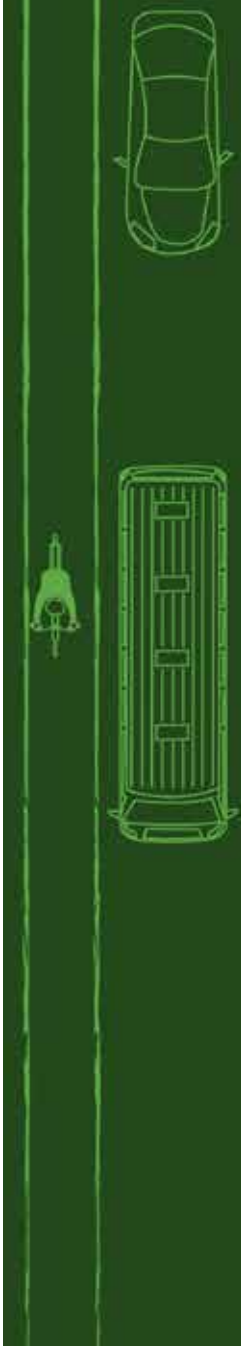
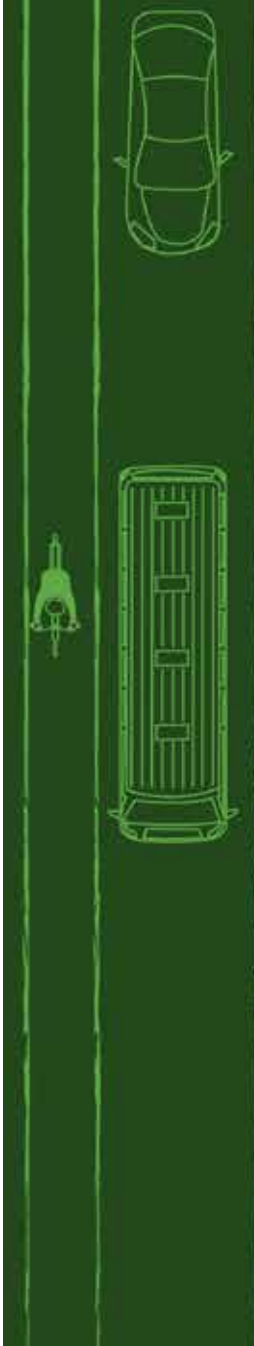


Appendices



List of Tables and Figures

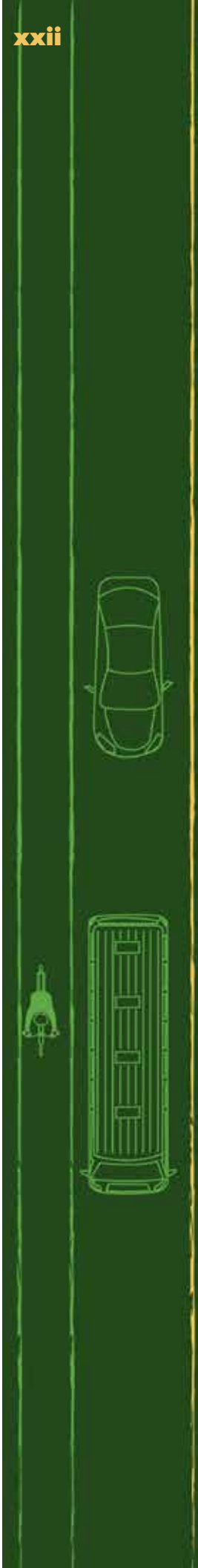


FIGURE PAGE

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY TO THE LONG-RANGE TRANSPORTATION PLAN

Introduction

Destination 2050 is the Boston Region Metropolitan Planning Organization's (MPO) Long-Range Transportation Plan (LRTP). Updated every four years, it guides decisions about investments in the region's transportation network to move the system towards the MPO's vision for its future:

> *The Boston Region MPO envisions an equitable, pollution-free, and modern regional transportation system that gets people to their destinations safely, easily, and reliably, and that supports an inclusive, resilient, healthy, and economically vibrant Boston region.*

To create a plan designed to implement this vision, the LRTP

- defines goals and objectives that guide the MPO's planning process,
- establishes new investment programs and makes updates to existing programs through which the MPO will invest in transportation projects over the next four years that advance its goals and objectives,
- outlines the transportation needs and challenges the region faces over the next 25 years, and
- identifies strategies to address those needs using financial resources available to the MPO.

The MPO conducted engagement activities throughout the development of the LRTP. Engagement began in fall 2019 with the kick-off development of the Needs Assessment and continued through the 30-day public comment period for the draft LRTP in the summer of 2023. The MPO conducted two public surveys: one on vision, goals, and objectives; and one on investment priorities. The MPO engaged many stakeholders, including the Regional Transportation Advisory Council, municipalities, the Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), regional transit authorities, community organizations, economic development and business organizations, transportation equity advocates, environmental advocates, and academic institutions.

Transportation Needs

A critical step in developing the LRTP was to collect, analyze, and identify transportation needs for the Boston region. Using results from data analyses and engagement activities, the Needs Assessment documents the transportation needs of the Boston region since the last LRTP was approved in 2019, focusing on the years between 2019 and 2023. It looks at how people travel; the condition of transportation facilities; the interaction of the transportation system with the built and natural environment and how well it serves minority, low-income, and other disadvantaged populations; and possible changes to travel patterns and demand in the future. It supports the LRTP by providing information about the region's most pressing transportation needs, thereby shaping the MPO's vision, goals, and objectives; and informing the development of new investment programs.

The Needs Assessment summarizes needs within each of the MPO's goal areas. Equity is integrated throughout the Needs Assessment—transportation impacts on transportation equity populations are assessed within the context of each goal area. Some of the needs identified are to

- close gaps in the bicycle network, focusing on roads with a high potential for everyday bicycling as identified by MassDOT;
- improve coordination between transit services, including scheduling and route planning, to increase efficiency and expand access to more people and places;
- reduce pollution emissions through, for example, electrification and mode shift to non-automobile transportation, prioritizing improvements for equity communities that bear a disproportionate burden of pollution impacts;
- expand access to and quality of public transit, for example, by addressing corridors with significant bus delay;
- upgrade and modernize public transit facilities, and improve state of good repair for transit facilities, especially tracks;
- improve the resiliency of transportation facilities to climate impacts, especially those that serve disadvantaged populations that are more vulnerable to these impacts;
- invest in safety interventions in areas with the most vulnerable road users, such as equity populations, people who bicycle, and people who walk; and
- invest in preventative countermeasures on roadways that have been identified as high risk before severe crashes happen.

To explore these and other analyses, see the full Needs Assessment, which is compiled into a series of interactive StoryMaps where readers can explore a series of maps, charts, and tables, and is available on the MPO's website.

Vision, Goals, and Objectives

During each LRTP development cycle, the MPO updates its planning framework, which consists of a vision statement, a set of goals, and a series of objectives associated with each goal (Figure ES-1). These serve as a guide for MPO decision-making for the next four years. The content of this framework—particularly the MPO goals—informs staff proposals and MPO decisions related to creating investment programs for the Transportation Improvement Program (TIP). Further, studies proposed for funding each year in the Unified Planning Work Program (UPWP) are assessed for their support of the MPO goals, and the objectives are translated into criteria for use in the TIP project selection process to ensure projects funded by the MPO support the MPO's goals. Finally, this framework, including its vision, helps communicate the MPO's values to partners, stakeholders, and the public.

Figure ES-1

Destination 2050 Vision, Goals, and Objectives

VISION STATEMENT

The Boston Region Metropolitan Planning Organization envisions an equitable, pollution-free, and modern regional transportation system that gets people to their destinations safely, easily, and reliably, and that supports an inclusive, resilient, healthy, and economically vibrant Boston region.

GOALS	OBJECTIVES
EQUITY	
Facilitate an inclusive and transparent transportation-planning process and make investments that eliminate transportation-related disparities borne by people in disadvantaged communities.	• Facilitate an inclusive and transparent engagement process with a focus on involving people in disadvantaged communities.* • Ensure that people have meaningful opportunities to share needs and priorities in a way that influences MPO decisions. • Eliminate harmful environmental, health, and safety effects of the transportation system on people in disadvantaged communities. • Invest in high-quality transportation options in disadvantaged communities to fully meet residents' transportation needs.
SAFETY	
Achieve zero transportation-related fatalities and serious injuries and improve safety for all users of the transportation system.	• Eliminate fatalities, injuries, and safety incidents experienced by people who walk, bike, roll, use assistive mobility devices, travel by car, or take transit. • Prioritize investments that improve safety for the most vulnerable roadway users: people who walk, bike, roll, or use assistive mobility devices. • Prioritize investments that eliminate disparities in safety outcomes for people in disadvantaged communities.
MOBILITY AND RELIABILITY	
Support easy and reliable movement of people and freight.	• Enable people and goods to travel reliably on the region's transit and roadway networks. • Prioritize investments that address disparities in transit reliability and frequency for people in disadvantaged communities. • Reduce delay on the region's roadway network, emphasizing solutions that reduce single-occupancy-vehicle trips, such as travel demand management. • Prioritize investments that reduce delay on the region's transit network. • Support reliable, safe travel by keeping roadways, bridges, transit assets, and other infrastructure in a state of good repair, and prioritize these investments in disadvantaged communities. • Modernize transit systems and roadway facilities, including by incorporating new technology that supports the MPO's goals, such as electric-vehicle technologies.

*** Disadvantaged communities are those in which a significant portion of the population identifies as an MPO equity population—people who identify as minority, have limited English proficiency, are 75 years old or older or 17 years old or younger, or have a disability—or has low income.**

Table ES-1 (cont.)

GOALS	OBJECTIVES
ACCESS AND CONNECTIVITY	
Provide transportation options and improve access to key destinations to support economic vitality and high quality of life.	• Improve multimodal access to jobs, affordable housing, essential services, education, logistics sites, open space, and other key destinations. • Prioritizing transportation investments that support the region's and the Commonwealth's goals for housing production, land use, and economic growth. • Increase people's access to transit, biking, walking, and other non-single-occupancy-vehicle transportation options to expand their travel choices and opportunities. • Prioritize investments that improve access to high quality, frequent transportation options that enable people in disadvantaged communities to easily get where they want to go. • Close gaps in walking, biking, and transit networks and support interorganizational coordination for seamless travel. • Remove barriers to make it easy for people of all abilities to use the transportation system, regardless of whether they walk, bike, roll, use assistive mobility devices, or take transit.
RESILIENCY	
Provide transportation that supports sustainable environments and enables people to respond and adapt to climate change and other changing conditions.	• Prioritize investments to make the region's roadway and transit infrastructure more resilient and responsive to current and future climate hazards, particularly within areas vulnerable to increased heat and precipitation, extreme storms, winter weather, and sea level rise. • Prioritize resiliency investments in disadvantaged communities and in areas that bear disproportionate climate and environmental burdens. • Prioritize investments in transportation resiliency that improve emergency access and protect evacuation routes. • Prioritize investments that include nature-based strategies such as low-impact design, pavement reduction, and landscape buffers to reduce runoff and negative impacts to water resources, open space, and environmentally sensitive areas.
CLEAN AIR AND HEALTHY COMMUNITIES	
Provide transportation free of greenhouse gas emissions and air pollutants and that supports good health.	• Reduce transportation-related greenhouse gases, other air pollutants, and growth in vehicle-miles traveled by encouraging people and goods to move by non-single-occupancy-vehicle modes. • Support transit vehicle electrification and use of electric vehicles throughout the transportation system to reduce greenhouse gases and other air pollutants. • Prioritize investments that address air pollution and environmental burdens experienced by disadvantaged and vulnerable communities. • Support public health through investments in transit and active transportation options and by improving access to outdoor space and healthcare.

Updated: February 2, 2023

Source: Boston Region Metropolitan Planning Organization.

Funding the Transportation Network

The MPO has approximately $5 billion, called discretionary, or Regional Target, dollars, to spend between federal fiscal years 2024 and 2050. The LRTP only lists specific projects between 2024 and 2033, and funding from 2034 to 2050 is allocated to investment programs. The dollars allocated in the LRTP to major infrastructure projects and investment programs must remain within the limit of available funding. *Destination 2050* and the short-term capital plan, the TIP, must demonstrate that projects selected by the MPO can be implemented within fiscal constraints. The financial plan for *Destination 2050* reflects how the MPO plans to balance the region's transportation needs while operating under the fiscal constraint of projected revenues.

Regional Target dollars are only a portion of the dollars available to support the region's transportation system. MassDOT has other sources of funding that it spends on highway projects in the Boston region, as do the MBTA, the Cape Ann Transportation Authority, and the MetroWest Regional Transit Authority to provide and improve transit service.

The Recommended Plan

The Recommended Plan includes the MPO's investment programs, as well as the major infrastructure projects that federal guidance requires to be listed in the LRTP. Investment programs prioritize the types of transportation projects that the MPO funds through the TIP. *Destination 2050's* investment programs include the following:

- Complete Streets: Funds projects that create continuous sidewalks, construct bicycle lanes, improve roadway geometry and bridges, and fortify storm water drainage systems.
- Major Infrastructure: Funds large-scale projects that expand major roadways and rail lines. Projects on facilities that are important to regional travel, that extend the rail network, or that cost $50 million or more are included in this program.
- Intersection Improvements: Funds projects that improve signals and include geometric improvements to shorten crossings for pedestrians, add turning lanes for vehicles, and improve sidewalks.
- Bicycle Network and Pedestrian Connections: Funds projects that expand bicycle networks, create new shared-use paths, implement traffic calming measures, and enhance signage.

- Community Connections: Funds first- and last-mile shuttles, updates to transit technology, car and bicycle parking near transit stations, bicycle and pedestrian infrastructure (including for people with mobility impairments), and travel instruction and education.
- Transit Transformation: Funds transit-related investments such as multimodal access improvements near or at transit stations, transit system electrification projects, or customer amenities such as bus shelters.
- Bikeshare Support: Funds capital costs associated with expanding the regional bikeshare system and replacing or upgrading existing stations.

Table ES-1 shows the percentage of funding dedicated to each investment program in each time band and the total funding allocated to each investment program over the entire plan. The allocations in 2029–33 differ from those in the other time bands because of the combined cost of the Major Infrastructure projects that the MPO selected for that time band.

Table ES-1

Funding Allocated to MPO Investment Programs in *Destination 2050*

Investment Program	Percentage Allocation, 2024–28 and 2034–50	Percentage Allocation, 2029–33	Funding Allocation, 2024–2050
Complete Streets	45%	30%	$2,130,828,621
Major Infrastructure	30%	47%	$1,643,425,636
Intersection Improvements	12%	10%	$584,554,172
Bicycle Network and Pedestrian Connections	5%	5%	$250,506,232
Transit Transformation	5%	5%	$250,506,232
Community Connections	2%	2%	$100,202,493
Bikeshare Support	1%	1%	$50,101,246
Total			$5,010,124,631

Note: Years are federal fiscal years

Source: Boston Region Metropolitan Planning Organization.

The Recommended Plan also includes major infrastructure projects that will be built in the region by 2050. Major infrastructure projects are either

- roadway projects that improve roadways that are important to regional travel, including interstate highways, principal arterials, freeways, and expressways, and all other arterials with controlled access or cost $50 million or more, or
- transit projects that add new connections to or extend the rail or fixed-guideway network or cost $50 million or more.

Major infrastructure projects listed in the LRTP are shown in Table ES-2. The first project in Table ES-2, Allston Multimodal, is included in the plan for illustrative purposes only and is not within the fiscal constraint of the plan. The second project, I-495 and I-90 Interchange, is funded mostly using MassDOT statewide program priority funding and is also not within the fiscal constraint of the plan.

Table ES-2
Recommended Plan Projects

Project Name	Current Estimated Cost	Time Bands	Within Fiscal Constraint?
Boston: Allston Multimodal	$675,500,000	2024-28	No
Hopkinton: I-495 and I-90 Interchange	$300,942,836	2024-28	No
Boston: Reconstruction of Rutherford Avenue from City Square to Sullivan Square	$197,759,449	2024-33	Yes
Framingham: Intersection Improvements at Route 126 and Route 135/MBTA and CSX Railroad	$115,000,000	2029-33	Yes
Lexington: Route 4/225 (Bedford Street) and Hartwell Avenue	$45,000,000	2029-33	Yes
Norwood: Intersection Improvements at Route 1 and University Avenue/Everett Street	$28,699,272	2024-28	Yes
Somerville: McGrath Boulevard	$98,840,000	2024-33	Yes
Wrentham: I-495/Route 1A Ramps	$20,117,638	2024-28	Yes

Note: Years are federal fiscal years.

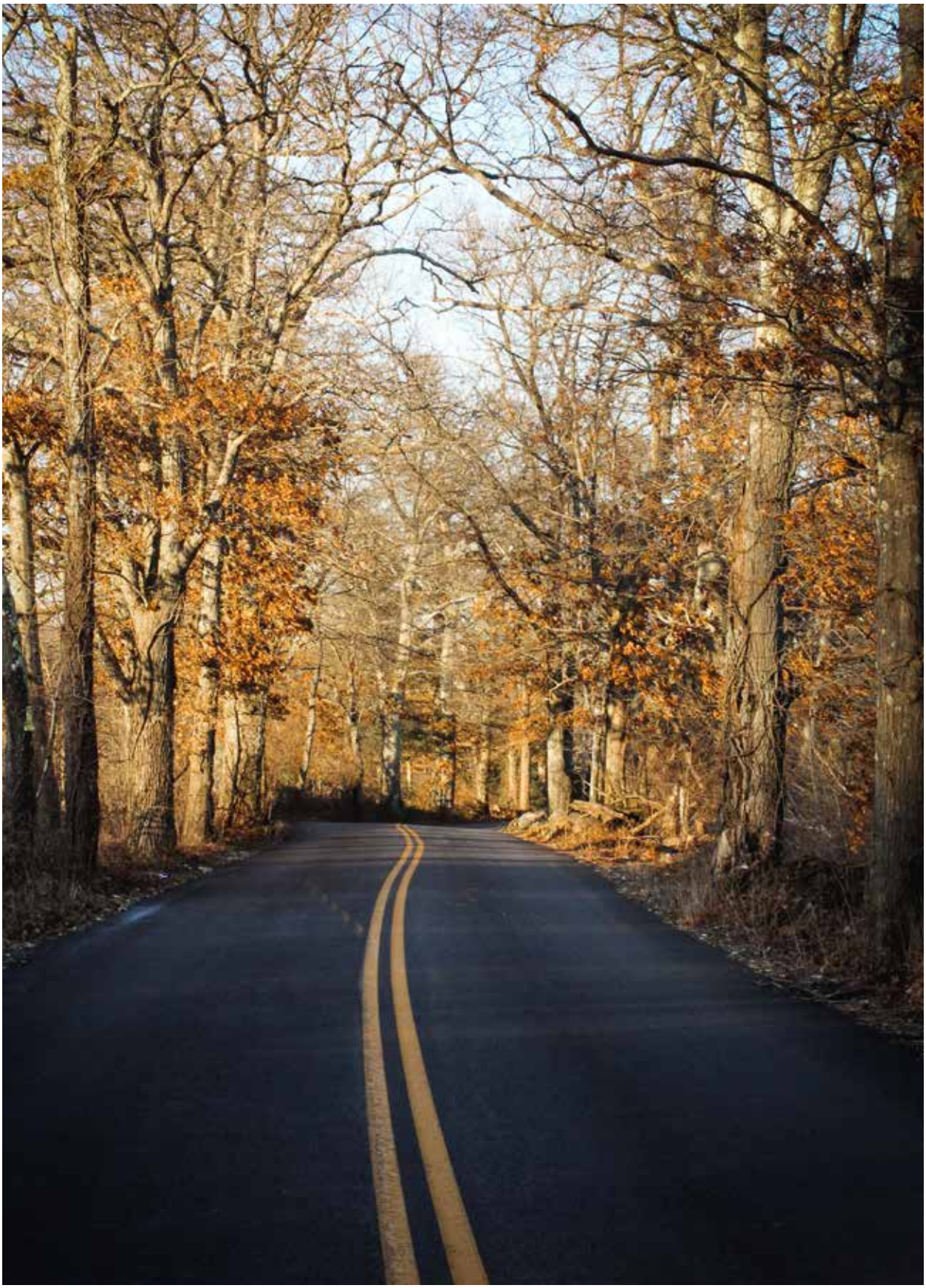
Source: Boston Region Metropolitan Planning Organization.

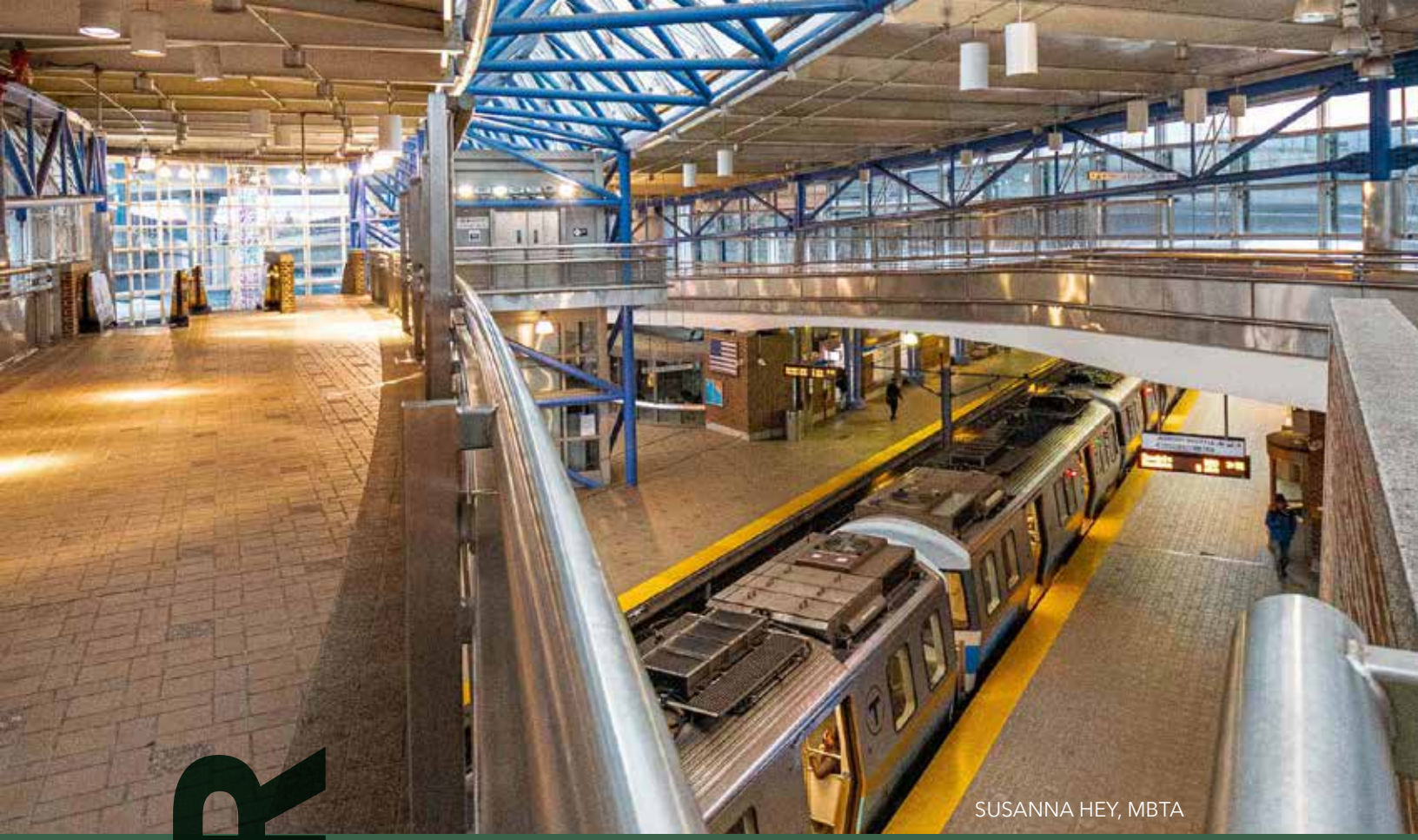
Disparate Impact and Disproportionate Burden Analysis Results

The disparate impact and disproportionate burden analysis shows that there would be six instances of disparate impacts and disproportionate burdens if the MPO's Regional Target projects were built by 2050. There are projected to be three disparate impacts for the minority population associated with access to healthcare by transit, average travel time by highway, and average travel time by transit. There are projected to be three disproportionate burdens for the low-income population associated with access to jobs by transit, access to healthcare by transit, and access to parks by highway. In all instances, the difference between the impact on the minority and nonminority populations and the low-income and non-low-income populations, respectively, is expected to be relatively small. In compliance with federal regulations, the MPO will identify and implement opportunities to mitigate the impacts of these disparate impacts and disproportionate burdens through future planning and project funding decisions.

Conclusion

Destination 2050 continues the MPO's practice of providing funding to support bicycle, pedestrian, and transit projects, along with major roadway improvements that promote safety, equity, and multimodal connectivity in the region. Continuing along this course will help to achieve its transportation vision for the future, improve the quality of life for Boston region residents, and enhance the environment in the whole region.





SUSANNA HEY, MBTA

CHAPTER ONE

PURPOSE OF THE PLAN

Destination 2050, the Boston Region Metropolitan Planning Organization's (MPO) Long-Range Transportation Plan (LRTP), will guide the MPO's decisions about investments in the Boston region's transportation network to bring the system from its present state towards the MPO's vision for the future:

> *The Boston Region MPO envisions an equitable, pollution-free, and modern regional transportation system that gets people to their destinations safely, easily, and reliably, and that supports an inclusive, resilient, healthy, and economically vibrant Boston region.*

According to federal regulations, every MPO must develop an LRTP every four years. The Boston Region MPO developed *Destination 2050* by following federal guidance for metropolitan planning, which involved conducting a planning process that engaged the public. Throughout the process, the MPO and public grappled with this challenge:

> *How can we improve the transportation network to meet existing needs, adapt and modernize it for future demand, and meet climate and other goals while working within the reality of constrained fiscal resources?*

The resulting LRTP defines goals and objectives that the MPO will adhere to when making near-term decisions about project and program funding during the next four years. It also outlines the transportation needs and challenges the region faces over the next 25 years. Finally, it identifies strategies to address those needs using the financial resources available to the MPO.

The Metropolitan Transportation Planning Process

Decisions about allocating transportation funds in a metropolitan area are guided by information and ideas gathered from a broad group of people, including elected officials, municipal planners and engineers, transportation advocates, and interested residents. Metropolitan planning organizations (MPOs) are responsible for providing a forum for this decision-making process and for deciding how to spend federal transportation funds for capital projects and planning studies for the area.

Federal legislation requires every metropolitan area in the United States with a population of 50,000 or more (also known as an urbanized area) to establish an MPO. MPOs must carry out a continuing, comprehensive, and cooperative (3C) transportation planning process, resulting in plans and programs consistent with the planning objectives of the metropolitan area, in order to be eligible for federal funds.

More information about the Boston Region MPO, its planning process, and its regulatory framework can be found in Appendices A and B.

The Role of Public Engagement

The public was consulted throughout the development of the LRTP and its associated Needs Assessment. The Needs Assessment, the vision, goals, and objectives, and the investment programs and projects in the LRTP reflect public engagement during each stage of development. From 2019 to 2023 the MPO received more than 2,000 comments, ideas, and survey responses about the region's transportation needs, investment priorities, and opportunities for improving the transportation system. This input was gathered through various activities, including the following:

- Big Ideas for Scenario Planning, 2021: A series of focus groups involving more than 40 organizations in the Boston region that aimed to identify driving forces that will shape transportation in the region and strategies to respond to future conditions
- Subregional group meetings, 2019–22: Annual meetings with the Metropolitan Area Planning Council (MAPC) subregional groups and quarterly meetings with the Inner Core Committee transportation group to discuss local transportation needs
- Regional Transportation Advisory Council meetings, 2019–23: Monthly meetings of the MPO's public Advisory Council comprising municipal, community, business, and advocacy representatives
- Transit Working Group meetings and coffee chats, 2020–22: Informal discussions with transit providers and other interested parties on public transit topics, including human services transportation needs, regional coordination needs, and regional transit priorities
- MPO open houses, 2019–22: Public open houses held annually for the draft Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP)
- Meetings and interviews with advocacy and community-based organizations, 2019–23: Meetings to discuss transportation issues and needs in the region:
    - Other workshops, meetings, and forums, 2019–23: Often done in collaboration with partner organizations to reach broader audiences, these gatherings included the following:
    - Regional Coordinating Council and Transportation Management Association meetings at which staff discussed MPO work and gathered feedback
    - Events that showcased MPO work and where participants discussed transportation topics such as freight planning and transit system mapping
    - Workshops for MPO projects and plans, including the Coordinated Public Transit-Human Services Transportation Plan
    - Events held by advocacy organizations that MPO staff attended to share information about the MPO and build relationships
    - Forums held in partnership with MAPC to discuss transportation topics such as travel demand management strategies

  - Public meetings held in partnership with the Massachusetts Department of Transportation to discuss capital planning in the Boston region

- Public surveys for *Destination 2050* and other MPO programs and projects, 2019–23 on the following topics:
  - *Destination 2050* vision, goals, and objectives
  - *Destination 2050* investment priorities
  - Coordinated Public Transit-Human Services Transportation Plan
  - Annual UPWP study ideas
  - TIP criteria update
  - Climate resilience in MPO studies
  - Corridor and intersection safety and operations

The public comment period for *Destination 2050* in June and July of 2023 provided the public a final opportunity to review and comment on the recommended plan and its development process before it was finalized. More details about the public input process can be found in Appendix C.

SUSANNA HEY, MBTA

CHAPTER TWO

OVERVIEW OF TRANSPORTATION NEEDS

A critical step in developing the Long-Range Transportation Plan (LRTP) was to collect, analyze, and identify transportation needs for the Boston region. Using results from data analyses and public engagement activities, the Needs Assessment documents the transportation needs of the Boston region since the last LRTP was approved in 2019—focusing on the years between 2019 and 2023. The development of the Needs Assessment took into account how people travel, the condition of transportation facilities, the interaction of the transportation system with the built and natural environment, how well it serves and how it impacts minority, low-income, and other disadvantaged populations, and possible changes to travel patterns and demand in the future.

The Needs Assessment supports the LRTP by providing information about the most pressing transportation needs in the Boston region, thereby shaping the MPO's vision, goals and objectives, and informing the MPO's decisions about investment programs to develop and projects to prioritize in the LRTP. It also guides future decision-making about projects to fund in the MPO's Transportation Improvement Program (TIP), studies to conduct through the Unified Planning Work Program (UPWP), and work to undertake in the MPO's programs, such as the Transportation Equity Program and the Bicycle and Pedestrian Support Program.

This chapter summarizes the region's transportation needs. The full Needs Assessment is presented in nine online interactive StoryMaps where readers can explore a series of maps, charts, and tables related to the transportation needs in the Boston region. The StoryMaps are organized by theme, centered around the needs relevant to each *Destination 2050* goal area:

1. **Transportation in the Boston Region Today:** Describes the region's current travel patterns, the existing transportation system, and an overview of the current land use and development patterns.
2. **Future Conditions and Travel Demand:** Describes projected socioeconomic, land use, and travel conditions in 2050.
3. **Safety:** Identifies needs relative to transit, roadway, and nonmotorized transportation safety.
4. **Mobility and Reliability:** Identifies needs relative to the ease of travel and the reliability of the transportation network.
5. **Access and Connectivity:** Identifies needs relative to the ability of people to access destinations and the multimodal transportation network, and how well that network is connected.
6. **Resiliency:** Identifies needs relative to the resilience of the transportation network in the face of climate impacts.
7. **Clean Air and Healthy Communities:** Identifies needs relative to air quality and the environment, and their impacts on the health of Boston area communities.
8. **Regional Recommendations:** Summarizes regional needs and recommendations identified in the Needs Assessment.
9. **The Boston Region MPO's Approach to Transportation Equity:** Describes how the MPO addresses equity in both the Needs Assessment and throughout other agency work.

The remainder of this chapter provides highlights from the various goal areas of the Needs Assessment; the full analyses can be found online.

Transportation Equity

The MPO's approach to transportation equity (TE) is rooted in the disparate ways in which the Boston region's transportation system has and continues to impact different communities. Past transportation decision-making has led to systemic inequities and discriminatory transportation outcomes among TE and other disadvantaged populations, who are often those who can least bear the burdens. The MPO considers six demographic groups TE populations—populations that are protected by federal mandates and that have been disproportionately underserved and overburdened by the Boston region's transportation system:

- Minority population
- Low-income population
- People with limited English proficiency (LEP)
- People with disabilities
- Youth (ages 17 and younger)
- Older adults (ages 75 and older)[1]

The Needs Assessment assesses the equity of the transportation system and the impacts on its residents within the context other goal areas in two ways:

- Mapping where TE populations live relative to transportation infrastructure and incidents (such as roadway crashes)
- Analyzing how TE populations are impacted by the transportation system compared to non-TE populations

Transportation needs for TE populations are identified in the context of each analysis, as applicable. In the sections that follow in this chapter, needs for TE populations are identified within each goal area.

1 TE Populations are defined as follows:

- People who identify as a minority include those who identify as Hispanic or Latino/a/x and/or a race other than White.
- A person is considered to have a low income if their annual family income is less than or equal to 200 percent of the poverty level for their family size.
- People with limited English proficiency are those who report speaking English less than "very well" on the American Community Survey.
- The older adult population refers to people age 75 and older.
- The youth population refers to people age 17 and younger.

Safety Needs Summary

While the Boston region has safer roads than the nation at large, the region has been following nationwide trends of more severe crashes and fatalities, especially for bicyclists and pedestrians. During the COVID-19 pandemic, fatalities and serious injuries from crashes decreased, as residents drove fewer miles. But in 2021 and the beginning of 2022, as pandemic-era restrictions loosened and driving approached previous levels, fatalities and serious injuries surpassed pre-pandemic totals.

The Needs Assessment analyses conducted for the MPO's safety goal area evaluate fatalities and serious injuries for different modes, factors that contribute to crash risk, and transit safety. Table 2-1 summarizes key findings about safety needs that MPO staff identified through data analysis and public input.

Table 2-1
Safety Needs in the Boston Region

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Roadway Risk—Fatalities and Serious Injuries	After an initial decrease in 2020 due to the COVID-19 pandemic, the rate of fatalities and serious injuries in crashes has increased.
	
	Fatalities and serious injuries are increasing, especially for bicyclists and pedestrians.
		Invest in safety interventions to bring down fatalities and serious injuries toward zero, with a focus on vulnerable roadway users—TE populations and bicyclists and pedestrians.	**Existing Initiatives**
			• **Existing TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Complete Streets, Intersection Improvements, and Major Infrastructure
			• **Completed MPO Studies:**
			  • Bicycle Level-of-Service Metric
			  • Locations with High Bicycle and Pedestrian Crash Rates in the Boston Region MPO Area
			  • New and Emerging Metrics for Roadway Usage
			  • Pedestrian Report Card Interactive Database
			  • Review of Vision Zero Strategies
			• **Ongoing MPO Programs:** Bicycle and Pedestrian Planning Program; Multimodal Mobility Infrastructure Program; and Performance-based Planning and Programming
			• **Other MPO Activities:**
			  • Recommended solutions for specific locations through the Community Transportation Technical Assistance Program and Roadway Safety Audits
			  • Safe Streets for All Planning Grant
			  • Collecting and analyzing data and monitoring roadway safety performance measures
			Proposed Initiatives
			• **Upcoming MPO Study:** Parking in Bike Lines: Strategies for Safety and Prevention
			• **Other MPO Activities:** Develop equity-related safety metrics to identify existing disparities among equity populations and propose solutions

Table 2-1 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Roadway Risk—Crash Factors and Locations	Crash clusters are over-represented in communities with high shares of minority, low-income, or people with limited English proficiency, especially pedestrian crash clusters.
	
	Crashes involving individuals traveling by nonmotorized means are more likely to result in fatalities and serious injuries.
	
	Bicyclists and pedestrians are over-represented as people at risk for crashes.
		Invest in safety interventions in communities that are disproportionately impacted by crashes.
		
		Invest in preventative countermeasures on roadways that have been identified as high-risk before severe crashes happen, addressing the relevant high-risk crash factors, such as those that affect bicyclists or pedestrians.
			Existing Initiatives
			• **Existing TIP Investment Programs:** Complete Streets, Intersection Improvements, and Major Infrastructure
			• **Completed MPO Studies:**
			  • Bicycle Level-of-Service Metric
			  • Locations with High Bicycle and Pedestrian Crash Rates in the Boston Region MPO Area
			  • New and Emerging Metrics for Roadway Usage
			• **Ongoing MPO Programs:** Bicycle and Pedestrian Planning Program; Multimodal Mobility Infrastructure Program
			• **Other MPO Activities:**
			  • Safe Streets for All Planning Grant
			  • Recommended solutions for specific locations through the Community Transportation Technical Assistance Program
			Proposed Initiatives
			• **MPO Study Ideas:**
			  • Further research into understanding crash factors and their causes
			  • Further use and support of MassDOT's Network Screening Safety Analyses to better identify which roadways have highest risk for severe crashes

Transit Safety	Transit safety outcomes have remained steady, with slight variations in reliability between modes for each of the three RTAs (MBTA, CATA, and MWRTA).	Assess state-of-good-repair status for of each transit agency's assets, and within their Safety Management Systems, address the causes of safety events.	**Existing Initiatives**
			• **Existing TIP Investment Program:** Transit Modernization
			• **Current MPO Studies:** Transit Transformation Program
			• **Ongoing MPO Programs:** Performance-based Planning and Programming
			• **Other MPO Activities:**
			  • Continue to collect and analyze data and monitor performance measures related to transit safety.
			  • Work with partner agencies to identify areas the MPO can support transit safety.
			• **Other Partner Activities:** Continue to improve state of good repair and address other safety concerns (MBTA, MWRTA, and CATA).
			Proposed Initiatives
			• **New TIP Investment Program:** Transit Transformation

CATA = Cape Ann Transportation Authority. MBTA = Massachusetts Bay Transportation Authority. MassDOT = Massachusetts Department of Transportation. MPO = metropolitan planning organization. MWRTA = MetroWest Regional Transit Authority. RTA = regional transit authority. TE = transportation equity. TIP = Transportation Improvement Program.

Source: Boston Region MPO.

Mobility and Reliability Needs Summary

Mobility and reliability relate to the seamless and dependable movement of people and freight. This goal focuses on the ability of people in the region to easily travel, regardless of travel mode, as well as the preservation of the region's transportation assets to enable that ease of travel. Keeping infrastructure in a state of good repair—including bridges, pavement, and fixed rail—ensures that people and freight can travel safely and reliably across the region.

The Needs Assessment analyses conducted for the mobility and reliability goal area evaluates transit and roadway infrastructure condition, and the ease and reliability of travel on roadways, bicycle, and transit. Table 2-2 summarizes key findings about mobility and reliability needs that MPO staff identified through data analysis and public input.

Table 2-2
Reliability and Mobility Needs in the Boston Region

Emphasis Area	Issues	Needs	Recommendations to Address Needs
Transit Infrastructure Condition	Slow zones on rapid transit lines have reduced the reliability of the transit network.	Upgrade and modernize transit facilities and tracks to improve transit reliability and mobility. Develop funding streams for long-term reliability improvements. Provide project funding support, in collaboration with transit agencies, for transit infrastructure projects as needed.	**Existing Initiatives** • **Existing TIP Investment Programs:** Major Infrastructure and Transit Modernization • **Current MPO Studies:** Transit Transformation Program • **Ongoing MPO Programs:** Performance-based Planning and Programming • **Other MPO Activities:** Collect and analyze data and monitor performance measures related to transit infrastructure condition • **Other Partner Activities:** Modernize transit facilities to improve reliability of travel on the transit network (MBTA, MWRTA, and CATA) **Proposed Initiatives** • **New TIP Investment Program: Transit Transformation**

Road Infrastructure Condition	Road and bridge conditions have declined slightly in recent years.	Increase investment in the maintenance of roadways and bridges to keep up with the rate of deterioration.
		Reduce the deterioration of infrastructure by promoting alternative transportation modes to single-occupancy vehicles and reducing the number of vehicles on roadways and bridges.
			Existing Initiatives
			• **Existing TIP Investment Programs:** Complete Streets, Intersection Improvements, Major Infrastructure
			• **Completed MPO Studies:** Travel Demand Management Follow-up
			• **Ongoing MPO Programs:** Performance-based Planning and Programming
			• **Other MPO Activities:** Collect and analyze safety data and monitor performance measures related to roadway infrastructure condition
			Proposed Initiatives
			• **Study Ideas:**
			  ◦ Research into which active transportation facilities have a high potential for shifting car trips to active modes
			  ◦ Research into which new transit services or changes to existing transit services would have the greatest potential for mode shift

Table 2-2 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Transit Mobility	From 2019 to 2022, on-time performance improved across the MBTA, but more for non-minority bus routes than for minority bus routes.
	
	Transit ridership has not recovered since the start of the COVID-19 pandemic in 2020.
		Improve bus mobility and reliability, focusing on routes with high minority ridership.
		
		Establish reliable sources of funding to replace funding shortfalls caused by declining ridership.
		
		Identify additional possible corridors for bus rapid transit, focusing on routes with high ridership potential and opportunities to improve reliability.
			Existing Initiatives
			• **Existing TIP Investment Programs:** Community Connections, Major Infrastructure, and Transit Modernization
			• **Current MPO Studies:** Transit Transformation Program
			• **Completed MPO Studies:**
			  • 2019 Coordinated Public Transit-Human Services Transportation Plan
			  • Identifying Transportation Inequities in the Boston Region
			  • Managing Curb Space in the Boston Region: A Guidebook
			  • New and Emerging Metrics for Roadway Usage
			  • Operating a Successful Community Shuttle Program: A Guidebook
			  • Prioritization of Dedicated Bus Lanes
			  • Reverse Commute Areas Analysis
			  • Scan of Integrating Transit and Truck Priority
			  • Transit Signal Priority in the Boston Region: A Guidebook
			• **Current Partner Studies at CTPS:** MBTA Sources of Community Value
			• **Other MPO Activities:**
			  • Recommended solutions for specific locations through Regional Transit Service Planning Technical Support
			  • Develop equity-related transit mobility metrics to identify existing disparities among equity populations and propose solutions
			  • Development of 2023 Coordinated Public Transit-Human Services Transportation Plan
			Proposed Initiatives
			• **New TIP Investment Program:** Transit Transformation
			• **Upcoming MPO Study:** Applying Conveyal to TIP Project Scoring
			• **MPO Study Ideas:**
			  • Update existing MPO study (Prioritization of Dedicated Bus Lanes) to identify possible corridors for bus rapid transit, in collaboration with MBTA, focusing on routes with high ridership potential and opportunities to improve reliability
			  • Research which active transportation facilities have a high potential for shifting car trips to active modes
			  • Research which new transit services or changes to existing transit services have the greatest potential for mode shift
			  • Research the most cost-effective transit services to increase ridership

Table 2-2 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Mobility on Roadways	Recent years have seen a steady rise in roadway congestion across the Boston region.	Prioritize investments that reduce congestion, such as transit, biking, and walking.
		
		Improve management of roadway and parking demand to reduce congestion and encourage alternative transportation modes.
		
		Promote transit-oriented development to encourage mode shift from driving to transit use, which would reduce congestion.
			Existing Initiatives
			• **Existing TIP Investment Programs:** Community Connections, Complete Streets, Transit Transformation
			• **Completed MPO Studies:**
			  • Managing Curb Space in the Boston Region: A Guidebook
			  • New and Emerging Metrics for Roadway Usage
			  • Scan of Integrating Transit and Truck Priority
			  • Travel Demand Management Follow-up
			• **Current MPO Studies:**
			  • Lab and Municipal Parking Study
			  • Learning from Roadway Pricing Experiences
			  • Ongoing MPO Programs: Freight Planning Support and Multimodal Mobility Infrastructure Program
			  • Other MPO Activities: Recommended solutions for specific locations through the Community Transportation Technical Assistance Program
			Proposed Initiatives
			• **Upcoming MPO Studies:**
			  • Applying Conveyal to TIP Project Scoring
			  • Lab and Municipal Parking Phase II
			• **MPO Study Idea:** Investigate the role of the MPO in supporting transit-oriented development.

Table 2-2 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Bicycle Mobility	Bluebikes ridership more than doubled from 1.7 million to 3.7 million trips between 2018 and 2022, and ridership rose particularly outside of peak travel hours.	Continue expanding Bluebikes to new neighborhoods and maintain existing bikes and stations, particularly in disadvantaged communities.
		
		Develop protected, dedicated bicycle infrastructure to connect near Bluebikes stations and support increases in ridership.
			Existing Initiatives
			• **Existing TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections
			• **Existing MPO Studies:**
			  • Bicycle Level-of-Service Metric
			  • Managing Curb Space in the Boston Region: A Guidebook
			  • New and Emerging Metrics for Roadway Usage
			• **Current MPO Study:** Update Bicycle/Pedestrian Count Database
			• **Ongoing MPO Program:** Bicycle and Pedestrian Planning Program
			• **Other MPO Activities:** Development of equity-related bicycling metrics to identify existing disparities among equity populations and propose solutions
			Proposed Initiatives
			• **New TIP Investment Program:** Bikeshare State of Good Repair Set-aside
			• **Upcoming MPO Studies:**
			  • Applying Conveyal to TIP Project Scoring
			  • Parking in Bike Lanes: Strategies for Safety and Prevention
			• **MPO Study Idea:** Identify priority areas for high-quality bicycle facilities to support Bluebike ridership and bicycling more generally
			• **Other MPO Activities:** Coordinate with Bluebikes municipal owners and MAPC on funding needs and opportunities for the MPO to support Bluebikes ridership through TIP projects

CATA = Cape Ann Transportation Authority. MAPC = Metropolitan Area Planning Council. MBTA = Massachusetts Bay Transportation Authority. MPO = metropolitan planning organization. MWRTA = MetroWest Regional Transit Authority. TIP = Transportation Improvement Program.

Source: Boston Region MPO.

Access and Connectivity Needs Summary

Access and connectivity are vital aspects of an effective transportation system. People should be able to access the destinations they want, and transportation options should be equally accessible for all groups of people. Similarly, the various components of the transportation system (such as transit, roadways, and the bicycle network) must be connected so that users can access the benefits of the full system.

The Needs Assessment analyses conducted for the access and connectivity goal area evaluate the ability of people to access various forms of transportation, and destinations that are important to quality of life, such as jobs and healthcare. The analyses also measures the connectivity of the transportation network and accessibility for people of all abilities. Table 2-3 summarizes key findings about access and connectivity needs that MPO staff identified through data analysis and public input.

Table 2-3
Access and Connectivity Needs in the Boston Region

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Destination Access	There is inequitable access to important destinations in many parts of the Boston region, such as parks and healthcare for minority and low-income residents.	Expand access to parks, healthcare, and other destinations as identified in the MPO's 2022 study Identifying Transportation Inequities in the Boston Region, prioritizing minority and low-income communities. Refer to the MPO's 2022 study Equity and Access to the Blue Hills as a best practice example of developing projects for improving access.	**Existing Initiatives**
			• **Existing TIP Investment Programs:** Bicycle Network and Pedestrians Connections, Community Connections, Complete Streets, and Major Infrastructure
			• **Completed MPO Studies:**
			  • Equity and Access to the Blue Hills
			  • Identifying Transportation Inequities in the Boston Region
			  • Operating a Successful Community Shuttle Program: A Guidebook
			• **Ongoing MPO Programs:** Bicycle and Pedestrian Planning Program and Transportation Equity Program
			• **Other MPO Activities:** Refinement of existing equity-related destination access metrics developed in the study Identifying Transportation Inequities in the Boston Region to identify existing disparities among equity populations and propose solutions
			Proposed Initiatives
			• **New TIP Investment Program:** Transit Transformation
			• **Upcoming MPO Study:** Applying Conveyal to TIP Project Scoring

Rideshare Usage	Ridesharing was trending upwards before a significant decrease in 2020 due the COVID-19 pandemic. Since then, it has started to increase, with fewer trips that are longer on average.	Provide reliable, sustainable alternatives to rideshare trips and identify where transit or active transportation could replace these trips.	**Existing Initiatives**
			• **Completed MPO Studies:**
			  • New and Emerging Metrics for Roadway Usage
			  • Travel Demand Management Follow-up
			Proposed Initiatives
			• **MPO Study Idea:** Identify trips that are filled by rideshare and strategies for providing alternatives by more sustainable modes

Table 2-3 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Proximity to Transportation Services and Infrastructure	There is a limited electric vehicle charging station network in the Boston region.
	
	Access to transit has been improving for minority and low-income populations.
	
	There is limited access to high quality bicycle infrastructure in minority and low-income neighborhoods.
	
	There is limited access to frequent transit outside of the urban core.
		Expand the electric vehicle charging network, making sure that stations are equitably distributed.
		
		Continue to expand transit service to minority and low-income populations, and other transit dependent riders.
		
		Upgrade low- and medium-quality bicycle infrastructure to create a high-quality network (i.e., protected bicycle facilities) with a focus on minority and low-income neighborhoods where there has been less investment.
		
		Improve transit service to areas outside of the urban core, focusing on communities with high shares of transit-dependent riders.
			Existing Initiatives
			
			• **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, Major Infrastructure, and Transit Modernization
			• **Current MPO Studies:**
			  • Bicycle Level-of-Service Metric
			  • Managing Curb Space in the Boston Region: A Guidebook
			  • Pedestrian Report Card Assessment
			• **Ongoing MPO Programs:** Bicycle and Pedestrian Planning Program, Multimodal Mobility Infrastructure Program, and Transportation Equity Program
			• **Other MPO Activities:** Recommended solutions for specific locations through the Community Transportation Technical Assistance Program and Regional Transit Service Planning Technical Support
			
			Proposed Initiatives
			
			• **New TIP Investment Program:** Transit Transformation
			• **Upcoming MPO Study:** Applying Conveyal to TIP Project Scoring

Connectivity	There is insufficient data on pedestrian facilities to assess the quality and connectivity of the network.
	
	There is a fragmented bicycle network with high-quality bicycle facilities.
		Gather sidewalk data to help inform where investments should go.
		
		Close gaps in the bicycle network, particularly high-quality bicycle infrastructure (i.e., protected bicycle lanes).
			Existing Initiatives
			
			• **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, and Complete Streets
			• **Current MPO Studies:**
			  • Pedestrian Report Card Assessment
			  • Bicycle Level-of-Service Metric
			  • Emerging Metrics for Roadway Usage
			• **Ongoing MPO Programs:** Bicycle and Pedestrian Planning Program and Multimodal Mobility Infrastructure Program
			• **Other MPO Activities:**
			  • Coordination with MassDOT on gathering sidewalk and related data to help inform investment decisions
			  • Recommended solutions for specific locations through the Regional Transit Service Planning Technical Support
			
			Proposed Initiatives
			
			• **Upcoming MPO Study:** Applying Conveyal to TIP Project Scoring
			• **MPO Study Ideas:**
			  • Develop a regionwide sidewalk inventory, in collaboration with MassDOT and MAPC
			  • Assess gaps in the bicycle network and collection and inventory of data

Table 2-3 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs
Accessibility	There is varied accessibility at Green Line stations and incomplete accessibility system-wide at the MBTA.	Upgrade platforms and trains to provide access for people with disabilities.	**Existing initiatives** • **Current TIP Investment Programs:** Complete Streets and Transit Modernization **Proposed Initiatives** • **New TIP Investment Program:** Transit Transformation

MAPC = Metropolitan Area Planning Council. MBTA = Massachusetts Bay Transportation Authority. MassDOT = Massachusetts Department of Transportation. MPO = metropolitan planning organization. TIP = Transportation Improvement Program.

Source: Boston Region MPO.

Resiliency Needs Summary

Climate change impacts the transportation system in a variety of ways. Extreme air and land surface temperatures can cause asphalt deterioration along roadways, buckling of pavement and rail lines, and health impacts to transportation users. Extreme weather events such as hurricanes and tropical storms have resulted in flooding and inundation of transportation assets along the coastline and are amplified by rising sea levels. Heavy rainfall events and Nor'easters can overwhelm stormwater drainage systems with compounding impacts from sea level rise and high tide cycles. Investments in resilience can enable the region's transportation system to anticipate extreme events, absorb their impacts, recover in a timely and efficient manner, and adapt to better withstand future disturbances caused by a changing climate.

The Needs Assessment analyses conducted for the resiliency goal area evaluate the vulnerability of transportation assets and people to climate impacts, including sea level rise, flooding due to severe storms, and extreme heat. Table 2-4 summarizes key findings about climate resiliency needs that MPO staff identified through data analysis and public input.

Table 2-4
Resiliency Needs in the Boston Region

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Climate Impacts—Flooding	Some transportation facilities and infrastructure are in places vulnerable to flooding as a result of storm surge, high tide events, and heavy precipitation events.
	
	Sea level rise and changing storm behavior caused by climate change are expected to increase the amount of vulnerable infrastructure by 2050.
		Retrofit infrastructure by elevating assets, improving stormwater drainage, resizing culverts, and integrating nature-based adaptation to minimize the impacts of natural hazards and climate change.
		
		Identify at-risk infrastructure by studying regional plans and the results from the MassDOT Flood Risk Assessment, applying vulnerability assessment methodology to fill in gaps.
		
		Prioritize nature-based adaptation strategies such as wetland preservation or rain gardens.
		
		Prioritize adaptation in disadvantaged communities and along evacuation routes.
			Existing initiatives
			• **Current TIP Investment Programs:** Complete Streets, Intersection Improvements, Major Infrastructure, and Transit Modernization
			• **Existing MPO Study:** All-Hazards Planning Application
			• **Ongoing MPO Programs:** Climate Resilience Program and Transportation Equity Program
			• **Other MPO Activities:** Develop equity-related flood risk metrics to identify existing disparities among equity populations and propose solutions
			
			Proposed Initiatives
			• **New TIP Investment Program:** Transit Transformation
			• **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement
			• **MPO Study Idea:** Mapping evacuation routes and modeling flood impacts as they relate to regional travel patterns
			• **Other MPO Activities:**
			  ◦ Revisions to TIP criteria to reflect new Resiliency goal area and place greater emphasis on climate resilience
			  ◦ Develop regional climate adaptation vulnerability assessment

Table 2-4 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs
Climate Impacts--Extreme Heat	Extreme heat events in the Boston region are expected to increase in frequency and severity, putting both transportation infrastructure and users at risk. Urban areas are particularly vulnerable to the impacts of extreme heat due to high amounts of paved surfaces and a general lack of tree cover.	Retrofit infrastructure to better withstand the impacts of extreme heat by planting shade trees, providing shelters for transit users, and using heat-resistant materials to prevent rail buckling. Continue to identify locations vulnerable to extreme heat using regional data sources such as MAPC's climate assessments and municipalities' MVP reports. Prioritize improvements in areas with populations that are particularly sensitive to extreme heat, such as older adults. Prioritize nature-based adaptation strategies such as tree planting and pavement reduction.	**Existing Initiatives** • **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, Intersection Improvements, and Transit Modernization • **Ongoing MPO Programs:** Climate Resilience Program and Transportation Equity Program **Proposed Initiatives** • **New TIP Investment Program:** Transit Transformation • **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement • **Other MPO Activities:** Revise TIP criteria to reflect new Resiliency goal area and place greater emphasis on climate resilience • **MPO Study Idea:** Conduct analyses to identify locations where extreme heat is greatest, with a focus on communities with populations sensitive to extreme heat
Regional Coordination	All municipalities in the Boston region are designated MVP communities and have developed plans and assessments related to resilience-building and vulnerability to climate change.	Increase engagement between the MPO and municipalities on topics related to climate resilience to prioritize projects of regional significance and coordinate improvements. Leverage findings from regional MVP reports to identify potential resilience projects and climate vulnerabilities. Increase engagement with regional advocacy groups to better represent local climate needs and concerns.	**Existing Initiatives** • **Ongoing MPO Programs:** Climate Resilience Program and Public Engagement Program **Proposed Initiatives** • **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement • **Other MPO Activities:** Coordinate with municipalities, state, regional agencies, and local advocacy groups on potential resilience projects and ways that the MPO can support regional climate resilience efforts

MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation MPO = metropolitan planning organization. MVP = Municipal Vulnerability Preparedness. TIP = Transportation Improvement Program.

Source: Boston Region MPO.

Clean Air and Healthy Communities Needs Summary

The transportation sector produces the highest share of greenhouse gases of any sector in Massachusetts. Single-occupancy vehicle use accounts for most transportation sector emissions. In addition to greenhouse gases, transportation is a major source of air pollutants such as fine particulate matter ($PM_{2.5}$) and ground-level ozone that are harmful to human and environmental health. The transportation sector continues to be a source of harmful air pollution resulting from car, truck, bus, and rail emissions. Emissions from fossil fuel-powered vehicles can impact public health, particularly among populations who live near polluting roadways or congested areas, as well as those more susceptible to adverse health impacts. Exposure to $PM_{2.5}$, ozone, and other tailpipe pollutants can cause respiratory illnesses, asthma, and cardio-pulmonary disease.

The Needs Assessment analyses conducted for the mobility and reliability goal area evaluate emissions from transportation and their impacts on human and environmental health, including greenhouse gases, carbon monoxide, $PM_{2.5}$, and ozone. Table 2-5 summarizes key findings about clean air and healthy communities needs that staff identified through data analysis and public input.

Table 2-5
Clean Air and Healthy Communities Needs in the Boston Region

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Emissions from SOVs	Light-duty SOV trips account for most transportation sector emissions.	Support state CECP goals to reduce VMT, improve alternatives to personal vehicles, and reduce SOV travel in the Boston region, with mode shift, travel demand management, and roadway pricing.
		
		Continue to investigate the drivers of SOV travel, as well as its impacts on communities.
		
		Expand access to EV charging stations and promote state EV purchase incentives and goals.
			Existing Initiatives:
			• **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, and Transit Modernization
			• **Ongoing MPO Programs:** Air Quality Conformity and Support Activities and Performance-based Planning and Programming
			• **Other MPO Activities:** Continue to collect and analyze data and monitor performance measures related to SOV travel and emissions.
			
