

## MEMORANDUM

**DATE** October 7, 2010  
**TO** Transportation Planning and Programming Committee  
of the Boston Region Metropolitan Planning Organization  
**FROM** Arnold J. Soolman, CTPS Director  
**RE** Work Program for: MBTA Neighborhood Maps and Bus Shelter  
Maps

### ACTION REQUIRED

Review and approval

### PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Bay Transportation Authority, vote to approve the work program for MBTA Neighborhood Maps, Spider Maps and Bus Shelter Maps in the form of this memorandum dated October 7, 2010.

### PROJECT IDENTIFICATION

**Unified Planning Work Program Classification**  
Technical Support/Operations Analysis Projects

**CTPS Project Number**  
14314

**Client**  
Massachusetts Bay Transportation Authority  
*Project Supervisor:* Erik Scheier

**CTPS Project Supervisors**  
*Manager:* Jane Gillis  
*Principal:* Kenneth Dumas

**Funding**  
Amendment to existing MBTA Contract

## IMPACT ON MPO WORK

The MPO staff has sufficient resources to complete this work in a capable and timely manner. By undertaking this work, the MPO staff will neither delay the completion of nor reduce the quality of programmed MPO work.

## BACKGROUND

In 2007 the MBTA requested that CTPS create neighborhood maps for most of its stations. These neighborhood maps display a half-mile radius from a MBTA station complete with street names, buildings, points-of-interest as well as connecting MBTA bus routes. CTPS has completed that task, and now the MBTA needs updates for 30 existing neighborhood maps and an additional 10 new neighborhood maps to complete its inventory. The updates to the original 30 maps are necessary so that they will comply with newly adopted design and accessibility standards. The MBTA also needs new maps for its bus shelters, which are manufactured and maintained by the companies CEMUSA and JCDecaux.

## OBJECTIVE(S)

Create 10 new neighborhood maps, update the existing 30 neighborhood maps and create new maps for the MBTA's CEMUSA and JCDecaux bus shelters.

## WORK DESCRIPTION

Create the 10 new maps one at a time in an order determined by the MBTA. The stations are, BU East, BU West, BU Central, Boston College, Newton Highlands, Newton Center, Brookline Village, Brookline Hills, Waban, and Woodland. Update the 30 existing neighborhood maps based on new MBTA design and accessibility standards. Create new "community specific" MBTA system maps for the bus shelters, which are manufactured and maintained by the companies CEMUSA and JCDecaux.

### **Task 1 Create 10 First-Draft Maps**

Using the latest mapping software and data, CTPS will create each neighborhood map showing streets, street names, building footprints, points of interest and MBTA bus routes. Each map will have a "You Are Here" designation at the station location as well as a quarter-mile-radius ring depicting the distance of a 5-10-minute walk from the station.

### **Task 2 Update Existing Neighborhood Maps**

With new MBTA design and accessibility standards supplied by the MBTA, CTPS will update each existing neighborhood map showing streets, street names, building footprints, points of interest and MBTA bus routes.

**Task 3 Create New CEMUSA and JCDecaux Bus Shelter Maps**

Using the existing MBTA System Map as a base, CTPS will create a new large scale master base map that will be customized for communities containing bus shelters manufactured and maintained by the companies CEMUSA and JCDecaux.

**Task 4 Correct Proofed Maps and Deliver Final Files**

Once each draft map is complete the MBTA will proof it; CTPS will make any desired changes to each map. Then the final computer files will be made available to the MBTA print shop for the production of the final maps to be installed at each station.

**ESTIMATED SCHEDULE**

It is estimated that this project would be completed 36 weeks after the notice to proceed is received. An estimated schedule is presented in Exhibit 1.

**ESTIMATED COST**

The total cost of this project is estimated to be \$40,464. This includes the cost of 18 person-weeks of staff time and overhead at the rate of 90.69 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/KAD/kad

Exhibit 1

ESTIMATED SCHEDULE

MBTA Neighborhood Maps and Bus Shelter Maps

Task	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	
1. Create 10 First-Draft Maps	█												
2. Update Existing Neighborhood Maps					█								
3. Create New Bus Shelter Maps						█							
4. Correct Proofed Maps, Deliver Files									█				

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Exhibit 2

ESTIMATED COST

MBTA Neighborhood Maps and Bus Shelter Maps

<b>Direct Salary and Overhead</b>	<b>\$40,423</b>
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Task	Person-Weeks			Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-4	Total			
1. Create 10 First-Draft Maps		8.0	8.0	\$9,431	\$8,553	\$17,984
2. Update Existing Neighborhood Maps		2.0	2.0	\$2,358	\$2,138	\$4,496
3. Create New Bus Shelter Maps		6.0	6.0	\$7,073	\$6,415	\$13,488
4. Correct Proofed Maps, Deliver Files	0.1	1.9	2.0	\$2,337	\$2,119	\$4,455
Total	0.1	17.9	18.0	\$21,198	\$19,225	\$40,423

<b>Other Direct Costs</b>	<b>\$0</b>
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<b>TOTAL COST</b>	<b>\$40,423</b>
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# Greenbush Commuter Rail Before-and-After Study



a report produced by the Central Transportation Planning Staff  
for the Massachusetts Bay Transportation Authority

# **Greenbush Commuter Rail Before-and-After Study**

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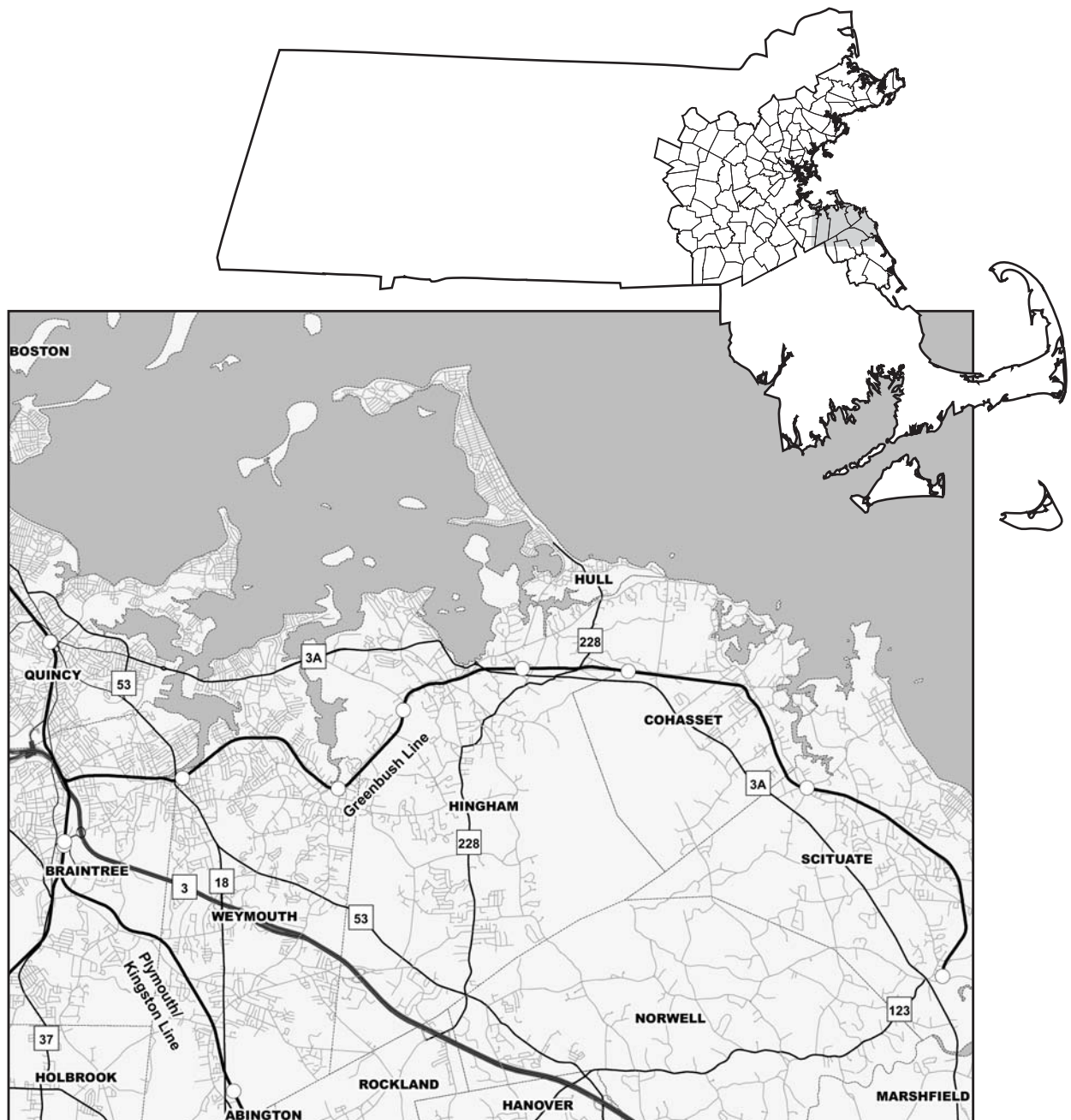
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# ABSTRACT

The Greenbush Before-and-After Study analyzed the effect of the commencement of service on the Massachusetts Bay Transportation Authority's Greenbush commuter rail line, which reopened on October 31, 2007, on travel patterns in the towns of Quincy, Weymouth, Hingham, Hull, Cohasset, and Scituate, and other, surrounding towns. Before-and-after data were gathered on the utilization of other public transportation modes as well as on highway traffic volumes. The operation of the Greenbush Line appears to have had the greatest impact on commuter boat utilization, attracting a number of passengers away from that service.

## *Acknowledgments*

We wish to thank Lauren Coughlin, Mary Ellen Grogan, Melissa Dullea, and Sandra Clarey of the Massachusetts Bay Transportation Authority for their assistance with our obtaining the transit ridership data presented in this study.

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*GREENBUSH BEFORE-AND-AFTER STUDY*

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**KEYWORDS**

transit  
commuter rail  
impact study

# EXECUTIVE SUMMARY



The Greenbush Before-and-After Study analyzed the effect of the commencement of service on the Massachusetts Bay Transportation Authority's Greenbush commuter rail line, which reopened on October 31, 2007, on travel patterns in the towns of Quincy, Weymouth, Hingham, Hull, Cohasset, and Scituate, and other, surrounding towns. Before-and-after data were gathered on the utilization of other public transportation modes as well as on highway traffic volumes. In addition, as part of the data collection effort for the 2009 Systemwide Passenger Survey, a question was asked of riders on the Greenbush Line about their prior modal choices.

The travel modal impact can be broken down into three categories. First, there are modes that do not appear to have been affected in any way by the opening of the Greenbush Line. These modes are the directly operated and privately contracted local bus routes operating mainly in the western section of the study area and in the town of Hull.

The second category of impact applies to those modes that may have been affected, but likely only in a minor way; in these cases, making a clear correlation between the opening of the Greenbush Line and any changes in modal utilization is difficult. These modes are the Red Line at Braintree, Quincy Adams, and Quincy Center Stations, as well as private vehicle use, as measured by highway volumes and ramp counts. An example of lack of clear correlation is that, while survey results indicate that a large portion of riders on the Greenbush Line formerly drove alone, daily highway volumes dwarf this number, making it difficult to link the shift with any perceptible change in highway traffic.

The third type of impact is a shift in trips towards commuter rail and away from the mode in question. The mode most affected by the opening of the Greenbush Line is commuter boat. Ridership on this mode decreased by slightly less than 25 percent in the year following the opening in terms of both annual ridership and average daily weekday ridership. Ridership on the nearby

Plymouth/Kingston commuter rail line, particularly at South Weymouth Station, also declined after the opening. In addition, express bus ridership appears to have been affected by the opening of the Greenbush Line.

