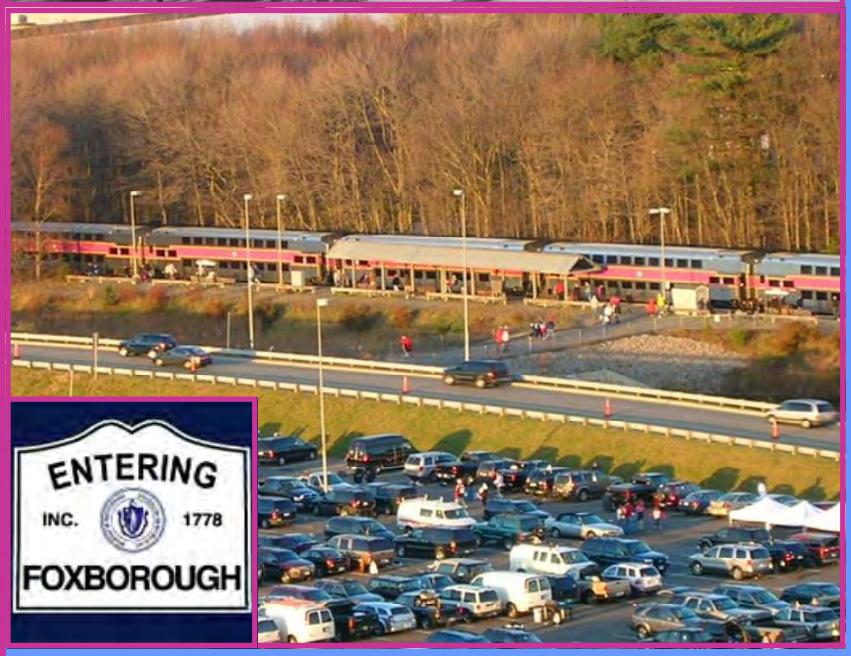
Massachusetts Bay Transportation Authority

Foxborough Commuter Rail Feasibility Study

FINAL REPORT

September 1, 2010



Prepared For:

Massachusetts Bay Transportation Authority

Massachusetts Bay Transportation Authority

With Support From:

Massachusetts Executive Office of Housing and Economic Development

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REPORT NAME: Foxborough Commuter Rail Feasibility Study

PROJECT NUMBER: A92PS03, Task Order No. 2

PREPARED FOR: Massachusetts Bay Transportation Authority (MBTA)

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Central Transportation Planning Staff (CTPS)

DATE: September 1, 2010

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EXECUTIVE SUMMARY

The Massachusetts Bay Transportation Authority (MBTA) working in concert with the Executive Office of Housing and Economic Development (EOHED) are exploring the feasibility of offering fulltime commuter rail service to the existing special-event rail station at Gillette Stadium in Foxborough.

The Town of Foxborough designated 500 acres in the vicinity of the stadium as the Route 1 Economic Development Overlay District and EOHED designated this area as a Growth District in 2008. Planned private development in the district includes 1,500,000 ft^2 of laboratory/office space, 150,000 ft^2 of retail space and the potential for up to 1,000 new homes.

Public officials from Walpole, Foxborough and other surrounding communities were involved in the study process as were abutters to the proposed facility and other interested parties.

Foxborough has not enjoyed regularly scheduled passenger rail service since before World War II. The last regularly scheduled service was a daily round trip between Fitchburg and Taunton calling on Foxborough in each direction. The station lies on a CSX-owned freight only line (the Framingham Secondary) running between Framingham and Mansfield. Special event MBTA trains from Boston travel down the MBTA's Franklin Branch to access the Secondary via a connection at the MBTA's Walpole Station.

This feasibility study was developed with respect to, and is consistent with the five goals and objectives listed in the Massachusetts State Rail Plan[1]:

1) **Capacity and Operations**: Ensure adequate capacity and operational efficiency of the freight and rail system in Massachusetts.

2) **Economic Development**: Support development and a healthy economy through informed investment in the freight and passenger rail system.

3) **Environmental and Quality of Life:** Ensure that improvements to the freight and rail system do not negatively impact the environment and help improve the quality of life for Massachusetts residents.

4) **Safety and Security**: Enhance the safety and security of passenger rail and the freight transportation system in all modes.

5) **Policy and Decision-making**: Provide tools and information to state decision-makers to make informed choices about investment in the freight and passenger rail system in the current transportation funding environment.

There are several inherent capacity issues in the MBTA's existing Southside network on which Foxborough station is located. These issues limit service levels on the network, including terminal capacity at South Station, Northeast Corridor capacity, existing equipment maintenance schedules,

[1] Goals and Objectives for the Massachusetts State Rail Plan can be found at: http://www.massfreightandrailplan.com/about-plan.html. Last Accessed: June 30, 2010.

and existing MBTA commuter rail equipment cycles. The Commonwealth of Massachusetts and the MBTA must determine whether dedicating its limited Southside network capacity to fulltime Foxborough service is the best use of these finite transportation resources.

Service Options

Collaborating with the Massachusetts Bay Transportation Authority (MBTA) and the Massachusetts Bay Commuter Railroad Company (MBCR) operating and planning staff, the study team developed three full-time service alternatives for Foxborough Station representing a spectrum of cost, complexity, and time to implement ranging from a shuttle train connecting with existing Franklin service at Walpole Station to a direct service created by extending Fairmount service to Foxborough with additional service to Dedham, Norwood and Walpole. The design of service alternatives was guided by six primary factors:

1. **Line capacity –** Foxborough Station should be accessed from the Franklin branch to north, since it has available capacity for a new service, as compared to the Northeast Corridor to the south. Service should be integrated with existing service to Forge Park and Fairmount.

2. **Terminal capacity –** Changes in the number and timing of peak period train movements at South Station should be minimized. All service alternatives consequently use existing train slots at South Station to provide Foxborough service. No new peak trains are scheduled at the South Station.

3. **Maintenance capacity –** All alternatives should respect the tight maintenance capacity at South Hampton Street and Readville by requiring service to operate within the constraints of the existing fleet and maintenance cycles. One new train set is introduced into the weekday Southside equipment schedule for the most ambitious alternative. That train set is comprised of a new locomotive and coaches drawn from the existing fleet.

Figure S.1:
Southside Commuter Rail Lines and Stations in the Vicinity of Foxborough

4. **Midday & overnight storage capacity –** The more ambitious alternatives address the existing deficiency in overnight storage capacity for Franklin Branch and Fairmount service by building a six track layover facility for Foxborough, Franklin and Fairmount service. Current facilities at Readville and South Hampton Street are used for midday storage.

5. **Seating Capacity –** The service plans should respect current ridership patterns on existing trains. No seat shortages are created by introduction of the new service.

6. **Parking Capacity** – The service alternatives should take advantage of the extensive availability of parking at Foxborough Station.

7. **Accessibility** – Regional accessibility options are currently limited. Fulltime service to Foxborough will enhance regional accessibility.

Table S.1:
Foxborough Service Options

Option	No. Trains Serving Foxborough		Service Description
	Weekday Trains	**Peak Trains**	
Option A. Connecting Service	40	8	• Existing equipment assigned to the Forge Park service would be employed to provide a rail shuttle service connecting with existing trains serving Walpole Station. • All travel to and from Foxborough would require a transfer to the Franklin Branch. • Impacts on existing service and equipment requirements would be negligible.
Option B. Hybrid Service	34	9	• Foxborough would be served with a combination of connecting shuttle service and direct service to South Station via the Dorchester Branch. • All direct service would be provided by extending existing Fairmount trains to Foxborough. • New travel options for travelers using existing stations in Walpole, Norwood and Dedham would be created. • No new rolling stock would be required. • Impacts on existing service and equipment requirements would be minimal.
Option C. Full Direct Service	32	8	• All Fairmount service would be extended to Foxborough. • All Foxborough trips would operate via the Dorchester Branch. • New travel options for travelers using existing stations in Norwood and Dedham would be created. • One new train set created using existing coaches and a new locomotive would be necessary. • Impacts on existing service and equipment requirements would be minor but noticeable.

Option A offers low capital cost rail service with minimal impact on other services. All trips to and from Foxborough require a transfer at Walpole.

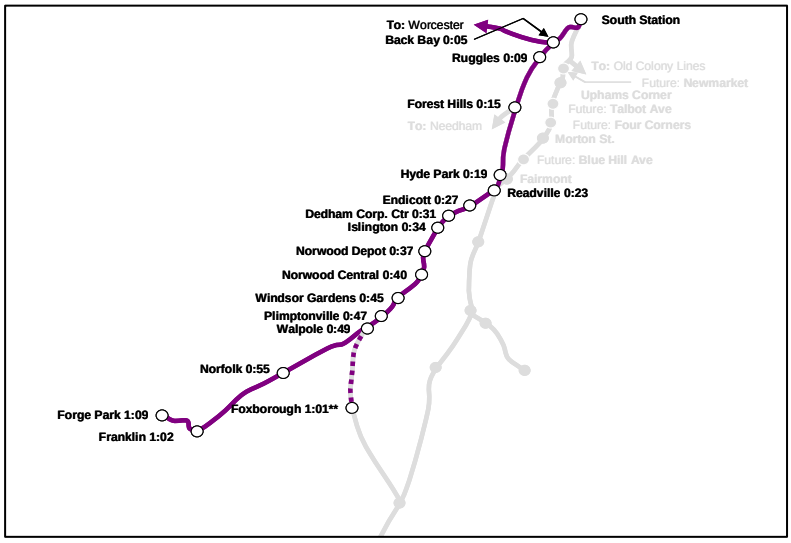


Figure S.2:
Service Option A

Option B extends some of the existing Fairmount Line services approximately 13 miles to Foxborough. A shuttle train similar to Option A will also provide some service. Eight stations on the Franklin Branch between Readville and Walpole generally enjoy more frequent service to and from Boston. No new rolling stock is required. Some peak trips require a transfer at Walpole.

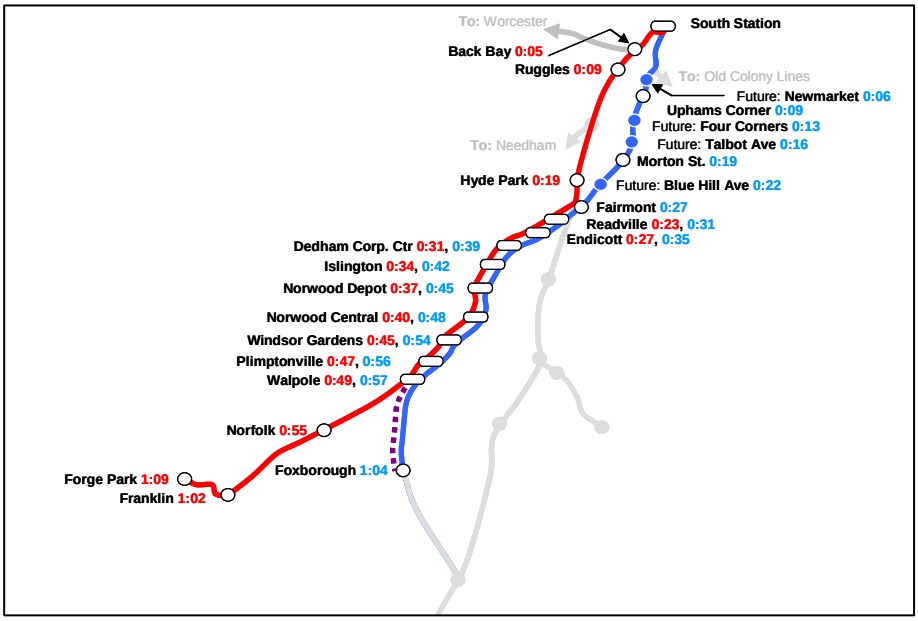


Figure S.3:
Service Option B

Option C extends all existing Fairmount Line service to Foxborough. Six of the eight stations on the Franklin Branch between Readville and Walpole will enjoy more frequent service to and from Boston. This option does not increase the number of trains serving Walpole. One new train set is added to the weekday line-up eliminating the need for any transfers at Walpole.

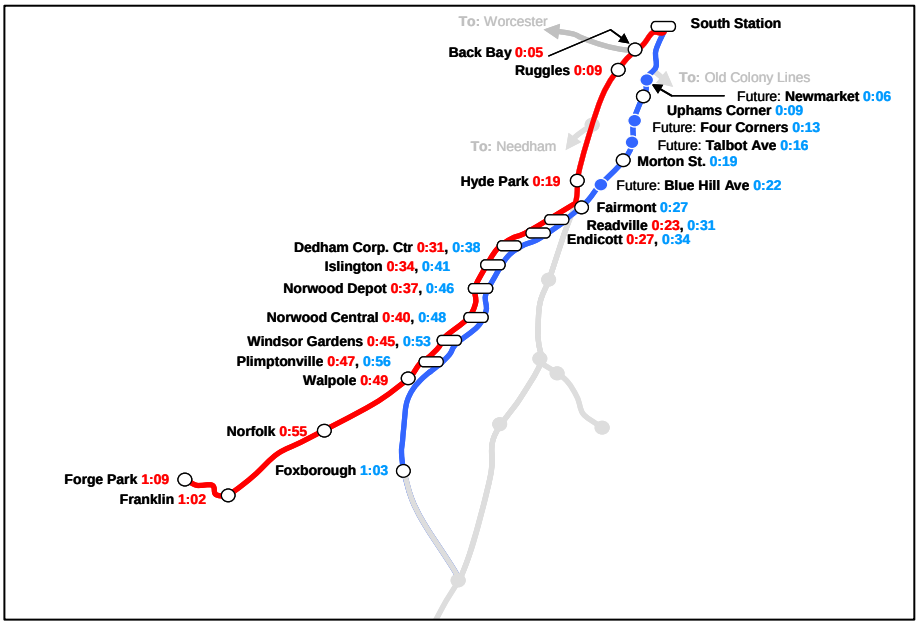


Figure S.3:
Service Option C

Each of the service options would require investments in infrastructure. Only Option C would require additional rolling stock. The estimated capital costs and cost elements necessary for each option are summarized below.

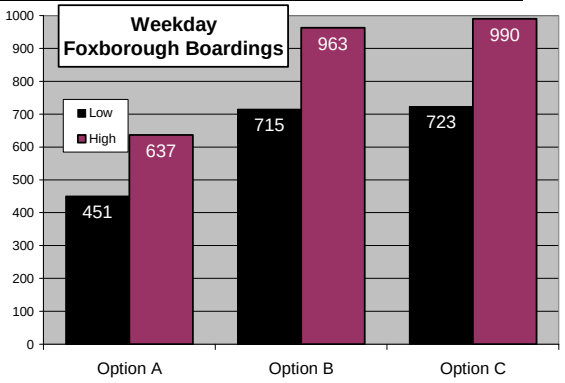
Table S.2
Infrastructure and Cost Summary

	Infrastructure and Capital Cost	Annual Operating Cost
Option A. Connecting Service	• Upgrade CSX Framingham Secondary (Walpole to Mansfield) • New Walpole Station • Franklin passing siding **$50.1 million**	**$1.2 million**
Option B. Hybrid Service	• Upgrade CSX Framingham Secondary (Walpole to Mansfield) • New Walpole Station • Franklin passing siding • Extend double track to Windsor Gardens • Foxborough Layover Facility • Second track at Foxborough Station **$84.0 million**	**$5.7 million**
Option C. Full Direct Service	• Upgrade CSX Framingham Secondary (Walpole to Mansfield) • *No new Walpole Station* • Franklin passing siding • Extend double track to Windsor Gardens • Foxborough Layover Facility • Second track at Foxborough Station • One new locomotive **$63.2 million**	**$7.7 million**

Ridership and Revenue Forecasts

The Central Transportation Planning Staff (CTPS) prepared two sets of twenty-year demand forecasts. One assumes the normal rate of development in and around the Foxborough Growth District. The other assumes full build out of the existing commercial and potential for future residential development. Different assumptions concerning development in the vicinity of the stadium have an obvious impact on forecast boardings. Forecast boardings at Foxborough range from a low of 451 passengers for Option A with a normal growth to 990 passengers for Option C with a full build out.

Option A is forecast to create very few new regional transit trips. Most boardings at Foxborough would be existing passengers diverted to Foxborough by the lure of free parking or by travelers that would otherwise use transit regardless of the Foxborough service. Options B and C on the other hand would stimulate new riders at other stations besides Foxborough with enhancements to service at stations in Walpole, Norwood and Dedham.



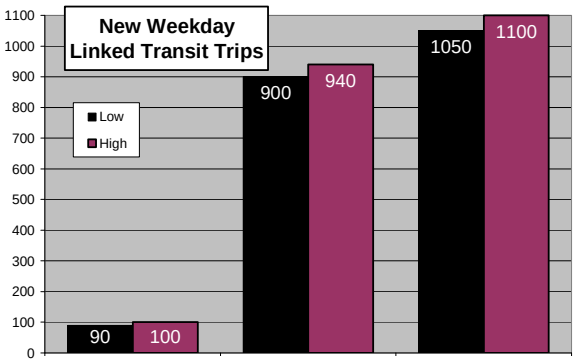


Figure S.4:
Ridership Forecasts

Options B and C would add $2.0 million to $2.3 million to annual fare revenue. Option A's revenue impact would be much less.

In addition to attracting new riders to the MBTA, Options B and C are forecast to accommodate unmet demand for parking at other nearby stations by shifting 275 to 300 riders each weekday morning.

Without the new service, local peak automobile traffic on Foxborough arterials is expected to increase by 72% over the next twenty years. Implementation of the new commuter rail service would add 3% to 5% additional peak traffic to local roadways over the no-build condition.

Evaluation of Service Options

The study team collaborated with stakeholders to recommend an array of criteria to evaluate the service alternatives. The criteria reflect the standards employed by the Commonwealth's Program for Mass Transit, Federal Transit Administration standards, EOHED Growth District Initiative considerations, and MBTA System Benefits as shown in Table S.3

Table S.3:
Recommended Evaluation Criteria for Foxborough Commuter Rail Service

PMT CRITERIA	*DESCRIPTION*	*MEASURE*
Regional Transportation Impacts	Projected number of weekday boardings on Foxborough commuter rail service	# passengers
	Projected number of passengers diverted from auto mode, systemwide (new transit riders)	# passengers
	Projected % increase in weekday transit mode share, systemwide	% increase
	Projected reduction in weekday auto vehicle miles traveled, regionwide	miles
	Projected reduction in VOC, NOx, CO and CO_2 emissions	tons
System Configuration	Expansion of transit access to geographical areas underserved by transit	Hi-Med-Low
Expediency	Improvements to service frequency (net # additional peak hour inbound rail trips)	# train trips
	Increase in travel speed; time savings for all rail users in the corridor	minutes
Fairness/Elimination of Travel Barriers	Elimination of barriers to efficient travel between key destinations and neighborhoods with substantial minority or low-income population (# peak period trains in reverse-peak direction)	# trains
	Provision of benefits that outweigh burdens in neighborhoods with substantial minority or low-income populations	Hi-Med-Low
Job Accessibility	Expansion of access to major activity centers (% increase in number of industrial, retail and service jobs within a 65 minute transit trip	% increase in jobs
Land Use Impacts/Consistency w/ Local Goals	Consistency with local plans promoting TOD and sustainable land use patterns	Hi-Med-Low
	Contribution to brownfield and infill development	Hi-Med-Low
OTHER CRITERIA	DESCRIPTION	MEASURE
Job Opportunities	Potential for reverse commute /access to jobs (# peak hour trains in reverse-peak direction)	Hi-Med-Low
Fairness to Existing Neighbors	Traffic (and air quality impacts) within traffic analysis zones	% increase VMT
	Ability to limit noise impacts in neighborhoods adjacent to ROW	Hi-Med-Low
Community Enhancement	Assesses whether alternatives would have a positive impact on future residential growth	Hi-Med-Low

Table S.3:
Recommended Evaluation Criteria for Foxborough Commuter Rail Service

PMT CRITERIA	*DESCRIPTION*	*MEASURE*
Environmental Sensitivity/Land Reuse	Ability to limit environmental impacts and preserve open space.	Hi-Med-Low
	Ability of project to re-use land or avoid development on previously undisturbed land.	Hi-Med-Low
State of Good Repair Benefits	Involves replacement of aging assets or provides critical infrastructure	Hi-Med-Low
Systemwide Operational Benefits	Secondary benefits in terms of layover space, operational flexibility, system capacity, etc.	Hi-Med-Low
Capital and Operating Cost Effectiveness	Total Capital Cost (for fixed assets such as land, track, stations, etc.)	$
	Capital Cost per New Transit Trip	$/trip
	Net Operating Cost (operations less incremental fare and parking revenues)	$
	Net Operating Cost per New Transit Trip	$/trip

The study team's finding on each measure are summarized in Table S.4 and briefly summarized below.

Table S.4
Evaluation Summary

Measure	*Option A*	*Option B*	*Option C*
Daily Foxborough Station Boardings	637	963	990
New Transit Riders (systemwide)	100	940	1,100
System Configuration (new access)	Medium	Medium	Low
System Expediency	Medium	Medium	Medium
Fairness/Elimination of Travel Barriers	Low	Medium	High
Job Accessibility & Opportunities	Low	Medium	High
Consistency w/ Land Use Goals	Medium	High	Medium
Fairness to Existing Neighbors / Community Enhancement	High	Medium	Medium
Environmental Sensitivity/Land Reuse	High	Medium	Medium
State of Good Repair Benefits	Low	High	Medium
Systemwide Operational Benefits	Medium	High	High
Capital Cost per New Transit Trip (over one year)	$1,710	$305	$196
Operating Support per New Transit Trip	$35.06	$13.33	$16.69

Option A – Would operate connecting train service between Foxborough Station and Walpole, where passengers would transfer at a reconstructed Walpole Station to use Franklin Branch service for travel to and from Boston. Without the need for a layover facility and with no change in existing conditions north of Walpole Center, Option A performs best overall in terms of Fairness to Existing Neighbors and Environmental Sensitivity/Land Reuse.

However, due to the time and inconvenience associated with the transfer at Walpole Station, only 100 new transit riders would be attracted to the service and Option A scores the lowest in terms of regional transportation benefits and overall cost-effectiveness. It is also the lowest performing alternative in terms of eliminating travel barriers, increasing job accessibility and supporting MBTA State of Good Repair needs.

Option B – Offers a combination of peak period direct service and peak-period connecting service to Walpole Station with direct off-peak service to Boston. It would attract 963 daily boardings at Foxborough and, due to increased service at existing stations, would attract a similar number of new transit riders (940) to the system that would not otherwise use mass transit.

Option B performs the best overall in terms of Consistency with Local Land Use Goals, and in terms of providing the MBTA with secondary benefits associated with State of Good Repair upgrades and other Systemwide Operational Benefits. With a relatively high number of new transit riders and mid-range Operating & Maintenance Costs, this alternative would require the lowest level of Operating Support per New Transit Trip and would be the most cost-effective to operate.

Option C - Extends all Fairmont Line commuter rail service 13 miles south to Foxborough via the Franklin Branch, and supplements this service with one additional train set. It would attract the greatest number of riders to the system, with a forecast 990 daily boardings at Foxborough and a total of 1,100 new transit riders (including other new riders attracted by higher service levels at existing stations). With a lower capital investment level needed to implement the service, it would also have a lower capital cost per new linked trip.

Option C performs the best overall in terms of Job Accessibility, its ability to support a reverse commuter and Eliminating Travel Barriers from neighborhoods with high numbers of low income households and/or minority populations. Along with Option B, it also provides a high level of secondary Systemwide Operational Benefits for the MBTA.

Option C was assigned a low ranking in only one category – System Configuration – largely because it provides the lowest level of daily service to Foxborough Station and would not provide any service from Foxborough to Back Bay Station.

Options B and C attract a higher number of Foxborough boardings and new transit riders to the MBTA system and, as a result, would present more cost-effective service alternatives than Option A. Option C would attract the most passengers and require the lowest level of capital investment per new trip. Option B attracts nearly the same level of passengers as Option C, would provide service to Back Bay, and would require the lowest overall operating subsidy per new trip.

A review of the more qualitative factors indicates trade-offs. Option A requires fewer capital improvements and would have less impact on the surrounding communities. Option B appears to

be most consistent with local land use goals, while Option C would do a better job of supporting Job Accessibility and reverse commute options. Options B and C would help the MBTA realize additional secondary benefits including State of Good Repair upgrades and other operational improvements.

Finally, in order to provide a further basis for considering the overall effectiveness of fulltime weekday commuter rail service from Foxborough station, a comparison of other projected commuter rail conditions to current MBTA operating statistics is provided in Table S.5

Table S.5
Foxborough Operating Economics

Measure	MBTA 2008 CR Avg.	Option A	Option B	Option C
Fare Box Recovery Rate (Fare Revenue / Operating & Maintenance Cost)	**54%**	14%	35%	30%
O&M Cost per Commuter Rail Boarding	**$5.86**	$9.89	$15.60	$9.76
Subsidy per Commuter Rail Boarding	**$2.69**	$8.55	$10.11	$6.83
O&M Cost per CR Passenger Mile	**$0.29**	$0.35	$0.64	$0.68

The costs and subsidies required are higher than MBTA operating standards. However, these are offset to some degree by the benefits presented by new service, including the removal of several hundred vehicles from area roadways, reduction of vehicular emissions and corresponding improvements in regional air quality. Other offsets may include increased MBTA operations efficiencies and service reliability that may be realized with a Foxborough-based layover station. Further study of commuter rail options to Foxborough may include recommendations for additional service options with lower operating costs.

One potentially attractive alternative may be a variant on Option C in which trains are run during peak service hours with most of the off-peak service to Foxborough being offered via a bus connection to and from Sharon Station. This alternative would cost dramatically less to operate compared with extending all Fairmount service trains to Foxborough but would still provide attractive peak travel options from Foxborough when most mobility is required. This alternative would also maintain Option Cs ability to address deficiencies in MBTA facilities for overnight equipment storage and servicing.

Completion of this analysis has provided the stakeholders with a number of attractive options for expansion of regional public transit that will complement existing and future development plans in the region. However, the development of new housing in the study area is critical to the viability of expanded service.

