



DESCRIPTION OF THE CORRIDOR

The Northwest Corridor extends from the Charles River in Cambridge to the New Hampshire border. The corridor is anchored in the south by the densely populated cities of Cambridge, Somerville, and Watertown. Seventeen of the municipalities in the corridor are located within the Boston Region MPO area; in addition to the towns and cities already mentioned, they are (proceeding northwest) Belmont, Arlington, Waltham, Lexington, Lincoln, Bedford, Concord, Carlisle, Maynard, Acton, Littleton, Stow, Boxborough, and Bolton.

This needs assessment addresses only the needs of the municipalities in the Boston Region MPO portion of the corridor. In doing so, however, it must take into consideration conditions and travel activity in other portions of the corridor. This is reflected in the discussion. The portions of the corridor outside of the Boston Region MPO area are not shown in most of the maps.

Ten corridor municipalities, in the northern part of this corridor, are all located outside of the Boston Region MPO area: Harvard, Ayer, Groton, Clinton, Lancaster, Lunenburg, Townsend, Sterling, and Lancaster which are in the Montachusett MPO area, and Westford and Pepperell, which are in the Northern Middlesex MPO area.

EXISTING TRANSPORTATION FACILITIES

The major transportation facilities and services in the Northwest Corridor, broken down by mode, are described here. Although this assessment considers the needs in the Boston Region MPO area only, existing transportation facilities outside of the area but within the Northwest Corridor are included in this section for informational purposes.

Highway

The major roadways in this corridor are (see Figure 4-1):

- North–south travel: Interstate 95, Interstate 495, Route 16, Route 126, Route 27, Route 85, Route 3, Route 4, and Route 62
- East–west travel: Route 2, Route 111, Route 60, Route 2A, Route 114, and Route 225

There are 1,605 centerline miles in the corridor:

- State-owned – 139 centerline miles (9%)
- Locally owned – 1,312 centerline miles (81%)
- Privately owned – 154 centerline miles (10%)

When looking at lane miles (as opposed to centerline miles) in the corridor, there are a total of 2,701 lane miles. Of the total lane miles, 41% or 1,095 lane miles are federal aid eligible.

There are 292 bridges in the corridor:

- State-owned – 223 (76%)
- Locally owned – 59 (20%)
- Other – 10 (4%)

Of the 292 bridges, 104 (36%) accommodate pedestrians as well as motorists, 21 (7%) are for bicyclists and pedestrians only, 35 (12%) are railroad bridges over highways or water, and 2 (1%) are closed.

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

Transit

Transit in the corridor includes a variety of modes: commuter rail, intercity rail, rail rapid transit, bus; and paratransit (provided by the MBTA's THE RIDE program and the Lowell and Montachusett Regional Transit Authorities) see Figure 4-2. A description of the transit services is provided below.

Commuter Rail and Intercity Rail

One MBTA commuter rail line runs through the corridor and provides service into North Station in Boston. The stations on the line, along with their numbers of park-and-ride spaces and average utilization rates, and other selected information as applicable, are:

- Fitchburg Line with 14 stations in the corridor (three additional stations are in the West corridor):
 - Porter Square (Cambridge) – No park-and-ride spaces; bicycle parking; Red Line station; bus connections

FIGURE 4-1

EXISTING HIGHWAY TRANSPORTATION FACILITIES - NORTHWEST

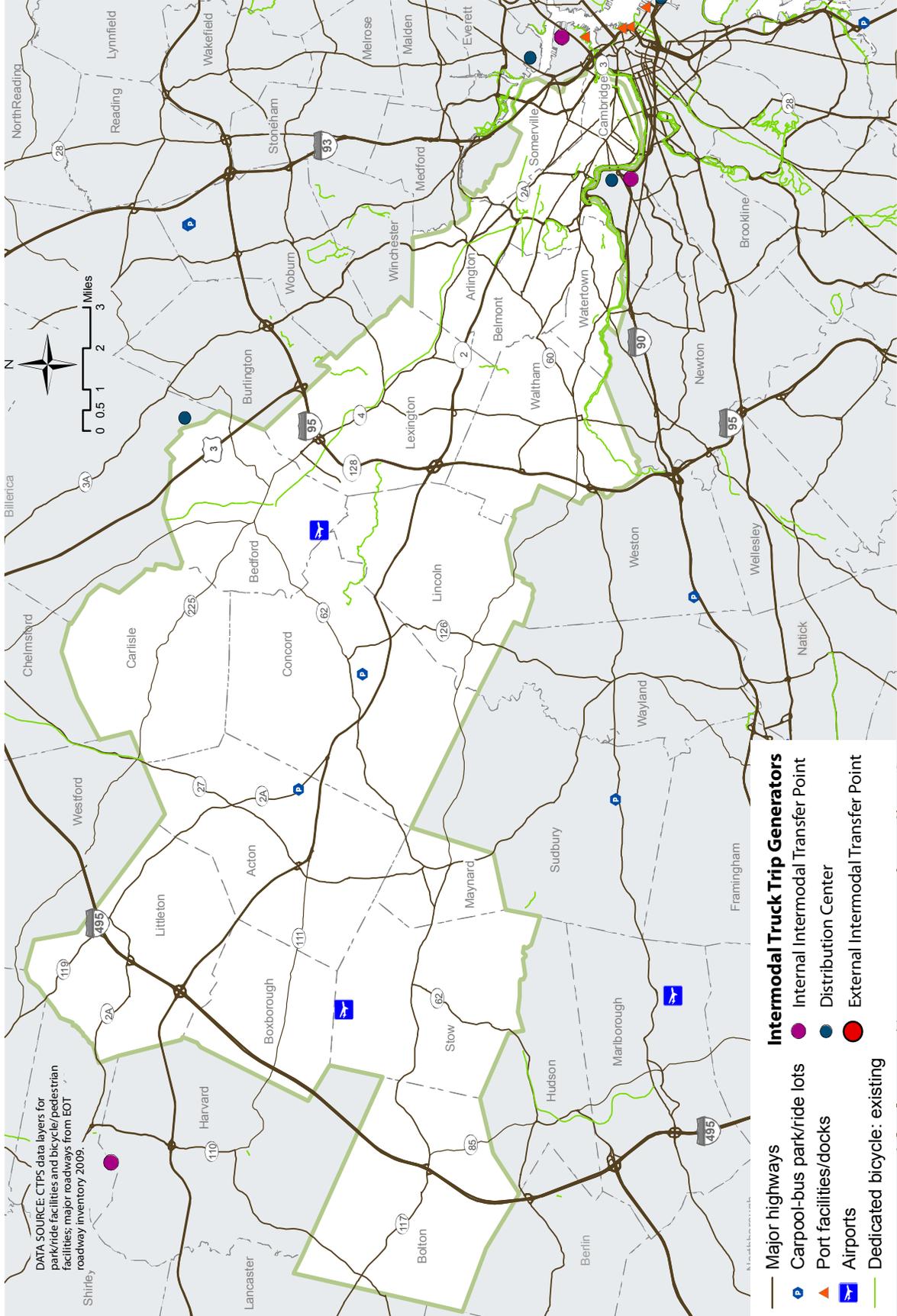
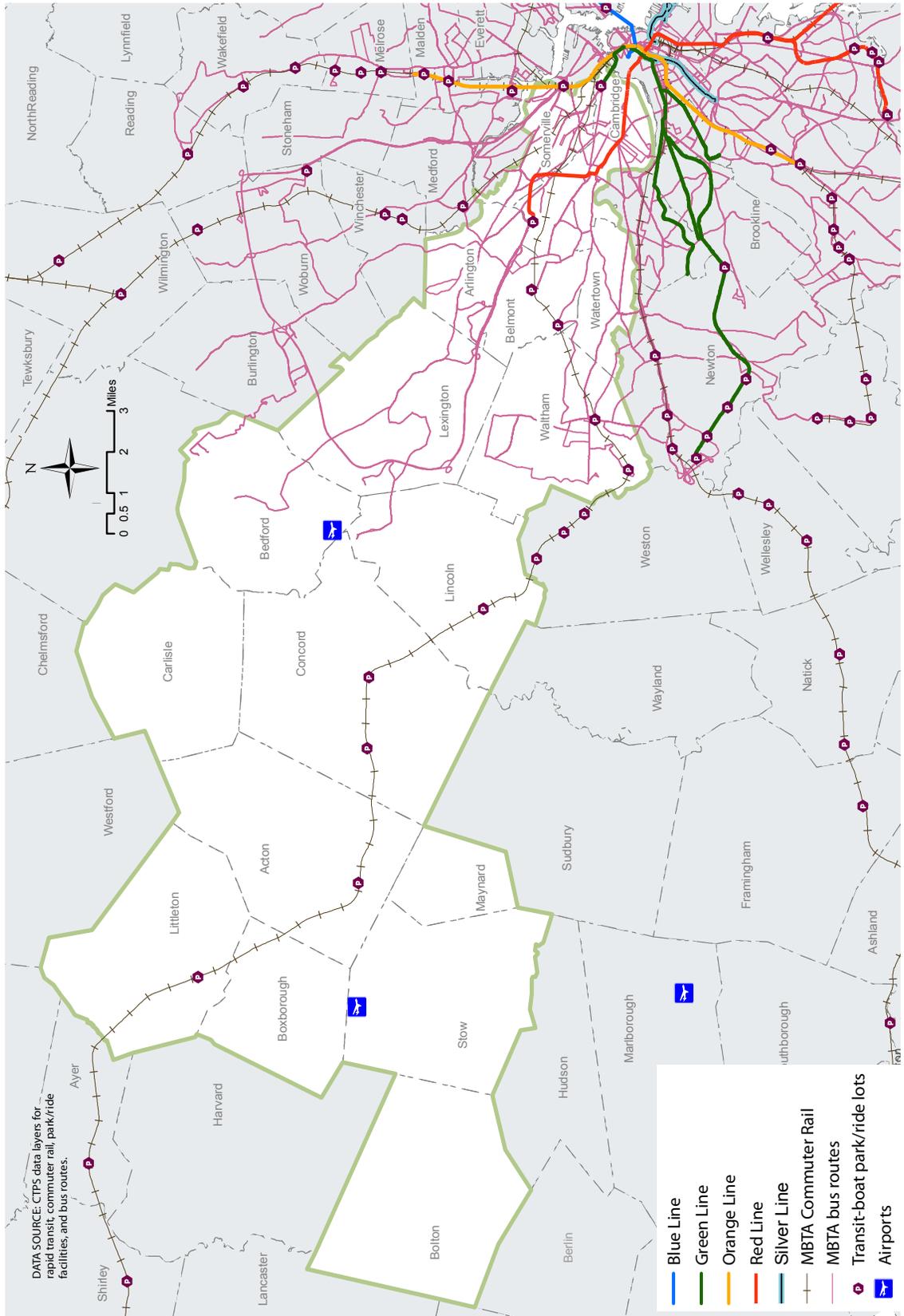


FIGURE 4-2
EXISTING TRANSIT TRANSPORTATION FACILITIES - NORTHWEST



- Belmont – No park-and-ride spaces; bicycle parking; bus connections
- Waverly (Belmont) – no park-and-ride spaces; bus connections
- Waltham – 50 park-and-ride spaces managed by City (92% utilization rate); bicycle parking also; bus connections
- Brandeis/Roberts (Waltham) – 70 park-and-ride spaces owned by Brandeis University (35% utilization rate); bicycle parking also; bus connections
- Lincoln – 161 park-and-ride spaces managed by Town (67% utilization rate); bicycle parking also
- Concord – 86 park-and-ride spaces managed by Town (99% utilization rate); bicycle parking also
- West Concord – 146 park-and-ride spaces managed by Town (61% utilization rate); bicycle parking also
- South Acton – 287 park-and-ride spaces managed by Town (99% utilization rate); bicycle parking also
- Littleton/Route 495 – 47 park-and-ride spaces (75% utilization rate)
- Ayer – 30 park-and-ride spaces managed by the Town (96% utilization rate)
- Shirley – 25 park-and-ride spaces managed by Town (63% utilization rate)
- North Leominster – 140 park-and-ride spaces managed by Montachusett Regional Transit Authority (MART) (80% utilization rate)
- Fitchburg – 400 park-and-ride spaces managed by MART (22% utilization rate); MART bus service

MBTA Rail Rapid Transit

Red and Green rapid transit lines provide service from Cambridge and Somerville to Boston, where they connect to other rapid transit lines. The Red and Green Lines extend beyond Boston into the Southeast and West Corridors, respectively. MBTA buses provide feeder services that connect many municipalities in the corridor to these rapid transit lines. The stations on the line, along with their number of park-and-ride spaces and other selected information as applicable, are:

- Red Line with six stations in the corridor:
 - Kendall – No park-and-ride spaces; bicycle parking; bus connections
 - Central Square – No park-and-ride spaces; bicycle parking; bus hub
 - Harvard Square – No park-and-ride spaces; bicycle parking; major bus hub
 - Porter Square – No park-and-ride spaces; bicycle parking; commuter rail; bus connections
 - Davis – No park-and-ride spaces; bicycle parking; bus connections



- Alewife – 2,733 park-and-ride spaces; (100% utilization rate); bicycle parking also; bus hub
- Green Line with one station in the corridor:
 - Lechmere – 347 park-and-ride spaces (100% utilization rate); bicycle parking also; bus connections

Bus

Numerous public bus services operate in or through the corridor:

- MBTA express buses (7 express routes) – These routes serve several corridor communities and terminate at points in Boston Proper.
 - MBTA local buses (34 routes) – The routes extend through Cambridge, Somerville, Watertown, Waltham, Belmont, Arlington, and Lexington. Several routes extend into Bedford or Lincoln as well. Several local bus routes offer circumferential connections to destinations in other corridors.
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- Montachusett Regional Transit Authority (MART) – Eight routes from the intermodal center in Fitchburg to points in Fitchburg, Leominster, and Lunenburg, as well as three other routes that are entirely within Leominster. MART provides bus connection to the Fitchburg Commuter Rail Line.
 - Lowell Regional Transit Authority provides service to the Bulington Mall and the Lahey Clinic.
 - Municipal and private bus carriers – The towns of Acton and Lexington oversee municipal transit services operated by contractors in their respective towns. Yankee Lines provides service from Acton and Concord to Copley Square in Boston. In Fitchburg, a dedicated, privately operated bus from the Mount Wachusett ski resort offers guaranteed connections to seasonal weekend trains.

Intermodal Facilities (Passenger)

There are no intermodal passenger facilities within the Boston Region MPO area in the Northwest Corridor. However, the Fitchburg Intermodal Center is located on Main Street in Fitchburg and serves the Fitchburg commuter rail line. The transportation services at this location are MBTA commuter rail (Fitchburg Line) service to North Station, MART fixed route buses, shuttle buses to the Mount Wachusett ski resort, park-and-ride spaces, and bicycle parking.

Connections to MBTA Service from Other Regional Transit Authorities' Services

MART provides bus connections to MBTA commuter rail at the Fitchburg commuter rail station.

Transportation Management Associations

The following Transportation Management Associations (TMAs) provide service in the corridor:

The 128 Business Council offers the following shuttle services:

- The Alewife Shuttle for Waltham and Lexington connects Alewife Station, on the MBTA's Red Line, with member companies in the two communities.
- The Alewife Shuttle for Windsor Village connects Alewife station on the MBTA's Red Line, with Windsor Village Apartments in Waltham.
- Bentley College CitiBus provides service to Bentley College ID holders on two routes: a campus shuttle with periodic service to Windsor Village, and a shuttle between the college, Waverly Square (in Belmont), where there is a connection to the Fitchburg Commuter Rail, and Harvard Square where there is a connection to the MBTA's Red Line.
- The 128 Connection Shuttle is a private service that connects companies at three locations with Waltham center. In addition to Waltham center, the shuttle makes stops at: AstraZeneca R&D Boston (35 Gatehouse Drive), Bay Colony Corporate Center and its Tenants (950 – 1100 Winter Street), and 305 Second Avenue (the intersection of Bear Hill Road and Fox Road).

The Charles River TMA provides EZRide shuttle service between Cambridgeport, Kendall Square, East Cambridge, and North Station, where there are connections to the northside commuter rail lines, the Green Line, and Downeaster Amtrak service.

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 analysis of Interstate 495 took advantage of actual MassDOT vehicle classification count data, which is available for a limited number of locations in the region. The following is a list of the highways in the Northwest Corridor with the highest current volumes of truck traffic:

- Interstate 95 from Weston to Route 2, with volumes ranging from 11,000 to 19,500
- Interstate 95 from Route 2 to Burlington, with volumes ranging from 9,000 to 13,000
- Interstate 495 from Interstate 290 to Westford with volumes near 20,000
- Route 2 from Harvard to Interstate 495, with volumes ranging from 5,000 to 9,000





Rail Freight

Pan Am Railways and Pan Am Southern operate in the corridor, serving Pan Am's enhanced intermodal container and trailer facility, an automotive unloading facility, and a transloading facility in Ayer, which is in the outer portion of the Northwest Corridor (outside of the MPO area).

Pan Am Southern is a joint venture between Pan Am Railways and Norfolk Southern, a major Class 1 railroad. Pan Am Southern operates on the Patriot Corridor, which is the portion of Pan Am Railways Freight Main Line that runs from Mechanicsville, New York to Ayer, Massachusetts. As part of the partnership, improvements are planned for the auto and intermodal facilities in Ayer. Planned improvements to the Patriot Corridor also include upgrading the tracks to Ayer to handle 286,000 pound rail cars.

Pan Am Railways connects to Pan Am Southern in Ayer. The Pan Am Railways Freight Main Line continues from Ayer into New Hampshire and Maine. It is an important connection for paper and lumber industries in Maine and Canada. The entire Freight Main Line moves up to 5 million tons of freight annually.

Several rail yards are operated by Pan Am Railways in the outer portion of the Northwest Corridor. Hill Yard in Ayer handles intermodal and merchandise traffic. The Intermodal Yard is a terminal handling mostly containers, but also some trailers. The SanVel site in Ayer has been unused for several years, but could be used as an auto unloading facility. Also in the outer portion of the corridor is the East Fitchburg Yard in Lunenburg, which is used primarily for plastic resin transload and some local freight.

Within the MPO area, Pan Am serves the Valley area facility in Boston and Somerville. Merchandise freight is handled here behind the Commuter Rail maintenance facility by one local freight train serving the area. Cars destined for Boston Sand and Gravel are handled directly at their facility.

MBTA Commuter Rail service operates on the Pan Am Railways Freight Main Line between Fitchburg and Ayer.

Marine Freight

There are no marine freight facilities in this corridor.

Air Freight

Hanscom Field handles some light cargo. It is located in the towns of Bedford, Concord, Lexington, and Lincoln.

Intermodal Freight Facilities

There are no intermodal freight facilities located in the Boston Region MPO portion of the corridor.

The Guilford Intermodal Facility in Ayer is the only Intermodal freight facility located in the corridor, and it is outside of the Boston Region MPO area. It is shown in Figure 4-1.