The three modes most affected by the opening of the Greenbush Line – commuter boat, other commuter rail, and express bus – all share the characteristic of largely serving a demand for commute travel. The majority of trips on these modes are scheduled during commute hours; pass prices are set to be cost-effective for the typical commuting schedule; and each mode has a terminal in downtown Boston. The decrease in ridership on commuter boat, other nearby commuter rail, and express bus immediately following the opening of the Greenbush commuter rail line on October 31, 2007, would therefore seem to confirm that there is a competition among these modes, largely for commute trips. However, as shown by the 2009 Systemwide Passenger Survey, while a significant percentage of riders on the Greenbush Line appear to have switched from other transit modes, approximately one-half of the riders appear to be new transit riders. As is not uncommon with new transit investments, therefore, the opening of the Greenbush Line has both drawn away riders from existing transit modes and attracted new transit riders who formerly drove.

# CHAPTER 1



## Introduction

MBTA commuter rail service on the Greenbush Line recommenced on October 31, 2007. Commuter rail service on the Greenbush Line and the two other branches of the Old Colony Railroad, to Plymouth and Middleborough, had ended in 1959, although freight service had continued on the Plymouth and Middleborough branches. On these two lines commuter service resumed in 1997, with the Greenbush Line also intended for restoration at that time. However, concern over the environmental impacts of running trains along the Greenbush right-of-way, which had not been used in almost 30 years, delayed this line's reopening.

The reinstated Greenbush service was intended to provide an additional travel option for communities in the South Shore area of metropolitan Boston. Forecasts of 2010 commuter rail ridership on the Greenbush Line corridor to Boston and Cambridge, made as part of the *Final Environmental Impact Report for Transportation Improvements in the Greenbush Line Corridor* (FEIR),<sup>1</sup> projected inbound ridership during the AM peak time period of 3,230. This was a projected 40 percent increase over the base year (2000), as compared to a projected 4 percent increase under the no-build scenario. Automobile traffic was projected to decrease by 9 percent, compared to an increase of 4 percent under the no-build scenario. The majority of trips on the Greenbush Line were forecast to be commute trips, though this was not expected to significantly reduce highway congestion. Commuter boat ridership was projected to decline by 29 percent by 2010, as many of these riders were expected to switch to the Greenbush Line.

In recent years, when the MBTA has implemented a major new transit service, it has been a practice to conduct a study of the changes in regional travel patterns attributable to the new service. Such studies have included passenger counts on other transportation facilities in the same area before and after implementation of the new service, along with passenger counts and surveys

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<sup>1</sup> Massachusetts Bay Transportation Authority, *Final Environmental Impact Report: Transportation Improvements in the Greenbush Line Corridor* (Boston, MA, 2001): IV-13.



on the new service itself. The present study collected and analyzed such information for analysis of the Greenbush Line's impact.

Ridership counts are used to present a picture of ridership before and after the opening of the Greenbush Line. Vehicle counts at transit station parking lots provide another measure of ridership, particularly for modes where the majority of riders access the mode via park-and-ride. Surveys of vehicle license plates at station parking lots provide an indication of where riders are beginning their trip. The 2009 Systemwide Passenger Survey also asked riders on the Greenbush Line about their trip origin as well as various other trip characteristics. In addition, a specific question was added to the survey form asking riders to list the ways in which they formerly made the same trip before the opening of the Greenbush Line.

This report begins with a description of the study area and an overview of its transportation network. It then follows with a discussion and comparison of travel pricing and travel times for each of the modes serving the study area. Finally, it presents travel data in terms of ridership or volumes before and after the opening of the Greenbush Line and draws conclusions about the impact of this opening on other travel options.

# CHAPTER 2



## Study Area Overview

The study area covers most of that portion of the South Shore area of metropolitan Boston which lies between Route 3 and the coast. It includes the towns of Quincy, Weymouth, Hingham, Hull, Cohasset, and Scituate, and other, surrounding towns.

### 2.1 HIGHWAYS

The primary roads in the study area are Route 3 to the south and Route 3A to the north. Although Route 3 generally runs north-south, in the Greenbush study area it runs east-west, as does Route 3A. The three primary connecting roads between Routes 3 and 3A are, from west to east, Routes 53/18, 228, and 123. Figure 1 shows these and other routes composing the road network in the study area.

### 2.2 TRANSIT SERVICES

The transit network is depicted in Figure 2. From its terminus in Scituate, the Greenbush commuter rail line serves seven stations over approximately 16 miles before joining at Quincy Center Station with the Old Colony Lines to Plymouth and Middleborough/Lakeville. From Quincy Center the three lines proceed northward, terminating at South Station in Boston. Two stations on the Greenbush Line are located in the town of Weymouth: one to the west on the town border of Braintree at Weymouth Landing and the other in East Weymouth. The town of Hingham also has two stations: one in the west of the town and the other at Nantasket Junction to the east. The town of Cohasset has one commuter rail station near the town border with Hingham, and the town of Scituate has two stations: one in North Scituate and the other in the south at Greenbush. All of the commuter rail stations have park-and-ride lots.

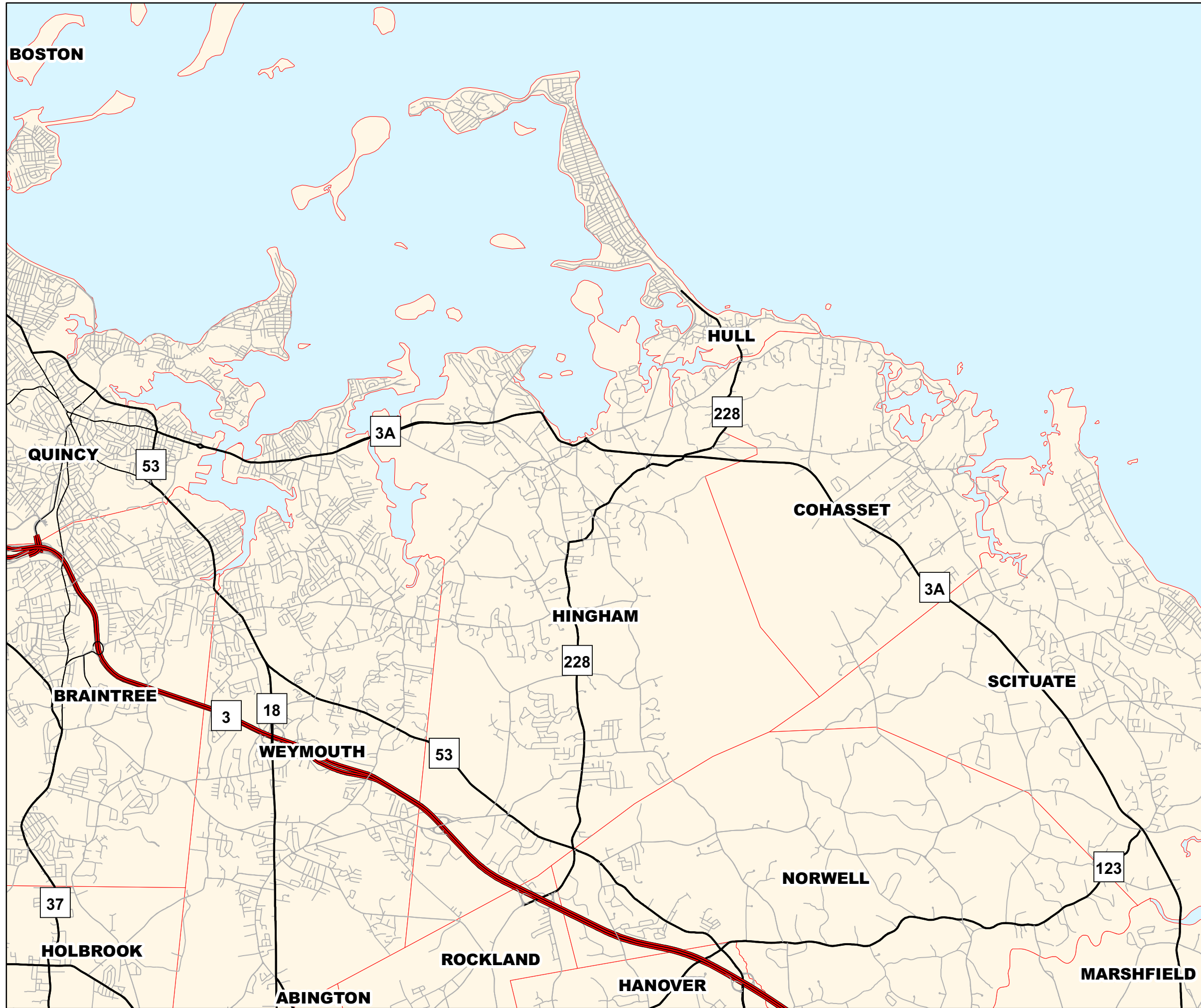
The Red Line, MBTA rapid transit, has three stations in the study area: Quincy Center, Quincy Adams, and Braintree.

Portions of the study area are also served by commuter boat routes running to

Boston. Commuter boat terminals are located at the Fore River Shipyard in Quincy, Hewitt's Cove in Hingham, and Pemberton Point in Hull and serve terminals in downtown Boston and at Logan Airport. The F1 commuter boat serves the terminal at Hewitt's Cove and Rowes Wharf in Boston Harbor. The F2 commuter boat serves the terminal at the Fore River Shipyard, with variations of the F2 route serving Pemberton Point in Hull, Logan Airport, and Long Wharf in Boston Harbor. All of the commuter boat terminals have park-and-ride lots.








Several local bus routes serve the western portion of the Greenbush study area and provide transfer opportunities to commuter rail, rapid transit, and commuter boat. All of the following routes except one (specified below) are operated directly by the MBTA and come out of Quincy Center Station. Routes 220 (Quincy Center Station–Hingham, serving Hewitt's Cove), 221 (Quincy Center Station–Fort Point), and 222 (Quincy Center Station–East Weymouth) serve portions of Quincy, Weymouth, and Hingham via Route 3A. Routes 220 and 222, but not Route 221, serve neighborhoods also served by the Greenbush Line. Route 714 (Pemberton Point, Hull–Station Street, Hingham), a contracted route operated by JBL Bus Lines, joins with Route 220 in Hingham and serves the Nantasket Junction commuter rail station as well as the town of Hull out to Pemberton Point. Route 225 (Quincy Center Station–Weymouth Landing/Columbia Square) serves the northeastern corner of Braintree and the western portion of Weymouth, including the Weymouth Landing/East Braintree commuter rail station. On the western border of the study area, Routes 230 (Quincy Center Station–Montello commuter rail station) and 236 (Quincy Center Station–South Shore Plaza) serve the study area's three Red Line stations.

The Plymouth and Brockton Street Railway Company operates express bus service between Plymouth/Hyannis and Boston/Logan Airport via the Rockland park-and-ride facility located at the junction of Route 3 and Route 228 in the town of Rockland.