CHAPTER 1: IDENTIFY KEY ISSUES AND PROJECT APPROACH

Introduction

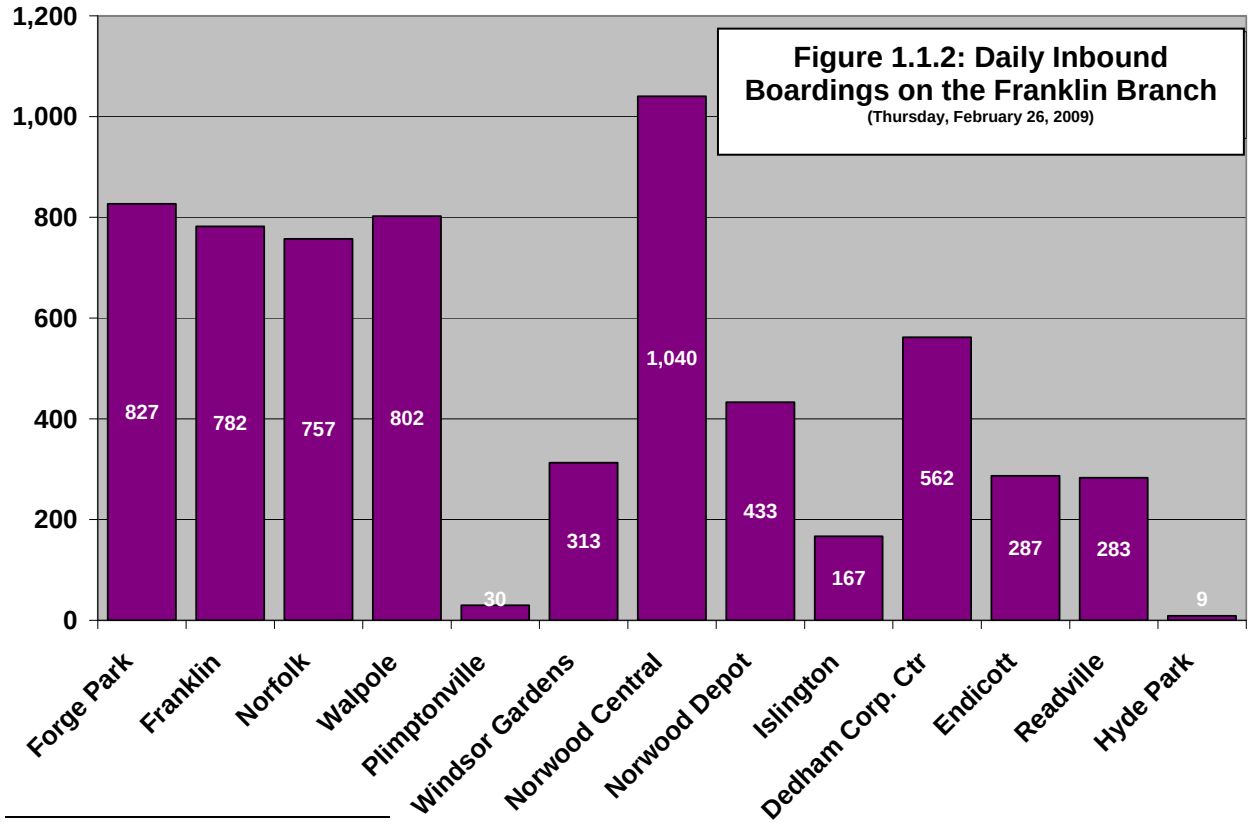
The Massachusetts Bay Transportation Authority (MBTA) working in concert with the Executive Office of Housing and Economic Development (EOHED) are exploring the feasibility of offering fulltime commuter rail service to the existing special-event station at Gillette Stadium in Foxborough. The area currently encompassing Gillette Stadium and Patriot Place (which replaced Sullivan Stadium) – as well as surrounding land – has been designated as a Growth District by EOHED. This designation involves an EOEHD partnership with local municipalities to expedite the permitting of residential and commercial growth in desired areas. It is also the State's intent to support these districts by making them "development ready" through actions such as the development of transportation facilities and other public infrastructure.

Figure 1.1.1:
Commuter Rail lines in the Vicinity of Foxborough (to scale)

1.1 Background

Foxborough has not enjoyed regularly scheduled passenger rail service since before World War II. The last regularly scheduled service was a daily round trip between Fitchburg and Taunton calling on Foxborough in each direction. Special event service related to the stadiums and racetracks in Foxborough can be traced to 1973.[2] The station has since been used to carry spectators to Patriots games and other events at the venue. The station at Gillette Stadium is approximately 23 rail miles from Boston's South Station. It is located on a CSX-owned freight only line (the Framingham Secondary) running between Framingham and Mansfield. Special event MBTA trains from Boston access the branch via a reverse move over a wye-connection at the Authority's Walpole Station approximately 3.5 miles to the north. They do not use the direct head-end move across the wye since operation of the power switch is not reliable. Special event MBTA trains from Providence access the branch from Mansfield Station approximately 5.0 miles to the south.

To the north of Foxborough is Walpole. Walpole Station is located on the MBTA's 11-station Franklin Branch. The 20 mile Franklin Branch is served by 37 weekday revenue trains (including trains turning at Walpole and Norwood Central) carrying roughly 6,300 inbound weekday commuters.[3] Approximately 40%[4] of the daily ridership on the branch boards at one of the three stations south of Walpole (Norfolk, Franklin, and Forge Park). See Figure 1.1.2.



[2] Sverdrup Corporation. *Foxborough-Sullivan Stadium Commuter Rail Service Study*. (February 1989). Prepared for: the Massachusetts Bay Transportation Authority, pp. 1.
[3] Massachusetts Bay Commuter Railroad. *Conductor Audit of the Franklin Line, February 26, 2009*. Received from the MBTA, October 21, 2009.
[4] Sverdrup Corporation. *Foxborough-Sullivan Stadium Commuter Rail Service Study*. (February 1989). Prepared for: the Massachusetts Bay Transportation Authority, pp. 1.

Of the 37 trains using the Franklin Branch, approximately 90% of the trains travel on the Northeast Corridor from Readville to South Station, while the remaining 10% utilize the Dorchester Branch for travel between Readville and South Station.[5]

Tables 1.1.1 and 1.1.2 detail weekday revenue operations along the Franklin and Fairmount services. Fairmount service is included on the table due to two circumstances:

1. Dorchester and Franklin branches meet at Readville providing an alternative route for Franklin Branch trains to reach South Station

2. Most Fairmount trains have excess seating capacity. This capacity could possibly be utilized by extending those trains via the Readville connection to carry passengers to and from Foxborough.

Table 1.1.1:
Franklin and Fairmount Line Weekday Trains *to Boston*[6] (February 26, 2009)

Train	From	To	So. Station Arrival	Psgrs[7]	Seats[8]	Standees	Set ID[9]	Prev. Train	Next Train	Route	Remark
790	Forge Park	So. Station	6:15 AM	589[†]	684	0	S	703	745	DB	Local
702	Forge Park	So. Station	6:50 AM	672	948	0	I	N/A	905	NEC	Local
744	Readville	So. Station	7:02 AM	83	570	0	Y	743	SH	DB	Local
704	Forge Park	So. Station	7:09 AM	451	948	0	G	N/A	607	NEC	Express
746	Readville	So. Station	7:32 AM	365	684	0	S	745	749	DB	Local
706	Forge Park	So. Station	7:41 AM	1,069	948	121	V	DH6701	735	NEC	Local
708	Forge Park	So. Station	7:59 AM	1,100	1,260	0	H	DH6701	SH	NEC	Express
748	Readville	So. Station	8:25 AM	176	684	0	W	747	509	DB	Local
732	**Walpole**	So. Station	8:40 AM	588	684	0	M	733	SH	NEC	Local
750	Readville	So. Station	8:52 AM	81	684	0	S	749	753	DB	Local
710	Forge Park	So. Station	8:54 AM	743	948	0	R	N/A	707	NEC	Local
734	**Nrwd Ctrl**	So. Station	9:25 AM	265	948	0	V	735	611	NEC	Local
712	Forge Park	So. Station	10:08 AM	359	948	0	C	795	SH	NEC	Local
754	Readville	So. Station	11:30 AM	13	684	0	S	753	755	DB	Flag stop
714	Forge Park	So. Station	11:48 AM	588	948	0	R	707	811	NEC	Local
716	Forge Park	So. Station	1:06 PM	284	948	0	T	709	529	NEC	Local
756	Readville	So. Station	1:30 PM	34	684	0	S	755	757	DB	Flag stop
718	Forge Park	So. Station	3:05 PM	201	684	0	N	711	917	NEC	Local

[5] Massachusetts Bay Transportation Authority. *Franklin Line Schedule, Effective: May 18, 2009*. Available: http://www.mbta.com/uploadedfiles/Documents/Schedules_and_Maps/Commuter_Rail/Franklin%20Line%20040708.pdf. Retrieved: October 19, 2009.
[6] Bold destinations represent turns prior to Forge Park, and shaded columns indicate MBTA service using the Dorchester Branch.
[7] Massachusetts Bay Commuter Railroad Company. ROSS Conductor's Counts for February 2009. Received electronically from the Massachusetts Bay Transportation Authority, October 21, 2009.
[8] Massachusetts Bay Commuter Railroad Company. (June 20, 2009). *South Side Equipment Cycle.* Received electronically from MBCR, October 8, 2009.
[9] Ibid.
[†] Jacobs believes the Conductor's Counts for this train to be inaccurate. According to the MBCR commuter train audit for February 26, 2009, a total of 209 passengers boarded Train #790 between Forge Park and Readville.

Table 1.1.1:
Franklin and Fairmount Line Weekday Trains *to Boston* [6] (February 26, 2009)

Train	From	To	So. Station Arrival	Psgrs[7]	Seats[8]	Standees	Set ID[9]	Prev. Train	Next Train	Route	Remark
758	Readville	So. Station	3:30 PM	30	684	0	S	757	SH	DB	Flag stop
760	Readville	So. Station	4:40 PM	11	882	0	LL	759	763	DB	Local
720	Forge Park	So. Station	5:08 PM	171	1,260	0	A	713	817	NEC	Flag stop
762	Readville	So. Station	5:50 PM	33	1,260	0	H	761	819	DB	Flag stop
794	**Nrwd Ctrl**	So. Station	6:05 PM	90	684	0	U	737	531	NEC	Express
764	Readville	So. Station	6:20 PM	25	882	0	LL	763	089	DB	Flag Stop
766	Readville	So. Station	6:40 PM	22	684	0	O	765	533	DB	Express
796	Forge Park	So. Station	7:05 PM	51	684	0	W	717	769	DB	Flag Stop
768	Readville	So. Station	7:40 PM	22	684	0	B	767	631	DB	Flag Stop
770	Readville	So. Station	8:40 PM	40	684	0	W	769	771	DB	Flag Stop
798	Forge Park	So. Station	8:45 PM	70	948	0	C	723	633	DB	Express
726	Forge Park	So. Station	9:45 PM	13	948	0	X	725	537	NEC	Express
772	Readville	So. Station	10:35 PM	10	684	0	W	771	539	DB	Flag Stop
728	Forge Park	So. Station	11:06 PM	17	570	0	Y	727	N/A	NEC	Express
730	Forge Park	So. Station	12:41 AM	11	1,260	0	F	729	N/A	NEC	Express

Table 1.1.2:
Franklin and Fairmount Line Weekday Trains *to Boston* [10] (February 26, 2009)

Train	From	To	So. Station Departure	Psgrs[11]	Seats[12]	Standees	Set ID[13]	Prev. Train	Next Train	Route	Remark
703	So. Station	Forge Park	4:00 AM	29	684	0	S	N/A	790	NEC	Express
743	So. Station	Readville	5:40 AM	17	570	0	Y	N/A	744	DB	Flag Stop
745	So. Station	Readville	6:30 AM	7	684	0	S	790	746	DB	Flag Stop
733	So. Station	**Walpole**	6:55 AM	49	684	0	M	500	732	NEC	Local
747	So. Station	Readville	7:20 AM	59	684	0	W	902	748	DB	Express
795	So. Station	Forge Park	7:35 AM	79	948	0	C	804	712	DB	Flag Stop
749	So. Station	Readville	7:50 AM	45	684	0	S	746	750	DB	Flag Stop
735	So. Station	**Nrwd Ctrl**	7:55 AM	233	948	0	V	706	734	NEC	Express
707	So. Station	Forge Park	9:20 AM	277	948	0	R	710	714	NEC	Local
753	So. Station	Readville	10:05 AM	25	684	0	S	750	754	DB	Flag Stop
709	So. Station	Forge Park	10:50 AM	169	948	0	T	514	716	NEC	Local
755	So. Station	Readville	12:05 PM	35	684	0	S	754	756	DB	Flag Stop
711	So. Station	Forge Park	12:45 PM	271	684	0	N	SH	718	NEC	Local
757	So. Station	Readville	2:05 PM	50	684	0	S	756	758	DB	Flag Stop
713	So. Station	Forge Park	2:40 PM	487	1,260	0	A	SH	720	NEC	Local
759	So. Station	Readville	3:30 PM	63	882	0	LL	RDV	760	DB	Flag Stop

[10] Bold destinations represent turns prior to Forge Park, and shaded columns indicate MBTA service using the Dorchester Branch.
[11] Massachusetts Bay Commuter Railroad Company. ROSS Conductors Counts for February 2009. Received electronically from the Massachusetts Bay Transportation Authority, October 21, 2009.
[12] Massachusetts Bay Commuter Railroad Company. (June 20, 2009). *South Side Equipment Cycle*. Received electronically from MBCR, October 8, 2009.
[13] Ibid.

Table 1.1.2:
Franklin and Fairmount Line Weekday Trains *to Boston* [10] (February 26, 2009)

Train	From	To	So. Station Departure	Psgrs[11]	Seats[12]	Standees	Set ID[13]	Prev. Train	Next Train	Route	Remark
715	So. Station	Forge Park	3:55 PM	662	948	0	P	064	N/A	NEC	Local
717	So. Station	Forge Park	4:20 PM	1,139†	684	455	W	SH	796	NEC	Local
761	So. Station	Readville	4:30 PM	36	1,260	0	H	SH	762	DB	Local
737	So. Station	**Nrwd Ctrl**	4:45 PM	878	684	194	U	618	794	NEC	Local
763	So. Station	Readville	5:10 PM	101	882	0	LL	760	764	DB	Local
719	So. Station	Forge Park	5:10 PM	247	1,260	0	F	RDV	798	NEC	Express
765	So. Station	Readville	5:40 PM	210	684	0	O	RDV	766	DB	Local
721	So. Station	Forge Park	5:40 PM	1050	948	102	I	SH	N/A	NEC	Local
723	So. Station	Forge Park	6:15 PM	840	948	0	C	620	798	NEC	Local
767	So. Station	Readville	6:30 PM	120	684	0	B	526	768	DB	Local
769	So. Station	Readville	7:30 PM	219	684	0	W	796	770	DB	Flag Stop
725	So. Station	Forge Park	7:35 PM	365	948	0	X	530	726	NEC	Local
727	So. Station	Forge Park	8:50 PM	199	570	0	Y	628	728	NEC	Local
771	So. Station	Readville	9:30 PM	110	684	0	W	770	772	DB	Flag Stop
729	So. Station	Forge Park	10:35 PM	178	1,260	0	F	798	730	NEC	Local
731	So. Station	Forge Park	11:50 PM	261	948	0	R	826	N/A	NEC	Local

1.2 Key Issues

Several key issues affect the feasibility of fulltime commuter service. Each of these issues are briefly discussed below with a note concerning where the issue will be addressed in the project plan.

1. **Northeast Corridor, Franklin Branch and Dorchester Branch Capacity.** The Northeast Corridor (NEC) is utilized by the Authority's Franklin, Providence/Stoughton, and Needham commuter services, as well as by Amtrak's Acela and Regional service. Franklin service uses the NEC and the Dorchester Branch to reach South Stations. Time slots for all services during the peak periods are at a premium, and finding slots for any Foxborough service could be a challenge. (Task 2)

2. **Back Bay Station.** Back Bay Station is one of the Authority's most popular passenger destinations. It is serviced by five of the MBTA's nine Southside commuter rail lines (the Framingham/Worcester line, Providence/Stoughton line, Needham line, and Franklin line), as well by all Amtrak intercity service arriving and departing from South Station. Any service offering not stopping at Back Bay (e.g., service using the Dorchester Branch) needs to be carefully analyzed for any potential impacts. (Tasks 2 and 4)

3. **South Station capacity for additional trains, if any.** During the peak periods, South Station is near its platform capacity. Although there are plans to expand platform capacity

† Jacobs believes the reported riders for Train #717 to be inaccurate. According to the February 26, 2009 Revenue Audit, the monthly average weekday ridership for Train #717 is 949 resulting in 265 standees. Jacobs has confirmed with the MBTA and MBCR that the audit for this trip is overestimated. MBTA Railroad Operations states that Franklin Train #717 has no capacity problems. Telephone conversation with Mr. Tom Foster, MBTA Railroad Operations, November 10, 2009.

at South Station, it is most desirable if Foxborough service could be offered without any increased demand on platform capacity. (Task 2)

4. **Parking capacity at Walpole, Mansfield, and Sharon.** Foxborough residents must currently commute to a neighboring town to use Commuter Rail service for travel to Boston. The lots at these stations are at or near capacity, and provide few spaces for Foxborough residents. Service to Foxborough would help to alleviate some parking congestion, and make the service more attractive to local residents. (To be addressed in Task 2 with input from a CTPS license plate survey at existing stations. See Appendix A for the results of this survey).

5. **Integration with current Franklin and Dorchester Branch service.** Current MBCR conductor audits indicate approximately 40% of all inbound boardings on the Franklin Branch occur at Norfolk, Franklin, and Forge Park, a figure which increases to 50% if Walpole is included with the previous three stations.[14] Any service must present minimal disruptions to existing southern half of the Franklin Branch ridership. Strategies that integrate Foxborough service with the Dorchester Branch must also be mindful to potential disruptions in Dorchester Branch service and increased running times on the Dorchester Branch. (Tasks 2 and 4)

6. **Locations for storing rolling stock.** The existing MBTA midday and overnight layover facilities at Readville, Southampton, and Franklin are at or are near capacity. The MBTA has stated it is not feasible to deadhead equipment (i.e., make a non-revenue move) from Boston to Foxborough to provide fulltime service. An overnight layover facility in the vicinity of Foxborough will be required to offer service, as will increased midday layover capacity at one of the facilities close to Boston. (Tasks 2 and 4)

7. **ADA accessibility at area commuter rail stations.** Walpole and Sharon stations are not ADA accessible stations. Mansfield and Foxboro provide accessibility to commuter rail service via mini-high platforms. Offering fulltime service to Foxborough with a fully accessible high-level platform will improve the local commuter rail accessibility options. (Tasks 2 and 4)

8. **The existing configuration of Walpole Station**. The current eastbound wye connection from the Franklin Branch to the Framingham Secondary bisects the existing passenger platform and parking lot. Special event MBTA trains from Boston access the branch via a reverse move over a wye-connection. They do not use the direct head-end move across the wye. Fulltime service to Foxborough needs to address this problem and present a solution that does not adversely impact the existing Walpole passengers. (Task 4)

9. **Passenger service on the existing Framingham Secondary** currently operates at 10 mph. The MBTA has stated that Federal Railroad Administration (FRA) Class 3 track would be required to offer full time service. To make fulltime service convenient for Foxborough passengers, any service option would require raising the existing speed limit to so that trains can operate at Class 3 speeds (up to 60 mph). (Task 4)

[14] Massachusetts Bay Commuter Railroad. *Conductor Audit of the Franklin Line, February 26, 2009*. Received from the MBTA, October 21, 2009.

10. **Ridership, revenue and peak rolling stock requirements.** The existing station location is roughly equidistant from the stations in Walpole (Franklin line), Mansfield and Sharon (Providence line). Any fulltime service to Foxborough needs to provide passengers within the EOHED Growth District with convenient service and should be seen as competitive with the service offered at the three regional stations. Ridership will also be a critical element in determining peak rolling stock requirements. (Task 4)

11. **Incremental operating cost** is a measure of the additional cost needed to maintain and operate Foxborough service above the current Franklin costs. The costs required to operate Foxborough service will need to be in line with other of the Authority's operating costs. (Task 4)

12. **Capital costs for infrastructure improvements** is the measure of the investment associated with the purchase, development or construction of fixed assets, such as land, guideways, stations, buildings, and vehicle acquisition. The extent of the improvements required will determine the feasibility of offering fulltime Foxborough service. (Task 4)

13. **Framingham Secondary ownership.** A recent agreement between CSX and the Commonwealth does not include acquisition of the Framingham Secondary between Mansfield and Walpole stations by Massachusetts. The ownership will remain with CSX. Any fulltime service offered to Foxborough will need to be coordinated with CSX. (Not addressed in study scope per direction from MBTA.)

1.3 Approach

This section has provides a brief overview of the issues related to development of fulltime Foxborough commuter rail service, and represents Task 1 of the study. The following outlines the remaining tasks accomplished as part of this study.

Task 2: Analyze the Capacity of the Existing System

The capacity of the Franklin Branch, Northeast Corridor, Dorchester Branch, South Station and the South Side Commuter Rail servicing and storage facilities influenced how much service can be offered to a full-time Foxborough Station. Task 2 reviewed current and planned operations and available capacity on these system elements to inform the evaluation of options for Foxborough service.

Activities: JEK consulted with MBTA Railroad Operations and leveraged previous studies including, but not limited to, the 2004 CRINA report and recent Fairmount Line planning studies to determine future plans and capacities for the branches and facilities that may be employed in the operation of a full-time Foxborough service. Stringlines and station capacity analyses prepared for earlier studies will be reviewed and updated as necessary to reflect 2009 conditions. The team used the track charts, current MBTA, Amtrak & freight schedules, existing South Side equipment cycles, 2009 Massachusetts Bay Commuter Railroad (MBCR) passenger and conductor audits, recent Fairmont Line planning studies, and previous Foxborough planning studies for reference.

Deliverable: JEK prepared a summary of findings supported with worksheets and graphs as included as appendices where necessary, as well as a discussion of upgrades that would be necessary to facilitate full-time service to Foxborough.

Task 3: Develop Evaluation Criteria
Formal evaluation criteria were developed to evaluate potential full-time service options for Foxborough Station.

Activities: JEG developed recommended criteria for the evaluation of service options. The criteria reflected the measures used by the Commonwealth and the Federal Transit Administration used to evaluate other mass transportation initiatives including the standards employed by the Program for Mass Transit and FTA New Starts criteria. Special attention was paid to the potential for economic growth and sustainable transit oriented development in the designated Growth District. JEG liaised with EOHED regarding their criteria for the evaluation of economic development opportunities created by new transit services.

Deliverable: JEG prepared a list of recommended evaluation criteria, with weights and ranking if appropriate, and with a description of how they were applied to the service options. The recommendations were reviewed with the MBTA and EOHED and other stakeholders before they are finalized and employed in the evaluation of service options.

Task 4: Alternatives Analysis and Evaluation
JEK developed three full-time service development options for Foxborough Station. These options represented a spectrum of cost, complexity, and time to implement with sufficient detail provided to encompass all relevant issues. The analysis allowed the MBTA to make an informed decision about whether to pursue additional Commuter Rail service.

Activities: Each of the three service options developed included an analysis of station locations, running times, service schedules, stringlines, equipment cycles, infrastructure and rolling stock requirements and passenger loadings in the form of a draft operating plan. Each improvement package was reviewed with MBTA Railroad Operations before they were finalized.

Based on past experience, JEG structured its service options as a sequential improvement program starting with a package of relatively low cost, "quick fix" improvements and progressing to more capital intensive packages that require increased lead time and funding to implement. The improvement packages were structured in such a way that Package One was used as a building block for Package Two, which was in turn used as a building block for Package Three.

JEG shared details of each service option with CTPS to provide inputs to the ridership forecasts being developed by that agency.

These options were vetted with key stakeholders. JEG and CTPS collaborated to prepare a quantitative and substantive evaluation of each option including the following elements:

- Travel Demand and Passenger Revenue
- Economic Development Impacts & Transit Oriented Development Opportunities
- Operating Costs
- Railroad Infrastructure Requirements and Capital Costs

- Stations and Platforms
- Parking and Traffic
- Track Improvements
- Signals and Grade Crossings
- Bridge and Structures
- Rolling Stock
- Rolling Stock Storage and Maintenance Capacity

Deliverable*:* Jacobs prepared a draft service development packages for review and comment by the MBTA Railroad Operations, MBTA Planning and Development before they were finalized for evaluation.

The findings of the evaluation were be reported in a short document not exceeding 20 pages of text that described the three analyzed alternatives and assessing how each option fares relative to the evaluation criteria established in Task 3.

Task 5: Stakeholder Outreach and Interaction
Throughout the study, JEG worked with the MBTA to coordinate, inform and liaise with stakeholders including but not limited HED, CTPS, CSX, Town of Foxborough, New England Patriots, regional planners and other public officials.

Activities: JEG's stakeholder outreach encompassed several meetings with project stakeholders. At each meeting, JEG prepared and delivered materials to facilitate information gathering and to present analysis and findings. After each meeting, JEG prepared and distributed meeting minutes and performed any indicated follow-up.

Deliverables: Meeting materials, such as hand outs or power point presentation, and minutes the formal meetings with stakeholders.

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CHAPTER 2: ANALYZE THE CAPACITY OF THE EXISTING SYSTEM

Introduction and Summary

In considering options to develop fulltime commuter rail service to Foxborough Station, seven dimensions of capacity must be considered.

1. Line Capacity
2. Terminal Capacity
3. Maintenance Capacity
4. Midday and Overnight Storage Capacity
5. Seating Capacity
6. Parking Capacity
7. Accessibility

This chapter reviews the current and projected future capacity of the MBTA network on each of these dimensions pertaining to weekday Foxborough service.

The evaluation of current capacity relies on data supplied by the MBTA and MBCR pertaining to current operations and infrastructure. The evaluation of future capacity relies on information and analyses derived from the following sources:

- *South Coast Rail Alternatives Analysis Project: Capacity Utilization Analyses Technical Memorandum*. Prepared for Massachusetts Bay Transportation Authority, prepared by Systra Corporation (2009).

- *Commuter Rail Infrastructure Needs Analysis (CRINA).* Prepared for Massachusetts Bay Transportation Authority, prepared by Vannesse Hangen and Brustlin (VHB) and KKO and Associates (2004).

- Amtrak's 2030 Northeast Corridor Master Plan.[15]

- Goals and Objectives from the *Massachusetts State Rail Plan*[16]:
    - **1) Capacity and Operations** Ensure adequate capacity and operational efficiency of the freight and rail system in Massachusetts.
    - **2) Economic Development**: Support development and a healthy economy through informed investment in the freight and passenger rail system.
    - **3) Environmental and Quality of Life:** Ensure that improvements to the freight and rail system do not negatively impact the environment and help improve the quality of life for Massachusetts residents.
    - **4) Safety and Security**: Enhance the safety and security of passenger rail and the freight transportation system in all modes.

[15] Received by Jacobs Engineering from Amtrak, January 2009.
[16] Goals and Objectives for the Massachusetts State Rail Plan can be found at: http://www.massfreightandrailplan.com/about-plan.html. Last Accessed: June 30, 2010.

5) **Policy and Decision-making**: Provide tools and information to state decision-makers to make informed choices about investment in the freight and passenger rail system in the current transportation funding environment.

Currently underway, the South Coast Rail study is the MBTA's most current and comprehensive long range planning study for South Side commuter rail service. It is important that the Foxborough analysis be consistent with this report. The CRINA study provides a 2025 forecast of infrastructure and services required on the MBTA commuter rail network to satisfy forecast future ridership on its existing network. Both sources were consulted regarding demands for capacity necessary to satisfy growth in current markets.

Key findings of the review include:

1. **Line capacity**
   The analysis of current and projected operations relative to line infrastructure indicates:
   - Serious capacity constraints and potential conflicts with other services on any route to Foxborough via Mansfield on the Northeast Corridor, particular on the double track segment south of Read interlocking
   - Adequate capacity for expanded service on the triple track Northeast Corridor north of Read interlocking
   - Adequate capacity for expanded service on the double track Dorchester Branch except for a short single track bottleneck at Readville Station where the Dorchester and Franklin Branches connect
   - Capacity constraints on the Franklin Branch, due to its largely single track configuration, pose challenges that could be addressed with selective expansions to a two track configuration especially over
     - the 4.1 miles between Walpole and Norwood Central, and
     - the 0.6 miles at Readville Station.

