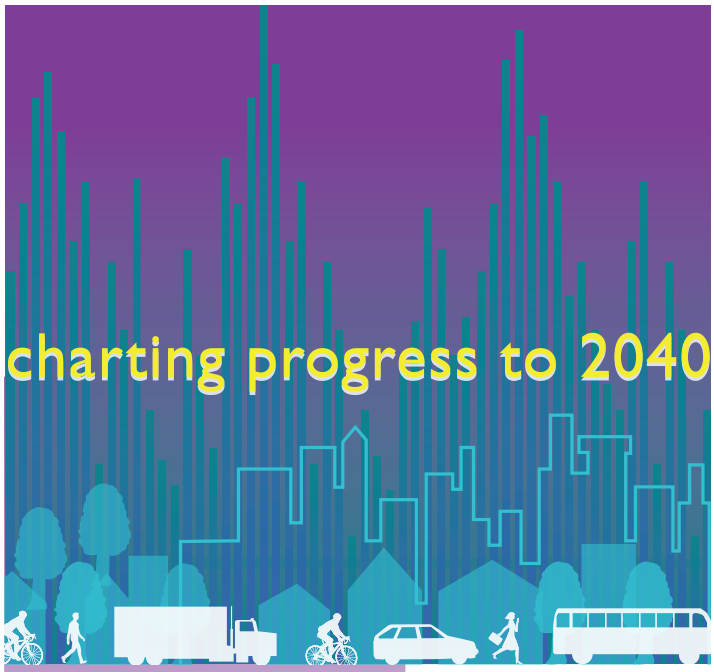
charting progress to 2040

Needs Assessment

of the Long-Range Transportation Plan of the
Boston Region Metropolitan Planning Organization

July 2015



NEEDS ASSESSMENT

FOR THE LONG-RANGE TRANSPORTATION PLAN OF THE BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

JULY 2015

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Massachusetts Bay Transportation Authority
Massachusetts Bay Transportation Authority Advisory Board
Massachusetts Port Authority
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Prepared by the MPO's Central Transportation Planning Staff
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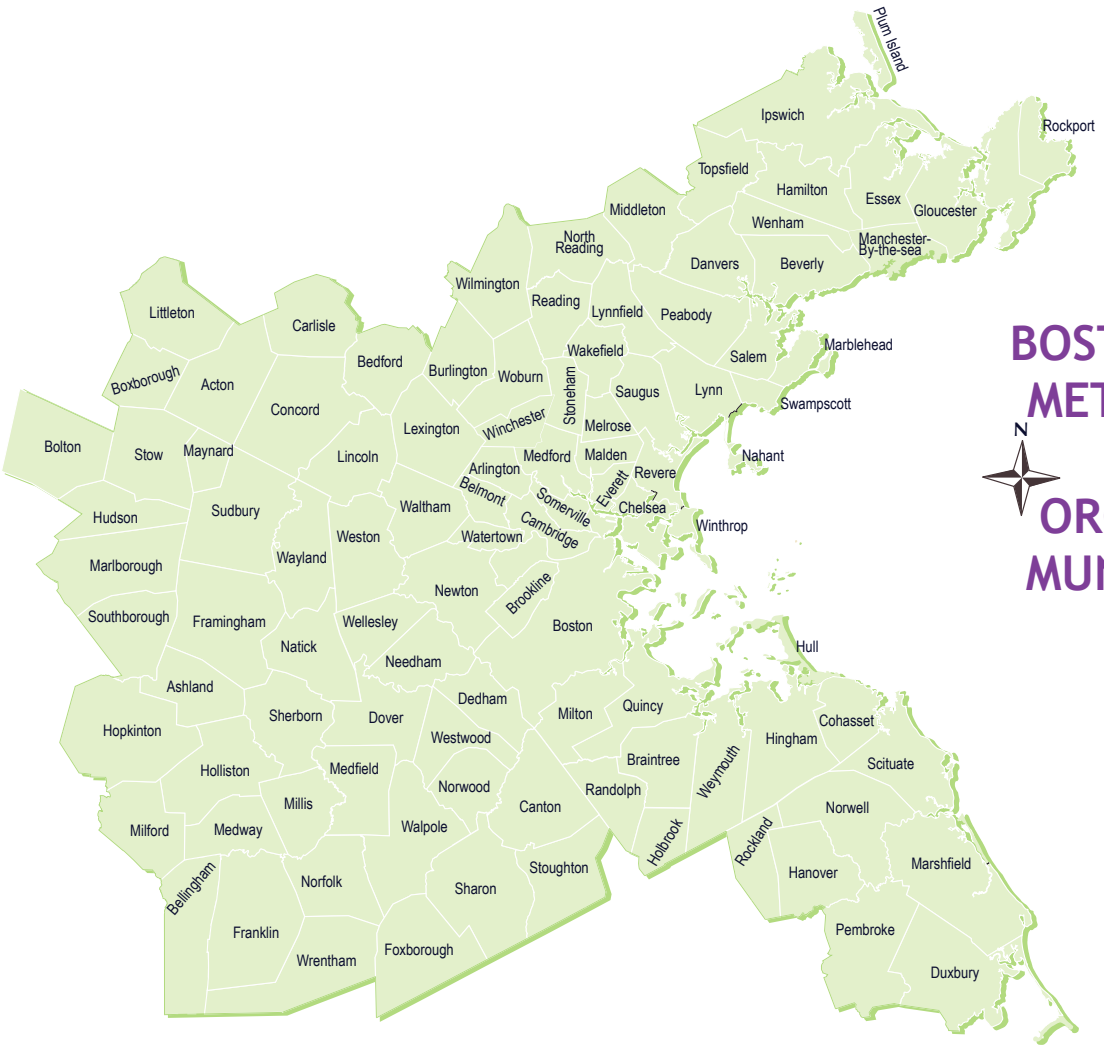

BOSTON REGION METROPOLITAN PLANNING ORGANIZATION MUNICIPALITIES

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By mail	Central Transportation Planning Staff Certification Activities Group 10 Park Plaza, Suite 2150 Boston, MA 02116
By telephone	(857) 702-3690 (voice) (617) 570-9193 (TTY)
By fax	(617) 570-9192
By e-mail	amcgahan@bostonmpo.org

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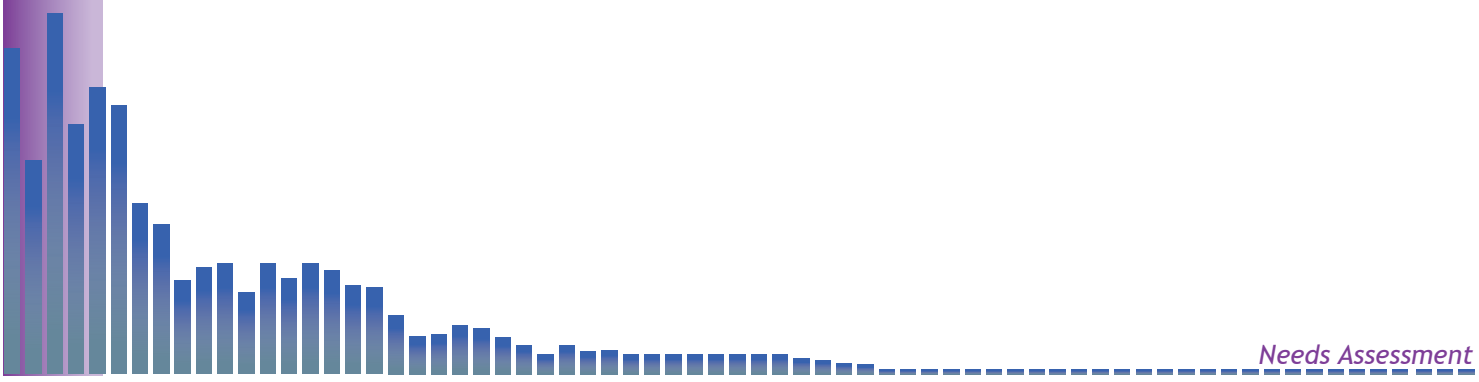

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1 INTRODUCTION

BACKGROUND

The Long-Range Transportation Plan and Needs Assessment

The Boston Region Metropolitan Planning Organization (MPO) develops a new long-range transportation plan (LRTP) every four years, as mandated by federal requirements and reaffirmed in the most recent federal transportation reauthorization legislation, *Moving Ahead for Progress in the 21st Century* (MAP-21). The MPO developed a new LRTP, *Charting Progress to 2040* which was adopted in July 2015. The LRTP establishes a vision for the Boston region's future transportation system, establishes goals and objectives to achieve the vision, and identifies transportation projects and programs that support the visions and goals.

The MPO's Needs Assessment—a database of existing transportation, population and employment conditions, and analysis and projections of future conditions that indicate prospective transportation demand—is a critical tool for planning the region's future. This Needs Assessment includes information about various components of the transportation system, their existing condition, how they are used, and their projected future use.

Performance Based Planning and Programming

As part of developing *Charting Progress to 2040,* the MPO integrated performance-based planning and programming (PBPP) into its practices (required by MAP-21) in order to achieve and document progress toward the MPO's goals. PBPP refers to transportation agencies' application of performance management in their planning and programming processes to achieve desired outcomes for the multimodal transportation system.

For MPOs, PBPP is a comprehensive planning practice that reflects the MPO's continuing, cooperative, and comprehensive (3C) metropolitan transportation planning process. It involves undertaking a range of activities and producing a variety of products in coordination and consultation with all applicable agencies, organizations and stakeholders, including the public. The PBPP is fully integrated into the MPO's 3C process, which includes developing:

- A long-range transportation plan
- Other plans and processes, including those that are federally required, such as Strategic Highway Safety Plans, Asset Management Plans, Congestion Management Process, transit agency Asset Management Plans, and transit agency safety plans, as well as other plans that are not required
- Programming documents, including the Transportation Improvement Program (TIP)
- Studies conducted through the Unified Planning Work Program (UPWP)

The MPO is developing performance measures—metrics used to monitor and report on a transportation characteristic—particularly to assess progress toward MPO goals. Through its PBPP practice, the MPO is working to base its transportation investment decisions—both long-term planning and short-term programming—on their ability to meet the MPO's established goals.

The Boston Region MPO's Needs Assessment

EXISTING CONDITIONS

A critical first step in developing the long-range transportation plan and the MPO's PBPP practice is to gather, organize, and analyze available sources of data about the existing transportation system. This is a vital component of the LRTP because the region's transportation system must be inventoried before decisions can be made about how to address problems within the constraints of future funding. This process allows the MPO to understand the many needs that must be addressed for all transportation modes regarding population and employment in the region.

PURPOSE AND USE

The Needs Assessment guided the MPO's decision making about how to address the region's needs through the LRTP, and will guide future decision making about which projects to fund in the TIP, and which studies to conduct through the UPWP.

Clearly, the region has extensive needs for maintaining and modernizing all modes of its transportation system. Authorities estimate that the cost of meeting all identified needs will exceed anticipated financial resources between now and 2040. Therefore, it is important to prioritize the region's needs in order to guide investment decisions.

The information included in the Needs Assessment will be used to establish a baseline for the MPO's performance measurement process, then to track it over time to determine if the transportation system it is moving toward its goals and objectives.

ORGANIZATION OF THE NEEDS ASSESSMENT

Unlike the Needs Assessment for the previous LRTP, *Paths to a Sustainable Region*, the updated Needs Assessment developed for the new LRTP, *Charting Progress to 2040,* is a Web-based document—that is, embedded in the textual components, are links to other detailed MPO information, which is displayed in tabular and map formats. This embedded information is not present in a printed document. Instead, the viewer may access it online and/or download it. Any interested party may use this information to understand the region's transportation conditions and needs, or to help with their own transportation planning. Displaying information in this way makes the Needs Assessment a true regional data resource.

Below is a description of the content in the Needs Assessment document:

- **Chapter 1** describes the study area and the data resources used to inventory and assess the region's transportation needs.
- **Chapter 2** provides an overview of the region's current land use, and that which is projected to occur between now and 2040 if there are no improvements to the transportation system. It includes information on population, employment, and housing.
- **Chapter 3** describes the region's current travel patterns (under base-case 2012 conditions), and those which are projected to occur between now and 2040 if there are no improvements to the transportation system (no-build condition). No-build conditions assume that there are no new improvements to the existing transportation system other than those currently under construction, advertised for construction, or included in the first year of the 2014–2017 Transportation Improvement Program.
- **Chapter 4** reports on regional high-priority needs for the next 25 years, based on analyzing information provided in the Needs Assessment application tool and other sources, and presented in Chapters 2 and 3.
- **Appendix A** presents information on the laws, regulations, guidelines, and policies identified in Chapter 4 under each of the goals that direct and influence MPO activities in the metropolitan transportation planning process.

The Needs Assessment organizes the identified needs according to the MPO's goal themes, which are derived from the Boston Region MPO's vision for the region's transportation future. The vision states:

The Boston Region Metropolitan Planning Organization envisions a modern transportation system that is safe, uses new technologies, provides equitable access, excellent mobility, and varied transportation options—in support of a sustainable, healthy, livable, and economically vibrant region.

The MPO's goal themes are:

- Safety
- System Preservation
- Capacity Management and Mobility
- Clean Air and Clean Communities
- Transportation Equity
- Economic Vitality

Concerns for each travel mode—highway, transit, freight, bicycle, and pedestrian—are identified within each goal, as applicable.

DEFINITION OF THE STUDY AREA

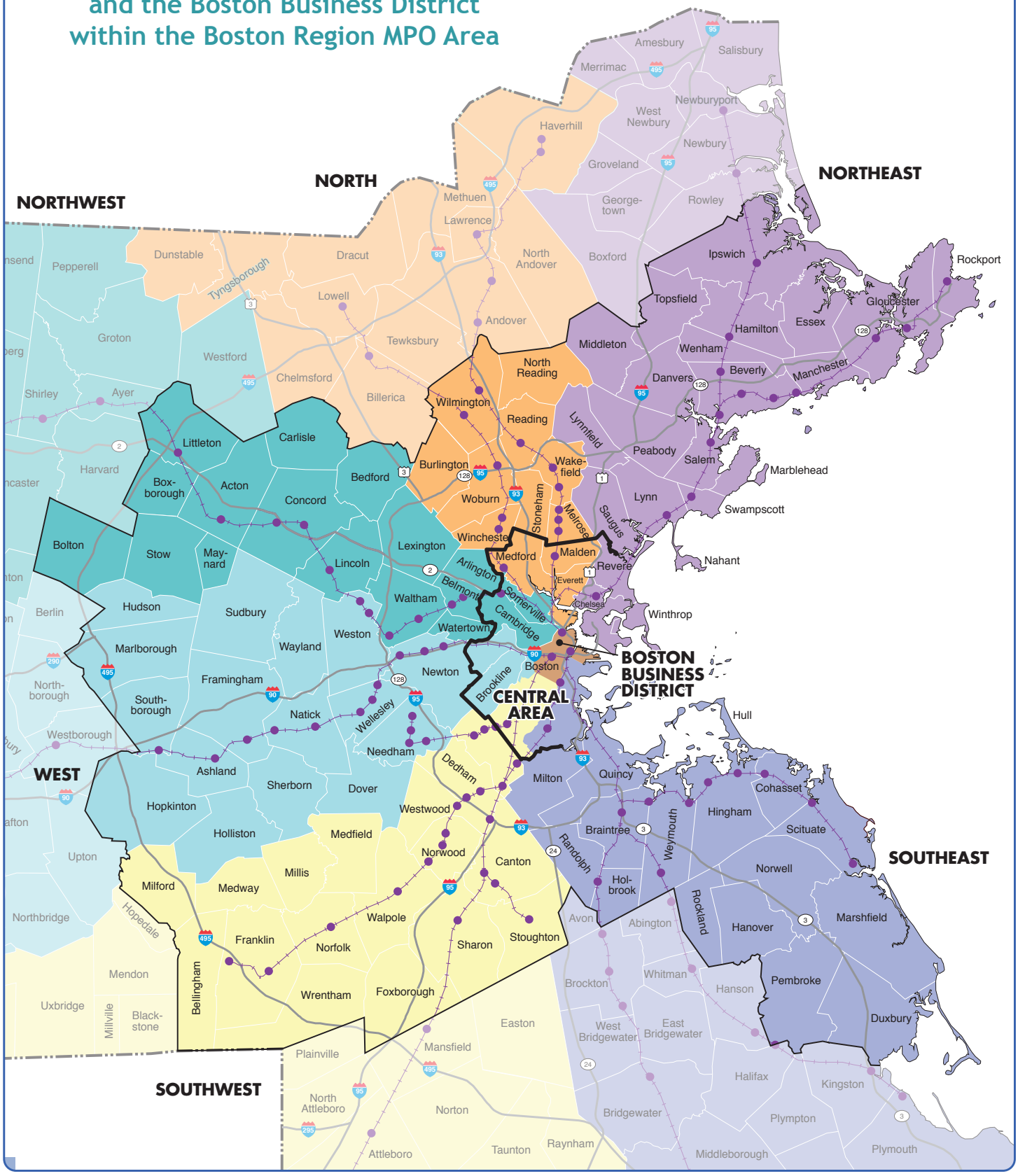
The Boston Region MPO encompasses 101 municipalities from Ipswich to Duxbury and Boston to Marlborough. For transportation planning purposes, the MPO maintains a travel demand model, which includes the 101 municipalities plus an additional 63 municipalities around the MPO—164 municipalities in total. While the Needs Assessment addresses only the needs of the municipalities in the Boston Region MPO, it does take into consideration conditions and travel activity in other portions of the region. For the purposes of the Needs Assessment, the 164 municipalities were divided into six radial corridors as shown in Figure 1.1. The map also may be found at (ftp://ctps.org/pub/LRTP/MPO-RadialCorr-CA-BBD.pdf). The municipalities in the Boston Region are shown in the darker colors, while municipalities within the model area but outside of the MPO are shown in the lighter shade of that color. A list of the municipalities in the Boston Region MPO along with the associated radial corridor may be found at http://www.ctps.org/datacatalog_share/content/municipality-corridor-table-long-range-transportation-plan.

The six radial corridors were established around major highway and rail facilities with an orientation into and out of the Boston business district. The corridors, and some of the major facilities around which they were established, are listed as follows.

Radial

- **Northeast Corridor** – Routes 1 and 128, Interstate 95, the Rockport/Newburyport Line of the commuter rail system, and the Blue Line of the rapid transit system
- **North Corridor** – Interstate 93, Route 3, the Lowell and Haverhill Lines of the commuter rail system, Amtrak's Downeaster service, and the Orange Line of the rapid transit system

FIGURE 1.1
Radial Corridors, the Central Area, and the Boston Business District within the Boston Region MPO Area



- **Northwest Corridor** – Route 2, the Fitchburg Line of the commuter rail system, and the Red Line of the rapid transit system
- **West Corridor** – Interstate 90, the Framingham/Worcester Line of the commuter rail system, the CSX Boston Line (freight), and the Green Line of the rapid transit system
- **Southwest Corridor** – Interstate 95, the Franklin and Providence/Stoughton Lines of the commuter rail system, Amtrak's Northeast Corridor service, and the Orange Line of the rapid transit system
- **Southeast Corridor** – Interstate 93, Routes 3 and 24, the Middleborough/Lakeville, Kingston/Plymouth, and Greenbush Lines of the commuter rail system, and the Red Line of the rapid transit system

Central Area

The Central Area includes the City of Boston (excluding the neighborhoods of Hyde Park, Roslindale, West Roxbury, and Mattapan), Brookline, Cambridge, Somerville, Medford, Malden, Everett, Revere, Chelsea, and Winthrop. This area is the hub of the radial corridors and the central and major activity center of the region. The Central Area was delineated based on proximity to the Boston Business District and the ratio of employment to population (greater than or equal to 1:1). The Boston neighborhoods of Hyde Park, Roslindale, West Roxbury, and Mattapan are farther from the Boston Business District and have a lower employment-to-population ratio than the other Boston neighborhoods. In addition to being a major destination and origin for radial travel in the region, the Central Area has important circumferential travel patterns. The Central Area is shown in Figure 1.1, which also may be found at (ftp://ctps.org/pub/LRTP/MPO-RadialCorr-CA-BBD.pdf).

Boston Business District

The Boston Business District is the heart of the Central Area. Its boundaries are the Charles River to the north, Massachusetts Avenue to Interstate 93 on the west and south, and the South Boston Seaport District bounded by Broadway to Haul Road, New Cypher Street, D Street, and Summer Street to the Marine Industrial Site. The Boston Business District is shown in Figure 1.1, which also may be found at (ftp://ctps.org/pub/LRTP/MPO-RadialCorr-CA-BBD.pdf).

INFORMATION INCLUDED IN THE NEEDS ASSESSMENT

MPO staff studied each individual corridor, the Central Area, and the Boston Business District to understand current travel patterns and trends, projected future travel demand, and transportation conditions; and staff combined this information in order to study the entire region. Information about the transportation system helps the Boston Region MPO evaluate its performance relative to its goals regarding safety, system

preservation, capacity management and mobility, greenhouse gases and air pollutants, transportation equity, and economic vitality. Staff used information from previous and ongoing transportation planning work—including the *Paths to a Sustainable Region* LRTP, the MBTA's Program for Mass Transportation, the MPO's Congestion Management Process (CMP), transportation equity outreach, MPO studies, and special studies—to update the Needs Assessment.

The MPO's travel demand model, updated with data from the most current (2011) Massachusetts Household Travel Survey, and demographic projections also were used in the Needs Assessment. Existing and projected socioeconomic information (population, housing, and employment data) and the existing and proposed transportation network were important factors in determining transportation needs. In the modeling process, the adopted LRTP used a base year of 2012 and a future year of 2040 for the transportation network and socioeconomic data. A detailed description of the modeling process may be found at http://www.ctps.org/Drupal/travel_modeling_101.

Information used in the updated, 2015 Needs Assessment is documented on the MPO's website. It may be found by accessing the LRTP Needs Assessment webpage http://www.bostonmpo.org/Drupal/charting_2040_needs or through the Data Catalog webpage http://www.ctps.org/datacatalog_share/ under the long-range transportation plan category. Staff also have created specific applications that provide information used in developing the Needs Assessment. These applications also may be found on the MPO's website, and include:

- Long-Range Transportation – Needs Assessment Application http://www.ctps.org/map/www/apps/lrtpNeedsAssessmentApp/index.html
- Congestion Management Process Dashboards
    - Express Highway Performance Dashboard (http://www.ctps.org/geoserver/www/apps/expressHighwayPerformanceDashboard/index.html)
    - Arterial Performance Dashboard (http://www.ctps.org/geoserver/www/apps/arterialHighwayPerformanceDashboard/index.html)
- Livability Communities Data Browser (http://www.ctps.org/map/www/apps/lcApp/index.html)
- All-Hazards Planning Application (http://www.ctps.org/map/www/apps/eehmApp/pub_eehm_index.html)
- Vehicle-Miles Traveled and Emissions Data Browser (http://www.ctps.org/geoserver/www/apps/vmtApp/index.html)

The sections below cite the type of information, along with their links available in the web-based Needs Assessment. Information on the website includes a description of

the information (metadata), the data, and if applicable, an analysis of the displayed data that is used to determine and prioritize the needs of the region's transportation system. Most of the information is in the form of a table or map and may be viewed for the entire region or individual corridors.

Long-Range Transportation Plan Needs Assessment Application (http://www.ctps.org/map/www/apps/lrtpNeedsAssessmentApp/index.html)

TRANSPORTATION

The transportation system in the MPO region is a collection of roads, bridges, transit services, freight lines, bicycle routes, pedestrian facilities, and ferry routes. It is maintained and operated by a number of different agencies, including but not limited, to the Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), the Massachusetts Port Authority, the Department of Conservation and Recreation, and local entities.

Information about the existing major transportation facilities and services included in the Web-based Needs Assessment is as follows:

1. **Highways (Maps)**
    - Major roadways
    - Pavement condition
2. **Transit and Bicycle**
    - MBTA rapid transit (map and table)
    - MBTA commuter rail (map and table)
    - Airports (map and table)
    - MassDOT park and-ride lots (map and table)
    - Docks (map and table)
    - Dedicated bicycle paths (map and table)
    - Commuter ferries (map)
    - MBTA bus routes (map)
3. **Freight – (Truck) Trip Density and Generators (Maps)**
    - 2012 base year with selected truck trip generators
    - 2040 future year

- Change truck trip density 2012 to 2040
- Rail freight lines

4. **Volume/Capacity Ratio – 2012 and 2040 (Maps and Tables)**
    - 2012 AM expressways
    - 2012 PM expressways
    - 2040 AM expressways
    - 2040 PM expressways
    - 2012 AM arterials
    - 2012 PM arterials
    - 2040 AM arterials
    - 2040 PM arterials
5. **Speed Index (2012 – Table)**
    - The ratio of observed speed to the posted speed limit
6. **Travel Time Index (2012 – Table)**
    - The ratio of travel time during the peak period to the time required to make the same trip at free-flow speeds
7. **Crashes (Map and Table)**

LAND USE AND DEMOGRAPHICS

The Boston Region MPO area has long been home to a changing population, economy, and landscape, and the coming decades will be no exception. The forces of an aging population, growing diversity, economic restructuring and changing household preferences will intersect to create a region that in 2040 could be markedly different from the one that exists today. The Metropolitan Area Planning Council (MAPC) develops socioeconomic forecasts for use by the Boston Region MPO in developing the LRTP. The Needs Assessment includes information about existing land use in the region, and where possible, that which is projected to occur between now and 2040, as follows:

1. **Population Density (Maps and Tables)**
    - 2012 base year
    - 2040 future year

- Change 2012 to 2040
- Population areas beyond transit range: Shows transit services, population density, and catchment areas around commuter rail and rapid transit stations and bus stops. For commuter rail and rapid transit stations, a half-mile catchment area for walk access is assumed, while the catchment area for bus stops is a quarter mile.

2. **Households (Maps and Tables)**
   - 2012 base year
   - 2040 future year
   - Change 2012 to 2040
3. **Employment Density (Maps and Tables)**
   - 2012 base year
   - 2040 future year
   - Change 2012 to 2040
4. **Elderly Population (Maps and Tables)**
   - Population age 70+ (2010 census data)
   - Percent population age 70+
5. **Environmental Justice Areas (Maps)**
   - Title VI Areas
     - Specific neighborhoods defined by the federal government with high concentrations of minority residents
   - Areas of Environmental Justice Concern
     - Specific neighborhoods defined by the Boston Region MPO with high concentrations of low-income and/or minority residents

TRAVEL CHARACTERISTICS

To understand the MPO's transportation needs, it is important to know the region's travel patterns. Information about highway, transit, freight, bicycle, and pedestrian travel modes included in the LRTP Needs Assessment application was derived from the MPO's regional travel demand model, which uses base year (2012) conditions and projects future (2040) travel patterns.

1. **Origins-Destination Flows between Regions (Maps and Tables)**
    - 2012 Auto person trips
    - 2012 Transit person trips
    - 2012 Bike-walk person trips
    - 2012 Truck trips
    - 2040 Auto person trips
    - 2040 Transit person Trips
    - 2040 Bike-walk person trips
    - 2040 Truck trips
2. **Trips from Regions to Boston Business District and Central Area (Maps and** Tables)
    - 2012 trips into Boston Business District and Central Area by mode (highway, transit, bike, and walk)
    - 2040 trips into Boston Business District and Central Area by mode (highway, transit, bike, and walk)

Congestion Management Process Dashboards

The Express-Highway Performance Dashboard and Arterial Performance Dashboard display 2012 peak-period congestion for expressways and arterials in the Boston Region MPO area in both map and table format. The congestion performance measures in the dashboards represent three factors related to congestion: duration, intensity, and travel time reliability. Each dashboard consists of regional overview maps, route-specific data, and downloadable accessible tables. The roadway data that are represented in both dashboards were collected in 2012 by INRIX and processed by MPO staff.

1. **Express Highway Performance Dashboard (Maps and Tables)**

    (http://www.ctps.org/geoserver/www/apps/expressHighwayPerformanceDashboard/index.html)

    - AM/PM congested time
    - AM/PM average speed
    - AM/PM speed index
    - AM/PM delay per mile

- AM/PM travel time index
- AM/PM planning time index

2. **Arterial Performance Dashboard (Maps and Tables)**

   (http://www.ctps.org/geoserver/www/apps/arterialHighwayPerformanceDashboard/index.html)

   - AM/PM congested time
   - AM/PM speed index
   - AM/PM travel time index

Livable Communities Data Browser (http://www.ctps.org/map/www/apps/lcApp/index.html)

The MPO Livable Communities Data browser is a resource for exploring data associated with livability throughout the Boston region. The information is presented in both maps and tables. The database provides access to data, by municipality, related to demographics, available transportation options, and existing transportation patterns to facilitate a better understanding of the current state of livability and conditions necessary for supporting livability.