			Proposed Initiatives
			• **New TIP Investment Programs:** Bikeshare State of Good Repair Set-aside, Transit Transformation
			• **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement
			• **Other MPO Activities:**
			  • Support the implementation of MassDOT's NEVI EV Infrastructure Deployment Plan and Carbon Reduction Strategy
			  • Collecting and analyzing data and monitoring SOV and emissions performance measures

Emissions from Freight Activities	Emissions from heavy-duty truck traffic and idling contributes to global warming and can harm human and environmental health.	Include freight activities in the conversation surrounding electrification and alternative fuels adoption. Evaluate other strategies to reduce freight and diesel emissions such as vehicle efficiency and facility improvements, diversifying transport modes, sustainable last-mile delivery options, and intelligent transportation systems.	**Existing Initiatives:** • **Current MPO Study:** Sustainability and Decarbonization in the Freight and Logistics Sector in the North Suffolk Area • **Ongoing MPO Programs:** Air Quality Conformity and Support Activities and Freight Planning Support • **Other MPO Activities:** Coordination on freight planning with partner agencies, such as MassDOT **Proposed Initiatives** • **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement

Table 2-5 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs

Emissions from Rideshare Trips	The use of rideshare services such as Uber and Lyft is increasing, with implications for increased emissions and traffic congestion.	Encourage rideshare companies to incentivize use of EVs and shared trips through increased coordination and promotion of state EV purchase incentives. Better understand trip patterns and sustainable options, and ways to reduce idling and minimize congestion from picking up and dropping off passengers.	**Existing Initiatives:**
			• **Existing MPO Study:** Managing Curb Space in the Boston Region: A Guidebook
			• **Ongoing MPO Program:** Air Quality Conformity and Support Activities
			Proposed Initiatives:
			• **MPO Study Ideas:**
			  • Investigate transportation needs and motivations behind using rideshare services to determine whether and when more sustainable modes could be used to fill these needs
			  • Update Managing Curb Space in the Boston Region: A Guidebook with new strategies for managing congestion from rideshare trips
			• **Other Partner Activities:** Encourage rideshare companies to incentivize use of EVs and shared trips (MassDOT)

Health Impacts	Exposure to transportation-based air pollutants can harm human health by increasing risk of developing respiratory illness and cardio-pulmonary disease as well as aggravating asthma symptoms.	Support investments that reduce emissions from SOV travel and other transportation activities through mode shift and electrification. Prioritize air quality improvements in equity communities and in areas that bear a disproportionate burden of transportation impacts.	**Existing Initiatives:** • **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, and Transit Modernization • **Ongoing MPO Programs:** Air Quality Conformity and Support Activities and Transportation Equity • **Other MPO Activities:** Develop equity-related health metrics to identify existing disparities among equity populations and propose solutions **Proposed Initiatives:** • New TIP Investment Programs: Bikeshare State of Good Repair Set-aside and Transit Transformation
Environmental Impacts	Transportation pollutants can be harmful to the natural environment, slowing plant growth, contributing to lake and stream acidification, affecting nutrient balances in ecosystems, and causing acid rain in urban areas.	Prioritize projects that consider and limit environmental impacts through nature-based adaptation, low-impact design, and emissions reduction. Minimize the impacts of transportation to sensitive natural environments, such as wetlands, forests, and conservation land.	**Existing Initiatives:** • **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, Intersection Improvements, Major Infrastructure, and Transit Modernization • **Ongoing MPO Program:** Climate Resilience Program **Proposed Initiatives** • **New TIP Investment Program:** Transit Transformation • **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement

Table 2-5 (cont.)

Emphasis Area	Issues	Needs	Recommendations to Address Needs
Impacts to TE Populations	TE populations are more likely to be exposed to air pollution, traffic congestion, and freight and industrial emissions due to historically inequitable planning practices. TE populations may be less able to adapt to poor air quality conditions due to fewer financial resources, lack of access to healthcare and open space, and inability to relocate.	Prioritize projects that reduce the impacts of emissions and air pollution to TE populations and in overburdened communities.	**Existing Initiatives:** • **Current TIP Investment Programs:** Bicycle Network and Pedestrian Connections, Community Connections, Complete Streets, Major Infrastructure, Intersection Improvements, and Transit Modernization • **Ongoing MPO Programs:** Air Quality Conformity and Support Activities; Public Engagement Program; and Transportation Equity Program • **Other MPO Activities:** Develop equity-related air quality metrics to identify existing disparities among equity populations and propose solutions **Proposed Initiatives:** • **New TIP Investment Programs:** Bikeshare State of Good Repair Set-aside and Transit Transformation • **Upcoming MPO Study:** Strategies for Environmental Outreach and Engagement • **MPO Study Idea:** Investigate connections between transportation emissions, air quality, health, and equity in the Boston region • **Other MPO Activities:** Build partnerships with health and environmental organizations

CECP = Clean Energy and Climate Plan for 2025 and 2030. EV = electric vehicle. MassDOT = Massachusetts Department of Transportation. MPO = metropolitan planning organization. NEVI = National Electric Vehicle Infrastructure. SOV = single-occupancy vehicle. TE = transportation equity. TIP = Transportation Improvement Program. VMT = vehicle-miles traveled.

Source: Boston Region MPO.

Conclusion

As the Needs Assessment has shown, the Boston region has extensive transportation needs, and the MPO is invested in addressing these needs through various studies, capital investments, ongoing programs, and technical assistance. The MPO also collaborates extensively with its partners in the region, including the Massachusetts Department of Transportation, Metropolitan Area Planning Council, MBTA, and the other regional transit authorities in the region on its own work as well as to support partner initiatives. The Needs Assessment guided the development of *Destination 2050*'s investment programs and will continue to support the prioritization of the kinds of transportation projects and studies the MPO will fund over the coming years, as noted in the summary tables. It will also help staff develop the work undertaken through the MPO's ongoing programs. By examining recent and existing conditions, the MPO can better understand the region's needs and prioritize future investment to improve the transportation system for everyone.

CHAPTER THREE

PLANNING AND INVESTMENT FRAMEWORK

Vision, Goals, and Objectives

During each Long-Range Transportation Plan (LRTP) development cycle, the Boston Region Metropolitan Planning Organization (MPO) updates its planning framework, which is made up of a vision statement, a set of goals, and a series of objectives associated with each goal. This planning framework serves as a foundational guide for the MPO's decision-making. The content of this framework informs staff proposals and MPO decisions related to creating investment programs for the LRTP and Transportation Improvement Program (TIP) and the development of criteria used to evaluate and select

TIP projects for funding. This framework also helps to communicate the MPO's values to partners, stakeholders, and the general public.

The MPO's previous planning framework was adopted in 2019 as part of the *Destination 2040* development process. While developing *Destination 2050*, the MPO explored ways to refresh this planning framework. Activities to support this update included the following:

- A July 2022 MPO member workshop and an October 2022 Regional Transportation Advisory Council workshop to collect feedback about updating the MPO's planning framework. MPO staff released surveys to these groups following these events to gather additional comments.
- A review of plans and policies from partner agencies, and the visions, goals, and factors that these documents describe.
- A review of recent MPO studies and preliminary analysis products from the *Destination 2050* Needs Assessment process and an assessment of staff's impressions.
- A review of public input and feedback from recent MPO studies and certification document development processes.
- Collection of new input through MPO engagement activities, including participation in the Metropolitan Area Planning Council's (MAPC) subregional meetings and stakeholder organization events and a public survey on a vision for transportation and MPO priorities.

The resulting vision statement in this framework offers a succinct picture of the MPO's hopes for the Boston region's transportation system and the way it will support quality of life in the region overall. The goal areas and statements provide more detail about what the MPO aspires to achieve for different aspects of the region's transportation system. The objectives reflect specific actions the MPO can take through its investments, research, and policies to improve the transportation system. Some objectives reflect outcomes, while others reflect where the MPO will focus attention or resources. These objectives are meant to be monitored using quantitative and qualitative information, although neither the goals nor the objectives are time-bound or include specific targets. These elements can be addressed as part of the MPO's ongoing performance-based planning and programming activities.

The MPO also reviewed responses to its public LRTP Vision and Priorities Survey, which was open from November 21, 2022, until January 20, 2023. This survey included questions asking respondents to rank their transportation priorities, identify words and phrases that describe their ideal transportation system, and describe aspects of the Boston region's transportation system that need to be improved. Overall, 982 people answered some or all of the survey questions. Staff incorporated details from these responses into both the initial and revised *Destination 2050* planning frameworks and continued to refer to these results when working on other aspects of the *Destination 2050* process, such as when proposing updates to the MPO's investment programs. More information on the survey can be found in Appendix C.

This planning framework will help to guide future updates to Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP) project selection processes and the MPO's performance-based planning and programming process.

The MPO's vision, goals, and objectives are shown in Figure 3-1.

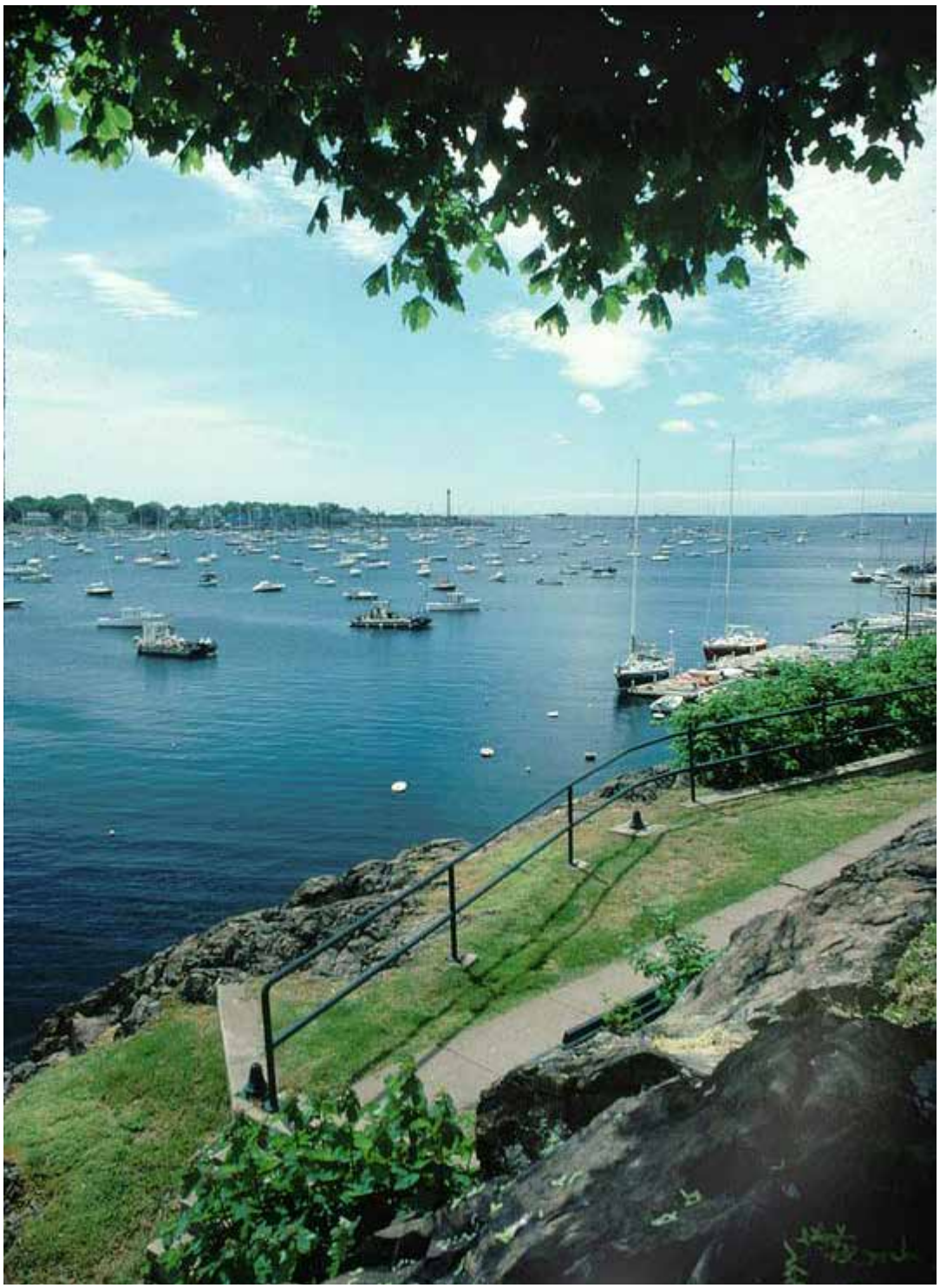


Figure 3-1

Destination 2050 Vision, Goals, and Objectives

VISION STATEMENT

The Boston Region Metropolitan Planning Organization envisions an equitable, pollution-free, and modern regional transportation system that gets people to their destinations safely, easily, and reliably, and that supports an inclusive, resilient, healthy, and economically vibrant Boston region.

GOALS	OBJECTIVES
EQUITY	
Facilitate an inclusive and transparent transportation-planning process and make investments that eliminate transportation-related disparities borne by people in disadvantaged communities.	• Facilitate an inclusive and transparent engagement process with a focus on involving people in disadvantaged communities.* • Ensure that people have meaningful opportunities to share needs and priorities in a way that influences MPO decisions. • Eliminate harmful environmental, health, and safety effects of the transportation system on people in disadvantaged communities. • Invest in high-quality transportation options in disadvantaged communities to fully meet residents' transportation needs.
SAFETY	
Achieve zero transportation-related fatalities and serious injuries and improve safety for all users of the transportation system.	• Eliminate fatalities, injuries, and safety incidents experienced by people who walk, bike, roll, use assistive mobility devices, travel by car, or take transit. • Prioritize investments that improve safety for the most vulnerable roadway users: people who walk, bike, roll, or use assistive mobility devices. • Prioritize investments that eliminate disparities in safety outcomes for people in disadvantaged communities.
MOBILITY AND RELIABILITY	
Support easy and reliable movement of people and freight.	• Enable people and goods to travel reliably on the region's transit and roadway networks. • Prioritize investments that address disparities in transit reliability and frequency for people in disadvantaged communities. • Reduce delay on the region's roadway network, emphasizing solutions that reduce single-occupancy-vehicle trips, such as travel demand management. • Prioritize investments that reduce delay on the region's transit network. • Support reliable, safe travel by keeping roadways, bridges, transit assets, and other infrastructure in a state of good repair, and prioritize these investments in disadvantaged communities. • Modernize transit systems and roadway facilities, including by incorporating new technology that supports the MPO's goals, such as electric-vehicle technologies.

*** Disadvantaged communities are those in which a significant portion of the population identifies as an MPO equity population—people who identify as minority, have limited English proficiency, are 75 years old or older or 17 years old or younger, or have a disability—or has low income.**

Table 3-1 (cont.)

GOALS	OBJECTIVES
ACCESS AND CONNECTIVITY	
Provide transportation options and improve access to key destinations to support economic vitality and high quality of life.	• Improve multimodal access to jobs, affordable housing, essential services, education, logistics sites, open space, and other key destinations. • Prioritizing transportation investments that support the region's and the Commonwealth's goals for housing production, land use, and economic growth. • Increase people's access to transit, biking, walking, and other non-single-occupancy-vehicle transportation options to expand their travel choices and opportunities. • Prioritize investments that improve access to high quality, frequent transportation options that enable people in disadvantaged communities to easily get where they want to go. • Close gaps in walking, biking, and transit networks and support interorganizational coordination for seamless travel. • Remove barriers to make it easy for people of all abilities to use the transportation system, regardless of whether they walk, bike, roll, use assistive mobility devices, or take transit.
RESILIENCY	
Provide transportation that supports sustainable environments and enables people to respond and adapt to climate change and other changing conditions.	• Prioritize investments to make the region's roadway and transit infrastructure more resilient and responsive to current and future climate hazards, particularly within areas vulnerable to increased heat and precipitation, extreme storms, winter weather, and sea level rise. • Prioritize resiliency investments in disadvantaged communities and in areas that bear disproportionate climate and environmental burdens. • Prioritize investments in transportation resiliency that improve emergency access and protect evacuation routes. • Prioritize investments that include nature-based strategies such as low-impact design, pavement reduction, and landscape buffers to reduce runoff and negative impacts to water resources, open space, and environmentally sensitive areas.
CLEAN AIR AND HEALTHY COMMUNITIES	
Provide transportation free of greenhouse gas emissions and air pollutants and that supports good health.	• Reduce transportation-related greenhouse gases, other air pollutants, and growth in vehicle-miles traveled by encouraging people and goods to move by non-single-occupancy-vehicle modes. • Support transit vehicle electrification and use of electric vehicles throughout the transportation system to reduce greenhouse gases and other air pollutants. • Prioritize investments that address air pollution and environmental burdens experienced by disadvantaged and vulnerable communities. • Support public health through investments in transit and active transportation options and by improving access to outdoor space and healthcare.

Updated: February 2, 2023

Source: Boston Region Metropolitan Planning Organization.

Federal Funding Programs

HIGHWAY PROGRAMS

The Massachusetts Department of Transportation (MassDOT) receives funding from the federal government for statewide and regional priorities. After accounting for debt service payments and recurring funding line items (e.g. Metropolitan Planning, State Planning and Research, extra work order, etc.), MassDOT allocates roughly two-thirds of its funding across the following funding categories:

- Reliability Investments: These programs include the Bridge Program—comprising inspections, systematic maintenance, and National Highway System (NHS) and non-NHS improvements—the Pavement Program, the Roadway Improvements Program, and the Safety Improvements Program.
- Modernization Investments: These programs include the Americans with Disabilities Act (ADA) Retrofit Program, the Intersection Improvement Program, the Intelligent Transportation Systems (ITS) Program, and the Roadway Reconstruction Program.
- Expansion Investments: These programs include the Bicycle and Pedestrian Program and transit network expansions.

MassDOT allocates the remaining third of funding among the state's 13 MPOs for programming. This discretionary funding for MPOs is suballocated by formula to determine the Regional Target amounts. The Boston Region MPO receives the largest portion of MPO funding in the state, with approximately 43 percent of Massachusetts' Regional Target funds allocated to the region. These targets were previously set according to a formula developed by the Massachusetts Association of Regional Planning Agencies (MARPA).

Each MPO may decide how to prioritize its Regional Target funding. Given that the Regional Target funding is a subset of the Highway Program, the MPO typically programs the majority of funding for roadway projects; however, the MPO has flexed portions of its highway funding to the Transit Program for transit expansion projects and through its Transit Modernization and Community Connections Programs.

TRANSIT PROGRAMS

The Federal Transit Administration (FTA) allocates the funds programmed in the TIP Transit Program according to formula. The three transit authorities in the Boston Region MPO area that are recipients of these funds are the MBTA,

Cape Ann Transportation Authority (CATA), and MetroWest Regional Transit Authority (MWRTA). The MBTA, with its extensive transit program and infrastructure, is the recipient of the preponderance of the region's federal transit funds.

The current federal transportation legislation, the Bipartisan Infrastructure Law allocates funding to transit projects through the following formula programs:

- Section 5307 (Urbanized Area Formula Grants): Provides grants to urbanized areas to support public transportation based on levels of transit service, population, and other factors
- Section 5337 (Fixed Guideway/Bus): Seeks to maintain public transportation systems in a state of good repair through replacement and rehabilitation capital projects
- Section 5309 (Fixed Guideway Capital Investment Grants): Provides grants for new and expanded rail, bus rapid transit, and ferry systems that reflect local priorities to improve transportation options in key corridors
- Section 5339 (Bus and Bus Facilities): Provides funding to replace, rehabilitate, and purchase buses and related equipment, and to construct bus-related facilities
- Section 5310 (Enhanced Mobility of Seniors and Individuals with Disabilities): Provides funding to support transportation to meet the special needs of older adults and persons with disabilities. MassDOT's Rail and Transit Division manages the distribution of these funds through a competitive process known as the Community Transit Grant Program.

More information about these programs can be found in Appendix F.


SOUTH
MARKET
2
Wi-Fi

CHAPTER FOUR

GUIDING MPO INVESTMENTS

Available Funding

The Boston Region Metropolitan Planning Organization (MPO) and its partner transportation agencies anticipate the resources that will be available for transportation capital investment, maintenance, and operations when preparing the Long-Range Transportation Plan (LRTP). For *Destination 2050*, the MPO has approximately $5 billion in discretionary dollars, known as Regional Target funds, to spend between federal fiscal years (FFYs) 2024 and 2050. The LRTP only lists projects between FFYs 2024 and 2033. For FFYs 2034 to 2050, the MPO allocates percentages of its available funding to investment programs in order to help guide the investments it will make in projects through its five-year capital plan, the Transportation Improvement Program (TIP).

The dollars allocated in the LRTP to projects and investment programs must remain within the limit of available funding. As such, *Destination 2050* and the TIP must demonstrate that projects selected by the MPO can be implemented within fiscal constraints. The financial plan for *Destination 2050* reflects how the MPO plans to balance the region's transportation needs while operating under the fiscal constraint of projected revenues. Table 4-1 shows the Regional Target funding the MPO anticipates having available between FFYs 2024 and 2050.

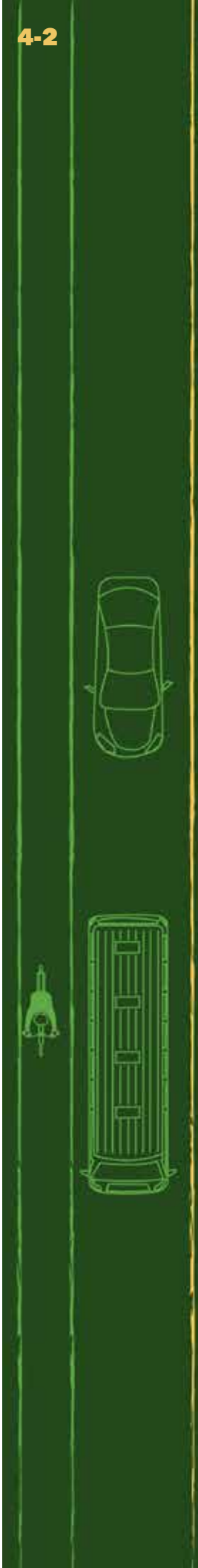
Table 4-1
Anticipated MPO Regional Target Funding

Time Band	Anticipated Funding
FFYs 2024–28	$697,545,145
FFYs 2029–33	$833,039,179
FFYs 2034–38	$898,589,991
FFYs 2039–43	$988,357,623
FFYs 2044–50	$1,592,592,693
Total	$5,010,124,631

Source: Massachusetts Department of Transportation

Regional Target dollars are only a portion of the funding available to support the region's transportation system. The Massachusetts Department of Transportation (MassDOT) has other sources of funding that it spends on highway projects in the Boston region, as does the MBTA, the Cape Ann Transportation Authority, and the MetroWest Regional Transit Authority to provide and improve transit service.

More information about sources and uses of transportation funding in Massachusetts can be found in Appendix F.



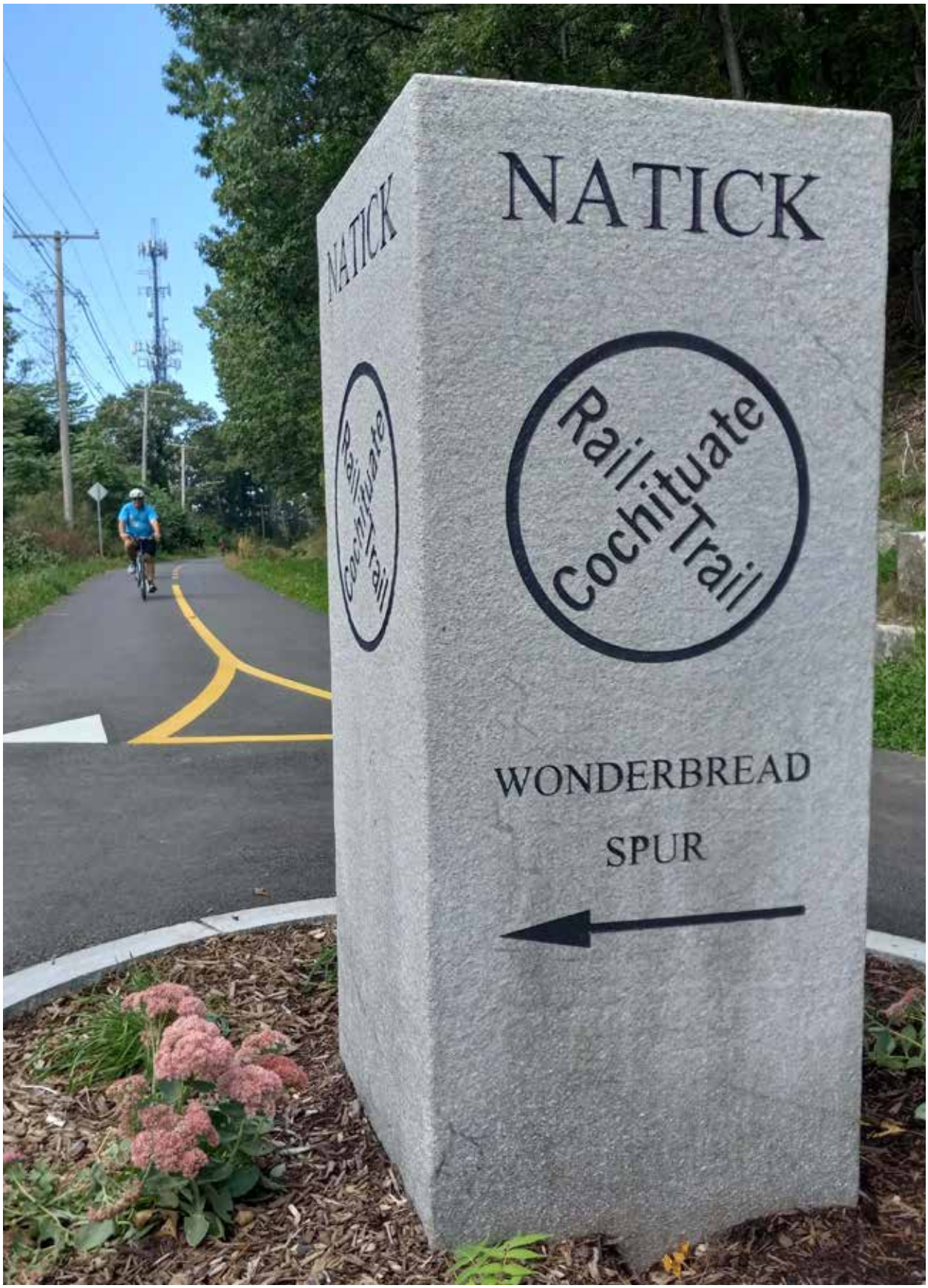
Decision Process

The MPO engaged in a series of interrelated activities to develop *Destination 2050*, which are illustrated in Figure 4-1 and described below:

- Data were gathered and analyzed for the Needs Assessment in order to identify current and future needs facing the region. A summary of the Needs Assessment can be found in Chapter 2.
- The MPO established its vision and goals for transportation in the region. More information about the vision and goals can be found in Chapter 3.
- The MPO sought feedback on its investment programs. It considered potential new investment programs and changes to existing programs, and then the MPO voted to approve a structure of investment programs. More information on investment programs can be found in Chapter 5.
- The MPO developed a universe of projects that had the potential to be relevant to the LRTP. The MPO reviewed and refined the universe by seeking information about projects from MassDOT, municipalities, and other partner agencies. The universe can be found in Appendix D.
- The MPO selected eight projects from the universe to include in *Destination 2050*, with six projects being listed within fiscal constraint and two being listed as recommended projects either still in need of additional funding or with funding from other sources (see Chapter 5 for additional details). The MPO made this selection by considering which projects were required to be listed in the LRTP based on their characteristics and which projects were regional priorities. Project selection was guided by the MPO's policy to list projects only in the first ten years of the LRTP, from FFY 2024 to 2033. Between FFY 2034 and 2050, the MPO allocated funding to its investment programs on a percentage basis.
- The MPO documented its decisions and related information in *Destination 2050*.
- The MPO engaged stakeholders and the public in every stage of the development of *Destination 2050*. More information about engagement can be found in Appendix C.

Figure 4-1
***Destination 2050* Activities**

Source: Boston Region Metropolitan Planning Organization


NATICK
NATICK
Rail Trail
Cochituate
Rail Trail
Cochituate
WONDERBREAD
SPUR

CHAPTER FIVE

RECOMMENDED PLAN

A major component in the development of the Long-Range Transportation Plan (LRTP) is the Recommended Plan. The Recommended Plan contains the regionally significant projects that are expected to be built in the region in the next 25 years and the investment programs that will guide Boston Region Metropolitan Planning Organization (MPO) investments in the Transportation Improvement Program (TIP). This chapter describes these projects and programs: the investment programs cover those that will be funded with MPO discretionary funds, also called Regional Target funds, while the projects include both those that could be funded with Regional Target funds as well as those prioritized for Massachusetts Department of Transportation (MassDOT) funding.

This chapter begins with descriptions of the MPO's investment programs and the expected funding amounts for each program by time band. It then describes the projects that were selected for inclusion in the plan. Finally, it summarizes the results of air quality conformity analyses and greenhouse gas analyses, anticipated performance impacts, and equity impacts for the Recommended Plan.

Investment Program Structure

The Boston Region MPO is responsible for deciding how Regional Target funds are spent in the region. Generally, these investments come in the form of specific transportation projects, such as the reconstruction of a roadway, the conversion of a former railbed into a shared-use path, or providing shuttle service. The MPO uses investment programs to prioritize the types of transportation projects that it funds through the TIP.

The MPO's investment programs direct funding to priority areas over the 25-year LRTP planning timeframe. The projects that are funded through each program may vary by type (such as intersection improvements versus shared-use path construction), scale, transportation mode (such as the roadway network or transit network), funding source, or other factors. These programs are developed to help the MPO achieve the vision and goals outlined in its LRTP. They also communicate to potential project proponents—such as municipalities or regional transit authorities (RTA)—the types of projects that the MPO is interested in funding.

MPO staff undertook several activities to review and update the investment programs. Staff reviewed laws, plans, policies, and regional transportation needs; consulted MPO members; collected stakeholder input; and consulted project proponents and implementing agencies. Staff then presented their recommendations to the board, which voted to adopt the following investment programs:

- Complete Streets
- Major Infrastructure
- Intersection Improvements
- Bicycle Network and Pedestrian Connections
- Transit Transformation
- Community Connections
- Bikeshare Support

In addition, in FFY 2025, the MPO will launch a project design support pilot. The objectives of this pilot program are to provide additional resources for projects to achieve MassDOT's 25 percent design threshold so that they may be eligible for construction funding through the TIP, to lay a foundation for expanded funding opportunities in later TIP cycles if successful, and to encourage and incentivize the development of transformative projects for the Boston region's transportation network. The pilot will provide financial support to municipalities for the development of capital transportation projects consistent with the MPO's vision, goals, and objectives. MPO staff will solicit applications from municipalities and engage in a competitive selection process to identify projects approved by MassDOT's Project Review Committee that require additional resources to reach a state ready for construction. Projects included in the pilot will be funded under the relevant investment programs.

COMPLETE STREETS

The MPO established its Complete Streets investment program as part of the *Charting Progress to 2040* LRTP adopted in 2015 and continued it as part of the *Destination 2040* LRTP adopted in 2019. This federally funded MPO program is distinct from MassDOT's state-funded Complete Streets program, although the two programs fund similar types of projects.

This program modernizes roadway corridors to achieve a variety of MPO goals, such as improving safety, infrastructure condition, and multimodal mobility and access. The projects are initiated through the MassDOT Highway Division Project Development Process and designs are reviewed by MassDOT staff. Complete Streets project elements can include the following:

- new or improved sidewalks and other pedestrian accessibility improvements
- bicycle lanes, cycle tracks, and other bicycle facilities on or adjacent to the roadway corridor
- upgrades to roadway geometry and cross sections, which can include road diets
- dedicated bus lanes within a corridor improvement project
- new or improved signals, including those that support transit signal priority
- pavement, bridge, drainage, and streetscape improvements that support active transportation infrastructure

This investment program is in effect from federal fiscal years (FFY) 2024 through 2050.

MAJOR INFRASTRUCTURE

The MPO first established its Major Infrastructure program in 2015 as part of *Charting Progress to 2040*. The program invests in roadway projects that improve expressways and major arterials to reduce congestion and improve safety or transit projects that expand the fixed-guideway network. Since 2015, the MPO has chosen to prioritize lower-cost, smaller-scale projects, limiting larger projects to the Major Infrastructure Program.

The Major Infrastructure program includes projects are regionally significant, as defined in Title 23 of the code of federal regulations, section 450.104:

> *Regionally significant project means a transportation project (other than projects that may be grouped in the TIP and/or STIP or exempt projects as defined in EPA's transportation conformity regulations (40 CFR part 93, subpart A) that is on a facility that serves regional transportation needs (such as access to and from the area outside the region; major activity centers in the region; major planned developments such as new retail malls, sports complexes, or employment centers; or transportation terminals) and would normally be included in the modeling of the metropolitan area's transportation network. At a minimum, this includes all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel.*

The MPO voted in October 2020 to define Major Infrastructure projects as those that are regionally significant as defined above, or those that cost $50 million or more. All regionally significant projects must be listed in the LRTP. However, not all projects that cost $50 million or more are required to be listed in the LRTP because not all such projects are regionally significant.

Roadway-oriented projects funded by the Major Infrastructure program are initiated through the MassDOT Highway Division Project Development Process and designs are reviewed by MassDOT personnel. Transit projects, such as the Green Line Extension that opened in 2022, are initiated by the Massachusetts Bay Transportation Authority (MBTA). The criteria for including projects in the Major Infrastructure program have evolved over time in response to changes in federal guidance and MPO board deliberations.

This investment program is in effect from FFY 2024 through 2050.

INTERSECTION IMPROVEMENTS

The MPO established its Intersection Improvements program as part of *Charting Progress to 2040* and continued it as part of *Destination 2040*. This program supports projects that enhance intersections in ways that improve safety and mobility for pedestrians, bicyclists, buses, and cars. Projects funded by this program are initiated through the MassDOT Highway Division Project Development Process and designs are reviewed by MassDOT personnel. They are distinct from Complete Streets projects in that they are focused on one intersection, or several intersections spread out in an area (as opposed to those aligned in the corridor), but they often include elements similar to those in Complete Streets projects:

- Upgrades to existing signals or new signals
- Changes to roadway geometry, such as new turn lanes
- Striping and lighting, including for bicycle lanes
- Shortened crossing distances for pedestrians
- Improved curb cuts

This investment program is in effect from FFY 2024 through 2050.

BICYCLE NETWORK AND PEDESTRIAN CONNECTIONS

The MPO's Bicycle Network and Pedestrian Connections program was established in *Charting Progress to 2040* and continued in *Destination 2040*. Projects funded through this program expand the region's bicycle and pedestrian network and support safe bicycle and pedestrian access to key destinations. Like roadway projects in other investment programs, these projects are initiated through the MassDOT Highway Division Project Development Process and designs are reviewed by MassDOT personnel. This program supports the creation of new off-road bicycle and multiuse paths. It can also fund upgrades to bicycle and pedestrian infrastructure, such as

- improved bicycle and pedestrian crossings;
- new or expanded sidewalks;
- enhanced signage and lighting;
- traffic calming features; and
- upgrades for bicyclists and pedestrians such as those in a Complete Streets or Intersection Improvements project.

This investment program is in effect from FFY 2024 through 2050.

TRANSIT TRANSFORMATION

In *Destination 2050*, the MPO is establishing a new Transit Transformation program. This program is a modified version of the Transit Modernization program included in *Destination 2040*. Transit Transformation expands beyond the state-of-good-repair and transit infrastructure upgrades of the former Transit Modernization program to incorporate multimodal access and other goals. The Transit Transformation program will fund transit-related investments with higher costs than those typically included in the Community Connections program (typically less than $500,000) but that do not meet the criteria for the Major Infrastructure Program ($50 million or more). Examples of potential projects include

- station or facility investments costing less than $50 million;
- multimodal access improvements near or at transit stations;
- transit system electrification projects costing less than $50 million; and
- transit customer amenities (such as bus shelters) implemented at multiple locations.

The MPO will continue to direct FFYs 2024–28 funding set-asides for the Transit Modernization program in consultation with the MPO board, the MBTA, the Cape Ann Transportation Authority, MetroWest Regional Transit Authority, MassDOT, and other stakeholders prior to more detailed program guidelines being available. The Transit Transformation program will take effect from FFY 2029 through 2050.

COMMUNITY CONNECTIONS

The Community Connections program is the MPO's funding program for first- and last-mile solutions, community transportation, and other small, nontraditional transportation projects. It evolved out of the Community Transportation/Parking/Clean Air and Mobility Program established through *Charting Progress to 2040* and appeared as the Community Connections program in *Destination 2040*. The goals of this program are to

- create first- and last-mile connections between transit and other modes;
- incentivize collaboration between entities; and
- promote mode shift by filling gaps in the transportation system.

The Community Connections program differs from the other MPO programs in that project proponents apply solely to the MPO, as opposed to initiating the project through the MassDOT Highway Division or the MBTA. The MPO developed the features and guidelines for this program over time, first through an MPO study designed to create a program framework, then through a pilot-funding round through the TIP. The MPO continues to refine the program's

features and guidelines as they learn from experiences funding different types of projects. Under the current framework, municipalities and RTAs in or overlapping the Boston region may apply for Community Connections funding, while other entities, such as transportation management associations and nonprofit organizations, may apply in partnership with a municipality or RTA that has agreed to serve as a project proponent and fiscal manager.

This investment program is in effect from FFY 2024 through 2050.

BIKESHARE SUPPORT

In *Destination 2040*, bikeshare projects were funded through the Community Connections program. In *Destination 2050*, the MPO is establishing a separate Bikeshare Support program to support capital costs associated with expanding the bikeshare system and replacing or upgrading existing stations. Municipalities that currently participate in the Bluebikes bikeshare system include Arlington, Boston, Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Newton, Revere, Salem, Somerville, and Watertown, and other municipalities have requested to join the Bluebikes system. While this program will focus on supporting the Bluebikes system, it could also support other bikeshare initiatives in the region.

MPO communities can continue to apply for funding for bikeshare capital projects through the Community Connections program from FFY 2024 to 2028. The Bikeshare Support investment program will begin in FFY 2029 and be in effect through 2050.

Investment Program Funding by Time Band

The Recommended Plan allocates funding to investment programs as a percentage of total available funds. These funding allocations reflect the MPO's priorities for the types of projects it wishes to fund. Funding percentages by investment program for all time bands except FFY 2029 to 2033 are as follows:

- Complete Streets: 45 percent
- Major Infrastructure: 30 percent
- Intersection Improvements: 12 percent
- Bicycle Network and Pedestrian Connections: 5 percent
- Transit Transformation: 5 percent
- Community Connections: 2 percent
- Bikeshare Support: 1 percent

Between 2029 and 2033, funding percentages by investment program are as follows:

- Complete Streets: 30 percent
- Major Infrastructure: 47 percent
- Intersection Improvements: 10 percent
- Bicycle Network and Pedestrian Connections: 5 percent
- Transit Transformation: 5 percent
- Community Connections: 2 percent
- Bikeshare Support: 1 percent

The FFYs 2029–33 funding allocations differ from other time bands because of the combined cost of the Major Infrastructure projects that the MPO selected for that time band. All projects that the MPO selected for 2029–33 exceed $50 million and are classified as Major Infrastructure. However, the projects include elements of other MPO investment programs. For example, the McGrath Boulevard project in Somerville has Complete Streets elements, and the project at Route 126, Route 135, and the MBTA and CSX railroads in Framingham has Intersection Improvement elements.

As shown in Chapter 4, the MPO anticipates having slightly more than $5 billion available in total discretionary funding between 2024 and 2050. Table 5-1 applies the percentage funding allocations shown above to each five-year time band in the Recommended Plan to show the total funding that the MPO anticipates allocating to each investment program in each time band.

Table 5-1
Investment Program Funding Allocations

Investment Program	2024–28	2029–33	2034–38	2039–43	2044–50	Total
Complete Streets	$313,895,315	$251,140,168	$404,365,496	$444,760,930	$716,666,712	$2,130,828,621
Major Infrastructure	$209,263,544	$390,300,000	$269,576,997	$296,507,287	$477,777,808	$1,643,425,636
Intersection Improvements	$83,705,417	$83,303,918	$107,830,799	$118,602,915	$191,111,123	$584,554,172
Bicycle Network and Pedestrian Connections	$34,877,257	$41,651,959	$44,929,500	$49,417,881	$79,629,635	$250,506,232
Transit Transformation	$34,877,257	$41,651,959	$44,929,500	$49,417,881	$79,629,635	$250,506,232
Community Connections	$13,950,903	$16,660,784	$17,971,800	$19,767,152	$31,851,854	$100,202,493
Bikeshare Support	$6,975,451	$8,330,392	$8,985,900	$9,883,576	$15,925,927	$50,101,246
Total	$697,545,145	$833,039,179	$898,589,991	$988,357,623	$1,592,592,693	$5,010,124,631

Notes: Years are federal fiscal years. The amounts shown in this table are applications of the MPO's investment program allocation percentages to anticipated Regional Target funding and could differ from the amounts shown in the TIP.

Source: Boston Region Metropolitan Planning Organization.

Recommended Projects

Federal regulations require that regionally significant projects be listed in the Recommended Plan; the MPO's Major Infrastructure program contains these projects. Following the process described in Chapter 4, the MPO selected eight Major Infrastructure projects to list in the Recommended Plan. Those projects are listed in Table 5-2 and mapped in Figure 5-1. The final two projects in Table 5-2, Allston Multimodal and I-495/I-90 Interchange, are statewide priority projects that are outside the fiscally constrained portion of the LRTP.

Being listed in the Recommended Plan does not guarantee MPO funding for a project, as projects are listed based on federal requirements for LRTPs. To receive MPO funding, projects must be submitted to the TIP for funding and evaluated through that process.

Table 5-2
Recommended Projects

Proponent	Project	ID	Current Cost	2024–28	2029–33	MPO Funding	Other Funding (Non-MPO Funds)
MPO	Norwood: Intersection Improvements at Route 1 and University Avenue/Everett Street	605857	$26,573,400	$26,573,400		$26,573,400	
MPO	Wrentham: I-495/Route 1A Ramps	603739	$17,994,890	$17,994,890		$17,994,890	
MPO	Boston: Reconstruction of Rutherford Avenue from City Square to Sullivan Square	606226	$197,759,449	$42,100,000	$155,659,449	$197,759,449[a]	
MPO	Somerville: McGrath Boulevard	607981	$98,840,000	$65,000,000	$33,840,000	$98,840,000	
MPO	Framingham: Intersection Improvements at Route 126 and Route 135/MBTA and CSX Railroad	606109	$115,000,000		$145,500,000[b]	$145,500,000	
MPO	Lexington: Route 4/225 (Bedford Street) and Hartwell Avenue	NA	$45,000,000		$57,000,000[b]	$57,000,000	
MassDOT	Boston: Allston Multimodal	606475	$675,500,000				$675,500,000
MassDOT	Hopkinton: I-495 and I-90 Interchange [c]	607977	$300,942,836				$300,942,836

Note: Years are federal fiscal years.

a The City of Boston has committed to contributing $25 million to the cost of this project.

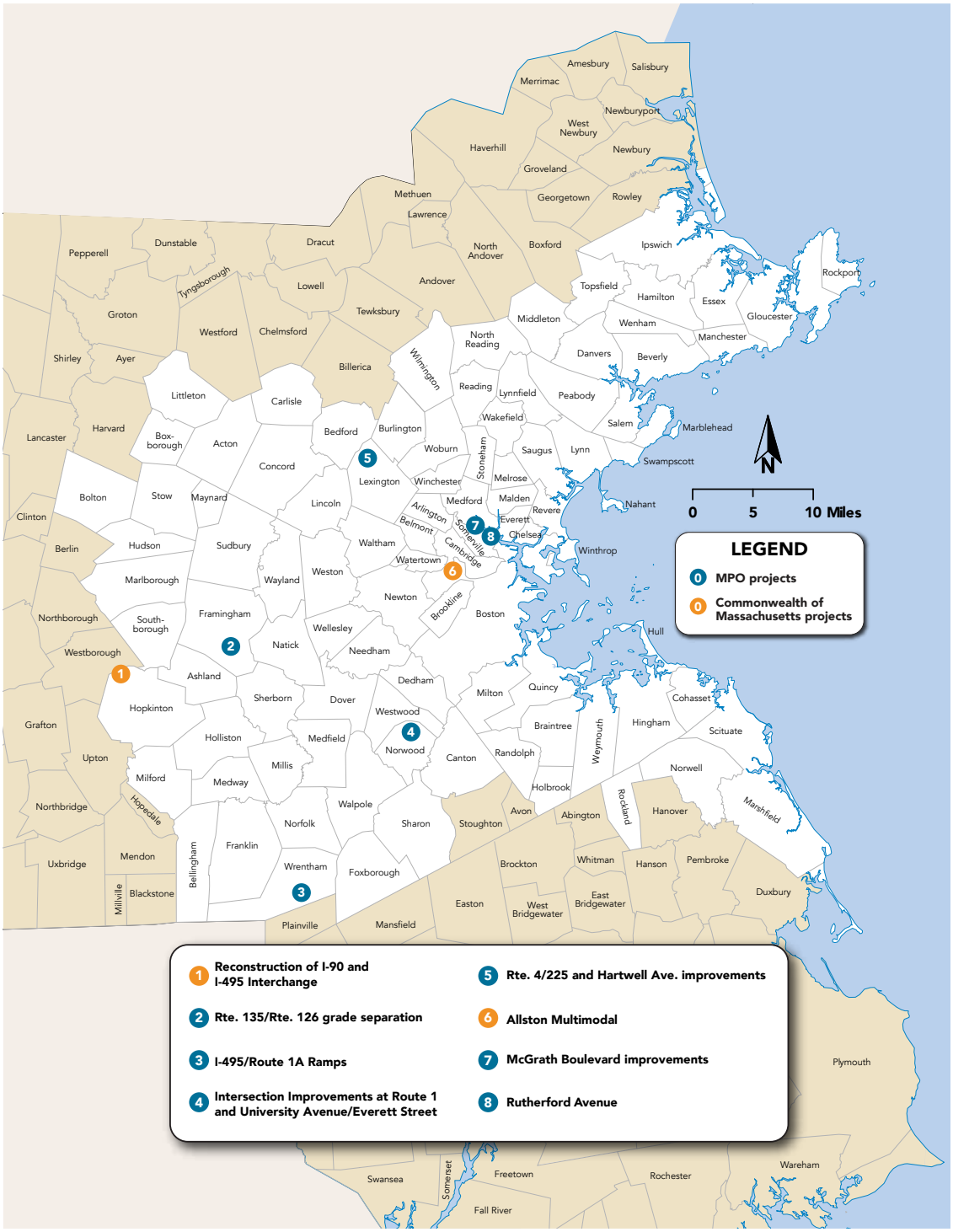
b These cost estimates assume a four percent annual increase between 2023 and 2029.

c The total cost of this project is approximately $2 billion. Of that amount, approximately $1.191 billion is being sought through federal discretionary grants.

MassDOT = Massachusetts Department of Transportation. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization.

Source: Boston Region Metropolitan Planning Organization.

Figure 5-1
Recommended Projects



MPO = Metropolitan Planning Organization.

Project Descriptions

The following are descriptions of the projects listed in Table 5-2. A description of how the projects were scored can be found in Appendix D.

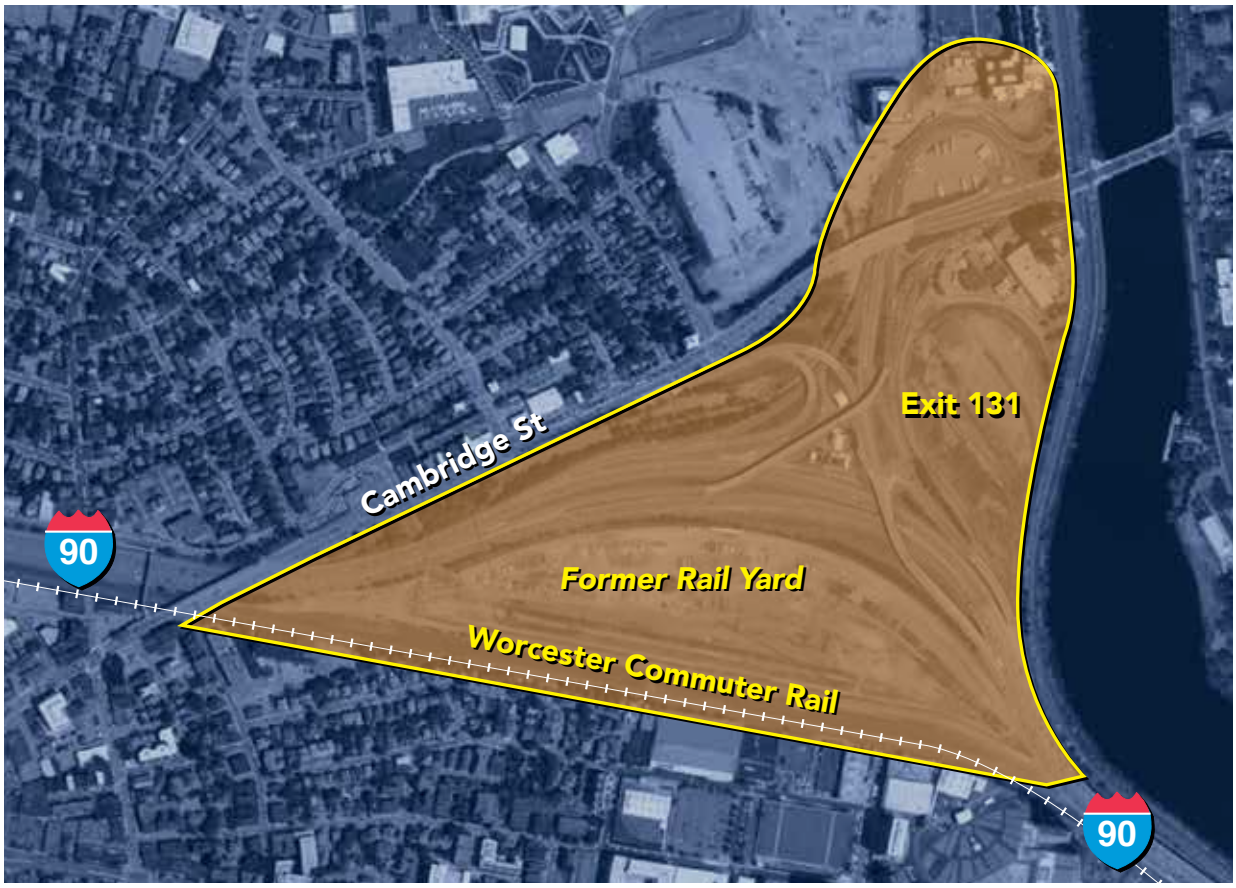
BOSTON: ALLSTON MULTIMODAL

The Allston Viaduct, which carries the Massachusetts Turnpike (I-90) from the Allston Interchange to the Commonwealth Avenue Bridge, is nearing the end of its useful lifespan, and must be replaced. I-90 is the primary east-west route between Western Massachusetts, Worcester, and Boston, and it carries heavy vacation traffic on weekends. With the change to all electronic tolling, toll booths have been removed from the interchange. This allows for the straightening of the Turnpike in Allston and improvements to multimodal connections.

The interchange is crucial to the Commonwealth's roadway network. Improvement to I-90 as part of this project will ensure its efficient operation. Improvements include the following:

- Improved livability, connectivity, and open space for residents of the Allston neighborhood
- Improved regional mobility and roadway safety with the straightening of I-90, including shrinking the Allston interchange
- Replacing the aging Allston Viaduct, decreasing the need for traffic-impacting maintenance
- Creating a new open space along the Charles River
- Complete Streets improvements to Cambridge Street
- Enhanced bicycle and pedestrian connections
- Significant transit enhancements with the new West Station and commuter rail layover facility, providing greater access and improvements to the commuter rail and local bus service
- Removing elevated bridge structure allows for an improved gateway into the city and enhanced neighborhood views
- Allowing for an attractive and highly desired pedestrian/bicycle connection from Agganis Way to Charles River

Score: This is a MassDOT-prioritized project and is therefore not directly evaluated using the MPO's scoring criteria.


Cambridge St
Exit 131
90
Former Rail Yard
Worcester Commuter Rail
90

HOPKINTON: I-495 AND I-90 INTERCHANGE

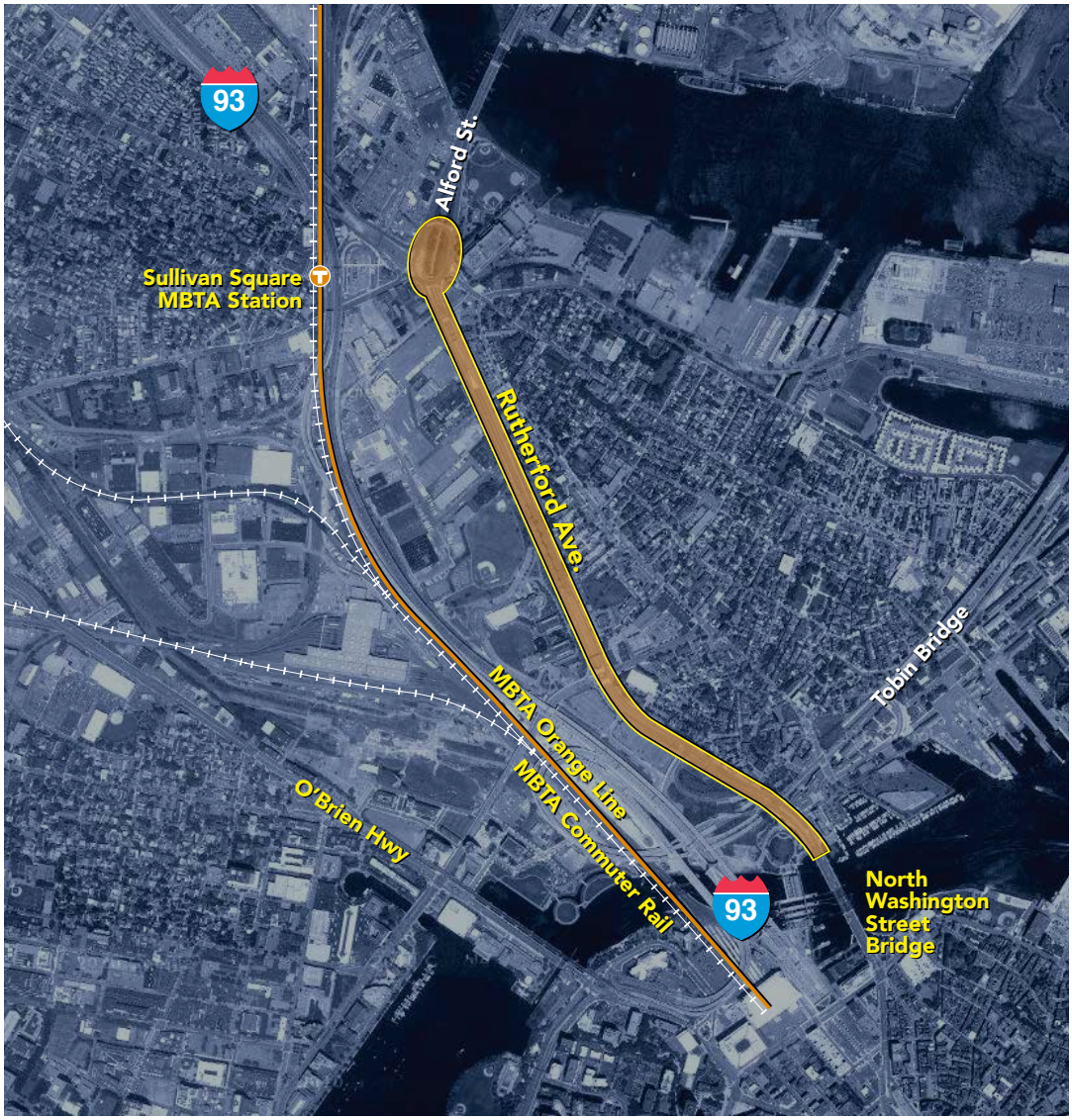
For years, the I-495 and I-90 interchange has experienced traffic demands exceeding its capacity. On an average day, more than 100,000 vehicles travel on both I-90 and I-495, with approximately 75,000 vehicles traveling through the interchange, including approximately one-half of all trucks entering eastern Massachusetts. The deficient geometry concentrates movements through the former toll plaza area, resulting in queuing onto the interstate mainlines and crash rates twice the statewide average. The project is meant to improve the movement of people and goods through the area.

Score: This is a MassDOT-prioritized project and is therefore not directly evaluated using the MPO's scoring criteria.

BOSTON: RUTHERFORD AVENUE

The Rutherford Avenue project seeks to transform the corridor into a multimodal urban boulevard. Rutherford Avenue in the Charlestown neighborhood of Boston extends about 1.5 miles from the North Washington Street Bridge to the Sullivan Square MBTA Orange Line station and then to the Alford Street Bridge at the Mystic River. The existing corridor consists of eight to 10 lanes of median-divided highway that facilitate high-speed automobile travel. Although this roadway layout served high volumes of traffic during construction of the Central Artery/Tunnel project, it now acts as a barrier to the neighborhood. The existing roadway creates significant challenges and safety issues for pedestrians and bicyclists seeking to reach various destinations, including Bunker Hill Community College, Paul Revere Park, the Hood Business Park and Schrafft's Center employment areas, and MBTA rapid transit stations.

Available project evaluation data were insufficient to score this project.



FRAMINGHAM: ROUTE 126/ROUTE 135 GRADE SEPARATION

This project would provide a grade-separated crossing at the intersection of Route 135 and Route 126. Route 135 would be depressed under Route 126 with Route 126 approximately maintaining its existing alignment. The depressed section of Route 135 would extend from approximately 500 feet to the west and east of Route 126. Route 126 would continue to cross the Worcester commuter rail line at grade, but traffic on both Routes 135 and 126 would be significantly less affected by rail operations with this grade separation.

Score: 8 out of 12.

LEXINGTON: ROUTES 4/225 AND HARTWELL AVENUE

This project proposes to improve safety and capacity management by reconstructing portions of Bedford Street (Routes 4 and 225), Hartwell Avenue, and Wood Street to accommodate people walking, people on bicycles, and people taking transit. It would facilitate traffic flow between I-95 and employment centers along the corridor such as Lincoln Labs and Hanscom Airforce Base. It would improve pedestrian and bicycle needs in the corridor and provide a direct connection to the Minuteman Bikeway. The project would also reconstruct the I-95 ramps.

Score: 10 out of 12.

