3

NORTH CORRIDOR

DESCRIPTION OF THE CORRIDOR

The North Corridor extends from the Charles River in Boston to the New Hampshire border. The corridor is anchored in the south by the Boston neighborhood of Charlestown and the densely populated cities of Everett, Malden, and Medford. Thirteen of the municipalities in the corridor are located within the Boston Region MPO area; in addition to the cities and towns already mentioned, they are (proceeding north) Melrose, Stoneham, Winchester, Woburn, Wakefield, Burlington, Reading, North Reading, and Wilmington.

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.

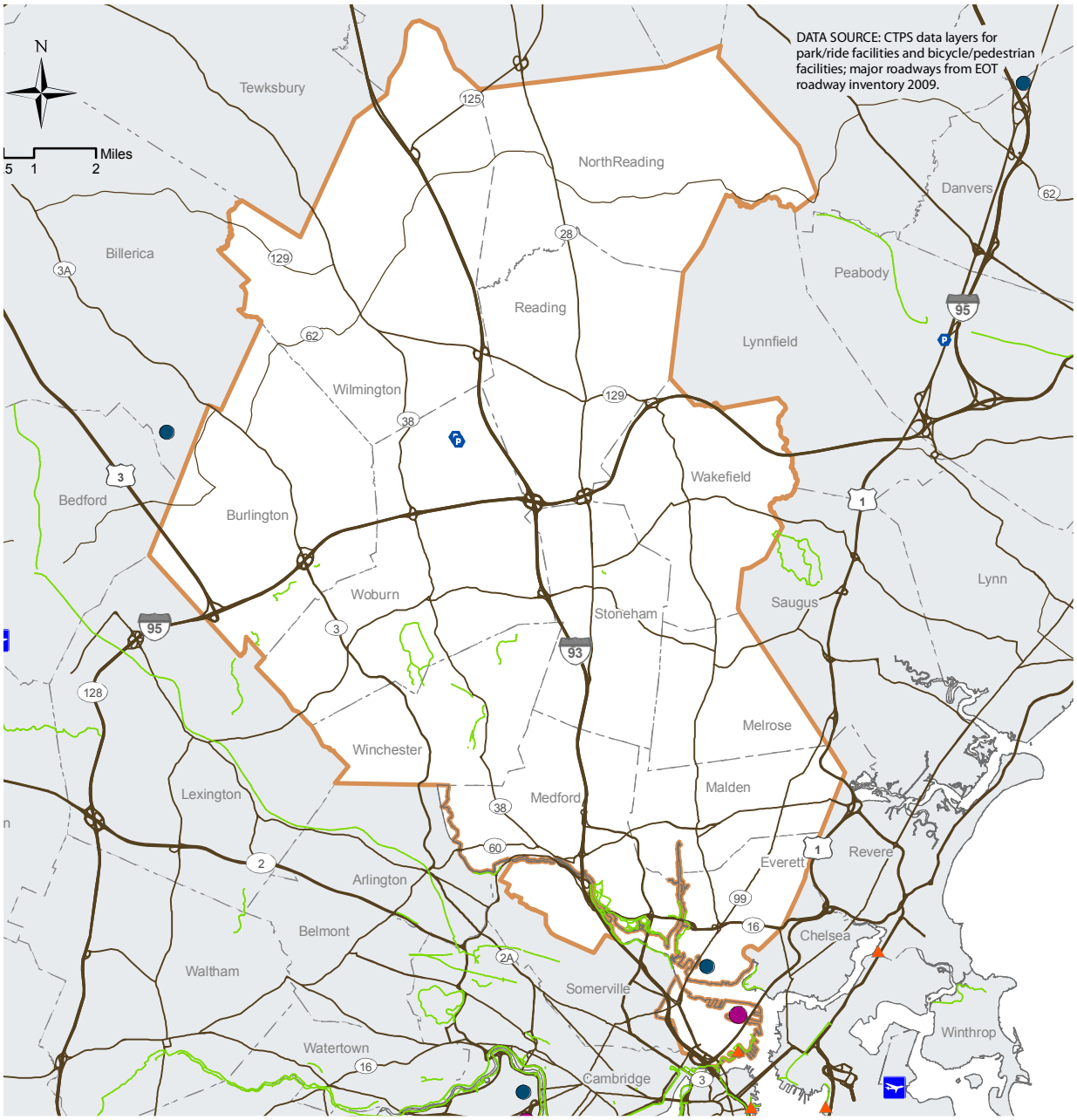
Twelve corridor municipalities, in the northern part of this corridor, are located outside of the Boston Region MPO area: Andover, North Andover, Lawrence, Methuen, and Haverhill, which are in the Merrimack Valley MPO area, and Billerica, Tewksbury, Chelmsford, Lowell, Dracut, Tyngsborough, and Dunstable, which are in the Northern Middlesex MPO area.

EXISTING TRANSPORTATION FACILITIES

The major transportation facilities and services in the North 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 that area but within the North Corridor are included in this section for informational purposes.

FIGURE 3-1

Existing Highway Transportation Facilities - North



- Major highways
- Carpool-bus park/ride lots
- Port facilities/docks
- Airports
- Dedicated bicycle: existing

Intermodal Truck Trip Generators

- Internal Intermodal Transfer Point
- Distribution Center
- External Intermodal Transfer Point

Highway

The major roadways in this corridor are (see Figure 3-1):

- North–south travel: Interstate 93, Route 3, Route 38, and Route 28
- East–west travel: Interstate 95/Route128, Route 16, Route 60, Route 62, Route 129, Interstate 495, and Route 113

There are 1,250 centerline miles in the corridor:

- State-owned – 94 centerline miles (8%)
- Locally owned – 1,008 centerline miles (80%)
- Privately owned – 148 centerline miles (12%)

When looking at lane miles in the corridor, there are a total of 1898 lane miles. Of the total lane miles, 36% or 680 lane miles are federal aid eligible.

There are 253 bridges in the corridor:

- State-owned – 217 (86%)
- Locally owned – 34 (13%)
- Other – 2 (1%)

Of the 253 bridges, 88 (35%) accommodate pedestrians as well as motorists, 13 (5%) are for bicyclists and pedestrians only, 36 (14%) are railroad bridges over highways or water, and 9 (4%) are closed.

Park-and-ride facilities that are not connected with a public transit station are located in Andover, Methuen, Haverhill, and Tyngsborough (all outside of the Boston Region MPO area). They are operated by MassDOT.

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 Regional Transit and the Merrimack Valley Regional Transportation Authorities); see Figure 3-2. A description of the transit services is provided below.

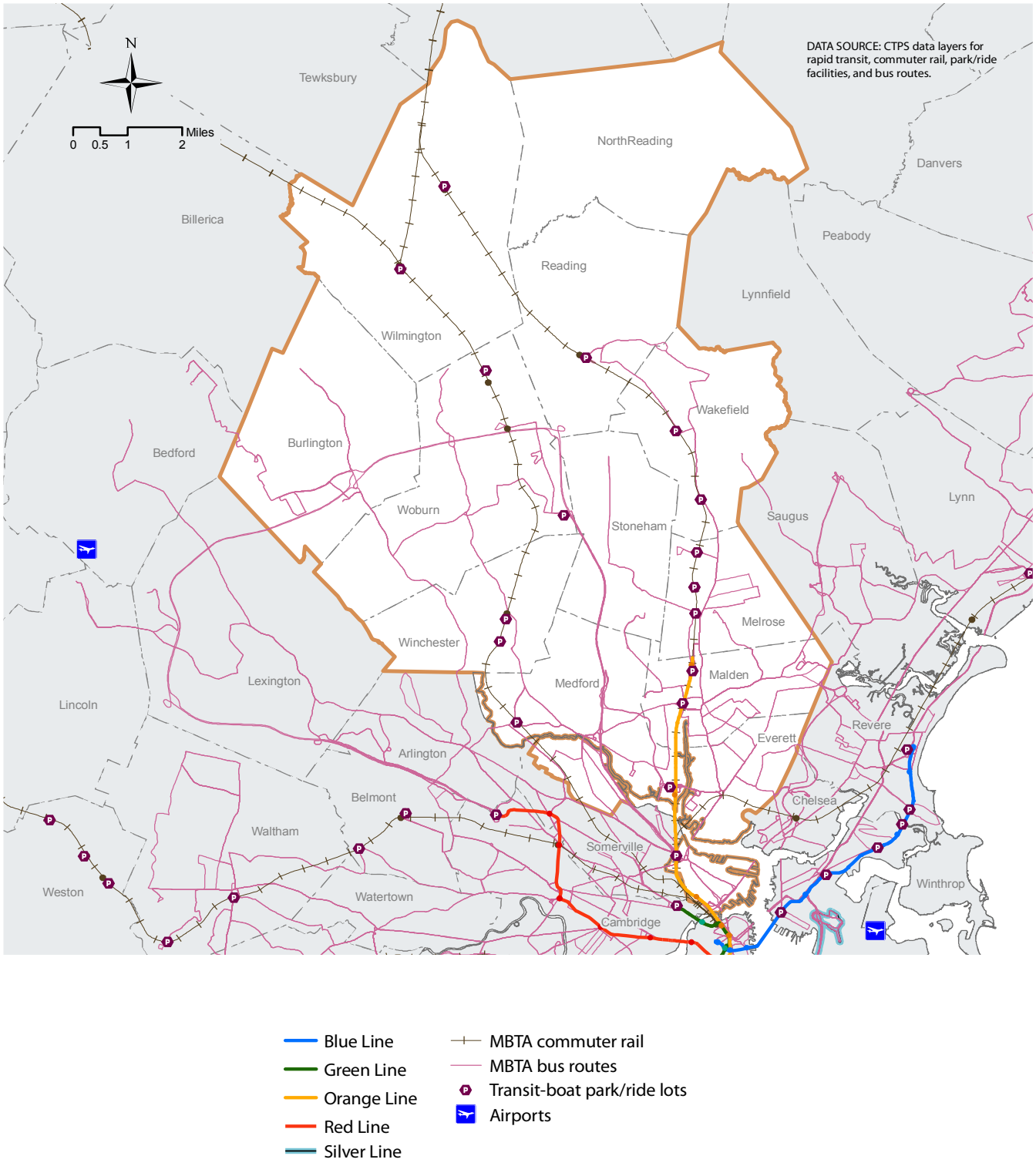
Commuter Rail and Intercity Rail

Two MBTA commuter rail lines run through the corridor and provide 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:

- Haverhill Line, with 13 stations:
  - Malden – 188 spaces (100% utilization rate); Orange Line station; major bus hub
  - Wyoming Hill (Melrose) – 33 spaces (57% utilization rate)
  - Melrose/Cedar Park – 71 spaces (70% utilization rate)

FIGURE 3-2

Existing Transit Transportation Facilities - North



- Melrose Highlands – 110 spaces (85% utilization rate); bicycle parking also
- Greenwood (Wakefield) – 82 spaces (49% utilization rate); bicycle parking also
- Wakefield – 159 spaces (60% utilization rate); bicycle parking also
- Reading – 426 spaces (49% utilization rate); bicycle parking also
- North Wilmington – 80 spaces (93% utilization rate)
- Ballardvale – 120 spaces (50% utilization rate); bicycle parking also
- Andover – 206 spaces (49 % utilization rate); bicycle parking also
- Lawrence – 709 spaces (73% utilization rate)
- Bradford – 303 spaces (19% utilization rate); bicycle parking also
- Haverhill – 173 spaces (42% utilization rate)

- Lowell Line, with eight stations:
  - West Medford – 61 spaces (97% utilization rate)
  - Wedgemere (Winchester) – 170 spaces (100% utilization rate)
  - Winchester Center – 152 spaces (91% utilization rate); bicycle parking also
  - Mishawum (Woburn) – L imited daily trips; parking facility is closed
  - Anderson/Woburn – 1,540 spaces (60% utilization rate); bicycle parking also; part of Anderson Regional Transportation Center (see Intermodal Facilities [Passenger], below)
  - Wilmington – 191 spaces (80% utilization rate); bicycle parking also
  - North Billerica – 541 spaces (77% utilization rate); bicycle parking also
  - Lowell – 870 spaces (75% utilization rate); bicycle parking also

Amtrak operates its Downeaster service on sections of the Haverhill and Lowell commuter rail lines and on Pan Am Railway lines. It departs from North Station in Boston and provides service through New Hampshire up to Portland, Maine.

MBTA Rail Rapid Transit

The northern arm of the MBTA's Orange Line provides direct access to the MBTA rapid transit system and indirect access to therest of the transit network for many municipalities in the corridor. Service can be directly accessed at five stations. These stations, along with their numbers of park-and-ride spaces and average utilization rates, and other selected information as applicable, are:

- Community College (Charlestown) – No park-and-ride spaces; majority of access is walk access or drop-off ; bicycle parking also
- Sullivan Square (Charlestown) – 600 park-and-ride spaces (100% utilization rate); bicycle parking also; major bus hub

- Wellington (Medford) – 2,450 park-and-ride spaces (99% utilization rate); bicycle parking also; major bus hub
- Malden – 204 park-and-ride spaces (100% utilization rate); commuter rail station; major bus hub
- Oak Grove (Malden) – 788 park-and-ride spaces (100% utilization rate); bicycle parking also

Bus

Numerous public bus services operate in or through the corridor:

- MBTA express buses – (7 routes) These serve Woburn, Burlington, and parts of Medford and terminate at points in Boston Proper.
- MBTA local buses (26 routes) – Some of the local bus routes anchored at the Orange Line stations offer circumferential connections to destinations in the Northeast or Northwest Corridor. In addition, some local bus routes in the North Corridor link the municipalities of Winchester, Melrose, Stoneham, Wakefield, and Reading to Boston.
- Logan Express provides service from the Anderson Regional Transportation Center in Woburn to Logan Airport.
- Lowell Regional Transit Authority buses (18 routes) – These radiate from Lowell Station in the northern part of corridor, largely outside of the Boston Region MPO area. One provides service to the Burlington Mall with a connection to MBTA service.
- Merrimack Valley Regional Transit Authority buses (23 routes) – The authority operates one express bus route from Methuen, Lawrence, and Andover to Boston. The other routes operate in the northern part of the corridor, outside of the Boston Region MPO area.

- Municipal and private bus carriers – The Town of Burlington oversees a municipal transit service operated by a contractor. Private bus carriers providing service outside of the Boston Region MPO travel through the corridor but do not provide service to it.

Intermodal Facilities (Passenger)

The Anderson Regional Transportation Center is located in Woburn adjacent to Interstate 93 at Exit 37C and to Route 128/ Interstate 95 near the Washington Street exit. The transportation services at this location are Amtrak service to Portland,

Maine, MBTA commuter rail (Lowell Line) service to North Station, Logan Express bus service to Logan Airport, shuttle service to Manchester-Boston Regional Airport, park-and-ride spaces, and bicycle parking.

Connections to MBTA Service from Other Regional Transit Authorities' Services

The two regional transit authorities (RTAs) that serve the corridor provide connections to MBTA services. However, the RTAs provide local service on even headways that do not always coincide with MBTA service. The Lowell Regional Transit Authority (LRTA) operates from the terminal of the MBTA's Lowell commuter rail line and provides a connection to that line. The Merrimack Valley Regional Transit Authority (MVRTA) provides very few opportunities to make transfers between the bus routes and commuter rail.

Transportation Management Associations

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

- Route 128 Business Council – provides shuttle bus service for members of the business council in the Route 128/West corridor from Woburn to Needham; the shuttle serves the municipalities of Woburn, Burlington, Lexington, Waltham, Weston, Newton, Wellesley and Needham.
- The Junction Transportation Management Organization – provides commuter services to its members in the Ballardvale Street/Lowell Junction area of Andover and Wilmington and nearby areas.

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 vehicles: tankers, large trucks, and business pickup trucks and vans. The following is a list of the highways in the North Corridor with the highest current volumes of truck traffic:

- Interstate 95 from Interstate 93 west to Route 3, with volumes ranging from 11,000 to 15,000 trucks per day
- Interstate 95 from Interstate 93 east to Route 1, with volumes ranging from 5,000 to 11,000 trucks per day
- Interstate 93 from Interstate 95 north to the Boston Region MPO border, with volumes ranging from 5,000 to 11,000 trucks per day
- Interstate 93 from Interstate 95 south to Route 60, with volumes ranging from 9,000 to 11,000 trucks per day
- Route 3 from Interstate 95 north to the Boston Region MPO border, with volumes ranging from 5,000 to 9,000 trucks per day

Rail Freight

Pan Am Railways operates in the corridor as an important rail link for the paper and lumber industry in northern New England. It also carries intermodal and merchandise traffic to Pan Am's intermodal facility at the Devens Commerce Center in Ayer, Massachusetts.