1. Community type
2. Population density
3. Employment density
4. Elderly population percentage
5. Sidewalk coverage
6. Miles of sidewalks
7. Resident walk share
8. Bicycle coverage
9. Resident bike share
10. Miles of bicycle trails
11. Miles of bicycle lanes
12. Automobiles per household
13. Daily vehicle miles traveled (VMT) per household
14. Pedestrian crash rate
15. Bicycle crash rate

All-Hazards Planning Application (http://www.ctps.org/map/www/apps/eehmApp/pub_eehm_index.html)

The All-Hazards Planning application shows the region's transportation network in relation to natural hazard zones in map format. This tool works in conjunction with the MPO's database of Transportation Improvement Program (TIP) projects and is used to determine if proposed projects are located in areas prone to flooding or at risk of seawater inundation from hurricane storm surges, or, in the long term, sea level rise. Transportation facilities in such hazard zones might benefit from flood protection measures, such as enhanced drainage systems, or adaptations for sea level rise.

1. Federal Emergency Management Agency (FEMA) flood zones
2. Hurricane surge
3. Earthquake liquefaction
4. Elevation above sea level

Vehicle-Miles Traveled and Emissions Data Browser (http://www.ctps.org/geoserver/www/apps/vmtApp/index.html)

This tool may be used to browse, in tabular form, the MPO's database of modeled VMT, vehicle hours traveled (VHT), and emissions data for the 101 cities and towns in the Boston Region MPO. The data is for the 2009 base year.

Data Catalog (http://www.ctps.org/datacatalog_share/)

MPO staff develops and maintains a varied collection of data crucial to regional planning and policy decisions. The information listed below is included as part of the LRTP Needs Assessment. This data is available for download. Tabular data is available in either Excel or PDF form, depending upon the particular dataset.

1. **Map of Regionally Significant Priority Development and Preservation Areas**
2. **Municipal Planning Checklist** – Table listing participating municipalities that have opted into contemporary planning activities and initiatives that promote economic development, smart growth, healthy transportation, and greenhouse gas emission reduction.
3. **Sidewalk Facilities by Municipality** – Table listing the total non-limited-access centerline miles and sidewalk miles for the 101 municipalities in the MPO region.
4. **Bicycle Facilities by Municipality** – Table listing the total non-limited-access centerline miles, bicycle-lane miles, cycle-track miles, shared-use-path miles, marked-shared-lane miles, miles of signs- posted-on-road bicycle routes that have no other bicycle accommodations, and miles of paved bike shoulder with a minimum

width of four feet for the 101 municipalities in the MPO region.

5. **MBTA Rapid Transit, Commuter Rail and Ferry Data 2014** – Table listing information about MBTA stations on the rapid transit, commuter rail, and ferry lines.
6. **MBTA Bus Performance Indicators 2012 Service Plan** – Table listing information about MBTA bus route performance indicators.
7. **Roadway Miles 2013** – Table listing total centerline miles, lane miles, and centerline miles by federal aid category for the 101 municipalities in the MPO region, and the same information by municipality and LRTP corridor.

2 LAND USE IN THE BOSTON REGION MPO

Existing Land Use in the Boston Region MPO Area

Background

The Boston Region MPO area is a mature area, with a dense urban core where the majority of jobs and population are located. This region is composed of 101 cities and towns, each with their own land-use regulatory authority.[1] These municipalities are connected with a diverse network of local roads, highways, rail lines, bus routes, and rapid transit services.

In order to understand how regional trends will affect the region's diverse communities over the coming decades, the Metropolitan Area Planning Council (MAPC) has identified four basic community types (shown in Figure 2.1)—the Inner Core, Regional Urban Centers, Maturing Suburbs, and Developing Suburbs. While each city and town is unique, communities within each community type share important characteristics that will influence their development in coming decades. The criteria used to define community types include land use and housing patterns, recent growth trends, and projected development patterns.

The Inner Core

The Inner Core consists of the high-density cities of Boston, Cambridge, Somerville, Revere, Everett, and Chelsea, as well as more residential "streetcar suburbs," such as Arlington and Brookline. The Inner Core is essentially "built out," with little vacant developable land. Virtually all recent development has occurred through infill and reuse of previously developed land. Multifamily housing is a significant component of the housing stock, as are rental and subsidized housing. Most employment is concentrated in downtown Boston and portions of Cambridge. There are 16 cities and towns in the Inner Core (within Route 128) that are classified as streetcar suburbs, which are built around village-scale commercial districts.

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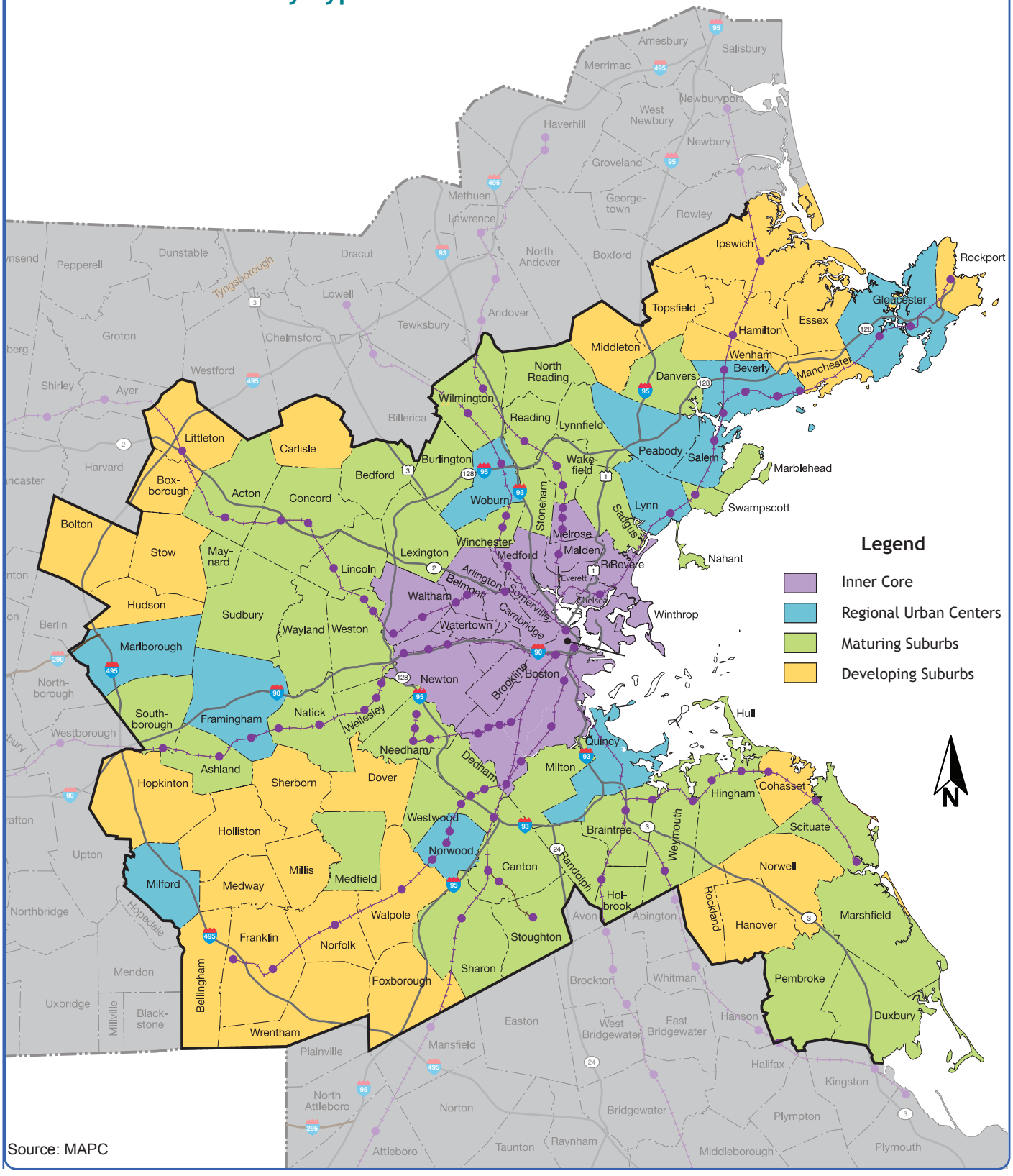
1 Throughout this chapter, the term "Boston Region MPO area" refers to the 101 municipalities in the Boston Region MPO area, and the term "Metro Boston" refers to the 164 municipalities in the Boston Region MPO's travel demand model set.

FIGURE 2.1
Metropolitan Area Planning Council
Community Types



Source: MAPC

Regional Urban Centers

This group includes urban centers that are located outside of the Inner Core. These communities are characterized by an urban-scale downtown core with multiple blocks of multistory, mixed-use buildings; moderately dense residential neighborhoods surrounding this core; and (in some cases) lower-density, single-family residential development surrounding the moderately dense neighborhoods. Some of these communities are "built out," while others still have vacant developable land around their peripheries. Rental housing and multifamily structures compose a significant component of the housing stock. Many of these communities have growing immigrant populations, such as Framingham and Lynn. Twenty-one regional urban centers are located mostly outside of Route 128.

Maturing Suburbs

These municipalities are moderate-density residential communities that have a dwindling supply of vacant developable land. Less than 25 percent of their land is still developable. Less than 20 percent of their land area is devoted to commercial and industrial uses, although some of these towns are significant job centers. More than half of their housing units are owner-occupied single-family homes.

There are 50 towns classified as maturing suburbs, most of them located along Route 128.

Developing Suburbs

These are less-developed towns that have large expanses of vacant developable land. Some of these towns have a locally significant stock of rental units in larger complexes and in modestly sized multifamily structures. Many of these towns have a well-defined, mixed-use town center. Others have town centers with historical and civic significance but no commercial or neighborhood function. The extent of economic development varies, but generally is quite limited. There are 77 towns classified as developing suburbs, most of them located along I-495 and on the North and South Shores. Some have strong town centers and moderate-density neighborhoods, while others are more rural.

PRIORITY DEVELOPMENT AND PRESERVATION AREAS

Many cities and towns in the developing suburbs are planning ahead by identifying and prioritizing areas for growth and preservation. Priority Development Areas (PDAs) have features that include:

- Potential capacity to support additional development or redevelopment, but that development may first require additional investments in infrastructure

- Single- or mixed-use development; a combination of retail, commercial, office, and/or housing
- Range in size from a single lot to many acres
- May include adaptive reuse of existing buildings to preserve sense of place
- Generally characterized by good access, available infrastructure (primarily water and sewer), and an absence of environmental constraints
- May include areas that have undergone extensive community or neighborhood planning processes, and may have detailed recommendations for future actions
- Areas designated under state programs such as Chapter 43D (expedited permitting), Chapter 40R (smart growth zones) or Economic Opportunity Areas can be examples of PDAs

Priority Preservation Areas' (PPA) features include:

- Deserve special protection because of significant environmental factors and/or natural features, such as endangered-species habitats, large blocks of high-quality intact habitat for natural communities and ecosystem diversity, areas critical to the water supply, scenic vistas, areas important to a cultural landscape, or areas of historical significance.
- Currently permanently protected (for example, via a conservation restriction, municipal or state conservation land, and land trust ownership). In general, existing parks and new park facilities do not fall within this category.
- May be critical to linking open space and trails within a community across municipal boundaries that are part of a larger, regional network.

TRANSIT-ORIENTED DEVELOPMENT (TOD)

Transit-oriented development has been a large part of Boston's growth since the days of the earliest horse-drawn railways. In fact, we live in a uniquely transit-oriented region, where 25 percent of housing units and 37 percent of employment are within a half mile of a rapid transit or commuter rail station. The Metro Boston area is experiencing a new wave of growth near transit service, with hundreds of residential and commercial developments under way and more on the horizon. Cities and towns are creating plans for developing areas near transit stations, and are updating their zoning to unlock development potential. The MBTA is accepting proposals for major developments on prime MBTA-owned parcels; state agencies are using transit proximity as a criterion for prioritizing infrastructure or housing resources; and the development community is finding a strong market for residential and commercial space near MBTA stations and stops.

More information on TOD in the region may be found in MAPC's report Growing Station Areas: The Variety and Potential of Transit-Oriented Development in Metro Boston (June 2012) (http://www.mapc.org/sites/default/files/MAPC-TOD-Report-FINAL-web-reduced-size.pdf).

Future Land Use: 2010 to 2040

Background

The Boston Region MPO area has long been home to a changing population, economy, and landscape, and the coming decades will be no exception. The forces of an aging population, growing diversity, economic restructuring and changing household preferences will intersect to create a region in 2040 that is markedly different from the one that exists today. The outcomes of certain key questions will determine those differences:

- How many young workers will choose to stay in the region?
- Where will new families want to settle?
- What locations will prove most attractive to expanding industries?
- How will access to transportation or congestion encourage or impede growth in the region?

It is possible to plan for these outcomes by using the MPO's regional travel demand model. The model can help us anticipate a range of feasible outcomes and assess what different scenarios might mean for housing demand, economic growth, school enrollment, and land use. Moreover, it is possible to influence the future through choices made at the local, regional, and state levels.

Since the future cannot be predicted, identifying a range of possible future scenarios may prove more useful than a single forecast. Each scenario will reallocate growth based on the transportation investments being examined, assuming that land-use policies do not change. Furthermore, the Boston Region MPO and MAPC recently adopted an integrated land-use transportation model that enables the MPO to assess how its investment decisions can help shape the region's land use. When the land-use model is linked to the travel demand model, we can predict real estate development and allocate total regional jobs by industry and households by type throughout the region based on changes to transportation accessibility and land-use policies. Here, "accessibility" refers to the ability to reach desired goods, services, activities, and other destinations. Land-use policies consist of zoning requirements, water or sewer limitations, and environmental restrictions. This model can demonstrate how increased transportation capacity may relocate growth, and

how transportation congestion or unreliability may deter growth. Each detailed land-use scenario described in this report reflects a set of assumptions about the region's future transportation network.

Except as otherwise noted, all of the land-use scenarios use the same assumptions about the region's total population, household, and employment growth over the coming decades. Regional control totals (the upper limit of population and employment) for Metro Boston were developed by MAPC in 2014, following its multiyear collaboration with the Massachusetts Department of Transportation (MassDOT), the Executive Office of Housing and Economic Development (EOHED), the Central Transportation Planning Staff (CTPS), the University of Massachusetts Donahue Institute, neighboring regional planning agencies, and numerous experts and stakeholders. That process examined two distinct growth scenarios in Metro Boston: The "Status Quo" scenario assumes a continuation of existing rates of births, deaths, migration, and housing occupancy. The "Stronger Region" scenario explores how changing trends could result in higher population growth, greater housing demand, a substantially larger workforce, and more robust employment growth.

Which land-use scenario that is more likely to occur depends upon future decisions. Individual households will make their own choices about where to live, but they will do so in a context influenced by public-sector actions and investments. Policies for promoting housing construction will facilitate higher in-migration rates, which characterize the Stronger Region scenario. Conversely, continued widespread opposition to new housing likely will result in less production and higher costs, thereby maintaining the Status Quo prototype. In other words, decisions made by the region's cities and towns help determine how the future unfolds. If those communities were to plan for a shared vision of the future, they could make it more possible for that vision to be achieved.

Of the two land-use scenarios, Stronger Region is more consistent with the housing, land-use, and workforce development goals of MAPC's *MetroFuture*, the MPO region's land-use plan, which already has been adopted by the EOHED as the basis for the Commonwealth's multifamily housing production goal. As a result, Stronger Region is the MPO's recommended scenario for regional transportation planning, and serves as the basis for all of the land-use scenarios unless otherwise noted.

Despite the differences among various scenarios, they all reflect large-scale, long-term land-use trends in the region. The aging population, growing diversity, a restructured economy, and changing household preference (household size and location) determine the broad outlines of the region's changes over the coming decades. The following sections describe these trends.

Population and Housing Demand—Key Trends

SLOW GROWTH IS IN STORE IF THE REGION'S POPULATION KEEPS DECLINING.

The Status Quo scenario projects that the region's population will grow an average of 2.1 percent in each of the next three decades, one-third more slowly during the last decade. The loss of population to other states is a major contributor to slow growth. Historically, more people move out of the Metro Boston region to other states or to other parts of Massachusetts than the reverse; we estimate that this "net domestic out-migration" averaged about 10,000 people per year between 2000 and 2010. Births and international immigration were sufficient to keep the state growing during that same period, but both factors likely would diminish in coming years.

ATTRACTING MORE YOUNG PEOPLE IS CRITICAL TO A GROWING ECONOMY.

Over the coming decades, the "baby boomers" born between 1945 and 1964 will be reaching retirement age, depleting the supply of our region's most critical asset: a skilled, well-educated workforce. By 2030, nearly one million workers now older than 40 years—or currently, 39 percent of all workers in the region—will have left the labor force. The current population of young adults is barely sufficient to fill the positions vacated by retiring baby boomers, much less provide the workforce needed for robust economic growth. If the region stems the loss of population to other states and achieves a small net inflow, as the Stronger Region Scenario anticipates, the labor force could grow by 175,000 over the next 30 years, an increase of almost 7 percent, as shown in Figure 2.2.[2]

NEW HOUSING DEMAND WILL OUTPACE POPULATION GROWTH BECAUSE OF DECLINING HOUSEHOLD SIZE.

Despite relatively slow population growth under the Status Quo scenario, the region will see substantial demand for new housing units. With more single-person households (especially seniors), more divorced households, and fewer children per family, the average household size likely would decline by 10 percent by 2040 under either of the land-use scenarios, as shown in Figure 2.3. In other words, a given number of people will form 10 percent more households and require 10 percent more housing units than today. Under either scenario, declining household size alone will result in approximately 86,000 additional households over the next 10 years, which accounts for more than two-thirds of Status Quo housing demand over that same period. This phenomenon will cause a number of suburban communities

2 Unless otherwise stated, all of the information in each figure was produced by MAPC and/or the University of Massachusetts Donahue Institute.

to experience population declines even as new housing units are constructed.

A "SENIOR SELL-OFF" MAY PROVIDE MOST OF THE SINGLE-FAMILY HOMES NEEDED BY YOUNGER FAMILIES.

While the aging of the baby-boomer generation will cause the number of seniors in the region to swell considerably, over time the same generation will need fewer homes—especially single-family homes—than it does today as its members downsize, move elsewhere, or die. The Stronger Region scenario anticipates that all Eastern Massachusetts residents born before 1971 will put 112,000 single-family homes back on the market by 2020, enough to supply about 66 percent of the demand from younger residents. For householders born between 1951 and 1970, there will be a small net demand for condominiums in the next decade, but that will free up even more single-family homes in

FIGURE 2.2
Population in the Labor Force
Metro Boston, 2010-30
Status Quo vs. Stronger Region

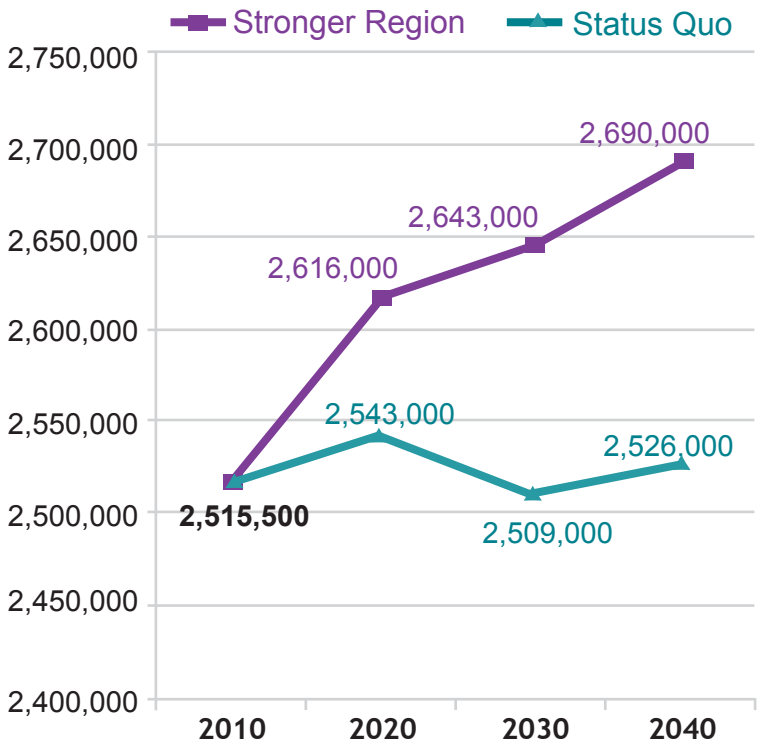
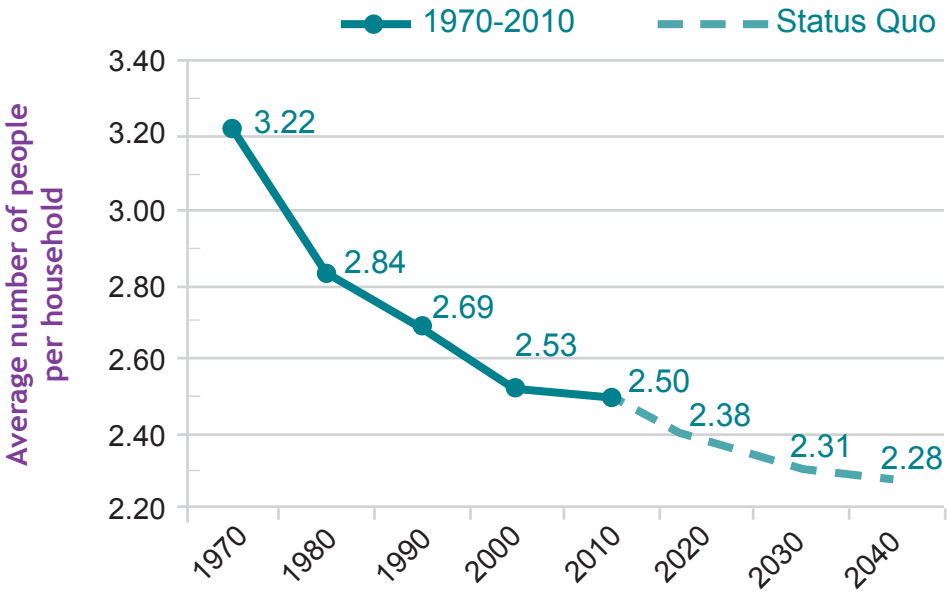
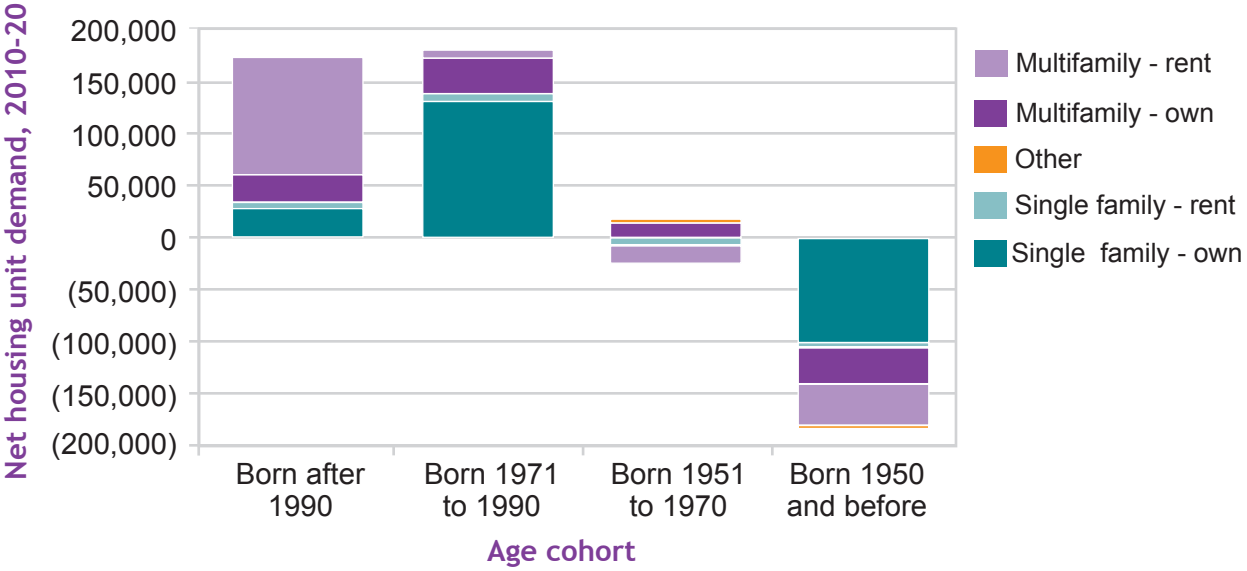


FIGURE 2.3
Average Household Size, Metro Boston 1970-2040



subsequent decades. Meanwhile, the younger-than 40-year-old households critical to growing the labor force overwhelmingly prefer apartments and condominiums, but far fewer of these units will be freed up by older residents. These patterns will continue into the future, and as a result, nearly two-thirds of housing demand would be for multifamily housing in the Stronger Region scenario, as shown in Figure 2.4.

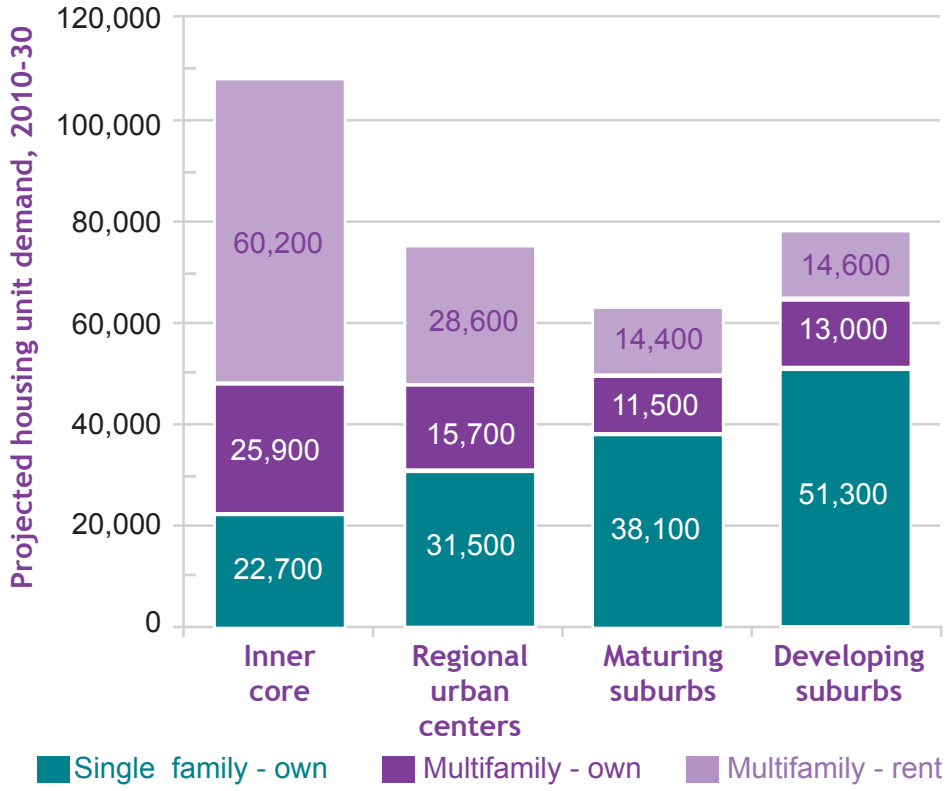
FIGURE 2.4
Net Housing Unit Demand by Resident, Metro Boston, 2010-30, Stronger Region Scenario



MANY SIGNS POINT TO THE RESURGENCE OF URBAN COMMUNITIES.

Current trends show that many urban municipalities—both the Inner Core and outlying regional urban centers—experience a large influx of young people but lose them to suburban communities as those residents form families. However, these trends are changing. When compared to the 1990s, in the last 10 years, more young people have been moving to urban communities and fewer of them have moved out once they turn 30. An increasingly diverse population attracted by the job proximity, transit access, vibrancy, and cultural assets of urban areas likely will drive continued population growth. Urban communities are projected to attract 52 percent (Status Quo) to 56 percent (Stronger Region) of new housing production, as shown in Figure 2.5. This same chart also indicates that multifamily housing will be needed across the region, including a 25-to-35 percent increase in housing production in suburban communities.

