



North Suburban Mobility Study

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Prepared for North Suburban Planning Council

Executive Summary

The Metropolitan Area Planning Council (MAPC), the regional planning agency that serves the 101 communities of Metro Boston, collaborated with the towns and cities in the North Suburban Planning Council (NSPC) to conduct a suburban mobility study. The study concentrated on non-single-occupancyvehicle options for serving the "first and last mile" of transit work trips in the subregion. These options can include better coordination of existing transit services, employer-sponsored shuttles, new locally operated public transportation services, partnerships with private sector transportation network companies, and improved pedestrian and bicycle connections among transit, residences, and employment centers.

The NSPC subregion consists of nine municipalities – Burlington, Lynnfield, North Reading, Reading, Stoneham, Wakefield, Wilmington, Winchester, and Woburn – that are between 20 and 30 miles north of central Boston. The subregion is served by four public transit agencies and three Transportation Management Associations (TMAs), and has access to I-95 (known locally as Route 128) and I-93. The subregion is largely suburban, with some rural areas. Employment areas are primarily concentrated along Route 128, I-93, and within the downtowns.

This study consisted of four steps.

- 1. Literature review of previous studies, and a review of **emerging trends** in communities creating first and last mile connections for transit trips.
- 2. Inventory of **existing demographics and transit services** in the subregion.
- 3. **Outreach** in the form of focus group discussions with employers, non-profits, and other institutions to discuss the challenges of accessing jobs in the region with transit.

4. Using data from the above steps, Identification of areas more suitable for transit, and development of recommendations for possible services and pilot programs.

The study findings include the following:

- There are more work trips of residents commuting within the subregion than there are work trips commuting to Boston and Cambridge. This shows that employment has become distributed within the Metro region.
- Transit carries more work trips into Boston's core than reverse commute trips or commute trips within the subregion. This shows that the existing transit network is more suited to commuting in and out of Boston than in meeting the more localized and east/west work trips within the subregion.
- Existing commuter rail and bus services are clustered within the areas with greater population and employment densities, especially in the communities of Burlington, Woburn, Winchester and Wakefield. However, there are significant areas within limited transit services in northern Woburn, Reading, Stoneham, and Wilmington, as well as areas of development in North Reading and Lynnfield with no transit service.
- Discussions with developers and employers in the subregion have shown that younger workers are less likely to consider living and working in suburban areas without walkable and connected street network and without good transit service.
- Others employers noted the difficulty of workers in the retail, hospitality and restaurant sector using the existing transit services, which are designed more for commuting into Boston and which may not serve second and third shift workers.

The transit suitability analysis and needs assessment found several areas that could support either improvements to the

existing transit services, and/or new transit shuttles or other transit partnerships. To help with these unmet needs, the **study recommendations** include the following options.

- Improvements to existing MBTA Service recognizing that the MBTA is limited in its ability to increase frequencies for existing bus and rail services, this study nevertheless suggests alternative routes and route extensions for MBTA bus routes 132, 136, 137, and 134.
- New Local Shuttles seven potential routes for local shuttles were identified to better connect the subregion. Shuttles can provide critical "last mile" connections from commuter rail stations to employment, and connect local residents and jobs. They can also provide additional connections for residents to commuter rail and bus services. These shuttles can be operated and funded through employer and town partnerships via a TMA (with more limited stops and services), or operated by municipalities with several local stops.
- Ride Hailing/TNC Partnerships Another option to improve connections is to enter into a partnership with a transportation network company (TNC) such as Uber or Lyft for subsidized rides to/from select locations. The trips could be restricted to serving employers or developments who are members of a TMA, or who enter an agreement with a town or transit provider. This option could be a first step to determine the demand for a new shuttle or bus extension, and can be an option for serving locations that may not have the densities for more traditional bus or shuttle services.
- Mobility Hubs -- with the expanded MBTA bus network and local shuttles, several commuter rail stations can act as local mobility hubs where users can connect to a variety of transportation options including bus, local shuttles, ride sharing (taxis, Uber, Lyft, etc.), bikes haring, and car sharing (e.g., zipcar). The study also recommends the creation of a mobility hub near the Burlington Mall that would serve MBTA,

Burlington Transit, Lowell RTA and Lexpress, allowing riders to interconnect with these services and future local shuttles.

• Complete Streets and Land Uses – Municipalities can help with first and last mile connections through better integration of land use and transportation decision-making, and through better multimodal street design. Corridors that could support better transit at times have inadequate sidewalks, limited crosswalks, and buildings separated by large parking lots – all which make pedestrian access, and thus effective transit, more difficult. Streets identified for improved transit services should have priority for complete street improvements such as pedestrian scale lighting, bicycle routes, more visible and frequent crosswalks, and wider sidewalks.

The MBTA bus route changes and local shuttle recommendations are shown in **Figure ES-1**.

As a next step, towns that are interested in implementing one or more of the recommendations should form a working group to conduct more detailed studies of these new services, including development of an operating framework through partnerships with a regional transit authority, a TMA, or via a municipal transit agency.



Figure ES-1. Mobility Study Recommendations

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1 Emerging Trends on First and Last Mile Connections

1.1 Introduction

1.1.1 Overview

The Metropolitan Area Planning Council (MAPC), the regional planning agency that serves the 101 communities of Metro Boston, is collaborating with the towns and cities in the North Suburban Planning Council (NSPC) to conduct a suburban mobility study. The study concentrates on options –specifically non-single-occupancy-vehicle options – for serving the "first and last mile" of transit work trips in the subregion. These options can include better coordination of existing transit services, employersponsored shuttles, new locally operated public transportation services, partnerships with private sector transportation network companies, and improved pedestrian and bicycle connections among transit, residences, and employment centers.

1.1.2 Project Study Area and Study Participants

The NSPC subregion consists of nine municipalities – Burlington, Lynnfield, North Reading, Reading, Stoneham, Wakefield, Wilmington, Winchester, and Woburn – that are between 20 and 30 miles north of central Boston. Figure 1.1 on the following page shows the NSPC subregion within the larger MAPC region.

The subregion is served by four public transit agencies and three Transportation Management Associations (TMAs), and has access to I-95 (known locally as Route 128) and I-93. The subregion is largely suburban, with some rural areas. Employment areas are primarily concentrated along Route 128, I-93, and within the downtowns. The vast majority of trips in the subregion are taken by automobile.

Each municipality participated in the mobility study through planning council meetings, focus group meetings, and completion of a survey of existing transit services and transit development practices. **Table 1.1** below shows a list of municipalities in the NSPC subregion and their corresponding representatives.

Table 1.1: NSPC Mobility Study Representatives

Municipality	Member	Title
Burlington	Josh Morris	Senior Planner
Burlington	Liz Bonventre	Assistant Planner
Lynnfield	Heather Sievers	Member, Town Planning Board
North Reading	Danielle McKnight	Town Planner
Reading	Julie Mercer	Community Development Director
Stoneham	Erin Wortman	Town Planner
Wakefield	Paul Reavis	Town Planner
Wilmington	Carolyn Cronin	Assistant Planner
Wilmington	Valerie Gingrich	Planner
Winchester	Brian Szekely	Town Planner
Woburn	Daniel Orr	Planner
Woburn	Tina Cassidy	Planner

Figure 1.1: North Suburban Planning Council (NSPC) Subregion Location Map



1.1.3 Project Tasks

The study was divided into four Tasks, with four deliverables:

- 1. Literature Review of Previous Studies and Emerging Trends – MAPC reviewed the subregion's previous transit and transportation studies to review past recommendations and implementation. MAPC also reviewed innovative ways communities and transit agencies in Massachusetts and the nation have met the challenge of serving the first/last mile connections for transit trips.
- 2. Inventory of Existing Conditions and Transit Services --MAPC collected data on existing populations, automobile ownership and use, employment, development, and journey-to-work data for each census tract and town in the subregion. MAPC also inventoried the existing transit services in the subregion, including MBTA commuter rail and bus service, other regional transit authorities (RTAs), and senior and other local shuttles. This inventory included a quality-of-service analysis of the availability and accessibility of the subregion's public transportation. This analysis provided a snapshot of the various transit needs, and how the existing transit services are meeting that need.
- 3. Outreach MAPC, in conjunction with the towns in the NSPC subregion, conducted focus group discussions with employers, non-profits, and other institutions to review the study findings to-date and discuss the challenges of accessing jobs in the region with transit.
- 4. Needs Assessment and Recommendations Using the data collected in the first three phases, MAPC mapped areas more suitable for transit, and develop recommendations for possible services and pilot programs. MAPC documented the findings from all four phases into this final report.

1.2 Previous Planning Studies

MAPC reviewed seven recent transportation planning studies to find what transit needs and possible solutions had been previously identified for the NSPC subregion. The studies listed in **Table 1.2** include five recent studies for the North Suburban subregion, as well as a recent study on the Boston region's transit travel and a review of MAPC's vision for a regional greenway network.

Table 1.2: List of Previous	Planning Studies
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Study Title	Year
	Completed
North Suburban Transit Opportunity Study	2002
North Suburban Commuter-Oriented Transit	2005
Opportunities Study Phase II	
Route 128 Central Corridor Plan [Burlington]	2011
Main Street Corridor Study (Reading,	2012
Wakefield, Melrose)	
North Suburban Planning Council Subregional	2014
Priority Mapping Project	
Town of Reading Bicycle Network and	2014
Pedestrian Priority Plan	
LandLine Vision	Ongoing
Exploring the 2011 Massachusetts Travel	2016
Survey: Barriers and Opportunities Influencing	
Mode Shift	

The subregion's previous transportation studies share these common themes:

- Anderson/Woburn RTC should be a hub for new transit services
- Localized bus routes or employer shuttles should connect the Anderson/Woburn RTC and to other area commuter

rail stations, with shuttles for major employment areas in Woburn, Burlington, and Stoneham

- The region's transit providers MBTA, LRTA, Burlington Transit, and Lexpress – should better coordinate their services
- Development standards from complete streets to zoning – should be revised to better support transit, walking, and bicycle trips
- A regional network of bicycle and walking trails should connect with commuter rail and among town centers and other major destinations
- Develop partnerships through improved technology (bike sharing, ride sharing, etc.)



Previous transit studies for the subregion have recommended employer shuttles connecting to the Anderson/Woburn Regional Transit Center (Photo: BMRR/Wikimedia)

These recommendations and findings were reviewed again during the needs assessment in Chapter 4 of this mobility study.

Short summaries of each study are provided below.

1.2.1 2002 North Suburban Transit Opportunities Study

This study recommended several new transit routes (either extensions of bus routes or new employer shuttles) to serve suburban employment trips. It should be noted that North Reading, Winchester, and Lynnfield were not included in this study, though Bedford, not part of the North Suburban subregion, was. Only one recommended change -- extending AM hours of service of the Burlington transit service to the Lahey Medical Center -- was implemented. The unimplemented changes included the following:

- Employer sponsored shuttles to Reading, Woburn, and Stoneham from Anderson/Woburn Regional Transportation Center (RTC)
- Extension of MBTA Route 132 or other bus service from Stoneham north to Reading
- Extension of MBTA Route 354 to Lahey Medical Center, or extension of LRTA routes from Lahey Medical Center to Van de Graff for better connections (since 2002, however, some 354 bus service continues north on Cambridge Street/Route 3A to North Burlington Park & Ride)
- Expanded service hours on the L Route and LRTA routes serving Burlington
- Revised routing of the reverse (northbound) trips on MBTA Route 354 to serve parts of Stoneham

Figure 1.2 includes a map of several of these recommended improvements.





1.2.2 <u>2005 North Suburban Commuter-Oriented Transit</u> <u>Opportunities Study Phase II</u>

As a follow up to the 2002 study, the Phase II study further developed the transit service improvements recommended in the "Phase I" 2002 study. The recommendations included the following.

- Shuttles between Anderson/Woburn RTC and Woburn employment areas along Commerce Way, Washington Street, Olympia Avenue, Salem Street, Wildwood Avenue, and Mishawum Road, as well as possibly north to Boston Street
- Shuttles connecting Stoneham, Reading, and Reading Station to Woburn employment areas and Anderson RTC. This would be in lieu of MBTA route extensions from the 2002 study that were rejected by the MBTA as not cost effective
- Extension of MBTA Route 354 and/or LRTA routes serving south Burlington to create better connections
- Earlier runs on Lexpress route 5 to Burlington Mall area and on the Burlington B-Line to Lahey Medical Center (was implemented for Lexpress)
- Extension of LRTA Lowell-Tewksbury bus route to Wilmington commuter rail (was implemented)

1.2.3 2011 Route 128 Central Corridor Plan [Burlington]

This study investigated transportation improvements along Route 128 (I-95) in Weston, Waltham, Lincoln, Lexington, and Burlington. The study notes that Burlington is a major employment center, with concentrations along Route 3 and the Middlesex Pike; and that the Lahey Medical Center is one of the largest employers, with an estimated 2,200 to 2,500 day shift employees (4,500 total employees) at the main campus at 41 Mall Road. Some of the recommendations from this study that

may be applicable to the North Suburban subregion, including better coordination of overlapping and connecting public transportation and of private shuttles in the region; participation of businesses in Transportation Management Associations (TMAs); and common site design requirements to bring buildings closer to streets, which would make them more suitable for walking, transit, and shuttles.



Both the Burlington Mall (top) and the Lahey Medical Center (bottom) are major employers in Burlington served by bus transit (Photos: John M. Sullivan and George Disario)

1.2.4 <u>2012 Main Street Corridor Study (Reading, Wakefield,</u> <u>Melrose)</u>

The Main Street Corridor Study identified ways to improve the existing transportation network in two North Suburban towns, Reading and Wakefield, by promoting walking, bicycling and transit. The study area was concentrated on the "Main Street" shared by all three towns, as well as the Haverhill MBTA commuter rail line, with six stations.

The study recommendations that could improve first and last mile transit connections include:

- Improved schedules for enhanced bus and commuter rail connections
- Work with the MBTA to improve transit schedule information on smart phones
- Add real-time information on next bus arrivals at major stops
- Better schedule information at train station and bus stops
- Better shelters for transit users
- Non-peak commuter transit options
- Improved accessibility of commuter parking at transit stations
- Promote development sponsored shuttle services
- Promote car sharing programs
- Implement a bike sharing program
- Increase wayfinding signage between downtowns and commuter rail stations
- Update zoning requirements to encourage development that supports transit



Sidewalk availability analysis from 2012 Main Street Corridor Study

1.2.5 <u>2014 North Suburban Planning Council Subregional</u> <u>Priority Mapping Project</u>

The North Suburban Priority Mapping Project developed a list of regionally significant development, preservation, and infrastructure investment priorities in the eight municipalities in the North Suburban subregion. Some of the priority transportation projects that could help with first and last mile work trips include:

- Tri-Community Bikeway connecting Woburn, Winchester and Stoneham
- New Boston Street bridge to Anderson Commuter Rail station in Woburn
- Possible multi-use path on MBTA rail right-of-way (Reading to Wilmington)
- New express bus route from Stoneham to Haymarket
- Expanded TMA employer shuttles to Burlington
- Multi-use trail from North Reading to Peabody
- Rail/trail from Lynnfield to Wakefield
- Multi-use trail from Wakefield to Saugus
- Multi-use path from Greenwood Commuter Rail station to Oak Grove subway station (Wakefield)
- Signal and complete street (pedestrian, bicycle) improvements along several streets

1.2.6 <u>2014 Town of Reading Bicycle Network and Pedestrian</u> <u>Priority Plan</u>

Reading's recently completed bicycle and pedestrian priority plan included several recommendations that can help with the first/last mile work trips connections, including prioritized crosswalk improvements to access Reading's commuter rail station, and a road diet/complete street conversion along Walkers Brook Drive, which includes a heavily used bus stop served by MBTA bus route 137.

1.2.7 LandLine (Metro Boston Greenway Network)

LandLine is MAPC's vision to connect the region's greenways and trails into a seamless network. The plan has been developed in coordination with the LandLine Coalition, a group of 40 volunteers representing a number of local agencies and advocacy groups. The vision is updated regularly, based upon revised pedestrian and bicycle plans for towns and subregions. Several existing and proposed greenways connect with commuter rail stations and employment and residential areas in the North Suburban subregion, and can be a key component of serving the first/last mile connections. **Figure 1.3** shows the North Suburban subregion portion of the LandLine Vision.

Figure 1.3: Portion of LandLine Greenway Network



1.2.8 <u>2016 Exploring the 2011 Massachusetts Travel Survey:</u> <u>Barriers and Opportunities Influencing Mode Shift</u>

The Boston Regional Metropolitan Planning Organization (MPO) in November 2016 completed a draft comprehensive analysis of data from the 2011 Massachusetts Travel Survey. The purpose of the 2016 study is to determine what factors most influence mode choice, and thus determine the types of work trips that are most competitive for transit in the Boston region. The study found that distance - specifically distance from work and/or home to a rail stop - and density - specifically, at the worksite and the availability of parking - were the two factors that best determined the attractiveness for using transit. Other factors, including income, had a lower impact on mode choice. The study also found that work trips to the Boston inner core and reverse commute trips had the highest choice for transit. However, the analysis also found that new transit services that are developed to serve work trips to the Boston inner core can also serve the reverse commute trips and other work trips, if designed appropriately. The study recommendations include:

- Implement better bus service to commuter rail stations; this service can also serve additional employment centers in the suburban areas
- Implement a number of small but measurable transit improvements, especially within the markets most competitive for transit
- Municipalities should encourage employment and residential development convenient to transit
- Make "encouragement for non-automobile travel" a condition for new development, particularly in areas with attractive transit service

The recommendations and findings from all of these transportation studies were reviewed again during the needs assessment in Task 4 of this mobility study.

1.3 <u>Emerging National Trends on Shared Mobility and</u> <u>Transit Integration</u>

A review was undertaken of US transit agencies and governments that are finding ways to better integrate multiple transit services and ways to partner with transportation network companies to improve connections (a practice also known as "shared mobility").