NORWOOD: INTERSECTION IMPROVEMENTS AT ROUTE 1 AND UNIVERSITY AVENUE/EVERETT STREET

This project proposes reconstruction of the traffic signals and associated geometric improvements at the intersection of Route 1 with University Avenue and Everett Street. The geometric improvements include constructing an additional travel lane in each direction on Route 1, a second left-turn lane on both Route 1 approaches with median separation from the travel lanes, an additional left-turn lane on the University Avenue and Everett Street approaches, and an additional receiving lane on Everett Street and University Avenue departing the intersection. The project includes construction of bicycle facilities on each of the intersecting roadways: buffered bike lanes are proposed on Route 1 approaches to the intersection, shared use paths are proposed on both sides of Route 1 at the intersection, a shared-use path is proposed on the north side of University Avenue, and buffered bike lanes are proposed on Everett Street. New sidewalks are proposed on the west side of Route 1 and on the east side of Route 1 north of University Avenue. The existing sidewalks will be reconstructed on University Avenue and Everett Street. In addition, the project includes replacement of the two Purgatory Brook culverts under Route 1, reconstruction of the median with concrete barrier, drainage improvements, and installation of curbing, signage and guardrail.

Score: 5 out of 12.

SOMERVILLE: MCGRATH BOULEVARD CONSTRUCTION

This project will remove the existing McCarthy Viaduct along McGrath Boulevard in Somerville and replace it with an at-grade urban boulevard, approximately 1.5 miles long, from Broadway in the north to Third Street in the south. The project will result in more conventional intersection configurations at Washington Street and Somerville Avenue, which are currently under or next to the viaduct. Removing the viaduct will physically reconnect the neighborhoods of Somerville with more direct vehicle, pedestrian, bicycle, and transit networks. The project will enhance transit access along the corridor, improving bus operations and the bus rider experience with the installation of floating/in-lane bus stops, transit signal priority, and bus queue-jump lanes at key intersections. New sidewalks and bicycle facilities will be provided for the length of the proposed McGrath Boulevard and will connect with the extended Somerville Community Path, creating access to the regional bicycle network. The proposed facilities will provide direct intermodal connections to existing bus routes and the new Green Line station in East Somerville.

Score: 8 out of 12.

WRENTHAM: I-495/ROUTE 1A RAMPS

This project consists of the construction of ramps at the interchange of Route 1A and Interstate 495 to accommodate increased volumes resulting from development at the interchange. The design may proceed by developers and, depending on cost and scale of development proposals, MassDOT may incorporate ramp construction into a highway project. Future mitigation packages for developers may involve a median island to meet MassDOT's and the Town of Wrentham's long-range plan for the interchange.

Score: 4 out of 12.

Recommended Plan Analyses

AIR QUALITY CONFORMITY

The Determination of Air Quality Conformity in Appendix E documents the latest air quality conformity status and requirements for the Boston Region MPO area in accordance with the Environmental Protection Agency's and the Commonwealth of Massachusetts' latest conformity regulations and guidance. This includes conformity determination for the 1997 Ozone National Ambient Air Quality Standards (NAAQS) and carbon monoxide NAAQS, as well as the Boston Region's designation status, legal background and considerations, and federal guidance. The analyses demonstrate that *Destination 2050* meets the Clean Air Act and Transportation Conformity Rule requirements for the 1997 Ozone NAAQS and is consistent with the air quality goals of, and in conformity with, the Massachusetts State Implementation Plan.

GREENHOUSE GASES

The Greenhouse Gas Analysis section of Appendix E explains the legislation and regulations that establish the MPO's responsibilities to contribute to emissions reduction and statewide goals. The MPO's relationship with MassDOT and strategies for reducing emissions are also explained. It documents modeled greenhouse gas emissions that would be produced from the implementation of projects in this LRTP and other MPOs' LRTPs in the Commonwealth in order to demonstrate progress toward reducing regional and statewide emissions.

ANTICIPATED PERFORMANCE IMPACTS

Analysis drives the implementation of *Destination 2050*. The Boston Region MPO continues to transition to a performance-based approach to making investments in the region's transportation system. Appendix G describes the MPO's current set of performance measures and targets and provides information about the current state of the region's transportation system with respect to relevant measures. In addition, Appendix G explains how the Recommended Plan will help the Boston Region MPO make progress toward its performance goals.

TRANSPORTATION EQUITY PERFORMANCE

Appendix H contains the federally required Title VI and environmental justice analyses—collectively referred to as a Disparate Impact and Disproportionate Burden (DI/DB) analysis—completed for the MPO-funded projects in the Recommended Plan. The DI/DB analyses determine whether minority and low-income populations may be disproportionately affected by the projects, in the aggregate, in the Recommended Plan. A more detailed description of this analysis can be found in Appendix H. The MPO's DI/DB policy can be found in Appendix I.

CHAPTER SIX

MOVING FORWARD/ NEXT STEPS

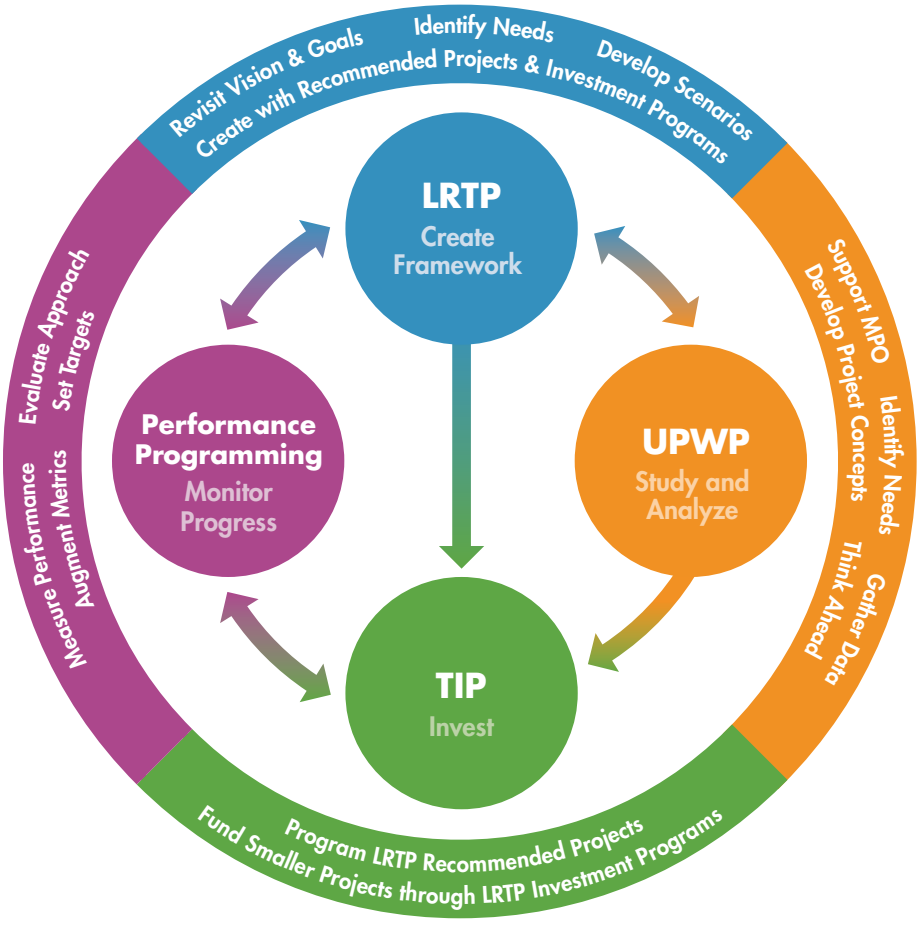
The *Destination 2050* Long-Range Transportation Plan (LRTP) provides a 25-year vision for transportation in the Boston region and creates the framework that the Boston Region Metropolitan Planning Organization (MPO) will use to set its priorities for federally funded transportation planning studies and transportation projects. Upon adoption by the MPO and approval by the Federal Highway Administration and the Federal Transit Administration, *Destination 2050* will guide the MPO in its decision-making over the next four years. Each year, the MPO will select studies and transportation projects that support *Destination 2050's* goals and objectives and program those studies and projects in the MPO's Unified Planning Work Program (UPWP) and Transportation Improvement Program (TIP), respectively.

IMPLEMENTING *DESTINATION 2050*

Destination 2050 is the culmination of a four-year planning process that began with the Needs Assessment in 2019. The Needs Assessment supports the LRTP by providing information about the region's most pressing transportation needs, thereby shaping the MPO's vision, goals, and objectives; informing the development of new investment programs; and informing the selection of projects listed in the LRTP. The Needs Assessment will continue to be an important resource for the MPO as it implements *Destination 2050* through the UPWP, the TIP, the ongoing performance-based planning and programming (PBPP) process, and other MPO programs.

Figure 6-1 illustrates this feedback relationship between the MPO's planning, investment decisions, and performance monitoring.

Figure 6-1
MPO Planning Process



LRTP = Long-Range Transportation Plan. MPO = Metropolitan Planning Organization. TIP = Transportation Improvement Program. UPWP = Unified Planning Work Program.

Source: Boston Region MPO.

The implementation of *Destination 2050* will include several primary activities:

- Undertaking data analyses and public engagement activities to update the Needs Assessment to reflect the changing travel patterns, demographics, land use, and transportation system
- Implementing policies and undertaking work activities to accomplish the MPO's vision and goals, such as aligning work in ongoing programs with the goals, revising TIP criteria to align with the new goals, and by funding projects through the TIP that reflect the priorities expressed in the vision and goals
- Monitoring the MPO's performance measures and assessing the equity implications of MPO-funded projects to inform MPO investment decisions in the TIP
- Guiding the development of the TIP, through which the MPO can make near-term investments that align with LRTP goals and objectives
- Maintaining compliance with federal regulations and requirements

Other activities will be coordinated with other MPO programs (noted in parentheses in this list):

- Updating project selection criteria used to evaluate projects for programming in the TIP so that they align with the goals and objectives set in *Destination 2050* and establishing criteria for new investment programs. (TIP)
- Updating criteria used to select studies that are funded in the UPWP and shaping the activities undertaken within MPO programs, both of which are guided by the vision, goals, and objectives established in the LRTP. The results of this work in turn will shape the subsequent LRTP. (UPWP)
- Exploring the MPO's roles and responsibilities in building climate resilience in the Boston region through studies conducted as part of the UPWP, project selection criteria revisions. Additionally, the MPO's Climate Resilience Program supports analyses of climate vulnerabilities in the region and explores ways to incorporate climate resilience considerations into the planning process. The MPO will coordinate efforts with other entities, including municipalities and state and regional agencies. (Climate Resilience Program, UPWP, TIP, and LRTP)
- Developing scenarios that will help the MPO in the decision-making process for the next LRTP. These scenarios could include examining different allocations of demographic projections or exploring the effects of climate change on the transportation system. (LRTP)
- Engaging with stakeholders and the public through the Public Engagement Program (PEP), with a focus on transportation equity (TE) populations, to identify evolving transportation needs and challenges for communities throughout the Boston region. These activities will also help communicate the MPO's vision and goals for the region, and transportation priorities established through the investment programs. (PEP and TE Program)

- Analyzing the existing transportation system's impacts on TE populations and tracking changes over time to assess the MPO's progress in meeting its TE goal. (TE Program)
- Developing performance measures and targets—both those that are federally required and that are MPO-developed and region-specific—tracking progress, and reporting results through the MPO's PBPP efforts. The current performance measures are described each year in the TIP, as well as how projects support progress on the performance measures and MPO goals and objectives. (PBPP)

AMENDMENTS TO *DESTINATION 2050*

If, following the adoption of *Destination 2050*, the MPO decides to make a major policy change, such as new programming, the removal of an existing major infrastructure project, or the addition of a new investment program, an amendment will be required. When the MPO considers amending the LRTP, the MPO board votes to do so at an MPO meeting. After voting to release the amendment for public comment, MPO staff posts the amendment and begins a comment period that lasts 30 days.

COORDINATING WITH PLANNING PARTNERS

To achieve *Destination 2050's* vision for the Boston region, the MPO will continue working with its partner agencies and stakeholders on an ongoing basis. The MPO will continue to work with MassDOT, MBTA, and the regional transit authorities to implement a comprehensive set of investments that address the region's transportation needs in equity, safety, mobility, reliability, access, connectivity, resiliency, and clean air and health. The MPO will also continue to build and maintain relationships with the region's municipalities, other transit providers, and other stakeholders to find solutions and take advantage of opportunities that support an inclusive, resilient, healthy, and economically vibrant region.

ONGOING ENGAGEMENT

The MPO updates the LRTP every four years, but opportunities to provide information on transportation needs and to participate in the MPO's planning process are ongoing. There are a variety of ways to stay informed about the MPO transportation planning process:

- Attend MPO or MPO committee meetings, an MPO-sponsored event, or Regional Transportation Advisory Council meetings.
- Subscribe to the MPO's mailing lists to receive MPO notices and meeting reminders, Regional Transportation Advisory Council notices, and updates on MPO work at https://www.ctps.org/subscribe.
- Follow the MPO on Twitter @BostonRegionMPO.
- Visit www.ctps.org/public-engagement.

The following are ways for members of the public to get involved in the MPO transportation planning process:

- Identify a transportation need by visiting the LRTP Needs Assessment online at https://www.bostonmpo.org/destination2050 or send an email to publicinfo@ctps.org.
- Suggest a UPWP study idea or location by sending an email to publicinfo@ctps.org or contact MPO staff at 857.702.3700.
- Follow the TIP development process and work with your municipality's TIP contact. (See www.bostonmpo.org/tip.)
- Initiate a new TIP highway project—learn more about the MassDOT's Project Review Committee at https://www.mass.gov/info-details/massdot-highway-initiating-a-project.

APPENDIX A

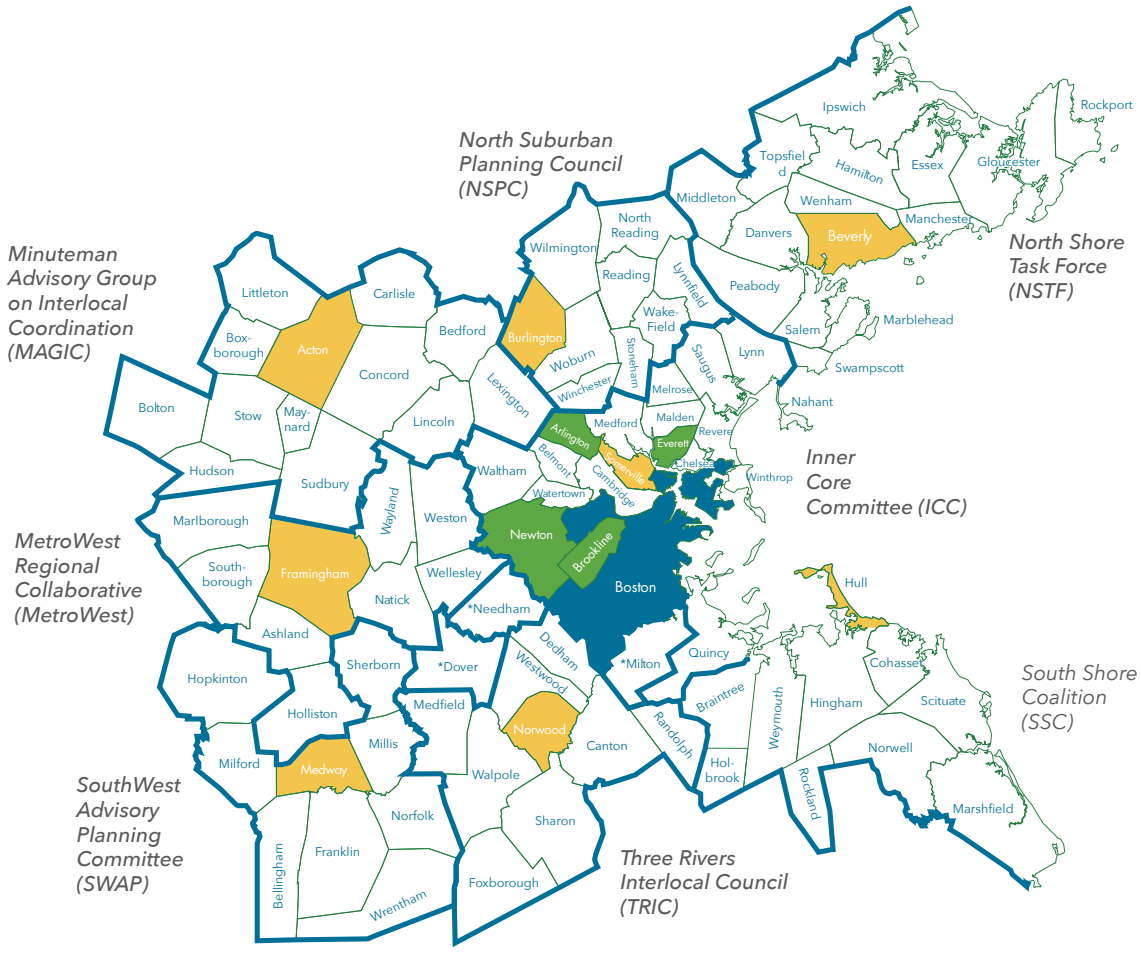
ABOUT THE MPO

Overview

The Boston Region Metropolitan Planning Organization's (MPO) planning area covers 97 municipalities from Boston north to Ipswich, south to Marshfield, and west to Interstate 495. Figure A-1 shows the map of the Boston Region MPO's member municipalities.

Figure A-1

Boston Region Metropolitan Planning Organization Municipalities



*Community is in more than one subregion: Dover is in TRIC and SWAP; Milton and Needham are in ICC and TRIC.

97 Cities and towns

Subregion boundary

MPO representative from subregion

MPO city or town at-large representative

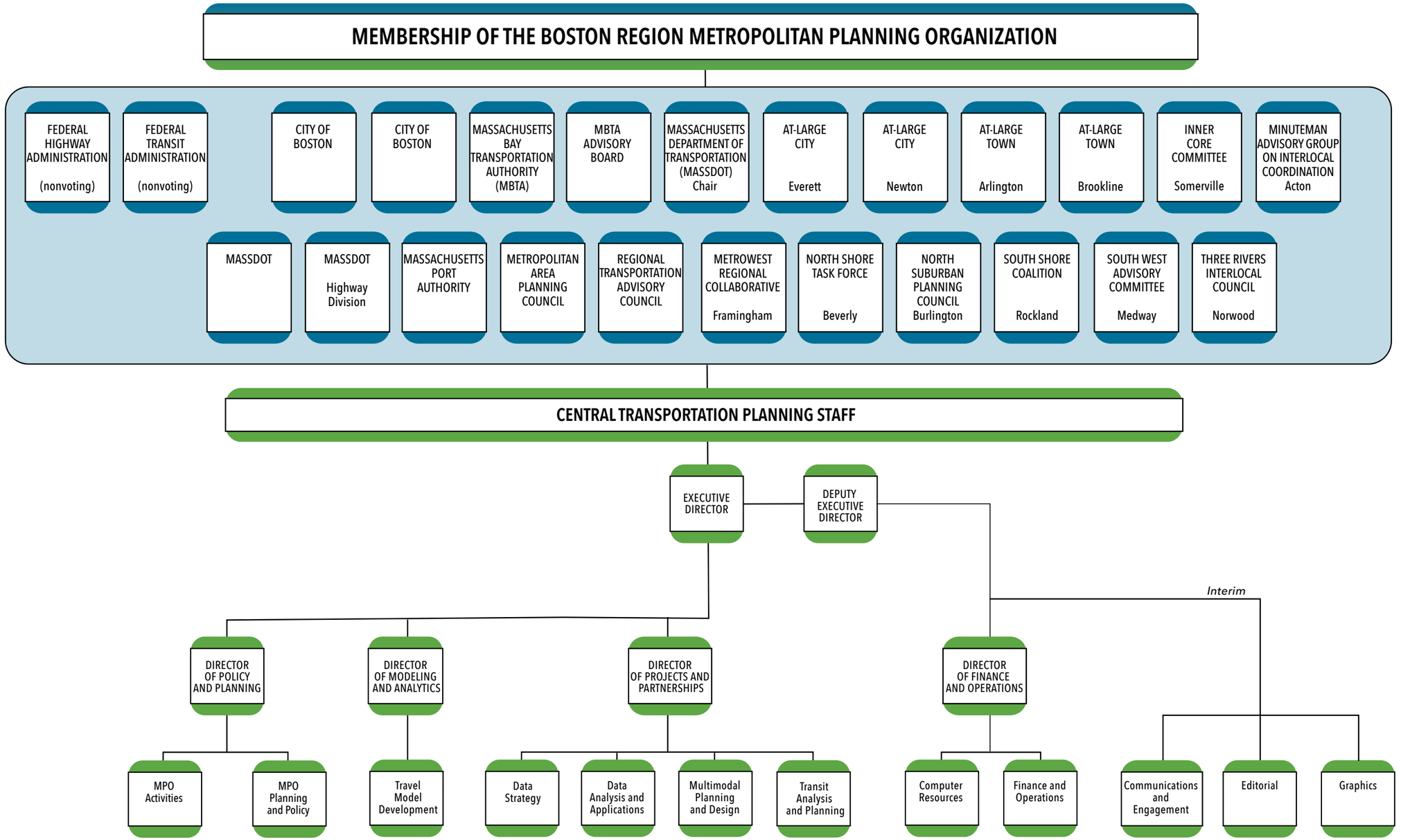
Boston has two permanent MPO representatives

Source: Boston Region MPO.

The MPO's board has 22 voting members. Several state agencies, regional organizations, and the City of Boston are permanent voting members, while 12 municipalities are elected as voting members for three-year terms. Eight municipal members represent each of the eight subregions of the Boston region, and there are four at-large municipal seats. The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) participate on the MPO board as advisory (nonvoting) members. Figure A-2 shows MPO membership and the organization of the Central Transportation Planning Staff (CTPS), which serves as staff to the MPO.

Figure A-2

Boston Region Metropolitan Planning Organization Member Structure



Source: Boston Region MPO.

Planning Documents

As part of its continuing, comprehensive, and cooperative (3C) planning process, the MPO regularly produces several planning and programming documents that describe MPO priorities and investments. These are collectively referred to as *certification documents* and are required for the MPO's process to be certified as meeting federal requirements and, subsequently, to receive federal transportation funds. The three documents that comprise the certification documents are the Long-Range Transportation Plan (LRTP), the Transportation Improvement Program (TIP), and the Unified Planning Work Program (UPWP). In addition to producing these documents, the MPO must also establish and conduct an inclusive public participation process; comply with all federal Title VI, environmental justice, and nondiscrimination requirements; and maintain transportation models and data resources to support air quality conformity determination and long- and short-range planning work and initiatives. The following is a summary of each of the certification documents.

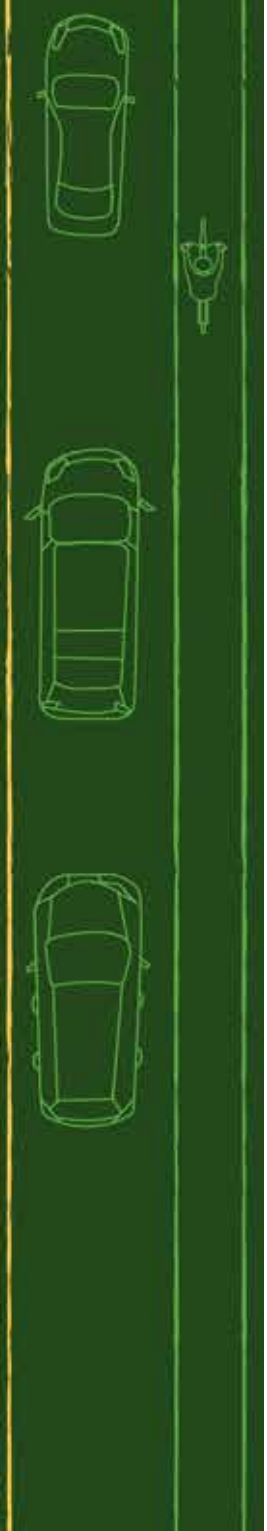
- The LRTP guides decision-making on investments that will be made in the Boston region's transportation system over the next two decades. It defines an overarching vision of the future of transportation in the region, establishes goals and objectives that will lead to achieving that vision, and allocates projected revenue to transportation projects and programs consistent with established goals and objectives. The MPO produces an LRTP every four years.
- The TIP is a multiyear, multimodal program of transportation improvements that align with the vision, goals, and objectives that are laid out in the LRTP. The TIP serves as the implementation arm of the LRTP. Updated annually, it prioritizes and programs transportation projects to fund during a five-year period. The types of transportation projects, within investment programs, that are funded in the TIP are described in the LRTP. Starting with the federal fiscal year (FFYs) 2025–29 TIP, all TIP investments will reflect the investment programs described in *Destination 2050*, until the next LRTP is developed. These programs include major highway reconstruction, intersection improvements, public transit improvements, community shuttles, Complete Streets redesigns, bicycle paths and other bicycle-supporting infrastructure, bikeshare expansion and maintenance, and pedestrian improvements. The TIP will also provide project design support, and it contains a financial plan that shows the revenue sources, current or proposed, for each project. An MPO-endorsed TIP is incorporated into the State Transportation Improvement Program for submission to the FHWA, FTA, and the United States Environmental Protection Agency for approval.

- The UPWP, which is produced annually, contains information about transportation planning studies that will be conducted by MPO staff during a FFY, which runs from October 1 through September 30. The UPWP also describes all of the supportive planning activities undertaken by the MPO staff, including data resources management, preparation of the federally required certification documents, and ongoing regional transportation planning assistance. Transportation needs identified in the development of the LRTP's Needs Assessment often serve as the catalyst for studies programmed in the UPWP. The studies and work products programmed for funding through the UPWP are integrally related to other planning initiatives conducted by the Boston Region MPO, the Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), the Massachusetts Port Authority (Massport), the Metropolitan Area Planning Council (MAPC), and municipalities in the Boston region.

Voting Members

MassDOT was established under Chapter 25 of the Acts of 2009*, An Act Modernizing the Transportation Systems of the Commonwealth*. MassDOT has four divisions: Highway, Rail and Transit, Aeronautics, and the Registry of Motor Vehicles. The MassDOT Board of Directors, composed of 11 members appointed by the governor, oversees all four divisions and MassDOT operations and works closely with the MBTA Board of Directors. The MassDOT Board of Directors was expanded to 11 members by the Legislature in 2015, a group of transportation leaders assembled to review structural problems with the MBTA and deliver recommendations for improvements. MassDOT has three seats on the MPO board, including seats for the Highway Division.

The **MassDOT Highway Division** has jurisdiction over the roadways, bridges, and tunnels that were overseen by the former Massachusetts Highway Department and Massachusetts Turnpike Authority. The Highway Division also has jurisdiction over many bridges and parkways that previously were under the authority of the Department of Conservation and Recreation. The Highway Division is responsible for the design, construction, and maintenance of the Commonwealth's state highways and bridges. It is also responsible for overseeing traffic safety and engineering activities for the state highway system. These activities include operating the Highway Operations Control Center to ensure safe road and travel conditions.



The **MBTA**, created in 1964, is a body politic and corporate, and a political subdivision of the Commonwealth. Under the provisions of Chapter 161A of the Massachusetts General Laws, it has the statutory responsibility within its district of operating the public transportation system in the Boston region, preparing the engineering and architectural designs for transit development projects, and constructing and operating transit development projects. The MBTA district comprises 176 communities, including all 97 cities and towns of the Boston Region MPO area.

The **MBTA Advisory Board** was created by the Massachusetts Legislature in 1964 through the same legislation that created the MBTA. The Advisory Board consists of representatives of the 176 cities and towns that compose the MBTA's service area. Cities are represented by either the city manager or mayor, and towns are represented by the chairperson of the board of selectmen. Specific responsibilities of the Advisory Board include reviewing and commenting on the MBTA's long-range plan, the Program for Mass Transportation; proposed fare increases; the annual MBTA Capital Investment Program; the MBTA's documentation of net operating investment per passenger; and the MBTA's operating budget. The MBTA Advisory Board advocates for the transit needs of its member communities and the riding public.

Massport has the statutory responsibility under Chapter 465 of the Acts of 1956, as amended, for planning, constructing, owning, and operating such transportation and related facilities as may be necessary for developing and improving commerce in Boston and the surrounding metropolitan area. Massport owns and operates Boston Logan International Airport, the Port of Boston's Conley Terminal, Flynn Cruiseport Boston, Hanscom Field, Worcester Regional Airport, and various maritime and waterfront properties, including parks in the Boston neighborhoods of East Boston, South Boston, and Charlestown.

MAPC is the regional planning agency for the Boston region. It is composed of the chief executive officer (or a designee) of each of the cities and towns in the MAPC's planning region, 21 gubernatorial appointees, and 12 ex-officio members. It has statutory responsibility for comprehensive regional planning in its region under Chapter 40B of the Massachusetts General Laws. It is the Boston Metropolitan Clearinghouse under Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966 and Title VI of the Intergovernmental Cooperation Act of 1968. Also, its region has been designated an economic development district under Title IV of the Public Works and Economic Development Act of 1965, as amended. MAPC's responsibilities for comprehensive planning encompass the areas of technical assistance to communities, transportation planning, and development of zoning, land use, demographic, and environmental studies. MAPC activities that are funded with federal metropolitan transportation planning dollars are documented in the Boston Region MPO's UPWP.

The **City of Boston**, six elected cities (currently **Beverly, Burlington, Everett, Framingham, Newton,** and **Somerville**), and six elected towns (currently **Acton, Arlington, Brookline, Hull, Medway,** and **Norwood**) represent the 97 municipalities in the Boston Region MPO area. The City of Boston is a permanent MPO member and has two seats. There is one elected municipal seat for each of the eight MAPC subregions and four seats for at-large elected municipalities (two cities and two towns). The elected at-large municipalities serve staggered three-year terms, as do the eight municipalities representing the MAPC subregions.

The **Regional Transportation Advisory Council**, the MPO's citizen advisory group, provides the opportunity for transportation-related organizations, non-MPO member agencies, and municipal representatives to become actively involved in the decision-making processes of the MPO as it develops plans and prioritizes the implementation of transportation projects in the region. The Advisory Council reviews, comments on, and makes recommendations regarding certification documents. It also serves as a forum for providing information on transportation topics in the region, identifying issues, advocating for ways to address the region's transportation needs, and generating interest among members of the general public in the work of the MPO.

Nonvoting Members

FHWA and **FTA** participate in the Boston Region MPO in an advisory (nonvoting) capacity, reviewing the LRTP, TIP, and UPWP, and other facets of the MPO's planning process to ensure compliance with federal planning and programming requirements. These two agencies oversee the highway and transit programs, respectively, of the United States Department of Transportation under the provisions of the Bipartisan Infrastructure Law and other pertinent legislation.

APPENDIX B

MPO REGULATORY FRAMEWORK

This appendix contains detailed background on the regulatory documents, legislation, and guidance that shape the Boston Region Metropolitan PlanningOrganization's (MPO) transportation planning process.

Introduction

The Boston Region MPO is charged with executing its planning activities in line with federal and state regulatory guidance. Maintaining compliance with these regulations allows the MPO to directly support the work of these critical partners and ensures its continued role in helping the region move closer to achieving federal, state, and regional transportation goals. This appendix describes all of the regulations, policies, and guidance taken into consideration by the MPO during development of the certification documents and other core work the MPO will undertake during federal fiscal year (FFY) 2024.

Federal Regulations and Guidance

The MPO's planning processes are guided by provisions in federal transportation authorization bills, which are codified in federal statutes and supported by guidance from federal agencies. The Bipartisan Infrastructure Law (BIL), signed into law on November 15, 2021, replaced the Fixing America's Surface Transportation (FAST) Act as the nation's five-year surface transportation bill, and covers FFYs 2022–26. This section describes new provisions established in the BIL as well as items established under previous bills, such as the FAST Act.

FIXING AMERICA'S SURFACE TRANSPORTATION (FAST) ACT: NATIONAL GOALS

The purpose of the national transportation goals, outlined in Title 23, section 150, of the United States Code (23 USC § 150), is to increase the accountability and transparency of the Federal-Aid Highway Program and to improve decision-making through performance-based planning and programming. The national transportation goals include the following:

1. **Safety:** Achieve significant reduction in traffic fatalities and serious injuries on all public roads
2. **Infrastructure condition:** Maintain the highway infrastructure asset system in a state of good repair
3. **Congestion reduction:** Achieve significant reduction in congestion on the National Highway System
4. **System reliability:** Improve efficiency of the surface transportation system
5. **Freight movement and economic vitality:** Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
6. **Environmental sustainability:** Enhance performance of the transportation system while protecting and enhancing the natural environment
7. **Reduced project delivery delays:** Reduce project costs, promote jobs and the economy, and expedite movement of people and goods by accelerating project completion by eliminating delays in the project development and delivery process, including by reducing regulatory burdens and improving agencies' work practices

The Boston Region MPO has incorporated these national goals, where practicable, into its vision, goals, and objectives, which provide a framework for the MPO's planning processes. More information about the MPO's vision, goals, and objectives is included in Chapter 3.

FAST Act: Planning Factors

The MPO gives specific consideration to the federal planning factors, described in Title 23, section 134, of the US Code (23 USC § 134), when developing all documents that program federal transportation funds. In accordance with the legislation, studies and strategies undertaken by the MPO shall

1. Support the economic vitality of the metropolitan area, especially by enabling global competition, productivity, and efficiency
2. Increase the safety of the transportation system for all motorized and nonmotorized users
3. Increase the ability of the transportation system to support homeland security and to safeguard the personal security of all motorized and nonmotorized users
4. Increase accessibility and mobility of people and freight
5. Protect and enhance the environment, promote energy conservation, improve quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns
6. Enhance integration and connectivity of the transportation system, across and between modes, for people and freight
7. Promote efficient system management and operation
8. Emphasize preservation of the existing transportation system
9. Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation
10. Enhance travel and tourism

FAST Act: Performance-Based Planning and Programming

The United States Department of Transportation (USDOT), in consultation with states, MPOs, and other stakeholders, established performance measures relevant to the national goals established in the FAST Act. These performance topic areas include roadway safety, transit system safety, National Highway System (NHS) bridge and pavement condition, transit asset condition, NHS reliability for both passenger and freight travel, traffic congestion, and on-road mobile source emissions. The FAST Act and related federal rulemakings require states, MPOs, and public transportation operators to follow performance-based planning and programming practices—such as setting targets—to ensure that transportation investments support progress toward these goals. See Appendix G for more information about how the MPO has and will continue to conduct performance-based planning and programming.

BIPARTISAN INFRASTRUCTURE LAW (BIL): PLANNING EMPHASIS AREAS

On December 30, 2021, the Federal Highway Administration and Federal Transit Administration jointly issued updated planning emphasis areas for use in MPOs' transportation planning process, following the enactment of the BIL. Those planning emphasis areas include the following:

1. **Tackling the Climate Crisis–Transition to a Clean Energy, Resilient Future:** Ensure that transportation plans and infrastructure investments help achieve the national greenhouse gas (GHG) reduction goals of 50–52 percent below 2005 levels by 2030, and net-zero emissions by 2050, and increase resilience to extreme weather events and other disasters resulting from the increasing effects of climate change.
2. **Equity and Justice40 in Transportation Planning:** Ensure public involvement in the planning process and that plans and strategies reflect various perspectives, concerns, and priorities from impacted areas. The Justice40 initiative works toward the goal of having at least 40 percent of the benefits of federal transportation grants, programs, and initiatives flow to disadvantaged communities.
3. **Complete Streets:** Review current policies, rules, and procedures to determine their impact on safety for all road users. This effort should work to include provisions for safety in future transportation infrastructure, particularly for those outside automobiles.
4. **Public Involvement:** Increase meaningful public involvement in transportation planning by integrating virtual public involvement tools into the overall public involvement approach while ensuring continued public participation by individuals without access to computers and mobile devices.
5. **Strategic Highway Network (STRAHNET)/US Department of Defense (DOD) Coordination:** Coordinate with representatives from DOD in the transportation planning and project programming process on infrastructure needs for STRAHNET routes and other public roads that connect to DOD facilities.
6. **Federal Land Management Agency (FLMA) Coordination:** Coordinate with FLMAs in the transportation planning and project programming process on infrastructure and connectivity needs related to access routes and other public roads and transportation services that connect to Federal lands.
7. **Planning and Environment Linkages:** Use a collaborative and integrated approach to transportation decision-making that considers environmental, community, and economic goals early in the transportation planning process, and use the information, analysis, and products developed during planning to inform the environmental review process.
8. **Data in Transportation Planning:** Incorporate data sharing and consideration into the transportation planning process.

1990 CLEAN AIR ACT AMENDMENTS

The Clean Air Act, most recently amended in 1990, forms the basis of the United States' air pollution control policy. The act identifies air quality standards, and the US Environmental Protection Agency (EPA) designates geographic areas as *attainment* (in compliance) or *nonattainment* (not in compliance) areas with respect to these standards. If air quality in a nonattainment area improves such that it meets EPA standards, the EPA may redesignate that area as being a *maintenance* area for a 20-year period to ensure that the standard is maintained in that area.

The conformity provisions of the Clean Air Act "require that those areas that have poor air quality, or had it in the past, should examine the long-term air quality impacts of their transportation system and ensure its compatibility with the area's clean air goals." Agencies responsible for Clean Air Act requirements for nonattainment and maintenance areas must conduct air quality conformity determinations, which are demonstrations that transportation plans, programs, and projects addressing that area are consistent with a State Implementation Plan (SIP) for attaining air quality standards.

Air quality conformity determinations must be performed for capital improvement projects that receive federal funding and for those that are considered regionally significant, regardless of the funding source. These determinations must show that projects in the MPO's Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) will not cause or contribute to any new air quality violations; will not increase the frequency or severity of any existing air quality violations in any area; and will not delay the timely attainment of air quality standards in any area. The policy, criteria, and procedures for demonstrating air quality conformity in the Boston region were established in Title 40, parts 51 and 53, of the Code of Federal Regulations (40. C.F.R. 51, 40 C.F.R. 53).

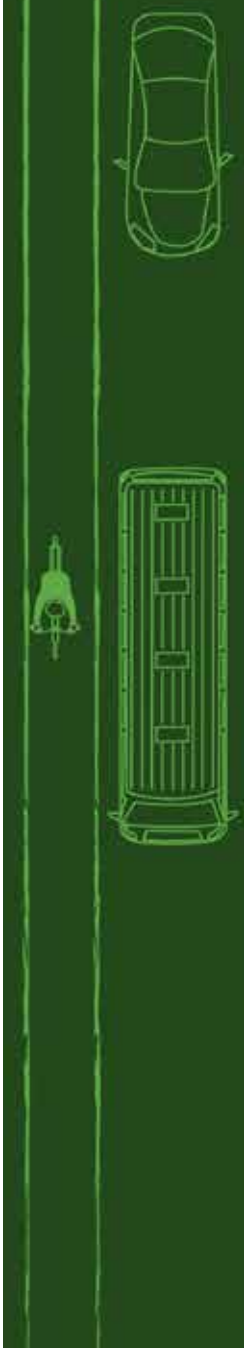
On April 1, 1996, the EPA classified the cities of Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere, and Somerville as in attainment for carbon monoxide (CO) emissions. Subsequently, the Commonwealth established a CO maintenance plan through the Massachusetts SIP process to ensure that emission levels did not increase. While the maintenance plan was in effect, past TIPs and LRTPs included an air quality conformity analysis for these communities. As of April 1, 2016, the 20-year maintenance period for this maintenance area expired and transportation conformity is no longer required for carbon monoxide in these communities. This ruling is documented in a letter from the EPA dated May 12, 2016.

On April 22, 2002, the EPA classified the City of Waltham as being in attainment for CO emissions with an EPA-approved limited-maintenance plan. In areas that have approved limited-maintenance plans, federal actions requiring conformity determinations under the EPA's transportation conformity rule are considered to satisfy the conformity test. The MPO is not required to perform a modeling analysis for a conformity determination for carbon monoxide, but it has been required to provide a status report on the timely implementation of projects and programs that will reduce emissions from transportation sources—so-called transportation control measures—which are included in the Massachusetts SIP. In April 2022, the EPA issued a letter explaining that the carbon monoxide limited maintenance area in Waltham has expired. Therefore, the MPO is no longer required to demonstrate transportation conformity for this area, but the rest of the maintenance plan requirements, however, continue to apply, in accordance with the SIP.

On February 16, 2018, the US Court of Appeals for the DC Circuit issued a decision in *South Coast Air Quality Management District v. EPA*, which struck down portions of the 2008 Ozone National Ambient Air Quality Standards (NAAQS) SIP Requirements Rule concerning the ozone NAAQS. Those portions of the SIP Requirements Rule included transportation conformity requirements associated with the EPA's revocation of the 1997 ozone NAAQS. Massachusetts was designated as an attainment area in accord with the 2008 ozone NAAQS but as a nonattainment or maintenance area as relates to the 1997 ozone NAAQS. As a result of this court ruling, MPOs in Massachusetts must once again demonstrate conformity for ozone when developing LRTPs and TIPs.

MPOs must also perform conformity determinations if transportation control measures (TCM) are in effect in the region. TCMs are strategies that reduce transportation-related air pollution and fuel use by reducing vehicle-miles traveled and improving roadway operations. The Massachusetts SIP identifies TCMs in the Boston region. SIP-identified TCMs are federally enforceable and projects that address the identified air quality issues must be given first priority when federal transportation dollars are spent. Examples of TCMs that were programmed in previous TIPs include rapid-transit and commuter-rail extension programs (such as the Green Line Extension in Cambridge, Medford, and Somerville, and the Fairmount Line improvements in Boston), parking-freeze programs in Boston and Cambridge, statewide rideshare programs, park-and-ride facilities, residential parking-sticker programs, and the operation of high-occupancy-vehicle lanes.

In addition to reporting on the pollutants identified in the 1990 Clean Air Act Amendments, the MPOs in Massachusetts are also required to perform air quality analyses for carbon dioxide as part of the state's Global Warming Solutions Act (GWSA) (see page B-10).



NONDISCRIMINATION MANDATES

The Boston Region MPO complies with Title VI of the Civil Rights Act of 1964, the American with Disabilities Act of 1990 (ADA), Executive Order 12898—*Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations* (EJ EO), and other federal and state nondiscrimination statutes and regulations in all programs and activities it conducts. Per federal and state law, the MPO does not discriminate on the basis of race, color, national origin (including limited-English proficiency), religion, creed, gender, ancestry, ethnicity, disability, age, sex, sexual orientation, gender identity or expression, veteran's status, or background. The MPO strives to provide meaningful opportunities for participation of all persons in the region, including those protected by Title VI, the ADA, the EJ EO, and other nondiscrimination mandates.

The MPO also assesses the likely benefits and adverse effects of transportation projects on equity populations (populations covered by federal regulations, as identified in the MPO's Transportation Equity program) when deciding which projects to fund. This is done through the MPO's project selection criteria. MPO staff also evaluate the projects that are selected for funding, in the aggregate, to determine their overall impacts and whether they improve transportation outcomes for equity populations. The major federal requirements pertaining to nondiscrimination are discussed below.

Title VI of the Civil Rights Act of 1964

Title VI of the Civil Rights Act of 1964 requires that no person be excluded from participation in, be denied the benefits of, or be subjected to discrimination on the basis of race, color, or national origin, under any program or activity provided by an agency receiving federal financial assistance. Executive Order 13166—*Improving Access to Services for Persons with Limited English Proficiency*, dated August 11, 2000, extends Title VI protections to people who, as a result of their nationality, have limited English proficiency. Specifically, it calls for improved access to federally assisted programs and activities, and it requires MPOs to develop and implement a system through which people with limited English proficiency can meaningfully participate in the transportation planning process. This requirement includes the development of a Language Assistance Plan that documents the organization's process for providing meaningful language access to people with limited English proficiency who access their services and programs.

Environmental Justice Executive Order

Executive Order 12898, dated February 11, 1994, requires each federal agency to advance environmental justice by identifying and addressing any disproportionately high and adverse human health or environmental effects, including interrelated social and economic effects, of its programs, policies, and activities on minority and low-income populations.

On April 15, 1997, the USDOT issued its *Final Order to Address Environmental Justice in Minority Populations and Low-Income Populations*. Among other provisions, this order requires programming and planning activities to

- explicitly consider the effects of transportation decisions on minority and low-income populations;
- provide meaningful opportunities for public involvement by members of minority and low-income populations;
- gather (where relevant, appropriate, and practical) demographic information such as race, color, national origin, and income level of populations affected by transportation decisions; and
- minimize or mitigate any adverse impact on minority or low-income populations.

The 1997 Final Order was updated in 2012 with USDOT Order 5610.2(a), which provided clarification while maintaining the original framework and procedures.

Americans with Disabilities Act

Title III of the ADA "prohibits states, MPOs, and other public entities from discriminating on the basis of disability in the entities' services, programs, or activities," and requires all transportation projects, plans, and programs to be accessible to people with disabilities. Therefore, MPOs must consider the mobility needs of people with disabilities when programming federal funding for studies and capital projects. MPO-sponsored meetings must also be held in accessible venues and be conducted in a manner that provides for accessibility. Also, MPO materials must be made available in accessible formats.

Other Nondiscrimination Mandates

The Age Discrimination Act of 1975 prohibits discrimination on the basis of age in programs or activities that receive federal financial assistance. In addition, the Rehabilitation Act of 1975, and Title 23, section 324, of the US Code (23 USC § 324) prohibit discrimination based on sex.

State Guidance and Priorities

Much of the MPO's work focuses on encouraging mode shift and diminishing GHG emissions through improving transit service, enhancing bicycle and pedestrian networks, and studying emerging transportation technologies. All of this work helps the Boston region contribute to statewide progress toward the priorities discussed in this section.

BEYOND MOBILITY

Beyond Mobility, the Massachusetts 2050 Transportation Plan, is a planning process that will result in a blueprint for guiding transportation decision-making and investments in Massachusetts in a way that advances MassDOT's goals and maximizes the equity and resiliency of the transportation system. MPO staff continue to coordinate with MassDOT staff so that *Destination 2050* aligns with *Beyond Mobility*.

CHOICES FOR STEWARDSHIP: RECOMMENDATIONS TO MEET THE TRANSPORTATION FUTURE

The Commission on the Future of Transportation in the Commonwealth—established by Massachusetts Governor Charlie Baker's Executive Order 579—published *Choices for Stewardship* in 2019. This report makes 18 recommendations across the following five thematic categories to adapt the transportation system in the Commonwealth to emerging needs:

1. Modernize existing transportation assets to move more people
2. Create a mobility infrastructure to capitalize on emerging transportation technology and behavior trends
3. Reduce transportation-related GHG emissions and improve the climate resiliency of the transportation network
4. Coordinate land use, housing, economic development, and transportation policy
5. Alter current governance structures to better manage emerging and anticipated transportation trends

Beyond Mobility will build upon the Commission report's recommendations. The Boston Region MPO supports these statewide goals by conducting planning work and making investment decisions that complement MassDOT's efforts and reflect the evolving needs of the transportation system in the region.

MASSACHUSETTS STRATEGIC HIGHWAY SAFETY PLAN

The *Massachusetts 2023 Strategic Highway Safety Plan* (SHSP) identifies the state's key safety needs and guides investment decisions to achieve significant reductions in highway fatalities and serious injuries on all public roads. The SHSP establishes statewide safety goals and objectives and key safety emphasis areas, and it draws on the strengths of all highway safety partners

in the Commonwealth to align and leverage resources to address the state's safety challenges collectively. The Boston Region MPO considers SHSP goals, emphasis areas, and strategies when developing its plans, programs, and activities.

MASSACHUSETTS TRANSPORTATION ASSET MANAGEMENT PLAN

The Massachusetts Transportation Asset Management Plan (TAMP) is a risk-based asset management plan for the bridges and pavement that are in the NHS inventory. The plan describes the condition of these assets, identifies assets that are particularly vulnerable following declared emergencies such as extreme weather, and discusses MassDOT's financial plan and risk management strategy for these assets. The Boston Region MPO considers MassDOT TAMP goals, targets, and strategies when developing its plans, programs, and activities.

MASSDOT MODAL PLANS

In 2017, MassDOT finalized the *Massachusetts Freight Plan*, which defines the short- and long-term vision for the Commonwealth's freight transportation system. In 2018, MassDOT released the related *Commonwealth of Massachusetts State Rail Plan*, which outlines short- and long-term investment strategies for Massachusetts' freight and passenger rail systems (excluding the commuter rail system). In 2019, MassDOT released the *Massachusetts Bicycle Transportation Plan* and the *Massachusetts Pedestrian Transportation Plan*, both of which define roadmaps, initiatives, and action plans to improve bicycle and pedestrian transportation in the Commonwealth. These plans were updated in 2021 to reflect new investments in bicycle and pedestrian projects made by MassDOT since their release. The MPO considers the findings and strategies of MassDOT's modal plans when conducting its planning, including through its Freight Planning Support and Bicycle/Pedestrian Support Activities programs.

GLOBAL WARMING SOLUTIONS ACT

The GWSA makes Massachusetts a leader in setting aggressive and enforceable GHG reduction targets and implementing policies and initiatives to achieve these targets. In keeping with this law, the Massachusetts Executive Office of Energy and Environmental Affairs (EEA), in consultation with other state agencies and the public, developed the *Massachusetts Clean Energy and Climate Plan for 2020*. This implementation plan, released on December 29, 2010 (and updated in 2015), establishes the following targets for overall statewide GHG emission reductions:

- 25 percent reduction below statewide 1990 GHG emission levels by 2020
- 80 percent reduction below statewide 1990 GHG emission levels by 2050

In 2018, EEA published its GWSA 10-year Progress Report and the GHG Inventory estimated that 2018 GHG emissions were 22 percent below the 1990 baseline level.

MassDOT fulfills its responsibilities, defined in the *Massachusetts Clean Energy and Climate Plan for 2020*, through a policy directive that sets three principal objectives:

1. To reduce GHG emissions by reducing emissions from construction and operations, using more efficient fleets, implementing travel demand management programs, encouraging eco-driving, and providing mitigation for development projects
2. To promote healthy transportation modes by improving pedestrian, bicycle, and public transit infrastructure and operations
3. To support smart growth development by making transportation investments that enable denser, smart growth development patterns that can support reduced GHG emissions

In January 2015, the Massachusetts Department of Environmental Protection amended Title 310, section 7.00, of the Code of Massachusetts Regulations (310 CMR 60.05), *Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation*, which was subsequently amended in August 2017. This regulation places a range of obligations on MassDOT and MPOs to support achievement of the Commonwealth's climate change goals through the programming of transportation funds. For example, MPOs must use GHG impact as a selection criterion when they review projects to be programmed in their TIPs, and they must evaluate and report the GHG emissions impacts of transportation projects in LRTPs and TIPs.

The Commonwealth's 10 MPOs (and three non-metropolitan planning regions) are integrally involved in supporting the GHG reductions mandated under the GWSA. The MPOs seek to realize these objectives by prioritizing projects in the LRTP and TIP that will help reduce emissions from the transportation sector. The Boston Region MPO uses its TIP project evaluation criteria to score projects based on their GHG emissions impacts, multimodal Complete Streets accommodations, and ability to support smart growth development. Tracking and evaluating GHG emissions by project will enable the MPOs to anticipate GHG impacts of planned and programmed projects. See Appendix E for more details related to how the MPO conducts GHG monitoring and evaluation.

HEALTHY TRANSPORTATION POLICY INITIATIVES

On September 9, 2013, MassDOT passed the Healthy Transportation Policy Directive to formalize its commitment to implementing and maintaining transportation networks that allow for various mode choices. This directive will ensure that all MassDOT projects are designed and implemented in ways that provide all customers with access to safe and comfortable walking, bicycling, and transit options.

In November 2015, MassDOT released the *Separated Bike Lane Planning & Design Guide*. This guide represents the next step in MassDOT's continuing commitment to Complete Streets, sustainable transportation, and the creation of more safe and convenient transportation options for Massachusetts residents. This guide may be used by project planners and designers as a resource for considering, evaluating, and designing separated bike lanes as part of a Complete Streets approach.

In *Destination 2050*, the Boston Region MPO has continued to use investment programs—particularly its Complete Streets and Bicycle Network and Pedestrian Connections programs—that support the implementation of Complete Streets projects. In the Unified Planning Work Program, the MPO budgets to support these projects, such as the MPO's Bicycle and Pedestrian Support Activities program, corridor studies undertaken by MPO staff to make conceptual recommendations for Complete Streets treatments, and various discrete studies aimed at improving pedestrian and bicycle accommodations.

CONGESTION IN THE COMMONWEALTH 2019

MassDOT developed the *Congestion in the Commonwealth 2019* report to identify specific causes of and impacts from traffic congestion on the NHS. The report also made recommendations for reducing congestion, including addressing local and regional bottlenecks, redesigning bus networks within the systems operated by the Massachusetts Bay Transportation Authority (MBTA) and the other regional transit authorities, increasing MBTA capacity, and investigating congestion pricing mechanisms such as managed lanes. These recommendations guide multiple new efforts within MassDOT and the MBTA and are actively considered by the Boston Region MPO when making planning and investment decisions.

Regional Guidance and Priorities

THE MBTA'S PROGRAM FOR MASS TRANSPORTATION

The Program for Mass Transportation (PMT) is the MBTA's long-range capital planning document. It defines a 25-year vision for public transportation in eastern Massachusetts. The MBTA's enabling legislation requires it to update the PMT every five years and to implement the policies and priorities outlined in it through the annual Capital Investment Plan (CIP). MassDOT's Office of Transportation Planning will lead the process for updating the 2024 PMT.

MassDOT and the MBTA released the most recent PMT, Focus40, in 2019. Focus40 aims to position the MBTA to meet the transit needs of the Greater Boston region through 2040. Complemented by the MBTA's Strategic Plan and other internal and external policy and planning initiatives, Focus40 serves as a comprehensive plan guiding all capital planning initiatives at the MBTA. These initiatives include the Rail Vision plan, which will inform the vision for the future of the MBTA's commuter rail system; the Bus Network Redesign (formerly the Better Bus Project), the plan to re-envision and improve the MBTA's bus network; and other plans. The Boston Region MPO continues to monitor the status of Focus40 and related MBTA modal plans to inform its decision-making about transit capital investments, which are incorporated in the TIP and LRTP.

METROCOMMON 2050

MetroCommon 2050, which was developed by the Metropolitan Area Planning Council (MAPC) and adopted in 2021, is Greater Boston's regional land use and policy plan. MetroCommon 2050 builds off of MAPC's previous plan, MetroFuture (adopted in 2008), and includes an updated set of strategies for achieving sustainable growth and equitable prosperity in the region. The MPO considers MetroCommon 2050's goals, objectives, and strategies in its planning and activities. MetroCommon 2050 also serves as the foundation for land use projections in *Destination 2050*.

THE BOSTON REGION MPO'S CONGESTION MANAGEMENT PROCESS

The purpose of the Congestion Management Process (CMP) is to monitor and analyze the mobility of people using transportation facilities and services, develop strategies for managing congestion based on the results of traffic monitoring, and move those strategies into the implementation stage by providing decision-makers in the region with information and recommendations for improving the transportation system's performance. The CMP monitors roadways, transit, and park-and-ride facilities in the Boston region for safety, congestion, and mobility, and identifies problem locations.

COORDINATED PUBLIC TRANSIT-HUMAN SERVICES TRANSPORTATION PLAN

Every four years, the Boston Region MPO completes a Coordinated Public Transit–Human Services Transportation Plan (CPT–HST), in coordination with the development of the LRTP. The CPT–HST supports improved coordination of transportation for seniors and people with disabilities in the Boston region. This plan also guides transportation providers in the Boston region who are developing proposals to request funding from the Federal Transit Administration's Section 5310 Program. To be eligible for funding, a proposal must meet a need identified in the CPT–HST. The CPT–HST contains information about

- current transportation providers in the Boston region;
- unmet transportation needs for seniors and people with disabilities;
- strategies and actions to meet the unmet needs; and
- priorities for implementing those needs.

The MPO adopted its current CPT–HST in 2023.

MBTA AND REGIONAL TRANSIT AUTHORITY (RTA) TRANSIT ASSET MANAGEMENT PLANS

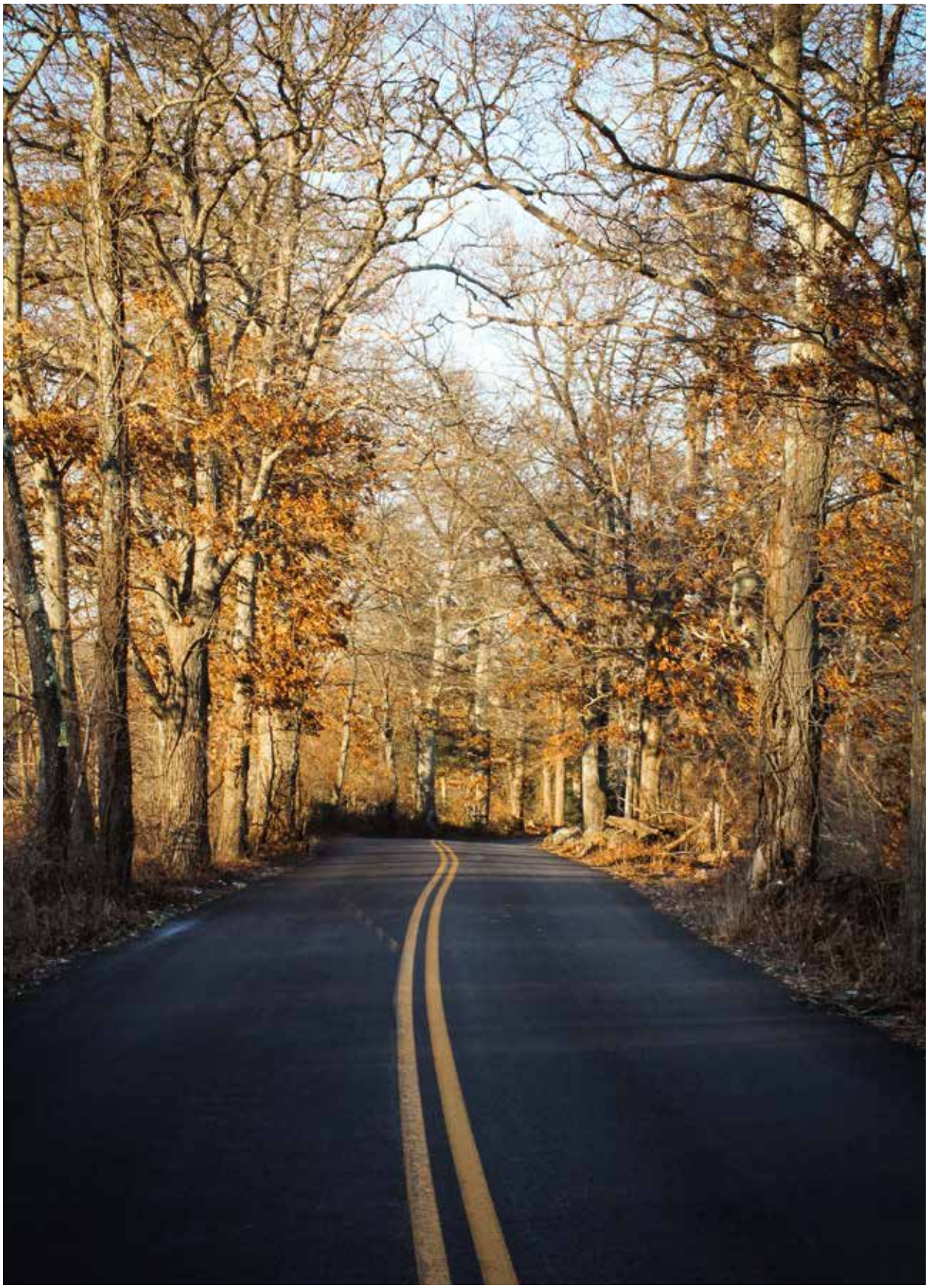
The MBTA and the region's RTAs—the Cape Ann Transportation Authority (CATA) and the MetroWest Regional Transit Authority (MWRTA)—are responsible for producing transit asset management plans that describe their asset inventories and the condition of these assets, strategies, and priorities for improving the state of good repair of these assets. The Boston Region MPO considers goals and priorities established in these plans when developing its plans, programs, and activities.