     These circumstances favor developing service options via Walpole on the Franklin Branch that run to South Station on either the Dorchester Branch or the triple tracked portion of the Northeast Corridor.

2. **Terminal capacity**
   The South Station Terminal is presently operating near its practical capacity. Planning is underway for a substantial upgrade to provide for growth in ridership on existing services and to allow for the development of new services. In the more immediate term, absent capacity enhancements, it should be possible to add one or two more peak MBTA arrivals at South Station. This is especially true if the trains are not operating on the predominantly Old Colony tracks. (Tracks 10-13). Any increase in peak period Amtrak service and/or offering of commuter rail service to Fall River and New Bedford would necessitate an expansion of the number of terminal tracks at South Station.

3. **Maintenance capacity**
   The current Service and Inspection (S&I) facility at Southhampton Street is operating above nominal capacity. However it may be possible to add one or two more train sets without requiring an increase in S&I capacity. However, such an initiative would put the South Side operation even further outside industry norms.

4. **Midday & overnight storage capacity**
   Midday and overnight capacity to store idle MBTA South Side trains is in short supply. Careful analysis indicates that there is currently one available track at Readville in the midday. No excess capacity for the overnight storage equipment was found. It is possible that one or perhaps two train sets could be "shoehorned" into the lineup without any additional midday capacity enhancements. However, MBTA Railroad Operations stipulates that any initiative to expanded Foxborough Service via Walpole ***must*** address overnight storage deficiencies along the Franklin Branch.[17] Presently three of the six morning trains originating on the branch are stored overnight in Boston.

5. **Seating capacity**
   Historically, seating capacity on peak trains serving Forge Park and Walpole has been barely sufficient (or insufficient) to meet demand. In the last two years with increased fares and parking charges and a national employment downturn, pressure for seats has markedly declined. With eventual economic recovery leading to a surge in downtown employment competition for seats on peak trains should be expected to return.

   At this time there is excess capacity on many South Side trains. The present circumstances provide current opportunities to use capacity on existing trains to serve passengers from Foxborough. Future growth in ridership returning the MBTA to and beyond historic high levels of ridership may absorb much of the slack capacity currently exhibited by the system. The eventual replacement of all single level cars with higher capacity bi-levels will ameliorate some projected future capacity shortfalls. The long range forecasts indicate that an additional peak train on the Franklin Branch will eventually be required to satisfy future growth in ridership.

6. **Parking capacity**
   Parking lots on the MBTA commuter rail network have historically been operated at, or above, capacity requiring an ongoing program of constant incremental opportunistic expansion to satisfy pent up demand. However, as with seating capacity, the combined impacts of recently increased fares and parking charges with a national employment downturn, has reduced demand for parking to temporarily manageable levels. As with seating, the eventual economic recovery will lead to an inevitable surge in downtown employment leading to parking shortages at most, or all stations.

7. **Accessibility**
   Federal and state regulations and guidelines stipulate that all transit stations should offer access to service for passengers with limitations in their mobility including persons confined to wheelchairs and using other mobility assistance devices such as walkers and canes. Three MBTA stations in the vicinity of Foxborough Station are accessible via mini-high platforms. Foxborough is also equipped with a mini-high platform for handicapped accessibility. Any new platforms required for Foxborough service will be full length 850 foot long high-level platforms.

[17] Kick-Off Meeting for Foxborough Commuter Rail Project. Held at Gillette Stadium, Foxborough, MA. October 18, 2009. Attendees represented the MBTA, Jacobs Engineering, CTPS, EOHED, EOT, Kraft Group, and the Town of Foxborough.

2.1 Line Capacity

Line capacity refers to the maximum number of trains that can be routed along a particular segment during a specified time period. In examining the line capacity for fulltime Foxborough service, five segments are of particular interest:

1) Forge Park to "Read" Interlocking (Franklin Branch)
2) "Read" Interlocking to South Station (via Northeast Corridor)
3) Readville to South Station (via Dorchester Branch)
4) Mansfield to "Transfer" (via Northeast Corridor)
5) CSX Framingham Secondary
   - Foxborough to Walpole
   - Mansfield to Foxborough

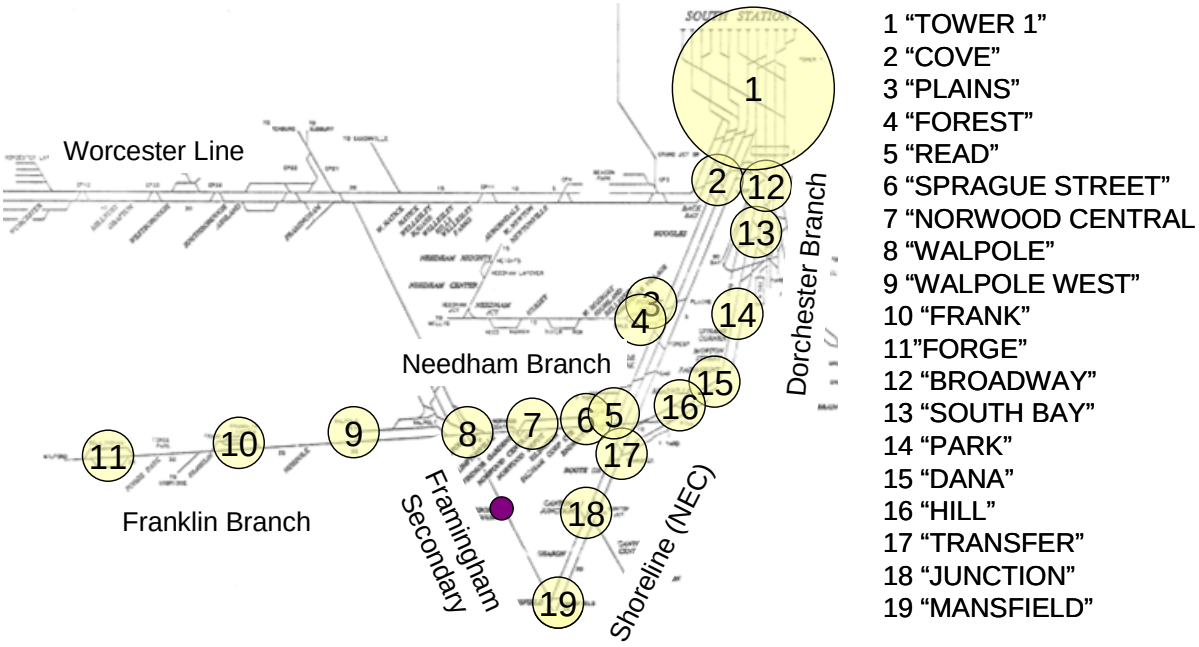

Figure 2.1.1:
MBTA Commuter Rail Track and Interlocking Guide (Partial)

2.1.1 Forge Park to "Read" Interlocking

The segment between Forge Park and "Read" Interlocking is 20.8 miles; 68% of this distance is single tracked. Between Forge Park and Norwood Central, the railroad is a single track railroad with two passing sidings located in the vicinity of Franklin and Walpole stations. The siding near Franklin is 0.8 miles long and the siding near Walpole is approximately 0.5 miles long. In the current schedule, only one meet occurs along the single track segment south of Norwood Central; MBTA #796 and #719 meet at the Walpole passing siding at approximately 5:53 PM. North of Norwood Central, the Branch is a two track railroad to "Read" where it connects to both the Northeast Corridor and the Dorchester Branch.

Train movements between Forge Park to "Read" interlocking are governed by Rule 261 which allows for two way operation on each track, controlled by the dispatcher.[18]

On average, the one-way trip time from Forge Park to Readville is 45 minutes, and 1:09 from Forge Park to South Station.

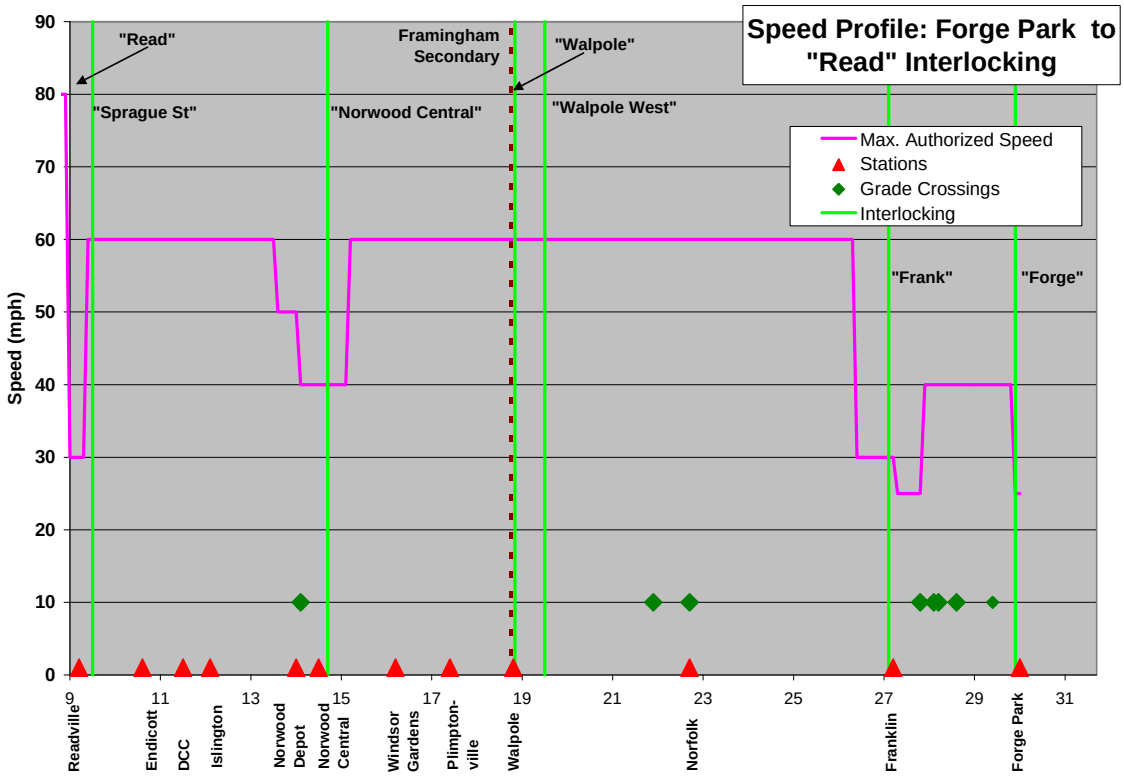

Figure 2.1.2

Each weekday, the MBTA operates 19 inbound trains to South Station over the Franklin Branch and 19 outbound trains from South Station (including non-revenue moves).

[18] Massachusetts Bay Commuter Railroad Company. *MBTA Commuter Rail Service Employee Timetable No. 3.* Effective Date: November 1, 2004, pp. 76.

Table 2.1.1:
Train Operations By Time of Day
(Forge Park to "Read" Interlocking)

	Inbound Trains					Outbound Trains				
Time Period	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**
Early AM	2	0	0	0	2	1	1	0	1[19]	3
AM Peak (7-9am)	3	2	0	0	5	1	1	0	0	2
Midday (9am-4pm)	5	0	0	0	5	5	0	0	0	5
PM Peak (4-6pm)	1	0	0	0	1	3	1	0	0	4
Evening (After 6pm)	1[20]	5	0	0	6	5	0	0	0	5
Total	***12***	***7***	***0***	***0***	***19***	***15***	***3***	***0***	***1***	***19***

The morning peak is the busiest peak period on the Franklin Branch. During this time, there are 5 peak direction trains to Boston and 2 reverse peak direction trains. During the evening peak, there are 4 peak direction trains and one reverse peak direction train.

Of the 37 revenue trains operated, there are 19 inbound revenue moves and 18 outbound revenue moves. Sixteen of the 19 inbound revenue trains use the Northeast Corridor (NEC) to arrive at South Station, and 17 of the 18 outbound trains also use the NEC, as shown in Table 2.1.2. The remaining four trains are Fairmont trips using the Dorchester Branch (DB) that start or terminate at Forge Park.

Table 2.1.2:
Franklin Branch Trains[21]

	Route		Total
Direction	**NEC**	**DB**	**Operated**
Inbound	16	3	19
Outbound	17	1	18
Total	***33***	***4***	***37***

Of the 19 inbound trains, 16 trains originate in Forge Park. One train short-turns at Walpole and two at Norwood Central. Of the 18 outbound trains, 15 terminate at Forge Park. One train short-turns at Walpole and two trains at Norwood Central. None of the short turn trains use the Dorchester Branch.

[19] The MBTA operates DH 6701 as a double draft from South Station to Forge Park. Double drafts are two train sets that are coupled together and operate as one.
[20] The MBTA operates Train #798 as a double draft to South Station. One set is used for revenue service and the other set is deadheading back to Boston.
[21] Franklin line schedule effective May 18, 2009.

Table 2.1.3: **Origin and Destination of Franklin Trains**		
Terminal	**Inbound**	**Outbound**
Franklin	16	15
Walpole	1	1
Norwood Central	2	2
Total	***19***	***18***

Freight operations on the Franklin Branch are light. For the purposes of this study, all movements along the Branch are considered to occur overnight or during the offpeak midday period and do not impact passenger service.

2.1.2 "Read" Interlocking and South Station (via Northeast Corridor)

The Northeast Corridor segment between "Read" interlocking and South Station is approximately 9.5 miles long. At "Read", trains using the Franklin Branch can either join the Shoreline (the Northeast Corridor), or the Dorchester Branch. The Northeast Corridor is triple tracked for approximately 8.4 miles from "Read" interlocking to "Cove" interlocking, just north of Back Bay station. North of "Cove" interlocking, the Shoreline is a five track railroad for the remaining 1.1 miles to South Station. Train movements between "Read" and South Station are controlled via Centralized Electrification and Traffic Control (CETC).

On average, the one-way MBTA trip time from "Read" interlocking to South Station takes 23 minutes. The maximum track speed is 80 mph between "Read" and Ruggles Station, with lower speeds through Back Bay and South Station.

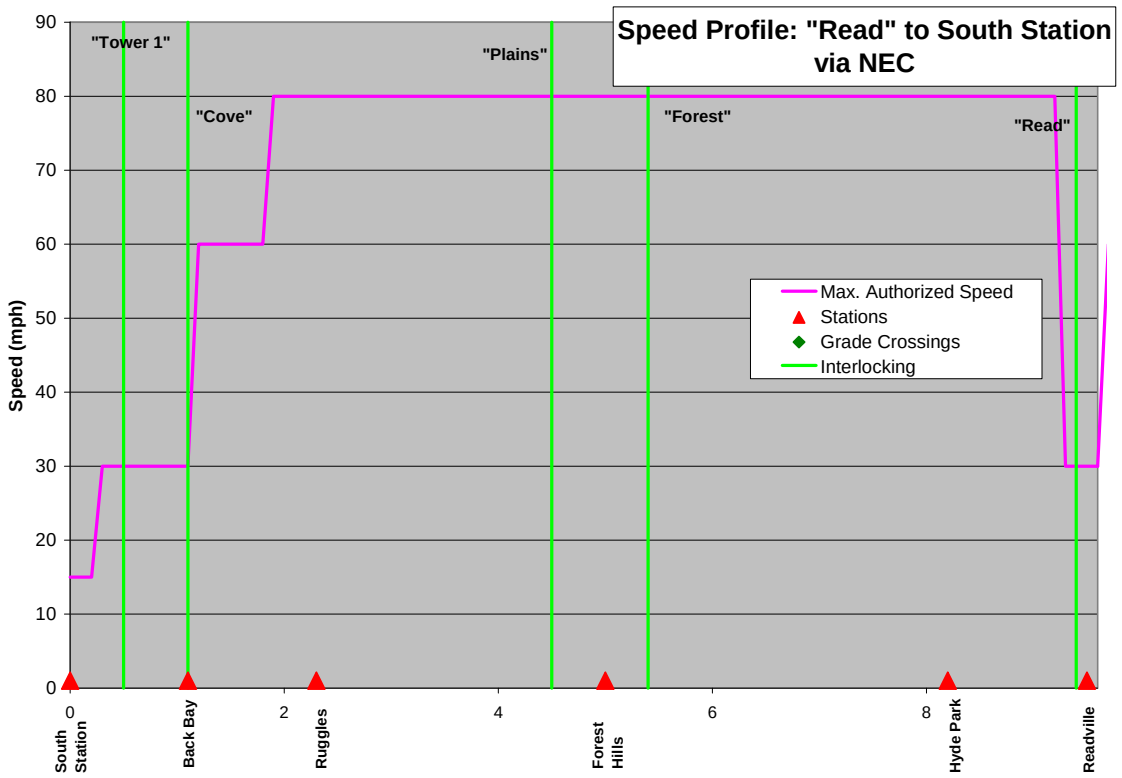

Figure 2.1.3

The MBTA currently operates 85 inbound trains to South Station over the Shoreline between "Read" interlocking and South Station and 87 outbound trains.

Table 2.1.4:
Train Operations By Time of Day
("Read" Interlocking to South Station via Shoreline)[22]

	Inbound Trains					Outbound Trains				
Time Period	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**
Early AM	4	0	0	0	4	3	4	2	1[23]	10
AM Peak (7-9am)	12	5	0	0	17	4	6	1	0	11
Midday (9am-4pm)	20	3	4	0	27	15	7	4	0	26
PM Peak (4-6pm)	4	3	1	0	8	12	4	2	0	18
Evening (After 6pm)	11[24]	13	5	0	29	20	2	0	0	22
Total	***51***	***24***	***10***	***0***	***85***	***54***	***23***	***9***	***1***	***87***[25]

[22] This excludes MBTA and Amtrak trains operating on the Framingham / Worcester line. However, this *does* include trains operating between "Plains" Interlocking (Needham Line) and South Station.
[23] DH6701 from South Station to Forge Park (Franklin Line) operates as a double draft, and is considered to be one train.
[24] Train #798 from Forge Park to South Station operates as a double draft with one consist in revenue service, with the other not in service. It is considered to be one revenue train movement.
[25] The MBTA's Franklin service operates 17 outbound trains and 16 inbound trains via the Shoreline.

The morning peak is the busiest peak period on the Shoreline. During this time, there are 17 peak direction trains to Boston and 11 reverse peak direction trains. During the evening peak, there are 18 peak direction trains and 8 reverse peak direction train.

Freight operations on the Shoreline between "Read" interlocking and South Station are negligible.

2.1.3 "Read" Interlocking to South Station (via Dorchester Branch)

The Dorchester Branch route segment between "Read" interlocking and South Station is also approximately 9.5 miles, and is double tracked for approximately 8.9 miles from "Dana" interlocking, just north of Readville Station to South Station. The 0.6 miles from "Read" Interlocking to "Dana" Interlocking is a single track railway. Train movements between "Read" and South Station are governed by Rule 261.[26]

On average, the MBTA one-way trip time from "Read" interlocking to South Station is 27 minutes. The maximum track speed in this segment is 60 mph.

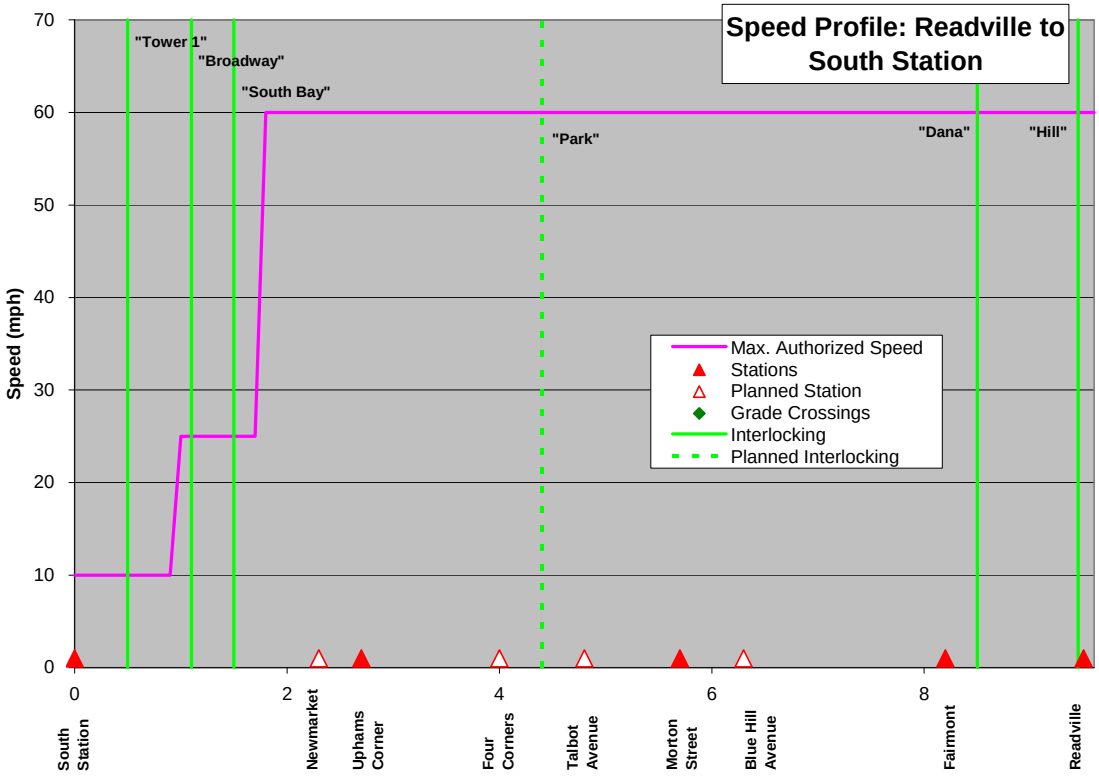

Figure 2.1.4

The MBTA currently operates 28 inbound trains to South Station over the Dorchester Branch between "Read" interlocking and South Station and 26 outbound trains.

[26] Massachusetts Bay Commuter Railroad Company. *MBTA Commuter Rail Service Employee Timetable No. 3.* Effective Date: November 1, 2004, pp. 53.

Table 2.1.5
Train Operations By Time of Day
(Readville to South Station via Dorchester Branch)

	Inbound Trains					Outbound Trains				
Time Period	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**	**Local**	**MBTA & Amtrak Express**	**Acela**	**Non-Revenue**	**Total**
Early AM	1	0	0	0	1	1	1	0	0	2
AM Peak (7-9am)	4	0	0	4	8	1	2	0	0	3
Midday (9am-4pm)	3	0	0	7	10	4	0	0	3	7
PM Peak (4-6pm)	2	0	0	0	2	3	0	0	8	11
Evening (After 6pm)	5	2	0	0	7	3	0	0	0	3
Total	***15***	***2***	***0***	***11***	***28***	***12***	***3***	***0***	***11***	***26***

The evening peak is the busiest peak period on the Dorchester Branch. In this period of time, there are 3 peak direction trains, 8 deadhead moves to South Station, and 2 reverse peak trains. During the morning peak, there are 4 peak direction trains to South Station, 4 deadhead moves to Readville Yard, and 3 reverse peak direction trains.

For the purposes of this study, freight traffic on the Dorchester Branch is considered negligible.

2.1.4 Mansfield to "Transfer" Interlocking

The segment between "Mansfield" and "Transfer" interlocking on the Northeast Corridor (NEC) is approximately 14.5 miles long, and is entirely double tracked. At "Transfer", trains using the NEC can either continue travelling on the Shoreline to South Station, or transfer to the Dorchester Branch to travel to South Station. Train movements between "Read" and South Station are controlled via CTEC.

On average, the one-way MBTA trip time between Mansfield and "Transfer" interlocking is 27 minutes. The maximum track speed in this segment is 80 mph. The MBTA typically operates 34 inbound trains (18 Providence trains and 16 Stoughton trains) and 34 outbound trains (again, 18 Providence trains and 16 Stoughton trains) between Mansfield and "Transfer."

2.1.5 Framingham Secondary

2.1.1.1 Foxborough to Walpole

The segment between Foxborough and Walpole on the Framingham Secondary is approximately 3.5 miles. At Walpole, a Wye connection links the Secondary with Franklin Branch. The unsignalled railroad is single tracked between Walpole and Foxborough. Train movements between Foxborough and Walpole are via Track Warrant Control and Form D Control System (TWC-DCS).[27] Track warrants are systematized permissions used on railroads authorize a train's use of the main line. When a signal system is not in use, dispatchers issue these permissions to

[27] CSX Transportation. *Albany Division Timetable No. 5*. Effective Date: July 1, 2009, pp. 45.

train crews instead of using signals. Track warrants are issued to crews either via radio, phone, or electronic transmission from the dispatcher.

Special event stadium trains currently provide the only passenger service to Foxborough, taking 33 minutes from Walpole.[28] With upgrades to the Framingham Secondary, it is estimated that the trip between Foxborough and Walpole would take approximately 7 minutes to complete (including an allowance for pad time to ensure schedule adherence).

2.1.1.2 Mansfield to Foxborough

The segment between Foxborough and Mansfield on the Framingham Secondary is approximately 5.5 miles. At Mansfield, a connection links the Secondary with the Shoreline. The unsignalled railroad is also single tracked between Mansfield and Foxborough. Train movements between Mansfield and Foxborough are governed via Track Warrant Control and Form D Control System (TWC-DCS).[29]

Special event stadium trains currently provide the only passenger service to Foxborough, taking 30 minutes from Mansfield.[30] With upgrades to the Framingham Secondary, it is estimated that the trip between Foxborough and Walpole would take approximately 9 minutes to complete (including an allowance for pad time to ensure schedule adherence).

[28] The trip time from Walpole to Norwood Central on Train #798 is 7 minutes. Special event trains from Norwood Central to Foxborough take 40 minutes. By subtracting the two, an estimate of the time from Walpole to Foxborough at current speeds is derived.

[29] CSX Transportation. *Albany Division Timetable No. 5*. Effective Date: July 1, 2009, pp. 45.

[30] The trip time from Walpole to Norwood Central on Train #798 is 7 minutes. Special event trains from Norwood Central to Foxborough take 40 minutes. By subtracting the two, an estimate of the time from Walpole to Foxborough at current speeds is derived.

