8

CENTRAL AREA

DESCRIPTION OF THE CENTRAL AREA

The Central Area consists of most of Boston (excluding Hyde Park, Roslindale, West Roxbury, and Mattapan) and nine communities surrounding the city: Brookline, Cambridge, Somerville, Medford, Malden, Everett, Chelsea, Revere, and Winthrop. Most parts of the Central Area have also been included in a radial corridor. The exception is Boston proper, which is not included in any radial corridor. Boston Proper is the part of the city that lies northeast of Massachusetts Avenue and is bordered by the Charles River, Boston Harbor, Fort Point Channel, and the Southeast Expressway.

EXISTING TRANSPORTATION FACILITIES

The major transportation facilities and services in the Central Area, broken down by mode, are described here.

Highway

The major roadways in this corridor are (see Figure 8-1):

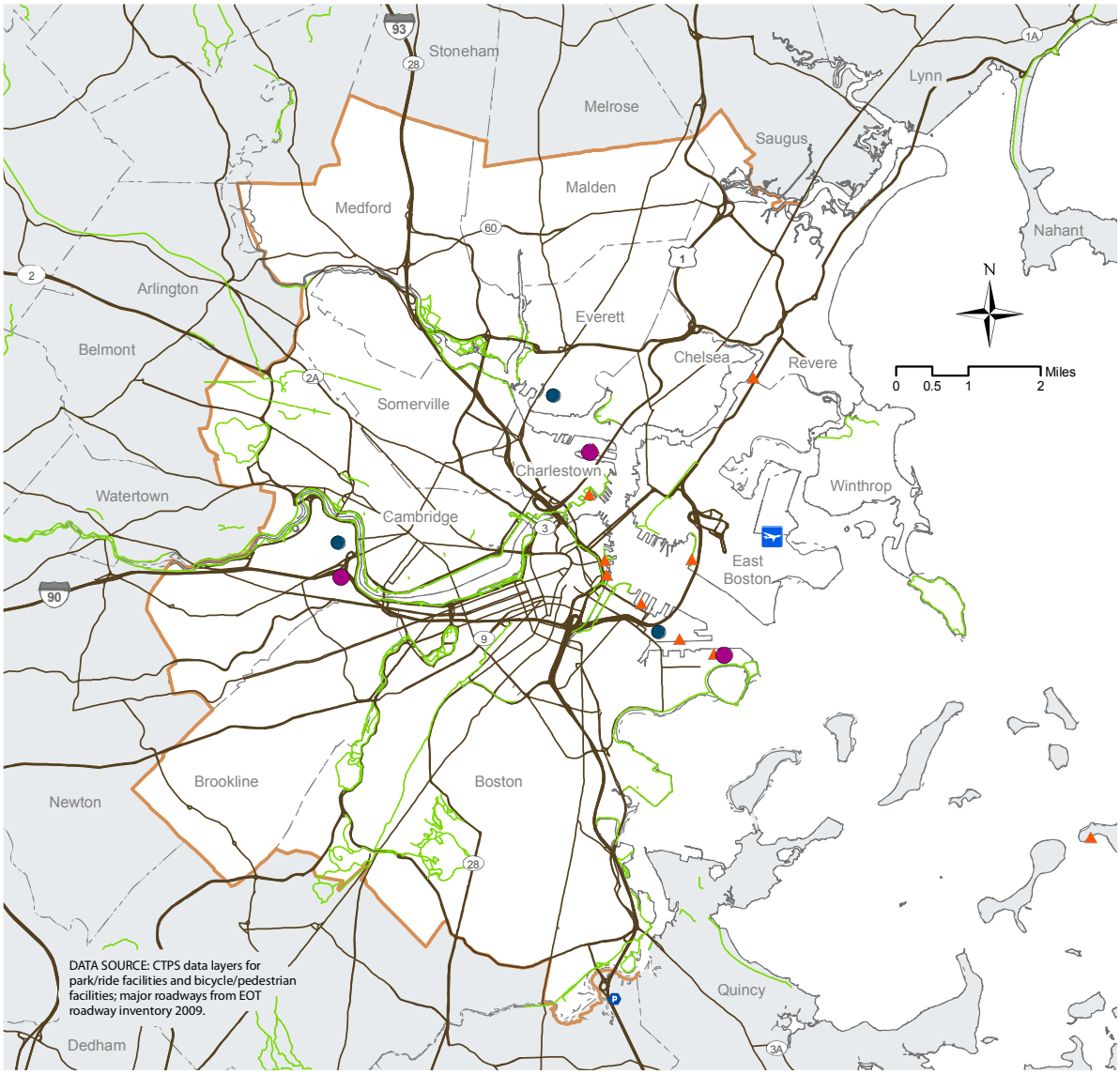
- North–south travel: Interstate 93, Route 1, Route 1A, Route 3, Route 99, Route 107, Route 2, Route 2A, Route 38, and Route 28
- East–west travel: Interstate 90, Route 16, Route 60, Route 9, Route 20, Route 30, and Route 203

There are 1,778 centerline miles in the Central Area:

- State-owned – 175 miles (10%)
- Locally owned – 1,475 miles (83%)
- Privately owned – 128 miles (7%)

FIGURE 8-1

Existing Highway Transportation Facilities - Central Area



When looking at lane miles (as opposed to centerline miles) in the corridor, there are a total of 4,075 lane miles. Of the total lane miles, 45% or 1,828 lane miles are federal aid eligible.

There are 622 bridges in the Central Area:

- State-owned – 578 (93%)
- Locally owned – 40 (6%)
- Other – 4 (less than one percent)

There are no park-and-ride facilities that are not connected with a public transit station located in the Central Area.

Transit

The Central Area encompasses most of the rapid transit system and much of the MBTA local bus network. Of the rapid transit system, only the Riverside Branch of the Green Line, the Mattapan High Speed Line, and Braintree Branch of the Red Line extend beyond the Central Area. While most commuter rail lines extend deep into the radial corridors, all serve at least one station in the Central Area.

Transit in the Central Area includes a variety of modes: commuter rail, intercity rail, rail rapid transit, bus, and ferry; see Figure 8-2. A description of the transit services, along with their stations and numbers of park-and-ride spaces, average utilization rates, and other selected information as applicable, is provided below.

Commuter Rail and Intercity Rail

Three commuter rail stations are located in the Boston Proper section of the Central Area and are common to several lines:

- North Station – a 1,275 space parking garage is located underneath the TD Bank Garden (no utilization information); bicycle parking; four commuter rail lines; Green and Orange rapid transit lines
- South Station – 226 parking spaces (no utilization information); bicycle parking; eight commuter rail lines; Red and Silver Lines; intercity buses; intercity rail
- Back Bay Station – no parking; bicycle parking; buses; four commuter rail lines

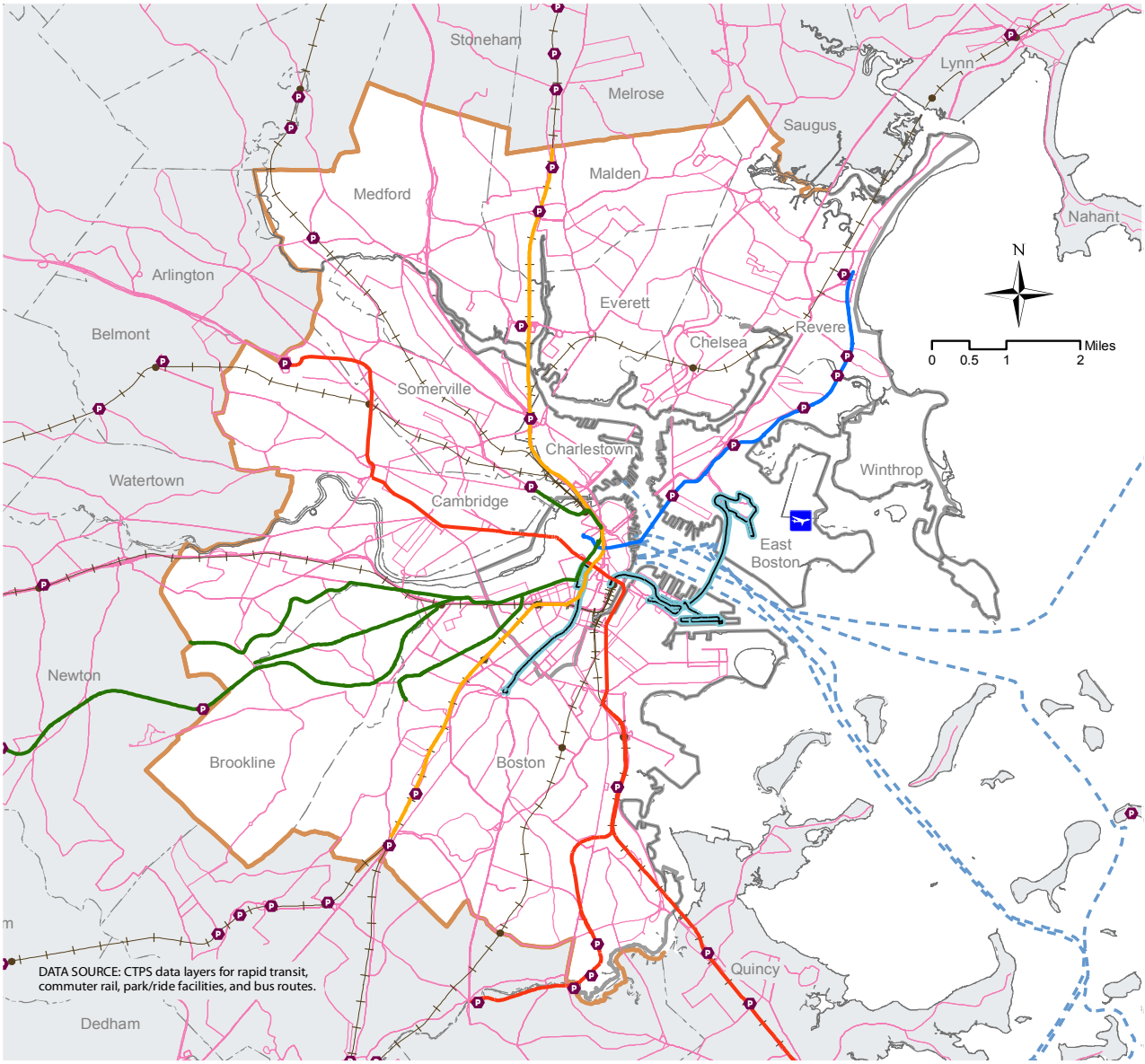
Twelve MBTA commuter rail lines run into the Central Area and provide service into North or South Station in Boston. The following stations are located in the Central Area:

To North Station:

- Lowell Line: West Medford – 61 park-and-ride spaces (97% utilization rate); buses
- Haverhill Line: Malden – 188 park-and-ride spaces (140% utilization); Orange Line station; major bus hub

FIGURE 8-2

EXISTING TRANSIT TRANSPORTATION FACILITIES - CENTRAL AREA



- Newburyport/Rockport Lines: Chelsea – No park-and-ride spaces
- Fitchburg Line: Porter Square – No park-and-ride spaces; bicycle parking

To South Station

- Greenbush, Kingston/Plymouth, and Middleborough/Lakeville Lines: JFK/UMass – No park-and-ride spaces
- Providence/Stoughton Line, Needham and Franklin Lines: Ruggles – No park-and-ride spaces; bicycle parking; Orange Line station
- Fairmont Line: Uphams Corner – No park-and-ride spaces
- Needham Line: Forest Hills – 206 park-and-ride spaces (100% utilization); bicycle parking; Orange Line; major bus hub
- Worcester/Framingham Line: Yawkey – No park-and-ride spaces

Amtrak departs from South Station in Boston and provides rail service throughout the Northeast Rail Corridor with connections to points south including New York, Philadelphia, Washington D.C., and beyond; and west of the Boston Region MPO area toward New York state and Chicago. Amtrak also departs from North Station and provides service to New Hampshire and north to Portland, Maine.

MBTA Rail Rapid Transit

All MBTA rapid transit lines and the both the Silver Line Washington Street and Silver Line Waterfront bus rapid transit lines operate in the Central Area. All lines except the Riverside Branch of the Green Line, the Braintree branch of the Red Line, and the Mattapan High Speed Trolley are entirely within the Central Area. These stations are:

Blue Line (12 stations in the Central Area)

- Bowdoin – No park-and-ride spaces; open weekdays only
- Government Center – No park-and-ride spaces; Green Line
- State Street – No park-and-ride spaces; bus connections; Orange Line
- Aquarium – No park-and-ride spaces; ferry service
- Maverick – No park-and-ride spaces; bicycle parking; major bus hub
- Airport – No park-and-ride spaces; complimentary shuttle service to/from Logan Airport Ferry Terminal and Airline Terminals; Massport shuttle

- Wood Island (East Boston) – No park-and-ride spaces; bicycle parking; bus connections
- Orient Heights (East Boston) – 434 park-and-ride spaces (55% utilization rate); bicycle parking also; bus connections
- Suffolk Downs (East Boston) – 110 park-and-ride spaces (72% utilization rate); bicycle parking also
- Beachmont (Revere) – 430 park-and-ride spaces (50% utilization rate); bicycle parking also; bus connections
- Revere Beach – no park-and-ride spaces; bicycle parking; bus
- Wonderland – 1,257 park-and-ride spaces (97% utilization rate); bicycle parking also; major bus hub

Green Line Common Stations (11 stations in the Central Area)

- Lechmere – 347 park-and-ride spaces (100% utilization rate); bus connections
- Science Park – No park-and-ride spaces
- North Station – 1,275 park-and-ride spaces located under the TD Bank Garden; bicycle parking; commuter rail; Orange Line
- Haymarket – No park-and-ride spaces; Orange Line; bus hub
- Government Center – No park-and-ride spaces; Blue Line
- Park Street – No park-and-ride spaces; Red Line; bus connections
- Boylston – No park-and-ride spaces; Silver Line
- Arlington – No park-and-ride spaces
- Copley – No park-and-ride spaces; bus hub
- Hynes Auditorium – No park-and-ride spaces; bus connections
- Kenmore – No park-and-ride spaces; bicycle parking; bus connections

Green Line Branches (4 lines in the Central Area)

- The Boston College Line (B) runs through the Boston neighborhoods of Allston and Brighton and has 18 surface stops, none of which have parking. Seven stops have at least one bus connection. This line generally serves local neighborhoods.
- The Cleveland Circle Line (C), with 13 stops primarily serves Brookline. Four stops have at least one bus connection. There is no designated MBTA parking.

- The Riverside Line (D) with six stops in the Central Area, runs through a portion of the Fenway, the Longwood Medical area, Brookline and Newton. The line also serves as a connection to the corridors at its Riverside terminal which is located near ramps to Interstate 95 and Interstate 90 and has a parking lot with 925 spaces. The Woodland station also attracts people from the corridors as it has a parking garage with 548 spaces and is easily accessible from I-95 and Washington Street (Route 16). Three other stations have smaller MBTA parking lots. Eight stations have at least one bus connection.
- The Heath Street Line (E) with 10 stops and no parking primarily serves locations in the immediate vicinity of Huntington Avenue in Boston.

Orange Line (19 stations in the Central Area)

- Oak Grove (Malden) – 788 park-and-ride spaces (100% utilization rate); bicycle parking also
- Malden – 204 park-and-ride spaces (100% utilization rate); commuter rail station; major bus hub
- Wellington – 2,450 park-and-ride spaces (99% utilization); bicycle parking also; major bus hub
- Sullivan Square (Charlestown) – 600 park-and-ride spaces (100% utilization rate); bicycle parking only; major bus hub
- Community College (Charlestown) – No park-and-ride spaces; bicycle parking
- North Station – 1,275 park-and-ride spaces located under the TD Bank Garden; bicycle parking also; commuter rail; Green Line
- Haymarket – No park-and-ride spaces; Green Line; bus hub
- State Street – No park-and-ride spaces; Blue Line; bus connections
- Downtown Crossing – No park-and-ride spaces; Red Line; Silver Line; bus connections
- Chinatown – No park-and-ride spaces; Silver Line
- Tufts Medical Center – No park-and-ride spaces; Silver Line; bus connections
- Back Bay – No park-and-ride spaces; bicycle parking; commuter rail; bus connections
- Massachusetts Avenue – No park and ride spaces; bicycle parking; bus connections

- Ruggles – No park-and-ride spaces; bicycle parking; commuter rail; bus hub
- Roxbury Crossing – No park-and-ride spaces; bicycle parking; bus hub
- Jackson Square – No park-and-ride spaces; bicycle parking; bus connections
- Stony Brook – No park-and-ride spaces; bicycle parking; bus connections
- Green Street – No park-and-ride spaces; bicycle parking; bus connections
- Forest Hills – 206 park-and-ride spaces (100% utilization); bicycle parking also; commuter rail; bus hub

Red Line (18 stations in the Central Area)

- Alewife – 2,733 park-and-ride spaces (100% utilization rate); bicycle parking also; bus hub
- Davis – No park-and-ride spaces; bicycle parking; bus connections
- Porter Square – No park-and-ride spaces; bicycle parking; commuter rail; bus connections
- Harvard Square – No park-and-ride spaces; bicycle parking; major bus hub
- Central Square – No park-and-ride spaces; bicycle parking; bus hub
- Kendall – No park-and-ride spaces; bicycle parking; bus connections
- Charles/MGH – no park-and-ride spaces
- Park Street – No park-and-ride spaces; Green Line; bus
- Downtown Crossing – No park-and-ride spaces; Orange Line; Silver Line; bus connections
- South Station – 226 park-and-ride spaces (no utilization information); bicycle parking; Silver Line; commuter rail; intercity buses; intercity rail
- Broadway – No park-and-ride spaces; bus connections
- Andrew – No park-and-ride spaces; bus connections
- JFK/UMass – No park-and-ride spaces; bicycle parking; commuter rail; bus connections
- Savin Hill – 30 park-and-ride spaces (100% utilization rate); bus connections
- Fields Corner – No park-and-ride spaces; bus hub
- Shawmut – No park-and-ride spaces

- Ashmont – No park-and-ride spaces; bicycle parking; major bus hub; connects with the Mattapan High Speed Line; connections to Brockton Area Transit (BAT)

Bus

Numerous public bus services provide service to the corridor:

- MBTA bus rapid transit – Silver Line Waterfront – (trunk service and two routes) Trunk service runs every five minutes from South Station to Court House Station, World Trade Center Station, and Silver Line Way. From Silver Line Way, the SL1 provides service to all terminals at Logan Airport, and the SL2 provides service to the Design Center, making eight stops in South Boston. None of the SL1 or SL2 stops have parking; MBTA local bus routes serve two of the three trunk stations and three of the eight SL2 stops.
- MBTA express buses (28 routes) – The majority of express bus routes terminate at points in Boston Proper.
- MBTA local buses (113 routes) – Of these routes, many operate completely within in the Central Area. Others serve areas both in and outside of the Central Area, and some operate outside of the Central Area, but serve stations on its borders. While most of these routes are radial in nature, some offer circumferential connections within the Central Area.
- Private bus carriers – Many private bus carriers provide intercity travel in the corridor. Locally and regionally they include:
  - Bloom Bus provides express commuter bus service between Boston and Easton, Raynham, Taunton, and West Bridgewater.
  - Cavalier Coach provides express bus service during weekday commuting hours between Boston and Weston, Wayland, Sudbury, Marlborough, Northborough, Framingham, and Southborough.
  - Dattco: provides express service operating several trips daily between Boston and Fairhaven, New Bedford, and Taunton.
  - The Coach Company provides express bus service during weekday commuting hours between Boston and Boxford, Georgetown, Groveland, Haverhill, Newburyport, Peabody, and Topsfield.

- Peter Pan/Bonanza: Service from Boston to Bourne/Falmouth and Boston to Fall River; operates several regional express trips daily from the South Station bus terminal.
- Peter Pan: Service from Boston to Springfield provides several regional express trips daily between the South Station bus terminal and Springfield and between Boston, Worcester, and Framingham.
- Plymouth & Brockton (P&B): Service from Boston to Plymouth and Kingston; provides weekday regional express service from Boston to Rockland, Marshfield, Duxbury, Kingston, and Plymouth during commuting hours.
- Plymouth & Brockton (P&B): Service from Boston to Hyannis; operates regional express service from South Station, Park Square, and Logan Airport, and makes stops in Rockland, Plymouth, Sagamore, Barnstable, and Hyannis.
- Yankee Line: Service from Boston to Concord/Acton; operates one inbound express trip in the morning from Concord and Acton to Copley Square, in Boston, and one outbound express trip in the evening, from Copley Square to Concord and Acton.

Interstate (outside of Massachusetts) include:

- Bolt Bus and Megabus provide bus service between Boston, New York City, Philadelphia, and Washington, D.C.
- Boston Express provides bus service between Boston, Nashua, Manchester, Londonderry, and Salem, NH
- C&J provides bus service between Boston, Portsmouth, and Derry, NH
- Concord Coach Company between Boston and Concord, NH
- Fung Wah Bus and Lucky Star Bus provide bus service between Boston and New York City
- LimoLiner provides luxury bus service between Boston and New York
- Peter Pan/Bonanza/Greyhound: nationwide connections

Ferry

The MBTA operates five year-round commuter boat routes between Boston (docks at Rowes and Aquarium, Long Wharfs) and Logan Airport and terminals in Quincy, Hingham, and Hull. Ferry terminals along with parking are:

- Fore River Shipyard (Quincy) – 350 spaces (50% utilization rate); bus connections

- Hewitts Cove (Hingham) – 1,841 spaces (32% utilization rate); bicycle parking also; bus connections
- Pemberton Point (Hull) – 100 spaces (no utilization data available)

The Salem Ferry, operated by Water Transportation Alternatives, runs between Salem and Boston on a seasonal basis (the end of May through the end of October).

Intermodal Facilities (Passenger)

The South Station Transportation Center is located at Atlantic Avenue and Summer Street in Boston Proper. The transportation services at this location include Amtrak intercity rail service to locations on the east coast with connections to points west, MBTA commuter rail service, Red Line Rapid Transit, Silver Line bus rapid transit service to Logan Airport and the Boston Exhibition and Convention Center, intercity bus service, park-and-ride spaces, and bicycle parking.

The North Station Transportation Center is located on Causeway Street in Boston Proper. The transportation services at this location include Amtrak intercity rail service to New Hampshire and Maine, MBTA commuter rail service, Green and Orange Line service, 1,275 park and ride spaces located under the TD Bank Garden, and bicycle parking.

Connections to MBTA Service from Other Regional Transit Authorities' Services

Two regional transit authorities (RTAs) that serve the corridor along with the MBTA and provide connections to MBTA services. The Merrimack Valley Regional Transit Authority (MVRTA) operates three inbound and three outbound daily trips between points in Methuen, Lawrence, Andover and downtown Boston. Brockton Area Transit (BAT) operates bus service between Brockton, Avon, Randolph and the Red Line at Ashmont station.