MBTA AND RTA PUBLIC TRANSIT AGENCY SAFETY PLANS

The MBTA, CATA, and MWRTA are required to create and annually update Public Transit Agency Safety Plans that describe their approaches for implementing Safety Management Systems on their transit systems. The Boston Region MPO considers goals, targets, and priorities established in these plans when developing its plans, programs, and activities.

State and Regional COVID-19 Adaptations

The COVID-19 pandemic has radically shifted the way many people in the Boston region interact with the regional transportation system. The pandemic's effect on everyday life has had short-term impacts on the system and how people travel, and it may have lasting effects. State and regional partners have advanced immediate changes in the transportation network in response to the situation brought about by the pandemic. Some of the changes may become permanent, such as the expansion of bicycle, bus, sidewalk, and plaza networks, and a reduced emphasis on traditional work trips. As the region recovers from the impacts of the COVID-19 pandemic and the long-term effects become apparent, state and regional partners' guidance and priorities are likely to be adjusted.



APPENDIX C

PUBLIC ENGAGEMENT AND PUBLIC COMMENT

Introduction

Boston Region Metropolitan Planning Organization (MPO) staff conducted engagement activities throughout the development of *Destination 2050*. Engagement began in fall 2019 with the kick-off of the Needs Assessment and continued through the 30-day public comment period for the draft Long-Range Transportation Plan (LRTP) in June and July 2023.

This appendix summarizes the engagement activities and public input received during the different phases of LRTP development: Needs Assessment; vision, goals, and objectives revision; and project and program selection. It concludes with the comments received during the formal 30-day public comment period for the draft LRTP.

The MPO engaged a variety of stakeholders in the development of *Destination 2050*:

- The Regional Transportation Advisory Council (Advisory Council)
- Municipalities in the Boston Region MPO area
- Transportation agencies, including the Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), and regional transit authorities
- Community organizations
- Economic development and business organizations
- Transportation equity advocates
- Transportation and environmental advocates
- Academic institutions
- Members of the public

MPO staff used a variety of communication and engagement methods and channels to involve the public and solicit feedback:

- Virtual and in-person meetings with the Advisory Council, the Metropolitan Area Planning Council (MAPC) subregional groups, and stakeholder organizations
- Participation in other agencies' and organizations' meetings and events
- MPO-sponsored events including MPO meetings and open houses
- LRTP website content
- Electronic communications including emails and social media content

Table C-1 provides a summary of the meetings, events, and content used in the *Destination 2050* public engagement process. Staff also considered feedback and comments from engagement activities for other MPO programs and projects between 2019 and 2023 as input for the development of *Destination 2050*. Staff sought to include diverse and regionally representative perspectives by emphasizing engagement and relationship-building with historically underrepresented communities, and this input is reflected throughout *Destination 2050*. Through virtual and in-person engagement, MPO staff received more than 2,000 comments, ideas, and survey responses while developing *Destination 2050*.

Table C-1
Summary of Communication and Engagement Activities Used in the Development of *Destination 2050*

Type of Engagement	Date	Description
MPO meetings	2019–23	Presented periodic updates about the development of *Destination 2050* in the MPO's largest public forum
Regional Transportation Advisory Council meetings	2021–23	Held conversations, workshops, and activities to gather input on transportation needs, priorities, vision, goals, objectives, programs, and projects; provided periodic updates on *Destination 2050* development
MAPC subregional group meetings	2020–22	Gathered input on transportation needs and priorities, and vision, goals, and objectives
Focus groups	2021	Collected input for Big Ideas scenario planning, including discussing and gathering feedback on driving forces, uncertainties, and proposed strategies
Interviews	2021–22	Interviewed stakeholders to gather input on needs, vision, goals, objectives, programs, and projects; and provided updates
Transit Working Group Coffee Chats	2021–22	Discussed and gathered feedback on transit-related topics
Stakeholder group meetings	2019–23	Gathered input on needs, vision, goals, objectives, programs, and projects from community and advocacy groups
Partner events	2019–23	Co-hosted meetings and events with other planning organizations to gather input on needs, vision, goals, objectives, programs, and projects
Open houses	2019–23	Shared information about MPO programs and gathered input on needs, vision, goals, objectives, programs, and projects
Email content	2019–23	Advertised opportunities for engagement

Table C-1 (cont.)

Type of Engagement	Date	Description
Social media content	2019–23	Advertised opportunities for engagement; engaged transportation advocates, community groups, and members of the public
Surveys	2019–23	Published surveys seeking input on transportation needs, vision, goals, objectives, and programs and projects, including surveys on the following topics: *Destination 2050* vision, goals, and objectives *Destination 2050* investment priorities Coordinated Public Transit-Human Services Transportation Plan TIP criteria update Exploring Resiliency in MPO Corridor and Intersection Studies FFYs 2021–24 UPWP study ideas Corridor and intersection safety and operations studies

FFY = federal fiscal year. MPO = metropolitan planning organization. TIP = Transportation Improvement Program. UPWP = Unified Planning Work Program.

Source: Boston Region MPO.

Engagement During *Destination 2050* Development

BIG IDEAS FOR SCENARIO PLANNING

Staff engaged stakeholders in exploratory scenario planning to inform the MPO's consideration of future conditions in *Destination 2050* through a series of focus groups in 2021, during which 53 participants from over 40 organizations in the Boston region identified driving forces they believe will shape transportation in the region, and strategies to respond to future conditions. Participants represented a wide range of stakeholder types and areas of expertise, including organizations that work with underrepresented communities.

The "big ideas" that stakeholders identified through these focus groups included the driving forces of climate change; new technologies and data; demographic, economic, and land use trends; consumer preferences, and policymaking. Strategies to address these forces included adaptation and emissions reduction; partnership and relationship building; flexibility; research and coordination with other areas of planning and policymaking; communications and engagement; and the equitable expansion of transportation options throughout the region.

More detailed information about this exploratory scenario planning engagement process and participants' responses is available in the Big Ideas StoryMap.

DESTINATION 2050 NEEDS ASSESSMENT ENGAGEMENT

The development of the Needs Assessment was informed by extensive engagement with stakeholders throughout the region. During the four-year development process for *Destination 2050,* MPO staff collected feedback about transportation needs from municipalities, transportation providers, advocates and community organizations, and members of the general public through a variety of engagement activities including focus groups, subregional meetings, public forums, and surveys.

Staff conducted broad and continuous engagement to collect feedback for the Needs Assessment, tracking needs expressed by stakeholders during targeted LRTP engagement efforts as well as from conversations, activities, and events in other venues or contexts. Staff prioritized the inclusion of a diverse range of perspectives throughout the region, including disadvantaged and historically underrepresented communities, and used demographic data to target, shape, and analyze the effectiveness of strategies to support equitable engagement efforts.

To collect feedback about transportation needs for *Destination 2050*, staff held a series of scenario planning focus groups (see *Big Ideas for Scenario Planning* above), which included sessions with interpretation and translated materials for communities with limited English proficiency; worked with municipal, agency, and advocacy partners to distribute surveys in seven languages; and held workshops and informational events at Advisory Council meetings and other public meetings. Throughout these engagement processes, staff built and deepened stakeholder relationships, helping to make MPO engagement more equitable and effective while laying the groundwork for ongoing efforts to hear and respond to the region's transportation needs and priorities.

Input for the Needs Assessment was gathered from the following engagement activities:

- Meetings with MAPC's eight subregional groups each fall (2019–22), and quarterly Inner Core Committee transportation group meetings. Staff visited each of these groups to discuss the MPO's work and transportation needs in the subregions. Staff encouraged members to review annual subregional booklets staff prepared to document needs and priorities and to provide feedback if there were missing items.
- Regional Transportation Advisory Council meetings. Staff attended Advisory Council meetings during fall 2021 to collect feedback on needs through discussions and activities.
- Scenario planning focus groups in 2021. Staff held a series of focus groups involving over 40 organizations in the Boston region to identify driving forces that will shape transportation in the region and strategies to respond to future conditions. The engagement process and results are documented in the Big Ideas StoryMap.
- Disparate Impact and Disproportionate Burden (DI/DB) engagement in 2019 and 2020. Staff collected information about the unequal impacts of transportation planning decisions through stakeholder meetings and activities to develop the MPO's DI/DB policy. This policy was used in the LRTP to identify any disparate impacts and disproportionate burdens on minority and low-income populations that would likely result from projects in the Recommended Plan. The engagement process and results are documented in the Moving Toward Equity StoryMap.
- TIP criteria update process in December 2019. Staff engaged the public through a survey and several workshops as part of the process of updating the MPO's criteria for scoring and selecting projects receiving MPO target funding.
- Meetings and interviews with stakeholder organizations, including advocacy and community-based organizations and others interested in discussing transportation issues and needs in the region.
- Open houses, which were held each spring to allow members of the public to discuss the draft TIP and UPWP with staff and provide comments.
- Transit Working Group Coffee Chats, 2020–22. Staff held informal discussions with transit providers and other interested parties on various public transit and transportation topics including human services transportation needs; regional coordination needs; and other needs, priorities, challenges, and opportunities.
- Other workshops, meetings, and forums, often in collaboration with partner organizations to reach broader audiences (2019–22). These gatherings included Regional Coordinating Council and Transportation Management Association meetings at which staff discussed MPO work and gathered feedback; virtual information sessions about TIP development; virtual events to showcase MPO work and discuss transportation topics such as freight planning and transit system mapping; events held by advocacy organizations, which staff attended to share information about the MPO

and build relationships; forums held in partnership with MAPC to discuss transportation topics, such as transportation demand management strategies; and public meetings held in partnership with MassDOT to discuss capital planning in the Boston region.

- Public surveys (2019–22). Staff conducted several surveys to collect feedback and information for MPO work and for the Needs Assessment. Surveys were advertised on the MPO website, social media, and email, and shared during meetings and engagement events. Surveys focused on the following topics:

  - Identifying resiliency-oriented issues, needs, and ideas from MPO municipalities (spring 2020)
  - Coordinated Public Transit-Human Services Transportation Plan—Collecting feedback on transportation needs and issues for seniors and people with disabilities (winter 2019)
  - UPWP study ideas—Collecting suggestions for the UPWP development process and identifying public needs and priorities (fall 2020 and fall 2021)
  - *Destination 2050* visioning—Collecting feedback on transportation needs, priorities, and visions for the future (fall 2022 to winter 2023)

DESTINATION 2050 PLANNING FRAMEWORK ENGAGEMENT

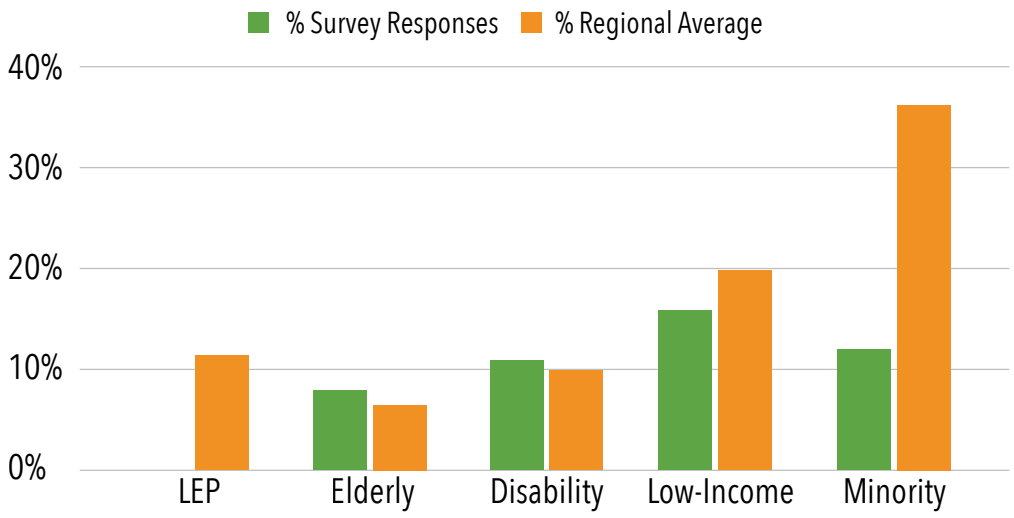
To inform the update of the MPO's planning framework for *Destination 2050*, staff engaged the public about visions, goals, and objectives for the region's transportation future. During the fall of 2022 and winter of 2023, staff met with MAPC subregional groups and held workshops with the Advisory Council and MPO board members to hear stakeholders' thoughts on how well the *Destination 2040* planning framework aligned with their vision and goals and what updates and changes staff should pursue for the draft *Destination 2050* vision, goals, and objectives. Feedback from these meetings and workshops informed significant updates to the *Destination 2050* planning framework, including the integration of equity-oriented objectives across all goal areas, the addition of an engagement objective to the Transportation Equity goal, and the restructuring of several goal areas to reflect safety, mobility, and resilience priorities.

LRTP Vision and Priorities Survey

Staff primarily collected input for the *Destination 2050* vision, goals, and objectives via a public survey that asked respondents to rank their transportation priorities, identify words and phrases that describe their ideal transportation system, and describe aspects of the Boston region's transportation system that need to be improved. Staff publicized the survey across all general MPO communication channels and conducted extensive targeted outreach, adjusting outreach strategies based on live demographic and geographic response data to better engage underrepresented audiences.

Staff received about 800 survey responses and about 675 responses to optional demographic questions at the end of the survey. A comparison of the demographic identification of survey respondents to the entire region's demographics is shown in Figure C-1. Fifty-six percent of respondents gave a zip code associated with communities in the Inner Core, which is roughly consistent with the region's population distribution. Distribution of gender, age, and household size was fairly even. Responses to a question about transportation mode use indicated that most respondents drove, either exclusively or in combination with other modes, while about 25 percent of respondents said they relied solely on transit or nonmotorized transportation.

Figure C-1
Demographics of Survey Respondents



LEP = Limited English Proficiency.

Note: These survey questions recorded responses from approximately 675 people.

Source: Boston Region MPO, 2017-21 American Community Survey, 2020 US Census.

The responses to survey questions about the *Destination 2050* planning framework highlighted several overarching themes related to visions and priorities for the region's transportation system:

- Reliability, frequency, accessibility, and connectivity of transit service and infrastructure
- Electrification of transit infrastructure and improvement of air quality and public health
- Safety for all modes
- Connectivity of bicycle and pedestrian infrastructure
- Responsiveness and adaptation to climate forces
- Consideration of intersections between transportation and other urban planning challenges

Figure C-2 represents 743 responses to a survey question asking participants to suggest three words to describe their ideal transportation system. The size and shading of each word correlate to the frequency with which the word was used. Words that are larger and bolder in color were more commonly expressed. Words or phrases that were similar in meaning were aggregated.

Figure C-2
Words to Describe an Ideal Transportation System

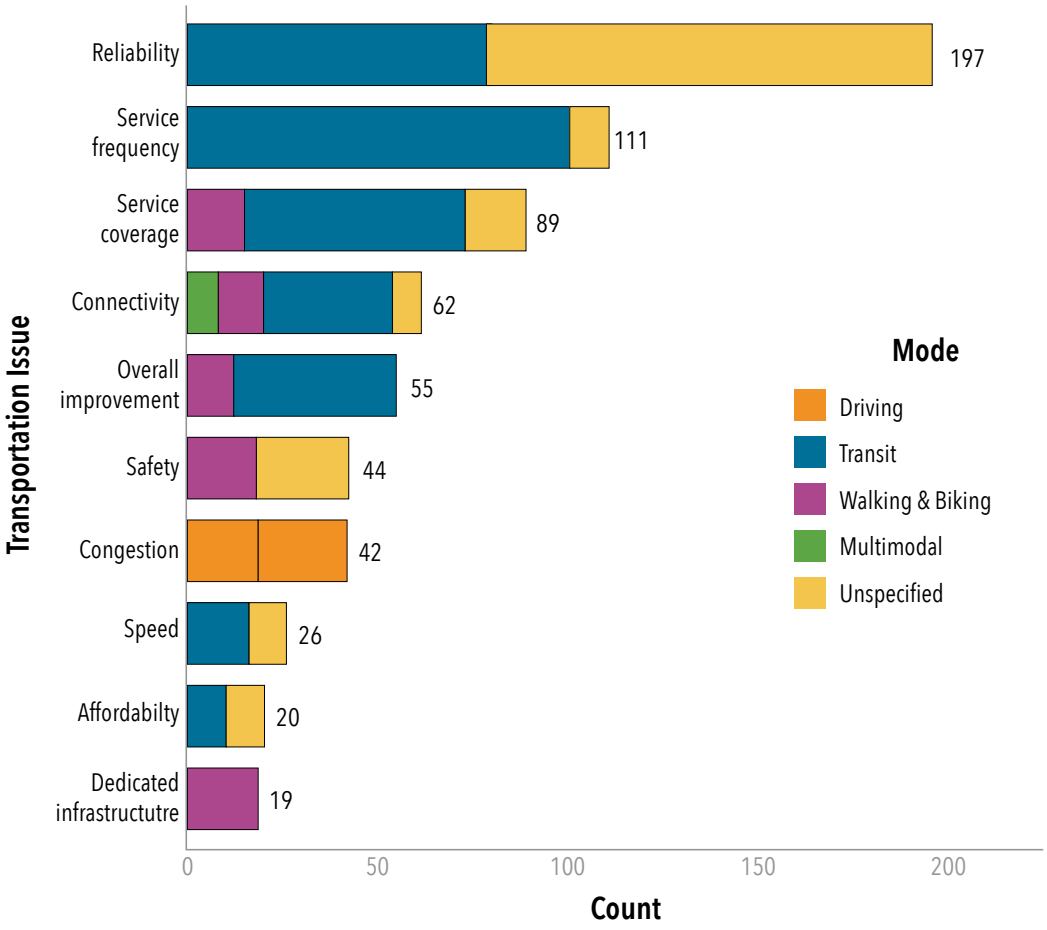
Note: This survey question recorded responses from 743 people.

Source: Boston Region MPO.

Figure C-3 shows 729 responses to an open-ended survey question asking participants to identify the most pressing transportation issues in the Boston region. Similar responses were aggregated and coded, and responses were categorized by mode and displayed in order of frequency.

Reliability was the top transportation challenge in the Boston region identified by survey respondents. Approximately one in four respondents called for improved reliability. Reliability was also often paired with other transportation challenges, such as frequency, safety, and speed. Among those who cited reliability in their response, more than half of them did not specify the mode of transportation where the issue manifests. Those who did, however, referred to delays and slow speeds of MBTA bus and rail rapid transit service.

Figure C-3
Transportation Challenges in the Boston Region



Note: This survey question recorded responses from 729 people.

Source: Boston Region MPO.

Other Engagement Activities

Other engagement activities during which staff discussed and gathered feedback on *Destination 2050* vision, goals, and objectives included the following:

- Regional Transportation Advisory Council meetings, October 2022 through January 2023, including *Destination 2050* planning framework workshops in October and January
- *Destination 2050* planning framework workshop with the Inner Core Committee Transportation group in January 2023
- Meetings with MAPC subregional groups in October through December of 2022
- Stakeholder group meetings, in fall 2022 through spring 2023, where staff met with several advocacy and community groups to learn about their transportation priorities and visions, which included transit system improvements, resiliency and climate adaptation, equitable community engagement, affordability, and accessibility
- Transit Working Group's *Destination 2050* planning framework discussion, November 2022

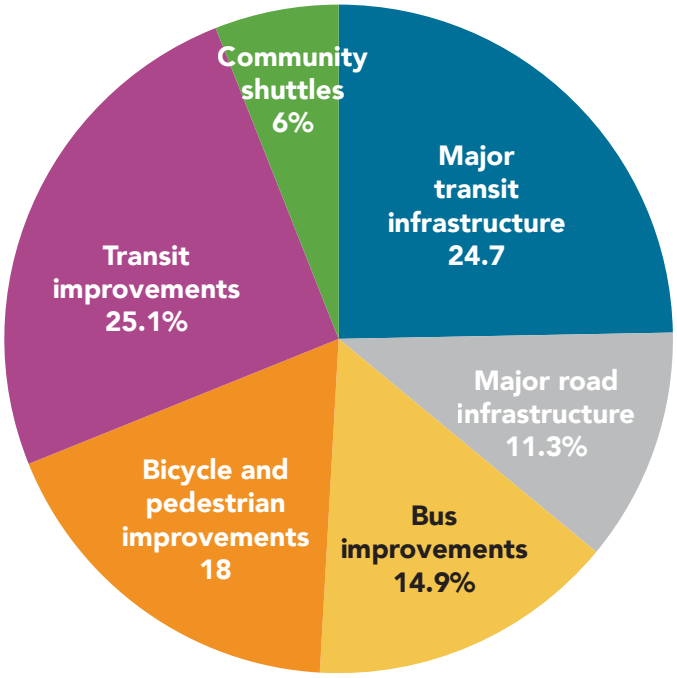
DESTINATION 2050 PROGRAMS AND PROJECTS ENGAGEMENT

To inform the update of proposed LRTP investment programs and projects for *Destination 2050*, staff engaged stakeholders and members of the public on questions of their priorities for transportation system investments. During the spring of 2023, staff solicited comments and led discussions about investment priorities at MPO board and Advisory Council meetings, conducted interactive investment prioritization activities, and collected public input through an investment survey. Staff also received several comments and letters from project proponents and members of the public advocating for specific projects to be included in the *Destination 2050* universe of projects.

Investment Programs

The *Destination 2050* investment survey asked respondents to allocate 100 tokens to different types of transportation system improvements. The survey helped the MPO to understand how well respondents felt the proposed investment programs aligned with public priorities for different types of transportation system investments and how they aligned with the MPO's vision and goals. Staff advertised the survey on the MPO website, social media, and in MPO email communications. Staff also shared the survey during meetings and engagement events, as well as directly with stakeholders and partners, receiving about 300 total responses. Figure C-4 illustrates the average allocation to each type of investment listed in the survey.

Figure C-4
Average Funding Allocation: Responses from Investment Programs Survey



Note: This survey question recorded responses from 299 people.

Source: Boston Region MPO.

More than 150 people responded to an optional write-in question about additional investment priorities, and other people gave additional comments during other engagement activities such as Advisory Council and stakeholder meetings. These comments highlighted several themes, including respondents' strong prioritization of investments to support transit system modernization, reliability, and safety; support for investments in transportation system

connectivity within and beyond the Boston region; support for investments in pedestrian and bicycle infrastructure and connections; and the necessity of making transportation investments that are equitable and proactively respond to climate forces. Stakeholders also submitted written and verbal comments about investment programs to staff during the MPO's consideration of *Destination 2050* investment programs, including several comments in support of the inclusion of a new bikeshare support program in *Destination 2050*.

Figure C-5 illustrates the percent of funding the MPO ultimately allocated to each investment program in *Destination 2050*.

Table C-2
Funding Allocated to MPO Investment Programs in *Destination 2050*

Investment Program	Percentage Allocation, 2024–28 and 2034–50	Percentage Allocation, 2029–33	Funding Allocation, 2024–2050
Complete Streets	45%	30%	$2,130,828,621
Major Infrastructure	30%	47%	$1,643,425,636
Intersection Improvements	12%	10%	$584,554,172
Bicycle Network and Pedestrian Connections	5%	5%	$250,506,232
Transit Transformation	5%	5%	$250,506,232
Community Connections	2%	2%	$100,202,493
Bikeshare Support	1%	1%	$50,101,246
Total			$5,010,124,631

Note: Years are federal fiscal years

Source: Boston Region Metropolitan Planning Organization.

Capital Projects

During discussions about investment program sizing and project selection, the MPO received comment letters and heard comments from proponents and members of the public supporting the following projects:

- Routes 4/225 and Hartwell Avenue project in Lexington (9 letters and comments)
- Route 126/Route 135 Grade Separation in Framingham (1 comment)
- Interstate 93/95 interchange project in Canton (1 comment)

Additional Engagement for *Destination 2050*

ENGAGING ORGANIZATIONS THAT WORK WITH SENIORS AND PEOPLE WITH DISABILITIES

Concurrently with the development of *Destination 2050*, MPO staff developed an updated Coordinated Public Transit-Human Services Transportation Plan (Coordinated Plan) with the participation of public, private, and nonprofit transportation representatives, human services providers, and members of the public. Staff collected input about unmet transportation needs as well as strategies and priorities for addressing those needs from organizations and stakeholders that work with and represent seniors and people with disabilities.

Engagement activities for the Coordinated Plan included the following:

- Human services transportation coordination workshop with municipal Councils on Aging, Disability Commissions, and other transit providers, with breakout sessions focused on various coordination topics and geographies (April 2023)
- Discussions with Regional Coordinating Councils (RCCs) (summer 2023)
- Transit Working Group Coffee Chats about human services transportation and the Coordinated Plan (October 2021 and November 2022)
- Discussions with the Advisory Council about local transit coordination and Coordinated Plan priorities (January 2023 and June 2023)
- Public survey about human services transportation needs, strategies, and priorities (spring 2023)

Staff also collected information about human services transportation needs and priorities to include in the Coordinated Plan from other sources:

- MAPC subregional group meetings (fall 2020, 2021, and 2022)
- Other Transit Working Group Coffee Chats (2021–22)
- Other RCC meetings (2022)
- UPWP study idea surveys (2020–23)
- TIP criteria update engagement (2019)
- Big Ideas for Scenario Planning focus groups (2021)
- *Destination 2050* visioning survey (2022–23)
- Community Health Needs Assessments from regional medical institutions (2019–23)

While the 2023 Coordinated Plan contains results in more detail, several overarching themes related to human services transportation needs, strategies and actions, and priorities were identified:

- Coordination of existing services across municipal boundaries
  - Coordination of existing planning and capital resources
  - Coordinated map or database of existing regional human services transportation network
- Expansion of existing services
  - By geography (particularly outside of the Inner Core)
  - By time or schedule
  - By eligibility or trip type
  - Through partnerships
- Funding support
- Education and training

An additional priority staff identified was the inclusion of riders and other stakeholders in human services transportation planning, and a desire for more institutional support for regional collaboration. Through the development of the next Coordinated Plan, staff will continue to consider feedback and pursue conversations about the ideal role for the MPO in supporting regional human services transportation coordination. Information and input from the development of the 2023 Coordinated Plan was included throughout *Destination 2050*, including the Needs Assessment, planning framework, and investment programs.

ENGAGING ENVIRONMENTAL STAKEHOLDERS

Staff emphasized the inclusion of input from environmental organizations, advocates, institutions, and agencies in the development of *Destination 2050* and consulted with these stakeholders on the resilience of the transportation system and equitable adaptation to climate forces affecting the region's future. Engagement activities included the following:

- Meetings with environmental advocates and community organizations
- Meetings with environmental justice organizations
- Meetings with regional, state, and federal environmental resource agencies and departments
- Conversations with municipalities and MAPC subregional groups
- Transportation resilience discussion with the Advisory Council

Feedback gathered from this engagement was central to the development of the Needs Assessment and *Destination 2050* vision, goals, and objectives, including the development of a new resilience goal area.

BUILDING STAKEHOLDER RELATIONSHIPS

Building and strengthening relationships with advocacy and community organizations throughout the region was at the core of the engagement undertaken to support the development of *Destination 2050,* and it will be critical to the success and effectiveness of future engagement efforts. Throughout the development of *Destination 2050*, staff met regularly with several transportation advocacy organizations and continued to expand these touchpoints to ongoing MPO work. Engagement activities for *Destination 2050* sought not just to collect public input, but also to build awareness about the MPO, capacity for public participation in transportation planning, and trust among the region's communities, particularly those who are underrepresented in the planning process.

Outreach Activities and Comments Received during the Formal Public Comment Period for *Destination 2050*

APPENDIX D

UNIVERSE OF PROJECTS AND PROJECT EVALUATIONS

Universe of Projects

A central element of the Long-Range Transportation Plan (LRTP) is a list of regionally significant transportation projects selected by the MPO. In order to create that list, the MPO first created a *universe of projects* list that included all potential projects that could be considered for inclusion in *Destination 2050*. Those projects came from the following sources:

- Projects listed in *Destination 2040*, the MPO's 2019 LRTP
- The universe of projects from *Destination 2040*
- Projects programmed in the Federal Fiscal Years (FFYs) 2023–27 Transportation Improvement Program (TIP)
- The universe of projects from the FFYs 2024–28 TIP
- Projects identified through consultation with other agencies

The *Destination 2050* universe of projects is presented in four tables:

- Table D-1 includes projects in *Destination 2040* as of the approval of Amendment One to *Destination 2040*, which was endorsed by the MPO in April 2020. Details about project status and cost reflect information from the Massachusetts Department of Transportation (MassDOT) Project Information System or MassDOT TIP Readiness Days, as appropriate. Not all projects in Table D-1 may be required to appear in *Destination 2050* based on MPO policies adopted in October 2020 and clarified in January 2023.[1] Some of these projects may appear in other tables in this appendix based on their source, characteristics, or status.

- Table D-2 shows projects in the FFYs 2023–27 TIP that may meet criteria for being included in the LRTP based on MPO policies adopted in October 2020 and clarified in January 2023. Details about project status and cost reflect information from the MassDOT Project Information System or MassDOT TIP Readiness Days, as appropriate.

- Table D-3 shows projects that are not in the FFYs 2023–27 TIP, but that (1) have been approved by MassDOT's Project Review Committee (PRC), and (2) may meet criteria for being included in the LRTP based on MPO policies adopted in October 2020 and clarified in January 2023. Details about project status and cost reflect information from the MassDOT Project Information System or MassDOT TIP Readiness Days, as appropriate.

- Table D-4 shows projects that may meet criteria for being included in the LRTP that have not yet been submitted to MassDOT's PRC or are otherwise in a conceptual stage.

1 https://www.ctps.org/data/calendar/pdfs/2023/0126_MPO_LRTP_Policies_Memo.pdf

Table D-1
***Destination 2040* Project Status**

Municipality	Proponent/ Source	Project	MassDOT ID	Design Status	Funding Status	Funding Agency	Cost Estimate	MAPC Subregion	MassDOT Highway District	Notes
Ashland	Ashland	Reconstruction of Pond Street	604123	Under construction	Funded FFY 2020	MPO	$19,667,628	MWRC	3	N/A
Boston	MassDOT	Roadway, Ceiling, Arch, and Wall Reconstruction and Other Control Systems in Sumner Tunnel	606476	Advertised for construction (6/26/2021)	Funded FFYs 2021–23	MPO, MassDOT	$136,190,450	ICC	6	N/A
Boston	Massport	Roadway Reconstruction–Cypher Street, E Street, and Fargo Street (includes *Destination 2040* project named Cypher Street Extension)	608807	PS&E Received (as of 09/28/2022)	Funded with non-federal dollars	Massport	$20,287,865	ICC	6	This project likely does not meet MPO criteria for including this project in *Destination 2050*.
Boston	Boston	Reconstruction of Rutherford Avenue	606226	25% Package Received – Resubmission (as of 10/05/2020)	Funded FFYs 2026–27 in FFYs 2023–27 TIP	MPO	$176,570,936	ICC	6	Listed in Table 2. Baseline readiness scenario for FFYs 2024-28 TIP moves first year to FFY 2028.
Boston	MassDOT	Allston Multimodal Project	606475	PRC Approved (03/30/2018)	Funded in FFYs 2030–34 time band in *Destination 2040*	MassDOT	$675,500,000	ICC	6	Listed in Table 3. Likely to require elevated NEPA review.
Cambridge, Somerville, Medford	MBTA	Green Line Extension to College Avenue with Union Square Spur	1570	In service	Funded FFYs 2016–21	MPO, MassDOT, MBTA	$190,000,000 (MPO contribution)	ICC	6	N/A
Everett	Everett	Reconstruction of Ferry Street	607652	Under construction	Funded FFY 2021	MPO	$33,252,903	ICC	4	N/A
Framingham	Framingham	Intersection Improvements at Route 126 and Route 135/MBTA and CSX Railroad	606109	PRC Approved (05/13/2010)	Funded in FFYs 2030–34 and 2035–39 time bands in *Destination 2040*	MPO	$115,000,000	MWRC	3	Listed in Table 3.
Hopkinton, Westborough	MassDOT	Reconstruction of Interstate 495 and Interstate 90 Interchange	607977	Advertised for Construction (10/30/2021)	Funded in FFYs 2023–27 in FFYs 2023–27 TIP	MassDOT	$300,942,836	MWRC	3	Listed in Table 2.

Table D-1 (cont.)

Municipality	Proponent/ Source	Project	MassDOT ID	Design Status	Funding Status	Funding Agency	Cost Estimate	MAPC Subregion	MassDOT Highway District	Notes
Lexington	Lexington	Route 4/225 (Bedford Street) and Hartwell Avenue (Lexington)	TBD	Pre-PRC Approval	Funded in FFYs 2030–34 time band in *Destination 2040*	MPO	TBD	MAGIC	4	Listed in Table 4.
Lynn	Lynn	Reconstruction of Western Avenue	609246	P	Funded in 2027 in FFYs 2023–27 TIP	MPO	$40,980,000	ICC	4	This project likely does not meet MPO criteria for including this project in *Destination 2050*.
Natick	MassDOT	Bridge Replacement, Route 27 (North Main Street) over Route 9 (Worcester Street), and Interchange Improvements	605313	25% Package Received – Resubmission (05/16/2022)	Funded in FFY 2024 in FFYS 2023–27 TIP	MassDOT	$75,677,350	MWRC	3	Listed in Table 2. Funded with CRRSAA Funds.
Newton, Needham	Newton, Needham	Reconstruction of Highland Avenue, Needham Street, and Charles River Bridge	606635	Under construction	Funded FFYs 2019–20	MPO	$26,205,992	ICC	6	N/A
Quincy	MassDOT	New connection from Burgin Parkway over the MBTA	606518	Construction complete	Funded with non-federal dollars	MassDOT	$9,156,557	ICC	6	N/A
Somerville	Somerville	McGrath Boulevard Construction	607981	PRC Approved (05/19/2014)	Funded in 2027 in FFYs 2023–27 TIP	MPO	$88,250,000	ICC	4	Listed in Table 2.
Walpole	Walpole	Reconstruction on Route 1A (Main Street)	602261	Under construction	Funded in FFY 2020	MPO	$19,790,904	TRIC	5	N/A
Watertown	Watertown	Rehabilitation of Mount Auburn Street (Route 16)	607777	75% Package Received (as of 10/18/2022)	Funded in 2027 in FFYs 2023–27 TIP	MPO	$27,899,345	ICC	6	This project likely does not meet MPO criteria for including this project in *Destination 2050*.
Woburn	Woburn	Bridge Replacement, New Boston Street over MBTA	604996	Under construction	Funded in FFY 2021	MPO	$23,549,743	NSPC	4	N/A

Note: *Destination 2040* references two other projects that are funded in other MPOs' LRTPs: the Southborough and Westborough—Interstate 495 and Route 9 project in Southborough and Westborough and the South Coast Rail project.

CRRSAA = Coronavirus Response and Relief Supplemental Appropriations Act. FFY = federal fiscal year. ICC = Inner Core Committee. MAGIC = Minuteman Advisory Group on Interlocal Coordination. MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation. MBTA = Massachusetts Bay Transportation Authority. MPO = metropolitan planning organization. MWRC = MetroWest Regional Collaborative. N/A = not applicable. NSPC = North Suburban Planning Council. PRC = Project Review Committee. PS&E = Plans, Specifications, and Estimates. TBD = to be determined. TIP = Transportation Improvement Program. TRIC = Three Rivers Interlocal Council.

Source: Boston Region MPO staff.

Table D-2
LRTP-Relevant Roadway Projects in FFYs 2023–27 TIP

Municipality	Proponent/ Source	Project	Roadway (Federal) Functional Classification*	Mass DOT ID	Design Status	MPO Investment Program	Current Program Year (in FFYs 2023–27 TIP)	Cost Estimate	MAPC Subregion	MassDOT Highway District	LRTP Status	Notes
Boston	Boston	Reconstruction of Rutherford Avenue	Principal Arterial – Other	606226	25% Package Received – Resubmission 1 (as of 10/05/2020)	Major Infrastructure	2025–27	$176,570,937	ICC	6	*In Destination 2040* (in FFYs 2020–24 and 2025–29 time bands)	Proposed for funding in FFYs 2027–30 per TIP Readiness Days.
Hopkinton, Westborough	MassDOT	Reconstruction of Interstate 495 and Interstate 90 Interchange	Interstate	607977	Advertised for construction (10/30/2021)	N/A	2023–27	$300,942,837	MWRC	3	*In Destination 2040* (in FFYs 2020–24 time band)	Funded by MassDOT. Funded FFYs 2023–27 in FFYs 2023–27 TIP.
Natick	MassDOT	Bridge Replacement, Route 27 (North Main Street) over Route 9	Principal Arterial – Other	605313	25% Package Received – Resubmission 1 (as of 05/16/2022)	Major Infrastructure	2024	$75,677,350	MWRC	3	In *Destination 2040* (in FFYs 2025–29 time band)	Funded with CRRSAA funds. Proposed Auxiliary lanes may affect roadway capacity.
Norwood	Norwood	Intersection Improvements at Route 1 and University Avenue/Everett Street	Principal Arterial – Other	605857	25% Package Received – Resubmission 1 (as of 01/05/2021)	Intersection Improvements	2025–26	$26,573,400	TRIC	5	N/A	Project changes capacity through the addition of travel lanes.
Somerville	Somerville	McGrath Boulevard Construction	Principal Arterial – Expressway	607981	PRC Approved (05/19/2014)	Major Infrastructure	2027	$88,250,000	ICC	4	*In Destination 2040* (in FFYs 2025–29 and 2030–34 time bands)	Proposed for funding in FFYs 2027–30 per TIP Readiness Days.
Wrentham	Wrentham	Construction of Interstate 495/ Route 1A Ramps	Interstate	603739	75% Package Comments to design engineer (as of 08/02/2022)	Major Infrastructure	2024	$20,117,638	SWAP	5	N/A	Proposed for funding in FFY 2024 per TIP Readiness Days.

* The federal functional classification listed above reflects the highest classification associated with roadways included in the project

CRRSAA = Coronavirus Response and Relief Supplemental Appropriations Act. FFY = federal fiscal year. ICC = Inner Core Committee. LRTP = Long-Range Transportation Plan. MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation. MBTA = Massachusetts Bay Transportation Authority. MPO = metropolitan planning organization. MWRC = MetroWest Regional Collaborative. N/A = not applicable. NSPC = North Suburban Planning Council. PRC = Project Review Committee. SWAP = Southwest Advisory Planning Committee. TIP = Transportation Improvement Program. TRIC = Three Rivers Interlocal Council.

Source: Boston Region MPO Staff.

Table D-3
LRTP-Relevant MassDOT PRC-Approved Roadway Projects

Municipality	Proponent/ Source	Project	Roadway (Federal) Functional Classification*	Mass DOT ID	Design Status	Potential MPO Investment Program	Proposed Program Year	Cost Estimate	MAPC Subregion	Mass DOT Highway District	LRTP Status	Notes
Bellingham	Bellingham	Roadway Rehabilitation of Route 126 (Hartford Road), from 800 North of Interstate 495 NB off ramp to the Medway town line, including B-06-017	Principal Arterial/ Other	612963	PRC Approved (9/15/2022)	Complete Streets	2027	$10,950,000	SWAP	3	N/A	Project impacts on roadway capacity to be determined.
Beverly	Beverly	Interchange Reconstruction at Route 128/Exit 19 at Brimbal Avenue (Phase II)	Principal Arterial – Expressway	607727	PRC Approved (2014)	Major Infrastructure	TBD	$23,000,000	NSTF	4	In *Destination 2040* Project Universe (Active Highway Projects)	Project would expand the interchange and add ramps.
Boston	MassDOT	Allston Multimodal Project	Interstate	606475	PRC Approved (03/30/2018)	N/A	TBD	$675,500,000	ICC	6	Funded in FFYs 2030–34 time band in *Destination 2040* (MassDOT-funded)	NEPA Review: Environmental Impact Statement. Advertising date depends on availability of funding and completion of permitting. Earliest construction likely FFYs 2026–33.
Boston	Boston	Bridge Preservation, Cambridge Street over MBTA	Principal Arterial – Other	612989	PRC Approved (12/21/2022)	Complete Streets	2026	$15,400,000	ICC	6	N/A	Project may add roadway capacity.
Canton, Dedham, Norwood	MassDOT	Interchange Improvements at Interstate 95 / Interstate 93 / University Avenue / Interstate 95 Widening	Interstate	87790	25% submitted (7/25/2014)	Major Infrastructure	TBD	$202,205,994	TRIC	6	In *Destination 2040* Project Universe (Active Highway Projects)	Project may add roadway capacity.
Concord	Concord	Reconstruction and Widening on Route 2, from Sandy Pond Road to Bridge over MBTA/ B&M Railroad	Principal Arterial Other	608015	PRC approved (2014)	Major Infrastructure	TBD	$8,000,000	MAGIC	4	In *Destination 2040* Project Universe (Active Highway Projects)	N/A
Concord	Concord	Improvements and Upgrades to Concord Rotary (Routes 2/2A/119)	Principal Arterial Other	602091	PRC Approved (02/25/1997)	Major Infrastructure	TBD	$103,931,250	MAGIC	4	In *Destination 2040* Project Universe (Active Highway Projects)	N/A
Framingham	Framingham	Intersection Improvements at Route 126/Route 135/MBTA and CSX Railroad	Principal Arterial/ Other	606109	PRC Approved 05/13/2010	Major Infrastructure	TBD	$115,000,000	MWRC	3	Funded in FFYs 2030–34 and 2035–39 time bands in *Destination 2040* (MPO-funded)	Project impacts on roadway capacity to be determined.
Malden Revere,	MassDOT	Improvements at Route 1 NB (In *Destination 2040*, Improvements on Route 1 NB Add-A-Lane)	Principal Arterial – Expressway	610543	PRC approved (2019)	Major Infrastructure	2027	$7,210,000	ICC	4	In *Destination 2040* Project Universe (Active Highway Projects)	N/A

Table D-3 (cont.)

Municipality	Proponent/ Source	Project	Roadway (Federal) Functional Classification*	Mass DOT ID	Design Status	Potential MPO Investment Program	Proposed Program Year	Cost Estimate	MAPC Subregion	Mass DOT Highway District	LRTP Status	Notes
Malden, Revere, Saugus	MassDOT	Reconstruction and Widening on Route 1, from Route 60 to Route 99	Principal Arterial – Expressway	605012	PRC Approved (09/10/2007)	Major Infrastructure	TBD	$172,500,000	ICC	4	In *Destination 2040* Project Universe (Active Highway Projects)	N/A
Randolph	Randolph	Interstate 93/Route 24 Interchange	Interstate	610540	PRC Approved (08/15/2019)	Major Infrastructure	TBD	$14,420,700	TRIC	6	N/A	Project may include capacity adding elements. However, per District 6, This specific project has not seen any advancement since initiation. Some elements of the scope have been implemented through interim improvements. Project may be deactivated.
Revere, Saugus	Revere, Saugus	Roadway Widening on Route 1 North (Phase 2)	Principal Arterial – Expressway	611999	PRC approved (2021)	Major Infrastructure	TBD	$2,397,600	ICC	4	In *Destination 2040* Project Universe (Active Highway Projects)	N/A
Salem	MassDOT	Reconstruction of Bridge Street, from Flint Street to Washington Street	Principal Arterial Other	612990	25% submitted (8/20/2004)	Complete Streets	TBD	$24,810,211	NSTF	4	In *Destination 2040* Project Universe (Active Highway Projects)	Project would add a separated bi-directional path along the north side of the roadway..
Woburn, Reading, Stoneham, Wakefield	MassDOT	Interchange Improvements to Interstate 93/Interstate 95	Interstate	605605	PRC-Approved 05/14/2009	Major Infrastructure	TBD	$276,708,768	NSPC	4	In *Destination 2040* Project Universe (Active Highway Projects)	Project may add roadway capacity.

* The federal functional classification listed above reflects the highest classification associated with roadways included in the project.

FFY = federal fiscal year. ICC = Inner Core Committee. LRTP = Long-Range Transportation Plan. MAGIC = Minuteman Advisory Group on Interlocal Coordination. MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation. MBTA = Massachusetts Bay Transportation Authority. MPO = metropolitan planning organization. MWRC = MetroWest Regional Collaborative. N/A = not applicable. NEPA = National Environmental Policy Act. NSPC = North Suburban Planning Council. PRC = Project Review Committee. SWAP = Southwest Advisory Planning Committee. TBD = to be determined.

Table D-4
LRTP-Relevant Conceptual Roadway Projects

Municipality	Proponent/ Source	Project	Roadway Classification	Potential MPO Investment Program	Design Status	Program Year	Cost Estimate	MAPC Subregion	MassDOT Highway District	LRTP Status	Notes
Boston	TBD	Charlestown Haul Road	Minor arterial, but proximate to the Tobin Bridge	TBD	Pre-PRC Approval	N/A	TBD	ICC	6	In *Destination 2040* Project Universe (Conceptual Highway Projects)	Project would construct an off-road truck route on the alignment of a freight spur that leads to Massport's Moran Terminal on the Mystic River near the Tobin Bridge.
Braintree	MassDOT	I-93/Route 3 Interchange (Braintree Split)	Interstate	Major Infrastructure	Pre-PRC Approval	N/A	$53,289,000 (estimate from 2019 *Destination 2040* Universe)	SSC	6	In *Destination 2040* Project Universe (Conceptual Highway Projects)	Proposed improvements include the addition of a travel lane, a pair of auxiliary lanes, and associated acceleration lanes. A new entrance ramp is proposed along with restricting the use of an existing ramp. District 6 notes that this project has not advanced.
Braintree, Weymouth, Norwell	MassDOT	Route 3 South Widening (Braintree to Weymouth)	Principal Arterial – Expressway	Major Infrastructure	Pre-PRC Approval	N/A	$800,000,000 (estimate from 2019 *Destination 2040* Universe)	SSC	6	In *Destination 2040* Project Universe (Conceptual Highway Projects)	District 6 notes that this project has not advanced.
Lexington	Lexington	Route 4/225 (Bedford Street) and Hartwell Avenue (Bedford/ Hartwell Complete Streets Project)	Principal Arterial – Other	Major Infrastructure	Pre-PRC Approval	N/A	TBD	MAGIC	4	In *Destination 2040* (in FFYs 2030–34 time band)	Specific nature of capacity impacts to be determined.

Table D-4 (cont.)

Municipality	Proponent/ Source	Project	Roadway Classification	Potential MPO Investment Program	Design Status	Program Year	Cost Estimate	MAPC Subregion	MassDOT Highway District	LRTP Status	Notes
Lynnfield, Reading	TBD	I-95 Capacity Improvements	Interstate	Major Infrastructure	Pre-PRC Approval	N/A	$198,443,000 (estimate from 2019 *Destination 2040* Universe)	NSPC	4	In *Destination 2040* Project Universe (Conceptual Highway Projects)	Specific nature of capacity impacts to be determined.
Newton	Newton	New Route 128 Ramp to Riverside Station	Interstate	Major Infrastructure	Pre-PRC Approval	N/A	$10,000,055 (estimate from 2019 *Destination 2040* Universe)	ICC	6	In *Destination 2040* Project Universe (Conceptual Highway Projects)	Project status to be determined.
Wilmington	Wilmington	I-93/ Route 125/ Ballardvale Street	Interstate	Major Infrastructure	Pre-PRC Approval	N/A	TBD	NSPC	4	In *Destination 2040* Project Universe (Conceptual Highway Projects)	Specific nature of capacity impacts to be determined.

Note: The federal functional classification listed above reflects the highest classification associated with roadways included in the project.

FFY = federal fiscal year. ICC = Inner Core Committee. MAGIC = Minuteman Advisory Group on Interlocal Coordination. MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation. Massport = Massachusetts Port Authority. MWRC = MetroWest Regional Collaborative. NSPC = North Suburban Planning Council. PRC = Project Review Committee. SSC = South Shore Committee. SWAP = Southwest Advisory Planning Committee. Transportation Improvement Program.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Project Evaluations

THE CHALLENGE OF LONG-RANGE PLANNING

The Boston Region MPO chose a list of projects to include in the LRTP (Table D-5). Each project was evaluated using quantitative and qualitative measurements of how it furthers the regional planning goals adopted by the MPO. (See Chapter 3.)

The evaluation criteria and the metrics that inform the evaluation are described below. The projects being evaluated come to MPO staff at different levels of preparation. A few projects may be defined at a 25 percent design level, generally the most design undertaken prior to a commitment to project funding in the TIP. Usually, however, there are only conceptual designs or project descriptions by proponents. The evaluation criteria have been specified in such a way that they can be applied to all candidate projects regardless of available project detail.

With a planning horizon to 2050, even well-defined projects can undergo significant changes, redesign, or rethinking before construction eventually begins. For these reasons, the evaluated projects are compared using a limited number of broad quantitative and qualitative measurements. These measurements examine the level of detail on what is known about existing conditions in the proposed project area. The effectiveness with which a project will address future deficiencies must be estimated by applying professional judgement to these preliminary project concepts. Cost estimates, in most instances developed by other agencies than the MPO, are similarly preliminary.

MPO PLANNING GOALS

The MPO has defined six goal areas:

- Safety
- Mobility and reliability
- Access and connectivity
- Resiliency
- Equity
- Clean air and healthy communities

The measurements used in this analysis are intended to reflect how effectively a project would further these MPO goals were it to be completed. Given the distant time horizon, preliminary designs, and complexity of the transportation activity being evaluated, these measurements were not as detailed as Transportation Improvement Program (TIP) evaluations.

The scarcity of applicable data and very preliminary nature of project plans make any projection of benefits or disbenefits insufficiently reliable in the goal areas of Equity or Clean Air and Healthy Communities. As a result, evaluation procedures and scores have not been developed for those two goal areas as part of the LRTP. However, all projects will be rescored for all six goal areas if they are included in the TIP.

The scoring methodology for the four goal areas scored here (safety, mobility and reliability, access and connectivity, and resiliency) builds upon project scoring procedures that were used in the preceding LRTP, *Destination 2040*. The evaluation and scoring procedures have been modified to reflect *Destination 2050* goals.

Next are descriptions of specific evaluation procedures for the four goal areas.

EVALUATION PROCEDURES

Safety

The elements that go into the development of the safety scores are shown in Table D-5. Additional data, not used directly in scoring but that inform and corroborate the safety scores, are also shown.

The safety scores are developed by considering the number and severity of crashes in the project areas, the number of vehicles that pass through, the expected project cost, and the nature of the roadway improvements proposed. Characterizing the nature of the proposed improvements is the scoring aspect that is most dependent on professional judgement.

Crashes and Crash Severity (or EPDO)

The Massachusetts Department of Transportation (MassDOT) maintains a database of statewide crashes that is updated annually. Crash data from 2016 is now available and crashes that occurred during the 2014–16 period were used in developing safety scores. Crashes range widely in severity and are measured using the concept of equivalent property damage only (EPDO).

The EPDO formula used for the evaluations has recently been revised. This method of assessing crash severity is a weighting system aligned with calculated crash costs based on a 2017 Federal Highway Administration report, *Crash Costs for Highway Safety Analyses*. The EPDO formula used in this evaluation counts all crashes that occurred in a project area over the three-year period and adds the number of crashes involving bodily injury multiplied by 20.

Crash Risk (Risk Group)

Crash risk is calculated by comparing the EPDO value with the number of vehicles that enter the project area during an average weekday. Project area traffic volumes are estimated using recent traffic studies by the Central Transportation Planning Staff, project development proponents, MassDOT's online traffic count database, or the MPO's travel demand model.

Dividing the EPDO value by vehicles per year is a measurement of risk. This fraction is usually multiplied by 100,000,000 to give EPDO per hundred million vehicles. The evaluated projects are then divided into two equal-sized groups, high risk (score=one) and low risk (score=two), based solely on this risk calculation.

Cost per EPDO (Cost/Benefit Group)

The second scoring index is project cost divided by the project area EPDO. This quotient resembles a cost-benefit ratio, but its meaning is more limited. A large EPDO value implies some degree of obsolete or deficient roadway design in the project area. Any reconstruction activity is required to meet current design and safety standards, so it is assumed that the project will improve safety.

There is no expectation that bringing the project area up to current design standards will eliminate all crashes, but EPDO serves as a proxy for potential safety improvement. A low cost per EPDO implies that the proposed investment that will bring the entire project area up to current standards will improve safety and will help to reduce a comparatively large number of crashes. The evaluated projects are divided into two equal-sized groups: low cost per EPDO (score=one) and high cost per EPDO (score=two).

Characterizing Project Improvements (Project Impact Group)

The third scoring measurement is achieved by characterizing the expected impact of the project. For instance, demolishing a cloverleaf interchange that was designed during the 1950s and replacing it with a new interchange with larger turning radii and longer acceleration lanes, conforming with modern standards, would be expected to have a significant safety impact. Reconstructing an arterial roadway within its existing right-of-way would be assumed to have a smaller impact. Some investments, such as adding a highway on-ramp where one currently does not exist, may improve mobility but do not necessarily improve safety in the project area even if adhering to modern design standards.

Each of the evaluated projects were placed in one of three groups based on the types of physical improvements proposed:

- Group 1: Grade separation or totally new alignment
- Group 2: Reconstruction or modernization in current alignment
- Group 3: Low-impact improvements

Placing projects in these groups requires professional judgement and often knowledge of the project area and its planning history. As mentioned above, descriptions of projects planned for future decades can be conceptual and MPO staff must predict the types of improvements likely to appear in community plans as the project gets closer to implementation. Defining a project area, necessary for calculating the EPDO, also requires this type of judgement.

Scoring

As described above, projects are scored according to three criteria: risk, cost-benefit, and project impact. Combined scores of two or three result in a project being rated in the high category. A combined score of only one results in a medium rating, and a combined score of zero results in a low rating.

Corroborating Data

Some Massachusetts locations are eligible for project funding through the Highway Safety Improvement Program (HSIP). Eligibility of projects for HSIP funding is determined by MassDOT. However, almost all HSIP locations were located in project areas that scored high under the three scoring criteria (risk, cost-benefit, and project impact). HSIP locations were identified for total crashes, bicycle-involved crashes, and pedestrian-involved crashes.

Mobility and Reliability

Projects can be awarded points for mobility and reliability if they

- add capacity at a critical point,
- improve the efficiency of existing system capacity, or
- restore or rebuild deteriorated system elements.

Four tests were developed for *Destination 2040* that are applicable for the Mobility and Reliability goal in *Destination 2050*:

- Identification of locations with severe traffic congestion
- Calculation of the amount of scheduled bus operations
- Assessment of the scope of improvements for pedestrians and bicycles
- Consideration of the level of project area roadway deterioration

This section describes the formulation and use of these four tests. For each of these tests a project may be awarded one, two, or three points for a maximum of 12 points. The scores for mobility and reliability are summarized in Table D-5 along with the data and assessments that informed the scores. Projects with a total mobility and reliability score of nine through 12 are designated in the high category, projects with score totals of seven or eight are medium, and projects with lower totals are low.

Identifying Locations with Severe Traffic Congestion

Estimating project benefits for vehicular traffic using the region's roadway system depends on data entirely derived from the MPO's travel demand model. The model is developed and calibrated with data on directly observed traffic at a large sample of regional locations. Only the model can provide a regionwide snapshot of all important roadways at critical time periods. The travel demand model can also generate a regionwide traffic snapshot for a future year, in this case 2050.

The most useful metric for evaluating regional capacity management issues is the volume-over-capacity ratio (V/C) on roadways during the morning and evening peak travel periods. Each modelled roadway segment has an estimated capacity in vehicles per hour based on current traffic engineering standards. The model estimates volumes for the morning, evening, midday, and night periods, and the V/C is calculated by dividing these volumes by the capacity. In the MPO's travel demand model, the morning peak period is defined as 6:00 AM to 9:00 AM and the evening peak period is 3:00 PM to 6:00 PM.

The analysis begins by identifying for each directional link whether the V/C is higher in the morning or evening. For reference, two-way roads are considered to be two links. Almost invariably, if one direction has its highest V/C in the morning, the reciprocal direction will have its highest V/C in the evening.

The base year and future year V/C were estimated and depicted graphically on a regionwide basis. Together, the morning and evening periods indicated both commuting patterns and bottlenecks in a single graphic. Locations with regionally significant congestion problems were easily identified by inspection. Congestion at these locations was characterized as severe, moderate, or inconsequential by balancing the V/C value with the length of the congested segments.

Projects that include roadways in the severe category were awarded three points, projects with moderately congested roadways were awarded two points, and all other projects received one point. The evaluated projects are anticipated to reduce congestion within their project areas.

Identifying Project Areas that are Important Bus Corridors

Project benefits for buses were estimated by calculating the number of local and regional buses that travel through a project area with scheduled service on a typical weekday. These numbers were developed from published schedules. Projects with bus routes are assumed to either improve traffic flow or improve the streetscape, allowing better pedestrian access to local buses.

Projects were ranked by the combined total of local and regional buses that traverse the project areas, including Logan Express buses. Break points were designated to divide projects into groups with high, medium, or low benefits for bus users, for which three, two, or one point would be awarded. Ridership was known for the local buses but not for the regional buses. Local bus ridership was one of the factors used to designate break points.

The Scope of Improvements for Pedestrians and Bicycles

Investments sufficiently large to be classified as major investments for MPO planning purposes tend to have extended project areas and involve some level of improvement or refurbishment benefiting both motorized and nonmotorized modes. Often the name of the project reflects primarily the roadway improvements and unless more detailed descriptions have been prepared by proponents, the nature of ancillary improvements to nonmotorized modes can only be surmised.