FIGURE 2.5
Housing Unit Demand by Type and Tenure, 2010-30
Stronger Region Scenario
Metro Boston Community Types



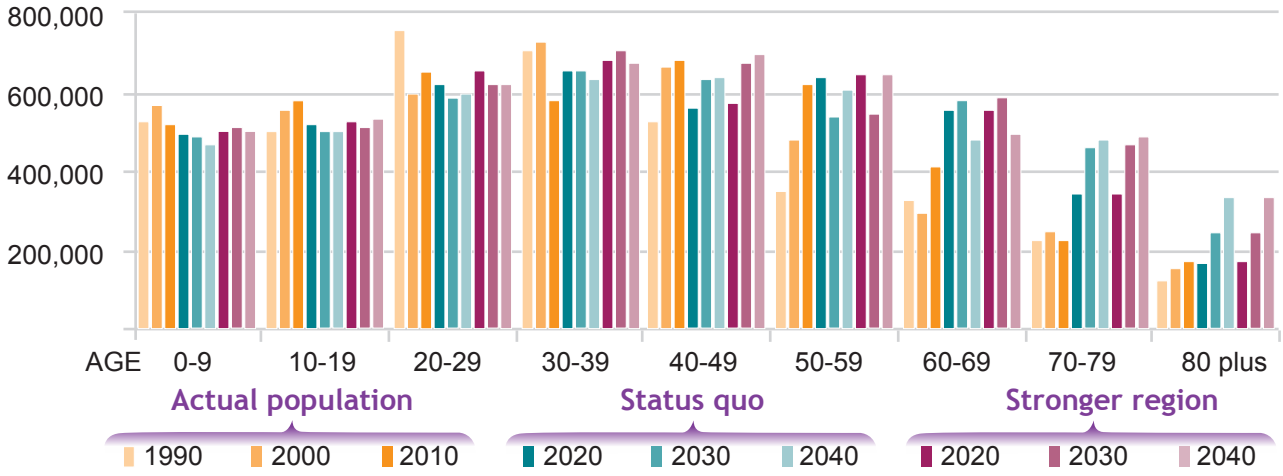
UNDER BOTH THE "STATUS QUO" AND "STRONGER REGION" SCENARIOS, THE NUMBER OF SCHOOL-AGE CHILDREN IN THE REGION AS A WHOLE, AND IN MOST MUNICIPALITIES, PEAKED IN 2000 AND LIKELY WILL DECLINE OVER THE COMING DECADES.

As shown in Figure 2.6, the region's school-age population peaked in 2000, when the baby boomers were in their prime child-rearing years (age 30 to 55). Now, there are fewer adults in that age range so the number of births (and subsequent school-age children) has begun to decline. The population aged 5 to 14 is now 6 percent smaller than it was at the 2000 peak, and it is projected to fall another 8 to 9 percent by 2020 and decline more slowly thereafter under the Status Quo scenario. If the region attracts and retains more young adults under the Stronger Region scenario, the school-age population may rebound slightly, but will remain 6 percent smaller in 2040 than it was in 2010.

Regional Economic Growth—Key Trends

Over the next three decades, the region's economy likely will be characterized by continued economic restructuring and constrained growth.

FIGURE 2.6
Metro Boston Population by Age, 1990-2040, Status Quo and Stronger Region Scenario



AVAILABILITY OF LABOR WILL BE A FUNDAMENTAL CONSTRAINT ON JOB GROWTH.

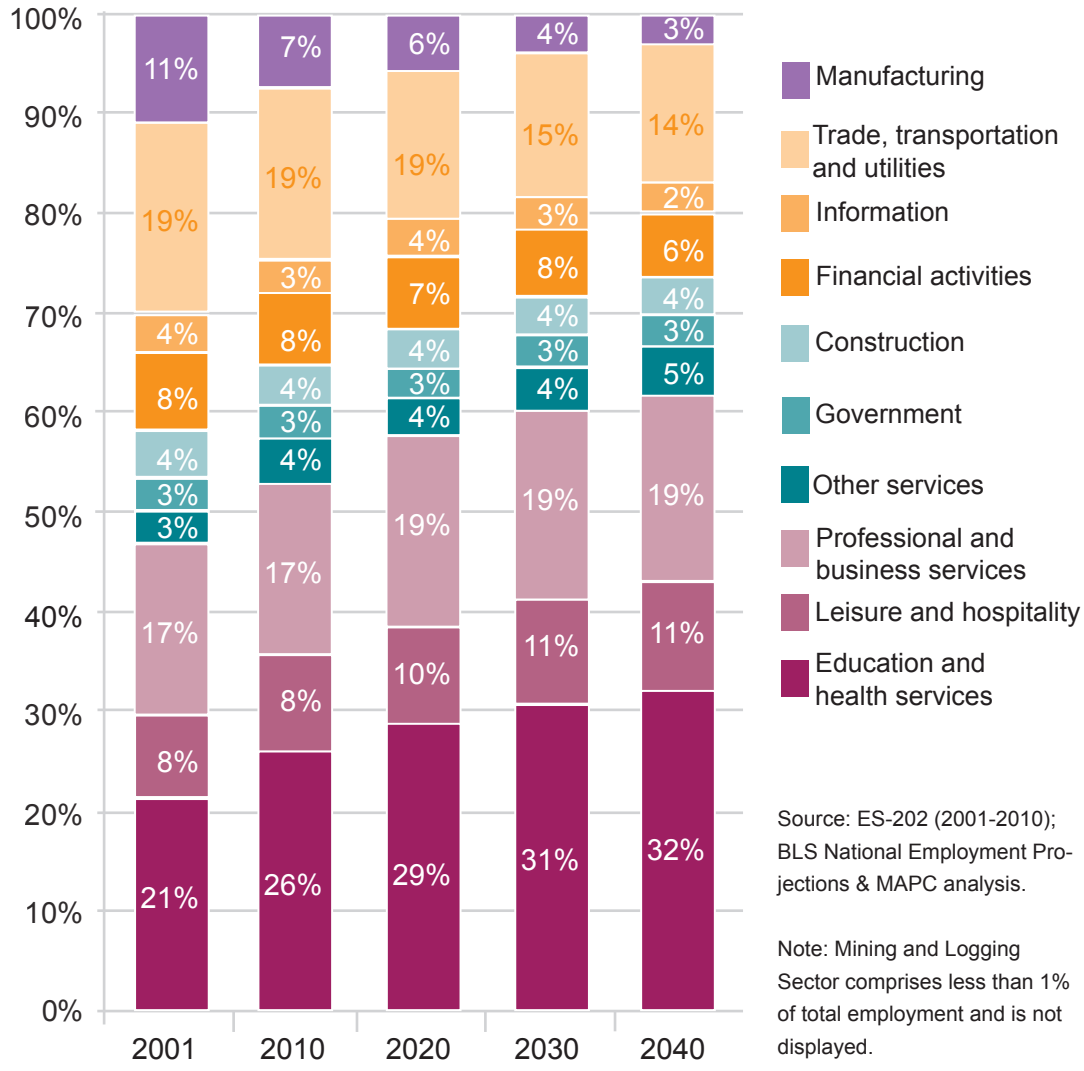
Forecasts based on national economic projections predict rapid growth for the MPO region and the state, but the lack of workers likely would be a major drag on growth. National projections prepared by the US Bureau of Labor Statistics suggest that Massachusetts jobs could increase from 8 to 17 percent between 2010 and 2020. However, a massive wave of baby-boomer retirement, combined with net out-migration to other states, will make it difficult, if not impossible, to provide enough labor to fill all of the jobs. In fact, even the Stronger Region scenario projects labor force growth of just 7 percent over a 30-year period. A statewide analysis indicates that the problem may be worse for other regions of Massachusetts than for Metro Boston, where the labor force may decline substantially over the coming decades. After accounting for a return to normal unemployment rates by 2020 and for reduced in-migration from other Massachusetts regions experiencing labor-force declines, MAPC projects that jobs in the Metro Boston region may increase to 184,000 from 2010 to 2040, an increase of 8 percent.

THE ECONOMY WILL CONTINUE TO EXPERIENCE SIGNIFICANT RESTRUCTURING AND SHIFTS BETWEEN DIFFERENT SECTORS.

Given the relatively slow pace of overall job growth in the coming decades, the growth and decline of certain sectors may have more impact on the region's economy than the absolute change in the number of jobs. Based on historical trends and national projections by sector, MAPC forecasts that certain sectors probably would grow rapidly while others would experience continued declines. Specifically, the education and health sector likely would grow by 33 percent in Metro Boston, gaining almost 200,000 jobs and expanding to compose nearly one-third

of the region's jobs by 2040. Professional and business services and the leisure and hospitality sectors also probably would grow at above-average rates, together gaining 120,000 jobs. Meanwhile, the share of jobs in financial activities and information is expected to decrease slightly, while manufacturing and the trade, transportation, and utilities sector are projected to decline substantially and compose a substantially smaller share of the state's employment in 2040. This reflects long-term trends in production and commerce, with more overseas manufacturing, more online purchasing, and fewer labor-intensive retail operations.

FIGURE 2.7
Metro Boston Employment Share by Sector, 2010-30
Employment Data and MAPC Projections



Source: ES-202 (2001-2010); BLS National Employment Projections & MAPC analysis.

Note: Mining and Logging Sector comprises less than 1% of total employment and is not displayed.

3 TRAVEL PATTERNS IN THE BOSTON REGION MPO

BACKGROUND

An important part of understanding the MPO's transportation needs is an understanding of the travel patterns in the region. The information used to analyze travel patterns for the Needs Assessment was obtained from several sources. Information on highway, transit, freight, bicycle, and pedestrian travel modes was derived from the MPO's regional travel demand model, which uses base year (2012) conditions and projects future travel patterns. In addition, information from MPO studies and activities, including freight studies and the 2011 Massachusetts Travel Survey were used to obtain information on travel patterns in the region.

BOSTON REGION MPO AREA TRAVEL PATTERNS DERIVED FROM THE REGIONAL TRAVEL DEMAND MODEL

In developing the Long-Range Transportation Plan (LRTP), *Charting Progress to 2040*, the MPO conceptualized the region's transportation needs over the next 25 years. Land use patterns, growth in employment and population, and trends in travel patterns will affect the demand on the region's transportation system in different ways. In order to estimate future demands on the system for this LRTP, the MPO utilized its regional travel demand model set (referred to as the "model" throughout this report).[1] The MPO's model, which is similar in nature to those used in most other large urban areas in North America, is a planning tool used to forecast and evaluate the impacts of transportation alternatives given varying assumptions with regard to population, employment, land use, and traveler behavior. The model is used to assess potential projects and programs in terms of air quality benefits, travel-time savings, and congestion reduction.

The model represents the transportation network in eastern Massachusetts, including all MBTA rail and bus lines, regional transit authority bus service, all private express-bus carriers, all commuter boat services, all limited-access highways and principal arterials, and many minor arterials and local roadways. Based on this network, the model simulates existing travel conditions and forecasts future-year travel on the transit and highway systems.

1 The regional travel demand model set is made up of four component models, each of which simulates a step in the travel decision-making process.

To obtain a more accurate picture of the travel demands in the Boston region, all communities in eastern Massachusetts are included in the modeled area: 101 municipalities in the MPO region and an additional 63 communities that are located outside of the MPO region. The modeled area is subdivided into more than 2,700 transportation analysis zones (TAZs), units of geography similar to census block groups.

The model simulates transportation supply characteristics and transportation demand for travel from every TAZ to every other TAZ in the modeled area. This simulation is the result of several inputs (different categories of data); the most important include population, employment, auto ownership, transit fares, automobile operating costs, highway and transit levels of service, and pedestrian and bicycle options. These inputs are updated on a regular basis to ensure the reliability of the forecasts. The MPO has incorporated many new procedures and capabilities into its model, including the ability to forecast nonmotorized trips (bicycle and pedestrian) and to utilize the parking capacities at MBTA stations to limit the number of drive-access transit trips reported in the model.

The model was used to estimate 2012 base-year travel conditions and project future-year 2040 No-Build travel conditions. No-Build conditions assume that there are no new improvements to the existing transportation system other than those that are currently under construction, advertised for construction, or included in the first year of the Federal Fiscal Years (FFYs) 2014–17 Transportation Improvement Program (TIP) of the Boston Region MPO and TIPs of adjacent MPOs.

Base- and future-year travel conditions were estimated for highway, transit, bicycle, and pedestrian travel into the Central Area and into the Boston Business District. The Central Area, as defined in this Needs Assessment, is the largest economic engine of the region; home to universities, hospitals, high-tech industries, retail establishments, and cultural institutions, providing the region with many jobs and other activities. The Central Area, shown in Figure 3.1, consists of most of Boston (excluding Hyde Park, Roslindale, West Roxbury, and Mattapan) and nine communities surrounding the city: Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Revere, Somerville, and Winthrop. Many people travel into this area from surrounding municipalities, located both inside and outside of the MPO region.

The Boston Business District is the heart of the Central Area, shown in Figure 3.2. The Boston Business District's boundaries are the Charles River to the north, Massachusetts Avenue to Interstate 93 (I-93) on the west and south, and the South Boston Seaport District bounded by Broadway from I-93 to Haul Road, and by New Cypher Street, D Street, and Summer Street from D Street to the Marine Industrial Site.

In addition, the model estimates travel for district-to-district groupings of communities' travel patterns. All district-to-district travel is presented in terms of highway and transit person-trips. The 164-municipality model area (101 in the MPO region and 63 on its periphery) was divided into 41 districts in order to study the suburb-to-suburb travel patterns in the region. Travel patterns may be viewed in the LRTP Needs Assessment

FIGURE 3.1
The Central Area and the Boston Business District within the Boston Region MPO Area

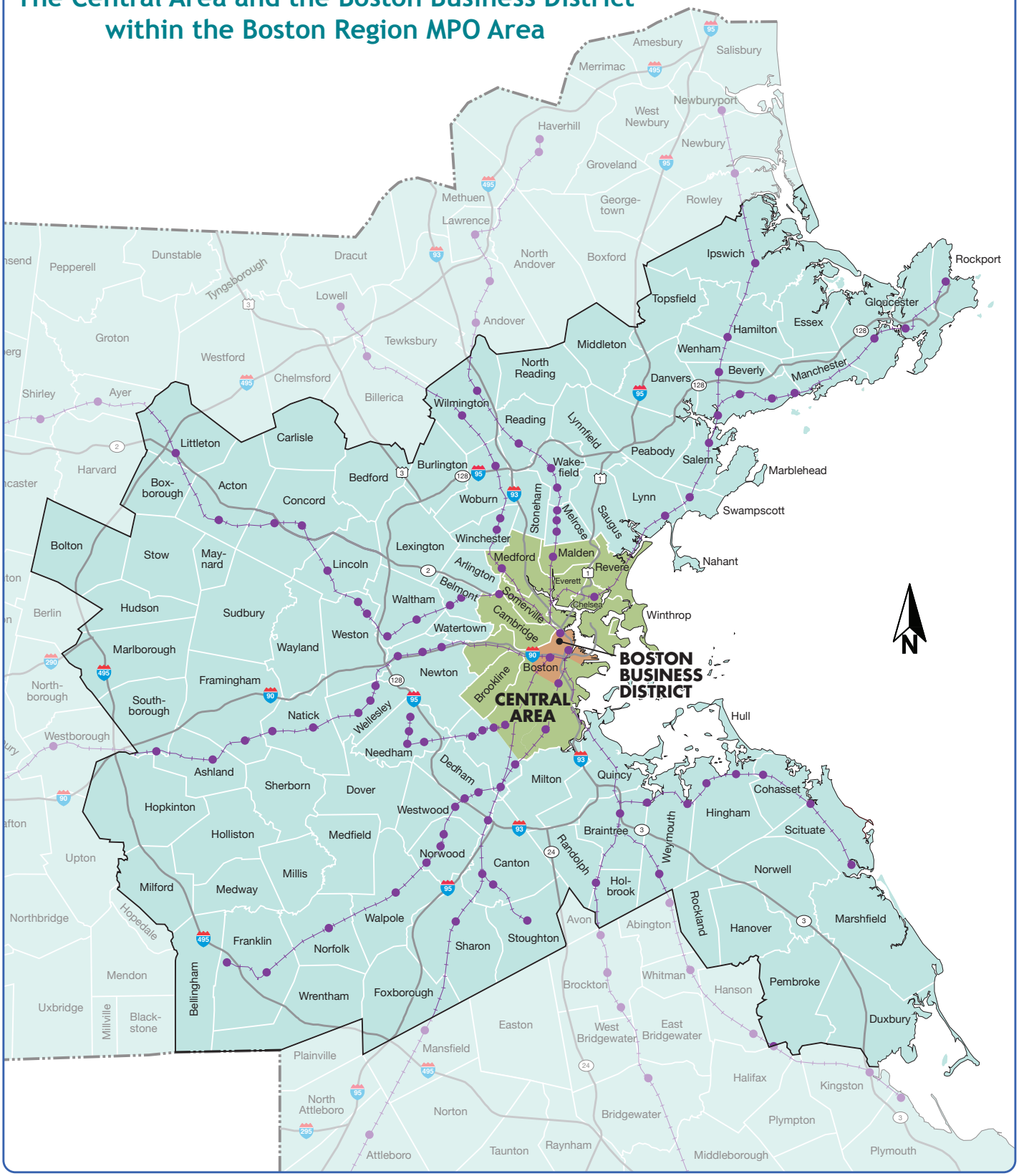
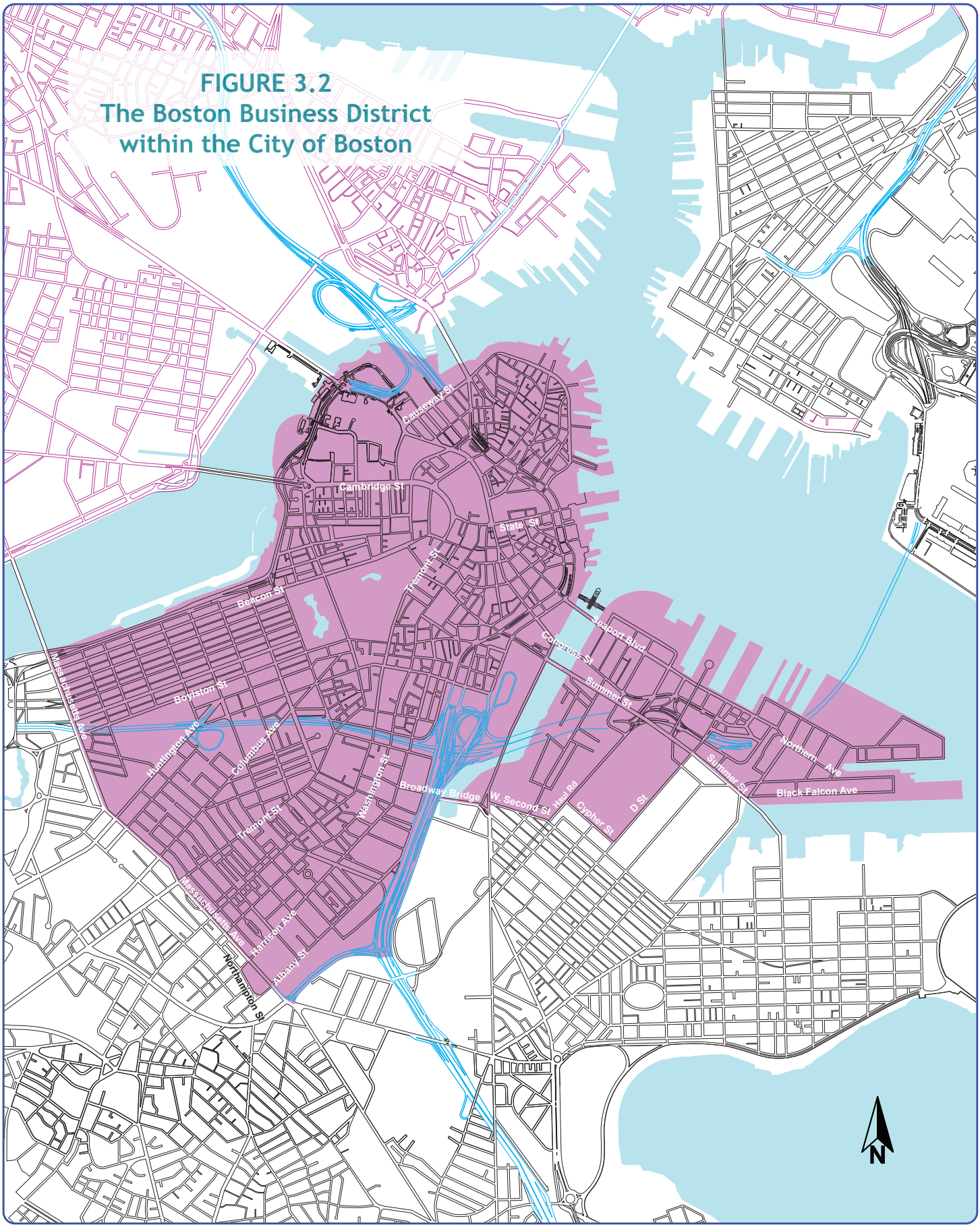


FIGURE 3.2
The Boston Business District within the City of Boston



Application at www.bostonmpo.org/drupal/charting_2040_needs, which shows typical weekday travel between the suburban districts that are located outside of the Central Area.

Travel into and within the Central Area

BASE-YEAR (2012) TRAVEL INTO THE CENTRAL AREA

The Central Area is the Boston Region MPO area's most prominent population and employment area. It is estimated that approximately 250,000 daily weekday person-trips[2] enter the Central Area from the Boston Business District alone. Among all the regional trips destined to the Central Area, approximately 72 percent of person-trips have both their origin and destination *within* the Central Area, because of its large number of residents and employment opportunities. Approximately 735,000 daily person-trips enter the Central Area from all MPO corridors, including the Boston Business District. Approximately 52,000 weekday person-trips enter the Central Area from non-MPO municipalities. Detailed information about travel from specific corridors in the Boston Region MPO area into the Central Area may be found on the LRTP Needs Assessment Application, at www.bostonmpo.org/drupal/charting_2040_needs.

Highway Travel

Accounting for 71 percent of all person-trips, highway travel is the predominant mode of travel into the Central Area. It is estimated that approximately 117,000 daily highway trips enter the Central Area from the Boston Business District alone, while the Northwest Corridor contributes approximately 105,000 daily trips to the Central Area. Approximately 66 percent of the total highway trips occurring throughout the MPO region have both their origin and destination *within* the Central Area. Overall, highway trips from other MPO corridors, including the Boston Business District, with the Central Area as their destination account for approximately 512,000 daily highway trips. An additional 48,000 daily trips enter from non-MPO municipalities[3].

Transit Travel

With approximately 317,000 transit person-trips on the average weekday, transit is the major mode of travel *within* the Central Area. Sixty-five percent of the transit trips *within* the Central Area use rapid transit (heavy rail and light rail), 33 percent use bus, 1.5 percent use commuter rail, and the remaining 0.5 percent use ferry. The Boston Business District contributes approximately 78,000 transit person-trips to the Central Area, the majority of which are made by rapid transit. Approximately 130,000 daily transit trips are destined to the Central Area from the remaining MPO corridors, including

2 A trip by one person in any mode of transportation.

3 Municipalities located outside of the 101 municipalities in the Boston Region MPO but within the MPO's travel demand model area.

the Boston Business District, while approximately 4,000 transit trips enter the Central Area from non-MPO municipalities.

Bicycle Travel

Bicycle trips are made mainly *within* the Central Area, with approximately 64,000 daily bicycle trips having both their origin and destination in the Central Area. The Boston Business District contributes approximately 12,000 bicycle trips to the Central Area each day, and 4,000 daily trips are from the Northwest Corridor. It is estimated that approximately 13,500 bicycle trips enter the Central Area from the MPO region overall, excluding the Boston Business District, with none entering from outside of the MPO region.

Pedestrian Travel

Walking is the second most prominent mode of travel *within* the Central Area, with an estimated 90 percent (623,000) of the total walk trips in the MPO area having both the origin and destination in the Central Area. The Boston Business District contributes approximately 43,000 walk trips to the Central Area, while other corridors contribute 24,000 walk trips to the Central Area. Many of these inter corridor trips to the Central Area originate within a close distance to the Central Area's corridor boundaries.

CENTRAL AREA: PROJECTED TRAVEL TRENDS – 2012 TO 2040

The Central Area will continue to be the region's most prominent population and employment area in 2040. Approximately 61,000 additional daily weekday person-trips are expected to enter the Central Area from the Boston Business District alone in 2040. The projections indicate that intraregional (both the origin and destination are in same region) person-trips for the Central Area will remain at 72 percent because of the large number of residents and employment opportunities in the area. Forecasts also indicate that an additional 139,000 daily person-trips will enter the Central Area from all the MPO corridors that are outside of the Central Area. There is a projected increase of 8,000 daily person-trips entering the Central Area from non-MPO municipalities.

Highway Travel

Highway travel will continue to be the most prominent mode of travel into the Central Area in 2040. Daily highway trips into the Central Area from the Boston Business District are projected to increase by approximately 17,500 (15 percent), while daily highway trips from the Northwest Corridor will increase by 15,000 (14 percent). Highway trips having both their origin and destination in the Central Area are projected to increase by approximately 137,600 (13 percent). Highway trips to the Central Area from all MPO corridors outside of the Central Area are projected to increase by approximately 71,000 (13 percent); highway trips from non-MPO municipalities are projected to increase by 8,000 (16 percent).

Transit Travel

Weekday daily transit trips *within* the Central Area are projected to increase by approximately 52,500. A 2 percent decrease in daily rapid transit trips and a 2 percent increase in commuter rail trips *within* the Central Area are projected for 2040. The model predicts that an additional 16,000 transit trips will enter the Central Area from the Boston Business District in 2040, and transit trips entering the Central Area from all other MPO areas, including the Boston Business District, are predicted to increase by approximately 26,000.

Bicycle Travel

Daily bicycle trips *within* the Central Area are predicted to increase by 9 percent, or 5,500 trips. The model predicts that bicycle trips from the Boston Business District to the Central Area will increase by 1,000, with bicycle trips from the Northwest Corridor projected to increase by 1,000, and approximately 2,000 additional bicycle trips will enter the Central Area from the other MPO corridors by 2040.

Pedestrian Travel

Walking will continue to be the second-most prominent mode of travel *within* the Central Area by 2040. Intraregional walk trips are estimated to grow by approximately 29 percent, or 181,000 trips. Approximately 26,500 additional walk trips will enter the Central Area from the Boston Business District, while walk trips from all other MPO corridors are expected to increase by an additional 13,000 trips.

Travel into and within the Boston Business District

BASE-YEAR (2012) TRAVEL INTO THE BOSTON BUSINESS DISTRICT

On an average weekday, the total number of person-trips (auto, transit, bicycle, and pedestrian) entering the Boston Business District from all other areas of the Boston Region MPO is approximately 448,000, with approximately 48,000 person-trips from non-MPO municipalities. Travel *within* the Boston Business District itself is high, with 40 percent of the total person-trips destined to the Boston Business District (approximately 335,000), also originating *within* the Boston Business District. Detailed information of travel from specific corridors in the Boston Region MPO into the Boston Business District may be found on the LRTP Needs Assessment Application at www.bostonmpo.org/drupal/charting_2040_needs.

Highway Travel

The majority of highway trips estimated to enter the Boston Business District are from the Central Area with approximately 113,000 trips. On an average weekday,

approximately 256,000 trips are estimated to enter the Boston Business District from other MPO corridors including the Central Area, with approximately 42,000 highway person-trips from municipalities outside of the MPO region.

Transit Travel

Transit is the second most prominent mode of travel *within* the Boston Business District, with approximately 98,500 weekday daily transit person-trips having both ends in the Boston Business District. Among these trips the majority of daily person-trips, or approximately 73,000 trips, are on rapid transit, 24,000 trips are on bus, 1,400 trips are on commuter rail, and 100 are on ferry. Approximately 84,000 transit trips enter the Boston Business District from the Central Area, with approximately 132,500 transit trips from other corridors in the MPO, including the Central Area. Approximately 6,000 transit trips enter the Boston Business District from non-MPO municipalities located outside of the MPO region.

Bicycle Travel

It is estimated that approximately 12,000 daily bicycle trips enter the Boston Business District from the Central Area. This is approximately 43 percent of the total daily bicycle trips destined to the Boston Business District. Approximately 10,000 daily bicycle trips are wholly *within* the Boston Business District. The remaining MPO corridors contribute 6,000 total bicycle trips to the Boston Business District.