Transportation Management Associations

The following Transportation Management Associations (TMAs) provide service to or in the Central Area:

- The Neponset Valley TMA operates the Route 128 Station Link A, which is an employee shuttle service between the Ashmont and Quincy Center Red Line stations, the Reebok complex, the One Beacon complex, and the Computershare complex
- The Charles River TMA provides EZRide shuttle service between Cambridgeport, Kendall Square, East Cambridge, and North Station.
- The Medical Academic and Scientific Community Organization Inc. (MASCO) offers the following shuttle services:
  - Fenway, Wentworth, Crosstown, and M6 (Park-and-Ride) shuttles for employees who park in one of the off-site MASCO-managed facilities.

- The Longwood Medical Area (LMA)–Harvard Medical School Shuttle (M2) connects the LMA and Harvard University in Cambridge.
- The Ruggles Express provides service between the Ruggles MBTA station and the LMA at no charge to all employees and students of MASCO member institutions.
- The JFK/UMass Shuttle provides service between the JFK/UMass MBTA station and the LMA at no charge to employees and students of MASCO's member institutions.
- The Landmark/Longwood Shuttle provides service between the Landmark Center and the Harvard School of Public Health via Vanderbilt Hall, Monday through Friday, from 9:00 AM to 5:00 PM.
- The Shuttle All-Ride Program allows employees and students of all Longwood Medical Area medical institutions to ride many of the shuttles servicing Longwood but operated by institutions other than their own.

- The Logan TMA organizes transportation programs for airport employees, such as carpools, vanpools, shuttle bus services, flexible work hour programs, parking programs and a central information service on ridesharing, paratransit, public transportation, private transportation and other transportation related subjects. The TMA offers the Sunrise Shuttle - a shuttle service operating every half hour between various East Boston locations and the airport's terminals; it operates during the hours before MBTA service begins.
- The Seaport TMA operates in the South Boston Waterfront and offers personal commute planning, guaranteed ride home, carpool subsidies, and carpool and vanpool ridematching.
- TransSComm serves the Boston University Medical Center and offers the following free shuttle services in the Albany Street neighborhood of Boston's lower South End from Monday through Friday:
  - All-Day Medical Campus Shuttle operates on a continuous loop leaving 1010 Massachusetts Avenue every 30 minutes from 6:35 AM to 6:35 PM. The shuttle has a total of six stops.
  - Inner Campus Shuttle is primarily for patients and operates from 9:00 AM to 5:00 PM on a continuous loop from Newton Pavilion.
  - Evening Transit 'T' Shuttle serves employees and students only and boards at one central stop every 60 minutes between 5:15 PM and 12:15 AM. The shuttle travels on request to parking facilities, five MBTA stations, and South End neighborhood locations within one mile.
  - Boston VA Medical Center Shuttle serves employees and students only and operates between the VA Hospital in Jamaica Plain and Boston Medical Center hourly between 9:30 AM and 5:00 PM.

- HealthNet Shuttle operates, primarily for patients, free shuttle service between the Boston Medical Center and the following neighborhood health centers: Mattapan Community Health Center, Harvard Street Neighborhood Health Center, Greater Roslindale Medical and Dental Center, Whittier Street Health Center, Roxbury Comprehensive Health Center, South End Community Health Center, Codman Square Health Center, East Boston Neighborhood Health Center, and Uphams Corner Health Center.
- The Boston University Shuttle (The BUS) travels between Boston University's Charles River and Medical Campuses.

Freight

Truck Freight

Trucks are the dominant freight mode in the Boston Region MPO area. They operate on all roadways in the region to transport goods and make deliveries. In this analysis, trucks include three categories of vehicle: tankers, large trucks, and business pickup trucks and vans. The following is a list of the highways in the Central Area with the highest current volumes of truck traffic:

- Interstate 93 in the Central Artery/Tunnel, with volumes ranging from 15,000 to 19,500 trucks per day
- Interstate 93 from the border of Dorchester and Quincy to the vicinity of the South Boston Haul Road, with volumes ranging from 11,000 to 19,500 trucks per day
- Interstate 93 in the vicinity of the border of Somerville and Charlestown, with volumes ranging from 9,000 to 15,000 trucks per day
- Interstate 93 north of Somerville, with volumes ranging from 5,000 to 13,000 trucks per day
- Interstate 90 in the Back Bay, Fenway, Allston, and Brighton neighborhoods of Boston, with volumes ranging from 9,000 to 13,000 trucks per day
- Interstate 90 in the Ted Williams Tunnel, with volumes ranging from 5,000 to 9,000 trucks per day
- Parts of Route 1 in Chelsea and Revere, with volumes ranging from 5,000 to 9,000 trucks per day

Rail Freight

Freight service in the Central Area is provided by CSX Transportation and Pan Am Railways.

CSX operates in the corridor along its Boston Line and secondary lines. The Boston Line runs from the CSX classification yard in Selkirk, New York to the Beacon Park Yard intermodal facility in Allston. Beacon Park Yard is a major freight yard serving many functions. The yard handles intermodal freight including containers and trailers, general merchandise freight, and commercial waste that is transferred in sealed containers from truck to rail. It also houses TRANSFLO, a facility that handles mostly sweeteners and edible oils. Additionally, Beacon Park Yard handles locomotive servicing and freight car running repairs. CSX plans to relocate its Beacon Park Yard operation to yards in Worcester and West Springfield.

CSX has operating rights over the state-owned Grand Junction Branch into the Chelsea industrial area. The line serves the New England Produce (NEP) Yard in Everett and Chelsea, which is a small yard supporting local customers, including the New England Produce Center. The Commonwealth of Massachusetts acquired the Grand Junction Branch on June 11, 2010.

Pan Am Railways operates in the Central Area with service from the north. Pan Am operates a train carrying sand to Boston Sand and Gravel and has rights to the tracks into Massport's Moran Terminal, a marine terminal in Charlestown along the Mystic Wharf Branch. Massport purchased this rail line from Pan Am in 2002 to preserve rail access to the port. However, in 2005 it was granted a Discontinuation of Service Exemption to discontinue service over this line. This branch should be considered "inactive" rather than "abandoned."

Marine Freight

The Port of Boston is the oldest continually active major port in the country. It became an international port in 1630 and remains today the state's major gateway for international shipping. As of 2007, it was the 30th largest container port in the United States handling approximately 220,000 twenty-foot equivalent (TEU) containers (TEU is a standard container measurement) at Conley Terminal in South Boston.

Additionally, as reported in the Boston Region MPO's 2007 Boston Region Freight Study, the Port of Boston annually handles more than 1.3 million tons of general cargo, 1.5 million tons of non-fuel bulk cargo, and 12.8 million tons of bulk fuel cargos. In addition to Conley Terminal, other large facilities include Moran Terminal in Charlestown, and Massport Marine Terminal in South Boston (see Figure 8-1).

Conley Terminal in South Boston is a 101-acre multi berth terminal. It has 2,000 feet of berthing space at a depth of 45 feet. The terminal serves three of the world's 10 container lines and handles nearly 1.5 million metric tons of cargo annually. The

top imports are alcoholic beverages, frozen seafood, footwear, and furniture. The top exports include hides and skins, automobiles, logs and lumber, frozen seafood, paper (including waste paper), and scrap metal. As of 2007, there was an average of 900 to 1,000 daily truck moves into and out of Conley Terminal. There is no rail service directly to Conley Terminal. Massport has estimated that 75 to 90 percent of marine freight shipments into the Conley Container Terminal are destined for locations within 100 miles of the port.

Moran Terminal and Mystic Pier One in Charlestown were converted and leased to the private operator - Boston Autoport, in 1998. The Boston Autoport is used for importing and processing automobiles. Currently the automobiles are transported by truck-carriers, although this facility also has the potential for rail service along the Mystic Wharf Branch. Two additional facilities are located along the waterfront in Charlestown. Mystic Piers, located just east of the Tobin Bridge, is used to import, store, and distribute salt. The Medford Street Terminal was bought by Massport to ensure that the area would remain available for marine-cargo use. Also, on the Mystic River in Everett, are facilities that handle petroleum products, scrap metal, and liquefied natural gas, which is delivered to the Distrigas Terminal.

The Massport Marine Terminal is an approximately 40-acre site located in the Boston Marine Industrial Park in South Boston. About 10 acres are dedicated to facilities that support the fishing industry. The Terminal has a potential rail connection via the Boston Terminal Running Track, also known as Track 61. The Massachusetts Department of Transportation acquired the Track 61 from CSX on June 11, 2010. On-dock rail via Track 61 to Boston Marine Industrial Park and the Massport North Jetty is seen as an opportunity and is being pursued. Other facilities in South Boston include the Boston Fish Pier, the International Cargo Port, and the Fargo Street Terminal.

Other marine freight facilities in the Central Area include the East Boston Shipyard and Marina, and several private port facilities along the Chelsea River in Chelsea, East Boston, and Revere. The East Boston Shipyard and Marina is equipped to repair midsized commercial vehicles. Among the facilities along the Chelsea River are several oil terminals.

Air Freight

Logan International Airport in East Boston is the region's most important airport for the movement of freight. Logan Airport moved 219,000 tons of freight in 2007. Among US airports in 2008, Logan was ranked 14th for the value of international freight it handled (approximately $14.8 billion). Exports accounted for 59% of the total according to data reported by the U.S. Bureau of Transportation Statistics.

Many private carriers, including Federal Express and United Parcel Service, operate air cargo facilities at Logan. Intermodal freight to and from Logan is moved by truck. Freight transported by air usually has at least one of the following characteristics: time sensitivity, high value-to-weight ratio, and perishability. There is no freight rail access to Logan Airport, and due to air freight's characteristics mentioned above, no provisions for it are likely to develop.

Intermodal Freight Facilities

The intermodal facilities located in the Central Area are shown in Figure 8-1 and listed below:

- Boston Autoport, Charlestown
- Boston Freight Terminal, South Boston
- Conley Terminal, South Boston
- CSX Beacon Park Yard, Allston
- Distrigas Terminal, Everett
- Logan International Airport, East Boston
- Route 1A/Chelsea Creek Petroleum Terminals, Chelsea, East Boston, and Revere

Air

Logan International Airport is the region's primary airport. According to the Bureau of Transportation Statistics, in 2008 it was the 19th-busiest airport in the United States with approximately 11.6 million commercial airline boardings. This represented an 8.4% increase between 1998 and 2008. More than 100 domestic and international destinations are served from the airport with nonstop service.

Access to Logan Airport is greatly facilitated by its location, less than two miles from downtown Boston. Currently, approximately 30 percent of people traveling to or from Logan use public transportation. The MBTA provides direct transit access to the airport on the Blue Line (Airport Station) and Silver Line, which connects with the Red Line at South Station. Access is also provided by Massport's Logan Express bus service, other private bus service and water shuttles and water taxis.

Bicycle

Bicycle Paths

The Central Area has eight major bicycle paths, including the Dr. Paul Dudley White Path (also known as the Charles River Bike Path), that totals 31.6 miles along the banks of the Charles River between Boston, Cambridge, Watertown, and Waltham; the Minuteman Commuter Bikeway, 11.5 miles in Cambridge, Arlington, Lexington, and Bedford; the Somerville Community Path/Red Line Linear Path, 1.7 miles in Somerville and Cambridge; the Southwest Corridor Trail, 3.9 miles in Jamaica Plain, Roxbury, South End and Back Bay; the Emerald Necklace Paths, approximately 7 miles in Brookline, Jamaica Plain, and Fenway; the Neponset River Greenway, 2.5 miles in South Dorchester, Mattapan, and Milton; the Mystic River Reservation Bike Path, totaling 6 miles in Somerville and Everett; and the East Boston Greenway, less than one mile in East Boston.[1] These are shown in Figure 8-1, along with other minor facilities used by bicyclists and pedestrians in the corridor.

1 The Charles River Bike Paths, Southwest Corridor Trail, Emerald Necklace Paths, and Neponset River Greenway are also part of the East Coast Greenway that aims to develop a trail system between Canada and Key West.

On-Road Bicycle Accommodations

Table 8-1 shows the percentage of roadways in each of the Boston Region MPO municipalities and Boston neighborhoods in the Central Area that have on-road bicycle accommodations, defined as roadways with bicycle lanes or shoulders of four feet or greater. The Boston neighborhoods of Hyde Park, Roslindale, Mattapan, and West Roxbury are not included in the Central Area.

TABLE 8-1

Percentage of Roadways with Bicycle Accommodations

MUNICIPALITY	TOTAL NON-INTERSTATE CENTERLINE MILES	CENTERLINE MILES WITH BICYCLE LANES	CENTERLINE MILES WITH FOUR-FOOT SHOULDERS	PERCENTAGE OF CENTER-LINE MILES WITH BICYCLE ACCOMMODATIONS
Boston Proper*	87	1.0	0.7	2.0%
Allston-Brighton*	83	4.0	2.7	8.0%
Charlestown*	27	0.0	0.1	0.3%
East Boston*	51	1.0	0.0	2.0%
Fenway*	38	1.4	0.0	3.7%
Jamaica Plain*	59	4.0	0.1	6.9%
North Dorchester*	63	2.5	0.0	4.0%
Roxbury*	87	1.1	1.0	2.4%
South Boston*	61	0.0	1.3	2.1%
South Dorchester*	94	2.5	0.2	2.9%
Brookline	105	2.2	0.6	2.6%
Cambridge	141	17.8	3.2	14.9%
Chelsea	49	0.0	0.0	0.0%
Everett	64	0.3	0.4	1.2%
Malden	109	0.6	1.3	1.7%
Medford	133	0.0	0.3	0.2%
Revere	109	0.0	5.0	4.6%
Somerville	105	3.0	0.7	3.5%
Winthrop	40	0.0	0.1	0.3%
TOTAL	**1,505**	**41.4**	**17.7**	**3.9%**

* Boston Neighborhoods

The bicycle accomodation coverage in the Central Area is low, but includes municipalities with the most miles of bicycle accommodations and those that have been most active in increasing bicycling. The City of Boston has made tremendous strides with on-road accommodations by increasing from no bicycle lanes in 2007 to 35 miles (17.5 centerline miles) of bicycle lanes by 2010, with 20 lane miles being marked in 2010 alone. Similarly, the cities of Cambridge and Somerville continue to add to their bicycle network annually. Bicycle coverage in the Central Area ranges from no coverage in Chelsea to almost 15% coverage in Cambridge. Overall, the Central Area ranks above the regional average of 1.7%.

Bicycle Parking

The MBTA has provided bicycle parking at various commuter rail and rapid transit stations in the Central Area (see lists of rail stations under the transit section). According to the MBTA, over 95% of stations now have bicycle parking, which includes three "Pedal and Park" bicycle parking facilities at Alewife, Forest Hills, and South Station. Also, the MBTA has secured funding for bike racks on all MBTA buses; therefore, the riders in the Central Area will be able to take their bicycles on the bus. The Boston Region MPO has a program funding the installation of bicycle racks in participating municipalities. Municipalities in the corridor that recently installed bike racks funded by the Boston Region MPO are:

- Boston
- Brookline
- Cambridge
- Medford
- Somerville

Municipalities planning bike rack installations are:

- Chelsea
- Everett
- Malden
- Revere

Pedestrian

Table 8-2 shows the percentage of roadways in each of the Boston Region MPO municipalities and Boston neighborhoods in the Central Area that have sidewalks on at least one side. The Boston neighborhoods of Hyde Park, Roslindale, Mattapan, and West Roxbury are not included in the Central Area.

TABLE 8-2

PERCENTAGE OF ROADWAYS WITH SIDEWALKS

MUNICIPALITY	TOTAL NON-INTERSTATE CENTERLINE MILES	CENTERLINE MILES WITH SIDEWALKS ON AT LEAST ONE SIDE	PERCENTAGE OF CENTER-LINE MILES WITH SIDE-WALKS
Boston Proper*	87	77	89%
Allston-Brighton*	83	72	86%
Charlestown*	27	21	78%
East Boston*	51	40	78%
Fenway*	38	35	91%
Jamaica Plain*	59	47	79%
North Dorchester*	63	57	91%
Roxbury*	87	78	90%
South Boston*	61	51	84%
South Dorchester*	94	90	96%
Brookline	105	94	89%
Cambridge	141	124	88%
Chelsea	49	41	84%
Everett	64	56	88%
Malden	109	88	81%
Medford	133	105	79%
Revere	109	77	71%
Somerville	105	94	90%
Winthrop	40	35	86%
TOTALS	**1,505**	**1,283**	**85%**

* Boston Neighborhoods

The Central Area has very high sidewalk coverage of 85%, and ranks well above the regional average of 50%. Sidewalk coverage ranges between 71% coverage in Revere to 96% coverage in the South Dorchester neighborhood of Boston.

LAND USE AND DEMOGRAPHICS

Demographics

Population

The majority of the Central Area is densely populated; however, there are a number of very dense residential areas including: the Boston neighborhoods of Fenway, Kenmore, Allston/Brighton, and East Boston and in the municipalities of Somerville, Cambridge, Chelsea, and areas of Malden around the Malden Center Orange Line stop. The cities of Somerville and Cambridge have

high density residential development around many of the Red Line stops such as Davis Square, Central Square and Kendall Square. Close proximity to transit tends to drive the density of development and housing costs in these areas (see Figure 8-3).

According to U.S. census data (updated annually at the town level), the corridor's 2009 population was 1,117,360. In the Metropolitan Area Planning Council's (MAPC's) MetroFuture forecasts, the corridor's population increases by 14%, to 1,272,850 by 2035 (MetroFuture is described briefly below). The municipalities projected to have the largest absolute growth are Boston, Cambridge, and Somerville.

Figure 8-4 shows, by community for 2009, total elderly (age 70 or higher) population. This information can be used to assess the types of transportation services needed now and in the future. As shown in Figure 8-4, although the entire Central Area has a high elderly population, Boston currently has the highest.

Land Use, Housing, Sustainable Transportation

As of the year 2000, there were 439,170 households in the Central Area, including Boston. Boston, Cambridge and Somerville comprised 72% of all households in the year 2000. The highest population densities are found in the Back Bay and Downtown neighborhoods of Boston, around Red Line stops in Cambridge and all throughout Somerville.

Figure 8-5 shows transit service and catchment areas with population density in the Central Area; it includes commuter rail and boat, and rapid transit stations along with bus stops. For rapid transit, commuter rail stations, and commuter boat terminals, a half-mile catchment area for walk access is assumed, while the catchment area for bus stops is a quarter mile. This figure shows that the Central Area has very good transit coverage with the exception of Winthrop and other small pockets of high-density areas.

From 2000 to 2009, Central Area municipalities, including Boston, issued building permits for 16,575 new housing units (according to the U.S. Census Bureau), representing housing unit growth of 3.8%. Boston and Cambridge issued the highest number of permits with over 12,600 housing units permitted, more than 76% of the total.

In 2007 and again in 2010, MAPC surveyed municipalities about recent and anticipated development. Many of the largest housing developments completed or underway in the Central Area, outside of Boston Proper, were in Allston/Brighton, Cambridge, Chelsea, Medford, and Revere. Large housing developments recently completed or under active construction in the Central Area include Chestnut Hill Waterworks in Allston/Brighton, Overlook Ridge in Revere, Station Landing in Medford, and Third Street in Cambridge. These four projects combined added nearly 2,000 additional housing units. A majority of the housing growth planned through the year 2035, outside of Boston, is anticipated to occur in Cambridge and Somerville with projects like North Point and Assembly Square. These two projects alone have the potential to bring in over 3,000 new housing units.

Within Boston, but outside Boston Proper, three major employment projects were recently completed in the Fenway/Kenmore area: The Merck Research Center, Blackfan

FIGURE 8-3

Population Density by Transportation Analysis Zone – Central Area

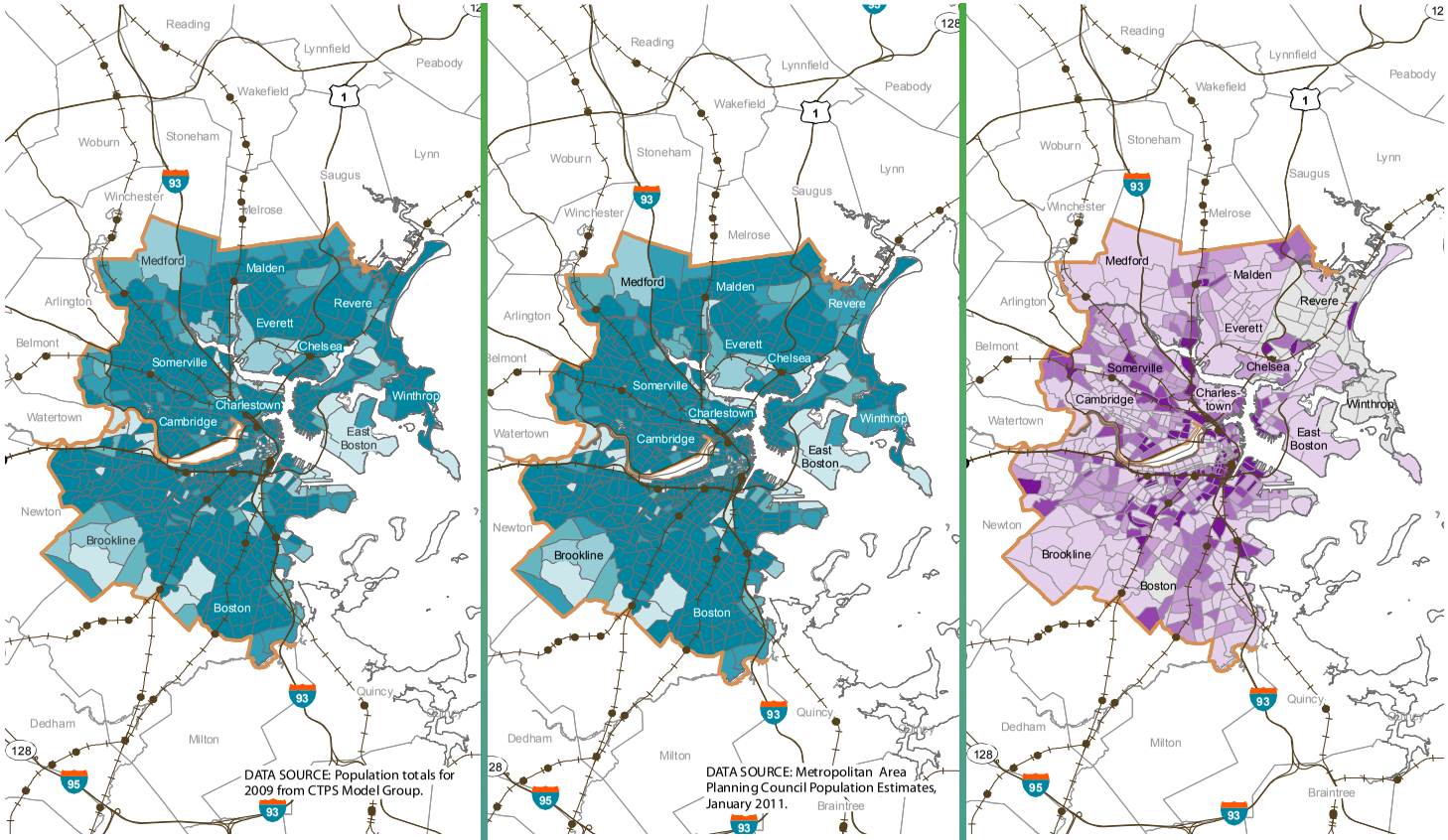
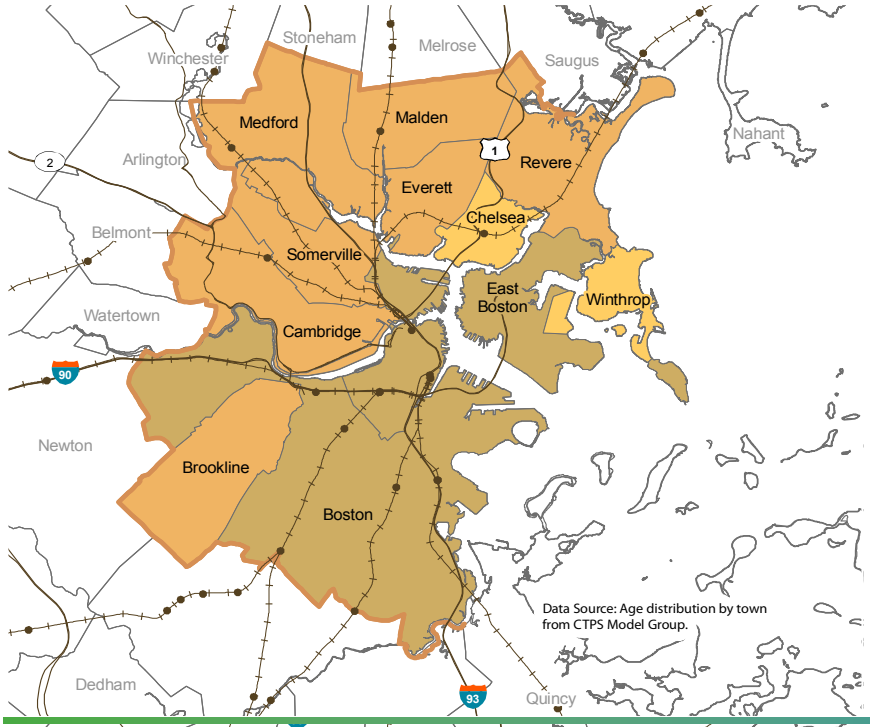