**FIGURE 1**  
**Road Network**

**Legend**

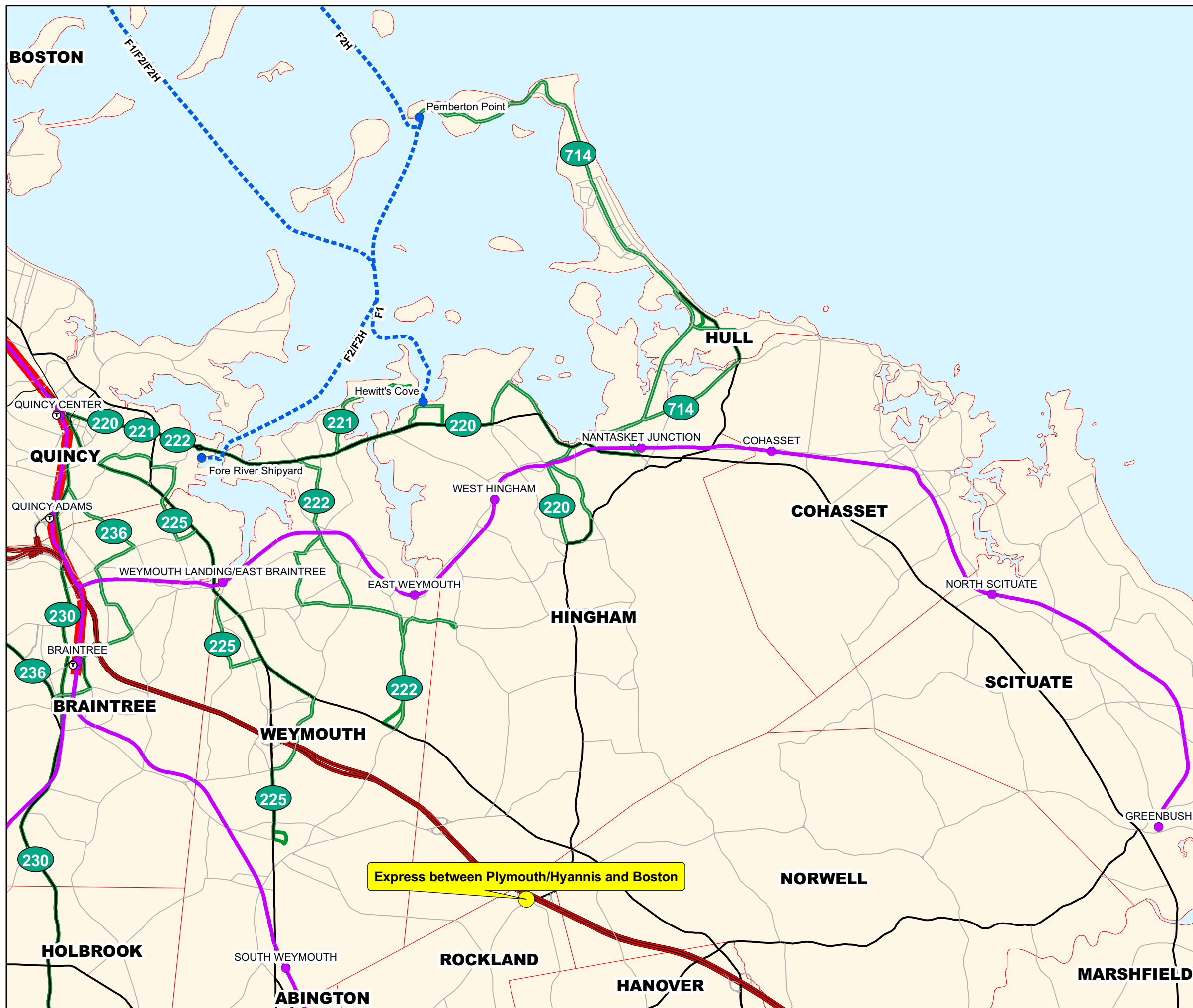
-  Interstate
-  Other limited-access road
-  Federal route
-  State route
-  Other arterial
-  Minor road
-  Town boundary

*Data taken from the CTPS road inventory and MBTA layer files.*



*Greenbush Before-and-After Study*

**CTPS**

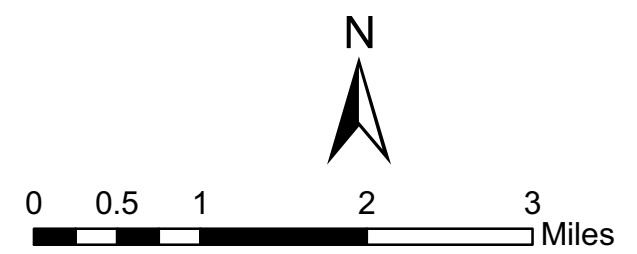


**FIGURE 2**  
**Transit Network**

**Legend**

- Commuter boat terminal
- - - Commuter boat
- Ⓞ Rapid transit station
- Commuter rail station
- Commuter rail
- Express bus
- Local bus route
- Red Line
- Town boundary

*Data taken from the CTPS road inventory and MBTA layer files.*



*Greenbush Before-and-After Study*

# CHAPTER 3



## Travel Pricing, Times, and Headways

This chapter presents current characteristics of the study area’s travel options.

### 3.1 TRAVEL PRICING

There are no tolls on any of the roads serving the Greenbush study area.

Stations along the Greenbush Line span commuter rail Zones 2 through 6, as shown in Table 1, which also lists the single-ride fare and the pass price for each station. Senior and student fares are approximately one-half the adult single-ride fares.

**TABLE 1**  
**Greenbush Line Fares by Station**

Station	Zone	Single-Ride Adult Fare	Monthly Pass Price
Weymouth Landing/East Braintree	2	\$4.75	\$151.00
East Weymouth	2	\$4.75	\$151.00
West Hingham	3	\$5.25	\$163.00
Nantasket Junction	4	\$5.75	\$186.00
Cohasset	4	\$5.75	\$186.00
North Scituate	5	\$6.25	\$210.00
Greenbush	6	\$6.75	\$223.00

Fares on MBTA and MBTA-contracted local bus routes are \$1.25 with a CharlieCard and \$1.50 with a CharlieTicket for a single-ride trip. The senior bus fare is \$0.40, and the student bus fare is \$0.60. The monthly Local Bus pass is \$40.00.

Red Line fares are \$1.70 and \$2.00 with a CharlieCard and CharlieTicket, respectively. However, the transfer price from local bus to the Red Line is \$0.45 with a CharlieCard; transfers from the Red Line to local bus are free. No transfer discount is provided with a CharlieTicket. Seniors pay \$0.60 and students pay \$0.85 for the Red Line. The monthly LinkPass (covering travel on

all rapid transit as well as local bus) costs \$59.00.

The adult commuter boat fare for users of any of the three terminals in the Greenbush study area is \$6.00 for trips to or from Boston and \$12.00 for trips to or from Logan Airport (\$6.00 for Logan trips for riders with a monthly Commuter Boat pass). Senior and student fares are one-half the adult fares. Ten-ride packages of adult fares are sold for \$54.00. The monthly Commuter Boat pass is \$198.00.

Express bus fares between Boston and the Rockland park-and-ride facility are \$12.00 for a one-way trip and \$22.00 for a round-trip. Children pay \$6.00 one-way and \$12.00 round-trip. Ten-ride packages are available for \$55.00.

Parking fees at park-and-ride lots throughout the Greenbush study area are presented in Table 2.

**TABLE 2**  
**Park-and-Ride Lot Parking Fees**

<b>Mode</b>	<b>Town</b>	<b>Lot Name (Ownership)</b>	<b>Parking Fee</b>
Commuter boat	Quincy	Fore River Shipyard (MBTA)	\$3.00
	Hingham	Hewitt's Cove (MBTA)	\$3.00
	Hingham	Hewitt's Cove (Private)	\$3.00
	Hull	Pemberton Point (Town)	Free
Express bus	Rockland	Rockland Park-and-Ride (Town)	Free
Commuter rail	Weymouth	Weymouth Landing/East Braintree (MBTA)	\$4.00
	Weymouth	East Weymouth (MBTA)	\$4.00
	Hingham	West Hingham (MBTA)	\$4.00
	Hingham	Nantasket Junction (MBTA)	\$4.00
	Cohasset	Cohasset (MBTA)	\$4.00
	Scituate	North Scituate (MBTA)	\$4.00
	Scituate	Greenbush (MBTA)	\$4.00
Subway	Braintree	Braintree Station (MBTA)	\$7.00
	Quincy	Quincy Adams Station (MBTA)	\$7.00
	Quincy	Quincy Center Station (MBTA)	\$7.00

## 3.2 TRAVEL TIMES

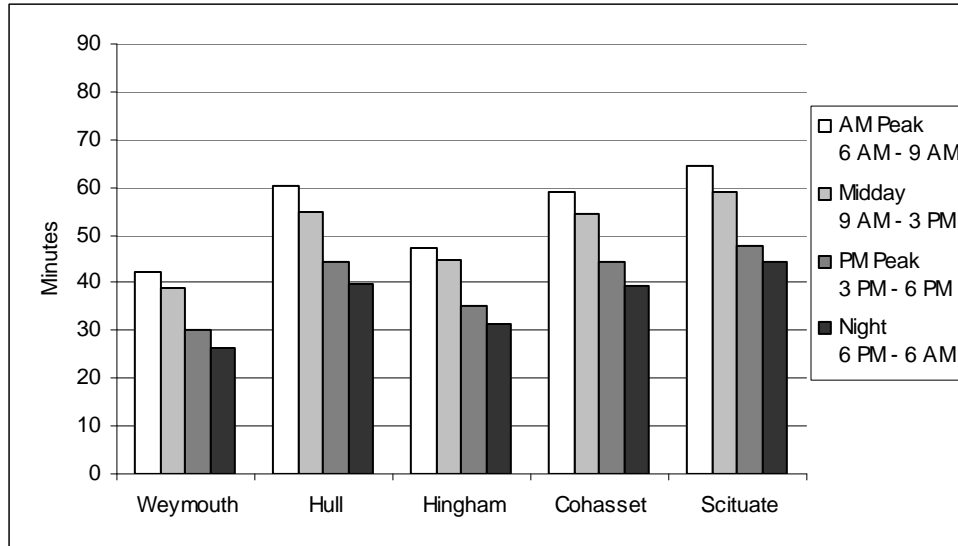
### 3.2.1 HIGHWAY

Highway travel times between downtown Boston and the central towns in the Greenbush study area by time period are presented in Figures 3 and 4. Figure 3 shows travel times from a transportation analysis zone (TAZ)<sup>2</sup> at the center of each town to downtown Boston (more specifically, to the TAZ in which the

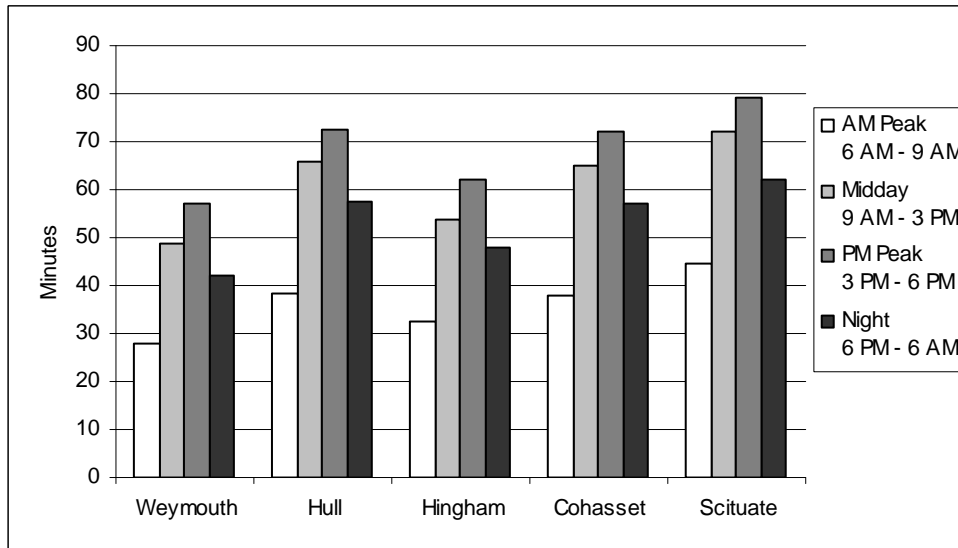
<sup>2</sup> Transportation analysis zones are the geographic unit most commonly used to input and analyze data in a regional travel demand model. When TAZs are being defined, their boundaries are typically set so that the zones have similar magnitudes of trip attractions and productions. The boundaries themselves are typically based on major roads, town boundaries, or physical barriers.

South Station bus and rail terminal is located). Figure 4 shows travel times from downtown Boston to each town.<sup>3</sup> As shown in the figures, the longest travel times occur in outbound travel from Boston, with both midday and PM peak travel times in this direction exceeding the longest inbound travel time to Boston in the AM peak time period. As could be expected, towns lying at a greater distance from Boston have longer travel times to and from Boston.