Air

Hanscom Airport is located in the towns of Bedford, Concord, Lincoln, and Lexington. It is owned and operated by Massport and is the busiest regional, general aviation airport in New England, handling business, charter, private, and air taxi flights.

The Minute Man Air Field located in Stow is a private airport and is the only other airport in the corridor.

Bicycle

Bicycle Paths

The corridor has four 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; and the Watertown Branch Rail Trail, less than one mile in Watertown.¹ These are shown in Figure 4-1, along with other minor facilities used by bicyclists and pedestrians in the corridor. The Bruce Freeman Rail Trail (outside the MPO region) and the Minuteman Commuter Bikeway are existing bicycle facilities of the Merrimack River Corridor of MassDOT's Bay State Greenway Plan. Currently, 22 of 60 miles of the proposed Merrimack River Corridor have been constructed.

The Dr. Paul Dudley White Path (also known as the Charles River Bike Path) and Somerville Community Path/Red Line Linear Path are existing bicycle facilities of



¹ The Charles River Bike Path is also part of the East Coast Greenway that aims to develop a trail system between Canada and Key West.

the Mass Central Corridor of MassDOT’s Bay State Greenway Plan. Currently, 52 of 150 miles of the proposed Mass Central Corridor have been constructed.

On-Road Bicycle Accommodations

Table 4-1 shows the percentage of roadways in each of the Boston Region MPO municipalities in the corridor that have on-road bicycle accommodations, defined as roadways with bicycle lanes or shoulders of four feet or greater.

TABLE 4-1

PERCENTAGE OF ROADWAYS WITH BICYCLE ACCOMMODATIONS

MUNICIPALITY	TOTAL NON-INTER-STATE CENTERLINE MILES	CENTERLINE MILES WITH BICYCLE LANES	CENTERLINE MILES WITH FOUR-FOOT SHOULDERS	PERCENTAGE OF CENTERLINE MILES WITH BICYCLE ACCOMMODATIONS
Acton	121	0.0	2.1	1.7%
Arlington	121	1.0	0.2	1.0%
Bedford	86	0.0	0.6	0.6%
Belmont	83	1.0	1.0	2.4%
Bolton	61	0.0	0.0	0.0%
Boxborough	37	0.0	0.3	0.8%
Cambridge	141	17.8	3.2	14.9%
Carlisle	55	0.0	0.0	0.0%
Concord	127	0.0	1.0	0.8%
Lexington	150	0.0	1.1	0.8%
Lincoln	63	0.0	1.1	1.7%
Littleton	81	0.0	4.1	5.1%
Maynard	41	0.0	2.2	5.4%
Somerville	105	3.0	0.7	3.5%
Stow	60	0.0	0.2	0.3%
Waltham	159	0.0	1.4	0.9%
Watertown	78	2.5	0.0	3.3%
TOTAL	1,569	25.0	19.0	2.8%

The Northwest Corridor has the highest on-road bicycle accommodation coverage of all the radial corridors with 2.8% coverage. Bicycle coverage varies from no coverage in Bolton and Carlisle to almost 15% coverage in Cambridge. Overall, the Northwest Corridor ranks above the regional average of 1.7%.

Bicycle Parking

The MBTA provides bicycle parking at various commuter rail and rapid transit stations in the corridor (see lists of rail stations in the Transit section). According to the MBTA, over 95% of stations now have bicycle parking. Also, the MBTA has secured funding for bike racks on all MBTA buses; therefore, the riders in this corridor 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:

- Arlington
- Belmont
- Bolton
- Boxborough
- Cambridge
- Carlisle
- Concord
- Lexington
- Lincoln
- Maynard
- Somerville
- Stow
- Watertown



Municipalities planning bike rack installations are:

- Bedford
- Waltham

Pedestrian

Table 4-2 shows the percentage of roadways in each of the Boston Region MPO municipalities in the corridor that have sidewalks on at least one side.

TABLE 4-2

PERCENTAGE OF ROADWAYS WITH SIDEWALKS

MUNICIPALITY	TOTAL NON-INTER-STATE CENTERLINE MILES	CENTERLINE MILES WITH SIDEWALKS ON AT LEAST ONE SIDE	PERCENTAGE OF CENTERLINE MILES WITH SIDEWALKS
Acton	121	17	14%
Arlington	121	81	67%
Bedford	86	36	42%
Belmont	83	56	68%
Bolton	61	2	3%
Boxborough	37	6	16%
Cambridge	141	124	88%
Carlisle	55	3	5%
Concord	127	40	31%
Lexington	150	59	39%

TABLE 4-2 (CONT.)

PERCENTAGE OF ROADWAYS WITH SIDEWALKS

MUNICIPALITY	TOTAL NON-INTER-STATE CENTERLINE MILES	CENTERLINE MILES WITH SIDEWALKS ON AT LEAST ONE SIDE	PERCENTAGE OF CENTERLINE MILES WITH SIDEWALKS
Lincoln	63	2	3%
Littleton	81	9	12%
Maynard	41	15	35%
Somerville	105	94	90%
Stow	60	8	13%
Waltham	159	102	64%
Watertown	78	70	90%
TOTAL	1,569	723	46%

The Northwest Corridor contains some of the region’s municipalities with the highest and lowest sidewalk coverage. The sidewalk coverage varies widely, from under 5% coverage in Bolton and Lincoln to over 90% coverage in Somerville and Watertown. Overall, the Northwest Corridor, with 46% coverage, ranks below the regional average of 50%.

LAND USE AND DEMOGRAPHICS

Demographics

Population

The largest densely populated areas in the Northwest Corridor are within Cambridge, Somerville, and Watertown. The areas that are projected to become more densely populated between 2009 and 2035 include already-developed areas along the Red Line and commuter rail. In general, population is projected to remain relatively stable, with most municipalities experiencing only moderate gains or losses (see Figure 4-3).

According to U.S. census data (updated annually at the town level), the corridor’s 2009 population was 468,109. In the Metropolitan Area Planning Council’s (MAPC’s) MetroFuture forecasts, the corridor’s population increases by 13%, to 529,920 by 2035 (MetroFuture is described briefly below). The municipalities projected to have the largest absolute growth are Cambridge and Somerville.

Figure 4-4 shows, by community for 2009, total elderly (age 70 or higher) population of elderly residents. This information can be used to assess the types of transportation services needed now and in the future. As shown in Figure 4-4, Arlington, Belmont, Cambridge, Lexington, Somerville, Waltham, and Watertown currently have the highest population of elderly residents.

Land Use, Housing, Sustainable Transportation

As of the year 2000, there were 187,000 households in the Northwest Corridor. Cambridge, Waltham, and Somerville account for 51% of the population and 62% of

FIGURE 4-3

POPULATION DENSITY BY TRANSPORTATION ANALYSIS ZONE

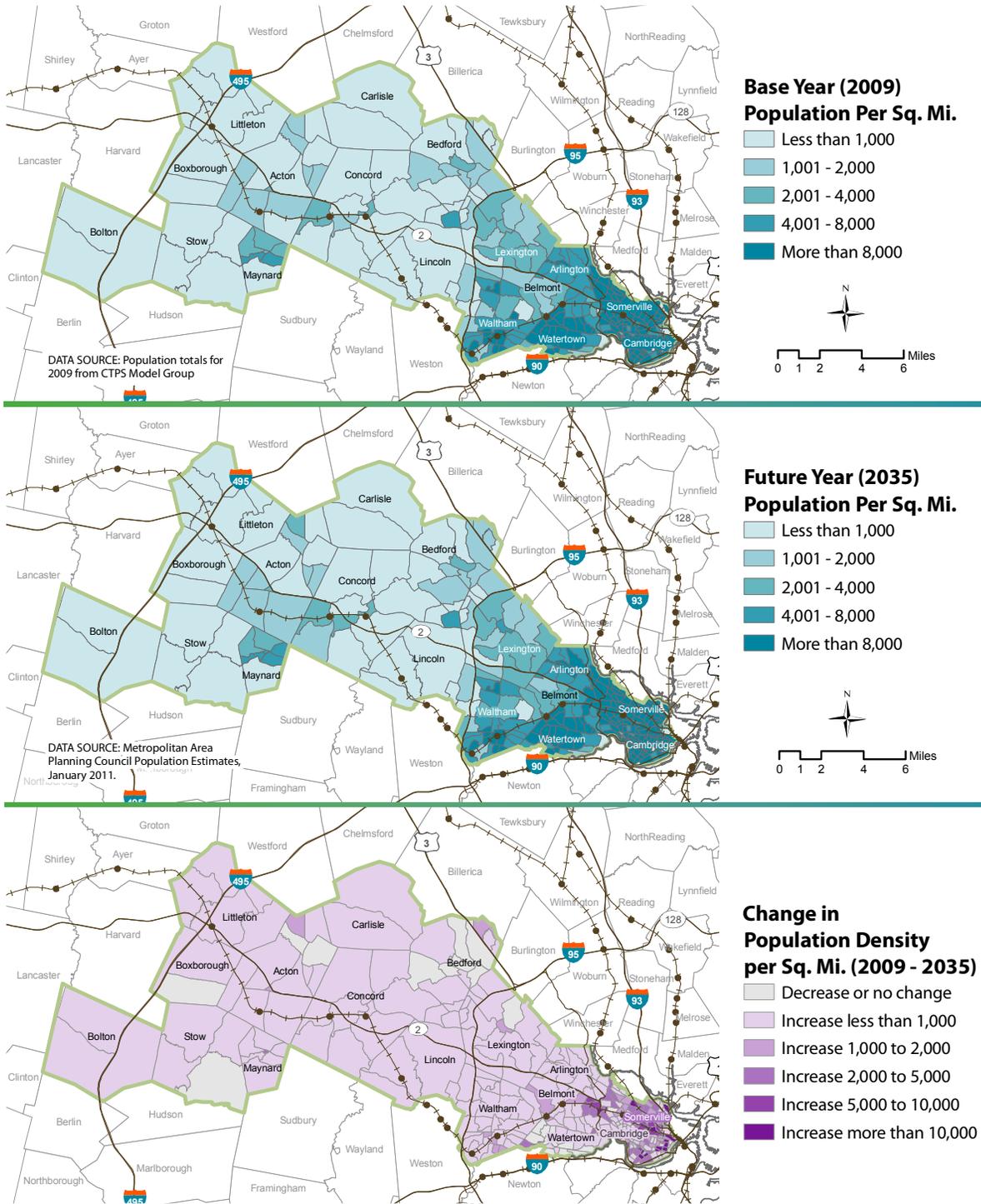
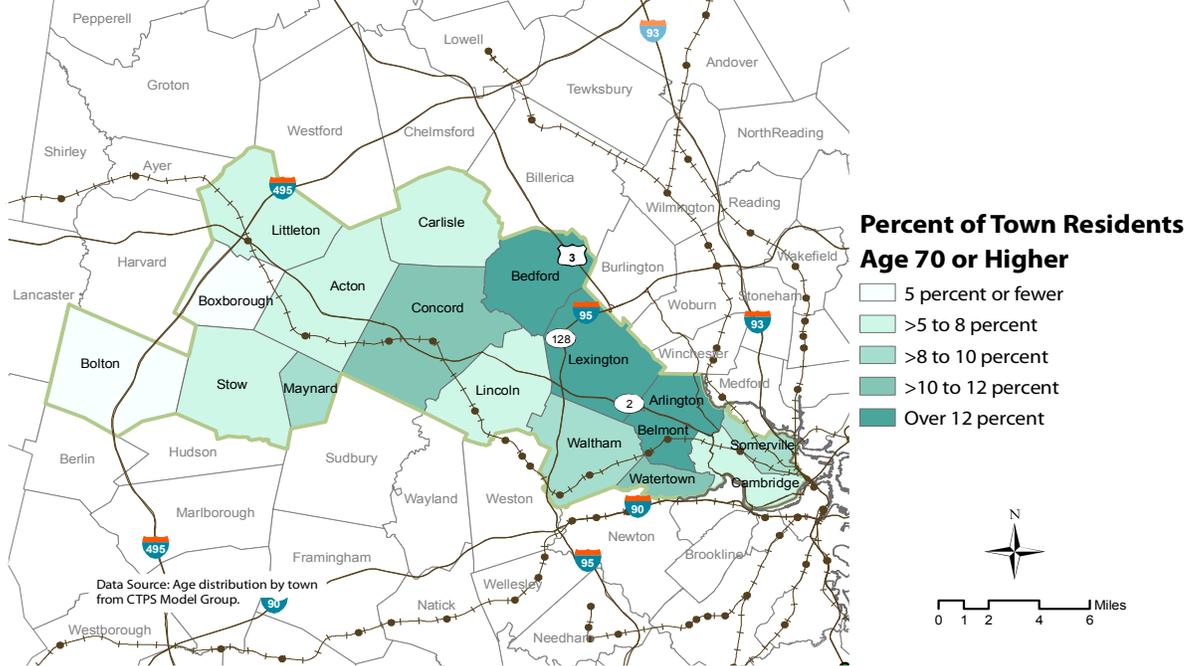
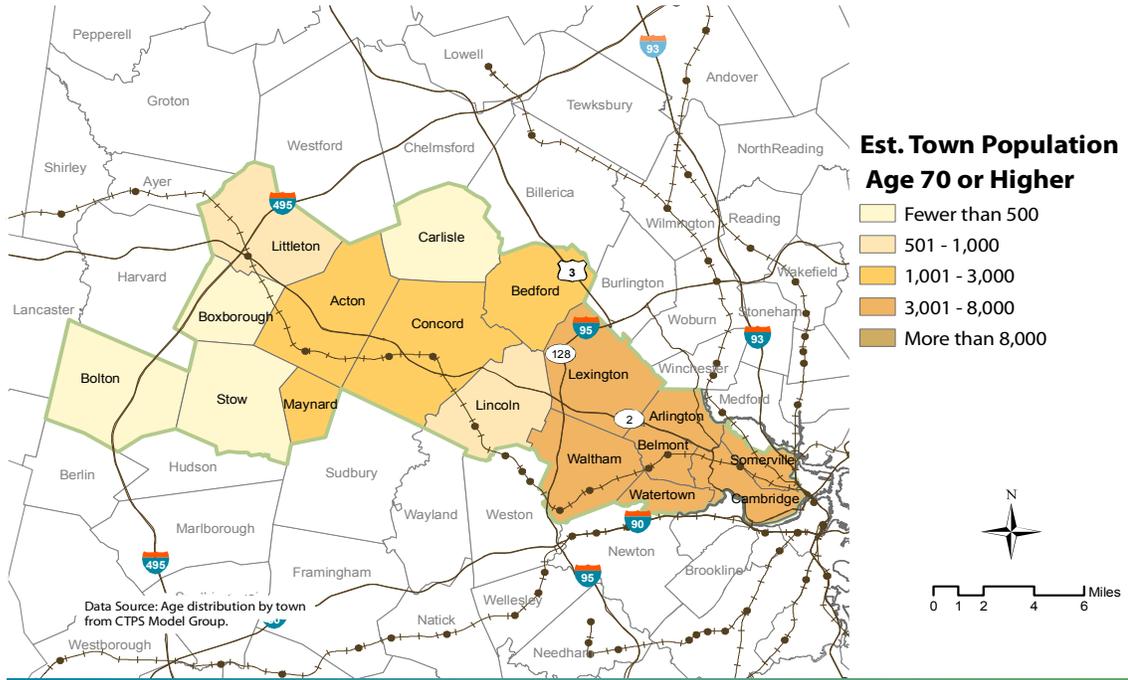


FIGURE 4-4

ELDERLY POPULATION BY TOWN - 2009



employment. 27% of households in the corridor are within ½ mile of one of the six Red Line stations in Cambridge or Somerville. An additional 8% are within ½ mile of the Fitchburg Commuter Rail line. The highest population densities are found in Cambridge and Somerville; the population density around Central Square is nearly 40,000 residents per square mile; and around Harvard, Porter, and Davis Squares, the density is nearly 30,000 persons per square mile. In contrast, the areas around the commuter rail stations west of Route 128 have considerably lower density, ranging from 3,200 residents per square mile around West Concord down to 307 residents per square mile around the Littleton/Route 495 station.

Figure 4-5 shows transit service and catchment areas with population density in the Northwest Corridor; it includes commuter rail and rapid transit stations along with bus stops. For rapid transit and commuter rail stations, 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 higher-density areas in parts of Belmont, Lincoln, Maynard, Waltham, and Watertown do not have direct access to transit services.

From 2000 to 2009, Northeast Corridor municipalities issued building permits for 9,057 new housing units (according to the U.S. Census Bureau), a 4.8% increase. Cambridge led the way with 2,400 housing units permitted, more than 25% of the total. Waltham permitted over 1,500 units. Five municipalities reported permitting fewer than 200 housing units over the past ten years: Boxborough, Belmont, Lincoln, Maynard, and Carlisle. (Somerville only reported building permits for fewer than 12 months over the ten year period, and so is not included.)

In 2007 and again in 2010, MAPC surveyed municipalities about recent and anticipated development. The largest recent residential developments in the corridor include Acton Avalon (a 296 unit 40B development), Repton Place in Watertown (179 units), “The Groves” retirement community in Lincoln (173 units), and two 40B developments in Bedford (303 units combined.) The largest developments currently planned in the corridor are located in Somerville, in Assembly Square and along the proposed Green Line Extension. Full buildout of the proposed Assembly Square development would create more than 2.5 million square feet of commercial and office space as well as 2,100 housing units. Rezoning and redevelopment of the Inner Belt, Brickbottom, Boynton Yards, and Union Square areas along the Green Line extension have the potential to add more than 5 million square feet of retail, office, and residential space, with 1,300 new housing units and up to 9,500 new jobs. The pharmaceutical company Shire has been making major investments and expansions at its campus in Lexington; when completed these expansions could total more than 1 million square feet of space.