FIGURE 8-4

Elderly Population by Town, 2009 –Central Area



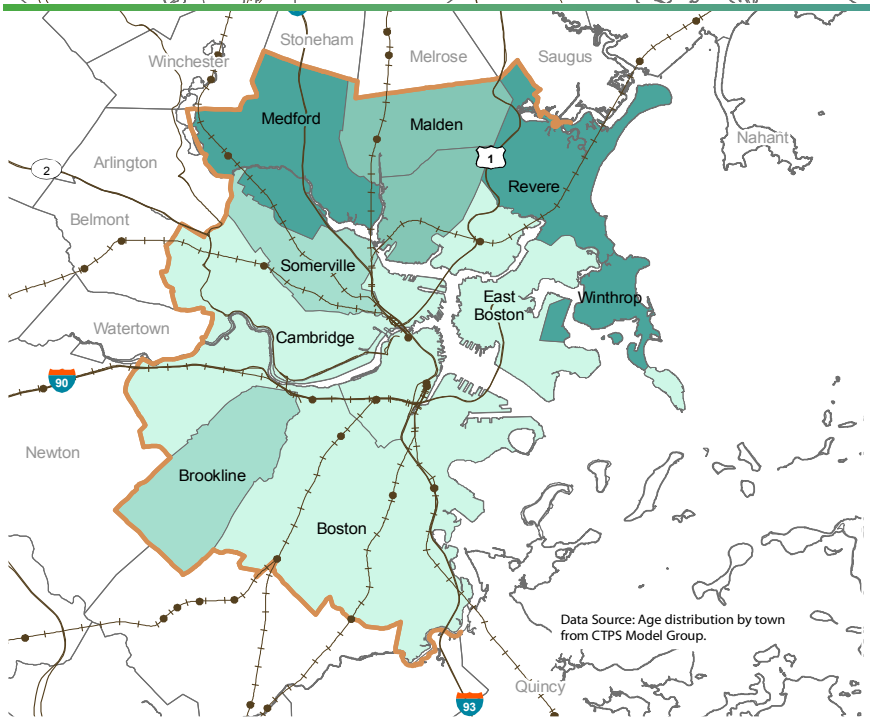


FIGURE 8-5

Transit Services Catchment Areas - Central Area

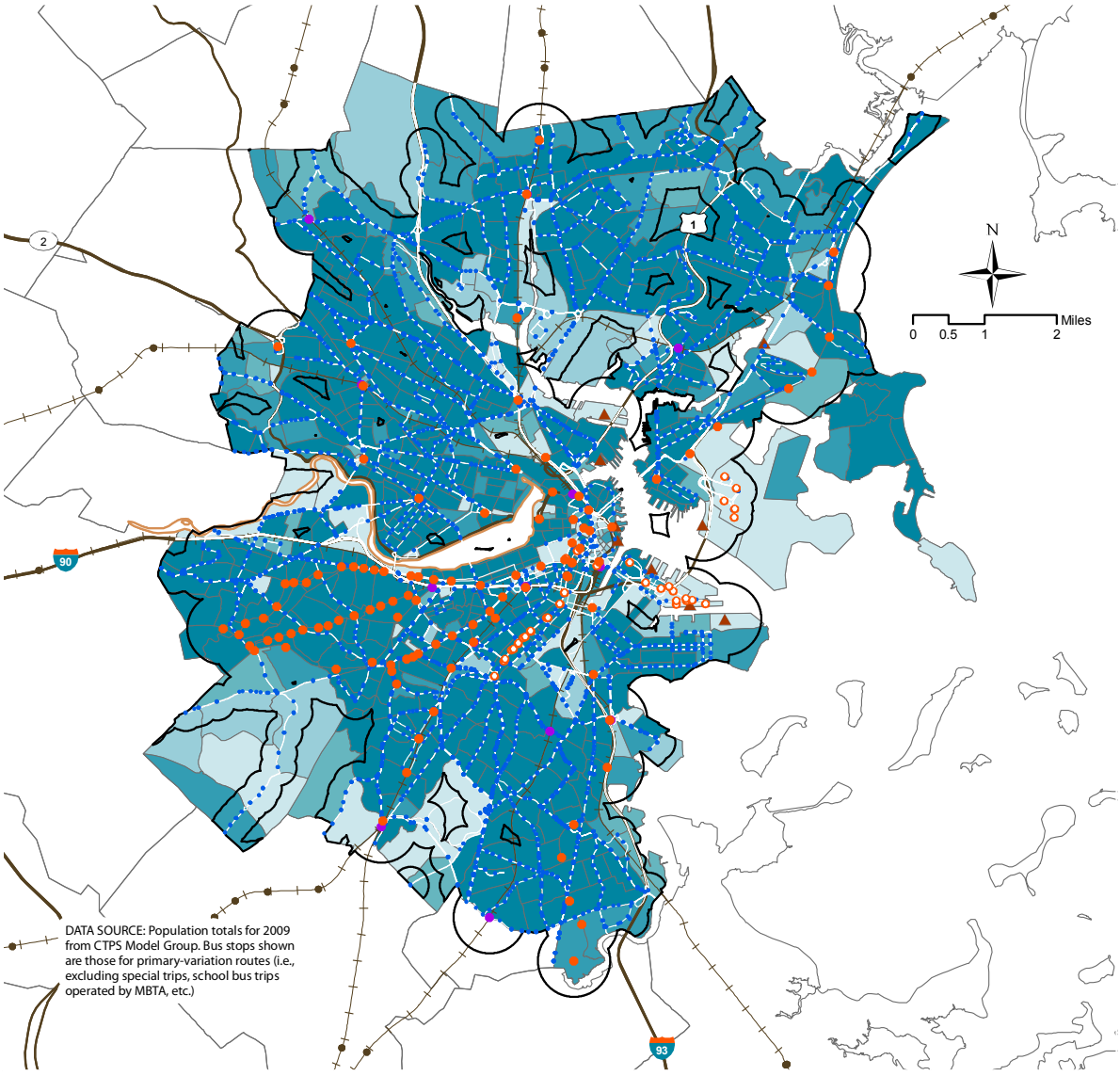
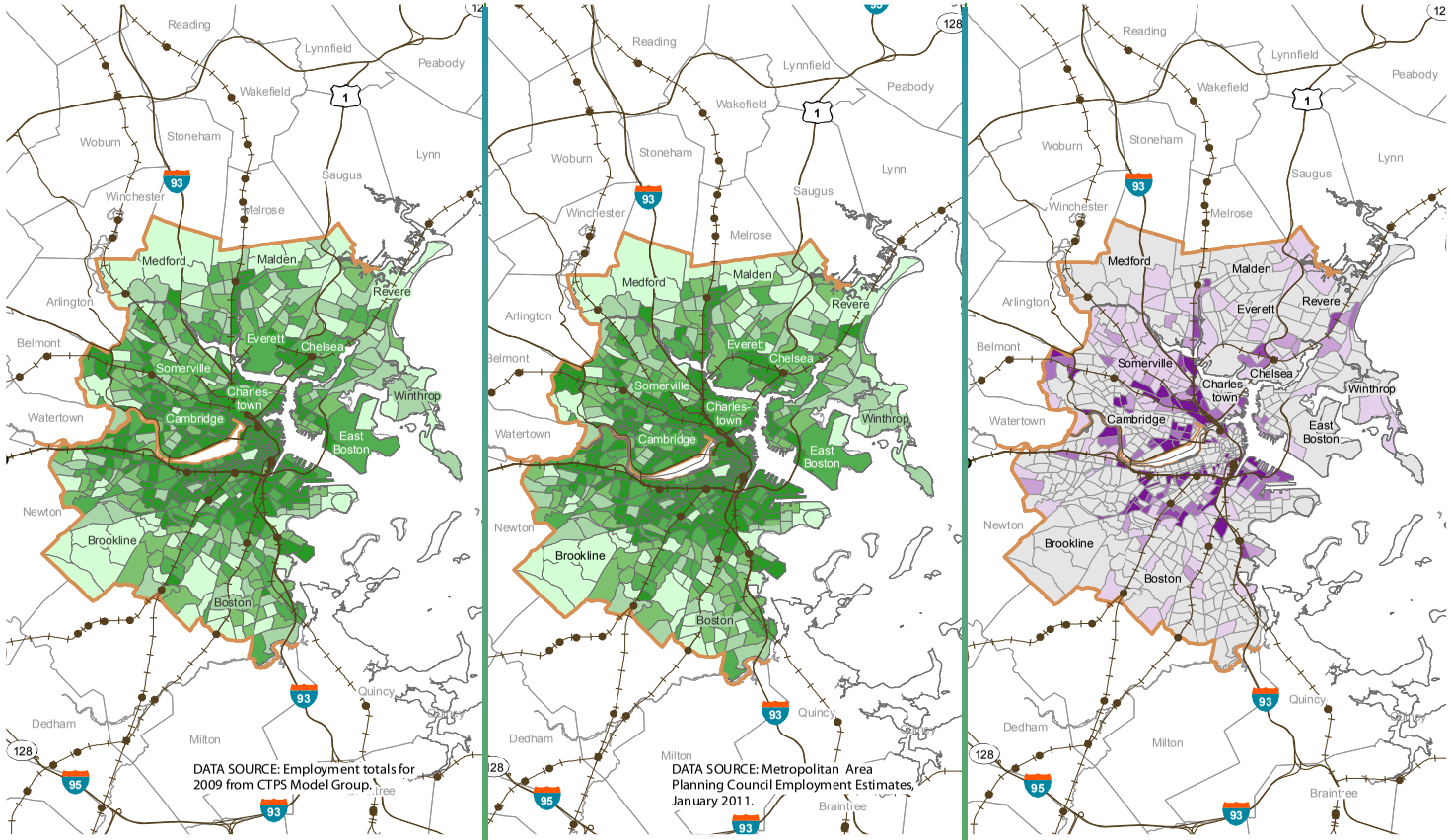


FIGURE 8-6

Employment Density by Transportation Analysis Zone – Central Area



Research Center and the B&W Center for Advanced Medicine. These three projects added an approximately 6,000 workers. Outside of Boston, six large employment projects recently completed construction in Cambridge. These developments were mainly associated with MIT and Harvard and employ an estimated 5,570 employees. There are also five additional projects under construction in Cambridge around MIT and Harvard which are expected to add an additional 3,600 jobs.

The largest planned project in Boston, outside of Boston Proper, is 100 Acres in South Boston. This project is a combination of hotel space, retail, office, and residential units. The development is anticipated to produce an additional 2,376 housing units and 2.8 million square feet of office and retail space. Not surprisingly given the planned extension of the Green Line to Somerville and Medford, the largest planned employment generators outside Boston are in Cambridge and Somerville around the Inner Belt, Assembly Square, Union Square, and North Point areas. These areas are anticipated to grow significantly in job production and housing production over the next 25 years. Their proximity to existing and planned rapid transit lines makes them key locations for both population and job growth.

Corridor-wide, auto ownership and average household mileage are markedly lower than the regional averages, at 1.1 autos per household and 29 miles per household per day. The regional averages are 1.7 autos per household and 47 miles per household per day.

Employment

According to the Executive Office of Labor and Workforce Development, the Central Area's 2009 employment was 760,475. Boston and Cambridge makes up approximately 86% of the Central Area's employment. Employment concentrations are highest in the neighborhoods of Fenway/Kenmore, Back Bay, and Downtown Boston and around the MIT and Harvard campuses in Cambridge. Employees in the Central Area commute an average of 17 miles round trip, with 46% accomplished by non-auto modes of travel. This high percentage is not surprising given the excellent transit connectivity, high employment and population densities and pedestrian and bicycle infrastructure found in the Central Area.

MAPC's MetroFuture forecasts show employment increasing by 12%, to 854,200 by 2035, with most municipalities experiencing modest growth in absolute terms. The largest gains are expected in the Fenway/Kenmore neighborhood and the Seaport area of South Boston in Boston and in the municipalities of Cambridge and Somerville. Smaller employment gains (10% or less of the corridor total) are projected for Chelsea, Medford, and Revere.

MetroFuture Plan

MetroFuture is a long-range plan for land use, housing, economic development, and environmental preservation in the Boston region comprising both a vision for the region's future and a set of strategies to achieve that future. The MetroFuture land use plan and associated socioeconomic projections are used in the MPO's travel demand model. MetroFuture seeks to create a more sustainable future for the region by focusing growth in areas where development already exists in order to make better

use of existing infrastructure and reduce the need for new highways, interchanges, and other infrastructure.

MetroFuture classified municipalities into distinct community types based on existing conditions and potential for sustainable development. The Central Area is classified as the Inner Core.

The MetroFuture land use vision for the Central Area envisions this area as the central hub for the region. The Central Area will be the largest population and employment generator and attractor in the region. It is also seen as a key location for job growth built around medical and educational institutions, as well as other major industries. Key improvements in schools, public safety and open space will be attractive to young professionals, families and retiring baby boomers. Much of the growth in Central Area is anticipated to be completed through the redevelopment and reuse of existing building stock and infill development on vacant parcels. The Central Area is also viewed as a key transportation hub. MetroFuture recommends expanding the current transit network to better facilitate work and personal trips. Where transit expansion does occur, economic development should follow linking jobs and housing to sustainable transportation choices. New housing and employment developments should be located in areas with strong transit access and within walking distance to common household destinations.

In locations more distant from transit, MetroFuture recommends land use, design, and transportation demand strategies that facilitate transit and bicycle or pedestrian access.

Municipal Planning

Most municipalities in the corridor have adopted or opted in to contemporary planning initiatives and other planning activities that promote economic development, smart growth, healthy transportation, and greenhouse gas (GHG) emission reductions. Participating municipalities along with their programs and municipality designations, are shown in Table 8-3. A description of these programs is provided in Appendix B.

The MPO does not have direct control over land use decisions; land use is controlled by local municipalities through zoning. However, the MPO can use ther information presented here in its decision-making when choosing projects to fund in the LRTP and Transportation Improvement Program (TIP). Projects can be ranked based on how well the community is implementing the smart growth and healthy transportation initiatives in addition to whether a project reduces GHG emissions.

TABLE 8-3

MUNICIPAL PLANNING: COMMUNITY CHECKLIST

MUNICIPALITY	ECONOMIC DEVELOPMENT			SMART GROWTH								LAND USE			PUBLIC HEALTH			CLIMATE CHANGE	
	PWED	Approved 43D Site	TMA	TOD & Housing Support	Approved 40R District	Regional Hub	Suburban Center	Urban Center	Maturing Suburb	Growth Districts Initiative	District Local Tech. Asst.	TOD District	Mixed-Use Zoning District	Comm. Preservation Act	Mass In Motion	Safe Routes to School	WCW	ICLEI Member	Green Community
Boston	•	•	•	•		•	•	•	•		•	•	•			•		•	•
Brookline																•	•	•	
Cambridge			•	•							•		•	•				•	•
Chelsea		•	•	•	•						•		•			•	•		
Everett											•				•				
Malden	•									•	•	•	•			•	•		
Medford	•										•		•			•		•	•
Revere	•	•								•	•		•		•				
Somerville		•	•	•						•	•	•	•			•	•		
Winthrop	•										•		•						

TRAVEL CHARACTERISTICS

Travel within the Central Area and Travel between It and Other Corridors (Highway and Transit Combined)

Data were analyzed for both the base year 2008 and the proposed 2030 No-Build scenario, on the person-trips (highway and transit combined) that originate in and are destined to the Central Area. The 2030 No-Build assumes the realization of the projected MetroFuture population and employment with the existing transportation network. This information was developed using the travel demand model.

In the 2008 base year, 68% of person-trips for all purposes (work-based, school-based, shopping, etc.) remain in the Central Area. This remains stable in the 2030 No-Build scenario with 69% of person-trips remaining in the Central Area. When looking at the 2000 Census Journey-to-Work data for the Central Area, 46% of the work-based trips (compared to 68% of all trips) remain within the Central Area.

As discussed in all of the radial corridor chapters, the Central Area is the region's most prominent population and employment area within the region. Other than travel within each of the corridors, the Central Area is the destination of the highest percentage of person trips from each radial corridor:

- Northeast – 9%
- West – 10%

- North – 14%
- Northwest – 12%
- Southwest – 11%
- Southeast – 14%

When looking at the 2000 census Journey-to-Work data for the Central Area, the following share of work-based trips in each radial corridor are destined to the Central Area.

- Northeast – 19%
- North – 29%
- Northwest – 30%
- West – 24%
- Southwest – 20%
- Southeast – 30%

Truck Travel

Daily truck trip-ends per square mile are shown in Figure 8-7 along with the locations of freight intermodal facilities. This figure shows that the highest concentrations of 2008 daily truck activity occur in Boston proper, with truck activity steadily declining from here to the outer edges of the Central Area. Areas with particularly high concentrations of truck activity include intermodal facilities such as the Boston Autoport intermodal facility in Charlestown, Conley Terminal in South Boston, and Beacon Park Yards in Allston; the fuel distribution facility in Everett; the Financial District and Back Bay in Boston proper; eastern Cambridge and Somerville; in the Longwood Medical Area, near Harvard Square, and parts of the Allston and Brighton neighborhoods of Boston.

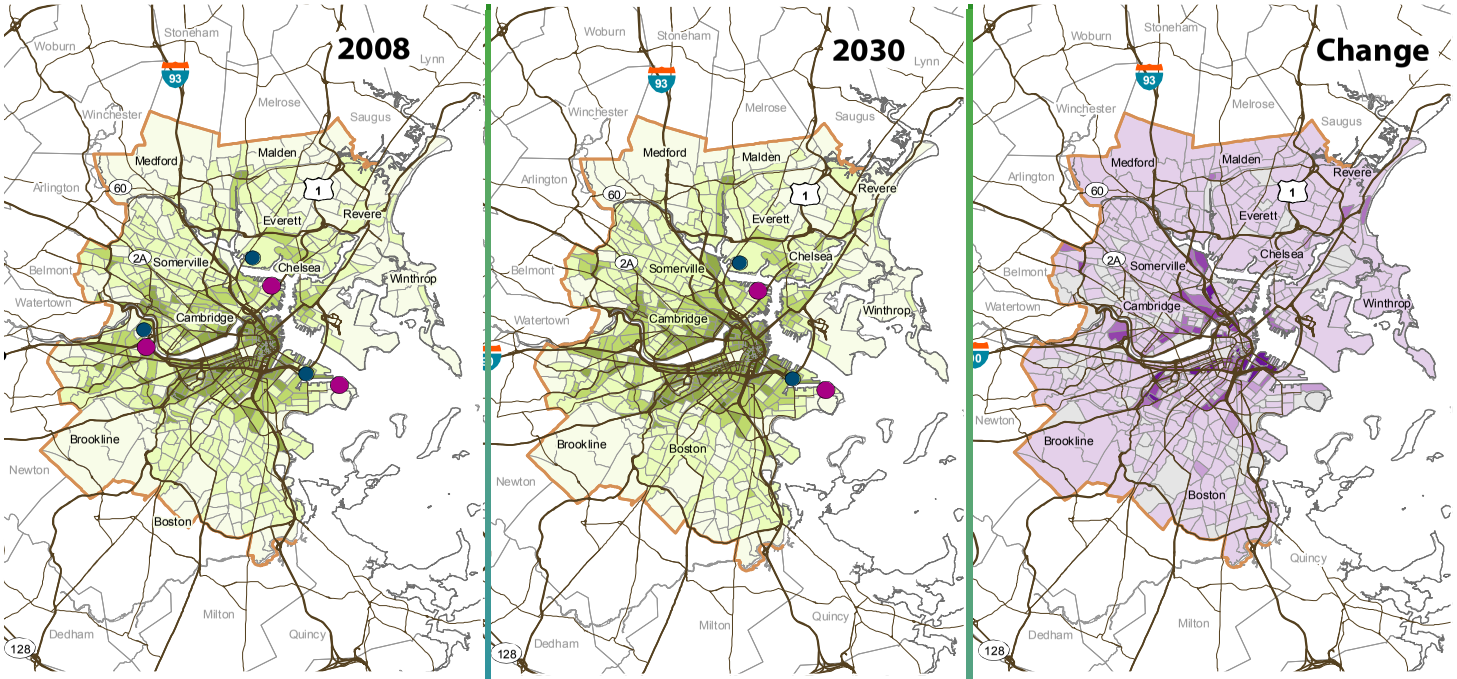
Between 2008 and 2030 (No-Build scenario), the truck model predicts that the largest increases in truck travel will occur in the South Boston Waterfront area, in the Longwood Medical Area, around Assembly Square in Somerville, in Allston in the vicinity of the Harvard University campus, in the Back Bay neighborhood of Boston, in parts of eastern Cambridge and Somerville, in the vicinity of Melnea Cass Boulevard and Interstate 93 in Boston, and in Revere along and between Routes 1A and 60.

Bicycle and Pedestrian Travel

A predominate portion of the region's bicycle facilities are within the Central Area. Approximately 4% of the non-interstate centerline miles provide bicycle accommodations. According to 2000 census Journey-to-Work data, slightly more than one percent of Central Area residents bicycle to work. However, MPO-conducted bicycle counts within the Central Area indicate that ridership has nearly doubled at most major facilities between 2005 and 2010. Similarly, the City of Boston estimated that as of 2009, bicycling composed over 2% of commute trips.