Pedestrian Travel

Walking is the most prominent mode of travel *within* the Boston Business District. Approximately 81 percent of the MPO region's weekday daily walk trips are observed *within* this district. The Central Area contributes approximately 41,000 walk trips to the Business District.

BOSTON BUSINESS DISTRICT: PROJECTED TRAVEL TRENDS—2012 TO 2040

In 2040, the model predicts that the total number of weekday person-trips entering the Boston Business District from all other corridors in the Boston Region MPO will increase by approximately 18 percent or 82,400 trips and by approximately 10 percent or 5,000 trips from non-MPO municipalities that are located outside of the MPO region. Travel totally *within* the Boston Business District is expected to increase by approximately 92,000 between 2012 and 2040.

Highway Travel

The Central Area will continue to contribute the majority of highway person-trips entering the Boston Business District, with an additional 17,000 trips during the base year

(2012). With the exception of the Boston Business District, there is a projected increase of 25,000 highway trips from all MPO corridors, while highway trips from non-MPO municipalities are forecast to increase by 3,000.

Transit Travel

With 27 percent of total trips, transit continues to be the second most prominent mode of travel *within* the Boston Business District. The model predicts that approximately 15,500 additional weekday daily transit person-trips will occur *within* the Boston Business District. Rapid transit trips are predicted to increase by an additional 12,000, bus trips by an additional 3,000, and commuter rail trips by 500. Transit trips from all other MPO corridors outside of the Boston Business District are predicted to increase by approximately 29,000, while transit trips from non-MPO municipalities are predicted to increase by approximately 2,000.

Bicycle Travel

Daily bicycle trips entering the Boston Business District from the Central Area are predicted to increase by approximately 1,000 or 8 percent by 2040. The model predicts that total daily bicycle trips that are *within* the Boston Business District will increase by 1,200, and approximately 1,500 bicycle trips will enter the Boston Business District from all other MPO corridors (including the Central Area).

Pedestrian Travel

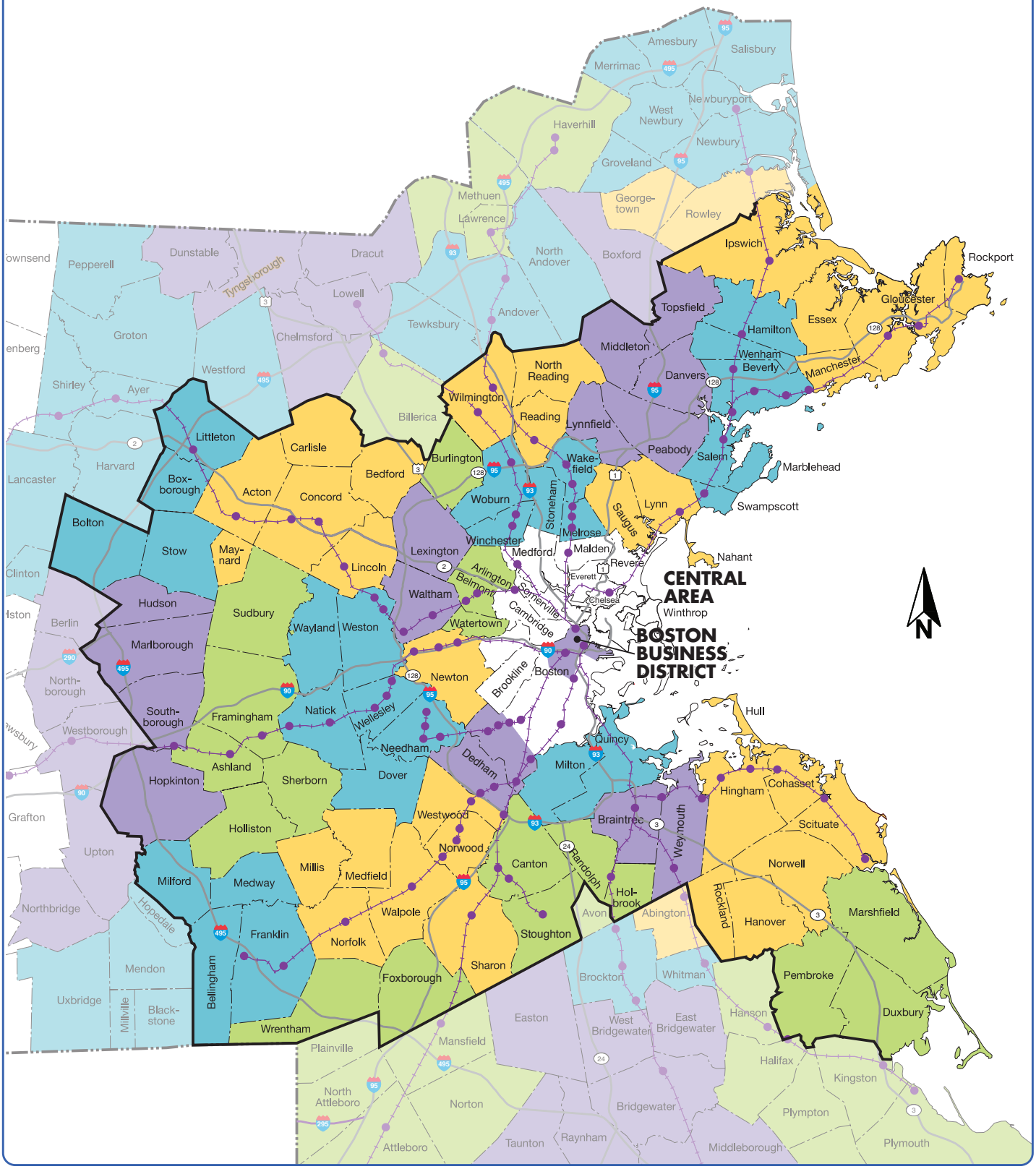
In the base year (2012), walk trips accounted for 53 percent of person-trips *within* the Boston Business District. By 2040, walking continues to be the most predominant mode of travel. It is projected that daily weekday walk trips occurring *within* the Boston Business District will increase by an additional 66,000, and that walk trips from the Central Area to the Boston Business District will increase by approximately 26,000.

District-to-District Travel

BASE YEAR (2012)

One clear trend of district-to-district travel (highway and transit trips only) estimated by the model is that most travel (52 percent) occurs completely within districts (the districts are shown in Figure 3.3). This is not unexpected, considering that more than 60 percent of trips in the region are shorter than five miles. While the largest intra-district flow in the region exceeds 250,000 person-trips per day, the highest trip flow between adjacent districts is only 42,800 trips per day. The typical weekday travel between nonadjacent districts seldom exceeds 10,000 trips.

FIGURE 3.3
Districts within the Boston Region MPO



The five highest MPO-area suburban district-to-district trip flows include:

- 42,800 person-trips per day: Swampscott, Salem, Marblehead, Beverly, Wenham, and Hamilton to Lynnfield, Peabody, Danvers, Middleton, Topsfield, and Boxford
- 42,300 person-trips per day: Lynnfield, Peabody, Danvers, Middleton, Topsfield, and Boxford to Swampscott, Salem, Marblehead, Beverly, Wenham, and Hamilton
- 34,300 person-trips per day: Sudbury, Framingham, Ashland, Holliston, and Sherborn to Wayland, Weston, Natick, Wellesley, Needham, and Dover
- 34,200 person-trips per day: Wayland, Weston, Natick, Wellesley, Needham, and Dover to Sudbury, Framingham, Ashland, Holliston, and Sherborn
- 34,000 person-trips per day: Reading, North Reading, and Wilmington to Woburn, Stoneham, and Winchester

PROJECTED FUTURE-YEAR (2040) DISTRICT-TO-DISTRICT TRAVEL

As is the case for the base year, most travel occurs within districts. The top intra-district flow in the region is predicted to increase by 70,000 daily person-trips (highway and transit person-trips only). The highest trip flow between adjacent districts is forecast to increase from 42,800 trips to 53,500 trips.

The five highest suburban district-to-district trip flows presented above are predicted to remain the same in 2040. Trips for each of these five district-to-district pairs are expected to increase by approximately 23 to 25 percent.

BOSTON REGION MPO TRAVEL PATTERNS DERIVED FROM MPO STUDIES

The MPO conducts a variety of studies and activities that provide information on the travel patterns in the region. Some of the information presented below was obtained from the MPO's freight-planning activities and studies conducted since 2007. In addition, information on bicycle and pedestrian travel was extracted from the 2011 Massachusetts Travel Survey.

Freight Travel

DESCRIPTION OF FREIGHT MOVEMENT IN THE BOSTON REGION MPO

Efficient motor freight transportation contributes to a vibrant economy. This requires suitable infrastructure, operations, and policies. Most goods manufactured outside of

the MPO region and delivered to the region are transported by one of the following methods:

Large Shipments with North American Origins:

1. By truck directly from outside of the MPO region to its final destination within the MPO region
2. Intermodal rail to Worcester with delivery to its final destination by truck
3. Limited carload freight by rail

Large Shipments with Overseas Origins, to:

1. Conley Terminal in Boston, with truck delivery via the South Boston Haul Road to I-90 and I-93
2. The Port of New York/New Jersey, with truck delivery from New Jersey to its final destination
3. West Coast ports, double-stack rail to Syracuse, unstacked to single stack to Worcester, with delivery to its final destination by truck

Small Air-Freight Shipments from all Origins, to Logan Airport:

1. Truck delivery from Logan Airport

Freight transportation relies on the same road and rail networks that people use to access their everyday needs. These networks are often congested at peak hours and have acute maintenance needs. Therefore, increases in freight volume may affect system performance for both freight transport and passenger travel.

Forecasts prepared using the Truck Trip Generation component of the Boston Region MPO's regional travel demand model predicts that the number of truck trips that begin and/or end in the region will increase by about 18 percent, and the number of truck trips with both trip ends in the region will increase by approximately 13 percent between 2010 and 2040. In the same time period, trips with one or both ends outside of the MPO region are expected to increase by roughly 44 percent (trips with one or both ends outside of the MPO region show a higher growth rate, but are a much smaller proportion of all trips). This growth would have a significant impact on the highway system.

The Massachusetts Freight Plan (MassDOT, September 2010) predicts that the share of freight moving by trucks will increase in the future, but the use of other freight modes will also increase significantly. The Massachusetts State Freight Plan and Massachusetts State Rail Plan (MassDOT, September 2010) recommend making several investments that would support shifting freight transport, when feasible, from trucks to trains and ships in order to mitigate some of the effects of trucking in Massachusetts. While

increasing the share of freight moved by other modes would yield benefits for the region's road network, long-term growth in freight traffic still would result in increased numbers of trucks, which would continue to distribute the vast majority of freight within the Boston Region MPO area.

The MPO conducted a freight study, which was published in 2012, that profiled the impact of trucks in the region. The primary purpose of this study was to examine how, where, and to what extent trucks affect the region's transportation system. It produced a profile of truck impacts in the region, with a focus on highway volumes and crashes that involve trucks. The following section presents information from that study on truck travel, in addition to updated data on truck travel in the region.

ANALYSIS OF TRUCK TRAVEL IN THE BOSTON REGION MPO AREA

Trucks are the dominant freight mode in the Boston Region MPO area. They operate on all of the roadways in the region, for both long-distance movement of goods and local deliveries. In this analysis, trucks are defined as vehicles with six or more wheels, excluding buses. Numerous four-wheeled pickup trucks and vans also support regional commerce. These are reflected in the model but are not considered trucks in this analysis.

A review of recent truck-specific traffic counts and modeled traffic data reveals certain truck travel patterns. Some of the heaviest truck traffic, both in absolute numbers and as percent of total traffic, is found on I-495. Over 20,000 trucks each weekday travel over its northwest arc, which serves as the key truck corridor connecting the Middle Atlantic region with northern New England. Slightly fewer trucks share the Route 128/I-95 circumferential highway, with a significantly higher number of autos, resulting in a lower percentage of trucks. The radial express highways shed trucks as they approach Boston, with about 10,000 passing through downtown Boston on I-93 and slightly fewer on I-90 each weekday.

The highways with the highest truck volumes in the MPO region are:

- I-93 south of Boston – 11,000 to 19,000 trucks per day
- I-93 north of Boston – 9,000 to 11,000 trucks per day
- I-95 east of I-93 – 5,000 to 9,000 trucks per day
- I-95 between I-90 and I-93 – 9,000 to 19,000 trucks per day
- I-95 south of I-90 – 5,000 to 11,000 trucks per day
- I-90 between I-495 and I-95 – 5,000 to 11,000 trucks per day
- I-90 between I-95 and East Boston – 5,000 to 9,000 trucks per day

- I-495 north of I-90 – More than 20,000 trucks per day
- I-495 south of I-90 – Up to 17,000 trucks per day
- Route 1 between the Tobin Bridge and Lynnfield – 5,000 to 9,000 trucks per day
- Route 3 north of I-95 – 5,000 to 9,000 trucks per day
- Route 3 between Braintree and Weymouth – 5,000 to 9,000 trucks per day
- Route 24 in Canton – 5,000 to 9,000 trucks per day

Bicycle Travel

Bicycle travel in the Boston Region, as estimated by the travel demand model, was described in Section 2, above. In addition to modeled data, the Boston Region MPO staff obtained information about travel into and within the MPO region through the 2011 Massachusetts Travel Survey. The survey provided information on nonmotorized modes of travel, which was used to estimate the amount of bicycle travel in specific areas, described below. Almost 700 survey respondents statewide reported making a total of 1,680 daily trips by bicycle.

The survey data were further analyzed by community type. The Metropolitan Area Planning Council (MAPC) developed a set of descriptions of community types, as Shown in Figure 3.4, which is used to provide context for understanding regional land use issues and trends. MAPC's four community types are described below, along with the findings from the 2011 Massachusetts Travel Survey on bicycle travel within each type of community.

- Inner Core – Consists of the high-density cities of Boston, Cambridge, Somerville, Revere, Everett, and Chelsea, as well as more residential "streetcar suburbs."

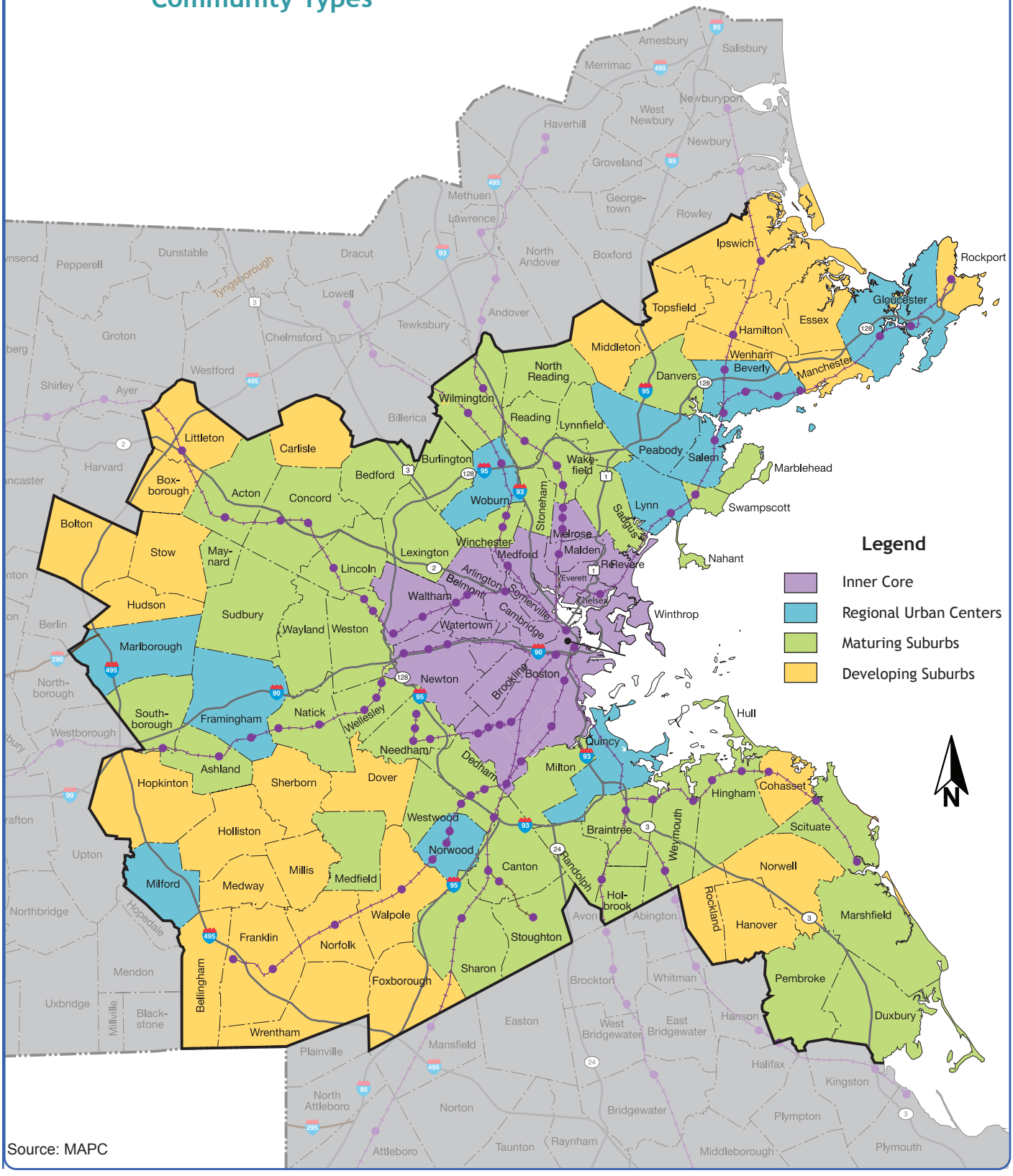
  The Inner Core generates the most bicycle travel per resident, with 184 miles reported per 1,000 residents per weekday. Of these 184 miles, 100 were reported as being part of travel from home to work or from work to home.

  The Inner Core is the only type of community where bicycle-miles[4] for commuting purposes exceed the bicycle-miles for other purposes. This is understandable given the large concentration of households and employment in the Inner Core. The 84 miles of travel per 1,000 residents for non-commuting purposes is higher than for any other community type, reflecting the high-density destinations in this area. Friends, schools, and merchants are more likely to be located within a convenient bicycling distance in the Inner Core than in less-dense communities.

- Regional Urban and Suburban Centers – Includes urban and suburban centers outside of the Inner Core. These municipalities are characterized by an urban-scale

4 Miles traveled on bicycle.

FIGURE 3.4
Metropolitan Area Planning Council Community Types



Source: MAPC

downtown core with multiple blocks of multistory, mixed-use buildings; moderately dense residential neighborhoods surrounding this core; and (in some cases) lower-density single-family residential development.

The total number of bicycle-miles per 1,000 residents in Regional Urban and Suburban Center municipalities is 21, 6 of which are for commuting between home and work.

- Maturing Suburbs – Moderate-density residential municipalities with a dwindling supply of vacant developable land.

  The total number of bicycle-miles in maturing suburbs is 57 miles per 1,000 residents. Commuting trips comprise 19 of these 57 miles.

- Developing Suburbs – Less-developed towns with large expanses of vacant developable land. The Developing Suburbs have recently experienced high rates of growth, primarily through large-lot single-family homes.

  Of all the community types, Developing Suburbs have the greatest proportion of non-commute bicycle-miles: 25 of 32 total bicycle-miles per 1,000 residents are for non-commuting purposes.

Pedestrian Travel

Pedestrian travel in the Boston region, as estimated by the regional travel demand model, was described in Section 2, above. In addition, the MPO staff obtained information about travel into and within the MPO region through the 2011 Massachusetts Travel. The survey collected information on all modes of travel, including the pedestrian mode.

Walking is an important transportation mode in the MPO region; it is used extensively both to travel between activities and to connect to other modes as part of longer journeys. The data available in the 2011 Massachusetts Travel Survey allow walk activity to be quantified, and the mode's importance to the various regional communities to be compared and analyzed as follows:

- The households in the 164-municipality Boston Region MPO modeled region reported a total of 10,906 walk segments connecting with activities or other modes in journeys originating from home ("home-based"). This represented a population of about 817,000 walkers reporting a total of 629,000 home-based miles by foot on the weekday of the survey.
- The eastern Massachusetts households also reported 9,443 segments of "remote"

walking, where the chain of walk segments begins somewhere other than home. Remote walkers use autos or transit to reach some point away from home, and report walk segments originating from that point. The estimated number of regional walkers was 685,000, reporting an estimated 386,000 remote miles on the weekday of the survey.

- A greater amount of walk activity was reported in the denser municipalities than in the less-dense municipalities, a finding that has been assumed in the past and is now confirmed by the 2011 Massachusetts Travel Survey data.

4 REGIONWIDE NEEDS ASSESSMENT

INTRODUCTION

A critical early step in developing the LRTP is to gather, organize, and analyze available sources of data about the transportation system. This allows the MPO to understand the many needs that exist for all transportation modes.

After analyzing data included in the Web-based Needs Assessment described in Chapter 1, it is clear that the region has extensive maintenance and modernization requirements, including the need to address safety and mobility for all modes. MPO staff estimates that these needs likely would exceed the region's anticipated financial resources between now and 2040. Therefore, the MPO must prioritize the region's needs in order to guide investment decisions.

This chapter provides an overview of the MPO region's transportation needs for the next twenty-five years. The information in this chapter has been organized according to the LRTP's goals—which are used to evaluate projects in the Universe of Projects List both for scenario planning, and then project selection for the recommended LRTP. The LRTP's goals are related to:

- Safety
- System Preservation
- Capacity Management and Mobility
- Clean Air and Clean Communities
- Transportation Equity
- Economic Vitality

Information in each goal-based section of this chapter falls into these general categories:

- The goals and related objectives
- Background information for each goal
- The policy context that surrounds each goal, which includes:
    1. Initiatives and directives that shape the goal and related needs. Detailed information about each of the policies is included in Appendix A.

2. Relevant studies, reports, and documents that help the MPO understand the region's transportation needs. These studies are available on the Recent Studies page of the MPO website (www.bostonmpo.org/Drupal/Recent_Studies) or may be requested from the MPO.

- Resources that contributed to establishing the regional transportation needs of a specific goal
- Public input on transportation needs related to a specific goal: to collect information about transportation needs, the MPO conducted a series of forums and subregional meetings, collected information on its website via online surveys, its ongoing public-comment route, and its transportation equity survey. Public input about needs may align with and support the needs identified through data collection and performance metrics. This input also provides a qualitative dimension to the MPO's understanding of transportation needs and public expectations. It is important that the MPO is aware of the public's views as it conducts its planning.
- A list of prioritized needs pertaining to a specific goal
- A list of potential programs that would help address each goal

SAFETY

Goals and Objectives

EXISTING GOAL:

Transportation by all modes will be safe.

EXISTING OBJECTIVES:

- Reduce number and severity of crashes, all modes
- Reduce serious injuries and fatalities from transportation
- Protect transportation customers and employees from safety and security threats

Background

Safety continues to be a top priority at the federal, state, and regional level. At the federal level, *Moving Ahead for Progress in the 21st Century's (MAP-21)* established a goal to achieve significant reduction in traffic fatalities and serious injuries on all public roads. At the state level, goals in the Massachusetts Strategic Highway Safety Plan (SHSP) include:

- Reduce motor vehicle fatalities and hospitalizations by 20 percent in the five years following adoption of the SHSP (Short-Term Goal)
- Reduce by 50 percent the number of fatalities and serious injuries by 2030 (Interim Goal)
- Move Toward Zero Deaths and eliminate fatalities and serious injuries on the roadways (Long-Term Goal)

The MPO shares federal and state goals of reducing crash severity for all users of the transportation system. At the regional level, the MPO's safety goal states, "transportation by all modes will be safe." The MPO will support this goal by committing to take steps to reduce the number and severity of crashes, and serious injuries and fatalities caused by transportation modes. The MPO is making this commitment via two planning mechanisms currently in development: 1) the LRTP objectives, and 2) performance-measurement program.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

- *Moving Ahead for Progress in the 21st Century*
- *United States Department of Transportation 23 CFR Parts 450 Subpart C – Metropolitan Transportation Planning and Programming Regulation*
- *Massachusetts Strategic Highway Safety Plan*

RELEVANT MPO STUDIES, REPORTS, AND DOCUMENTS

Roadways and Intersections

- *Safety and Operations Analysis at Selected Intersections* studies, conducted between October 2009 and September 2013
- Operational Improvements at Selected Congested and High-Crash Locations memoranda
- Community Transportation Technical Assistance memoranda
- *Addressing Safety, Mobility, and Access on Subregional Priority Roadways* studies, conducted for the following locations:
    - Washington Street in Newton (FFY 2013–14)
    - Route 3A, Cohasset and Scituate Route 127A/127 Gloucester and Rockport (FFY 2013–14)

- *Priority Corridors for LRTP Needs Assessment* studies, conducted for the following locations:
  - Route 2 in Concord and Lincoln (FFY 2013)
  - Route 3 in Framingham and Natick (FFY 2013)
  - Route 114 in Danvers (FFY 2012)
  - Route 203 in Boston (FFY 2012)
- *Roundabout Installation Screening Tool,* 2013

Transit

- *Safe Access to Transit for Pedestrian and Bicyclists* memorandum 2014

Resources Used to Establish Transportation Needs

- LRTP Needs Assessment Application: Crash Data – Top five percent crash locations by equivalent property damage (EPDO) ratings
- Livability Indicators Database: Pedestrian and bicycle crash rates
- Truck Crashes: The MPO's Crash Cluster map, which contains data for truck crashes from 2010–2012 by EPDO values
- Top Crash Locations: MassDOT's interactive Top High Crash Intersection Locations map, which shows clusters of crashes that have been submitted to the statewide crash system at the Registry of Motor Vehicles (includes Top-200 Intersection Clusters, Highway Safety Improvement Program (HSIP) Clusters, HSIP bicycle clusters, and HSIP pedestrian clusters from 2010–2012)

Public Input on Regional Needs

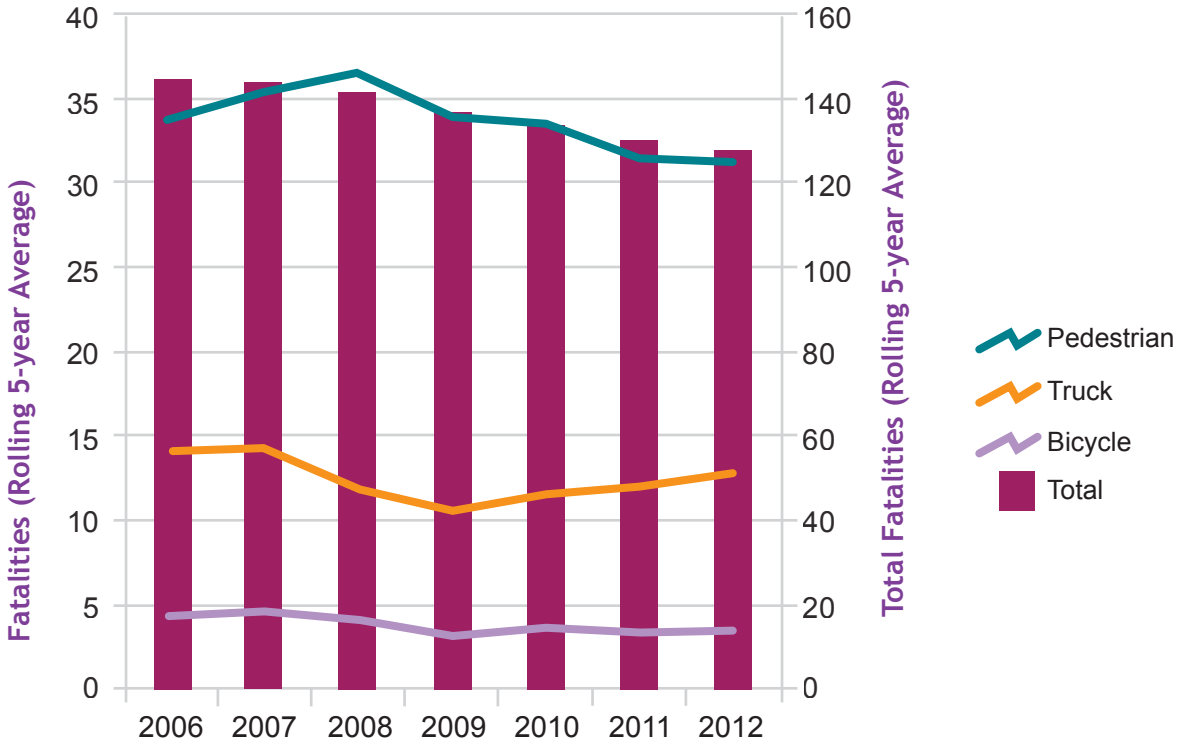
The following is a list of safety needs identified through public outreach conducted in fall 2014, and on an ongoing basis through the MPO website:

- Safety on regional and local arterials regarding school-related travel (specifically children walking to school)—for example, the Route 16 and Mount Auburn Street area in Cambridge
- Safety on regional arterials—for example, the Route 2 Rotary in Concord
- Safety at interstate interchanges, such as I-290/I-495 and I-90/I-495

Safety Needs

Overall, safety is improving in the region. Between 2006 and 2012, traffic fatalities (based on a rolling five-year average) decreased from 145 fatalities in 2006 to 129 in 2012. Figure 4.1 shows the change in traffic fatalities by mode during this time period and indicates that the 11 percent decline in fatalities included fewer automobile, truck, pedestrian, and bicycle fatalities. Similarly, total traffic crashes and injuries declined by 21 percent and 27 percent, respectively between 2006 and 2012.