MPO staff evaluated each project using available project descriptions and supplemented these sources using sketch planning analyses. In this approach, staff considered project area geography and current infrastructure configuration and condition to anticipate what types of improvements for nonmotorized modes would likely be incorporated into future plans as they develop. Points were awarded on these bases:

- Two points: Adds or substantially improves an existing pedestrian route
- One point: Improves an existing pedestrian route
- Two points: Adds or substantially improves an existing bicycle route
- One point: Improves an existing bicycle route
- One point: Improves access to transit for nonmotorized modes

The total nonmotorized points awarded are shown in Table D-5 along with the other scores for pedestrian and bicycle improvements that factor into the total score. Projects with three, four, or five points in the subcategories receive three points overall, and projects with one or two points in the subcategories receive two points overall. Projects with zero nonmotorized points still receive one point in this category.

Reversing Roadway Deterioration

Ongoing expenditures in routine maintenance, refurbishment, and total reconstruction are necessary to preserve the safety and efficiency of transportation systems. When scoring projects in this category, the basic assumption is that any proposed project will result in new roadway elements built to applicable modern standards. The number of points awarded depends on the type and severity of roadway deficiencies in the project area, as indicated in Table D-5.

Calculating Pavement Condition Deficiency

Determining a score in the pavement condition category first requires the calculation of the weighted deficiency index using MassDOT's pavement condition database; the latest data are from 2022. The condition of pavement on state numbered routes is measured regularly with measurements expressed using the International Roughness Index (IRI). MPO staff calculated an average IRI for the lane miles in each project area, shown in Table D-5 as weighted IRI.

Average project area IRI values ranged from 45 (best project area pavement) to 282 (worst). The average IRI of each project was adjusted downwards by 45 and then multiplied by the number of lane miles in the project area. This gave staff an estimate of the total amount of project area pavement deficiency, shown in Table D-5 as the project area pavement deficiency index.

Estimating Cost Effectiveness

The cost-effectiveness analysis assumes that at the completion of a project, the pavement deficiency (calculated above) will be eliminated. Dividing the total project cost by the total project area pavement deficiency index gives an estimate of cost effectiveness, shown in Table D-5 as the cost per index point.

When the costs per index point are sorted from lowest (most cost effective) to highest (least cost effective) breakpoints can be defined and the projects divided into three groups with the most cost-effective projects getting three points. This cost-effectiveness estimate is an oversimplification because structures unrelated to pavement, such as bridges and culverts, may also need to be replaced.

Bonus Points for Structurally Deficient Bridges

The MassDOT Bridge Section maintains a database of detailed information from periodic inspections of all bridges in Massachusetts. Structurally deficient bridges must be inspected frequently and if a bridge is in danger of failure, it is closed.

If there are one or more structurally deficient bridges in a project area, the project score can be increased one level, for example, from one point to two or from two points to three. This is an extremely simplistic adjustment and only reflects that a substantial portion of the project costs are expected to be used for bridge replacement or refurbishment.

Access and Connectivity

The access and connectivity goal is to provide transportation options and improve access to key destinations to support economic vitality and quality of life. The relationship of transportation to land use and its importance for economic activity have long been acknowledged, and the evaluation methods described in this section relate primarily to the location of the proposed improvements.

The access and connectivity scores shown in Table D-5 specify types of locations and improvements for which one or two points might be awarded depending on the project location and type of improvement. Point totals of five to seven result in an overall high score, totals of two to four points result in a medium score, and totals of zero or one result in a low score.

While any major transportation improvement can be expected to contribute to economic vitality, the ratings in this goal area reflect the degree to which the improvements support the land use objectives embraced by the MPO. The seven possible scores fall into three groups: projects that serve concentrated development, facilitate new development, or provide access to targeted development areas.

Serves Concentrated Development

A project could receive one or two points for serving an area of concentrated development, depending on whether the project was entirely or only partially located within an area with this designation.

Facilitates New Development

A project could be awarded a point if progress on a nearby development is contingent upon the implementation of the transportation improvement.

Provides Access to Targeted Development Areas

A project could be awarded as many as four points for improving access to designated targeted development areas for specific modes with one point awarded to each mode with improved access. The four modes are motor vehicles, transit, bicycle, and pedestrian.

Resiliency

Projects are also evaluated on how they increase the resiliency of the region's infrastructure to sea level rise and associated environmental challenges. It is assumed that any future roadway reconstruction in flood-hazard areas will be done in accordance with resiliency standards in effect at the time of construction. To evaluate a proposed project, it is necessary to know how much of the project area will be vulnerable to flooding.

The pavement condition database that is used to develop the scores for reversing roadway deterioration also indicates whether sections of roadway are within the 100-year flood zone. Based upon project descriptions, MPO staff calculated the lane miles within the flood zones that the project would replace.

These calculations are summarized in Table D-5. Multiplying the percent of project roadway vulnerable to flooding by the total project lane miles (noted in the reversing roadway deterioration section of the table) results in number of lane miles vulnerable to flooding.

Any project with no elements within a flood plain was given a low resiliency score. For the projects shown here in Table D-5, any project with as many as 0.5 miles lane miles in a flood plain was given a medium resiliency score, and projects with more than 0.5 miles in a flood plain received a high resiliency score.

DESTINATION 2050 PROJECT EVALUATIONS

Table D-5 lists the eight projects that are included in *Destination 2050*. The first four projects were evaluated for *Destination 2040* and the earlier evaluation results have been adapted to reflect the *Destination 2050* MPO planning goals, as described above. The last four projects were not evaluated for *Destination 2040*. However, Table D-5 presents some available data and evaluation results to provide some basis of comparison between the eight projects.

Two of the projects, I-495/Route 1A Ramps in Wrentham and Route 1 and University Avenue/Everett Street in Norwood, were evaluated for inclusion in the MPO's Transportation Improvement Program (TIP). Projects considered for inclusion in the TIP are at a significantly more advanced level of design, typically 25 percent, than LRTP projects. Using more robust data sets, TIP scores are developed that reflect how projects advance MPO planning goals.

The Wrentham and Norwood projects were part of a universe of projects that were evaluated for a previous TIP. Four of the TIP criteria considered at that time roughly correspond to the LRTP goals used for *Destination 2050*. These TIP areas were:

- Safety and security (29 possible points)
- Livability and economic benefit (29 possible points)
- Mobility (25 possible points)
- System Preservation, modernization, and efficiency (36 possible points)

The scores of the projects in the TIP universe were averaged, and the Wrentham and Norwood projects were compared with the TIP universe averages. Their scores in relation to the other TIP projects in that universe suggested an appropriate score for a corresponding LRTP goal.

Destination 2050 project evaluations are summarized in Table D-6, including the two projects with scores synthesized from TIP evaluations. No data has been developed for the last two projects in Table D-5, but the projects are listed with cost and traffic estimates.

SUSANNA HEY, MBTA

Table D-5

Destination 2050 Project Evaluations

Project Name	Estimated Project Cost (Current Dollars)	Annual Average Daily Traffic	Total Rank	Safety	EPDO	EPDO per 100,000,000 vehicles (Risk)	Cost per EPDO (Cost/Benefit)	Risk Group	Cost/ Benefit Group	Project Impact Group	Top 200 Crash Location (Total EPDO)	HSIP Cluster (Total EPDO)	HSIP Bicycle Cluster (Bike-involved EPDO)	HSIP Pedestrian Cluster (Ped-involved EPDO)	Mobility and Reliability	Locations with Severe Traffic Congestion	MPO-identified Express Highway Bottleneck Location	Important Bus Corridors
Route 4/225 (Bedford Street) and Hartwell Avenue (Lexington)	$45,000,000	40,200	18	high	2335	5867	$19,272	1	1	2		4			high	1		2
McGrath Boulevard (Somerville)	$98,840,000	38,000	62	low	536	1425	$184,403	2	2	3	1	1	1	1	high	1		3
Replacement of Allston I-90 Elevated Viaduct (Boston)	$675,500,000	174,000	106	low	1246	723	$542,135	2	2	2		1	1		high	1		3
Improvements at Route 126/135/MBTA (Framingham)	$115,000,000	35,400	77	high	533	1521	$215,760	1	2	1		2	1	1	low	1		2
I-495/Route 1A Ramps	$20,117,638	19,600		low	Note A										low	1	Note A	1
Improvements at Route 1 and University Avenue/Everett Street	$28,699,272	58,350		low											low	1		1
I-495 and I-90 Interchange	$300,942,836	230,000			Note B													
Reconstruction of Rutherford Avenue: City Square to Sullivan Square	$197,759,449	54,000																

Note A: LRTP scores have been derived from existing TIP scores.

Note B: Project evaluation data is not currently available.

EPDO = Equivalent Property Damage Only. HSIP = Highway Safety Improvement Program. IRI = International Roughness Index. LRTP = Long-Range Transportation Plan. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization. TIP = Transportation Improvement Program.

Source: Boston Region Metropolitan Planning Organization.

Table D-5 (cont.)

Project Name	Regional and Local Bus Trips (Daily)	Total Regional Bus Trips (Daily)	Total Local Bus Trips (Daily)	Number of Regional Bus Routes Served	Number of Local Bus Routes Served	Scope of Improvements for Pedestrians and Bicycles	Non-motorized Total	Pedestrian Improve-ments	Bicycle Improve-ments	Improves Transit Access	Reversing Roadway Deterioration	Cost per Index Point (000s)	Structurally Deficient Bridges	Weighted IRI	Total Project Roadway-miles	Total Project Lane-miles	Project Area Pavement Deficiency Index	Access and Connectivity	Total points
Route 4/225 (Bedford Street) and Hartwell Avenue (Lexington)	48		48		1	3	5	2	2	1	3	$29		185	4.5	11.1	1554	medium	2
McGrath Boulevard (Somerville)	329		329		4	3	5	2	2	1	3	$99	2	218	1.3	5.8	1003	high	7
Replacement of Allston I-90 Elevated Viaduct (Boston)	542	112	430	3	10	3	3	1	1	1	2	$209	1	142	8.4	33.4	3240	high	7
Improvements at Route 126/135/MBTA (Framingham)	40		40		5	2	2	1	0	1	1	$1133		248	.2	.5	102	high	7
I-495/Route 1A Ramps	Note A					1	Note A				2	Note A						low	Note A
Improvements at Route 1 and University Avenue/ Everett Street						1					2							medium	
I-495 and I-90 Interchange																			
Reconstruction of Rutherford Avenue: City Square to Sullivan Square																			

Note A: LRTP scores have been derived from existing TIP scores.

Note B: Project evaluation data is not currently available.

EPDO = Equivalent Property Damage Only. HSIP = Highway Safety Improvement Program. IRI = International Roughness Index. LRTP = Long-Range Transportation Plan. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization. TIP = Transportation Improvement Program.

Source: Boston Region Metropolitan Planning Organization.

Table D-5 (cont.)

Project Name	Mostly Serves Existing Area of Concentrated Development	Partly Serves Existing Area of Concentrated Development	Facilitates New Development	Provides Vehicle Acess to Target Development Area	Provides Transit Acess to Target Development Area	Provides Bicycle Acess to Target Development Area	Provides Pedestrian Acess to Target Development Area	Resiliency	Percent of project roadway vulnerable to flooding	Lanes-miles vulnerable to flooding
Route 4/225 (Bedford Street) and Hartwell Avenue (Lexington)		1	1					medium	2.5	0.3
McGrath Boulevard (Somerville)	2		1	1	1	1	1	low		
Replacement of Allston I-90 Elevated Viaduct (Boston)	2		1	1	1	1	1	low		
Improvements at Route 126/135/MBTA (Framingham)	2		1	1	1	1	1	low		
I-495/Route 1A Ramps								low	Note A	
Improvements at Route 1 and University Avenue/Everett Street								low		
I-495 and I-90 Interchange										
Reconstruction of Rutherford Avenue: City Square to Sullivan Square										

Note A: LRTP scores have been derived from existing TIP scores.

Note B: Project evaluation data is not currently available.

EPDO = Equivalent Property Damage Only. HSIP = Highway Safety Improvement Program. IRI = International Roughness Index. LRTP = Long-Range Transportation Plan. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization. TIP = Transportation Improvement Program.

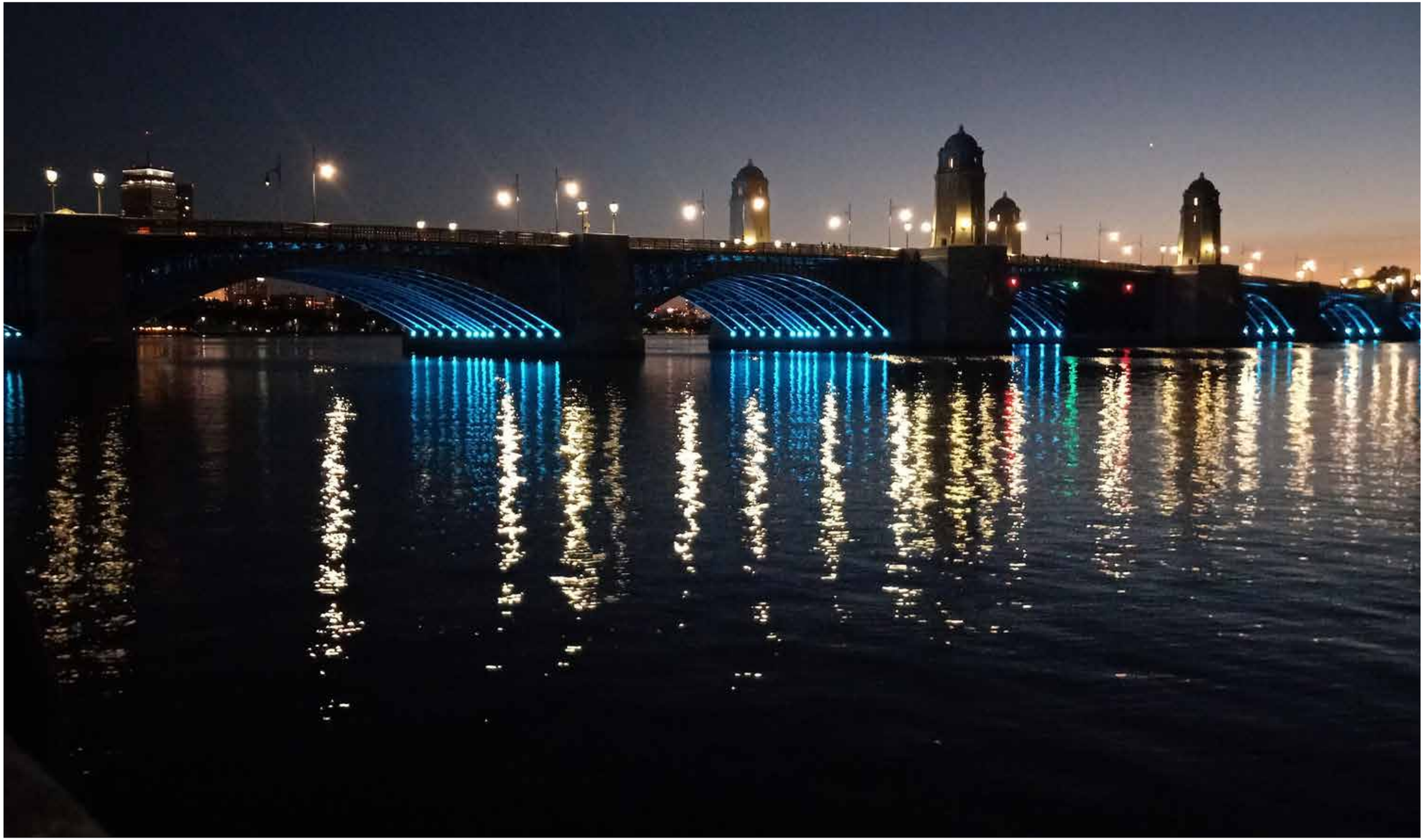
Source: Boston Region Metropolitan Planning Organization.

Table D-6

***Destination 2050* Project Evaluation Summary**

Location	Project Name	Project Cost	Annual Average Daily Traffic	Safety	Mobility and Reliability	Access and Connectivity	Resiliency	Total Rating	4 low ratings	3 low ratings	2 low ratings	2 high ratings
Lexington	Route 4/225 (Bedford Street) and Hartwell Avenue	$45,000,000	40,200	3	3	2	2	10				X
Somerville	McGrath Boulevard Project	$98,840,000	38,000	1	3	3	1	8			X	X
Boston	Replacement of Allston I-90 Elevated Viaduct	$675,500,000	174,000	1	3	3	1	8			X	X
Framingham	Intersection Improvements at Route 126/135/MBTA and CSX Railroad	$115,000,000	35,400	3	1	3	1	8			X	X
Norwood	Intersectioin Improvements at Route 1 and University Avenue/Everett Street	$28,699,272	58,350	1	1	2	1	5		X		
Wrentham	I-495/Route 1A Ramps	$20,117,638	19,600	1	1	1	1	4	X			

Source: Boston Region Metropolitan Planning Organization.



APPENDIX E

DETERMINATION OF AIR QUALITY CONFORMITY AND GREENHOUSE GAS ANALYSIS

Air Quality Conformity

BACKGROUND

This chapter documents the latest Long-Range Transportation Plan (LRTP) air quality conformity determination for the 1997 Ozone National Ambient Air Quality Standards (NAAQS) and carbon monoxide (CO) NAAQS in the Boston Region Metropolitan Planning Organization (MPO) area. It covers the applicable conformity requirements according to the latest regulations, regional designation status, legal considerations, and federal guidance.

INTRODUCTION

The 1990 Clean Air Act Amendments (CAAA) require MPOs within nonattainment and maintenance areas to perform air quality conformity determinations prior to the approval of LRTPs and Transportation Improvement Programs (TIP), and at such other times as required by regulation. CAAA Section 176(c) (Title 42, United States Code [USC], Section 7506 [c]) requires that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the State Implementation Plan (SIP). Conformity to the purpose of the SIP means that Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and transit activities that

- will not cause or contribute to new air quality violations;
- worsen existing violations; or
- delay the timely attainment of the relevant NAAQS or any interim milestones (42 USC 7506[c][1]).

The United States Environmental Protection Agency's (EPA) transportation conformity rules establish the criteria and procedures for determining whether metropolitan transportation plans, TIPs, and federally supported highway and transit projects conform to the SIP (Title 40, Code of Federal Regulations [CFR], Parts 51.390 and 93).

A nonattainment area is one that the EPA has designated as not meeting certain air quality standards. A maintenance area is a nonattainment area that now meets the standards and has been redesignated as maintaining the standard. A conformity determination is a demonstration that plans, programs, and projects are consistent with the SIP for attaining the air quality standards. The CAAA requirement to perform a conformity determination ensures that federal approval and funding go to transportation activities that are consistent with air quality goals.

LEGISLATIVE AND REGULATORY BACKGROUND

The Commonwealth of Massachusetts was previously classified as a nonattainment area for ozone and was divided into two nonattainment areas. The Eastern Massachusetts ozone nonattainment area included Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester counties. The Western Massachusetts ozone nonattainment area included Berkshire, Franklin, Hampden, and Hampshire counties. With these classifications, the 1990 CAAA required the Commonwealth to reduce its emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx), the two major precursors to ozone formation, to achieve attainment of the ozone standard.

The 1970 Clean Air Act defined a one-hour NAAQS for ground-level ozone. The 1990 CAAA further classified degrees of nonattainment of the one-hour standard based on the severity of the monitored levels of the pollutant. The Commonwealth of Massachusetts was classified as being in serious nonattainment of the one-hour ozone standard and was required to achieve attainment by 1999. The attainment date was later extended, first to 2003 and a second time to 2007.

In 1997, the EPA proposed a new eight-hour ozone standard that replaced the one-hour standard, effective June 15, 2005. Scientific research had shown that ozone could affect human health at lower levels and over longer exposure times than one hour. The new standard was challenged in court, and after a lengthy legal battle the courts upheld it. The new standard was finalized in June 2004. The new eight-hour standard is 0.08 parts per million (ppm) averaged over eight hours, and this level is not to be exceeded more than once per year. With this new standard, nonattainment areas were again further classified based on the severity of the eight-hour values. Massachusetts was classified as being in moderate nonattainment for the eight-hour standard and again was separated into two nonattainment areas—Eastern Massachusetts and Western Massachusetts.

In March 2008, the EPA published revisions to the eight-hour ozone NAAQS, establishing a level of 0.075 ppm (Volume 73, Federal Register [FR], page 16438; March 27, 2008). In 2009, EPA announced it would reconsider this standard because it fell outside of the range recommended by the Clean Air Scientific Advisory Committee. However, EPA did not take final action on the reconsideration, keeping the standard as 0.075 ppm.

After reviewing data from Massachusetts monitoring stations, EPA sent a letter on December 16, 2011, proposing that *only* Dukes County be designated as nonattainment for the new proposed 0.075 ppm ozone standard. The Commonwealth of Massachusetts concurred with these findings.

On May 21, 2012, the final rule (77 FR 30088) was published in the Federal Register. This rule defined the 2008 NAAQS as 0.075 ppm, the standard that was promulgated in March 2008. A second rule (77 FR 30160) published on May 21, 2012, revoked the 1997 ozone NAAQS effective one year after the July 20, 2012, effective date of the 2008 NAAQS.

Also, on May 21, 2012, the Federal Register published the air quality designation areas for the 2008 NAAQS. Dukes County was the only area in Massachusetts designated as a nonattainment area. All other Massachusetts counties were designated as *attainment/unclassified* for the 2008 standard.

On March 6, 2015, EPA published the final rulemaking, "Implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for Ozone: State Implementation Plan Requirements; Final Rule" (80 FR 12264), effective April 6, 2015. This rulemaking confirmed the removal of transportation conformity to the 1997 ozone NAAQS and the replacement with the 2008 ozone NAAQS, which actually set a stricter level of allowable ozone concentration than the 1997 standards and classified Massachusetts (except for Dukes County) as *attainment/unclassifiable*.

However, on February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit in *South Coast Air Quality Mgmt. District v. EPA* ("*South Coast II*," 882 F.3d 1138) held that transportation conformity determinations must be made in areas that were designated either as nonattainment or maintenance areas for the 1997 ozone NAAQS and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked.

On November 29, 2018, EPA issued *Transportation Conformity Guidance for the South Coast II Court Decision* (EPA-420-B-18-050, November 2018), which addressed how transportation conformity determinations could be made in these areas. According to the guidance, both Eastern and Western Massachusetts, along with several other areas across the country, were defined as orphan nonattainment areas—areas that were designated as nonattainment areas for the 1997 ozone NAAQS at the time of its revocation (80 FR 12264, March 6, 2015) and as attainment areas for the 2008 ozone NAAQS in EPA's original designation rule for this NAAQS (77 FR 30160, May 21, 2012). As of February 16, 2019, conformity determinations are required in these areas.

Conformity Determination

OZONE

After February 16, 2019, as a result of the court ruling and the subsequent federal guidance, transportation conformity for the 1997 NAAQS—intended as an anti-backsliding measure—now applies to both Massachusetts orphan areas. Therefore, a conformity determination was made for the 1997 ozone NAAQS in all of the Massachusetts MPOs' federal fiscal years (FFYs) 2020–40 LRTPs. This conformity determination was finalized in July 2019, following all of the MPOs' endorsements of their LRTPs, and approved by the Massachusetts Divisions of FHWA and FTA on October 15, 2019. This conformity determination continues to be valid for the Boston Region MPO's FFYs 2024–28 TIP, and Massachusetts' 2024–28 State Transportation Improvement Program (STIP), as each is developed from the conforming 2020–40 LRTPs.

The transportation conformity regulation in 40 CFR § 93.109 sets forth the criteria and procedures for determining conformity. The conformity criteria for TIPs and LRTPs include a demonstration of fiscal constraint (§ 93.108), a basis on the latest planning assumptions (§ 93.110), use of the latest emissions model (§ 93.111), consultation (§ 93.112), provision for the timely implementation of transportation control measures (TCMs) (§ 93.113[b] and [c]), and consistency with an emissions budget and/or interim emissions tests (§ 93.118 and/or § 93.119).

For the 1997 ozone NAAQS areas, transportation conformity for TIPs and LRTPs for the 1997 ozone NAAQS can be demonstrated without a regional emissions analysis, per 40 CFR § 93.109(c). This provision states that the regional emissions analysis requirement applies one year after the effective date of EPA's nonattainment designation for a NAAQS and until the effective date of revocation of such NAAQS for an area. The 1997 ozone NAAQS revocation was effective on April 6, 2015, and the court for *South Coast II* upheld the revocation. As no regional emission analysis is required for this conformity determination, there is no requirement to use the latest emissions model, budget, or interim emissions tests.

Therefore, transportation conformity for the 1997 ozone NAAQS for the Boston Region MPO's 2050 LRTP can be demonstrated by showing that the remaining requirements in 40 CFR § 93.109 have been met. The following requirements regarding the use of the latest planning assumptions, consultation, timely implementation of TCMs, and fiscal constraint are defined in Section 2.4 of that guidance and are addressed in the following sections.

Latest Planning Assumptions

The requirement to use the latest planning assumptions in 40 CFR § 93.110 generally applies to regional emissions analyses. In the areas subject to the 1997 ozone NAAQS, the use of latest planning assumptions requirement applies to assumptions about TCMs in an approved SIP. (See the section titled *Timely Implementation of Transportation Control Measures* below).

Consultation

The consultation requirements in 40 CFR § 93.112 for interagency consultation and public consultation were addressed. Interagency consultation was conducted with FHWA, FTA, EPA Region 1, the Massachusetts Department of Environmental Protection (DEP), and the other Massachusetts MPOs on March 6, 2019, to discuss the latest conformity-related court rulings and resulting federal guidance. Regular and recurring interagency consultations have been held on (at least) an annual schedule, with the most recent conformity consultation held on March 13, 2023. Ongoing consultation is conducted in accordance with the following items:

- The Commonwealth of Massachusetts' Air Pollution Control Regulations 310 CMR 60.03, "Conformity to the State Implementation Plan of Transportation Plans, Programs, and Projects Developed, Funded, or Approved Under Title 23 USC or the Federal Transit Act"
- The Commonwealth of Massachusetts' Memorandum of Understanding (MOU) between DEP, the Massachusetts Department of Transportation (MassDOT), and Massachusetts MPOs, and Regional Transit Authorities, titled "The Conduct of Air Quality Planning and Coordination for Transportation Conformity" (dated September 16, 2019)

Public consultation was conducted consistent with planning rule requirements in 23 CFR § 450. Title 23 CFR § 450.324 and 310 CMR 60.03(6)(h) requires that the development of the TIP, LRTP, and related certification documents provide an adequate opportunity for public review and comment. Section 450.316(b) also establishes the outline for MPOs' public engagement programs.

The Boston Region MPO's current Public Engagement Plan was endorsed by the MPO board in October 2021 and amended in September 2022. The Public Engagement Plan ensures that the public will have access to the TIP and LRTP and all supporting documentation, provides for public notification of the availability of the TIP and LRTP and the public's right to review the document and comment thereon, and provides a 21-day public review and comment period prior to the adoption of the TIP and LRTP and related certification documents. The plan is available at https://www.bostonmpo.org/public-engagement.

The public comment period for this conformity determination will commence on or about June 16, 2023. During the 21-day public comment period, any comments received will be incorporated into this LRTP. This process will allow sufficient opportunity for public comment and for the MPO board to review the draft document. The public comment period will close on or about July 15, 2023, and the Boston Region MPO is expected to endorse this air quality conformity determination on July 15, 2023. These procedures comply with the associated federal requirements.

Timely Implementation of Transportation Control Measures

Transportation control measures were required in the SIP in revisions submitted to EPA in 1979 and 1982. All of these TCMs have been accomplished through construction projects or through implementation of ongoing programs. All of the projects have been included in the Boston Region MPO's TIPs (present and past) as recommended projects or projects requiring further study. Information on the Green Line Extension to Somerville and Medford, which was completed between this and last year's TIP, is as follows:

Green Line Extension to Somerville and Medford Project—SIP Required *Completion by December 2014*

The Green Line Extension is a 4.7-mile light rail line, which extended the current Green Line service from a relocated Lechmere Station in East Cambridge to a terminus at College Avenue in Medford, with a spur to Union Square in Somerville. This project had a cost estimate of $2.289 billion. Funding came from a combined $1.99 billion in federal and state funds and pledged contributions totaling approximately $296 million from the Cities of Cambridge and Somerville ($75 million), the Boston Region MPO ($157.1 million), and MassDOT ($64.3 million through Special Obligation Bonds). Cambridge and Somerville were refunded their full $75 million in November 2021.

In early 2017, the Massachusetts Bay Transportation Authority (MBTA) initiated a procurement process for a design-build entity to design and construct the project. In November 2017, approval was received to execute a design-build contract with Green Line Extension contractors. The notice to proceed under the contract was issued in December 2017. The FTA obligated an initial portion ($100 million) of the Capital Investment Grant funds for the project in December 2017, under the 2015 Full Funding Grant Agreement. Additional funds followed. The contract with Green Line Extension contractors was in the amount of $999.7 million.

The primary goals of the project were to improve corridor mobility, boost transit ridership, improve regional air quality, ensure equitable distribution of transit services, and support opportunities for sustainable development in Cambridge, Somerville, and Medford. In addition to the light rail service on two new branches extending from Lechmere Station to Union Square Station and College Avenue Station, the project included the construction of a vehicle maintenance facility and a multiuse path.

SIP Requirement Status

By filing an Expanded Environmental Notification Form, procuring multiple design consultants, and publishing both Draft and Final Environmental Impact Reports, MassDOT met the first four interim milestones associated with the Green Line Extension project. Since those filings, MassDOT committed substantial resources to the Green Line Extension project, a top transportation priority of the Commonwealth and the largest expansion of the MBTA rapid transit system in decades. The project then transitioned from the planning and environmental review phases to the design, engineering, and construction phases, and the tasks associated with programming federal funding began.

The timeline for overall project completion, however, was substantially delayed. In the 2011 SIP Status Report, MassDOT reported that the Green Line Extension project would not meet the legal deadline for completion by

December 31, 2014. The delay triggered the requirement to provide interim emissions reduction offset projects and measures for the period of the delay (beginning January 1, 2015). Working with the Central Transportation Planning Staff, MassDOT and the MBTA calculated the value for reductions of non-methane hydrocarbons, CO, and NOx that would be equal to or greater than the reductions projected to result from the operation of the Green Line Extension during the period of the delay, as specified in the SIP regulation.

In June 2012, MassDOT released a list of potential mitigation ideas received from the public that could be used as offset measures. In the summer and fall of 2012, MassDOT elicited public comments on these potential measures. Then the MBTA created an internal working group to determine a final portfolio of interim mitigation measures to implement by December 31, 2014, the legal deadline for the implementation of the Green Line Extension.

This work resulted in a recommendation to implement the following three interim mitigation measures, which collectively would meet the emissions reduction target for the project:

- Additional off-peak service along existing routes serving the corridor, including the Green Line, and MBTA bus Routes 80, 88, 91, 94, and 96
- Purchase of 142 new hybrid-electric vehicles for the MBTA's paratransit service, The RIDE
- Additional park and ride spaces at the Salem and Beverly intermodal facilities

The Petition to Delay was submitted to the DEP on July 22, 2014, and expanded further on the analysis and determination of the interim offset measures. In a letter dated July 16, 2015, the DEP conditionally approved MassDOT's request to delay the Green Line Extension project and the implementation of the above interim mitigation measures. Both the 2014 Petition to Delay and the July 2015 Conditional Approval are available on MassDOT's website.

The Green Line Extension to Union Square opened for service on March 21, 2022, and the extension to Medford opened on December 12, 2022.

Fiscal Constraint

Transportation conformity requirements in 40 CFR § 93.108 state that TIPs and LRTPs must be fiscally constrained so as to be consistent with the United States Department of Transportation's metropolitan planning regulations (23 CFR part 450). The Boston Region MPO's 2050 LRTP is consistent with the required fiscal constraints, as demonstrated in this document.

CARBON MONOXIDE

The requirement to perform a conformity determination for CO for the city of Waltham has expired. On April 22, 2002, the EPA classified Waltham as being in attainment for CO emissions. Subsequently, an EPA-approved CO limited maintenance plan was set up through the Massachusetts SIP to ensure that emission levels did not increase. While the maintenance plan was in effect, past TIPs and LRTPs included an air quality conformity determination against a "budget test" (using "hot spot" analyses as needed at the project level) for Waltham. As of April 22, 2022, however, the 20-year maintenance period for this CO area expired and transportation conformity is no longer required for this pollutant in this municipality. This ruling is documented in a letter from EPA dated April 26, 2022.

Conclusion

In summary and based on the entire process described above, the Boston Region MPO has prepared this conformity determination for the 1997 ozone NAAQS in accordance with EPA's and the Commonwealth of Massachusetts' latest conformity regulations and guidance. This conformity determination process demonstrates that the 2050 LRTP meets the Clean Air Act and Transportation Conformity Rule requirements for the 1997 ozone NAAQS and has been prepared following all the guidelines and requirements of these rules during this period.

Therefore, the implementation of the Boston Region MPO's 2050 LRTP is consistent with the air quality goals of, and in conformity with, the Massachusetts SIP.

Greenhouse Gas Analysis

This section documents recent progress made by MassDOT and the MPOs to help achieve greenhouse gas (GHG) reduction goals as outlined in state regulations applicable to Massachusetts. This progress report estimates future carbon dioxide (CO_2) emissions from the transportation sector, which is part of the requirement of meeting the GHG reduction goals established through the Commonwealth's Global Warming Solutions Act (GWSA).

GWSA TRANSPORTATION STATUS: FUTURE CARBON DIOXIDE EMISSIONS REDUCTIONS

The Global Warming Solutions Act of 2008 requires statewide reductions in GHG emissions (CO_2) of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050.

The Commonwealth's thirteen metropolitan planning organizations are involved in helping to achieve greenhouse gas reductions mandated under the GWSA. The MPOs work closely with MassDOT and other agencies to develop common transportation goals, policies, and projects that would help to reduce GHG emission levels statewide and meet the specific requirements of the GWSA regulation—*Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05).* The purpose of this regulation is to assist the Commonwealth in achieving its adopted GHG emission reduction goals by the following means:

- Requiring each MPO to evaluate and report the aggregate GHG emissions and impacts of both its Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)[1]
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its RTP and TIP based on factors that include GHG emissions and impacts

The requirements of this regulation are being achieved through the transportation goals and policies contained in the FFY 2024 RTPs, the major projects planned in the RTPs, and the mix of new transportation projects that are programmed and implemented through the TIPs.

The GHG evaluation and reporting processes enable the MPOs and MassDOT to identify the anticipated GHG impacts of the planned and programmed projects and also to use GHG impacts as a criterion in prioritizing transportation projects. This approach is consistent with the GHG reduction policies of promoting healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, and bicycle and pedestrian investments, as well as by supporting smart growth development patterns through the creation of a balanced, multimodal transportation system. All of the MPOs and MassDOT are working toward reducing GHGs with sustainable transportation plans, actions, and strategies that include (but are not limited to) the following activities:

[1] Regional Transportation Plan is another name for Long-Range Transportation Plan.

- Reducing emissions from construction and operations
- Using more fuel-efficient fleets
- Implementing and expanding travel demand management programs
- Encouraging eco-driving
- Providing mitigation for development projects
- Improving pedestrian, bicycle, and public transit infrastructure and operations (healthy transportation)
- Investing in higher density, mixed use, and transit-oriented developments (smart growth)

REGIONAL GHG EVALUATION AND REPORTING IN RTPS

MassDOT coordinated with MPOs and regional planning agency staff on the implementation of GHG evaluation and reporting in development of each MPO's 2016 and 2020 RTPs. This collaboration has continued in developing the MPOs' FFY 2024 RTPs and FFYs 2024–28 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

- The modeling and production of long-range statewide projections for GHG emissions resulting from the transportation sector has been completed as a supplement to the FFY 2024 RTPs. Using the newly updated statewide travel demand model, GHG emissions have been estimated for 2019 (base) conditions and for 2050 base ("no-build" including existing and committed projects) and build (action) conditions.
- All of the MPOs have addressed GHG emission reduction projections in their RTPs along with a discussion of climate change and a statement of MPO support for reducing GHG emissions from transportation as a regional goal.

MassDOT's statewide estimates of CO_2 emissions resulting from the collective list of all recommended projects in all Massachusetts RTPs combined are presented in Table E-1. Emissions estimates incorporate the latest planning assumptions, including updated socioeconomic projections consistent with the FFY 2024 RTPs.

Table E-1
Massachusetts Statewide Aggregate Carbon Dioxide Emissions Estimates from RTP Projects

Year	CO_2 Action Emissions (tons)	CO_2 Base Emissions (tons)	Difference (Action – Base)
2019	75,113.6	75,113.6	n/a
2050	53,772.5	53,781.4	-8.9

Note: Emissions are in tons per summer day.

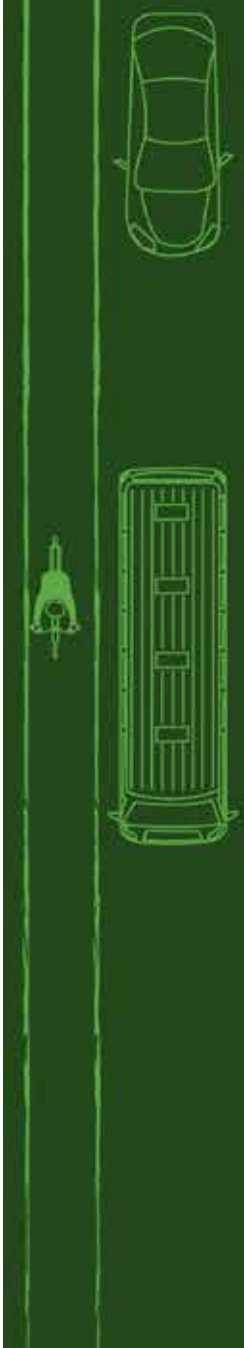
CO_2 = carbon dioxide. n/a = not applicable.

Sources: MassDOT and Central Transportation Planning Staff's Travel Demand Model.

This analysis includes only those larger, regionally significant projects that are included in the statewide travel demand model. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, and intersection improvements) are covered in each MPO region's RTP with either qualitative assessments of likely CO_2 change or quantitative estimates listed for each project.

As shown in Table E-1, collectively, all the projects in the RTPs in the 2050 Action scenario provide a statewide reduction of nearly 9 tons of CO_2 per day compared to the base (existing and committed projects) case.

These results demonstrate that the transportation sector is expected to continue making positive progress in contributing to the achievement of GHG reduction targets consistent with the requirements of the GWSA. MassDOT and the MPOs will continue to advocate for steps needed to accomplish the Commonwealth's long-term goals for GHG reductions.



APPENDIX F

FINANCIAL REPORT

Overview

To address the needs of the Boston region's transportation system, the Boston Region Metropolitan Planning Organization (MPO) and its partner transportation agencies anticipate the resources that will be available for transportation capital investment, maintenance, and operations. In addition, these agencies seek to understand expected project costs and how they may change over time, including as a result of inflation. This appendix describes funding sources that will support the portions of the Boston region's transportation system over which the MPO has some programming jurisdiction: the roadway and transit networks. It also discusses projected capital, operations, and maintenance revenues and spending for these systems.

The Boston Region MPO estimates future revenues and costs for its investments because it is required by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) to develop Long-Range Transportation Plans (LRTPs) that are fiscally constrained. This practice is intended to ensure that LRTPs are based on a "reasonable expectation of sufficient revenues to support the costs of maintaining the existing metropolitan area transportation system and any planned expansion of that transportation system over at least a 20-year time frame."[1]

The Boston Region MPO has discretion to program approximately $5 billion between federal fiscal years (FFYs) 2024 and 2050, and the dollars that it allocates to major infrastructure projects and other s must remain within that limit. *Destination 2050* and the MPO's short-term implementation plan, the Transportation Improvement Program (TIP), must include sufficient information to demonstrate that projects selected by the MPO can be implemented "using committed, available, or reasonably available Federal, State, local and private revenues, with the assurance that the federally supported transportation system is being adequately operated and maintained."[2] The details of the Boston Region MPO's recommended projects and investment programs for *Destination 2050* are included in Chapter 5. This appendix describes how those projects and programs fit within the MPO's available discretionary funding.

The MPO's discretionary, or Regional Target, dollars are only a portion of the dollars available to support the region's transportation system and meet anticipated transportation needs. By describing the projected revenues for the Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), the Cape Ann Transportation Authority (CATA), and the MetroWest Regional Transit Authority (MWRTA), and how those agencies plan to spend them, the MPO aims to provide a more comprehensive financial outlook for the region.

1 US Department of Transportation Research and Innovative Technology Administration and John A. Volpe National Transportation Systems Center, ***Fiscal Constraint in Long-Range Transportation Planning: Best Practices Case Studies*** (2012), pg. 4, accessed on June 5, 2023. https://www.planning.dot.gov/documents/fiscalConstraint_rpt.pdf.

2 Ibid. pg. 4.

Highway System Funding

HIGHWAY SYSTEM FUNDING SOURCES

Investments in the region's highway system are funded with dollars approved by the United States Congress and distributed through federal-aid highway programs, state funds approved by the Massachusetts Legislature, and local sources. This section provides information on funding sources for the region's highway system, including amounts of funds that the MPO expects to be available during the planning horizon of *Destination 2050*. It also describes planned programming of funds by MassDOT and the MPO to improve and maintain the highway system.

Federal Aid

Federal highway funds for states are typically authorized by Congress through a multiyear act. The most recent authorization act, the Bipartisan Infrastructure Law (BIL), was signed into law on November 15, 2021. The BIL provides approximately $567 billion for FFYs 2022–26. Approximately $350 billion of that amount is directed to highway programs.[3]

Federal funds support construction and rehabilitation of highways and bridges on federal-aid eligible routes (as determined by the roadway's functional classification). They also support projects and programs that address particular focus areas, such as improving safety and air quality, building bicycle and pedestrian networks, and maintaining the Interstate Highway System. Congress has established various funding programs for appropriating federal funds to these key focus areas.

The BIL established new formula funding levels and some new formula funding programs, created new discretionary grant programs and reauthorized existing ones, and set policy priorities. The BIL expanded the set of competitive federal discretionary grant programs for transportation. Eligible entities—which can include states, municipalities, or MPOs, depending on the program guidelines—can apply for funding for project activities, including design and construction. Examples include the National Infrastructure Investment program (also known as the Rebuilding America's Infrastructure Program with Sustainability, or RAISE program), which has funded large-scale infrastructure projects; and the Safe Streets and Roads for All Program, which supports regional, local, and Tribal safety initiatives.

3 US Department of Transportation, Federal Highway Administration, "Bipartisan Infrastructure Law: Overview of Highway Provisions" (November 2022), pgs. 5 and 10, accessed May 15, 2023. https://www.fhwa.dot.gov/bipartisan-infrastructure-law/docs/BIL_overview_update_2022-11-8b.pdf.

The BIL authorizes a single amount for each year for all federal highway funding programs combined. The US Department of Transportation (USDOT) then apportions that amount to the states based on formulas specified in federal law.[4] Each year, a state may use its apportionment only up to a ceiling referred to as the *obligation authority*, a limit set by Congress to control federal expenditures. The obligation authority represents the federal government's commitment to reimburse the state for eligible expenditures on approved projects.

A state must obligate its apportionment of funds, up to its obligation authority limit, to specific transportation projects and programs before the close of the federal fiscal year, September 30. In August, FHWA follows a process established by Congress to redistribute obligation limitations to states that can obligate more than their initial share by the year-end deadline.[5] In recent years, this process, which is referred to as the August redistribution, has granted Massachusetts the ability to obligate more funds than its initial limit when other states were not expected to reach their obligation limits. However, Massachusetts and other states have been subject to rescissions, when the federal government rescinds the unused balances of previously authorized funds.

FHWA will reimburse states for costs associated with federal-aid eligible projects out of the Highway Trust Fund (HTF). The primary source of revenue for the HTF is the federal tax on motor fuels. Additional revenue comes from other transportation-related fees and interest on trust fund reserves.[6]

In recent years, the HTF has been at risk of insolvency, in part because its revenues are heavily dependent on fuel taxes. According to the Congressional Research Service, the HTF has needed significant transfers of general revenues to remain solvent.[7] During the life of *Destination 2050,* a key challenge will be to ensure a stable source of federal funding for surface transportation.

4 U.S. Department of Transportation, Federal Highway Administration, "Apportionment of Federal Aid Highway Program Funds for Fiscal Year (FY) 2022" (December 2021), accessed May 15, 2023. https://www.fhwa.dot.gov/legsregs/directives/notices/n4510858/.

5 US Department of Transportation, Federal Highway Administration, ***Funding Federal-aid Highways*** (January 2017), pg. 34, accessed June 5, 2023. https://www.fhwa.dot.gov/policy/olsp/fundingfederalaid/FFAH_2017.pdf.

6 US Congressional Research Service, Funding and Financing Highways and Public Transportation (May 11, 2020), pg. 1, accessed June 5, 2023. https://crsreports.congress.gov/product/pdf/R/R45350.

7 Ibid., pg. 1.

State Aid

Revenues for the region's highway system are also generated at the state level. The Massachusetts Legislature authorizes the issuance of bonds for transportation expenditures through passage of transportation bond bills. This allows the Commonwealth to provide matching funds to federal-aid projects, to pay for fully state-funded (nonfederal aid) projects, and to offer support to municipalities through local-aid programs, such as Chapter 90.

The two main types of bonds the Commonwealth issues are General Obligation bonds, which are backed by the full taxing authority of the Commonwealth, and Special Obligation Bonds, which are backed primarily by gas taxes and fees from the Registry of Motor Vehicles. The funds generated by taxes and fees are deposited in the Commonwealth Transportation fund and are used to pay debt service on the bonds and to fund MassDOT, the MBTA, and other regional transit authorities (RTAs) in the Commonwealth.

The Commonwealth supports other infrastructure improvements in the region using revenue collected from three tolled facilities: the Western Turnpike (Interstate 90 west of Interstate 95); the Metropolitan Highway System (MHS) tolled facilities east of Interstate 95; and the Tobin Bridge. The projected annual net revenues on each of the toll facilities—after operating expenses and debt service payments of the MHS—are available for capital projects as pay-go capital funds. The term *pay-go* is short for *Pay As You Go*, which refers to the practice of financing projects with funds that are currently available rather than borrowed.

Other Funding Sources

In the BIL, as in some past federal transportation funding acts, congressional earmarks provide funding for specific projects. In addition, with federal approval, MassDOT can access funding from the Central Artery Project Repair and Maintenance Trust Fund to address eligible MHS projects. Funding for transportation projects, including matching funds, may also be provided by municipalities or private institutions. For example, MassDOT is exploring the use of public-private partnerships as a financing mechanism for transportation projects.

HIGHWAY SYSTEM SPENDING

MassDOT is the recipient of federal highway aid to the Commonwealth. Between FFYs 2024 and 2050, Massachusetts will receive approximately $28 billion from the federal government to invest in the state's highway system, based on funding details and assumptions provided by MassDOT. This total reflects annual estimates that account for both anticipated Massachusetts apportionments and additional obligation authority that MassDOT expects the federal government will redistribute from other states to the Commonwealth through the August

redistribution process. These projections assume that Congress will enact a future transportation authorization act that will provide similar funding levels to those in the BIL (after it expires on September 30, 2026), and that the Highway Trust Fund will be sufficient to provide reimbursements for state transportation spending.

To create this $28 billion estimate, MassDOT developed near-term funding estimates for the first five-year period in the Massachusetts MPOs' LRTPs, FFYs 2024 to 2028. Between FFYs 2024 and 2028, the annual percentage change in the Massachusetts apportionment is an approximate two percent increase per year. Federal agencies also advised MassDOT and the MPOs to assume that federal apportionments to Massachusetts will increase by two percent each year from FFY 2029 to FFY 2050. This growth factor is based on an analysis of actual federal funding allocations to the Commonwealth in recent years. The assumption is that Massachusetts will receive a consistent level of redistributed obligation authority from FHWA, which is estimated at $50 million per year between FFYs 2024 and 2028.

When MassDOT allocates its apportionment of federal dollars for the highway system, it first deducts the Commonwealth's debt service payments owed to the federal government. It then allocates the remaining federal funds, which are matched with state funds, to statewide road and bridge programs for projects prioritized by MassDOT, and to the MPOs in the Commonwealth for projects prioritized by these regional bodies. The sections that follow provide additional detail about each stage of this funding distribution process.

Debt Service Payments

In recent years, the Commonwealth has used a highway project financing mechanism known as grant anticipation notes (GANs) to pay for major highway projects. GANs are bonds issued by the state that are secured by anticipated, future federal highway funds. In the late 1990s, the Commonwealth issued $1.5 billion in GANs to finance construction of a portion of the Central Artery/Ted Williams Tunnel Project. The majority of the project was completed in 2006. The Commonwealth made its final payment on this debt in 2014.

While the Central Artery/Tunnel repayments were winding down, the Commonwealth issued GANs again in 2010 for the Accelerated Bridge Program (ABP). This action followed the passage in 2008 of the Accelerated Bridge Program Act, which authorized issuance of as much as $1.108 billion in GANs and $1.876 billion in Commonwealth special obligation bonds. The ABP has advertised more than 200 construction contracts with a combined budget of $2.43 billion.

The debt that the Commonwealth has incurred for the ABP will continue into the period covered by *Destination 2050*. The GANs for the ABP began to mature in state fiscal year (SFY) 2015 and are anticipated to continue to mature until SFY 2026.

Between FFYs 2023 and 2027, MassDOT expects to invest more than $3 billion repairing the Commonwealth's bridges. This amount includes $816 million already programmed in the State Transportation Improvement Plan (STIP) under the BIL's reauthorization of existing programs, $1.1 billion under the BIL's new Bridge Formula Program, and $1.25 billion in bonding authority under the Commonwealth's Next Generation Bridge Program (NGBP).

The Commonwealth has also issued GANs for the NGBP. Like the ABP, the NGBP will leverage state bonding capacity to accelerate the rehabilitation and replacement of critical or structurally deficient bridges across Massachusetts, and the debt payments on these bonds will be paid using future federal formula funding. The GANs for the NGBP will begin to mature in SFY 2032 and are anticipated to continue to mature until SFY 2045. The total GANs repayment amounts during the life of *Destination 2050* are estimated to be $739.8 million.

Regional Priorities

Available Funding

After MassDOT has allocated funding to GANs repayments, it designates the remainder for spending on state and regional (MPO) priorities. These remaining federal dollars, which come through several FHWA funding programs established in the BIL, must be matched in some portion by state or local dollars, as dictated by the funding split formula of each particular program. Federal funds usually cover 80 percent of a project's cost, and the state or local government covers 20 percent. Some federal programs offer a 90 percent federal share or full funding. MassDOT customarily provides the non-federal match, though other entities can also provide it.

States and MPOs must consider the eligibility requirements of federal-aid highway programs when spending money on projects and programs. Table F-1 lists FHWA programs that generally supply funding to MassDOT and the Commonwealth's MPOs.

Table F-1
Federal Highway Administration Programs Applicable to MassDOT and Massachusetts MPOs

BIL Program	Eligible Uses
Bridge Formula Program (BFP)	Efforts to replace, rehabilitate, preserve, protect, and construct highway bridges
Carbon Reduction Program (CRP)*	Projects designed to reduce carbon dioxide emissions from on-road highway sources
Congestion Mitigation and Air Quality Improvement (CMAQ)	A wide range of projects to reduce congestion and improve air quality in nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter
Highway Safety Improvement Program (HSIP)	Implementation of infrastructure-related highway safety improvements
Metropolitan Planning	Facilities that contribute to an intermodal transportation system, including intercity bus, pedestrian, and bicycle facilities
National Electric Vehicle Infrastructure (NEVI) Program	Projects that support the strategic deployment of electric vehicle (EV) charging infrastructure and establish an interconnected EV network to facilitate data collection, access, and reliability
National Highway Freight Program (NHFP)	Projects that improve the efficient movement of freight on the National Highway Freight Network
National Highway Performance Program (NHPP)	Improvements to interstate routes, major urban and rural arterials, connectors to major intermodal facilities, and the national defense network; replacement or rehabilitation of any public bridge; and resurfacing, restoring, and rehabilitating routes on the Interstate Highway System

Table F-1 (cont.)

BIL Program	Eligible Uses
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program*	Efforts to make surface transportation more resilient to natural hazards, including climate change, sea level rise, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure
Surface Transportation Block Grant (STBG) Program	A broad range of surface transportation capital needs, including roads; transit, sea, and airport access; and vanpool, bicycle, and pedestrian facilities
Transportation Alternatives (TA)	A set-aside from the STBG program that funds the construction of infrastructure-related projects (for example, sidewalk, crossing, and on-road bicycle facility improvements)

* Although MassDOT will be directing the use of these funds, their apportioned amounts are factored into the amount of regional target funding allocated to MPOs and projected as part of RTP financial estimates.

BIL = Bipartisan Infrastructure Law. FHWA = Federal Highway Administration. MassDOT = Massachusetts Department of Transportation. MPO = Metropolitan Planning Organization. RTP = Regional Transportation Plan.

Source: Federal Highway Administration.

The distribution of funds to MPOs is determined by a formula established by the Massachusetts Association of Regional Planning Agencies (MARPA), which factors in each region's share of the state population. This formula was last updated in 1991. Of the 10 MPOs and three transportation planning organizations in the Commonwealth, the Boston Region MPO receives the largest portion (approximately 43 percent) of this Regional Target funding through this formula-based distribution because of its large population. Again, these funds must be programmed in the TIP and, subsequently, the STIP before construction can be authorized using federal-aid funds. The STIP describes the federal-aid funded projects to be implemented statewide over a five-year period.

Table F-2 summarizes the distribution of federal funds expected in Massachusetts between FFY 2024 and FFY 2050 for Boston Region MPO Regional Target funding, other Massachusetts MPO Regional Target funding, funding for MassDOT's statewide programs, and GANs repayments. Funding is summarized in each category by *Destination 2050* time band.

Table F-2
Federal Highway Funding for Massachusetts

Federal Fiscal Years	Boston Region MPO Funds	Other MPO Funds	Statewide Program Funds	GANs Repayment*	Total
2024–28	$697.6	$925.9	$3,152.8	$349.8	$4,776.2
2029–33	$833.0	$1,105.7	$3,753.6	$25.0	$5,692.3
2034–38	$898.6	$1,192.8	$4,007.9	$150.0	$6,099.3
2039–43	$988.4	$1,311.9	$4,408.3	$160.0	$6,708.6
2044–50	$1,592.6	$2,113.9	$7,103.4	$25.0	$10,809.9
Total	$5,010.1	$6,650.2	$22,426.0	$684.8	$34,086.3

Note: Dollar values are shown in millions. Totals may not match the sums of values due to rounding.

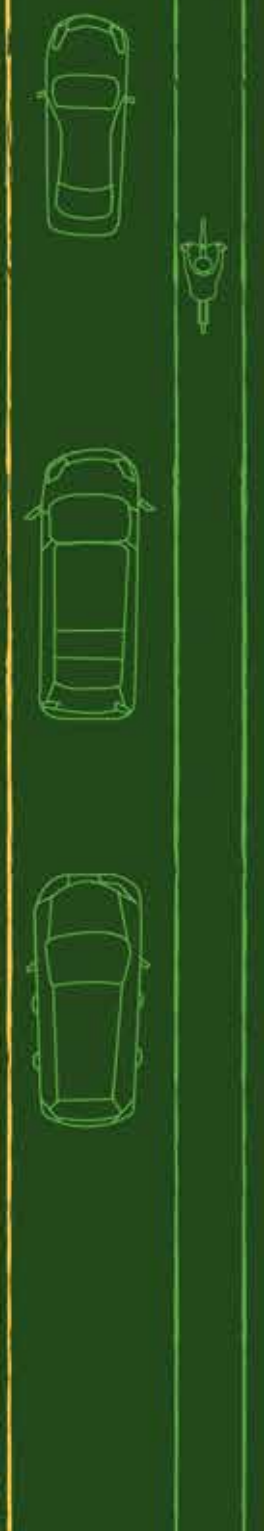
* The GANs Repayment dollar values include federal funds only. All other categories include state matching funds.

GANs = Grant Anticipation Notes. MPO = Metropolitan Planning Organization.

Source: Massachusetts Department of Transportation.

Boston Region MPO LRTP Programming

Each MPO in the state can decide how to prioritize its Regional Target funding, and the MPO engages its 97 cities and towns in this decision-making when developing its LRTP every four years and its TIP each year. Given that the Regional Target funding originates from the Federal-Aid Highway Program, the Boston Region MPO board typically programs the majority of its Regional Target funding on roadway projects. However, the MPO board has flexed portions of its Regional Target funding to transit projects, such as when it gave support to the Green Line Extension transit expansion project.



As mentioned previously, the MPO expects to receive approximately $5 billion in Regional Target funds (federal dollars plus a state match) to spend on transportation projects in the region between FFYs 2024 and 2050. This estimate is based in part on MassDOT's and the MPO's assumption that federal appropriations to Massachusetts will increase by two percent per year.

MPOs must document selected projects and programs in ways that comply with federal requirements before construction can be authorized with federal-aid funds. When the Boston Region MPO develops its LRTP, which has a horizon of 20 years or longer, it must list, describe, and provide cost estimates for projects that are regionally significant. Using FHWA's definition, the MPO defines regionally significant projects as those that would change the capacity of the transportation system on regionally significant facilities (roadways classified as principal arterials or higher, or fixed-guideway transit systems), regardless of whether they are funded with federal-aid or nonfederal-aid sources.

A challenge for MPOs and MassDOT when selecting projects and programs to fund is that project costs are expected to inflate by four percent per year over the life of *Destination 2050*, while federal funding is only expected to increase by two percent per year. If these projections hold true, the MPO expects project cost growth to outpace funding growth, which will result in diminished buying power in future years. For example, a project costing $10 million if constructed in FFY 2029 would cost increasingly more if programmed in the outer years of the LRTP. To deliver the same project in FFY 2050, the cost would be $22.8 million, while the available revenues for that project would be only $15.2 million.

The MPO considers these anticipated project cost growth rates as well as projected revenues when it allocates funding to investment programs and selects transportation projects for its LRTP. This helps the MPO ensure that it meets fiscal constraint requirements.

The projects and programs outlined in Chapter 5 set the long-term framework for the short-term funding decisions that the MPO makes annually when developing its rolling five-year TIP. Projects that are scheduled to be implemented in that five-year period, regardless of cost or regional impact, must be documented in the TIP. When making decisions about the TIP each year, the MPO accounts for the timing of regionally significant projects and considers how other candidate projects may fit into its investment programs. Each year, the TIPs from all the MPOs in the state are combined to form the STIP.

In addition to documenting federally funded projects for which the state has obligation authority, the TIP and STIP also document projects that would be funded using the Advance Construction financing method. In these cases, a state may receive approval from FHWA to begin a project before the state has received the necessary obligation authority. This prequalification allows a project to move forward initially with state funding and request federal reimbursements later.