Pan Am operates a train carrying sand to Boston Sand and Gravel and has rights to the tracks into Massport's Moran Terminal (part of the Boston Autoport) 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."

Pan Am operates on rail owned by MassDOT in northern Massachusetts. MassDOT owns the Lowell and Haverhill commuter rail lines in the North Corridor, but the lines are operated as shared-use facilities with Pan Am Railways. Pan Am dispatches commuter rail operations for both of these MBTA lines on the outer ends of the lines.

Marine Freight

Marine facilities in the corridor include the Moran Terminal and Mystic Pier One, located in Charlestown (see Figure 3-1). In 1998, the two facilities were converted and leased to the Boston Autoport. The Boston Autoport is used for importing and processing automobiles. Currently the automobiles are transported by truck-carriers that access the terminal via Medford Street to Sullivan Square or via Medford Street to Chelsea Street to City Square. As discussed above, this facility 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.

Air Freight

There are no freight airport facilities in the corridor.

Intermodal Freight Facilities

The intermodal facilities located in the Boston Region MPO portion of the North Corridor are shown in Figure 3-1 and listed below:

- Boston Autoport, Charlestown
- ITZ-Ohlson Transport (Distribution Center), Everett

The intermodal facilities located in the North Corridor but outside of the Boston Region MPO area are:

- R&C Distribution Center, Billerica
- New Balance Distribution Center, Lawrence

Air

There are no airports in the corridor.

Bicycle

Bicycle Paths

The corridor has one major bicycle path, the Mystic River Reservation Bike Path, located in Somerville and Everett. It is shown in Figure 3-1, along with other minor facilities used by bicyclists and pedestrians in the corridor. There are no existing bicycle facilities in the North Corridor that are part of the North Shore Corridor of MassDOT's Bay State Greenway Plan. Currently, slightly more than one of 55 miles of the proposed North Shore Corridor has been constructed.

On-Road Bicycle Accommodations

Table 3-1 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. Charlestown is not included in this table but is included in Chapter 8, Central Area.

TABLE 3-1

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
Burlington	113	0.00	0.33	0.29%
Everett	64	0.32	0.43	1.17%
Malden	109	0.58	1.29	1.72%
Medford	133	0.00	0.30	0.23%
Melrose	82	0.00	0.77	0.94%
North Reading	87	0.00	1.32	1.52%
Reading	98	0.00	3.14	3.20%
Stoneham	79	0.00	0.25	0.32%
Wakefield	103	0.00	0.00	0.00%
Wilmington	119	0.00	0.00	0.00%
Winchester	92	0.00	0.00	0.00%
Woburn	147	0.00	0.00	0.00%
TOTAL	**1,226**	**0.90**	**7.83**	**0.7%**

The bicycle accommodation coverage in the North Corridor is low, varying from no coverage in Wakefield, Wilmington, Winchester, and Woburn to over 3% coverage in Reading. Overall, the North Corridor, ranks below 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:

- Medford
- Reading
- Wilmington
- Winchester

Municipalities planning bike rack installations are:

- Everett
- Malden
- Melrose
- Stoneham
- Woburn

Pedestrian

Table 3-2 shows the percentage of roadways in each of the Boston Region MPO municipalities in the corridor that have sidewalks on at least one side. Charlestown is not included in this table but is included in Chapter 8, Central Area.

TABLE 3-2

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
Burlington	113	24	22%
Everett	64	56	88%
Malden	109	88	81%
Medford	133	105	79%
Melrose	82	57	70%
North Reading	87	38	43%
Reading	98	48	49%
Stoneham	79	46	58%
Wakefield	103	66	64%
Wilmington	119	31	26%
Winchester	92	49	53%
Woburn	147	67	46%
TOTAL	**1,226**	**675**	**55%**

The North Corridor has the highest sidewalk coverage of all of the radial corridors. The sidewalk coverage varies widely, from 22% coverage in Burlington to 88% in Everett. Overall, the North Corridor, with 55% coverage, ranks above the regional average of 50%.

LAND USE AND DEMOGRAPHICS

Demographics

Population

The largest densely populated areas in the North Corridor are within Charlestown, Everett, Medford, and Malden. The areas that are projected to become more densely populated between 2009 and 2035 include already-developed areas along the Orange Line and commuter rail. In general, the corridor's population is projected to remain relatively stable, with most municipalities experiencing moderate gains or losses (see Figure 3-3).

According to U.S. census data (updated annually at the town level), the corridor's 2009 population was 366,350. In the Metropolitan Area Planning Council's (MAPC's) MetroFuture forecasts, the corridor's population increases by 9%, to 404,200 by 2035 (MetroFuture is described briefly below). The municipalities projected to have the largest absolute growth are Malden, Medford, and Reading.

Figure 3-4 shows, by community for 2009, total elderly (age 70 or higher) population and the percentage 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 3-4, Woburn, Wakefield, Stoneham, Melrose, Medford, Malden, Everett, and Charlestown currently have the highest percentages of elderly residents.

Land Use, Housing, Sustainable Transportation

As of the year 2000, there were 142,000 housing units in the North Corridor. One quarter of these units (35,000) were within ½ mile of Orange Line or commuter rail service, with the highest population densities around the Malden Center Station (approximately 21,000 people per square mile.)

Figure 3-5 shows transit service and catchment areas with population density in the North 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 Medford, Malden, Woburn, Stoneham, and Reading do not have direct access to transit services.

From 2000 to 2009, North Corridor municipalities issued building permits for 7,481 new housing units (according to the U.S. Census Bureau), a 5.3% increase. Leading the way were North Reading and Burlington, with more than 1,200 units each.

In 2007 and again in 2010, MAPC surveyed municipalities about recent and anticipated development. Much of the recent development is oriented around the Orange Line Stations in Medford, Malden, and Melrose, with more than 1,110 units

FIGURE 3-3

Population Density by Transportation Analysis Zone

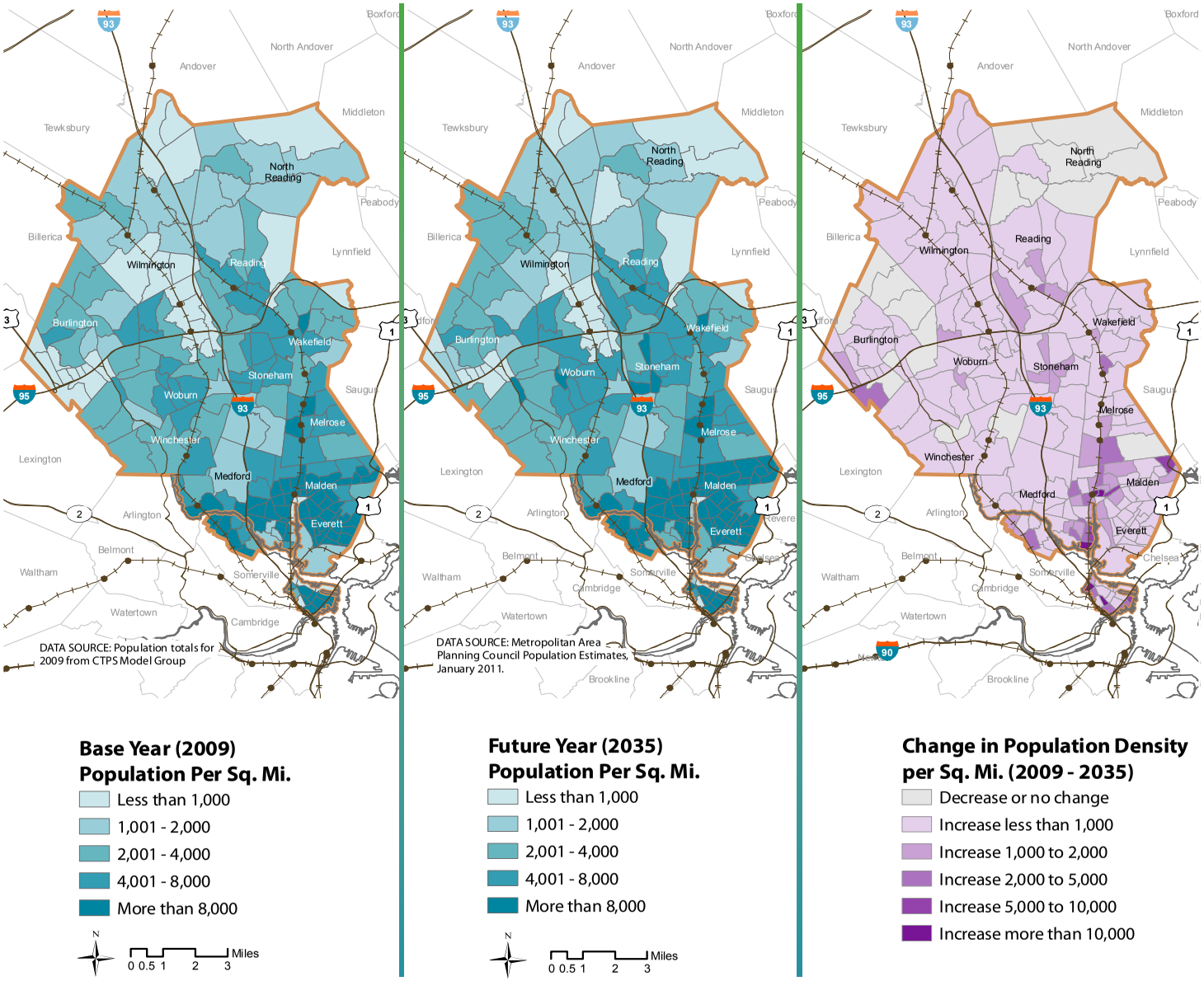
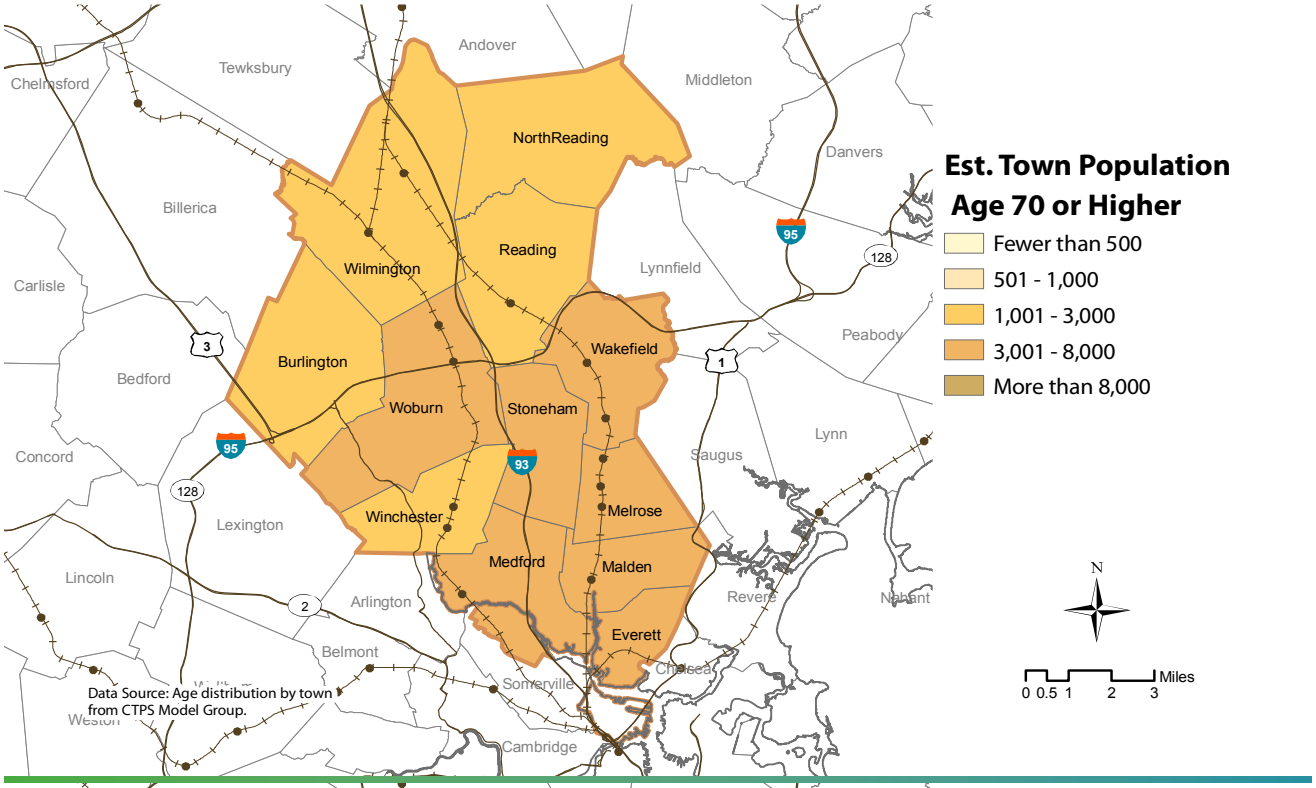