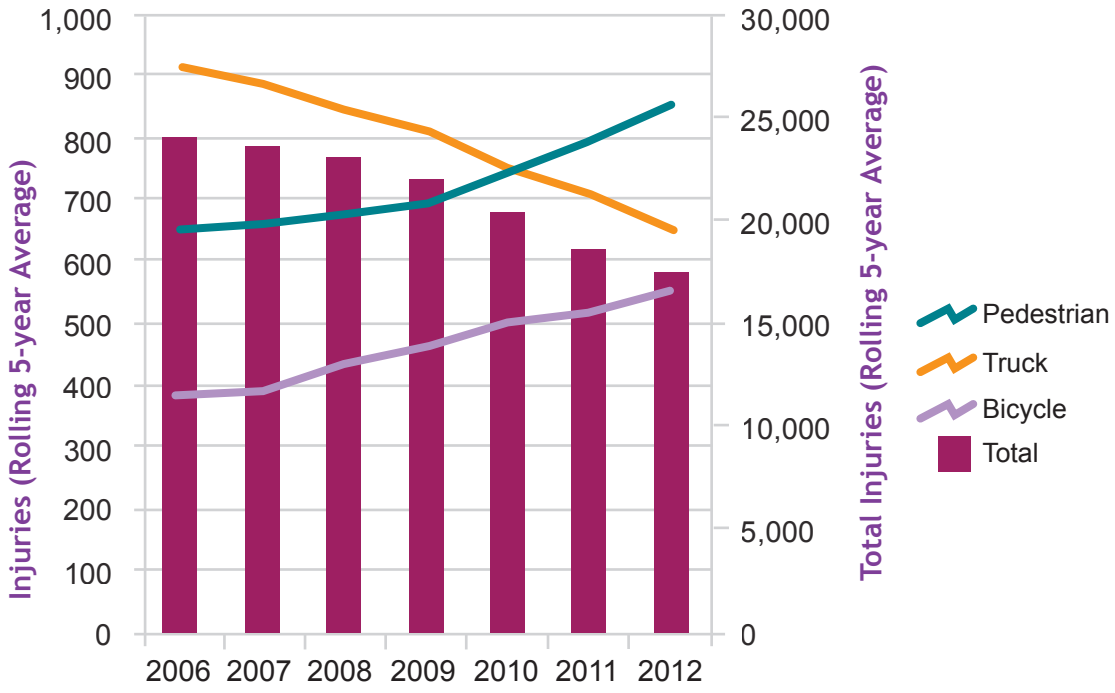
FIGURE 4.1
Traffic Fatalities in the Boston Region MPO by Mode, 2006–2012



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

Despite these overall gains, crashes and injuries for pedestrians and bicyclists rose during this same period, as shown in Figure 4.2. Between 2006 and 2012, roughly two-thirds of pedestrian and bicycle crashes resulted in an injury. For pedestrians, the number of crashes increased by 18 percent and injuries grew by 31 percent. For bicycles, the number of crashes increased by 36 percent and injuries jumped by 46 percent.

FIGURE 4.2
Traffic Injuries in the Boston Region MPO by Mode, 2006-2012



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

HIGH CRASH LOCATIONS

The most dangerous locations on the region's roadway network are identified by using geographic information system (GIS) mapping to locate specific crash sites and the Equivalent Property Damage Only (EPDO) index to determine the severity of those crashes. The EPDO is a weighted index that assigns a value to each crash based on whether the accident resulted in a fatality, injuries, or property damage. A crash involving a fatality receives the most points (10), followed by a crash involving injuries (5), then a crash involving only property damage (1).

Crash data, which is compiled by the MassDOT Registry of Motor Vehicles, is analyzed for a three-year period to identify locations where multiple crashes have occurred. The combined EPDOs of the crashes in these so called "crash clusters" measure the severity of the safety problem at a particular intersection, highway interchange, or roadway segment.

Table 4.1 presents a list of the top-25 highway crash locations in the Boston region, based on EPDO from 2009 to 2011; and includes accompanying crash data from MassDOT's Registry of Motor Vehicles.

TABLE 4.1
Top-25 Highway Crash Locations in the Boston Region MPO

Location	Municipalities	EPDO	Top 200	HSIP Crash Cluster	Truck Crash Cluster	Pedestrian Crash Cluster	Bicycle Crash Cluster
Interstate 93 at Columbia Rd	Boston	464	•	•	•		•
Middlesex Turnpike at Interstate 95	Burlington	388		•	•		
Rte 3 at Rte 18 (Main St)	Weymouth	339		•	•		
Interstate 93 (Near Ramps for Furnace Brook Parkway)	Quincy	330		•	•		
East St Rotary at Rte 1 and Rte 128	Westwood	328		•	•		
Interstate 95 at Interstate 93	Reading	326	•	•	•		
I-93 at Granite Ave (Exit 11)	Milton	325		•	•		
Interstate 95 at Rte 2	Lexington	324		•	•		
Rte 9 at Interstate 95	Wellesley	320		•	•		
I-93 at North Washington St	Boston	319		•		•	
I-93 at Rte 138 (Washington St)	Canton	316		•	•		
I-93 at Rte 3A (Gallivan Blvd/ Neponset Ave)	Boston	271		•	•		
Interstate 95 at Rte 4 (Bedford St)	Lexington	270		•	•		
Rte 18 (Main Street) at West St	Weymouth	247	•	•	•		
Interstate 93 at Rte 37 (Granite St)	Braintree	245	•	•	•		
Rte 139 (Lindelof Ave) at Rte 24	Stoughton	240		•			
Interstate 93 at Leverett Connector	Boston	236		•			
Interstate 93 at Rte 28	Medford	233	•	•	•		
Rte 128 at Rte 114 (Andover St)	Peabody	219		•	•		
I-93 at Rte 28 and Mystic Ave	Somerville	214	•	•	•		
Storrow Dr at David G. Mugar Way	Boston	212		•			
Rte 28 (Randolph Ave) at Chickatawbut Rd	Milton	203	•	•			
Rte 2 – Crosby's Corner	Concord/Lincoln	200	•	•			
Rte 1 at Rte 129	Lynnfield	194		•	•		
Rte 1 at Rte 129 (Walnut St)	Saugus	193		•			

EPDO = Equivalent Property Damage Only. HSIP = Highway Safety Improvement Program.

Source: MassDOT Registry of Motor Vehicles.

INTERSECTIONS

According to the Massachusetts SHSP, more than one in five fatalities in the state occurs at an intersection. Consistent with the SHSP, intersection safety remains an area of emphasis for the Boston Region MPO. Seventy-nine of the Top-200 Crash Locations are located in the Boston Region MPO. Corridors with multiple Top-200 Crash Locations include Route 9 in Natick and Framingham, Route 18 in Weymouth, Route 107 in Lynn, Route 16 in Newton and Wellesley, Route 126 in Bellingham, and Route 16 in Milford.

Strategies to address safety at intersections consist of geometric improvements to install exclusive left-turn lanes, align approaches, and modify turning radii.

LANE DEPARTURES

Lane departures are one of the state's nine areas of strategic emphasis, and a continuing priority of the Boston Region MPO. According to MassDOT data for the period 2004 to 2011, 55 percent of all roadway fatalities and 24 percent of all incapacitating injuries on roadways involved lane departure crashes. A lane departure crash is a non-intersection crash that occurs after a vehicle crosses the edge or center line, or otherwise leaves the traveled way. MPO staff compiled data on lane departure crashes in the Boston region, which indicate that a disproportionate share of lane departure crashes occur on interstates and arterials. Interstates make up five percent of lane miles in the region, yet account for nearly 15 percent of lane departure crashes. Similarly, arterials account for less than a quarter of the region's lane miles, yet more than half of lane departure crashes. For interstates, there is a high prevalence of lane departure crashes along I-93 between I-90 and I-95 Northbound, I-93 between I-90 and I-95 Southbound, and I-495 between I-90 and I-95. For arterials, there is a high prevalence of lane departure crashes along Route 3 in Weymouth, Route 1 in Chelsea and Revere, the Jamaicaway in Boston, and Soldiers Field Road in Boston.

Strategies to address lane departure crashes consist of incorporating safety elements into roadway design and maintenance such as the addition of rumble strips, pavement markings, guardrails, or enhanced lighting and signage.

PEDESTRIANS

Pedestrians are one of the state's nine strategic areas and an ongoing focus of the Boston Region MPO. As vulnerable users of the transportation system, pedestrians are more susceptible to risk than other roadway users. In the Boston region, pedestrians account for a growing share of crashes and a disproportionate share of injuries.

The MassDOT Crash Clusters map identifies the top pedestrian crash locations throughout the state. HSIP pedestrian clusters are locations with the highest crash severity for pedestrian-involved crashes based on EPDO. In the Boston region, there are many clusters in urban areas, including the downtown sections of Boston, Chelsea, Framingham, Lynn, Malden, Natick, Peabody, Salem, Waltham, and Wellesley; as well as along Massachusetts Avenue in Cambridge, Hancock Street in Quincy, and in Newton Centre, Watertown Square, and Davis Square in Somerville.

Strategies to address pedestrian safety at the HSIP pedestrian clusters consist of reducing traffic speeds, limiting pedestrian exposure to automobiles, and increasing motorists' awareness and visibility of pedestrians. These infrastructure improvements take the form of traffic-calming measures, shortened crossing distances, turning restrictions, and enhanced signage and lighting.

There are also locations across the region where conditions remain unsafe for pedestrians, but which are not at the HSIP pedestrian cluster level. For less urban areas, sidewalk coverage is less extensive and often inconsistent. These inadequate facilities are an ongoing issue for suburban communities with a desire for more transit options. In addition, the need for adequate sidewalks should increase along with the region's growing elderly population.

BICYCLISTS

Bicyclists are one of the state's four most proactive areas, and a growing priority of the Boston Region MPO. Similar to pedestrians, bicyclists also are vulnerable users of the transportation system and account for a growing share of crashes and a disproportionate share of injuries in the region.

The state also compiles high crash locations for bicycles. HSIP bicycle clusters are locations with the highest crash severity for bicycle-involved crashes based on EPDO. In the Boston region, there are multiple HSIP bicycle clusters in urban areas, ranging from the downtown sections of Beverly, Chelsea, Framingham, Lexington, Lynn, Natick, Salem, to Commonwealth Avenue in Boston, Harvard Street in Brookline, Massachusetts Avenue in Arlington and Cambridge, Main Street in Waltham, and Beacon Street and Somerville Avenue in Somerville.

During the past decade, the state has made substantial progress in expanding the bicycle network in order to increase bicycle usage and safety. Yet a majority of the

region still lacks adequate bicycle infrastructure. The limits of the network also limit the likelihood of bicycling as a transportation option. Similar to other modes of travel, bicyclists require safe conditions, and an infrastructure to help create those desired conditions.

Strategies to address bicycle safety at the HSIP bicycle clusters consist of reducing traffic speeds, reducing conflicts between bicycles and motor vehicles, increasing separation between them, and increasing motorists' awareness and visibility of bicyclists. These infrastructure improvements involve traffic-calming measures, separation between bicycles and motor vehicles (especially in high-speed traffic), turning restrictions, and enhanced signage and lighting, and increasingly are part of the MassDOT project design process.

TRUCKS

Truck-involved crashes also are one of the state's four proactive emphasis areas. As among the larger and heavier vehicles used in the transportation system, trucks account for a greater proportion of crash severity than other modes. Between 2006 and 2012, trucks made up approximately five percent of crashes, yet accounted for nine percent of fatalities.

MPO staff compiled high crash locations throughout the region based on truck-related EPDO. In the Boston region, the majority of high crash locations for trucks are located at older interchanges with obsolete designs. These interchanges connect express highways to express highways and express highways to arterials. Express highway to express highway interchanges with high truck crash severity includes I-95 interchanges at I-93 in Woburn, I-90 in Weston, and I-93 in Canton. Express highway to arterial interchanges with high truck crash severity includes I-95 interchanges at Route 1 in Dedham, Middlesex Turnpike in Burlington, and Route 138 in Canton.

Interchange modernization projects incorporate strategies to reduce the likelihood of rollovers at these obsolete interchanges by widening the turning radii or banking the roadway through tight curves.

SUMMARY

Table 4.2 cites locations in the Boston Region MPO that have multiple safety needs, as described above.

TABLE 4.2
Locations with Multiple Safety Needs

Location	Municipalities	Top 200	HSIP Crash Cluster	Truck Crash Cluster	Pedestrian Crash Cluster	Bicycle Crash Cluster
Downtown Framingham	Framingham	•	•	•	•	•
Rte 20 (Main Street) and Moody St	Waltham	•	•	•	•	•
Watertown Square	Watertown	•	•	•	•	•
Washington St	Salem	•	•	•	•	•
Everett Ave	Chelsea	•	•	•	•	•
Essex St	Lynn	•	•		•	•
Rte 107 (Western Ave)	Lynn	•	•	•	•	
Massachusetts Ave	Arlington	•	•	•	•	
Rte 16 (Alewife Brook Parkway)	Arlington, Somerville, Cambridge	•	•	•		•
Broadway	Chelsea		•	•	•	•
Newtonville	Newton		•	•	•	•
Rte 16 (East Main St)	Milford	•	•	•		
I-495 at Rte 126 (Hartford Ave)	Bellingham	•	•	•		
Downtown Quincy	Quincy	•	•		•	
I-95 at Rte 16 (Washington St)	Newton	•	•	•		
Rte 16 (Revere Beach Parkway)	Revere, Everett, Medford	•	•	•		
I-495 at Rte 1A (South St)	Wrentham	•	•	•		
Rte 20 (East Main St)	Marlborough	•	•	•		
Rte 9	Framingham, Natick	•	•	•		
Downtown Natick	Natick		•		•	•
Downtown Lynn	Lynn		•		•	•
Rte 1A	Lynn		•	•	•	
Rte 28 (McGrath Hwy) at Washington St	Somerville		•		•	•
Newton Center	Newton		•		•	•
Cambridge St	Cambridge		•		•	•
Rte 16 (Mystic Valley Parkway)	Medford		•	•	•	

HSIP = Highway Safety Improvement Program.
Source: MassDOT Registry of Motor Vehicles.

Potential Programs to Address Safety Needs

- **Intersection Improvement Program** – Can implement safety improvements at high crash locations for motorists, trucks, pedestrians and bicyclists. Improvements could consist of upgraded geometry, shortened crossing distances, enhanced signage and lighting, and other improvements consistent with elements of Complete Streets.
- **Interchange Modernization Program** – Can rebuild older interchanges by using current design standards to improve safety for all vehicle types. Improvements could eliminate weaving and reduce the likelihood of rollovers, especially for trucks, by widening the turning radii or banking the ramps' through curves.
- **Complete Streets Program** – Can modernize the roadway network to provide safe conditions for all modes along corridors. Improvements could consist of lane reconfiguration, traffic signal and access improvements for motorists, new sidewalks, curb ramps, improved roadway crossings for pedestrians, and continuous bicycle facilities to reduce conflicts between bicyclists and motor vehicles.
- **Bicycle Network Program** – Can create a safe pedestrian and bicycle corridor that connects activity centers while avoiding high crash locations on the roadway system.
- **Pedestrian Connections Program** – Can implement safety improvements to facilitate pedestrian access to transit or other activity centers. Improvements could consist of traffic calming, sidewalk network expansion, and upgrades similar to those in a Complete Streets Program, or enhanced signage and lighting.

SYSTEM PRESERVATION

Goals and Objectives

EXISTING GOAL:

Maintain the transportation system

EXISTING OBJECTIVES:

- Improve the condition of on- and off-system bridges
- Improve pavement conditions on MassDOT-monitored roadway system
- Maintain and modernize capital assets, including transit assets, throughout the system

- Prioritize projects that support planned response capability to existing or future extreme conditions (sea level rise, flooding, and other natural and security-related man-made hazards)
- Protect freight network elements, such as port facilities, that are vulnerable to climate-change impacts

Background

System preservation is a priority for the MPO because the transportation infrastructure in the region is aging. The demands placed on highway and transit facilities have been taxing to the point that routine maintenance is insufficient to keep up with the need. As a result, there is a significant backlog of maintenance and state-of-good repair work to be done on the highway and transit system, including bridges, roadway pavement, transit rolling stock, and traffic and transit control equipment. Under these circumstances, system preservation and efficiency have become more important. Maintenance must receive attention, but because of the region's financial constraints, the MPO will set priorities, considering the most crucial maintenance needs and the most effective ways to deploy funding.

In addition, the MPO agrees that if climate trends continue as projected, the conditions in the Boston region likely would include a rise in sea level coupled with storm-induced flooding, and warmer temperatures that would affect the region's infrastructure, economy, human health, and natural resources. The MPO seeks to improve resiliency of infrastructure that could be affected by climate change through its evaluation criteria. The MPO rates projects on how well the proposed project design improves the infrastructure's ability to respond to extreme conditions and addresses those impacts. This information helps guide decision making in the LRTP and TIP. The MPO also recognizes the need to keep major routes well maintained in order to respond to emergencies and evaluates projects on how well they improve emergency response or improve an evacuation route, diversion route, or an alternate diversion route.

The MPO, through its studies and freight-planning work also acknowledges that movement of freight is critical to the region's economy. The majority of freight is moved by truck in this region. Major highway freight routes must be maintained to allow for the efficient movement of goods. The MPO also places special emphasis on protecting all freight network elements, including port facilities that are vulnerable to climate-change impacts.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

- *Moving Ahead for Progress in the 21st Century*
- *United States Department of Transportation 23 CFR Parts 450 Subpart C – Metropolitan Transportation Planning and Programming Regulation*
- *Accelerated Bridge Program (ABP)*
- *MBTA's Program for Mass Transportation (PMT)*
- State legislation related to climate change
  - *Global Warming Solutions Act (GWSA)*, 2008
  - MassDOT's *GreenDOT Policy*

RELEVANT MPO STUDIES, REPORTS, AND DOCUMENTS

- *Roadway Network Inventory for Emergency Needs: A Pilot Study*, 2015
- *Maintenance Costs for Municipally Controlled Federal-Aid Roads*, 2012

Resources Used to Establish Transportation Needs

- LRTP Needs Assessment Application: Pavement Condition: data on pavement condition, classified as 'good', 'fair', or 'poor'
- All-hazards Planning Application: used to measure a number of preservation-related factors: data in the application includes substandard bridges, emergency service routes, and locations of hospitals, emergency services, police, and fire stations. The application helps gauge a project's ability to improve emergency response and response to extreme conditions.
- *MBTA's Program for Mass Transportation* (PMT)
- MassDOT's Bridge Database
- *Results of the Boston Region MPO's 2010 Freight Study – A Profile of Truck Impacts*
- *MassDOT's Freight Plan*, 2010

Public Input on Regional Needs

The following is a list of needs identified through public outreach conducted in fall of 2014, and on an ongoing basis through the MPO website, as they relate to system preservation:

- Roadways need to be improved to accommodate transit; for example, Route 1 in Milton has no bus stop area and hardly a curb, which is unsafe for riders.
- Improvements are needed to pedestrian/cycling infrastructure. Problems include locations where bike lanes suddenly end and do not have enough road space. Many bike lanes are full of potholes or debris.
- Improvements are needed to Annisquam Bridge in Gloucester.
- Improvements are needed to the Rockport Commuter Rail Station, including parking.
- Climate change adaptation is important to coastal communities.

System Preservation Needs

BRIDGES

Unlike roadways, all bridges in the region are eligible to receive federal aid for maintenance and modernization projects. MassDOT and the MBTA prioritize resources for bridge preservation, as well as repair and replacement, and fund this work through the Statewide Bridge Program and MBTA bridge initiatives. MassDOT and the MBTA maintain a bridge management software tool (PONTIS) for recording, organizing, and analyzing bridge inventory and inspection data. PONTIS is used to guide the Statewide Bridge Program, which prioritizes resources for bridge preservation, as well as repair and replacement.

Of the 2,866 bridges located in the Boston Region MPO, 559 (19%) are considered functionally obsolete (do not meet current traffic demands or highway standards), and 154 (5%) are considered structurally deficient (deterioration has reduced the load-carrying capacity of the bridge).

Another important indicator of bridge condition is bridge health index. This is the ratio of the current condition of each bridge element to its perfect condition expressed as a score of 0 to 100; a value of zero indicates that all of a particular bridge's elements are in the worst condition. A bridge health index of 85 indicates that the condition of a bridge is good. One-third of bridges (956) have health indices with a score 85 or greater; 36 percent (1029 bridges) have health indices of less than 85; and 31 percent (881 bridges) do not have core element data needed to calculate an index. An additional 44 bridges have health indices of zero. Approximately 43 percent of the latter are railroad bridges, 20 percent are pedestrian bridges, and an additional 20 percent of bridges are closed.

Currently, MassDOT is in the midst of making a $3 billion investment in its bridges. The Commonwealth instituted the eight-year Accelerated Bridge Program in 2008 to reduce the number of structurally deficient bridges. During the course of the program, the state

plans to replace or repair more than 200 bridges. According to MassDOT, as of October 1, 2014, the ABP advertised 196 construction contracts with a combined budget valued at $2.43 billion. As of October 1, 2013, 52 projects in the Boston Region MPO area were substantially complete, 13 projects were under construction, and 15 projects were in design.

MassDOT, through its Office of Performance Management and Innovation, has developed a set of performance measures to address the state's bridges: They are to:

- Prevent the number of structurally deficient bridges from exceeding 463
- Maintain a system-wide bridge health index of at least an 81.98

The performance measure target of 463 structurally deficient bridges is approximately nine percent of bridges statewide. When comparing the statewide percentage to the structurally deficient bridges in the Boston Region MPO area, approximately five percent of bridges in the region are classified as structurally deficient. This indicates that MassDOT is addressing bridge maintenance needs in the region.

The performance measure of system-wide bridge health index for vehicular bridges in the Boston Region MPO area is 82.4. Again, this indicates that MassDOT is addressing bridge maintenance needs in the region.

PAVEMENT MANAGEMENT

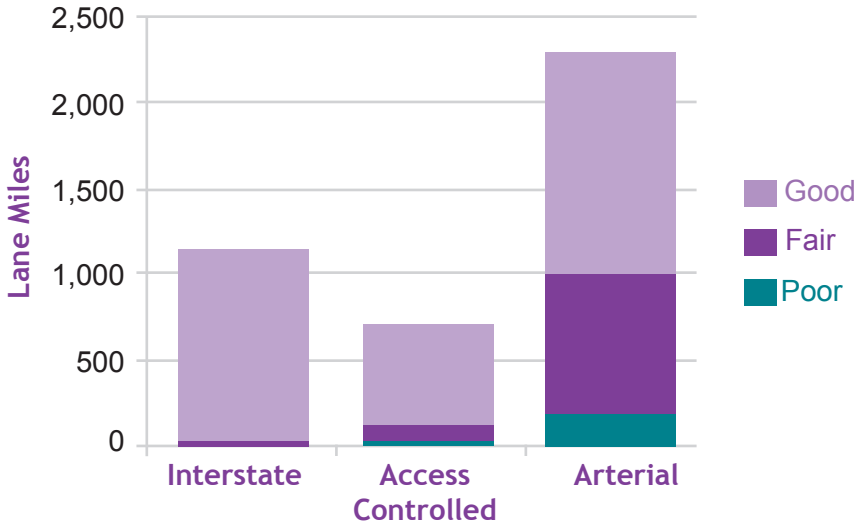
The Boston Region MPO currently does not maintain an independent pavement management tool, but relies on MassDOT's pavement management program. MassDOT's program monitors approximately 4,150 lane miles of interstate, arterial, and access-controlled arterial roadways in the Boston Region MPO area. It has been the policy of the MPO not to fund resurfacing-only projects in the TIP. However, the MPO does make funding decisions for roadway reconstruction projects that include resurfacing, usually deep reconstruction, in addition to other design elements.

The Chapter 90 program (named for Chapter 90 of the Massachusetts General Laws), which is administered by MassDOT, also contributes to the Commonwealth's strategy of preserving existing transportation facilities. This program supports construction and maintenance of roadways classified as local, i.e., work is performed by cities and towns of the Commonwealth. Typically, the majority of Chapter 90 allocations are used for road resurfacing and reconstruction. This program helps municipalities maintain and preserve locally owned roadways.

MassDOT, through its Office of Performance Management and Innovation, has developed a set of performance measures to address pavement management statewide. The measure ensures that at least 65% of National Highway System roadways are in good condition. The pavement serviceability index (PSI) measures the severity of cracking, rutting, raveling, and ride quality; and is reported on a scale from zero (impassible) to five (perfectly smooth).

An analysis of the pavement on MassDOT-maintained roadways in the Boston Region MPO area indicates that approximately 70 percent are in good condition, 25 percent in fair condition, and 5 percent in poor condition—which meets MassDOT's performance measure of at least 65 percent of the pavement in good condition. However, when this information is broken down further, looking at the pavement in *poor condition* by roadway type—interstate, arterial, and access-controlled arterials—MassDOT-maintained arterial roadways make up 62 percent of the monitored roadways, but 90 percent of the roadways that are in poor condition (see Figure 4.3).

FIGURE 4.3
Pavement Condition by Roadway Classification



Source: Massachusetts Department of Transportation Pavement Management Program.

Pavement data indicate that the majority of these arterial roadways are located in urban centers. The Pavement Condition map, in the LRTP Needs Assessment Application, shows larger expanses of arterial roadways with poor pavement condition in the Boston, Cambridge, Chelsea, Everett, Lynn, Malden, Medford, Newton, Revere, and Somerville urban centers. The MPO can address improved pavement condition in these areas through Complete Streets or bottleneck improvement projects if they are submitted for funding consideration.

TRANSIT INFRASTRUCTURE AND ROLLING STOCK

Currently, the most pressing need that the MBTA faces is to bring the system into a state of good repair. Maintaining existing capital assets must be the highest priority for future investments or the quality of current services will degrade. Once the system is in a state of good repair, ongoing maintenance, replacement, and modernization of assets and infrastructure will be necessary to meet current and future demand for services. Providing sufficient resources for maintenance should be part of any program of system expansion.

The MBTA is developing a transit asset-management system to help address its capital needs. This program is using the MBTA's state of good repair (SGR) database to help meet the new asset-management requirements under MAP-21, including:

- Preparing a transit asset-management plan
- Enhancing the MBTA's SGR database, including:
  - Developing a capital assets inventory
  - Formulating criteria for assessing assets
- Implementing a decision support tool to help prioritize capital investments
- Establishing annual performance targets and a system to monitor them

In addition to monitoring the performance measures reported through the ScoreCard and using its existing service standards, the MBTA is in the process of determining whether additional performance measures should be incorporated into its service delivery policy. MPO staff will continue to coordinate with MassDOT and the MBTA as they develop their performance measures.

The MBTA has dedicated 100 percent of its federal formula funding, programmed through the LRTP and TIP, to maintenance and state-of-good repair projects. The MPO has not provided any of its target funding (those funds programmed at the MPO's discretion) to the MBTA for maintenance needs in the past; however, it could in the future. This LRTP considers all transportation needs in the region, so the LRTP Needs Assessment identifies examples of transit needs in this category, including:

- Signals in the Green Line central tunnel, which date from the 1920s, need to be replaced.
- On the commuter rail system, 44 bridges are rated as structurally deficient and need to be rehabilitated (some are currently under renovation).
- All but the most recently purchased commuter rail coaches and locomotives need to be replaced over the next 25 years.
- On the Red Line, 74 cars built in 1969 need to be replaced. (The MBTA has awarded a contract for new Red Line cars, which will be funded by MassDOT.)
- On the Orange Line, 120 cars built between 1979 and 1981 need to be replaced. (The MBTA has awarded a contract for new Orange Line cars, which will be funded by MassDOT.)
- New vehicles are needed on the Mattapan High Speed Line to replace the Presidents Conference Committee (PCC) cars that were originally built in the 1940s.
- On the commuter rail system, 33 stations (24 percent) need to be made accessible.