**FIGURE 3**  
Inbound Highway Travel Times to Boston by Time Period



**FIGURE 4**  
Outbound Highway Travel Times from Boston by Time Period



<sup>3</sup> TAZ-to-TAZ travel times are determined using the CTPS regional travel demand model.



### 3.2.2 GREENBUSH LINE

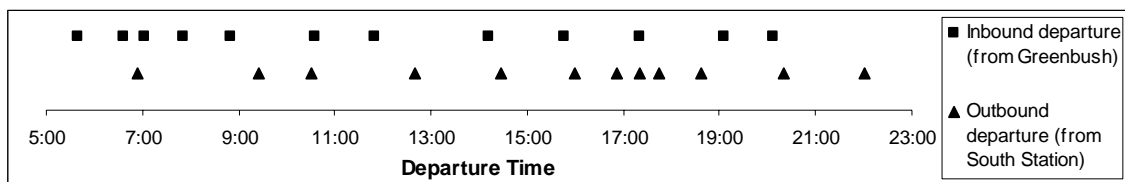
According to the most recent timetable, trips between South Station and Greenbush Station are scheduled to take, on average, approximately one hour. This trip time is better than highway travel times to and from Scituate in the peak directions, particularly in the PM peak time period (outbound from downtown Boston to Scituate). The average scheduled trip times in both the inbound and outbound directions between each station on the Greenbush Line and South Station in downtown Boston are presented in Table 3.

**TABLE 3**  
Greenbush Line Average Daily Scheduled Trip Times to/from South Station

Station	Inbound Trips to South Station	Outbound Trips from South Station
Weymouth Landing/East Braintree	0:27	0:22
East Weymouth	0:33	0:28
West Hingham	0:37	0:33
Nantasket Junction	0:42	0:37
Cohasset	0:46	0:40
North Scituate	0:53	0:48
Greenbush	1:00	0:58

In both directions on the Greenbush Line, the number of trips and the scheduled headways reflect the study area’s prevalent travel patterns. For instance, trips are clustered in the inbound direction during the AM peak time period and in the outbound direction during the PM peak time period, reflecting a pattern of commute travel to Boston in the morning and from Boston in the evening. Figure 5 shows the times between scheduled departures as well as the clustering of inbound and outbound trips in the AM and PM peak time periods, respectively.

**FIGURE 5**  
Greenbush Line Scheduled Departure Times



### 3.2.3 LOCAL BUS

As described in Chapter 2, local bus service operates in the western section of the study area and provides transfer opportunities to commuter rail, commuter boat, and rapid transit. Table 4 shows the total running times of the five routes.

**TABLE 4**  
**Local Bus Routes: AM and PM Peak Running Times**

Route #	Inbound Terminus	Outbound Terminus	Running Time	
			Inbound AM Peak	Outbound PM Peak
220	Hingham Center	Quincy Ctr. Sta.	28	32
221	Fort Point	Quincy Ctr. Sta.	17	18
222	East Weymouth	Quincy Ctr. Sta.	30	25
225	Weymouth Landing	Quincy Ctr. Sta.	21	24
714	Pemberton Point, Hull	Station St., Hingham	28	26

Routes 220, 221, and 222 provide service along Route 3A between Quincy Center Station and the Bicknell Square neighborhood in North Weymouth (before diverging), with an average between them of 11 arrivals and departures in the AM peak hour and 9 arrivals and departures in the PM peak hour at Quincy Center Station. Table 5 shows the various service headways of the local bus routes in the Greenbush study area.

**TABLE 5**  
**Local Bus Routes: Service Headways in Minutes**

Route	Peak Hour	Day	Night	Sat.	Sun.
220 (Quincy Ctr. Sta. – Hingham Center)	10	60	60	60	60
221 (Quincy Ctr. Sta. – Fort Point)	Limited*	Limited*	None	None	None
222 (Quincy Ctr. Sta. – East Weymouth)	15	30	60	30	60
225 (Quincy Ctr. Sta. – Weymouth Landing or Columbian Square)	10	30	60	30	60
714 (Pemberton Point, Hull – Station St., Hingham)	60	60	None	60	None

\* Limited: Route 221 runs two AM trips and two PM trips in both directions

**3.2.4 RED LINE**

Red Line service out of Braintree Station operates at headways of 9 minutes during the two peak hours and of 12-16 minutes during the day, night, and on weekends. Trips from Braintree Station take approximately 29 minutes to reach South Station in downtown Boston.

**3.2.5 EXPRESS BUS**

Express bus service between Boston and the Rockland park-and-ride facility operates at headways of 10 to 30 minutes in the peak time periods and every hour in the off-peak time periods. In addition, trips to and from Logan Airport are scheduled for approximately every hour and include service to downtown Boston in the off-peak time periods. Peak-direction trips to and from

downtown Boston in the two peak time periods are scheduled to take between 30 and 40 minutes, and Logan Airport trips are scheduled to take 40 minutes inbound and 50 minutes outbound. Trips serving both downtown Boston and Logan Airport in the off-peak time periods are scheduled to take 45 minutes inbound and 50 minutes outbound.

### **3.2.6 COMMUTER BOAT**

Two commuter boat routes serve the Greenbush study area. The F1 boat serves the terminal at Hewitt's Cove in Hingham and Rows Wharf in Boston Harbor. Trips in both directions are scheduled to take 35 minutes; during the peak periods, the headways in the peak direction (inbound in the AM, outbound in the PM) range from 15 minutes to 30 minutes.

The F2 commuter boat serves the terminal at the Fore River Shipyard in Quincy. Different variations of the F2 boat serve Pemberton Point in Hull, Logan Airport, and Long Wharf in Boston Harbor. Trips directly between the Fore River Shipyard and Long Wharf are scheduled to take 30 minutes, while trips that also serve Logan Airport are scheduled to take an additional 10 minutes. F2H variations of those two routes also serve Pemberton Point, adding 15 minutes to the scheduled running time. The F2 service has AM peak inbound headways ranging from 30 to 40 minutes and PM peak outbound headways ranging from 15 to 45 minutes.

# CHAPTER 4



## Greenbush Impacts on Utilization of Other Modes

This chapter reviews available utilization figures for the various modal options available to residents of the Greenbush study area. Comparisons of utilization before and after the opening of the Greenbush commuter rail line are presented for each mode where applicable. While these comparisons may provide some indication as to the effect of the opening of the Greenbush Line on travel patterns in the study area, it should be noted that there is no way of definitively determining that the opening was itself the cause of any changes.

### 4.1 GREENBUSH LINE UTILIZATION

CTPS conducted passenger counts during the AM peak time period for inbound trains at each station on the Greenbush commuter rail line in November 2009. The results of those counts are presented in Table 6. The two largest boarding totals occurred at the stations at East Weymouth and Greenbush, followed (in the following order) by the stations at North Scituate, Weymouth Landing, West Hingham, Cohasset, and Nantasket Junction. According to the MBTA, Greenbush trains have a seated capacity of 702 passengers on two bi-level and three single-level coaches. As is evident from the table, sufficient passenger capacity exists throughout the AM peak time period. Off-peak ridership on the Greenbush Line is estimated to be significantly less than peak ridership, with fewer than 33 passengers, on average, estimated to board each inbound train in the inbound direction.

Forecasts of 2010 commuter rail ridership on the Greenbush Line corridor to Boston and Cambridge, made as part of the *Final Environmental Impact Report for Transportation Improvements in the Greenbush Line Corridor* (FEIR),<sup>4</sup> projected inbound ridership during the AM peak time period of 3,230. It is important to note that ridership projections are not necessarily intended to be predictive; that is, they are made with the assumption of consistent economic conditions. Specifically, these forecasts were made in 2001, and the

<sup>4</sup> Massachusetts Bay Transportation Authority, *Final Environmental Impact Report: Transportation Improvements in the Greenbush Line Corridor* (Boston, MA, 2001): IV-13.

economic recession and high gas prices currently affecting the Boston metropolitan region and the consequent impact on travel volumes were not anticipated. Indeed, as late as 2005, AM peak inbound ridership on the other two Old Colony branches was close to the projected number for the Greenbush Line (3,800 on the Plymouth/Kingston Line and 2,708 on the Middleborough/Lakeville Line<sup>5</sup>). However, as shown in Table 6, according to CTPS passenger counts, actual Greenbush ridership is approximately 40 percent less than the projection. Had the forecast ridership been achieved, it is likely that several Greenbush trains in the AM peak time period would be near or above their seated capacity level.

**TABLE 6  
Greenbush Line AM Peak Passenger Boarding Counts**

Station	Train					Total	Avg. per Train	Pct. Avg.
	70 (5:40)	72 (6:37)	74 (7:03)	76 (7:50)	78 (8:50)			
Greenbush	41	149	96	84	22	392	78.4	20.2%
No. Scituate	43	94	93	69	18	317	63.4	16.3%
Cohasset	21	73	52	43	10	199	39.8	10.3%
Nantasket Jct.	17	37	37	38	3	132	26.4	6.8%
W. Hingham	25	49	71	49	11	205	41.0	10.6%
E. Weymouth	48	115	152	77	18	410	82.0	21.1%
Weymouth Ldg.	31	50	77	83	9	250	50.0	12.9%
Quincy Ctr.	3	0	2	19	5	29	7.3	1.9%
<b>Total</b>	<b>229</b>	<b>567</b>	<b>580</b>	<b>462</b>	<b>96</b>	<b>1,934</b>	<b>388.3</b>	

Average daily weekday ridership on the Greenbush Line can be estimated by assuming that all riders from the AM peak time period will make the return trip during the PM peak time period and adding an estimate of the number of off-peak trips based on commuter rail conductor counts. This total comes to 4,323 daily weekday trips.

Park-and-ride lot utilization is also an indicator of commuter rail ridership, as a significant percentage of commuter rail riders typically drive to stations and use the park-and-ride lots. Table 7 presents this percentage as well as the parking lot capacity and utilization rate (the percentage of parking spaces occupied at the end of the AM peak time period) for each station on the Greenbush Line.<sup>6</sup>

CTPS also conducted a survey of license plates at each of the Greenbush commuter rail stations. These counts indicate where riders on the Greenbush Line who access the station via park-and-ride are traveling from. Table 8 presents these counts for each station and for the line as a whole. The top

<sup>5</sup> Ridership figures from the Old Colony Planning Council, November 2005.

<sup>6</sup> Drive-access percentages are derived from the 2009 Systemwide Passenger Survey, and parking lot utilization rates are derived from the 2010 Parking Inventory. Both of these efforts were conducted by CTPS.

origin towns for each station are listed, and the percentages for all other towns with recorded license plates are listed under “Other.”

**TABLE 7**  
**Greenbush Park-and-Ride Use and Lot Utilization**

Station	Percent of Riders Using Park-and-Ride	Parking Capacity	Percent of Non-Handicapped Parking Spaces Occupied
Greenbush	72.4%	1,000	15.0%
No. Scituate	59.9%	253	39.1%
Cohasset	62.8%	410	34.1%
Nantasket Jct.	71.3%	495	13.9%
W. Hingham	70.6%	207	64.7%
E. Weymouth	66.2%	335	61.5%
Weymouth Ldg.	57.1%	94	43.6%
<b>Total</b>	<b>65.7%</b>	<b>2,794</b>	<b>30.0%</b>

**TABLE 8**  
**Greenbush Station Park-and-Ride Lot License Plate Survey**

Origin Town	Greenbush Line Station							
	Weymouth Ldg.	E. Weymouth	W. Hingham	Nantasket Jct.	Cohasset	No. Scituate	Greenbush	Entire Line
Abington	1.9%							
Boston						2.7%		
Cohasset			2.9%	6.2%	59.3%	3.6%		7.8%
Duxbury	1.9%						2.8%	
Hanover		5.1%						
Hingham		35.4%	81.0%	20.0%				19.6%
Hull				53.8%	2.2%			4.6%
Marshfield				4.6%	6.6%		38.2%	9.6%
Norwell		7.3%	2.9%				12.9%	4.9%
Out of state	1.9%					1.8%		
Quincy	3.8%							
Rockland		2.8%	1.9%					
Scituate				4.6%	15.4%	85.5%	31.5%	20.6%
Weymouth	57.1%	28.7%	2.9%					14.3%
Other	33.3%	20.8%	8.6%	10.8%	16.5%	6.4%	14.6%	18.5%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

As shown in the table, the largest percentage of riders driving to each station on the Greenbush Line originates from towns within the study area. Indeed, aside from the stations of East Weymouth (which lies just west of the border

with Hingham) and Greenbush (which lies just north of the border to Marshfield), the largest percentage of parked vehicles originated in the town in which the station was located. In total, towns through which the Greenbush Line passes and the adjoining towns make up over 80 percent of the riders who drive to a park-and-ride station.