FIGURE 3-4

ELDERLY POPULATION BY TOWN - 2009



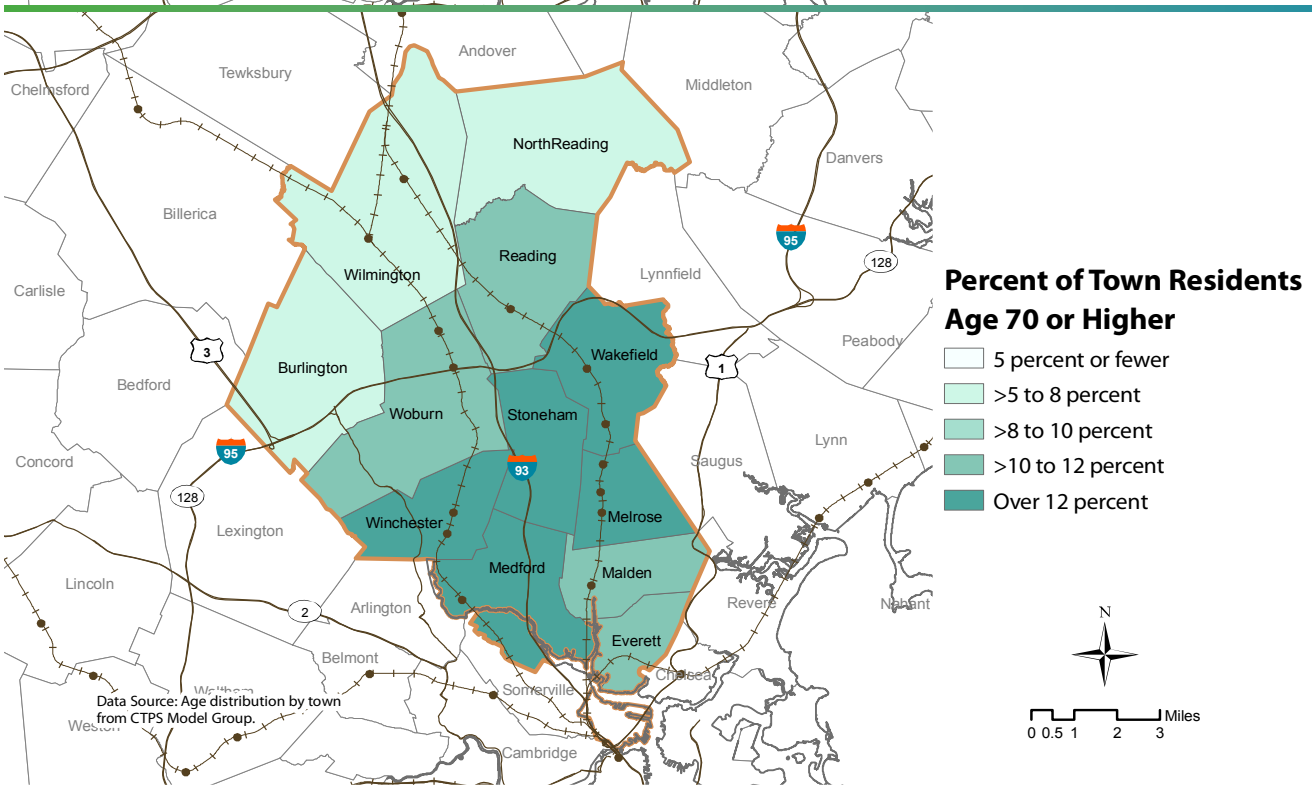
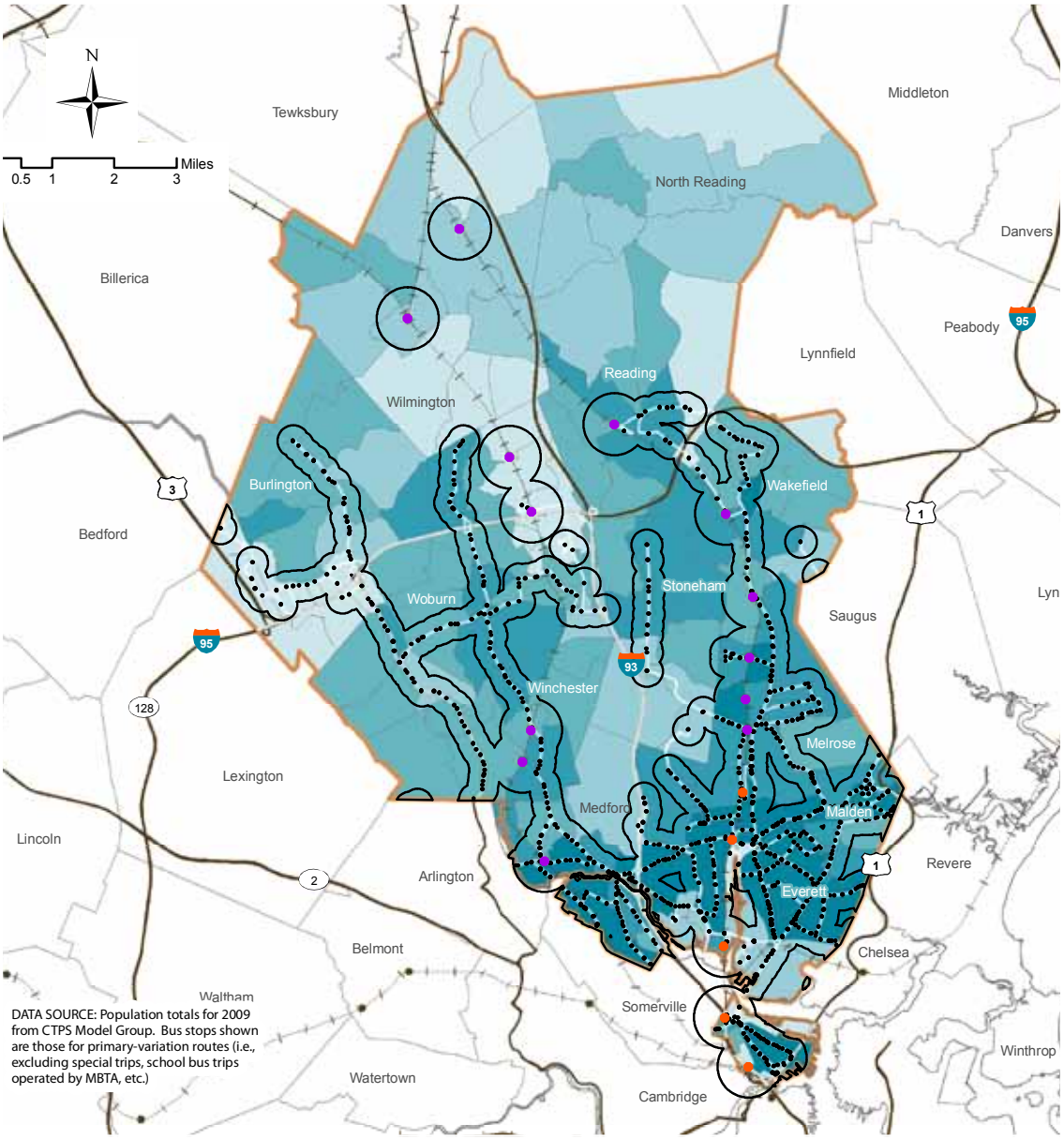


FIGURE 3-5

Transit Services Catchment Areas - North



Existing Transit Services and Catchment Areas

- Rapid transit station
- Commuter rail station
- MBTA bus stop
- Transit buffers *(see text for varying distances)*

2009 Population per Sq. Mi.

- Less than 1,000
- 1,001 - 2,000
- 2,001 - 4,000
- 4,001 - 8,000
- More than 8,000

near Station Landing, 400 in Malden Center, and 550 new units near Oak Grove. There are currently at least 600 additional units planned near the Malden Center and Oak Grove Stations.

Auto ownership and household vehicle miles travelled are slightly above the regional average, at 1.6 autos per household and 48.0 miles per household per day for passenger vehicles. These rates vary widely, however, with North Reading, Wilmington, and Burlington both exceeding 2.0 vehicles per household and 64 miles per household per day. Everett, Malden, Medford, and Melrose are all at or below the regional average of 1.5 vehicles per household and 47 miles per household per day.

Employment

The areas with the highest numbers of jobs are concentrated in the municipalities of Woburn, Burlington, and Wilmington, in the municipalities closest to Boston, along Interstates 93 and 95 and commuter rail lines, and in older downtowns (Figure 3-6). According to the Executive Office of Labor and Workforce Development, the number of jobs in the North Corridor in 2009 was 186,339, down from nearly 203,000 in 2001. Approximately half of this employment is in Woburn, Burlington, and Wilmington. These are also the areas with the highest commuting VMT per worker; in both Burlington and Wilmington, the average worker drives more than 17 miles to and from work each day. Only 6% of commuting miles to those municipalities are traveled by a mode other than transit. In Malden, Medford, Melrose, and Everett, more than 17% of commuting miles are traveled by transit, biking or walking. As a result, these communities generate just 6 round trip auto miles per commuter.

MAPC's MetroFuture forecasts show employment increasing by 1% to 196,750 by 2035, with some municipalities experiencing modest growth in absolute terms. Increases in employment density between 2009 and 2035 are projected to occur through redevelopment of underutilized industrial land along the Orange Line and Commuter Rail corridors (such as the Station Landing and Rivers Edge developments in Medford), as well as through expansion and densification of existing employment centers along Route 128 and I-93 (such as the recent expansion of the Lahey Clinic in Burlington.)

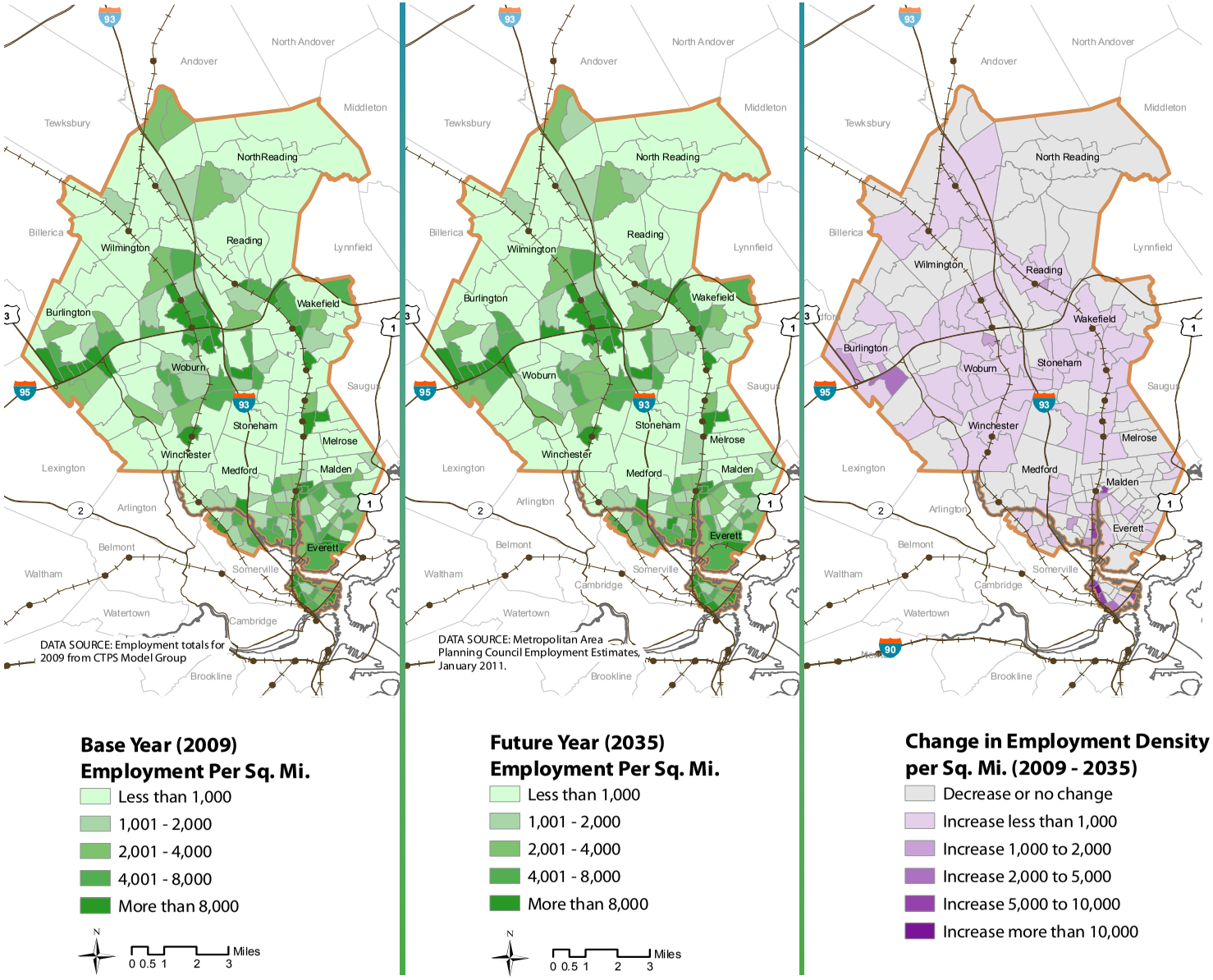
The Lowell Junction development proposed for Wilmington, Andover, and Tewksbury is projected to have approximately 3 million square feet of commercial and industrial space. The Wilmington census tract included in that development has among the highest auto VMT per commuter in the Corridor (22 auto miles per commuter per day.) At average occupancy rates of 2.5 employees per 1,000 square feet, this development could generate over 160,000 auto commuting miles per day.

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

FIGURE 3-6

Employment Density by Transportation Analysis Zone



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 North Corridor includes three Inner Core communities (Malden, Medford, Melrose) and one Regional Urban Center (Woburn). The remaining towns are Maturing Suburbs.

The MetroFuture land use vision for the North Corridor is built around redevelopment of commercial and industrial land along the Orange Line Corridor and at commuter rail stations. In these locations, new households will have the greatest access to transit and the highest proximity to common household destinations. The recent and planned developments along the Orange Line demonstrate a demand for this type of development, which can be satisfied through additional redevelopment of underutilized commercial and industrial land.

Economic development along the Orange Line and near 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 access to transit and bicycle or pedestrian improvements. For example, the Northwest Park redevelopment in Burlington has the potential to increase employment density while also dramatically shifting commute trips to alternative modes through parking strategies, pedestrian oriented design, and increased transit service to nearby population centers and transit hubs.

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 3-3. 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 3-3

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
Burlington			•		•	•			•	•	•		•						
Everett											•				•				
Malden										•	•	•	•			•	•		
Medford											•		•			•		•	•
Melrose						•					•		•			•			•
North Reading		•			•				•				•						
Reading		•					•		•				•			•			
Stoneham									•				•			•	•		
Wakefield									•		•		•			•			
Wilmington			•		•	•	•		•				•						
Winchester									•				•					•	
Woburn			•			•		•					•			•			

TRAVEL CHARACTERISTICS

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

The most recent count information for highway and transit travel into Boston Proper from the North Corridor is shown in Table 3-4. Also included is the same information from the travel demand model showing projected future 2030 No-Build conditions. Highway and transit trips were assigned to the corridor from which they enter Boston Proper, rather than assigning them to the corridor in which they originate. 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 3-4

Average Daily Highway and Transit Person-Trips into Boston Proper from the North Corridor: 2008 and 2030 No-Build

	2008 PERSON-TRIPS	2030 NO-BUILD PERSON-TRIPS
Highway	131,300	136,290
Transit	56,670	58,070
Total	187,970	194,360
Highway percentage	70%	70%
Transit percentage	30%	30%
Corridor's share of total person-trips into Boston	19%	19%

Table 3-5 gives the modal breakdown of the transit trips.

TABLE 3-5

Average Daily Transit Person-Trips by Mode into Boston Proper from the North Corridor: 2008 and 2030 No-Build

	2008 PERSON-TRIPS	2030 NO-BUILD PERSON-TRIPS
Bus	2,490	2,620
Rapid transit	45,700	47,490
Commuter rail	8,480	7,960
Contracted bus service	0	0
Ferry	0	0
TOTAL	56,670	58,070
Corridor's share of total transit trips into Boston	16%	15%

Inbound congestion levels on each of the three major modes of transit entering Boston Proper from the North 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 transit mode are shown in Table 3-6.

TABLE 3-6

Average Daily Congestion Levels on Transit Modes with Service into Boston Proper from the North Corridor (2008)

MODE	BY SEATING CAPACITY	BY PLANNING CAPACITY
Bus	76%	54%
Rapid transit	42%	15%
Commuter rail	62%	52%

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

North Corridor Travel Patterns

Figure 3-7 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 North 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, 52% of person-trips in the 2008 base year and 53% of person-trips in the 2030 No-Build scenario remain in the inner North Corridor (municipalities within the Boston Region MPO that are not part of the Central Area). Other travel to and from the inner North Corridor includes the outer North (municipalities in the North Corridor but not in the Boston Region MPO), Northwest and Northeast corridors and the Central Area. In total, travel within the North and adjacent corridors accounts for 96% of all person-trips associated with the North Corridor. The Central Area is the region's most prominent population and employment area within the region, and it includes the North Corridor municipalities of Everett, Malden, Everett, and Charlestown. The remaining 4% of the person-trips travel to the remaining corridors. In comparing 2008 base-year and 2030 No-Build travel, the latter includes slightly more travel within the inner North Corridor and slightly less to or from the surrounding corridors. The only increase in travel in the future is projected to be in travel destined to the North Corridor from the Northwest Corridor.

The information above discusses person trips for all purposes (work-based, school-based, shopping, etc.). When looking at the 2000 census Journey-to-Work data for the North Corridor, only 39% of the work-based trips (compared to 52% of all trips) remain within the North Corridor, while over 29% of the work-based trips (compared to 14% of all trips) are destined to the Central Area.

Truck Travel

Daily truck trip-ends per square mile are shown in Figure 3-8 along with the locations of freight intermodal facilities. This figure shows that the highest concentrations of 2008 daily truck activity occur around the Boston Autoport intermodal facility in Charlestown, the ITZ-Ohlson Transport Distribution Center, the fuel distribution facility in Everett, and along Interstate 95 at the intersection of Interstate 93 in Woburn, and between Routes 3 and 3A in Burlington. Other areas with high levels of truck travel include Route 28 in Wakefield, Melrose, and Malden and Route 38 in Woburn and Winchester. Between 2008 and 2030 (No-Build scenario), the truck model predicts that the largest increases in truck travel will occur in Burlington between the interchanges of Route 3 and 3A with Interstate 95, Woburn near the interchange of Interstates 93 and 95, Malden along Route 60, and the western side of Charlestown.