- On the rapid transit system, 38 stations (26 percent) need to be made accessible, most notably Boylston and Hynes on the Green Line (Government Center Station, closed for a two-year reconstruction, will be accessible when renovation is completed).

The MBTA is taking steps to address some of these issues:

- Committed to increasing capital investment in bridges and the power system
- Ordered 60 new diesel-electric hybrid buses
- Ordered 75 new commuter rail coached at a cost of $190 million
- Ordered 40 new locomotives at a cost of approximately $200 million

In addition to these needs, the MBTA will provide the MPO with a list of unfunded state-of-good-repair transit projects once the MBTA's Capital Investment Program document is completed. These unfunded needs can be considered for funding in an LRTP program.

FREIGHT

The physical condition of the regional roadway network also influences the health of the freight transportation system. Maintaining and modernizing the roadway network directly benefits freight users. Many express highways were designed in the 1950s; highways constructed today are designed to higher standards that benefit both trucks and light vehicles. This is especially important for trucks, which are on average larger now than when these roads were built.

Intermodal freight connections in the Boston Region MPO area are almost all between rail and truck or between ship and truck. These intermodal terminals—whether publicly owned like the Conley Container Terminal in South Boston, or privately owned like the bulk commodity terminals on the Mystic and Chelsea Rivers—finance their terminal investments outside the MPO process. However, the MPO may identify opportunities to improve connections between these intermodal terminals and the regional road network. Alternatively, MPO analyses undertaken as part of the UPWP process may identify intermodal freight roadway improvements that could be implemented by others.

The system of arterial roadways that connect regional express highways with local freight transportation users is undergoing gradual transformation as sections are rebuilt to "complete streets" standards. The emerging practices of arterial roadway design may pose challenges for truck movements if accommodation for modern trucks is not addressed at the outset. Ironically, the viability of local merchants is a key "livability" goal, reversing overdependence on the mall retail concept. The ability of "Main Street" merchants to receive deliveries by truck needs to be understood as a requirement for their viability.

Given the shared use of the roadway system by freight and passenger vehicles, addressing the needs of the freight transportation system also will include broader automobile and bus transit mobility and safety needs. Freight priorities are stated with reference to specific freight concerns:

- Reconstruction and modernization of the express highway system needs to continue.
- Reconstruction or improvements to arterial roadways need to be explicitly vetted for truck compatibility.
- Growth of truck traffic serving regional intermodal terminals needs to be accommodated.

CLIMATE CHANGE ADAPTATION

The MPO has developed an all-hazards planning application that shows the region's transportation network in relation to natural hazard zones. This tool works in conjunction with the MPO's database of LRTP and TIP projects so that it can be used to determine if proposed projects are located in areas prone to flooding or at risk of seawater inundation from hurricane storm surges, or, in the long term, sea level rise, which may be a result of climate change. Transportation facilities in such hazard zones might benefit from flood protection measures, such as enhanced drainage systems, or adaptations for sea level rise.

MassDOT is conducting a pilot project, *Climate Change and Extreme Weather Vulnerability Assessment and Adaptation Options of the Central Artery*. This study is assessing the vulnerability of the Central Artery to sea level rise and extreme storm events. It is investigating options to reduce identified vulnerabilities and establish an emergency response plan for tunnel protection and/or shut down in the event of a major storm.

Climate change impacts also present a number of planning challenges for the freight industry. In some ways, the freight transportation system is less vulnerable than other systems such as subways. Even on the shared roadway system freight is less vulnerable; because hazardous cargo is prohibited in tunnels, their transportation routes are designed using only above-ground roadways.

In addition, regional port facilities finance their own terminal investments outside of the MPO process. Recent and proposed port investments anticipate more severe storm surge conditions than found in the historical record, and associated MPO planning efforts can build on these new planning assumptions.

The MPO should continue to evaluate proposed projects to determine if they are located in areas prone to flooding, at risk of seawater inundation from hurricane storm surges, or, in the long term, sea-level rise because of climate change. The design of transportation projects in these hazard zones should address flood protection

measures, such as enhanced drainage systems, or adaptations for sea-level rise, giving special attention to major infrastructure projects including tunnels and major freight routes and facilities.

Potential Programs to Address System Preservation Needs

- **Intersection Improvement Program** – Can address pavement condition, modernization of signal equipment, and other improvements consistent with elements of Complete Streets.
- **Complete Streets** – Can address pavement condition, upgrade sidewalk and bicycle accommodations, and improve bridges and culverts (including adaptations to transportation infrastructure vulnerable to climate change and other hazards).
- **Bottleneck Program** – Can address pavement condition, upgrade sidewalk and bicycle accommodations, and improve bridges and culverts (including adaptations to transportation infrastructure vulnerable to climate change and other hazards).
- **Interchange Modernization** – Can address maintenance issues for older interchanges or can rebuild them using current design standards to improve roadway condition.
- **Major Infrastructure** – For highway: Can address pavement condition and bridges. For transit: Can improve infrastructure and rolling stock and infrastructure adaptations to address climate change hazards.
- **MassDOT's Climate Adaptation Vulnerability Assessment** – Will help prioritize assets and climate variables to focus adaptation efforts.

CAPACITY MANAGEMENT AND MOBILITY

Goals and Objectives

EXISTING GOAL:

Use existing facility capacity more efficiently and increase healthy transportation capacity

EXISTING OBJECTIVES:

- Improve reliability of transit
- Implement roadway management and operations strategies, constructing improvements to the bicycle and pedestrian network, and supporting community-based transportation

- Create connected network of bicycle and accessible sidewalk facilities (at both regional and neighborhood scale) by expanding existing facilities and closing gaps
- Increase automobile and bicycle parking capacity and usage at transit stations
- Increase percentage of population and employment within one-quarter mile of transit stations and stops
- Increase percentage of population and places of employment with access to bicycle facilities
- Improve access to and accessibility of transit and active transportation modes
- Support community-based and private-initiative services and programs to meet last mile, reverse commute, and other non-traditional transit/transportation needs, including those of the elderly and persons with disabilities
- Eliminate bottlenecks on the freight network
- Enhance intermodal connections
- Emphasize capacity management through low-cost investments; give priority to projects that focus on lower-cost operations and management-type improvements such as intersection improvements and Complete Street solutions

Background

Through its capacity management and mobility goal and objectives, the MPO seeks to maximize the region's existing transportation system so that both people and goods can move reliably and connect to key destinations. The Boston region is mature, which creates challenges to making major infrastructure changes to its transportation system. The Boston region also contains high population density and concentration of key destinations and is home to extensive and well-used roadway and public transit networks. These networks provide a solid foundation that—through targeted improvements to bottlenecks and utilizing management and operations strategies—can accommodate the ways the region is expected to change and grow.

The MPO's capacity management and mobility goal and objectives also seek to expand travelers' travel options to reach principal destinations. One approach to increasing mobility is to reduce single-occupancy vehicle travel, which may be achieved by encouraging multi-modal transportation options, including public transportation and bicycle and pedestrian transportation, in addition to automobile travel. The MPO's goals and objectives respond to federal, state, and regional activities to increase transit, bicycle, and pedestrian travel, such as MassDOT's GreenDOT initiative, the MassDOT Mode Shift Goal, the Healthy Transportation Compact, and MetroFuture's transportation goals, objectives, and strategies. They also respond to increasing demand for transit, bicycle, and pedestrian connections by communities throughout the region.

ROADWAY

The MPO monitors the mobility of its roadways as part of its Congestion Management Process (CMP), which also includes activities to monitor high-occupancy vehicle (HOV) lanes, public transportation, and park-and-ride lot usage. It is essential to keep all transportation facilities functioning at their optimum levels because how these facilities perform affect roadway and transit congestion. Improving congestion will ease the economic loss caused by travel delay, help increase mobility, and decrease vehicle emissions.

In order to determine how well the region's roadways are performing, the MPO applies performance measures that gauge the duration, extent, intensity, and reliability of congestion. MPO staff analyzed congestion in the region using the CMP Express Highway and Arterial Performance Dashboards, which applied the following measures:

- **Congested Time** – Monitors duration of congestion (measured in minutes per peak-period hour). This is the average number of minutes that drivers experience congested conditions during the peak period.[1] Congestion is considered to persist when the average speed is less than 35 miles per hour (mph) on limited-access roadway and 19 mph on arterial roadways.
- **Speed Index** – Monitors intensity, and is the average speed divided by the posted speed limit. When average speed matches the posted speed, the index equals one (1); lower values indicate more congestion.
- **Travel Time Index** – Monitors reliability, and is the average peak-period travel time divided by free-flow travel time. When the average peak-period travel time equals free-flow travel time, the index equals one (1); higher values indicate more congestion.
- **Lane Miles of Congestion** – Monitors the extent of congestion. Lane miles of congestion are determined by the travel time index values of the region's roadways.

Tables 4.3 and 4.4 show the performance measure values of the duration, intensity, and reliability of congestion for the region's expressways and arterials. Figures 4.4 and 4.5 show the performance values of the extent of congestion for the region's expressway and arterials.

1 The morning peak period is from 6:00 AM to 10:00 AM, and the evening peak period is from 3:00 PM to 7:00 PM.

TABLE 4.3
Regional Performance for Expressways

Performance Measure	Value
AM Average Speed	57.81 mph
AM Speed Index	0.99
AM Travel Time Index	1.12
PM Average Speed	58.53 mph
PM Speed Index	1.01
PM Travel Time Index	1.11
Free Flow Speed	65.28 mph
Average Congested Time per AM Peak Period Hour	6.82 Minutes
Average Congested Time per PM Peak Period Hour	5.92 Minutes

Source: Boston Region MPO Congestion Management Process.

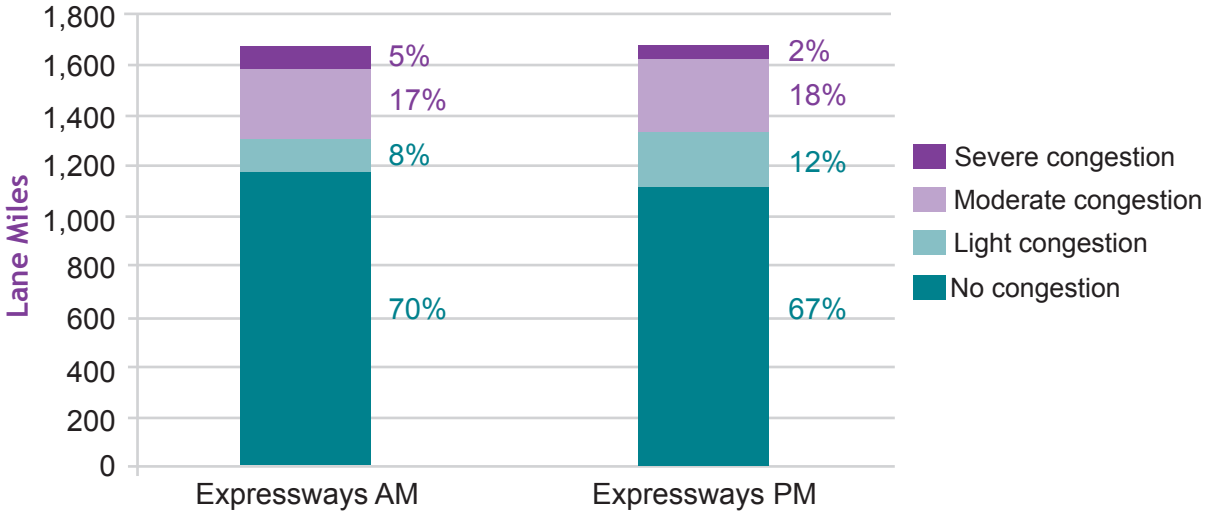
TABLE 4.4
Regional Performance for Arterials

Performance Measure	Value
AM Average Speed	31.57 mph
AM Speed Index	0.86
AM Travel Time Index	1.09
PM Average Speed	31.92 mph
PM Speed Index	0.87
PM Travel Time Index	1.07
Free Flow Speed	34.27 mph
Average Congested Time per AM Peak-Period Hour	2.95 Minutes
Average Congested Time per PM Peak-Period Hour	2.34 Minutes

Source: Boston Region MPO Congestion Management Process.

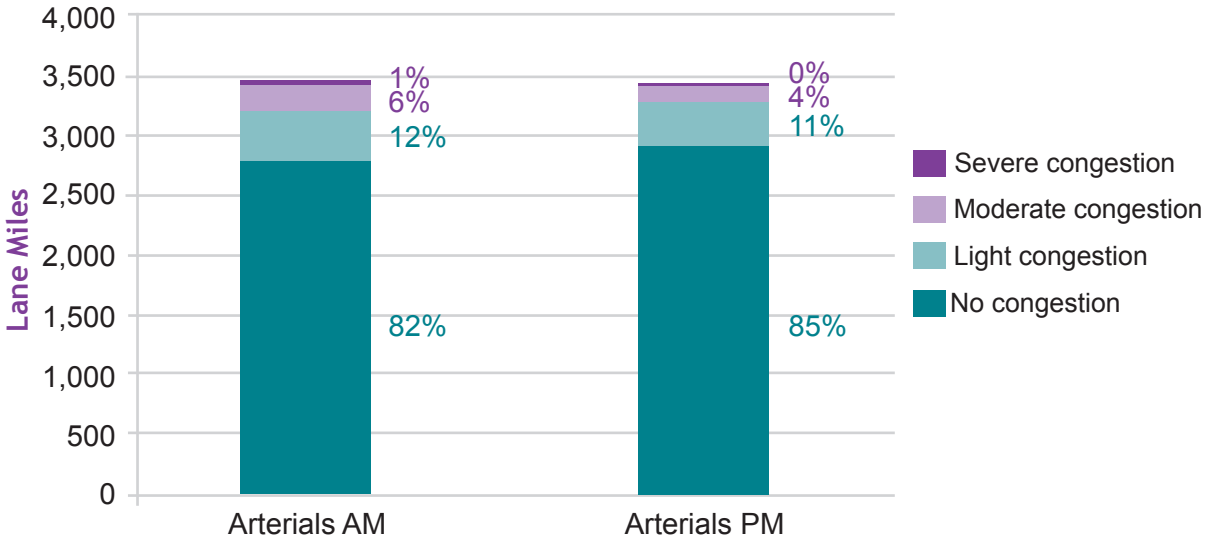
Lane miles of congestion, as measured by travel time index, measure the extent of congestion on the roadway network. This was analyzed for the entire CMP expressway network. Overall, 30 percent of all expressway lane miles in the AM peak period and 32 percent of all expressway lane miles in PM peak period experience congestion to some degree. Lane miles of congestion for the arterials are significantly less, at 18 percent for the AM peak period and 15 percent for the PM peak period.

FIGURE 4.4
Lane Miles of Congestion: CMP Monitored Expressways



Source: Boston Region MPO Congestion Management Process.

FIGURE 4.5
Lane Miles of Congestion: CMP Monitored Arterials



Source: Boston Region MPO Congestion Management Process.

Based on this data, the MPO has identified several general trends for the region's expressways and arterials:

- There are a higher percentage of congested lane miles in the PM peak period; however, a higher percentage of lane miles are severely congested in the AM peak period.
- The intensity of congestion on the region's expressways is more severe in the AM peak period.
- The travel time index is higher for expressways than arterials for both peak periods.
- The average speed indexes for the entire region for both the AM and PM peak periods are lower on arterial roadways than on expressways.
- Congested time is less widespread and less severe on arterials than on expressways.
- The duration, extent, intensity, and reliability of congestion is higher in the AM peak period than in the PM peak period for both expressways and arterials.
- There is a lower percentage of severely congested lane miles on arterials than on expressways, indicating that congestion is less widespread on arterials.
- Applying the performance measures to a regional context generates less extreme congestion values than if these were applied on a roadway segment basis. This is because congestion for both expressways and arterials is concentrated in specific areas. Most roadways in the region experience no peak period congestion at all, and non-congested segments may skew the regional results.

FREIGHT

The MPO also must address the transportation system's ability to move freight efficiently, as this contributes significantly to the region's economic vitality. The freight transportation system consists of a very large number of enterprises operating many distinct types of equipment over both publicly and privately owned or managed transportation networks. Key components of this system include the public roadway network, the rail system (both the publicly and privately owned sections), and navigable waterways. A number of specialized terminals (both publicly and privately owned) connect and allow freight to transfer between these different systems.

The roadway network is the most important component of the freight transportation system in the Boston Region MPO area. Trucks are the dominant mode for freight movement in this area; and virtually all freight that moves by rail or water requires transshipment to or from trucks in order to serve regional freight customers.

Trucks share the regional roadway network with light vehicles, both commercial and private. Measuring, managing, and reducing delay in the region's road network is an important defined responsibility of the MPO and is the ongoing work of the MPO's Congestion Management Process. Freight movements are expected to increase gradually into the near future in conjunction with population and economic growth. Strategies to affect mode shift in the MPO region are not applicable to freight, since no practical alternatives to trucks exist for final distribution of consumer goods to retail locations, as well as for most industrial logistic needs.

Railroads have been successful in increasing intermodal shipments using high-capacity double-stacked rail services to modern terminals, such as the one in Worcester. These expanded rail services slow the growth of trucks on the national interstate system, but add increasing numbers of trucks to roadways within the MPO. The impacts of larger vessels using an expanded Conley Terminal are similar.

Given the shared use of the road network, it is important that policies and investments that control or reduce congestion improve parts of the network heavily used by trucks. Fortunately, there is a strong correlation between parts of the road network experiencing severe congestion and parts heavily used by trucks.

TRANSIT TRAVEL

The MPO region is served by variety of transit services:

- **The Massachusetts Bay Transportation Authority (MBTA)** – Provides rapid transit, bus and trackless trolley, commuter rail, commuter boat, and paratransit service to a network of 175 municipalities
- **The Cape Ann Transportation Authority (CATA)** – Provides fixed-route and Dial-a-Ride transit service to the city of Gloucester and the towns of Essex, Rockport, and Ipswich
- **The MetroWest Regional Transit Authority (MWRTA)** – Provides fixed-route bus service in and between the municipalities of Ashland, Dover, Framingham, Holliston, Hopkinton, Hudson, Marlborough, Natick, Sherborn, Southborough, Sudbury, Wayland, Wellesley, and Weston (also operates paratransit service in Framingham and Natick)
- **Additional Regional Transit Authorities (RTAs)** – Provide service in areas that overlap with municipalities in the MPO region (includes the Brockton Area Transit [BAT], Greater Attleboro Regional Transit Authority [GATRA], and the Montachusett Regional Transit Authority [MART])
- **Massachusetts Port Authority (Massport)** – Transit services that provide connections to Logan Airport

- **Transportation Management Associations (TMAs)** – Serve member companies, developments, or institutions, and in some cases, the general public
- **Privately Operated Intercity Bus and Ferry Services**
- **Councils on Aging (COA)** – Social-service organizations, private non-profit organizations, and volunteer driver programs; collectively serve a range of clients, including older adults, persons with disabilities, veterans, and others
- **MassRIDES** – A MassDOT service that provides free statewide travel-options assistance to employers and other travelers. MassRIDES supports an active employer-based partnership program; statewide ride matching; vanpool formation and support program; extensive coordination with 16 regional transit authorities; a statewide, toll-free bilingual customer-service telephone line; and the Massachusetts Safe Routes to School program. Also promotes carpooling and vanpooling through a statewide ride-matching database of more than 15,400 commuters who register for MassRIDES programs and services.

To date, most of the Boston Region MPO's target funding for capital projects has gone to support the roadway network, bicycle, and pedestrian facilities; with the region's RTAs, the MassDOT Rail and Transit Division, and others supporting investment in the transit system. The MPO has made some investments in the transit system in recent years through its Suburban Mobility Program, which evolved into the Clean Air and Mobility Program, These programs have allocated Congestion Mitigation Air Quality (CMAQ) funding for starting up new, locally developed and supported transit services that improve air quality and reduce congestion. The MPO also supports the distribution of federal transit grant funds by the Rail and Transit Division.

Like the region's roadway system, the region's transit services and networks face reliability and capacity-management concerns. Buses, trackless trolleys, and shuttles operating on roadways are affected by traffic congestion. The size of vehicle fleets, the capacity of individual vehicles, and the condition of vehicles and infrastructure all have an impact on the number of passengers that can be moved and the ability of services to adhere to schedules.

The region's transit services also should provide connectivity to housing, employment, and other key destinations, as well as to other passenger transportation modes. Table 4.5 describes the portion of the MPO's population and employment in 2010 that fell within one-quarter mile of an MBTA, CATA, or MWRTA bus stop or an MBTA rapid transit or commuter rail station, as well as the amount projected to fall within the walkshed in 2040. Modest population gains are expected within this existing walkshed over the next 25 years.

Table 4.5
Population and Employment within One-quarter Mile of an MBTA, CATA or MWRTA Bus Stop, Rapid Transit Station, or Commuter Rail Station, by MAPC Community Type (2010 and 2040)

	MPO Region Population (2010)	MPO Region Employment (2010)	MPO Region Population (2040)	MPO Region Employment (2040)
Within MBTA, CATA, MWRTA Walkshed	1,756,000	1,292,600	2,115,200	1,418,900
MPO Total	**3,162,300**	**2,028,500**	**3,732,900**	**2,209,400**
Percent	**55.5%**	**63.7%**	**56.7%**	**64.2%**

Note: Population and employment results rounded to the nearest hundred.
Source: Central Transportation Planning Staff.

Tables 4.6 and 4.7 describe the portion of the MPO's 2010 and 2040 population by community type[2] that is projected to fall within the MBTA, CATA, or MWRTA fixed-route station walkshed. Tables 4.8 and 4.9 describes the portion of the MPO's employment by area type that is projected to fall within the walkshed in 2010 and 2040.

Table 4.6
Population within One-Quarter Mile of Transit (MBTA, CATA or MWRTA Bus Stop, Rapid Transit Station, or Commuter Rail Station), by MAPC Community Type (2010)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within Transit Walkshed	1,196,200	328,900	207,900	23,000	1,756,000
MPO Total	**1,391,300**	**545,300**	**900,500**	**325,100**	**3,162,300**
Percent	**86.0%**	**60.3%**	**23.1%**	**7.1%**	**55.5%**

Note: Population and employment results rounded to the nearest hundred.
Source: Central Transportation Planning Staff.

2 The Metropolitan Area Planning Council (MAPC) has developed a classification system that organizes Massachusetts' cities and towns into one of five types, four of which are present in the Boston region. These types can be used to understand how demographic, economic, transportation and other trends may affect different communities in the region. For more information, visit http://www.mapc.org/publications.

Table 4.7
Population within One-Quarter Mile of Transit (MBTA, CATA or MWRTA Bus Stop, Rapid Transit Station, or Commuter Rail Station), by MAPC Community Type (2040)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within Transit Walkshed	1,454,800	392,200	242,000	26,200	2,115,200
MPO Total	**1,688,700**	**651,100**	**1,029,900**	**363,300**	**3,732,900**
Percent	**86.1%**	**60.2%**	**23.5%**	**7.2%**	**56.7%**

Note: Population and employment results rounded to the nearest hundred.
Source: Central Transportation Planning Staff.

Table 4.8
Employment within One-Quarter Mile of Transit (MBTA, CATA or MWRTA Bus Stop, Rapid Transit Station, or Commuter Rail Station), by MAPC Community Type (2010)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within Transit Walkshed	922,400	194,200	164,200	11,800	1,292,600
MPO Total	**1,048,600**	**313,600**	**514,700**	**151,700**	**2,028,500**
Percent	**88.0%**	**61.9%**	**31.9%**	**7.8%**	**63.7%**

Note: Population and employment results rounded to the nearest hundred.
Source: Central Transportation Planning Staff.

Table 4.9
Employment within One-Quarter Mile of Transit (MBTA, CATA or MWRTA Bus Stop, Rapid Transit Station, or Commuter Rail Station), by MAPC Community Type (2040)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within Transit Walkshed	1,017,600	210,400	178,500	12,400	1,418,900
MPO Total	**1,151,900**	**340,200**	**556,200**	**161,100**	**2,209,400**
Percent	**88.3%**	**61.8%**	**32.1%**	**7.7%**	**64.2%**

Note: Population and employment results rounded to the nearest hundred.
Source: Central Transportation Planning Staff.

Tables 4.7 and 4.9 show that in 2040 relatively low portions of population and employment in maturing and developing suburbs are projected to fall within the MBTA, CATA, and MWRTA fixed-route walkshed. This suggests that transit services may need to be expanded or diversified in order to increase transit use within these parts of the MPO region.

As part of providing connections to key destinations, transit services and stations should support "last-mile" connections by linking to bicycle and pedestrian routes and shuttle or other services; parking for vehicles and bicycles also should be made available, where appropriate. Transit services should account for the travel needs associated with non-work trips, as well as reverse commutes and other types of trip-making activity. Finally, these services and facilities should account for the needs of a diverse population of riders, which include young people, older adults, and persons with disabilities.

BICYCLE AND PEDESTRIAN TRAVEL

The MPO agrees that bicycle and pedestrian facilities provide opportunities for healthy, environmentally sustainable travel. Federal, state, regional and local initiatives supporting Complete Streets underscore interest in integrating and enhancing the role of these modes in the transportation system. For example, MassDOT issued its Complete Streets design standards and related Healthy Transportation Policy Directive to ensure that MassDOT projects are designed and implemented so that all customers have access to safe and comfortable walking, bicycling, and transit options.

MassDOT also supports the Bay State Greenway (BSG), a seven-corridor network of bicycle routes that comprise both on- and off-road bicycle facilities throughout the state intended to support long-distance bicycle transportation. Approximately 200 miles of this 750-plus mile on- and off-road network have been constructed. MassDOT has identified the "BSG Priority 100," one-hundred miles of high-priority shared-use path projects within the network.

On-road bike routes, separated paths, sidewalks, and other supporting infrastructure are a key component of the last-mile connections described. When these facilities are integrated into well-connected networks, they support trips both within and between the region's communities. When they are connected to key destinations, they can support a diversity of trip types, and effective connections between facilities can support longer trips.

Today, approximately three percent of the region's non-limited-access roadways provide bicycle accommodations—a more-than 50 percent increase since the previous Boston Region MPO LRTP. Tables 4.10 and 4.11 below show the portion of the MPO's population and employment that fell within one-half mile of a bike facility in 2010.

Table 4.10
MPO-Region Population within One-half Mile of a Bike Facility (2010)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within One-Half Mile of Bike Facility	1,120,900	105,100	189,500	22,700	1,438,100
MPO Total	**1,391,300**	**545,300**	**900,500**	**325,100**	**3,162,300**
Percent	**80.6%**	**19.3%**	**21.0%**	**7.0%**	**45.5%**

Note: Population and employment results rounded to the nearest hundred. Interstates and access controlled roads excluded from analysis.
Source: Central Transportation Planning Staff.

Table 4.11
MPO-Region Employment within One-half Mile of a Bike Facility (2010)

	Inner Core Communities	Regional Urban Centers	Maturing Suburbs	Developing Suburbs	Total MPO Region
Within One-Half Mile of Bike Facility	843,300	51,200	129,800	10,800	1,035,100
MPO Total	**1,048,600**	**313,600**	**514,600**	**151,700**	**2,028,500**
Percent	**80.4%**	**16.3%**	**25.2%**	**7.1%**	**51.0%**

Note: Population and employment results rounded to the nearest hundred. Interstates and access controlled roads excluded from analysis.
Source: Central Transportation Planning Staff.

As the tables above show, the proportion of MPO employment that fell within one-half mile of a bicycle facility in 2010 was larger than the portion of MPO population that was within one-half mile of a bicycle facility. As of 2010, approximately 80 percent of population and employment in Inner Core Communities was located within one-half mile of a bicycle facility. In comparison, much lower shares of population and employment are within one-half mile of bicycle facilities in communities characterized as regional urban centers, maturing suburbs, and developing suburbs.

TABLE 4.12
Miles by Bicycle per 1,000 Residents for Communities in the Boston MPO Region, by MAPC Community Type (2011)

	Total Distance	Between Home and Work	Other Travel
Inner Core Communities	184	100	84
Maturing Suburbs	57	19	38
Regional Centers	21	6	15
Developing Suburbs	32	7	25

Note: Population and employment results rounded to the nearest hundred. Interstates and access controlled roads excluded from analysis.
Source: Central Transportation Planning Staff.