MAPC reviewed the following studies to find examples of recent trends on shared mobility and transit integration.

- 2010 Guide for Planning and Operating Flexible Public Transportation Services (TCRP Report 140)
- 2015 Improving Transit Integration Among Multiple Providers, Volumes I and II (TCRP Report 173)
- 2015 Transportation Demand Management Case Studies and Regulations (MAPC)
- 2016 Shared Mobility and the Transformation of Public Transit (APTA)
- 2016 Private Mobility, Public Interest (Transit Center)

MAPC's review of these reports found the following emerging trends:

• Flexible route and deviated fixed route: Several transit providers have used this as a way to serve lower density areas where traditional fixed route bus service might not be cost effective. The services could work when agencies need to reduce the costs of full demand-responsive services, and/or eliminate the need to operate ADAcomplementary paratransit services in select geographic areas, and can be a way to provide an introduction to public transportation to areas not previously served by fixed-route transit. An example of this flexible service is Denver's Call-n-Ride service, which operates in multiple areas in the region where demand does not warrant fixedroute bus service. Riders can schedule the service 2 hours in advance and frequent users can subscribe to the service for daily or weekday trips. A 2009 study found that nearly 74 percent of the riders are work trips, and about one-third of riders are new to transit. The service costs more per ride and carries far fewer riders per hour than traditional fixed route bus service.

- Integration: Integration can run from several providers communicating about service changes, travel patterns, etc., to coordinating service connections, to more formal agreements for collaboration and even consolidation. Valley Metro in the Phoenix region has a single "brand" and marketing among several providers. GoTriangle in the Raleigh-Durham-Chapel Hill region has a regional call center and regional fare structure, a single integrated transit-trip-planning website, as well as consolidated marketing and branding across several providers. In the Puget Sound region, the ORCA (One Regional Card for All) is a contactless smart card that allows riders one fare medium on any of the region's seven transit providers.
- Shared Mobility with transportation network companies (TNCs): Several transit providers in the US have formed partnerships with TNCs such as Lyft and Uber. Examples of these include:
 - Pinellas Suncoast Transit Authority (PTSA) in Florida will subsidize up to \$3 Uber, taxi or paratransit trips for select underserved zones to a designated PTSA transit stop or transit center. This service began in early 2016 and is now being expanded to other areas with "unlimited, on-

demand" Uber and Taxi rides for \$1.

- PTSA is also now offering TD Late Shift, a pilot program demonstration aimed at helping lowincome, unemployed residents overcome transportation barriers to employment. With this new program, riders can request up to 23 free rides per month between the hours of 9 PM and 6 AM. Rides must be to a place of employment or residence.
- Kansas City Area Transportation Authority (KCATA) has partnered with Bridj¹ to provide an ondemand transit service between two areas of the Kansas City area during peak periods. Riders use the Bridj app to register where they want to go, are instructed to walk to a "rallying" point, and are picked up with other passengers and then dropped off at their destination. There is no transfer required. Fares are the same as one-way bus fares and are charged through the Bridj app. Vehicles providing the service are 14 passenger vans operated by KCATA.
- The City of Altamonte Springs, FL is offering discounted Uber rides within the city limits and deeper discounted rides to the SunRail commuter rail station in the city.

¹ Bridj ceased operations in May 2017.

 Riders using the GoTriangle (North Carolina) website and app can book with Uber for a portion of their trip through the transit agency's tripplanning apps and software (TransLoc). North Carolina recently began a joint Amtrak/Uber trip planning and ticketing option for intercity rail trips booked online to stations in North Carolina.²



GoTriangle (NC) recently partnered with Uber allowing customers to book both transit and ridesharing trips within a single application (Graphic: TransLoc)

It should be noted that these TNC partnerships are very new, so that trends and lessons learned are difficult for possible application for other communities.

Summaries of these studies are attached to this report in Appendix A.

1.4 Local Best Practices

In addition to the national emerging trends, there are several local and regional transit initiatives that could be best practices for meeting the first and last mile connections.

Local fixed route public transportation: The town of Acton, through its partnership with other adjacent towns, is now operating four distinct fixed route services to the South Acton Commuter Rail station that connect to various parts of Acton and to other nearby towns.

The **Cross-Acton Transit** connects the commuter rail station with local shopping, schools, town hall, and residential areas. The route runs hourly from 8 AM to 6 PM on weekdays. According to news reports, the service costs the Town approximately \$130,000 annual to operate. The costs are split between the Lowell Regional Transit Authority (LRTA) and the Town. The local funding is from a local prepared-meal tax. LRTA provided the vehicles and drivers. Fares are \$1.00. The Town notes that the service helps with three types of trips. First, it provides access to the South Acton Commuter Rail Station: the station's parking lot often fills up before 8 AM. Second, the all-day service will help seniors and others access to shopping and other daily needs trips. Finally, the service can connect students to after-school activities.³

Acton also operates a public transportation morning and evening shuttle service to the South Acton Commuter Rail station, called the **MinuteVan Rail Shuttle**. This commuter shuttle runs from the West Acton Fire Station and the Mt. Calvary Church lot to the MBTA Commuter Rail Station in South Acton. The service runs between 6:45 AM and 9:00 AM and then again between 5:12 PM

² <u>http://www.bizjournals.com/triangle/news/2016/11/03/how-ncdot-transloc-and-uber-plan-to-solve-the.html</u> Accessed November 8, 2016.

³ "Acton Introducing New Transit Service" The Beacon, October 5, 2015. <u>http://acton.wickedlocal.com/article/20151005/news/151007892</u> Accessed October 26, 2016.

and 7:30 PM. Riders have options to purchase combination parking/bus passes or just bus passes (single rider or day passes). The standard single trip fare is \$1.00.⁴ The service allows for West Acton residents to access the South Acton commuter rail station, which often has a full parking lot. Acton also operates the **MinuteVan Dial-A-Ride**, a service that is available to any resident. Trips are \$1.00 and must be booked at least 24 hours in advance. The service covers trips within Acton, as well as to Boxborough, Littleton, Maynard and to medical facilities in Concord.

Most recently in October 2016, Acton and Maynard began operating a **Maynard/Acton Shuttle** that connects Maynard and Acton the South Acton Commuter Rail station. The commuter shuttle picks up riders beginning at four stops in the towns, with service to the train station. Similar to the MinuteVan Rail Shuttle, the service operates in the morning and afternoon/evenings to connect with peak travel connections with the commuter rail. The service has no fare, and will only run from October 2016 to January 2017 on a trial basis.⁵



CrossTown Connect, a Transportation Management Association partially funded by the towns of Acton, Boxborough, Littleton, Maynard, and Westford, operates public transportation shuttles connecting the crowded South Action commuter rail station to area employment and residential centers. (Photo source: Google)

http://maynardtownadmin.org/2016/09/29/maynardacton-commutershuttle-pilot-program-starts-monday-october-3rd/ Accessed October 26, 2016.

⁴ MinuteVan website. <u>http://www.minutevan.net/Home</u> Accessed October 26, 2016.

⁵ Town of Maynard website.

<u>TMA/Employer Shuttles</u>: Currently Massachusetts has 14 TMAs (sometimes knowns as Transportation Management organizations, or TMOs), seven of which operate primarily outside of the inner core of Boston. TMAs are membership based publicprivate partnerships of businesses, institutions, and municipalities joined together in a legal agreement to provide and promote commuter transportation options that reduce traffic congestion and improve air quality.⁶ Services provided by all or most TMAs include:

- Transportation advocacy
- Bicycle/walking promotions and incentives
- Emergency/guaranteed ride home
- Ridesharing, carpooling, vanpooling
- Ride matching

Several of the TMAs also operate shuttle services for their members. Of these seven suburban TMAs, three (**128 Business Council, Middlesex 3, and Neponset Valley**) operate employer shuttles. Most of the shuttles operate only during the morning and late afternoon peak periods, providing bus or van service from a central point (such as a commuter rail or subway stop) to employment centers a few miles away. The TMA operates or hires a transportation company to operate the shuttle, which is paid by businesses served by the shuttles. Employees must show a valid employee ID to board. Currently, only the Middlesex 3 TMA has employer shuttles serving the NSPC subregion, with service from various subway stops to employment centers in Burlington.

Partnerships with TNCs: Similar to what others have done in the US, two government agencies in Metro Boston have partnered with TNCs to improve mobility. In 2016, the North Shore TMA developed a plan for North Shore Community College (NSCC) to partner with Uber for discounted trips to help with student mobility. Beginning in fall 2016. NSCC partnered with Uber to provide students partially subsidized trips between NSCCs' Danvers Campus and the North Shore Mall or Beverly Depot. NSCC provides this service as an alternative to contracting for an additional shuttle (currently, the college funds a shuttle to run among the three NSCC campuses in Lynn, Middleton, and Danvers).⁷ Students register for the service and are eligible for a \$10 discount on rides between the Danvers Campus and the Mall or Depot during select hours Monday through Saturday.⁸ According to the college's Vice President, the service has proven popular with students and has proven less costly than hiring a second shuttle. NSCC is considering expanding the service to cover trips for medical students who need transportation for their clinicals.

The **MBTA** also recently began a pilot program and entered a partnership with **Uber** and **Lyft** to provide **RIDE** paratransit trips. Ride-share pilot participants have on-demand service available with Uber or Lyft and pay the first \$2.00 of the trip. The MBTA picks up the next \$13.00 of the trip, with the customer picking up any remaining trip costs. In March 2017, the pilot program was expanded to the entire Ride service area.^{9,10}

⁶ <u>http://www.masscommute.com/what-is-a-tmatmo/</u> Accessed November 4, 2016.

⁷ <u>http://www.northshore.edu/shuttle/</u> Accessed November 7, 2016.

 <u>http://www.northshore.edu/uber/</u> Accessed November 7, 2016.
 <u>http://www.mass.gov/governor/press-office/press-</u>

releases/fy2017/governor-t-launch-ride-pilot-program-with-uber-lyft.html Accessed November 7, 2016.

¹⁰ The MBTA estimates that the six-month pilot program has reduced costs for each trip, but the program's success increased the overall number of paratransit trips taken. A revised program is now underway in 2017.

2 Inventory of Existing Conditions and Transit Services

2.1 Existing Demographics

As an early step in the mobility study, MAPC analyzed municipal and subregion demographics to look for trends and patterns in population, employment and travel. MAPC compiled data, where available, for the MAPC region and the Commonwealth for comparison against the NSPC subregion.

2.1.1 Population

The NSPC subregion's population increased by approximately three percent between 2000 and 2010, similar to the growth in the MAPC region and the Commonwealth for the same time period. However, the growth was not even across the municipalities in the subregion. For example, Burlington and North Reading both had increases of over seven percent, while Stoneham's population decreased during this decade. Woburn continues to have the most residents, at around 38,000, with several other communities between 21,000 and 25,000 residents. **Table 2.1** lists the population for the subregion as measured by the US Census.

Table 2.1: NSPC Subregion Population

Municipality	Population, 2000	Population, 2010	Percent Change 2000-2010
Burlington	22,876	24,498	7.1%
Lynnfield	11,542	11,596	0.5%
North Reading	13,837	14,892	7.6%
Reading	23,708	24,747	4.4%
Stoneham	22,219	21,437	-3.5%
Wakefield	24,804	24,932	0.5%
Wilmington	21,363	22,325	4.5%
Winchester	20,810	21,374	2.7%
Woburn	37,258	38,210	2.6%
NSPC Subregion	198,417	204,011	2.8%
MAPC Region	3,066,394	3,161,712	3.1%
Massachusetts	6,349,097	6,547,629	3.1%

Source: US Census, compiled by MAPC

Because this study is examining improvements for transit work trips, MAPC also looked at the change in population for those aged 25 and 64, the population most likely to be employed. As seen in **Table 2.2**, the NSPC subregion has seen less population growth in the 25 to 64 age range, and a greater increase in those older than 65. This indicates that the subregion is seeing growth in the number of retirees and seniors who work beyond the traditional retirement age, and may include some who require transit for continued mobility.

	Percent Change, 2000-2010			
Municipality	Total Population	25-64 years old	Under 25 years old	Over 65 years old
Burlington	7.1	4.6	1.5	29.4
Lynnfield	0.5	-2.9	4.9	3.0
North Reading	7.6	6.6	3.1	27.8
Reading	4.4	5.1	3.6	3.6
Stoneham	-3.5	-2.3	-6.3	-3.1
Wakefield	0.5	2.1	-1.2	-2.1
Wilmington	4.5	3.3	0.2	24.1
Winchester	2.7	-3.6	17.0	-1.4
Woburn	2.3	2.5	-0.5	6.7
NSPC Subregion	2.8	1.9	2.0	7.5
Massachusetts	3.1	4.1	0.8	4.9

Table 2.2: NSPC Subregion Population Change 2000-2010

Source: US Census, compiled by MAPC

2.1.2 Employment

There are greater variances among the NSPC municipalities in employment than in population. Burlington and Woburn are the largest employment centers, with over 54 percent of the subregion's jobs in 2015. **Table 2.3** shows employment snapshots in 2001, 2010 and 2015.

Table 2.3: NSPC Subregion Employment

Municipality	2001 2010		10 2015	
Burlington	39,125	39,419	43,747	
Lynnfield	5,168	5,676	6,335	
North Reading	6,794	6,742	8,396	
Reading	7,312	6,486	7,018	
Stoneham	8,574	7,015	7,403	
Wakefield	14,920	13,493	14,625	
Wilmington	22,430	18,419	20,211	
Winchester	7,850	8,447	8,183	
Woburn	40,032	39,443	42,238	
NSPC Subregion	152,205	145,140	158,156	
Massachusetts	3,276,103	3,111,633	3,428,259	

Source: Massachusetts Executive Office of Labor and Workforce Development, Table ES-202 Employment and Wages

2.1.3 Automobile Ownership and Use

All of the municipalities in the NSPC subregion have household vehicle ownership averages higher than the statewide average. The number of daily miles driven per household varies significantly from town to town. Interestingly, nearly all of the municipalities had overall lower vehicle miles per day for all vehicles (passenger and commercial) than the statewide average. **Table 2.4** shows a snapshot of vehicle use and ownership for the municipalities in the NSPC subregion.

Table 2.4: NSPC Subregion Vehicle Ownership and Use

	Vehicles	Household	Miles per	CO2 per
Municipality	Per	Miles per	Day, All	Day per
	Housenoid	Day	venicies	Housenoid
Burlington	1.93	51.92	27.35	0.0227
Lynnfield	1.99	57.44	29.71	0.0280
North Reading	2.17	65.84	31.01	0.0293
Reading	1.89	51.91	27.74	0.0225
Stoneham	1.75	43.88	25.51	0.0191
Wakefield	1.75	46.66	27.14	0.0214
Wilmington	1.92	47.10	24.79	0.0210
Winchester	1.79	46.63	27.84	0.0206
Woburn	1.93	51.92	27.35	0.0227
Massachusetts	1.69	48.88	29.46	0.0217

Source: Massachusetts Vehicle Census (2014) compiled by Massachusetts Registry of Motor Vehicles and MAPC

2.1.4 Journey to Work

A vast majority of the subregion's workers drive to work, with only five percent using transit. Only Wilmington and Wakefield are close the statewide average of nine percent for transit work trips, likely due to their close proximity to the Boston core and commuter rail. **Table 2.5** shows the breakdown for commuting in the subregion.

Table 2.5: NSPC Subregion Journey to Work

Municipality	Workers	Percent Drive	Percent Transit	Percent Other
Burlington	12,738	91.2	3.5	5.3
Lynnfield	6,001	87.5	1.9	10.6
North Reading	7,562	91.4	2.6	6.0
Reading	12,654	86.5	6.8	6.6
Stoneham	11,114	90.4	4.9	4.7
Wakefield	13,728	85.1	9.1	5.8
Wilmington	11,624	93.2	3.6	3.2
Winchester	9,399	78.8	9.5	11.7
Woburn	20,184	92.0	3.8	4.2
NSPC Subregion	105,004	88.8	5.2	5.9
MAPC Region	1,617,434	71.0	16.0	13.0
Massachusetts	3,231,819	80.3	9.2	10.5

"Other" includes taxi, motorcycle, walk, working from home, and other means. Source: American Community Survey 5-year averages, 2008-2012, compiled by MAPC

In 2010, the total number of NSPC residents who commuted into Boston or Cambridge for work was approximately 18,700. Figure 2.1 shows the percentage of residents in each NSPC municipality who commute to Boston or Cambridge. Towns closer to Boston and Cambridge have a higher percentage of residents who commute to these cities. Today, there is a greater number of residents who work within the NSPC subregion (43,000) than who commute to Boston and Cambridge (18,700), illustrating how both housing and employment is now dispersed in the Metro region. Figure 2.2 shows the percent of residents in each municipality who work within the NSPC subregion. Figure 2.1: NSPC Residents Commuting to Boston or Cambridge



Figure 2.2: Residents Working within NSPC Subregion



2.2 Existing Transit Services

To better understand the transit needs for the subregion, MAPC collected information on the existing transit services (public and private) in the nine NSPC municipalities. MAPC also surveyed planners in each municipality and searched online resources to develop an inventory of services.

2.2.1 Regional Transit Authorities

A regional transit authority (RTA) is an agency tasked with providing transit services and programs to a group of municipalities under its jurisdiction. Each municipality pays an annual assessment to the RTA in return for the provision of transit services. Eight of the nine municipalities in the NSPC subregion are served by the Massachusetts Bay Transportation Authority (MBTA), with six of those receiving fixed-route bus service and five receiving commuter rail service. All of the municipalities in the MBTA service area receive the RIDE paratransit service.¹¹

Burlington and Wilmington are also served by the Lowell Regional Transit Authority (LRTA) and pay an assessment to LRTA. North Reading pays an assessment to the MBTA as an abutter community, but is not served by either RTA.