FIGURE 8-7

Daily Truck Trips by Transportation Analysis Zone – Central Area



Daily Truck Trips per Sq. Mi. by Transportation Analysis Zone (TAZ)

- Fewer than 2,000
- 2,001 - 5,000
- 5,001 - 10,000
- 10,001 - 50,000
- 50,000 - 100,000
- More than 100,000

Truck Generator Types

- Internal intermodal transfer point
- Distribution center
- External intermodal transfer point

Change in Truck Trips per Square Mile (2008-2030)

- Decrease
- Increase less than 1,000
- Increase 1,000 to 2,000
- Increase 2,000 to 5,000
- Increase 5,000 to 10,000
- Increase more than 10,000

DATA SOURCE: CTPS truck model runs, June 2010.

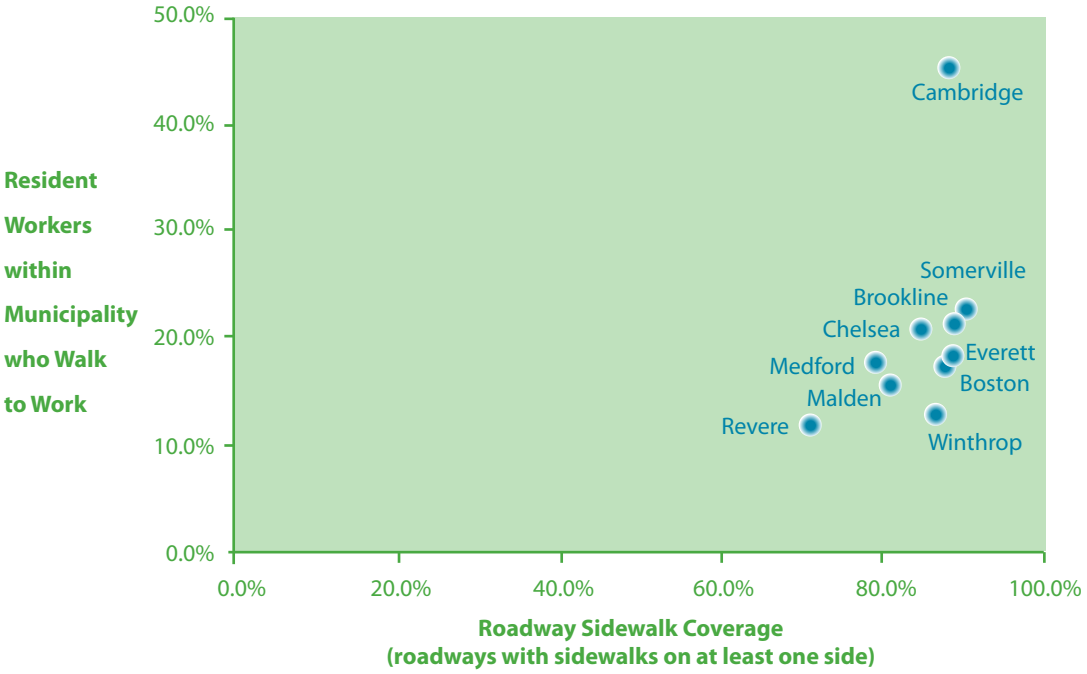
N

0 0.5 1 2 3 Miles

Walking conditions vary from good to very good in the Central Area. Table 8-4 shows the relationship between roadway sidewalk coverage and percentage of resident workers that walk to work by community. (Walk-to-work data are derived from 2000 Census Journey-to-Work data.[2]) This table indicates the range in sidewalk coverage from 71% in Revere to 90% in Somerville, and walk share from 12% in Revere to over 45% in Cambridge.

TABLE 8-4

Relationship between Sidewalk Coverage and Residents who Walk to Work



Bicycle and pedestrian activity has been counted at numerous off-road and on-road facilities in the Central Area. Table 8-5 contains the top counted locations by average AM weekday, PM weekday, and daily weekend peak user volumes. Users are classified as bicyclists or pedestrians (people walking, jogging, skating, using wheelchairs, and pushing strollers).

2 It should be noted that these percentages are estimates based on a U.S. Census Bureau questionnaire. Only workers over 16 years of age are included. All students, including those over 16, are excluded. The data were collected in early spring, when, according to metropolitan Boston counts, bicycle volumes are about one-quarter of the peak-season volumes. It is not known what the seasonal variations are for pedestrians, but pedestrian volumes are assumed to be less variable than bicycle volumes. Another factor to consider is that the census questionnaire asks for the mode used for the longest part of the trip to work. A trip comprising a two-mile bicycle trip to a rail station, a five-mile train trip, and a half-mile walk to the workplace, for example, would be classified as a rail trip.

TABLE 8-5

Average Peak-Hour Bicyclist and Pedestrian Volumes

FACILITY NAME	AM WEEKDAY PEAK-HOUR VOLUMES		
	BICYCLISTS	PEDESTRIANS	TOTAL
Huntington Ave. (Boston)	27	690	717
Memorial Dr. at Harvard Bridge (Cambridge)	267	391	658
Longwood Avenue (Brookline)	93	486	579
Minuteman Bikeway (Cambridge)	164	255	419
Anderson Memorial Bridge (Cambridge)	107	309	416
Somerville Community Path (Somerville)	32	301	333
Broadway (Chelsea)	4	324	328
Beacon St. (Somerville)	135	163	298
Malcolm X Blvd. (Boston)	46	229	275
Southwest Corridor Trail (Boston)	189	29	218
Dr. P.D. White Path (Cambridge)	59	152	211
Arlington St. (Chelsea)	3	189	192
Albany St. (Boston)	0	155	155
Harrison Ave. (Boston)	0	155	155
Dudley St. (Boston)	7	124	131
Blue Hill Ave. (Boston)	7	113	120
Washington St. (Boston)	5	98	103
Temple St. (Somerville)	5	79	84
Emerald Necklace Path (Brookline)	34	48	82
Warren St. (Boston)	3	35	38
FACILITY NAME	**PM WEEKDAY PEAK-HOUR VOLUMES**		
	BICYCLISTS	PEDESTRIANS	TOTAL
Memorial Dr. at Harvard Bridge (Cambridge)	250	860	1110
Elm St. (Somerville)	55	946	1001
Minuteman Bikeway (Cambridge)	233	283	516
Beacon St. (Somerville)	159	216	375
Dr. P.D. White Path (Cambridge)	75	245	320
Southwest Corridor Trail (Boston)	245	45	290
Harrison Ave. (Boston)	0	224	224
Broadway (Chelsea)	5	210	215
Arlington St. (Chelsea)	4	163	167
Spruce St. (Chelsea)	16	131	147
Temple St. (Somerville)	6	132	138
Albany St. (Boston)	0	131	131
Dudley St. (Boston)	8	66	74
FACILITY NAME	**DAILY WEEKEND PEAK-HOUR VOLUMES**		
	BICYCLISTS	PEDESTRIANS	TOTAL
Minuteman Bikeway (Cambridge)	173	128	301
Dr. P.D. White Path (Cambridge)	72	224	296
Southwest Corridor Trail (Boston)	116	51	167

IDENTIFIED TRANSPORTATION ISSUES

System Preservation and Modernization Issues

Highway

Roadways

The Boston Region MPO area is the most densely populated MPO area in the state. The conditions of its roadways are under constant pressure from high traffic volumes and harsh weather conditions. Because of this and the advanced age of much of the infrastructure, the roadways require significant preservation activities. Pavement needs were not calculated at the corridor level but have been calculated for the MPO region as a whole. That information is provided in Chapter 10.

In addition, sections of the Massachusetts Turnpike in the Central Area have been identified as in need of maintenance or repair. They include:

- Bridge Deck Reconstruction of the Boston Viaduct
- Bridge Deck Widening/Reconstruction of the Mainline over Interstate 95/Route 128 and the Charles River
- Sumner Tunnel Plenum/Ceiling Rehabilitation

Bridges

Condition: In Massachusetts, the condition of bridges is categorized through a nationally adopted rating system based on a number of standards, including structural adequacy, safety, serviceability, traffic, and public use. The system assigns one of three classifications to a bridge, based on its condition: 1) meeting standards, 2) functionally obsolete, and 3) structurally deficient. Functionally obsolete means that the bridge fails to meet current traffic demands or highway standards on bridge width, traffic volume, or condition of approach roadways. Inclusion in this category does not necessarily mean there is an imminent safety concern. Structurally deficient means that deterioration has reduced the load-carrying capacity of the bridge and is an indication that reconstruction may be necessary. Of the 622 bridges in the Central Area, 153 (25%) are classified as functionally obsolete, and 67 (11%) are classified as structurally deficient.

Vertical Clearance: The desired vertical clearance for trucks on highways as outlined in the 2006 Massachusetts Highway Department Project Development and Design Guide is 16 feet and 6 inches. This allows for the larger truckloads that are becoming more prevalent. There are 302 bridges in the Central Area that should meet this

vertical clearance for trucks. Of these bridges, 279 (92%) do not meet this standard.

Highway Bridge Weight Restrictions: Closed bridges and weight-restricted bridges cost truckers time and money due to increased fuel consumption, longer delivery times, and other inefficiencies. There are 57 (9%) weight-restricted bridges in the Central Area.

Transit: Universe of Transit Preservation and Modernization Needs Identified for the Central Area in the MBTA's Program for Mass Transportation (PMT)

The MBTA's Program for Mass Transportation, approved in December 2009, provides information on current and proposed transit needs. Some of the major transit needs or issues regarding system preservation and modernization in the Central Area are as follows:

State-of-Good-Repair Projects

A number of system preservation projects must be undertaken in the short- to mid-term to bring the system into a state of good repair and to ensure the safety of passengers and reliability of service including:

- The signal system in the Green Line Central Subway dates from the 1920s[3]. Power substations and power transmission and distribution lines at several locations on the Green Line are in need of upgrading or replacement. Tie replacement is needed on the B and C Branches. At-grade crossings of streets need to be reconstructed or rehabilitated at 37 locations on the surface Green Line branches.

- On the Blue Line, power substation equipment and an outdated signal system are in need of replacement. The overhead catenary system and track and switches at some locations also need to be replaced.
- On the Orange Line, power substation buildings and equipment are in need of replacement at Oak Grove, Malden, and Wellington, and upgrades are needed at all north-side Orange Line stations to improve passenger areas. Also on the Orange Line, the power system needs to be upgraded and the concrete support pedestals that support the third rail, as well as part of the third rail itself, need to be replaced. In addition, new Orange Line cars must be purchased, so that the 1979–1981 fleet can be retired. The Wellington Orange Line maintenance facility is in need of renovations.

3 The Green Line Central Subway includes all underground Green Line stations, as well as Science Park and Lechmere.

- On the Red Line, power cables, emergency lighting systems, and track components are in need of replacement at some locations. The oldest cars in use on the line need to be replaced. The Cabot maintenance facility is in need of renovations.

- On the Silver Line Washington Street, the CNG vehicle fleet needs a mid-life overhaul.
- On the commuter rail system, 12 bridges on the Fairmount Line are currently rated as structurally deficient. Work has commenced on some of these.
- New vehicles are needed to replace the PCC cars on the Mattapan High Speed Line. These cars were originally built in the 1940s.
- On the bus system, the Charlestown garage needs a new roof and air conditioning system. The Cabot garage needs some repairs and upgrades.

Infrastructure Enhancements

In order to continue to maintain and improve service quality as demand grows and as technologies and materials improve, the MBTA will need to continually invest in infrastructure enhancements. These include power, track/right-of-way, and signals projects for the Red and Green lines and the Fairmount commuter rail line.

ADA Accessibility

Some gaps remain in providing ADA Accessibility. The following stations are not accessible:

- Chelsea (Newburyport/Rockport Line)
- West Medford (Lowell Line)
- Boylston, Government Center, Hynes, Symphony (Green Line Central Subway)
- Blandford Street, BU West, St. Paul Street, Packard's Corner, Pleasant Street, Babcock Street, Griggs Street/Long Avenue, Allston Street, Warren Street, Sutherland Road, Chiswick Road, Chestnut Hill Avenue, South Street (Green Line B Branch)
- Hawes Street, Kent Street, St. Paul Street, Summit Avenue, Brandon Hall, Fairbanks Street, Tappan Street, Dean Road, Englewood Avenue (Green Line C Branch)
- Valley Road (Mattapan High Speed Line)
- Bowdoin, Government Center (Blue Line)

Freight

Weight-Restricted Tracks

Rail tracks in the Central Area, with the exception of the Boston Line, are restricted to 263,000 pound rail cars. The entire Boston Line is rated to allow cars weighing up to 315,000 pounds, though branch lines are typically restricted to rail cars weighing 263,000 pounds and less. The industry standard has become 286,000 pounds. Weight restrictions increase costs for all shippers who need consequently more cars to move their freight than they would in areas with 286,000-pound tracks.

Dredging

An Army Corps of Engineers feasibility study has recommended dredging the entrance channel to the Port of Boston to a depth of 50 feet, and deepening the Conley Terminal access channel to 48 feet. The channel into the Port of Boston is currently dredged to a depth of 40 feet. The Boston Harbor Deep Draft Navigation Project also calls for deepening the Chelsea River Channel to 40 feet to provide better freight access.

Mobility

Highway

Highway Bottlenecks

A highway bottleneck is defined as a location where a constraint impedes the flow of traffic. The constraint at a bottleneck can be caused by, among other things, close spacing of intersections operating near or at capacity, a lane drop, or the confluence of large volumes of traffic at an interchange connecting two major highways. The types of roadways included in this bottleneck analysis are:

1. Express highways, which are multilane, divided highways with fully controlled limited access
2. Class I and II arterials, which are defined as higher-speed arterials (those with some degree of limited access) and partially limited-access highways
3. The remainder of the arterial roadway network, which is classified as Urban Street Class III

Bottlenecks on express highways and arterials can be identified using a number of methods. For identifying those in the Central Area, three types of data that the Boston Region MPO collects or produces for express highways and arterials have been used:

- Travel speed index during peak periods (existing conditions for express highways and Class I and II arterials)
- Volume-to-capacity ratio during peak periods (existing and future conditions for express highways and all arterials)
- Intersections given priority by the Congestion Management Process (CMP) for improvement (existing conditions for Class III arterials)

Information of each type for the Central Area is presented in the following three subsections. Based on that information, the worst bottlenecks in the corridor were identified; these are listed in the subsequent section.

CMP Travel Speed Index

Congestion thresholds have been established for express highways and Class I and II arterials using existing travel speed index data and are used in this identification of bottlenecks. The speed index is the ratio of observed speed to the posted speed limit. The locations on express highways and Class I and II arterials that have the worst speed indexes are shown in Table 8-6 for the AM peak period and Table 8-7 for the PM peak period, and also in Figures 8-8 and 8-9. Note that the tables include only Class I and II arterials; however, Figure 8-9 also shows Class III arterials. Many of the locations shown in Figure 8-9 with a travel speed indexbeloew 40% are CMP priority intersections on Class III arterials and are also discussed below In the CMP Priority Intersections section and shown in Figure 8-14. The AM and PM peak periods referred to in the tables and figures are defined as follows. For express highways, the AM peak period is from 6:00 AM to 10:00 AM, and the PM peak period is from 3:00 PM to 7:00 PM. For arterials the AM peak period is from 6:30 AM to 9:30 AM, and the PM peak period is from 3:30 PM to 6:30 PM. Te travel speed index information is provided for existing conditions only.

TABLE 8-6

Travel Speed Index (from the CMP): Worst Locations* in AM Peak Period

EXPRESS HIGHWAYS	SPEED INDEX
I-93 southbound from Rte. 28 to the Leverett Connector (Medford, Somerville, Boston)	0.36 to 0.63
I-93/Southeast Expressway northbound from Granite Ave. to Government Center (Boston)	0.38 to 0.92
Rte. 1 southbound (Chelsea and Boston)	0.61-0.67
CLASS I & II ARTERIALS	**0.36 TO 0.62**
Rte. 1A southbound from the rotary to the first Bell Circle signal (Revere)	0.09 to 0.22
Alewife Brook Pkwy eastbound from Lexington Ave. to the Huron Ave. signal (Cambridge)	0.30
Alewife Brook Pkwy eastbound from Brattle St. to Mt. Auburn St. (Cambridge)	0.36
Rte. 203/Jamaica way westbound from the Arborway pedestrian signal to the Center St. Rotary (Boston)	0.37
Rte. 9 eastbound from Washington St. to Brookline Ave. (Boston)	0.37

*Where multiple communities are listed for a roadway, they are in descending order of severity.

FIGURE 8-8

EXPRESS HIGHWAY TRAVEL SPEED INDEX (EXISTING CONDITIONS) – AM AND PM: CENTRAL AREA

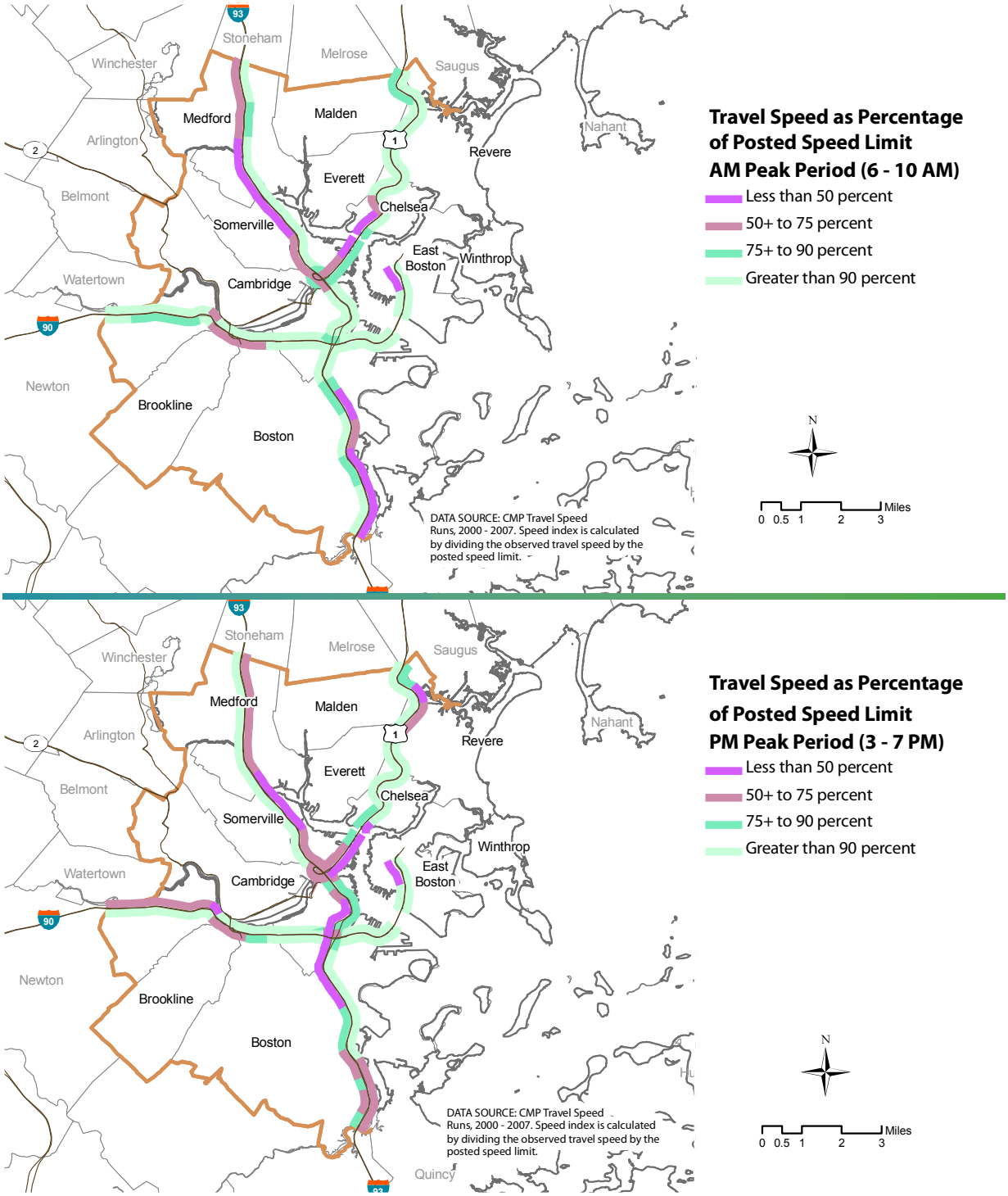
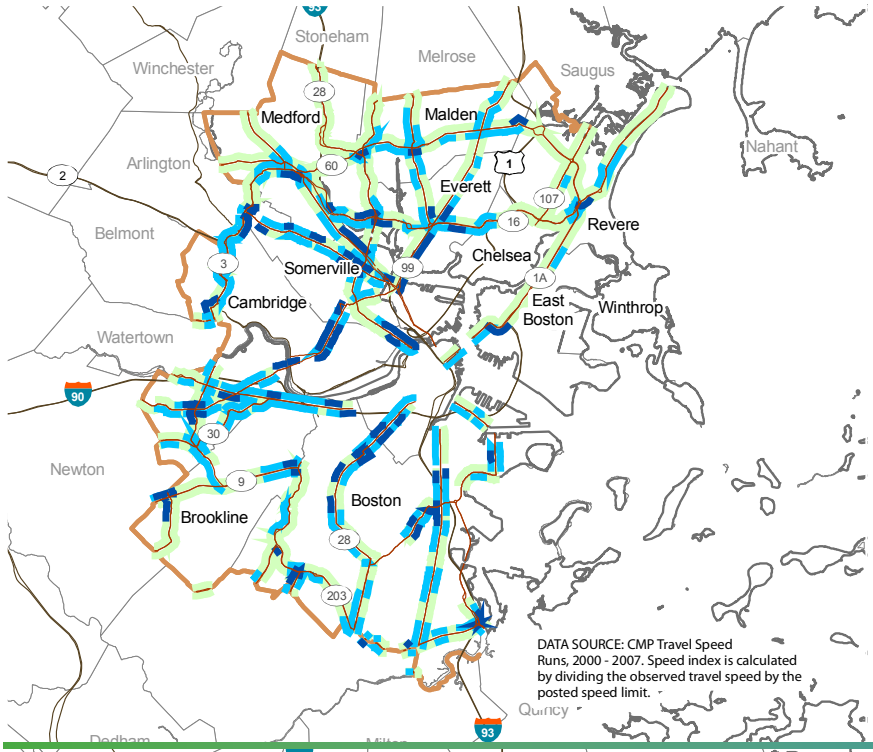