The auto ownership is slightly above the regional average, at 1.6 autos per household, while the average household drives 41.9 miles per day, well below the regional average of 46.7 miles per day. These rates are heavily influenced by the low auto usage in Cambridge and Somerville, where the household car ownership is below 1.0 and the average household drives less than 25 miles per day. Meanwhile, six towns—Bolton, Carlisle, Stow, Littleton, Boxborough, and Acton—have household auto

FIGURE 4-5
EXISTING TRANSIT TRANSPORTATION FACILITIES - NORTHWEST

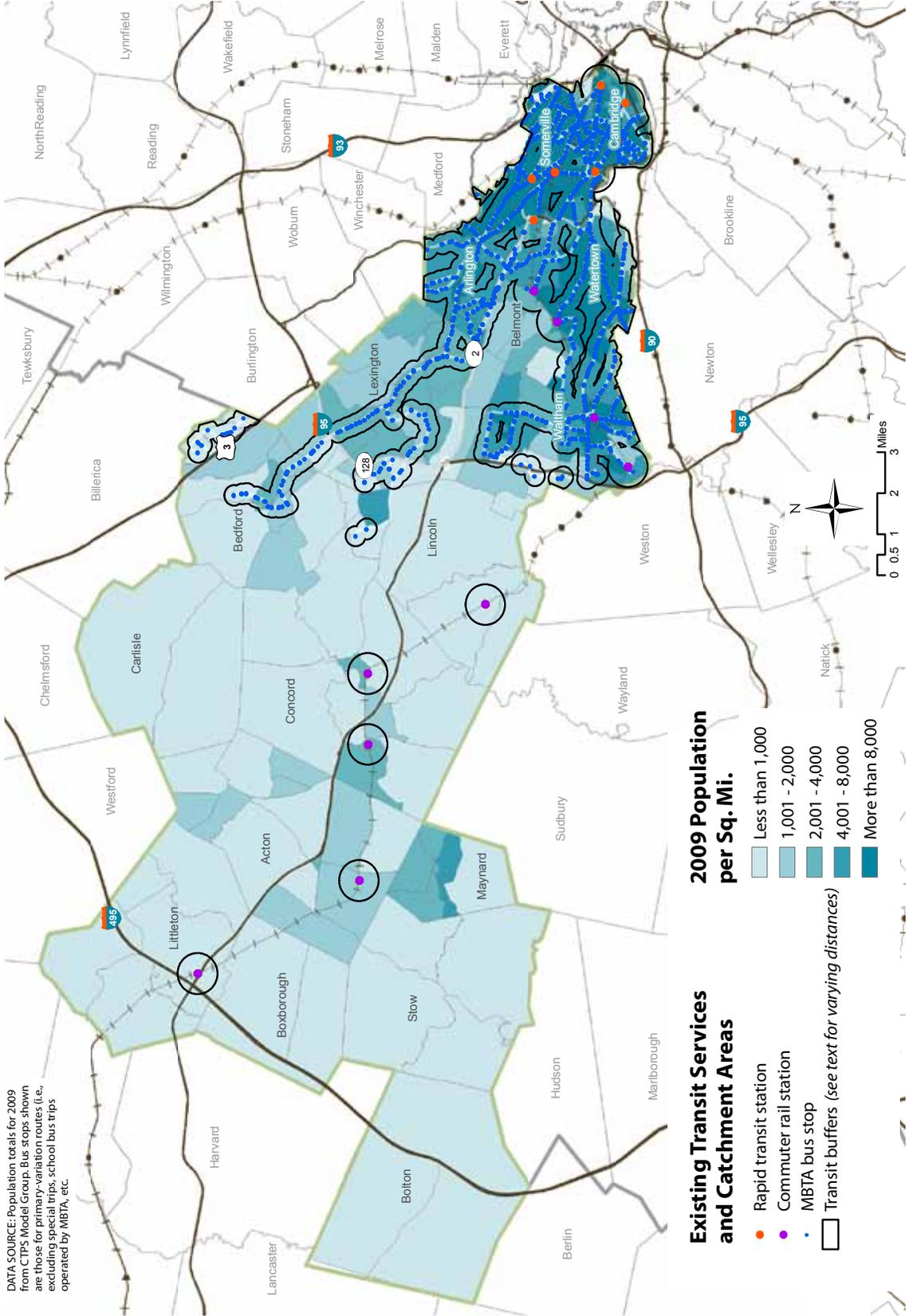
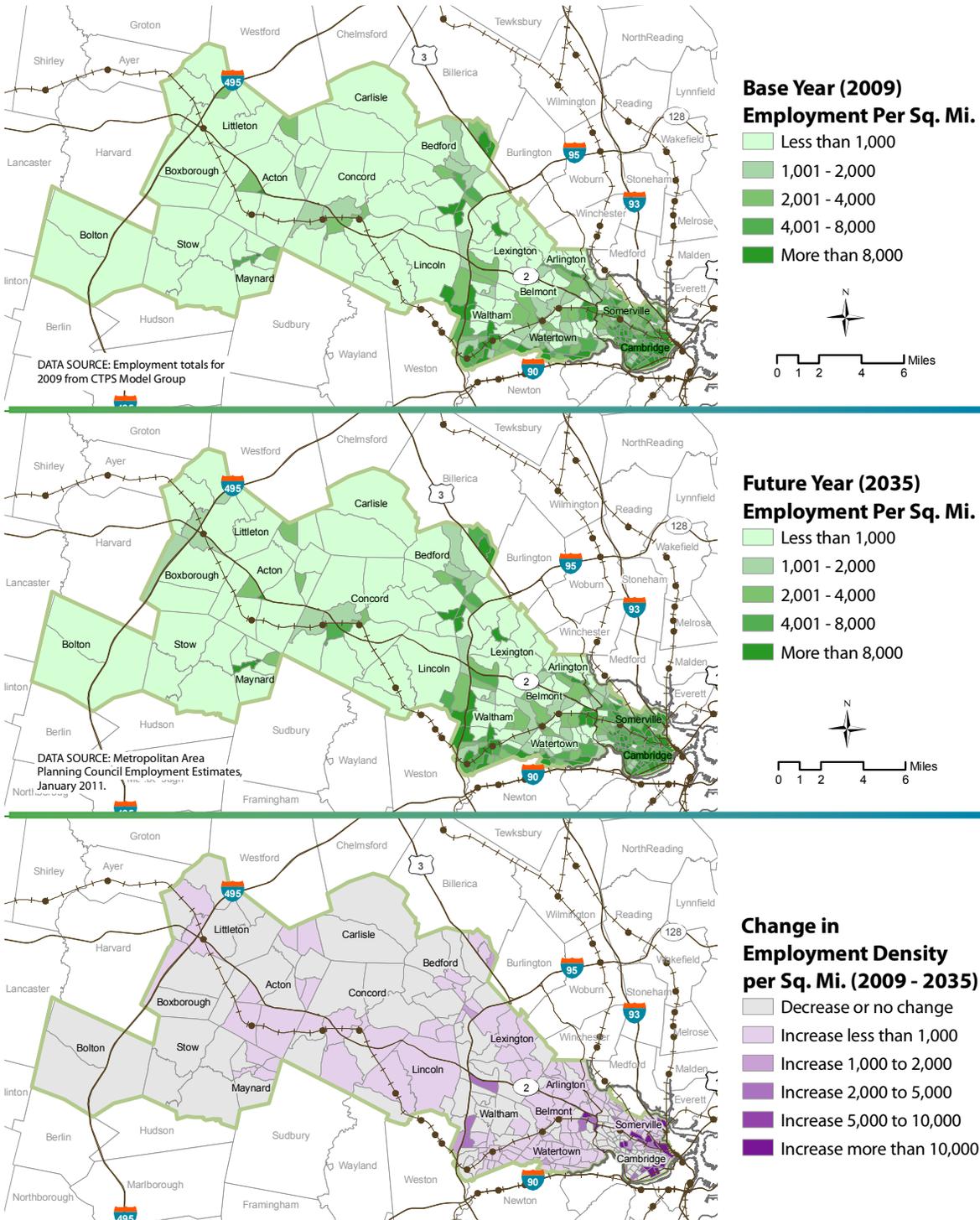


FIGURE 4-6

EMPLOYMENT DENSITY BY TRANSPORTATION ANALYSIS ZONE



ownership above 2.0 and average household mileage of over 75 miles per day.

Employment

According to the Executive Office of Labor and Workforce Development, the number of jobs in the Northwest Corridor in 2009 was 293,500. 54% of this employment is in Cambridge or Waltham. (Cambridge alone accounts for 36% of total employment in the Corridor.) Somerville, Lexington, Watertown, and Bedford are also major employment centers, with more than 18,000 jobs each. Waltham generates more than 209,000 auto commuting miles daily, with an average auto commuting distance of 17.4 miles round-trip. While Cambridge has twice as many employees as Waltham, it generates fewer auto commute miles because commutes are



shorter and more than 30% of commuting miles are traveled by transit, walking, or biking (versus 13.7% for the corridor overall.) The least sustainable commuting patterns are found in Littleton, Bedford, Bolton, Concord, and Boxborough, all of which have average round trip commuting distances more than 19.5 miles, and less than 7.5% of all commuting miles are accomplished by transit, walking, or biking.

MAPC's MetroFuture forecasts show employment increasing by 12% to 330,900 by 2035, with most municipalities experiencing modest growth in absolute terms. Most of the employment growth in the corridor is projected to occur in Somerville or Cambridge, through redevelopment in Assembly Square, along the Green Line Extension, in Kendall Square, or at Alewife. Smaller employment

gains (10% or less of the corridor total) are projected for Acton, Bedford, Concord, Lexington, and Watertown. Arlington, Belmont, Boxborough, Lincoln, and Maynard are all projected to add fewer than 300 net new jobs.

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 four distinct community types based on existing conditions and potential for sustainable

development. The Northwest Corridor includes six Inner Core communities (Arlington, Belmont, Cambridge, Somerville, Waltham, and Watertown). The remaining towns are Maturing Suburbs or Developing Suburbs.

The MetroFuture land use vision for the Northwest Corridor is built around redevelopment of commercial and industrial land along the Red Line, Orange Line, and Green Line extension, and through continued urban revitalization and infill in Cambridge, Somerville, Arlington, and Watertown. In these locations, new households will have the greatest access to transit and the highest proximity to common household destinations. Economic development along the subway, light rail, and commuter rail stations will also create more options for commuters, especially if transit service is structured to serve reverse commutes from the Inner Core to suburban job locations near transit.



In locations more distant from transit, MetroFuture recommends land use, design, and transportation demand strategies that facilitate transit and bicycle or pedestrian access. For example, high-density redevelopment of office and industrial parks along Route 128 could create the conditions —through new transit, pedestrian-oriented design, and limited parking—for a dramatic shift to alternative modes. Such redevelopment would increase employment density while minimizing added congestion and reducing the need for roadway expansion projects.

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 4-3. 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 the 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 4-3

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
Acton			•			•	•		•			•	•		•	•	•	•
Arlington										•		•			•	•		•
Bedford	•					•		•				•	•		•	•		
Belmont		•				•				•		•			•	•	•	
Bolton		•								•						•		
Boxborough												•						
Cambridge			•	•						•		•	•				•	•
Carlisle												•	•		•			
Concord						•	•		•				•		•		•	
Lexington			•			•	•		•	•		•	•		•	•	•	•
Lincoln						•		•		•		•	•		•			•
Littleton					•					•		•	•					
Maynard	•					•	•		•	•		•	•			•		
Somerville			•	•	•				•	•	•	•			•	•		
Stow												•	•			•		
Waltham	•		•			•				•	•	•	•		•		•	
Watertown		•			•	•				•		•		•	•			•

TRAVEL CHARACTERISTICS

Travel into Boston Proper from the Northwest Corridor (Highway and Transit)

The most recent count information for highway and transit travel into Boston Proper from the Northwest Corridor is shown in Table 4-4. Also included is the same

information from the travel demand model showing projected future 2030 No-Build conditions. Boston Proper is the area with the following boundaries:

- Charles River on the north
- Massachusetts Avenue to Interstate 93 on the west and south
- Interstate 93 to South Station on the east

TABLE 4-4

AVERAGE DAILY HIGHWAY AND TRANSIT PERSON-TRIPS INTO BOSTON PROPER FROM THE NORTHWEST CORRIDOR: 2008 AND 2030 NO-BUILD

	2008 PERSON-TRIPS	2030 NO-BUILD PERSON-TRIPS
Highway	44,770	50,230
Transit	55,300	61,550
Total	100,070	111,780
Highway percentage	45%	45%
Transit percentage	55%	55%
Corridor's share of total person-trips into Boston	10%	11%

Table 4-5 gives the modal breakdown of the transit trips.

TABLE 4-5

AVERAGE DAILY TRANSIT PERSON-TRIPS BY MODE INTO BOSTON PROPER FROM THE NORTHWEST CORRIDOR: 2008 AND 2030 NO-BUILD

	2008 PERSON-TRIPS	2030 NO-BUILD PERSON-TRIPS
Bus	450	700
Rapid transit	51,500	56,950
Commuter rail	3,350	3,900
Contracted bus service	0	0
Ferry	0	0
TOTAL	55,350	61,550
Corridor's share of total transit trips into Boston	15%	16%

Inbound congestion levels on each of the three major modes of transit entering Boston Proper from the Northwest Corridor were calculated via two methods: by comparing the ridership loads to the seating capacity and by comparing them to the planning capacity (planning capacity is the seating capacity plus standing capacity). The 2008 congestion levels for each mode are shown in Table 4-6.

TABLE 4-6

AVERAGE DAILY CONGESTION LEVELS ON TRANSIT MODES WITH SERVICE INTO BOSTON PROPER FROM THE NORTHWEST CORRIDOR (2008)

MODE	BY SEATING CAPACITY	BY PLANNING CAPACITY
Bus	94%	67%
Rapid transit	72%	27%
Commuter rail	71%	60%

More detailed information on both highway and transit congestion is included in the Identified Transportation Issues section under Mobility.

Northwest Corridor Travel Patterns

Figure 4-7 presents data, for both the base year 2008 and the projected 2030 No-Build scenario, on the person-trips (highway and transit combined for all types of travel: work-based, school-based, shopping, etc.) that originate in and are destined to the inner Northwest Corridor – the corridor communities that are not part of 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.

As shown, 62% of person-trips in the 2008 base year and 62% of person-trips in the 2030 No-Build scenario remain in the inner Northwest Corridor (municipalities within the Boston Region MPO that are not part of the Central Area). The other top origins and destinations for travel in the inner Northwest Corridor are the North and West Corridors, and the Central Area.

The Central Area is the region’s most prominent population and employment area, and it includes the Northwest Corridor municipalities of Cambridge and Somerville. Travel originating in or destined to the Central Area accounts for about 13% of the Northwest Corridor person trips. In comparing 2008 base-year and 2030 No-Build travel, the latter includes slightly more travel to the Central Area. Travel within the Northwest Corridor and between it and the previously listed corridors accounts for 91% of all person-trips associated with the Northwest Corridor. The remaining 9% of person-trips travel to the remaining corridors.

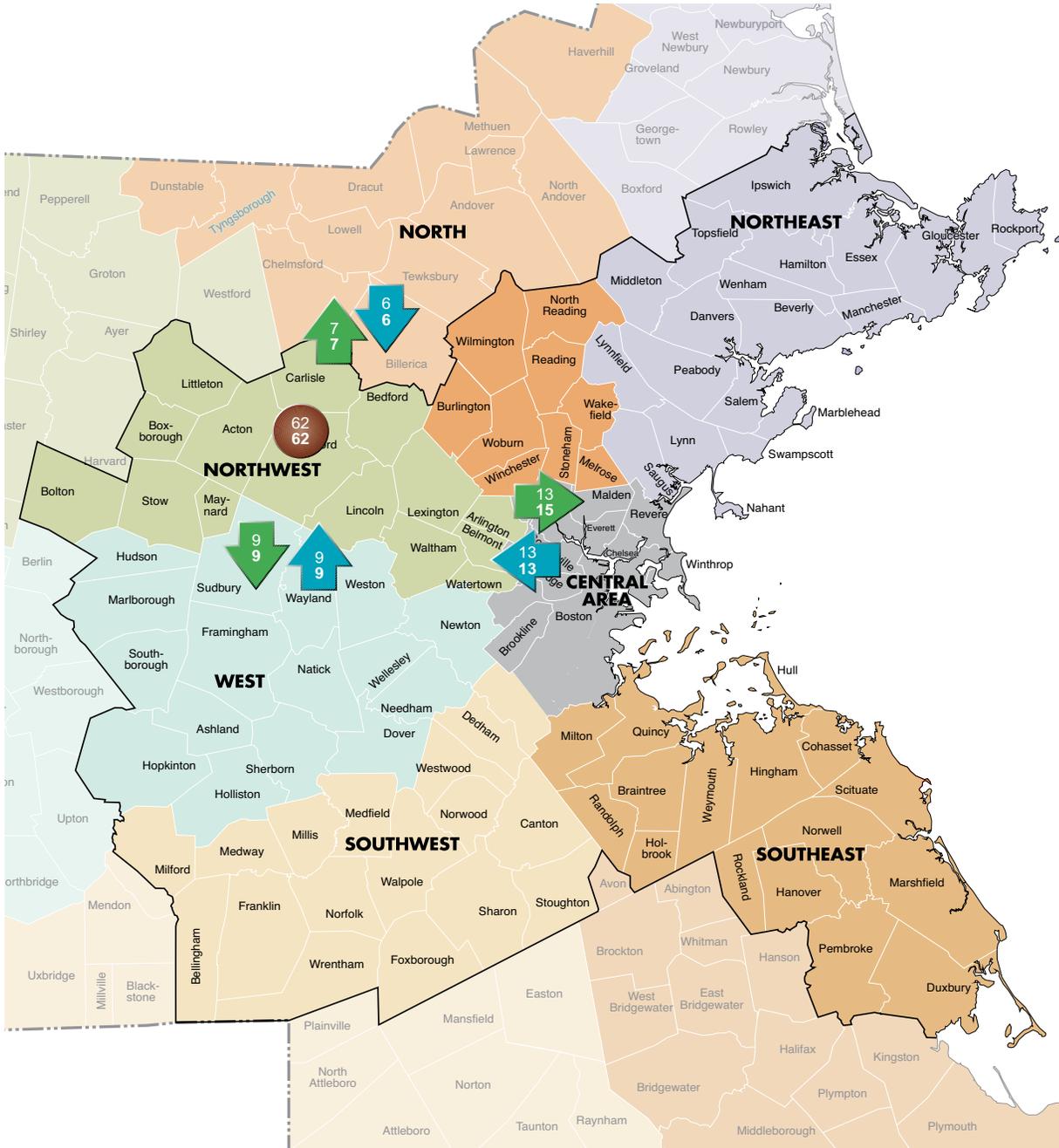
When looking at the 2000 census Journey-to-Work data for the Northwest Corridor, only 39.5% of the work-based trips (compared to 62% of all trips) remain within the Northwest Corridor, while over 24% of the work-based trips (compared to 13% of all trips) are destined to the Central Area.

Truck Travel

Daily truck trip-ends per square mile are shown in Figure 4-8 along with the locations of freight intermodal facilities. This figure shows that the highest concentrations of 2008 daily truck activity occur closest to Boston in parts of Cambridge and Somerville. Other areas with high levels of truck travel are found in southern portions of Waltham and Watertown, in the central parts of Lexington and Arlington around Route 2A, Interstate 95 in Lexington and the southern portion of Waltham, Route 2 in Acton, and Routes 117 and 62 in Maynard.