2.2.2 Municipal Transit Services

In addition to service by the MBTA and LRTA, Burlington operates a fixed-route transit system under the name of Burlington Transit. The service consists of seven routes providing weekday service with most trips in the morning and afternoon peak periods. Burlington is also served by the Lexpress Route 5, a municipal transit service operated by the Town of Lexington.

2.2.3 Transportation Management Associations

Two of the communities in the NSPC subregion are also in part served by three Transportation Management Associations (TMAs). TMAs are membership based, public-private partnerships of businesses, institutions and municipalities joined together under a legal agreement for the purpose of providing and promoting transportation solutions for commuters. The 128 Business Council TMA members include businesses in Burlington while the Junction TMO and the Middlesex 3 TMA include members in Burlington and Wilmington. All three TMAs promote transportation solutions such as carpool and vanpool matching, emergency ride home for transit riders, and incentives for those who choose green commuting (cycling, walking, transit, carpooling, etc.). The Middlesex 3 TMA also operates employer sponsored shuttles running between select Burlington businesses and MBTA subway stations.

Tables 2.6 and 2.7 lists the existing transit services for each of the municipalities in the NSPC subregion. **Figure 2.3** shows the fixed-route bus service and commuter rail line/stations in the subregion.

¹¹ Paratransit service is transportation to eligible people who cannot use fixed-route transit all or some of the time because of a physical, cognitive or mental disability.

Table 2.6: Existing Fixed Route Bus Services in NSPC Subregion

Municipality	Provider/Route	Fares (One Way)*	Stops/Service Areas (within Municipality)	Bus Route Ridership (entire route)	
	Burlington Transit Route 10/10 Reversed		Various		
	Burlington Transit Route 10A/10A Reversed	\$3 per ride. Transfers	Various		
	Burlington Transit Route 11/11 Reversed		Various		
	Burlington Transit Route 12/12 Reversed	\$0.50. No joint tickets or passes with	Various	Route ridership not available	
	Burlington Transit Route 12A	other services	Various		
Burlington	Burlington Transit Route 13		Various		
	Burlington Transit Route 14		Various		
	Lowell Regional Transit Authority Route 13	\$1.50 "suburban" full fare; transfers \$0.50.	Chestnut Street (end of line) with connections to MBTA buses	326	
	Lowell Regional Transit Authority Route 14	can be added to MBTA CharlieCard	Mitre Facility (on town border), Burlington Mall and Lahey Medical Center (end of line)	511	
	Lexpress Route 5	\$2.75. No joint tickets or passes with other services	Middlesex Commons (Market Basket) and Burlington Mall; other locations on route when requested by riders	1,271	
	MBTA route 350		Cambridge Street, Burlington Mall	1,653	
	MBTA route 351	\$2.00 local, \$5.00	Middlesex Turnpike, Burlington Mall	190	
	MBTA route 352 (Express)	Outer Express	Cambridge Street	412	
	MBTA route 354 (Express)		Cambridge Street, Van Der Graff Drive	728	
Lynnfield	None				
North Reading	None				

*All transit providers offer discounts to students and seniors. MBTA offers discounts to Charlie Card users.

Municipality	Provider/Route	Fares (One Way)*	Stops/Service Areas (within Municipality)	Daily Bus Route Ridership (entire route)
Pooding	MBTA route 136	\$2.00 local, \$5.00	Reading commuter rail station, downtown Reading, Salem Street	1,150
Neduling	MBTA route 137	Outer Express	Reading commuter rail station, downtown Reading, Washington Street, Walker Brook Drive	1,157
	MBTA route 99	\$2.00 local \$5.00	Woodland Drive (Boston Regional Medical Center)	1,555
Stoneham	MBTA route 132	Inner Express/\$7.00	er Express/\$7.00 Main Street, South Street, Pond Street	
	MBTA route 325 (Express)		Main Street	305
	MBTA route 136	00 37 Jacob 00 27	Wakefield commuter rail, Main Street, downtown, North Avenue and other locations in northern Wakefield	1,150
Wakefield	MBTA route 137	Inner Express/\$7.00 Outer Express	Wakefield commuter rail, Main Street, downtown, North Avenue and other locations in northern Wakefield	1,157
	MBTA route 428		Wakefield Memorial HS	164
Wilmington	Lowell Regional Transit Authority route 12	\$1.50 "suburban" full fare; transfers \$0.50. LRTA monthly passes can be added to MBTA CharlieCard		397
MBTA Route 134		\$2.00 local, \$5.00	Winchester Center commuter rail station, Main Street	2,149
Windhester	MBTA Route 350	Outer Express	Route 3/Cambridge Street	1,653
	MBTA route 134		Main Street	2,149
Woburn	MBTA route 350\$2.00 local, \$5.00Inner Express/\$7.00Inner ExpressMBTA route 354 (Express)Outer Express		Cambridge Street/Road	1,653
			Main Street, downtown, Lexington Street, Pleasant Street, Montvale Avenue, Blow Street, Salem Street, Cambridge Street/Road	728

Table 2.6 (continued): Existing Fixed Route Bus Services in NSPC Subregion

*All transit providers offer discounts to students and seniors. MBTA also offers discounts to Charlie Card users.

Sources: MAPC, LRTA.com, lexingtonma.gov, burlington.org, mbta.com; ridership for LRTA and Lexpress routes from agency staff

Table 2.7: Existing Commuter Rail Services in NSPC Subregion

Municipality		Stop Locations	Somioo (No. of Traino, Wooldovo)	Parking Spaces				Didorphintt
Municipality	Line	(within Town)	Service (No. of Trains, weekdays)	MBTA	Accessible	Bicycle	Other*	Ridership**
Burlington	None							
Lynnfield	None							
North Reading	None							
Reading	Haverhill Line	Downtown Reading	Inbound: 8 AM and 8 PM trains; Outbound: 6 AM and 15 PM trains	113	0	12	308	799
Stoneham	None							
Wakefield	Haverhill Line	Greenwood	Inbound: 8 AM and 8 PM trains; Outbound: 5 AM and 14 PM trains	0	0	7	76	146
Wakefield	Haverhill Line	Wakefield	Inbound: 8 AM and 8 PM trains; Outbound: 5 AM and 14 PM trains	117	6	23	0	682
Wilmington	Haverhill Line	North Wilmington	Inbound: 5 AM, 4 PM trains; Outbound: 3 AM and 11 PM trains	0	0	16	20	310
Wilmington	Lowell Line	Downtown Wilmington	Inbound: 11 AM, 14 PM trains; Outbound: 8 AM and 17 PM trains	191	7	26	0	544
Winchester	Lowell Line	Wedgemere	Inbound: 11 AM, 13 PM trains; Outbound: 7 AM, 16 PM trains	0	0	18	103	512
Winchester	Lowell Line	Winchester Center	Inbound: 11 AM, 13 PM trains; Outbound: 7 AM, 16 PM trains	0	2	24	237	789
Woburn	Lowell Line	Anderson/ Woburn	Inbound: 12 AM, 15 PM trains; Outbound: 9 AM, 18 PM trains	0	24	14	2,000	1,502
Woburn	Lowell Line	Mishawum (limited service)	Inbound: 3 PM trains; Outbound: 3 AM trains	0	0	0	0	42

*Other parking spaces near station, estimated by 2013 MBTA survey **2013, Weekday, Boston Bound

Sources: MBTA.com; Ridership and Service Statistics, Fourteenth Edition 2014



Figure 2.3: Existing Fixed Route Transit in NSPC Subregion

2.2.4 Other Transit Services

Each municipality offers shuttle services or mileage reimbursements for seniors, through volunteers, the local Council on Aging, or via Mystic Valley Ender Services. These services are in addition to paratransit service provided by the RIDE (if provided). Because these services are not used for work trips, they were not evaluated further within this study.¹²

2.2.5 <u>Transit Quality of Service</u>

In addition to collecting information on existing transit services, MAPC performed a "quality of service" evaluation to better understand how well existing transit serves the subregion, in terms of service availability.¹³ The quality of service evaluation was performed by examining metrics using the following available data for all four transit service providers in the subregion:

- Frequency average weekday headways
- Service Span hours and days of service
- Access population and employment within walking distance of transit stops

MAPC reviewed the posted schedules for the bus and rail service in the region to determine the number of days and hours services are available. Service span (number of hours transit service available per day) and frequency (average time in minutes between trains or buses) are important measures since the transit riders use them to determine if, and how often, service is available to them. Because schedules vary widely between peak and off-peak commute times, an average weekday headway (in minutes) was calculated by dividing the hours of weekday service by the number of one-way trips at stops. **Table 2.8** shows the frequency and service span for bus service, and **Table 2.9** shows the same measures for the commuter rail service. (Please note that a single bus or train line may have different schedules, frequencies, etc., in different towns.)

¹³ For more detail on the possible transit quality of service measures, see *Transit Capacity and Quality of Service Manual, 3rd Edition,* TCRP Report 165, Transportation Research Board, 2013.

¹² It should be noted, however, that Acton and Maynard have recently began using Council on Aging vehicles for a locally operated peak period fixed-route transit service, and using the vehicles for senior trips during the mid-day.

Table 2.8: Bus Transit Quality of Service in NSPC Subregion

Municipality	Provider/Route	Provider/Route Service Days; Service Hours		Hours of Service	Average Weekday
	Burlington Transit Route 10/10	M-F: 7:30 AM to 1:30 PM and	TTP5 *	per weekudy	nodaway (minacoo)
	Reversed	4:35 PM to 5:35 PM	7	10.0	86
	Burlington Transit Route 10A/10A Reversed	M-F; 7:42 AM to 1:42 PM and 4PM and 5 PM	7	9.0	77
	Burlington Transit Route 11/11 Reversed	M-F; 9:30 AM to 3:30 PM	6	5.5	55
	Burlington Transit Route 12/12 Reversed	M-F; 2 peak AM and 2 peak PM trips, hourly	4	4.0	60
	Burlington Transit Route 12A	M-F; 2 peak AM and 2 peak PM trips, hourly	4	4.0	60
	Burlington Transit Route 13	M-F; 10 AM to 4 PM	6	6.5	65
Burlington	Burlington Transit Route 14	M-F; 7:30 AM to 1:30 PM and 4:35 PM to 5:35 PM	4	5.0	75
	Lowell Regional Transit Authority Route 13	M-F; 6:42 AM to 6:42 PM	13	12.0	55
	Lowell Regional Transit Authority Route 14	M-F; 6:40 AM to 7:40 PM	14	13.0	56
	Lexpress Route 5	M-Sa; 7AM to 6PM	12	11.0	55
	MBTA route 350	M-Sa; 8:30 AM to 10:30 PM; Su; 12:20 PM to 7 PM	23	14.0	37
	MBTA route 351	M-F; 6:30 AM to 9 AM (outbound); 3:40 PM to 6:40 PM (inbound)	4	4.0	60
	MBTA route 352 (Express)	M-F, 6 AM to 10:30 PM; Sa-Su; 8 AM to 7 PM	30	12.0	24
	MBTA route 354 (Express)	M-F; 5:30 AM to 9:30 AM and 3:30 PM to 6 PM (inbound); 7 AM to 9 AM and 3:30 PM to 9 PM (outbound)	15	6.5	26
Lynnfield	None				
North Reading	None				

*Number of weekday trips at typical bus stop within municipality, inbound (to Boston).

Municipality	Provider/Route	Service Days; Service Hours	Weekday Service Trips*	Hours of Service per Weekday	Average Weekday Headway (minutes)
Pooding	MBTA route 136	M-F; 6:30 AM to 8:30 PM; Sa; 6 AM to 8:30 PM	15	14.0	56
Reduing	MBTA route 137	M-F; 6:15 AM to 10 PM; Sa; 6 AM to 7:30 PM	17	16.0	56
	MBTA route 99	M-F; 6 AM to 1 AM; Sa; 6:30 AM to 1 AM; Su; 8:30 AM to 1 AM	32	18.5	35
Stoneham	MBTA route 132	M-F, 6 AM to 1 AM; Sa; 6:30 AM to 1 AM; Su; 8:30 AM to 1 AM	24	17.5	44
	MBTA route 325 (express)	M-F; 1 morning, 1 evening trip	1	1.0	60
Wakefield	MBTA route 136	M-F; 5:30 AM to 9 PM; Sa; 6 AM to 9 PM	21	16.5	47
	MBTA route 137	M-F, 6:30 AM to 10 PM; Sa; 6 AM to 7 PM	17	15.5	55
	MBTA route 428	M-F; 6:40 AM to 8 AM; 5:50 PM to 7 PM	3	2.5	50
Wilmington	Lowell Regional Transit Authority route 12	M-F; 6:45 AM to 8 PM; Saturday; 7:45 AM to 5:45 PM	14	13.0	56
Winchester	MBTA Route 134	M-F; 6 AM to 8 AM; Sa;7:30 AM to 7;30 PM; Su; 11 AM to 7 PM	15	14.0	56
winchester	MBTA Route 350	M-F; 6:30 AM to 11 PM; Sa; 7:30 AM to 10 PM; Su; 8 AM to 7 PM	30	11.0	22
Woburn	MBTA route 134	M-F; 6 AM to 8 AM; Sa; 7:30 AM to 7;30 PM; Su; 11 AM to 7 PM	15	14.0	56
	MBTA route 350	M-F; 6 AM to 11 PM; Sa; 7:15 AM to 10 PM; Su; 8 AM to 7 PM	30	11.0	22
	MBTA route 354 (Express)	M-F; 5:45 AM to 6:15 PM	15	12.5	50

Table 2.8 (continued): Bus Transit Quality of Service in NSPC Subregion

*Number of weekday trips at typical bus stop within municipality, inbound (to Boston). Sources: MAPC, LRTA.com, lexingtonma.gov, burlington.org, mbta.com Table 2.9: Rail Transit Quality of Service in NSPC Subregion

Municipality	Line	Stop Locations (within Town)	To Boston Trips	From Boston Trips	Hours of Service (Weekdays)	Average Weekday Headways (minutes)
Burlington	None					
Lynnfield	None					
North Reading	None					
Reading	Haverhill Line	Downtown Reading	16	21	18.0	58
Stoneham	None					
Wakefield	Haverhill Line	Greenwood	16	20	18.0	60
Wakefield	Haverhill Line	Wakefield	16	20	18.0	60
Wilmington	Haverhill Line	North Wilmington	9	14	18.0	94
Wilmington	Lowell Line	Downtown Wilmington	25	25	18.0	43
Winchester	Lowell Line	Wedgemere	24	23	18.0	46
Winchester	Lowell Line	Winchester Center	24	23	18.0	46
Woburn	Lowell Line	Anderson/ Woburn	27	27	18.0	40
Woburn	Lowell Line	Mishawum (limited service)	3	3	2.0	40

Source: MBTA.com

Hours of service range from 18 hours (for nearly all rail services and one bus route) to four hours for some bus routes. Any service that operates fewer than 12 hours per day can hinder the ability of a traditional worker to have flexible hours and run errands after work. Service less than seven hours per day can be effective for some work trips, if the service is provided in the peak morning and afternoon commutes. Service at four or fewer hours a day requires riders to plan their days around the service schedule.¹⁴

Frequency (headways) is another metric that helps measure the availability or convenience of a transit service. As seen in **Tables 2.8** and **2.9**, most headways in the subregion are between 30 minutes to over an hour. Such headways suggests that passengers will (at a minimum) check the schedule to minimize their wait time, and may need to adapt their arrival or departure times to be less than optimal for their personal schedules.⁴

The final measure for transit availability is to measure the spatial coverage and access of the transit service. MAPC evaluated this by measuring a one-quarter mile walkshed around bus stops and one-half mile walksheds around commuter rail stations. MAPC then measured the number of businesses, employees, households, household units and residents within the walksheds. As seen in **Table 2.10**, around 42 percent of the subregion's jobs and around 31 percent of its housing and residents are within walking distance to transit. However, the coverage varies significantly from municipality to municipality. For example, nearly 54 percent of the approximately 6,000 employees in Reading are within walking distance to transit, while none of the over 6,500 employees in North Reading have access to transit at all. Figure **2.4** shows the geographic coverage of the existing transit services compared with the intensity of residential use and employment in the subregion. Transit routes in the subregion operate primarily north-south and are designed mostly to serve workers who

commute to the inner core of Boston. Moreover, several concentrations of residential and employment in areas such as Main Street/Route 28 in Reading and North Reading and along Route 128 in Woburn and Stoneham do have not transit service. This shows that most of the transit service in the subregion is not established to serve local work trips, which make up a majority of the commute trips in the NSPC subregion.

The NSPC subregion continues to grow in population and has developed significant concentrations of employment. Some of subregion has suitable transit geographic coverage, through nearly all of the bus and rail routes operate along a north-south network built to serve commuters to and from the inner core of Boston. This transit network does not adequately meet the growing number of localized work trips within the subregion, particularly along the east-west routes. A more detailed, localized assessment of transit needs, along with recommendations for new services to meet those needs, are explored in the chapter 4.