FIGURE 3-7

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

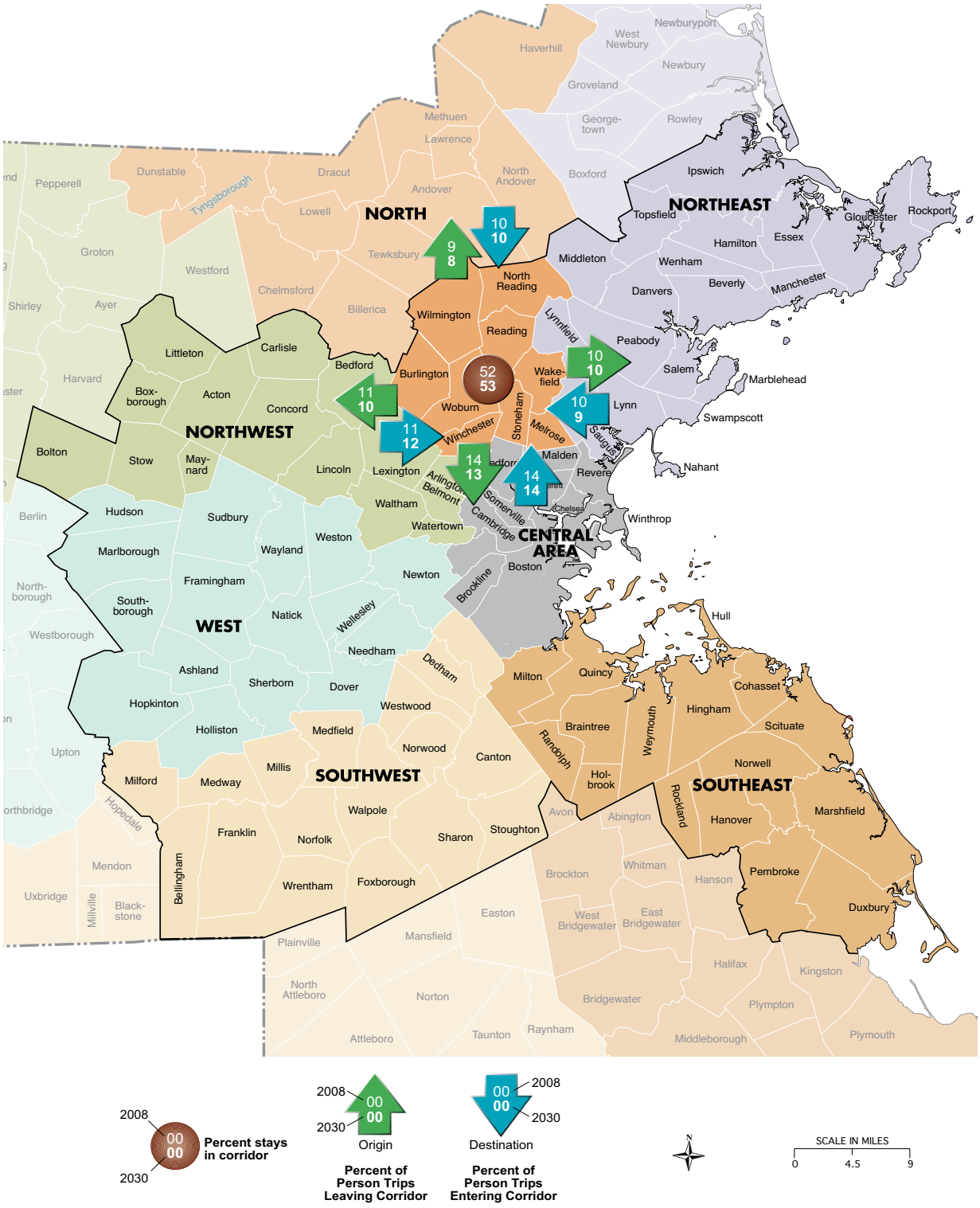
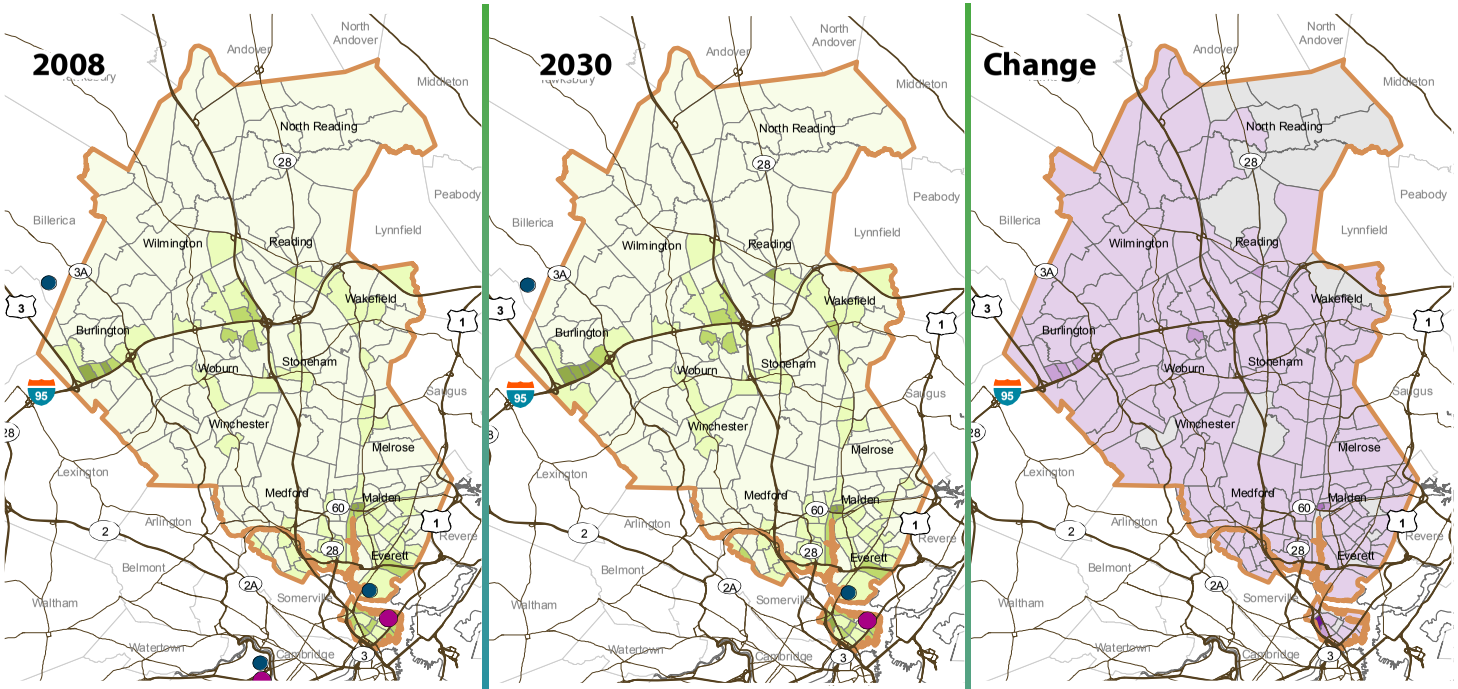


FIGURE 3-8

Daily Truck Trips by Transportation Analysis Zone - North



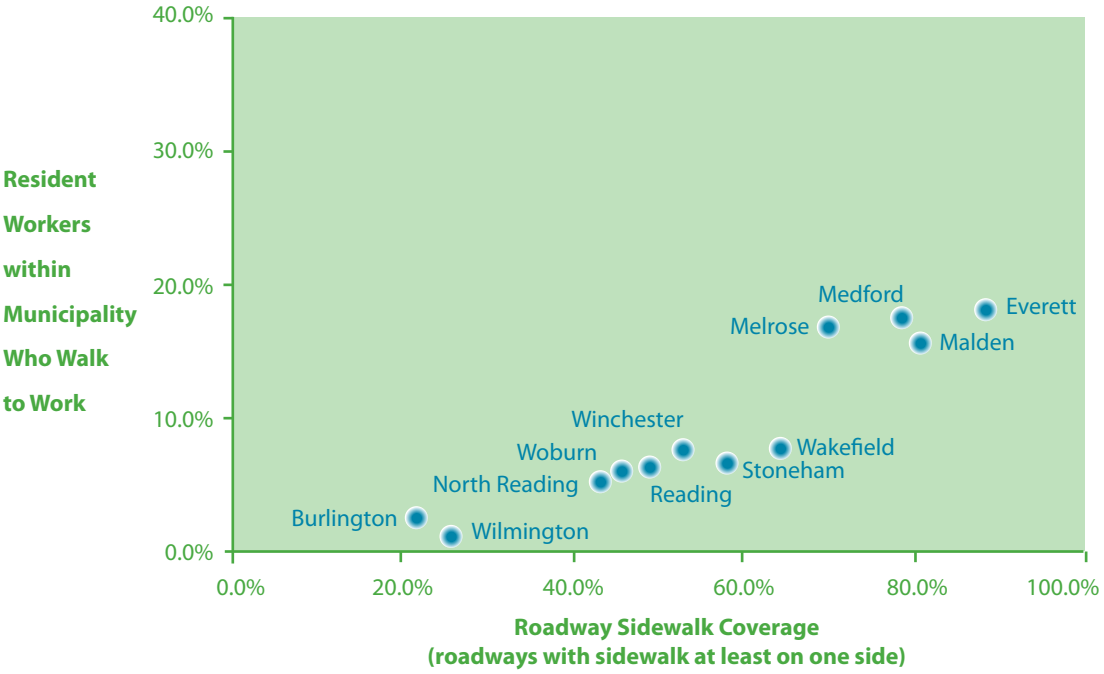
Bicycle and Pedestrian Travel

There are limited bicycle facilities and bicycle travel in the North Corridor. Less than 1% of the non-interstate centerline miles provide bicycle accommodations. Similarly, less than 1% of North Corridor residents bicycle to work (data derived from 2000 census Journey-to-Work data).

Walking conditions vary from poor to very good in the North Corridor. Table 3-7 indicates that the relationship between roadway sidewalk coverage (roadways having a sidewalk on at least one side) and percentage of residents that walk to work by community. (Walk-to-work data are derived from 2000 census Journey-to-Work data[1]) This table demonstrates the range in sidewalk coverage from 22% in Burlington to 88% in Everett, and in walk share from under 1% in Wilmington to over 4.5% in Everett.

TABLE 3-7

Relationship between Sidewalk Coverage and Residents who Walk to Work



Bicycists and pedestrians have not been counted at any major on-road or off-road facilities in the North Corridor.

[1] 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.

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 253 bridges in the North Corridor, 56 (22%) are classified as functionally obsolete, and 10 (4%) 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 114 bridges in the corridor that should meet this vertical clearance for trucks. Of these bridges, 86 (75%) do no 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 13 (5%) weight-restricted bridges in the North Corridor.

Transit: Universe of Transit Preservation and Modernization Needs Identified for the North 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 North 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, a number of bridges are currently rated as structurally deficient, including one on the Lowell Line and six on the Haverhill Line.

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.

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. This includes facilities, power, track/right-of-way, and signals projects for the Lowell Line and Haverhill commuter rail.

ADA Accessibility

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

- Wedgemere, West Medford, and Winchester (Lowell Line)
- Greenwood, Melrose Cedar Park, North Wilmington, Wakefield, and Wyoming Hill (Haverhill Line)

Freight

Weight-Restricted Tracks

The tracks in the North 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.

Truck Rollover Crashes

A high percentage of the lane-departure crashes in the MPO region are truck rollovers occurring at the Interstate 93/Interstate 95 interchange in Woburn.

Dredging

The channel into the Port of Boston, which provides access into the Charlestown terminals, is currently dredged to a depth of 40 feet but needs to be at least 45 feet deep in order to accommodate ships of deeper draft.

Mobility

Highway Bottlenecks: Method for Identifiying 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 used in this bottleneck analysis are as follows:

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 arterialscan be identified using a number of methods for express highways and arterials. For identifying those in the North 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 North 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 3-8 for the AM peak period and Table 3-9 for the PM peak period, and also in Figures 3-9 and 3-10. Note that the tables include only Class I and II arterials, however, Figure 3-10 also shows Class III arterials. Many of the locations shown in Figure 3-10 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 3-15. The AM and PM peak periods referred to in the tables and figures are defined as follows. For express highways, the AM 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 3-8

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

EXPRESS HIGHWAYS	SPEED INDEX
I-93 southbound between Montvale Ave. & Leverett Connector (Medford, Boston, Stoneham)	0.36 to 0.74
Rte. 1 Tobin Bridge (Charlestown)	0.36 to 0.9
I-95 @ Rte. 3 northbound (Burlington)	0.69
I-95 southbound between Rte. 129 & Rte. 38 (Reading, Wakefield, Woburn)	0.75 to 0.89
CLASS I & II ARTERIALS	**SPEED INDEX**
Rte. 28 at Rte. 60 & Rte. 16 (Medford)	0.44 to 0.62

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

TABLE 3-9

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

EXPRESS HIGHWAYS	SPEED INDEX
Rte. 1 Tobin Bridge (Charlestown)	0.43 to 0.82
I-93 northbound between Rte. 1 & I-95 (Stoneham, Medford, Boston, Reading)	0.50 to 0.69
Rte. 3 northbound @ I-95 (Burlington)	0.69 to 0.73
I-95 southbound between Rte.3A and Rte. 3 (Burlington)	0.78 to 0.80
I-95 northbound between Rte. 38 & Rte. 28 (Woburn and Reading)	0.80 to 0.86
I-95 southbound between Rte. 28 & I-93 (Reading)	0.88
CLASS I & II ARTERIALS	**SPEED INDEX**
Rte. 28 at Rte. 16 & Rte. 60 (Medford)	0.39 to 0.58

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

FIGURE 3-9

Express Highway Travel Speed Index (Existing Conditions) – AM and PM: North Corridor

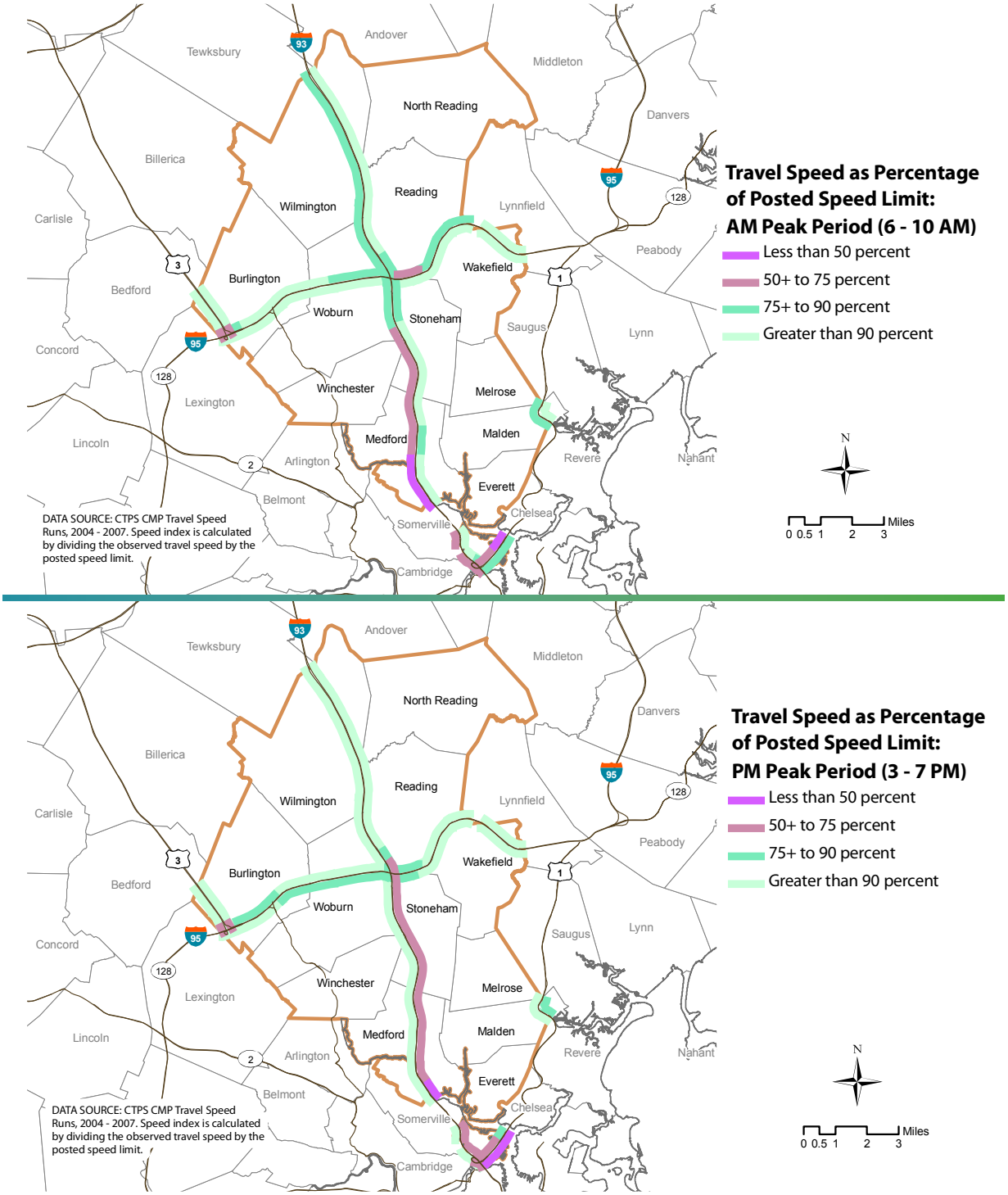
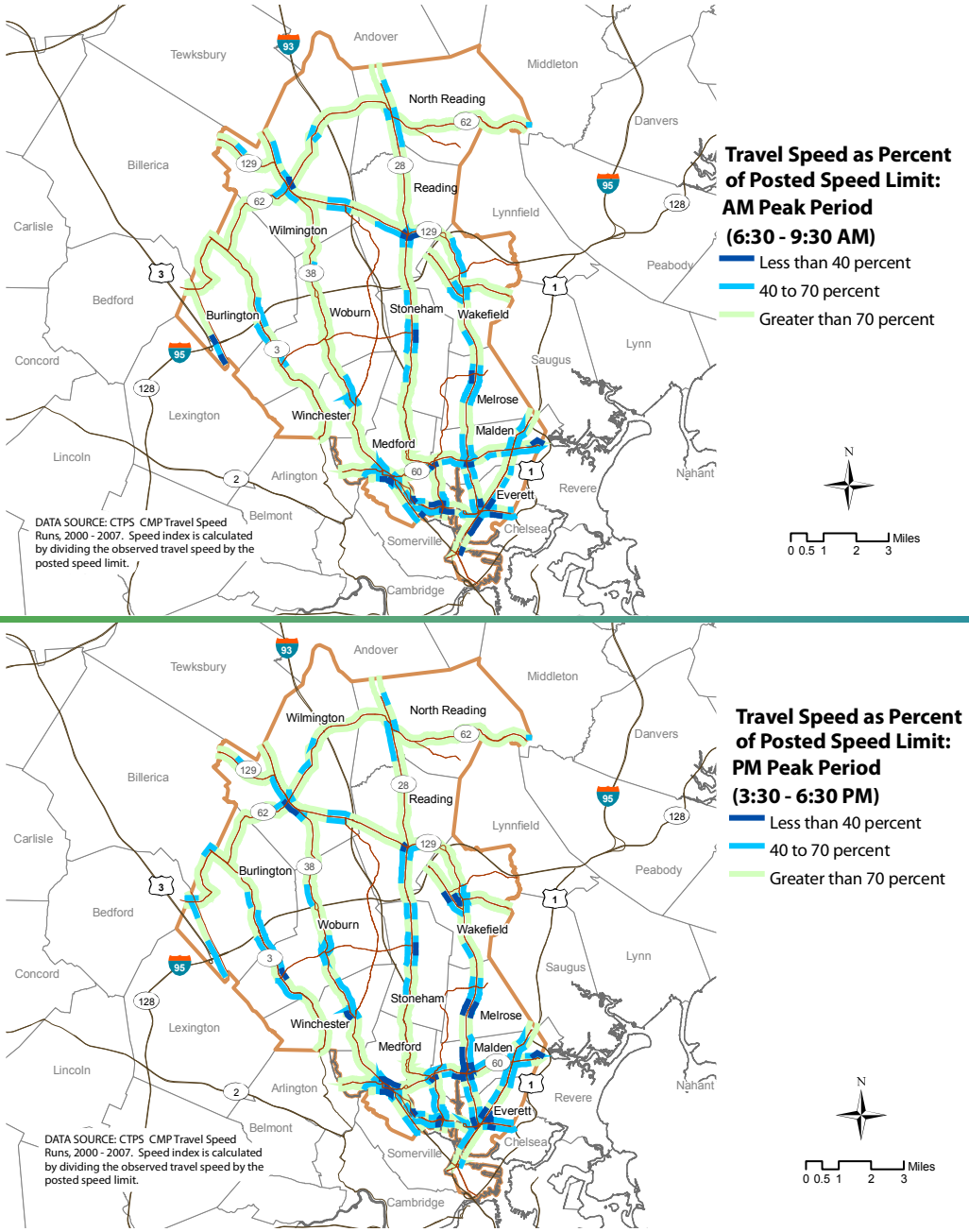