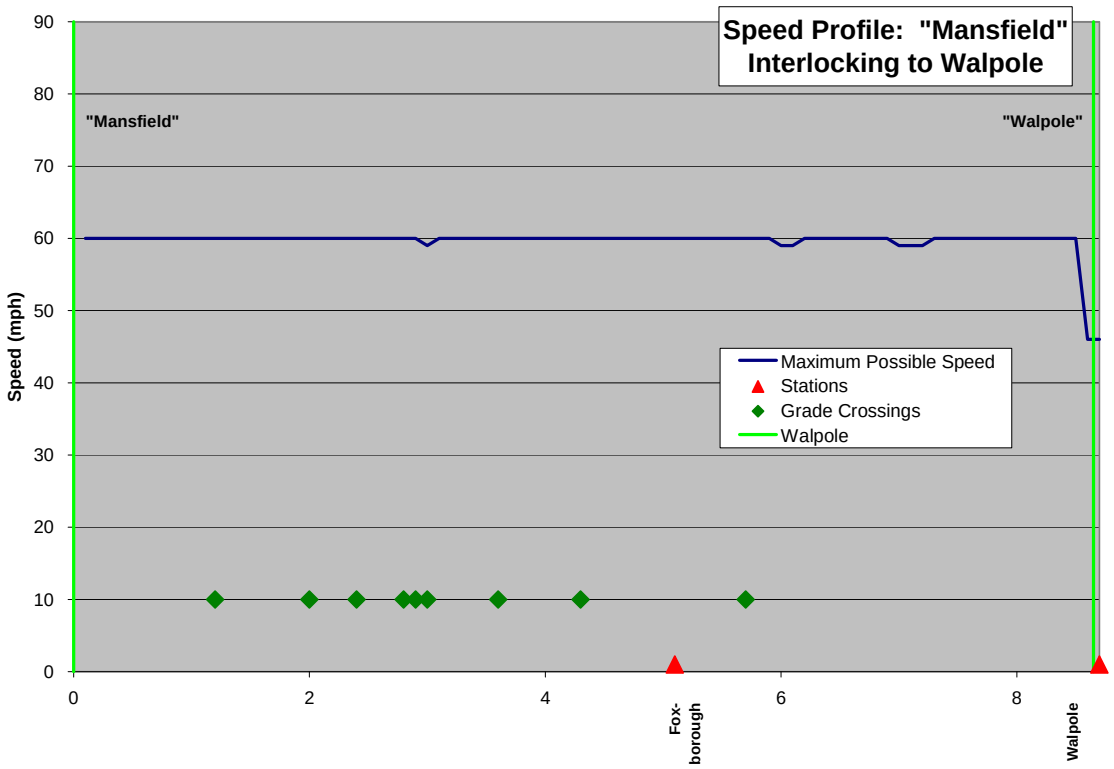

Figure 2.1.5

Freight traffic on this branch is heavier than the other three segments, but is still relatively light, generally limited to two to four train movements per day. For the purposes of this study, all movements along the Secondary are considered to occur during the offpeak and would not affect passenger service.

2.1.6 General Capacity Parameters

Typical train spacing requirements for services operated by the MBTA and Amtrak are summarized in Table 2.1.6.

Table 2.1.6:
General Minimum Passenger Train Spacing

Service	**Minutes behind Leader**
Local (MBTA)	5
Express (MBTA/Amtrak)	10
High Speed (Amtrak)	15

This yields a maximum theoretical capacity of 12 local trains per hour per track. However, with allowances for off schedule operations, the practical capacity is more in the range of 8 to 10 trains per hour per track.

With opposing traffic on routes with single track, capacity is gauged by the length of time required to traverse the longest single track section. Without opposing traffic, the capacity of the single track line is bounded by the minimum train spacing reviewed above. As previously mentioned, there is one MBTA meet on the Franklin Branch south of Norwood Central. There are numerous movements and turns on the single track section of the Dorchester Branch between "Read" and "Dana" interlockings.

For the four route segments previously described, there are six single track segments listed in Table 2.1.7.

Table 2.1.7:
Single Track Sections in Study Area

Line	From	To	Length (Miles)	Minutes to Traverse (Making all local stops)
Franklin Branch	"Read"	"Sprague St."	0.8	2
Dorchester Branch	"Dana"	Readville	0.6	2[31]
Franklin Branch	"Norwood Central"	"Walpole"	4.1	11
Franklin Branch	"Walpole West"[32]	"Frank"	6.8	14
Franklin Branch	"Frank"	Forge Park	2.9	7
Framingham Sec.	Walpole	Foxborough	3.5	7[33]

[31] Trains turning at Readville Station take approximately 13 minutes.
[32] "Walpole West" Interlocking is the western end of the passing siding that begins at "Walpole"
[33] Assumes operation at 60mph.

Table 2.1.8 shows the fraction of theoretical capacity available on each segments during the morning peak hour.

Table 2.1.8:
Summary of Current Morning Peak Hour Operations by Track Segment[34]

Segment	Local	Express	Acela	Total	Capacity Utilization
Cove to Forest Hills (Inbound)	5	4	0	9	54%[35]
Forest Hills to Read (Inbound)	4	4	0	8	50%[36]
South Bay to Dana (Inbound)	2	0	0	2	17%
Dana to Readville (Inbound)	2	0	0	2	65%
Dana to Readville (Outbound)	1	0	0	1	
Read to Norwood Central (Inbound)	2	1	0	3	33%
Norwood Central to Walpole (Inbound)	2	1	0	3	52%
Norwood Central to Walpole (Outbound)	1	0	0	1	
“Walpole” to "Frank" (Inbound)	2	1	0	3	55%
“Walpole” to "Frank" (Outbound)	1	0	0	1	
"Frank" to Forge Park (Inbound)	2	1	0	3	45%
"Frank" to Forge Park (Outbound	1	0	0	1	
Walpole to Foxboro (Inbound)	0	0	0	0	0%

During the morning peak hour, most segments operate at 50% or more of their capacity. The five segments that currently operate above 50% capacity are:

- “Dana” Interlocking and Readville (65%)
- Walpole and “Frank” Interlocking (55%)
- “Cove” to Forest Hills (54%)
- Norwood Central to Walpole (52%)
- Forest Hills to “Read” Interlocking (50%)

Table 2.1.9:
Summary of Current Evening Peak Hour Operations by Track Segment[37]

Segment	Local	Express	Acela	Total	Capacity Utilization
Cove to Forest Hills (Outbound)	5	4	1	10	67%[38]
Forest Hills to Read (Outbound)	3	4	1	8	58%[39]
South Bay to Dana (Outbound)	2	0	0	2	17%
Dana to Readville (Inbound)	1	0	0	1	65%
Dana to Readville (Outbound)	2	0	0	2	
Read to Norwood Central (Outbound)	1	1	0	2	25%
Norwood Central to Walpole (Inbound)	1	0	0	1	43%
Norwood Central to Walpole (Outbound)	1	1	0	2	

[34] Busiest weekday hour of operation.
[35] Assumes two tracks for peak direction trains and one track for reverse peak trains
[36] Assumes two tracks for peak direction trains and one track for reverse peak trains
[37] Busiest weekday hour of operation.
[38] Assumes two tracks for peak direction trains and one track for reverse peak trains
[39] Assumes two tracks for peak direction trains and one track for reverse peak trains

Table 2.1.9:
Summary of Current Evening Peak Hour Operations by Track Segment[37]

Segment	Local	Express	Acela	Total	Capacity Utilization
"Walpole" to "Frank" (Inbound)	1	0	0	1	48%
"Walpole" to "Frank" (Outbound)	1	1	0	2	
"Frank" to Forge Park (Inbound)	1	0	0	1	37%
"Frank" to Forge Park (Outbound)	1	1	0	2	
Walpole to Foxborough (Inbound)	0	0	0	0	0%

During the evening peak hour, the four segments operating above or near 50% of capacity are:

- "Cove" Interlocking to Forest Hills (67%)
- "Dana" Interlocking and "Read" Interlocking (65%)
- Forest Hills to "Read" Interlocking (58%)
- Walpole and "Frank" Interlocking (48%)

The analysis above indicates that there are several bottlenecks that significantly impact line capacity. Bottlenecks principally arise along segments where the railroad is single tracked.

Also, MBTA Railroad Operations does not consider 100% capacity possible. The practical maximum capacity allowed is usually between 80% and 90% for longer track sections, and around 90-95% for shorter track sections.

Table 2.1.10:
Single Track Bottlenecks on the Existing System

Segment	Miles	Peak Hour Capacity Utilization
"Dana" and Readville[40]	0.6	73%
Walpole and "Frank" Interlocking	6.8	55%
Norwood Central & Walpole	4.1	52%
"Frank" Interlocking and Forge Park	2.9	47%

Additionally, the 3.5 mile segment between Walpole and Foxborough is also a single track railroad. The stations of Walpole and Foxborough are located in this vicinity. If track were upgraded to 60 mph, the theoretical maximum capacity for bi-directional operation would be 8 trains per hour. If service was offered in the one direction up to 12 trains could be operated for a capacity utilization of 100%.

2.1.7 Line Capacity for Future Operations

As noted in the introduction this projects evaluation of future demands for commuter rail capacity is largely informed by recent (2009) work for the South Coast Rail project and the comprehensive CRINA study conducted in 2004.

[40] Trains turning at Readville are the primary cause of a high capacity in this segment.

2.1.6.1 South Coast Rail

The Commonwealth is planning to offer commuter rail service to the cities of Fall River and New Bedford. As of the date this report is written, two rail alternatives are currently under consideration, and would run a portion of their route on the Shoreline.

One alternative would use the Shoreline between South Station and Attleboro Junction, and where it would branch off to provide service to the South Coast via Taunton Junction. The other (preferred) alternative would extend Stoughton service to Fall River and New Bedford via Taunton Junction. Service under this alternative would use the Shoreline between Canton Junction and South Station.

Two service considerations were taken into account when analyzing the capacity of the system for this study, namely future Amtrak and MBTA operations.

2.1.6.2.1 Amtrak Operations

A recent analysis of the capacity of the NEC for potential commuter service to Fall River and New Bedford, the 2030 operating plan was assumed to be the projected 2020 "North End" (New York – Boston) Amtrak operating plan developed by Amtrak in 2003 for application to the MTA/LIRR East Side Access Project and the Metro-North/ConnDOT New Haven Line Traction Power Study. This is seen as the best available representation of future Amtrak operations in the subject time frame and falls well within the limits set out in the Amtrak- MBTA Operating Agreement dated July 1, 2003. Table 2.1.11 lists *peak-period* Amtrak arrivals at and departures from Boston's South Station for current (2008) and anticipated 2030 operations.

Table 2.1.11:
Existing (2008) vs. Future (2030) "North End" Peak Amtrak Train Counts, Boston South Station

	Acela Arrivals at So. Station	Acela Departures at So. Station	Regional Arrivals at So. Station	Regional Departures at So. Station
2009 AM Peak	0	1	1	1
2009 PM Peak	1	2	2	1
2030 AM Peak	0	2	0	1
2030 PM Peak	3	3	2	1

Using this information in combination with Amtrak's Northeast Corridor Master Plan, it has been determined that Amtrak intends to operate 25 roundtrips per weekday between Boston and New York in 2030.[41] Fifteen of the 25 roundtrips would be Acela service, and the remainder would be made up of Regional trains. This breaks down into roughly hourly Acela service, and bi-hourly Regional service.

Also, in the development of the combined Amtrak/MBTA NEC 2030 operating plan, it was assumed that the Amtrak 2020 slots would remain as proposed by Amtrak. It was also assumed that all Amtrak station dwells would be 120 seconds in length.

[41] Amtrak currently operates 18 roundtrips between New York and Boston.

2.1.6.2.2 MBTA Operations

The South Coast capacity study assumed that all MBTA branches currently using the NEC would operate one additional peak-period peak-direction train over 2009 volumes in 2030.[42] RIDOT's planned *South County I* project would be operational, with no additional service north of Providence. It was also assumed that all consists will be eight cars comprised entirely of 180 passenger bi-level coaches, except for Framingham/Worcester service. No new Old Colony trains were added into service. No additional service to the Fairmont line was assumed.

At South Station, it was assumed that an additional five station platforms have been built in the location of the current US Post Office to the east of the station.

It was also assumed that MBTA station dwells occurring within the peak periods would be 120 seconds at Attleboro, Mansfield, Sharon, and Route 128 Stations and 60 seconds at all other station stops. Outside the peak periods, Attleboro, Mansfield, Sharon, and Route 128 Stations would see dwells of 45 seconds and all other station stops would see dwells of 30 seconds.

Based upon the Amtrak 2030 operation plan and the MBTA's additional services, the South Coast rail project analysis of the corridor including all planned MBTA and Amtrak services indicate that the existing NEC track and signal configuration between Providence and South Station will support proposed 2030 Amtrak and MBTA operations.

However, this operation will be at capacity and any trains added between "Junction" and "Transfer" (Readville to Canton Junction) interlockings during the peak of the peak will make the operation not practicable.[43] In particular, four sections on the NEC will have critical capacity utilization. See Table 2.1.12 for more information. A map of these locations is shown in Figure 2.1.6.

Table 2.1.12:
NEC Identified Locations of Critical Capacity: South Coast Rail Project

	2030	
Segment	**AM Peak Hour Capacity Utilization**	**PM Peak Hour Capacity Utilization**
Holden - Mansfield	58%	50%
Mansfield - Junction	59%	43%
Junction - Transfer	76%	95%
Transfer - Read	58%	79%

Of these four segments, the only occurrence of capacity utilization exceeding 90% (aside from near-terminal sections) was in the evening peak hour between "Junction" interlocking (Milepost 213.9) and "Transfer" interlocking (Milepost 218.5), a distance of 4.6 miles. In this section, capacity utilization for Tracks 1 and 2 was 93% and 95%, respectively. These results predict

[42] SYSTRA (2009). *Capacity Utilization Analyses Technical Memorandum*. Prepared for: the Massachusetts Bay Transportation Authority, pp. 4.

[43] If commuter service is introduced to Fall River and New Bedford, as part of the Commonwealth's *Southcoast Rail Initiative*, substantial improvements in infrastructure will be required.

operations at full capacity would be sustainable for a limited time.[44] This segment of track is used by both the Providence and the Stoughton commuter rail lines and has been identified by the Massachusetts State Rail Plan as requiring an upgrade, most likely in the form of third track.[45]

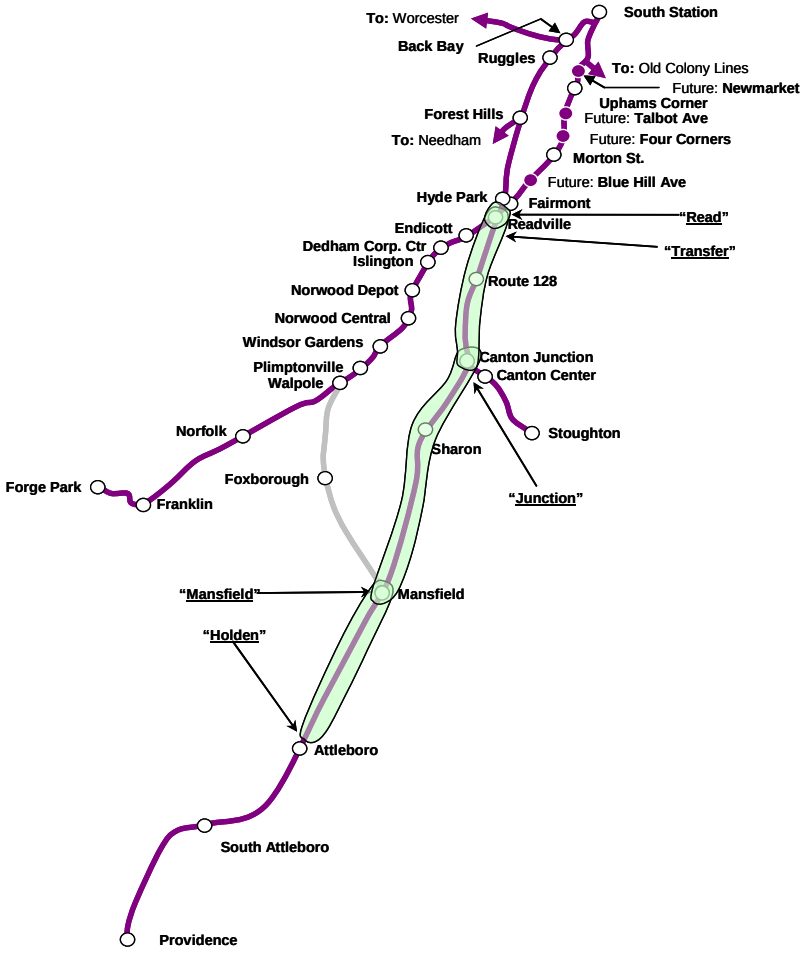

Figure 2.1.6:
High Capacity Sections of the Northeast Corridor, by Interlocking
(to scale)

2.1.6.2 2030 CRINA Forecasts

The 2004 CRINA study's 2030 ridership forecasts provide a worst case capacity scenario for the Authority.[46] By 2030, CRINA indicated up to 9 new trains on the Providence/Stoughton, Franklin

[44] SYSTRA (2008). *Capacity Utilization Analyses Technical Memorandum*. Prepared for: the Massachusetts Bay Transportation Authority, pp. 30.
[45] Conversation with the Massachusetts Department of Transportation. August 23, 2010.
[46] Comparing CRINA's 2010 ridership forecasts to today's actual ridership levels, CRINA's forecasts are high. No additional service has been added to the system (excluding the addition of Greenbush line service) since 2004. This does not mean that CRINA's forecasts are faulty. On the contrary, they can be seen as an indication of the Authority's future ridership and are used as such throughout this report.

and Needham lines will need to be added in order to meet passenger demand, as shown in Table 2.1.13.[47]

Table 2.1.13:
Future Franklin, Needham, and Providence / Stoughton Trains

		Early Morning	Morning Peak		Evening Peak		
Year	**Line**	**<7AM**	**7-8AM**	**8-9AM**	**4-5PM**	**5-6PM**	**Totals**
By 2010	**Franklin**	**0**	**0**	**1**	**0**	**1**	**2**
	Providence/Stoughton	0	1	0	0	1	2
	Total	***0***	***1***	***1***	***0***	***2***	***4***
By 2015	Providence/Stoughton	0	0	1	0	0	1
	Needham	0	1		1	0	2
	Total	***0***	***1***	***1***	***1***	***0***	***3***
By 2020	**Franklin**	**1**			**0**		**1**
	Total	***1***	***0***	***0***	***0***	***0***	***1***
By 2025	Providence/Stoughton	0	0	0	1	0	1
	Total	***0***	***0***	***0***	***1***	***0***	***1***
						Grand Total	***9***

Table 2.1.14 shows the maximum trains operated in the morning peak in 2030+. Note, the morning peak train totals do *not* include commuter rail service to Fall River and New Bedford.[48] The only segment nearing its maximum capacity during the morning peak, is the segment between "Cove" interlocking and Forest Hills.

Table 2.1.14:
CRINA 2030+ Worst Case Future AM Peak Hour Operations by Track Segment

Segment	**Local**	**Express**	**Acela**	**Total**	**Capacity Utilization**
Cove to Forest Hills (Outbound)	5	6	1	12	83%
Forest Hills to Read (Outbound)	3	6	1	10	75%
South Bay to Dana (Outbound)	2	0	0	2	17%
Dana to Readville (Inbound)	2	0	0	2	65%
Dana to Readville (Outbound)	1	0	0	1	
Read to Norwood Central (Outbound)	1	2	0	3	42%
Norwood Central to Walpole (Inbound)	1	0	0	1	60%
Norwood Central to Walpole (Outbound)	1	2	0	3	
Walpole to "Frank" (Inbound)	1	0	0	1	65%
Walpole to "Frank" (Outbound)	1	2	0	3	
"Frank" to Forge Park (Inbound)	1	0	0	1	53%
"Frank" to Forge Park (Outbound)	1	2	0	3	
Walpole to Foxboro (Inbound)	0	0	0	0	0%

[47] KKO & Associates and VHB. (2004). MBTA Commuter Rail Infrastructure Needs Assessment Study. Prepared for the Massachusetts Bay Transportation Authority, pp. 7-28.
[48] Ibid., pp. 7-16 to 7-28.

Table 2.1.15 shows the CRINA estimate of evening peak train operations in the 2030+ timeframe. Like the previous morning peak 2030+ train operations, this does *not* include commuter rail service to Fall River and New Bedford.[49]

Table 2.1.15:
CRINA 2030+ Worst Case Future PM Peak Hour[50] Operations by Track Segment

Segment	Local	Express[51]	Acela[52]	Total	Capacity Utilization
Cove to Forest Hills (Outbound)	8	4	1	13	79%
Forest Hills to Read (Outbound)	7	4	1	12	75%
South Bay to Dana (Outbound)	2	0	0	2	17%
Dana to Read (Inbound)	1	0	0	1	65%
Dana to Read (Outbound)	2	0	0	2	
Read to Norwood Central (Outbound)	2	1	0	3	25%
Norwood Central to Walpole (Inbound)	3	0	0	3	43%
Norwood Central to Walpole (Outbound)	2	1	0	3	
Walpole to "Frank" (Inbound)	2	0	0	2	48%
Walpole to "Frank" (Outbound)	3	1	0	4	
"Frank" to Forge Park (Inbound)	2	0	0	2	37%
"Frank" to Forge Park (Outbound	3	1	0	4	
Walpole to Foxboro (Inbound)	0	0	0	0	0%

2.1.8 Line Capacity Summary and Conclusions

In reviewing current and future capacity for expanded operations on the lines running between South Station and Foxborough the analysis indicates:

- Serious capacity constraints and potential conflicts with other services on any route to Foxborough via Mansfield on the Northeast Corridor, particularly on the double track segment south of Read interlocking
- Adequate capacity for expanded service on the triple track Northeast Corridor north of Read interlocking
- Adequate capacity for expanded service on the double track Dorchester Branch except for a short single track bottleneck at Readville Station where the Dorchester and Franklin Branches connect
- Capacity constraints on the Franklin Branch, due its largely single track configuration, pose challenges that could possibly be addressed with selective expansions to a two track configuration especially over
    - the 4.1 miles between Walpole and Norwood Central, and
    - the 0.6 miles at Readville Station.

[49] Ibid., pp. 7-16 to 7-28.
[50] Busiest weekday hour of operation, 5PM to 6PM.
[51] Jacobs Engineering Group. (2009). *Rhode Island Intrastate Commuter Rail Feasibility Study.* Prepared for: The Providence Foundation, pp. 45.
[52] Ibid., pp. 45.

These circumstances favor developing service options running via Walpole on the Franklin Branch that run to South Station on either the Dorchester Branch or the triple tracked portion of the Northeast Corridor.

2.2 Terminal Capacity

Terminal capacity refers to the number of station tracks and berths available to receive additional trains resulting from expanded service. Weekday service to Foxboro could increase the number of trains that operate in and out of South Station, which currently operates near its practical capacity.

The existing South Side system terminates at South Station a stub-end facility located in downtown Boston. South Station has thirteen station tracks serviced by high-level platforms. Track lengths at South Station vary considerably; the longest tracks can accommodate trains of up to twelve to thirteen coaches, while the shortest track can hold only a six-car consist. Generally, seven of the nine full-length tracks (those accommodating at least a nine-car consist) and three shorter tracks are available for use by the MBTA. The remaining tracks are generally used by Amtrak to operate its extensive schedule of intercity trains along the Northeast Corridor (NEC).

Tracks One and Two are used primarily by Framingham / Worcester service due to the ease of movement from the tracks to the Worcester main line. Both tracks have a berthing limit of 8 coaches plus a locomotive. Most scheduled Framingham / Worcester trains are berthed on Tracks One and Two, with the exception of some nine car trains that are berthed either on Track Three or Track Four.

Tracks Three through Eight provide capacity for service from Framingham / Worcester, Needham, Franklin (non-Dorchester Branch), and Providence / Stoughton trains. Track Eight is a shared MBTA / Amtrak track. These tracks accommodate the MBTA's maximum train length of nine coaches plus one locomotive.

Tracks Nine and Ten are designated for use primarily by Amtrak trains by agreement between Amtrak and the MBTA. The MBTA can use these tracks, but since there is some variability in the setup time required for Amtrak trains, these two tracks are not reliably available for MBTA use. Tracks Nine and Ten will accommodate nine car MBTA trains. These two tracks are used very sparingly in the peak-periods for MBTA trains. The Dorchester Branch service to Readville service comprises most of the traffic assigned to these two tracks.

Old Colony trains are generally berthed on tracks Eleven through Thirteen. Some Dorchester Branch trains are also berthed on these tracks when space is available, but preference is given to the Old Colony consists. Track Eleven is able to handle the maximum consist length of nine coaches and one locomotive. Track Twelve is limited to seven coaches plus a locomotive, and Track Thirteen has a berthing limit of six coaches and one locomotive. All the Old Colony trains are designed and limited to fit on Track 13. As a result, all Old Colony trains are limited to six coaches.

Table 2.2.1: **South Station Track Capacity**		
	Length	**Primary Use**
Track One	8 coaches	Framingham/Worcester
Track Two	8 coaches	Framingham/Worcester
Track Three	9 coaches	All services except Old Colony
Track Four	9 coaches	All services except Old Colony
Track Five	9 coaches	All services except Old Colony
Track Six	9 coaches	All services except Old Colony
Track Seven	9 coaches	All services except Old Colony
Track Eight	9 coaches	Shared Amtrak track
Track Nine	9 coaches	Amtrak and Fairmont Line
Track Ten	9 coaches	Amtrak and Fairmont Line
Track Eleven	9 coaches	Old Colony and Fairmont
Track Twelve	7 coaches	Old Colony
Track Thirteen	6 coaches	Old Colony

On a typical service day, there are 165 revenue arrivals and 161 revenue departures to and from South Station. Approximately 70% of all activity at the station is related to MBTA arrivals and departures. Approximately 20% are non-revenue moves by the MBTA. The remaining 10% is related to Amtrak service.

Table 2.2.2: **Number of Weekday Trains at South Station**				
		Arrivals	**Departures**	**Total**
MBTA	Revenue	145	141	286
	Non-Revenue	38	42	80
	Total	183	183	366
Amtrak	Revenue	20	20	40
	Non-Revenue[53]	5	5	10
	Total	25	25	50
Total		***208***	***208***	***416***

Typical maximum throughput of a large stub end commuter rail terminal is 3 arrivals per track per hour. The typical track cycle includes:

- Five minutes to line, set and clear the route from the limits of terminal area to the platform track
- Ten minutes of scheduled recovery and turn time at the platform
- Five minutes to line, set and clear the route from the platform to the limits of the terminal area.

[53] This assumes that the first five Acela and Regional departures of the day from South Station are made by the equipment from the last five Acela and Regional arrivals at South Station the previous night. This equipment is then stored Amtrak's storage facility in the South End.

The more scheduled recovery time that is available at the terminal, the more likely the service is able to absorb any schedule perturbations which adversely affect arrival and departure times of future trips made by the equipment set. Long distance trains require more recovery time at the terminal. Based on the current scheduled arrivals and departures from South Station, the average recovery time is 49 minutes for Amtrak service. Regional service has a calculated average recovery time of 41 minutes, and Acela service averages a 56 minute recovery.

Table 2.2.3:
Average Observed Amtrak Recovery Times at South Station

Service	**Minutes**
Acela	56
Regional	41
Average	***49***

Based on these considerations, the theoretical capacity of the ten MBTA tracks at South Station is 30 arrivals per hour. However, operations at South Station are more complicated and limited by practical real world considerations including:

- Not all trains fit on all platforms (Tracks 11-13 are short)
- Not all trains are the same length and cannot be universally substituted for each other (leads to longer terminal dwells waiting for the right opportunity to leave)
- Lines leading into South Station have substantial segments of single track forcing the MBTA to store some trains in the terminal waiting for an opportunity to start an outbound revenue train
- Storage and maintenance capacity for midday trains is very limited forcing the MBTA to store trains in the terminal waiting for slots at the maintenance and storage facilities
- Temporary use of tracks 8-10 by the MBTA when Amtrak is not using the platforms

The actual levels of traffic are presently somewhat less than 30 arrivals in the peak hour as shown in Table 2.2.4 and 2.2.5. There are currently 15 MBTA arrivals and 2 Amtrak arrivals (1 deadhead and 1 revenue arrival) during the peak morning hour.