FIGURE 4-7

**TRAVEL ASSOCIATED WITH THE NORTHWEST CORRIDOR
(2008 AND 2030 PERSON-TRIPS)**



2008
2030
Percent stays in corridor

2008
2030
Percent of Person Trips Leaving Corridor

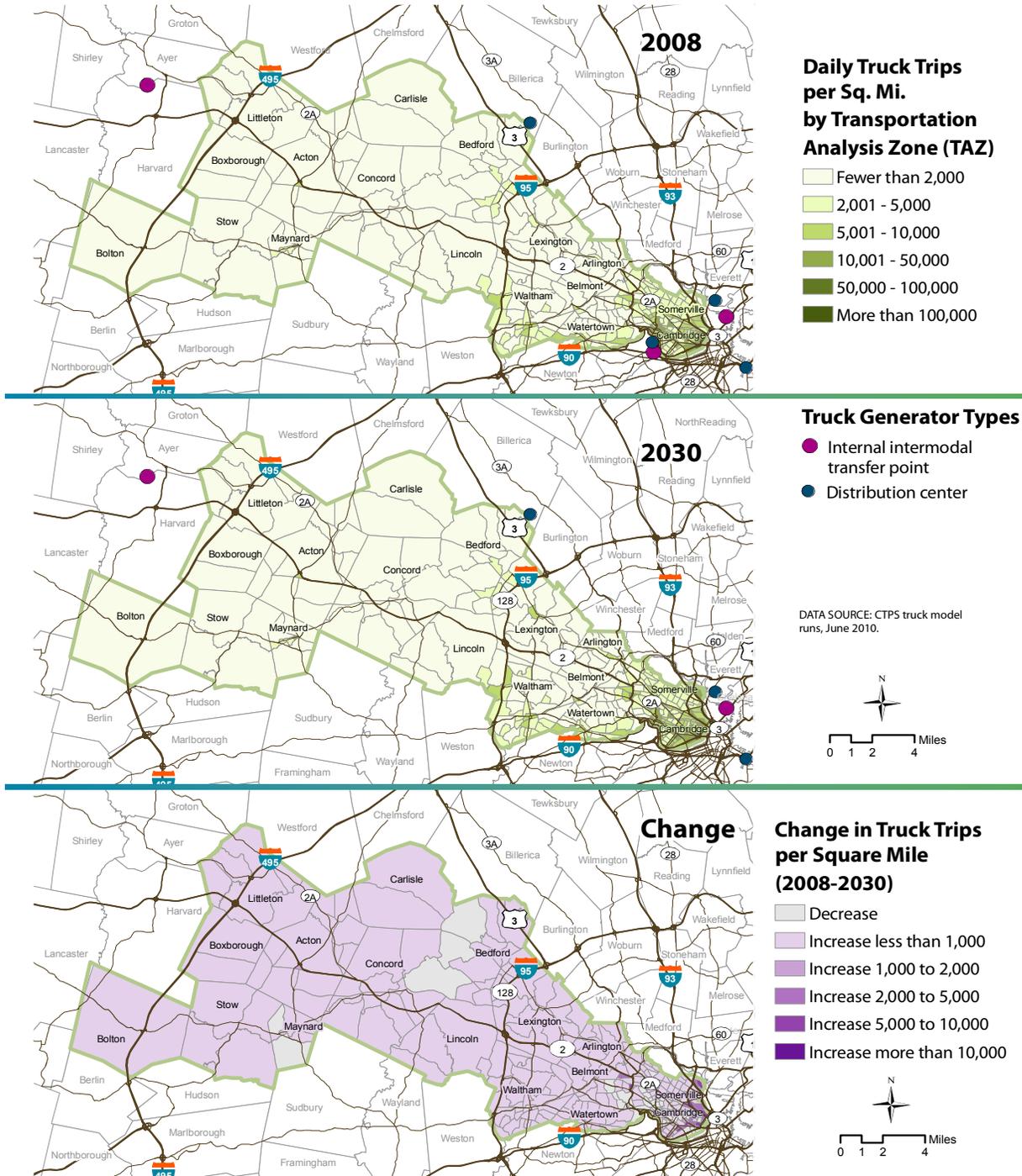
2008
2030
Percent of Person Trips Entering Corridor



SCALE IN MILES
0 4.5 9

FIGURE 4-8

DAILY TRUCK TRIPS BY TRANSPORTATION ANALYSIS ZONE - NORTHWEST



The areas predicted to have the largest increase in daily truck trips between 2008 and 2030 (No-Build scenario), include areas of eastern Cambridge and Somerville, including the Assembly Square site in the latter, and in the vicinity of Alewife Station in Cambridge at the Intersection of Routes 2 and 3A, and the Alewife Brook Parkway.

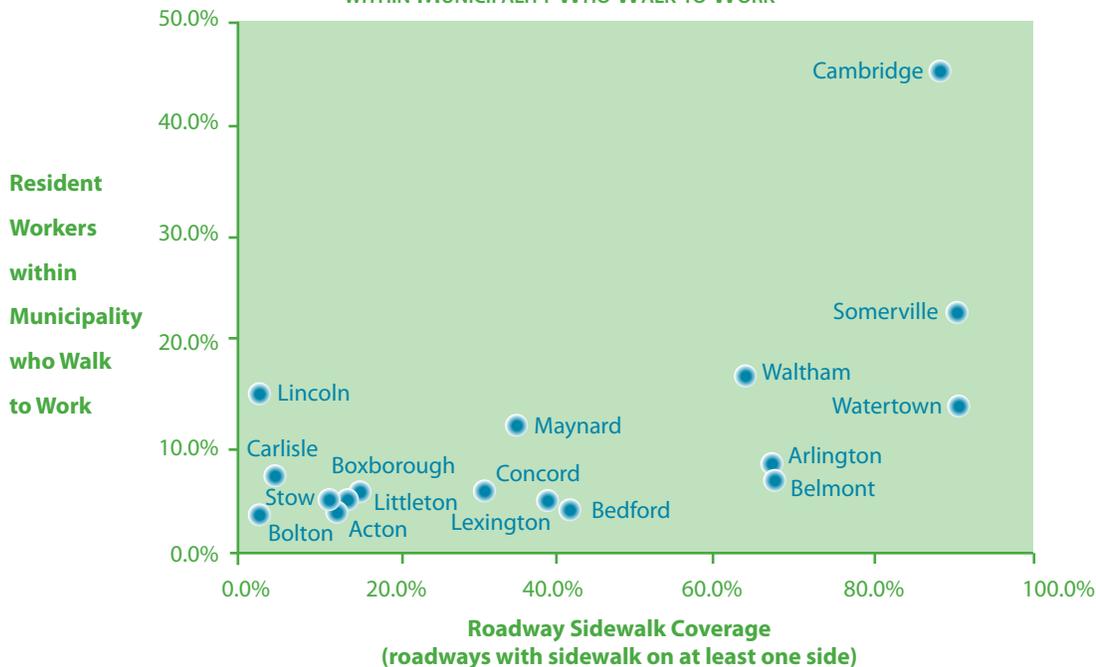
Bicycle and Pedestrian Travel

The Northwest Corridor has the most developed bicycle network of all the radial corridors, and is evidenced by the bicycle travel counted in the corridor. Cumulatively, less than 2% of Northwest Corridor residents bicycle to work. However, the cities of Cambridge and Somerville, that have more developed bicycle networks have higher bicycle to work shares of almost 4% and 3%, respectively (data derived from 2000 census Journey-to-Work data).

Walking conditions fluctuate from poor to very good in the Northwest Corridor. Table 4-7 shows the relationship between roadway sidewalk coverage (roadways having a sidewalk on at least one side) 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 under 5% in Bolton and Lincoln to over 90% in Somerville and Watertown, and in walk share from almost 4% in Bolton to over 20% in Cambridge and Somerville.

TABLE 4-7

RELATIONSHIP BETWEEN SIDEWALK COVERAGE AND RESIDENT WORKERS WITHIN MUNICIPALITY WHO WALK TO WORK



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.

Bicyclists and pedestrians have been counted at several on-road and off-road facilities in the Northwest Corridor. Table 4-8 contains the top locations by average weekday peak-hour user volumes. Users primarily consist of bicyclists and pedestrians, and also include people jogging, skating, using wheelchairs, and pushing strollers.

TABLE 4-8

AVERAGE PEAK-HOUR BICYCLIST AND PEDESTRIAN VOLUMES

FACILITY NAME	AM WEEKDAY PEAK-HOUR VOLUMES		
	BICYCLISTS	PEDESTRIANS	TOTAL
Memorial Dr. at Harvard Bridge (Cambridge)	267	491	658
Minuteman Bikeway (Cambridge)	164	255	419
Anderson Memorial Bridge (Cambridge)	107	309	416
Beacon St. (Somerville)	135	163	298
Somerville Community Path (Somerville)	32	301	333
Dr. P.D. White Path (Cambridge)	59	152	211
Minuteman Bikeway (Lexington)	94	34	128
Main St. (Waltham)	9	84	93
Massachusetts Ave. (Lexington)	13	75	88
Temple St. (Somerville)	5	79	84
Minuteman Bikeway (Bedford)	46	18	64
Lexington St. (Belmont)	7	46	53
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
Minuteman Bikeway (Lexington)	210	67	277
Dr. P.D. White Path (Cambridge)	75	245	320
Minuteman Bikeway (Bedford)	102	36	138
Temple St. (Somerville)	6	132	138
FACILITY NAME	DAILY WEEKEND PEAK-HOUR VOLUMES		
	BICYCLISTS	PEDESTRIANS	TOTAL
Minuteman Bikeway (Lexington)	332	82	414
Minuteman Bikeway (Bedford)	324	47	371
Minuteman Bikeway (Arlington)	174	163	337
Minuteman Bikeway (Cambridge)	173	128	301
Dr. P.D. White Path (Cambridge)	72	224	296

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 condition of its roadways is 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.

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 292 bridges in the Northwest Corridor, 77 (26%) are classified as functionally obsolete, and 22 (7.5%) 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 89 bridges in the corridor that should meet this vertical clearance for trucks. Of these bridges, 72 (81%) 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 37 (12.7%) weight-restricted bridges in the Northwest Corridor.

Transit: Universe of Transit Preservation and Modernization Needs Identified for the Northwest Corridor in the MBTA's Program for Mass Transportation

The MBTA's Program for Mass Transportation (PMT) 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 Northwest Corridor 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.

On the commuter rail system, eight bridges in the Northwest Corridor on the Fitchburg Line are currently rated as structurally deficient, and 18.4 miles of rail are in need of replacement. (Federal stimulus funds were granted for some of these improvements.)

On the Red Line, power cables, emergency lighting systems, and track components are in need of replacement at some locations. Seventy-four cars built in 1969 need to be replaced.

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.



ADA Accessibility

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

- Shirley, Ayer, Littleton/495, South Acton, Concord, Lincoln, Silver Hill, Hastings, Kendal Green, Waverley, and Belmont (Fitchburg Line)

Freight

Weight-Restricted Tracks

The tracks in the Northwest Corridor are restricted to 263,000 pounds per train car. The industry standard has become 286,000 pounds. This increases costs for

all shippers who need more cars to move their freight than they would in areas with 286,000-pound tracks.

Mobility

Highway Bottlenecks: Method for Identifying Them

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 Northwest Corridor, 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 Northwest Corridor 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.

Travel Speed Index (from the CMP)

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 4-9 for the AM peak period and Table 4-10 for the PM peak period, and also in Figures 4-9 and 4-10. Note that the tables include only Class I and II arterials; however, Figure 4-10 also shows Class III arterials. Many of the locations shown in Figure 4-10 with a travel speed index below 40% are CMP priority intersections on Class III arterials and are also discussed below in the CMP Priority Intersections section and shown in Figure 4-15. 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. The travel speed index information is provided for existing conditions only.

TABLE 4-9

**TRAVEL SPEED INDEX (FROM THE CMP):
WORST LOCATIONS* IN AM PEAK PERIOD**

EXPRESS HIGHWAYS	SPEED INDEX
I-93 southbound from Mystic Ave. to Rte. 99 Sullivan Sq. (Somerville)	0.38 to 0.47
Rte. 2 between Lake St. and the first Alewife signal (Arlington)	0.47 to 0.80
I-95 southbound from Rte. 3 to Winter St. (Lexington, Waltham)	0.72 to 0.87
Rte. 2 (Lincoln, Concord, Acton)	0.47 to greater than 1
ARTERIALS	SPEED INDEX
Rte. 60 (Waltham)	0.25 to 0.68
Rte 119 from Rte. 2 to Pope Rd. (Concord, Acton)	0.26 to 0.53
Alewife Brook Pkwy eastbound from Alewife to the Mt. Auburn St. signal (Cambridge)	0.30 to 0.66
Rte. 28 southbound from the Assembly Sq. Mall to the Broadway signal (Somerville)	0.47 to 0.66
Rte. 28 southbound from the Twin City Mall to the Third St. signal (Somerville)	0.56
Alewife Brook Pkwy/Fresh Pond Pkwy from Soldiers' Field on-ramp to Rte. 2 (Cambridge)	0.39 to 0.65

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

TABLE 4-10

**TRAVEL SPEED INDEX (FROM THE CMP):
WORST LOCATIONS* IN PM PEAK PERIOD**

EXPRESS HIGHWAYS	SPEED INDEX
I-93 northbound from the Leverett Connector to Mystic Ave. (Somerville)	0.47
Rte. 2 from the first Lake St. on-ramp to the Alewife signal (Arlington)	0.51 to 0.92
I-95 northbound from Rte. 2 to Rte. 3 (Lexington, Waltham)	0.67 to 0.85
I-95 southbound from Trapelo Rd. to Rte. 20 (Waltham)	0.89 to 0.90
Rte. 2 (Concord, Lincoln, and Acton)	0.58 to 0.9
CLASS I & II ARTERIALS	SPEED INDEX
Alewife Brook Pkwy/Fresh Pond Pkwy from Soldiers' Field on-ramp to Rte. 2 (Cambridge)	0.27 to 0.66
Rte 119 from Rte. 2 to Pope Rd. (Concord, Acton)	0.35 to 0.65
Rtes. 62, 225, and 4 corridor (Bedford, Lexington)	0.29 to 0.66
Rte. 28 between Mystic Ave. and Highland Ave. (Somerville)	0.34 to 0.63

*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 highway and arterial segments in the Northwest Corridor 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.

FIGURE 4-9

**EXPRESS HIGHWAY TRAVEL SPEED INDEX (EXISTING CONDITIONS) – AM AND PM:
NORTHWEST CORRIDOR**

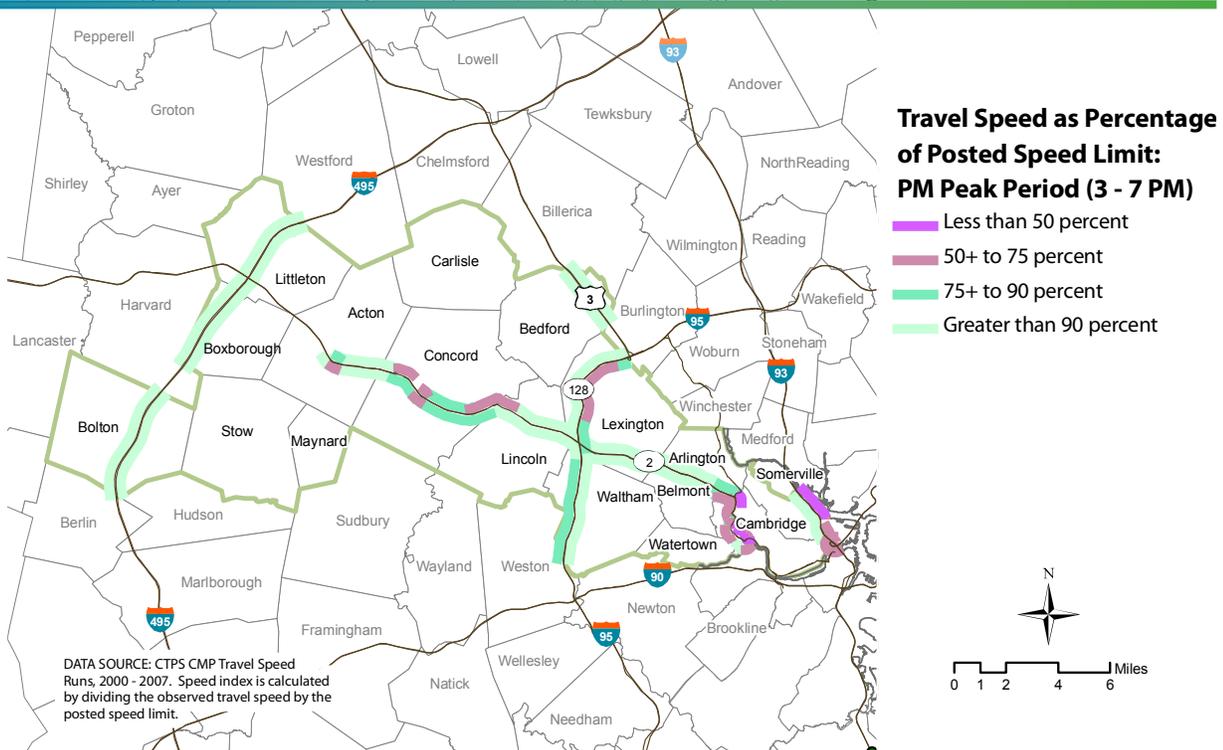
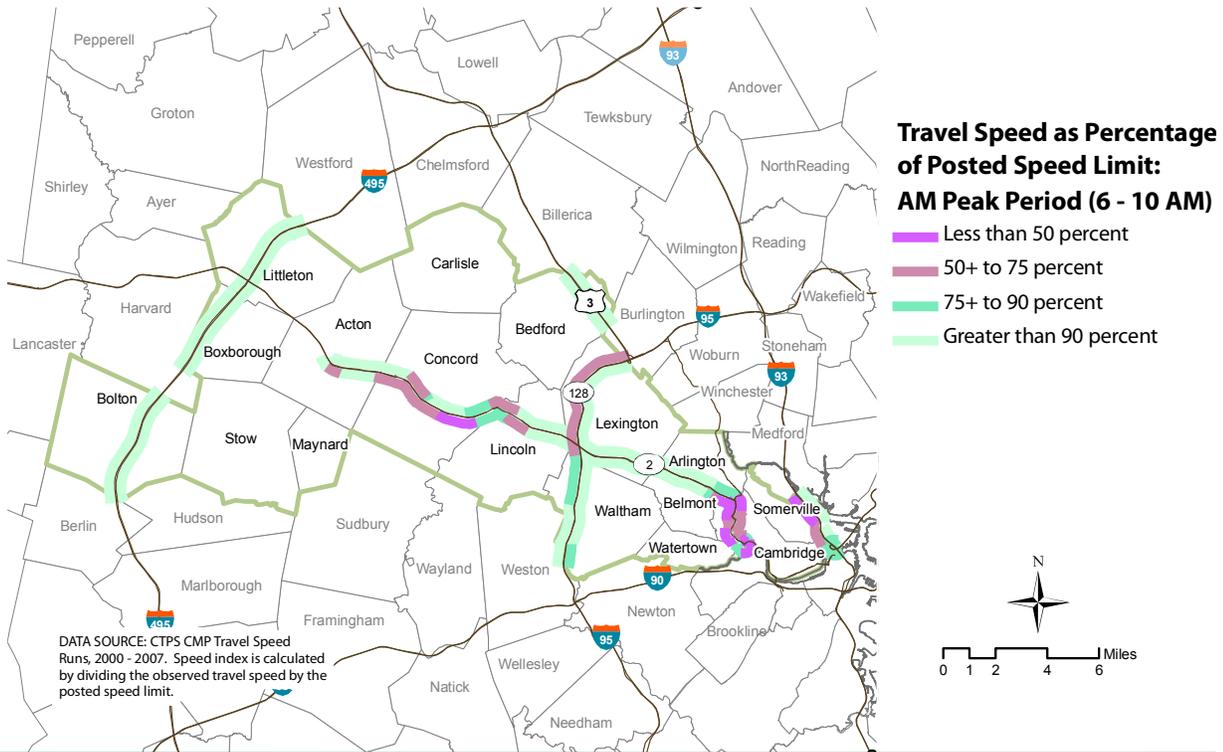