FIGURE 3-10

Arterial Travel Speed Index (Existing Conditions) – AM and PM: North Corridor



Volume-to-Capacity Ratio

The existing volume-to-capacity ratios (V/Cs) of express highways and arterial segments in the North 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.

Table 3-10 and Figures 3-11 and 3-12 present the segments of roadways in the North Corridor with the highest V/Cs during the AM peak period, listed in descending order of severity. Table 3-11 and Figures 3-11 and 3-12 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 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 3-10

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

EXPRESS HIGHWAYS	V/C
Rte. 3 @ I-95 (Burlington)	Greater than 1
I-93 southbound between Rte. 1 & Roosevelt Circle (Boston, Somerville, Medford)	0.8 to greater than 1
I-95 southbound between North Ave. & I-93 (Wakefield, Reading)	0.7 to greater than 1
I-95 southbound between Cambridge St. & Rte. 3 (Burlington)	0.8
I-93 southbound between Rte. 129 & Atlantic Ave. (Wilmington, Woburn)	0.8
ARTERIALS	**V/C**
Rte. 99 between Revere Beach Pkwy. & the Malden bridge (Everett)	0.9 to greater than 1
Rte. 1 (Tobin Bridge) (Chelsea to Boston)	Greater than 1
Rte. 3A between Billerica town line & Woburn town line (Burlington)	0.7 to greater than 1
Mystic Valley Pkwy. (Winthrop St. to Main St. (Medford)	0.8 to greater than 1
Rte. 38 (portions in Wilmington and Woburn)	0.6 to greater than 1

FIGURE 3-11

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

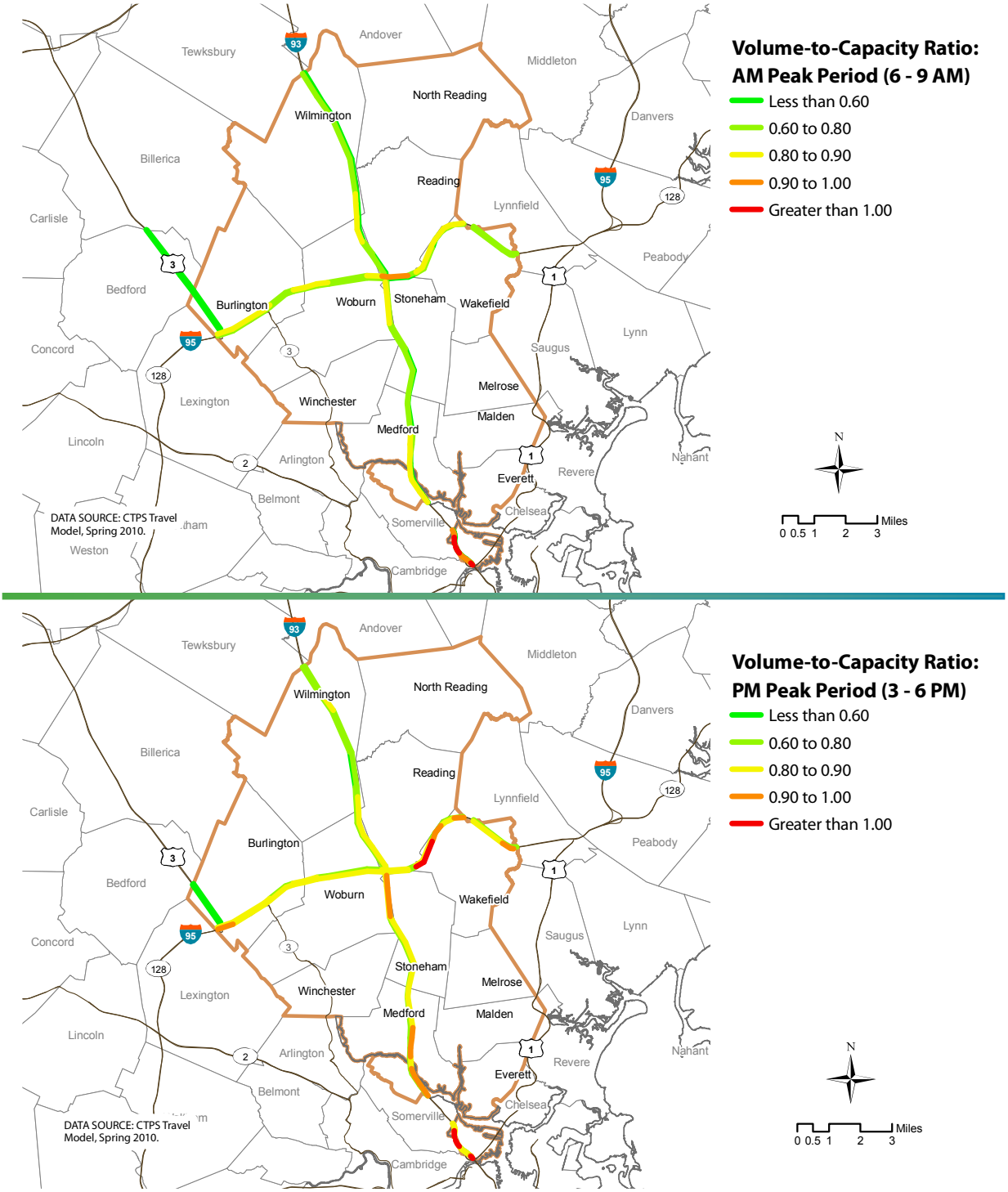


FIGURE 3-12

Arterial Volume-to-Capacity Ratio – 2008, AM and PM: North Corridor

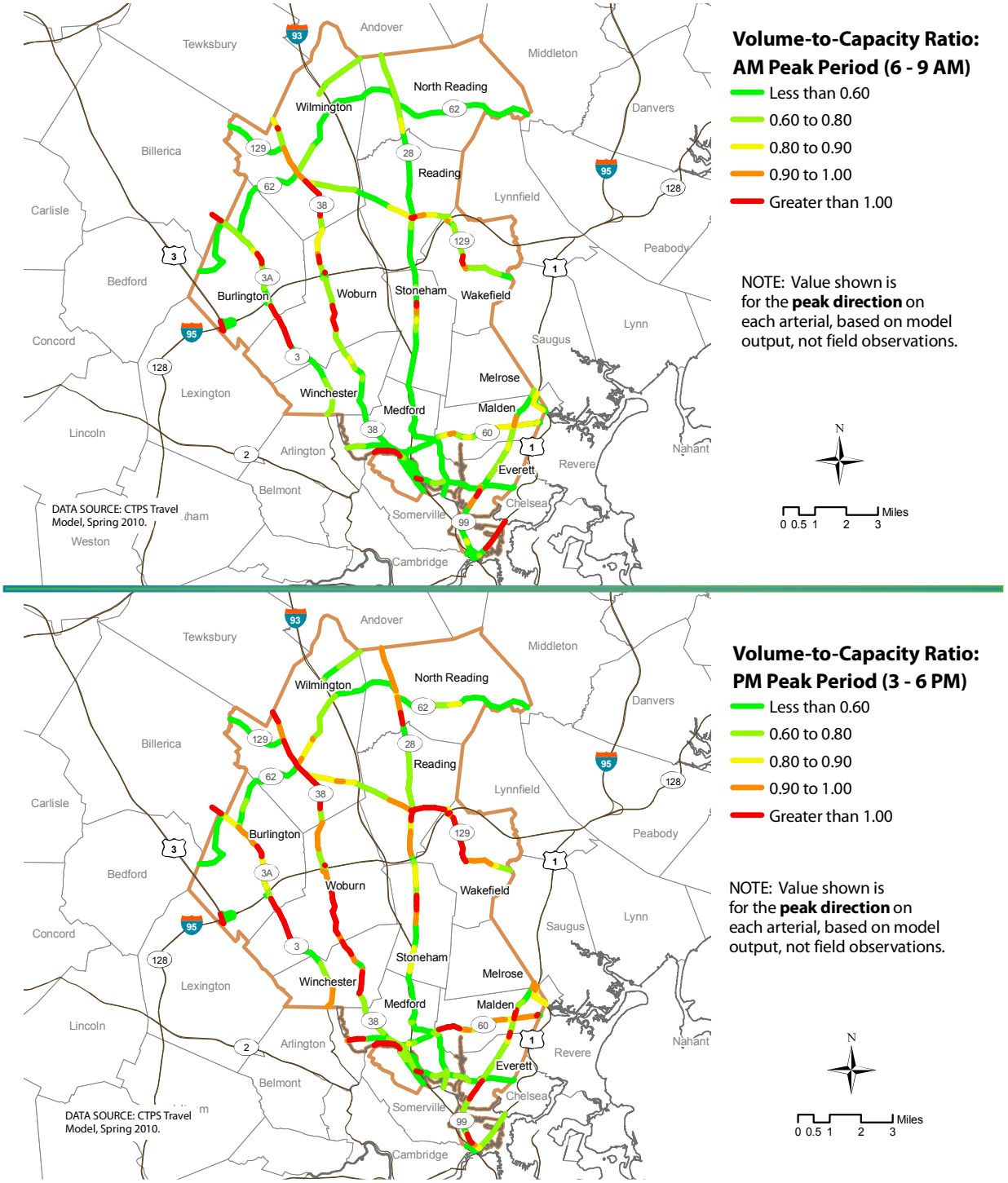


TABLE 3-11

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

EXPRESS HIGHWAYS	V/C
I-93 southbound between Broadway & Rte. 1 (Boston, Somerville)	Greater than 1
I-95 northbound between Rte. 28 & Rte. 129 (Reading, Wakefield)	0.9 to greater than 1
I-93 northbound from Medford/Somerville town line to Rte. 28 (Medford)	0.9 to 1.0
I-93 northbound (Charlestown)	0.9 to greater than 1
I-95 northbound from Lexington/Burlington town line to Rte. 3A (Burlington)	0.9
ARTERIALS	**V/C**
Rte. 99 (Everett)	Greater than 1
Mystic Valley Pkwy. from Auburn St. to Main St. (Medford)	Greater than 1
Rte. 3A/3 between Church Lane & Lexington St. (Burlington, Woburn)	Greater than 1
Rte. 129 between Water St. & Rte. 28 (Wakefield, Reading)	0.9 to greater than 1
Rte. 38 between Tewksbury & Medford	0.9 to greater than 1

In addition, the Boston Region MPO's travel demand model was used to determine V/C for roadways under 2030 No-Build conditions. Table 3-12 and Figures 3-13 and 3-14 present the segments of roadways in the North Corridor with the highest AM peak period V/Cs under the 2030 No-Build, again listing them in descending order of severity. Table 3-13 and Figures 3-13 and 3-14 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 the V/C analysis, arterials are not broken down by classification.