Table 2.2.4: **Number of Morning Peak Hour Trains at South Station**[54]				
		Arrivals	**Departures**	**Total**
MBTA	Revenue	15	12	27
	Non-Revenue[55]	0	2	2
	Total	***15***	***14***	***29***
Amtrak	Revenue	1	1	2
	Non-Revenue[56]	1	0	1
	Total	***2***	***1***	***3***
	Total	***17***	***15***	***32***

In the evening peak, there are 19 MBTA revenue departures and 4 Amtrak departures (2 deadhead and 2 revenue departures).

Table 2.2.5: **Number of Evening Peak Hour Trains at South Station**[57]				
		Arrivals	**Departures**	**Total**
MBTA	Revenue	4	19	23
	Non-Revenue[58]	6	0	6
	Total	***10***	***19***	***29***
Amtrak	Revenue	1	2	3
	Non-Revenue[59]	0	2	2
	Total	***1***	***4***	***5***
	Total	***11***	***23***	***34***

2.2.1 Future Growth – South Coast Rail Assumptions

As previously mentioned, planning for South Coast Rail assumed that there would be an additional 5 tracks added to South Station. The planned "platform infill" project is anticipated to decrease the lengths of platform tracks 1-10, but not reduce the capacity of the station itself. Planning for tracks 14-18 has assumed that the a pair of right-hand ladders would be added for the four tracks crossing the Fort Point Channel to serve the Dorchester Branch and Old Colony lines.[60] None of the South Coast planning analyzed the current 13 track South Station configuration.

[54] 7AM to 8AM
[55] Assumes that trains bound for Readville Yard depart 15 minutes after their scheduled arrival at South Station.
[56] Assumes that Acela trains arrive at South Station 56 minutes prior to its scheduled departure, and that Regional trains arrive 41 minutes prior to its scheduled departure.
[57] 5PM to 6PM
[58] Assumes that trains from Readville Yard arrive 15 minutes prior to their scheduled departure from South Station.
[59] Assumes that Acela trains depart South Station 56 minutes after their scheduled arrival, and that Regional trains depart 41 minutes after their scheduled arrival.
[60] SYSTRA (2008). *Technical Memorandum: Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations*. Prepared for: the Massachusetts Bay Transportation Authority, pp. 27.

2.2.2 CRINA Growth Recommendations

The service plans developed in the 2004 CRINA study suggest that no new berthing capacity is required through 2030+ timeframe, assuming that no additional trains are added beyond the nine necessary to accommodate growth in ridership of existing services. CRINA did not take into consideration any additional Amtrak service beyond 2010. If any additional services or additional frequencies are added onto the South Side system, peak period terminal capacity at South Station would be adversely affected.

2.2.3 Terminal Capacity Summary and Conclusions

Without increased capacity enhancements, and with possible minor modifications to existing services, it would be possible to add one or two more peak MBTA arrivals at South Station. This is especially true if the trains are not operating on the predominantly Old Colony tracks. (Tracks 10-13). Any increase in peak period Amtrak service and/or offering of commuter rail service to Fall River and New Bedford would necessitate an expansion of the number of terminal tracks at South Station.

As previously shown, there are several inherent capacity issues in the MBTA's existing Southside network on which Foxborough station is located. These issues limit service levels on the network, including terminal capacity at South Station, Northeast Corridor capacity, existing equipment maintenance schedules, and existing MBTA commuter rail equipment cycles. The Commonwealth of Massachusetts and the MBTA must determine whether dedicating its limited Southside network capacity to fulltime Foxborough service is the best use of these finite transportation resources.

2.3 Maintenance Capacity

Capacity to store and maintain commuter rail rollingstock is in acutely short supply for MBTA South Side operations. The introduction of additional equipment and train sets to provide service to Foxborough would add to this problem unless new capacity is developed. It is beyond the scope of this project to solve this capacity problem. Instead, this section merely describes the challenges that presently face rollingstock maintenance and layovers. Obviously, the introduction of a new fleet of vehicles for Foxborough service with expanded maintenance capacity would further tax capacity and add complexity to an already severe capacity problem.

Presently the South Side service operates with one Service and Inspection (S&I) track and two fueling tracks. There is an immediate need to add to S&I capacity. In the 2030+ timeframe, the system will require two additional service and inspection tracks and an additional fueling track.

2.3.1 Maintenance Facilities

Two equipment maintenance facilities service the South Side of the MBTA commuter rail system: the South Side Service and Inspection Facility (Southside S&I) and the Readville Maintenance Repair Facility.

2.3.1.1 South Side S&I Facility

The South Side S&I facility is located in South Boston, Massachusetts immediately south of the junction of the Old Colony Main Line and the Dorchester Branch at the mouth of Amtrak's Southampton Street Yard. The four-track running maintenance facility is used to perform daily service and inspection functions to South Side train sets. Minor periodic inspections and running repairs are also performed at this facility.

The two indoor tracks can each accommodate nine coaches and one locomotive. The building has provisions for adding essential supplies (fuel, sand, lubricants, and coolant) to the locomotive as well as toilet dumping stations and fresh water for coaches equipped with toilets. Fuel, main engine lube oil, and water are available on Tracks 3 and 4, outside the building. The South Side S&I facility is also equipped with an overhead crane, single axle drop table, car washer, and ground power stations.

Presently all 37 MBTA South Side commuter rail consists are serviced at the four track facility[61]. On weekends and holidays consists are fueled but servicing and inspection limited to focus primarily on correcting reported defects and running repairs. As of the last project team review (March 2004) the productivity of the S&I for inspections and servicing at the then three track facility was four to six trainsets per day.

At the observed servicing rate, every consist generally visits the S&I no more often than once every two weeks. The MBTA is dissatisfied with the frequency of periodic servicing and inspections on the South Side and would like to provide more capacity for this activity. The facility, as operated, is not providing the capacity necessary to service the *existing* commuter rail fleet serving South Station.

During the course of preparing the 2004 CRINA report, the Railroad Operations Directorate indicated a third and fourth inspection track should be added by 2010 to overcome the current capacity shortfall and to provide capacity for near term ridership growth. As of 2009, only a fueling track located outside of the building has been added. The Railroad Operations Directorate also indicated that a fifth and sixth track would be required in the 2030+ timeframe.

2.3.1.2 Readville Maintenance and Repair Facility

The Readville Maintenance and Repair Facility is located in Hyde Park. It is used for modifications, wheel truing, and special projects such as retrofits and Advanced Civil Speed Enforcement System (ACSES) installation. The shop consists of three tracks, two of which accommodate two coaches each. The third track is equipped with a wheel-truing machine.

2.3.2 Existing South Side Fleet

There are currently 37 sets of equipment in operation on the South Side. There are 126 bi-level coaches and 102 flats providing an overall seating capacity of 34,308. The average consist is 6.2 cars long, consisting of 3.4 bi-levels and 2.8 flats.

[61] Most fueling is also conducted at the facility although a fuel truck is also employed to fuel some locomotives during their overnight layover periods.

Table 2.3.1:
Existing South Side Equipment Sets

Overnight Location	Set ID	Peak Passenger Load	Coaches		
			Bi-Level	Single	Total
Pawtucket	A	1,168	7	0	7
Pawtucket	B	604	0	6	6
Pawtucket	C	875	4	2	6
Pawtucket	D	1,253	7	0	7
Pawtucket	E	1,225	7	0	7
Pawtucket / Boston	F	1,196	7	0	7
Franklin	G	772	4	2	6
Pawtucket / Boston	H	985	7	0	7
Franklin	I	913	4	2	6
Worcester	J	825	4	2	6
Worcester / Boston	K	749	4	2	6
Worcester	L	1,414	7	1	8
Worcester	M	664	0	6	6
Needham	N	569	0	6	6
Needham	O	557	0	6	6
Needham	P	742	4	2	6
Boston	Q	648	0	6	6
Franklin	R	746	4	2	6
Boston	S	655	0	6	6
Boston	T	719	4	2	6
Boston	U	623	0	6	6
Boston / Worcester	V	868	4	2	6
Boston	W	661	0	6	6
Boston / Worcester / Needham	X	715	4	2	6
Boston	Y	474	0	5	5
Kingston	AA	416	3	3	6
Kingston	BB	803	5	1	6
Kingston	CC	987	5	1	6
Kingston	DD	826	5	1	6
Middleborough	EE	556	3	3	6
Middleborough	FF	496	3	3	6
Middleborough	GG	675	3	3	6
Middleborough	HH	796	5	1	6
Greenbush	II	333	3	3	6
Greenbush	JJ	525	3	3	6
Greenbush	KK	656	3	3	6
Greenbush	LL	513	3	3	6
Total Coaches			***126***	***102***	***228***
Total Seats			***22,680***	***11,628***	***34,308***
Average Consist Length			***3.4***	***2.8***	***6.2***

2.3.3 Maintenance Capacity Summary and Conclusions

The current S&I facility at South Hampton Street is operating above nominal capacity. However it may be possible to add one or two more train sets without adding to the existing S&I capacity. However, such an initiative would put the South Side operation even further outside industry norms.

2.4 Midday and Overnight Layover Capacity

Midday storage capacity is at premium on the South Side. The current facilities on the South Side available for in-town midday storage include Readville, Southampton Street, Fan Yard, and South Station. Neither the Fan Yard nor Southampton Yard has adequate capacity to allow switching moves to "cut" defective locomotives or cars from MBTA trains. This function is performed at Readville.

As previously stated, between this date and 2030, the South Coast rail study projects the number of peak period MBTA commuter rail trains serving South Station are expected on the Providence, Franklin, Stoughton, Needham, and Worcester services to increase by one morning peak direction train, and one evening peak direction train, in response to forecast growth in ridership.[62] Table 2.4.1 below shows how the need for midday storage facilities are expected to change over the next few decades just to meet customer demand, and without any increase in the number of train sets providing service to Foxborough.

Table 2.4.1:
South Side In-Town Layover Deficits (Consists)

	2010	**2030+**
Total Available	24	24
Total Required	32	38
Deficit	**8**	**14**

2.4.1 Southampton Street

The MBTA has deeded rights to use five tracks in Amtrak's Southampton yard (near Andrew Square) for midday storage. The five tracks available to the MBTA have the capacity for storage of ten trains varying in length from six to nine cars:

Table 2.4.2:
Southampton Street Storage Facility

Track	**Track Available (ft)**	**Cars (assuming 2 locomotives)**
17	1480	15
16	1440	15
15	1340	14
14	1380	14
13	1440	15

[62] SYSTRA (2008). *Technical Memorandum: Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations*. Prepared for: the Massachusetts Bay Transportation Authority, pp. 25.

The five tracks provide capacity for the midday storage of approximately 10 trains of the following combination of lengths:

A. Three 8-car trains plus seven 7-car trains, (10) or
B. Three 9-car trains plus four 7-car trains plus three 6-car trains, (10) or
C. Five 8-car trains plus three 7-car trains plus two 6-car trains (10), or
D. Several other combinations.

2.4.2 Readville Yard

In addition to its use as maintenance and repair base, the yard at Readville is used for the midday storage of up to 12 train sets on 12 storage tracks. No other consists can be added to the Readville facility without expansion. A previous study indicated that the land located immediately east of the facility could be used for expansion of Readville Yard as shown in Figure 2.4.1.[63]

Figure 2.4.1:
Potential Site of New Maintenance and Storage Facilities Next To Readville Yard

There is currently one available track at Readville in the midday. One or perhaps two train sets could be "shoehorned" into the lineup without any additional capacity enhancements. However, MBTA Railroad Operations stipulates that any Foxborough Service initiative ***must*** address overnight storage deficiencies along the Franklin Branch.[64]

2.4.3 Fan (Front) Yard

The Fan Yard is bounded on the southeast by MBTA's Dorchester Branch, on the west by Frontage Road, and on the north by the "loop" tracks at Widett Circle. Amtrak claims ownership of the Fan Yard and would prefer the MBTA not use this facility. The Fan Yard is limited to three 6-car trains.

2.4.4 South Station

As previously noted, track lengths at South Station vary considerably; the longest tracks can accommodate trains of up to twelve to thirteen coaches, while the shortest track can hold only a six-car consist. Midday and overnight storage of MBTA trains at South Station occurs today because there is limited space elsewhere on the South Side to store equipment. It is preferable that consists are stored out of the terminal station.

[63] Jacobs Engineering Group. *Fairmount Line Corridor Improvements Project: Service Enhancement Study*. (April 2008). Prepared for: Massachusetts Bay Transportation Authority, pp. 44.
[64] Kick-Off Meeting for Foxborough Commuter Rail Project. Held at Gillette Stadium, Foxborough, MA. October 18, 2009. Attendees represented the MBTA, Jacobs Engineering, CTPS, EOHED, EOT, Kraft Group, and the Town of Foxborough.

2.4.5 Future Layover Conditions

The MBTA's 2004 Commuter Rail Infrastructure Needs Assessment forecast that the need for midday layover will increase by 15 consists by 2030. It also forecast that five more consists will require a downtown Boston overnight layover berth. Consequently more in-town layover capacity will be required.[65] Storage at Southampton Street facility will be limited to five consists due to increased future year train lengths. Similarly, it was assumed that storage at Fan Yard will remain at three consists, the same as today's situation. Table 2.4.3 summarizes the change in South Side in-town layover requirements up to 2030.

Table 2.4.3:
CRINA Estimates of South Side In-Town Layover Requirements (Consists)

	2004	**2010**	**2015**	**2020**	**2025**
Midday[66]	23	32	34	36	38
Overnight	11	13	14	15	16

With no additional storage at Readville, Southampton Street or the Fan Yard, a new facility is required to handle the residual storage requirements as shown in Table 2.4.3.

2.4.6 Franklin Layover

The 2004 CRINA report also indicated that the present Franklin layover holds only three six-car consists. It is already at capacity. [67] The addition of one more coach, let alone another consist is not possible given the current configuration of the facility. Of the six Franklin line trains arriving at South Station before 9am, only three originate from the layover in Franklin. CRINA assumed that a new 8-track layover facility located near Forge Park would be opened by 2010 for additional Franklin line trains.[68] However, as of the date this report is written, no facility has been opened and the MBTA continues to deadhead equipment to and from Forge Park.

[65] MBTA Commuter Rail Infrastructure Needs Assessment Study completed in April 2004. The study assumed Greenbush service and extended service to TF Green Airport were online by 2010. No other expansions were considered including the Nashua Extension, New Bedford/ Fall River or Fairmont Service.
[66] Midday storage requirements are determined by the number of consists needing to be stored in-town at the peak load point, which generally occurs around 12:30PM. For this study, it was assumed that the additional in-town layover capacity would be provided at a new facility at Widett Circle.
[67] CRINA, pp. 7-36.
[68] CRINA, pp 7-36.

Table 2.4.4:
Overnight Storage Location for Franklin and Fairmont Line Morning Weekday Trains[69]
(February 26, 2009)

Train	From	So. Station Arrival	Psgrs[70]	Set ID[71]	Seats	Prev. Train	Next Train	Overnight Storage Site
790	Forge Park	6:15 AM	589†	S	684	703	745	Boston
702	Forge Park	6:50 AM	672	I	948		905	Franklin
744	Readville	7:02 AM	83	Y	570	743	SH	Boston
704	Forge Park	7:09 AM	451	G	948		607	Franklin
746	Readville	7:32 AM	365	S	684	745	749	Boston
706	Forge Park	7:41 AM	1,069	V	948	DH6701	735	Boston
708	Forge Park	7:59 AM	1,100	H	1,260	DH6701	SH	Boston
748	Readville	8:25 AM	176	W	684	747	509	Boston
732	**Walpole**	8:40 AM	588	M	684	733	SH	Worcester
750	Readville	8:52 AM	81	S	684	749	753	Boston
710	Forge Park	8:54 AM	743	R	948		707	Franklin

2.4.7 South Coast Rail Layover and Assumptions

With the implementation of commuter rail service to the Commonwealth's South Coast, additional midday layover and overnight capacity will be required. There are several possibilities for supporting this additional need. These possibilities are still undergoing research. All of the current possibilities can accommodate South Coast Rail trains entering and leaving service over the Fort Point Channel Bridge.[72] At a recent meeting between Jacobs and the South Coast rail planning team, the planning team indicated that an additional midday storage facility might be located to the west of existing Southhampton Street Yard.[73]

2.4.8 Storage Capacity Summary and Conclusions

Midday and overnight capacity to store idle MBTA South Side trains is in short supply. Careful analysis indicates that there is currently one available track at Readville in the midday. No excess capacity of the overnight storage equipment was found. It is possible that one or perhaps two train sets could be "shoehorned" into the lineup without any additional midday capacity enhancements. However, MBTA Railroad Operations stipulates that any initiative to expanded Foxborough

[69] Shaded rows indicate service that uses the Dorchester Branch. Red-colored text indicates Franklin line trains. Bold faced text indicate service not terminating at Forge Park.
[70] Massachusetts Bay Commuter Railroad Company. (February 26, 2009). Received electronically from the Massachusetts Bay Transportation Authority, October 21, 2009.
[71] Ibid.
† Jacobs believes the Conductor's Audit to be inaccurate. According to the MBCR commuter train audit for February 26, 2009, a total of 209 passengers boarded Train #790 between Forge Park and Readville.
[72] Vanasse Hangen Brustlin, Inc. *South Coast Rail: Draft Alternatives Description.* (September 2009). Prepared for: the Executive Office of Transportation and Public Works, pp. 4-50.
[73] Foxborough Commuter Rail Project Coordination Meeting with VHB. Held at Jacobs Engineering, Boston, MA. November 2, 2009. Attendees represented the MBTA, Jacobs Engineering, CTPS, and VHB.

Service via Walpole ***must*** address overnight storage deficiencies along the Franklin Branch.[74] Presently three of the six morning trains originating on the branch are stored overnight in Boston.

2.5 Seating Capacity

Historically, seating capacity on peak trains serving Forge Park and Walpole has been barely sufficient or insufficient to meet demand. In the last two years with increased fares and parking charges and a national employment downturn, pressure for seats has markedly declined. With eventual economic recovery leading to a surge in downtown employment competition for seats on peak trains should be expected to return.

Presently the MBTA operates 11 morning peak trains on the Franklin and Farimont lines offering 9,042 seats to 5,537 passengers. Approximately 116 (2%) of the passengers cannot find a seat due to boarding an overcrowded train.

Table 2.5.1:
Franklin and Fairmont Line Weekday AM Peak Seating Capacity and Crowding[75]
(February 2009)

Train	From	So. Station Arrival	Psgrs[76]	Available Seats[77]	Standees	Set ID[78]	Route	Remark
790	Forge Park	6:15 AM	265	684		S	DB	Local
702	Forge Park	6:50 AM	755	948		I	NEC	Local
744	Readville	7:02 AM	106	570		Y	DB	Local
704	Forge Park	7:09 AM	483	948		G	NEC	Express
746	Readville	7:32 AM	154	684		S	DB	Local
706	Forge Park	7:41 AM	1,064	948	116	V	NEC	Local
708	Forge Park	7:59 AM	1,080	1,260		H	NEC	Express
748	Readville	8:25 AM	245	684		W	DB	Local
732	**Walpole**	8:40 AM	456	684		M	NEC	Local
750	Readville	8:52 AM	114	684		S	DB	Local
710	Forge Park	8:54 AM	743	948		R	NEC	Local
		Totals	***5,465***	***9,042***	***121***			

[74] Kick-Off Meeting for Foxborough Commuter Rail Project. Held at Gillette Stadium, Foxborough, MA. October 18, 2009. Attendees represented the MBTA, Jacobs Engineering, CTPS, EOHED, EOT, Kraft Group, and the Town of Foxborough.
[75] Shaded rows indicate service that uses the Dorchester Branch. Bold faced text indicates service not terminating at Forge Park.
[76] Massachusetts Bay Commuter Railroad Company. (February 26, 2009). Received electronically from the Massachusetts Bay Transportation Authority, October 21, 2009.
[77] Massachusetts Bay Commuter Railroad Company. (June 20, 2009). *South Side Equipment Cycle*. Received electronically from MBCR, October 8, 2009.
[78] Ibid.

Table 2.5.2:
Morning Ridership and Capacity by Station and Train[79]
(February 26. 2009)

Train No.	**790**	**702**	**744**	**704**	**746**	**706**	**708**	**748**	**732**	**750**	**710**	
So. Station Arr.	06:15	06:50	07:02	07:09	07:32	07:41	07:59	08:25	08:40	08:52	08:54	**Total**
Seats	684	948	570	948	684	948	1,260	684	684	684	948	9,042
Forge Park	36	74		96		70	200		0		142	618
Franklin	36	104		95		80	180		0		77	572
Norfolk	28	105		26		200	140		0		112	611
Walpole	19	110		85		140	194		90		47	685
Plimptonville	0	0		0		12	0		0		0	12
Windsor	5	10		47		0	60		60		76	258
Norwood Ctr	16	82		83		180	210		86		100	757
Norwood Depot	21	62		0		80	0		74		41	278
Islington	6	25		0		35	0		18		24	108
Dedham	7	20		38		110	96		81		51	403
Endicott	19	95		0		60	0		13		31	218
Readville	16	57	33	0	31	90	0	80	34	26	23	390
Hyde Park		9		0		0	0		0		0	9
Ruggles		0		7		7	0		0		2	16
Back Bay		2		6		0	0		0		17	25
Fairmont	19		19		36			81		34		189
Morton Street	25		31		53			40		26		175
Uphams Corner	12		23		34			44		28		141
Total	***265***	***755***	***106***	***483***	***154***	***1,064***	***1,080***	***245***	***456***	***114***	***743***	***5,465***

[79] Shaded columns indicate service that uses the Dorchester Branch.

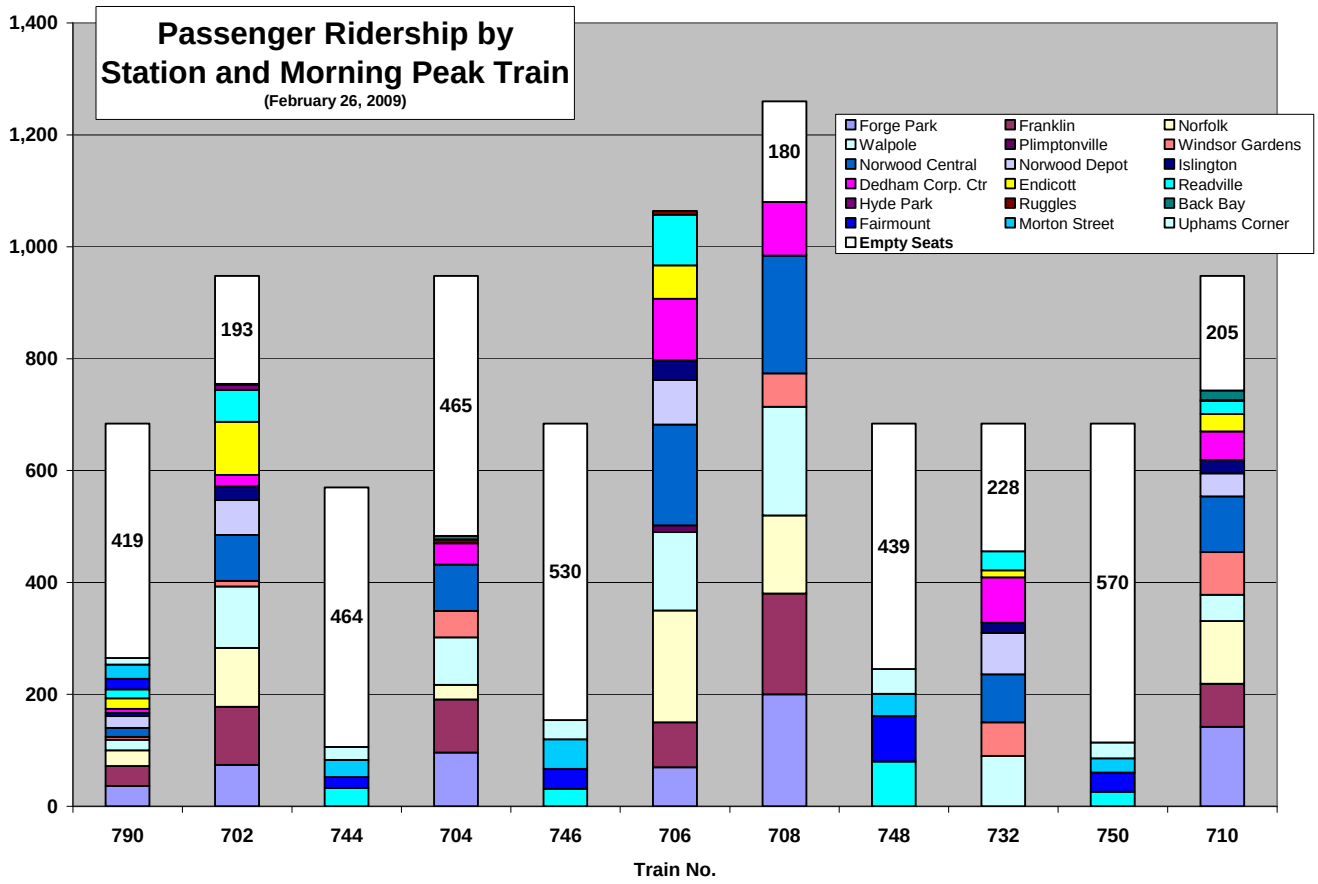

Figure 2.5.1

Each weekday afternoon, the MBTA offers nine afternoon peak trains on the Franklin and Farimont lines offering 8,298 seats to 4,452 passengers. According to the data provided by the MBTA, all passengers are able to find a seat on all trains operated.

Table 2.5.3:
Estimate of Franklin and Fairmont Line Weekday PM Peak Seating Capacity and Crowding[80]
(February 2009)

Train	To	So. Station Departure	Psgrs[81]	Seats[82]	Standees	Set ID[83]	Route	Remark
715	Forge Park	3:55 PM	517	948		P	NEC	Local
717	Forge Park	4:20 PM	661	684		W	NEC	Local
761	Readville	4:30 PM	40	1,260		H	DB	Local
737	**Nrwd Ctrl**	4:45 PM	291	684		U	NEC	Local
763	Readville	5:10 PM	114	882		LL	DB	Local
719	Forge Park	5:10 PM	1,096	1,260		F	NEC	Express
765	Readville	5:40 PM	237	684		O	DB	Local
721	Forge Park	5:40 PM	907	948		I	NEC	Local
723	Forge Park	6:15 PM	589	948		C	NEC	Local
		Totals	***4,452***	***8,298***				

[80] Shaded rows indicate service that uses the Dorchester Branch. Bold faced text indicates service not terminating at Forge Park.
[81] Massachusetts Bay Commuter Railroad Company. (February 26, 2009). *Franklin Conductor's Audit.* Received electronically from the Massachusetts Bay Transportation Authority, October 21, 2009.

Estimates were derived based on the average accuracy of the morning peak inbound train audit as compared to the passenger counts. Jacobs adjusted Franklin Branch trains by -0.88%, and Fairmont trains by 12% to arrive at initial passenger loads per train. Passengers per train and destination were calculated by taking the total percentage of inbound passengers and multiplying it by the total estimated passengers per train. This resulted in an estimate of disembarkings per station. For trains not serving certain stations, these passengers were uniformly added onto trains stopping at the station.

[82] Massachusetts Bay Commuter Railroad Company. (June 20, 2009). *South Side Equipment Cycle.* Received electronically from MBCR, October 8, 2009.
[83] Ibid.