¹⁴ Exhibits 5-2 and 5-3, *Transit Capacity and Quality of Service Manual 3rd Edition* (2013).
Table 2.10: Transit Walkshed in NSPC Subregion

Municipality	Number of Employees	Number of Employees in Transit Walkshed	Percent of Employees in Transit Walkshed	Number of Households	Number of Households in Transit Walkshed	Percent of Households in Transit Walkshed	Number of Employees Plus Residents	Number of Employees Plus Residents in Transit Walkshed	Percent of Employees and Residents in Transit Walkshed
Burlington	31,627	17,428	55.1%	9,412	979	10.4%	56,457	19,593	34.7%
Lynnfield	4,073	37	0.9%	4,254	78	1.8%	15,902	252	1.6%
North Reading	6,546	0	0.0%	5,379	0	0.0%	21,252	0	0.0%
Reading	6,047	3,260	53.9%	8,780	2,284	26.0%	29,846	8,842	29.6%
Stoneham	7,551	3,849	51.0%	8,980	2,915	32.5%	28,954	10,626	36.7%
Wakefield	14,971	8,794	58.7%	10,207	5,048	49.5%	40,308	20,675	51.3%
Wilmington	21,125	1,312	6.2%	7,575	504	6.7%	43,602	2,716	6.2%
Winchester	8,555	4,524	52.9%	7,581	3,859	50.9%	29,759	15,127	50.8%
Woburn	35,487	18,439	52.0%	15,459	8,268	53.5%	73,462	37,696	51.3%
NSPC Subregion	135,982	57,643	42.4%	77,627	23,934	30.8%	339,541	115,527	34.0%



Figure 2.4: Transit Coverage and Development Intensity in NSPC Subregion

3 Stakeholder Outreach

MAPC, in conjunction with the towns in the NSPC subregion, conducted focus group discussions with town staff, area employers, non-profits, and other institutions to review the study findings to-date and discuss the challenges of accessing jobs in the region with transit.

3.1 Discussion with and Survey of NSPC Members

During the mobility study MAPC met with the members of the NSPC three times: in September 2016, as part of the project study kickoff; in November 2016, to review existing conditions and emerging trends in meeting first and last mile transit trips; and in February 2017 to review draft findings. At each meeting, staff from the nine municipalities provided feedback on existing conditions, areas for potential service, criteria for the suitability analysis and needs assessment, and stakeholders who should be invited for focus group discussions.

3.2 Focus Groups

MAPC held three focus group discussions with stakeholders from all nine municipalities. The stakeholders invited were gleaned from discussions with staff from the municipalities, along with recommendations from stakeholders as outreach progressed throughout the study.

Focus group participants are listed below.

- Travis Pollack, Metropolitan Area Planning Council
- Carolyn Cronin, Town of Wilmington
- Andrea Leary, Junction TMO
- Marci Loeber, Griffith Properties
- Julie Mercier, Town of Reading
- Josh Morris, Town of Burlington

- Bob Buckley, Riemer and Braunstein
- Bill Paille, BSC Group
- Jeff Bennett, 128 Business Council
- Erin Wortman, Town of Stoneham
- Greg Gagne, National Development
- Judy Sadaca, Hallmark Health
- Jennifer Welter, Stoneham Chamber of Commerce
- Michael Prisco, North Reading Board of Selectmen
- Danielle McKnight, North Reading Planning
- Valerie Gingrich, Town of Wilmington
- Dan Mills, North Reading Resident
- Sharon Iovanni, StonehamBank
- Heather Sievers, Town of Lynnfield
- Liz Bonentre, Town of Burlington
- Paul Reavis, Town of Wakefield
- Frank DiPietro, BSC Group
- Meg McIssac, StonehamBank
- Tina Cassidy, City of Woburn
- Brad Szekely, Town of Winchester
- Brad Ross, Winchester Hospital
- State Representative Michael Day
- William Bellevance, Jr, North Reading Planning Board/ National Development
- Jim Murphy, North Suburban Chamber of Commerce

Below is a summary of the discussion questions and comments received.

- 1. How does lack of transit service hinder our region's ability to attract and retain residents, businesses and employees?
 - It is becoming harder for businesses to attract younger workers (millennials); they want to live and work in urbanized and mixed-use areas with transit.
 - Having a bus stop with a direct connection to a subway is a big selling point for attracting tenants.
 - While our town can attract residents, having good transportation connections is a big difference in the selling price of a house.
 - In our business park, it has been hard for operators of the cafes to find staff, since many food service employees or potential employees don't have a car and there's no transit access. Also some tech companies in the park are noting that younger employees don't want to work in a suburban office park, they would rather work and live in the city. This is not the case for everyone, but for some.
 - In Stoneham and Woburn, there are several businesses along Montvale Ave and they do not have access to transit. It would be good to connect this corridor with the MBTA route 132.
 - Businesses have had requests to expand employee shuttles to connect to the commuter rail; however this would greatly expand their capital and operating costs for the existing shuttles.
 - Several employers in the restaurant and retail have abnormal hours/second shift jobs, which are not served as well by much transit.
 - Need better connections to commuter rail and other transit options (other than MBTA).

- Younger people don't like to drive as much, some take Uber.
- Younger people also want to live and work in areas where they feel connected, not disconnected suburban office parks.
- 2. What innovative solutions are employers, organizations or others undertaking to improve access to employment in our region?
 - Several employers and office parks operate their own shuttles, including the District (in Burlington), Biogen, Winchester Hospital, Cummings office park and Hallmark Health. Operating costs can usually run \$150,000 annually for each shuttle.
 - 128BC is now doing reverse commute service from apartment complexes (Lexington Hartwell Avenue shuttle).
 - We should inventory hotel shuttles, each hotel operates their own shuttle.
 - Middlesex 3 TMA operates a shuttle in Burlington, it should be coordinated with the other transit services.
- 3. What funding options should be explored to improve transit, vanpools or employer shuttles?
 - Towns may not have much money for operations, but they are "land rich" and provide land for satellite commuter lots.
 - Any new service must provide something that is a value added for the businesses that help pay for it.
 - Maybe consider a development assessment to help pay for new services.

- Spread the costs so that no one business, town or sector is burdened too much.
- Consider the subsidized Uber/Lyft rides as a more cost-effective starter system; it has lower capital costs.
- Funding should be a combination of local funding, perhaps via a TMA.
- It would be good to know what are the funding agreements and mechanisms for the recent Acton-Maynard public transit routes, to see how they might be applicable to this subregion.
- Businesses should see a tangible return for whatever they fund.
- Towns pay an assessment to the MBTA, but would like to get more in return.
- Employer sponsored shuttles should have amenities like computer tables and wifi. That way employees can be more productive during their commute, which is a benefit versus driving alone.
- 4. What geographic areas might best be markets for better transit services?
 - In Wilmington and North Reading, employers are not as concentrated, but Amazon, Teradyne and the Riverpark and Ballardvalle areas may have the density to support shuttles.
 - In towns with lower density, satellite commuter lots that are "rallying points" for shuttles to commuter rail and/or express service to Boston may work best. The shuttles maybe should also serve local areas with concentrated housing.
 - Analog in Wilmington might be an area to serve.

- There are two new housing complexes on the old MBTA route 99, near Greenwood Park and along Fallon Road.
- Anderson commuter rail should have better connection; maybe a bus route from Washington Street in Winchester to Anderson.
- Montvale Avenue in Stoneham and Woburn.
- Edgewater office park area in Wakefield.
- Need more east/west service with hubs that connect to other services.
- Washington Street corridor in Woburn.
- 5. Think about the residents where you live do people need better transit options to get to work?
 - Transit is needed since so many areas don't have service, and commuter rail lots fill up early.
 - Transit for seniors is desperately needed [this will be covered in a separate study].
 - Younger workers and entrepreneurs are finding cities such as Cambridge, Boston too expensive for living or for startup businesses, and they don't always have cars, and living in areas without transit isn't an option.
 - Ask any realtor, and they will tell you transit access is becoming a bigger factor in desire and housing price, even being close to a bus line. Towns without good transit are falling behind in their ability to attract new residents.
 - One participant's daughter commuted to Suffolk University, and had to drive or get a ride to the commuter rail. During bad weather, she skipped classes.

- We need better connections to bus/rail and between LRTA and MBTA.
- Need better connections from the outskirts to commuter rail, and better connections for high school students after school.
- 6. Any other factors we should consider?
 - Look at the Lexington TMA which operates a shuttle; it provides a good service to students and the public but maybe not so much for the employers who fund a large portion of it.
 - Any new service should be regional. No single town should bear the entire costs.
 - Contact businesses that operate their own shuttles and see how these shuttles are working, operations, costs, etc.
 - The study should look at the possibility of extending MBTA bus routes to the Wilmington commuter rail stations with additional connections with Lowell RTA.
 - Would like to know the bus ridership of the Burlington transit routes (when they were MBTA routes) before taken over by the Town.
 - Look at success of additional runs on MBTA route 132, ridership has held steady or increased.
 - We need more complete streets to have better pedestrian connections.
 - There are employers who operate their own private shuttles; they should be coordinated or consolidated.
 - It would be good to consider HOV/HOT lanes on Route 128. It could be a game changer for east-west commuting.

• Think of ways to get remote parking with shuttles into downtowns. There was a study for this recently in Wakefield.

In Spring 2017, MAPC held an open meeting for staff from the towns in the subregion and the public to review the draft recommendations, suggest additional improvements, and vote for which recommendations might have the greatest positive impacts and could be implemented in the short or long term. A summary of that meeting is in **Appendix C**. The draft recommendations were also sent in February 2017 to individuals on the North Suburban subregion's email distribution list for their review and comment. The comments received and other results from this public review are included in the next chapter (**Needs Assessment/Suitability Analysis and Recommendations**).

4 Needs Assessment/Suitability Analysis and Recommendations

Using the data collected in the first three chapters, MAPC mapped areas of unmet transit needs, and develop recommendations for possible services and pilot programs.

4.1 <u>Needs Assessment/Suitability Analysis Process</u>

To identify areas where existing transit service could be improved, or where new types of service may be implemented, MAPC conducted a transit needs assessment and suitability analysis for the NSPC subregion. The process was based upon the procedures used in the Minuteman Advisory Group on Inter-Local Coordination *MAGIC Suburban Mobility Study* (2011)¹⁵ as well as methods used by MAPC in local access scoring to find the potential roadway utility for pedestrian and bicycle connections.¹⁶ Through the needs assessment and suitability analysis process, MAPC identified areas where combined demographic characteristics and the built environment indicated potential locations for transit service improvements.

4.1.1 Calculation Methods and Criteria

MAPC's Data Services department conducted the analysis to determine which areas within the NSPC subregion would the best candidates for local public transportation improvements. This analysis was conducted at the tract level using Community Viz, a ArcGIS add-in for planning applications. This analysis was run for three scenarios—traditional commutes, reverse commutes, and local commutes within the subregion. Each of the criteria listed for the scenarios below were assembled into a single feature class, then each measure is rescaled to a score from 0 to 100 and then combined to create an overall score for each scenario. The data used in each analysis are described below.

Traditional Commute Suitability Criteria

- Population Density Number of residents per acre. A higher density resulted in a higher rating. (Source: Census 2010)
- 2. Vehicles per Household A lower number of vehicles per household resulted in a higher rating. (Source: Mass Vehicle Census, 2014 quarter 4)
- 3. Journey to Work Data for Traditional Commuting
 - a. To Boston/Cambridge Percent of residents of each Census tract who work outside the home who work in either Boston or Cambridge. A higher percentage of commuters resulted in a higher rating. Weighted at 10. (Source: Central Transportation Planning Package 2006-2010)
 - b. To Lowell and Haverhill- Percent of residents of each Census tract who work outside the home who work in either Lowell or Haverhill. A higher percentage of commuters resulted in a higher rating. Weighted at 3. (Source: CTPP 2006-2010)
- 4. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)

¹⁵ <u>http://www.mapc.org/magic-suburban-mobility-transit-study</u>

¹⁶ http://localaccess.mapc.org/

- a. Distance from Census Tract centroid to nearest MBTA bus stop. Weighted at 5
- b. Distance from Census Tract centroid to nearest Commuter Rail station. Weighted at 10
- 5. Minority population, low income households, population that does not speak English very well - Census tracts with high proportions of minority population, low income households, and population that does not speak English very well ranked higher. (Source: MassGIS/MAPC)
 - a. Percent minority population (Source: Census 2010)
 - b. Percent of population over the age of 5 that speaks a language other than English and does not speak English very well or does not speak English at all (ACS 5 year estimates 2010-2014)
 - c. Low-Income Households A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area is \$74,494, 80% of this is \$59,595. (Source: ACS 5-year estimates 2010-2014)

Reverse Commute Suitability Criteria

- 1. Employment Density Number of employees per acre. A higher density resulted in a higher rating. (Source: LEHD 2014)
- 2. Journey to Work Data for Reverse Commuting
 - a. From Boston Percent of employees in each NSPC Census Tract who live in Boston or Cambridge. A higher share of commuters originating from Boston, or

Cambridge resulted in a higher rating. Weighted at 10. (Source: CTPP 2006-2010)

- b. From Lowell or Haverhill Number of employees in each NSPC Census Tract who live in Lowell or Haverhill. A higher share of commuters originating from Lowell or Haverhill resulted in a higher rating. Weighted at 3. (Source: CTPP 2006-2010)
- 3. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)
 - a. Distance from Census Tract centroid to nearest MBTA bus stop. Weighted at 5.
 - b. Distance from Census Tract centroid to nearest Commuter Rail station. Weighted at 10.

Local Commute Suitability Criteria

- 1. Population Density Number of residents per acre. A higher density resulted in a higher rating. (Source: Census 2010)
- Employment Density Number of employees per acre. A higher density resulted in a higher rating. (Source: LEHD 2014)
- Vehicles per Household A higher percentage of households having less than one vehicle resulted in a higher rating. (Source: Mass Vehicle Census 2010)
- Journey to Work Data for Intra-subregion Commuting Percent of workers in each NSPC Census tract who do not work at home who commuted from within the NSPC subregion. A higher number of workers commuting from an NSPC town results in a higher rating. (Source: ACS 2006-2010 Journey to Work Data)

- Residents with Disabilities Census tracts which have a high percentage of disabled residents received a higher rating. (Source: Census 2010)
- 6. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)
 - a. Distance from Census Tract centroid to nearest MBTA bus stop
 - b. Distance from Census Tract centroid to nearest Commuter Rail station
- 7. Minority population, low income households, population that does not speak English very well - Census tracts with high proportions of minority population, low income households, and population that does not speak English very well ranked higher. (Source: MassGIS/MAPC)
 - a. Percent minority population (Source: Census 2010)
 - b. Percent of population over the age of 5 that speaks a language other than English and does not speak
 English very well or does not speak English at all (ACS 5 year estimates 2010-2014)
 - c. Low-Income Households A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area is \$74,494, 80% of this is \$59,595. (Source: ACS 5-year estimates 2010-2014)

4.2 Needs Assessment Results

MAPC reviewed the suitability analysis findings for all Census tracts, and compared those findings with a review of the existing transit services and land uses in the subregion. Most of the Census tracts with "high" and "highest" suitability ratings currently have commuter rail and MBTA bus service. For those parts of the subregion with existing fixed-route transit, some improvements to these services may be warranted, in terms of route extensions or additional frequencies. New localized bus or shuttle services can also help with the first and last mile connections for work trips.

Many of the Census tracts that lack bus or rail service by MBTA or another RTA do not have the residential or employment densities typically needed to support fixed route transit service and often scored lowest in the suitability analysis. Therefore, investment in such transit service may not be feasible at this time. However, these towns should continue to focus other efforts at improving accessibility and mobility, such as through mixed land uses and the development of complete streets and greenways.

The assessment results below include geographies that were identified as most suitable for transit improvements, and general recommendations. The data used in the analysis is included in Appendix B. The **Recommendations** (section 4.4) that follows the assessment results combines the findings from all three trip types and includes pilot programs that can help meet the combined findings.

4.2.1 <u>Traditional Commute Needs Assessment Results</u>

The travel patterns associated with traditional commuting place an emphasis on access to major fixed route bus services and commuter rail. Given the number of jobs within central Boston, and the availability of bus, rapid transit and commuter rail service, more transit trips in the subregion are for work trips into Boston than for reverse commute transit or for transit work trips within the subregion.

As seen in Figure 4.1, the suitability analysis found the following:

- Several high ranked census tracts for traditional commuting are within Woburn, Winchester, Stoneham, and Wakefield. All four towns currently have some transit service to Boston.
- Winchester currently has the best service, with two commuter rail stops and MBTA bus route 350, which runs frequently (headways are approximately 22 minutes).
 Wakefield is served by three MBTA bus routes and two commuter rail stations, with frequencies on these routes approximately every 50 to 60 minutes.
- Two commuter rail stations also serve Woburn, but one (Mishawum) has very limited service. The two MBTA bus routes that serve the heart of Woburn along Main Street (route 134) and Pleasant Street and Montvale Avenue (route 354) have service approximately every hour. MBTA route 350, which has more frequent service, serves the less populated western edge of the town.
- Stoneham's Main Street is served by the MBTA route 132, with buses running every 30 minutes during weekday peak periods (rush hour) and every hour off-peak, and provides connecting service to the commuter rail station at Wyoming Hill and Orange Line stations at Oak Grove and Malden Center.

• Changes to the MBTA service that could help serve these areas include adjusting or extending bus lines to serve additional residential areas, as well as to intersect with other bus and rail lines for improved connectivity. More specifics on these route changes are described in **4.4**. **Recommendations** below.

Figure 4.1: Traditional Commute Suitability Analysis Results



4.2.2 <u>Reverse Commute Needs Assessment Results</u>

Per analysis of the 2011 Massachusetts travel survey data, reverse commuters make up only five percent of all work trips in the Boston Metro region, but transit serves approximately 18 percent of these trips. Reverse commute transit users, moreover, are more likely to be those without access to an automobile than other transit users.¹⁷

The reverse commute suitability analysis (Figure 4.2) findings are:

- The highest ranked census tracts for reverse commuting area concentrated along the I-93 corridor (Woburn, Reading), northern Stoneham and portions of Burlington along Routes 128 and 3A.
- The existing level of transit service in these areas, however, varies greatly. Woburn has the best existing transit service, with both commuter rail and relatively comprehensive MBTA bus service (described in Traditional Commute Needs Assessment above). Reading is served by its commuter rail stations and two MBTA routes, while Burlington has the greatest concentration of bus service (Burlington Transit, Lexpress, LRTA and MBTA, as well as TMA service). The most suitable tracts in Stoneham are primarily served by one MBTA bus line (route 132).