FIGURE 4-10

**ARTERIAL TRAVEL SPEED INDEX (EXISTING CONDITIONS) – AM AND PM:
NORTHWEST CORRIDOR**

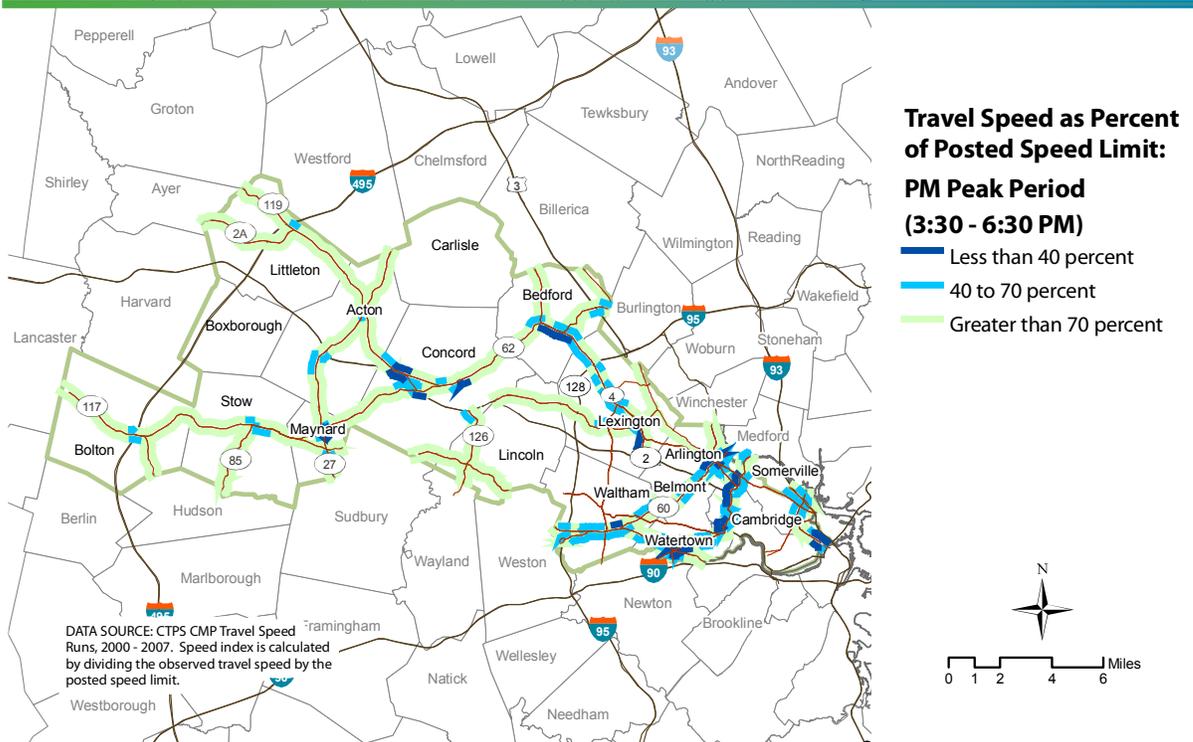
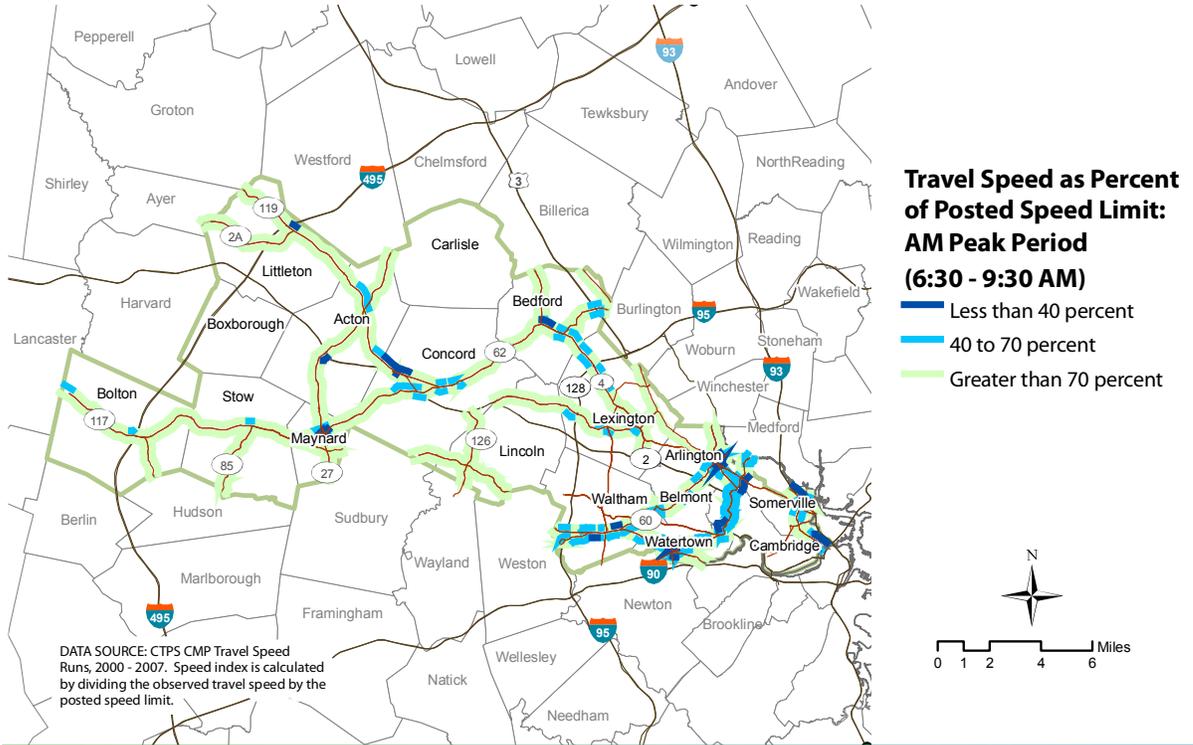


Table 4-11 and Figures 4-11 and 4-12 present the segments of roadways in the Northwest Corridor with the highest V/Cs during the AM peak period, listed in descending order of severity. Table 4-12 and Figures 4-11 and 4-12 present the same information for the PM peak period. Order of severity was determined 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 the 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 4-11

**VOLUME-TO-CAPACITY RATIO (V/C):
WORST LOCATIONS IN AM PEAK PERIOD, 2008**

EXPRESS HIGHWAYS	V/C
I-93 southbound from Mystic Ave. to Sullivan Sq. (Somerville)	0.9 to greater than 1
I-95 southbound from the Rte. 2 interchange to the Totten Pond Rd. interchange (Lexington, Waltham)	0.84 to 0.87
I-95 northbound from the Rte. 20 interchange to the Rte. 2 interchange in (Waltham, Lexington)	0.68 to 0.87
ARTERIALS	V/C
Rte. 60 from the Rte. 2 interchange to the intersection with 2A and Medford St. (Arlington)	0.93 to greater than 1
Rte. 2/2A from Crosby's Corner to the intersection with Rtes. 111 and 119 (Concord)	0.67 to greater than 1
Alewife Brook Pkwy/Fresh Pond Pkwy from Soldiers' Field on-ramp to Rte. 2 (Cambridge)	0.80 to greater than 1
Rtes. 62, 225 and 4 corridor (Bedford, Lexington)	0.61 to greater than 1
Rte. 16 corridor from Somerville to Cambridge	0.61 to greater than 1

TABLE 4-12

**VOLUME-TO-CAPACITY RATIO (V/C):
WORST LOCATIONS IN PM PEAK PERIOD, 2008**

EXPRESS HIGHWAYS	V/C
I-93 from Mystic Ave. to Sullivan Sq. (Somerville)	Greater than 1
I-95 southbound from the Rte. 2 interchange to the Totten Pond Rd. interchange (Lexington, Waltham)	0.89 to 0.92
I-95 northbound from the Rte. 20 interchange in Waltham to the Rte. 2 interchange in Lexington	0.87 to 0.95
ARTERIALS	V/C
Rte. 60 from the Rte. 2 interchange to the intersection with 2A and Medford St. (Arlington)	Greater than 1
Rtes. 62, 224 and 4 corridor (Concord, Bedford, Lexington)	0.75 to greater than 1
Rte. 16 corridor from Somerville to Cambridge	0.74 to greater than 1
Rte. 2/2A from Crosby's Corner to the intersection with Rtes. 111 and 119 (Concord)	0.74 to greater than 1
Alewife Brook Pkwy/Fresh Pond Pkwy from Soldiers' Field on-ramp to Rte. 2 (Cambridge)	0.80 to greater than 1

FIGURE 4-11

EXPRESS HIGHWAY VOLUME-TO-CAPACITY RATIO – 2008, AM AND PM:
NORTHWEST CORRIDOR

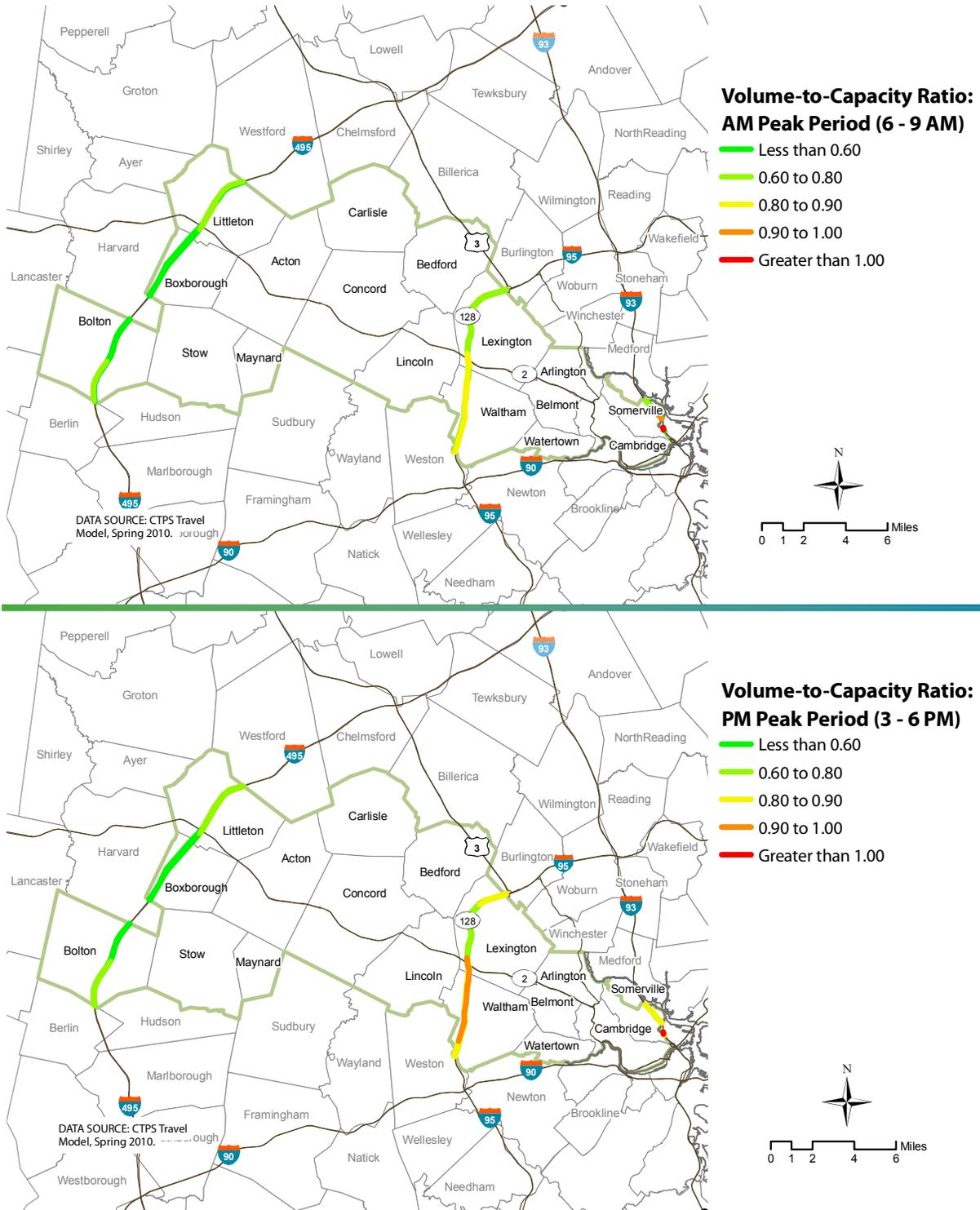
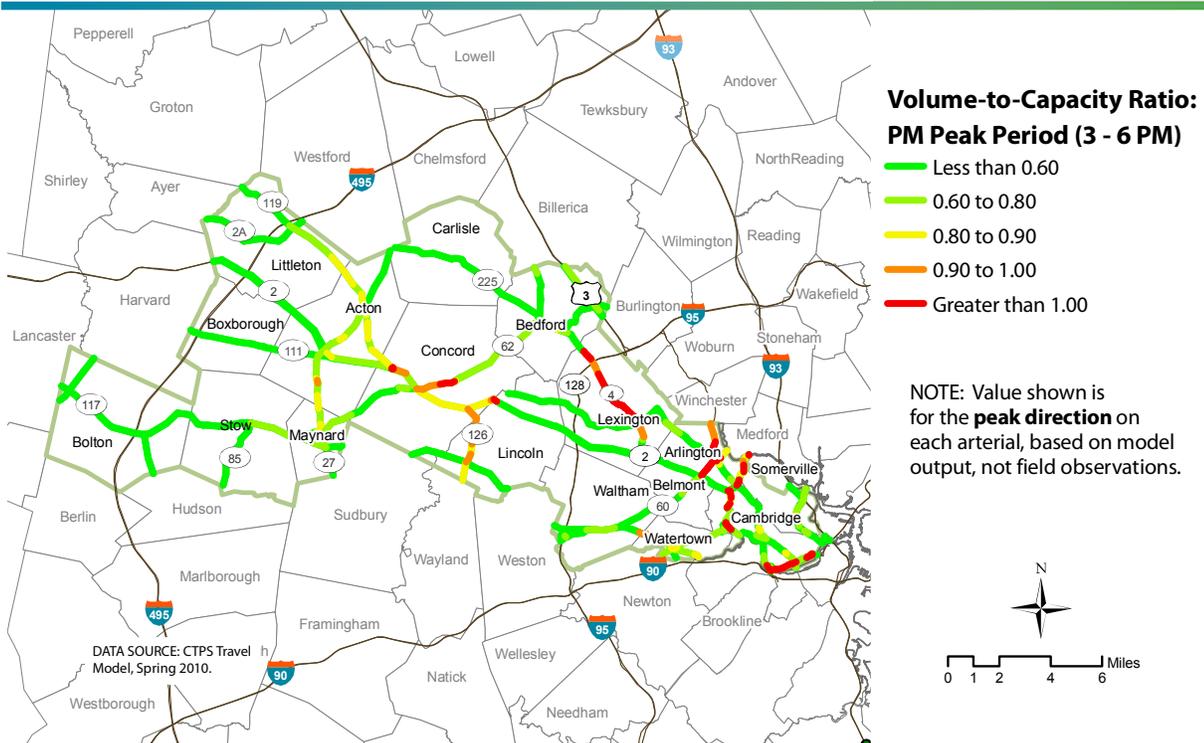
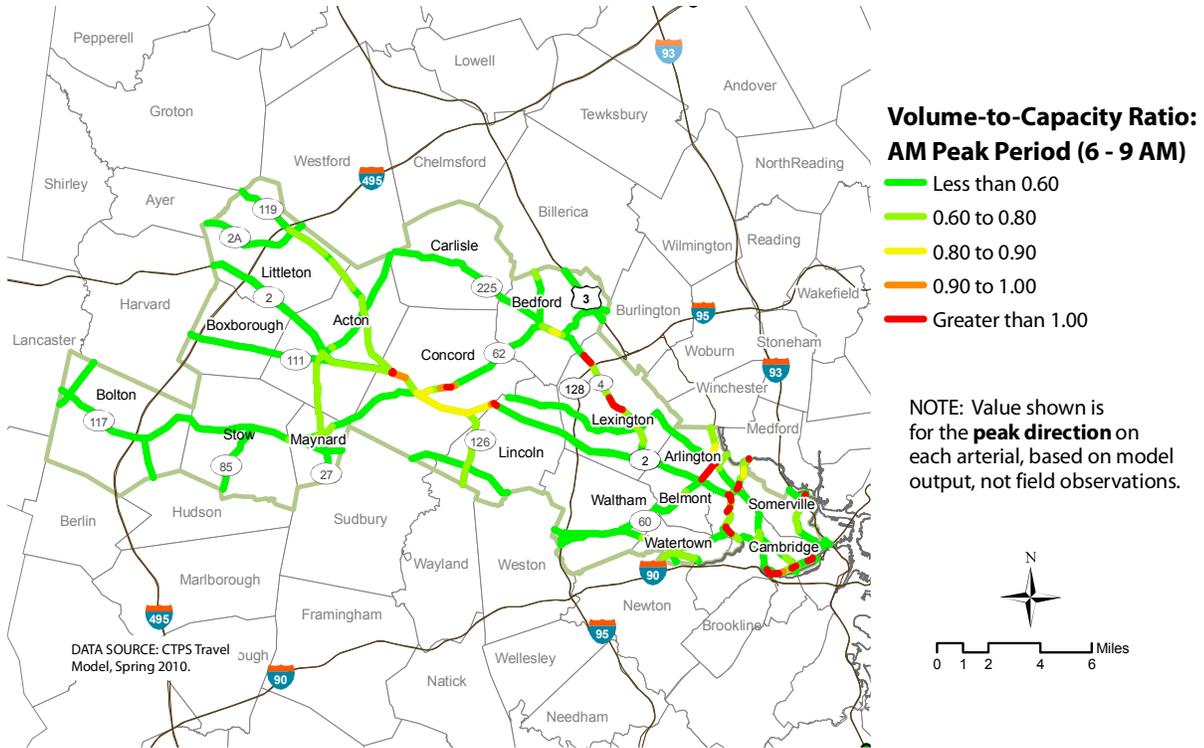


FIGURE 4-12

ARTERIAL VOLUME-TO-CAPACITY RATIO – 2008, AM AND PM:
NORTHWEST CORRIDOR



In addition, the Boston Region MPO's travel demand model was used to determine V/C for roadways under 2030 No-Build conditions. Table 4-13 and Figures 4-13 and 4-14 present the segments of roadways in the Northwest Corridor with the highest AM peak period V/Cs under the 2030 No-Build, again listing them in descending order of severity. Table 4-14 and Figures 4-13 and 4-14 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 4-13