TABLE 3-12

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

EXPRESS HIGHWAYS	V/C
I-93 southbound between Rte. 1 & Roosevelt Circle (Boston, Somerville, Medford)	0.8 to greater than 1
I-95 southbound between North Ave. & I-93 (Wakefield, Reading)	0.8 to greater than 1
I-93 southbound between Tewksbury town line & Industrial Way (Wilmington, Woburn)	0.8 to 1
ARTERIALS	**V/C**
Rte. 38 (Wilmington to Winchester)	0.4 to greater than 1
Rte. 3A from Billerica town line to Bedford St. (Burlington)	0.8 to greater than 1
Rte. 3 between I-95 & Lexington St. (Burlington to Woburn)	0.9 to greater than 1
Mystic Valley Pkwy. (Route 16) from Mystic Valley Connector to Auburn St. (Medford)	0.7 to greater than 1
Rte. 129 between Water St. & Rte. 28 (Wakefield, Reading)	0.6 to 1.0

FIGURE 3-13

Express Highway Volume-to-Capacity Ratio – 2030 No-Build, AM and PM: North Corridor

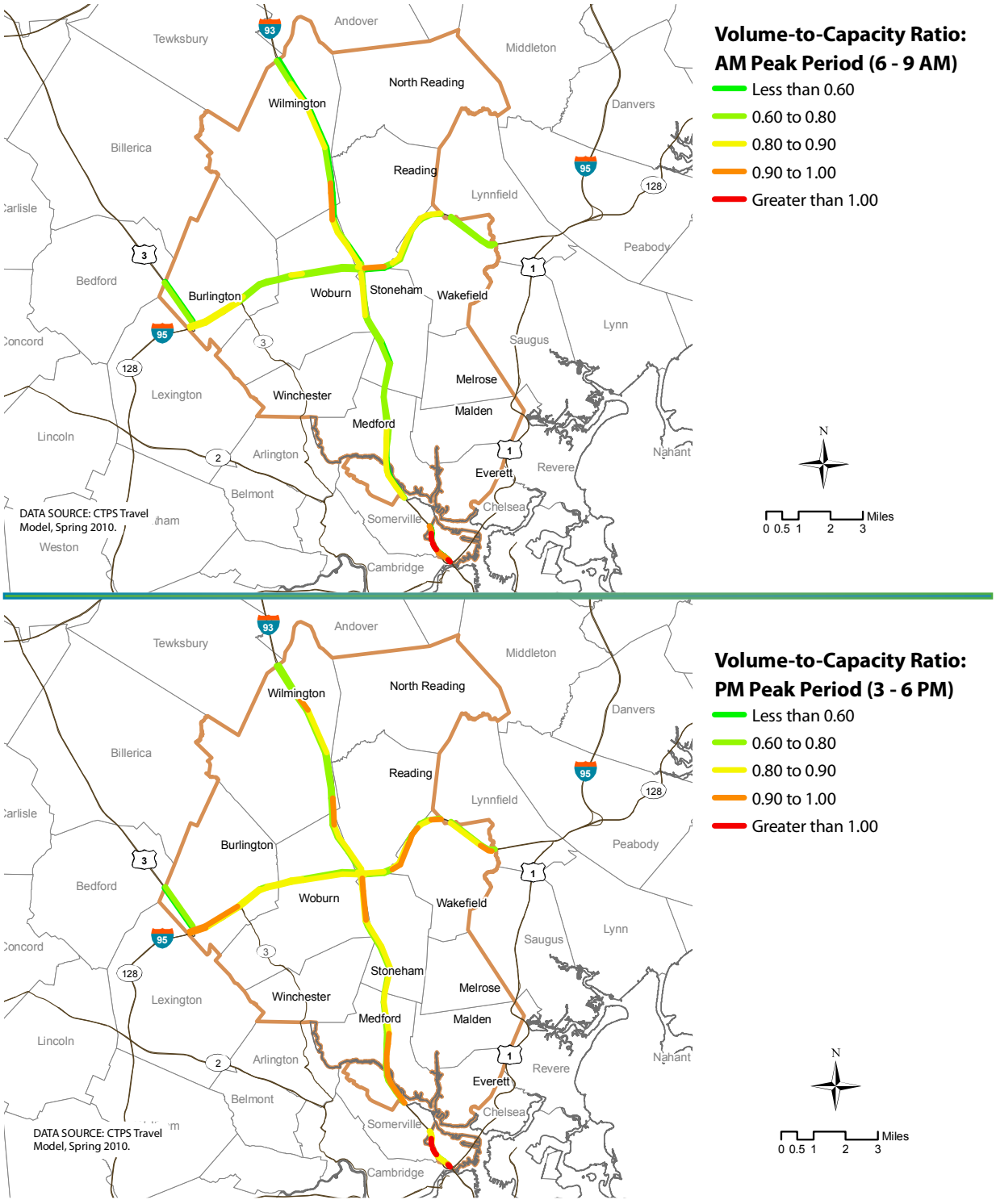


FIGURE 3-14

Arterial Volume-to-Capacity Ratio – 2030 No-Build, AM and PM: North Corridor

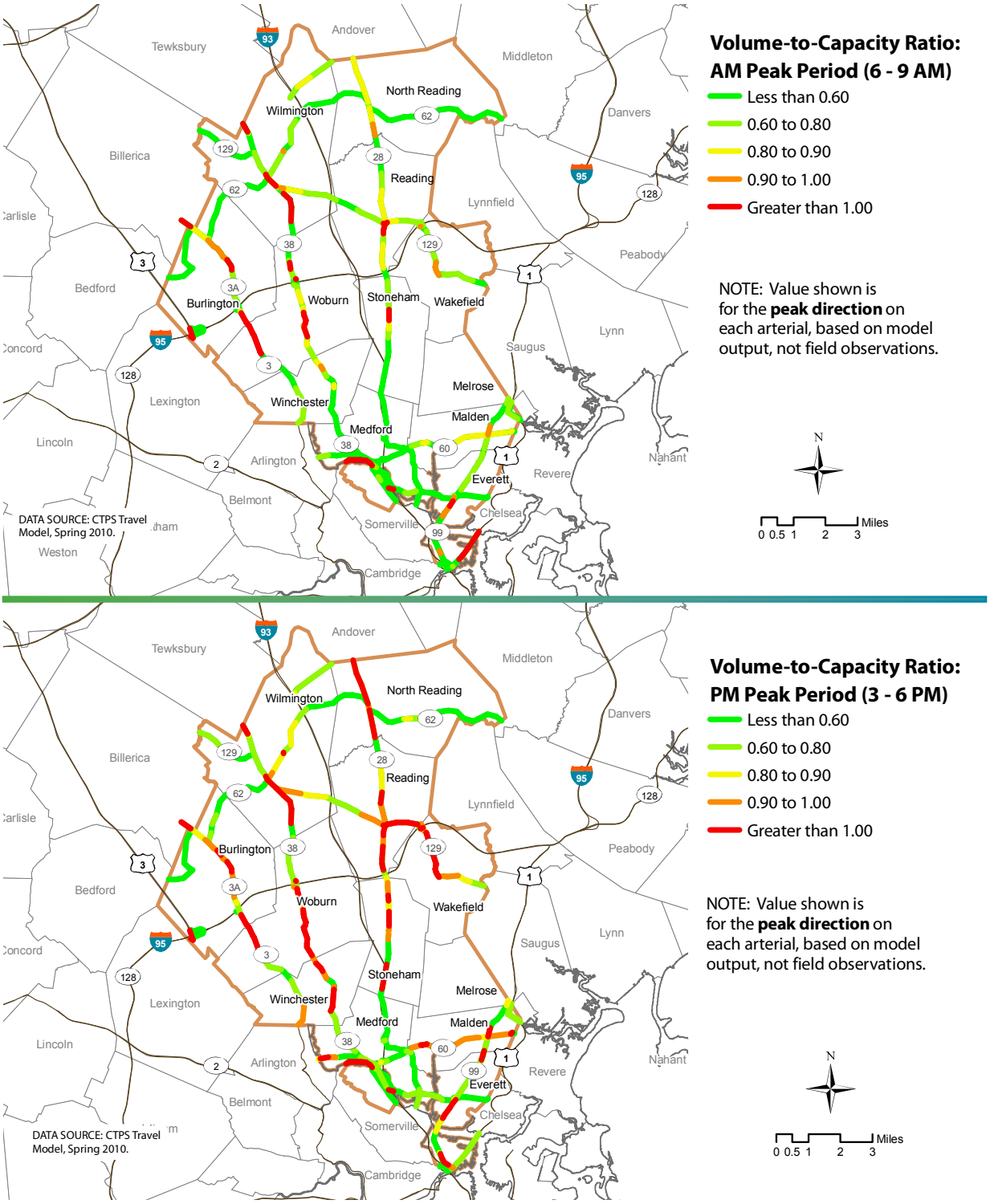


TABLE 3-13

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

EXPRESS HIGHWAYS	V/C
I-93 southbound between Roosevelt Cir. & Rte. 1 (Boston, Somerville, Medford)	0.9 to greater than 1
I-95 northbound between I-93 & Lynnfield town line (Reading, Wakefield)	0.8 to 1
I-93 northbound @ I-95 (Reading)	0.9 to 1
I-95 southbound between Rte. 3A & Rte. 3 (Burlington)	0.9
I-93 northbound between Rte. 62 & Rte. 129 (Wilmington, Reading)	0.8 to 1
ARTERIALS	**V/C**
Rte. 129 between Water St. & Rte. 28 (Wakefield, Reading)	Greater than 1
Rte. 38 (Wilmington, Winchester)	0.7 to greater than 1
Rte. 3 between I-95 & Lexington St. (Burlington to Woburn)	0.8 to greater than 1
Rte. 60 between Pleasant St. & Eastern Ave. (Malden)	0.8 to greater than 1
Rte. 3A from Billerica town line to Bedford St. (Burlington)	0.8 to greater than 1

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.

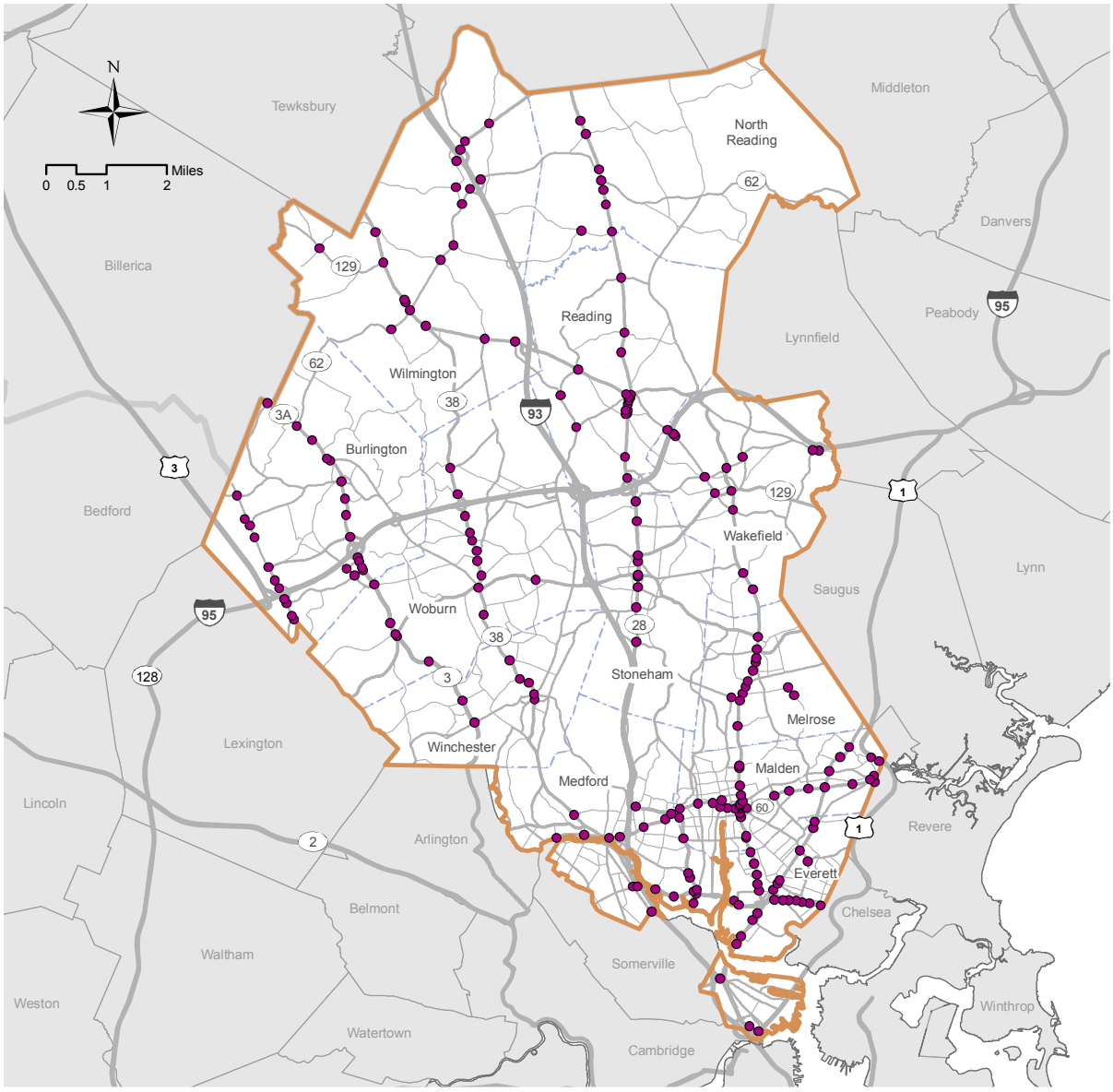
The North Corridor intersections that have been given priority by the CMP are shown in Figure 3-15. The roadways in the corridor that have clusters of priority intersections are (in roughly geographical order):

- Route 16 in Everett
- Route 99 in Everett
- Main Street through Everett, Malden, and Melrose
- Route 60 in Medford and Malden
- Route 28 in Stoneham, Reading, and North Reading
- Route 38 in Woburn
- Route 3A in Burlington
- Middlesex Turnpike in Burlington

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

FIGURE 3-15

CMP Priority Intersections, North Corridor



A SOURCE: Boston Region MPO
gestion Management Program (CMP)

ntersection has been categorized as a "priority intersection"
neets at least one of the following criteria:
igh accident location.
igh levels of approach delay greater than 80 seconds
vehicle as monitored through the CMP (all state
ıbered routes).
dentified as such in an MPO study.

● **Priority Intersections**

Worst Highway Bottlenecks in the North Corridor

Table 3-14 shows the locations that have been identified as the worst bottlenecks in the North Corridor, based on the three types of information presented above. This table indicates the criteria by which the location was identified as ac bottleneck.

TABLE 3-14

Worst Bottleneck Locations

EXPRESS HIGHWAYS	SPEED INDEX	VOLUME TO CAPACITY	PRIORITY INTERSECTIONS
Interstate 93 between the Leverett Connector and Interstate 95 (Charlestown, Medford, Reading, and Stoneham) and between Route 129 and Atlantic Avenue (Wilmington and Woburn)	•	•	
Interstate 95 between Route 28 and Route 3 (Wakefield, Reading, Woburn, and Burlington)	•	•	
Route 3 @ Interstate 95 (Burlington)	•	•	
ARTERIALS			
Main Street through Everett, Malden, and Melrose			•
Middlesex Turnpike in Burlington			•
Mystic Valley Parkway in Medford		•	
Route 1 Tobin Bridge in Charlestown		•	
Route 3A in Burlington and Woburn		•	•
Route 16 in Everett			•
Route 28 in Medford, Stoneham, Reading, and North Reading	•		•
Route 38 in Woburn and Wilmington		•	•
Route 60 in Medford and Malden		•	•
Route 99 in Everett		•	•
Route 129 in Wakefield and Reading		•	

Transit Mobility Needs Identified by the MBTA for the North 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 passenger 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 the off-peak at 100% .[2]

According to the most recent passenger counts available, the part of the Orange Line that operates in the north corridor meets its vehicle load standard of an average of no more than 131 riders per car at the peak load points during the AM and PM peaks. Recent data show that none of the commuter rail trips on the Haverhill and Lowell lines exceed the vehicle load standards. Tables 3-15 and 3-16 show the peak period vehicle load ratios for the Haverhill and Lowell lines respectively.

Table 3-15

Haverhill Line Vehicle Loads

INBOUND AM PEAK								
Arrive North Station	6:14 AM	6:50 AM	7:25 AM	7:48 AM	8:00 AM	8:30 AM	8:39 AM	9:00 AM
Assigned Seats	570	570	684	684	570	570	570	684
Peak Load	229	335	579	590	505	259	549	219
Peak Load/Seats	40.2%	58.8%	84.6%	86.3%	88.6%*	45.4%*	96.3%	32.0%*
OUTBOUND PM PEAK								
Depart North Station	3:50 PM	4:30 PM	4:49 PM	5:15 PM	5:35 PM	5:55 PM	6:20 PM	
Assigned Seats	798	570	570	684	570	684	570	
Peak Load	128	509	221	582	379	290	248	
Peak Load/Seats	16.0%	89.3%	38.8%*	85.1%	66.5%	42.4%*	43.5%	

* Reading short-turn trains

Table 3-16

Lowell Line Vehicle Loads

INBOUND AM PEAK								
Arrive North Station	6:22 AM	7:05 AM	7:22 AM	7:40 AM	8:05 AM	8:26 AM	8:57 AM	9:10 AM
Assigned Seats	684	570	570	798	684	684	798	570
Peak Load	266	535	293	700	712	683	184	351
Peak Load/Seats	38.9%	93.9%	51.4%*	87.7%	104.1%	99.9%	23.1%*	61.6%
OUTBOUND PM PEAK								
Depart North Station	4:10 PM	4:20 PM	4:40 PM	5:10 PM	5:30 PM	5:50 PM	6:25 PM	
Assigned Seats	570	570	570	684	798	570	684	
Peak Load	451	94	460	582	479	502	331	
Peak Load/Seats	79.1%	16.5%*	80.7%	85.1%	60.0%**	88.1%	48.4%	

* Anderson/Woburn short-turn trains ** Limited Stops

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

- Route 93 (Sullivan Station-Franklin & Arch Streets) - 4,200 average daily boardings

[2] For bus, light rail and heavy rail, thevehicle 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 of-peak periods. For commuter rail and ferry services, the load standard is based on the ratio of boarding passengers per vehicle to seated capacity.