• Expanding and connecting bus routes with commuter rail can help meet the reverse commute needs. New bus services or local shuttles connecting commuter rail stations to nearby employment can also help meet this need. The best options for this new service is from connections to stations at Anderson/Woburn, Wilmington, Winchester, and Wakefield. Finally, improved transit connections are needed in Burlington, which has several office, medical and retail clusters.

¹⁷Exploring the 2011 Massachusetts Travel Survey: Barriers and Opportunities Influencing Model Shift. Boston Metropolitan Area Planning Organization, November 2016.

Figure 4.2: Reverse Commute Suitability Analysis Results



4.2.3 Local Commute Needs Assessment Results

There are more work trips within the subregion than work trips between the NSPC subregion and Boston and Cambridge. However, transit only accounts for one to three percent of these local work trips. This small number of transit trips is due in part to the predominately north-south nature of the existing transit services in the area, as well as to the dispersed, relatively lowdensity and auto-oriented development patterns.

The service improvements described above - while designed to serve traditional and reverse work trips - will also help with the transit work trips within the NSPC subregion. Conversely, additional local shuttle service can also improve transit connections for all three types of work trips (traditional, reverse, local).

The results for the local commute suitability analysis are shown in **Figure 4.3** and indicate the following needs.

- Areas most suitable for improved local transit service are concentrated in Woburn and Stoneham, with additional tracts in Wakefield, Winchester and some of Burlington. Currently MBTA bus routes 354 and 134 serve a portion of this travel market in Woburn, and several bus routes cover portions of Burlington.
- Burlington is served by MBTA, LRTA, Lexpress, and its own Burlington Transit buses. These services converge in two general locations: near Burlington Mall, and in north Burlington near the intersection of Wilmington Road and Cambridge street. The Burlington Mall area needs a single location where riders can connect among all the services. Similar hubs could be created at the commuter rail stations if the additional shuttles and MBTA route extensions are implemented.

• Locally-sponsored shuttles could serve an important link in the first/last mile connection where existing bus and rail service does not exist in these areas.

Figure 4.3: Local Commute Needs Suitability Analysis Results



4.2.4 Lower Suitability Tracts

Several tracts scored lower in the suitability analysis for all three trip types, while others scored higher in one trip type but lower in others. MAPC reviewed the data in these areas to determine the reasons for these lower scores, with the following findings.

- Tracts in Wilmington, North Reading and Lynnfield have lower densities for population and employment than other areas in the subregion, thereby contributing to a low score in all three analyses.
- Some tracts in Winchester, Wakefield and Reading scored significantly lower for the reverse commute because they were mainly residential with lower overall employment densities, and/or were farther from commuter rail stations.
- In Wilmington three tracts scored higher for the reverse commute and lower for traditional and local commute. While there are concentrations of employment in Wilmington, the tracts have lower overall populations and thus scored lower in the demographic criteria used for the traditional and local commute suitability analyses.
- The tract for downtown Reading scored high only for the reverse commute (and not for traditional commute), despite its overall population and employment densities and good transit coverage. The journey-to-work data shows that residents in Reading are less likely to commute to Boston, Cambridge or within the NSPC subregion; hence, the lower suitability scores for these commutes.

4.3 <u>Recommendations</u>

After completing the needs assessment at the Census tract level, MAPC then examined the existing land uses and street network within those Census tracts that score highest for each work trip type (traditional, reverse, and local) to determine possible transit trip origins and destinations. Because each Census tract is a relatively large area, a more refined analysis was undertaken. For example, a tract may have scored high due to a cluster of employment or population within a smaller area, and/or may include areas that do not need transit service – such as forests, golf courses, and lakes.

A good example of the need for this refined analysis can be seen in **Figure 4.4** below. The two Census tracts with the high scores for all three trip types were in Stoneham and Woburn. A closer look at the geography of these tracts shows more defined patterns that could be served by transit. In Stoneham, most of the multi-family housing and employment is located along Main Street at the western edge of the tract, with lower densities (including a golf course and public park) in other areas. In northern Woburn, the high scoring Census tract has three distinct areas that will likely require different services: the retail and distribution areas along Commerce Way and near the Anderson/Woburn station; other warehouse and employment areas west of the railroad; and the cluster of retail, office and multi-family housing near exit 35 on Route 128/I-95. Figure 4.4: Concentrated Development within High Scoring Census Tracts



Source: Google/MAPC

4.3.1 MBTA Bus Service Revisions

This study recommends that MBTA consider the following revisions to bus routes serving the subregion, as shown in **Figure 4.5**.

• Extend route 132 north to Reading: This bus route extension would be approximately two miles and would meet several needs. First, it would provide service to a concentration of multifamily housing and businesses along Main Street in Stoneham near Exit 38B at Route 128. Second, it would extend bus service to neighborhoods with access to Main Street in Reading. Finally, it could serve a satellite parking site for the Reading commuter rail station, which currently has surface parking that can fill up quickly in the morning. An alternative, shorter extension would instead expand the route north one-half mile to serve the multifamily housing and businesses along Main Street with a turnaround at the businesses on North Street in Stoneham.

• Revise route 132 in southern Stoneham: Currently, this MBTA route operates between Wyoming Hill commuter rail station and downtown Stoneham, and a portion of the route serves areas that consist of Spot Pond and parks. A revised routing that would serve a greater concentration of residents and Stoneham High School would instead operate along Franklin Street, and would also allow additional connections with the Melrose Highlands commuter rail station.

During the stakeholder outreach, there was concern expressed about neighborhoods along south Main Street (Stoneham) and West Wyoming Avenue (Melrose) losing bus service. Alternatively, others stakeholders suggested the MBTA consider extending bus route 99 north from Boston Regional Medical Center into downtown Stoneham, connecting to a future mobility hub near downtown Stoneham on Main Street. For either option, MBTA will need to look at the stop level ridership and other data as part of their bus service evaluation to determine the impacts and benefits of any route revisions.

• Extend route 136 and/or 137 west to Anderson/Woburn: This three mile route extension would serve Reading via Woburn and West Streets as well as northeast Woburn along Washington Street and Commerce Way. It would provide a bus connection to stations north of Route 128 on both commuter rail lines, which is currently lacking. The service extension would serve a relatively walkable, established neighborhood west of the Reading commuter rail station. It would also connect with several retail and dining establishments at Woburn Mall, connecting residents to these jobs. Finally, the bus route would serve the various office and distribution centers along Commerce Way, linking these jobs to the commuter rail services at Anderson/Woburn as well as the bus and commuter rail in Reading, thus providing greater reverse commute connections.

• Revise route 134 to connect to Anderson/Woburn station: The current MBTA route 134 terminates in north Woburn on Main Street, west of the Anderson/Woburn station. A two mile extension of this route could be made once the New Boston Street bridge replacement is complete.¹⁸ This would revise the route to serve Merrimack Street and new Boston Street, then cross the railroad on the new bridge and then serve Presidential Way before terminating at the Anderson/Woburn station. This would provide service to several employers within a few miles of Anderson/ Woburn, providing connections to jobs for both local and reverse commuters.

This proposed re-routing of MBTA route 134 would mean that one mile of Main Street from School Street to Border Avenue would lose service; however, the connection to Anderson/Woburn commuter rail station would likely produce higher ridership through better connections with commuter rail and possible shuttle services. Alternatively, the bus route could be extended north to Eames Street and then access Anderson/Woburn via Woburn Street and Presidential Way.

• Improve transit connections in Burlington: A more visible mobility hub in the Burlington Mall region would allow riders to more easily connect to the numerous transit providers in the area. More information on this recommendation can be found below (see **4.3.4 Local Mobility Hubs** recommendation below).

¹⁸ Boston MPO Transportation Improvement Program Project ID 604996

Extension of MBTA route 132 was recommended previously in the 2002 North Suburban transit study; the improved connections near the Burlington Mall was also recommended in the 2005 transit study.¹⁹ **Figure 4.5** illustrates these changes overlaid on the current MBTA system map.

Previous transit studies for the area recommended similar extensions, but also noted that these revisions would require MBTA to add a bus and driver to ensure the same level of service along the existing routes, which MBTA has found to be not costeffective. MBTA is scheduled to conduct a comprehensive review of all their bus routes beginning in 2017, and these proposed modifications could be considered in MBTA's larger system-wide review. This review should include a survey of rider origins and destinations, which has not been completed since 2008. For example, the last 2008 rider survey found that most passengers on route 132 connect with rapid transit (Orange Line). Thus, a revision to this route could move the southern terminus to Oak Grove instead of Malden, which might allow MBTA to extend the bus route to Reading.

¹⁹ 2002 North Suburban Transit Opportunities Study and 2005 North Suburban Commuter-Oriented Transit opportunities Study Phase II



Figure 4.5: Proposed MBTA Service Revisions

4.3.2 Local Shuttles

The operation of local shuttles could be done by one or more of the municipalities, perhaps through an intergovernmental agreement, or through the creation of a Transportation Management Association with municipal membership. The proposed MBTA bus route revisions listed above could be incorporated into local shuttles routes, if extension of the MBTA route is not feasible. Likewise, MBTA should consider these proposed shuttle routes as extended bus routes during service evaluations of their existing bus services.

Wakefield-Stoneham-Woburn-Winchester: This shuttle would serve these four towns and would start at the Wakefield commuter rail station, connecting to downtown Stoneham, office and retail centers along Montvale Avenue, Winchester Hospital, and ending at the Winchester Center commuter rail station. This shuttle would provide the following benefits.

- It provides a more direct transit connection for residents in these towns to two commuter rail stations (Winchester and Wakefield), as well as to six MBTA routes (136, 137, 132, 325, 354 and 134).
- The shuttle would help reverse commuters, particularly those connecting from two different commuter rail lines (Lowell and Haverhill).
- It would connect major employment areas, including downtown Stoneham and downtown Winchester, as well as the Montvale Avenue corridor and Winchester Hospital. The shuttle could replace or supplement one of the Winchester Hospital shuttles that currently operates between Montvale Avenue and the main hospital.

Figure 4.6 shows a possible routing for this shuttle.

Examples of how communities are improving first and last mile connections - CrossTown Connect Local Transit



Your Community, Your Transportation, Your Way

After MAPC completed two suburban mobility study for the MAGIC subregion, several towns and area businesses formed a new TMA named CrossTown Connect. The TMA operates transit services in the service area, including a central dispatch call center to coordinate Council on Aging vehicle services; van service for seniors and those with a qualified disability; Dial-a-Ride service for any trip within four municipalities; the *MinuteVan Rail Shuttle*, which connects off-site commuter parking with peak hour trains at the South Acton MBTA Station; and the *Cross Acton Transit*, a public transportation shuttle connecting the South Acton MBTA Station with several locations in Acton.

The services have varied costs and funding arrangements. For example, the *Cross Acton Transit* (operating 10 hours per weekday), has an annual cost of approximately \$140,000 and is funded through a combination of Acton's assessment to the Lowell Regional Transit Authority, local subsidy and fares. The *Rail Shuttle* (which operates 5 hours per weekday) costs approximately \$106,000 and is fully funded through fares and fees charged at Acton's commuter rail parking lot.

Service began in 2015.

More information: http://www.crosstown-connect.org/

Figure 4.6: Possible Wakefield-Stoneham-Woburn-Winchester Shuttle



Winchester-Woburn-Anderson/Woburn: This shuttle would operate between Winchester Center and Anderson/Woburn commuter rail stations, with the following benefits.

- It would serve the employment areas along Holton, Wildwood Street, and the Woburn Mall.
- The route would help connect residents in these two towns with jobs, as well as link reverse commuters alighting from either Anderson/Woburn or Winchester Center.
- The shuttle would also connect with MBTA routes 134and 354 as well as other local shuttles serving Woburn and Winchester proposed in this study.

Figure 4.7 shows this this option. It should be noted that this the northern portion of this proposed shuttle is similar to an employment shuttle recommended in the 2005 North Suburban transit study.

Figure 4.7: Possible for Woburn-Winchester Shuttle



Anderson/Woburn-Burlington Mall: This shuttle would operate between Anderson/Woburn station and the Burlington Mall, also serving 200 Trade Center, Mishawum station, and the Woburn Mall area.

- This shuttle would connect with MBTA route 134 in Woburn as well as all the bus services in Burlington (MBTA, Lexpress, LRTA, Burlington Transit).
- It would serve local work trips to jobs around Anderson/Woburn, Woburn Mall area, the Burlington Mall area, including the District and Lahey Medical.
- This shuttle also would connect the apartment complexes near route 128 to several MBTA bus routes and to commuter rail options (and future bus service) at Anderson/Woburn.

Figure 4.8 shows a possible routing for this shuttle.

During the stakeholder outreach, MAPC learned that the 128 Business Council operated a shuttle in 2005 that was similar in routing to the proposed Anderson/Woburn-Burlington Mall shuttle. The shuttle was discontinued due to high operating costs and low ridership. Since 2005, however, both the 200 Trade Center and Lahey Medical have expanded, increasing the ridership potential. A shuttle with a greater number of sponsors – including municipal sponsorship, and connecting with a new transit/mobility hub in Burlington, might prove more successful. Figure 4.8: Possible Anderson/Woburn Burlington Mall Shuttle



Four additional shuttle options could be explored in areas that have lower density and but still have concentrations of employment. While these geographic areas did not score high in the suitability analysis, they were identified as concentrated areas of development through the stakeholder engagement process and in the more refined geographic analysis. For the first two of these proposed shuttles, similar shuttle routes were recommended in previous transit studies for the subregion.²⁰

- Anderson/Woburn Employment: This short shuttle could operate in peak periods to serve the distribution and office employment around the Anderson/Woburn Station. Figure 4.9 shows a possible routing.
- Woburn-Wilmington: This peak-period shuttle would operate between the Anderson/Woburn and Wilmington stations, possibly via Woburn Street/Route 129. This would connect riders from the rail stations to employers along this corridor such as Analog Devices, Tecomet and Textron Systems. It could also serve satellite parking for the Wilmington station. Figure 4.10 shows possible routing for this shuttle.
- North Reading: This peak-period shuttle would operate between the Anderson/Woburn station and the employment cluster around Concord Street near the I-93 interchange (see Figure 4.11).
- Wakefield/Lynnfield: This peak-period shuttle would operate between the Wakefield commuter rail station and the employment and multifamily concentrations along Edgewater Drive in Wakefield and the multifamily and retail development along Audubon Road (see Figure 4-11).





²⁰ 2002 North Suburban Transit Opportunities Study and 2005 North Suburban Commuter-Oriented Transit opportunities Study Phase II

Figure 4.10: Possible Anderson/Woburn-Wilmington Shuttle





Figure 4.11: Possible North Reading and Wakefield/Lynnfield Shuttles

4.3.3 <u>Ride hailing/TNC partnerships</u>

Another option to improve the first/last mile connections is to enter a partnership with a transportation network company such as Uber or Lyft for subsidized rides to/from select locations. The trips could be restricted to those serve employers or developers who are members of the TMA, or who enter an agreement with the transit agency. By restricting the trips by geography and/or time of day, the towns or TMA could ensure that only eligible trips are supported. This option could be a first step to determine the demand for a new shuttle or bus route extension.

As noted in Chapter 1, there are several transit agencies and communities that have developed these partnerships. To ensure that only related trips are funded, rides would need to be restricted to and from certain locations (such as to/from a commuter rail station, mobility hub, or office park) and restricted to a time day and/or days of a week (e.g., 7 AM to 7 PM, Monday through Friday). The drawback to this partnership are that setting geographic limits will miss some work trips that would have been served by a bus route or other fixed-route transit.

When developing the partnership, the municipalities and/or TMA should ensure that the agreement includes data sharing of trip origins and destinations by day of the week, time of day and location. The data should be at a level of detail that can ensure rider privacy but still be relevant for evaluation and planning. For example, the data from TNCs on trip origins and destinations should be refined enough to truly understand the effects of these trips on the local transportation network. This data will then allow government officials to make informed decisions on investments in transit operations, street improvements, sidewalks, land use, zoning, etc. to better meet the needs of the users of these services, and to mitigate possible impacts.

Examples of how communities are improving first and last mile connections - Altamonte Springs, Florida Uber Program

The City of Altamonte Springs (population 43,905) in 2016 began a pilot program that offers discounted Uber rides within the city limits. The City initiated the subsidized Uber service after it was unable to start a locally-operated flexible route bus service.

The program provides a 20 percent discount on any ride within the Altamonte Springs city limits. To help boost commuter rail ridership, the program also provides a 25 percent discount to trips beginning or ending at the City's SunRail station. Soon after Altamonte Springs began its service, four other adjacent municipalities began to offer similar discounts with Uber.

According to the town's website, riders must enter the promo code "ALTAMONTE" and choose the Altamonte option to receive the discounted services. The Uber app's location function will recognize if the user is within the Altamonte Springs city limits. The subsidized portion of rides is automatically deducted from the rider's cost of the trip, with the City reimbursing Uber the discounted portion of the fare.

Due to a confidentiality clause in their agreement with Uber, the City has not released the number of rides that have used the discount. However, the Orlando Sentinel reported that the City has paid more than \$14,000 for the first six months of the program. The City estimates that Uber ridership has increased more than tenfold since it the program started in March 2016.

More information: http://www.altamonte.org/index.aspx?NID=736

4.3.4 Local Mobility Hubs

With the expanded MBTA bus network and local shuttles, many of the commuter rail stations (Anderson/Woburn, Wakefield, Winchester) within the NSPC subregion will act as local mobility hubs where users can connect to a variety of transportation options (MBTA/RTA, local transit/shuttles, ride sourcing, etc.).

Burlington should also become a western transit/mobility hub, since it currently is served by MBTA, LRTA, Lexpress, and its own Burlington Transit buses. Many of these services converge near the Burlington Mall; this location could support a small mobility hub on Burlington Mall Road. This hub should be located near Burlington Mall Road, to allow connections between those bus routes that terminate at the Mall, and those that run beyond the Mall.