**VOLUME-TO-CAPACITY RATIO (V/C):
WORST LOCATIONS IN AM PEAK PERIOD, 2030 NO-BUILD**

EXPRESS HIGHWAYS	V/C
I-93 from Mystic Ave. to Sullivan Sq. (Somerville)	0.9 to greater than 1
I-95 (Waltham)	0.85 to 0.94
I-95 from Rte. 2 to Totten Pond Rd. (Waltham)	0.85
ARTERIALS	V/C
Rte. 60 from the Rte. 2 interchange to the intersection with 2A and Medford Street (Arlington)	0.93 to greater than 1
Rte. 2/2A from Crosby's Corner to the intersection with Rtes. 111 and 119 (Concord)	0.67 to greater than 1
Rte. 2A/119 to the rotary with Rte. 2 (Littleton, Concord)	0.65 to greater than 1
Rtes. 62, 224 and 4 corridor (Concord, Bedford, Lexington)	0.61 to greater than 1
Rte. 16 corridor (Somerville, Cambridge)	0.61 to greater than 1

TABLE 4-14

**VOLUME-TO-CAPACITY RATIO (V/C):
WORST LOCATIONS IN PM PEAK PERIOD, 2030 NO-BUILD**

EXPRESS HIGHWAYS	V/C
I-93 from Mystic Ave. to Sullivan Sq. (Somerville)	Greater than 1
I-95 southbound from the Route 2 interchange to the Totten Pond Rd. interchange (Lexington, Waltham)	0.93 to 0.97
I-95 northbound from the Rte. 20 interchange to the Rte. 2 interchange (Lexington, Waltham)	0.94 to 0.96
ARTERIALS	V/C
Rte. 2A/119 to the rotary with Rte. 2 (Littleton to Concord)	0.84 to greater than 1
Rte. 2/2A from Crosby's Corner to the intersection with Rtes. 111 and 119 (Concord)	0.81 to greater than 1
Rte. 60 from the Rte. 2 interchange to the intersection with 2A and Medford St. (Arlington)	0.80 to greater than 1
Rtes. 62, 225 and 4 corridor (Concord, Bedford, Lexington)	0.79 to greater than 1
Rte. 16 corridor (Somerville, Cambridge)	0.79 to greater than 1
Rte. 126 (Lincoln)	Greater than 1

FIGURE 4-13

**EXPRESS HIGHWAY VOLUME-TO-CAPACITY RATIO – 2030 NO-BUILD, AM AND PM:
NORTHWEST CORRIDOR**

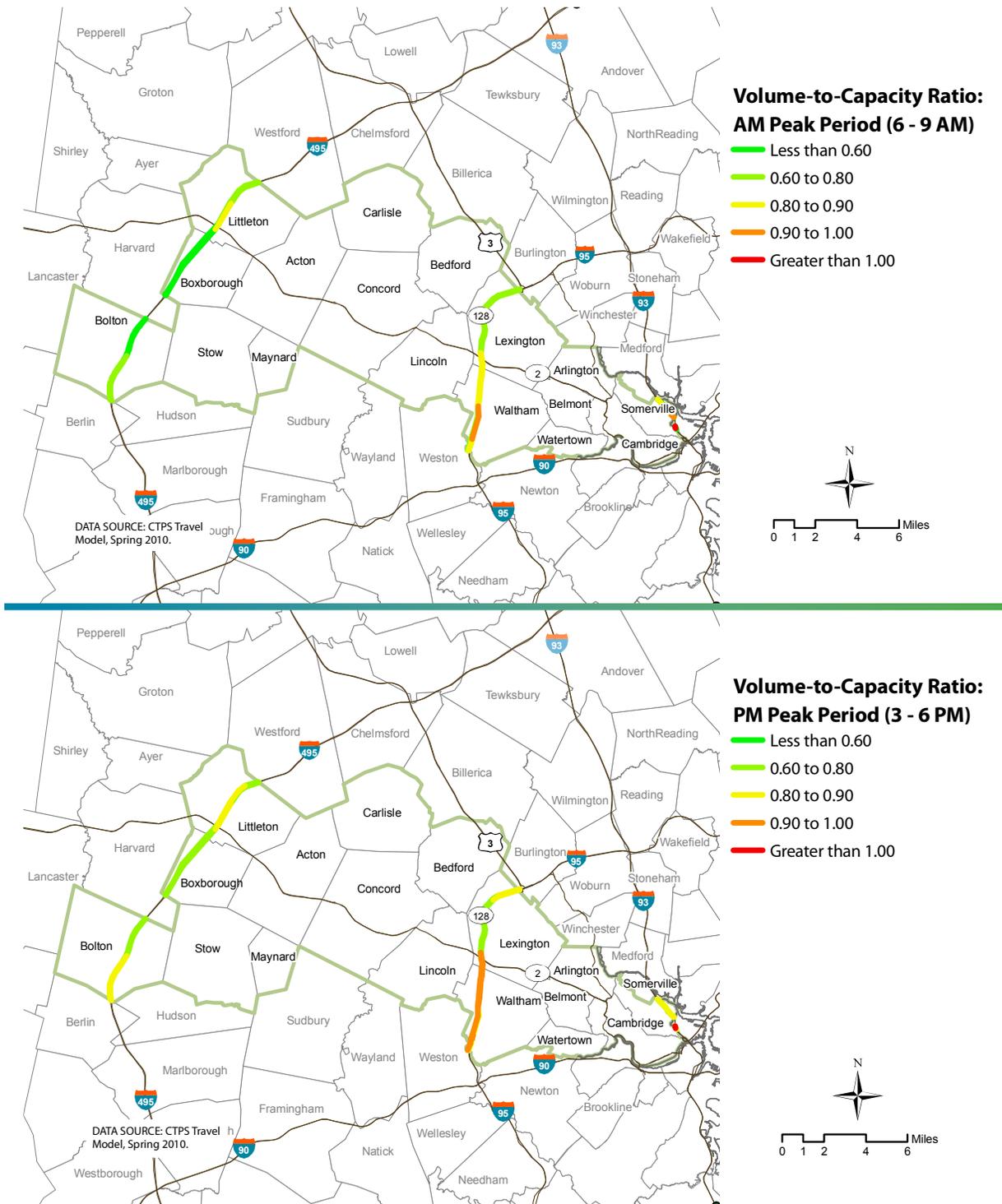
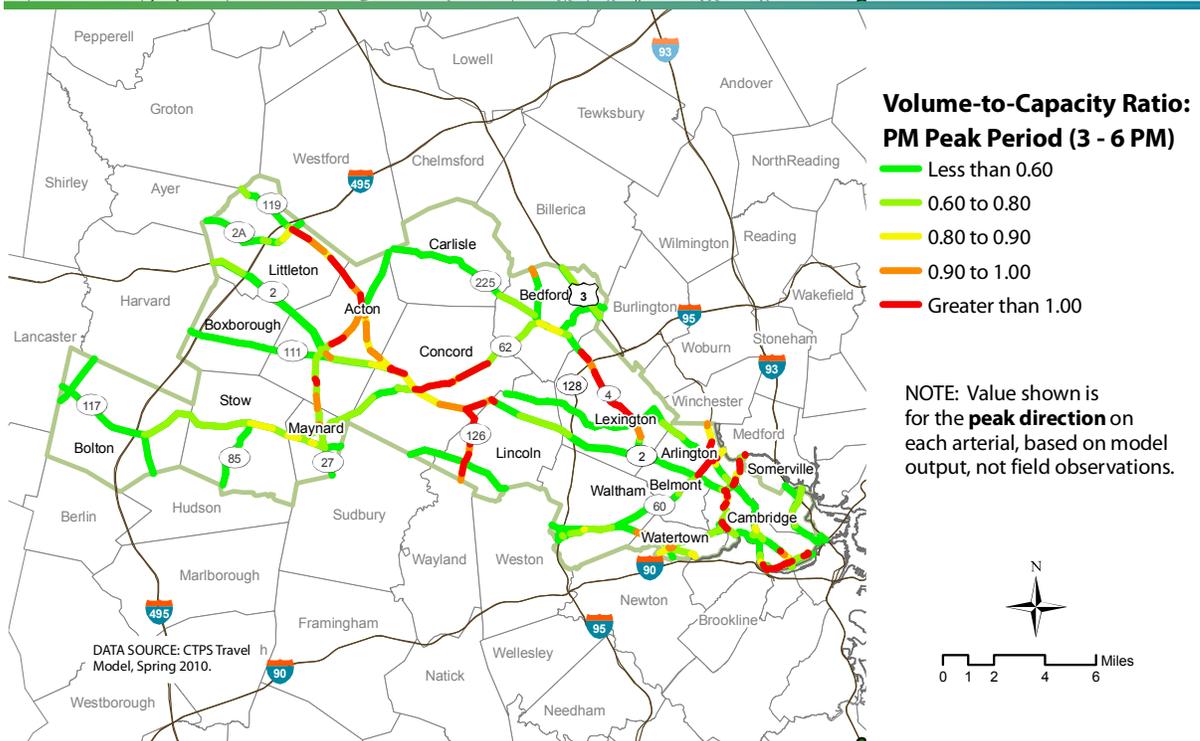
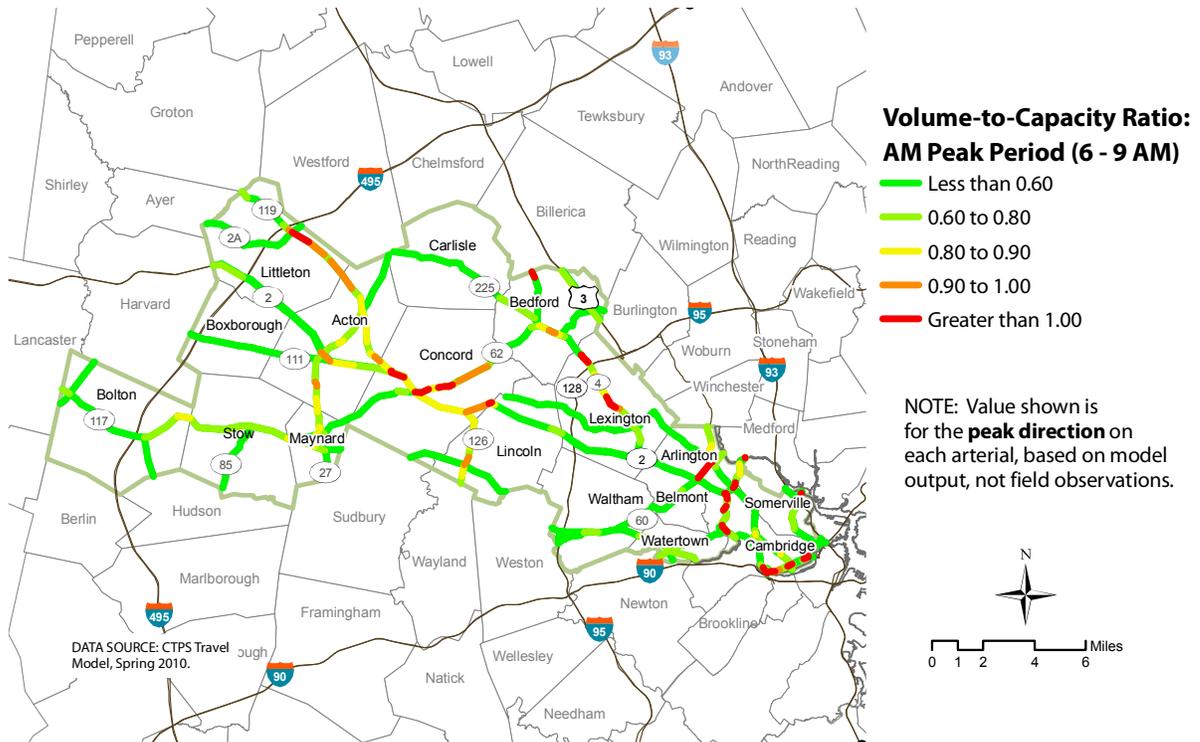


FIGURE 4-14

**ARTERIAL VOLUME-TO-CAPACITY RATIO – 2030 NO-BUILD, AM AND PM:
NORTHWEST CORRIDOR**



CMP Priority Intersections

The CMP identifies the intersections in the region that, on the basis of certain criteria, should be given priority for receiving improvements. An intersection is categorized as a priority if it meets at least one of the following criteria: it has a high incidence of crashes, the average delay on its major approaches is greater than 80 seconds per vehicle as monitored by the CMP (all state-numbered routes are monitored), or it has been identified in an MPO study as needing improvement.

The Northwest Corridor intersections that have been given priority by the CMP are shown in Figure 4-15. The roadways in the corridor that have clusters of priority intersections are (in roughly geographical order):

- Mystic Avenue in Somerville
- Route 28 in Somerville
- Route 16 in Somerville, Cambridge, and Watertown
- Route 2A in Cambridge and Arlington
- Alewife Brook Parkway in Cambridge
- Massachusetts Avenue in Cambridge and Arlington
- Route 60 in Arlington, Belmont, and Waltham
- Route 20 in Watertown and Waltham
- Lexington Street in Waltham
- Route 4/225 in Bedford and Lexington
- Route 2 in Concord
- Route 62 in Concord

Many of the clusters of priority intersections are on Class III arterials with the worst travel speed indexes (as determined by the CMP).

Worst Highway Bottlenecks in the Northwest Corridor

Table 4-15 shows the locations that have been identified as the worst bottlenecks in the Northwest Corridor based on the three types of information presented above. This table indicates the criteria by which the location was identified as a bottleneck.

FIGURE 4-15
CMP PRIORITY INTERSECTIONS, NORTHWEST CORRIDOR

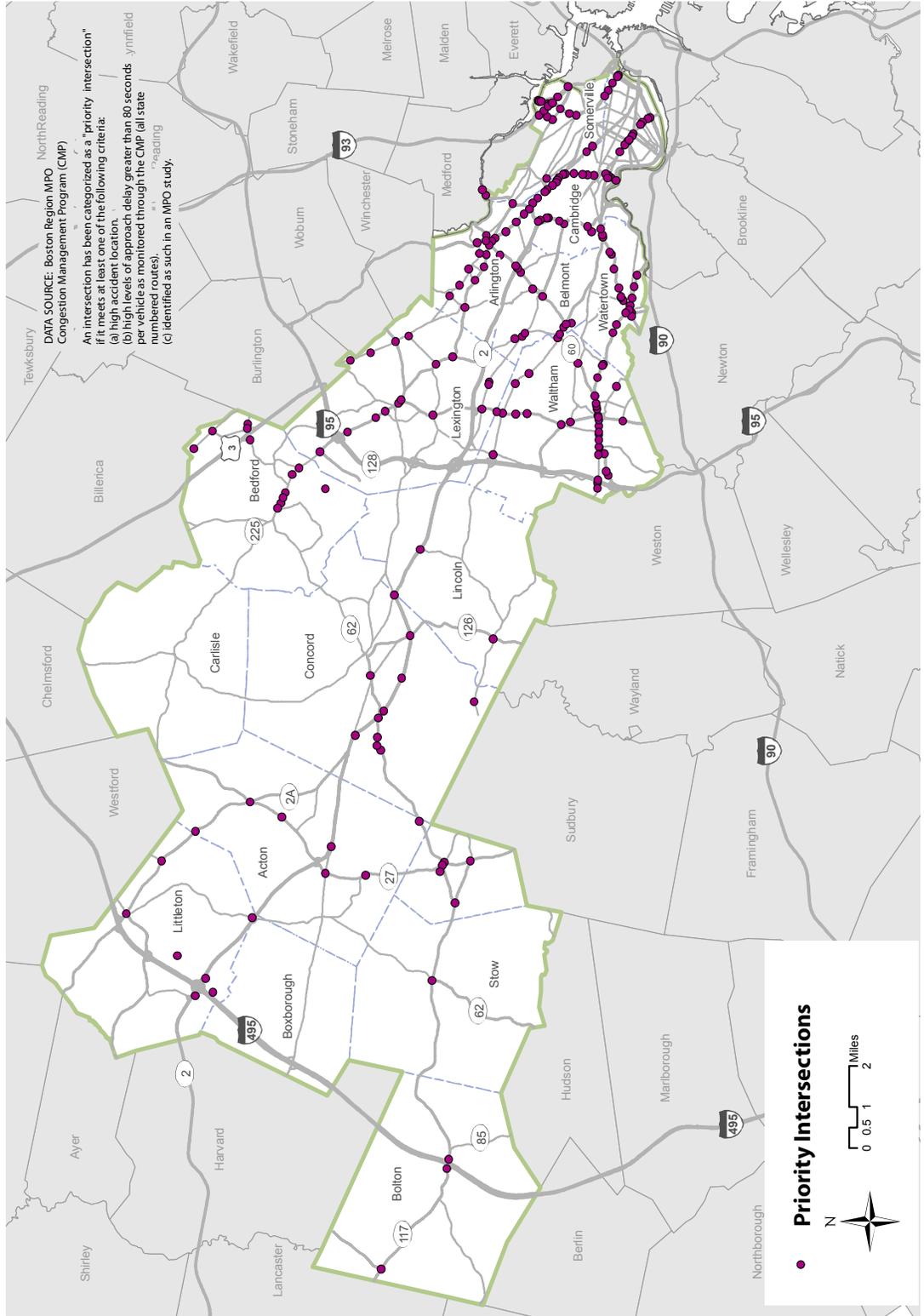


TABLE 4-15

WORST BOTTLENECK LOCATIONS

EXPRESS HIGHWAYS	SPEED INDEX	VOLUME TO CAPACITY	PRIORITY INTERSECTIONS
Rte. 2 (Arlington to Acton)	•		
I-93 (Somerville)	•	•	
I-95 (Lexington, Waltham)	•	•	
ARTERIALS			
Rte. 2/Alewife Brook Pkwy/Fresh Pond Pkwy (Cambridge)	•	•	•
Rte. 2/2A (Concord)		•	•
Rte. 2/2A (Littleton)		•	
Rtes. 62/4/225 (Bedford, Lexington)	•	•	•
Rte. 16 (Somerville, Cambridge, Watertown)		•	•
Route 20 (Watertown, Waltham)			•
Rte. 28 (Somerville)	•		•
Rte. 60 (Arlington, Belmont, Waltham)		•	•
Rte. 119 (Concord, Acton)	•	•	
Rte. 126 (Lincoln)		•	
Lexington Street (Waltham)			•
Massachusetts Ave. (Cambridge)			•
Mystic Ave. (Somerville)			•

Transit Mobility Needs Identified by the MBTA for the Northwest Corridor

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 percent 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 off peak is 100%.³

According to the most recent passenger counts available, the part of the Red Line that operates in the Northwest Corridor meets the vehicle load standard. Recent data also show that none of the peak-period commuter rail trips on the Fitchburg Lines exceed the vehicle load standards, as is shown in Table 4-16.