- Route 101 (Malden Station-Sullivan Station) - 4,100 average daily boardings
- Route 104 (Malden Center Station-Sullivan Station via Ferry) - 3,400 average daily boardings
- Route 109 (Linden Square-Sullivan Station via Broadway) - 3,000 average daily boardings

Table 3-17 presents data on the performance of the North Corridir bus routes. As shown by the routes' maximum load ratios (based on recent ridership counts), some of the routes in the North Corridor fail the load standard, Routes 96, 134, 137, and 430. Service adjustments have been made on Routes 96 and 430, and a more recent point check did not show continued load problems on the Route 137.[3] Table 3-17 also shows the number of trips and percent of trips on each bus route serving the North Corridor that were operated during the month of October 2010. These columns give an indication of which routes operate with a high frequency of service and the degree to which scheduled trips are not run.

In addition, Table 3-17 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 3-17, 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.

3 A point check is an observation of the vehicle load made at the maximum load point of a route during the period of heaviest use. This differs from a full passenger count, which involves counting the number of riders who board and alight a route at all stops on all trips operated throughout the service day.

Table 3-17

Performance of North Corridor Bus Routes

					BASED ON ALL TRIPS OPERATED DURING OCTOBER 2010			
TYPE	ROUTE	ROUTE NAME	VEHICLE LOAD STAN-DARD	MAXIMUM LOAD FACTORS	% TIME-POINTS ON TIME	SCHEDULE ADHERENCE STANDARD	% TRIPS OPERATED	# TRIPS OPERATED
Local	90	Davis Sq. Station - Wellington Station		85%	66%	Fail	100.0%	420
Local	92	Sullivan Station - Franklin & Arch Sts.		99%	65%	Fail	99.9%	849
Local	93	Sullivan Station - Franklin & Arch Sts.		114%	71%	Fail	97.5%	1,525
Local	94	Medford Sq. - Davis Sq. Station		138%	70%	Fail	99.9%	719
Local	95	West Medford - Sullivan Station		105%	76%		99.9%	881
Local	96	Medford Sq. - Bennett St. Alley via George	Fail	146%	64%	Fail	99.9%	796
Local	97	Malden Station - Wellington Station		73%	52%	Fail	99.7%	398
Local	99	N.E. Memorial Hosp. - Malden Ctr.		68%	66%	Fail	99.7%	660
Local	100	Elm St. & Fellsway - Wellington Station		104%	83%		99.7%	796
Local	101	Malden Station - Sullivan Station		78%	57%	Fail	98.6%	1,168
Local	104	Malden Ctr. Station - Sullivan Station via Ferry		120%	55%	Fail	99.7%	1,012
Local	105	Malden Ctr. Station - Sullivan Station		93%	58%	Fail	100.0%	378
Local	106	Lebanon Street Loop - Wellington Station		82%	55%	Fail	99.7%	879
Local	108	Linden Sq. - Wellington Station via Malden		108%	60%	Fail	98.8%	828
Local	109	Linden Square - Sullivan Station via Broadway		110%	56%	Fail	99.3%	1,146
Local	110	Wonderland Station - Wellington Station		121%	65%	Fail	98.9%	930
Local	112	Wellington Station - Wood Island Station		65%	59%	Fail	100.0%	504
Local	131	Melrose Highlands - Malden Ctr. Station		88%	70%	Fail	99.4%	486
Local	132	Redstone Shopping Center - Malden Ctr. Station		115%	81%		100.0%	389
Local	134	North Woburn - Wellington Station	Fail	142%	58%	Fail	99.9%	798
Local	136	Reading Depot - Oak Grove Station		123%	63%	Fail	99.7%	387
Local	137	Reading Depot - Malden Ctr. Station	Fail	150%	63%	Fail	99.7%	366
Express	325	Elm St. & Fellsway West - Haymarket Sq.		64%	70%	Fail	100.0%	356
Express	326	West Medford - Haymarket Square		54%	73%	Fail	100.0%	356
Local	350	Burlington - Alewife Station		93%	58%	Fail	100.0%	581
Local	351	Oak Park - Alewife Station via Middlesex Tnpk.		32%	60%	Fail	100.0%	137
Express	352	Burlington - State St. via I-95 & I-93		82%	70%	Fail	100.0%	179
Express	354	Woburn Line - State St.		95%	59%	Fail	99.9%	462
Express	355	Mishawum Station - Boston		28%	41%	Fail		*
Local	411	Revere/Jack Satter House - Malden Ctr. Station		135%	52%	Fail	100.0%	389
Express	426	Lynn Central Sq. - Haymarket via Saugus		135%	56%	Fail	100.0%	714
Express	428	Oaklandvale - Haymarket via Granada Hglds		102%	64%	Fail	100.0%	63
Local	430	Saugus, Appleton St. - Malden Center Station	Fail	160%	59%	Fail	100.0%	441

*Route 355 operates only four trips per day, three of which would otherwise be deadhead trips on Route 352.

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 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 the Charlestown and Fellsway 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.

Orange Line rapid transit service from June through October met the MBTA's schedule adherence standard of 95% on-time performance according to the November 2010 ScoreCard. However, the average daily vehicle availability was below the required level of 102 cars in July and August, 2010, and the mean miles between failures were also below the target level of 32,000 in July and August. This may be, at least in part, a reflection of the age of the Orange Line fleet, which will reach the end of its useful life in 2015.[4]

The ScoreCard shows that neither the Haverhill nor the Lowell commuter rail line passed 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 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 North Corridor and systemwide.

Mobility Issues Identified in the Program for Mass Transportation (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 North Corridor:

4 MBTA Program for Mass Transportation, December 2009, p. 5-3

- 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.
- Modeling projections suggest that Bus Route 132 will experience crowding levels that will trigger the need for additional service.
- 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 that currently generate significant trips into the urban core do not have access to rapid transit service.
- The Haverhill Line layover facility creates noise pollution and localized air pollution in a densely developed residential neighborhood.
- Much of the Haverhill Line is single-track, seriously limiting schedule and operational flexibility. The Wildcat Branch that connects the Lowell and Haverhill Lines is also single-track.
- Proposed projects adjacent to the Haverhill Line that promote smart growth and economic development should be supported.

Transit Station Parking Issues

- The current park and ride inventory shows that the following stations are utilized at 85% of capacity or greater:
  1. North Wilmington, Melrose Highland, and Malden (Haverhill Line)
  2. Winchester Center, Wedgemere, and West Medford (Lowell Line)
  3. Oak Grove, Malden, Wellington, and Sullivan Square (Orange Line)
  4. Woburn (Express Bus)
- For some customers, access to rail services is constrained by the lack of bicycle parking.

Connections with Other Regional Transit Authorities' Services

Both the Merrimack Valley Regional Transit Authority (MVRTA) and the Lowell Regional Transit Authority (LRTA) serve the North 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

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.

Highway Freight Bottlenecks

Route 3 at Interstate 95 in Burlington and the interchange of Interstates 93 and 95 were identified in the MassDOT Freight Plan as among the 12 worst highway freight bottlenecks in Massachusetts.

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 55 bridges over rail lines in the corridor, 37 (67%) do not meet this desired height.

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.

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 North Corridor's bicycle network limit users' ability to safely connect to their destinations. Unlike the Northwest and West corridors, the North Corridor lacks a bicycle corridor to Boston, and no routes for circumferential travel currently exist. None of the bicycle facilities identified in the North Shore Corridor of MassDOT's Bay State Greenway Plan has been constructed within the North Corridor. The limited bicycle network prevents 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 access to stations limit their utilization. Currently, there are no on-road or off-road bicycle accommodations for accessing the Orange Line of the rapid transit system or the Haverhill or Lowell Line of the commuter rail system.

The North Corridor's pedestrian network is more developed than the bicycle network, but it varies significantly. Sidewalk coverage in the corridor ranges from a low of 22% coverage in Burlington to a high of 88% coverage in Everett. Gaps in the pedestrian network limit users' access to activity generators, including transit stations, schools, recreation destinations, elderly services, and commercial areas. Pedestrian access to both rapid transit and commuter rail stations varies significantly, from poor access at Sullivan Square Station in Somerville and Wilmington Station in Wilmington to good access at Winchester Station in Winchester and Malden Center Station in Malden. Some of the issues limiting pedestrian access at stations are associated with crosswalks, sidewalks, and station signage.

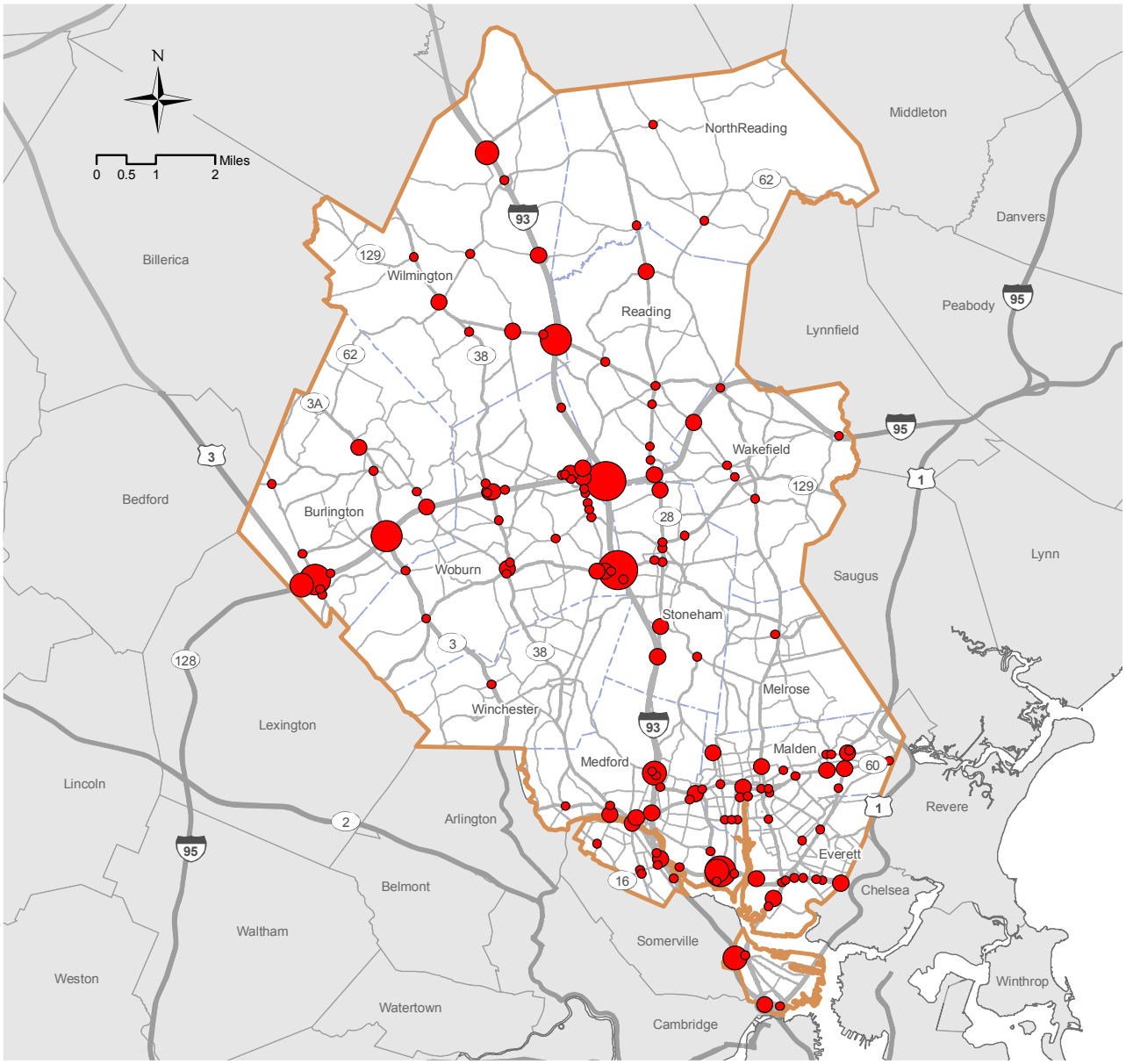
Safety Issues

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. EDPO 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 3-16 identifies the top crash cluster locations in the North Corridor. It shows that the locations in this corridor with the highest EPDO values are located on Interstates 95 and 93, the Middlesex Turnpike, and Routes 16 and 129. Specifically,

FIGURE 3-16

Top Five Percent of Crash Cluster Locations - North Corridor



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

the locations with the highest EPDO values (shown in parentheses below) are:

- Interstate 95 and Interstate 93 interchange, Reading (755)
- Interstate 93 at Montvale Avenue, Woburn (533)
- Interstate 95 at Route 3, Burlington (418)
- Middlesex Turnpike at Interstate 95, Burlington (359)
- Interstate 93 at Route 129 (Lowell Street), Wilmington (319)

Environmental Issues

Figures 3-17 through 3-19 provide an overview of environmental constraints in the North 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 North Corridor has one Area of Critical Environmental Concern (ACEC), Golden Hills that is located in Melrose, Saugus, and Wakefield. Golden Hills has 500 acres and was designated in 1987.

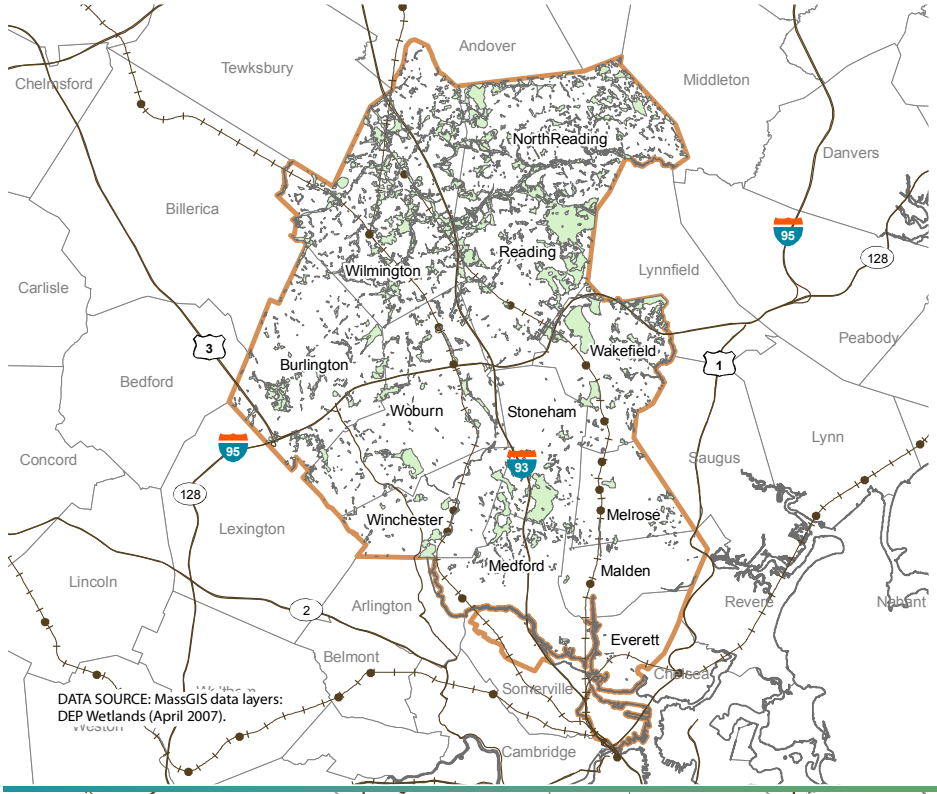
The locations of projects being considered for inclusion in the LRTP are overlaid on these environmental constraint maps. This information is then used during the project selection process. These environmental constraints are further addressed during project design and mitigation.

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 that is 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 Boston Region MPO portion of the North Corridor include areas in Charlestown, Everett, Malden, and Medford. MPO staff meet with social service and community contacts and conduct surveys to identify needs and suggested responses within these environmental justice areas. Table 3-18 outlines issues and needs identified by contacts in the environmental justice areas in the North Corridor.

FIGURE 3-17

DEP Wetlands/FEMA Flood Zones - North



DATA SOURCE: MassGIS data layers: DEP Wetlands (April 2007).