Table 2.5.4:
Estimated Evening Ridership and Capacity by Station and Train[84]
(February 2009)

Train No.	**715**	**717**	**761**	**737**	**763**	**719**	**765**	**721**	**723**	
So. Station Dep.	3:55PM	4:20PM	4:30PM	4:45PM	5:10PM	5:10PM	5:40PM	5:40PM	6:15PM	**Total**
Seats	948	684	1,260	684	882	1,260	684	948	948	8,298
Uphams Corner			8		22		46			76
Morton Street			10		29		60			99
Fairmont			11		31		65			107
Back Bay	2	4		3		7		5	3	23
Ruggles	1	2		1		3		2	1	11
Hyde Park	0	2		2		0		2	0	6
Readville	28	39	11	38	32	0	66	47	32	294
Endicott	37	0		54		0		56	42	189
Dedham	40	58		48		105		74	47	372
Islington	22	0		20		0		28	14	84
Norwood Depot	31	45		37		81		57	36	287
Norwood Central	74	108		88		194		138	87	689
Windsor Gardens	25	36		0		62		45	29	198
Plimptonville	0	0		0		13		0	0	13
Walpole	65	93		0		160		115	75	507
Norfolk	61	88		0		151		108	71	479
Franklin	63	90		0		156		112	73	495
Forge Park	67	96		0		165		118	78	523
Totals	***517***	***661***	***40***	***291***	***114***	***1,096***	***236***	***907***	***589***	***4,452***

[84] Shaded columns indicate service using the Dorchester Branch.

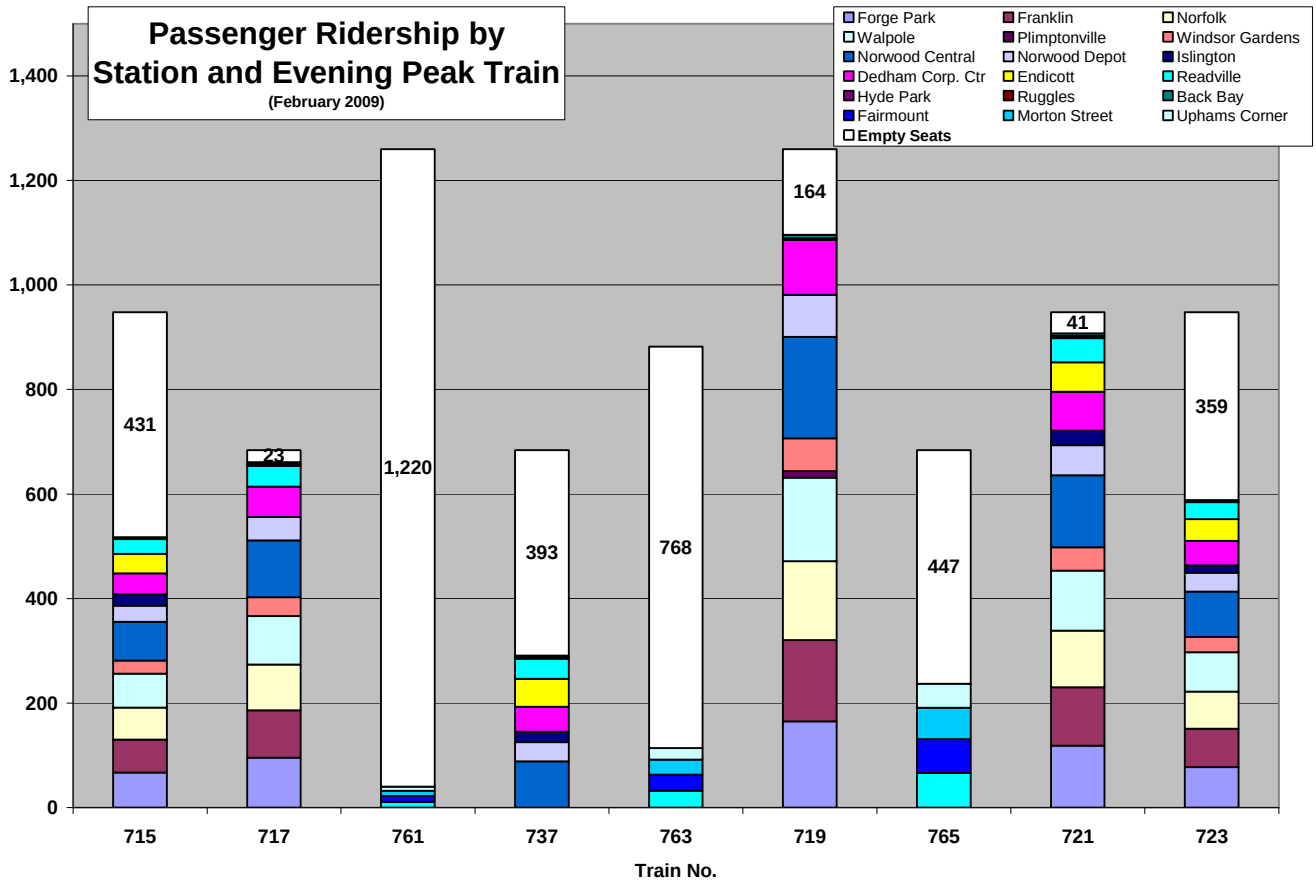

Figure 2.5.2

2.5.1 Future Coach Requirements

The 2004 CRINA report found that as ridership grows on the Franklin Branch and other lines, extra cars and trains will need to added into service. Based on an optimistic 2025 ridership forecast the service would need to grow to include one more inbound peak train and one more outbound peak trains in the next 15 to 20 years.

The 2004 CRINA report also found that Fairmont ridership through 2025 and beyond could be satisfied with the current line up of service trains, but that some cars might need to be added to some of the trains.

Note the CRINA study assumed that all single level cars serving South Station would be retired or transferred out of South Station by 2025. All future trains on the MBTA South Side would be composed exclusively with bi-level coaches.

Replacing all single level coaches with bi-levels provides the Authority more flexibility to interchange consists from train-to-train and from line-to-line. This should decrease South Station dwell times since all trains will generally have the same capacity, and make it more operationally fluid.

2.5.2 Seating Capacity Summary and Conclusions

At this time there is adequate seating capacity on nearly all MBTA trains serving the Franklin and Dorchester branches. This capacity indicates that there are presently opportunities to use capacity on existing trains to serve passengers from Foxborough provided that the MBTA can identify opportunities to satisfy customers that currently use the service from Forge Park, Franklin and Norfolk. Future growth in ridership returning the MBTA to and beyond historic high levels of ridership may absorb much of the slack capacity currently exhibited by the system. The eventual replacement of all single level cars with higher capacity bi-levels will ameliorate some projected future capacity shortfalls. Nonetheless an additional peak train on the Franklin Branch will eventually be required to satisfy future growth in ridership.

2.6 Parking Capacity

Parking lots on the MBTA commuter rail network have historically been operated at, or above capacity generating an ongoing program of constant incremental opportunistic expansion to satisfy pent up demand. However, as with seating capacity, the combined impacts of recently increased fares and parking charges with a national employment downturn, has reduced demand for parking to temporarily manageable levels. As with seating, the eventual economic recovery will lead to an inevitable surge in downtown employment leading to parking shortages at most, or all stations.

Table 2.6.1:
MBTA Parking Capacity in the Vicinity of Foxborough[85,86]

Station	Typical Daily Boardings	Total Parking Spaces	Typically Occupied Spaces	Spaces Typically Available
Walpole	802	343	206	137
Mansfield	1,871	806	685	121
Norfolk	757	532	399	133
Sharon	1,061	542	325	217
Total	***4,491***	***2,223***	***1,615***	***608***

This parking data indicates that for every two passengers at regional stations, there is approximately one parking space. Offering fulltime service at Foxborough could address a possible future parking shortage at area stations by diverting riders to Foxborough where there is an abundance of parking spaces adjacent to the station.

Please see Appendix A for the results of a recent survey of the regional parking commuter rail parking lots.

[85] Massachusetts Bay Transportation Authority. *Schedules and Maps for*: *Walpole, Mansfield, Norfolk, Sharon, Foxborough stations.* Accessed: November 10, 2009. Available: http://www.mbta.com/schedules_and_maps/rail/
[86] Derived from MBTA parking space data and average weekday availability.

2.7 Accessibility

Federal and state regulations and guidelines stipulate that all transit stations should offer access to service for passengers with limitations in their mobility including persons confined to wheelchairs and using other mobility assistance devices such as walkers and canes.

Table 2.7.1 lists the accessibility options to existing MBTA service in the vicinity of Foxborough Station.

Table 2.7.1:
Accessibility at Foxborough Vicinity Stations[87]

Station	Accessible	No. Accessible Parking Spaces
Walpole	No	4
Mansfield[88]	Yes	9
Norfolk	Yes	11
Sharon	No	4
Foxborough	Yes	
Total		***28***

Three MBTA stations in the vicinity of Foxborough Station are accessible via mini-high platforms. Foxborough is also equipped with a mini-high platform for handicapped accessibility. Among the accessible stations, Mansfield is nominally accessible, but suffers from the circumstance that there is no accessible path between the outbound and inbound platforms. It is interesting to note that while some of the stations may not be ADA accessible, they all provide handicapped parking spaces.

As shown in Table 2.7.1, the accessibility offerings of the MBTA in the vicinity of Foxborough Station are limited.

[87] Ibid.
[88] While Mansfield Station is accessible, there is no accessible path from the outbound platform to the inbound platform.

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CHAPTER 3: EVALUATION CRITERIA

Introduction

This chapter provides the evaluation criteria used to evaluate potential service options for fulltime commuter rail service to Foxborough. It includes a description of the range of evaluation criteria considered and the methodology used for evaluating each alternative developed for this study. The evaluation categories, criteria and measures used to evaluate potential service options for Foxborough Station are listed in Table 3.2.1 at the end of this chapter.

There are several inherent capacity issues in the MBTA's existing Southside network on which Foxborough station is located. These issues limit service levels on the network, including terminal capacity at South Station, Northeast Corridor capacity, existing equipment maintenance schedules, and existing MBTA commuter rail equipment cycles. It is important to note that while the criteria developed here do not reflect the inherent capacity limitations on the system, the Commonwealth of Massachusetts and the MBTA must determine whether dedicating its limited Southside network capacity to fulltime Foxborough service is the best use of these finite transportation resources.

3.1 Criteria Considered

A range of possible evaluation criteria were considered for use in this study:

FTA New Starts/Small Starts (Section 5309) Project Justification Criteria

Projects seeking capital funding under the FTA's New Starts/Small Starts program are compared based on a series of quantitative measures including Cost Effectiveness, Land Use, Economic Development and other factors. These criteria are typically developed as a project goes through the prescribed FTA Alternatives Analysis, Project Development, and Preliminary Engineering phases.

The level of detail required by FTA to properly quantify and assess these performance measures is beyond the scope contemplated for this feasibility study. Furthermore, it is anticipated that reauthorization of the Federal Surface Transportation Act in 2010 may involve modification to these criteria. If the MBTA chooses to pursue FTA Section 5309 (New Starts) funding as a means of advancing Foxborough service, this level of detail will be developed in subsequent, more advanced phases of project planning and design.

Program for Mass Transportation (PMT)[89]

The PMT defines the capital investment projects that could be implemented to meet the MBTA's long range system vision, and evaluates potential transportation solutions in the areas of system preservation, service enhancement and system expansion. Projects included in the PMT program are selected for their potential to achieve established MBTA goals and objectives, and are evaluated based on quantitative and qualitative performance measures within the following categories:

[89] "*Program for Mass Transportation*", prepared for the MBTA by the Central Transportation Planning Staff; May 2009.

- **Customer Conveyance** (includes System Configuration, Expediency, Reliability and Comfort, Fairness, Customer Information, Regional Transportation Impacts, and Land Use Impacts)
- **Customer Support and Safety**
- **Accessibility**

It is recommended that measures similar to those applied within the PMT be used to evaluate Foxborough commuter rail service alternatives. Outputs from the travel demand modeling process and other technical work will provide the necessary level of quantitative and qualitative detail required to rate the project within each category. More importantly, the development and application of measures consistent with the PMT will provide the MBTA and other decision-makers with the ability to evaluate the overall effectiveness of the project in relation to other potential transit investments.

The PMT evaluation criteria for system enhancement and expansion were individually reviewed to ensure that each had applicability to the Foxborough Station alternatives. Recommended measures, including the additional non-PMT performance measures described above, are included in Table 3.1. Measures that do not apply to the Foxborough service alternatives or that would receive a similar rating, regardless of service plan, are not included in Table 1. For example, the evaluation criteria included under the categories of "Customer Information" and "Reliability and Comfort" are not applicable to this project.

Other Factors to be Considered

Due to the unique nature of this project, there are other factors that could affect the overall cost, benefit and appeal of potential alternatives. In addition to established PMT performance measures discussed above, several additional criteria are proposed for use in this Study.

Economic Development/Transit-Oriented Development

The area surrounding the existing Foxborough Station, which includes Gillette Stadium and Patriot Place, has been designated as a Growth District by EOHED. This designation indicates the State's intent to support increased development densities in this area through targeted public investment in transportation facilities and other public infrastructure.

Locations targeted for EOHED assistance as growth districts have six fundamental characteristics[90]:

- **Pre-Planned Zoning and Streamlined Permitting** – local zoning and land use regulations should be modified in advance, in order to permit new projects within six months.
- **Market-Based Planning** – districts should be zoned for uses and densities for which there is reasonable market demand.
- **Fairness to Neighbors** – contemplated uses and densities should reasonably take into account and mitigate possible impacts on neighboring communities.

[90] http://www.mass.gov/ > Executive Office of Housing and Economic Development > Growth Districts Initiative (website visited December 12, 2009).

- **Focused and Environmentally Sensitive Land Use** – new development should be sited to avoid environmentally significant areas and designed to preserve open spaces.
- **Transportation Access** – contemplated uses and densities will be supported by existing transportation infrastructure or by reasonable upgrades to that infrastructure.
- **Adequate Utilities** – contemplated uses will be supported by existing utility infrastructure or by reasonable upgrades to that infrastructure.

Local Zoning and Utility upgrades would not be affected by any of the alternatives considered for Foxborough commuter rail service. Utility upgrades required for the layover facility are not considered. Conversely, any alternative considered *would* involve a positive impact in terms of upgrading Transportation Access for the growth district; yet all alternatives would be rated equally The two remaining characteristics: Fairness to Neighbors and Environmentally Sensitive Land Use should be considered during the evaluation of alternatives.

EOHED also identifies eight additional "desirable" characteristics: Job Opportunities, Housing Opportunities, Community Enhancement, Land Re-Use, Transit Availability, Smart Energy, Green/Low Impact Development and Good Design. Smart Energy and Green/Low Impact Development and Good Design would not be affected by any of the commuter rail alternatives. Transit Availability would be positively impacted by any of the alternatives. The four remaining characteristics: Job Opportunities, Housing Opportunity, Community Enhancement and Land Re-Use should be considered.

To better assess the potential benefits and impacts of full-time Foxborough service to the Foxborough/Gillette Stadium EOHED Growth District the following additional criteria can be added to the PMT measures:

- **Environmental Sensitivity** – including direct and indirect impacts, as well as preservation of open space.
- **Job Opportunities** – including the potential for the service to support a reverse commute.
- **Housing Opportunity/Community Enhancement** – assessing the potential impact on existing and future residential development.
- **Land Reuse** – assessing whether development will be on previously undisturbed land.

Systemwide Benefits/Impacts

Foxborough service alternatives may also have a larger impact on the MBTA commuter rail system. These broader impacts/benefits will help the MBTA assess the overall effectiveness and priority of potential full-time service to Foxborough:

- **Systemwide Operations** – assessing any potential secondary benefits or impacts in terms of operational/scheduling flexibility; any potential impact to existing commuter rail line operations; the ability to meet any increased layover and maintenance needs, etc.
- **State of Good Repair Benefits** – assessing whether project alternatives would involve replacement of aging assets or correct of system deficiencies.
- **Capital & Operating Costs** – assessing the capital costs required to implement each of the alternatives, as well as ongoing costs related to the operation of service.

3.2 Proposed Evaluation Methodology

A range of Foxborough commuter rail service alternatives have been screened to identify any critical operational flaws or other factors (e.g. cost, impact to other line operations, etc.) that would clearly restrict their feasibility. A limited number of full time service development options for Foxborough station have been advanced into more detailed analysis in Chapter 5.

Quantitative evaluation measures presented in Table 3.2.1 have been evaluated using outputs from the travel demand model, as provided by CTPS. More qualitative measures (those rated with a High-Medium-Low rating) have been assessed based on demographic, land use, environmental and other factors considered during project development and based on coordination and input with key project stakeholders.

Detailed results presenting the evaluation outcome or rating for each measure are presented for all alternatives in Chapter 6.

Table 3.2.1:
Recommended Evaluation Criteria for Foxborough Commuter Rail Service

PMT CATEGORY	*CRITERIA*	*MEASURE*
System Configuration	Expansion of transit access to geographical areas underserved by transit	Hi-Med-Low
Expediency	Improvements to service frequency (net # additional peak hour inbound rail trips)	# train trips
	Increase in travel speed; time savings for all travelers in region	hours
	Reduction in automobile travel advantage; avg. time savings for Foxborough station users	minutes
Fairness	Elimination of barriers to efficient travel between key destinations and neighborhoods with substantial minority or low-income population	Hi-Med-Low
	Provision of benefits that outweigh burdens in neighborhoods with substantial minority or low-income population	Hi-Med-Low
Regional Transportation Impacts	Total passengers on MBTA system (systemwide linked trips, weekday)	# passengers
	Projected number of weekday boardings on Foxborough commuter rail service	# passengers
	Projected number of passengers diverted from auto mode, systemwide (new transit riders)	# passengers
	Projected % increase in weekday transit mode share, systemwide	% increase
	Projected reduction in weekday auto vehicle miles traveled, regionwide	miles
	Projected reduction in VOC, NOx, CO and CO_2 emissions	tons
Land Use Impacts	Consistency with local plans promoting TOD and sustainable land use patterns	Hi-Med-Low
	Contribution to brownfield and infill development	Hi-Med-Low
Accessibility	Expansion of access to major activity centers (avg. travel time to industrial, retail and service jobs within a 40 minute transit trip	minutes
OTHER CRITERIA	**MEASURES**	**UNIT**
Fairness to Existing Neighbors	Traffic and air quality impacts within the traffic analysis zone	VMT and CO per sq. mi
	Ability to limit noise impacts to adjacent neighborhoods	Hi-Med-Low
Environmental Sensitivity	Ability to limit environmental impacts and preserve open space.	Hi-Med-Low
Job Opportunities	Potential for reverse commute /access to jobs (# peak hour trains in outbound direction)	# train trips
	Avg. # industrial, retail and service jobs within 40 min. transit trip	# jobs
Community Enhancement	Assesses whether alternatives would have a positive impact on future residential growth	Hi-Med-Low
Land Reuse	Ability of project to re-use land or avoid development on previously undisturbed land.	Hi-Med-Low
Systemwide Operational Benefits	Secondary benefits in terms of layover space, operational flexibility, system capacity, etc.	Hi-Med-Low
State of Good Repair Benefits	Involves replacement of aging assets or provides critical infrastructure	Hi-Med-Low
Cost	Capital Cost (for fixed assets such as land, track, stations, etc.)	$
	Capital Cost per New Transit Rider	$/rider
	Net Operating Cost (operations less farebox revenues)	$
	Net Operating Cost per New Transit Rider	$/rider

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CHAPTER 4: ALTERNATIVES ANALYSIS

Introduction

This chapter describes the characteristics of three full-time service alternatives for Foxborough Station. It only shows the feasibility of operating fulltime service to Foxborough. In the constantly evolving environment of the Authority's Railroad Operations, the proposed service shown below encapsulates a snapshot of what potential Foxborough service could look like.

The alternatives developed incorporate the findings of the capacity limitations of the existing system, and represent a spectrum of cost, complexity, and time to implement service. The alternatives range from a shuttle train connecting with existing Franklin service at Walpole Station to a direct service integrated with the MBTA's Fairmount and Franklin services.

All improvements to allow for fulltime Foxborough service will benefit existing services operated by the MBTA. Specifically, infrastructure improvements will increase the reliability of existing Franklin service, enhance the existing special event trains serving Foxborough, and provide an emergency bypass for Providence line trains between Readville and Mansfield. These improvements will be described in detail later on.

The design of service alternatives was guided by several factors identified during the course of the team's analysis of system capacity:

1. **Line capacity –** Foxborough Station should be accessed from the north. Service should be integrated with existing service to Forge Park and Fairmount.

2. **Terminal capacity –** Changes in the number and timing of peak period train movements at South Station should be minimized. All service alternatives consequently use existing train slots at South Station to provide Foxborough service. No new peak trains are scheduled at the South Station.

3. **Maintenance capacity –** All alternatives should respect the tight maintenance capacity at South Hampton Street and Readville by requiring all service to operate within the constraints of the existing fleet and maintenance cycles. One new train set is introduced into the South Side equipment schedule for the more ambitious alternatives. That train set is comprised of a new locomotive and coaches drawn from the existing fleet.

4. **Midday & overnight storage capacity –** The more ambitious alternatives should address the existing deficiency in overnight storage capacity for Franklin Branch and Fairmount service by building a six track layover facility for Foxborough, Franklin Branch and Fairmount service. Current facilities at Readville and South Hampton Street are used for midday storage.

5. **Seating Capacity –** The service plans should respect current ridership patterns on existing trains. No seat shortages are created by introduction of the new service.

6. **Parking Capacity** – The service alternatives should take advantage of the extensive availability of parking at Foxborough Station.

7. **Accessibility** – The service alternatives should expand accessible travel options for commuter rail passengers using the Foxborough and Forge Park services.

The three alternatives service designs cover a spectrum of cost and complexity.

All service plans were reviewed with officials from MBTA Railroad Operations, the Massachusetts Bay Commuter Railroad and Amtrak. The plans reflect input and suggestions from these operating officials and are considered reasonable conceptual plans suitable for a feasibility study. More detailed scheduling and coordination would be required should MassDOT and the MBTA chose to advance any of the service alternatives.

The study team's plans for each service alternative included a full weekday timetable, string line diagrams used to ensure workable integration with existing services and to identify required infrastructure upgrades, a conflict analysis offering suggestions to resolve conflicts between the service proposals and existing service, equipment cycles and consist requirements, required infrastructure upgrades and preliminary estimates of operating cost.

4.1 Service Design

As noted in Chapter Two, Foxborough Station is located on the CSX owned Framingham Secondary between the MBTA's Walpole Station (Franklin Branch) and Mansfield Station (Northeast Corridor). Currently, special event trains provide the only service to Foxborough – from Boston in the north and Providence in the south. Any service from Foxborough would use the Framingham Secondary for travel between Foxborough and Walpole (Franklin Branch) or Mansfield (Northeast Corridor). Although currently rated for Class I speeds, it is assumed that the infrastructure on the Framingham Secondary will be improved to allow for bi-directional operation at 60 mph.

4.1.1 Service Alternatives

Twelve conceptual options were initially considered by the study team. Review of the twelve alternatives with the MBTA Railroad Operations Directorate[91] indicated that any service to Foxborough would need to operate over the Franklin and Dorchester branches. All connecting service would make transfers at Norwood Central or Walpole Stations connecting with existing Forge Park service. Details regarding the one-way trip times, and routing alternatives for each preliminary option can be found in Appendix B.

Three alternatives were developed based on the direction and guidance provided by MBTA operating officials. Draft service plans for the three alternatives were reviewed with MBTA, MBCR and Amtrak officials. The conceptual plans described here reflect the input and suggestions of these officials.

[91] Meeting with MBTA Railroad Operations. December 22, 2009.

Service Option	# Weekday Trains	Peak Trains	Service Description
A. Connecting Service	40	8	• Existing equipment assigned to the Forge Park service would be employed to provide a rail shuttle service connecting with existing trains serving Walpole Station. • All travel to and from Foxborough would require a transfer on the Franklin Branch. • Impacts on existing service and equipment requirements would be negligible.
B. Hybrid Service	34	9	• Foxborough would be served with a combination of connecting shuttle service and direct service to South Station via the Dorchester Branch. • All direct service would be provided by extending existing Fairmount trains to Foxborough. • New travel options for travelers using existing stations in Walpole, Norwood and Dedham would be created. • No new rolling stock would be required. • Impacts on existing service and equipment requirements would be minimal.
C. Full Direct Service	32	8	• All Fairmount service would be extended to Foxborough. • All Foxborough trips would operate via the Dorchester Branch. • New travel options for travelers using existing stations in Norwood and Dedham would be created. • One new train set created using existing coaches and a new locomotive would be necessary. • Impacts on existing service and equipment requirements would be minor but noticeable.

4.1.2 Option A – Foxborough to Walpole Shuttle

Option A provides all-day shuttle service between Foxborough and Walpole stations providing transfers to and from existing Forge Park trains. Passengers would transfer at Walpole (or Norwood Central) to/from existing Forge Park service.

The shuttle service would operate over the CSX owned Framingham Secondary between Foxborough and Walpole stations. A new Walpole station would be required. Minor upgrades to Foxborough station are required. No upgrades to Norwood Central Station are anticipated.

There are no modifications to the existing Franklin Branch service or Readville service; they would continue to operate as they currently do.

No additional equipment would be required to offer the shuttle service. All service would be operated using slack time in the present schedules of existing equipment.

Figure 4.1.1 shows a map of Option A.

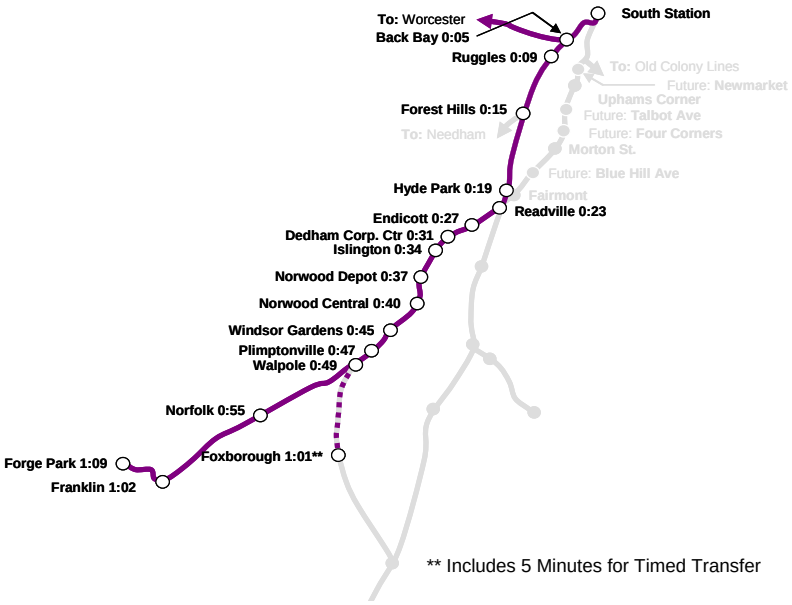

Figure 4.1.1:
Map of Service Option A (with travel times to South Station)

Schedule and Service Design – Passengers would be provided with the opportunity to make a cross platform to timed transfer to/from Franklin line service at Walpole Station.[92] Passengers would be provided with 21 trips to Walpole and Norwood Central[93] from Foxborough (4 morning peak transfers to inbound Franklin line service), and 19 trips from Walpole to Foxborough (4 evening peak transfers from Franklin line service).[94]

Table 4.1.1 summarizes the number of transfers to inbound and outbound Franklin line service.