TABLE 4-16

FITCHBURG LINE VEHICLE LOADS

INBOUND AM PEAK						
Arrive North Station	7:17 AM	7:44 AM	8:00 AM	8:25 AM	8:54 AM	
Assigned Seats	570	570	684	684	570	
Peak Load	436	453	514	640	405	
Peak Load/Seats	76%	79%	75%	94%	71%	
OUTBOUND PM PEAK						
Depart North Station	4:00 PM	4:40 PM	4:50 PM	5:20 PM	5:40 PM	6:20 PM
Assigned Seats	684	570	570	684	684	570
Peak Load	210	580	427	565	357	279
Peak Load/Seats	31%*	102%	75%	83%	52%	49%

*South Acton short-turn train

The buses with the highest ridership in the Northwest Corridor are:

- Route 1 (Harvard Square - Dudley Station via Mass. Ave.) - 12,300 average daily boardings
- Route 70/70A (Cedarwood/North Waltham - University Park, Cambridge) - 6,700 average daily boardings
- Route 77 (Arlington Heights - Bennett Street Alley) - 6,600 average daily boardings
- Route 73 (Waverly Square - Harvard Station) - 6,400 average daily boardings
- Route 86 (Sullivan Station - Cleveland Circle) - 5,100 average daily boardings

Table 4-17 presents data on the performance of the Northwest Corridor bus routes. As shown by the routes' maximum load ratios (based on recent ridership counts), some of the routes in the Northwest Corridor fail the load standard in either the AM or PM peak. These include Routes 1, 47, 57, 66, and 71. Service adjustments have been made to all of these routes, and the MBTA Service Planning Department is monitoring them to evaluate whether additional changes need to be made.

³ For bus, light rail and heavy rail, the vehicle load standard is based on the ratio of passengers to seated capacity at maximum load for each trip, averaged over 30 minutes during the peaks and 60 minutes during off-peak periods. For commuter rail and ferry services, the load standard is based on the ratio of boarding passengers per vehicle to seated capacity.

In addition, Table 4-17 lists the percent of timepoints on each route (for all trips operated during October) at which the buses were on time, and gives an indication of whether or not the route might pass the schedule adherence standard. In the *Service Delivery Policy*, the schedule adherence standard establishes a two-step process. First, the standard measures whether or not the bus is on time at various timepoints along the route. The definition of “on time” at any given timepoint on a route varies by time period and by the frequency of service and depends on whether the timepoint is at the beginning of the route, mid-route, or at the end of the route. Second, a requirement that 75% of trips be “on time” is applied to individual time periods, and a route fails the standard if it fails during any time period during the day.



In Table 4-17, the 75% threshold has been applied to all timepoints on all trips operated during the month of October 2010, and so the result is not an official schedule adherence designation. It does, however, give an idea of how well individual routes are performing and provides a comparative indication of which routes have the worst problems and are most in need of operational improvements. The MBTA now employs 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. MBTA Service Planning is currently using automatic vehicle locator (AVL) data to refine bus schedules to better represent actual running times. This should improve on-time performance.

TABLE 4-17

PERFORMANCE OF BUS ROUTES

					BASED ON ALL TRIPS OPERATED DURING OCTOBER 2010			
TYPE	ROUTE	ROUTE NAME	VEHICLE LOAD STANDARD	MAXIMUM LOAD RATIO	% TIME-POINTS ON TIME	SCHEDULE ADHERENCE STANDARD	% OF SCHEDULED TRIPS OPERATED	# TRIPS OPERATED
Local	1	Harvard - Dudley Sta. via Mass. Ave.	Fail	146%	71%	Fail	99.4%	2,343
Local	47	Central Sq., Cambridge - Broadway Sta.	Fail	154%	67%	Fail	99.8%	983
Local	52	Dedham Mall - Watertown Sq.		98%	59%	Fail	99.8%	440
Local	57	Watertown Sq. - Kenmore Sq.	Fail	145%	65%	Fail	97.9%	2,580
Local	59	Needham Junction - Watertown Sq.		73%	55%	Fail	99.6%	525
Local	62	Bedford V.A. Hospital - Alewife Sta.		123%	51%	Fail	99.7%	460
Local	64	Oak Sq. - University Pk., Cambridge		119%	65%	Fail	99.9%	788
Local	66	Harvard Sq. - Dudley Sta. via Brookline	Fail	162%	70%	Fail	99.4%	1,968
Local	67	Alewife Sta. - Turkey Hill Reservation		108%	65%	Fail	99.8%	503
Local	68	Harvard Sq. - Kendall Sq.		98%	63%	Fail	99.8%	504
Local	69	Harvard Sq. - Lechmere Sta.		106%	65%	Fail	99.9%	1,060
Local	70/70A	Cedarwood - University Pk., Cambridge		134%	59%	Fail	99.3%	1,572
Local	71	Watertown Sq. - Harvard Sta.	Fail	144%	77%		99.7%	2,343
Local	72	Aberdeen & Mt. Auburn - Bennett St. Alley		95%	73%	Fail	100.0%	987
Local	73	Waverley Sq. - Harvard Subway		134%	67%	Fail	98.9%	2,745
Local	74	Belmont Ctr. - Bennett St. Alley		115%	63%	Fail	100.0%	725
Local	75	Belmont Ctr. - Bennett St. Alley		127%	61%	Fail	100.0%	273
Local	76	Hanscom Air Base - Alewife Sta.		100%	70%	Fail	100.0%	471
Local	77	Arlington Heights - Bennett St. Alley		119%	68%	Fail	98.7%	2,952
Local	78	Arlmont Village - Bennett St. Alley		80%	64%	Fail	99.9%	934
Local	79	Arlington Heights - Alewife Sta.		82%	70%	Fail	99.4%	891
Local	80	Arlington Ctr. - Lechmere Sta.		87%	64%	Fail	99.7%	824
Local	83	Rindge Ave. - Central Sq., Cambridge		90%	62%	Fail	99.8%	975
Local	84	Arlmont Loop - Alewife Sta.		94%	79%		100.0%	242
Local	85	Spring Hill - Kendall Sta.		73%	80%		100.0%	462
Local	86	Sullivan Sta. - Cleveland Circle		113%	57%	Fail	99.7%	1,150
Local	87	Arlington Ctr. - Lechmere Sta. via Somerville Ave.		118%	55%	Fail	99.9%	1,089
Local	88	Clarendon Hill - Lechmere Sta via Highland		93%	65%	Fail	99.8%	1,176
Local	89	Clarendon Hill or Davis Sta. - Sullivan Sta.		109%	67%	Fail	98.8%	1,305
Local	90	Davis Sq. Sta. - Wellington Sta.		85%	66%	Fail	100.0%	420
Local	91	Sullivan Sta. - Central Sq., Cambridge		73%	64%	Fail	99.9%	797
Local	CT2	Sullivan Sq. Sta. - Ruggles Sta.		105%	57%	Fail	99.9%	1,335
Local	350	Burlington - Alewife Sta.		93%	58%	Fail	100.0%	581
Local	351	Oak Park - Alewife Sta. via Middlesex Tnkp.		32%	60%	Fail	100.0%	137
Express	502	Watertown Sq. - Copley Sq.		101%	63%	Fail	98.3%	597
Express	504	Watertown Sq. - Federal & Franklin Sts.		93%	60%	Fail	99.6%	1,031

TABLE 4-17 (CONT.)

PERFORMANCE OF BUS ROUTES

					BASED ON ALL TRIPS OPERATED DURING OCTOBER 2010			
TYPE	ROUTE	ROUTE NAME	VEHICLE LOAD STANDARD	MAXIMUM LOAD RATIO	% TIME-POINTS ON TIME	SCHEDULE ADHERENCE STANDARD	% OF SCHEDULED TRIPS OPERATED	# TRIPS OPERATED
Express	505	Waltham Ctr. - Federal & Franklin Sts.		91%	51%	Fail	99.8%	638
Express	553	Roberts - Federal & Franklin Sts.		102%	45%	Fail	99.5%	313
Express	554	Waverley Sq. - Federal & Franklin Sts.		117%	57%	Fail	100.0%	294
Express	556	Waltham Highlands - Federal & Franklin Sts.		100%	52%	Fail	99.8%	315
Express	558	Riverside - Federal & Franklin via Auburndale		102%	46%	Fail	100.0%	221

Bus schedule adherence can be affected by various factors, most notably the level of traffic on the roadway. However, the size and condition of the fleet also affect to service reliability and capacity. A sufficient number of vehicles must be available to operate the regular service with spare vehicles to cover breakdowns and other unusual events. The generally accepted industry standard for spare vehicles is 20% of the active bus fleet. Currently, the spare ratio for buses systemwide and at all garages (out of which most of the bus routes in the corridor operate) 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.

Red Line rapid transit service during July and August the did not meet the MBTA's schedule adherence standard, according to the November 2010 ScoreCard. This was due to the need to perform signal and track maintenance at Alewife Station. In September and October, the schedule adherence standard was met. The average daily vehicle availability met the minimum requirement to operate the scheduled service in June through October, 2010, and the mean miles between failures were below the target level in July and October. This may be, at least in part, a reflection of the age of the No. 1 and No. 2 cars, which together comprise 60 percent of the Red Line fleet and have been in service since 1969 and 1988, respectively.

The ScoreCard shows that in October the Fitchburg commuter rail line did not pass the schedule adherence standard, which requires that 95% of all trips departing and arriving at terminals be within five minutes of the scheduled departure and arrival times. For locomotives, the average daily vehicle availability meets the minimum requirement to operate the scheduled service, and the mean miles between failures is 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 reliability in the Northwest Corridor and systemwide.



Mobility Issues Identified in the PMT

In addition, the MBTA's PMT, approved in December 2009, identified the following specific transit capacity needs and other issues regarding mobility in the Northwest Corridor:

- By 2030, projected growth in demand on 13 bus routes in the Northwest Corridor may cause crowding levels that would require additional service or larger, articulated vehicles. These are Routes 1, 47, 62, 66, 67, 68, 71, 73, 77, 86, 87, 89, and 554. Most of these routes operate entirely within the Northwest Corridor, but Routes 1, 47, 66, and 86 also extend into other corridors.
- Outside of the inner core communities of Cambridge and Somerville, Acton, Concord, and Westford show the largest projected growth in intracity travel by 2030. Of the latter three municipalities, Acton and Westford are in the service area of the Lowell Regional Transit Authority.
- The transit mode share in Waltham is currently lower than would be expected (2.6% of all trips), given the existing level of bus and rail service.
- Service on the Fitchburg Line currently faces frequent delays, increasing passenger travel times. (Since completion of the PMT, the MBTA has begun to implement improvements on this 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 this corridor.
- Traffic congestion around Alewife Station increases the running times and reduces the reliability of bus routes that serve the station.

Transit Station Parking Issues

- The current park and ride inventory shows that the following stations are utilized at 85% of capacity or greater:
 - Ayer, Concord, South Acton, and Waltham (Fitchburg Line)
 - Alewife (Red Line)
 - Lechmere (Green Line)
- For some customers, access to rail services is constrained by the lack of bicycle parking.

Connections with Other Regional Transit Authorities' Services

The Montachusett Regional Transit Authority (MART) serves the Northwest Corridor; however, current schedules provide few close connections between RTA and MBTA services. In general, RTA bus routes do not function well as commuter rail feeders, as they serve different purposes and populations. Most RTA routes provide local service on even headways, while commuter rail provides long-distance commuter service and operates on uneven headways due to a number of equipment and operational constraints. In addition, because RTA routes have frequent stops and many do not provide direct service to stations, using them to access stations is much slower than driving.



Freight Mobility Issues

Highway Freight Bottlenecks

Three locations in the West Corridor were identified by the MassDOT Freight Plan as among the 12 worst highway freight bottlenecks in Massachusetts: Interstate 290 at Interstate 495 in Marlborough, Interstate 90 at Interstate 495 in Hopkinton, and Interstate 95 at Route 9 in Wellesley.

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.

In addition, many trucks carrying fuel from Everett travel through Boston and Cambridge to access Interstate 90 westbound. Cambridge has established a hazardous materials truck route to accommodate this traffic.

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 47 bridges over rail lines in the corridor, 37 (79%) do not meet this desired height.



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 Northwest Corridor's bicycle network limit users' ability to safely connect to their destinations. The Northwest Corridor has two bicycle corridors into Boston in the Minuteman Bikeway, and the

Watertown Branch Rail Trail and Dr. Paul Dudley White Path (Charles River Paths), but there are few facilities to support circumferential travel. There is a gap in the Merrimack River Corridor of MassDOT's Bay State Greenway Plan between the Minuteman Commuter Bikeway and the Bruce Freeman Rail Trail (outside the MPO region). The gaps in the bicycle network limit users from accessing activity generators, including transit stations, schools, recreation destinations, and commercial areas.

Although providing bicycle parking at stations and racks on buses encourages 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 the Red Line Stations of the rapid transit system, but there is poor access to most of the Fitchburg Line stations of the commuter rail system. On the Red Line, the Minuteman Bikeway provides access to Alewife Station, the Somerville Community Path provides access to Davis Square Station, and bicycle lanes on Massachusetts Avenue in Cambridge provide access to other Red Line stations. On the Fitchburg Line, bicycle lanes on Concord Avenue provide access to the Belmont commuter rail Station.

Similar to the bicycle network, the Northwest Corridor's pedestrian network varies significantly. Sidewalk coverage in the corridor ranges from under 5% in Bolton and Lincoln to over 90% in Somerville and Watertown. Gaps in the pedestrian network limit users from accessing activity generators, including transit stations, schools, recreation, elderly services, and commercial areas. The Northwest Corridor has very good pedestrian access to rapid transit stations, and has varied pedestrian access to commuter rail stations. Pedestrian access to commuter rail stations varies significantly from poor access at Kendall Green, Hastings, and Silver Hill Stations in Weston to good access at Waltham Station and Concord Station. 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 clusters are 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 4-16 identifies the top crash cluster locations in the Northwest Corridor. It shows that the locations in this corridor with the highest EPDO values are located on Interstates 95 and 93. Specifically, the locations with the highest EPDO values (shown in parentheses below) are:

- Interstate 95 at Route 4 (Bedford Street), Lexington (364)
- Interstate 93 at Route 28 (Fellsway), Somerville (335)
- Interstate 95 at Route 2, Lexington (304)
- Interstate 95 at Route 20, Waltham (294)
- Lexington Street and Trapelo Road, Waltham (185)

Environmental Issues

Figures 4-17 through 4-19 provide an overview of environmental constraints in the Northwest Corridor. 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 Northwest Corridor has one Area of Critical Environmental Concern (ACEC), Central Nashua River Valley that is located in Bolton, Harvard, Lancaster, and Leominster. Central Nashua River Valley has 12,900 acres and was designated in 1996.