Figure 4.12 shows some of the components of a local mobility hub, including clearly defined areas for connections to local buses and shuttles, ride sourcing (taxis and TNCs), car-share, bicycle share, bicycle storage, as well as wayfinding and proper connections to a larger pedestrian and bicycle network. Similar mobility hubs are being constructed in San Diego, as part of its comprehensive transit network plan, and have been proposed in Boston as part of the Go Boston 2030 plan.²¹





As part of the new Mid-Coast Trolley light rail line opening in 2021, the City of San Diego is developing mobility hubs at each station to improve access and connectivity. The possible range of mobility options at each station include:

- Bus and shuttles
- Bicycle lockers and bicycle sharing
- Carsharing (e.g., zipcar)
- Ride hailing (taxis, Uber, Lyft)
- Electric vehicle charging stations
- Real-time transit information
- Pedestrian and bicycle wayfinding
- Universal transportation account (online payment and information for all available transportation services)

The City is currently implementing prototype mobility hubs at some rail and transit stations and town centers.

More information: <u>http://www.sdforward.com/mobility-planning/mobilityHubs</u>

²¹ San Diego: <u>http://www.sdforward.com/mobility-</u>

planning/mobilityHubs and Boston: Neighborhood Mobility microHUBs

⁽p. 146), at <u>https://www.boston.gov/sites/default/files/document-file-03-2017/go_boston_2030_7_projects_and_policies_spreads_1.pdf</u>

Figure 4.12: Components of Mobility Hubs

Examples of components that can be part of a local mobility hub include (clockwise from upper left) shelters and clear signage for local bus and shuttles; ride sharing (taxis, Uber, Lyft, etc.); car sharing (zipcar, etc.); wayfinding and pedestrian connections, connections to bicycle networks, and bike sharing.



4.3.6 Revisions to Burlington Transit

Currently Burlington is the only municipality in the subregion that operates local transit service. An in-depth review of these bus routes was outside of the scope of this study. If Burlington wishes to become part of regional transit system or TMA, a more detailed study of the routes with a rider survey is recommended. This may allow for a revised bus service with more streamlined routing, with some vehicles instead serving the local shuttle routes recommended above.

4.3.7 Land Use and Multimodal Networks

One of the most effective ways that municipalities can help close the first and last mile connections is through better integration of land use and transportation decision making and through better multimodal street design. Some corridors that have densities that could support better transit unfortunately consist of streets that have inadequate sidewalks, no crosswalks, and buildings separated by large parking areas – all which make pedestrian access, and thus effective transit, extremely difficult. **Figure 4.13** shows two examples of suburban streets that were upgraded as complete streets to better serve transit, pedestrians, and cyclists.

As towns further evaluate their future transit needs, those streets identified for improved transit services should have priority for complete street improvements such as pedestrian scale lighting, bicycle routes, more visible and frequent crosswalks, and wider sidewalks. Land uses along these corridors should also be revised via a transit supportive zoning overlay district or other tool that encourages more mixed uses and buildings closer to the street with parking located in the rear. These tools will allow better pedestrian connections from existing and future transit services, eliminating circuitous bus routing and allowing transit to operate more efficiently.

Figure 4.13: Examples of Complete Streets for Transit

Two examples of complete street conversions that included components to support transit (left: Urbana, IL, right: Olympia, WA. Photos courtesy of Dan Burden)



center turn lanes, bike lanes, ped refuge island at bus stop





4.3.8 Monitoring Impacts of New Mobility

Transportation in the US is undergoing a transformation with new and rapidly evolving technologies that are changing and disrupting our traditional ways of traveling, working and socializing. Cities and towns should monitor these trends and work together to determine what actions are needed to force positive change and mitigate negative impacts.

- Telecommuting is becoming an increasingly popular in the US, doubling since 1980. According to the American Community Survey, in 2015 around 4.5 percent of workers in Massachusetts worked from home on a regular basis, up from 3.3 percent just ten years earlier. Moreover, recent analysis of the Census data showed no correlation between working from home and density, commute time or commuting distance. Instead, education level seems to be the best predictor, indicating that improvements in technology and the increasing number of office jobs has allowed more people to choose to work from home.²²
- Transportation Network Companies (TNCs) have grown exponentially since these services started in the past few years. For example, in five years of service, Uber has now completed over 2 million trips in the region. Both Uber and Lyft have now started to offer a variety of services, including UberPool and Lyft Line that allows riders to combine their trips and share costs. As the service areas for their TNCs expand, more people will have access and the options for larger scale contracting may increase.

However, there are equity issues since the companies are not as accessible to those who do not have smart phones and/or use a wheelchair. Moreover, it should be noted that there are several press reports that both Uber and Lyft are not yet turning a profit, and the full cost model for these services is still unknown.²³

- Autonomous Vehicles are vehicles that can operate partially or fully without a human, at least in some circumstances.²⁴ Waymo (Google/Alphabet), Tesla Autopilot, nuTonomy and others have been testing autonomous vehicles in various cities. Several states. including Massachusetts, have legislation permitting the testing of autonomous vehicles and regulating when, where and how they operate. The USDOT in 2016 established the first federal policy on automated vehicles. The full impact of this technology is unknown. As these vehicles become more available, people might be more willing to "ride" to work, thereby increasing roadway congestion and travel times and decreasing transit use. There may be a reduced need for parking lots and structures, since autonomous vehicles could drive themselves home (or to satellite locations) and then pick up users later for the return ride. Under this scenario. however, curbside and queueing areas will need to be expanded as more vehicles line up to pickup and drop-off passengers in downtowns and office parks. TNCs will use autonomous vehicles more often, perhaps lowering the labor costs and costs per ride. Transit agencies may also benefit, by having autonomous buses that can pull up directly to the curb and allow easier access, and by
- ²³ <u>http://fortune.com/2016/12/19/uber-financials-2016/</u> and <u>http://www.bizjournals.com/sanfrancisco/news/2017/01/05/lyft-</u> <u>profitability-ridership.html</u>

²² "Why Telecommuting Really Matters." CityLab, February 4, 2014. <u>http://www.citylab.com/commute/2014/02/why-telecommuting-really-matters-6-charts/8227/</u>

²⁴ Also known as highly automated vehicles (HAVs), automated vehicles, driverless cars, self-driving cars, robotic cars.

allowing drivers to leave the wheel and instead interact with customers onboard.

Mobility on Demand (MoD) is a web-based system that . helps create an integrated and connected multi-modal network of transportation options that are available and accessible to all travelers. Current MoD systems allow users to determine which travel options are available for a trip - transit, ride sourcing, carpool, walking, bike rental, etc. - and some allow users to reserve and pay for options within a single application. As this technology develops, communities will be able to develop their own local transit, ride sharing, and/or bicycle sharing systems that can be integrated into other regional systems via a single application and payment system (San Diego, CA for example, is including MoD as part of their "mobility hub" program). In the future, this will any transit or for-hire transportation service to be integrated via numerous third-party applications.

This new era of transportation and mobility technology should not mean that municipalities and transit providers should develop a "wait and see" attitude and do nothing to improve first and last mile connections. Instead, towns should work together to monitor the impacts of these changes and be ready to adjust their forecasts, traffic models and adopted plans to reflect the findings from the consortium of data that will become available over the coming years, and be ready to revise policies and partnerships to address this evolving mobility landscape.

4.4 Costs and Funding Options

4.4.1 Potential Costs

Shuttle operations: The costs to operate any proposed shuttles or local bus routes are dependent on hours of service, length, and type of vehicle. Based upon research of recently implemented shuttles and bus routes operated in the region, a new shuttle route would likely cost approximately \$125,000 to \$150,000 annually, assuming weekday operations.

The shuttles could be operated as transit routes (open to all riders with more frequent stops), similar to the municipal services operated by the Town of Burlington, Lexpress (Lexington) or Cross-Acton Transit. Alternatively, the shuttles could be operated as or as employer-sponsored routes via a TMA, with a few stops at businesses funding the service and closed to employees at the sponsoring businesses.

TNC Partnerships: If a subsidized TNC/ride hailing service were implemented, the costs could be less, but the number of riders and service areas would also be partially dependent upon the funding established by the municipalities that wish to participate. For example, an agreement to pay up to \$5 per ride, with approximately 10 rides per day, would equal \$18,250 per year in required subsidies.

An example of how the service could work is something similar to the partnerships established by North Shore Community College, Pinellas Suncoast Transit Authority (PSTA) or the City of Altamonte Spring, FL. All three programs have specific requirements of where trips must begin or end (i.e., origin or destination), or with limitations also by time (e.g., for North Shore Community College, when classes are in session). For a municipality in the North Suburban subregion, the program could be limited to trips that originate or end at a commuter rail station or local bus route terminus, and could be limited to the same operating hours as the MBTA buses/trains. This would help ensure the program funds work trips.

This option could be a first step to determine the market and demand for a more comprehensive shuttle or fixed route bus service.

Any partnership with TNC must also follow the Americans with Disabilities Act of 1990 (ADA) and, if using Federal funding, must follow Title VI of the Civil Rights Act of 1964. These requirements includes providing an alternative method of payment and reservations for those without access to a smart phone, and providing accessible vehicle service to those who use wheelchairs and/or have intellectual disabilities.²⁵

MBTA Routes: In January 2017, the MBTA adopted a new service delivery policy that staff will use to evaluate all existing bus routes. Costs and ridership benefits from proposed revisions to the existing MBTA routes would be developed as part of a larger study by the MBTA. The MBTA is currently working to close a funding deficit, which limits the capital and operating funds to add or expand bus services. The number of buses that can be operated and maintained out of the agency's various bus garages also regulates the MBTA's possible service changes in the subregion.

4.4.2 Potential Funding and Partnerships

Funding for new transit services can come from federal, state and local sources. Below is a list of funding opportunities to implement one or more of the recommendations in this report. It should be noted that these funding options are not mutually exclusive, i.e., more than one funding source will likely be necessary to implement a project.

- <u>Federal/State Funds</u>: Federal and state funding for new transit services will need to be requested through the Boston MPO Transportation Improvement Program (TIP) process. There are two MPO funding sources that can help implement first/last mile mobility projects.
 - The Regional Transit Service Planning Technical Support Program (TIP ID 14342) provides municipalities or others technical assistance to improve transit services. These funds could be used to execute a more in-depth planning study that will establish the operating parameters for a pilot project.
 - Beginning in Federal fiscal year 2021, the Boston MPO TIP includes \$1.75 million annually in the Community Transportation Program (TIP ID 1729) to improve community mobility. Example projects listed in the program include locally developed transit services to improve first/last mile connections; park-and-ride improvements at transit stations, or at other viable locations; bikeshare or shuttle-bus services.
- Local Funds: Operating funds should be provided locally. For example, the Town of Acton has a local meals tax that is used to partially fund local transit operated by the Crosstown Connect. While there may be opportunities for federal or state funds to operate a pilot program, there should be local funding sources established at the end of the pilot program to continue the service, if successful. If charging a fare, most public transportation services have a farebox recovery ratio of only 15 to 30 percent of operating costs.

Additionally, municipalities in the subregion could require

²⁵ <u>https://www.transit.dot.gov/regulations-and-guidance/policy-letters/dot-dear-colleague-letter-equity-access-shared-mobility</u>

mitigation funding from new development which generates additional automobile traffic in the area. Mitigation could come in multiple forms including payment in lieu of improvements, an agreement to initiate transportation demand management strategies to reduce automobile trips, or join a TMA.

• <u>TMA Partnerships</u>: Other options include municipalities developing partnerships with private entities, such as employers and developers, to determine how the needs for each could be aided by expanding transit service to capture ridership and share common costs. Working through one of the two TMAs in the subregion (the Junction and 128 Business Council) can be an avenue for connecting to businesses in each community that are looking for additional transportation options for their employees. TMAs can also help by providing expertise in detailed transit planning and implementation of a pilot program.

4.5 <u>Next Steps</u>

The next steps are dependent upon the level of interest of the various municipalities in the subregion to implement new services. Below are possible steps that can be taken to implement a pilot program and other new transit services.

1. Create Working Group

The municipalities most interested in implementing new services can form a working group to oversee the additional planning process. If possible, this working group could include representatives from employers or others in the private sector who may be interested in funding and operating partnerships, such as a TMA.

2. Conduct More Detailed Study of New Services

The working group formed in step 1 can then conduct a more detailed study through a contract with a consultant and/or TMA to refine the potential for new services. This will allow the municipalities to better determine the potential costs, service areas and hours of operations. As stated above, the detailed services could be conducted through a partnership with the Boston MPO staff and/or contract with a TMA.

3. Determine Operating Framework and Implementation Plan If municipalities decide to move forward with employing some first/last mile services, there are three options for

first/last mile services, there are three options for implementation:

- Municipal Transit Service- One or more the towns could decide to create their own municipal transit services, similar to Lexpress and Burlington Transit. This service could be within a single town, or multiple towns via an intergovernmental agreement. A town operated service would allow the municipalities greatest flexibility in routing and other operations. However, the town or towns might have fewer opportunities to leverage other funding from the state or private sector or in forming a larger service area and sharing costs with others.
- TMA One or more of the municipalities could create a new TMA to implement employer shuttles and local public transit routes, or join an existing TMA, especially if the TMA currently operates shuttles or other fixed route services that can be expanded into new areas.
- RTA Towns could look to join an existing RTA, such as LRTA, or could look to form their own. However, any town that leaves the MBTA would likely lose some or all MBTA bus service and would no longer be eligible for paratransit service (the RIDE). Any replacement paratransit service would have a smaller geography. In January 2017 the
Governor signed into law an amendment that allows municipalities to join multiple RTAs.²⁶

Once the operating framework and implementation plan is developed, the town or towns should work with the MPO to request community transportation investment funds and other funds.

4. Engage MBTA and RTAs on Service Improvements

As noted earlier, the MBTA is conducting a comprehensive review of their bus routes. The recommendations from this study will be shared with the MBTA, who can further evaluate the costs and benefits of the proposed route revisions. The municipalities in the NSPC subregion should take an active role in meeting with MBTA staff during this comprehensive review to ensure the changes are most beneficial to the communities, and are aligned with any locally sponsored transit improvements. The municipalities should also be watchful and work with Lowell RTA, and Lexpress on possible service reviews that could impact routes serving the subregion.

²⁶ https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter432

Appendix A: Summary of Recent Studies

The following is a summary of five recent studies on emerging trends and innovations that agencies have undertaken to improve transit connections in suburban areas, particularly in providing for the first and last mile of transit trips. Following each summary are notes on possible applications for meeting the needs identified in the NSPC suburban mobility study.

2010 Guide for Planning and Operating Flexible Public Transportation Services (TCRP Report 140)

Summary: This study looked at deviated fixed route (flexible route) service at US transit agencies. The report is a guide for public transportation providers to use in considering the merits of flexible public transportation services. The services require greater scheduling technology and are not suitable for riders who require a regular schedule and who have time-sensitive trips. The services could work when agencies need to reduce the costs of full demand-responsive services, eliminate the need to operate ADA-complementary paratransit services in select geographic areas, and can be a way to provide an introduction to public transportation to areas not previously served by fixed-route transit.

Possible Applications: Denver's Call-n-Ride service is extensive and serves multiple areas in the region where demand does not warrant fixed-route bus service. Riders can schedule the service two hours in advance and frequent users can subscribe to the service for daily or weekday trips. As of 2009 (when study was done) the service has been successful. Nearly 74 percent of the rides are work trips, and about one-third of riders are new to transit. The service costs more per ride and carries far fewer riders per hour than traditional fixed route bus service. Denver continues to offer this service today. An internet search of other transit systems covered in the study, however, seems to show that many have eliminated their flexible route services since the study was completed.

2015 Improving Transit Integration Among Multiple Providers, Volumes I and II (TCRP Report 173)

Summary: This manual "describes a range of possible integration activities, potential benefits of integration, and related management responsibilities for efficient delivery of integrated transit services." (Foreword of Volume I report).

The report notes that there are typically four levels of integration, which can be represented as a "continuum of integration" (p. 9).

Communication – acting independently, but communicating as opportunities arise Coordination – acting jointly on an informal basis Collaboration – acting jointly on a formal basis on select functions Consolidation – merging some or all functions by legal agreement or by creating a single transit entity.

Possible Applications: Currently transit providers in the subregion have some level of integration. The MBTA website and bus system maps include information on adjacent transit systems (LRTA, Lexpress, and Burlington Transit) such as bus routes and numbers, phone numbers, and websites to help riders find connections. LRTA payment structure includes the MBTA's Charlie Card, and recently LRTA extended their bus route to serve the MBTA's Wilmington commuter rail station. Other examples of transit integration that could be applied in the North Suburban subregion include better coordination of bus routes, expansion of the CharlieCard to all providers, and more frequent communication/coordination with required reports to governing bodies.

2015 Transportation Demand Management Case Studies and Regulations (MAPC)

Summary: This report is a guide for municipalities to implement bylaws or zoning that advance Transportation Demand Management (TMD) measures. Case studies include policies and programs that promote transit, ridesharing, carpooling, and vanpooling.

Possible Applications: In the Town of Needham, development in specific districts that request a Special Permit to increase the floor area ratio over what is permitted by-right are subject to additional Special Permit Applications. The Town's Planning Board can require TDM measures to reduce peak hour traffic volumes. These requirements can include providing cash incentive for carpools, subsidized transit passes, and shuttles to and from public transportation terminals. The Town of Acton imposed an excise of 0.65% on the sale of restaurant meals, which is used to help fund a new fixed route transit service in the Town.

2016 Shared Mobility and the Transformation of Public Transit (APTA)

Summary: This study by APTA has four main findings on "shared modes." 1.) Those who use shared modes are also more likely to use transit and not have their own car, and spend less on transportation overall. 2.) Ridesharing services are most frequently used between 10pm and 4am, when transit is less frequently available. 3.) Shared modes will continue to grow, and public agencies should find opportunities to engage them to improve mobility for all. 4.) There is potential for public-private partnerships, particularly on paratransit, that can help drive down costs.