Table 4.1.1:
Option A: Transfers to Franklin line Service

	Daily Trips Operated	**Peak Period, Peak Direction Transfers**
Inbound	21	4
Outbound	19	4
Total	40	8

Table 4.1.2 and Table 4.1.3 show the proposed inbound and outbound shuttle schedule. Figure 4.1.2 shows the morning peak stringlines for the shuttle service.

[92] Most transfers allow five minutes for connections. In several instances during the peak periods, the timed transfers are as short as three minutes.
[93] One trip each weekday would connect at Norwood Central.
[94] Note, not all inbound Foxborough trips are transfers **to** inbound Franklin line service, and not all outbound trips are transfers **from** outbound Franklin line service.

Table 4.1.2:
Option A: Inbound Foxborough Service

Train No.	**790**	**702**	**704**	**706**	**708**	**732**	**710**	**734**	**712**	**714**
Set ID	**s**	**i**	**g**	**v**	**h**	**m**	**r**	**v**	**c**	**r**
Forge Park	5:05 AM	5:45 AM	6:15 AM	6:35 AM	7:00 AM	-	7:45 AM	-	9:03 AM	10:45 AM
Franklin	5:10 AM	5:52 AM	6:22 AM	6:42 AM	7:07 AM	-	7:52 AM	-	9:10 AM	10:52 AM
Norfolk	5:19 AM	5:59 AM	6:29 AM	6:49 AM	7:14 AM	-	7:59 AM	-	9:17 AM	10:59 AM
Walpole	5:25 AM	6:05 AM	6:35 AM	6:55 AM	7:21 AM	7:54 AM	8:05 AM		9:24 AM	11:06 AM
D: Foxborough	5:13 AM	5:51 AM	6:25AM	-	-	-	7:57 AM	8:28 AM	9:13 AM	10:53 AM
A: Walpole	5:20 AM	5:58 AM	6:32AM	-	-	-	8:04 AM	8:35 AM	9:20 AM	11:00 AM
Windsor Gardens	-	-	-	-	-	-	-	8:39 AM	-	-
	X-fer to/from 790	**X-fer to/from 702**	**X-fer to/from 704**				**X-fer to/from 710**	**X-fer to 734/from 735**	**X-fer to 712**	**X-fer to/from 714**
Norwood Central	-	-	-	-	-	-	-	8:43 AM	-	-
X-fer to IB MBTA	5:25 AM	6:05 AM	6:35 AM	6:55 AM	7:21 AM	7:54 AM	8:05 AM	8:47 AM	9:24 AM	11:06 AM
D: Norwood Central	-	-	-	-	-	-	-	8:53 AM	-	-
Walpole	5:30 AM	6:08 AM	-	-	-	-	-	8:58 AM	9:30 AM	11:08 AM
A: Foxborough	5:37 AM	6:15 AM	-	-	-	-	-	9:05 AM	9:37 AM	11:15 AM
Plimptonville	-	-	-	6:58 AM	-	-	-	-	-	-
Windsor Gardens	5:29 AM	6:09 AM	6:39 AM	7:01 AM	7:25 AM	7:58 AM	-	8:39 AM	9:29 AM	11:11 AM
A: Norwood Central	-	-	-	-	-	-	-	8:43 AM	-	-
D: Norwood Central	5:33 AM	6:13 AM	6:43 AM	7:05 AM	7:30 AM	8:02 AM	-	8:45 AM	9:33 AM	11:15 AM
Norwood Depot	5:36 AM	6:16 AM	-	7:08 AM	-	8:05 AM	-	8:47 AM	9:35 AM	11:17 AM
Islington	5:39 AM	6:19 AM	-	7:11 AM	-	8:08 AM	8:20 AM	8:50 AM	9:39 AM	11:21 AM
Dedham Corp. Center	5:42 AM	6:22 AM	6:48 AM	7:14 AM	7:35 AM	8:11 AM	8:23 AM	8:52 AM	9:42 AM	11:24 AM
Endicott	5:45 AM	6:26 AM	-	7:18 AM	-	8:15 AM	8:27 AM	8:54 AM	9:44 AM	11:26 AM
DB/FB/NEC Split	-	-	-	-	-	-	-	-	9:47 AM	-
Readville	-	6:29 AM	-	7:21 AM	-	8:19 AM	8:31 AM	8:59 AM	9:47 AM	11:29 AM
Readville Yard	-	-	-	-	-	-	-	-	-	-
Fairmont	5:51 AM	-	-	-	-	-	-	-	-	-
Blue Hill Avenue	-	-	-	-	-	-	-	-	-	-
Morton Street	5:55 AM	-	-	-	-	-	-	-	-	-
Talbot Avenue	-	-	-	-	-	-	-	-	-	-
Four Corners	-	-	-	-	-	-	-	-	-	-
Uphams Corner	6:01 AM	-	-	-	-	-	-	-	-	-
Newmarket	-	-	-	-	-	-	-	-	-	-
South Station	6:15 AM	6:50 AM	7:09 AM	7:41 AM	7:59 AM	8:40 AM	8:54 AM	9:25 AM	10:08 AM	11:48 AM

Train No.	**716**	**718**	**720**	**794**	**796**	**798DD**	**726**	**728**	**730**
Set ID	**t**	**n**	**a**	**u**	**w**	**c**	**x**	**y**	**f**
Forge Park	12:05 PM	2:05 PM	4:00 PM	-	5:36 PM	7:40 PM	8:50 PM	10:15 PM	11:50 PM
Franklin	12:12 PM	2:12 PM	4:07 PM	-	5:43 PM	7:47 PM	8:57 PM	10:22 PM	11:57 PM
Norfolk	12:19 PM	2:19 PM	4:14 PM	-	5:49 PM	7:53 PM	9:03 PM	-	-
Walpole	12:26 PM	2:26 PM	4:20 PM	-	5:56 PM	8:00 PM	9:09 PM	10:33 PM	12:08 AM
D: Foxborough	12:14 PM	2:14 PM	-	-	-	7:47 PM	8:57 PM	10:21 PM	11:56 PM
A: Walpole	12:21 PM	2:21 PM	-	-	-	7:54 PM	9:04 PM	10:28 PM	12:03 AM
Windsor Gardens	-	-	-	-	-	-	-	-	-
	X-fer to/from 716	**X-fer to/from 718**	**X-fer to/from 720**		**X-fer to**	**X-fer to 798**	**X-fer to 726**	**X-fer to 728**	**X-fer to 730 & 731**
Norwood Central	-	-	-	-	-	-	-	-	-
X-fer to IB MBTA	12:26 PM	2:26 PM	4:20 PM	-	5:56 PM	8:00 PM	9:09 PM	10:33 PM	12:08 AM
D: Norwood Central	-	-	-	-	-	-	-	-	-
Walpole	12:31 PM	2:31 PM	-	-	-	8:22 PM	9:32 PM	10:38 PM	12:34 AM
A: Foxborough	12:38 PM	2:38 PM	-	-	-	8:29 PM	9:39 PM	10:45 PM	12:41 AM
Plimptonville	-	-	-	-	-	-	-	-	-
Windsor Gardens	12:31 PM	2:31 PM	4:24 PM	-	6:01 PM	-	-	-	-
A: Norwood Central	-	-	-	-	-	-	-	-	-
D: Norwood Central	12:35 PM	2:35 PM	4:28 PM	5:35 PM	6:05 PM	8:07 PM	9:16 PM	10:39 PM	12:14 AM
Norwood Depot	12:37 PM	2:37 PM	4:31 PM	-	6:07 PM	-	9:18 PM	-	-
Islington	12:41 PM	2:41 PM	4:36 PM	-	6:11 PM	-	9:22 PM	-	-
Dedham Corp. Center	12:44 PM	2:44 PM	4:40 PM	5:40 PM	6:14 PM	8:16 PM	9:25 PM	10:44 PM	12:19 AM
Endicott	12:46 PM	2:46 PM	4:44 PM	-	6:17 PM	-	9:27 PM	-	-
DB/FB/NEC Split	-	-	-	-	-	-	-	-	-
Readville	12:49 PM	2:49 PM	4:48 PM	-	6:25 PM	8:22 PM	-	-	-
Readville Yard	-	-	-	-	-	-	-	-	-
Fairmont	-	-	-	-	6:30 PM	-	-	-	-
Blue Hill Avenue	-	-	-	-	-	-	-	-	-
Morton Street	-	-	-	-	6:48 PM	-	-	-	-
Talbot Avenue	-	-	-	-	-	-	-	-	-
Four Corners	-	-	-	-	-	-	-	-	-
Uphams Corner	-	-	-	-	6:55 PM	-	-	-	-
Newmarket	-	-	-	-	-	-	-	-	-
South Station	1:06 PM	3:05 PM	5:08 PM	6:05 PM	7:05 PM	8:45 PM	9:45 PM	11:06 PM	12:41 AM

Table 4.1.3:
Option A: Outbound Foxborough Service

Train No.	703	733	795	735	707	709	711	713	715
Cycle	s	m	c	v	r	t	n	a	p
South Station	4:00 AM	6:55 AM	7:35 AM	7:55 AM	9:20 AM	10:50 AM	12:45 PM	2:40 PM	3:55 PM
Newmarket	-	-	-	-	-	-	-	-	-
Uphams Corner	-	-	7:48 AM	-	-	-	-	-	-
Four Corners	-	-	-	-	-	-	-	-	-
Talbot Avenue	-	-	-	-	-	-	-	-	-
Morton Street	-	-	7:55 AM	-	-	-	-	-	-
Blue Hill Avenue	-	-	-	-	-	-	-	-	-
Fairmont	-	-	7:59 AM	-	-	-	-	-	-
Readville Yard	-	-	-	-	-	-	-	-	-
Readville (DB)	4:15 AM	7:12 AM	8:00 AM	8:17 AM	9:36 AM	11:05 AM	1:03 PM	2:58 PM	4:14 PM
DB/FB/NEC Split	-	-	-	-	-	-	-	-	-
Endicott	-	7:16 AM	8:04 AM	8:18 AM	9:39 AM	11:08 AM	1:06 PM	3:01 PM	4:18 PM
Dedham Corp. Center	-	7:19 AM	8:07 AM	8:20 AM	9:41 AM	11:10 AM	1:08 PM	3:04 PM	4:21 PM
Islington	-	7:22 AM	8:10 AM	8:23 AM	-	11:13 AM	1:11 PM	3:06 PM	4:24 PM
Norwood Depot	-	7:25 AM	8:13 AM	8:26 AM	9:46 AM	11:16 AM	1:14 PM	3:10 PM	4:27 PM
Norwood Central	4:22 AM	7:32 AM	8:16 AM	8:29 AM	9:49 AM	11:19 AM	1:17 PM	3:13 PM	4:31 PM
Windsor Gardens	-	-	8:20 AM	-	9:53 AM	11:23 AM	1:21 PM	3:17 PM	4:35 PM
Plimptonville	-	-	-	-	-	-	-	-	-
D: Walpole	4:30 AM	-	8:24 AM	-	9:57 AM	11:32 AM	1:26 PM	3:21 PM	4:40 PM
Walpole	4:30 AM	-	8:24 AM	-	9:57 AM	11:35 AM	1:26 PM	3:21 PM	4:40 PM
D: Foxborough	-	-	-	-	9:47 AM	11:23 AM	1:14 PM	3:09 PM	-
A: Walpole	-	-	-	-	9:54 AM	11:30 AM	1:21 PM	3:16 PM	-
					X-fer to/from 707	**X-fer to/from 709**	**X-fer to/from 711**	**X-fer to/from 713**	
D: Walpole	-	-	-	-	10:02 AM	11:40 AM	1:31 PM	3:26 PM	-
Foxborough	-	-	-	-	10:09 AM	11:47 AM	1:38 PM	3:33 PM	-
Norfolk	-	-	8:31 AM	-	10:05 AM	11:37 AM	1:32 PM	3:28 PM	4:47 PM
Franklin	4:40 AM	-	8:38 AM	-	10:10 AM	11:45 AM	1:40 PM	3:36 PM	4:55 PM
Forge Park	4:50 AM	-	8:45 AM	-	10:17 AM	11:52 AM	1:47 PM	3:46 PM	5:02 PM

Train No.	717	737	719	721	723	725	727	729	731
Cycle	w	u	f	i	c	x	y	f	y
South Station	4:20 PM	4:45 PM	5:10 PM	5:40 PM	6:15 PM	7:35 PM	8:50 PM	10:35 PM	11:50 PM
Newmarket	-	-	-	-	-	-	-	-	-
Uphams Corner	-	-	-	-	-	-	-	-	-
Four Corners	-	-	-	-	-	-	-	-	-
Talbot Avenue	-	-	-	-	-	-	-	-	-
Morton Street	-	-	-	-	-	-	-	-	-
Blue Hill Avenue	-	-	-	-	-	-	-	-	-
Fairmont	-	-	-	-	-	-	-	-	-
Readville Yard	-	-	-	-	-	-	-	-	-
Readville (DB)	4:40 PM	5:07 PM	5:31 PM	6:02 PM	6:32 PM	7:53 PM	9:08 PM	10:55 PM	12:08 AM
DB/FB/NEC Split	-	-	-	-	-	7:56 PM	-	-	-
Endicott	-	5:11 PM	-	6:06 PM	6:36 PM	7:56 PM	9:12 PM	11:00 PM	12:11 AM
Dedham Corp. Center	4:45 PM	5:13 PM	5:33 PM	6:10 PM	6:39 PM	7:59 PM	9:14 PM	11:02 PM	12:13 AM
Islington	-	5:16 PM	-	6:12 PM	6:42 PM	8:02 PM	9:17 PM	11:05 PM	12:16 AM
Norwood Depot	4:50 PM	5:19 PM	5:38 PM	6:15 PM	6:45 PM	8:05 PM	9:20 PM	11:08 PM	12:19 AM
Norwood Central	4:54 PM	5:22 PM	5:41 PM	6:18 PM	6:48 PM	8:08 PM	9:23 PM	11:10 PM	12:21 AM
Windsor Gardens	4:58 PM	-	5:44 PM	6:22 PM	6:52 PM	8:12 PM	9:27 PM	11:14 PM	12:25 AM
Plimptonville	-	-	5:48 PM	-	-	-	-	-	-
D: Walpole	5:03 PM	-	5:52 PM	6:28 PM	6:57 PM	8:17 PM	9:31 PM	11:18 PM	12:29 AM
Walpole	5:03 PM	-	5:52 PM	6:28 PM	6:57 PM	8:17 PM	9:31 PM	11:18 PM	12:29 AM
D: Foxborough	4:49 PM	-	-	6:13 PM	6:45 PM	-	-	11:06 PM	-
A: Walpole	4:57 PM	-	-	6:20 PM	6:52 PM	-	-	11:13 PM	-
	X-fer to/from 717			**X-fer to/from 721**	**X-fer to/from 723**	**X-fer to/from 725**	**X-fer to/from 727**	**X-fer to/from 729**	**X-fer to/from 731**
D: Walpole	5:06 PM	-	5:56 PM	6:28 PM	7:02 PM	-	-	11:23 PM	-
Foxborough	5:13 PM	-	6:03 PM	6:35 PM	7:09 PM	-	-	11:28 PM	-
Norfolk	5:10 PM	-	6:04 PM	6:35 PM	7:05 PM	8:25 PM	9:38 PM	11:25 PM	12:36 AM
Franklin	5:18 PM	-	6:12 PM	6:42 PM	7:13 PM	8:33 PM	9:46 PM	11:33 PM	12:44 AM
Forge Park	5:25 PM	-	6:19 PM	6:49 PM	7:20 PM	8:40 PM	9:53 PM	11:40 PM	12:51 AM

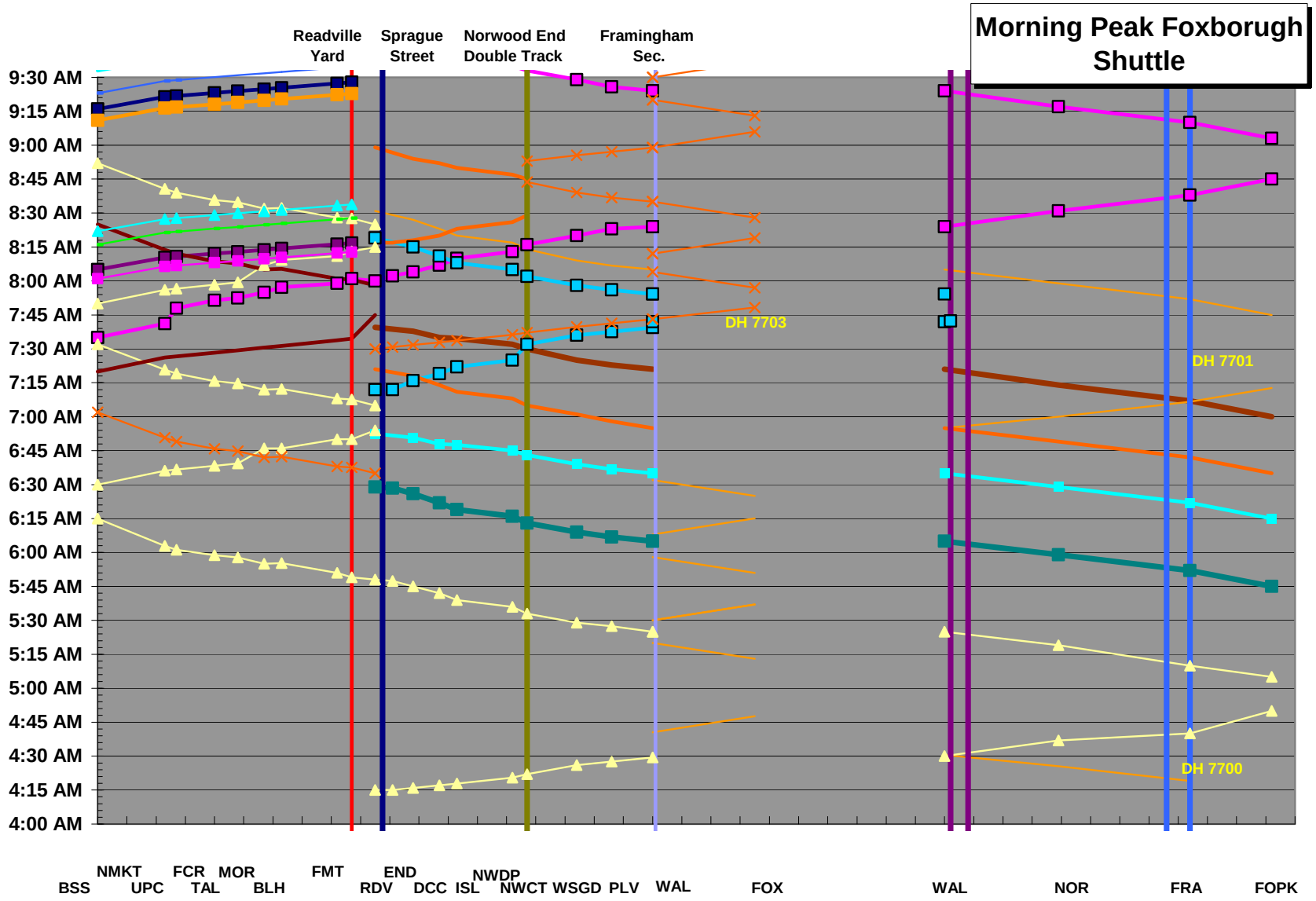

Figure 4.1.2:
Option A: Morning Peak Foxborough Shuttle Service

The service design employs existing rolling stock to operate the service. Adjustments to the duty cycles of several train sets were required. All adjustments occurred from trains that are in either midday or overnight layover. As a rule of service design, all equipment is allowed a minimum of three (3) hours of midday layover.

Table 4.1.4:
Adjustments to Existing South Side Equipment Cycle

Set ID	From	To	Trips Operated	Notes
R	Franklin Layover	Foxborough	5	Early AM peak shuttle
Y	South Station	Foxborough	7	Late AM peak shuttle; Early AM offpeak
JJ	Readville Yard	Foxborough	11	Midday Shuttle
T	South Hampton	Foxborough	2	Mid PM peak
P	Forge Park	Foxborough	15	Late PM shuttle and all evening shuttles

The service design requires some new deadhead trains between Boston and Foxborough and between Foxborough and Forge Park/Franklin. All new meets in Option A are meets between MBTA service and Foxborough deadheads traveling to and from Foxborough. When possible, meets were scheduled to occur between Norwood Central and the "Sprague Street" interlocking. However, there are two meets that create conflicts during the service day. These two conflicts and their resolutions are described below.

- Conflict 1 - DH 7701 traveling southbound towards Forge Park conflicts with MBTA #708 traveling northbound towards Boston at the Franklin Layover facility at 7:08AM. This conflict is resolved by constructing an interlocking at the northern end of the Franklin layover facility. This would allow the empty layover facility to be used as a passing siding for the duration of the service day avoiding any conflicts with revenue service.

- Conflict 2 - DH 7706 traveling northbound towards Walpole (and Foxborough) conflicts with MBTA #717 traveling southbound towards Forge Park at Franklin layover at 5:18PM. This conflict is eliminated by the new passing siding at Franklin.

Although only weekday schedules were developed, it is assumed that for weekend service, shuttles would be able to meet every inbound and outbound Forge Park trains, since it operates on a bi-hourly basis. Table 4.1.5 shows the estimated weekly service statistics for Option A.

Table 4.1.5:
Option A: Summary of Weekly Service Statistics

	Route Miles	Daily Trips	Daily Rev. Miles	Daily Rev. Hours	Consists in Service
Weekday	3.5	40	155	17:49	5
Saturday	3.5	18	63	9:09	2
Sunday	3.5	14	49	7:07	2
		Weekly	***889***	***105:22***	

4.1.3 Option B – Hybrid Service

Option B provides a mixture is direct service between Foxborough and Boston and connecting service like that offered by Option A. It was designed to provide as much direct service to South Station as possible subject to the constraint that no new trainsets would be introduced into the weekday lineup. It offers some peak shuttle connections to existing Forge Park trains at Walpole station mixed with some shoulder peak direct (one-seat ride) service between Foxborough and South Station. All offpeak service offers a direct (one-seat) trip between Foxborough and Boston.

Like Option A, service between Foxborough and Walpole would operate over the CSX owned Framingham Secondary. Between Walpole and Readville, service would operate on the Authority's Franklin Branch; From Readville to South Station, service would use the newly improved Dorchester Branch. It is assumed that all track and signal upgrades that are currently under construction on the Dorchester Branch will be completed, and that the four new stations on the Dorchester Branch (Newmarket, Four Corners, Talbot Avenue, and Blue Hill Avenue) have been constructed and are operational.

All Forge Park trains will use the NEC for service to South Station; All Foxborough trains will travel on the Franklin Branch between Walpole and Readville, and on Dorchester Branch between Readville and South Station. Foxborough trains en-route between Walpole and Readville would provide new hourly offpeak service options for Windsor Gardens, Norwood Central, Norwood Depot, Islington, Dedham Corporate Center, Endicott, and Readville. No Foxborough trains would stop at Back Bay Station.

Also like Option A, no additional equipment would be required to offer the shuttle service. All service would be operated with adjustments to the duty cycles of the existing line up of weekday trains.

A new station at Walpole would provide passengers with a timed transfer to/from the Foxborough shuttles and Forge Park service. It also will increase the frequency of service at Walpole Station, with Foxborough trains stopping at the station in addition to Forge Park trains.

Figure 4.1.3 shows a map of Option B.

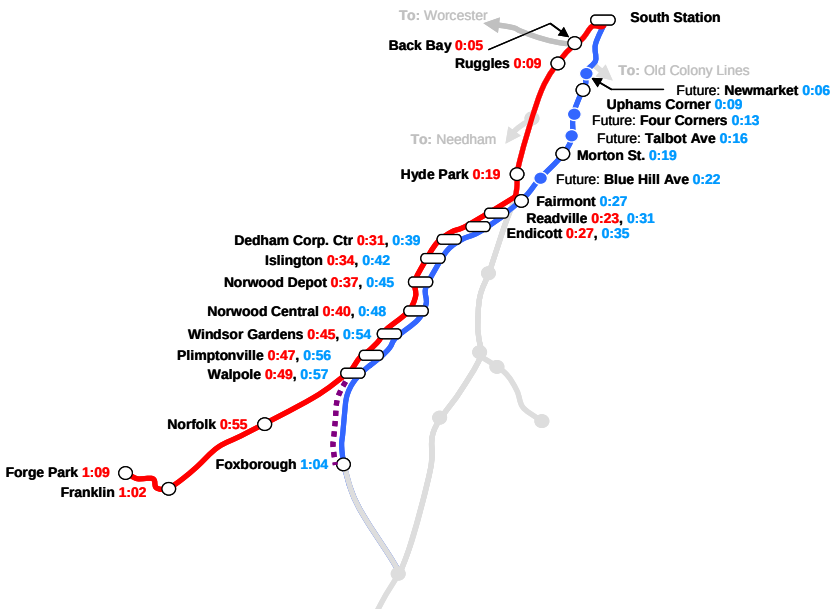

Figure 4.1.3:
Map of Service Option B (with travel times to South Station)

Schedule and Service Design – Due to the increase of trains operating on the Franklin Branch, modifications to existing Franklin line offpeak services would be required. The schedule of offpeak service would be modified to provide service at hourly intervals along the Franklin Branch between Walpole and Readville stations. This is a substantial upgrade over current off peak service offerings. Respecting the capacity constraints identified in Chapter 2, the peak service arrival and departure slots at South Station would not be modified.[95,96]

The study team determined that the best way to create peak arrival and departure slots for one-seat rides for Foxborough without impacting existing South side operations was to extend the existing Fairmont service to Foxborough. This approach allows the service to be scheduled with no new peak train arrivals and departures at South Station. Impacts on existing operations terminal operations would be minimal. Offpeak and weekend service for the Franklin and Fairmount branches would be expanded.[97]

Some travel between Foxborough and Boston would be accommodated with a connecting service at Walpole as in Option A. Passengers would be provided with one morning peak connecting trip to Walpole and two evening peak connecting trips from Walpole. Table 4.1.6 summarizes the number of daily trips operated to Foxborough, Forge Park and Readville.

Due to the increased infrastructure investments required to offer commuter service with this option, the number of deadhead trips to/from Forge Park have decreased. The number of Forge

[95] MBTA #708 (South Station arrival: 7:59) and the *current* Fairmont #748 (South Station arrival: 8:25) have swapped their arrival slots in the morning peak to make service delivery more even.
[96] Current Fairmont trains are assumed to be able to be modified by ±5 minutes from their peak existing arrival and departure slots. Meeting with MBTA Railroad Operations. January 27, 2010.
[97] There is currently no weekend service for the Fairmont line.

Park roundtrips remains constant at 15 per day, a substantial change is that all Forge Park trains operate via the NEC and do not use the Dorchester Branch.

Since no additional equipment is required for this option, and in order to maintain the current level of service for the Fairmont line, two evening peak roundtrips have been added to the Fairmont line.

Table 4.1.6:
Option B: Trip Summary

	Daily Trips Operated			
	Foxborough via Fairmount	**Foxborough Walpole Connections**	**Forge Park**	**Readville Only**
Inbound	13	4	15	2
Outbound	13	4	15	2
Total	26	8	30	4

Table 4.1.7 outlines the number of peak direction trips by outer terminal.