FIGURE 4-16
TOP FIVE PERCENT OF CRASH CLUSTER LOCATIONS - NORTHWEST CORRIDOR

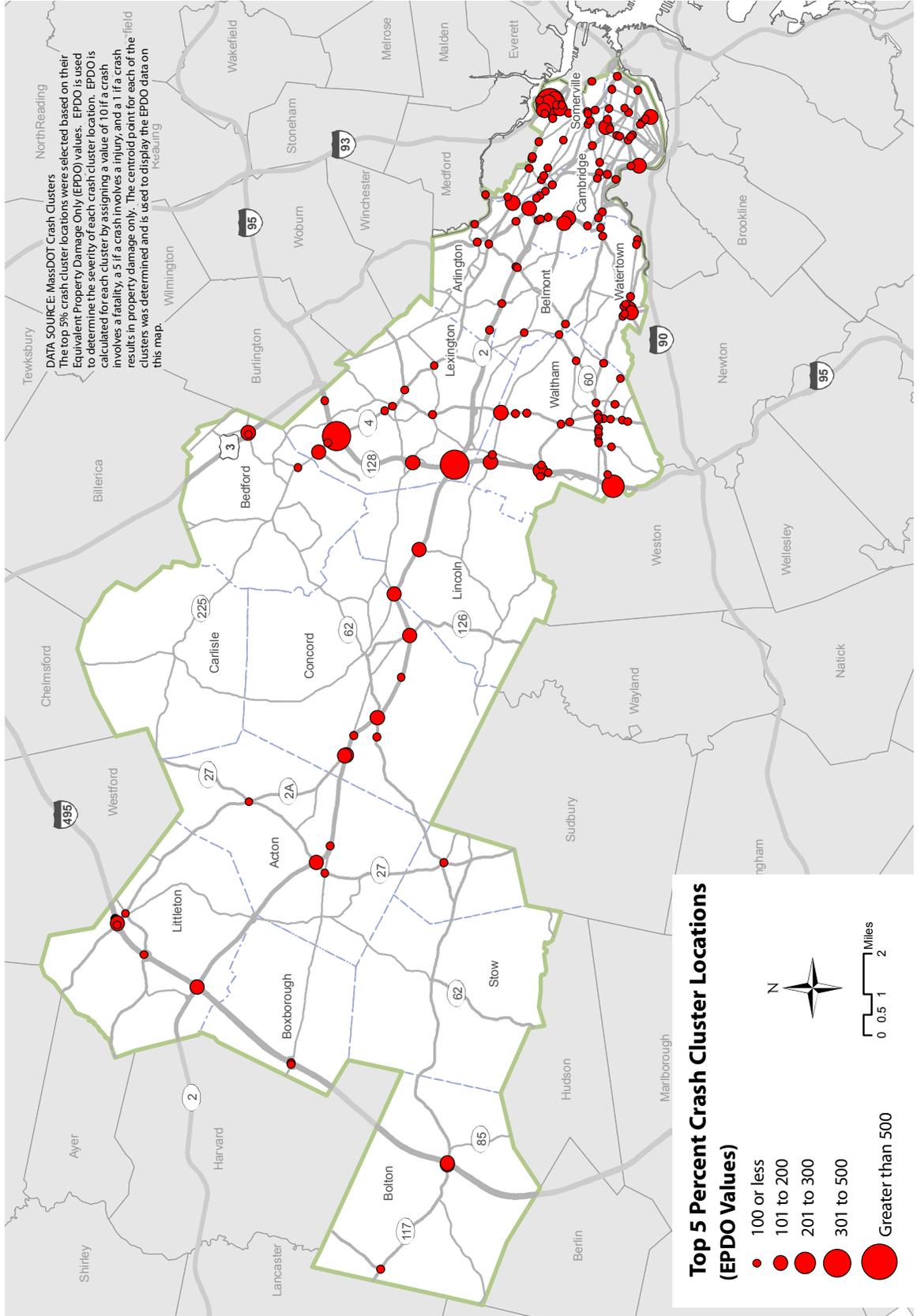


FIGURE 4-17

DEP WETLANDS/FEMA FLOOD ZONES - NORTHWEST

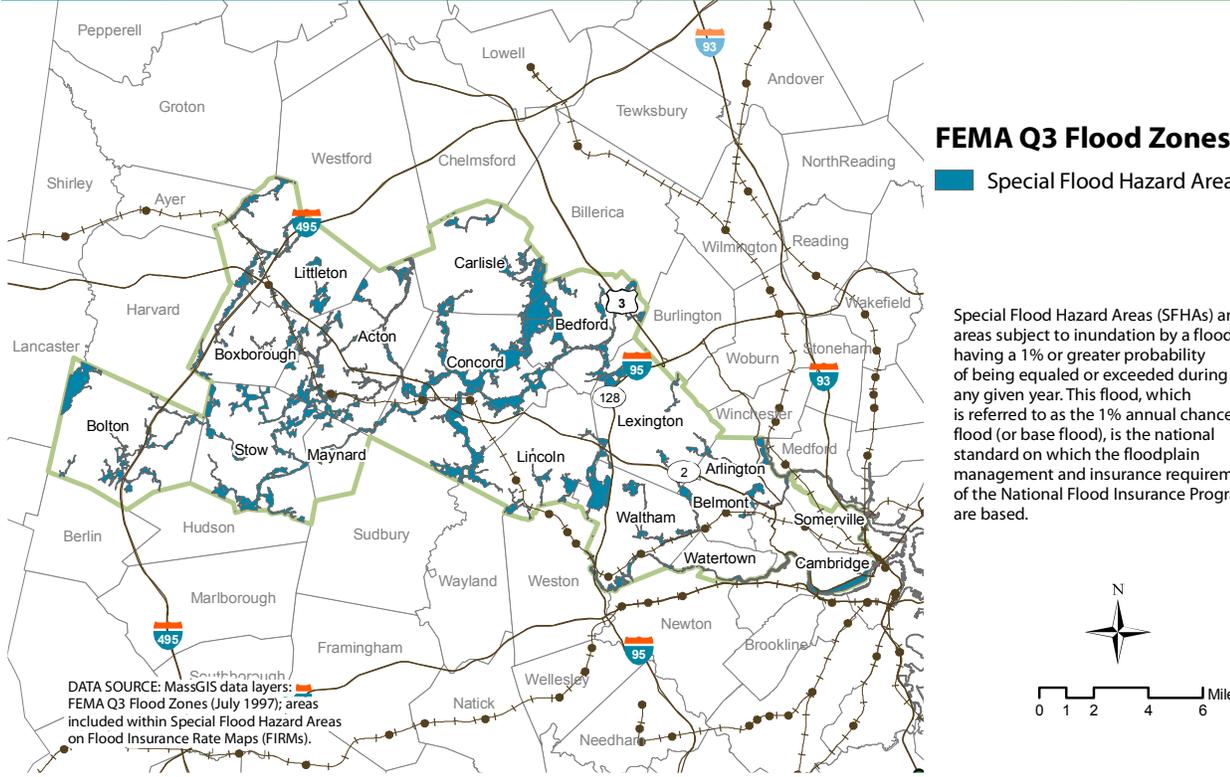
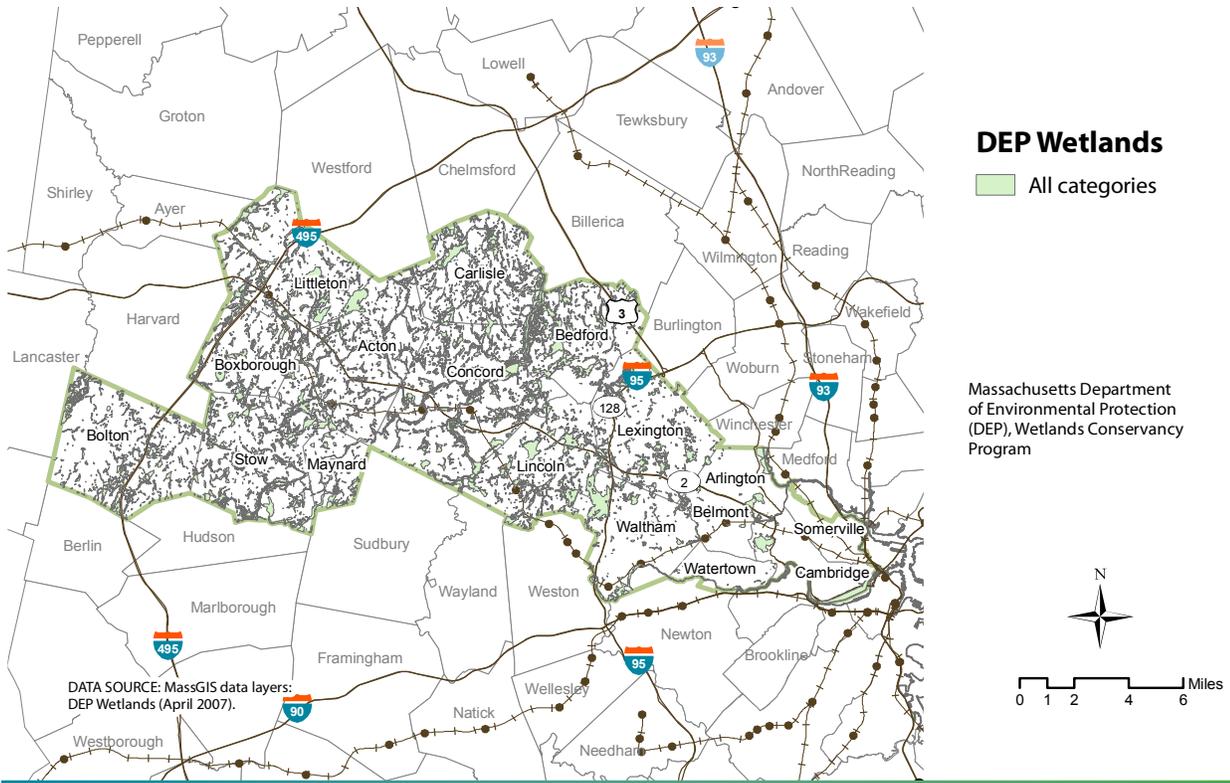


FIGURE 4-18

PUBLIC WATER SUPPLY/SURFACE WATER PROTECTION AREAS - NORTHWEST

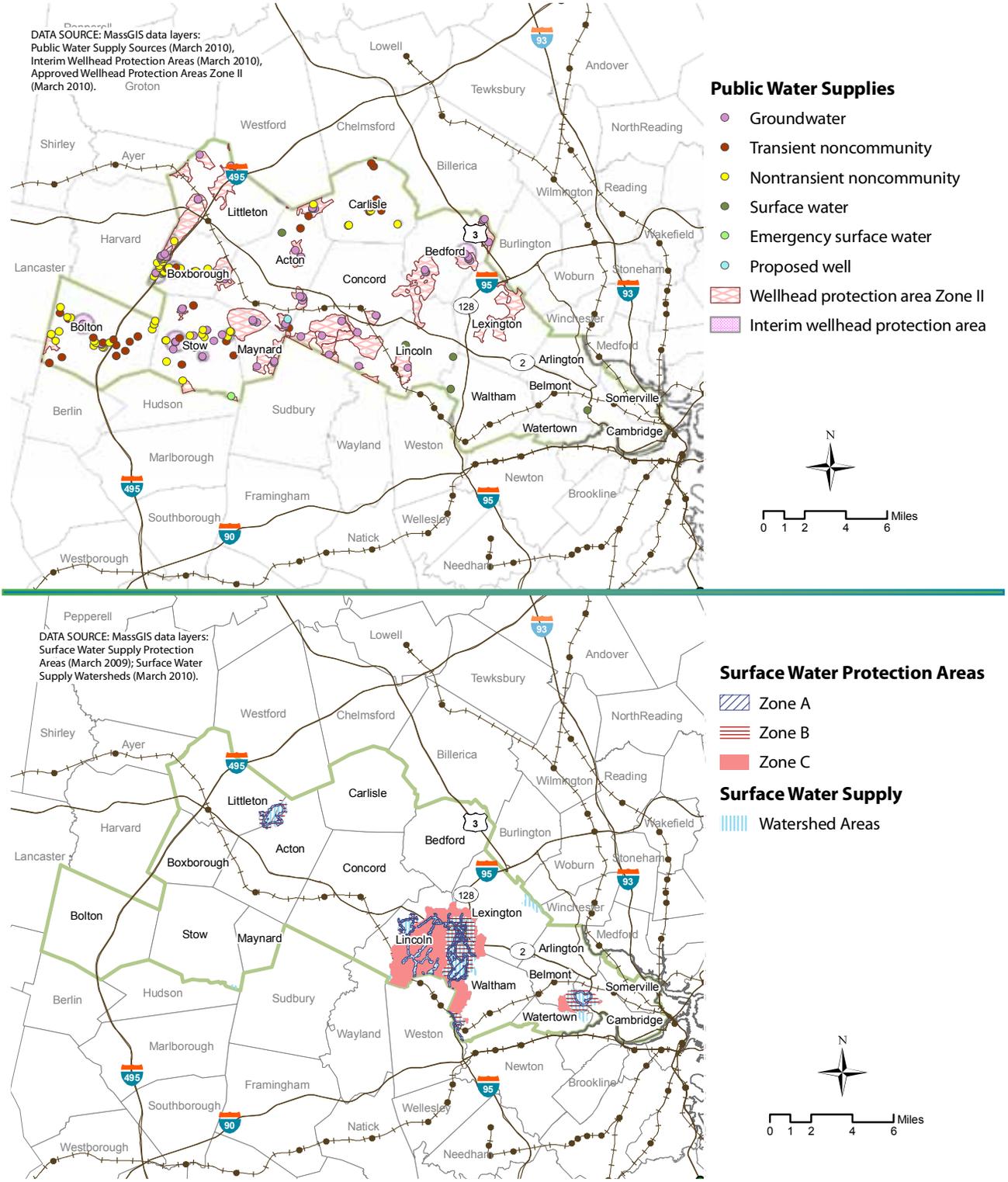
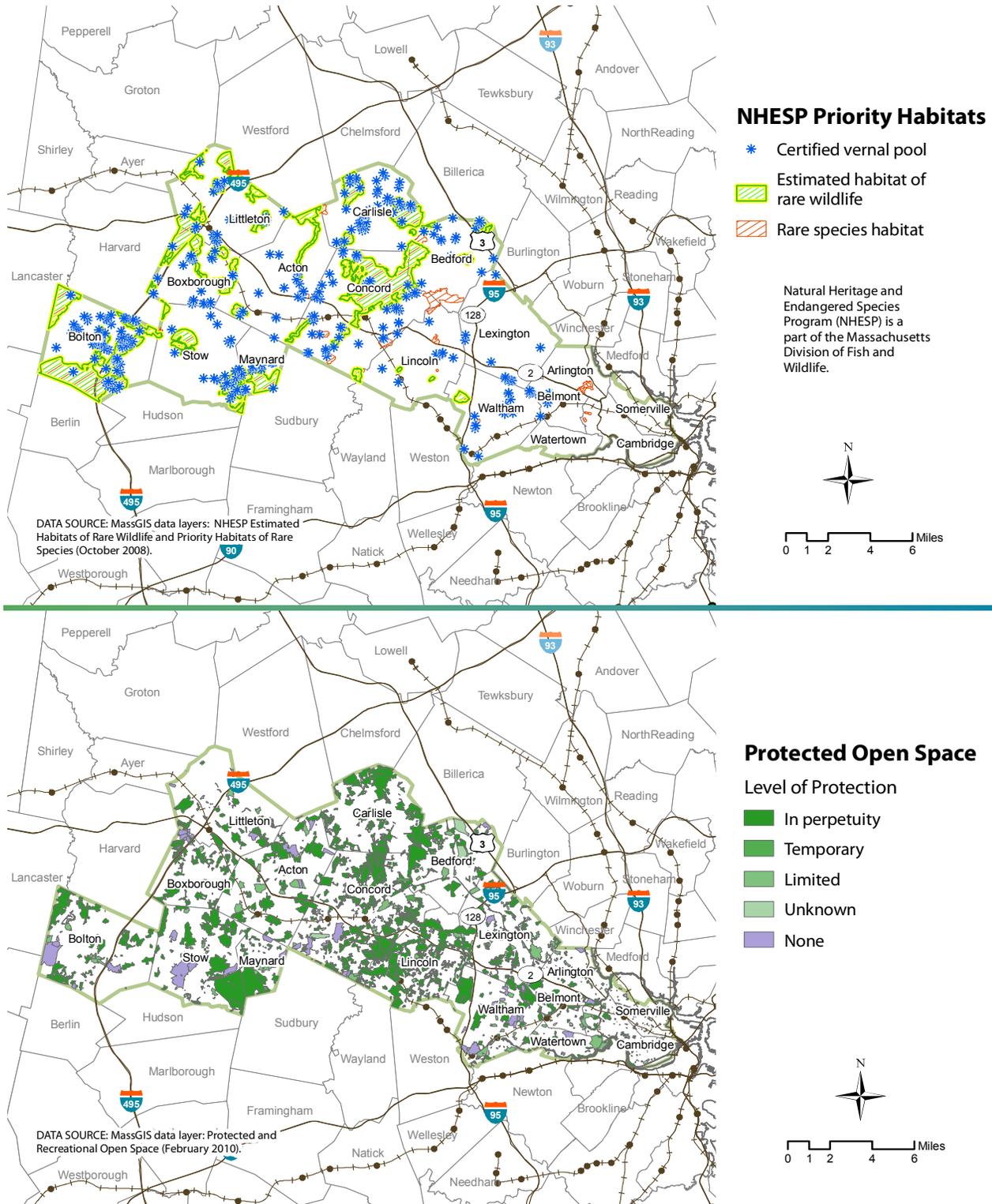


FIGURE 4-19

NHESP HABITATS/PROTECTED OPEN SPACE - NORTHWEST



Projects being considered for inclusion in the LRTP are overlaid on these environmental constraint maps. This information is then used during the project selection decision-making 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 that is over 50% minority and a median household income at or below 60% of the region’s median income (at or below \$33,480). The environmental justice areas located in the Boston Region MPO portion of the Northwest Corridor include areas in Cambridge, Waltham, and Somerville. MPO staff meet with social service and community contacts and conduct surveys to identify needs within these environmental justice areas. Table 4-18 outlines issues and needs and suggested responses identified by contacts in the environmental justice areas in the Northwest Corridor.

TABLE 4-18

IDENTIFIED TRANSPORTATION EQUITY ISSUES

COMMUNITY	REPORTED ISSUES	POSSIBLE SOLUTIONS*
Waltham	Transit service to Riverside, Belmont/Waverly Square, and Winter Street is inadequate	Provide transit service to Riverside
		Increase the frequency of bus service to Waverly Square.
		Provide transit service to Winter Street to meet the needs of service industry workers.
Waltham	Transit service schedules do not meet the needs of service industry workers	Increase the frequency of weekend service.
		Increase early morning and late evening bus service.
Somerville	Roads are dangerous for bicyclists. Union Square is especially dangerous for pedestrians and bicyclists, and should have rapid transit service.	

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

SUMMARY OF NORTHWEST CORRIDOR NEEDS

The preceding sections have laid out the corridor’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 Northwest Corridor needs assessment identifies bridge and roadway maintenance needs and significant bottleneck and crash locations. Addressing the identified needs and problems listed below will promote the realization of the vision:

- Of the 292 bridges in the Northwest Corridor, 77 (26%) are considered functionally obsolete (do not meet current traffic demands or highway standards), and 22 (7.5%) 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 in Somerville
 - Interstate 95 in Lexington and Waltham
 - Route 2/Alewife Brook Parkway/Fresh Pond Parkway in Cambridge
 - Route 2/2A in Concord
 - Route 2A in Cambridge and Arlington
 - Route 62/4/225 in Concord, Bedford, and Lexington
 - Route 16 in Somerville, Cambridge, and Watertown
 - Route 28 in Somerville
 - Route 60 in Arlington, Belmont, and Waltham
 - Route 119 in Concord and Acton
- The top crash locations in the Northwest Corridor 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 95 at Route 4 (Bedford Street), Lexington (364)
 - Interstate 93 at Route 28 (Fellsway), Somerville (335)

- Interstate 95 at Route 2, Lexington (304)
- Interstate 95 at Route 20, Waltham (294)
- Lexington Street and Trapelo Road, Waltham (185)

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:

- Service on the Fitchburg Line currently faces frequent delays, increasing travel times. Eight bridges on the line are currently rated as structurally deficient, and 18.4 miles of rail are in need of replacement. (Federal stimulus funds were granted for some of these improvements.)
- On the Red Line, power cables, emergency lighting systems, and track components are in need of replacement at some locations. Seventy-four cars built in 1969 need to be replaced.
- Transit reliability throughout the Northwest Corridor is poor. Only three of the 41 bus routes (7.3%) meet the MBTA's schedule adherence standards. The Fitchburg Line fails to meet the schedule adherence standard for commuter rail.
- Eleven commuter rail stations on the Fitchburg Line are not ADA accessible.
- The Ayer, Concord, South Acton, and Waltham commuter rail station park and ride lots are utilized at 85% of their capacity or greater. The Alewife (Red Line) and Lechmere (Green Line) rapid transit station park and ride lots also exceed the 85% utilization rate.
- Thirteen bus routes (1, 47, 62, 66, 67, 68, 71, 73, 77, 86, 87, 89, and 554) in the Northwest Corridor are predicted to have crowding levels in 2030 that would require additional service or larger, articulated vehicles.

Issues to watch:

- Higher transit demand resulting from the implementation of the MetroFuture land use plan will require investments to increase capacity.
- 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 this corridor.
- Outside of the inner core communities of Cambridge and Somerville, Acton, Concord, and Westford show the largest projected growth in intracity travel by

2030. Waltham has a low transit mode share (2.6% of all trips) given the existing level of bus and rail service.

- Higher density areas in parts of Belmont, Lincoln, Maynard, Waltham, and Watertown do not have direct access to transit services.

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:

- Three locations in the West Corridor were identified by the MassDOT Freight Plan as among the 12 worst highway freight bottlenecks in Massachusetts: Interstate 290 at Interstate 495 in Marlborough, Interstate 90 at Interstate 495 in Hopkinton, and Interstate 95 at Route 9 in Wellesley.
- As demand for rail freight increases, tracks carrying that freight in the Northwest Corridor 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.
- 81% of highway bridges and 79% 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 is poor bicycle access to most of the Fitchburg Line commuter rail stations.
- Few roads (less than 3%) in the Northwest Corridor provide bicycle accommodations.
- There is poor pedestrian access to some of the Fitchburg Line commuter rail stations.
- About 54% of the centerline miles on non-interstate roads in the Northwest Corridor do not have a sidewalk on at least one side of the roadway.
- The Northwest Corridor bicycle network has few on-road or off-road bicycle accommodations 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.

Addressing the needs and problems identified below will promote the realization of this vision:

- Union Square in Somerville lacks rapid transit service.
- Late evening and early morning transit service is needed by many low income workers.
- Transit service to parts of Waltham is not sufficient.
- Many streets are dangerous for pedestrians and bicyclists.

Issue to watch:

- The elderly population is expected to grow substantially between now and 2035. Meeting their mobility needs will be an important issue to address during this time period.

Land Use

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

- Areas expected to grow the most between now and 2035 are those along the Red and Orange Lines, the planned Green Line extension, and the Inner Core communities of Cambridge, Somerville, Arlington, and Watertown. Transit capacity may need to increase in order to handle service demands.
- The largest developments planned in the corridor are located in Somerville along the planned Green Line extension and at Assembly Square. The proposed development of Assembly Square would create up to 2,100 housing units and more than 2.5 million square feet of commercial and office space.