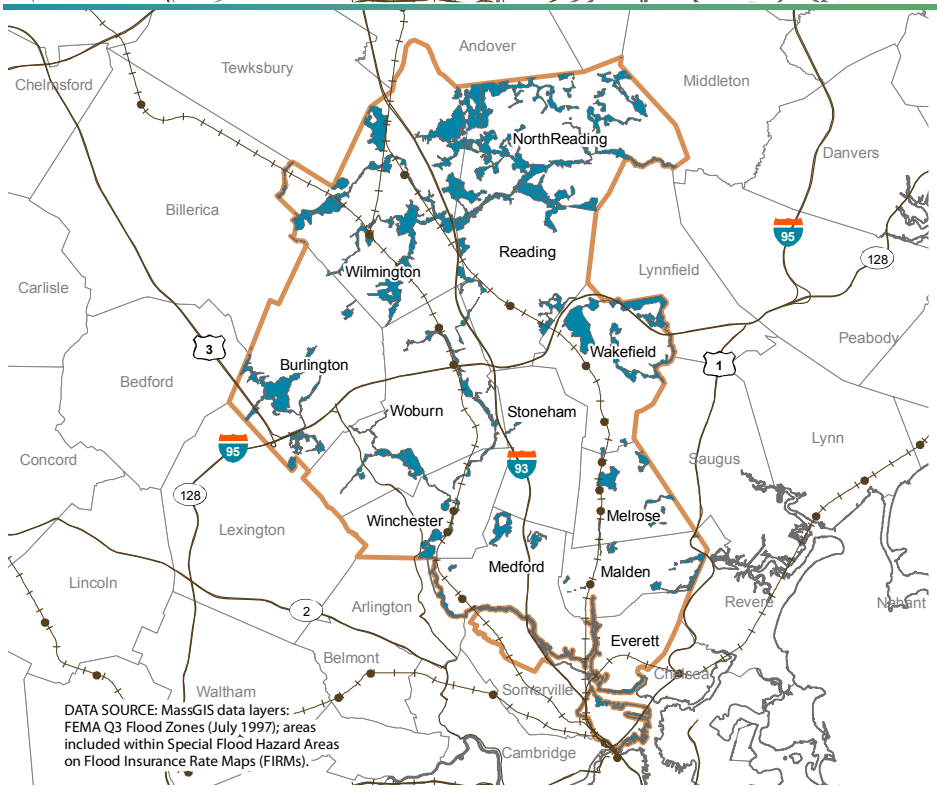
DEP Wetlands

All categories

Massachusetts Department of Environmental Protection (DEP), Wetlands Conservancy Program

N

0 0.5 1 2 3 Miles



DATA SOURCE: MassGIS data layers: FEMA Q3 Flood Zones (July 1997); areas included within Special Flood Hazard Areas on Flood Insurance Rate Maps (FIRMs).

FEMA Q3 Flood Zones

Special Flood Hazard Areas

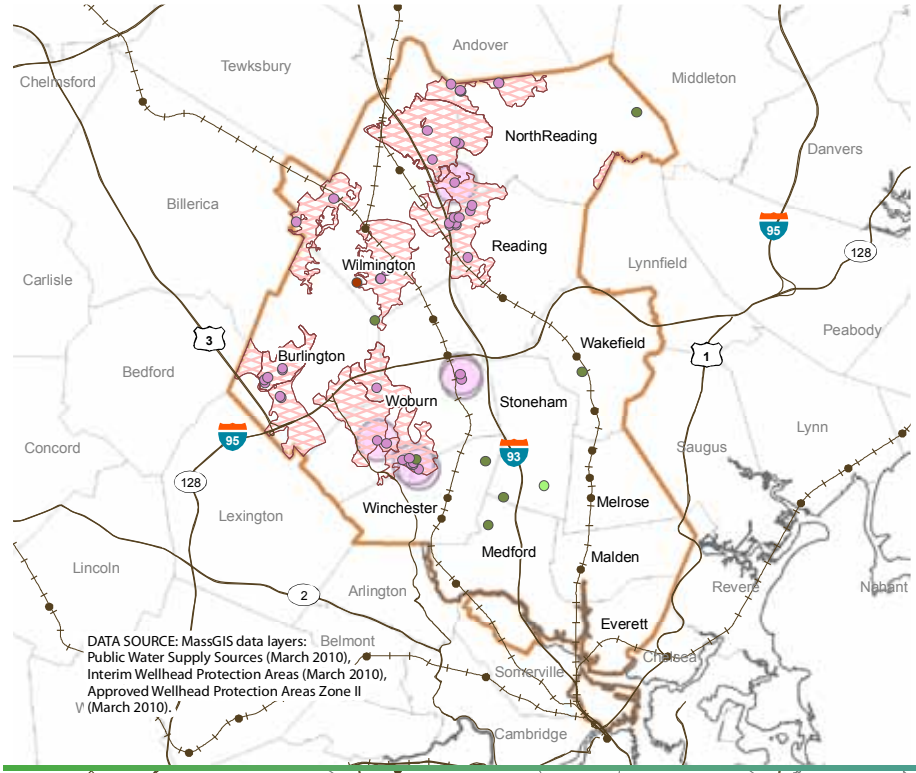
Special Flood Hazard Areas (SFHAs) are areas subject to inundation by a flood having a 1% or greater probability of being equaled or exceeded during any given year. This flood, which is referred to as the 1% annual chance flood (or base flood), is the national standard on which the floodplain management and insurance requirements of the National Flood Insurance Program are based.

N

0 0.5 1 2 3 Miles

FIGURE 3-18

Public Water Supply/Surface Water Protection Areas - North



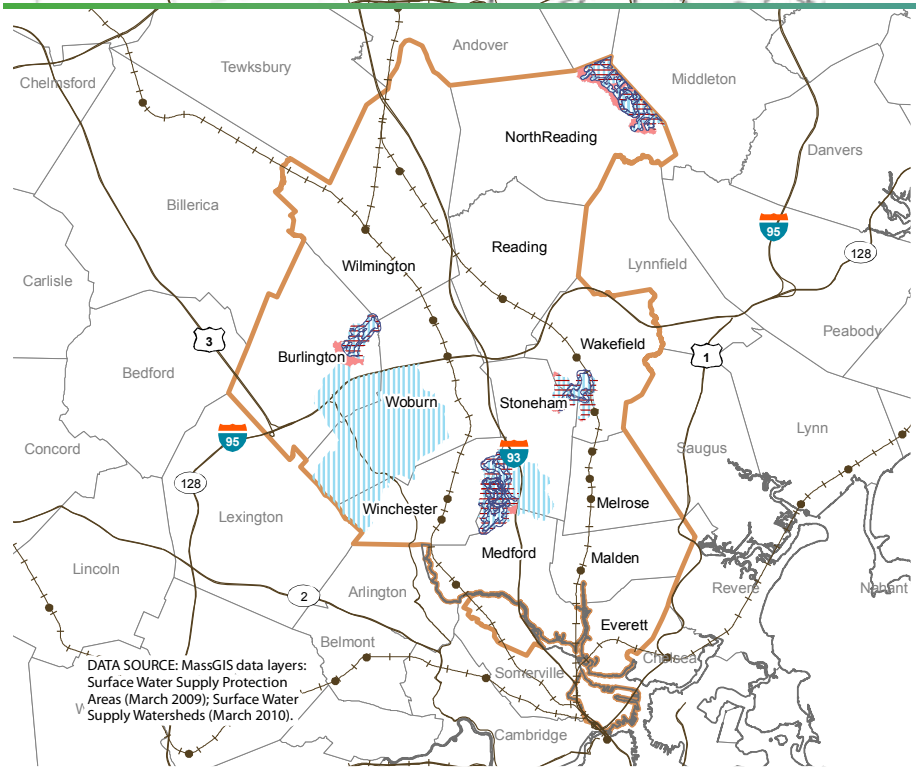
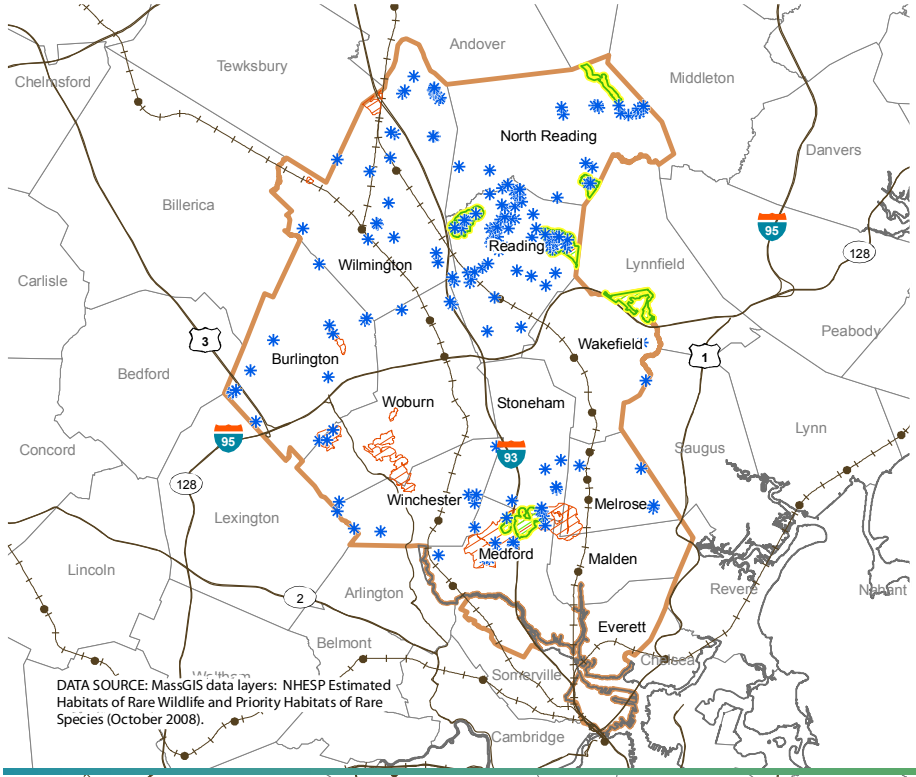


FIGURE 3-19

NHESP Habitats/Protected Open Space - North



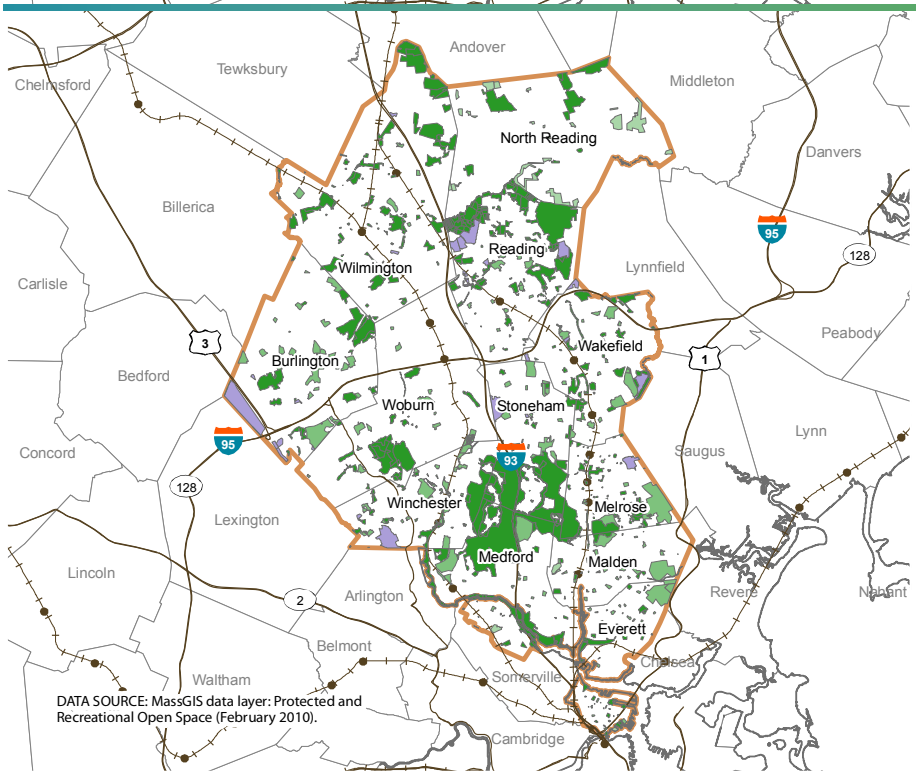
NHESP Priority Habitats

- Certified vernal pool
- Estimated habitat of rare wildlife
- Rare species habitat

Natural Heritage and Endangered Species Program (NHESP) is a part of the Massachusetts Division of Fish and Wildlife.

N

0 0.5 1 2 3 Miles



Protected Open Space

Level of Protection

- In perpetuity
- Temporary
- Limited
- Unknown
- None

N

0 0.5 1 2 3 Miles

TABLE 3-18

Identified Transportation Equity Issues

COMMUNITY	REPORTED ISSUES	POSSIBLE SOLUTIONS*
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 elderly and people with disabilities 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 Center).
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.
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 its 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.

* 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 NORTH 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 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 North Corridor needs assessment identifies bridge and roadway maintenance needs an significant bottleneck and crash locations. The identified needs and problems listed below will promote the realization of the vision:

- Of the 253 bridges in the North Corridor, 56 (22%) are considered functionally obsolete (do not meet current traffic demands or highway standards), and 10 (4%) 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 three methods described in the highway mobility section of this chapter:
  - Interstate 93 between the Leverett Connector and Interstate 95 (Charlestown to Stoneham) and between Route 129 and Atlantic Avenue (Wilmington and Woburn)
  - Interstate 95 between Route 28 and Route 3 (Wakefield to Burlington)
  - Route 1 Tobin Bridge in Chelsea and Boston

- Route 3 at Interstate 95 in Burlington
- Route 3A in Burlington and Woburn
- Route 28 in Medford, Stoneham, Reading, and North Reading
- Route 38 in Woburn and Wilmington
- Route 60 in Medford and Malden
- Route 99 in Everett
- Route 129 in Wakefield and Reading

- The top crash locations in the North 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 and 93 interchange (Reading) - EPDO of 755
  - Interstate 93 at Montvale Avenue (Woburn) - EPDO of 533
  - Interstate 95 at Route 3 (Burlington) - EPDO of 418
  - Middlesex Turnpike at Interstate 95 (Burlington) - EPDO of 359
  - Interstate 93 at Route 129 (Wilmington) - EPDO of 319

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:

- Six bridges on the Haverhill Line and one on the Lowell Line need to be replaced.
- Much of the Haverhill Line is single-track, which limits its capacity.
- New Orange Line cars need to be purchased to replace the current fleet from 1979-1981.
- Transit reliability throughout the North Corridor is poor. Only three of the 33 bus routes (9%), and neither of the commuter rail lines, meet the MBTA's schedule adherence standards.

- Eight commuter rail stations in the corridor are not ADA accessible.
- Six commuter rail station park-and-ride lots in the corridor and the Woburn express bus lot are utilized at 85% of their capacity or greater. Each Orange Line park-and-ride lot in the corridor exceeds the 85% utilization rate.

Issues to watch:

- By 2030, bus Route 132 is projected to experience passenger crowding levels that would require additional service or larger, articulated vehicles.
- Higher density areas in parts of Medford, Malden, Woburn, Stoneham, Reading, and Burlington do not have direct access to transit services.
- Higher transit demand resulting from the implementation of the MetroFuture land use plan will require investments to increase capacity.
- Roadways in parts of Medford, Somerville, and Everett are congested, yet the communities have sufficient density and travel into the urban core to support rapid transit service.

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 interchange of Interstates 93 and 95 needs to be improved in order to reduce the number of truck rollover crashes occurring at the location.
- Route 3 at Interstate 95 in Burlington and the interchange of Interstates 93 and 95 were identified in the MassDOT Freight Plan as among the 12 worst highway freight bottlenecks in Massachusetts.
- The Port of Boston needs to be dredged to 45 feet in order to accommodate larger ships.
- 75 percent of highway bridges and 67 percent of railroad bridges do not meet the desired vertical clearance.

Issue to watch:

- If demand for rail freight increases, tracks carrying that freight in the North 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.

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 Orange Line or commuter rail stations.
- Few roads (less than 1%) in the North Corridor provide bicycle accommodations.
- About 45% of the non-interstate roads in the North Corridor do not have a sidewalk on at least one side of the roadway.
- The North Corridor lacks a bicycle corridor into Boston Proper. There are no major bicycle connections for east-west 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:

- Late evening and early morning transit service is needed by many low income workers.
- Circumferential transit is needed for people living in the North Corridor and working in points west of Boston Proper, such as Cambridge.
- The transit system is difficult to navigate for people who speak languages other than English.

Issue to watch:

- 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*.

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 those along the Orange Line and commuter rail lines. Transit capacity will need to increase in order to handle service demands.
- The Lowell Junction development proposed at the confluence of three MPOs (Wilmington in the Boston Region, Tewksbury in Northern Middlesex, and Andover in Merrimack Valley) may generate more than 160,000 auto commuting miles per day.