FIGURE 8-9

Arterial Travel Speed Index (Existing Conditions) – AM and PM: Central Area

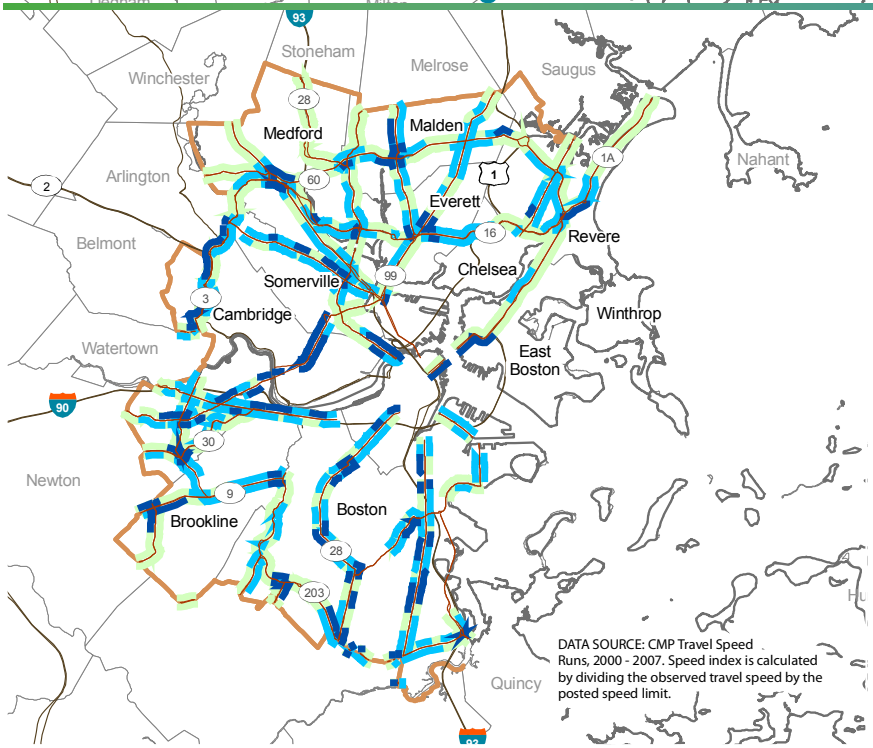


Travel Speed as Percentage of Posted Speed Limit: AM Peak Period (6:30 - 9:30 AM)

- Less than 40 percent
- 40 to 70 percent
- Greater than 70 percent

N

0 0.5 1 2 3 Miles



Travel Speed as Percentage of Posted Speed Limit: PM Peak Period (3:30 - 6:30 PM)

- Less than 40 percent
- 40 to 70 percent
- Greater than 70 percent

N

0 0.5 1 2 3 Miles

TABLE 8-7

Travel Speed Index (from the CMP): Worst Locations* in PM Peak Period

EXPRESS HIGHWAYS	SPEED INDEX
I-93 southbound from Purchase St. to Columbia Rd. (Boston)	0.38 to 0.50
I-93 northbound from the Leverett Connector to Rte. 28 (Somerville, Medford)	0.47 to 0.60
I-93 southbound from the Logan Airport exit to Purchase St. (Boston)	0.63
I-93/Southeast Expressway southbound from Columbia Rd. to Granite Ave. (Boston)	0.47 to 0.78
Rte. 1 northbound (Chelsea and Boston)	0.48 to 0.82
I-90 westbound (Watertown)	0.61 to 0.72
I-90 eastbound at the Allston tolls (Boston)	0.66
CLASS I & II ARTERIALS	**SPEED INDEX**
Rte. 203/Jamaicaway eastbound from the pedestrian signal at Wildwood St. to Norfolk St. (Boston)	0.22
Route 9 from Tully St to Hammond St. (Brookline)	0.23 to 0.30
Rte. 9 westbound from Rte. 1 to Washington St. (Brookline)	0.27 to 0.30
Rte. 203/Morton St. from Harvard St. to Rt. 28/Blue Hill Ave. (Boston)	0.27
Rte. 203/Gallivan Blvd. eastbound from Washington St. to Dorchester Ave. (Boston)	0.31
Rte. 203/Gallivan Blvd. westbound from the I-93 northbound on-ramp to Neponset St. (Boston)	0.31

*Where multiple communities are listed for a roadway, they are in descending order of severity.

Volume-to-Capacity Ratio

The existing volume-to-capacity ratios (V/Cs) of express highways and arterial segments in the Central Area were calculated using the roadways' existing traffic volumes and capacities. The V/C is an indication of the operational quality of a roadway segment. A roadway is reaching capacity as the V/C begins to approach 1.

Table 8-8 and Figures 8-10 and 8-11 present the segments of roadways in the Central Area with the highest V/Cs during the AM peak period, listed in descending order of severity. Table 8-9 and Figures 8-10 and 8-11 present the same information for the PM peak period. Order of severity was determined based on all data points and is therefore not always reflected in the ranges shown in the tables. In these tables and figures, for both express highways and arterials, the AM peak period is from 6:00 AM to 9:00 AM and the PM peak period is from 3:00 PM to 6:00 PM.

TABLE 8-8

Volume-to-Capacity Ratio (V/C): Worst Locations in AM Peak Period, 2008

EXPRESS HIGHWAYS	V/C
I-93/ Central Artery from the Rowes Wharf area to I-90 (Boston)	Greater than 1
Rte. 1 southbound (Chelsea and Boston)	Greater than1
I-93 southbound (Somerville)	0.94 to greater than 1
I-93/Southeast Expressway northbound from the Boston-Milton line to downtown Boston (Boston)	0.89 to greater than 1
ARTERIALS	**V/C**
Rte. 145/Bennington St. from Boston to Winthrop (Boston, Winthrop)	Greater than 1
Rte. 1A (East Boston, Revere)	0.77 to greater than 1
Mystic Valley Pkwy. (Medford)	0.77 to greater than 1
Storrow Dr. (Boston)	0.61 to greater than 1

TABLE 8-9

Volume-to-Capacity Ratio (V/C): Worst Locations in PM Peak Period, 2008

EXPRESS HIGHWAYS	V/C
I-93/Southeast Expressway southbound from downtown Boston to the Boston-Milton line (Boston, Milton)	Greater than 1
I-90 westbound at the intersection with I-93 under the Fort Point Channel (Boston)	Greater than 1
Various segments of northbound I-93 from downtown Boston to the Medford-Somerville line (Boston, Somerville, Medford)	0.98 to greater than 1
I-90 eastbound (East Boston)	0.98
ARTERIALS	**V/C**
Rte. 99/Broadway from Everett to Boston, (Boston, Everett)	0.78 to greater than 1
Storrow Dr. (Boston)	0.78 to greater than 1
Memorial Dr. (Cambridge)	0.80 to greater than 1
Mystic Valley Pkwy. (Medford)	0.78 to greater than 1
Rte. 1A, Boston (Revere)	0.78 to greater than 1

FIGURE 8-10

EXPRESS HIGHWAY VOLUME-TO-CAPACITY RATIO
2008, AM AND PM: CENTRAL AREA

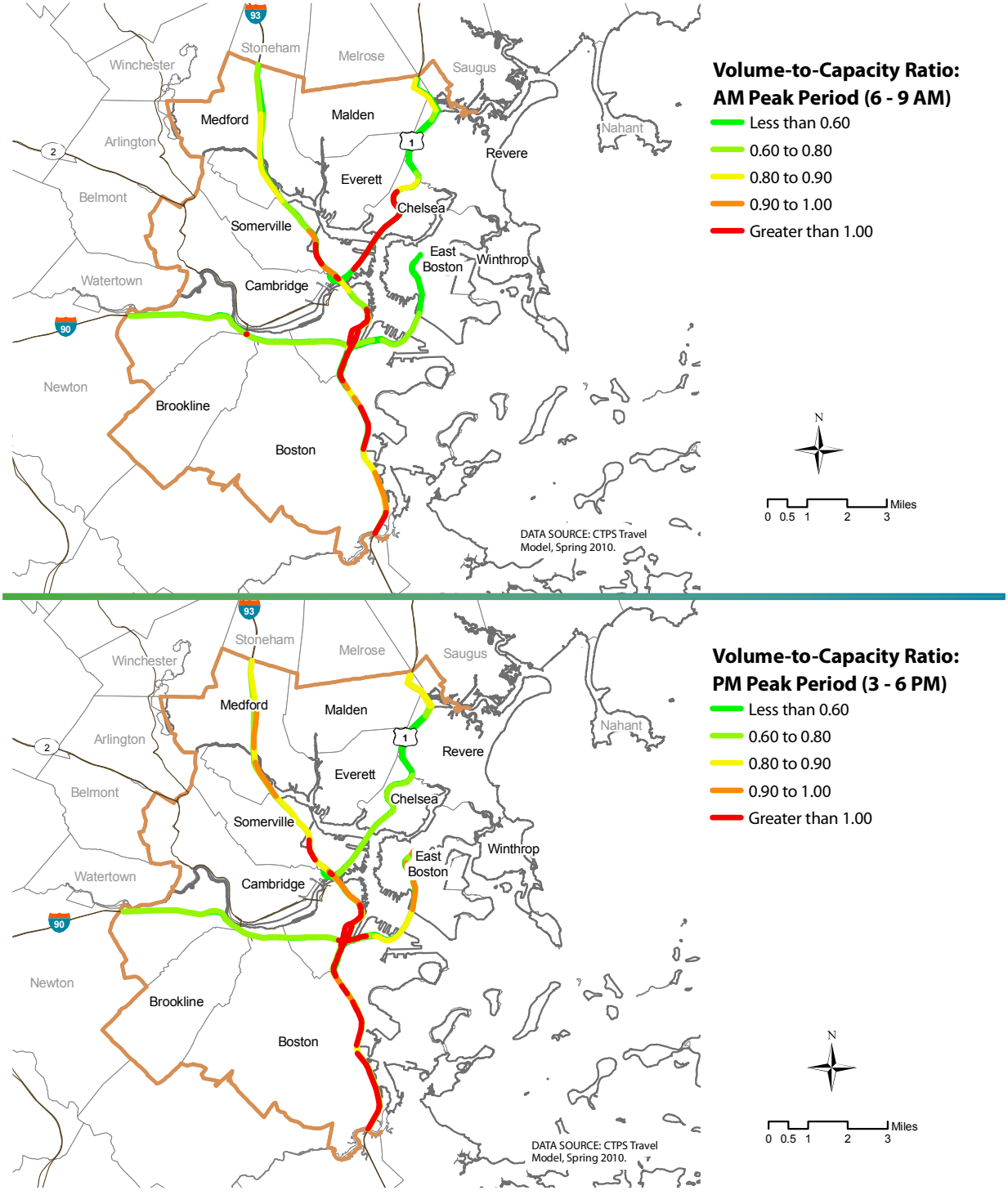
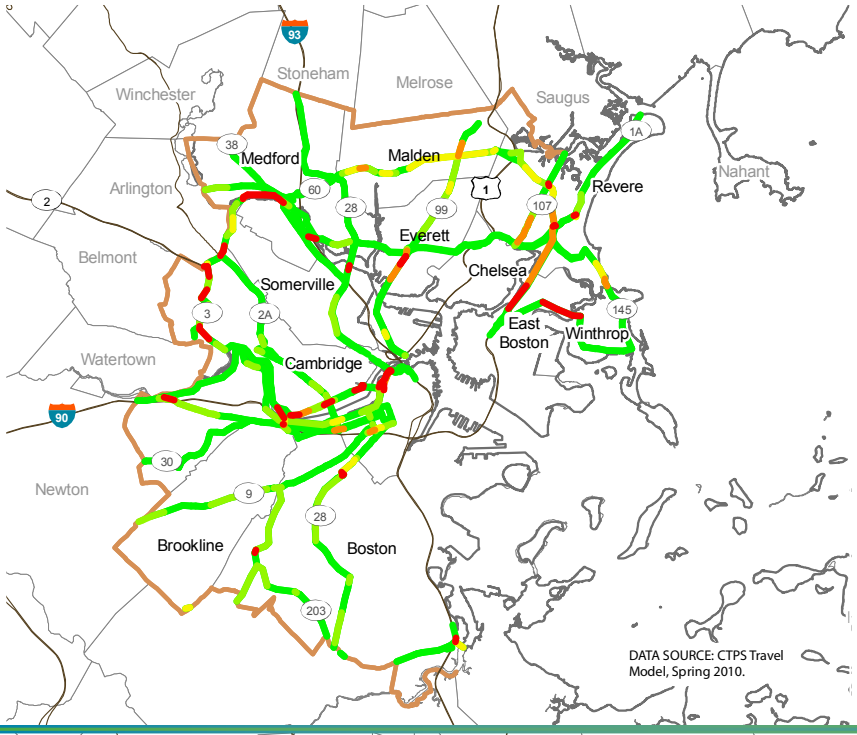


FIGURE 8-11

Arterial Volume-to-Capacity Ratio
2008, AM and PM: Central Area



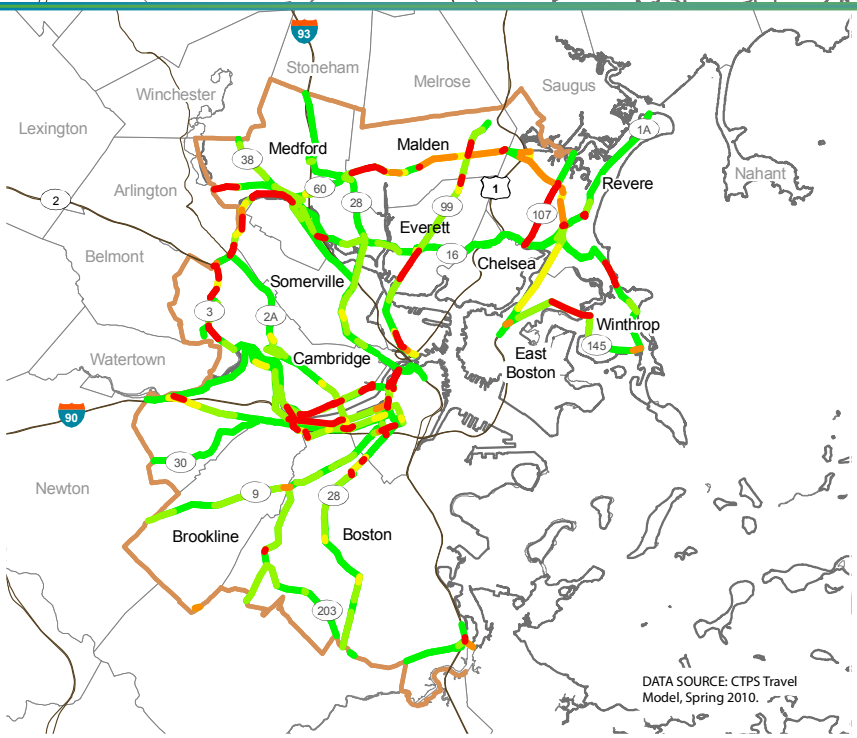
Volume-to-Capacity Ratio: AM Peak Period (6 - 9 AM)

- Less than 0.60
- 0.60 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- Greater than 1.00

NOTE: Value shown is for the **peak direction** on each arterial, based on model output, not field observations.

N

0 0.5 1 2 3 Miles



Volume-to-Capacity Ratio: PM Peak Period (3 - 6 PM)

- Less than 0.60
- 0.60 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- Greater than 1.00

NOTE: Value shown is for the **peak direction** on each arterial, based on model output, not field observations.

N

0 0.5 1 2 3 Miles

In addition, the Boston Region MPO's travel demand model was used to determine V/C for roadways under 2030 No-Build conditions. Table 8-10 and Figures 8-12 and 8-13 present the segments of roadways in the Central Area with the highest AM peak period V/Cs under the 2030 No-Build, again listing them in descending order of severity. Table 8-11 and Figures 8-12 and 8-13 present the same information for the PM peak period. Order of severity was determined based on all data points and is therefore not always reflected in the ranges shown in the tables. In this V/C analysis, arterials are not broken down by classification.

TABLE 8-10

Volume-to-Capacity Ratio (V/C): Worst Locations in AM Peak Period, 2030 No-Build

EXPRESS HIGHWAYS	V/C
I-93/ Central Artery from the Rowes Wharf area to I-90 (Boston)	Greater than 1
I-93/Southeast Expressway northbound from the Boston-Milton line to downtown Boston (Boston)	0.90 to greater than 1
I-93 southbound (Somerville)	0.94 to greater than 1
Rte. 1 (Chelsea, Charlestown)	0.73 to greater than 1
ARTERIALS	**V/C**
Rte. 1A, Revere (East Boston)	0.77 to greater than 1
Memorial Dr. (Cambridge)	0.66 to greater than 1
Storrow Dr., Boston	0.64 to greater than 1
Jamaicaway from the Brookline line to Kelley Circle (Boston)	0.75 to greater than 1

TABLE 8-11

Volume-to-Capacity Ratio (V/C): Worst Locations in PM Peak Period, 2030 No-Build

EXPRESS HIGHWAYS	V/C
I-93/Southeast Expressway southbound from downtown Boston to the Boston-Milton line, (Boston, Milton)	Greater than 1
I-90 westbound at the intersection with I-93 (under the Fort Point Channel) (Boston)	Greater than 1
Various segments of northbound I-93 from downtown Boston to the Medford-Somerville line (Boston, Somerville, Medford)	0.98 to greater than 1
I-93 southbound at the Somerville line (Boston)	Greater than 1
ARTERIALS	**V/C**
Memorial Dr. (Cambridge)	0.95 to greater than 1
Rte. 99/Broadway from Rte. 16 to Boston (Boston, Everett)	0.82 to greater than 1
Storrow Dr. (Boston)	0.77 to greater than 1
Rte. 107 from Rte. 60 to Chelsea (Revere, Chelsea)	0.77 to greater than 1
Mystic Valley Pkwy. (Medford)	0.76 to greater than 1

FIGURE 8-12

Express Highway Volume to Capacity Ratio
2030 No-Build AM and PM Central Area

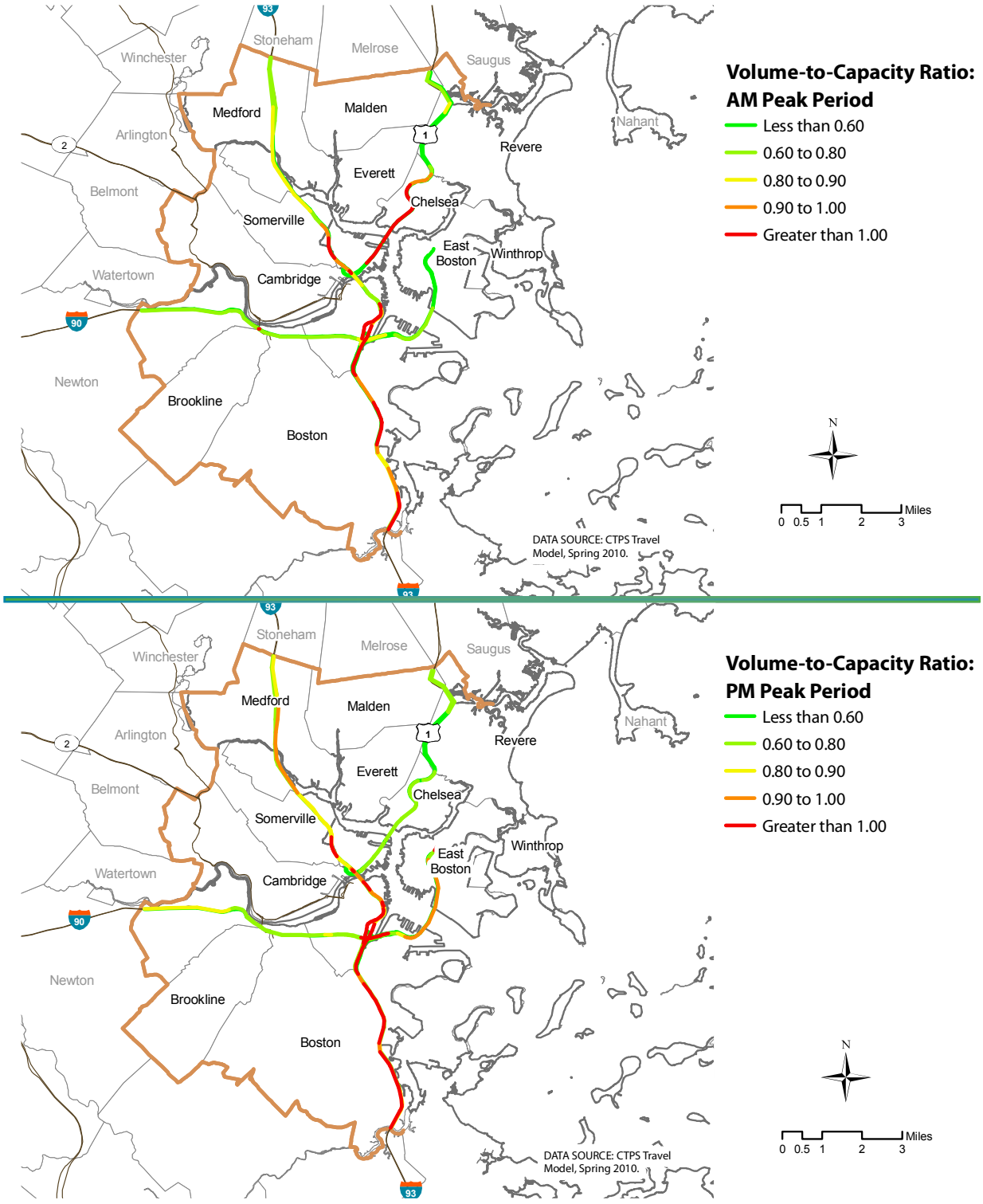
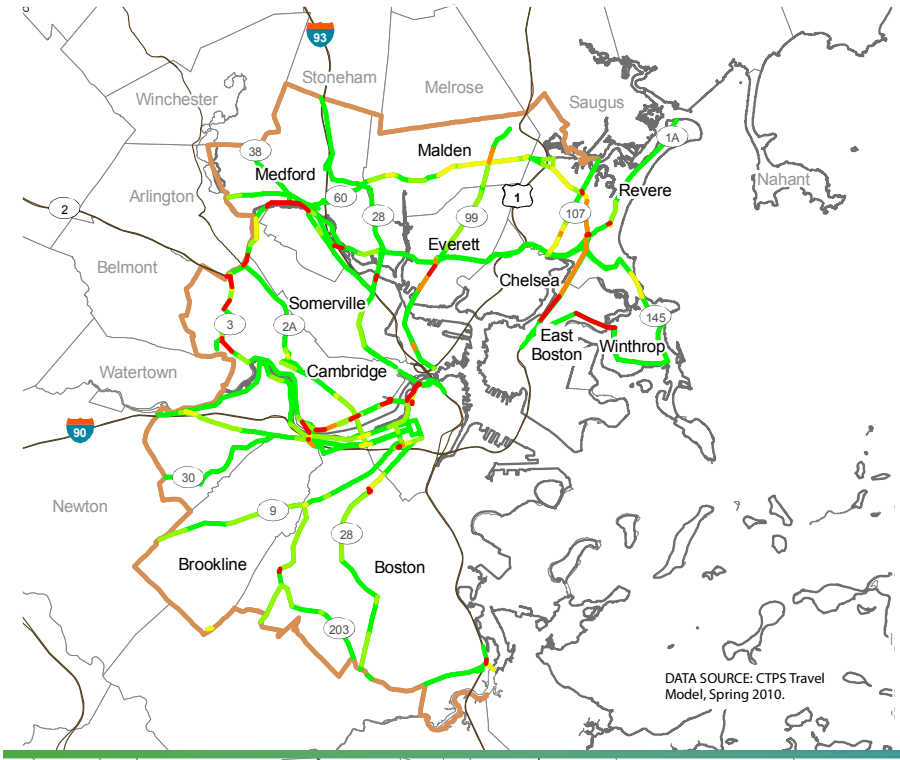


FIGURE 8-13

Arterial Volume to Capacity Ratio
2030 No-Build AM and PM Central Area



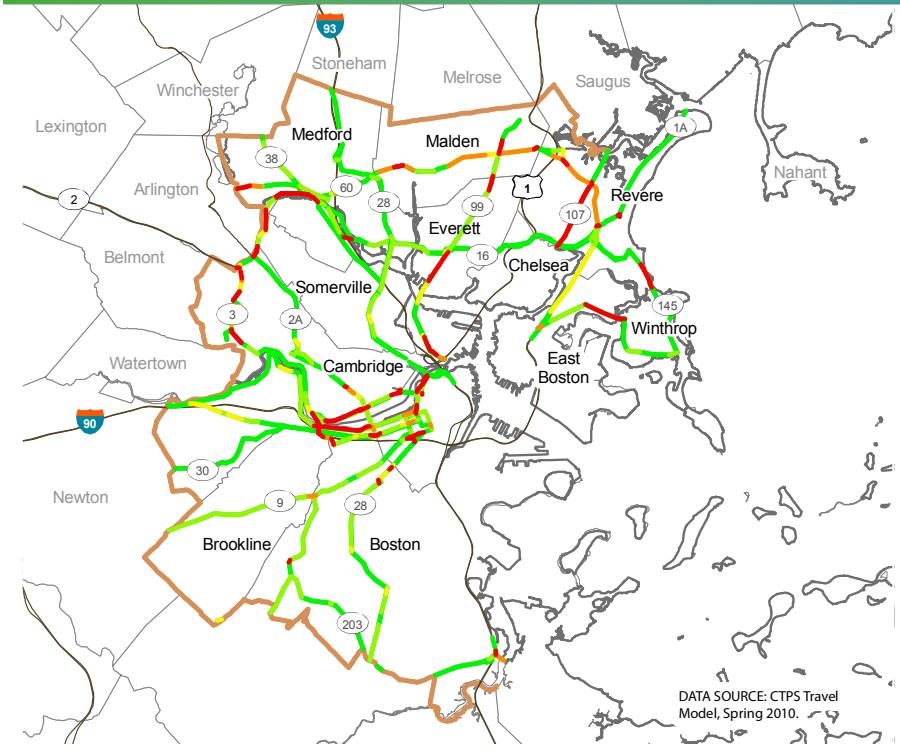
Volume-to-Capacity Ratio:
AM Peak Period

- Less than 0.60
- 0.60 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- Greater than 1.00

NOTE: Value shown is for the **peak direction** on each arterial, based on model output, not field observations.