The results of the license plate survey were quite similar to those of the 2009 Systemwide Passenger Survey of park-and-ride users on the Greenbush Line for town of origin. The major towns of origin from the license plate survey were also the major towns of origin from the passenger survey, with the only difference occurring where the passenger survey identified Weymouth as the second-greatest town of origin instead of Hingham. As shown in Table 9, for towns representing greater than three percent of total origins across the line, the license plate and passenger surveys resulted in very similar percentages of vehicles and respondents.

**TABLE 9**  
**Town-of-Origin: Comparison of Surveys**  
**for Greenbush Line Park-and-Ride Users**

<b>Town</b>	<b>License Plate Survey</b>	<b>Passenger Survey</b>
Cohasset	7.8%	7.7%
Hingham	19.6%	19.7%
Hull	4.6%	5.0%
Marshfield	9.6%	12.5%
Norwell	4.9%	5.2%
Scituate	20.6%	23.0%
Weymouth	14.3%	19.8%
Other*	18.5%	7.1%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>

\*Other towns are those representing 3% or less.

Finally, 77.5 percent of survey respondents reported that they had made their current trip on the Greenbush Line at the same frequency using a different mode prior to the line’s opening. The remaining responses were split between those who reported never having made this trip before (14.0 percent) and those who had made this trip before but at some other frequency (8.5 percent). It appears, therefore, that a majority of riders on the Greenbush Line are making the same trip they did prior to the opening, but are now using the Greenbush Line instead of another mode.

The following sections examine each transportation mode for trends in travel volumes or park-and-ride usage before and after the opening of the Greenbush Line and attempt to determine the potential impact of that opening on any such trends.

## 4.2 IMPACT ON OTHER COMMUTER RAIL

As part of the 2009 Systemwide Passenger Survey, CTPS asked Greenbush Line riders to list each mode of travel they ever used to make the same trip prior to the opening of the Greenbush Line. Of the respondents, 15.8 percent indicated that they had previously used another commuter rail line. In absolute terms, this translates to an estimated maximum of 342 daily riders. The Greenbush stations at which passengers reported the greatest percentage of former usage of another commuter rail line were East Weymouth Station, Weymouth Landing Station, and Greenbush Station. Presumably, these riders were former users of the Old Colony Line to Plymouth or Kingston.

The number of vehicles and utilization rate at park-and-ride lots along the Plymouth/Kingston Line before and after the opening of the Greenbush Line are presented in Table 10. (The “before” data are from the 2005/2006 systemwide parking inventory conducted by CTPS.) As shown in the table, the number of parked vehicles and the utilization rate decreased at every station from 2005/2006 to 2009/2010 and across the entire Plymouth/Kingston Line by 780. South Weymouth Station had the largest decrease in the number of parked vehicles of any station: 245, or -46.2 percent. It is important to note, however, that CTPS’s 2009/2010 systemwide parking inventory found declines in both the number of parked vehicles and the utilization rate compared to 2005/2006 across the entire commuter rail system. The systemwide utilization rate decreased 19 percent between the two inventories, from 77 percent in 2005/2006 to 58 percent in 2009/2010. One likely reason for this systemwide parking decrease is the increase in fees at commuter rail park-and-ride lots implemented in 2009. Thus, while the opening of the Greenbush Line and the maximum estimated shift of 342 daily riders from other commuter rail to the Greenbush Line may have contributed somewhat to the decline in parked vehicles at South Weymouth Station and on the Plymouth/Kingston Line more generally, it is unlikely to be completely responsible.

**TABLE 10**  
**MBTA Park-and-Ride Lot Utilization on Plymouth/Kingston Line:**  
**Pre- and Post-Greenbush**

Station	Parked Vehicles			Utilization Rate	
	2005/ 2006	2009/ 2010	Percent Change	2005/ 2006	2009/ 2010
South Weymouth	530	285	-46.2%	100.0%	53.8%
Abington	394	234	-40.6%	98.5%	57.8%
Whitman	189	133	-29.6%	98.4%	69.3%
Hanson	381	331	-13.1%	90.7%	77.3%
Halifax	332	251	-24.4%	83.4%	63.1%
Kingston/Route 3	699	516	-26.2%	69.3%	41.1%
Plymouth	5	0	-100.0%	5.4%	0.0%
<b>Total</b>	<b>2,530</b>	<b>1,750</b>	<b>-30.8%</b>	<b>83.2%</b>	<b>53.0%</b>



## **4.3 IMPACT ON LOCAL BUS SERVICES**

### **4.3.1 JBL ROUTES**

One modal option in the Greenbush study area for which data are not available for a before-and-after comparison is the JBL service to South Weymouth and Whitman. These two routes were discontinued following the start of service on the Greenbush commuter rail line in October 2007. The service between Whitman and downtown Boston (running local between Whitman and Weymouth Landing and express between Weymouth Landing and downtown Boston) was discontinued in December 2007, and the local service between South Weymouth and Braintree Station was discontinued in June 2008. Figure 6 shows the routing of these former routes as well as the existing routing of local MBTA bus service in the same vicinity.

Variations to Routes 222 and 225 were added in response to the elimination of the local JBL service. Outbound Route 222 now alternates its destination between West Hingham and Lovell's Corners in East Weymouth throughout the day. The new outbound Route 225 variation runs selected trips throughout the day to Columbian Square. As shown in the figure, the only portion of the former local JBL service that is not currently covered by MBTA service lies south of Columbian Square to Pleasant Street and along Pleasant Street from South Weymouth to East Weymouth.

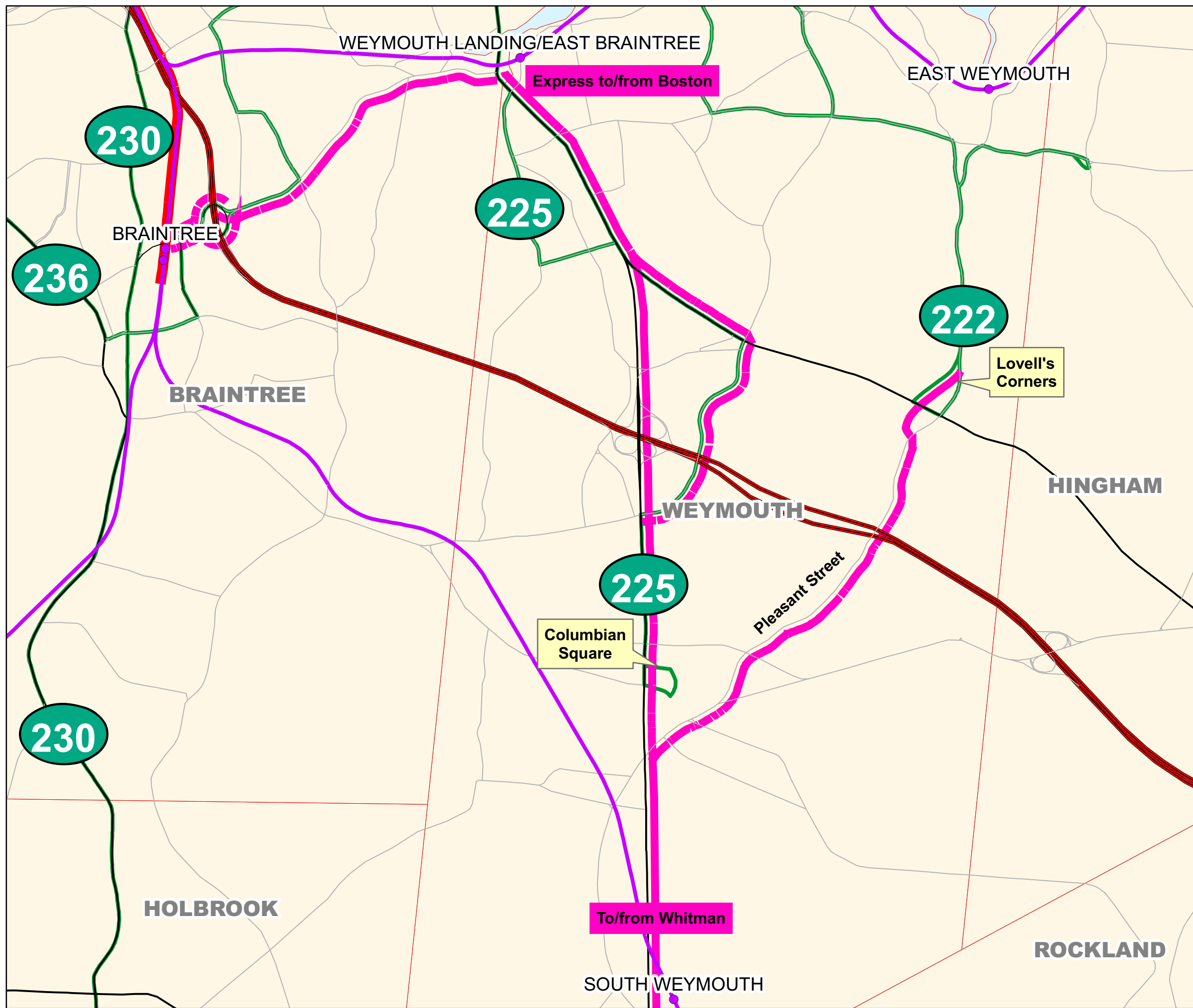
JBL continues to run Route 714, a contracted local bus route serving Hingham and Hull that provides a transfer to Nantasket Junction Station on the Greenbush Line. Federal fiscal year (FFY) data for this route show a 1.3 percent increase in ridership from FFY 2006 (32,951 riders from July 2005 to June 2006) to FFY 2008 (32,831 riders from July 2007 to June 2008). The opening of the Greenbush Line allowed passengers from Hull on Route 714 to transfer to commuter rail. It is difficult to attribute with certainty, however, the change in Route 714 ridership directly to the opening of the Greenbush Line.

### **4.3.2 MBTA ROUTES**

Data on local MBTA bus service are available for both before and after the opening of the Greenbush commuter rail line. All pre-Greenbush data were collected via CTPS ridechecks of various trips from which were compiled a composite service day. All post-Greenbush data were collected using the automatic passenger-counter (APC) hardware installed on all buses operating out of the Quincy Garage, including those serving Routes 220, 222, and 225.<sup>7</sup> Data on daily weekday ridership pre- and post-Greenbush are presented in Table 11.

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<sup>7</sup> Note that data for Route 221 are not presented, as this route has no overlap with any of the neighborhoods directly served by the Greenbush commuter rail line.