State Priorities

The Boston Region MPO's investments in the roadway system are complemented by the Commonwealth's roadway investment priorities overseen by MassDOT. State priorities play a primary role in addressing the operations and infrastructure maintenance needs of the highway system in the Boston region.

MassDOT's rolling five-year Capital Investment Plan (CIP) directs how MassDOT's component divisions prioritize capital improvements for Massachusetts' transportation system.[8] The CIP process is based on a framework that prioritizes funding according to MassDOT's strategic goals (listed in order of priority):

- Reliability Investments are oriented toward maintaining and improving the overall condition and reliability of the transportation system. They include capital maintenance projects, state-of-good-repair projects, and other asset management and system preservation projects.
- Modernization Investments enhance the transportation system to make it safer and more accessible and to accommodate growth. These projects address compliance with federal mandates or other statutory requirements for safety or accessibility improvements, exceed state-of-good-repair thresholds to substantially modernize existing assets, and provide expanded capacity to accommodate current or anticipated demand on transportation systems.
- Expansion Investments provide more diverse transportation options for communities throughout the Commonwealth. They expand highway, transit, and rail networks or services, and they expand bicycle and pedestrian networks to provide more transportation options and address health and sustainability objectives.

MassDOT creates investment programs for the CIP that relate to these strategic goals, and it allocates funding to these goals and programs in ways that emphasize their priority. MassDOT's operations and maintenance investments are funded through these programs, which are referenced in the sections that follow. MassDOT's decisions about how to manage its assets via these programs are shaped by an array of asset management tools and systems. One important tool is MassDOT's Transportation Asset Management Plan for National Highway System (NHS) assets in Massachusetts. This plan provides an inventory and assessment of bridge and pavement assets, identifies performance gaps, discusses the results of life cycle cost and risk management analyses, and describes investment strategies and a financial plan MassDOT will follow to improve the system.

8 The MassDOT CIP is available at https://www.mass.gov/info-details/developing-the-capital-investment-plan.

Bridges

MassDOT is responsible for prioritizing bridge projects statewide. In addition to the Next Generation Bridge Program, bridge preservation and maintenance projects are funded through the statewide Bridge Program, one of MassDOT's reliability-oriented capital programs. Funding for this program comes from several of the federal-aid highway programs mentioned in Table F-1: the National Highway Performance Program (NHPP), the Surface Transportation Block Grant (STBG) Program, and the Bridge Formula Program. NHPP funding is generally applied to projects involving bridges on the NHS, while the STBG Program generally funds bridges on public roads that may not be on the NHS. A portion of STBG Program funding is also set aside for "Off-System Bridges," or highway bridges located on a public road that is not a federal-aid highway. Projects funded through the statewide bridge program typically receive 80 percent federal funding and a 20 percent nonfederal match. When programming funding toward bridge improvements, MassDOT programs federally required minimum amounts of NHPP funds to address NHS bridge performance needs.

The portion of total statewide federal dollars (including match funding) dedicated to the statewide bridge program each year ranges between 32 and 40 percent between FFY 2024 and FFY 2028. From FFY 2029 through 2050, it comprises approximately 41 percent of statewide federal dollars and match funding each year. Between FFY 2024 and 2050, MassDOT expects to dedicate $9 billion to the statewide bridge program. MassDOT's decisions about federal-aid bridge project programming are based on data from asset management systems and condition-based criteria; they are not shaped by region-level allocations. As a result, federal bridge funding projections specific to the Boston region between FFYs 2024 and 2050 are not included here.

MassDOT also expects to spend nonfederal aid on NHS bridge maintenance and improvement and NHS roadway preservation between FFYs 2024 and 2050. MassDOT uses the MARPA formula to estimate the portion of funds that will be spent in each regional planning area in Massachusetts; however, the actual expenditure of funds in each region will be informed by MassDOT's asset management systems. The Boston Region MPO expects that MassDOT will allocate approximately 43 percent of the funding to the region in accordance with that formula, and a portion of those funds will be spent to improve bridges.

Interstate Maintenance and Pavement Management

MassDOT's pavement programs for interstate and non-interstate (MassDOT-owned) highways also support its Reliability strategic goal area. The federal funding source for these programs is the NHPP.

Between FFYs 2024 and 2050, MassDOT expects to make approximately $1.4 billion in federal dollars (including state match funds) available for interstate pavement maintenance throughout Massachusetts. This funding comprises six percent of total statewide federal dollars. Approximately 39 percent of the interstate lane miles in the Commonwealth are in the Boston Region MPO area, thus the MPO expects to receive that proportion of statewide interstate maintenance funds over the span of the LRTP, amounting to $541 million.

MassDOT also expects to make approximately $2.38 billion in federal funding (including state match funds) available for non-interstate NHS pavement maintenance throughout the state between FFYs 2024 and 2050. The portion of total statewide federal dollars (including match funding) dedicated to the non-interstate MassDOT-owned NHS network ranges between 10 and 13 percent each year between FFY 2024 and FFY 2050.

In addition to its interstate lane mileage, the Boston Region MPO area contains 27 percent of the lane miles of non-interstate NHS roadways that are eligible to receive funding through the non-Interstate MassDOT pavement program. As a result, the MPO expects to receive 27 percent of this statewide funding for other highway preservation projects, which will amount to $648 million during the span of this LRTP.

In addition, MassDOT anticipates making additional nonfederal aid available for NHS bridge maintenance and improvement and NHS roadway preservation between FFYs 2024 and 2050. Forty-three percent of that funding is expected to be spent in the Boston region during that timeframe, and a portion of that funding will be spent to address pavement preservation needs.

Other Statewide Programs Addressing Transportation Needs

MassDOT's CIP framework includes additional programs that meet statewide transportation needs, including other aspects of maintaining and operating the roadway network:

- Reliability Programs: In addition to the statewide bridge, interstate pavement, and non-interstate MassDOT pavement programs mentioned above, MassDOT's reliability-oriented programs include the Roadway Improvements Program, which addresses preventative maintenance needs on non-interstate state-owned roadways, along with federally funded stormwater retrofit projects. This category also includes the Safety Improvements Program, which addresses signal, signage, lighting, and other safety improvements, and the Tunnels Program, which improves tunnel systems and infrastructure.

- Modernization Programs: Programs in this category include the following:
  - The Americans with Disabilities Act (ADA) Retrofit Program, which improves the condition and accessibility of state-owned sidewalks
  - The Complete Streets Program, which provides technical assistance and project funding to municipalities implementing Complete Streets policies
  - The Intelligent Transportation Program, which supports innovative and new communication and technology systems on the roadway network
  - The Intersection Improvements Program, which improves traffic signals and intersection features to meet safety and other needs
  - The Roadway Reconstruction Program, which improves roadway condition and bicycle and pedestrian facilities
- Expansion Programs: Major programs in this category include the Capacity Program, which adds new roadways, connections, or lanes to the state's roadway network, and the Shared-Use Path Program, which constructs bicycle or pedestrian paths that are separate from roadways.

Regionally significant projects funded by the Commonwealth may be partially or wholly paid for through these programs.

These statewide programs are supported by a range of funding sources noted in Table F-1, including, but not limited to, the federal Congestion Mitigation and Air Quality Improvement (CMAQ) Program, the Highway Safety Improvement Program (HSIP), and Transportation Alternatives (TA) Program. For example, CMAQ supports transportation projects that reduce traffic congestion and thereby improve air quality, and HSIP funding is used to reduce the number and severity of crashes at locations identified as particularly hazardous based on crash reports on file at the Registry of Motor Vehicles. In addition, TA funding supports projects such as transportation enhancements, multiuse trails, and projects that create safe routes for children to access schools.

MassDOT expects to spend approximately $9.6 billion in federal and statewide match funding on these other statewide programs between FFY 2024 and FFY 2050. The portion of total statewide federal funding (including state match) dedicated to other statewide investment programs ranges between 41 and 49 percent each year. MassDOT projected each region's share of this funding using the MARPA formula. The Boston region is expected to receive 43 percent of available funding, or $4.14 billion, between FFY 2024 and FFY 2050.

Table F-3 summarizes the funding MassDOT expects to have available in each of its statewide priority areas: statewide bridges, interstate maintenance, non-interstate NHS maintenance, and other statewide programs. This information is organized by *Destination 2050* time band.

Table F-3
Projected Funding for Statewide Priority Areas

Federal Fiscal Years	Statewide Bridge	Interstate Maintenance	Non-Interstate NHS Maintenance	Other Statewide Programs	Total
2024–28	$1,082.7	$213.7	$355.8	$1,486.3	$3,138.5
2029–33	$1,500.8	$226.9	$385.9	$1,626.9	$3,740.5
2034–38	$1,656.9	$250.5	$426.1	$1,674.4	$4,007.9
2039–43	$1,829.4	$276.6	$470.4	$1,831.9	$4,408.3
2044–50	$2,885.4	$436.3	$742.0	$3,015.0	$7,078.7
Total	$8,955.2	$1,404.1	$2,380.2	$9,634.5	$22,374.0

Note: Dollar values are shown in millions. Totals may not match the sums of values due to rounding.

NHS = National Highway System.

Source: Massachusetts Department of Transportation.

Table F-4 summarizes the funding the Boston region expects to receive for interstate maintenance, non-interstate NHS pavement maintenance, and other statewide transportation programs by *Destination 2050* time band.

Table F-4
Estimates of Projected Funding for Statewide Roadway Investments in the Boston Region

Federal Fiscal Years	Interstate Maintenance	Non-Interstate NHS Maintenance	Other Statewide Programs	Total
2024–28	$82.4	$96.8	$638.6	$817.8
2029–33	$87.4	$105.0	$699.1	$891.5
2034–38	$96.5	$116.0	$719.4	$931.9
2039–43	$106.6	$128.0	$787.1	$1,021.7
2044–50	$168.1	$201.9	$1,295.5	$1,655.5
Total	$540.9	$647.8	$4,139.7	$5,328.3

Note: Dollar values are shown in millions. Totals may not match the sums of values due to rounding. This table excludes funding through the statewide federal-aid bridge program, as specific projections are not available for the Boston region.
NHS = National Highway System. MPO = Metropolitan Planning Organization.
Source: Massachusetts Department of Transportation.

The Commonwealth will also support maintenance and operations needs on the region's transportation system using revenue collected from its tolled facilities. In its SFY 2024–28 CIP, MassDOT notes that over the next five years it expects to spend $840 million on the MHS, $503 million on the Western Turnpike, and $132 million on the Tobin Bridge. As mentioned above, these would be pay-go funds. In addition, according to the SFY 2024–28 CIP, MassDOT expects to spend $166 million in funds from the Central Artery Tunnel Project Repair and Maintenance Trust Funds.

Local Priorities

Several Commonwealth programs are geared towards providing funding to address municipal-level transportation priorities. The largest of these is the Chapter 90 program, which reimburses municipalities for spending on local roadway and bridge projects. The Massachusetts Legislature establishes Chapter 90 funding on an annual basis. According to the SFYs 2024–28 CIP, MassDOT

estimates that the Commonwealth will spend approximately $200 million in Chapter 90 funds statewide each year during that five-year period. Funding is allocated to municipalities based on a legislatively established formula. Municipalities have the discretion to select their projects, which may include maintenance of municipal roadways, sidewalk improvements, right-of-way acquisition, landscaping, drainage improvements, street lighting, and upgrades to traffic control devices. The Commonwealth's SFY 2024 apportionment of Chapter 90 funds to Boston region municipalities is $79.9 million.

Other programs that support local priorities include MassDOT's Complete Streets program (which is distinct from the MPO's Complete Streets investment program). This program provides funding and technical assistance to communities for the construction of facilities that enhance pedestrian, bicycle, and transit travel for roadway users of all ages and abilities. As noted in its SFY 2024–28 CIP, MassDOT expects to spend $75 million through this program over five years.

In addition, the Commonwealth's Municipal Small Bridge program assists municipalities by providing repair or replacement funding for town-owned bridges that are shorter than 20 feet and are therefore not eligible for federal bridge funding. MassDOT's SFY 2024–28 CIP reports that MassDOT will spend $75 million through this program over the next five years.

Additional funding for transportation may be available to municipalities from sources beyond MassDOT. For example, the Transportation Network Company (TNC) Division of the Department of Public Utilities must collect a $0.20 per-ride assessment on all TNC rides (such as Uber or Lyft) originating in the Commonwealth. In 2022, half of the total $12.1 million assessment was distributed to MassDevelopment, the Commonwealth's economic development and finance agency, and to the Commonwealth's Transportation fund. The other half was distributed to Massachusetts cities and towns based on the number of TNC rides that originated in each municipality. Municipalities spent this money on an assortment of transportation initiatives including bikeshare operational support and the purchase of benches, bollards, and other streetscape elements.

In addition, the MassWorks Infrastructure Program, which is administered by the Commonwealth's Executive Office of Housing and Economic Development, provides capital funds to municipalities and other eligible public entities for infrastructure projects that support and accelerate housing production, spur private development, and create jobs throughout Massachusetts. In 2022, twelve Boston Region municipalities— Arlington, Bellingham, Braintree, Foxborough, Franklin, Holbrook, Littleton, Lynn, Marlborough, Newton, Rockland, and Weymouth—received MassWorks funding for projects with transportation components.

Transit System Funding

Transit systems require funding for capital improvements, to operate service, and to conduct maintenance to provide safe and reliable transit service. This section reports on funding for the three transit providers that receive federal funds in the Boston region on an ongoing basis: the MBTA, CATA, and MWRTA. These three agencies report their federally funded investments in the Boston Region MPO's LRTP and TIP. This section also provides information on MassDOT-managed statewide grant funding (partially funded with federal dollars) that a variety of transit providers in the region can access to improve their systems. Finally, information on funding resources and expected costs associated with operating and maintaining the MBTA's, CATA's, and MWRTA's transit systems is provided.

TRANSIT CAPITAL FUNDING SOURCES

Federal Aid

Congress has authorized federal aid for transit programs through the Bipartisan Infrastructure Law until September 30, 2026. Approximately 80 percent of federal funding for public transportation in the United States comes from the Mass Transit Account of the Highway Trust Fund, while the remainder comes from the general fund of the US Treasury. Like federal funding for highways, federal funding for transit is dependent on both transportation authorization bills such as the BIL and the availability of resources from the HTF. In addition, as with federal highway funding, federal transit dollars are subject to obligation authority limits.

FTA provides funding for transit through both formula-based programs and non-formula grants. Formula-based aid is allocated to urbanized areas (UZAs), which are areas defined by the US Census that have populations of 50,000 or more. MassDOT receives federal aid for the Boston UZA and allocates it to transit agencies within the UZA based on a negotiated split agreement. Transit agencies can also access federal funds by applying to FTA non-formula, or discretionary grant, programs. Transit agencies may also be eligible to apply to discretionary grant programs administered by the Federal Railroad Administration (FRA) and USDOT. Federal funds provided to transit agencies must be matched by funds from state, local, or other sources. These match requirements vary by program.

Table F-5 describes FTA and FRA programs that have provided funds to the Boston region's transit systems in recent years.

Table F-5
Federal Transit Administration and Federal Railroad Administration Programs Applicable to Transit Providers in the Boston Region

BIL Program	Federal Agency	Program Type	Eligible Uses
Section 5307: Urbanized Area Formula Grants	FTA	Formula	Transit capital and operating assistance in urbanized areas
Section 5337: State of Good Repair Program	FTA	Formula	Maintenance, rehabilitation, and replacement of transit assets to maintain a state of good repair
Section 5339: Bus and Bus Facilities	FTA	Includes formula and discretionary grant components	Capital projects to replace, rehabilitate, and purchase buses and related equipment, to construct bus-related facilities, and to purchase or lease low- or no-emission buses
Section 5310: Enhanced Mobility of Seniors and Individuals with Disabilities	FTA	Formula	Capital expenses that support transportation to meet the special needs of older adults and persons with disabilities
Section 5309: Capital Investment Grants	FTA	Discretionary grant	Grants for new and expanded rail, bus rapid transit, and ferry systems that reflect local priorities to improve transportation options in key corridors
Positive Train Control Grant Program	FTA and FRA	Discretionary grant	Installation of positive train control systems on commuter rail systems*

*Positive train control systems are advanced systems designed to stop a train automatically before certain accidents occur.

FRA = Federal Railroad Administration. FTA = Federal Transit Administration. MPO = Metropolitan Planning Organization.

Sources: FTA, FRA, and the Boston Region MPO.

Federal Funding for the MBTA

The MBTA receives formula funding from the Urbanized Area Formula Grants program (Section 5307), the State of Good Repair program (Section 5337), and the Bus and Bus Facilities program (Section 5339), as described in Table F-6. The MBTA, which has the largest transit service and asset portfolio of the transit agencies in the Boston region, is the recipient of the preponderance of federal transit funds that come to the region via these programs.

As with the federal sources of highway funding, MPO staff developed estimates of FTA formula funds expected to be available for transit agencies throughout the Commonwealth. The MBTA typically provides a 20 percent match to these FTA formula funds.

Table F-6 shows the amounts of Section 5307, Section 5337, and Section 5339 federal formula funds that the MBTA is expected to receive between FFY 2024 and FFY 2050, grouped by *Destination 2050* time band. This table also shows a projected amount of MBTA match funding, based on an 80 percent federal share and 20 percent local share of funding through these programs. More information about the sources of MBTA match funding is available in the sections that follow.

Table F-6
Federal Formula Funds for the MBTA

Federal Program	FFYs 2024–28	FFYs 2029–33	FFYs 2034–38	FFYs 2039–43	FFYs 2044–50	Total
Section 5307: Urbanized Area Formula Grants	$943.4	$943.4	$943.4	$943.4	$1,320.8	$5,094.6
Section 5337: State of Good Repair Grants	$1,137.7	$1,137.7	$1,137.7	$1,137.7	$1,592.8	$6,143.6
Section 5339: Bus and Bus Facilities	$30.4	$30.4	$30.4	$30.4	$42.6	$164.4
MBTA Match for All Formula Programs	$527.9	$527.9	$527.9	$527.9	$739.1	$2,850.6
Total	$2,639.5	$2,639.5	$2,639.5	$2,639.5	$3,695.3	$14,253.2

Note: Dollars are shown in millions. Federal program funds are expected to remain constant each year.

FFY = Federal Fiscal Year. MBTA = Massachusetts Bay Transportation Authority. MPO = Metropolitan Planning Organization.

Sources: FTA, MassDOT, the MBTA, and the Boston Region MPO.

In addition to these federal formula funds, the MBTA will continue to pursue discretionary funding opportunities in the Bipartisan Infrastructure Law. As of February 2023, the MBTA had won $249.4 million in discretionary grant funding in state fiscal years 2022 and 2023. Some examples of this funding include the following :

- Bus electrification
  - $116 million for battery-electric buses
  - $5 million for bus charging infrastructure for the new Quincy bus facility
- System Accessibility and Passenger Facilities
  - $66.6 million for accessibility improvements at Symphony Station
  - $6.6 million for modifications to the Hingham ferry dock

- System Safety
  - $6.9 million for transit security from the Department of Homeland Security and the Federal Emergency Management Agency
  - $100,000 for the MBTA's Suicide Trespass Prevention Project
  - $20,000 for the South Coast Rail Transit Safety Education Project

Federal Funding for CATA

CATA receives a portion of the Urbanized Area Formula Grants program (Section 5307) funds that come to the Boston UZA. MPO staff assumed that these funds would increase two percent per year between FFY 2024 and FFY 2050. These projections are shown in Table F-7.

Table F-7
Federal Funds for CATA

Federal Program	FFYs 2024–28	FFYs 2029–33	FFYs 2034–38	FFYs 2039–43	FFYs 2044–50	All Years
Section 5307: Urbanized Area Formula Grants	$3.8	$4.2	$4.6	$5.1	$8.1	$25.8

Note: Funding amounts are shown in millions. FTA Section 5307 funds are expected to increase by two percent per year. Matching funds are not shown in this table.
CATA = Cape Ann Transportation Authority. FFY = Federal Fiscal Year. FTA = Federal Transit Administration. MassDOT = Massachusetts Department of Transportation. MPO = Metropolitan Planning Organization.
Sources: FTA, MassDOT, and the Boston Region MPO.

CATA can spend these Urbanized Area Formula funds on capital projects and is eligible to spend as much as 75 percent of its annual Urbanized Area Formula funding allocation on operating costs or use the funds for capital costs, per FTA. CATA typically spends a portion of this funding on preventative maintenance for its vehicles each year; this is an operating expense that FTA has deemed eligible as a capital project that can be funded 80 percent with federal dollars.[9] It allocates the rest to capital investments.

Both CATA and MWRTA typically receive capital dollars from the Commonwealth's RTA Capital Assistance (RTA CAP) fund. MassDOT works with RTAs to provide matching funds for individual capital projects that are approved for inclusion in the MassDOT CIP, with the match amount based on the amount of federal funds that RTAs pledge toward each project. FTA formula funds typically require a 20 percent local match, which MassDOT typically fulfills, although in some cases MassDOT may provide a larger share.

Federal Funding for MWRTA

Like CATA, MWRTA receives Urbanized Area Formula Grants program (Section 5307) funds to support its capital infrastructure. Table F-8 shows the amount of these funds expected to be available to MWRTA during the life of *Destination 2050,* based on MassDOT projections.

9 US Department of Transportation Federal Transit Administration, "FTA Circular 9030.1E: Urbanized Area Formula Grants Program: Program Guidance and Application Instructions" (January 16, 2014), accessed June 5, 2023 at https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FINAL_FTA_circular9030.1E.pdf, pg. E-1.

Table F-8
Federal Funds for MWRTA

Federal Program	FFYs 2024-28	FFYs 2029-33	FFYs 2034-38	FFYs 2039-43	FFYs 2044-50	Total
Section 5307: Urbanized Area Formula Grants	$16.4	$18.5	$21.0	$23.7	$38.5	$118.2

Note: Funding amounts are shown in millions. FTA Section 5307 funds are expected to increase by 2.5 percent per year. Matching funds are not shown in this table.

FFY = Federal Fiscal Year. FTA = Federal Transit Administration. MassDOT = Massachusetts Department of Transportation. MPO = Metropolitan Planning Organization. MWRTA = MetroWest Regional Transit Authority.

Sources: FTA, MassDOT, and the Boston Region MPO.

MWRTA is also similar to CATA in that it is eligible to spend as much as 75 percent of its allocation on operating costs, per FTA. MWRTA typically spends a significant share of its Urbanized Area Formula funds on operating expenses each year, particularly to support its ADA paratransit service. MWRTA allocates its remaining Section 5307 funding to capital projects after operating needs are met. As discussed previously, the Commonwealth matches federal funding for CIP-approved RTA capital projects on an individual project basis; typically, MassDOT's match share is 20 percent, although this share can vary from project to project.

Other Federal Funding for Transit

MassDOT oversees the distribution of other federal funding for transit in the Boston region. Each year, MassDOT's Rail and Transit Division administers the competitive Community Transit Grant Program, which awards funding to help meet the transportation and mobility needs of seniors and people with disabilities. This program is supported by both the federal Enhanced Mobility of Seniors and Individuals with Disabilities program (Section 5310), and Mobility Assistance Program (MAP) funds from the Commonwealth. Awards from this program fund mobility management initiatives, operational costs, and capital equipment, such as vehicles. A Community Transit Grant Program committee advises MassDOT staff by reviewing and scoring applications for Section 5310 and MAP funding through this program. Once awards are made, MassDOT submits a Section 5310 funding application to FTA.

While MassDOT distributes federal Section 5310 funding through a competitive grant process, a designated portion of this funding must be allocated within the Boston UZA, as Section 5310 is a formula-based program. Table F-9 shows the expected amount of Section 5310 dollars that MPO staff expect to be available in the Boston UZA.

Table F-9
Federal Section 5310 Funds for the Boston Urbanized Area

Federal Program	FFYs 2024–28	FFYs 2029–33	FFYs 2034–38	FFYs 2039–43	FFYs 2044–50	Total
Section 5310: *	$29.4	$32.4	$35.8	$39.5	$62.4	$199.5

*Enhanced Mobility of Seniors and Individuals with Disabilities

Note: Funding amounts are shown in millions. FTA Section 5310 funds are expected to increase by two percent per year.

FFY = Federal Fiscal Year. FTA = Federal Transit Administration. MassDOT = Massachusetts Department of Transportation. MPO = Metropolitan Planning Organization.

Sources: FTA, MassDOT, and the Boston Region MPO.

MWRTA and CATA are eligible to receive funds through the Community Transit Grant Program. For example, in SFY 2023, MWRTA was awarded $80,000 for MWRTA TOP, which improves individual mobility and enhances transportation equity and accessibility by making travel independence possible within the MetroWest area. In that same year, CATA was awarded $61,320 to provide van transportation for people going to dialysis and medical appointments in Beverly, Danvers, and Peabody as well as a direct transfer to the MBTA RIDE. Other types of entities that may receive these funds include municipal governments and private, nonprofit transportation providers in the Boston UZA. Funds awarded through the Community Transit Grant Program may be matched by local sources, depending on their use.

State Aid

The Commonwealth supplements federal dollars for transit capital spending with state revenues, including bond funds. The Commonwealth issues general obligation bonds and special obligation bonds. In its SFY 2024–28 CIP, MassDOT expects to make the following investments in the MBTA:

- Reliability
  - $127 million for procuring bi-level commuter rail coaches
  - $10 million for MBTA stations
  - $8 million for MBTA tracks, signals, and power systems

- Modernization
  - $168 million for new Red and Orange Line vehicles
  - $116 million for the state match for BIL funds
  - $80 million for Red and Orange Line infrastructure
- Expansion
  - $286 million for South Coast Rail

Commonwealth bond funds are also used to provide RTA CAP funding to RTAs such as MWRTA and CATA. These funds provide the match funding for federal dollars or help RTAs to make additional capital investments. RTAs coordinate with the MassDOT Rail and Transit Division to identify funding for individual projects that are approved for inclusion in the CIP. According to MassDOT's draft 2024–28 State Transportation Improvement Program (STIP), MassDOT expects to spend $169 million statewide in RTA CAP funding, portions of which would support MWRTA and CATA.

Finally, MassDOT's Mobility Assistance Program provides funding that helps to support the Community Transit Grant Program. The MassDOT CIP notes that the MAP is expected to make approximately $103 million available statewide between SFYs 2024–28.

Other Funding Sources

The MBTA has several other funding sources that supplement Commonwealth and federal dollars for transit capital improvement projects. MBTA revenue bonds, including sustainability bonds, help provide matches for federal dollars and otherwise support MBTA capital projects. The MBTA's ability to issue these bonds is contingent on the ability of its operating budget to support increased debt service, and market variables will have an impact on the costs of new debt and the bond proceeds available to support the capital program from future debt issuance.

Other funding sources for MBTA capital projects include the following:

- *MBTA Pay-as-you-go (pay-go) funds*: Pay-go is a financial instrument that uses cash to fund capital projects rather than issuing bonds and incurring debt-service expenses.
- *Municipal and local funds*: Municipalities may contribute to some transit projects. For example, the City of Boston contributed to bus lanes on Columbus Avenue.
- *Reimbursable and third-party funds*: This category includes funds received via reimbursable agreements with the Rhode Island Department of Transportation, Amtrak, and other parties.

MWRTA and CATA projects may also be supported by local funds. In some cases, revenues from tolls—referred to as toll credits—can also be used to match federal funds.

TRANSIT CAPITAL SPENDING

The transit funding sources described previously help to support the capital investments that the MBTA, MWRTA, and CATA will make between FFYs 2024 and 2050. As with highway investments, transit capital investments can be organized according to the strategic goals in the MBTA CIP, which parallel those in the MassDOT CIP: reliability and modernization, and expansion. These transit agencies' priorities are also shaped by their respective transit asset management plans, which include transit asset inventory and condition assessments and strategies to bring vehicles, facilities, and other infrastructure into a state of good repair. This section explains the MBTA's, MWRTA's, and CATA's approaches to spending federal funds to meet their systems' state of good repair, modernization, and other needs.

MBTA Capital Investment

The MBTA's capital investments are driven by two overarching priorities:

1. Improve the **safety** and **reliability** of the system and **modernize** existing assets to reduce safety risks, lower maintenance costs, enhance system performance, and accommodate current or anticipated growth.
2. Make targeted investments in the **expansion** of the transportation network, in an effort to increase capacity or multimodal options.

The MBTA has investment programs that it uses to support its priorities. The investment programs are sized annually to align with the MBTA's needs and goals. The MBTA's investment programs are shown in Table F-10.

Table F-10
MBTA CIP Investment Programs and Priority Areas

Priority Area	Related Capital Investment Programs
Reliability and Modernization	Bridge and Tunnel
	Guideway, Signal, and Power
	Maintenance and Administrative Facilities
	Passenger Facilities
	Vehicles
	Business and Operational Support
	Technology and Innovation
Expansion	Green Line Extension
	South Coast Rail
	Other Expansion Projects

Source: Draft MBTA SFYs 2024–28 Capital Investment Plan.

The MBTA is required by FTA to develop an asset management program to prioritize asset investments based on current condition assessments. Annually, the MBTA reports information about its assets to the National Transit Database and sets forward-looking asset performance targets for fleet age, speed restrictions, and facility condition. These targets are reviewed and approved each year by the MPO and FTA.

The MBTA also updates its Transit Asset Management Plan (TAMP) every four years to identify existing and proposed levels of service and determine life cycle management needs by asset class. The TAMP is intended to document the MBTA's asset portfolio, current condition, and asset management practices and establish the MBTA's approach to maintaining the more than 50,000 assets and 11 asset classes that make up its transit system.

Between SFY 2024 and SFY 2028, the MBTA proposes to spend $9.2 billion on 600 capital projects. Table F-11 shows the MBTA's proposed spending by category.

Table F-11
MBTA Proposed Capital Spending, SFY 2024 to 2028

Primary Mode	Proposed Spending	Number of Projects
Commuter Rail	$2,372	117
Systemwide	$1,841	220
Green Line	$1,654	55
Bus	$1,204	65
Red and Orange Lines	$696	7
Red Line	$598	35
Multimodal	$442	47
Orange Line	$149	18
Blue Line	$79	17
Mattapan Line	$78	3
Ferry	$38	7
Paratransit	$29	4
Silver Line	$28	5

Note: Dollars are shown in millions.

SFY = State Fiscal Year.

Source: Draft MBTA SFYs 2024–28 Capital Investment Plan.

More information can be found in the MBTA's SFY 2024–28 CIP.[10]

10 https://www.mbta.com/financials/capital-investment-plan

RTA Capital Investment

MassDOT's SFYs 2024–28 CIP also includes programs in its reliability and modernization goal areas that are specific to RTAs. Table F-12 lists these programs.

Table F-12
RTA-Related CIP Programs and MassDOT Strategic Goal Areas

Strategic Goal Area	Related Capital Investment Programs
Reliability	RTA Facility and Vehicle Maintenance RTA Vehicle Replacement
Modernization	RTA Facility and System Modernization RTA Fleet Upgrades Program

CIP = Capital Investment Plan. MassDOT = Massachusetts Department of Transportation. RTA = Regional Transit Authority. SFY = State Fiscal Year.

Source: SFYs 2024–28 MassDOT Capital Investment Plan.

The CIP reflects upcoming capital expenditures by MWRTA and CATA, which are informed by their TAM Plans. CATA's upcoming capital expenses include replacement vehicle purchases, shelter replacements, improvements to the parking lot at CATA's Pond Road facility in Gloucester, and purchases of other shop equipment and software. Ongoing capital funding will be needed to support vehicle replacement and facility improvements. Table F-7 shows that CATA can expect to receive $25.8 million in federal Urbanized Area Formula funds to support its capital investments over the life of *Destination 2050*.These funds would be matched by RTA CAP or local funds on a project-by-project basis. These funds may be supplemented by capital awards from MassDOT's Community Transit Grant Program, which are made on an annual basis. CATA uses a large share of its Urbanized Area Formula funds for preventative maintenance for its vehicles. CATA staff notes that in recent years, RTA CAP support from MassDOT has made it possible for the agency to catch up on vehicle replacements.

MWRTA's upcoming capital expenses include continued investment in vehicles, with a goal of replacing one-fifth of its fleet per year. MWRTA will also invest in bus support equipment and IT infrastructure, and it will maintain and make improvements at both its Blandin Avenue facility in Framingham and at the operations center at the Framingham commuter rail station, which it manages and maintains under contract with the MBTA.

Table F-8 shows that MWRTA can expect to receive $118.2 million in federal Urbanized Area Formula (Section 5307) funds over the life of *Destination 2050*. MWRTA typically spends a significant share of these Urbanized Area Formula funds on operating costs each year. It allocates remaining Urbanized Area Formula funds to capital projects after operating needs are met. MWRTA staff also notes that it seeks additional capital funding to help support MWRTA's current level of service (provided six days per week); it also seeks to increase frequency and add evening and Sunday service.

Table F-8
Federal Funds for MWRTA
(repeated from page F-23)

Federal Program	FFYs 2024–28	FFYs 2029–33	FFYs 2034–38	FFYs 2039–43	FFYs 2044–50	Total
Section 5307: Urbanized Area Formula Grants	$16.4	$18.5	$21.0	$23.7	$38.5	$118.2

Note: Funding amounts are shown in millions. FTA Section 5307 funds are expected to increase by 2.5 percent per year. Matching funds are not shown in this table.

FFY = Federal Fiscal Year. FTA = Federal Transit Administration. MassDOT = Massachusetts Department of Transportation. MPO = Metropolitan Planning Organization. MWRTA = MetroWest Regional Transit Authority.

Sources: FTA, MassDOT, and the Boston Region MPO.

TRANSIT OPERATIONS AND MAINTENANCE FINANCING

Transit agencies in the Boston region must not only invest in the capital assets of their transit systems, but also operate and maintain them on an ongoing basis. This section describes the types of revenues and costs associated with MBTA, CATA, and MWRTA operations and maintenance. This section also provides projections of costs and revenues related to operations and maintenance between now and FFY 2050.

MBTA

In SFY 2024, the MBTA expects to receive operating funds from the following sources:

- Sales Tax: The MBTA receives a portion of state sales tax receipts. In SFY 2024, the MBTA expects to receive $1.463 billion from the sales tax, which accounts for 55 percent of annual operating revenue.
- State Assistance: Aside from the sales tax, the MBTA expects to receive $441 million in other state assistance in SFY 2024. This includes one-time and recurring funds, such as $68 million for responding to safety directives from FTA and $5 million for start-up costs related to means-tested fares.

- Fares: Based on ridership projections, the MBTA anticipates receiving $418 million in fare revenue in SFY 2024.
- Local Assessments: The MBTA receives funding through local assessments in accordance with a statutory formula. The municipalities within the MBTA's service district pay an assessment to the MBTA on an annual basis. The amount paid by each municipality varies according to the population and the level of service provided. In SFY 2024, the MBTA anticipates receiving $188 million in local assessments.
- Other operating revenue: The MBTA anticipates receiving $82 million in other operating revenue in SFY 2024. Sources of this revenue include parking, advertising, and real estate.

MBTA operating expenses typically include wages, benefits, payroll taxes, materials, supplies, purchased transportation services, and debt service payments.

Table F-13 shows preliminary projections of available revenue and expenses for the MBTA's operations and maintenance activities during the *Destination 2050* planning period. These estimates reflect baseline service as accounted for in the MBTA's SFY 2024 budget. These baseline estimates reflect year-over-year inflationary increases for each category of spending on wages, materials, and services and contracts.

Table F-13
Projected MBTA Operations and Maintenance Revenues and Costs

Category	SFYs 2024–28	SFYs 2029–33	SFYs 2034–38	SFYs 2039–43	SFYs 2044–50
Operations and Maintenance Revenues					
Fare Revenue	$2,346.7	$2,718.9	$3,147.9	$3,644.6	$6,088.3
Non-Fare Revenue	$497.9	$589.4	$695.7	$821.3	$1,404.6
Sales Tax and Local Assessments	$8,379.4	$9,549.4	$10,882.6	$12,401.9	$20,324.6
Additional State Assistance	$935.0	$935.0	$935.0	$935.0	$1,309.0
Federal and One-Time Revenue	$30.6	$0	$0	$0	$0
Total Revenues	**$12,189.5**	**$13,792.6**	**$15,661.2**	**$17,802.7**	**$29,126.4**
Operations and Maintenance Costs					
Wages, Materials, and Services and Contracts	$11,549.0	$13,985.3	$17,051.4	$20,789.8	$36,980.0
Debt Service	$2,803.1	$3,654.4	$4,807.7	$6,324.9	$12,343.4
Total Costs	**$14,352.1**	**$17,639.7**	**$21,859.1**	**$27,114.7**	**$49,323.4**
Difference Between Revenues and Costs	-$2,162.6	-$3,847.0	-$6,197.9	-$9,312.0	-$20,196.9

Note: Funding amounts are shown in millions. Totals may not sum due to rounding. These estimates reflect baseline service as accounted for in the MBTA's SFY 2024 budget.
MBTA = Massachusetts Bay Transportation Authority. SFY = State Fiscal Year.
Source: MBTA.

MWRTA and CATA

The operation and maintenance needs of the MWRTA and CATA are funded through a variety of sources, including:

- *FTA Funds*: Both agencies receive federal Urbanized Area Formula (Section 5307) funds and are eligible to use as much as 75 percent of those funds on operating expenditures. MWRTA in particular uses a significant portion of its Urbanized Area Formula funds to support operating needs. Urbanized formula funds are matched typically at a 50 percent federal and 50 percent local rate, usually with State Contract Assistance (SCA) funds, which are described below. From time to time, CATA and MWRTA may also receive funds from the Community Transit Grant Program, the federal share being provided by the Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310) program.
- *State Support*: MassDOT distributes SCA funding to RTAs to support their operating expenditures. These dollars, which come from the Commonwealth Transportation Fund and the Massachusetts Transportation Trust Fund, can be used to match federal funds for transit operations. The total amount of SCA funds provided in the state budget is distributed among the RTAs in Massachusetts according to an allocation formula. MWRTA and CATA may occasionally receive funds from other state sources, such as the Massachusetts Rural Transit Assistance program.
- *Local Assessments*: Member municipalities provide annual support for RTA operations.
- *Fare Revenues*: These sources include revenues from fixed-route and demand-response services.
- *Other Non-Fare Sources*: These sources include interest income, rental income, fuel tax rebates, advertising, and parking revenues. MWRTA receives a monthly lease payment for its compressed natural gas fueling facility, and vehicle maintenance revenues through partnership agreements. CATA also generates operating revenue from rent received from leasing space in its building and from contract transportation service.

Both RTAs' operating expenses include administrative staff expenses (salaries, benefits, and payroll taxes), vehicle-related expenses, building- and parking-facility related expenses, and office and business expenses (such as professional services and advertising). MWRTA staff note that it is able to reduce its energy expenses significantly through the use of its solar photovoltaic canopy. RTA operations and maintenance costs also include purchased transportation; these costs include the operating expenses of the private companies that, under contractual arrangements, operate the RTA's services, and management fees. The RTAs are required by law to contract out the operation of their transit service to a private company. These operating arrangements are expected to continue in the future.

To produce estimates of CATA's operating and maintenance costs over the life of *Destination 2050,* MPO staff obtained a SFY 2023 budget from CATA and projected operations revenues and costs using various inflation factors as recommended by CATA. Table F-14 shows projected estimates of CATA's operations and maintenance revenues and costs over the approximate life of *Destination 2050*. These expected dollar amounts will be adjusted on an annual basis and may differ compared to the numbers presented in the table. As shown in the table, revenues are expected to cover costs. However, CATA currently provides limited service throughout the service area, with its most frequent bus service provided hourly. Future service improvements, such as more frequent service and service offered later in the day, will require additional support.

Table F-14
Projected CATA Operations and Maintenance Revenues and Costs

Category	SFYs 2024–28	SFYs 2029–33	SFYs 2034–38	SFYs 2039–43	SFYs 2044–50
Operations and Maintenance Revenues					
FTA Funds*	$6.0	$6.6	$7.3	$8.1	$12.7
State Contract Assistance	$8.3	$9.4	$10.7	$12.1	$19.6
Local Assessments	$4.4	$5.0	$5.6	$6.4	$10.3
Fares	$1.0	$1.0	$1.0	$1.0	$1.3
Other Revenues	$1.8	$1.8	$1.8	$1.8	$2.5
Total Revenues	**$21.4**	**$23.8**	**$26.4**	**$29.3**	**$46.5**
Operations and Maintenance Costs					
Operations and Maintenance Costs	$21.4	$23.8	$26.4	$29.3	$46.5
Difference Between Revenues and Costs	$0	$0	$0	$0	$0

Note: Funding amounts are shown in millions. Totals may not sum due to rounding.

* This category reflects FTA Urbanized Area Formula (Section 5307) funds. CATA spends these dollars on preventative maintenance, a capital expense, but reflects them as part of their annual operations and maintenance budget.

CATA = Cape Ann Transportation Authority. FTA = Federal Transit Administration. MPO = Metropolitan Planning Organization. SFY = State Fiscal Year.

Sources: CATA and the Boston Region MPO.

Table F-15 shows projected estimates of MWRTA's operations and maintenance revenues and costs during the life of *Destination 2050,* following the same approach used to project CATA's operations and maintenance revenues and costs. As with the CATA information presented in Table F-14, dollar amounts will be adjusted on an annual basis and may differ compared to the numbers presented in the table. As shown below, MWRTA's revenues are expected to cover costs. It should be noted, however, that the MWRTA provides limited service six days per week. Future service improvements, including evening and Sunday service, will require additional support.

Table F-15
Projected MWRTA Operations and Maintenance Revenues and Costs

Category	SFYs 2024–28	SFYs 2029–33	SFYs 2034–38	SFYs 2039–43	SFYs 2044–50
Operations and Maintenance Revenues					
FTA Funds*	$16.4	$18.5	$21.0	$23.7	$38.5
State Contract Assistance	$19.3	$21.8	$24.7	$28.0	$45.4
Local Assessments	$19.4	$21.9	$24.8	$28.1	$45.6
Fares	$3.2	$3.7	$4.2	$4.7	$7.7
Other Revenues	$3.4	$3.8	$4.3	$4.9	$7.9
Total Revenues	**$61.7**	**$69.8**	**$79.0**	**$89.4**	**$145.2**
Operations and Maintenance Costs					
Operations and Maintenance Costs	$61.7	$69.8	$79.0	$89.4	$145.2
Difference Between Revenues and Costs	$0	$0	$0	$0	$0

Note: Funding amounts are shown in millions. Totals may not sum due to rounding.

*This category reflects FTA Urbanized Area Formula (Section 5307) funds. MWRTA spends this funding on operating costs, particularly for its ADA paratransit service.

ADA = Americans with Disabilities Act. FTA = Federal Transit Administration. MPO = Metropolitan Planning Organization. MWRTA = MetroWest Regional Transit Authority. SFY = State Fiscal Year.

Sources: MWRTA and the Boston Region MPO.

APPENDIX G

SYSTEMS PERFORMANCE REPORT

Introduction

This appendix discusses the Boston Region MPO's (MPO) performance-based planning and programming (PBPP) process. It also describes the MPO's current set of performance measures and targets, as well as baseline values that reflect the current state-of-the-region's transportation system. Finally, it explains how *Destination 2050* will help the Boston Region MPO make progress toward its performance goals.

Overview of Performance-Based Planning and Programming

Performance-based planning and programming is a process that uses data to help achieve desired transportation outcomes. It improves project and program delivery, informs investment decisions, and provides greater transparency and accountability to the public around transportation project performance.

Performance-based planning and programming activities include

- setting goals and objectives for the transportation system;
- selecting performance measures and setting performance targets;
- gathering data and information to monitor and analyze trends;
- using performance measures and data to make investment decisions; and
- monitoring, analyzing, and reporting decision outputs and performance outcomes.

The MPO's PBPP process is shaped by both federal transportation performance management requirements and the MPO's goals and objectives, which are updated every four years as part of the MPO's Long-Range Transportation Plan (LRTP).

FEDERAL PERFORMANCE MANAGEMENT REQUIREMENTS

The Moving Ahead for Progress in the 21st Century Act (MAP-21) directed states, MPOs, and public transit providers to carry out a performance and outcome-based surface transportation program, and these requirements are continued under current federal regulations under the Fixing America's Surface Transportation (FAST) Act as well as the most recent federal surface transportation reauthorization law, the Bipartisan Infrastructure Law (BIL) of 2021. MAP-21 identified seven national goals for the nation's highway system:

- Safety—Achieve a significant reduction in traffic fatalities and serious injuries on all public roads
- Infrastructure condition—Maintain the highway infrastructure asset system in a state of good repair
- Congestion reduction—Achieve a significant reduction in congestion on the National Highway System (NHS)[1]

1 The National Highway System consists of interstates and other principal arterial roads that are important to the nation's economy, defense, and mobility. Sources: US Department of Transportation (DOT), Federal Highway Administration.

- System reliability—Improve the efficiency of the surface transportation system
- Freight movement and economic vitality—Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
- Environmental sustainability—Enhance the performance of the transportation system while protecting and enhancing the natural environment
- Reduced project delivery delays—Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

Table G-1 shows the relationship between national goal areas and the MPO's goal areas. The MPO's goals and related objectives are described in more detail in Chapter 1.

Table G-1
National and Boston Region MPO Goal Areas

National Goal Area	Boston Region MPO Goal Area
Safety	Safety
Infrastructure Condition	Mobility and Reliability, Resiliency
System Reliability	Mobility and Reliability
Congestion Reduction	Mobility and Reliability
Freight Movement/Economic Vitality	Mobility and Reliability, Access and Connectivity
Environmental Sustainability	Clean Air and Healthy Communities, Resiliency
Reduced Project Delivery Delays	Not applicable
Not applicable	Transportation Equity

MPO = Metropolitan Planning Organization.

Source: Boston Region MPO.

The PBPP mandate is also designed to help the nation's public transit systems provide high-quality service to all users, including people with disabilities, seniors, and individuals who depend on public transportation.

The US Department of Transportation (USDOT) has established measures in performance areas that support the national goals. Table G-2 lists federally required performance measures for public transit systems and Table G-3 lists those for roadway safety. These performance measures and relevant performance targets are discussed in more detail later in this chapter.

Table G-2
Federally Required Public Transit Performance Measures

National Goal Area	Transit Performance Area or Asset Category	Performance Measures	Relevant MPO Goal Area
Safety	Fatalities	Total number of reportable fatalities and rate per total vehicle revenue-miles by mode	Safety
Safety	Injuries	Total number of reportable injuries and rate per total vehicle revenue-miles by mode	Safety
Safety	Safety Events	Total number of reportable events and rate per total vehicle revenue-miles by mode	Safety
Safety	System Reliability	Mean distance between major mechanical failures by mode	Safety
Infrastructure Condition	Equipment	Percent of vehicles that have met or exceeded their ULB	Mobility and Reliability
Infrastructure Condition	Rolling Stock	Percent of revenue vehicles within a particular asset class that have met or exceeded their ULB	Mobility and Reliability
Infrastructure Condition	Infrastructure	Percent of track segments with performance restrictions	Mobility and Reliability
Infrastructure Condition	Facilities	Percent of facilities within an asset class rated below 3.0 on the Federal Transit Administration's Transit Economic Requirements Model scale	Mobility and Reliability

MPO = Metropolitan Planning Organization. ULB = Useful Life Benchmark.

Sources: National Public Transportation Safety Plan (July 2018), the Public Transportation Agency Safety Plan Rule (Title 49 Code of Federal Regulations [CFR] Part 673), and the Transit Asset Management Rule (49 CFR Part 625).

Table G-3
Federally Required Roadway Performance Measures

National Goal Area	Highway Performance Area	Performance Measures	Relevant MPO Goal Area
Safety	Injuries and Fatalities	• Number of fatalities • Fatality rate per 100 million vehicle-miles traveled • Number of serious injuries • Serious injury rate per 100 million vehicle-miles traveled • Number of nonmotorized fatalities and nonmotorized serious injuries	Safety
Infrastructure Condition	Pavement Condition	• Percent of pavements on the Interstate System in good condition • Percent of pavements on the Interstate System in poor condition • Percent of pavements on the non-Interstate NHS in good condition • Percent of pavements on the non-Interstate NHS in poor condition	Mobility and Reliability
Infrastructure Condition	Bridge Condition	• Percent of NHS bridges by deck area classified as in good condition • Percent of NHS bridges by deck area classified as in poor condition	Mobility and Reliability
System Reliability	Performance of the NHS	• Percent of the person-miles traveled on the Interstate System that are reliable • Percent of the person-miles traveled on the non-Interstate NHS that are reliable	Mobility and Reliability
System Reliability, Freight Movement, and Economic Vitality	Freight Movement on the Interstate System	• Truck Travel Time Reliability Index (for truck travel on interstate highways)	Mobility and Reliability
Congestion Reduction	Congestion Mitigation and Air Quality	• Annual hours of peak hour excessive delay per capita (for travel on NHS roadways) • Percentage of non-single-occupant vehicle travel	Access and Connectivity, Mobility and Reliability, Clean Air and Healthy Communities
Environmental Sustainability	Congestion Mitigation and Air Quality	• Total emissions reduction for applicable pollutants and precursors for CMAQ-funded projects in designated nonattainment and maintenance areasa	Clean Air and Healthy Communities

[a] As of the FHWA 2021 Congestion Mitigation and Air Quality Improvement Program performance requirements applicability determination, the Boston Region MPO area contains an area designated as in maintenance for carbon monoxide, so the MPO is currently required to comply with this performance measure requirement. This designation expired in April 2022; however, the MPO must fulfill these performance requirements at least until FHWA issues an updated applicability determination related to CMAQ performance requirements.

CMAQ = Congestion Mitigation and Air Quality Improvement. FHWA = Federal Highway Administration. MPO = Metropolitan Planning Organization. NHS = National Highway System.

Sources: Highway Safety Improvement Program Rule (23 CFR 924), National Performance Management Measures Rule (23 CFR 490).

Federal performance measure rulemakings identify key activities that agencies receiving federal transportation dollars must complete in order to integrate these federally required performance measures into their planning processes:

- The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) require State DOTs, MPOs, and public transportation providers to establish targets for relevant performance measures and to develop written provisions that describe how they will coordinate with one another on data collection and sharing, target setting, reporting, and related activities.
- States are required to create performance-based plans, such as the Strategic Highway Safety Plan (SHSP) or the Transportation Asset Management Plan (TAMP) for the state's NHS bridges and pavements. Public transportation providers similarly must produce Transit Asset Management (TAM) Plans and Public Transportation Agency Safety Plans (PTASP). MPOs are required to integrate these plans into their planning processes and to create other performance-based plans, such as the Congestion Mitigation and Air Quality Improvement (CMAQ) Program Performance Plans, as necessary.
- States must report performance targets and progress to FHWA, while public transit providers report this information to FTA, including through the National Transit Database (NTD). MPOs list performance measures and targets and provide an evaluation of the transportation system's current performance with respect to performance targets in their LRTPs. When applicable, these reports must compare the MPO's progress on relevant performance measures to system performance recorded in previous LRTPs. Further, when MPOs prepare their capital programs, the Transportation Improvement Program (TIP), they must describe how they expect TIP investments will help achieve performance targets. States must provide similar information in their State Transportation Improvement Programs (STIP).

OTHER PERFORMANCE-BASED PLANNING AND PROGRAMMING ACTIVITIES

The MPO's PBPP process must respond to the federal performance management requirements established under MAP-21 and the BIL, but it can also address other areas that pertain to its 3C responsibilities or to the MPO's goals and objectives. For example, MAP-21 and the BIL do not specify transportation equity (TE) performance measures for states and MPOs to monitor. However, the MPO has established a TE goal to

> *Facilitate an inclusive and transparent transportation planning process and make investments that eliminate transportation-related disparities borne by people in disadvantaged communities.*

TE populations include people who identify as minority, low-income population, people with limited English proficiency, older adults, youth, and people with disabilities. These populations include those protected by federal laws and regulations and that have been disproportionately and adversely impacted by the region's transportation system.[2]

The MPO's TE goal and its associated objectives are rooted in several federal regulations and presidential executive orders, including Title VI of the Civil Rights Act of 1964, Executive Order 12898 (addressing environmental justice [EJ]), the Americans with Disabilities Act, and other USDOT orders. To comply with these regulations, the MPO addresses the concerns of populations that these regulations protect, referred to here as TE populations, throughout the MPO planning process. Currently, the MPO evaluates projects proposed for funding in the TIP to determine whether and how they will benefit TE populations. In addition, after projects are selected, the MPO assesses the impacts of the projects, in the aggregate, in the LRTP and TIP, on TE populations to identify any disproportionately high and adverse effects. MPO staff are developing additional ways to monitor a wider range of impacts in order to assess project impacts relative to existing transportation inequities in the Boston region, which the MPO can use to adjust project investments as needed to address inequities that persist.

Moving forward, the MPO will examine whether and how to incorporate other performance measures and practices into its PBPP process. The creation of additional performance measures may allow MPO programs to more efficiently allocate money toward improving its long-range goals and objectives.

Performance-based Planning and Programming Activities

The PBPP process involves three key phases: (1) planning, (2) investing, and (3) monitoring and evaluating.

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2 TE populations are identified using census data and are defined as follows:

- People who identify as a minority include those who identify as Hispanic or Latino/a/x and/or a race other than White.
- A person is considered to have a low income if their annual family income is less than or equal to 200 percent of the poverty level for their family size.
- People with limited English proficiency are those who report speaking English less than "very well" on the American Community Survey.
- The older adult population refers to people ages 75 years and older.
- The youth population refers to people ages 17 years and younger.

PLANNING PHASE

In the planning phase, agencies set goals and objectives for the transportation system, identify performance measures, and set performance targets that will guide their decision-making. They identify and acquire data and conduct analyses necessary to support these processes. They also create the frameworks they will use in key planning documents.

The Commonwealth creates performance-based plans for Massachusetts, such as the SHSP, TAMP, and the Massachusetts Department of Transportation (MassDOT) TAM Plan, along with modal plans—such as its Freight Plan, Bicycle Transportation Plan, and Pedestrian Transportation Plan—which include PBPP elements. Similarly, transit agencies, including the Massachusetts Bay Transportation Authority (MBTA), MetroWest Regional Transit Authority (MWRTA), and Cape Ann Transportation Authority (CATA), create TAM plans and PTASP that describe the data and processes these agencies will use to address transit state of good repair and safety needs. The Commonwealth is responsible for setting performance targets for the federally required roadway performance measures in Table G-3, while transit agencies must set targets for the measures in Table G-2. MassDOT's annual Tracker report (massdottracker.com) describes the agency's performance measure targets, including measures pertaining to the MBTA and the Commonwealth's regional transit authorities.

MPO activities in the planning phase include setting goals for the transportation system through its LRTP and establishing targets for federally required performance measures. To establish these targets, the MPO may elect to support performance targets set by the Commonwealth or public transit providers (depending on the measure), or it may set separate targets for the MPO area. MPOs typically have 180 days after a state establishes a set of performance targets to choose to support those state targets or to adopt separate targets for the MPO region. For transit safety and asset management targets, MPOs work with local transit providers to develop targets that are appropriate for the region. These agencies update their performance targets based on defined cycles, which vary for different measures:

- States and MPOs update roadway safety measure targets annually.
- States set two-year and four-year targets for NHS bridge and pavement condition and reliability measures and for the Interstate truck travel time reliability measure; MPOs set four-year targets for these measures.
- States and MPOs set two-year and four-year targets for the CMAQ emissions reduction measure, depending on applicability determined by FHWA.
- MPOs work with applicable transportation agencies in their Urbanized Area (UZA) to set two-year and four-year targets for CMAQ traffic congestion measures.

- Transit agencies update their TAM Plans and transit asset management targets annually.
- Transit agencies update their PTASPs at least every four years which will include targets for transit safety performance measures. The MPO revisits its targets in these performance areas each year when updating its TIP.

INVESTING PHASE

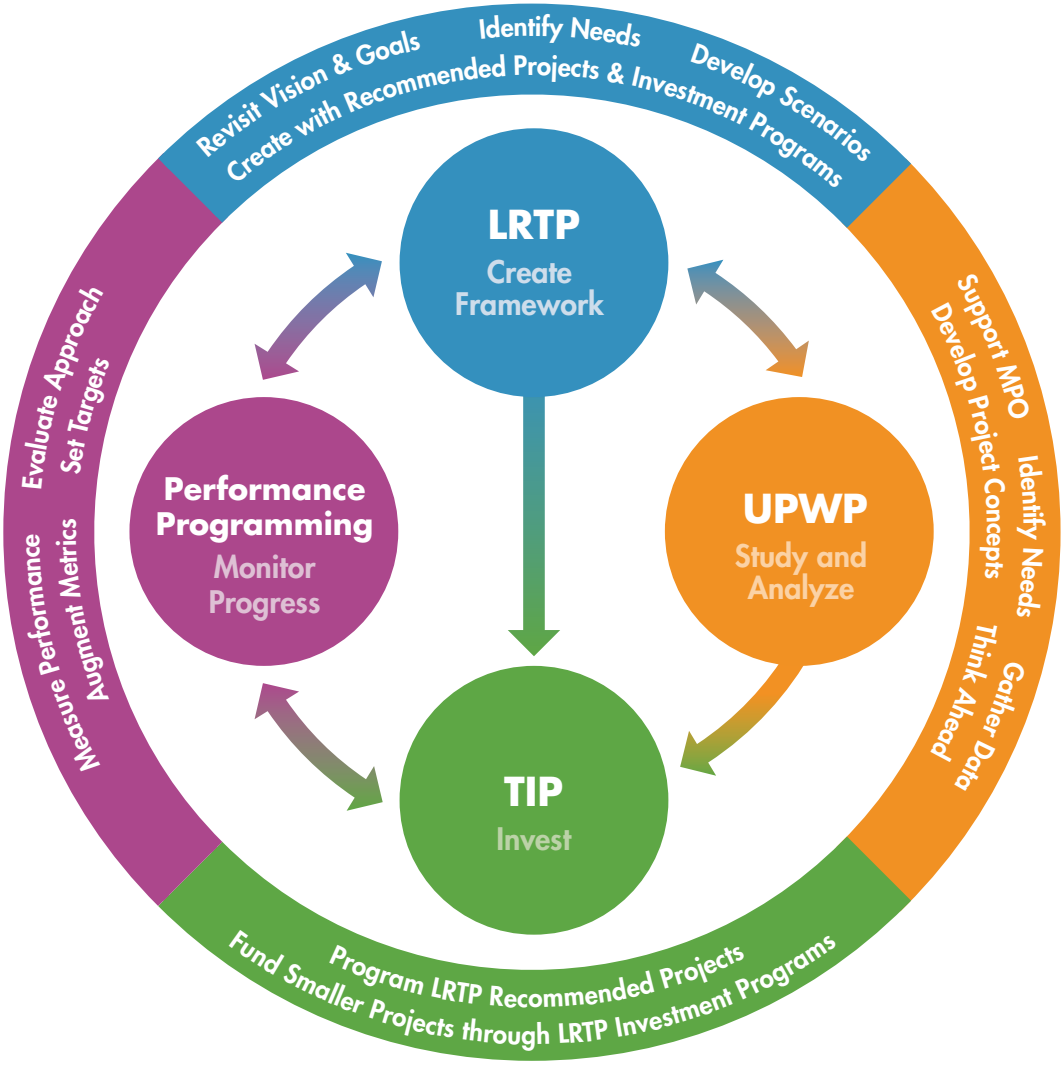
In the investing phase, agencies use the PBPP framework established in the planning phase to create strategies for investing in transportation improvements. The MPO develops investment programs and selects projects to fund with its Regional Target funds and documents those decisions in the LRTP and TIP. The LRTP identifies major infrastructure projects that may be funded in the region over the next 20 years or more, as well as establishes investment programs through which smaller-scale projects will be funded in the TIP. As the MPO's capital program, the TIP documents funding provided for all surface transportation in the region for a given five-year timeframe. Similarly, MassDOT, the MBTA, CATA, and MWRTA follow their processes to size programs and select projects for inclusion in the MassDOT Capital Investment Plan (CIP). The federally funded investments in the CIP are also documented in the STIP.