Possible Applications: This report includes almost no examples of applications. The report does note that shared modes are rarely used for daily or regular commuting trips, and that lower income groups can have the most to gain by using shared mode options, as these groups are more likely not to travel if transit is not available. Finally, the report notes that ADA paratransit rides have more than doubled between 1999 and 2012, and that contracting with shared mode services for these trips can provide a real costs savings for transit agencies.

2016 Private Mobility, Public Interest (Transit Center)

Summary: This study looks at transit agencies using emerging mobility services such as bikeshare, carshare, and on-demand transit and transportation network companies (Uber, Lyft) to determine trends in the industry and best practices. Agencies can use these emerging mobility services to be more flexible and reduce their operating costs. Moreover, data sharing with third parties can help with planning and marketing efforts. Agencies can leverage items such as parking spaces and street right-of-way to negotiate with private transportation network companies. Open data and integrated fare payment systems are also a key items that agencies can use to leverage these partnerships. Finally, the report notes that agencies need to proactively start to collaborate with these emerging mobility providers. However, at this time there are only a few pilot programs, so "there is a substantial gap between current practice and the anticipated potential for ondemand transit and transportation network companies to serve paratransit" and other transit markets. (p. 8) The study also notes that "emerging mobility services have not yet transformed public transportation. They will not replace high-quality, fixed-route transit as the most efficient means of moving people along dense urban corridors, and focusing on emerging mobility services is not a substitute for designing walkable, mixed-use neighborhoods or engaging in pedestrian- and transit-oriented planning." (p. 8)

Possible Applications: Examples of transit agencies using emerging mobility trends that might be applicable to NSPC region include:

- Pinellas Suncoast Transit Authority (PTSA) in Florida will subsidize up to \$3 Uber, taxi or paratransit trips for select underserved zones to a designated PTSA transit stop or transit center. The rider is responsible for any fare above \$3. This service began in early 2016 (and since the report publication) and is now being expanded with unlimited, on-demand Uber and taxi rides for \$1.
- PTSA is also now offering TD Late Shift, a pilot program demonstration aimed at helping low-income, unemployed residents overcome transportation barriers to employment. With this new program, riders can request up to 23 free rides per month between the hours of 9 p.m. and 6 a.m. Rides must be to a place of employment or residence. The project is funded via a \$300,000 grant from Florida's Commission for the Transportation Disadvantaged. (This service began post the report publication; more information can be found at http://www.psta.net/press/07-2016/index.php.)
- Kansas City Area Transportation Authority (KCATA) has partnered with Bridj, a transportation service provider to provide an on-demand transit service between two areas of the Kansas City area during peak periods. Riders use the Bridj app to enter where they want to go, are instructed to walk to a "rallying" point and are picked up with other passengers and then dropped off at their destination. There is no transfer required. Fares are the same as one-way bus fares and are charged through the Bridj app. Vehicles providing the service are 14 passenger vans operated by KCATA. Because this is a pilot program, results – including ridership and potential costs savings to KCATA – are unknown at this time. However, as of May

2017, KCATA decided not to extend the pilot, and Bridj shut down operations.

- The City of Altamonte Springs, FL is offering discounted Uber rides within the city limits and deeper discounted rides to the SunRail commuter rail station in the city.
- GoTriangle can help riders book with Uber for a portion of their trip through the transit agency's trip-planning apps and software (developed with TransLoc). MATA has a similar option.

Appendix B: Suitability Analysis Data

MAPC's Data Services department conducted the analysis to determine which areas within the NSPC subregion would the best candidates for local public transportation improvements. This analysis was conducted at the tract level using Community Viz, a ArcGIS add-in for planning applications. This analysis was run for three scenarios—traditional commutes, reverse commutes, and local commutes within the subregion. Each of the criteria listed for the scenarios below were assembled into a single feature class, then each measure is rescaled to a score from 0 to 100 and then combined to create an overall score for each scenario.

Traditional Commute Suitability Criteria

- 1. Population Density Number of residents per acre. A higher density resulted in a higher rating. (Source: Census 2010)
- 2. Vehicles per Household A lower number of vehicles per household resulted in a higher rating. (Source: Mass Vehicle Census, 2014 quarter 4)
- 3. Journey to Work Data for Traditional Commuting
 - a. To Boston/Cambridge Percent of residents of each Census tract who work outside the home who work in either Boston or Cambridge. A higher percentage of commuters resulted in a higher rating. Weighted at 10. (Source: Central Transportation Planning Package 2006-2010)
 - To Lowell and Haverhill- Percent of residents of each Census tract who work outside the home who work in either Lowell or Haverhill. A higher percentage of commuters resulted in a higher rating. Weighted at 3. (Source: CTPP 2006-2010)

- 4. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)
 - a. Distance from Census Tract centroid to nearest MBTA bus stop. Weighted at 5
 - b. Distance from Census Tract centroid to nearest Commuter Rail station. Weighted at 10
- 5. Minority population, low income households, population that does not speak English very well - Census tracts with high proportions of minority population, low income households, and population that does not speak English very well ranked higher. (Source: MassGIS/MAPC)
 - a. Percent minority population (Source: Census 2010)
 - Percent of population over the age of 5 that speaks a language other than English and does not speak English very well or does not speak English at all (ACS 5 year estimates 2010-2014)
 - c. Low-Income Households A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area is \$74,494, 80% of this is \$59,595. (Source: ACS 5-year estimates 2010-2014)

Reverse Commute Suitability Criteria

- 1. Employment Density Number of employees per acre. A higher density resulted in a higher rating. (Source: LEHD 2014)
- 2. Journey to Work Data for Reverse Commuting

- a. From Boston Percent of employees in each NSPC Census Tract who live in Boston or Cambridge. A higher share of commuters originating from Boston, or Cambridge resulted in a higher rating. Weighted at 10. (Source: CTPP 2006-2010)
- b. From Lowell or Haverhill Number of employees in each NSPC Census Tract who live in Lowell or Haverhill. A higher share of commuters originating from Lowell or Haverhill resulted in a higher rating. Weighted at 3. (Source: CTPP 2006-2010)
- 4. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)
 - a. Distance from Census Tract centroid to nearest MBTA bus stop. Weighted at 5.
 - b. Distance from Census Tract centroid to nearest Commuter Rail station. Weighted at 10.

Local Commute Suitability Criteria

- 1. Population Density Number of residents per acre. A higher density resulted in a higher rating. (Source: Census 2010)
- Employment Density Number of employees per acre. A higher density resulted in a higher rating. (Source: LEHD 2014)
- Vehicles per Household A higher percentage of households having less than one vehicle resulted in a higher rating. (Source: Mass Vehicle Census 2010)
- 4. Journey to Work Data for Intra-subregion Commuting Percent of workers in each NSPC Census tract who do not work at home who commuted from within the NSPC subregion. A higher number of workers commuting from an

NSPC town results in a higher rating. (Source: ACS 2006-2010 Journey to Work Data)

- Residents with Disabilities Census tracts which have a high percentage of disabled residents received a higher rating. (Source: Census 2010)
- 6. Proximity to MBTA Service- Census Tracts which have proximity to commuter rail stations or MBTA bus stops received a higher rating. (Source: MAPC analysis)
 - a. Distance from Census Tract centroid to nearest MBTA bus stop
 - b. Distance from Census Tract centroid to nearest Commuter Rail station
- 7. Minority population, low income households, population that does not speak English very well - Census tracts with high proportions of minority population, low income households, and population that does not speak English very well ranked higher. (Source: MassGIS/MAPC)
 - a. Percent minority population (Source: Census 2010)
 - Percent of population over the age of 5 that speaks a language other than English and does not speak English very well or does not speak English at all (ACS 5 year estimates 2010-2014)
 - c. Low-Income Households A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area is \$74,494, 80% of this is \$59,595. (Source: ACS 5-year estimates 2010-2014)

The following tables show the data used for each suitability analysis, as well as the rescaled analysis results for each census tract.

city	census tract ID	area acres	2010 population	population density (persons per acre)	employmen t , LEHD 2014	employment density (jobs per acre)	vehicles per HH	commute flow, NSPC to Boston and Cambridge, percent	commute flow, NSPC to Boston and Cambridge, MOE	commute flow, NSPC to Lowell or Haverhill, percent	commute flow, NSPC to Lowell or Haverhill, MOE
Lynnfield	2091	3,022	6,088	2.0	4,084	1.4	1.8	16.5	4.8	2.0	0.3
Lynnfield	2092	3,676	5,508	1.5	931	0.3	1.9	22.1	4.8	0.8	0.2
N Reading	3301	5,298	8,231	1.6	869	0.2	2.1	15.9	3.4	0.4	0.0
N Reading	3302	3,339	6,661	2.0	6,304	1.9	1.6	17.1	5.5	0.7	0.1
Wilmington	3311.01	2,780	3,011	1.1	7,007	2.5	1.9	18.4	5.5	3.7	0.6
Wilmington	3311.02	3,365	6,971	2.1	8,698	2.6	2.0	20.8	5.5	1.4	0.2
Wilmington	3312	1,604	5,346	3.3	1,469	0.9	2.1	13.4	4.0	1.0	0.2
Wilmington	3313	3,232	6,997	2.2	1,567	0.5	2.1	19.0	4.2	1.8	0.2
Burlington	3321	1,473	5,972	4.1	602	0.4	2.0	16.8	4.6	1.6	0.3
Burlington	3322	1,975	8,376	4.2	4,813	2.4	1.5	14.2	4.0	1.2	0.2
Burlington	3323	1,471	6,677	4.5	7,126	4.8	1.8	12.1	3.8	1.2	0.2
Burlington	3324	2,671	3,473	1.3	29,520	11.1	1.6	20.6	5.2	1.2	0.2
Woburn	3331	1,761	7,399	4.2	1,763	1.0	1.6	15.7	5.0	0.4	0.0
Woburn	3332	981	5,364	5.5	1,678	1.7	1.6	10.5	4.0	3.6	0.6
Woburn	3333	510	4,063	8.0	1,205	2.4	1.5	13.6	5.4	0.5	0.1
Woburn	3334	1,221	6,229	5.1	5,673	4.6	1.7	24.2	5.6	-	
Woburn	3335.01	1,224	5,001	4.1	9,406	7.7	1.7	14.3	4.5	-	
Woburn	3335.02	357	3,273	9.2	643	1.8	1.5	14.6	5.8	1.2	0.3
Woburn	3336	2,232	6,791	3.0	19,615	8.8	1.5	16.5	4.9	1.3	0.2
Reading	3341	1,090	6,718	6.2	546	0.5	1.5	26.5	5.2	0.7	0.1
Reading	3342	603	3,968	6.6	1,075	1.8	1.6	24.5	5.9	0.5	0.1
Reading	3343	2,426	7,605	3.1	1,326	0.5	2.0	21.9	4.5	0.4	0.0
Reading	3344	2,262	6,456	2.9	4,115	1.8	1.5	17.5	4.5	1.6	0.2
Wakefield	3351	1,274	5,728	4.5	4,419	3.5	1.5	19.9	4.9	1.8	0.3
Wakefield	3352	900	5,637	6.3	451	0.5	1.6	27.4	5.5	-	
Wakefield	3353.01	703	3,852	5.5	2,115	3.0	1.5	26.5	7.5	0.5	0.1
Wakefield	3353.02	1,315	4,621	3.5	5,867	4.5	1.7	24.5	6.9	0.4	0.1
Wakefield	3354	900	5,094	5.7	565	0.6	1.8	26.4	5.2	1.3	0.2
Stoneham	3371.01	376	3,095	8.2	319	0.8	1.6	20.1	5.8	0.6	0.1
Stoneham	3371.02	1,677	5,042	3.0	579	0.3	1.6	35.5	7.6	-	
Stoneham	3372.01	398	3,192	8.0	745	1.9	1.4	26.7	8.2	1.0	0.2
Stoneham	3372.02	727	4,849	6.7	2,094	2.9	1.5	23.4	6.5	0.9	0.2
Stoneham	3373	1,077	5,259	4.9	2,414	2.2	1.5	22.1	6.1	1.8	0.3
Winchester	3381	419	2,964	7.1	2,754	6.6	1.8	46.0	7.7	0.8	0.1
Winchester	3382	432	3,869	8.9	2,942	6.8	1.4	22.6	6.0	1.7	0.3
Winchester	3383	562	3,180	5.7	988	1.8	1.7	41.0	6.2	1.3	0.3
Winchester	3384	1,614	5,745	3.6	363	0.2	1.9	36.7	7.3	-	
Winchester	3385	1,033	5,616	5.4	1,070	1.0	1.8	43.4	6.2	1.3	0.2

HH: Household

MOE: Margin of Error

							percent of	percent of	
							population over	population over	
			distance to the				the age of 5 that	the age of 5 that	
		distance to the	nearest commuter				speaks English	speaks English	
		nearest MBTA	rail station, in	percent minority	percent low	percent low	less than very	less than very	analysis results,
city	census tract ID	bus stop, in miles	miles	population	income HH	income HH MOE	well	well MOE	rescaled
Lynnfield	2091	1.6	3.0	7.7	28.0	7.9	1.9	1.7	34.6
Lynnfield	2092	2.2	3.4	5.2	23.4	6.0	0.8	0.8	22.3
N Reading	3301	4.0	4.7	4.7	18.4	5.2	0.7	0.7	-
N Reading	3302	3.6	2.3	7.7	28.8	8.0	0.7	0.7	36.2
Wilmington	3311.01	4.7	1.3	10.2	30.3	8.5	0.5	0.8	30.4
Wilmington	3311.02	2.3	1.2	6.5	24.2	6.6	0.5	0.8	28.1
Wilmington	3312	3.7	1.1	7.6	25.1	6.8	0.4	0.6	21.3
Wilmington	3313	2.0	0.6	7.9	23.3	6.7	0.0	0.4	23.7
Burlington	3321	0.7	2.0	15.2	16.4	5.8	2.0	1.2	33.4
Burlington	3322	0.7	2.2	26.1	33.5	6.8	2.4	1.3	64.6
Burlington	3323	0.8	3.5	21.4	27.6	6.7	1.5	1.6	40.8
Burlington	3324	0.0	3.9	17.0	26.3	7.2	3.7	3.1	49.2
Woburn	3331	0.4	2.5	14.8	34.2	7.0	2.5	1.5	54.9
Woburn	3332	0.1	2.3	12.7	39.9	10.0	1.3	2.0	61.6
Woburn	3333	0.0	1.5	19.8	38.4	9.5	2.7	2.2	76.6
Woburn	3334	0.2	1.6	20.1	39.2	9.0	0.9	0.8	63.0
Woburn	3335.01	0.4	0.8	13.2	28.8	7.7	1.4	1.3	50.2
Woburn	3335.02	0.3	1.3	20.3	50.4	10.8	5.2	3.3	89.1
Woburn	3336	0.4	0.3	27.1	39.2	8.9	3.3	2.2	74.2
Reading	3341	0.7	0.8	9.1	22.5	6.6	0.2	0.5	67.9
Reading	3342	0.6	0.4	6.1	20.6	6.1	0.4	0.7	62.0
Reading	3343	1.5	1.6	5.1	19.5	6.0	0.7	1.0	26.0
Reading	3344	0.6	1.4	9.7	27.9	7.1	1.1	1.2	58.9
Wakefield	3351	0.2	0.9	5.8	37.2	9.6	0.4	0.7	63.3
Wakefield	3352	0.4	0.4	6.5	28.7	7.5	2.1	2.5	68.7
Wakefield	3353.01	0.4	0.9	9.6	30.7	7.9	6.0	5.0	79.5
Wakefield	3353.02	0.8	1.5	7.9	28.0	8.7	1.1	1.0	48.5
Wakefield	3354	0.2	0.4	6.3	19.8	6.6	0.9	0.8	58.1
Stoneham	3371.01	0.7	1.0	8.7	31.8	8.5	0.5	0.9	67.7
Stoneham	3371.02	0.6	1.0	8.5	24.4	5.9	0.6	0.7	58.2
Stoneham	3372.01	0.4	1.1	9.2	43.4	9.4	4.9	3.4	93.3
Stoneham	3372.02	0.4	1.6	8.0	37.9	10.9	0.8	0.9	68.9
Stoneham	3373	0.3	1.9	12.4	36.1	8.9	1.8	1.6	69.2
Winchester	3381	0.6	0.8	19.5	13.3	5.9	1.1	1.1	73.1
Winchester	3382	0.3	0.8	26.7	33.8	8.6	5.7	3.0	100.0
Winchester	3383	0.5	0.6	8.0	17.1	6.3	1.0	1.1	70.9
Winchester	3384	0.5	1.3	11.7	11.5	4.9	0.5	0.7	46.0
Winchester	3385	0.2	0.5	9.5			1.2	0.9	68.4