N

0 0.5 1 2 3 Miles



Volume-to-Capacity Ratio:
PM Peak Period

- Less than 0.60
- 0.60 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- Greater than 1.00

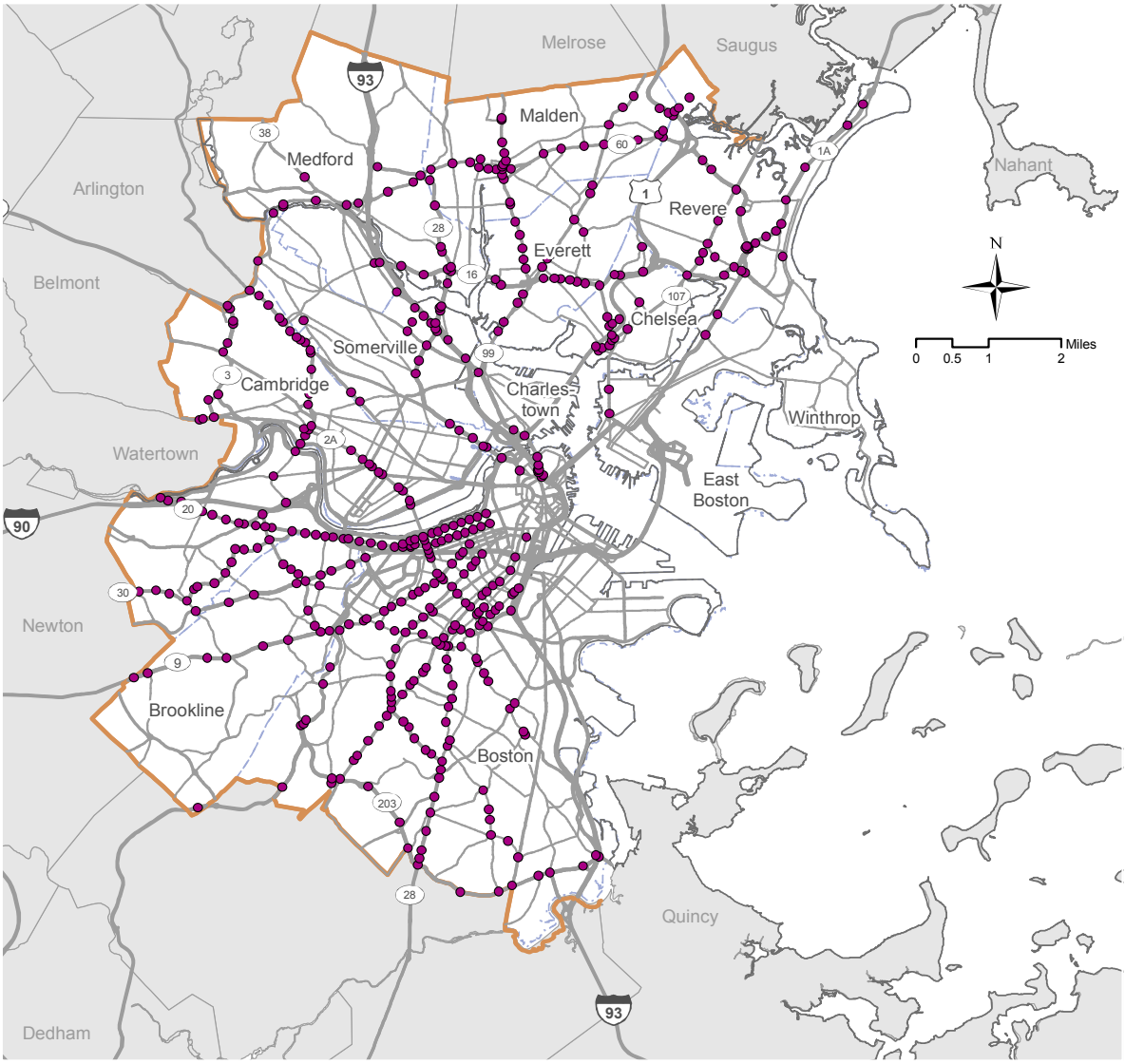
NOTE: Value shown is for the **peak direction** on each arterial, based on model output, not field observations.

N

0 0.5 1 2 3 Miles

FIGURE 8-14

CMP Priority Intersections, Central Area



DATA SOURCE: Boston Region MPO
Congestion Management Program (CMP)

An intersection has been categorized as a "priority intersection" if it meets at least one of the following criteria:
(a) high accident location.
(b) high levels of approach delay greater than 80 seconds per vehicle as monitored through the CMP (all state numbered routes).
(c) identified as such in an MPO study.

- **Priority Intersections**

CMP Priority Intersections

The CMP lists priority intersections. These locations have been derived using a variety of measures. Intersections have been categorized as a priority if they have met at least one of the following criteria – if it is a high accident location, high levels of approach delay greater than 80 seconds per vehicle as monitored through the CMP (all state numbered routes), or has been identified in a MPO study. The Central Area's priority intersections are shown in Figure 8-14 with a list of roadways with clusters of priority intersections as follows:

- Route 1 in Chelsea
- Route 1A in Revere
- Route 2A in Cambridge
- Route 9 in Boston and Brookline
- Route 16 in Chelsea, Everett, Somerville, and Cambridge
- Route 20 in Boston
- Route 28 in Boston and Somerville
- Route 30 (Commonwealth Avenue) in Boston and Brookline
- Route 38 in Woburn
- Route 60 in Revere, Medford and Malden
- Route 99 in Everett
- Route 203/Jamaicaway in Boston
- Route 203 (Morton Street and Gallivan Boulevard) in Boston
- Albany Street in Boston
- Alewife Brook Parkway in Cambridge
- Beacon Street in Boston and Brookline
- Dudley Street in Boston
- Everett Street in Chelsea
- Harvard Street in Brookline
- Huntington Avenue in Boston
- Main Street through Everett, Malden, and Melrose
- Massachusetts Avenue in Cambridge and Boston
- Morrissey Boulevard in Boston

- Mystic Avenue in Somerville
- Storrow Dr./Soldiers Field Road, Boston
- Washington Street in Boston

Many of the clusters of priority intersections coincide with the Class III arterials (as defined above under the CMP Travel Speed Index section) with the worst speed index ratios.

High-Occupancy Vehicle (HOV) Lanes in the Central Area

I-93 North: Southbound HOV and General-Purpose Lanes

The I-93 North HOV lane currently operates between 6:00 AM and 10:00 AM, Monday through Friday, and extends southbound 2.6 miles from a point 0.3 miles south of Exit 31 (Mystic Avenue) in Somerville to a point 0.2 miles south of the Route 1 merge on the Zakim Bridge over the Charles River. The following issues have been observed:

1. Travel times for both the HOV and general-purpose lanes were initially higher in 2002 and 2003 than in subsequent years. As several milestones of the Central Artery/Tunnel (CA/T) Project were achieved, the travel times in the HOV lane decreased dramatically.

2. The opening of the CA/T Project increased the traffic-carrying capacity of the HOV lane in 2004, and since then the HOV lane has had the ability to handle additional growth in HOV volumes.
3. The HOV lane has been 10 to 24 percent more efficient than the general-purpose lanes, as it carries more persons per hour per lane. This efficiency has been increasing over time as more high-occupancy vehicles use the HOV lane.
4. In 2010, the average time saved by using the HOV lane was about five minutes. This met the Massachusetts Department of Environmental Protection (DEP) time-savings threshold, which was established at one minute per mile.[4]

4 The HOV monitoring program is carried out in accordance with Massachusetts Department of Environmental Protection (DEP) regulation 310 CMR 7.37, which calls for samples of travel-time data from the HOV and general-purpose lanes to be collected and reported quarterly. The data are used to monitor compliance with a set threshold for the time savings afforded by the HOV lanes compared to travel in the general-purpose lanes. The DEP time-savings threshold was established at one minute per mile.

Southeast Expressway (I-93): Northbound HOV and General-Purpose Lanes

The Southeast Expressway northbound HOV lane currently operates between 6:00 AM and 10:00 AM. It extends northbound 5.5 miles from a point 0.24 miles north of the Interstate 93/Route 3 merge in Quincy to a point 0.9 miles south of the Columbia Road exit in Dorchester. The following issues have been observed:

1. Travel times in the HOV lane have been increasing gradually since 2002.
2. Travel times in the general-purpose lanes have been leveling off gradually since 2008.
3. The HOV lane is more efficient than the general-purpose lanes, as it carries 70 to 128 percent more persons per hour per lane. It is also more efficient than the HOV lane on I-93 North.
4. The HOV lane is operating near capacity during the peak hour, given the geometry of the HOV merge with the general-purpose traffic at the north end of the lane. From 2006 through 2010, it processed approximately 1,300 vehicles per peak hour.
5. The average time saved by using the HOV lane compared to the general-purpose lanes is more than seven minutes, which meets the Massachusetts Department of Environmental Protection's threshold.

Southeast Expressway (I-93): Southbound HOV and General-Purpose Lanes

The Southeast Expressway southbound HOV lane currently operates between 3:00 PM and 7:00 PM. Due to its contraflow design; it is identical in length and location to its northbound counterpart. The following issues have been observed:

1. Travel times in both the HOV and general-purpose lanes appear to have leveled off since 2006, and they have decreased slightly since 2009.
2. Although vehicle occupancy counts were not conducted for the southbound HOV and general-purpose lanes, it is likely that the HOV lane is more efficient than the general-purpose lanes, as was observed for its northbound counterpart.
3. Although the average travel times in the HOV lane are faster than the average travel times in the general-purpose lanes, the time savings the HOV lane offers do not meet the set of thresholds established by DEP.

Central Area Highway Bottlenecks

Based on the three types of information presented above, the following have been identified as the worst bottlenecks in the Central Area:

TABLE 8-12

Worst Bottleneck Locations

EXPRESS HIGHWAYS	SPEED INDEX	VOLUME TO CAPACITY	PRIORITY INTERSECTIONS
I-93/Southeast Expressway (Milton, Boston, Somerville, Medford)	•	•	
Rte. 1 (Boston and Chelsea)		•	•
I-90 (Boston)		•	
ARTERIALS			
Rte. 1A (Boston, Revere)	•	•	•
Rte. 2A (Cambridge)			•
Rte. 9 (Boston and Brookline)	•		•
Rte. 16 (Chelsea, Everett, Somerville, and Cambridge)			•
Rte. 20 (Boston)			•
Rte. 28 (Boston, Somerville)			•
Rte. 30 (Boston)			•
Rte. 38 (Woburn)			•
Rte. 60 (Revere, Medford, and Malden)			•
Rte. 99 (Everett)		•	•
Rte. 107 (Revere, Chelsea)		•	
Rte. 145/Bennington St. (Boston)		•	
Rte. 203 Jamaicaway, Morton St. and Gallivan Blvd. (Boston)	•	•	•
Albany St. (Boston)			•
Alewife Brook Pkwy (Cambridge)	•		•
Beacon St. (Boston and Brookline)			•
Dudley St. (Boston)			•
Everett St. (Chelsea)			•
Harvard St. (Brookline)			•
Huntington Ave. (Boston)			•
Main St. (Everett, Malden, and Melrose)			•
Massachusetts Ave. (Cambridge and Boston)			•
Memorial Dr. (Cambridge)		•	
Morrisey Blvd. (Boston)			•
Mystic Ave. (Somerville)			•
Mystic Valley Pkwy (Medford)		•	
Storrow Dr./Soldiers Field Rd. (Boston)		•	•
Washington St. (Boston)			•

Transit Mobility Needs Identified by the MBTA for the Central Area

Various factors affect transit mobility, including capacity issues related to vehicle loads, service reliability, infrastructure and/or vehicle condition, and parking

availability. Also affecting mobility is connectivity among modes and with other RTAs, private-carrier services, and TMA shuttles.

Vehicle Load and Service Reliability Issues

The ratio of passengers to seats on a vehicle is an indication of whether or not additional capacity is needed on a rail line or bus route. The MBTA's Service Delivery Policy defines acceptable vehicle loads by mode and by time period. The maximum allowable ratio of riders to seats on buses is 140% during peak travel periods and 100% during the off-peak. For light and heavy rail, the peak and off-peak maximum ratios of riders to seats varies according to the configuration of the various types of cars. For commuter rail, the vehicle load standard is set for peak periods at 110% and for thw off-peak at 100%. For commuter boat, the load standard is set at 100% of seated capacity.

According to the most recent passenger counts available, three of the rapid transit rail lines—Red (Northwest and Southeast Corridors), Blue (Northeast Corridor), and Orange (North and Southwest Corridors) pass their respective vehicle load standards; however, the Green Line (West Corridor) fails the load standard on the B, C, and D Branches. Recent data also show that all of the commuter rail lines and commuter boat pass the vehicle load standard.

Bus routes with the highest ridership that operate within the Central Area are listed below. These represent ten of the fifteen MBTA Key Bus Routes, which have the highest ridership in the system:

- Silver Line bus rapid transit - 29,600 average daily boardings (Silver Line Washington Street, 14,700; Silver Line Waterfront, 14,900)
- Route 66 (Harvard Square - Dudley Station) - 14,700 average daily boardings
- Route 39 (Forest Hills Station - Back Bay Sta.) - 14,400 average daily boardings
- Route 1 (Harvard - Dudley Station) - 12,300 average daily boardings
- Route 57 (Watertown Square - Kenmore Square) - 11,500 average daily boardings
- Route 23 (Ashmont Station - Ruggles Station) - 11,100 average daily boardings
- Route 28 (Mattapan Station - Ruggles Station) - 10,600 average daily boardings
- Route 111 (Woodlawn - Haymarket Station) - 8,700 average daily boardings
- Route 22 (Ashmont Station - Ruggles Station) - 7,000 average daily boardings

- Route 15 (Kane Square - Ruggles Station) - 6,900 average daily boardings

Recent ridership counts for buses show that 12% of all bus and bus rapid transit routes that provide service in the Central Area fail the vehicle load standard. In addition, data collected during October, 2010 show that 87% fail the schedule adherence standard. Bus schedule adherence can be affected by various factors, most notably the level of traffic on the roadway. The MBTA now uses various types of monitoring systems, including real-time vehicle locators and electronic passenger counters to generate data that can be used to improve service reliability.

A discussion of the way in which vehicle load and schedule adherence are measured, as well as the specific data for each route can be found in the individual radial corridor chapters. Also presented there is data on the number and percent of scheduled trips operated during October, 2010 for each route. By radial corridor, the following bus routes operate in the Central Area:

- Northeast Corridor: Routes 110, 111, 112, 114, 116, 117, 119, 120, 121, 411, 424, 426, 428, 429, 430, 431, 434, 435, 436, 439, 441, 442, 448, 449, 450, 451, 455, 456, 459, 465, and 468
- North Corridor: Routes 90, 92, 93, 94, 95, 96, 97, 99, 100, 101, 104, 105, 106, 108, 109, 110, 112, 131, 132, 134, 136, 137, 325, 326, 350, 351, 352, 354, 355, 411, 426, 428, and 430
- Northwest Corridor: Routes 1, 47, 52, 57, 59, 62, 64, 66, 67, 68, 69, 70/70A, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 83, 84, 85, 86, 87, 88, 89, 90, 91, 350, 351, 502, 504, 505, 553, 554, 556, 558, and CT2
- West Corridor: Routes 1, 8, 14, 15, 19, 22, 23, 28, 29, 39, 41, 43, 44, 45, 47, 48, 51, 52, 55, 57, 59, 60, 64, 65, 66, 70, 86, 170, 500, 501, 502, 503, 504, 505, 553, 554, 555, 556, 558, CT1, and CT2
- Southwest Corridor: Routes SL5, 1, 8, 14, 15, 16, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34/34E, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 50, 51, 52, 66, 170, 171, CT1, CT3, and SL5
- Southeast Corridor: Routes 4, 5, 7, 8, 9, 10, 11, 16, 17, 18, 19, 22, 23, 28, 201, 202, 210, 211, 212, 214, 215, 216, 217, 220, 221, 222, 225, 230, 236, 238, 240, 245, 448, 449, 459, SL1, and SL2

The size and condition of the fleet also contribute to service reliability and capacity. A sufficient number of vehicles must be available to operate the regular service with

spare vehicles to cover breakdowns or other unusual events. The generally accepted industry standard for spare vehicles is 20 percent of the active bus fleet. Currently, the bus spare ratio systemwide meet this spare ratio standard. The current bus fleet is fairly new and in good condition, as is indicated by the measure of mean miles between vehicle failures. The MBTA's November 2010 ScoreCard (which reports on performance during the months of June through October 2010) shows the mean miles between failures for the bus fleet to be 12,437 in October. This greatly exceeded the goal of 6,000.

The November 2010 ScoreCard also shows whether the Red Line (operating in the Northwest and Southeast Corridors), Blue Line (operating in the Northeast Corridor), and Orange Line (operating in the North and Southwest Corridors) meet the MBTA's heavy rail schedule adherence standard that requires 95 percent of all trips to be within 1.5 headways over the entire service day. The Red Line did not pass the standard in July and August, due to the need to perform signal and track maintenance at Alewife Station. However, the Blue and Orange lines passed the standard for all months reported in the ScoreCard. Schedule adherence for the Green Line (which operates in the West and Northwest Corridors) is not reported in the ScoreCard due to the use of different train tracking technology. However, all branches of the Green Line passed the MBTA's light rail schedule adherence standard. For more in-depth discussion, see the individual radial corridor chapters.

The average daily vehicle availability can also affect service reliability. The November ScoreCard shows that the Orange Line did not meet its required vehicle levels during two of the months reported, and the Red Line just barely met its required levels. Both of these fleets are reaching the end of their useful lives and are in need of replacement. The Blue Line, which has all new cars, and the Green Line, which has some newer and some older cars, both exceeded the required levels. The Blue Line exceeded its goal for mean miles between failures for all months reported in the ScoreCard, but the Red, Orange, and Green Lines fell short of their goals during some months.

The ScoreCard shows that, with the exception of the Fairmount Line, none of the commuter rail lines passed the schedule adherence standard, which requires that 95% of all trips departing and arriving at terminals be within 5 minutes of the scheduled departure and arrival times. Systemwide, for locomotives, the average daily vehicle availability meets the minimum requirement to operate the scheduled service, and the mean miles between failures are well below acceptable levels (4,705 vs. the goal of 10,200). The MBTA is

currently in the process of procuring 75 new bi-level commuter rail coaches and 22 locomotives. This should improve capacity and reliability in the Central Area and systemwide. According to the 2008 MBTA Service Plan, on-time performance for all commuter boats and ferries ranged from 97 to 100 percent.

Circumferential Travel Issues

The Central Area is home to many major trip generators, including medical, educational, and cultural institutions, densely populated residential areas, and high-density employment and retail. Circumferential travel in the area using the rapid transit system is constrained by the hub-and-spoke nature of the existing network. To make a trip between the spokes using rapid transit, a rider must travel through the congested central subway system, and travel back out to reach the final destination. The radial nature of the MBTA system works well for commuters who live in the Central Area and work in Boston Proper. However, as the region has grown, particularly in suburban areas, demand has increased for travel to and between areas outside of Boston Proper.

Currently, the following bus routes provide circumferential connections within the Central Area. Some act as feeder services to the rapid transit system and others provide connections between radial rapid transit lines:

- Route 8: Harbor Point/UMass - Kenmore Station
- Route 10: City Point - Copley Square
- Route 11: City Point - Downtown via Bayview
- Route 16: Forest Hills Station - U Mass.
- Route 19: Fields Corner Station - Kenmore Station
- Route 21: Ashmont Station - Forest Hills Station
- Route 22: Ashmont Station - Ruggles Station via Jackson
- Route 27: Mattapan Station - Ashmont Station
- Route 31: Mattapan Station - Forest Hills Station
- Route 41: Centre & Elliot Streets - JFK/UMass Station
- Route 47: Central Square - Broadway Station
- Route 51: Cleveland Circle - Forest Hills Station
- Route 65: Brighton Center - Kenmore Station
- Route 66: Harvard Square- Dudley Station via Brookline
- Route 86: Sullivan Station - Cleveland Circle
- Route 96: Medford Square - Bennett St Alley via George
- Route 101: Malden Station - Sullivan Station

- Route 108: Linden Square - Wellington Station via Malden
- Route 112: Wellington Station - Wood Island Station
- Route 411: Granada Highlands - Malden Ctr. Station
- Route 430: Saugus, Appleton Street - Malden Ctr. Station
- Route CT1: Central Square - South End Medical Area
- Route CT2: Sullivan Square Station - Ruggles Station
- Route CT3: Longwood Medical Area - Andrew Station

Additional circumferential services are needed to provide rapid and direct connections between activity centers in the Central Area.