MONITORING AND EVALUATING PHASE

In the last step, agencies evaluate their progress by reviewing and reporting on the performance of their transportation investments. Activities include tracking trends, collecting data to understand the impacts of project investments, and comparing targets to actual performance. At the statewide level, MassDOT reports performance to USDOT, including information about its federally required performance targets from the TIP. MassDOT's Tracker website (massdottracker.com) also includes detailed information about the agency's targets and progress. Transit agencies report progress on TAM measures to the NTD each year. The MPO reports on performance in the LRTP and through its Congestion Management Process, as well as through other tools, such as its PBPP webpage (https://www.bostonmpo.org/performance) and the MPO's Performance Dashboard. The MPO also assesses the need for new data, analysis tools, or methods to support its PBPP process, and may designate resources to address these needs in its Unified Planning Work Program.

Figure G-1 summarizes the three phases of this process, with a focus on MPO activities taking place in each phase.

Figure G-1
Phases in the MPO's Performance-Based Planning and Programming Process



LRTP = Long-Range Transportation Plan. MPO = Metropolitan Planning Organization. TIP = Transportation Improvement Program. UPWP = Unified Planning Work Program.
Source: Boston Region MPO.

COORDINATION

States, public transit operators, and MPOs must coordinate with one another and share information and data to ensure consistency across PBPP processes. In Massachusetts, coordination responsibilities are outlined in the 2019 Performance-Based Planning and Programming Agreement between MassDOT, Massachusetts MPOs, municipalities, the MBTA, and regional transit authorities operating in Massachusetts.

Staff from Massachusetts MPOs, MassDOT, and other stakeholders coordinate on PBPP implementation through the Transportation Program Managers Group's subcommittee on performance measures. For performance measures that states and MPOs track at the Boston UZA level, coordination responsibilities are documented in the 2018 Boston Urbanized Area Memorandum of Understanding.[3]

The LRTP's Role in Performance-based Planning and Programming

The LRTP plays several key roles in the MPO's PBPP process, many of which fall into the planning phase.

- Through the development of the LRTP Needs Assessment , the MPO assesses the condition and performance of the transportation system and the transportation needs of the region's residents. Findings from this process that pertain to performance measures support this system performance report.
- Using information provided by the Needs Assessment and stakeholder and public feedback, the MPO creates a vision and a set of goals and objectives, which define the MPO's desired state for the transportation system. In doing so, the MPO identifies what it wants to achieve by investing in the transportation system over the next 20 years or more. This framework influences the performance measures that the MPO tracks and the performance targets it adopts. The MPO further reinforces this framework by creating project selection criteria that help to select projects to advance these goals.
- The LRTP also describes the overarching investment strategies that the MPO will follow to make progress on performance measures and MPO goals. These include investment programs and guidelines, which the MPO uses to direct its funds toward achieving desired outcomes. Because transportation needs often outpace available funding, these investment strategies help the MPO prioritize its transportation investments.

3 Urbanized Areas (UZAs) are defined by the US Census Bureau to represent the urban cores of metropolitan areas. The Boston UZA includes the 97 municipalities in the Boston Region MPO and includes portions of neighboring MPOs in eastern Massachusetts and New Hampshire.

Once the LRTP is completed and in effect, the MPO refers to it on an ongoing basis to support its PBPP process. The LRTP's investment strategies also inform the short-term capital investment decisions the MPO makes each year in the TIP, which describes the links between short-term capital investment priorities and the MPO's performance goals, measures, and performance targets. The system performance report in the LRTP provides a snapshot in time that the MPO can use to benchmark its progress in improving both the transportation system and transportation performance outcomes.

Boston Region Transportation System Performance

As of July 2018, FHWA and FTA published final rules for all performance measure rulemakings associated with the performance management mandate first included in MAP-21 and continued as part of the Bipartisan Infrastructure Law. This section is the MPO's second report on system performance since those federal rules were finalized. It provides information about plans, measures, baselines, and targets that are relevant to each MPO goal area, and it concludes with a description of how *Destination 2050's* investment strategies—including its investment programs and projects—support progress in achieving MPO goals and federally required performance areas.

SAFETY PERFORMANCE

Relevant Goals, Policies, and Plans

The MPO's safety goal is to

> *Achieve zero transportation-related fatalities and serious injuries and improve safety for all users of the transportation system.*

The MPO has committed to investing in projects and programs that reduce the number and severity of crashes for all modes, and to reducing serious injuries and fatalities occurring on the transportation system. Similarly, the Massachusetts SHSP includes a long-term goal to move "toward zero deaths" by eliminating fatalities and serious injuries on the Commonwealth's roadways and has set interim goals for 2024 to reduce fatalities and serious injuries for a five-year average by two percent.[4] The MPO works closely with the MBTA, CATA, and MWRTA to make safety-oriented investments and implement related initiatives as identified in their PTASPs.

4 PTASP FFY 2023 Massachusetts Highway Safety Plan available at https://www.mass.gov/doc/ffy-2023-massachusetts-highway-safety-plan/download, pg. 27.

Roadway Safety Measures, Baselines, and Targets

The Commonwealth of Massachusetts and the MPO track traffic crashes, fatalities, and injuries involving motor vehicles using information from the Massachusetts Crash Data System and the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis and Reporting System. These data inform the targets that the Commonwealth and the MPO must set each calendar year (CY) for five federally required roadway safety performance measures:

- Number of fatalities
- Fatality rate per 100 million vehicle-miles traveled (VMT)
- Number of serious injuries
- Serious injury rate per 100 million VMT
- Number of nonmotorized fatalities and nonmotorized serious injuries

Table G-4 lists the Commonwealth's 2017–21 rolling average values for the fatality and serious injury performance measures; these make up Massachusetts' current roadway safety baselines for these measures. This table also lists the Commonwealth's current (CY 2023) targets for the federally required roadway safety performance measures. The MPO elected to support the Commonwealth's CY 2023 roadway safety performance targets in February 2023. In doing so, the MPO agrees to plan and program projects that contribute to achieving these targets.

Table G-4
Massachusetts Highway Safety Performance Baselines and CY 2023 Targets

Highway Safety Performance Measure	Baseline: 2022 Safety Measure Value (2017–21 Rolling Average)	2023 Safety Measure Target (Expected 2019–23 Rolling Average)
Number of fatalities	359.20	355.00
Rate of fatalities per 100 million vehicle-miles traveled	0.59	0.59
Number of serious injuries	2,624.80	2,569.00
Rate of serious injuries per 100 million vehicle-miles traveled	4.29	4.25
Number of nonmotorized fatalities and nonmotorized serious injuries	467.60	437.00

Note: All values have been rounded to the hundredth place.

CY = calendar year.

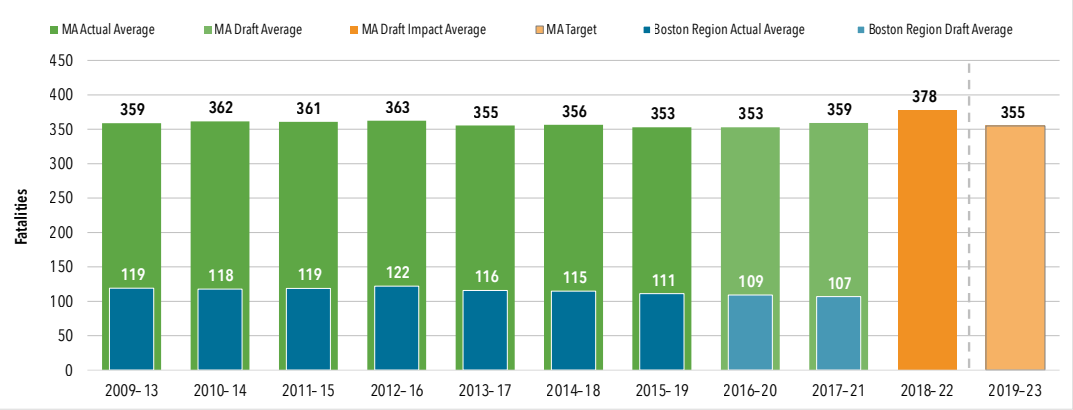
Sources: National Highway Traffic Safety Administration Fatality Analysis Reporting System, Massachusetts Crash Data System, and Massachusetts Department of Transportation.

These measures pertain to fatalities and serious injuries from motor vehicle crashes and apply to all public roads, and are expressed as five-year rolling annual averages. The Commonwealth set its current set of roadway safety performance targets to reflect a 2019–23 rolling annual average, as required by FHWA. When setting these targets, the Commonwealth considered the following:

- Historic trends for these measures and their component metrics (such as annual VMT)
- Effects on driving and safety due to measures implemented during the COVID-19 pandemic
- Planned implementation of safety countermeasures, including engineering, enforcement, education, awareness, and emergency response strategies

Figure G-2 shows historic and projected values for the number of fatalities resulting from motor vehicle crashes, while Figure G-3 shows the fatality rate per 100 million VMT. The Commonwealth considered this information when setting targets for lowering the number of fatalities. Meanwhile, VMT has been gradually increasing for both the Boston region and Massachusetts as a whole, which also has contributed to historic and projected decreases in the fatality rate.

Figure G-2
Fatalities from Motor Vehicle Crashes

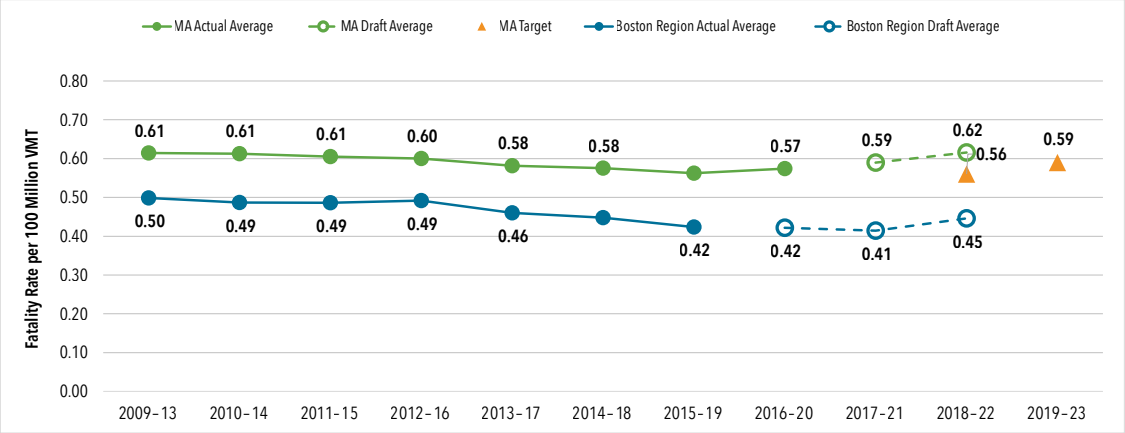


Note: Values reflect five-year rolling annual averages and have been rounded to the nearest integer.

MA = Massachusetts.

Sources: National Highway Traffic Safety Administration Fatality Analysis and Reporting System, Massachusetts Department of Transportation, and the Boston Region Metropolitan Planning Organization.

Figure G-3
Fatality Rate per 100 Million Vehicle-Miles Traveled



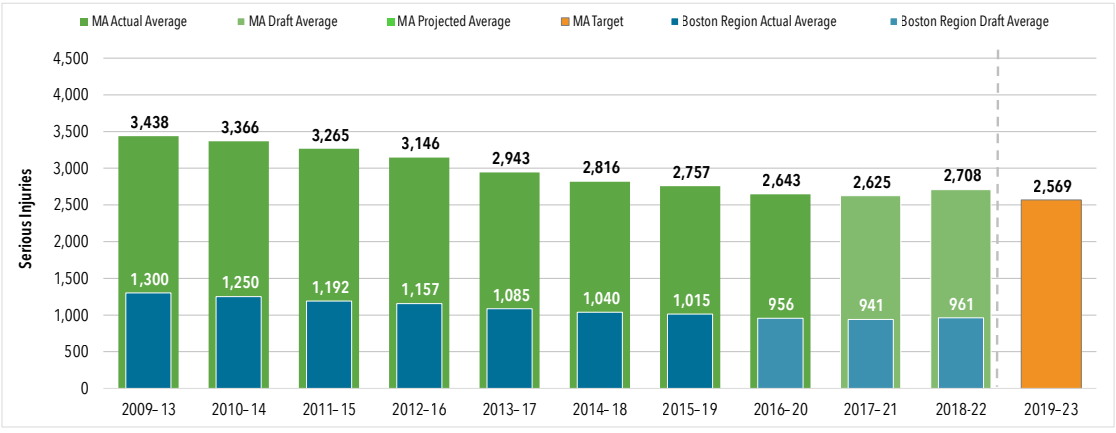
Note: Values reflect five-year rolling annual averages and have been rounded to the hundredth decimal place.

MA = Massachusetts. VMT = vehicle-miles traveled.

Sources: National Highway Traffic Safety Administration Fatality Analysis and Reporting System, Massachusetts Department of Transportation., and the Boston Region Metropolitan Planning Organization.

Figure G-4 shows historic and projected values for the number of serious injuries resulting from motor vehicle crashes, and Figure G-5 shows the serious injury rate per 100 million VMT.[5]

Figure G-4
Serious Injuries from Motor Vehicle Crashes

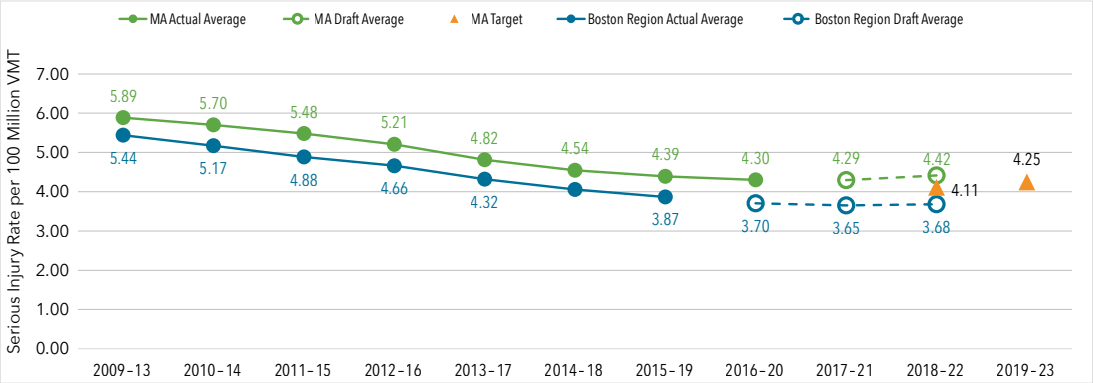


Note: Values reflect five-year rolling annual averages and have been rounded to the nearest integer.

Sources: Massachusetts Crash Data System, Massachusetts Department of Transportation, and the Boston Region Metropolitan Planning Organization.

5 MassDOT defines serious injuries as incapacitating injuries, which it identifies through incident reporting by police and vehicle operators using the Commonwealth of Massachusetts Motor Vehicle Crash Operator Report.

Figure G-5
Serious Injury Rate per 100 Million Vehicle-Miles Traveled



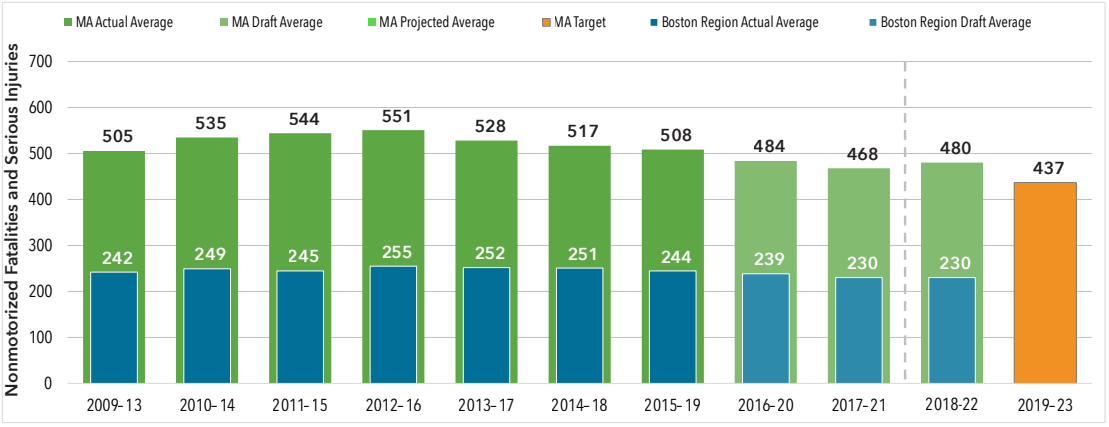
Note: Values reflect five-year rolling annual averages and have been rounded to the hundredth decimal place.

VMT = vehicle-miles traveled.

Sources: Massachusetts Crash Data System, Massachusetts Department of Transportation, and the Boston Region Metropolitan Planning Organization.

Figure G-6 shows historic and projected values for the number of fatalities and serious injuries experienced by people traveling by nonmotorized transportation for the Boston region and Massachusetts as a whole. This category reflects bicyclist and pedestrian fatalities and serious injuries, as well as those experienced by others traveling by nonmotorized modes (such as skateboarders and people using wheeled mobility devices).

Figure G-6
Nonmotorized Fatalities and Serious Injuries



Notes: Values reflect five-year rolling annual averages and have been rounded to the nearest integer.

Sources: National Highway Traffic Safety Administration Fatality Analysis and Reporting System, Massachusetts Crash Data System, Massachusetts Department of Transportation, and the Boston Region Metropolitan Planning Organization.

Transit System Safety Measures and Targets

The National Public Transportation Safety Plan details performance measures for which transit agencies subject to the PTASP rule must set targets. The PTASP rule requires public transit providers, MPOs, and states to coordinate in developing targets for federally established transit asset performance measures. Once transit agencies develop their safety plans and performance targets, they must share them with state Department of Transportations and MPOs, which set targets for their states and regions, respectively. General information on these topics is available in the *Destination 2050* Needs Assessment. Required performance measures include the following include the following:

- The total number of reportable fatalities and the fatality rate per vehicle revenue-miles (VRM), by mode
- The total number of reportable injuries and the injury rate per VRM, by mode
- The total number of reportable safety events and the safety event rate per VRM, by mode
- System reliability, which is measured by the distance between major mechanical failures, by mode

MBTA Safety Targets

The MBTA sets targets for four modes: heavy rail (Red, Orange, and Blue Lines), light rail (Green Line and the Mattapan High Speed Line), bus, and The RIDE paratransit system. Table G-5 shows averages for the transit safety measures for MBTA heavy rail, light rail, bus, and The RIDE from CYs 2019 to 2021.

Table G-5
Past Safety Performance Data for MBTA Transit Services
(CYs 2019–21 Averages)

MBTA Mode	Average Fatalities	Average Fatality Rate[1]	Average Injuries	Average Injury Rate[1]	Average Safety Events	Average Safety Event Rate[1]	Average System Reliability Value[2]
Heavy Rail	0.33	0.01	184.00	8.16	25.00	1.09	43,713.00
Light Rail	0.00	0.00	81.00	14.64	28.00	5.04	7,515.00
Bus	1.00	0.05	292.00	12.48	100.00	4.29	29,099.00
The RIDE	0.00	0.00	27.00	2.31	21.00	1.77	61,231.00

Notes: This table reflects data available at the time the MBTA developed its targets.

[1] Fatality, injury, and safety event rates are expressed per one million VRM. Rate values have been rounded to the nearest hundredth.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

CY = calendar year. MBTA = Massachusetts Bay Transportation Authority. VRM = vehicle revenue-miles.

Source: MBTA and the Boston Region MPO staff.

The MBTA's safety performance targets for CY 2023 are shown in Table G-6. When setting targets, the MBTA varied its approach by measure:

- Fatalities and Fatality Rates: The MBTA notes that fatality rates vary across modes due to the distinct operating environments and the inherent safety risk exposure associated with each mode. The MBTA is committed to reducing the number of fatalities across its system to zero and continues to invest in proactive solutions to achieve this goal.[6]
- Injuries and Injury Rates: The MBTA set its targets for these two injury measures by assuming a two percent decrease in the injury rate from the CYs 2019–21 average for each mode.
- Safety Events and Safety Event Rates: The MBTA established targets for these two measures by assuming a two percent decrease in the safety event rate from the CYs 2019–21 average. The MBTA uses both proactive and reactive safety risk management strategies to reduce the rate of safety events on its system.

6 MBTA, MBTA Transit Safety Plan, pg. 37.

- System Reliability: Transit system reliability is measured by the mean VRM traveled between major mechanical failures. The MBTA plans to introduce new vehicles into its fleets on multiple modes over the next few years. As these new vehicles are brought into revenue service, the MBTA will continue to monitor them. During this additional "burn-in" period, there may be a decrease in reliability. With this possibility in mind, the MBTA will strive to maintain the highest level of system reliability in CY 2023.[7]

Table G-6
MBTA CY 2023 Safety Performance Targets

MBTA Mode	Fatalities Target	Fatality Rate Target[1]	Injuries Target	Injury Rate Target[1]	Safety Events Target	Safety Event Rate Target[1]	System Reliability Target[2]
Heavy Rail	0.0	0.0	180.0	7.99	24.0	1.07	44,500
Light Rail	0.0	0.0	79.0	14.35	27.0	4.94	7,650
Bus	0.0	0.0	286	12.23	98.0	4.21	29,500
The RIDE[3]	0.0	0.0	27.0	2.27	20.0	1.74	62,500

[1] Fatality, injury, and safety event rates are expressed per one million VRM. Rate values have been rounded to the nearest tenth.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

[3] The injuries target for The RIDE remains the same as past averages due to rounding.

CY = calendar year. MBTA = Massachusetts Bay Transportation Authority. VRM = vehicle revenue-miles.

Source: MBTA and the Boston Region MPO staff.

7 MBTA, MBTA Transit Safety Plan, pg. 40.

CATA Safety Targets

CATA monitors safety performance and sets targets for its fixed-route bus service and its demand response service. Table G-7 provides SFY 2018–22 averages for the fatality, injury, safety event, and system reliability measures for CATA's fixed-route bus and demand response systems.[8]

Table G-7
Past Safety Performance Data for CATA Transit Services
(SFY 2018–22 Averages)

CATA Mode	Average Fatalities	Average Fatality Rate[1]	Average Injuries	Average Injury Rate[1]	Average Safety Events	Average Safety Event Rate[1]	Average System Reliability Value[2]
Fixed-Route Bus	0.0	0.0	0.2	0.1	2.4	0.2	73,603
Demand Response	0.0	0.0	0.2	0.2	1.2	0.8	133,848

Note: Values have been rounded to the nearest tenth.

[1] Fatality, injury, and safety event rates are expressed per one hundred thousand VRM.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

CATA = Cape Ann Transportation Authority. CY = calendar year. VRM = vehicle revenue-miles.

Sources: CATA, the National Transit Database, and the Boston Region MPO staff.

8 Specific data sources include the March 6, 2023, Monthly Modal Time Series file (available at https://data.transportation.gov/Public-Transit/Monthly-Modal-Time-Series/5ti2-5uiv), the March 6, 2023, Major Safety Events file (available at https://data.transportation.gov/Public-Transit/Major-Safety-Events/9ivb-8ae9), the 2017-21 Annual Database Vehicle Maintenance files (available at www.transit.dot.gov/ntd/ntd-data), and the January 2023 Monthly Module Adjusted Data Release file (available at www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release).

Table G-8 provides a summary of CATA's SFY 2023 performance targets, which cover the period from July 2022 to June 2023. Targets are expressed per one hundred thousand VRM. In general, CATA used past data and averages as the basis for determining its transit safety performance targets for SFY 2023. When CATA set targets, it reviewed data for years when injuries or safety events did take place.

Table G-8
CATA SFY 2023 Safety Performance Targets

CATA Mode	Fatalities Target	Fatality Rate Target[1]	Injuries Target	Injury Rate Target[1]	Safety Events Target	Safety Event Rate Target[1]	System Reliability Target[2]
Fixed-Route Bus	0.0	0.0	1.0	0.5	2.5	1.5	70,000.0
Demand Response	0.0	0.0	1.0	0.5	1.5	1.0	135,000.0

Note: Values have been rounded to the nearest tenth.

[1] Fatality, injury, and safety event rates are expressed per one hundred thousand VRM.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

CATA = Cape Ann Transportation Authority. SFY = state fiscal year. VRM = vehicle revenue-miles.

Source: CATA and the Boston Region MPO staff.

MWRTA Safety Targets

MWRTA monitors performance and sets targets for fixed-route bus service and demand response services. Table G-9 shows SFY 2018–22 averages for the transit safety measures for MWRTA's transit services.[9] MWRTA's rate values are expressed in 100,000 VRM.

Table G-9
Past Safety Performance Data for
MWRTA Transit Services (SFYs 2018–22 Averages)

MWRTA Mode	Average Fatalities	Average Fatality Rate[1]	Average Injuries	Average Injury Rate[1]	Average Safety Events	Average Safety Event Rate[1]	Average System Reliability Value[2]
Fixed-Route Bus	0.0	0.0	0.6	0.05	1.4	0.13	128,551
Demand Response	0.0	0.0	0.6	0.07	1.6	0.20	67,468

Note: Values have been rounded to the nearest tenth.

[1] Fatality, injury, and safety event rates are expressed per one hundred thousand VRM.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

MWRTA = MetroWest Regional Transit Authority. VRM = vehicle revenue-miles.

Sources: MWRTA, the National Transit Database, and the Boston Region MPO staff.

9 Specific data sources include the March 6, 2023, Monthly Modal Time Series file (available at https://data.transportation.gov/Public-Transit/Monthly-Modal-Time-Series/5ti2-5uiv , the March 6, 2023, Major Safety Events file (available at https://data.transportation.gov/Public-Transit/Major-Safety-Events/9ivb-8ae9), the 2017-21 Annual Database Vehicle Maintenance files (available at www.transit.dot.gov/ntd/ntd-data), and the January 2023 Monthly Module Adjusted Data Release file (available at www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release).

Table G-10 provides a summary of MWRTA's SFY 2022 performance targets, which include fatality, injury, and safety event rates expressed per one hundred thousand VRM. MWRTA set its transit safety performance targets by reviewing historic safety data for its fleet and by planning to operate as safely as possible and by proactively addressing hazards as they are identified.

Table G-10
MWRTA SFY 2023 Safety Performance Targets

MWRTA Mode	Fatalities Target	Fatality Rate Target[1]	Injuries Target	Injury Rate Target[1]	Safety Events Target	Safety Event Rate Target[1]	System Reliability Target[2]
Fixed-Route Bus	0.00	0.00	12.00	1.0	15.0	1.25	75,000
Demand Response	0.00	0.00	8.00	1.0	10.0	1.25	75,000

Note: Values have been rounded to the nearest tenth

[1] Fatality, injury, and safety event rates are expressed per one hundred thousand VRM.

[2] The system reliability measure is expressed as mean VRM traveled per major mechanical failure.

MWRTA = MetroWest Regional Transit Authority. VRM = vehicle revenue-miles.

Source: MWRTA and the Boston Region MPO.

MOBILITY AND RELIABILITY PERFORMANCE

Relevant Goals, Policies, and Plans

The MPO's goal for this area is to

Support easy and reliable movement of people and freight.

Mobility policies for the region explore the ease with which people and goods can move throughout the region by car, on foot, on public transit, by bicycle, and through freight. Reliability encompasses bridges, pavement, sidewalks, and transit system assets, and addresses maintenance and state-of-good-repair needs to meet the transportation needs of the region.

Roadway Asset Condition

Bridge Condition

To meet federal performance monitoring requirements, states and MPOs must track and set performance targets for the condition of bridges on the NHS. FHWA's bridge condition performance measures include the following:

- Percentage of NHS bridges by deck area classified as in good condition
- Percentage of NHS bridges by deck area classified as in poor condition

NHS ratings classify bridge condition as good, fair, or poor based on the condition of three bridge components: the deck, the superstructure, and the substructure.[10] The lowest rating of the three components determines the overall bridge condition.[11] The performance measures express the share of NHS bridges in a certain condition by deck area, divided by the total deck area of NHS bridges in the applicable geographic area (state or MPO).

Table G-11 shows performance baseline condition of bridges on the NHS in Massachusetts and the Boston region. The Boston region has a larger share of NHS bridge deck area considered to be in good condition, and a slightly smaller share of NHS bridge deck area considered to be in poor condition, compared to Massachusetts overall.

Table G-11
Massachusetts and Boston Region NHS Bridge Condition Baselines

Geographic Area	Total NHS Bridges	Total NHS Bridge Deck Area (square feet)	Percent of NHS Bridges in Good Condition	Percent of NHS Bridges in Poor Condition
Massachusettsa	2,246	28,689,888	16.9%	11.3%
Boston region[b]	844	13,916,199	15.7%	12.9%

[a] Massachusetts baseline data are based on a Massachusetts Department of Transportation analysis conducted in 2022.

[b] Boston region comparison data are based on a Boston Region Metropolitan Planning Organization analysis conducted in 2022.

NHS = National Highway System.

Sources: Massachusetts Department of Transportation and Boston Region Metropolitan Planning Organization.

10 National Bridge Inventory data are used to rate these components on a scale of zero (worst) to nine (best). The FHWA has classified these bridge ratings into good (seven, eight, or nine on the scale), fair (five or six), or poor (four or less).

11 Culverts are assigned an overall condition rating.

States set performance targets for NHS bridge performance measures at two-year and four-year intervals. The Boston Region MPO elected to support MassDOT's four-year targets for these measures in February 2023. Table G-12 shows MassDOT's NHS bridge performance targets. The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025. These targets reflect anticipated conditions based on historic trends and planned bridge investments.

Table G-12
MassDOT's NHS Bridge Condition Targets

Federally Required Bridge Condition Performance Measure	2022 Measure Value (Baseline)	Two-Year Target (CY 2023)a	Four-Year Target (CY 2025)[a]
Percent of NHS Bridges [by deck area] that are in good condition	16%	16%	16%
Percent of NHS Bridges [by deck area] that are in poor condition	12%	12%	12%

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

CY = calendar year. NHS = National Highway System.

Source: Massachusetts Department of Transportation.

Federal Pavement Condition

States and MPOs monitor and set targets for the condition of pavement on NHS roadways, a network that includes the Interstate Highway System and other roadways of importance to the nation's economy, defense, and mobility. Applicable federal performance measures include the following:

- Percentage of pavements on the Interstate System in good condition
- Percentage of pavements on the Interstate System in poor condition
- Percentage of pavements on the non-interstate NHS in good condition
- Percentage of pavements on the non-interstate NHS in poor condition

The performance measures classify interstate pavements as in good, fair, or poor condition based on their International Roughness Index (IRI) value and one or more pavement distress metrics (cracking and/or rutting and faulting) depending on the pavement type (asphalt, jointed concrete, or continuous concrete). The FHWA sets thresholds for each metric that determine whether the value is good, fair, or poor, along with thresholds that determine whether the pavement segment as a whole is in good, fair, or poor condition.[12] Non-interstate NHS pavements are subject to the same thresholds for IRI values.

MassDOT uses information from its Pavement Management program to track the condition of Massachusetts' NHS network.[13] MassDOT's targets are shown along with baseline data in Table G-13. The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

Table G-13
Massachusetts NHS Pavement Condition Baselines and MassDOT NHS Pavement Condition Performance Targets

Federally Required Pavement Condition Performance Measure	2021 Measure Value (Baseline)	Two-Year Target (CY 2023)[a]	Four-Year Target (CY 2025)[a]
Percent of Interstate Highway System pavement in good condition	71.8%	70.0%	70.0%
Percent of Interstate Highway System pavement in poor condition	0.0%	2.0%	2.0%
Percent of non-interstate NHS pavement in good condition	33.9%	30.0%	30.0%
Percent of non-interstate NHS pavement in poor condition	2.9%	5.0%	5.0%

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025. MassDOT has developed both two-year and four-year targets for internal consistency.

CY = calendar year. MassDOT = Massachusetts Department of Transportation. NHS = National Highway System.

Source: MassDOT.

12 FHWA's IRI thresholds for good, fair, and poor condition differ from those currently used by the MPO. For federally required NHS pavement condition performance measures, IRI values considered good are those less than 95; those considered fair are between 95 and 170; and those considered poor are greater than 170.

13 MassDOT continues to measure pavement quality and set statewide short-term and long-term targets in the MassDOT Tracker using the Pavement Serviceability Index (PSI), which is a different index than IRI.

MPOs are required to set four-year interstate pavement condition and non-interstate NHS pavement condition performance targets by either supporting state targets or setting separate targets for the region. The MPO elected to support MassDOT's four-year targets for these NHS pavement condition measures in February 2023. The MPO will work with MassDOT to meet these targets through its Regional Target investments. While it is the MPO's policy to not use its Regional Target funds for projects that only resurface pavement, it does fund roadway reconstruction projects that include pavement resurfacing, in addition to other design elements.

Transit System Asset Condition

The Boston region has three transit agencies that receive FTA funds: the MBTA, CATA, and MWRTA. These agencies are responsible for meeting planning and performance-monitoring requirements under FTA's TAM rule, which focuses on achieving and maintaining a state of good repair (SGR) for the nation's transit systems. Transit agencies develop these performance targets based on their most recent asset inventories and condition assessments, along with their capital investment and procurement expectations, which are informed by their TAM plans. MBTA, MWRTA, and CATA share their asset inventory and condition data and their performance targets with the Boston Region MPO so that the MPO can monitor and set TAM targets for the Boston region. For the most recent targets, the MPO adopted the MBTA, CATA, and MWRTA state fiscal year (SFY) 2023 TAM performance targets.

Rolling Stock and Equipment Vehicles

FTA's TAM performance measure for the SGR for rolling stock and equipment vehicles (service support, maintenance, and other nonrevenue vehicles) is the percentage of vehicles that meet or exceed their useful life benchmark (ULB). ULB uses vehicle age as a proxy for SGR (which may not necessarily reflect condition or performance), with the goal being to bring this value as close to zero as possible. FTA defines ULB as "the expected lifecycle of a capital asset for a particular transit provider's operating environment, or the acceptable period of use in service for a particular transit provider's operating environment." For example, FTA's default ULB value for a bus is 14 years. When setting targets, each agency has discretion to use FTA-identified default ULBs for vehicles or to adjust ULBs with approval from FTA. The MBTA uses FTA default ULBs for its rolling stock targets and MBTA-defined ULBs, which are based on agency-specific usage and experience, for its equipment targets. CATA and MWRTA use ULBs from other sources.[14]

14 CATA used useful life criteria as defined in FTA Circular 5010.1E (Award Management Requirements) for ULB values. MWRTA used useful life criteria as defined in MassDOT's Fully Accessible Vehicle Guide and in FTA Circular 5010.1E for ULB values.

Table G-14 shows SFY 2022 baselines and the MPO's SFY 2023 targets for rolling stock, which refers to vehicles that carry passengers.

Table G-14
SFY 2022 Baseline Measures and SFY 2023 Targets for Transit Rolling Stock

Agency	Asset Type	SFY 2022 Baseline (as of June 30, 2022)		SFY 2023 Targets (as of June 30, 2023)
		Number of Vehicles	Percent of Vehicles Meeting or Exceeding ULB	Percent of Vehicles Meeting or Exceeding ULB
MBTA	Buses	952	32%	32%
MBTA	Light Rail Vehicles	227	0%	0%
MBTA	Heavy Rail Vehicles	472	53%	39%
MBTA	Commuter Rail Locomotives	81	23%	23%
MBTA	Commuter Rail Coaches	393	8%	7%
MBTA	Ferry Boats	4	0%	0%
MBTA	THE RIDE Paratransit Vehicles[a]	704	0%	0%
CATA	Buses	16	25%	30%
CATA	Cutaway Vehicles[b]	16	63%	5%
MWRTA	Cutaway Vehicles[b]	108	8%	25%
MWRTA	Automobiles	2	0%	0%

[a] The MBTA's THE RIDE paratransit vehicles data and targets reflect automobiles, vans, and minivans.

[b] The National Transit Database defines a cutaway vehicle as a vehicle in which a bus body is mounted on a van or light-duty truck chassis, which may be reinforced or extended. CATA uses nine of these vehicles to provide fixed-route services, and 14 of these vehicles to provide demand-response service.

CATA = Cape Ann Transportation Authority. MBTA = Massachusetts Bay Transportation Authority. MWRTA = MetroWest Regional Transit Authority. SFY = state fiscal year. ULB = Useful Life Benchmark.

Sources: CATA, MBTA, MWRTA, and the Boston Region Metropolitan Planning Organization.

Table G-15 shows SFY 2022 baselines and the MPO's SFY 2023 targets for transit equipment vehicles. MPO staff has aggregated targets for nonrevenue vehicle subtypes for each of the three transit agencies. Similar to transit rolling stock, transit agencies can make improvements on these measures by expanding their fleets or replacing vehicles within those fleets.

Table G-15
SFY 2022 Measures and SFY 2023 Targets for Transit Equipment Vehicles

Agency	SFY 2022 Baseline (as of June 30, 2022)		SFY 2023 Targets (as of June 30, 2023)
	Number of Vehicles	Percent of Vehicles Meeting or Exceeding ULB	Percent of Vehicles Meeting or Exceeding ULB
MBTA[a]	1,417	22%	25%
CATA	3	100%	100%
MWRTA	11	36%	50%

[a] MBTA equipment includes both commuter rail and transit system nonrevenue service vehicles.

CATA = Cape Ann Transportation Authority. MBTA = Massachusetts Bay Transportation Authority. MWRTA = MetroWest Regional Transit Authority. SFY = state fiscal year. ULB = Useful Life Benchmark.

Sources: CATA, MBTA, MWRTA, and the Boston Region Metropolitan Planning Organization.

Facilities

FTA assesses the condition for passenger stations, parking facilities, and administrative and maintenance facilities using the FTA Transit Economic Requirements Model (TERM) scale, which generates a composite score based on assessments of facility components. Facilities with scores below three are considered to be in marginal or poor condition (though this score is not a measure of facility safety or performance). The goal is to bring the share of facilities that meet this criterion to zero. Infrastructure projects focused on individual systems may improve performance gradually, while more extensive facility improvement projects may have a more dramatic effect on a facility's TERM scale score.

Table G-16 shows SFY 2022 measures and the MPO's SFY 2023 targets for MBTA, CATA, and MWRTA facilities.

Table G-16
SFY 2022 Measures and SFY 2023 Targets for Transit Facilities

		SFY 2022 Baseline (as of June 30, 2022)		SFY 2023 Targets (as of June 30, 2022)
Agency	**Facility Type**	**Number of Facilities**	**Percent of Facilities in Marginal or Poor Condition**	**Percent of Facilities in Marginal or Poor Condition**
MBTA	Passenger[a]	382	6%	7%
MBTA	Administrative and Maintenance	427	68%	35%
CATA	Administrative and Maintenance	1	0%	0%
MWRTA	Administrative and Maintenance	1	0%	0%

Note: Facilities are classified as being in marginal or poor condition based on FTA's Transit Economic Requirements Model (TERM) scale. Facilities assigned a rating of less than three are considered to be in marginal or poor condition.

[a] Passenger facilities include stations and parking facilities.

CATA = Cape Ann Transportation Authority. FTA = Federal Transit Administration. MBTA = Massachusetts Bay Transportation Authority. MWRTA = MetroWest Regional Transit Authority. SFY = state fiscal year.

Sources: CATA, MBTA, MWRTA, and the Boston Region Metropolitan Planning Organization.

Fixed Guideway Infrastructure

Table G-17 describes SFY 2022 baselines and SFY 2023 targets for the condition of rail fixed guideways. The MBTA is the only transit agency in the Boston region with this type of asset. The performance measure that applies to these assets is the percentage of track that is subject to performance, or speed, restrictions.

Table G-17
SFY 2022 Measures and SFY 2023 Targets for MBTA Transit Fixed Guideway Infrastructure

		SFY 2022 Baseline (as of June 30, 2022)		SFY 2023 Targets (as of June 30, 2023)
Agency	**Track Type**	**Directional Route Miles**	**Percent of Miles with Speed Restrictions**	**Percent of Miles with Speed Restrictions**
MBTA	Transit Fixed Guideway[a]	127	5%	2%
MBTA	Commuter Rail Fixed Guideway	641	3%	4%

Note: The term "directional route miles" represents the miles managed and maintained by the MBTA with respect to each direction of travel (for example, northbound and southbound), and excludes nonrevenue tracks such as yards, turnarounds, and storage tracks. The baseline and target percentages represent the annual average number of miles meeting this criterion over the 12-month reporting period.

[a] The MBTA's Transit Fixed Guideway information reflects light rail and heavy rail fixed guideway networks.

MBTA = Massachusetts Bay Transportation Authority. SFY = state fiscal year.

Sources: MBTA and the Boston Region Metropolitan Planning Organization.

Travel Time Reliability

FHWA requires states and MPOs to monitor and set targets for two performance measures that pertain to all travelers on NHS roadways:

- Percentage of the person-miles traveled on the Interstate System that are reliable
- Percentage of the person-miles traveled on the non-interstate NHS that are reliable

These measures capture (1) whether travel times on an NHS segment are consistent (reliability); and (2) the extent to which NHS users' travel may be affected by those conditions (percent of person miles). Several component metrics make up this measure:

- Level of Travel Time Ratio (LOTTR). This ratio compares longer (80th percentile) travel times to average (50th percentile) travel times on an NHS segment. LOTTR values less than 1.5 indicate reliable travel on the NHS for a particular time period. Larger LOTTR values indicate greater differences between the 80th and 50th percentiles and, thus, less reliable travel times. LOTTR values of less than 1.5 for four designated day and time periods are considered reliable.15
- Annual Number of Travelers. States and MPOs calculate this figure using vehicle volumes and average vehicle occupancy factors.
- NHS segment length. States and MPOs use this value and data on the annual number of travelers to estimate person-miles traveled on the NHS.

Reliability is calculated by identifying the person-miles of travel for each NHS segment and then dividing the total person-miles on the relevant NHS network that are reliable by the total person-miles on the relevant NHS network. To support this analysis, FHWA provides travel-time and traffic-volume data as part of the National Performance Management Research Data Set (NPMRDS), in which travel time data are reported by traffic messaging channel (TMC) segments.

States are required to set two-year and four-year targets for these measures.[16]

15 States and MPOs must calculate LOTTR values for four time periods: weekdays from 6:00 AM to 10:00 AM, weekdays from 10:00 AM to 4:00 PM, weekdays from 4:00 PM to 8:00 PM, and weekend days from 6:00 AM to 8:00 PM.

16 FHWA, "Frequently Asked Questions: Target Setting," https://www.fhwa.dot.gov/tpm/faq.cfm#targ, accessed May 18, 2023.

Table G-18 shows MassDOT's CY 2021 baselines and two-year and four-year targets for reliability measures. The MPO is required to establish only four-year targets by either supporting state targets or setting its own targets for the Boston region. In January 2023, the MPO board voted to support the state's four-year targets.

Table G-18
Travel Time Reliability Performance Baselines and Performance Targets

Network	Measure	2021 Measure Value (Baseline)	Two-Year Target (CY 2023)[a]	Four-Year Target (CY 2025)[a]
Massachusetts–Interstate Highway System	Percent of person-miles on the Interstate Highway System that are reliable	84.2%	74.0%	76.0%
Massachusetts–Non-interstate NHS System	Percent of person-miles on the non-interstate NHS that are reliable	87.9%	85.0%	87.0%
Boston region–Interstate Highway System	Percent of person-miles on the Interstate Highway System that are reliable	71.4%	n/a	See Massachusetts target
Boston region–Non-Interstate NHS System	Percent of person-miles on the non-Interstate NHS that are reliable	81.7%	n/a	See Massachusetts target

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

CY = calendar year. n/a = not applicable. NHS = National Highway System.

Sources: National Performance Management Research Data Set, Cambridge Systematics, MassDOT, and the Boston Region MPO.

Truck Travel Time Reliability

FHWA requires states and MPOs to track truck travel reliability on the Interstate System to better understand the performance of the nation's freight system. The applicable measure in this case is the Truck Travel Time Reliability (TTTR) Index. Like the LOTTR, this measure compares longer (95th percentile) truck travel times to average (50th percentile) truck travel times. The greater the difference between these two travel times on an interstate segment, the less reliable truck travel on that segment is. For each interstate segment, TTTR Index values are calculated for different days and time periods and the segment length is weighted by the maximum applicable TTTR Index value.[17] The weighted segment lengths for all interstate segments are then summed and divided by the length of the full interstate network for the applicable geographic area. The greater this aggregate value is, the more unreliable the network is with respect to truck travel. Table G-19 displays these values.

Table G-19
Truck Travel Time Reliability Baselines and Performance Targets

Network	Measure	2021 Measure Value (Baseline)	Two-Year Target (CY 2023)a	Four-Year Target (CY 2025)[a]
Massachusetts—Interstate Highway System	Truck Travel Time Reliability Index	1.61	1.80	1.75
Boston Region—Interstate Highway System	Truck Travel Time Reliability Index	2.03	n/a	See Massachusetts target

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

CY = calendar year.

Sources: National Performance Management Research Data Set, Cambridge Systematics, Massachusetts Department of Transportation, and the Boston Region Metropolitan Planning Organization.

17 States and MPOs must calculate TTTR Index values for five time periods: weekdays from 6:00 AM to 10:00 AM, weekdays from 10:00 AM to 4:00 PM, weekdays from 4:00 PM to 8:00 PM, weekend days from 6:00 AM to 8:00 PM, and all days from 8:00 PM to 6:00 AM.

The MPO's approach to addressing freight needs is guided in large part by the Massachusetts Freight Plan, which sets a vision and goals for the freight system in the Commonwealth. MassDOT's performance goals for the freight system include the following:[18]

- Customer Experience. The freight system should work for all its customers: shippers, carriers, consumers, workforce, and communities.
- System Condition. The condition of the freight system should be improved to ensure an efficient and reliable supply chain.
- Budget and Capital Performance. Capital budgets should be set in part using freight performance metrics to ensure that the benefits of projects for freight uses are carefully considered in decision-making.
- Safety. Freight movement should be safe for operators, motorists and passengers, bicyclists, and pedestrians in urban, suburban, and rural areas.
- Healthy and Sustainable Transportation. The freight system should not adversely affect the health and livability of the communities it touches, and it should contribute to the achievement of an 80 percent statewide reduction in greenhouse gases (GHG) emissions from utilities, industry, transportation, and other sources by 2050 (Global Warming Solutions Act of 2008).

Peak Hours of Excessive Delay per Capita

MassDOT and the MPO also examine mobility using the peak hour excessive delay (PHED) per capita measure, which is monitored to meet CMAQ requirements. It helps FHWA, states, and MPOs better understand the impacts of CMAQ-funded investments, which are intended to improve air quality and relieve congestion. CMAQ traffic-congestion-related performance measures apply to UZAs that contain geographic areas designated as not attaining US Environmental Protection Agency (EPA) standards for air pollutants and precursors from mobile sources (also known as nonattainment areas).[19] The measures also apply to geographic areas that have a history of being in nonattainment and are thus required to maintain air quality monitoring and standard conformity processes (also known as maintenance areas).

Annual hours of peak hour excessive delay (PHED) per capita estimates the excessive delay on the NHS during peak periods. States and MPOs calculate this measure using several metrics:

18 Massachusetts Department of Transportation, Massachusetts Freight Plan 2017. Available at mass.gov/service-details/freight-plan. pgs. 1 to 5.

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

- 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).20 They determine the amount of travel time for all vehicles that exceeded the EDTTT during weekday peak periods.21 This remainder is the excessive delay for that NHS segment. It is calculated for peak periods for all NHS segments for a full year. Travel-time data for NHS segments are provided by the NPMRDS.
- Number of travelers during peak periods. To calculate this figure, states and MPOs use average annual daily traffic estimates for NHS 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.

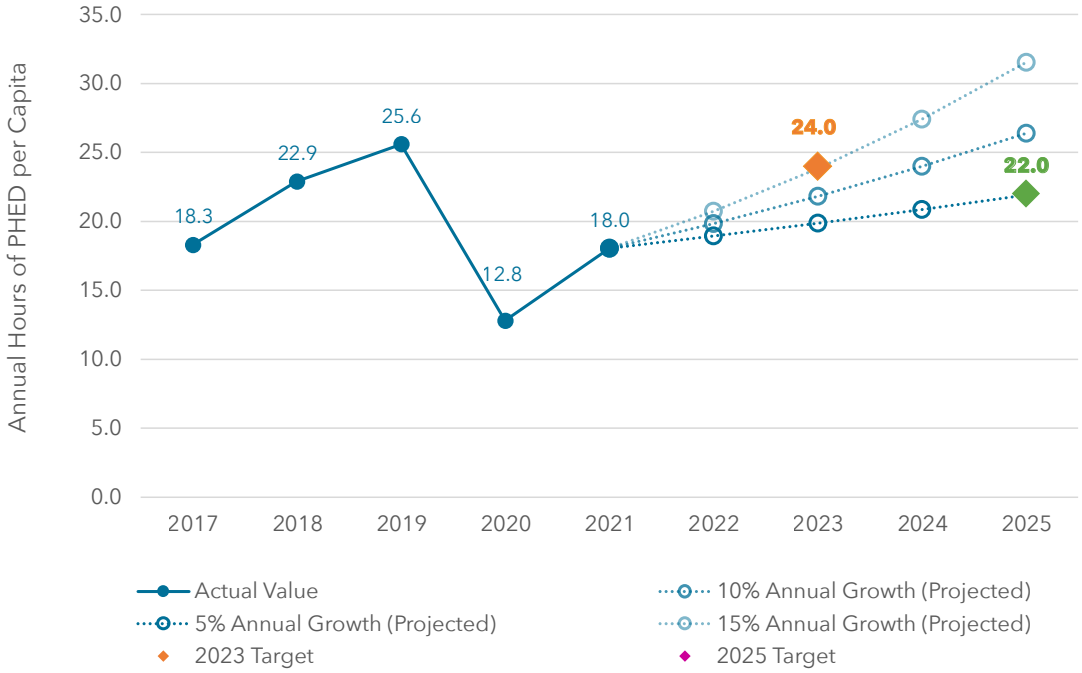
The PHED per capita measure is calculated at the Boston UZA level by multiplying the *hours of excessive delay during peak periods* by the *number of travelers during peak periods,* and then dividing that total by the *UZA population*.

When proposing targets, MassDOT and New Hampshire Department of Transportation (NHDOT) reviewed NPMRDS travel time data, speed data, annual average daily traffic information for NHS roadways, and population data from the American Community Survey (ACS) and the 2020 Decennial Census. 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 NHDOT 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. This five percent growth rate accounts for the fact that traffic has not yet returned to pre-pandemic levels. However, MassDOT and NHDOT 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 G-7 shows the past annual PHED per capita values and projected growth rates included in Figure G-5, along with the target values.

20 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.

21 FHWA requires states and MPOs to use the period from 6:00 AM to 10:00 AM to represent the morning peak period, but 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 New Hampshire DOT selected the period from 3:00 PM to 7:00 PM to represent the evening peak period for the Boston UZA.

Figure G-7
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 Metropolitan Planning Organization staff.

Table G-20
Boston UZA Baseline and Performance Targets for Annual Hours of Peak Hour Excessive Delay Per Capita

Geographic Area	2021 Measure Value (Baseline)	Two-Year Target (CY 2022–23)[a]	Four-Year Target (CY 2022–25)[a]
Boston Urbanized Area	18.0	24.0	22.0

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

CY =calendar year. MA = Massachusetts. NH = New Hampshire. PHED = peak hours of excessive delay. UZA = urbanized area.

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

CLEAN AIR AND HEALTHY COMMUNITIES PERFORMANCE

Relevant Goals, Policies, and Plans

The MPO aims to support clean air and healthy communities in the Boston region by investing in projects that reduce GHG and other transportation-related pollutants. The MPO's goal for this area is to

> *Provide transportation free of greenhouse gas emissions and air pollutants and that supports good health.*

The MPO agrees that GHG emissions contribute to climate change. If climate change trends continue as projected, the Boston region will experience significant sea-level rise, storm-induced flooding, and warmer temperatures, which would adversely affect the region's infrastructure, economy, human health, and natural resources. Massachusetts is taking action to reduce the GHGs produced in the state, including those generated by the transportation sector. To that end, Massachusetts passed the Global Warming Solutions Act, which requires reductions of GHGs by at least 80 percent by 2050, relative to 1990 baseline conditions. The Commonwealth met its previous compliance requirement, reducing GHGs by 25 percent by 2020, relative to 1990 baseline conditions.

Transportation projects may also help reduce air quality pollutants and precursors—including carbon dioxide, volatile organic compounds (VOC), nitrogen oxides (NOx) and carbon monoxide (CO)—by improving traffic flow and increasing travel by public transit, bicycle, and walking. The MPO tracks the air quality benefits of transportation projects to identify projects that may be eligible for CMAQ funds. The MPO's CMAQ Performance Plan includes targets for the amount of emissions the MPO expects will be reduced by CMAQ-funded projects in the region. As part of the plan, the MPO must note how it expects its CMAQ-funded projects to support improvements in these performance measures, which reinforces the connection between planning, investments, and expected performance outcomes. (The MPO must also track VOCs and NOx to meet EPA requirements. More detailed information about the MPO's air quality status and related requirements is available in Appendix E.)

Emission Reduction Measure and Targets

The federally required CMAQ emissions reduction measure, shown in Table G-21, is the total emissions reduction for applicable pollutants and precursors for CMAQ-funded projects in designated nonattainment and maintenance areas. FHWA requires states and MPOs subject to CMAQ performance management requirements to establish a baseline by identifying emissions reductions associated with any CMAQ-funded projects programmed in air quality nonattainment or maintenance areas. They must also set two-year and four-year targets for the emissions reductions expected from CMAQ-funded projects programmed in nonattainment or maintenance areas.

The Boston region included an area (Waltham, Massachusetts) designated as being in maintenance for air pollutant standards in 2021. This designation expired in April 2022; however, the MPO must fulfill air quality performance requirements at least until the FWHA issues an applicability determination related to CMAQ performance requirements (expected in October 2023). Agencies in each UZA that are responsible for these measures set two-year and four-year targets.

Table G-21
Boston Region MPO CMAQ Emissions Reduction Baseline and Performance Targets

Performance Measure	FFYs 2018–21 Measure Value (Baseline)	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	0	0.354	0.354

CMAQ = Congestion Mitigation and Air Quality. CO = carbon monoxide. FFY = federal fiscal year. MPO = Metropolitan Planning Organization.

Source: Boston Region MPO.

ACCESS AND CONNECTIVITY PERFORMANCE

The MPO is working to improve access and connectivity in the region in order to provide transportation options to key destinations, supporting economic vitality and a high quality of life for its residents. The MPO's goal for this area is to

> *Provide transportation options and improve access to key destinations to support economic vitality and high quality of life.*

The primary way the MPO assesses how it is improving access and connectivity is by measuring access to transit, biking, walking, and other non-single-occupancy-vehicle transportation options, which expand their travel choices and opportunities. The percentage of non-SOV travel performance is a key indicator of access to options that move people to their desired destinations.

Relevant Goals, Policies, and Plans

Percentage of Non-Single-Occupant-Vehicle Travel

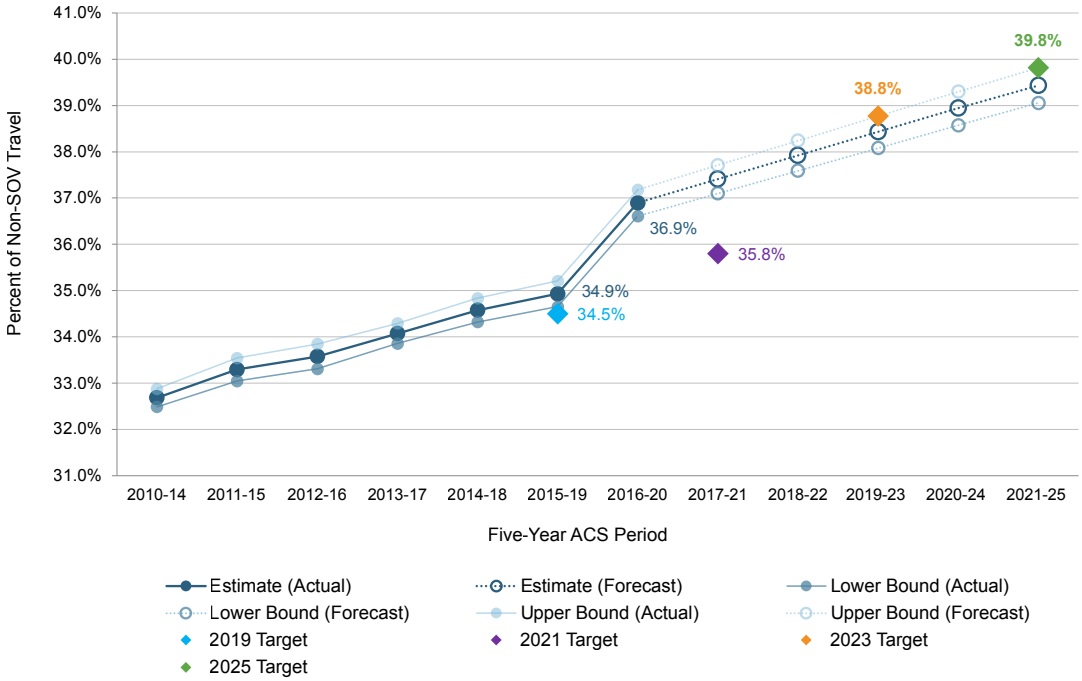
States and MPOs that meet applicability criteria for CMAQ performance requirements must also monitor and set targets for the share of non-SOV travel in applicable UZAs. The percentage of non-SOV travel performance measure describes the extent to which people are using alternatives to SOVs and, thus, helping to reduce traffic congestion and air pollution from mobile sources.