HH: Household MOE: Margin of Error

					commute flow,	commute flow,	commute flow,	commute flow,		distance to the	
				employment	Boston or	Boston or	Haverhill or	Haverhill or	distance to the	nearest commuter	
			employment,	density (jobs per	Cambridge to	Cambridge to	Lowell to NSPC,	Lowell to NSPC,	nearest MBTA	rail station, in	analysis results,
city	census tract ID	area acres	LEHD 2014	acre)	NSPC, percent	NSPC, MOE	percent	MOE	bus stop, in miles	miles	rescaled
Lynnfield	2091	3,022	4,084	1.4	5.0	3.7	5.4	2.9	1.6	3.0	38.7
Lynnfield	2092	3,676	931	0.3	0.0		1.9	3.4	2.2	3.4	0.0
N Reading	3301	5,298	869	0.2	4.5	3.9	5.7	4.9	4.0	4.7	10.7
N Reading	3302	3,339	6,304	1.9	4.6	2.5	10.9	4.3	3.6	2.3	43.5
Wilmington	3311.01	2,780	7,007	2.5	3.5	2.0	8.7	2.9	4.7	1.3	42.3
Wilmington	3311.02	3,365	8,698	2.6	3.4	2.4	8.7	2.4	2.3	1.2	50.8
Wilmington	3312	1,604	1,469	0.9	2.7	4.3	1.1	2.2	3.7	1.1	27.1
Wilmington	3313	3,232	1,567	0.5	8.6	5.3	2.7	2.5	2.0	0.6	65.5
Burlington	3321	1,473	602	0.4	4.9	5.8	2.5	4.3	0.7	2.0	41.6
Burlington	3322	1,975	4,813	2.4	5.4	2.2	4.6	2.1	0.7	2.2	53.6
Burlington	3323	1,471	7,126	4.8	3.6	1.7	4.3	1.9	0.8	3.5	43.9
Burlington	3324	2,671	29,520	11.1	7.1	1.4	6.4	1.4	0.0	3.9	88.8
Woburn	3331	1,761	1,763	1.0	3.5	2.0	2.7	1.8	0.4	2.5	34.4
Woburn	3332	981	1,678	1.7	3.9	5.0	2.3	3.2	0.1	2.3	41.8
Woburn	3333	510	1,205	2.4	6.3	5.8	5.9	4.1	0.0	1.5	66.6
Woburn	3334	1,221	5,673	4.6	5.9	2.3	5.0	3.2	0.2	1.6	72.1
Woburn	3335.01	1,224	9,406	7.7	5.9	2.6	4.0	2.2	0.4	0.8	88.6
Woburn	3335.02	357	643	1.8	5.2	5.1	1.7	2.3	0.3	1.3	54.4
Woburn	3336	2,232	19,615	8.8	5.7	1.4	7.9	1.7	0.4	0.3	100.0
Reading	3341	1,090	546	0.5	1.2	2.3	5.9	6.2	0.7	0.8	36.9
Reading	3342	603	1,075	1.8	8.3	6.1	2.5	2.4	0.6	0.4	75.6
Reading	3343	2,426	1,326	0.5	5.7	3.1	3.0	3.1	1.5	1.6	46.6
Reading	3344	2,262	4,115	1.8	0.8	1.3	1.5	1.6	0.6	1.4	31.0
Wakefield	3351	1,274	4,419	3.5	4.1	2.4	3.1	1.7	0.2	0.9	60.7
Wakefield	3352	900	451	0.5	0.0		1.8	3.5	0.4	0.4	29.8
Wakefield	3353.01	703	2,115	3.0	2.8	2.7	0.0		0.4	0.9	48.0
Wakefield	3353.02	1,315	5,867	4.5	2.0	1.3	2.8	1.7	0.8	1.5	48.1
Wakefield	3354	900	565	0.6	0.0		0.0		0.2	0.4	29.0
Stoneham	3371.01	376	319	0.8	2.4	3.8	3.9	4.3	0.7	1.0	40.1
Stoneham	3371.02	1,677	579	0.3	7.3	7.1	6.0	4.5	0.6	1.0	64.6
Stoneham	3372.01	398	745	1.9	8.8	5.5	0.9	1.3	0.4	1.1	72.8
Stoneham	3372.02	727	2,094	2.9	2.8	2.5	2.6	2.6	0.4	1.6	45.7
Stoneham	3373	1,077	2,414	2.2	3.1	2.1	2.0	1.5	0.3	1.9	41.8
Winchester	3381	419	2,754	6.6	3.5	3.7	2.5	2.2	0.6	0.8	69.2
Winchester	3382	432	2,942	6.8	1.8	1.6	5.0	4.3	0.3	0.8	65.9
Winchester	3383	562	988	1.8	5.0	3.6	1.8	2.5	0.5	0.6	58.0
Winchester	3384	1,614	363	0.2	1.0	2.8	0.0		0.5	1.3	24.6
Winchester	3385	1,033	1,070	1.0	3.2	2.3	0.0		0.2	0.5	46.0

HH: Household

MOE: Margin of Error

Т

				1.11					
				population		employment		commute flow	commute flow
city	consus tract ID	aroa acros	2010 population	density (persons		density (jobs per	vohiclos por HH	commute flow,	
Lyppfield	2001	3 022	2010 population 6 088		4 084	1 /	1 8		8 1
Lynnfield	2071	3,022	5 508	1.5	4,004	0.3	1.0	35.0	5.8
N Peading	3301	5 208	8 231	1.5	840	0.3	21	33.2	5.0
N Reading	3302	3,270	6,251	2.0	6 304	1.9	1.6	44.7	5.5
Wilmington	3311.01	2 780	3 01 1	1.1	7 007	25	1.0	35.1	6.9
Wilmington	3311.02	3 365	6 971	21	8,698	2.5	20	49.3	6.0
Wilmington	3312	1 604	5 346	2.1	1 469	0.9	2.0	40.2	5.0
Wilmington	3313	3 232	6 997	2.2	1,407	0.7	2.1	40.2	5.0
Burlington	3321	1.473	5,972	4.1	602	0.4	2.0	40.4	6.2
Burlington	3322	1,975	8.376	4.2	4,813	2.4	1.5	39.2	4.8
Burlington	3323	1.471	6,677	4.5	7,126	4.8	1.8	48.2	7.4
Burlington	3324	2.671	3.473	1.3	29.520	11.1	1.6	38.4	6.6
Woburn	3331	1.761	7.399	4.2	1.763	1.0	1.6	46.5	6.2
Woburn	3332	981	5.364	5.5	1.678	1.7	1.6	48.0	6.1
Woburn	3333	510	4.063	8.0	1.205	2.4	1.5	56.6	7.3
Woburn	3334	1.221	6.229	5.1	5,673	4.6	1.7	41.5	5.2
Woburn	3335.01	1,224	5,001	4.1	9,406	7.7	1.7	49.8	6.7
Woburn	3335.02	357	3.273	9.2	643	1.8	1.5	57.9	7.6
Woburn	3336	2,232	6,791	3.0	19,615	8.8	1.5	42.1	5.6
Reading	3341	1,090	, 6,718	6.2	546	0.5	1.5	45.0	4.8
Reading	3342	603	3,968	6.6	1,075	1.8	1.6	38.7	6.4
Reading	3343	2,426	7,605	3.1	1,326	0.5	2.0	43.7	5.5
Reading	3344	2,262	6,456	2.9	4,115	1.8	1.5	41.0	5.3
Wakefield	3351	1,274	5,728	4.5	4,419	3.5	1.5	44.3	6.7
Wakefield	3352	900	5,637	6.3	451	0.5	1.6	40.2	6.2
Wakefield	3353.01	703	3,852	5.5	2,115	3.0	1.5	39.9	7.2
Wakefield	3353.02	1,315	4,621	3.5	5,867	4.5	1.7	33.1	7.1
Wakefield	3354	900	5,094	5.7	565	0.6	1.8	25.9	5.2
Stoneham	3371.01	376	3,095	8.2	319	0.8	1.6	41.9	7.9
Stoneham	3371.02	1,677	5,042	3.0	579	0.3	1.6	35.3	7.1
Stoneham	3372.01	398	3,192	8.0	745	1.9	1.4	44.1	6.5
Stoneham	3372.02	727	4,849	6.7	2,094	2.9	1.5	42.5	7.4
Stoneham	3373	1,077	5,259	4.9	2,414	2.2	1.5	35.5	6.4
Winchester	3381	419	2,964	7.1	2,754	6.6	1.8	29.5	7.1
Winchester	3382	432	3,869	8.9	2,942	6.8	1.4	37.4	6.1
Winchester	3383	562	3,180	5.7	988	1.8	1.7	45.4	10.7
Winchester	3384	1,614	5,745	3.6	363	0.2	1.9	32.9	6.2
Winchester	3385	1,033	5,616	5.4	1,070	1.0	1.8	33.0	6.5

HH: Household MOE: Margin of Error

									percent of	percent of	
									population over	population over	
			distance to the						the age of 5 that	the age of 5 that	
		distance to the	nearest commuter			percent of	percent of		speaks English	speaks English	
		nearest MBTA	rail station, in	percent low	percent low	population with a	population with a	percent minority	less than very	less than very	analysis results,
city	census tract ID	bus stop, in miles	miles	income HH	income HH MOE	disability	disability, MOE	population	well	well MOE	rescaled
Lynnfield	2091	1.6	3.0	28.0	7.9	7.0	2.2	7.7	1.9	1.7	34.6
Lynnfield	2092	2.2	3.4	23.4	6.0	6.4	1.7	5.2	0.8	0.8	22.3
N Reading	3301	4.0	4.7	18.4	5.2	7.6	2.2	4.7	0.7	0.7	-
N Reading	3302	3.6	2.3	28.8	8.0	7.3	2.5	7.7	0.7	0.7	36.2
Wilmington	3311.01	4.7	1.3	30.3	8.5	8.1	2.6	10.2	0.5	0.8	30.4
Wilmington	3311.02	2.3	1.2	24.2	6.6	8.2	2.5	6.5	0.5	0.8	28.1
Wilmington	3312	3.7	1.1	25.1	6.8	7.8	1.8	7.6	0.4	0.6	21.3
Wilmington	3313	2.0	0.6	23.3	6.7	10.8	2.3	7.9	0.0	0.4	23.7
Burlington	3321	0.7	2.0	16.4	5.8	10.3	3.2	15.2	2.0	1.2	33.4
Burlington	3322	0.7	2.2	33.5	6.8	11.6	2.4	26.1	2.4	1.3	64.6
Burlington	3323	0.8	3.5	27.6	6.7	10.5	3.0	21.4	1.5	1.6	40.8
Burlington	3324	0.0	3.9	26.3	7.2	10.6	3.4	17.0	3.7	3.1	49.2
Woburn	3331	0.4	2.5	34.2	7.0	12.0	2.7	14.8	2.5	1.5	54.9
Woburn	3332	0.1	2.3	39.9	10.0	11.8	3.3	12.7	1.3	2.0	61.6
Woburn	3333	0.0	1.5	38.4	9.5	9.8	2.8	19.8	2.7	2.2	76.6
Woburn	3334	0.2	1.6	39.2	9.0	8.2	2.2	20.1	0.9	0.8	63.0
Woburn	3335.01	0.4	0.8	28.8	7.7	10.7	3.5	13.2	1.4	1.3	50.2
Woburn	3335.02	0.3	1.3	50.4	10.8	14.4	3.0	20.3	5.2	3.3	89.1
Woburn	3336	0.4	0.3	39.2	8.9	8.9	2.3	27.1	3.3	2.2	74.2
Reading	3341	0.7	0.8	22.5	6.6	6.0	2.0	9.1	0.2	0.5	67.9
Reading	3342	0.6	0.4	20.6	6.1	10.2	2.8	6.1	0.4	0.7	62.0
Reading	3343	1.5	1.6	19.5	6.0	5.5	1.7	5.1	0.7	1.0	26.0
Reading	3344	0.6	1.4	27.9	7.1	13.4	3.4	9.7	1.1	1.2	58.9
Wakefield	3351	0.2	0.9	37.2	9.6	8.1	2.5	5.8	0.4	0.7	63.3
Wakefield	3352	0.4	0.4	28.7	7.5	10.7	3.3	6.5	2.1	2.5	68.7
Wakefield	3353.01	0.4	0.9	30.7	7.9	10.6	2.7	9.6	6.0	5.0	79.5
Wakefield	3353.02	0.8	1.5	28.0	8.7	7.4	2.4	7.9	1.1	1.0	48.5
Wakefield	3354	0.2	0.4	19.8	6.6	7.7	2.2	6.3	0.9	0.8	58.1
Stoneham	3371.01	0.7	1.0	31.8	8.5	9.4	3.2	8.7	0.5	0.9	67.7
Stoneham	3371.02	0.6	1.0	24.4	5.9	9.2	2.6	8.5	0.6	0.7	58.2
Stoneham	3372.01	0.4	1.1	43.4	9.4	12.3	3.7	9.2	4.9	3.4	93.3
Stoneham	3372.02	0.4	1.6	37.9	10.9	14.0	4.3	8.0	0.8	0.9	68.9
Stoneham	3373	0.3	1.9	36.1	8.9	11.3	3.4	12.4	1.8	1.6	69.2
Winchester	3381	0.6	0.8	13.3	5.9	6.5	2.1	19.5	1.1	1.1	73.1
Winchester	3382	0.3	0.8	33.8	8.6	6.2	1.9	26.7	5.7	3.0	100.0
Winchester	3383	0.5	0.6	17.1	6.3	5.4	2.1	8.0	1.0	1.1	70.9
Winchester	3384	0.5	1.3	11.5	4.9	4.9	1.7	11.7	0.5	0.7	46.0
Winchester	3385	0.2	0.5	19.4	5.7	3.1	1.2	9.5	1.2	0.9	68.4

HH: Household

MOE: Margin of Error

Appendix C: Summary of Public Presentation of Draft Recommendations - North Suburban Mobility Study

The Metropolitan Area Planning Council (MAPC) held a public meeting on March 28, 2017 at the Al Merritt Community Room at Market Street in Lynnfield for the North Suburban Planning Council (NSPC) Mobility Study. This purpose of the meeting was to review the MAPC's draft recommendations and develop possible next steps.

Meeting participants: Travis Pollack, Amanda Chisholm and Eliza Wallace, MAPC; Heather Sievers, Town of Lynnfield; Liz Bonentre and Josh Morris, Town of Burlington; Tina Cassidy, City of Woburn; Brian Szakely, Town of Winchester; Erin Wortman, Town of Stoneham; Thomas Younger, Town of Stoneham; Jim Murphy, North Suburban Chamber of Commerce, Jeff Bennett, 128 Business Council; Sharon Iovanni, StonehamBank/Stoneham Transportation Advisory Committee; W. Bruce Cooper, Town of Reading; Cody Case, TransAction Associates/Middlesex 3 TMA; Heather Maguire, Woburn Business Association; Jennifer Welter, Stoneham Chamber of Commerce; Andrea Leary, Junction TMO; Lucas Toffoli, Cummings Properties.

Travis Pollack and Eliza Wallace summarized the suitability analysis and draft recommendations in the NSPC mobility study. The study recommendations included four options that could be used to improve first and last mile transit connections:

- Improvements to MBTA bus services
- Local shuttles, either as employment shuttles or as public transit routes
- Partnerships with transportation network companies (TNCs) such as Uber or Lyft
- Local transit (mobility) hubs, with improved connections with services such as ride sharing, bike sharing, private shuttles, taxis and car sharing (e.g., Zipcar), connections with regional greenways or bikeways and improved pedestrian signage

The recommendations are inclusive, meaning that a variety of improvements could occur over time and the municipalities did not need to choose one over another.

Participants asked questions during the presentation, and then were divided into five small groups to review the recommendations on the map and provide feedback. Finally, the meeting participants used dots to vote on which options they through might have higher impacts, and which might be implemented in the long- or short-term.

Below is a summary of questions received, as well as comments, both verbally and via the two exercises.

Questions:

- Can we get data on exactly how many commuters are taking transit in the subregion? *A: There are studies with some estimates and we will make sure to include those in the final report.*
- Did we consider how many people were riding on certain bus routes, or which ones were the most utilized etc. as part of our analysis? A: Yes, but more important in the analysis were the overall transit connections and residential and employment centers.
- Did we consider existing TMA routes when we laid out the shuttle routes or MBTA bus stops that might be closing down? *A: We did look at existing TMA routes but did not consider MBTA stops that might be removed.*
- Can we have someone at Uber or Lyft come in and talk to the communities about costs associated with a partnership, etc. *A: MAPC staff met with a representative with Uber about*

potential partnerships and we are actively looking to talk with a representative from Lyft as well.

Comments:

- If we create local transit hubs we need to be careful of other issues we might create like Burlington Mall becoming a park n ride. The details on the transit hubs will be important if these are selected.
- Coordination across regional TMA's is critical.
- We should find a way to funnel NSPC town feedback into MBTA review process of bus routes.
- There was lots of interest in Uber as maybe the best option in a place like Lynnfield, as well as for Reading, Stoneham, Winchester and Burlington.
- There was concern that shuttles to commuter rail stations may not be viable, given that commuter rail is less frequent than rapid transit. Most TMAs or other employer shuttles connect with the end of rapid transit (Red, Orange, Green or Blue) because of their frequency (every 5 to 7 minutes versus 30 to 60 minutes for commuter rail).
- Suggest looking at a shuttle from Alewife (end of Red Line) to employment centers and new transit hub in Burlington.
- Suggest a shuttle connecting Anderson/Woburn and Ballardvale commuter rail stations, serving employment centers along I-93, including Concord Street (North Reading) and Ballardvale Street (in Wilmington and Ballardvale).
- If there are local shuttles, it may make more sense to have them operate as more than employer shuttles, but also serve the public during off-peak periods to ensure ridership.
- We should look at more east-west shuttles. The map appears to show mostly more north-south connections. Consider a shuttle that would connect Wakefield to Anderson/Woburn.

- Consider a recommendation to extend MBTA route 99 further north, and maybe have a local transit hub somewhere in Stoneham.
- If employers help fund shuttles, there should be a variety of sponsors public and private so that the service is not wholly dependent on any one sponsor.

The votes for the recommendations (impacts and implementation) are shown below, with the highest votes in red.

	Imp	acts	Implementation			
	Higher	Lower	Short-term	Long-term		
Transit/ Mobility Hubs	13	4	7	7		
MBTA Route Revisions	10	5	6.5	5.5		
Local Shuttles	20	0	14	4		
TNC Partnerships	16	0	15	1		

Next Steps:

- MAPC to finalize report.
- Municipalities that are most interested can form working group to flesh out the phases and evaluate costs to implement pilot.
- MAPC can help with finding speakers to meet with subregion who can describe the steps towards implementation, including 128 Business Council (TMA shuttles); Crosstown Connect (TMA that operates employer shuttles and local public transportation in Acton and other towns); and representatives with Uber and Lyft.

Below are photos from the event.









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