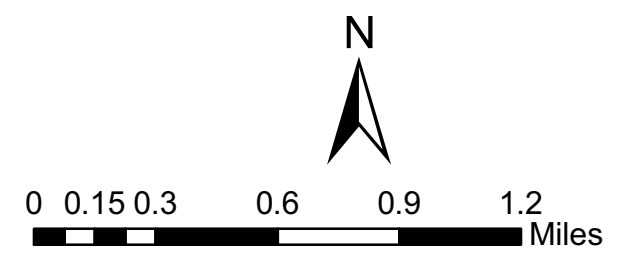


**FIGURE 6**  
**Discontinued JBL Bus**  
**Service to South**  
**Weymouth and Whitman**

**Legend**

- Town boundary
- JBL - discontinued bus service
- Commuter rail station
- Commuter rail
- Local bus route
- Red Line
- Interstate
- Other limited-access road
- Federal route
- State route
- Other arterial
- Minor road

*Data taken from the CTPS road inventory and MBTA layer files.*



*Greenbush Before-and-After Study*

**TABLE 11**  
**MBTA Local Bus Weekday Ridership: Pre- and Post-Greenbush**

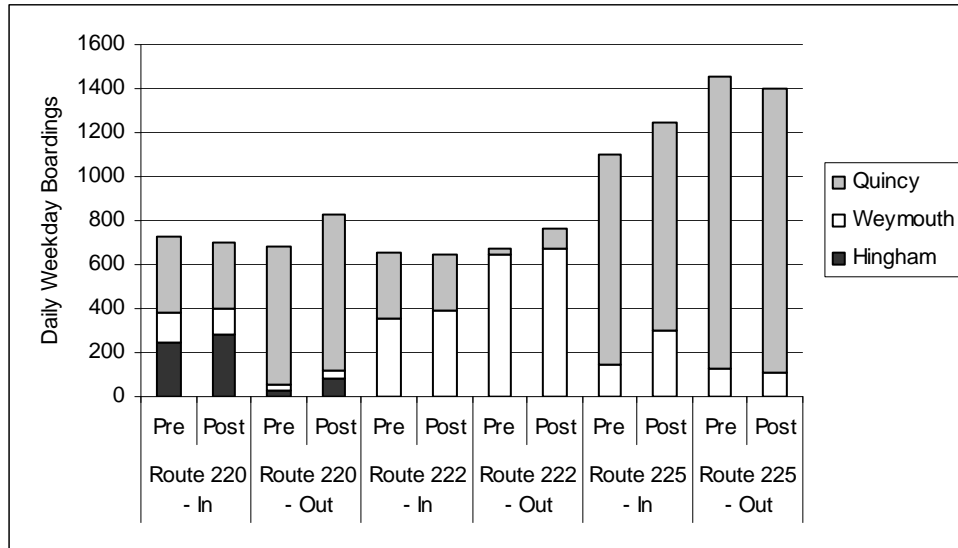
Route	Pre-Greenbush				Post-Greenbush				Percent Change
	Data Date	Direction		Total	Data Date	Direction		Total	
		In	Out			In	Out		
220 (Quincy Center Station - Hingham Center)	Fall 2006	727	683	1,410	Winter 2010	701	829	1,530	+8.5%
222 (Quincy Center Station - East Weymouth)	Fall 2006	651	656	1,326	Fall 2009	644	762	1,406	+6.0%
225 (Quincy Center Station - Weymouth Landing)	Winter 2008 <sup>8</sup>	1,100	1,456	2,556	Fall 2009	1,248	1,396	2,644	+3.4%

As shown in the table, since the opening of the Greenbush Line, ridership has increased on all the local bus routes serving neighborhoods that are also served by commuter rail. Ridership growth on Routes 222 and 225 was primarily driven by an increasing number of boardings in the town of Weymouth, though Quincy riders still made up the largest share of boardings on all routes except Route 222 (see Figure 7).

Indeed, transfers to and from the Red Line at Quincy Center Station appear to remain the major ways of alighting and boarding, respectively, for each route. This would indicate that the introduction of the Greenbush Line has not had a major effect on the patterns of local bus travel in the study area. Table 12 presents the percentage of inbound alightings and outbound boardings at Quincy Center Station for Routes 220, 222, and 225. According to the 2009 Systemwide Passenger Survey, the only Greenbush Line station where any inbound riders reported accessing commuter rail via public transportation of any kind was by MBTA bus at the Weymouth Landing/East Braintree Station (1.5 percent of riders boarding at that station).

<sup>8</sup> The closest ridecheck of Route 225 to the opening of the Greenbush Line is in the Winter Quarter of 2008. While this ridecheck was conducted after the October 2007 opening, it was done while JBL local bus service to South Weymouth was still in operation. The ridecheck was also conducted recently enough to expect that any potential ridership changes on the route due to the opening of the Greenbush Line may not have yet occurred. The previous ridecheck of Route 225, done in the Winter Quarter of 2003, was conducted too far in the past to be useful for comparative purposes.

**FIGURE 7**  
**Daily Weekday Boardings by Route by Town: Pre- and Post-Greenbush**



**TABLE 12**  
**Percentage Inbound Alightings and Outbound Boardings at Quincy Center Station**

Route	Percent Quincy Center Station	
	Inbound Alightings	Outbound Boardings
220 (Quincy Center Station - Hingham Center)	70.9%	64.0%
222 (Quincy Center Station - East Weymouth)	63.4%	74.1%
225 (Quincy Center Station - Weymouth Landing)	80.5%	73.6%

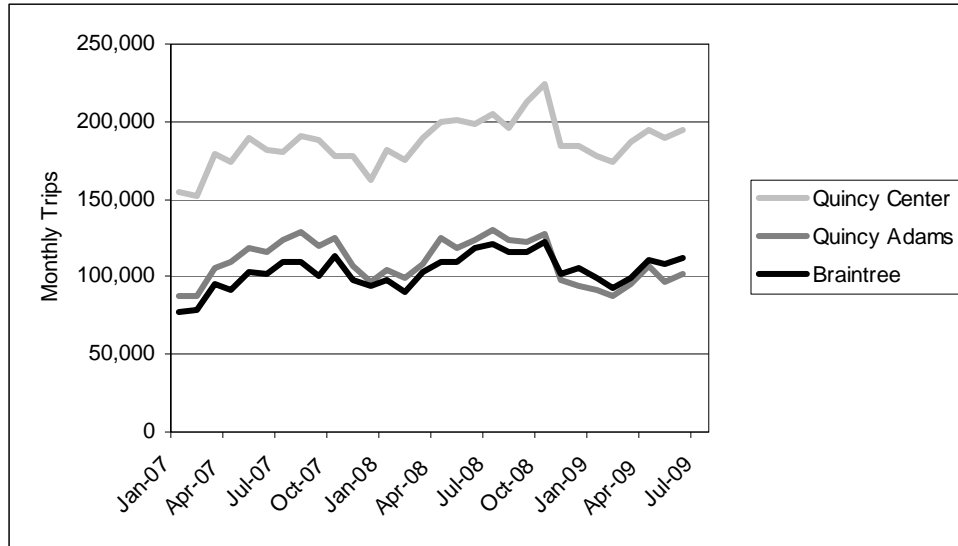
#### 4.4 IMPACT ON THE RED LINE

While the Red Line, by itself, may not directly compete against the Greenbush Line for ridership, there may be some Greenbush Line riders who formerly drove their vehicle to a park-and-ride lot at Braintree Station, Quincy Adams Station, or Quincy Center Station and then took the Red Line into Boston. Indeed, more than a third of the Greenbush Line riders who responded to the 2009 Systemwide Passenger Survey reported having made at least a portion of the same trip via subway prior to the opening of the Greenbush Line. In absolute terms, this translates to an estimated maximum of 766 daily riders.

Figure 8 and Table 13 present the level of station ridership and park-and-ride-lot use, respectively, over time for the three Red Line stations serving the study area. As shown in the figure, while monthly ridership did drop (by 7.9 percent) from October 2007 to November 2007, this decrease does not appear to be due to the opening of the Greenbush commuter rail line, as any impact from that opening should have been sustained in the following months. Instead, a comparison of ridership for the period January 2007–October 2007 to the same time period a year later shows an increase in ridership of more than 10 percent.

The decrease in monthly ridership from October to November may in fact be cyclical, as the same decrease, of an even greater magnitude, occurred the following year in 2008.

**FIGURE 8**  
**Monthly Red Line Station Ridership**



**TABLE 13**  
**MBTA Red Line Station Park-and-Ride Lot Utilization: Pre- and Post-Greenbush**

Station	Parked Vehicles			Utilization Rate	
	2005/2006	2009/2010	% Change	2005/2006	2009/2010
Quincy Center	742	356	-52.0%	87.7%	42.1%
Quincy Adams	1,897	1,442	-24.0%	80.2%	61.6%
Braintree	1,260	905	-28.2%	99.8%	72.9%
<b>Total</b>	<b>3,899</b>	<b>2,703</b>	<b>-30.7%</b>	<b>87.2%</b>	<b>61.0%</b>

Park-and-ride usage at the three Red Line stations did decrease by nearly one-third or 1,196 parked vehicles from the counts in 2005/2006 to 2009/2010. However, as is the case with commuter rail parking, while some of this decline may be attributable to the opening of the Greenbush Line, most of the decrease likely reflects the systemwide increase in parking fees and the resultant decrease in parked vehicles between the dates of the two inventories. It does not appear, therefore, that the opening of the Greenbush Line had any significant effect on usage of the Red Line.

#### 4.5 IMPACT ON EXPRESS BUS SERVICES

Local bus traditionally serves a much different passenger market from that of commuter rail. However, express bus services typically offer the faster travel

times to a downtown location that commonly characterize commuter rail service. Therefore, the introduction of commuter rail service to the Greenbush study area might have been expected to result in some competition for riders with express bus routes operating out of the Rockland park-and-ride facility. The Plymouth and Brockton Street Railway Company (P&B), which operates two express bus routes via Rockland between Boston and the towns of Plymouth and Hyannis, witnessed a 0.8 percent ridership decrease (a loss of 1,095 annual total trips) on these routes from the year before to the year after the opening of the Greenbush commuter rail line.<sup>9</sup> This annual decrease translates into an estimated daily weekday ridership loss of four to five riders. Consequently, it does not appear that the introduction of commuter rail service to the study area had a major effect on ridership on this express bus route.

Two express bus routes serving the study area were discontinued in the year and a half following the opening of the Greenbush Line. JBL eliminated its express service between Weymouth Landing and Boston (with local service between Weymouth Landing and Whitman) towards the end of 2007, and P&B discontinued an express route between Braintree Station and Marshfield towards the end of 2008. While ridership figures for the JBL service are not available, ridership on the P&B service to Marshfield decreased by less than one percent (a loss of 13 total trips) from the year before to the year after the opening of the Greenbush commuter rail line.<sup>10</sup> It is important to note that P&B stopped receiving financial assistance from the Commonwealth through the inter-district transportation program in March 2009 for the Plymouth route and in December 2008 for the Marshfield route.

As part of the 2009 Systemwide Passenger Survey, CTPS asked Greenbush Line riders to list each mode of travel they ever used to make the same trip prior to the opening of the Greenbush Line. According to this survey, 3.4 percent of the Greenbush Line riders indicated that they had used express bus to make the same trip. All of these riders who specified their town of origin reported towns lying east of Weymouth, with Marshfield, Hingham, and Scituate being the three towns with the greatest numbers of former express bus riders. This survey result is consistent with all former express bus riders' reporting a P&B route as the bus route they previously used. No survey respondents reported previously using the JBL express route.

#### **4.6 IMPACT ON COMMUTER BOAT SERVICES**

Commuter boat likely serves a similar market as the Greenbush commuter rail line. Commuter boat service offers similar travel times to downtown Boston, at a comparable price, and with similar headways throughout the day. Most likely, the major factors in commuters' choices between these modes are a

<sup>9</sup> Monthly ridership data (November 2006 through October 2008) for the Plymouth-Boston express route reported by P&B to the MBTA for the National Transit Database.

<sup>10</sup> Monthly ridership data (November 2006 through October 2008) for the Marshfield-Braintree express route reported by P&B to the MBTA for the National Transit Database. JBL did not receive financial assistance from the Commonwealth and therefore was not required to report ridership.