The MPO has analyzed patterns of regional bicycling activity using data from the 2011 Massachusetts Travel Survey. Table 4.12 shows the miles traveled per 1,000 residents for communities in the Boston Region, by Metropolitan Area Planning Council (MAPC) community type.

Bicycling, including for trips to work is highest in Boston's Inner Core communities, followed by its maturing suburbs. These bicycling activity levels are correlated with the portions of population and employment within one-half mile of a bicycling facility in each of the MAPC community types, as shown in Tables 4.10 and 4.11 above. The MPO's capacity management and mobility objectives include

an objective to increase the percentage of population and places of employment with access to bicycle facilities. The greatest potential for these increases exists in the maturing suburbs, regional urban centers, and developing suburbs in the Boston region, and by increasing bicycle network connectivity to key destinations in these areas, there may be growth in bicycling activity.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

- *Moving Ahead for Progress in the 21st Century*
- *United States Department of Transportation 23 CFR Parts 450 Subpart C – Metropolitan Transportation Planning and Programming Regulation*
- *Partnership for Sustainable Communities (EPA,DOT,HUD)*
- *1990 Clean Air Act and its Amendments*
- *United States Environmental Protection Agency (EPA) 40 CFR Parts 51 and 93 – Conformity Regulation*
- *The Americans with Disabilities Act*
- *Massachusetts Global Warming Solutions Act (GWSA)*
- *MassDOT's Bay State Greenway*
- *MassDOT's GreenDOT Policy and Implementation Plan (includes MassDOT Mode Shift Goal)*
- *MassDOT youMove Massachusetts (YMM)*
- *MassDOT weMove Massachusetts (WMM)*
- *Massachusetts Healthy Transportation Compact (HTC)*
- *MBTA's Program for Mass Transportation (PMT)*
- *MPO's Congestion Management Process (CMP)*
- *MPO's Coordinated Human-Services Transportation Plan (CHSTP):*
- *MAPC's MetroFuture*

RELEVANT MPO STUDIES, REPORTS, AND DOCUMENTS

Roadways and Intersection Studies

- The MPO produces periodic reports through its Congestion Management Process:
  - *Boston Region MPO Congestion Management Process: Performance-Based Planning for Efficiency, Mobility, and Safety,* 2013
  - Historical Trends: *Travel Times and Vehicle Occupancy Levels for I-93 North and Southeast Expressway HOV and General-Purpose Lanes*, 2012
- The MPO conducted a series of studies on preferential lane systems
  - *A Preferential Lane on I-93 North: A Conceptual Plan*, 2014
  - *Screening Regional Express Highways for Possible Preferential Lane Implementation*, 2012
  - *Improving the Southeast Expressway: A Conceptual Plan,* 2012
- *Addressing Safety, Mobility, and Access on Subregional Priority Roadways* studies, conducted for the following locations:
  - Washington Street in Newton (FFYs 2013–14)
  - Route 3A, Cohasset and Scituate and Route 127A/127, Gloucester and Rockport (FFYs 2013–14)
- *Priority Corridors for LRTP Needs Assessment* studies, conducted for the following locations:
  - Route 2 in Concord and Lincoln (FFY 2013)
  - Route 9 in Framingham and Natick (FFY 2013)
  - Route 114 in Danvers (FFY 2012)
  - Route 203 in Boston (FFY 2012)
- *Low-Cost Improvements at Freeway Bottleneck Locations* studies, conducted for the following locations:
  - I-95 southbound, at the off-ramp area of Interchange 32B in Burlington (FFY 2011)
  - I-95 between Interchange 28B in Waltham and Interchange 29A in Lexington (FFY 2011)

- I-95 northbound, ramp merge area at Interchange 24 in Weston (FFY 2010)
- Route 3 northbound, merge area at Interchange 17 in Braintree (FFY 2010)
- I-95 northbound, exit and entrance ramp at interchange 32 in Burlington (FFY 2010)
- Route 3 southbound, lane-drop at the Hingham-Weymouth town line (FFY 2010)

Parking and Park-and-Ride Facilities

- *2012-2013 Inventory of Park-and-Ride Lots at MBTA Facilities*, 2014
- *2012 Inventory of Bicycle Parking Spaces and Number of Parked Bicycles at MBTA Stations,* 2014

Freight Studies

- *Proposed Freight Planning Action Plan for the Boston Region MPO: Meeting the Goals and Addressing the Issues, 2013*
- *Results of the Boston Region MPO's 2012 Freight Study – A Profile of Truck Impacts, 2012*

Transit Studies

- *The Bus Walking Radius Study*, 2012
- *Core Efficiencies Study of the Massachusetts Bay Transportation Authority System*, 2012
- *MBTA Early Morning Transit Service*, 2013
- *Massachusetts Regional Bus Study*, 2013
- *MBTA Commuter Rail Passenger Counts*, 2012
- The MPO conducted several studies supporting RTAs and suburban transit:
  - *Evaluation of MetroWest Regional Transit Authority Fixed Route Network*, 2009
  - *SouthWest Advisory Planning Committee (SWAP) Regional Public Transit Feasibility Study*, Boston Region MPO and *Metropolitan Area Planning Council,* 2013

Bicycle and Pedestrian Resources

- *Bicycle and Pedestrian Improvements at Six Urban Centers*, 2010
- *Bicycle and Pedestrian Improvements in Town Centers,* 2007
- *Bicycle Network Evaluation*, 2014

Resources Used to Establish Transportation Needs

- LRTP Needs Assessment Application: Supports mapping of various types of transportation infrastructure (such as roadways, transit services, rail lines, bicycle facilities) and data on travel activity
- Express Highway Performance Dashboard (supported by the MPO's Congestion Management Process)
- Arterials Performance Dashboard (supported by the MPO's Congestion Management Process)
- Average Daily Traffic (ADT) Data Browser Application
- Monitored Intersections in the Boston Region MPO area database
- Massachusetts Travel Survey, 2011
- Boston MPO 2014 Bicycle Network Evaluation
- Sidewalk and bicycle facilities by municipality

Public Input on Regional Needs

The following is a list of needs identified through public outreach conducted in fall 2014, and on an ongoing basis through the MPO website, as they relate to capacity management and mobility:

- Congestion on regional arterials (commuter and non-commuter); examples: Route 1, 1A, 2, 3, 16, 30, 62, 97, 126, 128, 133, 135, Middlesex Turnpike
- Congestion on highways, I-90, 95, 495, and specifically the I-93/95 interchange
- Increasing congestion because of growth in housing, population, and shopping centers
- Need to improve bike infrastructure and expand bike network in congested corridors, such as in a circumferential route around the Inner Core and between Acton and Concord

- Need for connections between the Upper Charles Trail to Southern New England Trunkline Trail to the south and Bruce Freemen Trail to the north; and from Bruce Freeman to the east and west trails
- Need to increase walkability and support communities to promote walkability
- Need to improve quantity and quality of parking at transit stations, specifically at Alewife, Quincy Adams, Braintree, Littleton, Medway, Norfolk, Littleton, Fitchburg, Kingston, and Plymouth
- Need more train and bus transit options, including improved service hours and frequency, less expensive commuter rail and subway, bus-only lanes, point-to-point bus service; specifically:
    - Congested bus routes in Cambridge
    - A bus rapid transit lane on I-495 for buses and freight
    - Diesel multiple unit (DMU) hub in Framingham
    - North/south rail link between Clinton and Mansfield
    - Rail service for Marlborough and Foxboro
    - Extended commuter rail service on Fitchburg line
    - More reverse-commute options for Framingham and Natick
    - Expanded commuter rail and subway to the South Shore
    - Subway extension of the Blue Line to Lynn
    - Increased capacity at Alewife
    - Extend the Red Line past Braintree
    - More evening and weekend service for councils on aging
    - More transit on Cape Ann
- More ferry service in coastal cities and towns
- Better links to existing transit is needed, including local connections to transit that are convenient and easy to use; specific needs:
    - A first mile/last mile program
    - Better connections to suburban commuter rail stops
    - Investment in technology to help with connections
- Need for alternative transit for suburban environments, the aging population, and millennials

- Need to coordinate between RTAs, transit providers, and developers in suburbs, specifically:
    - Additional support for Neponset Valley TMA, MWRTA, in Concord, and areas between Central Mass and Boston Region MPOs
    - Corrections for schedule mismatches between RTA service and various shuttle services (eventually would like to use Charlie Card system)
    - Services that can accommodate teenagers, as well as millennials and seniors
    - Westwood shuttle and bus service stops at Westwood municipal borders
- Airport service, specifically in Fitchburg area

Capacity Management and Mobility Needs

ROADWAY RELIABILITY NEEDS

MPO activities and investments to increase reliability on the roadway network benefit both freight and non-freight road users. The MPO has identified a priority set of congested locations on the region's expressways and arterials using four measures: speed index, travel time index, volume-to-capacity ratio, and crash history. Each corridor was given a weighted score depending on the number of performance measures that indicated congestion. Below is a list of expressway and arterial corridors along with their corresponding LRTP needs assessment corridor.

Expressway Corridors

- I-93 between I-95 in Woburn and the Leverett Connector
- I-93 between the Braintree Split and the Massachusetts Ave. Interchange
- US 1 between Route 60 in Revere and Route 99 in Saugus
- Route 128 at Lowell St., Exit 26, in Peabody
- I-90 between Interchanges 16 and 17 in Newton
- I-95 between I-93 in Woburn and US 1 in Lynnfield

Arterial Corridors

- Route 1 Westwood to Sharon – Southwest
- Route 138 (Canton) – Southwest
- Route 1A from Salem to Revere – Northeast

- Route 107 Western Ave. at Route 129 Washington St. (Lynn) – Northeast
- Route 114 (Peabody, Salem) – Northeast
- Route 1A (Revere) – Northeast/Central
- Route 2 Bypass Rd./Cambridge Turnpike-Piper Rd./Taylor Rd. (Concord, Acton) – Northwest
- Route 60 from Route 2 to Route 2A and Medford St. (Arlington) – Northwest
- Route 62 Main Street in Concord between Elm St. and Route 2 – Northwest
- Routes 62, 225 and 4 corridor (Bedford, Lexington) – Northwest
- Route 16 Fresh Pond Parkway and Alewife Brook Parkway – Northwest/Central
- Memorial Drive (Cambridge) – Northwest/Central
- Route 3A Marshfield to Quincy – Southeast
- Route 18 (Weymouth) – Southeast
- Route 28 Milton to Randolph – Southeast
- Route 138 (Milton) – Southeast
- Route 9 Southborough to Newton – West
- Route 16 Holliston to Newton – West
- Route 20 (Weston) – West
- Route 30 between I-90 and Route 9 (Framingham) – West
- Route 135 Wellesley to Natick – West
- Route 16 Mystic Valley Parkway and Revere Beach Parkway – North/Central
- Route 99 Broadway (Everett) – North/Central
- Route 129 Wilmington to Reading – North

As discussed above, work on these priority expressways and arterials should consider the transportation needs of passengers and freight, as well as ways to accommodate transit, bicycling and walking.

TRANSIT RELIABILITY NEEDS

The MBTA Scorecard reports on various performance measures for the bus system as a whole, for individual rapid transit lines, for the commuter rail system as a whole, and for individual commuter rail lines. An analysis of monthly scorecards for 2013 reveals that:

- Overall, bus vehicle availability, scheduled bus trips operated, and mean miles between failures for bus fleet goals were met or exceeded. However, according to the 2012 MBTA Service Policy Delivery standards (revisited every two years), only 7.6 percent of all bus routes passed the service-adherence standard.
- The Orange Line did not meet the 95 percent on-time performance goal during any month of the year.
- The commuter rail system overall did not meet the on-time performance goal of 95 percent.
- On individual lines, only the Fairmount, Greenbush, Middleborough/Lakeville, and Kingston/Plymouth Lines had on-time performance rates greater than the 95 percent goal.
- The commuter rail system did not meet the locomotive mean miles between failures goal.

TRANSIT CAPACITY NEEDS

As mentioned above, the majority of transit capacity and expansion needs are funded by federal agencies, MassDOT, the region's RTAs, and other entities. A number of major infrastructure constraints on the MBTA system limit capacity and hinder the agency's ability to expand the system in the future. Most of these constraints are mentioned in *Paths to A Sustainable Region,* the previous LRTP, which include, but are not limited to, the following:

- Additional tracks are needed at South Station to accommodate any growth in service on south-side commuter rail lines. MassDOT currently has plans to expand Boston's South Station terminal capacity, and related layover capacity, to meet current and future high-speed, intercity, and commuter rail service needs. MassDOT has received $32.5 million from the Federal Railroad Administration for expansion planning and environmental review of South Station.
- The capacity of the Haverhill, Fitchburg, Franklin, Stoughton, Needham, and Old Colony Lines is constrained by sections of single track.
- The Green Line's central subway tunnel currently is operating at capacity.
- The Orange Line currently is overcrowded during peak hours between Downtown Crossing and North Station.
- Systemwide, 20 percent of park-and-ride lots associated with transit stations (MBTA and public or private lots that provide transit parking) are utilized at 85 percent of their capacity, or greater. Of these facilities, 62 percent are commuter rail, 31 percent are rapid transit, and seven percent serve both rapid transit and commuter rail.

A recent analysis of the MBTA's current Program for Mass Transportation (PMT) identified several locations and facilities with transit needs. These include, but are not limited to the following:

- Analysis indicates that numerous communities around the region will experience high growth in intercity trips by 2030. These include:
  - Peabody, Beverly, Salem
  - Acton, Concord, and Westford
  - Framingham, Marlborough, and Natick (communities served by the MWRTA)
  - Needham and Wellesley (MWRTA provides some service to Wellesley)
  - Stoughton, Canton, Norwood, Walpole
  - Lynn
- A great number of MBTA bus routes need additional service or larger, articulated vehicles, either to overcome periods of crowding or on a regular basis.
- There are opportunities to establish additional crosstown routes to provide quicker and more direct connections for crosstown travel. Relatedly, there are strong activity centers in adjacent radial corridors that are not currently connected by transit.
- Malden and Weymouth are expected to experience high growth in intra-city trips; however, current transit mode shares are extremely low.
- Everett, which is densely populated, lacks a direct public transit connection to downtown Boston.

In addition, the MBTA will provide the MPO with a list of capacity and mobility improvement projects once the MBTA's Capital Investment Program document is released for public review.

MPO staff has also identified several transit capacity and service needs through public outreach:

- There is an interest in exploring improvements to bus transit, such as bus prioritization, and dedicated lanes.
- Suburban transit service should be expanded in suburban areas throughout the region.

TRANSIT CONNECTIVITY NEEDS

Transit connectivity includes connections to other modes at stations or stops, as well as broader connectivity to employment, housing, and other key destinations. Multi-modal

connections at stations and stops take into account parking availability and bicycle and pedestrian links. MPO staff analyzed patterns of parking utilization on the MBTA system to determine which park-and-ride lots and bicycle facilities were congested. Any parking lot or bicycle facility that is more than 85 percent utilized is considered congested; these facilities are listed below:

Park and Ride Lots at More than 85-Percent Utilization

- Swampscott – Newburyport/Rockport Line
- Beverly Depot – Newburyport/Rockport Line
- Manchester – Newburyport/Rockport Line
- North Wilmington – Haverhill Line
- Wilmington – Lowell Line
- Wedgemere – Lowell Line
- West Medford – Lowell Line
- South Acton – Fitchburg Line
- Kendal Green – Fitchburg Line
- Waltham – Fitchburg Line
- West Natick – Worcester Line
- Wellesley Square – Worcester Line
- Wellesley Hills – Worcester Line
- Needham Junction – Needham Line
- Franklin – Franklin Line
- Plimptonville – Franklin Line
- Endicott – Franklin Line
- Providence – Providence Line
- South Attleboro – Providence Line
- Mansfield – Providence Line
- Maverick – Blue Line
- Oak Grove – Orange Line

- Forest Hills – Orange Line
- Savin Hill – Red Line
- Milton – Red Line
- Wollaston – Red Line
- Braintree – Red Line
- Lechmere – Green Line
- Waban – Green Line
- Eliot – Green Line
- Chestnut Hill – Green Line

Bicycle Parking at MBTA Stations at More than 85-Percent Utilization

- West Concord – Fitchburg Line
- Natick – Worcester Line
- Providence – Providence Line
- Whitman – Old Colony Line
- Alewife – Red Line
- Kendall/MIT – Red Line
- Downtown Crossing – Red Line
- North Quincy – Red Line
- Wollaston – Red Line
- Sullivan Square – Orange Line
- Chinatown – Orange Line
- BU Central – Green Line
- Hynes – Green Line
- Brookline Hills – Green Line
- Newton Centre – Green Line
- Chestnut Hill – Green Line
- Longwood Medical Center – Green Line

MPO staff has also identified needs related to bicycle and pedestrian connections at stations:

- Bicycle station access, such as at the recently opened Assembly Orange Line station, should be implemented wherever possible throughout the rapid transit system.
- Bicycle access to other north-side Orange Line stations, the Blue Line, and southern parts of the Red Line is inadequate.
- Most commuter rail stations outside the Inner Core communities have been designed to facilitate access by auto. Pedestrian and bicycle access to these stations should be improved wherever feasible.
- Pedestrian station access has been improved as part of the Blue Line stations' reconstruction.
- Additional opportunities exist to improve pedestrian access to rapid transit, especially to the north-side Orange Line stations, and southern parts of the Red Line.

MPO staff has identified several transit connectivity needs—both to transit facilities and destinations throughout the region—through reviews of the Program for Mass Transportation, and other public outreach and analysis:

- At Alewife Station, traffic congestion reduces reliability of bus routes and increases running times.
- There are opportunities to establish additional crosstown routes to provide quicker and more direct connections for crosstown travel. Relatedly, there are strong activity centers in adjacent radial corridors that are not currently connected by transit.
- Many communities are interested in improved links to existing transit service. These include park-and-ride, transit station parking, shuttle services, and other facilities and services that support last-mile connections.
- There is interest in improving connections between the region's RTAs.

BICYCLE AND PEDESTRIAN NETWORK CONNECTIVITY NEEDS

In 2014, MPO staff completed its Bicycle Network Evaluation, which assessed gaps in the MPO's existing bicycle network according to how well connections in these areas would support bicycle connectivity and maximize safe access throughout the region. A steering committee of bicycle representatives from MassDOT and MAPC guided this project, and advocacy groups and bicycling stakeholders in the region provided input. Staff evaluated more than 230 gaps and ranked these gaps using evaluation criteria pertaining to bicycle connectivity.

Through this evaluation process, MPO staff identified eleven top priorities.

- Waltham – Central Massachusetts Rail Trail
- Framingham/Ashland/Sherborn – Upper Charles Trail
- Framingham – Sudbury Aqueduct Trail
- Somerville – Community Path/Green Line Extension
- Boston – Dorchester Corridors
- Boston – Boston University Bridge to Emerald Necklace
- Boston – Charlesgate
- Arlington – Minuteman to Mystic Valley
- Cambridge – Central Square
- Chelsea – Commuter Rail to East Boston Greenway
- Salem – Canal Street Bikeway

Progress on these eleven identified priorities varies by gap. For example, some still need further planning and design, others have right-of-way or land-ownership challenges, yet others are proposed for funding. In addition, as part of the Bicycle Network Evaluation, MPO staff noted that there are areas within the region, such as the Three Rivers Interlocal Council and South Shore Coalition subregions, with so few bicycle facilities (on-road lanes, protected lanes, or off-road paths) that they did not meet the definitions for gaps in the study. Staff recommended that existing desire lines for facilities in these areas be considered in subsequent evaluations.

In addition to the priority connections identified through the Bicycle Network Evaluation, several BSG 100 priority corridor projects are within the MPO region:

- MassCentral corridor – Wayside Trail (includes Hudson, Sudbury, Waltham, Wayland, Weston)
- Merrimack-Charles River corridor – Bruce Freeman Rail Trail Extension (Acton, Carlisle, Concord)
- Merrimack Charles River corridor – Reformatory Branch Trail (includes Bedford)
- Merrimack Charles River corridor – Community Path Extension (includes Somerville)
- Boston Cape Cod corridor – Neponset River Greenway Phase 2 (includes Boston, Milton)
- North Shore corridor – Border to Boston (North and South) (includes Danvers, Topsfield, Wenham)

- North Shore corridor – Northern Strand Community Trail (includes Everett, Lynn, Malden, Revere, Saugus)

Progress has been made on a number of these projects; several have been proposed for TIP funding, and some are being advanced by other entities.

Through outreach and analysis, MPO staff has identified additional needs related to bicycle and pedestrian connectivity, and which address a combination of specific locations and broader themes:

- Bicycles approaching Boston via the northwest, west, and southwest corridors can use existing bicycle facilities, notably the Minuteman Bike Trail, the Charles River Basin paths, and the Southwest Corridor linear park. Comparable facilities do not exist for bicycles approaching from the northeast, north, or southeast.
- Communities are interested in improving bicycle connectivity throughout the region, including enhancements to the existing system and circumferential routes.
- Inadequate snow removal from sidewalks reduces mobility, especially for older people and those with mobility impairments.
- Only 52 percent of the region's non-limited-access roadways have a sidewalk on at least one side of the street. Within the Inner Core communities, 87 percent of streets have a sidewalk; outside the Inner Core, this drops to 45 percent. Many communities are interested in increasing local walkability. The completion of local sidewalk systems, preferably on both sides of the street, should be a long-range goal.

Potential Programs to Address Capacity Management and Mobility Needs

- **Intersection Improvement Program** – Can reduce congestion, which would improve mobility and reduce emissions; can include Complete Streets elements that would improve mobility for bicyclists, and mobility and accessibility for pedestrians.
- **Complete Streets Program** – Can increase transportation options by adding new sidewalks and bicycle facilities.
- **Bottleneck Program** – Can reduce congestion and would improve mobility. The identified congested expressway and arterial locations should be prioritized.
- **Interchange Modernization Program** – Can reduce congestion and would improve mobility.
- **Bicycle Network Program** – Can increase transportation options, provide access to transit or other activity centers, and support last-mile connections.

- **Pedestrian Connections Program** – Can increase transportation options, provide access to transit or other activity centers, and support last-mile connections.
- **Major Infrastructure** – Project specific, but potentially could increase transportation options.
- **Park-and-Ride and Bicycle Parking Programs** – Can increase transit ridership by expanding automobile and bicycle parking at commuter rail and rapid transit stations.
- **Clean Air and Mobility/Community Transportation Program** – Can provide funding for starting up new, locally developed transit services and support last-mile connections; provide transit vehicles and coordination to serve environmental justice (EJ) populations in suburban areas.

CLEAN AIR AND CLEAN COMMUNITIES

Goals and Objectives

EXISTING GOAL:

Create an environmentally friendly transportation system

EXISTING OBJECTIVES:

- Reduce greenhouse gases generated in the Boston region by all transportation modes as outlined in the Global Warming Solutions Act
- Reduce other transportation-related pollutants
- Minimize negative environmental impacts of the transportation system
- Support land use policies consistent with smart and healthy growth

Background

The Boston Region MPO agrees that greenhouse gas emissions (GHGs) contribute to climate change. If climate trends continue as projected, the conditions in the Boston region will include a rise in sea level coupled with storm-induced flooding, and warmer temperatures that would affect the region's infrastructure, economy, human health, and natural resources. Massachusetts is responding to this challenge by taking action to reduce the GHGs produced by the state, including those generated by the transportation sector. To that end, Massachusetts passed its Global Warming Solutions Act, which requires reductions of GHGs by 2020, and further reductions by 2050, relative to 1990 baseline conditions. Understanding that reducing the use of single-

occupant vehicles also would scale back production of GHGs and other pollutants, Massachusetts has a goal of tripling the share of travel in Massachusetts by bicycling, using transit and walking by 2030.

In addition, the MPO analyzes and monitors the presence of other air quality pollutants—volatile organic compounds (VOC), nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter ($PM_{2.5}$ and PM_{10}) from transportation in the region. The MPO region was classified as attainment for ozone (formed from VOC and NOx emissions) in 2012. The Boston Region MPO is in attainment with the PM standards, but remains in maintenance for CO.

Contributing to this improved air quality status is the MPO's attention to accomplishing the State Implementation Plan Commitments from the Central Artery/Third Harbor Tunnel project, and other measures and projects funded in the LRTP and TIP to reduce congestion and improve transit and active modes of transportation. Although the MPO area is in attainment and maintenance for these specific air quality standards, its goal is to continue to reduce emissions of these pollutants.

In addition to air quality, the MPO consults with agencies responsible for land management, natural resources, historic preservation, and environmental protection and conservation as related to transportation initiatives. Natural, environmental, and historic resources were mapped for the Boston region using information from the Commonwealth's Office of Geographic and Environmental Information Systems MassGIS). The MPO considers environmental impacts that stem from transportation projects, including areas of critical environmental concern, special flood hazard areas, wetlands, water supply, protected open space, endangered species, and brownfield and superfund sites. In the Boston region, environmental reviews for projects are conducted by the proponent transportation agency or municipality. The environmental reviews occur when each of the projects is in the design phase and prior to being funded for construction. Impacts to these resources from the project are factored into project evaluations through the MPO's evaluation criteria.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

Greenhouse Gas

- *Moving Ahead for Progress in the 21st Century*
- *Global Warming Solutions Act*
- *GreenDOT Implementation Plan*
- *Guidance for Evaluation of GHG Emissions:* MassDOT developed guidance for evaluating GHG emissions in the LRTP and the TIP that requires MPOs to provide

an air-quality analysis, calculating carbon dioxide (CO_2) emissions for all TIP projects. In addition, they require that a CO_2 analysis be performed for the LRTP.

- *Department of Environmental Protection (DEP) GHG Regulation*: DEP issued a regulation in January 2015 requiring that MPO's calculate GHG reductions associated with all projects programmed in the LRTP and TIP and report that information to MassDOT.
- *MassDOT Mode Shift Goal*

Air Pollution

- *1990 Clean Air Act and its Amendments*
- *United States Environmental Protection Agency (EPA) 40 CFR Parts 51 and 93 – Conformity Regulation*
- *United States Department of Transportation 23 CFR Parts 450 Subpart C*

Environment

- *United States Department of Transportation 23 CFR Parts 450 Subpart C – Metropolitan Transportation Planning and Programming Regulation*

RELEVANT MPO STUDIES, REPORTS, AND DOCUMENTS

Greenhouse Gas

- *Carbon Dioxide, Climate Change, and the Boston Region MPO: A Discussion Paper*, Boston Region MPO, 2008
- *Carbon Dioxide, Climate Change, and the Boston Region MPO: 2012 Update,* Boston Region MPO, 2012
- GHG calculations are performed for most studies involving transportation project evaluation

Air Pollution

- The MPO's previous LRTP *Paths to a Sustainable Region*, Chapter 10, adopted September 2011 and amended in November 2011, July 2013, and November 2013
- The MPO's previous *Transportation Improvement Program and Air Quality Conformity Determination*, Chapter 5, adopted in July 2014
- Calculations for air quality emissions (VOC, CO, NOx, and PM) are performed for most studies involving transportation project evaluation

Environment

- The MPO's previous LRTP *Paths to a Sustainable Region*, Chapter 5, adopted September 2011

Resources Used to Establish Transportation Needs

Greenhouse Gas

- *All-Hazards Planning Application*: This application shows the region's transportation network in relation to natural hazard zones. This tool works in conjunction with the MPO's database of TIP projects so that it can be used to determine if proposed projects are located in areas prone to flooding or at risk of seawater inundation from hurricane storm surges, or, in the long term, sea level rise, which may be a result of climate change. Transportation facilities in such hazard zones might benefit from flood protection measures, such as enhanced drainage systems, or adaptations for sea level rise.
- *Boston Region MPO Vehicle Miles Traveled and Emissions Data Browser*: This application can be used to browse CTPS's database of modeled vehicle miles traveled (VMT), vehicle hours traveled, VOC, NOx, and CO_2 emissions data for the 101 cities and towns in the Boston Region MPO. The data is presented by vehicle type (single-occupant vehicles, high-occupant vehicles, and trucks) and by period (6:00 AM-to-9:00 AM, 9:00 AM-to-3:00 PM, 3:00 PM-to-6:00 PM, and 6:00 PM-to-6:00 AM).

Air Pollution

- *Boston Region MPO Vehicle Miles Traveled and Emissions Data Browser* (see above)

Environment

The MPO addresses environmental impacts through its evaluation criteria, rating projects on how they address impacts in these areas prior to programming projects in the LRTP and TIP. The following information is available by accessing the LRTP Needs Assessment tool, which will direct you to the Massachusetts geographic information system (GIS) website. In addition, the MPO's All-Hazards Application described above provides information about some of the items listed below.