Mobility Issues Identified in the Program for Mass Transportation (PMT)

The MBTA's Program for Mass Transportation, approved in December 2009, provides information on current and proposed transit needs. Some of the transit needs and other issues regarding mobility in the Central Area are as follows:

Capacity Issues

Based on projections in the PMT, investments will be needed to ensure sufficient capacity is available to serve current and projected travel demand.

- Although the MBTA currently operates some circumferential bus connections between rapid transit spokes, buses must compete with cars on increasingly congested urban streets, reducing the appeal of these services. More frequent, rapid, and through-routed connections would greatly enhance circumferential mobility, particularly between the following Central Area activity centers: Logan Airport, Bellingham Square, Wellington Station, Sullivan Station, Lechmere Station, Kendall Station, Harvard Station, Allston Landing, BU/Kenmore Station, Yawkey Station, Fenway Station, the Longwood Medical and Academic Area, Ruggles Station, Dudley Station, Uphams Corner, and JFK/UMass Station.
- Transit travel to the business districts in Cambridge—especially near Kendall and Harvard Squares—is currently difficult for East Boston and North Shore residents. In addition, Cambridge residents do not have direct rapid transit access to the northern part of the financial district near State and Aquarium Stations on the Blue Line.
- Densely developed areas in Somerville currently generate high trip volumes to Cambridge and Boston. In addition, trip volumes between Somerville and

Cambridge are projected to increase substantially. Taken together, these expose a gap in rapid transit service in the Central Area.

- Very densely populated areas in Chelsea, which currently generate significant numbers of trips into the urban core, do not have frequent rapid transit access within a reasonable walking distance.
- Based on projections in the PMT, investments will be needed to ensure sufficient capacity is available to serve current and projected travel demand. Malden, in particular, currently has the fifth-highest number of intracity trips and is projected to have the fifth-largest increase in trips within a single municipality in the future. However, its mode share is comparatively low.

- Medford currently displays high trip volumes to Somerville and Boston; however these trips are not served by rapid transit.
- Very densely populated areas in Everett, which currently generate significant trips into the urban core do not have access to rapid transit service.
- A major commercial and residential development at Assembly Square could create burdens for an already congested area highway system.
- Currently, travel by MBTA between the Back Bay, Roxbury, Fenway, Brookline, and Newton to Logan Airport, the Boston Convention and Exhibition Center, and the rapidly developing South Boston Waterfront is a "three-seat ride." This negatively impacts the convention-dependent hospitality industry, as well as severely inconveniencing air travelers, workers, and residents.
- The lack of a direct connection between North and South Stations makes many types of trips cumbersome using transit. North-side commuter rail users need better direct access to the Back Bay (and the Ruggles area and Longwood Medical and Academic Area). Commuters on the south-side lines currently must transfer to travel via rapid transit from South Station to Government Center and areas further north in Boston.
- The Fenway/Longwood Medical and Academic Area is both a prominent tourist/cultural destination and a growing center for employment in the Boston region. Congestion of the transportation system in this area constrains growth and economic development potential.

- By 2030 projected growth in demand on 25 bus routes may cause crowding levels that would require additional service. These are Routes 1, 15, 19, 21, 22, 28, 37, 40, 43, 47, 64, 65, 66, 68, 71, 73, 77, 86, 87, 89, 110, 111, 117, CT1, and CT3
- Very densely populated areas of Roxbury and Dorchester are currently served by MBTA bus Routes 23 and 28. These heavily used routes terminate at Ruggles Station on the Orange Line, where large numbers of riders transfer in order to travel to Boston Proper. The neighborhoods served are not within a reasonable walking distance (one-fourth of a mile) of conventional rapid transit services, the routes are long and unreliable, and Route 23 has difficulty meeting demand since it uses 40-foot buses in mixed traffic. MassDOT is currently conducting the Roxbury/Dorchester/Mattapan Study that will look at issues along this corridor.
- Bus Routes 39 and 57 are very heavily-used Key Routes.
- Traffic congestion around Alewife Station increases the running times and reduces the reliability of bus routes that serve the station.
- The Orange Line is currently overcrowded during peak hours between Downtown Crossing and North Station.
- The Green Line Central Subway is currently operating at capacity, constraining the ability of the system to meet growth in demand for service In addition, by 2030 ridership demand on the Green Line's surface branches, as well as in the Central Subway, is projected to exceed capacity if two-car trains are still in use.
- Harvard and Boston Universities are planning major development adjacent to the Worcester commuter rail line.
- Many of the commuter rail trains that pass through Ruggles Station cannot stop there, because one of the three tracks does not have a platform.
- Track capacity at South Station limits service expansion. MassDOT has received $32.5 million from the Federal Railroad Administration for planning and environmental review of South Station expansion.

Transit Station Parking Issues

- The current park and ride inventory shows that the following stations are utilized at 85% of capacity or greater:
  1. Blue Line (Wonderland)
  2. Orange Line (Oak Grove, Malden, Wellington, Sullivan Square, Forest Hills)
  3. Red Line (Alewife, Savin Hill)
  4. Green Line (Lechmere)
- For some customers, access to rail services is constrained by the lack of bicycle parking.

Freight Mobility Issues

Transport of Hazardous Materials by Trucks

There is a long-standing prohibition against trucks carrying hazardous cargoes traveling in tunnels. The expressway segments impacted by this prohibition include Interstate 90 from the Prudential Center to Logan Airport, Interstate 93 through the Tip O'Neill Tunnel, including the Zakim Bridge, and Route 1 passing under City Square in Charlestown and over the Tobin Bridge. The process of establishing alternate routes involves federal, state, and municipal regulations, and the alternate route system is undergoing review as of this writing. The route designation that emerges from this process can have a material impact on the costs and efficiencies of regional fuel transportation. Restrictions have an effect on regional trucking patterns.

Vertical Clearance of Railroad Bridges

The desired vertical clearance for bridges over rail lines is 20 feet 8 inches. This allows double-stack trains to operate on the tracks. Of the 160 bridges over rail lines in the corridor, 146 (91%) do not meet this desired height.

"Last Mile" Connections

Massachusetts's seaports, like most other older seaports, have difficulty moving freight between their facility and major highways and rail lines. Interposed are districts of local or residential streets. Freight trains do not currently directly access the Port of Boston at Conley Terminal.

Overweight-truck Routes

The 2007 Boston Region Freight Study found that there is a lack of overweight-truck routes in the Port of Boston area. Containers often arrive at the port exceeding the weight allowed on roads in the region. In order to travel on the roads, the containers must be reconfigured to a lower weight. Overweight truck routes serving the port will improve the efficiency of freight operations, as shippers would save time and be able to use fewer trucks to move the same amount of freight.

Relocation of CSX Terminal Facility

MassDOT and CSX recently announced an agreement to relocate and consolidate the Beacon Park intermodal yard, in conjunction with planning to provide second generation (20'8") double stack capability between Worcester and the New York State border. This agreement is likely to enhance freight rail opportunities to Worcester with expanded passenger rail between Worcester and Boston.

Massport Feasibility Study

Massport has a strong interest in improving existing access and preserving future access to Moran Terminal for both rail and truck. They recently completed a feasibility study for rail access and a truck haul road along the Mystic Wharf Branch corridor in Charlestown. If Massport were to move forward with a haul road/rail corridor concept, a number of additional steps would be required before a preferred alternative could be selected and designed. It would also have to coordinate with potential plans for highway improvements for Rutherford Avenue and Sullivan Square.

Air Freight Land Use and Access

Preserving sites and developable space for air cargo warehousing and freight-forwarding facilities in South Boston and along Route 1 and 1A is a top priority for the air cargo industry. Landside congestion is a threat to restrict air freight activity at Logan International Airport.

Bicycle and Pedestrian Mobility Issues

According to the Regional Bicycle Plan, 66% of all transportation trips in the region are under five miles. Thus, there is potential to increase the percentage of short trip by bicycle. However, in order for more trips by bicycle to occur, users need safe access. According to the Regional Bicycle Plan, 76% of respondents to MAPC's bicycle survey rated the bicycling conditions in their community as "fair" or "poor" and 45% indicated that they would bicycle more often if provided with a safer route as their top response.

Currently, gaps in the Central Area's bicycle network limit users' ability to safely connect to their destinations. However, in the last several years, the City of Boston has begun to aggressively address the needs of bicyclists. Initiatives include bicycle lanes, bicycle parking, a bicycle suitability map, and plans for a bicycle sharing program.

There are bicycle corridors into Boston from the southwest, west, and northwest that provide access to downtown, however, the connections from the southeast, north and northeast remain weak. In addition, there are limited connections between corridors that serve as barriers to circumferential travel. The gaps in the Central Area's bicycle network limit users from safely connecting to trails in adjacent corridors or to transit and commuter rail stations.

Although providing bicycle parking at stations and racks on buses encourage riders to access transit services by bicycle, poor or unsafe access to stations can limit their utilization.

Currently, there is very good bicycle access to transit stations on the north side of the Red Line, south side of the Orange Line, and some branches on the Green Line. The Minuteman Bikeway, Somerville Community Path, and bicycle lanes provide access to Red Line Stations, the Southwest Corridor Trail and bicycle lanes provide access to Orange Line Stations, and the Emerald Necklace Paths and bicycle lanes provide access to Green Line Stations. However, there is poor bicycle access to transit stations on the south side of the Red Line, north side of the Orange Line, and most of the Blue Line. There are no on-road or off-road bicycle accommodations to the south side of the Red Line and the north side of the Orange Line of the rapid transit system; few accommodations exist along the entire Blue Line.

The Central Area has an extensive pedestrian network, and it varies between good to very good sidewalk coverage. Sidewalk coverage in the Central Area ranges between 71% coverage in Revere to 96% coverage in South Dorchester. Yet, there are still some gaps in the pedestrian network that limit users from accessing activity generators, including transit stations, schools, recreation destinations, elderly services, and commercial areas. The Central Area has very good pedestrian access to most rapid transit stations, but contains a few stations with poor pedestrian access, including JFK/UMass in Dorchester and Sullivan Square in Somerville. Some of the issues limiting pedestrian access at stations are associated with sidewalks, crosswalks, and station signage.

Safety Issues

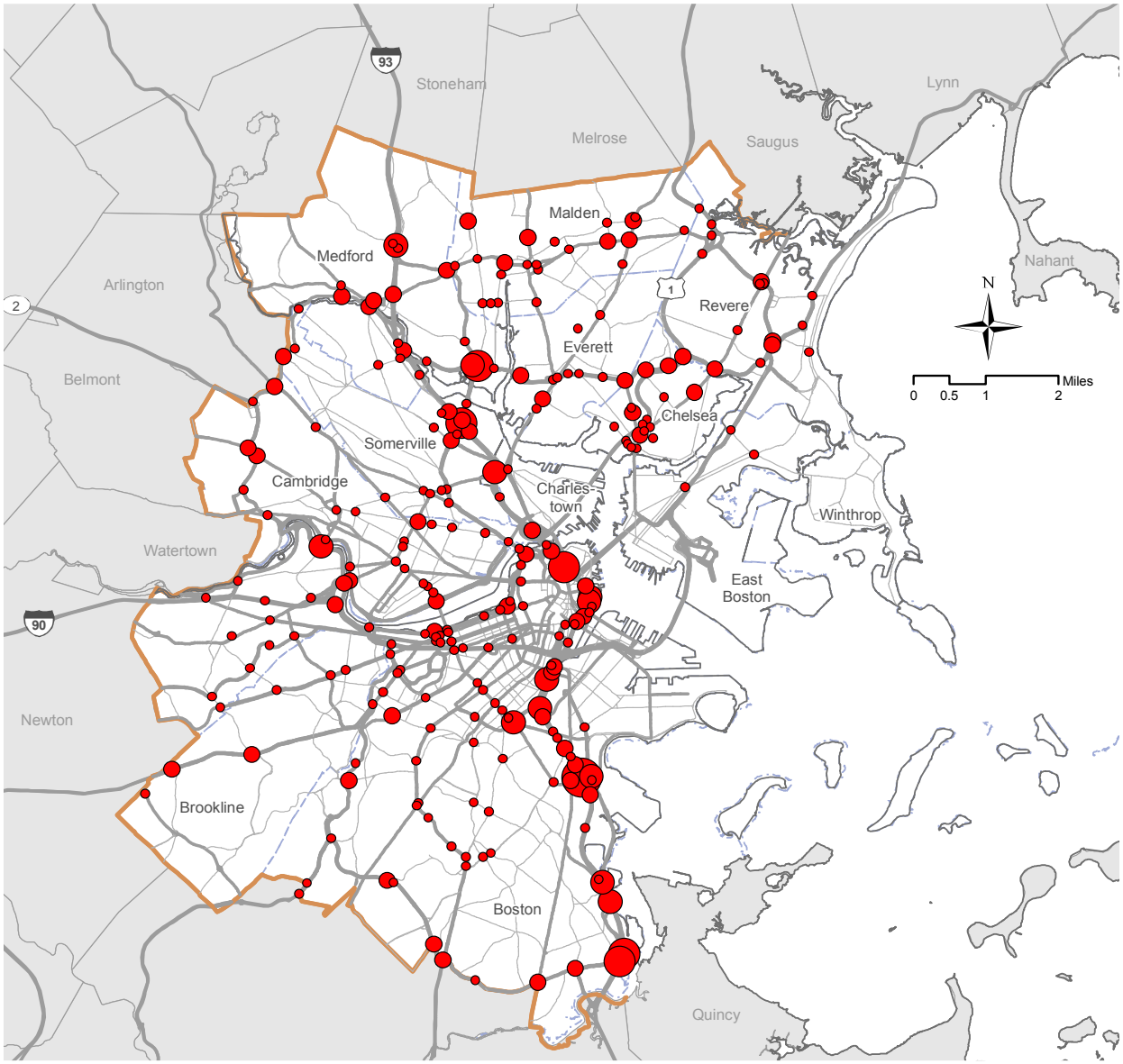
MassDOT identifies "crash clusters" based on crash reports provided by its Registry of Motor Vehicles. The top 5 percent of the clusters were ranked based on the sum of the Equivalent Property Damage Only (EPDO) values of the crashes within the clusters. EPDO values are calculated by giving a crash a 10 if it involves a fatality, a 5 if a personal injury is involved, and a 1 if the crash results in property damage only. MassDOT applies a spatial algorithm to generate the clusters. EPDO values are used by the MPO in selecting locations for safety-based studies and in the LRTP and TIP project selection process.

Figure 8-15 identifies the top crash cluster locations in the Central Area. It shows that the locations in this corridor with the highest EPDO values are located on Interstate 93. Specifically, the locations with the highest EPDO values (shown in parentheses below) are:

- Interstate 93 at Columbia Road, Boston (697)
- Interstate 93 at Neponset Avenue and Gallivan Boulevard, Boston (450)
- Interstate 93 near ramp to Route 3A, Boston (388)
- North Washington Street at Interstate 93 (Ramp to Sumner Tunnel), Boston (357)
- Interstate 93 at Route 28 (Fellsway), Somerville (335)

FIGURE 8-15

Top Five Percent of Crash Cluster Locations – Central Area



DATA SOURCE: MassDOT Crash Clusters
The top 5% crash cluster locations were selected based on their Equivalent Property Damage Only (EPDO) values. EPDO is used to determine the severity of each crash cluster location. EPDO is calculated for each cluster by assigning a value of 10 if a crash involves a fatality, a 5 if a crash involves a injury, and a 1 if a crash results in property damage only. The centroid point for each of the clusters was determined and is used to display the EPDO data on this map.

Top 5 Percent Crash Cluster Locations (EPDO Values)

- 100 or less
- 101 to 200
- 201 to 300
- 301 to 500
- Greater than 500

Environmental Issues

Figures 8-16 through 8-18 provide an overview of environmental issues in the Central Area. They include:

- Department of Environmental Protection–designated wetlands
- FEMA flood zones
- Public water supplies
- Surface Water Protection Areas
- Natural Heritage and Endangered Species Program Priority Habitats
- Protected open space

The Central Area has no Areas of Critical Environmental Concern (ACEC).

The locations of projects being considered for inclusion in the LRTP are overlaid on these environmental constraint maps. This information is then used during the project selection process. These environmental constraints are further addressed during project design and mitigation.

Transportation Equity Issues The MPO's transportation equity program considers the needs of persons in environmental justice areas. The MPO defines these areas as those that have both a population over 50% minority and a median household income below 60% of the region's median income (at or below $33,480). The environmental justice areas located in the Central Area include parts of the Boston neighborhoods of Allston-Brighton, Charlestown, Chinatown, Dorchester, East Boston, Fenway, Jamaica Plain, Roxbury, South Boston, and the South End, and parts of the municipalities of Cambridge, Chelsea, Everett, Malden, Medford, Revere, and Somerville. MPO staff meet with social service and community contacts and conduct surveys to identify needs within these environmental justice areas. Table 8-13 outlines issues and needs and suggested responses identified by contacts in the environmental justice areas in the Central Area.