GREENBUSH BEFORE-AND-AFTER STUDY

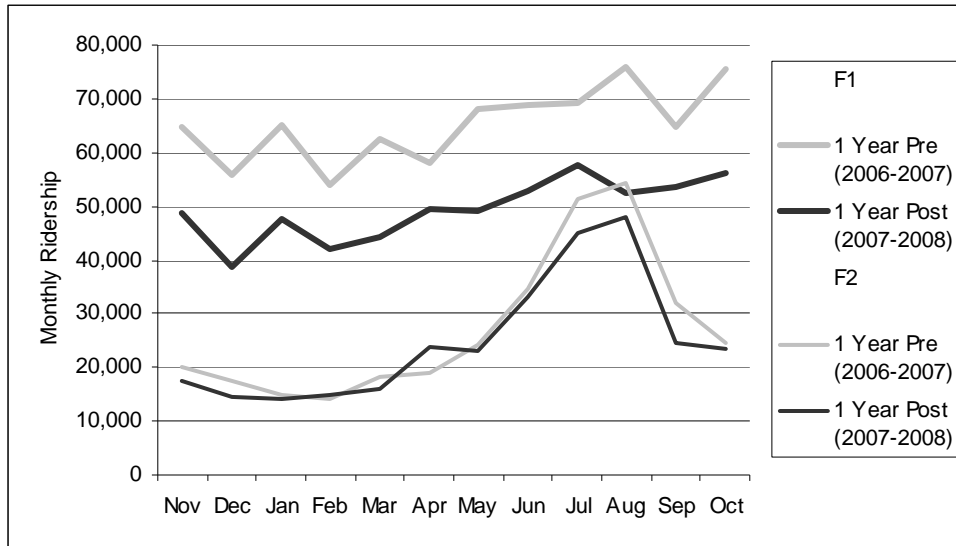
general preference for one form of travel over the other or the relative convenience of the two modes' station locations.

Table 14 presents the change in ridership on the two commuter boat routes serving the study area between the years before and after the opening of the Greenbush Line on October 31, 2007.<sup>11</sup> As shown in the table, ridership on both Routes F1 and F2 decreased in the year immediately following the opening. F1 ridership decreased more, falling 24.3 percent; F2 ridership decreased 8.2 percent. The difference between the changes in the two routes may also be seen in Figure 9's monthly comparison.

**TABLE 14**  
**Annual Commuter Boat Ridership by Route**

Year	F1: Hingham-Boston		F2: Quincy-Hull-Boston-Logan	
	Annual Ridership	Percent Change	Annual Ridership	Percent Change
2 Years Pre-Greenbush	780,042		299,678	
1 Year Pre-Greenbush	782,930	+0.4%	324,968	+8.4%
1 Year Post-Greenbush	592,550	-24.3%	298,240	-8.2%
2 Years Post-Greenbush	587,015	-0.9%	296,893	-0.5%

**FIGURE 9**  
**Monthly Commuter Boat Ridership by Route: One Year Pre- and Post-Greenbush**



The decrease in F2 ridership actually only returned it to the level recorded two years prior to the opening. The increase in F2 ridership one year prior to the opening was largely due to an incident that temporarily closed the Ted Williams Tunnel in the summer of 2007. It does appear, however, that the opening of the Greenbush Line had a dramatic effect on Route F1 ridership.

<sup>11</sup> Data provided by the MBTA.

The changes in average daily weekday ridership before and after the opening of the Greenbush Line reflect the trend presented in Figure 9. In the year following the opening, the average daily weekday ridership on Route F1 fell by 24.7 percent, or 756 riders. Route F2 average daily weekday ridership fell by 1.9 percent, or 18 riders.<sup>12</sup> This difference in ridership loss could be due to the location of the two commuter boat terminals in relation to the stations on the Greenbush Line and routing differences between the two commuter boat routes. Hewitt's Cove, serving Route F1, lies further east in the study area. Most riders of this commuter boat route come from areas south of the Greenbush Line. The opening of this line, therefore, likely attracted a significant portion of these riders, for whom the Greenbush Line now offers a closer public transit option. On the other hand, the Fore River Shipyard, serving Route F2, lies in Quincy, and a significant number of riders on this route come from areas north of the Greenbush Line. In addition, a portion of F2 ridership uses this route for travel to the airport, which the Greenbush Line does not serve. These two factors likely explain much of difference in the ridership impact of the Greenbush Line's opening on the two commuter boat routes.

Parking utilization rates at the three commuter boat park-and-ride lots reinforce these conclusions. While utilization rates at the F2 lots at the Fore River Shipyard and Pemberton Point increased (13 percent to 20 percent and 49 percent to 67 percent, respectively) between the two systemwide parking inventories of 2005/2006 and 2009/2010, the parking utilization rate at Hewitt's Cove decreased (from 84 percent to 78 percent).

Finally, confirmation also comes via the question in the 2009 Systemwide Passenger Survey asking survey respondents to list each mode of travel they ever used to make the same trip prior to the opening of the Greenbush Line. According to this survey, the greatest percentage of respondents (46.6 percent) of any category indicated that they had previously used one of the commuter boat routes in the study area. This percentage was greatest among passengers boarding at North Scituate Station, Cohasset Station, Nantasket Junction Station, and West Hingham Station.

In conclusion, among public transit modes, it appears that commuter boat incurred the greatest absolute loss in ridership when data prior to and following the opening of the Greenbush Line are compared. It also appears that this opening is likely responsible for much of this loss. While economic conditions undoubtedly also had a negative effect on commuter boat ridership, one would expect this effect to be consistent across both commuter boat routes. Instead, there is a substantial difference in proportional ridership loss between Routes F1 and F2, and the difference is likely due to the differing location and service characteristics of those routes in relation to the Greenbush Line. The large loss of F1 ridership seems to be primarily related to the Greenbush Line's opening.

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<sup>12</sup> Note that F1 service operates only on weekdays, while F2 service also operates on the weekends. The relationship between annual and average daily weekday ridership totals for the two routes, therefore, will differ due to the inclusion of weekend ridership in Route F2's annual ridership total.



## 4.7 IMPACT ON HIGHWAY TRAFFIC

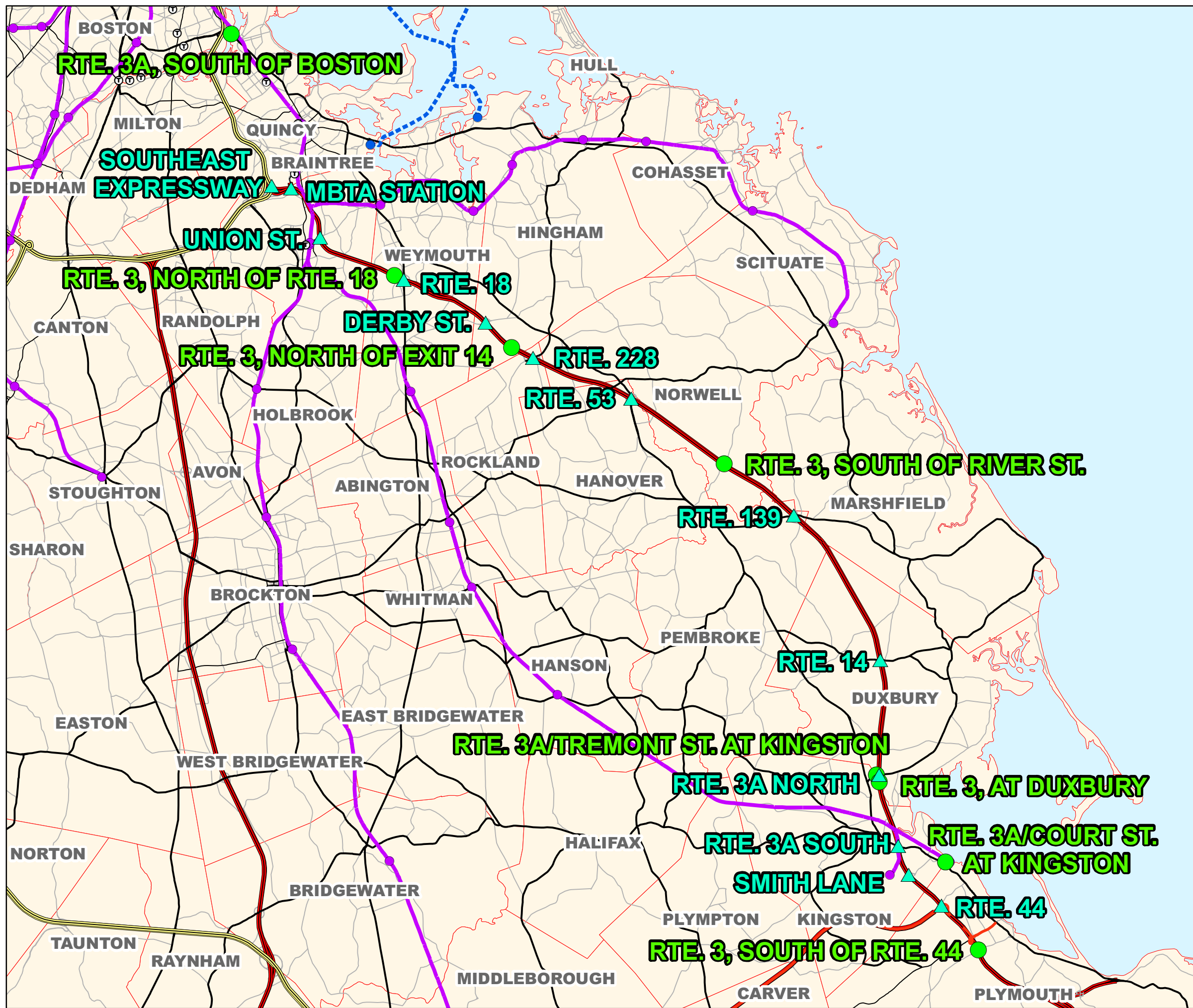
Average daily traffic (ADT) counts are available for various checkpoints in and around the Greenbush study area. Figure 10 shows the eight road stations and 12 ramps for which pre- and post-Greenbush counts of ADT exist. Tables 15 and 16 present these road station and ramp data, respectively, as well as the percent change in ADT for each location and the average percent change across all counts weighted by the post-Greenbush ADT.<sup>13</sup> Note that all “post” counts were conducted in 2008, all “pre” counts in Table 15 were conducted between 2005 and 2007, and all pre counts in Table 16 were conducted in 1997. While the time span between the pre and post Route 3 ramp counts makes it difficult to determine any potential impact from the opening of the Greenbush Line, the counts do describe the relative levels of highway traffic at various locations across the study area.

When considering the timing of the economic recession in the metropolitan Boston region and particularly the elevated gas prices in the summer of 2008, the date of the post counts could explain much of the decline in ADT seen in Table 15. A comparison of data from continuous traffic count locations across the Boston metropolitan region showed a decrease of 14 percent in ADT between 2005 and 2009. Therefore, most, if not all, of the 4.2 percent decrease in ADT (3,043 fewer daily vehicles, on average) across all road stations in the Greenbush study area is likely due to the influence of these macroeconomic factors.