Collectively, MassDOT, NHDOT, the Boston Region MPO, and the Northern Middlesex Council of Governments used ACS data from the US Census Bureau to estimate the percentage of workers aged 16 and older who commuted to work using an option other than driving alone.[22,23] Examples of non-SOV commuting options include, but are not limited to carpooling, taking transit, bicycling, or walking. These ACS five-year period estimates are rolling annual averages. As Figure G-8 shows, the share of non-SOV travel in the Boston UZA has been increasing steadily over time.

22 017–21 US American Community Survey, "Commuting Characteristics by Sex," American Community Survey Five-Year Estimates. Table S0801.

23 FHWA allows states and MPOs to measure non-SOV travel using US Census American Community Survey 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; or sample of continuous counts of travelers using different modes.

Figure G-8
Historic Values and Performance Targets for the Percent of Non-SOV Travel in the Boston UZA



Note: The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

ACS = US American Community Survey. CY = calendar year. SOV = single-occupant vehicle. UZA = urbanized area.

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

Table G-22 lists the recent baseline and performance targets for the Boston UZA for the percentage of non-SOV travel. It also includes a baseline value for non-SOV travel that is specific to the Boston region, which is a larger percentage than for the Boston UZA.

Table G-22
Boston UZA Baseline and Performance Targets for Percent of Non-SOV Travel

Geographic Area	2016–20 Measure Value (Baseline)	Two-Year Target (CY 2022–23)a	Four-Year Target (CY 2022–25)[a]
Boston UZA	36.9%	38.8%	39.8%

[a] The two-year target reflects conditions as of the end of CY 2023, and the four-year target reflects conditions as of the end of CY 2025.

CY = calendar year. SOV = single-occupancy vehicle. UZA = urbanized area.

Sources: Massachusetts Department of Transportation, New Hampshire Department of Transportation, the US Census Bureau, ACS Five-Year Estimates (Table DP03, "Selected Economic Characteristics"), and the Boston Region Metropolitan Planning Organization.

TRANSPORTATION EQUITY PERFORMANCE

The MPO aims to ensure that all residents fairly share in the benefits and burdens of its transportation planning investments, have meaningful opportunities to participate in the transportation planning process, and have a voice in the selection of transportation investments in their communities. To this end, the MPO integrates the transportation needs and interests of TE populations into its planning process and strives to address disparities in how the transportation network impacts TE populations through the selection of transportation projects that mitigate adverse impacts and provide benefits.

FHWA and FTA do not require states, MPOs, or transit agencies to monitor performance measures related to TE. However, as part of compliance with federal nondiscrimination and EJ mandates, MPOs must monitor how their investments are distributed relative to TE populations and whether the projects, in the aggregate, disproportionately affect minority and low-income populations. This helps ensure that these populations share in the benefits from MPO investments and are not unduly burdened by any potential adverse effects. In the LRTP, this is documented in the disparate impact and disproportionate burden (DI/DB) analysis (see Appendix H).

The DI/DB analysis determines whether projects in the Recommended Plan may result in potential future disparate impacts or disproportionate burdens on minority and low-income populations, respectively.[24,25] The MPO has developed a DI/DB Policy (see Appendix H) that allows the MPO to make that assessment.

Destination 2050 Support for Improved Performance

Destination 2050 lists both major infrastructure projects that are required to be included in the MPO's LRTP and describes the MPO investment programs that will be in place over the life of the plan. As this LRTP is implemented and projects are funded through the TIP, the MPO will describe in the TIP how it anticipates these projects will support progress toward the MPO's performance targets, both for federally required performance measures and other measures, as applicable. In advance of more detailed discussions in TIP documents, this section describes how the MPO's recommended set of projects and programs can support improvements with respect to federally required performance measures.

MPO MAJOR INFRASTRUCTURE PROJECTS

Chapter 4 discusses the process the MPO followed to set aside funding for investment programs and to select major infrastructure projects to include the Recommended Plan. The MPO recommends allocating discretionary funding to eight projects that improve facilities that are important to regional travel and/or cost $50 million or more. The eight projects are shown below in Table G-23.

24 A disparate impact is a facially neutral policy or practice that results in impacts that disproportionately affect members of a group based on their race, color, or national origin, where the recipient's policy or practice lacks a substantial legitimate justification and where there exists one or more alternatives that would serve the same legitimate objectives but with a less disproportionate effect on the basis of race, color, or national origin.

25 A disproportionate burden refers to a neutral policy or practice that disproportionately affects low-income populations more than non-low-income populations. A finding of a disproportionate burden requires the recipient to evaluate alternatives and mitigate burdens where practicable.

Table G-23
Boston Region MPO Projects funded in the Long-Range Transportation Plan

Project	Amount (Estimate)
Boston: Allston Multimodal[a]	$675,500,000
Hopkinton: I-495 and I-90 Interchange[a]	$300,942,836
Boston: Reconstruction of Rutherford Avenue from City Square to Sullivan Square	$196,100,000
Framingham: Intersection Improvements at Route 126 and Route 135/MBTA and CSX Railroad[b]	$145,500,000
Lexington: Route 4/225 (Bedford Street) and Hartwell Avenue[b]	$57,000,000
Norwood: Intersection Improvements at Route 1 and University Avenue/Everett Street	$28,699,272
Somerville: McGrath Boulevard	$98,800,000
Wrentham: I-495/Route 1A Ramps	$20,117,638

[a]Note: This project is primarily funded by MassDOT and is not a Regional Target project.

[b]Note: This project is proposed for programming outside of the FFY 2024-2028 TIP, taking place after 2028.

MPO INVESTMENT PROGRAMS

The five MPO investment programs described in Chapter 4 may also help the MPO make progress toward federally required performance targets. Table G-24 describes how TIP projects funded through these various programs may address relevant measures.

Table G-24
Recommended *Destination 2050* Investment Programs and Potential Performance Impacts

Investment Program	Potential Impacts Related to Federally Required Performance Measures
Intersection Improvements	Roadway Safety: reduce fatalities and injuries by updating roadway geometry, shortening crossing distances, and enhancing signals, lighting, signage, and bicycle and pedestrian accommodations. NHS Pavement Condition: projects on the NHS may improve pavement condition. NHS Travel Reliability and Congestion: Signal and geometry improvements at intersections on the NHS may support reliable travel and reduce congestion. Non-SOV Travel: Improved bicycle or pedestrian accommodations at intersections may encourage shifts to nonmotorized travel. Intersection improvements may also support the mobility of transit vehicles, which may make transit a more attractive travel option. Air Quality: Reduced congestion resulting from roadway and geometric improvements at intersections may help reduce emissions.
Complete Streets	Roadway Safety: projects that improve roadway geometry, upgrade signals and crossways, and/or add or enhance sidewalks and bicycle pedestrian facilities may help reduce fatalities and serious injuries. NHS Bridge and Pavement Condition: projects located on NHS roadways or bridges can improve these pavements or structures. NHS Travel Reliability and Congestion: projects that improve signals and geometry on NHS roadways may support reliable travel and reduce congestion. Non-SOV Travel: Bicycle, pedestrian, or transit improvements (such as dedicated bus lanes) may support shifts to non-SOV travel, especially if they support network connectivity and access to activity centers. Air Quality: Reduced congestion resulting from roadway and geometric improvements may help reduce emissions. Bicycle and pedestrian facility improvements may encourage people to shift to non-SOV modes, which can help reduce emissions.

Table G-24 (cont.)

Investment Program	Potential Impacts Related to Federally Required Performance Measures
Bicycle Network and Pedestrian Connections	Roadway Safety: New or improved bicycle and pedestrian facilities may help reduce fatalities and serious injuries, particularly for nonmotorized users. Non-SOV Travel: New or improved bicycle and pedestrian facilities may encourage shifts to non-SOV travel, especially if they support network connectivity and access to activity centers. Air Quality: Bicycle and pedestrian facility improvements may encourage nonmotorized travel, which can help reduce emissions.
Community Connections	Non-SOV Travel: Shuttle, parking improvement, and bicycle and pedestrian improvement-related projects funded through this program may encourage shifts to non-SOV travel, especially if these projects support access to activity centers. Air Quality: Projects funded through this program may encourage shifts to non-SOV modes, which can help reduce emissions.
Transit Transformation	TAM: Transit fleet and facility upgrades may improve asset performance. Transit Safety: Improvements to transit facilities and vehicles may make conditions safer for transit customers, employees, and the public. Non-SOV Travel: Modernizing transit facilities and vehicles may improve service and comfort, which may encourage people to shift to non-SOV travel. Air Quality: Modernizing transit assets may help reduce emissions by encouraging non-SOV travel or by changing the amount or type of energy these assets use.
Bikeshare Support	Non-SOV Travel: New or improved Bluebikes stations may encourage shifts to non-SOV travel.
Major Infrastructure	NHS Bridge and Pavement Condition: projects located on NHS roadways or bridges can improve these pavements or structures. NHS Travel Reliability and Congestion: Signal and geometry improvements on the NHS may support reliable travel and reduce congestion.

MPO = Metropolitan Planning Organization. NHS = National Highway System.

SOV = single-occupancy vehicle. TAM = Transit Asset Management.

Source: Boston Region MPO.

Performance improvements supported by investment programs will be complemented by MassDOT and transit agency investments included in MassDOT's CIP (see Chapter 3). The following list provides examples of how these programs relate to federally required performance areas.

- MassDOT's Reliability and Modernization programs—such as its Bridge, Interstate Pavement, and Non-Interstate Department of Transportation Pavement programs—are geared toward maintaining and upgrading infrastructure, which will help make travel safer on the region's roadways and improve NHS infrastructure.
- MassDOT's Intersection Improvements, Roadway Improvements, Roadway Reconstruction, and Safety Improvements programs most directly address safety considerations by improving signals, geometry, and other roadway features, although they may also improve NHS pavement. Bicycle and pedestrian improvements supported by these programs may improve safety for nonmotorized users and encourage non-SOV travel.
- MassDOT's Complete Streets and Bicycle and Pedestrian projects may reduce nonmotorized fatalities and injuries by providing separated facilities for bicyclists and pedestrians or addressing conflicts between different types of roadway users. These projects may also support transit, bicyclist, and pedestrian mobility, access, and safety, which can help encourage non-SOV travel and reduced emissions.
- The MBTA and Regional Transit Authority Reliability programs directly address transit safety and TAM performance by improving vehicle, facility and fixed guideway infrastructure state of good repair.
- MBTA Modernization programs, such as the Green Line Transformation and Customer Experience and Technology programs and transit expansion projects, may increase shifts to non-SOV travel and help reduce emissions.

Future MPO Performance-based Planning and Programming Activities

There are three key phases in the MPO's PBPP process—planning, investing, and monitoring and evaluating. *Destination 2050* relates to all three of these phases in this framework. First, it documents the MPO's goals, objectives, measures, and current performance targets, which are all key components of the planning phase. Second, it creates a framework for the MPO to use to invest in the Boston region's transportation system over the next 20 years—a framework designed to focus spending to further the MPO's goals. Finally, it contains an assessment of transportation system performance, which the MPO can use when conducting future monitoring and evaluation of progress.

In the coming years, the MPO will expand its PBPP practice by engaging in new activities in each of the three phases and building on the foundation set by *Destination 2050*. Future planning activities include the following:

- Working with MassDOT, transit agencies, the region's municipalities, and other stakeholders to improve the availability and quality of data used in the PBPP process
- Improving methods for understanding the impacts of MPO investments on various performance areas, including federally required performance areas and others identified by the MPO
- Improving methods for understanding the impacts of factors beyond MPO, Commonwealth, and transit agency investments on performance outcomes. These factors may include, but are not limited to, land use, local policies, and spending on transportation and changes in traveler behavior
- Enhancing methods for setting performance targets and updating performance targets according to defined schedules
- Establishing a set of performance measures pertaining to MPO goal areas, beyond those that are federally required, for the MPO to track over time
- Reviewing TIP project selection criteria to support its performance-oriented decision-making
- Updating the MPO's Performance Dashboard, which provides visualizations of the performance of the Boston region's transportation system on a variety of transportation-related metrics

The MPO will update this system performance report in each LRTP to include information about progress the MPO has made toward its performance targets and updated targets, as appropriate. The MPO will also report on performance in other federally required plans and reports, including its CMAQ performance plan This information will be provided on the MPO's PBPP web page (http://ctps.org/performance).

The Commonwealth and the region's transit agencies also have reporting and evaluation responsibilities. MassDOT and the Commonwealth's Executive Office of Public Safety and Security report roadway safety target information annually to FHWA and NHTSA. MassDOT reports other statewide performance targets and related information to FHWA on a biennial basis via FHWA's Performance Management form. The MBTA, MWRTA, and CATA must report their TAM targets to the NTD, and in future years, these agencies will need to create and regularly submit PTASPs, which discuss their targets for transit safety performance measures. These reports include information about the progress that has been made with respect to performance measures and targets as compared to previous reports.

Going forward, the MPO will need to put the results of these reports and evaluations to use in its future planning and investment activities. As part of this work, the MPO will improve methods for understanding the impacts of MPO investments on various performance areas, including federally required performance areas and others identified by the MPO. Over time, the MPO expects that its actions in the PBPP, investment, and monitoring and evaluation phases will help ensure that the MPO's investments are meeting its vision and goals for the region's transportation system.

APPENDIX H

TRANSPORTATION EQUITY PERFORMANCE REPORT

Introduction

This appendix contains the federally required Title VI and environmental justice (EJ) analyses completed for *Destination 2050*'s Recommended Plan.[1] The role of these analyses is to assess how the projects programmed in this Long-Range Transportation Plan (LRTP) may affect the minority and low-income populations in the

[1] The Recommended Plan consists of regionally significant projects and projects under National Environmental Policy Act review for the first two five-year bands of the LRTP. Regionally significant projects are those that change the capacity of the transportation system by adding or removing lane-miles of roadway or miles of railway. This analysis only pertains to those projects in the Recommended Plan that receive MPO Regional Target funds.

Boston region.[2] Included are maps of projects funded by the Boston Region Metropolitan Planning Organization (MPO) in the Recommended Plan overlaid on maps of the low-income and minority share of the population in the Boston region census tracts, and disparate impact and disproportionate burden (DI/DB) analyses that determine whether minority and low-income populations may be disproportionately affected by the projects in the Recommended Plan.

These analyses demonstrate the Boston Region MPO's compliance with Title VI and EJ analytical requirements as they pertain to the LRTP. They also provide information to assist the MPO in future decision-making that prioritizes minimizing, avoiding, or mitigating any potential future disparate impacts and disproportionate burdens that have been identified. Finally, the information provided helps the MPO meet its own transportation equity goal to eliminate transportation-related disparities borne by people in disadvantaged communities, including minority and low-income populations.

Federal Guidance

Two federal mandates directed the analyses in this appendix: Title VI of the Civil Rights Act of 1964 and the EJ Executive Order, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*. As a recipient of federal funding from the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA), the MPO complies with their Title VI and EJ requirements.

TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

Title VI of the Civil Rights Act prohibits discrimination on the basis of race, color, and national origin under any program or activity that receives federal financial assistance.[3] This prohibition includes unintentional discrimination, which is referred to as disparate impact discrimination. FTA and FHWA require MPOs to conduct several Title VI analyses that apply to the Recommended Plan. These requirements are described in FTA's Title VI Circular (C) 4702.1B and FHWA's *Environmental Justice Reference Guide*, which provides guidance for its nondiscrimination program that covers Title VI and the EJ Executive Order.

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[2] A minority person is one who identifies as American Indian or Alaska Native; Asian; Native Hawaiian or other Pacific Islander; Black or African American; some other race other than White; and/or Hispanic or Latino/a/x. A low-income person is one whose annual family income is less than or equal to 200 percent of the federal poverty level.

[3] These protections were subsequently clarified to include people with limited English proficiency through Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, which was signed on August 11, 2000.

ENVIRONMENTAL JUSTICE EXECUTIVE ORDER

The EJ Executive Order makes achieving EJ part of the mission of the executive branch of the federal government, directing federal agencies to incorporate EJ principles into their activities. Thus, federal agencies are required to identify and address any potential disproportionately high and adverse environmental and human health effects of their activities on minority populations and low-income populations. These requirements are described in FTA's EJ Circular (C) 4703.1 and FHWA's *Environmental Justice Reference Guide*.

Transportation Equity Analyses

The remainder of this chapter discusses the results of two analyses required by FTA and FHWA guidance:

- The Geographic Distribution of Transportation Investments analysis, which maps the locations of MPO-funded projects programmed in the Recommended Plan overlaid on census tracts that show the distribution of minority and low-income populations
- A DI/DB analysis, which determines if projects in the Recommended Plan, when analyzed in the aggregate, may disproportionately affect minority and low-income populations compared to nonminority and non-low-income populations, respectively

GEOGRAPHIC DISTRIBUTION OF TRANSPORTATION INVESTMENTS ANALYSIS

Figure H-1a shows the projects in the Recommended Plan that are MPO-funded overlaid on a map displaying the percent minority population in each Boston region census tract. Figure H-1b shows the same projects overlaid on a map displaying the percent low-income population in each of these tracts. (Although the analysis is required only for the minority population, it is also completed for the low-income population to fully incorporate EJ principles.)

Figure H-1a
Recommended Plan and Census Tracts by Share of Minority Population

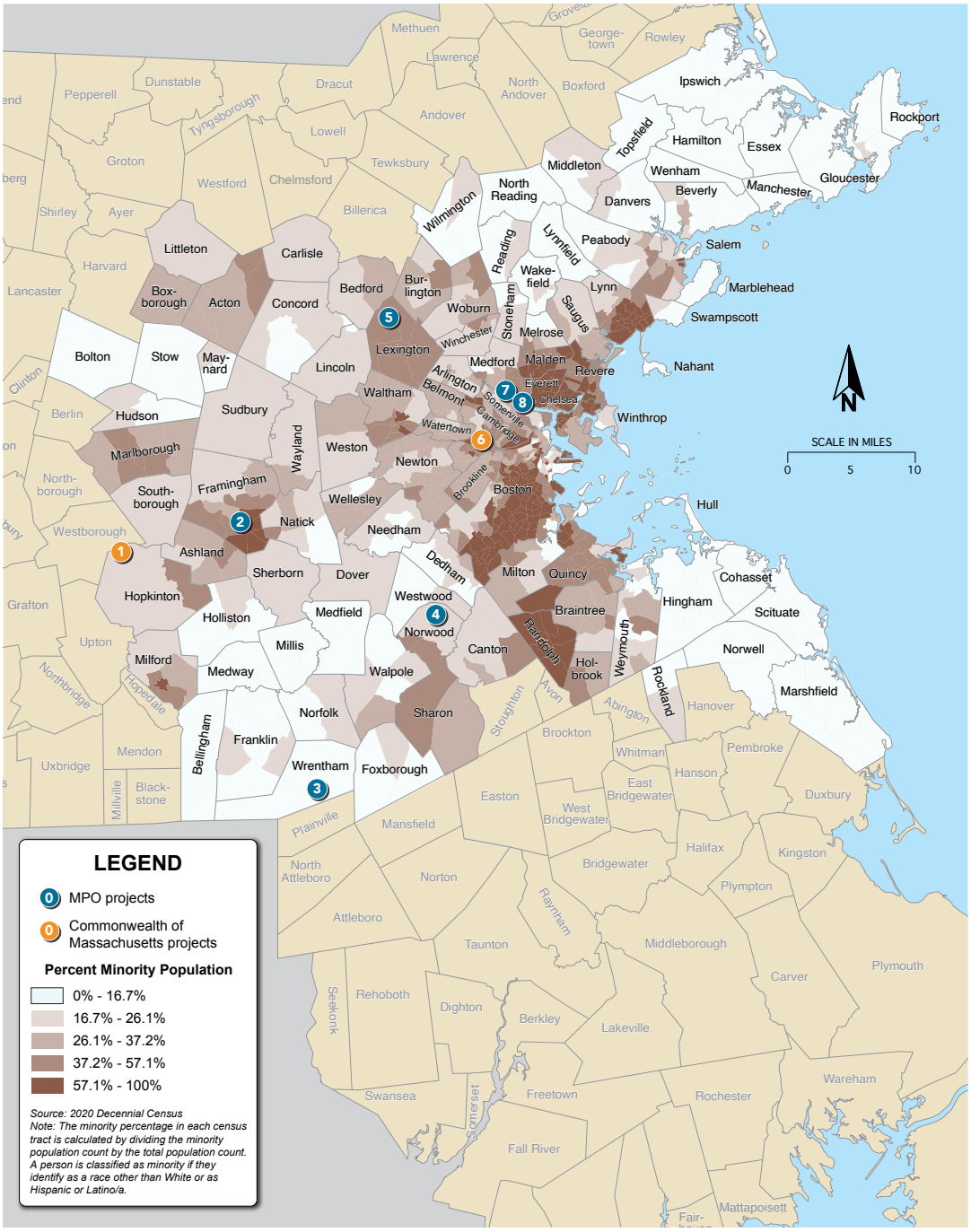
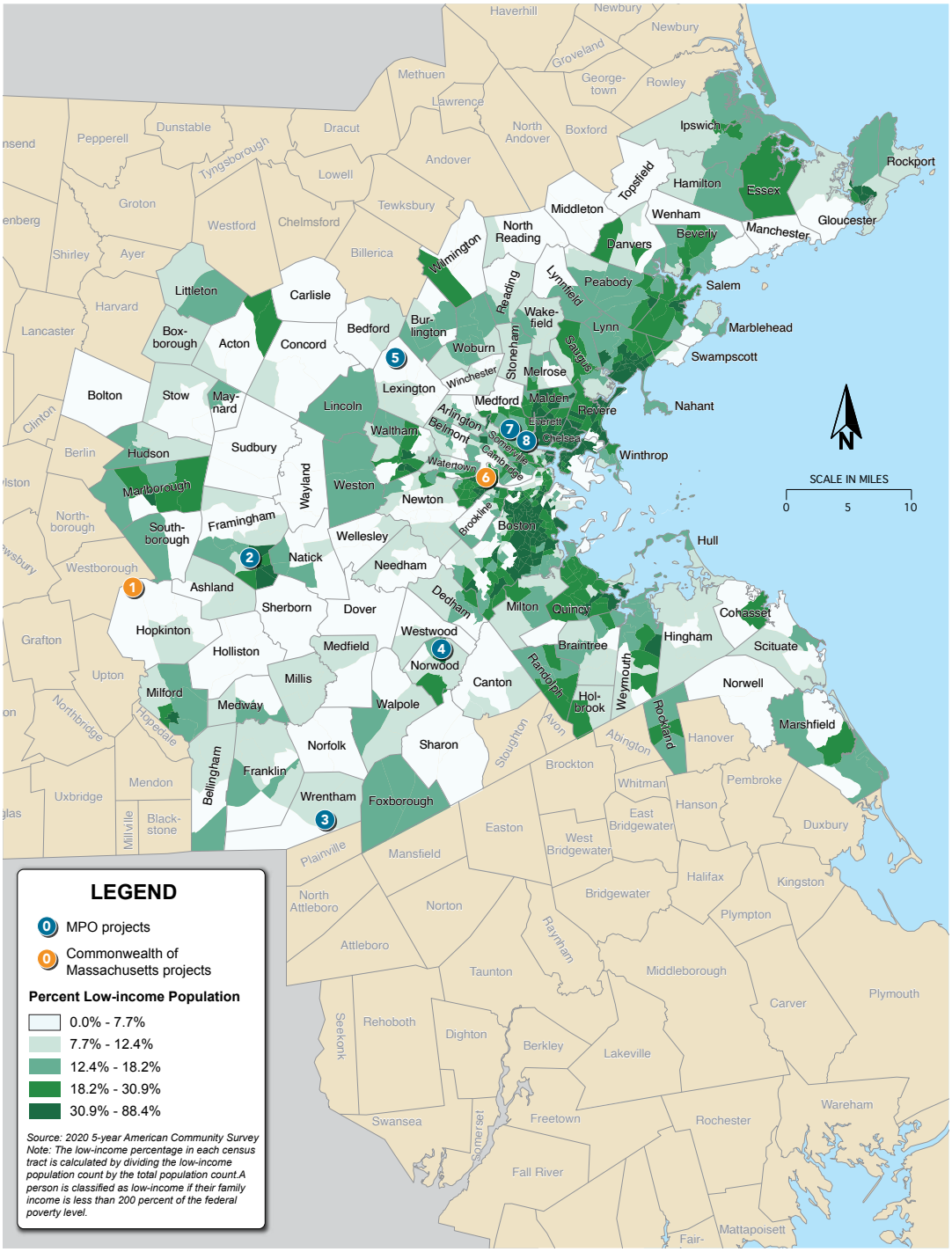


Figure H-1b
Recommended Plan Projects and Census Tracts by Share of Low-Income Population



DISPARATE IMPACT AND DISPROPORTIONATE BURDEN ANALYSIS

The DI/DB analysis identifies disparate impacts that may result from projects in the Recommended Plan on minority populations, as well as disproportionate burdens on low-income populations.[4] Disparate impacts refer to potential future adverse effects that would disproportionately affect minority populations. Disproportionate burdens refer to potential future adverse effects that would disproportionately affect low-income populations. Adverse effects may be either a delay or denial of benefits or an imposition of burdens. The DI/DB analysis assessed a suite of 16 metrics for disparate impacts and disproportionate burdens. The MPO's DI/DB Policy describes how the MPO determines whether impacts are disparate or disproportionate. (See Appendix I.)

Methodology

Federal regulations provide MPOs direction on how to conduct a DI/DB analysis. Projects must be analyzed as a group and not individually. In addition, potential impacts must be analyzed for the entire minority or low-income population in the region. This regional analysis does not assess potential impacts to individual communities or municipalities. This analysis only includes those projects in the Recommended Plan that receive MPO Regional Target funds.

The following projects were included in the analysis:

- Route 135/Route 126 grade separation (Framingham)
- Interstate 495/Route 1A ramps (Wrentham)
- Intersection improvements at Route 1 and University Avenue/Everett Street (Norwood)
- Route 4/225 and Hartwell Avenue improvements (Lexington)
- McGrath Boulevard improvements (Somerville)
- Rutherford Avenue (Boston)

Assuming that the geographic distribution of the minority and low-income populations would remain unchanged in the forecast year of 2050, staff used data from the American Community Survey to identify estimates for these populations in each census tract in the Boston region.[5] For each tract, MPO

4 A disparate impact is a facially neutral policy or practice that results in impacts that disproportionately affect members of a group based on their race, color, or national origin, where the recipient's policy or practice lacks a substantial legitimate justification and where there exists one or more alternatives that would serve the same legitimate objectives but with a less disproportionate effect on the basis of race, color, or national origin.

5 U.S. Census Bureau; American Community Survey, 2017–21 American Community Survey 5-Year Estimates, Table B01003; generated by CTPS using data.census.gov; https://data.census.gov/cedsci/ (April 2023).

staff identified the percent of the population who identify as minority and the percent who have low incomes. These tract-level totals were then aggregated to geographic areas known as transportation analysis zones (TAZs) for use in the MPO's travel demand model.

To determine the range of likely impacts, MPO staff derived margins of error for each metric analyzed for disparate impacts and disproportionate burdens. These were determined based on the range of uncertainty in the demographic data within each TAZ. Using these margins of error ensures that any findings of disparate impacts or disproportionate burdens account for the uncertainty of demographic distribution in the Boston region.

Identifying potential future disparate impacts and disproportionate burdens involves comparing the projected impacts on minority populations to those on nonminority populations, and those on low-income populations to those on non-low-income populations. First, two scenarios are tested using a regional travel demand model that analyzes these metrics to identify the projected impacts of the transportation network on each of the four populations. In one, the Recommended Plan scenario, the transportation network in 2050 includes the modeled projects. In another, the Existing and Committed (E+C) scenario, the transportation network in 2050 does not include those projects.[6]

For each scenario, the model produces results for the following 16 metrics and the results are sorted by TAZ:

- Destination access metricsAccess to jobs within a 45-minute highway trip[7]
  - Access to jobs within a 45-minute transit trip
  - Access to healthcare within a 25-minute highway trip
  - Access to healthcare within a 25-minute transit trip
  - Access to parks within a 45-minute highway trip
  - Access to parks within a 45-minute transit trip
  - Access to essential places within a 25-minute highway trip
  - Access to essential places within a 25-minute transit trip
  - Access to higher education within a 25-minute highway trip
  - Access to higher education within a 25-minute transit trip

6 The modeling region includes all of Massachusetts, Rhode Island, and southeastern New Hampshire, in addition to the Boston Region MPO area. This geography allows travel demand modeling analyses to account for trips that originate in or end outside of the Boston Region MPO area. Model results are only reported for the MPO region's 1,901 TAZs.

7 Highway trips consist of automobile and truck trips taken on any road in the Boston Region MPO area. Highway trips do not include bus trips.

- Travel time metrics
  - Travel time for all trips by highway
  - Travel time for all trips by transit
  - Environmental metrics
  - Carbon monoxide (CO) emissions per square mile
  - Nitrogen oxide (NOx) emissions per square mile
  - Volatile organic compounds (VOCs) emissions per square mile
  - Congested vehicle-miles traveled (VMT) per square mile

Then, the TAZs are aggregated to the region and the weighted regionwide average for each metric is calculated for the minority, nonminority, low-income, and non-low-income populations. This average is calculated for both the E+C and Recommended Plan scenarios. For example, for the minority population, the projected CO emissions per square mile, weighted by the entire minority population in the region, is calculated for both scenarios. The CO emissions per square mile for the E+C scenario are then subtracted from the CO emissions per square mile for the Recommended Plan scenario. This determines the change in CO emissions per square mile that is projected to occur in 2050 as a result of implementing the projects funded in the Recommended Plan.

Applying the Disparate Impact/Disproportionate Burden Policy

After completing this process for all populations, MPO staff applies the LRTP DI/DB Policy to each metric to determine whether there may be a potential disparate impact for the minority population or a disproportionate burden for the low-income population. The DI/DB Policy compares the projected impact on the minority and low-income populations to that on the nonminority and non-low-income populations, respectively, to determine whether there may be a potential future disparate impact for the minority population or disproportionate burden on the low-income population.

The MPO's LRTP DI/DB Policy states how the MPO identifies and addresses potential future disparate impacts and disproportionate burdens that may result from the modeled projects. The policy enables the MPO to meet federal requirements in a clear and consistent manner, and it makes the MPO's approach to identifying and addressing potential future disparate impacts and disproportionate burdens transparent to the public. Because of the similarities between FTA's and FHWA's EJ requirements, the MPO's policy was developed to meet both.

The full DI/DB Policy can be found in Appendix I. In sum, it states that there would be a potential future disparate impact or disproportionate burden if

- the minority or low-income population would likely be more adversely affected than the nonminority or non-low-income population, respectively; and
- this result is not due to the metric's forecasting error.

Analysis Results

This section describes the results of the DI/DB analysis. Tables H-1 through H-8 report the results for each evaluation metric. The tables show whether the analysis indicates a potential disparate impact or disproportionate burden. If the expected range of values for the E+C scenario for both the protected and non-protected populations overlaps with the expected range of values for the Recommended Plan scenario, then there is no disparate impact or disproportionate burden. Otherwise, there is. An overlap indicates that any difference between the Recommended Plan and E+C scenarios is likely due to uncertainty, not the MPO projects that are being analyzed.

Destination Access Metrics

The MPO's destination access metrics are based on the number of opportunities of various types (jobs, healthcare, education, parks, and essential places) in each TAZ that are reachable within a given travel time by highway and transit. Opportunities are calculated for minority, nonminority, low-income, and non-low-income populations, based on their respective shares within each TAZ. Travel times to jobs were updated to reflect average commute times for the Boston region as documented in the American Community Survey, or by an analysis of average travel times in the travel demand model.

Opportunities are defined in different ways for each metric. The access to jobs and healthcare metrics are defined based on the number of jobs and healthcare facilities people can access.[8] The higher education metric is weighted by enrollment at each college or university.[9]

8 Jobs destination data are from the following sources:

Future projections: Metropolitan Area Planning Council, "UrbanSim microsimulation model for the MAPC Region," UrbanSim, last updated May 2023, https://cloud.urbansim.com/docs/.

Massachusetts employment data: "Employment and Wages (ES-202)," Mass.gov, accessed May 2023, https://lmi.dua.eol.mass.gov/lmi/employmentandwages.

Demographic data: "American Community Survey 2015–19 Public Use Microdata Sample (PUMS)," US Census Bureau, accessed May 2023, https://www.census.gov/programs-surveys/acs/microdata.html.

Modeling methodology: UMass Donahue Institute, University of Massachusetts Amherst, https://donahue.umass.edu/business-groups/economic-public-policy-research/expertise-services/economic-demographic-research.

Healthcare destination data are from the following sources:

Community Health Centers: "MassGIS Data: Community Health Centers," Mass.gov, last updated October 2019, https://www.mass.gov/info-details/massgis-data-community-health-centers.

Medical clinics: "Find information about licensed or certified health care facilities: Clinics," Mass.gov, accessed February 2022, https://www.mass.gov/service-details/find-information-about-licensed-or-certified-health-care-facilities.

9 Higher education destination data are from the following sources:

Locations: "MassGIS Data: Colleges and Universities," Mass.gov, last updated May 2018, https://www.mass.gov/info-details/massgis-data-colleges-and-universities.

Enrollment (2020–21 academic year): "College Navigator," National Center for Education Statistics, accessed February 2022, https://www.mass.gov/info-details/massgis-data-protected-and-recreational-openspace.

The parks metric is defined as access to points where parks intersect roadways.[10] An essential place is defined as a cluster of essential destinations that contains five or more destinations from at least two categories.[11]

10 Parks are defined as any park larger than one-half acre. Park destination data are from the following source:

Parks: "MassGIS Data: Protected and Recreational Open Space," Mass.gov, accessed February 2022, https://www.mass.gov/info-details/massgis-data-protected-and-recreational-openspace.

11 The concept of essential places was developed in response to the COVID-19 pandemic to reflect places that were considered essential during the pandemic and to reflect the basic needs that the public require access to on a regular basis. Nine types of essential destinations were chosen and fall within three categories: healthcare, civic, and food destinations.

Healthcare destinations include hospitals, medical clinics, and community health centers. Sources:

Community Health Centers: "MassGIS Data: Community Health Centers," Mass.gov, last updated October 2019, https://www.mass.gov/info-details/massgis-data-community-health-centers.

Medical clinics: "Find information about licensed or certified health care facilities: Clinics," Mass.gov, accessed February 2022, https://www.mass.gov/service-details/find-information-about-licensed-or-certified-health-care-facilities.

Pharmacies: "Massachusetts Health Professions License Verification Site," Mass.gov, accessed February 2022, https://madph.mylicense.com/verification/Search.aspx?facility=Y.

Civic destinations include town halls, post offices, and libraries. Sources:

"MassGIS Data: Town and City Halls," Mass.gov, last updated July 2017, https://www.mass.gov/info-details/massgis-data-town-and-city-halls.

"MassGIS Data: Libraries," Mass.gov, last updated August 2017, https://www.mass.gov/info-details/massgis-data-libraries.

"Find USPS Locations," USPS.com, accessed February 2022, https://tools.usps.com/find-location.htm.

Food destinations include farmer's markets and grocery stores. Sources:

Grocery stores: "Data Common: Food Retailers," Metropolitan Area Planning Council, accessed February 2022, https://datacommon.mapc.org/browser/datasets/416.

Farmers markets: "MassGIS Data: Farmers' Markets," Mass.gov, last updated June 2016, https://www.mass.gov/info-details/massgis-data-farmers-markets.

Table H-1 shows the DI/DB analysis results for access to jobs, Table H-2 shows the results for access to healthcare facilities, Table H-3 shows the results for access to parks and open space, Table H-4 shows the results for access to essential places, and Table H-5 shows the results for access to higher education. The results of the DI/DB analysis of the MPO's Regional Target projects show that there will likely be a disproportionate burden for access to jobs by transit, a disparate impact and disproportionate burden for access to healthcare by transit, and a disproportionate burden for access to parks and open space by highway.

In the case of access to jobs by transit, the disproportionate burden finding is because the projected increase in job access for low-income populations is not statistically significant, while there is a statistically significant increase for non-low-income populations. This definitionally results in a DI/DB finding regardless of the size of the projected changes, because the non-low-income population is expected to access more jobs while the low-income population is expected to have no change in access to the number of jobs. In this case, the projected increase in job access for low-income populations is larger than the projected increase for non-low-income populations. Despite this, the projected value for low-income populations in the Recommended Plan scenario is within that population's range of values for the E+C scenario (though on the extreme upper end of this range).

There was a DI and DB finding for access to healthcare facilities by transit. Both minority and nonminority populations are expected to see a small increase in the number of healthcare facilities accessible within 25 minutes by transit. However, nonminority populations will see a slightly larger increase in accessibility than minority populations. This results in a DI finding. Conversely, low-income populations are not projected to see an increase in the accessibility of healthcare by transit, while non-low-income populations are expected to see an increase. This results in a DB finding.

There is also a DB finding for access to parks and open space by highway. Low-income populations are not expected to see an increase in the accessibility of parks and open space, while non-low-income populations are expected to see an increase. This results in a DB finding.

Table H-1a
Access to Jobs by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	1,316,881 ± 372	1,316,092	Yes, decrease	-788.6	No
Nonminority	1,097,075 ± 199	1,096,029	Yes, decrease	-1,045.9 ± 1.4	
Low-income	1,289,046 ± 677	1,288,279	Yes, decrease	-767.1	No
Non-low-income	1,144,231 ± 175	1,143,227	Yes, decrease	-1,004.5 ± 1.2	

Note: Numbers indicate the regionwide average number of jobs accessible within a 45-minute trip by highway for each population.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-1b
Access to Jobs by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	310,269 ± 206	310,573	Yes, increase	304	No
Nonminority	192,191 ± 113	192,371	Yes, increase	181.2 ± 1.1	
Low-income	326,812 ± 355	327,166	No	–	Yes, no impact for EJ, non-EJ benefit
Non-low-income	209,501 ± 93	209,691	Yes, increase	190.6 ± 0.8	

Notes: Numbers indicate the regionwide average number of jobs accessible within a 45-minute trip by transit for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-2a
Access to Healthcare Facilities by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	48.00 ± 0.03	48.09	Yes, increase	0.010	No
Nonminority	37.25 ± 0.01	37.32	Yes, increase	0.0739 ± 0.0002	
Low-income	49.72 ± 0.04	49.86	Yes, increase	0.14	No
Non-low-income	38.77 ± 0.01	38.84	Yes, increase	0.0672 ± 0.0002	

Note: Numbers indicate the regionwide average number of healthcare facilities accessible within a 25-minute trip by highway for each population.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-2b
Access to Healthcare Facilities by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	5.812 ± 0.001	5.820	Yes, increase	0.0082	Yes, non-EJ benefit greater than EJ benefit
Nonminority	3.404 ± 0.003	3.413	Yes, increase	0.00950 ± 0.00004	
Low-income	6.480 ± 0.009	6.487	No	–	Yes, no impact for EJ, non-EJ benefit
Non-low-income	3.672 ± 0.002	3.682	Yes, increase	0.00943 ± 0.00003	

Notes: Numbers indicate the regionwide average number of healthcare facilities accessible within a 25-minute trip by transit for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-3a
Access to Parks and Open Space by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	7,182.09 ± 1.11	7,184.16	Yes, increase	2.079	No
Nonminority	6,795.19 ± 0.58	6,795.19	No	–	
Low-income	6,905.15 ± 3.42	6,906.38	No	–	Yes, no impact for EJ, non-EJ benefit
Non-low-income	6,936.25 ± 0.44	6,936.85	Yes, increase	0.600 ± 0.006	

Notes: Numbers indicate the regionwide average number of park and open space access points accessible within a 45-minute trip by highway for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-3b
Access to Parks and Open Space by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	559.47 ± 0.34	559.68	No	–	No
Nonminority	368.86 ± 0.19	368.79	No	–	
Low-income	591.31 ± 0.60	591.72	No	–	No
Non-low-income	395.49 ± 0.15	395.43	No	–	

Notes: Numbers indicate the regionwide average number of park and open space access points accessible within a 45-minute trip by transit for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-4a
Access to Essential Places by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	0.999862 ± 0.000002	0.999863	No	–	No
Nonminority	0.998985 ± 0.000003	0.998985	No	–	
Low-income	0.999630 ± 0.000016	0.999630	No	–	No
Non-low-income	0.999204 ± 0.000004	0.999204	No	–	

Notes: Numbers indicate the proportion of each population in the region who can access an essential place within a 25-minute trip by highway.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-4b
Access to Essential Places by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	0.68127 ± 0.00029	0.68127	No	–	No
Nonminority	0.41619 ± 0.00017	0.41619	No	–	
Low-income	0.68598 ± 0.00051	0.68598	No	–	No
Non-low-income	0.46331 ± 0.00015	0.46330	No	–	

Notes: Numbers indicate the proportion of each population in the region who can access an essential place within a 25-minute trip by transit.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-5a
Access to Higher Education by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	77,806 ± 43	78,310	Yes, increase	505	No
Nonminority	58,455 ± 23	58,731	Yes, increase	276 ± 1	
Low-income	79,789 ± 75	80,367	Yes, increase	598	No
Non-low-income	61,477 ± 19	61,771	Yes, increase	293 ± 1	

Note: Numbers indicate the regionwide average higher education enrollment within a 25-minute trip by highway for each population.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-5b
Access to Higher Education by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	9,066 ± 10	9,087	Yes, increase	22	No
Nonminority	6,608 ± 5	6,622	Yes, increase	15 ± 1	
Low-income	11,243 ± 21	11,272	Yes, increase	27	No
Non-low-income	6,500 ± 5	6,515	Yes, increase	15 ± 1	

Note: Numbers indicate the regionwide average higher education enrollment within a 25-minute trip by transit for each population.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Travel Time Metrics

The travel time metrics are used to evaluate the average travel time for all trip purposes in the Boston region. Average travel times are then calculated for minority, nonminority, low-income, and non-low-income populations, based on their respective shares within each TAZ.

Table H-6 shows the results for highway and transit trip times. The results for the DI/DB analysis for the MPO-funded Regional Target projects for both travel time metrics show a disparate impact finding for travel time by highway and transit, but not a disproportionate burden. Travel times by highway and transit are projected to slightly increase for minority populations and slightly decrease for non-minority populations leading to a disparate impact.

Table H-6a
Average Travel Time by Highway

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	19.302 ± 0.002	19.307	Yes, increase	0.005	Yes, EJ burden and non-EJ benefit
Nonminority	20.379 ± 0.002	20.377	Yes, decrease	-0.00214 ± 0.00004	
Low-income	19.168 ± 0.004	19.167	No	–	No
Non-low-income	20.217 ± 0.001	20.218	No	–	

Notes: Numbers indicate the average travel time in minutes for all trips by highway for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-6b
Average Travel Time by Transit

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	51.926 ± 0.017	51.945	Yes, increase	0.020	Yes, EJ burden and non-EJ benefit
Nonminority	54.232 ± 0.009	54.210	Yes, decrease	-0.0217 ± 0.0002	
Low-income	51.966 ± 0.028	51.943	No	–	No
Non-low-income	53.801 ± 0.007	53.798	No	–	

Notes: Numbers indicate the average travel time in minutes for all trips by transit for each population.

Expected differences were not calculated where there is not likely to be a significant impact.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Environmental Metrics

The four environmental metrics are congested vehicle-miles traveled (VMT) per square mile and emissions of three pollutants: carbon monoxide (CO), nitrogen oxides (NOx), and volatile organic compounds (VOCs). While the other metrics evaluate the impacts affecting users of the roadway or transit system, these metrics assess the environmental impacts on residents. All are calculated based on highway trips, not transit trips. The CO, NOx, and VOC metrics assess the emissions per square mile within each TAZ. The congested VMT metric assesses the volume-to-capacity ratio on the roads within or adjacent to each TAZ; those with a ratio of 0.75 or greater are considered congested.

Table H-7 shows the DI/DB analysis results for congested VMT per square mile and Tables H-8 to H-10 shows the results for pollutant emissions. The results of the environmental metrics for the MPO Regional Target projects show no DI/DB findings for any of the four metrics. The MPO Regional Target projects would likely result in an increase for congested VMT per square mile for non-minority and non-low-income populations, and no impact for any other populations or metrics. As a result, there are no findings of disproportionate impacts or disproportionate burdens for the environmental metrics.

Table H-7
Congested Vehicle-Miles Traveled Per Square Mile

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	62,009 ± 109	62,068	No	–	No
Nonminority	52,791 ± 58	52,917	Yes, increase	–	
Low-income	65,708 ± 218	65,709	No	–	No
Non-low-income	53,576 ± 56	53,658	Yes, increase	–	

Note: Where there is not likely to be a significant impact, expected differences were not calculated.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-8
Carbon Monoxide Emissions

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	178.0 ± 0.2	178.0	No	–	No
Nonminority	140.5 ± 0.1	140.5	No	–	
Low-income	188.7 ± 0.4	188.7	No	–	No
Non-low-income	144.6 ± 0.1	144.6	No	–	

Note: Where there is not likely to be a significant impact, expected differences were not calculated.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Emissions are calculated for private vehicles only.

Source: Central Transportation Planning Staff.

Table H-9
Volatile Organic Compound Emissions

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	5.109 ± 0.007	5.109	No	–	No
Nonminority	4.157 ± 0.003	4.158	No	–	
Low-income	5.418 ± 0.013	5.417	No	–	No
Non-low-income	4.252 ± 0.004	4.253	No	–	

Notes: Emissions are calculated for private vehicles only.

Where there is not likely to be a significant impact, expected differences were not calculated.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Table H-10
Nitrogen Oxide Emissions

Population	E+C Scenario: Range of Values	RP Scenario: Expected Value	Significant Impact?	Expected Difference (Range for Non-EJ Population)	DI or DB?
Minority	4.521 ± 0.005	4.522	No	–	No
Nonminority	3.512 ± 0.003	3.513	No	–	
Low-income	4.798 ± 0.009	4.799	No	–	No
Non-low-income	3.625 ± 0.003	3.626	No	–	

Notes: Emissions are calculated for private vehicles only.

Where there is not likely to be a significant impact, expected differences were not calculated.

DB = disproportionate burden. DI = disparate impact. EJ = environmental justice. E+C = Existing and Committed. RP = Recommended Plan.

Source: Central Transportation Planning Staff.

Next Steps to Address Disparate Impacts and Disproportionate Burdens

The MPO's DI/DB analyses found that the MPO's Regional Target projects that are listed in the Recommended Plan, in the aggregate, would likely result in a disproportionate burden for job access by transit, a disparate impact and disproportionate burden for healthcare access by transit, a disproportionate burden for park and open space access by transit, and disproportionate burdens for average travel time by highway and transit.

The MPO elects to keep these projects in the LRTP as listed for several reasons. The projects fit the MPO's Major Infrastructure definition for inclusion in the LRTP. Additionally, further analysis to determine a mix of projects that may result in fewer disparate impacts or disproportionate burdens is constrained by the time it takes to run the analysis with the MPO's travel demand model and the need for the LRTP to be endorsed in July in order for it to be approved by October by federal partners.

Instead, mitigation of disparate impacts and disproportionate burdens through the Transportation Improvement Program (TIP) is a more appropriate strategy. The LRTP is not a funding document, whereas the TIP is the document through which project programming decisions are made. The MPO also has limited information about projects listed in the LRTP—impacts are likely to be different and better understood once the projects are evaluated for possible programming in the TIP. Finally, the DI/DB analysis demonstrates that the disparities are generally small and, as they would not occur until 2050, there is time to mitigate the impacts through the TIP.

SUSANNA HEY, MBTA

APPENDIX I

DISPARATE IMPACT AND DISPROPORTIONATE BURDEN POLICY

FEDERAL REQUIREMENT

The Federal Transit Administration's (FTA) Title VI Circular 4702.1B, issued October 2012 under the authority of Title VI of the Civil Rights Act of 1964, directs metropolitan planning organizations (MPO) to analyze the impacts of the distribution of state and federal funds in the aggregate and to identify any disparate impacts on the basis of race, color, or national origin (i.e., impacts to minority populations). FTA's Environmental Justice (EJ) Circular 4703.1, issued August 2015, further directs MPOs to identify and address disproportionately high and adverse effects (referred to as disproportionate burdens) of its activities on minority populations and low-income populations. The Federal Highway

Administration's (FHWA) *Environmental Justice Reference Guide*, issued in April 2015, contains the same requirements for MPOs related to identifying disparate impacts and disproportionate burdens.

PURPOSE OF THE POLICY

As a recipient of federal funding from FTA and FHWA, the Boston Region MPO complies with both agencies' Title VI and EJ requirements. The MPO's Disparate Impact and Disproportionate Burden (DI/DB) Policy allows the MPO to identify potential regionwide future disparate impacts on minority populations and disproportionate burdens on both minority populations and low-income populations in the MPO region (collectively referred to as protected populations) that may result from the set of investment decisions in its Long-Range Transportation Plan (LRTP). Disparate impacts and disproportionate burdens are defined by FTA and FHWA as follows:

Disparate Impact: A facially neutral policy or practice that disproportionately affects members of a group identified by race, color, or national origin, where the policy or practice lacks a substantial legitimate justification and where there exists one or more alternative policies or practices that would serve the same legitimate objectives but with less disproportionate effect on the basis of race, color, or national origin.

Disproportionate Burden: A neutral policy or practice that disproportionately affects low-income populations more than non-low-income populations. A finding of a disproportionate burden requires the evaluation of alternatives and mitigation of burdens where practicable. (Although EJ guidance covers minority populations as well, disproportionate burdens only refer to those impacts to low-income populations as minority populations are covered by the more stringent definition of a disparate impact.)

While neither FTA nor FHWA require MPOs to have a DI/DB policy, the policy allows the MPO to make those determinations in a transparent and consistent manner that clearly conveys the findings to the public.

SCOPE

This policy applies to the analysis of the projected impacts of the set of major infrastructure projects (MI) that would be funded in the LRTP over the next 20 years, and that would change the capacity of the transportation network. These projects are analyzed for impacts as one group; individual projects are not analyzed for disparate impacts or disproportionate burdens under this policy. The MPO defines MI projects as

Highway projects

- Projects that improve facilities that are important to regional travel, which include Interstate Highways; Principal Arterial Freeways and Expressways; or all sections of roadways classified as Principal Arterial "Other" that have fully or partially controlled access, or
- Projects that cost $50 million or more; and

Public transit projects

- Projects that add new connections to or extend the rail or fixed-guideway transit network or extend the bus rapid transit network, or
- Projects that cost $50 million or more

The MPO reserves funds for these projects in the LRTP's MI Program and also sets aside funding in several other investment programs as described in the LRTP. The actual projects funded through these other programs are identified in the Transportation Improvement Program (TIP). The equity analysis that is completed for the projects funded in the TIP addresses the impacts of these projects.

COMPARISON POPULATIONS

Per FTA and FHWA requirements, the analysis to identify disparate impacts and disproportionate burdens (DI/DB analysis) compares the projected impacts on the entire protected population in the MPO region to the projected impacts on the entire non-protected population in the MPO region. Analyzing and comparing impacts on these populations at the neighborhood and municipal scale is not part of this policy, as impacts of the program of projects are only identified at the regional population level. Thus, the projected impacts on the minority population in the MPO region are compared to those on the nonminority population, and the projected impacts on the low-income population in the MPO region are compared to those on the non-low-income population. The definitions of these populations are as follows:

Minority population: People who identify as Black or African American, Asian, American Indian or Alaska Native, or Native Hawaiian or other Pacific Islander, and/or Hispanic or Latino/a/x.

Nonminority population: All other people.

Low-income population: People whose family income is 200 percent or less of national poverty level, based on their family size.

Non-low-income population: All other people.[1]

1 Minority status is derived from the 2010 Decennial Census. Poverty status is derived from the 2010-14 American Community Survey.

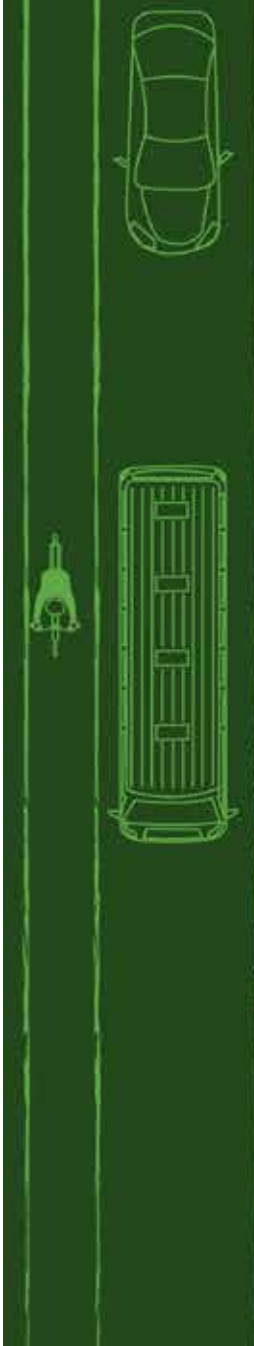
DEVELOPING THE POLICY

MPO staff worked with the MPO board, a stakeholder working group, and members of the public over three years to develop the DI/DB Policy. MPO staff convened four meetings of the stakeholder working group to help guide the direction of the policy and provide input throughout the process. The stakeholders represented a variety of interests, including advocacy groups, human service transportation agencies, municipal planners, and MPO board members. Stakeholders provided valuable feedback at critical decision-making points, helped staff prioritize metrics that are analyzed for disparate impacts and disproportionate burdens, and provided suggestions for the direction of the policy, many of which were ultimately included. The work to develop the policy was divided into two phases; two memos were written to summarize that work, which can be found here. At the conclusion of phase one, the MPO approved the use of an interim draft DI/DB Policy for use in the 2019 LRTP, *Destination 2040*. This final policy replaces the draft policy.

IDENTIFYING DISPARATE IMPACTS AND DISPROPORTIONATE BURDENS

The MPO staff use a travel demand model to analyze the projected impacts of the LRTP program of projects over the 20-year horizon on the regionwide minority, nonminority, low-income, and non-low-income populations. Staff analyze two scenarios projecting to the horizon year of the LRTP to assess these impacts: the no-build scenario (in which the program of projects is not implemented) and the build scenario (in which the program of projects is implemented). The results are assessed as weighted regionwide averages.

To identify potential future disparate impacts and disproportionate burdens, the MPO staff analyzes several metrics for both scenarios and compares the results. Using feedback from stakeholders and the public, the MPO selected metrics related to accessibility to opportunities, mobility, and the environment for *Destination 2040*. MPO staff identified each metric's baseline uncertainty for minority, low-income, nonminority, and non-low-income populations. The baseline uncertainty accounts for the inherent uncertainty in the travel demand forecasting process and helps to ensure that outcomes are not incorrectly labeled as potential disparate impacts or disproportionate burdens that are likely due to model uncertainty. The baseline uncertainty is distinct for each population because each populations' size, geographic distribution, and projected travel behavior differ. Due to the evolving nature of the analytical process, the specific metrics used to identify disparate impacts and disproportionate burdens may be updated between LRTPs, as will the accompanying baseline uncertainties.



The process to identify disparate impacts and disproportionate burdens aligns with federal guidance that requires the analysis to determine that

- the impact is caused by the MPO's investments,
- the impact is significant, and
- the impact disproportionately affects the protected population compared to the non-protected population.

To make this determination, every impact must pass a series of three thresholds, in the order listed below. If it does not pass any one of them, the analysis stops and there would be no disparate impact or disproportionate burden.

- Baseline Uncertainty Threshold: Moderate Uncertainty
- This threshold determines whether the model's predicted impact to each population group is likely to occur or whether it is likely due to the model's uncertainty. The impact to at least one population group in a pair must exceed the baseline uncertainty threshold to move on to the next threshold. For example, for the minority and nonminority population pair, at least one of these population groups must exceed the threshold.
- Practical Impact Threshold: 0 percent
- This threshold determines whether the impact would be practically significant. (An impact that is practically significant is one that would have a demonstratable effect on people's quality of life. For example, an increase in carbon monoxide emissions that affects health outcomes.) To pass the practical impact threshold, the impact must exceed the threshold for at least one population group in a pair.
- Disproportionality Threshold: 0 percent
- The disproportionality threshold determines whether the impact would disproportionately and adversely affect the protected population compared to the non-protected population. Disproportionality is calculated as a ratio comparing the absolute value of the percent change for the protected population to the absolute value of the percent change for the non-low-income population. If the ratio falls outside of the disproportionality threshold there would be a disparate impact or disproportionate burden.

Adverse impacts can either be the denial of benefits or the imposition of burdens. For some impacts (such as average travel time) an increase from the no-build to build scenarios will indicate a burden and a decrease will indicate a benefit, while for other impacts the reverse will be true (such as access to jobs).

ADDRESSING DISPARATE IMPACTS AND DISPROPORTIONATE BURDENS

If the DI/DB analysis for a given program of projects results in a finding of a potential future disparate impact for at least one metric, the MPO staff will determine whether there is a substantial, legitimate justification for implementing the program of projects as proposed, as required by federal regulations, and present the conclusion to the MPO board. Staff will also determine whether there are one or more alternatives to the program of projects that meet the same goals of the original projects but that have fewer disparate impacts. If there are, staff will present the alternatives to the MPO board. Any proposed alternative(s) will be subject to the same DI/DB Policy and analysis.

Similarly, if the DI/DB analysis indicates that there is a potential future disproportionate burden for at least one metric, the MPO staff will recommend to the MPO board steps to take to avoid, minimize, or mitigate these impacts, where practicable.

For both potential disparate impacts and disproportionate burdens, alternatives may include a mixture of strategies to mitigate, minimize, or otherwise avoid these impacts. Because the LRTP is a long-term planning document and the projected impacts are likely to occur 20 years into the future, these strategies will likely involve programming future TIP projects to mitigate the disparate impact(s) and/or disproportionate burden(s). The MPO may also use this policy during the development of future LRTPs, when conducting scenario planning or making decisions about project programming, to avoid disparate impacts and disproportionate burdens prior to project selection.

PUBLIC ENGAGEMENT

Members of the public have had opportunities to provide input throughout the development of this policy. This DI/DB Policy, as well as the metrics that are analyzed for disparate impacts and disproportionate burdens, reflects public input from outreach conducted between 2018 and 2020. During the development of future LRTPs, members of the public will also have the chance to review and comment on the results of the application of the DI/DB Policy to any scenario planning or other project selection process. The MPO board will also provide a meaningful opportunity for public comment on any proposed alternatives recommended by the MPO staff.