- *Areas of critical environmental concern (ACEC)* – 12 ACECs are located at least partially in the Boston Region MPO area and are recognized for their unique, significant natural and cultural resources. The ACEC designation helps to ensure that any activities undertaken in or near the ACEC have minimal negative impacts.

- *Special flood hazard areas* – A simplified definition of these areas is that they are within 100-year floodplains. Proponents are directed to minimize construction and implement mitigation measures in areas categorized as being within a 100-year floodplain.
- *Wetlands* – Wetlands fall into the following categories: marsh/bog, wooded marsh, cranberry bog, salt marsh, open water, reservoir (with public water system identification), tidal flats, and beach/dune.
- *Water supply and wellhead protection areas* – These are surface water protection areas, classified depending on proximity to water. Wellhead protection areas that include recharge areas for wells also are classified.
- *Protected open space* – There are four levels of protection: perpetuity, limited, term-limited, and none.
- *Natural heritage and endangered species program (NHESP) priority habitats* – Three categories are presented: NHESP certified vernal pools, NHESP estimated habitats of Rare Wildlife, and NHESP Priority Habitats of Rare Species.
- *Brownfield and Superfund Sites* – Brownfields are properties that may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. A superfund site is an uncontrolled or abandoned place where hazardous waste is located.

Public Input on Regional Needs

The following is a list of needs identified through public outreach conducted in the fall of 2014, and on an ongoing basis through the MPO website, as they relate to clean air and clean communities:

- Congestion increases vehicle idling which increases air pollution emissions in the region.
- GreenDOT is a comprehensive environmental responsibility and sustainability initiative; however, it is challenging to coordinate its initiatives across state and regional agencies.
- Attention to climate change is important to coastal communities.

Clean Air and Clean Communities Needs

The MPO's policy is to address climate change, reduce air pollution, and avoid harmful effects to the environment. The MPO should continue monitoring the estimated or projected levels of pollutants (VOC, NOx, CO, PM, and CO_2). It should use this information to guide planning and programming in its LRTP, TIP, studies or individual projects outlined in the UPWP, and project work for various transportation agencies.

In both the LRTP and TIP project-selection processes, the MPO reviews and rates projects on how well they meet criteria established to protect the environment.

Many of the objectives established under the goals of Capacity Management and Mobility will help the MPO to meet the Clean Air and Clean Communities goal in the future. It encourages programs that would help reduce vehicle-miles of travel (VMT), which in turn would help reduce emissions of VOC, NOx, CO, CO_2, and PM.

Environmental impacts of projects will continue to be reviewed at the individual project level as they are submitted for funding consideration in the LRTP and TIP. A qualitative evaluation is done for projects in the conceptual design phase using the MPO's All-Hazards Planning Application. A more detailed evaluation is possible for projects that are further along in design.

Potential Programs to Address Clean Air and Clean Community Needs

- **Intersection Improvement Program** – Can reduce emissions as a result of improved operations for all vehicles, and through mode shift; accompanied by improvements in transit reliability, and bicycle and pedestrian infrastructure.
- **Complete Streets** – Bicycle and pedestrian infrastructure improvements can help to reduce VMT through improved operations and mode shift .
- **Bottleneck Program** – Improved operations and traffic flow help to reduce emissions.
- **Bicycle Program** – Bicycle infrastructure improvements can help to reduce VMT through mode shift.
- **Pedestrian Program** – Pedestrian infrastructure improvements can help to reduce VMT through mode shift.
- **Major Infrastructure** – Would include projects to expand transit usage.

TRANSPORTATION EQUITY

Goals and Objectives

EXISTING GOAL:

Provide comparable transportation access and service quality among communities, regardless of income level or minority population

EXISTING OBJECTIVES:

- Target investments to areas that benefit a high percentage of low-income and minority populations
- Minimize any burdens associated with MPO-funded projects in low-income and minority areas
- Break down barriers to participation in MPO decision making

Background

The MPO's Transportation Equity goal is to provide comparable transportation access and service quality among communities regardless of income level or minority status. To accomplish this, the MPO will target investments to areas that benefit a high percentage of low-income and minority populations, minimize any burdens associated with MPO-funded projects in low-income and minority areas, and break down barriers to participation in MPO decision making.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

- *Title VI of the 1964 Civil Rights Act*
- *Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and in Low-income Populations*
- *Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency*
- *The Americans with Disabilities Act*
- *Coordinated Public Transit-Human-Services Transportation Plan (CPTHST)*

RELEVANT MPO STUDIES, REPORTS, AND DOCUMENTS

- *Coordinated Human Services Transportation Plan,* 2014
- *Assessment of Regional Equity Outreach* 2008–09
- *2013 Environmental Justice Outreach in the Transportation Equity Program*, MPO FFY 2013
- Title VI reports for the region, including:
  - *Title VI and Environmental Justice Demographic Profiles of the Region*, 2013
  - *2011 MBTA Title VI Report,* 2011
  - *2014 MPO Triennial Title VI Report*, 2014

- *Analysis of Job Access and Reverse Commute (JARC) and New Freedom Projects (in the MPO region)*, Boston Region MPO, FFY 2013
- *Job Access and Reverse Commute and New Freedom Federal Grant Program Projects in the Boston Region Metropolitan Planning Organization Area*: An Evaluation, Boston Region MPO, 2014
- *Proposed New Criteria for MPO Evaluation of Job Access Reverse Commute and New Freedom Grant Proposals*, Boston Region MPO, 2013

Resources Used to Establish Transportation Needs

- LRTP Needs Assessment Application:
    - Environmental Justice (EJ) Areas: The Needs Assessment includes information on Environmental Justice areas, which provide data on both Title VI areas and areas of EJ concern. Title VI defines low-income and minority areas. Environmental Justice areas of concern meet either a greater minority threshold, income threshold, or both thresholds.
    - Elderly Population: This data includes the population age 70 and older and the percentage of the population age 70 and older from 2010.

Public Input on Regional Needs

The following is a list of needs identified through public outreach conducted throughout 2014, and on an ongoing basis through the MPO website, as they relate to transportation equity:

- Weekend, early morning, and late night transit service is lacking.
- MBTA fares are burdensome for some populations.
- Transit does not always account for existing traffic flows and congestion when developing schedules.
- Many transit trips require too many transfers.
- Service gaps exist within and between communities.
- Affordable and accessible community shuttles are needed.
- Access to employment corridors is limited for some people.
- MBTA infrastructure and accessibility need to be improved.
- Additional benches at MBTA stations are needed.
- Snow removal from curb cuts, sidewalks and bus stops is inadequate.

- Intermodal connections need to be improved.
- There is a need to think more broadly beyond arbitrary service boundaries.
- Customer relations need to be improved.
- Communication systems need to be improved.
- There is a lack of coordination and some duplication of services among service providers.
- There is a lack of knowledge about transportation services available in communities.

Transportation Equity Needs

The MPO determines the transportation needs of people in environmental-justice areas in a number of ways. Staff posts a needs survey on the MPO's website; the MPO conducts forums and meetings to solicit input; staff attend various meetings where needs and transportation gaps are discussed; and staff keep current on reports and studies that identify these needs. Identified needs generally fall into several categories, including:

- Transit service improvements
- Transit and roadway infrastructure improvements
- Improved intermodal connections
- Coordination of various services

The MPO addresses regional transportation equity needs through TIP evaluation criteria, where projects that address a transportation issue in an environmental-justice neighborhood can score points. MPO staff gives positive ratings to projects that could benefit environmental-justice areas, and negative ratings to projects that might burden these areas. This scoring system gives projects that address transportation equity issues an advantage, as the MPO considers these ratings when deciding what projects should be funded in the LRTP or TIP.

Potential Programs to Address Transportation Equity Needs

- **Intersection Improvement Program** – Improved intersections can enhance transit services and can provide better and more bicycle and pedestrian connections, including those provided by a Complete Streets Program.
- **Complete Streets** – Can provide better transit access, improved pedestrian, bicycle infrastructure, and can help increase access to transit.
- **Major Infrastructure** – Transit: Can improve availability of transit options and

accessibility to important destinations. Highway: Can improve mobility for transit vehicles in some instances, and automobile travel.

- **Clean Air and Mobility/Community Transportation Program** – Can provide funding for starting up new, locally developed transit services; includes transit vehicles and coordination of service to EJ populations in suburban areas.

ECONOMIC VITALITY

Goals and Objectives

EXISTING GOAL:

Ensure our transportation network provides a strong foundation for economic vitality

EXISTING OBJECTIVES:

- Respond to mobility needs of the 25–34 year-old workforce
- Minimize the burden of housing and transportation costs for residents in the region
- Prioritize transportation investments that serve targeted development sites
- Prioritize transportation investments consistent with the compact-growth strategies of MetroFuture

Background

Land use decisions and many economic development decisions in Massachusetts are controlled directly by local municipalities through zoning—as guided by a significant body of laws and regulations enacted by the state legislature. At the regional level, MAPC is the regional planning agency that represents the 101 cities and towns in the metropolitan Boston area and the Boston Region MPO. The MPO relies on MAPC to develop the region's population and employment projections for use in transportation planning. MAPC also coordinates and consults with the region's municipalities regarding these projections, and reviews and evaluates land use and economic-development plans and their relationship to MPO planning.

MAPC created MetroFuture, a plan to make a "greater" Boston region—to better the lives of the people who live and work in metropolitan Boston, now and in the future. The MPO adopted this plan as its land use plan for the Boston Region MPO area. One of MetroFuture's implementation strategies is to focus on economic growth, and coordinate transportation investments to guide economic growth in the region.

Policy Context

INITIATIVES AND DIRECTIVES SHAPING THIS GOAL

- *Moving Ahead for Progress in the 21st Century*
- *United States Department of Transportation 23 CFR Parts 450 Subpart C – Metropolitan Transportation Planning and Programming Regulation*
- *Partnership for Sustainable Communities*
- *Healthy Transportation Compact (HTC)*
- *Massachusetts Planning Ahead for Growth strategy*
- MAPC's *Metro Future*

Resources Used to Establish Transportation Needs

- LRTP Needs Assessment Application:
    - Population Density: Residents per square mile for 2012 and 2040, and change from 2012-2040.
    - Employment Density: Jobs per square mile for 2012 and 2040, and change from 2012-2040.
    - Freight (Truck) Trip Density and Generators: Truck trips per square mile 2012 and selected truck trip generators, including internal intermodal transfer point, distribution center, and external intermodal transfer point. The data also includes change in truck trip density from 2012-2040.
- The Executive Office of Housing and Economic Development Planning Ahead for Growth Mapping Tool: This mapping tool illustrated targeted development areas based on both state and local priorities. Zoning data also includes Chapter 43D Districts, Economic Target Areas, Growth District Initiative Areas, Chapter 43E Districts, and Chapter 40R Subdistricts.

Public Input on Regional Needs

The following is a list of needs identified through public outreach conducted in the fall of 2014, and on an ongoing basis through the MPO website, as they relate to economic vitality:

- Desire for economic growth within subregions so that people do not need to travel to Boston for work.
- Need proactive efforts to make connections between projects that affect multiple communities.

- Concern about truck traffic on arterials that may potentially shift to other routes, i.e., onto Routes 126 and 135, if those routes are upgraded.
- Need for master vision that addresses transportation holistically, reviewing both truck and person travel; for example, a plan for Route 16 in Natick.
- Framingham would be a logical DMU hub for the western reaches of the MBTA, including opening several north-south low-density freight routes to passenger service (as was done many years ago by the B&M and New Haven Railroads).

Economic Vitality Needs

MassDOT, the Massachusetts Executive Office of Housing and Economic Development (EOHED), and the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) joined together to highlight their common strategy and commitment to the Commonwealth's sustainable development and the "Planning Ahead for Growth" strategy. This strategy calls for identification of priority areas where growth and preservation should occur.

MAPC worked with EOHED and the EOEEA to develop a process to identify local, regional, and state-level priority development and preservation areas in municipalities within the MPO area. MAPC staff worked with municipalities and state partners to identify locations throughout the region that are principal supporters of additional housing, employment growth, creation and preservation of open space, and the infrastructure improvements required to support these outcomes for each location. This process identified locations that are best suited to support the type of continued economic vitality and future growth that the market demands, and which communities desire. Identifying these key growth and preservation locations also helps MAPC, the Boston Region MPO, and state agencies to understand both the infrastructure and technical assistance needs better, in order to help them prioritize the limited regional and state funding.

Priority plans were developed for the following areas:

- **Metro North** – Includes the municipalities of Chelsea, Everett, Malden, Medford, Melrose, Revere, and Somerville, Winthrop, and the neighborhoods of East Boston and Charlestown in the City of Boston.
- **MetroWest** – Includes the municipalities of Acton, Ashland, Bellingham, Berlin, Bolton, Boxborough, Framingham, Franklin, Holliston, Hopkinton, Hudson, Littleton, Marlborough, Maynard, Medway, Milford, Millis, Natick, Norfolk, Sherborn, Southborough, Stow, Sudbury, Wayland, and Wrentham.
- **North Suburban Planning Council** – Includes the municipalities of Burlington, North Reading, Reading, Stoneham, Wakefield, Wilmington, Winchester, and Woburn.

- **North Shore Task Force** – Includes the municipalities of Beverly, Danvers, Hamilton, Ipswich, Salem, and Wenham.
- **South Coast Rail** – Includes the municipalities of Canton, Mansfield, Sharon, and Stoughton.

Economic development effects will be considered at the individual project level as projects are submitted for funding in the LRTP and TIP. Projects will be evaluated based on their proximity to the priority development areas and how well the transportation project or program would address existing and proposed economic development needs in the area.

Potential Programs to Address Economic Vitality Needs

- **Intersection Improvement Program** – Can reduce congestion, which would improve mobility and access to centers of economic activity; and can include Complete Streets elements that will improve mobility for bicyclists and mobility and accessibility for pedestrians.
- **Complete Streets Program** – Can increase transportation options and access to places of employment by adding new sidewalks and bicycle facilities.
- **Bottleneck Program** – Can reduce congestion and improve mobility for all vehicles. The identified congested expressway and arterial locations should be prioritized.
- **Interchange Modernization Program** – Can reduce congestion, which will improve mobility, potentially for all modes.
- **Major Infrastructure** – Highway: Can increase mobility for all modes and address access to existing centers of economic activity and services. Transit: Can provide access to existing centers of economic activity and services.

APPENDIX A
POLICIES GUIDING THE MPO

POLICY FRAMEWORK

The MPO operates under a variety of laws, regulations, guidance and policies. This appendix presents information about those that affect and influence MPO activities in the metropolitan transportation planning process most extensively, and reports how they relate to the LRTP goals. Table A1, on page 11, correlates the MPO goals with the laws, regulations, mandates, and guidance they address. The MPO's goals are:

- Safety
- System Preservation
- Capacity Management and Mobility
- Clean Air and Clean Communities
- Transportation Equity
- Economic Vitality

FEDERAL LAWS, REGULATIONS, MANDATES, AND GUIDANCE

The 1990 Clean Air Act Amendments (Title II)

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 the MPO's LRTP and 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 the air quality standards in any area.

Transportation control measures (TCMs) identified in the State Implementation Plan (SIP) for the attainment of air quality standards are federally enforceable and must be given first priority when using federal funds. Such projects include the parking-freeze program in Boston, the statewide rideshare program, rapid transit and commuter rail extension programs, park-and-ride facilities, residential parking-sticker programs, and the operation of high-occupancy-vehicle lanes.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Clean Air and Clean Communities

United States Environmental Protection Agency (EPA) 40 CFR Parts 51 and 93—Conformity Regulation

The regulation implements the federal Clean Air Act with respect to the conformity of transportation plans, programs, and projects that use federal funding. It sets the policy, criteria, and procedures for demonstrating air quality conformity in the MPO region.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Clean Air and Clean Communities

The Moving Ahead for Progress in the 21st Century Act (MAP-21)

This legislation requires all MPOs to carry out the 3C (continuing, cooperative, and comprehensive), metropolitan transportation planning process. Activities the MPOs must perform to meet this requirement include producing the LRTP, TIP, and the Unified Planning Work Program (UPWP). MPOs also are responsible for conducting an inclusive public participation process, and for maintaining transportation models and data resources to support air quality conformity determinations, as well as ongoing programs, such as (in some MPO regions) a congestion management process, and long- and short-range planning work and initiatives.

The MAP-21 legislation establishes national goals for federal highway programs, which include:

1. **Safety**—To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
2. **Infrastructure condition**—To maintain the highway infrastructure asset system in a state of good repair
3. **Congestion reduction**—To achieve a significant reduction in congestion on the National Highway System
4. **System reliability**—To improve the efficiency of the surface transportation system
5. **Freight movement and Economic Vitality**—To 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**—To enhance the performance of the transportation system while protecting and enhancing the natural environment

7. **Reduced project delivery delays**—To 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

MAP-21 also establishes performance-based planning as an integral part of the metropolitan planning process. Performance-based planning and programming refers to practices that apply performance-management principles to transportation system policy and investment decisions. In other words, a system-level, data-driven process is used to make decisions about strategies and investments.

MAP-21 requires that each MPO establish performance measures and targets that track progress toward attainment of priority outcomes for its region and stipulates that these targets are coordinated with those of relevant state agencies and public transportation providers to ensure consistency.

Associated Boston Region MPO goals addressed: Safety, System Preservation, Capacity Management and Mobility, Clean Air and Clean Communities, Economic Vitality

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

SAFETEA-LU's federal planning factors are maintained by MAP-21. These planning factors are:

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, 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 the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns
6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight
7. Promote efficient system management and operation
8. Emphasize the preservation of the existing transportation system

Associated Boston Region MPO goals addressed: Safety, System Preservation, Capacity Management and Mobility, Clean Air and Clean Communities, Economic Vitality

United States Department of Transportation 23 CFR Parts 450 Subpart C—Metropolitan Transportation Planning and Programming Regulation

This regulation provides the planning and process requirements for working toward the goals established in MAP-21 and addressing the planning factors established in SAFETEA-LU in the MPOs' LRTPs and TIPs. This is done through a performance-driven, outcome-based approach to planning. The LRTP and TIP's development process must:

1. Encourage and promote safe and efficient development, management, and operation of surface transportation systems to serve the mobility needs of people and freight (including accessible pedestrian walkways and bicycle transportation facilities)
2. Foster economic growth and development, while minimizing transportation-related fuel consumption and air pollution
3. Encourage continued development and improvement of metropolitan transportation planning processes as guided by the SAFETEA-LU planning factors

Associated Boston Region MPO goals addressed: Safety, System Preservation, Capacity Management and Mobility, Clean Air and Clean Communities, Economic Vitality

Partnership for Sustainable Communities

This initiative is a federal policy directive for three federal agencies, the Department of Transportation, the Environmental Protection Agency, and the Department of Housing and Urban Development, to work together to promote and implement policies and programs that help address climate change and protect the environment while advancing the federal goals for transportation and housing. This partnership is a recognition that these areas are interrelated and should be addressed in mutual consideration.

The Partnership for Sustainable Communities promotes a set of livability principles to generate and support planning and investments needed to evolve transportation and housing patterns that improve access to affordable housing and transportation options.

MPOs are asked to use livability principles to guide the development of their regional vision. These include: providing more transportation choices, enhancing economic competitiveness, and targeting resources to existing developed areas.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Economic Vitality

The Americans with Disabilities Act

Title III of the Americans with Disabilities Act (ADA) requires all transportation projects, plans, and programs to be accessible to people with disabilities. At the MPO level, this means that public meetings must be held in accessible buildings and be conducted in a manner that provides for accessibility. MPO materials—both paper and electronic—also must be made available in "accessible" formats. It also means that the MPO must consider the mobility needs of persons with disabilities and the elderly when programming federal funding for studies and capital projects.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Transportation Equity

Title VI of the 1964 Civil Rights Act

This statute 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. The MPO takes many steps in its communication practices and planning processes to provide for and facilitate participation of all persons in the region, including those protected by Title VI. The MPO also considers equitable effects (positive and negative) to these populations when deciding how to program federal funding.

Associated Boston Region MPO goal addressed: Transportation Equity

Executive Order 13166

This Executive Order, dated August 11, 2000, extends Title VI protections to persons who, because of national origin, have limited English proficiency (LEP). Specifically, it calls for improved access to federally conducted and federally assisted programs and activities and requires MPOs to develop and implement a system by which LEP persons can meaningfully participate in the transportation-planning process. Other executive orders further expand upon and reinforce Title VI.

Associated Boston Region MPO goal addressed: Transportation Equity

STATE REQUIREMENTS, POLICY DIRECTIVES, AND PLANNING FRAMEWORKS

Accelerated Bridge Program (ABP)

The $3 billion ABP represents a monumental investment in Massachusetts bridges. This program has greatly reduced the number of structurally deficient bridges (deterioration has reduced the load-carrying capacity of the bridge) in the state system, while creating thousands of construction jobs. Over the course of the eight-year ABP program, more than 200 bridges will be replaced or repaired.

Associated Boston Region MPO goal addressed: System Preservation

Global Warming Solutions Act

The Global Warming Solutions Act (GWSA), signed into law in August 2008, makes Massachusetts a leader in setting aggressive and enforceable greenhouse gas (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 (EOEEA), 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, establishes the following targets for overall, statewide GHG emissions:

- By 2020: Twenty-five percent reduction below statewide 1990 GHG emission levels
- By 2050: Eighty percent reduction below statewide 1990 GHG emission levels

Associated Boston Region MPO goals addressed: System Preservation, Clean Air and Clean Communities

GreenDOT Policy

MassDOT's approach to supporting implementation of the Massachusetts Clean Energy and Climate Plan for 2020 is presented in its GreenDOT policy directive, a comprehensive sustainability initiative that sets three principal objectives:

- Reduce GHG emissions.
- Promote the healthy transportation modes of walking, bicycling, and taking public transit. Use multimodal, "complete streets" design standards. MPOs are asked to prioritize and program a balance among projects that serve drivers, pedestrians, bicyclists, and public transit riders.
- Support smart-growth development. MPOs are asked to make transportation investments that make denser, smart-growth development patterns.

The GreenDOT Implementation Plan includes the MassDOT statewide mode-shift goal, which aims to triple the current level of bicycling, public transit, and walking mode shares by 2030.

The Commonwealth's 13 MPOs are integrally involved in helping to achieve the GreenDOT objectives and supporting the GHG reductions mandated under the GWSA. GHG emissions are taken into account.

Associated Boston Region MPO goals addressed: System Preservation, Capacity Management and Mobility, Clean Air and Clean Communities

Healthy Transportation Compact (HTC)

The HTC is an interagency initiative that will help ensure that the transportation decisions made by the Commonwealth balance the needs of all transportation users, expand mobility, improve public health, support a cleaner environment, and create stronger communities. The Transportation, Health and Human Services, Energy and Environment agencies and the Public Health Department work together to achieve positive health outcomes by coordinating land use, transportation, and public health policy.

MassDOT adopted the Healthy Transportation Policy directive that provides that all MassDOT projects are designed and implemented in ways that would provide all customers with access to safe and comfortable walking, bicycling, and transit options.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Clean Air and Clean Communities, Economic Vitality

MassDOT Mode Shift Goal

In the fall of 2012, MassDOT announced a statewide mode shift goal: to triple the share of travel in Massachusetts that uses bicycling, transit, and walking. The mode shift goal aims to foster improved quality of life by enhancing our environment and preserving the capacity of our highway network. In addition, positive public health outcomes will be achieved by providing more healthy transportation options. The statewide mode-shift goal is an important part of MassDOT's strategy for meeting the Commonwealth's commitments under the Global Warming Solutions Act of 2008.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Clean Air and Clean Communities

weMove Massachusetts (WMM)

WMM is MassDOT's statewide strategic multimodal plan. The initiative is a product of the transportation reform legislation of 2009 and the youMove Massachusetts (YMM) civic engagement process. In December 2013, MassDOT released *WMM: Planning*

for Performance, a single, multimodal long-range transportation plan. *WMM: Planning for Performance* incorporates performance management into investment decision making to calculate the differences in performance outcomes resulting from different funding levels available to MassDOT. The MPO will develop performance measures and targets in coordination with MassDOT.

Associated Boston Region MPO goal addressed: Capacity Management and Mobility

youMove Massachusetts (YMM)

YMM, a statewide initiative designed as a bottom-up approach to transportation planning, developed 10 core themes derived from a broad-based public participation process that articulated the expressed concerns, needs, and aspirations of Massachusetts residents related to their transportation network. These themes formed the basis for the YMM interim report (2009).

Associated Boston Region MPO goal addressed: Capacity Management and Mobility

Massachusetts Strategic Highway Safety Plan (SHSP)

The 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. It is a state-driven way to establish statewide goals, objectives and key safety emphasis areas. The SHSP brings together all highway safety partners in the state and draws on their strengths to align and leverage resources to address the state's safety challenges collectively. Statewide goals and safety programs are coordinated to reduce highway fatalities and serious injuries on all public roads most effectively.

Associated Boston Region MPO goal addressed: Safety

Massachusetts Planning Ahead for Growth Strategy

MassDOT, the Massachusetts Executive Office of Housing and Economic Development (EOHED), and EOEEA joined to highlight their common strategy and commitment to the Commonwealth's sustainable development and the "Planning Ahead for Growth" strategy. This strategy calls for identification of priority areas where growth and preservation should occur.

Associated Boston Region MPO goal addressed: Economic Vitality

REGIONAL PLANS AND PROGRAMS

Coordinated Human-Services Transportation Plan (CPTHST)

The Coordinated Public Transit–Human Services Transportation Plan documents the MPO region's unmet human-service transportation needs, describes the MPO region's current transportation network, and provides ideas for improving transportation services. The CPTHST plan is prepared by the MPO to allow organizations in the region to be eligible to receive funding in the Federal Transit Administration's Section 5310 transit funding program. This program provides capital and operations funding for services for the elderly and persons with disabilities.

Associated Boston Region MPO goals addressed: Capacity Management and Mobility, Transportation Equity

Congestion Management Process (CMP)

The purpose of the CMP is to 1) monitor and analyze performance of facilities and services; 2) develop strategies to manage congestion based on the results of monitoring; and 3) move those strategies into the implementation stage by providing decision makers in the region with information and recommendations to improve the transportation system performance. The CMP monitors roadways and park-and-ride facilities in the MPO region for safety, congestion, and mobility, and identifies "problem" locations. It is an important source of information about needs of the transportation network.

Associated Boston Region MPO goal addressed: Capacity Management and Mobility

MetroFuture

MetroFuture, which was developed by MAPC and adopted in 2008, is the long-range plan for land use, housing, economic development, and environmental preservation in the Boston region. It includes a vision for the region's future and a set of strategies for achieving that future. It was adopted as the future land-use scenario for the MPO's previous LRTP, *Paths to a Sustainable Region* and is the foundation for land use developed for *Charting Progress to 2040*, the current LRTP.

Associated Boston Region MPO goals addressed*:* Capacity Management and Mobility, Economic Vitality

The MBTA's Program for Mass Transportation (PMT)

The MBTA periodically prepares the PMT, a long-range capital plan for transit operated in the MBTA service area. The PMT is not fully fiscally constrained, so it includes the major transit projects and programs the MBTA would construct if the resources were available. The current PMT, which was adopted in 2009, was developed with extensive public involvement. The PMT is the foundational source of information about needs of the transit system.

Associated Boston Region MPO goals addressed: System Preservation, Capacity Management and Mobility

TABLE A-1
Long-Range Transportation Plan Goals and Policy Framework

	Safety	System Preservation	Capacity Management and Mobility	Clean Air and Clean Communities	Transportation Equity	Economic Vitality
FEDERAL						
Clean Air Act Amendments			•	•		
AQ Conformity Regulations			•	•		
MAP-21	•	•	•	•		•
SAFETEA-LU Planning Factors	•	•	•	•		•
Metropolitan Planning Regulations	•	•	•	•		•
Partnership for Sustainable Communities			•			•
ADA			•		•	
Executive Order 13166					•	
Title VI					•	
STATE						
ABP		•				
Global Warming Solutions Act		•		•		
GreenDOT		•	•	•		
HTC			•	•		•
Mode Shift Goal			•	•		
weMove			•			
youMove			•			
SHSP	•					
Planning Ahead for Growth						•
REGIONAL						
CPTHST			•		•	
CMP			•			
MetroFuture			•			•
PMT		•	•			

Source: Central Transportation Planning Staff.