**TABLE 15**  
**Average Daily Traffic: Station Counts: Pre- and Post-Greenbush**

<b>Station Counts</b>	<b>“Pre” Count</b>	<b>“Post” Count</b>	<b>Change</b>	<b>% Change</b>
Rte. 3A, South of Boston	57,200	58,000	800	1.4%
Rte. 3A/Tremont St. at Kingston	15,600	14,900	-700	-4.5%
Rte. 3A/Court St. at Kingston	11,700	11,900	200	1.7%
<b>Rte. 3A Weighted Average Percent Change</b>				<b>0.4%</b>
Rte. 3, North of Rte. 18	135,967	129,116	-6,851	-5.0%
Rte. 3, North of Exit 14	94,584	92,571	-2,013	-2.1%
Rte. 3, South of River St.	73,336	70,659	-2,677	-3.7%
Rte. 3, at Duxbury	66,300	52,100	-14,200	-21.4%
Rte. 3, South of Rte. 44	63,400	64,500	1,100	1.7%
<b>Rte. 3 Weighted Average Percent Change</b>				<b>-5.2%</b>
<b>Overall Weighted Average Percent Change</b>				<b>-4.2%</b>

<sup>13</sup> The data in Table 15 represent the total number of vehicles traveling on the road in both directions on an “average” day (including all weekdays, Saturdays, Sundays, and holidays) over the course of an entire year. Hence, a more accurate term is “annual average daily traffic” (AADT). The data in Table 16 represent the total number of vehicles traveling on the ramp on an “average” weekday (excluding all Saturdays and Sundays) over the course of an entire representative week. Hence, a more accurate term in that case is “average weekday daily traffic” (AWDT).

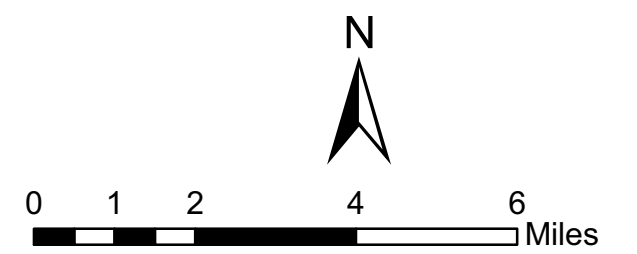


**FIGURE 10**  
Traffic Count Locations

**Legend**

- Ramp count
- Station count
- Commuter boat terminal
- Commuter boat
- Commuter rail station
- Commuter rail
- Interstate
- Other limited-access road
- Federal route
- State route
- Other arterial
- Minor road
- Town boundary

*Data taken from the CTPS road inventory and MBTA layer files.*



*Greenbush Before-and-After Study*

GREENBUSH BEFORE-AND-AFTER STUDY

**TABLE 16**  
Average Daily Traffic: Route 3 Ramp Counts: Pre- and Post-Greenbush

Intersection			"Pre" Count		"Post" Count		Percent Change	
Num.	Name	Dir.	On	Off	On	Off	On	Off
7	Rte. 44	North	4,000	5,000	6,500	8,500	62.5%	70.0%
8	Smith Ln.	North	4,000	2,500	5,000	3,500	25.0%	40.0%
9	Rte. 3A South	North	4,500	7,500	4,500	6,500	0.0%	-13.3%
10	Rte. 3A North	North	4,500	5,500	4,000	7,000	-11.1%	27.3%
11	Rte. 14	North	4,000	4,000	4,000	4,500	0.0%	12.5%
12	Rte. 139	North	12,000	5,500	12,500	7,000	4.2%	27.3%
13	Rte. 53	North	11,000	5,000	10,000	5,000	-9.1%	0.0%
14	Rte. 228	North	12,000	6,000	12,000	7,000	0.0%	16.7%
15	Derby St.	North	9,000	5,000	10,000	5,000	11.1%	0.0%
16	Rte. 18	North	22,500	5,000	21,500	5,000	-4.4%	0.0%
17	Union St.	North	16,000	7,500	17,000	7,500	6.3%	0.0%
19	T Station	North		12,000		12,000		0.0%
	SE Expressway	North		38,000		39,000		2.6%
<b>Northbound Weighted Average Percent Change</b>							<b>5.3%</b>	<b>11.1%</b>
	SE Expressway	South	38,000		38,000		0.0%	
19	T Station	South	12,000		12,000		0.0%	
17	Union	South	8,000	16,000	8,000	16,000	0.0%	0.0%
16	Rte. 18	South	6,000	21,500	6,000	20,500	0.0%	-4.7%
15	Derby St.	South	5,000	9,000	6,500	9,500	30.0%	5.6%
14	Rte. 228	South	7,000	13,500	6,000	14,500	-14.3%	7.4%
13	Rte. 53	South	5,000	12,000	5,000	11,500	0.0%	-4.2%
12	Rte. 139	South	5,500	12,000	7,500	12,500	36.4%	4.2%
11	Rte. 14	South	4,000	4,000	4,500	4,000	12.5%	0.0%
10	Rte. 3A North	South	5,500	5,500	6,500	4,000	18.2%	-27.3%
9	Rte. 3A South	South	7,500	3,500	7,500	4,000	0.0%	14.3%
8	Smith Ln.	South	2,500	5,000	3,500	6,000	40.0%	20.0%
7	Rte. 44	South	5,500	4,500	9,000	5,000	63.6%	11.1%
<b>Southbound Weighted Average Percent Change</b>							<b>10.6%</b>	<b>1.8%</b>

The opening of the Greenbush Line may have resulted in slight percentage decreases in overall highway traffic: in the 2009 Systemwide Passenger Survey, 44.5 percent of respondents using the Greenbush Line reported that they had sometimes driven when making the same trip prior to the opening of the Greenbush Line. Most of these survey responses were collected from stations lying east of Hingham. In absolute terms, this translates to a maximum of 1,923 average daily trips. Given the confluence of economic events with the opening of the Greenbush Line, however, it is impossible to attempt to isolate the potential decrease in highway traffic due to the introduction of commuter rail service alone. In addition, when comparing Route 3 ramp counts done several years before the opening of the Greenbush Line to those done soon thereafter, the results actually show an increase in vehicle traffic. In any event,

while it does appear that nearly one-half of Greenbush riders are new to public transit, the opening of the Greenbush commuter rail line did not appear to have any clear impact on traffic volumes on Route 3 or Route 3A.



# CHAPTER 5



## Summary and Conclusions

The Greenbush commuter rail line offers a convenient and affordable trip into downtown Boston from the towns of Weymouth, Hingham, Cohasset, and Scituate. Approximately 1,934 daily inbound peak and 4,323 daily weekday trips occur on the Greenbush Line. The operation of commuter rail on this branch of the Old Colony Railroad restores a public transit service to the South Shore of Boston that had been eliminated in 1959. The study area transit network to which Greenbush service was added on October 31, 2007, provided options for both local and regional travel needs. Several local bus routes, both contracted and directly operated by the MBTA, offered local trips in the western part of the study area along Route 3A and into South and East Weymouth. Express bus trips out of Weymouth Landing and the Rockland park-and-ride facility, commuter boat service from the Fore River Shipyard in Quincy and Hewitt's Cove in Hingham, and the Plymouth/Kingston commuter rail line provided commuter-oriented services into downtown Boston.

The introduction of commuter rail service to the Greenbush study area does not appear to have affected ridership on any of the local bus routes that are still in operation. Travel patterns on these routes, in terms of where passengers are boarding and alighting and where they are transferring to and from, have also remained relatively consistent.

Highway volumes dwarf the shift of drivers to the Greenbush Line, making it difficult to link that shift with any perceptible change in highway traffic. While traffic volumes do appear to have decreased slightly in 2008 (by 4.2 percent, or 3,043), and a significant portion of Greenbush Line riders (44.5 percent, or 1,923) did report having formerly driven to make the same trip, the decrease in traffic may be attributable to the economic recession and high gas prices of that time. Therefore, while the introduction of the Greenbush Line attracted a number of drivers, its effect on overall highway traffic was minor.

However, it does appear that the Greenbush Line, like other commuter rail lines in the MBTA system, serves a very similar market to that served by express bus and commuter boat. The Greenbush Line's market also overlaps with that of the Plymouth/Kingston Line. Indeed, it would seem that the three

modes of commuter rail, commuter boat, and express bus are largely competing for a similar group of potential riders who live within the study area and access public transit via park-and-ride lots.

A survey of passengers on the Greenbush Line, conducted as part of the 2009 Systemwide Passenger Survey, included a question asking survey respondents to list each mode of travel they ever used to make the same trip prior to the opening of the Greenbush Line. The results of this survey are presented in Table 17. Note that the percentages in each row do not sum to 100 percent, as the table lists all the modes that survey respondents indicated. MBTA bus and subway are not listed in the table since these modes are not substitutes for the Greenbush Line and are likely used in conjunction with one of the other modes listed in the table.

As shown in the table, the largest percentage of Greenbush Line riders reported having made the same trip via commuter boat. The second-largest percentage of riders reported having driven prior to the opening of the Greenbush Line. Riders formerly using express bus or another commuter rail line represented much smaller percentages of Greenbush Line ridership. These percentages indicate that, while the opening of the Greenbush Line did attract a number of drivers, it also diverted a number of existing transit users from other transit modes.

**TABLE 17**  
**Former Modes Used by Greenbush Line Riders**

<b>Station</b>	<b>Drove</b>	<b>Carpool</b>	<b>Commuter Rail</b>	<b>Commuter Boat</b>	<b>Private Bus</b>
Greenbush	54.8%	6.1%	16.5%	40.0%	8.7%
No. Scituate	52.9%	4.3%	1.4%	60.0%	0.0%
Cohasset	40.5%	2.4%	2.4%	73.8%	2.4%
Nantasket Jct.	58.3%	8.3%	0.0%	79.2%	4.2%
W. Hingham	18.2%	15.2%	3.0%	54.5%	3.0%
E. Weymouth	24.6%	6.2%	35.4%	32.3%	3.1%
Weymouth Ldg.	21.3%	4.3%	29.8%	17.0%	0.0%
<b>All riders</b>	<b>38.1%</b>	<b>6.4%</b>	<b>15.8%</b>	<b>46.6%</b>	<b>3.4%</b>

The table also shows how survey responses about former modes differed between stations. While a significant percentage of riders at stations towards the end of the line reported having driven prior to the opening of the Greenbush Line, this percentage is smaller once the Greenbush Line crosses into Hingham. Riders formerly using another commuter rail line composed a significant portion of survey respondents at Greenbush Station and the stations in Weymouth, while the intermediate stations had relatively few riders reporting this mode. Conversely, riders formerly using commuter boat represented the highest percentages of Greenbush Line ridership at these intermediate stations. Finally, Greenbush Station had the largest percentage of riders formerly using private bus services. These varying percentages by mode

and by station reflect the differences in modal competition depending on geographic location and the availability of alternative modes.

The decrease in express bus, other commuter rail, and commuter boat ridership immediately following the opening of the Greenbush commuter rail line would seem to confirm this competition between the modes. When the opening occurred, the three existing modes appeared to experience related ridership decreases; however, commuter boat seems to be the mode most in competition with commuter rail.

Express bus ridership decreased by approximately one percent in the year following the opening, with a loss of slightly more than 1,000 annual trips. This translates to a decline of approximately four to five daily weekday trips on express bus.

On the Plymouth/Kingston commuter rail line, the number of daily parked vehicles at South Weymouth Station fell by 46 percent or 245 vehicles, while the line's park-and-ride lots overall witnessed a decrease of 31 percent or 780 vehicles. However, it is likely that a significant percentage of this decrease is not tied to the opening of the Greenbush Line, given the general decrease in parking utilization rates across the entire commuter rail system.

Finally, commuter boat ridership decreased by slightly less than 25 percent in the year following the opening in terms of both annual ridership and average daily weekday ridership. The loss in annual riders on commuter boat totaled 190,380 on Route F1 and 26,728 on Route F2. In terms of average daily weekday ridership, this loss translated to 756 on Route F1 and 18 on Route F2.

Despite these decreases in ridership on express bus, other commuter rail, and commuter boat and the actual discontinuation of some private local and express bus service, overall public transportation ridership in the Greenbush study area was higher after the introduction of Greenbush commuter rail service. Nearly one-half of Greenbush riders made the same trip prior to the opening of the Greenbush Line via private vehicle. These riders saved, on average, between 4 and 15 minutes for inbound trips in the AM peak time period and between 21 and 35 minutes for outbound trips in the PM peak time period, depending on the location. Ridership on the Greenbush Line thus consists of both these new transit riders and riders who switched from express bus, commuter boat, and existing commuter rail.