FIGURE 8-16

DEP Wetlands/FEMA Flood Zones - Central Area

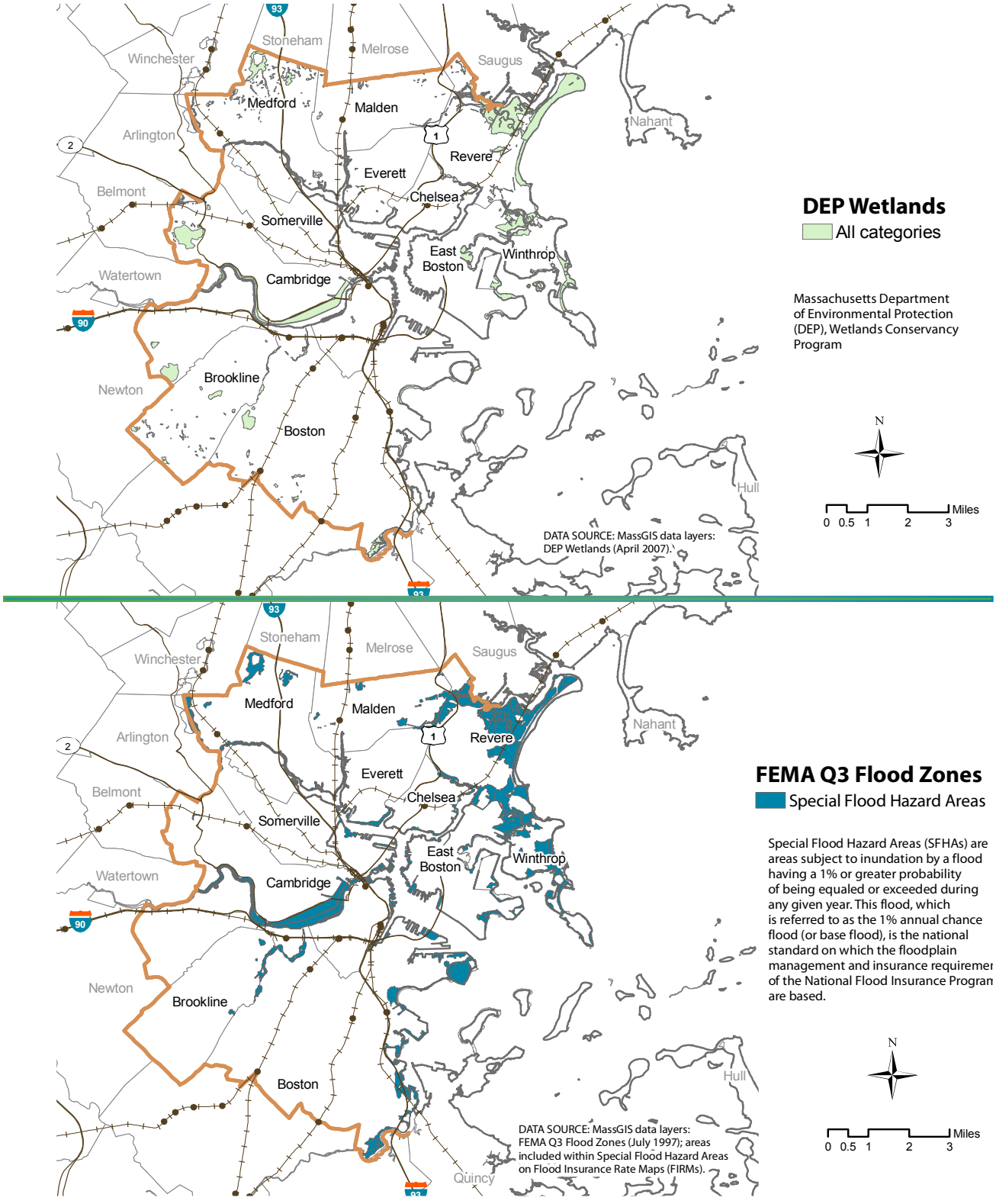


FIGURE 8-17

Public Water Supply/Surface Water Protection Areas - Central Area

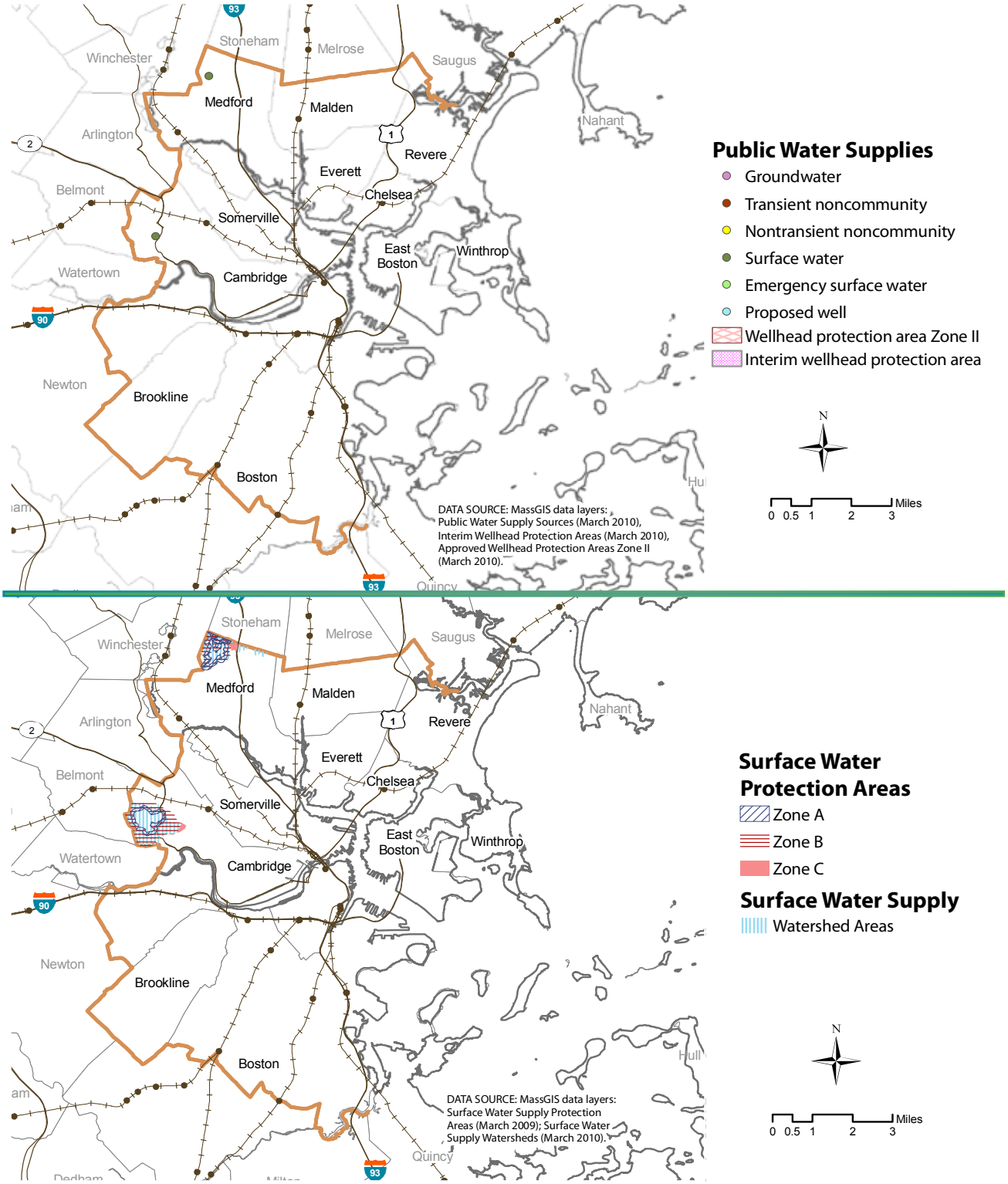
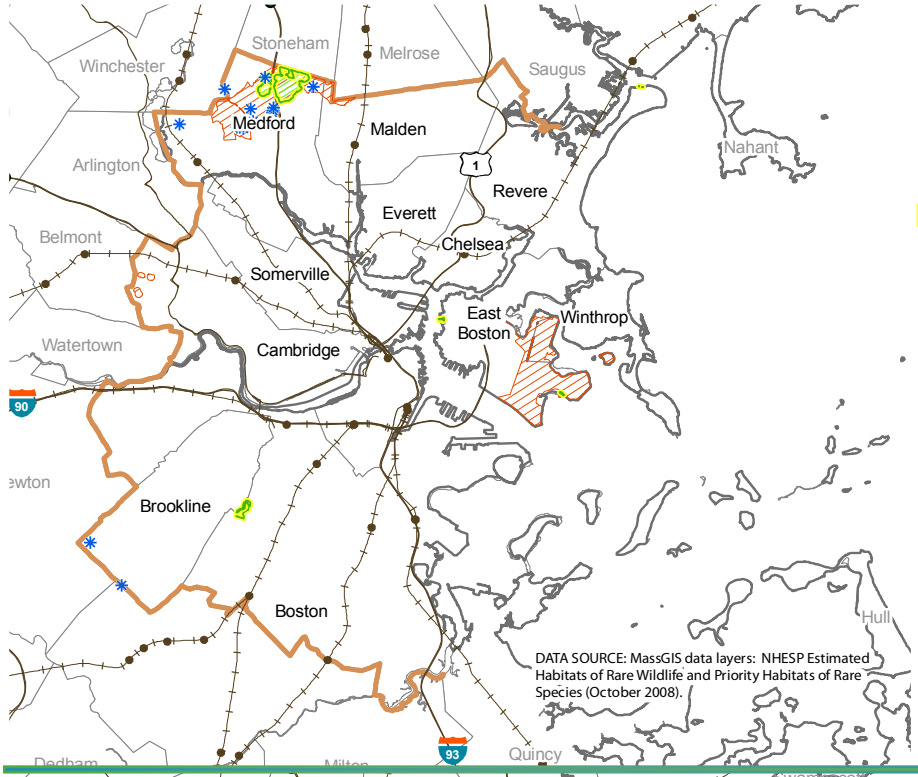


FIGURE 8-18

NHESP Habitats/Protected Open Space - Central Area



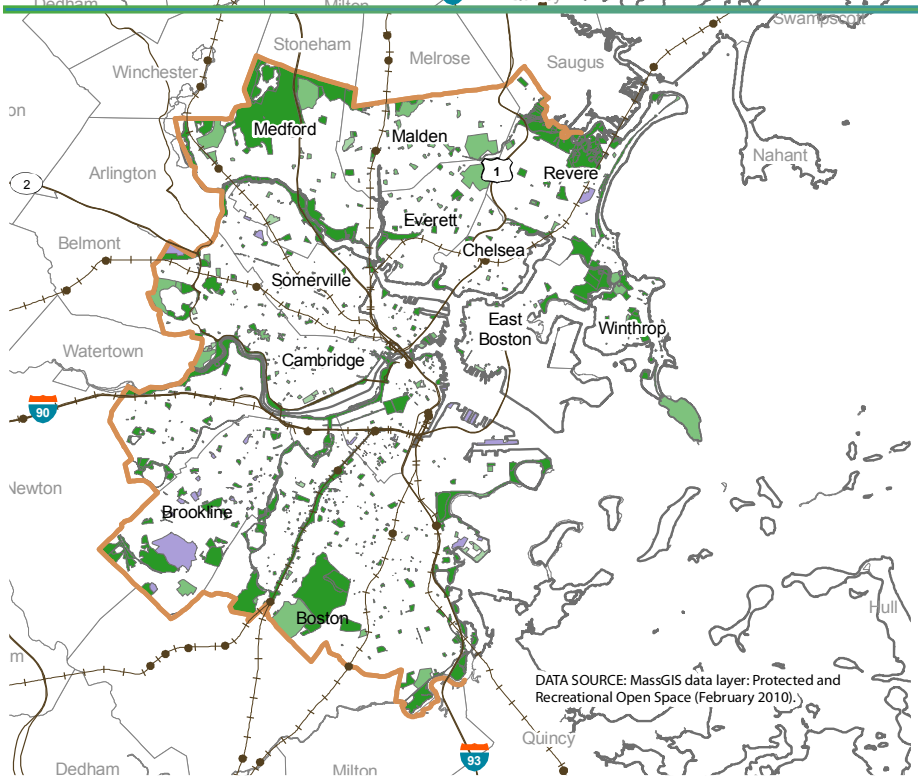


TABLE 8-13

Identified Transportation Equity Issues

COMMUNITY	REPORTED ISSUES	POSSIBLE SOLUTIONS*
Dorchester	Pedestrians and bicyclists need a safer environment and better infrastructure. Traffic calming and complete streets design principles would help. Traffic speeds are too fast on neighborhood streets.	
Dorchester	Kosciuszko Circle, near I-93 and Columbia Rd., is dangerous.	
Dorchester	Better circumferential transit is needed to connect Dorchester with neighborhoods to the west.	
Dorchester	Many of the buses are crowded or operate at slow speeds. Fares are high.	
Dorchester	A connection between the Red Line and Blue Line is needed.	
East Boston	Many transit trips require too many transfers	Connect the Blue Line to the Red Line at Charles/MGH Station. Project design & DEIR began in Fall 2008.
East Boston	East Boston experiences a lot of traffic congestion and air pollution from airport-generated traffic.	Construct a truck route on the railroad bed under Bennington St.
		Improve the intersection of Bennington Road and Saratoga St.
		Construct a grade-separated interchange for traffic traveling between Route 1A and Boardman St.
East Boston	Chelsea Street Bridge replacement is needed, but will be a burden to the community during construction.	
Everett	Service industry workers need transportation past the hours of public transportation.	Late evening/early morning service to meet the needs of service industry workers.
Everett	Public transportation has limited ability to meet the needs of people who are elderly and disabled who have limited mobility.	Service to accommodate the needs of the elderly, particularly for shopping and medical appointments.
Everett	MBTA maintenance facility is a burden. It occupies a large parcel of land, which the city could use for development.	
Everett	Bus routes cover all major roadways, but service hours are limited.	Longer service hours.
Everett	Many bus stops do not have shelters. This is a burden, particularly in foul weather.	Shelters at bus stops.
Everett	Commuter rail passes through Everett and does not stop.	Commuter rail stop (at Gateway Ctr.).
Everett	Absence of map and schedule displays at bus stops limits ridership, particularly those with limited English proficiency.	Map and schedule displays at stops.
Everett	Transit to employment destinations other than Boston is limited and cumbersome.	Urban Ring, Service to Kenmore Square and Longwood Medical Area.
Everett	Increased traffic over Alford Street bridge and through Everett since Tobin toll increase and truck traffic on Route 99.	Assess traffic impacts of toll increase and conduct reconnaissance of traffic in the area.
Jamaica Plain	The Arborway yards are a burden and any development that takes place must be environmentally safe for community use.	
Jamaica Plain	The Casey Overpass at Forest Hills should be removed and the area should be more friendly for pedestrians.	

TABLE 8-13 (CONT.)

IDENTIFIED TRANSPORTATION EQUITY ISSUES

COMMUNITY	REPORTED ISSUES	POSSIBLE SOLUTIONS*
Jamaica Plain	The community is very interested in transit-oriented development around the Orange Line stations, but wants to keep housing affordable.	
Jamaica Plain	There are gaps in the pedestrian and bicycle network along the Emerald Necklace.	
Jamaica Plain and Roxbury	Better circumferential transit is needed to connect Jamaica Plain and Roxbury with points to the west and north, such as Brookline, Cambridge, and Somerville.	
Jamaica Plain and Roxbury	Areas previously served by the elevated Orange Line no longer have access to rapid transit within a reasonable walking distance. Transit travel destined for downtown Boston often requires connections to the Orange Line.	
Jamaica Plain and Roxbury	Many of the buses operating in the Southwest Corridor neighborhoods of Jamaica Plain and Roxbury are crowded or operate at slow speeds.	
Malden	A new family health center may warrant a change in existing bus routes.	Identify route changes to serve the new health center.
Malden	Seniors find downtown crossings dangerous and have difficulty accessing the bus stops.	Improve the safety of crossings. Review the locations of downtown bus stops.
Malden	Senior transportation is limited.	
Malden, Medford, Everett	Travel between cities and towns on public transit requires going into Boston first and then traveling out again.	Provide circumferential transit to connect cities and towns.
Malden, Medford, Everett	Long off-peak headways on buses during the day and evening make it difficult for people who work non-traditional hours to commute to work.	Increase bus frequency on routes that provide access to jobs with non-traditional work hours.
Malden, Medford, Everett	The change in bus routes to go around instead of through Malden Square is a burden to elderly people, people with disabilities, and shoppers.	Return to the old route.
Malden, Medford, Everett	The pedestrian phase of the signal at Main and Salem Streets conflicts with turning traffic.	Change the signal phasing.
Malden, Medford, Everett	Everett and Medford are interested in Walkable Communities.	The MPO is available to coordinate its Walkable Communities Workshops program with Everett and Medford.
Malden, Medford, Everett	People placed in the Townline Inn on Broadway (Route 99) by the Department of Transitional Assistance have to walk where there are no sidewalks.	
Medford	Residents of West Medford will be burdened by the construction of the Green Line extension and consequent development that will disrupt the (low-income and/or minority) community and displace some of it's residents (due to both the construction and gentrification).	Consider the impact of the Green Line extension on West Medford residents, and try to mitigate negative impacts.
Malden, Medford, Everett	Some members of the community have difficulty reading and understanding the bus schedules.	Provide schedules in alternative languages and formats.
Somerville	Many streets in the city, and particularly around Union Square, are dangerous for bicyclists.	

* These ideas are proposed by transportation equity contacts responding to MPO outreach. Not all solutions have been studied and some may not be feasible.

SUMMARY OF CENTRAL AREA NEEDS

The preceding sections have laid out thecorridor's existing transportation infrastructure, land use conditions, travel characteristics and patterns, and transportation-related needs. This section summarizes the corridor's needs that are the most pressing as assessed in light of the MPO's visions established for *Paths to a Sustainable Region* and the available information on the needs. Many needs identified in the preceding sections stand out. In addition to passenger transportation needs by mode, this summary includes issues related to freight transportation, land use, and transportation equity.

Paths to a Sustainable Region envisions a system that is well maintained, has less congestion and fewer accidents on its roadways, offers attractive alternatives to driving, produces very little of the emissions that cause climate change and health problems, offers easy connections between nonmotorized modes and transit, efficiently moves freight, and supports development in areas where it already exists as a strategy to encourage alternatives to driving and to preserve open space.

Highway

Paths to a Sustainable Region envisions a highway system that is well maintained, and has less congestion and fewer severe crashes. The Central Area Needs Assessment reveals the need to maintain the roadways and bridges and address bottleneck locations. The identified needs and problems listed below will promote the realization of the vision:

- Of the 622 bridges in the Central Area, 153 (25%) are considered functionally obsolete (do not meet current traffic demands or highway standards) and 67 (11%) are considered structurally deficient (deterioration has reduced the load-carrying capacity of the bridge).
- Highway bottlenecks cause congestion and accidents and result in higher emissions of pollutants. The express highway and arterial bottleneck locations listed below were identified by at least two of the three methods described in the highway mobility section of this chapter:
    - Interstate 93/Southeast Expressway between Milton and Medford
    - Route 1A in Boston and Revere
    - Route 1 in Boston and Chelsea
    - Route 9 in Boston and Brookline
    - Route 99 in Everett
    - Route 203 Jamaicaway, Morton Street, and Gallivan Blvd in Boston
    - Alewife Brook Parkway in Cambridge
    - Storrow Drive/Soldiers Field Road in Boston

- The top crash locations in the Central Area were identified by the weighted Equivalent Property Damage Only (EPDO) index, which takes into consideration fatalities, injuries, and property damage. The top crash locations, in descending order of severity, are:
  - Interstate 93 at Columbia Road, Boston (697)
  - Interstate 93 at Neponset Avenue and Gallivan Boulevard, Boston (450)
  - Interstate 93 near ramp to Route 3A, Boston (388)
  - North Washington Street at Interstate 93 (Ramp to Sumner Tunnel), Boston (357)
  - Interstate 93 at Route 28 (Fellsway), Somerville (335)

Transit

Paths to a Sustainable Region envisions a transit system that, like the envisioned highway system, is safe and maintained in a state of good repair. However, unlike the vision for the highway system, the vision for transit calls for more use in order to reduce auto dependency and emissions causing climate change. In addition to projects that will bring the system into a state of good repair, addressing the needs and problems identified below will promote the realization of the vision:

Infrastructure Needs/Problems:

- On the Blue, Green, and Orange Lines, power substation equipment at several locations needs to be upgraded or replaced. Signal systems on the Blue and Green Line need to be upgraded or replaced. Parts of the third rail, and the concrete support pedestals, need to be replaced on the Orange Line.
- On the Green Line, tie replacement is needed on the B and C branches and at-grade crossings of streets need to be reconstructed or rehabilitated at 37 locations.
- One the Blue Line, the overhead catenary system and track and switches at some locations need to be replaced.
- On the Orange Line, upgrades are needed at all north-side Orange Line stations to improve passenger areas.
- On the Red Line, power cables, emergency lighting systems, and track components are in need of replacement at some locations.
- The Wellington (Orange Line) and Cabot (Red Line) maintenance facilities, and the Charlestown and Cabot bus garages, need renovations.
- The 1979-1981 fleet of Orange Line cars, Red Line cars dating to 1969, and the 1940s era PCC cars on the Mattapan High Speed Line are in need of replacement.
- On the Silver Line Washington Street, the CNG vehicle fleet needs a mid-life overhaul.

- The Green Line Central Subway is currently operating at capacity, constraining the ability of the system to meet growth in demand for service. By 2030 ridership demand on the Green Line's surface branches, as well as in the Central Subway, is projected to exceed capacity if two-car trains are still in use.
- On the commuter rail system, 12 bridges on the Fairmount Line are currently rated as structurally deficient. Work has commenced on some of these.
- Many of the commuter rail trains that pass through Ruggles Station cannot stop there, because one of the three tracks does not have a platform.
- Track capacity at South Station limits service expansion. MassDOT has received $32.5 million from the Federal Railroad Administration for planning and environmental review of South Station expansion.
- Twelve percent of all bus routes providing service in the Central Area fail the MBTA's vehicle load standard. On the rapid transit system, crowding is particularly acute on the Green Line's B, C, and D branches, which all fail the MBTA's vehicle load standard.
- 87% of all bus routes providing service in the Central Area fail their schedule adherence standard. With the exception of the Fairmount Line, none of the commuter rail lines passed the schedule adherence standard.
- Nine rapid transit station park and ride lots are utilized at 85% of their capacity or greater.
- Two commuter rail stations and 23 rapid transit stations in the corridor are not ADA accessible.

Service gaps and issues to watch:

- Although the MBTA currently operates some circumferential bus connections between rapid transit spokes, buses must compete with cars on increasingly congested urban streets, reducing the appeal of these services. More frequent, rapid, and through-routed connections would greatly enhance circumferential mobility, particularly between important Central Area activity centers.
- Transit travel to the business districts in Cambridge—especially near Kendall and Harvard Squares—is currently difficult for East Boston and North Shore residents. Cambridge residents do not have direct rapid transit access to the northern part of the financial district near State and Aquarium Stations on the Blue Line.
- Densely developed areas in Somerville currently generate high trip volumes to Cambridge and Boston. In addition, trip volumes between Somerville and Cambridge are projected to increase substantially.
- Very densely populated areas in Chelsea, Everett, and Medford, which currently generate significant numbers of trips into the urban core, do not have frequent rapid transit access within a reasonable walking distance.

- Currently, travel by MBTA between the Back Bay, Roxbury, Fenway, Brookline, and Newton to Logan Airport, the Boston Convention and Exhibition Center, and the rapidly developing South Boston Waterfront is a "three-seat ride."
- The lack of a direct connection between North and South Stations makes many types of trips cumbersome using transit. North-side commuter rail users need better direct access to the Back Bay (and the Ruggles area and Longwood Medical and Academic Area). Commuters on the south-side lines currently must transfer to travel via rapid transit from South Station to Government Center and areas further north in Boston.
- By 2030 projected growth in demand on 25 bus routes may cause crowding levels that would require additional service. These are Routes 1, 15, 19, 21, 22, 28, 37, 40, 43,.47, 64, 65, 66, 68, 71, 73, 77, 86, 87, 89, 110, 111, 117, CT1, and CT3.
- Bus Routes 39 and 57 are heavily used routes in busy corridors.
- Very densely populated areas of Roxbury and Dorchester lack direct rapid transit service to Boston Proper. They are currently served by MBTA bus Routes 23 and 28, which are long and unreliable, and terminate at Ruggles Station. MassDOT is currently conducting the Roxbury/ Dorchester/Mattapan Study that will look at issues along this corridor.

- Traffic congestion around Alewife Station increases the running times and reduces the reliability of bus routes that serve the station.
- The Orange Line is currently overcrowded during peak hours between Downtown Crossing and North Station.
- A major commercial and residential development at Assembly Square could create burdens for an already congested area highway system.
- Harvard and Boston Universities are planning major development adjacent to the Worcester commuter rail line.
- Higher transit demand resulting from the implementation of the MetroFuture land use plan will require investments to increase capacity.
- The tracks on which the Framingham/Worcester Line operates are owned by CSX Transportation, which runs freight service and controls train dispatching for both freight and commuter rail. On-time performance has been problematic on

this line, primarily due to conflicts with freight service and lack of MBTA control over dispatching on the line.

- The Fenway/Longwood Medical and Academic Area is both a prominent tourist/cultural destination and a growing center for employment in the Boston region. Congestion of the transportation system in this area constrains growth and economic development potential.

Freight

Paths to a Sustainable Region envisions a transportation system in which all freight modes operate efficiently. Addressing the needs and problems identified below will promote the realization of this vision:

- The entrance channel to the Port of Boston needs to be dredged to a depth of 50 feet, and the Conley Terminal access channel to 48 feet. Additionally, the Chelsea River Channel needs to be dredged to a depth of 40 feet to provide better freight access.
- Upgrading the truck routes serving the Port of Boston to handle overweight trucks would improve the efficiency of freight operations.
- The Port of Boston lacks direct access to highway and rail facilities.
- Preserving sites and developable space for air cargo warehousing and freight forwarding facilities in South Boston and along Route 1 and 1A is a top priority for the air cargo industry. Landside congestion to Logan International Airport is a threat to restrict air freight.

Issues to watch:

- CSX plans to move its terminal facility from Allston to Worcester, which will change some regional trucking patterns.
- As demand for rail freight increases, rail lines carrying freight in the Central Area may need to be upgraded to accommodate the industry standard of 286,000 pounds. Currently the capacity is 263,000 pounds. This restriction increases costs for shippers.
- 92% of highway bridges and 91% of railroad bridges do not meet the desired vertical clearance.

Bicycle/Pedestrian

Paths to a Sustainable Region calls for linking bicycle, pedestrian, and transit facilities in a network; increasing the use of sustainable modes; and improving transportation options and accessibility for all modes of transportation. Addressing the needs and problems identified below will promote the realization of this vision:

- There are no on-road bicycle facilities connecting to stations on the north side of the Orange Line or the south side of the Red Line.

- Few roads (about 4%) in the Central Area provide bicycle accommodations.
- About 15% of the non-interstate roads in the Central Area do not have a sidewalk on either side of the roadway.
- The Central Area lacks major bicycle connections for circumferential travel.

Transportation Equity

Paths to a Sustainable Region envisions a transportation system that provides affordable transportation options and accessibility to people of all incomes, ages, races, and language backgrounds and does not inequitably burden any particular group.

Issues to watch:

- Traffic calming and complete streets design principles will create a safer environment for pedestrians and bicyclists.
- Better circumferential transit and a connection between the Red and Blue Lines are needed.
- The transportation system will need to address the needs of the elderly population, which is expected to grow substantially during the time horizon of Paths to a Sustainable Region.
- Densely populated areas, such as parts of Roxbury, Jamaica Plain, Somerville, Chelsea, Medford, and Everett, lack access to rapid transit within a reasonable walking distance.
- Several bus routes in the Central Area operate at slow speeds.
- The MBTA's Arborway Yard in Jamaica Plain is an eyesore and incompatible with the surrounding community.
- Travel and transport to and from the airport generates traffic congestion in East Boston.

- Late evening and early morning transit service is needed by many low income workers.
- The transit system is difficult to navigate for people who speak languages other than English.

Land Use

Paths to a Sustainable Region shares the MetroFuture vision of a region in which new development is focused in developed areas already well served by infrastructure. As the work toward realization of this vision proceeds, issues to watch include:

- Areas expected to grow the most between now and 2035 are South Boston, Cambridge, and Somerville. Transit may need to increase in order to handle service demands.
- The largest planned developments in the corridor are in Cambridge, Somerville, and South Boston. North Point in Cambridge and Assembly Square in Somerville could bring more than 3,000 housing units to the area. Development planned on 100 acres in South Boston is anticipated to produce an additional 2,376 housing units and 2.8 million square feet of office and retail space.
- Corridor-wide, auto ownership and average household mileage are markedly lower than the regional averages, at 1.1 autos per household and 29 miles per household per day.
- 46% of commuting trips in the Central Area are accomplished by non-auto modes of travel.