Table 4.1.7:
Option B: Peak Period, Peak Direction Trip Summary

	Daily Trips Operated			
Direction	**Foxborough via Fairmount**	**Foxborough Walpole Connections**	**Forge Park**	**Readville Only**
Morning Peak	3	1	5	0
Evening Peak	3	2	5	2
Total	6	3	10	2

Table 4.1.8 and Table 4.1.9, show the proposed inbound and outbound Foxborough and Forge Park schedules.

Table 4.1.8:

Option B: Inbound Foxborough, Forge Park, and Readville Service

Trip	7700	700	7702S	702	704	7704	706	7706	708	7708	710	7710	712	7712	714	7714	716	7716
Cycle	s	r	y	i	g	y	v	s	h	m	r	y	c	s	r	h	t	s
Forge Park	-	5:06 AM		5:41 AM	5:58 AM	-	6:28 AM	-	7:14 AM	-	7:43 AM	-	9:03 AM	-	10:45 AM	-	12:20 PM	-
Franklin	-	5:13 AM		5:48 AM	6:05 AM	-	6:35 AM	-	7:21 AM	-	7:50 AM	-	9:10 AM	-	10:52 AM	-	12:27 PM	-
Norfolk	-	5:22 AM		5:57 AM	6:14 AM	-	6:44 AM	-	7:30 AM	-	7:59 AM	-	9:19 AM	-	11:01 AM	-	12:36 PM	-
Foxborough	*4:55 AM*	-	*5:52 AM*	-	-	*6:25 AM*	-	*6:59 AM*	-	*7:50 AM*	-	*8:58 AM*	-	*10:03 AM*	-	*11:46 AM*	-	*1:26 PM*
			X-fer to 702															
Walpole	5:01 AM	5:29 AM	5:58 AM	6:04 AM	6:21 AM	6:31 AM	6:51 AM	7:05 AM	7:37 AM	7:56 AM	8:06 AM	9:04 AM	9:26 AM	10:09 AM	11:08 AM	11:52 AM	12:43 PM	1:32 PM
Plimptonville	-	-		-	-	-	6:54 AM	-	-	-	-	-	-	-	-	-	-	-
Windsor Gardens	5:06 AM	5:34 AM		6:09 AM	6:26 AM	6:36 AM	6:58 AM	7:10 AM	7:42 AM	8:01 AM	8:11 AM	9:09 AM	9:31 AM	10:14 AM	11:13 AM	11:57 AM	12:48 PM	1:37 PM
Norwood Central	5:10 AM	5:38 AM		6:13 AM	6:30 AM	6:42 AM	7:03 AM	7:14 AM	7:46 AM	8:05 AM	8:15 AM	9:13 AM	9:35 AM	10:18 AM	11:17 AM	12:01 PM	12:52 PM	1:41 PM
Norwood Depot	5:13 AM	5:41 AM		6:16 AM	6:33 AM	6:45 AM	7:05 AM	7:17 AM	7:49 AM	-	8:18 AM	9:16 AM	9:38 AM	10:21 AM	11:20 AM	12:04 PM	12:55 PM	1:44 PM
Islington	5:18 AM	5:46 AM		6:21 AM	6:38 AM	6:50 AM	7:10 AM	-	7:54 AM	8:11 AM	8:23 AM	9:21 AM	9:43 AM	10:26 AM	11:25 AM	12:09 PM	1:00 PM	1:49 PM
Dedham Corp. Center	5:21 AM	5:49 AM		6:24 AM	6:41 AM	6:53 AM	7:13 AM	7:23 AM	7:57 AM	8:13 AM	8:26 AM	9:24 AM	9:46 AM	10:29 AM	11:28 AM	12:12 PM	1:03 PM	1:52 PM
Endicott	5:24 AM	-		-	6:44 AM	6:56 AM	7:17 AM	-	8:00 AM	8:17 AM	8:29 AM	9:27 AM	9:49 AM	10:32 AM	11:31 AM	12:15 PM	1:06 PM	1:55 PM
Readville	5:28 AM	5:54 AM		6:29 AM	6:48 AM	7:00 AM	7:20 AM	7:28 AM	8:04 AM	8:21 AM	8:33 AM	9:31 AM	9:53 AM	10:36 AM	11:35 AM	12:19 PM	1:10 PM	1:59 PM
Fairmont	5:32 AM	-		-	-	7:04 AM	-	7:32 AM	-	8:25 AM	-	9:35 AM	-	10:40 AM	-	12:23 PM	-	2:03 PM
Blue Hill Avenue	**5:37 AM**	**-**		**-**	**-**	**7:09 AM**	**-**	**7:37 AM**	**-**	**8:30 AM**	**-**	**9:40 AM**	**-**	**10:45 AM**	**-**	**12:28 PM**	**-**	**2:08 PM**
Morton Street	5:40 AM	-		-	-	7:12 AM	-	7:40 AM	-	8:32 AM	-	9:43 AM	-	10:48 AM	-	12:31 PM	-	2:11 PM
Talbot Avenue	**5:43 AM**	**-**		**-**	**-**	**7:15 AM**	**-**	**7:43 AM**	**-**	**8:36 AM**	**-**	**9:46 AM**	**-**	**10:51 AM**	**-**	**12:34 PM**	**-**	**2:14 PM**
Four Corners	**5:47 AM**	**-**		**-**	**-**	**7:18 AM**	**-**	**7:46 AM**	**-**	**8:39 AM**	**-**	**9:50 AM**	**-**	**10:55 AM**	**-**	**12:38 PM**	**-**	**2:18 PM**
Uphams Corner	5:51 AM	-		-	-	7:23 AM	-	7:50 AM	-	8:43 AM	-	9:54 AM	-	10:59 AM	-	12:42 PM	-	2:22 PM
Newmarket	**5:53 AM**	**-**		**-**	**-**	**7:25 AM**	**-**	**7:53 AM**	**-**	**8:46 AM**	**-**	**9:56 AM**	**-**	**11:01 AM**	**-**	**12:44 PM**	**-**	**2:24 PM**
South Station	6:00 AM	6:15 AM		6:50 AM	7:09 AM	7:32 AM	7:41 AM	7:59 AM	8:25 AM	8:52 AM	8:54 AM	10:03 AM	10:14 AM	11:08 AM	11:56 AM	12:51 PM	1:31 PM	2:31 PM

Trip	718	7718	720	7720	7722	7724	7726	722	7728S	7728	7724S	724	7730	7726S	726	7732	728
Cycle	n	d	a	o	t	ll	u	w	p	o	p	f	b	p	c	s	x
Forge Park	2:05 PM	-	4:10 PM	-		-		5:40 PM				6:39 PM	-		7:40 PM	-	8:50 PM
Franklin	2:12 PM	-	4:17 PM	-		-		5:47 PM				7:00 PM	-		7:47 PM	-	8:57 PM
Norfolk	2:21 PM	-	4:26 PM	-		-		5:56 PM				7:10 PM	-		7:56 PM	-	9:06 PM
Walpole (I495)	2:28 PM	-	4:33 PM	-		-						7:10 PM	-		8:03 PM	-	9:13 PM
						-											
Foxborough	-	*3:30 PM*	-	*4:37 PM*		*5:34 PM*	5:43 PM	-	*6:20 PM*		*6:51 PM*	-	*7:41 PM*	*7:52 PM*	-	*9:06 PM*	-
Walpole (Fox)	-	3:36 PM	-	4:43 PM		5:40 PM			6:26 PM			-	7:47 PM		-	9:12 PM	-
									X-fer to 721		**X-fer to 724, 723**			**Xfer to 726**			
Walpole	2:28 PM	3:36 PM	4:33 PM	4:43 PM		5:40 PM	-	-	-		6:57 PM	7:10 PM	-	7:58 PM	8:03 PM	-	9:13 PM
Plimptonville	-	-	-	-		-	-	-				-	-		-	-	-
Windsor Gardens	2:33 PM	3:41 PM	4:38 PM	-		-	-	6:08 PM				7:14 PM	7:52 PM		8:08 PM	9:17 PM	9:26 PM
Norwood Central	2:37 PM	3:45 PM	4:42 PM	-		5:47 PM	5:55 PM	6:12 PM				7:19 PM	7:56 PM		8:12 PM	9:21 PM	9:31 PM
Norwood Depot	2:40 PM	3:48 PM	4:43 PM	-		5:50 PM	-	6:14 PM				7:21 PM	7:59 PM		8:15 PM	9:24 PM	9:34 PM
Islington	2:45 PM	3:53 PM	4:48 PM	-		-	-	6:18 PM				7:26 PM	8:04 PM		8:20 PM	9:29 PM	9:39 PM
Dedham Corp. Center	2:48 PM	3:56 PM	4:48 PM	4:54 PM		-	6:01 PM	6:20 PM				7:29 PM	8:07 PM		8:23 PM	9:32 PM	9:41 PM
Endicott	2:51 PM	3:59 PM	4:49 PM	4:58 PM		-	-	6:24 PM				7:32 PM	8:10 PM		8:26 PM	9:35 PM	9:45 PM
Readville	2:55 PM	4:03 PM	4:50 PM	5:02 PM	5:49 PM	-	-	6:27 PM		6:25 PM		7:36 PM	8:14 PM		8:30 PM	9:39 PM	9:49 PM
Fairmont	-	4:07 PM	-	-	-	-	-			6:28 PM		-	8:18 PM		-	9:43 PM	-
Blue Hill Avenue	**-**	**4:12 PM**	**-**	**5:08 PM**	**-**	**-**	**-**			**6:33 PM**		**-**	**8:23 PM**		**-**	**9:48 PM**	**-**
Morton Street	-	4:15 PM	-	5:11 PM	-	-	-			6:36 PM		-	8:26 PM		-	9:51 PM	-
Talbot Avenue	**-**	**4:18 PM**	**-**	**5:14 PM**	**-**	**-**	**-**	**-**		**6:40 PM**		**-**	**8:29 PM**		**-**	**9:54 PM**	**-**
Four Corners	**-**	**4:22 PM**	**-**	**5:18 PM**	**-**	**-**	**-**	**-**		**6:43 PM**		**-**	**8:33 PM**		**-**	**9:58 PM**	**-**
Uphams Corner	-	4:26 PM	-	5:22 PM	-	-	-	-		6:47 PM		-	8:37 PM		-	10:02 PM	-
Newmarket	**-**	**4:28 PM**	**-**	**5:24 PM**	**-**	**-**	**-**	**-**		**6:49 PM**		**-**	**8:39 PM**		**-**	**10:04 PM**	**-**
South Station	3:16 PM	4:35 PM	5:11 PM	5:31 PM	6:05 PM	6:13 PM	6:21 PM	6:48 PM		6:56 PM		7:57 PM	8:46 PM		8:51 PM	10:11 PM	10:10 PM

Table 4.1.9:
Option B: Outbound Foxborough, Forge Park, and Readville Service

Trip	7701	7703S	703	7705	705	7707	7709	707	7711	709	7713	711	7715	713	7717	715	717	7719
Cycle	s	y	r	m	c	y	s	r	h	t	s	n	d	a	o	p	w	ll
South Station	6:10 AM		6:27 AM	6:47 AM	7:35 AM	7:45 AM	8:14 AM	9:20 AM	9:57 AM	10:50 AM	11:35 AM	12:45 PM	2:05 PM	2:40 PM	3:26 PM	3:55 PM	4:20 PM	4:25 PM
Newmarket	-		-	-	-	**7:51 AM**	**8:20 AM**	-	**10:03 AM**	-	**11:41 AM**	-	**2:11 PM**	-	**3:32 PM**	-	-	**4:31 PM**
Uphams Corner	6:17 AM		-	-	-	7:54 AM	8:23 AM	-	10:06 AM	-	11:44 AM	-	2:14 PM	-	3:35 PM	-	-	4:34 PM
Four Corners	**6:19 AM**		-	-	-	**7:58 AM**	**8:27 AM**	-	**10:10 AM**	-	**11:48 AM**	-	**2:18 PM**	-	**3:39 PM**	-	-	**4:38 PM**
Talbot Avenue	-		-	-	-	**8:01 AM**	**8:30 AM**	-	**10:13 AM**	-	**11:51 AM**	-	**2:21 PM**	-	**3:42 PM**	-	-	**4:41 PM**
Morton Street	-		-	6:58 AM	-	8:04 AM	8:33 AM	-	10:16 AM	-	11:54 AM	-	2:24 PM	-	3:45 PM	-	-	4:44 PM
Blue Hill Avenue	-		-	-	-	**8:07 AM**	**8:36 AM**	-	**10:19 AM**	-	**11:57 AM**	-	**2:27 PM**	-	**3:48 PM**	-	-	**4:47 PM**
Fairmont	-		-	7:03 AM	-	8:12 AM	8:41 AM	-	10:24 AM	-	12:02 PM	-	2:32 PM	-	3:53 PM	-	-	4:52 PM
Readville	6:27 AM		6:43 AM	7:07 AM	7:54 AM	8:16 AM	8:45 AM	9:41 AM	10:28 AM	11:11 AM	12:06 PM	1:06 PM	2:36 PM	3:01 PM	3:57 PM	-	4:41 PM	4:56 PM
Endicott	-		-	7:10 AM	7:57 AM	-	8:48 AM	9:44 AM	10:31 AM	11:14 AM	12:09 PM	-	2:39 PM	-	4:00 PM	4:16 PM	4:44 PM	4:59 PM
Dedham Corp. Center	-		6:47 AM	7:14 AM	8:00 AM	8:21 AM	8:52 AM	9:47 AM	10:35 AM	11:17 AM	12:13 PM	1:10 PM	2:43 PM	3:05 PM	4:04 PM	4:19 PM	4:47 PM	5:03 PM
Islington	-		-	-	8:03 AM	8:23 AM	8:55 AM	-	10:38 AM	11:20 AM	12:16 PM	-	2:46 PM	-	-	-	4:50 PM	5:06 PM
Norwood Depot	-		-	7:19 AM	8:08 AM	8:28 AM	9:00 AM	-	10:43 AM	11:25 AM	12:21 PM	-	2:51 PM	-	-	-	4:55 PM	-
Norwood Central	-		6:54 AM	7:22 AM	8:11 AM	8:31 AM	9:02 AM	9:54 AM	10:45 AM	11:28 AM	12:23 PM	1:17 PM	2:53 PM	3:12 PM	4:10 PM	-	4:58 PM	5:12 PM
Windsor Gardens	-		6:59 AM	-	8:16 AM	8:36 AM	9:07 AM	-	10:50 AM	11:33 AM	12:28 PM	-	2:58 PM	-	4:15 PM	4:28 PM	5:03 PM	-
Plimptonville	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Walpole	6:44 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5:08 PM	-
		X-fer from 702				-												
Walpole (Fox)	-	6:09 AM	-	7:29 AM	-	8:41 AM	9:12 AM	-	10:55 AM	-	12:33 PM	-	3:03 PM	-	4:20 PM	-	-	-
Foxborough	*6:48 AM*	*6:15 AM*	-	*7:36 AM*	-	*8:48 AM*	9:19 AM	-	*11:02 AM*	-	*12:40 PM*	-	*3:10 PM*	-	*4:27 PM*	-	-	*5:24 PM*
Walpole (I495)	-		7:02 AM	-	8:21 AM	Walpole (I495)	-	10:01 AM	-	11:38 AM	-	1:24 PM	-	3:19 PM	-	4:34 PM	5:08 PM	-
Norfolk	-		7:08 AM	-	8:29 AM	-	-	10:09 AM	-	11:45 AM	-	1:31 PM	-	3:26 PM	-	4:41 PM	5:16 PM	-
Franklin	-		7:23 AM	-	8:38 AM	-	-	10:17 AM	-	11:54 AM	-	1:40 PM	-	3:35 PM	-	4:50 PM	5:25 PM	-
Forge Park	-		7:30 AM	-	8:46 AM	-	-	10:25 AM	-	12:02 PM	-	1:48 PM	-	3:43 PM	-	4:57 PM	5:32 PM	-

Trip	7721	719	7719S	7723	721	7721S	7725	723	7723S	7727	725	7729	727	7731	729	7733	731
Cycle	u	f	p	t	i	p	o	c	p	b	x	s	f	k	r	s	y
South Station	4:43 PM	5:10 PM		5:10 PM	5:40 PM		5:41 PM	6:15 PM		6:30 PM	7:32 PM	7:45 PM	8:22 PM	8:45 PM	9:35 PM	10:21 PM	10:45 PM
Newmarket	-	-		-	-			-		**6:36 PM**	-	**7:53 PM**	-	-	-	-	-
Uphams Corner	4:50 PM	-		5:19 PM	-		5:50 PM	-		6:39 PM	-	7:56 PM	-	8:52 PM	-	10:28 PM	-
Four Corners	**4:54 PM**	-		**5:23 PM**	-		**5:54 PM**	-		**6:43 PM**	-	**8:02 PM**	-	-	-	**10:31 PM**	-
Talbot Avenue	-	-		-	-		**5:57 PM**	-		**6:46 PM**	-	**8:07 PM**	-	-	-	-	-
Morton Street	4:58 PM	-		5:29 PM	-			-		6:49 PM	-	8:10 PM	-	8:58 PM	-	10:34 PM	-
Blue Hill Avenue	**5:01 PM**	-		**5:32 PM**	-		**6:03 PM**	-		**6:52 PM**	-	**8:15 PM**	-	-	-	**10:36 PM**	-
Fairmont	5:06 PM	-		5:35 PM	-		6:08 PM	-		6:57 PM	-	8:20 PM	-	9:03 PM	-	10:39 PM	-
Readville Yard	-	-			-		6:10 PM	-		-	-	-	-	-	-	10:41 PM	-
Readville	-	5:31 PM		5:39 PM	6:01 PM		6:12 PM	6:36 PM		7:01 PM	7:53 PM	8:24 PM	8:43 PM	9:07 PM	9:56 PM	10:43 PM	11:06 PM
Endicott	-	5:34 PM		-	6:04 PM		-	6:39 PM		7:04 PM	-	8:27 PM	-	9:11 PM	9:59 PM	10:47 PM	11:09 PM
Dedham Corp. Center	-	5:37 PM		-	6:07 PM		-	6:42 PM		-	7:57 PM	8:31 PM	8:47 PM	9:14 PM	10:02 PM	10:50 PM	11:12 PM
Islington	-	5:40 PM		-	6:10 PM		-	6:45 PM		7:09 PM	-	8:33 PM	8:50 PM	9:17 PM	10:05 PM	10:53 PM	11:15 PM
Norwood Depot	5:16 PM	5:45 PM		-	6:15 PM		-	6:50 PM		7:14 PM	-	8:38 PM	8:55 PM	9:22 PM	10:10 PM	10:58 PM	11:20 PM
Norwood Central	5:18 PM	5:48 PM		-	6:20 PM		-	6:53 PM		-	8:04 PM	8:41 PM	9:00 PM	9:25 PM	10:13 PM	11:01 PM	11:23 PM
Windsor Gardens	5:21 PM	5:53 PM		-	6:24 PM		-	6:58 PM		7:19 PM	-	8:46 PM	9:04 PM	9:29 PM	10:18 PM	11:05 PM	11:28 PM
Plimptonville	-	5:57 PM		-	-		-	-		-	-	-	-	-	-	-	-
Walpole	-	-	6:06 PM	-	6:32 PM	6:36 PM	-	7:05 PM	7:07 PM	-	8:14 PM	-	-	-	10:25 PM	11:10 PM	-
			X-fer from 719			X-fer from 721			X-fer from 723, to 724								
Walpole (Fox)	-	-	7:24 PM	-	-		-	-		7:24 PM	-	8:51 PM	-	9:34 PM	-	11:10 PM	-
Foxborough	5:32 PM	-	*6:12 PM*	-	-	*6:42 PM*	-	-	*7:13 PM*	*7:31 PM*	-	*8:58 PM*	-	*9:41 PM*	-	11:17 PM	-
Walpole (I495)	-	6:00 PM		-	6:32 PM		-	7:05 PM		-	8:14 PM	-	9:11 PM	-	10:25 PM	-	11:35 PM
Norfolk	-	6:08 PM		-	6:40 PM		-	7:13 PM		-	8:21 PM	-	9:19 PM	-	10:33 PM	-	11:42 PM
Franklin	-	6:16 PM		-	6:48 PM		-	7:21 PM		-	8:30 PM	-	9:28 PM	-	10:41 PM	-	11:51 PM
Forge Park	-	6:24 PM		-	6:56 PM		-	7:29 PM		-	8:37 PM	-	9:35 PM	-	10:49 PM	-	11:58 PM

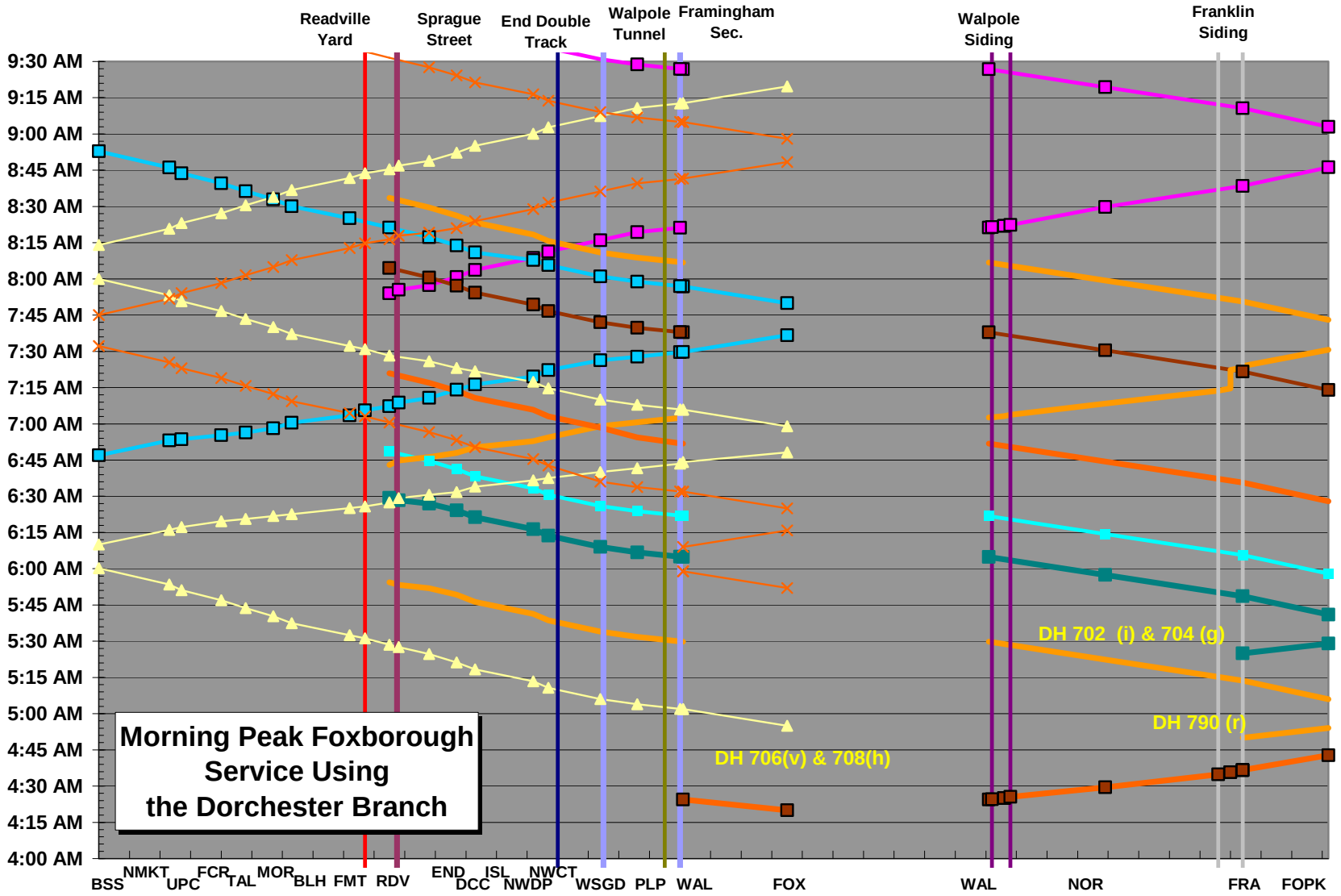

Figure 4.1.4:
Option B: Morning Peak Foxborough Shuttle Service

The service design employs existing rolling stock to operate the service. Adjustments to the duty cycles of several train sets were required.

Table 4.1.10:
Option B Equipment Cycle Modifications

Set ID	Changes/Modifications
S	• Overnight layover at Foxborough. • No longer operates trip 703. • Currently almost exclusively Fairmont set. • Is almost exclusively used for Foxborough service
R	• Makes early AM peak trip to S. Sta and returns, to make #710
Y	• Overnight layover at Foxborough. • Makes 2 roundtrips to S. Sta, and 1 shuttle roundtrip to Walpole in AM peak. • Makes one late evening trip to Foxborough
I	• Double draft Deadhead from Franklin to Forge Park
G	• Double draft Deadhead from Franklin to Forge Park
M	• Am peak trip extended to Foxborough from Walpole
V	• No longer deadheads to Forge Park from S. Sta with Set H as DH6701. • Double draft deadhead from Foxborough to Forge Park • No longer makes trips #734 and #735. • Goes into reserve as a "rescue" train.
H	• No longer deadheads to Forge Park from S. Sta with Set H as DH6701. • Double draft deadhead from Foxborough to Forge Park • Makes 1 roundtrip to Foxborough in morning instead of going into layover at SH after #708
D	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip
O	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip • Makes 1 PM peak Readville roundtrip
T	• Comes out of South Hampton early to make 1 Readville roundtrip
LL	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip
U	• Reprogrammed to serve Foxborough instead of Norwood Central
W	• Does not operate Readville trips in the evening • Waits at South Station for #539 upon returning from Forge Park. • Can be used elsewhere
P	• After #715, instead of going into layover, Set P makes 3 shuttle roundtrips between Foxborough and Walpole
C	• No longer deadheads back as Double Draft #798
F	• No longer returns as a deadhead attached to #798. • “Found" time is used to operate #631 and #630 for Set B
B	• Does not operate #631 and #630. Makes one evening roundtrip to Foxborough
K	• Operates one outbound trip to Foxborough in late evening. • Overnight layover at Foxborough instead of S. Sta

When possible, meets on the Franklin Branch were scheduled to occur on the existing double track between Norwood Central and the “Sprague Street” interlocking. However, the new service design created multiple conflicts to be addressed. Of all the conflicts that occur throughout the service day, two distinct types of conflicts arise and are explained in the proceeding section. Each conflict and its recommended resolution is described below:

- Conflict 1 - MBTA #7701 traveling south to Foxborough conflicts with MBTA #7704 at 6:38AM between Norwood Central and Windsor Gardens. This conflict is resolved by extending the double track from Norwood Central to Windsor Gardens.[98]

- Conflict 2 - MBTA #703 traveling south to Forge Park conflicts with MBTA #708 traveling north to Boston at 7:22AM in the vicinity of Franklin layover facility. This conflict is resolved using the same investment required at Franklin for Option A. A new interlocking would be constructed at the northern end of the layover facility allowing the empty layover facility to be used as a passing siding for the duration of the service day. MBTA #703 would wait at the passing siding for approximately 8 minutes for #708 can to pass.

- Conflict 3 - MBTA #705 traveling south to Forge Park conflicts with MBTA #710 traveling north to Boston at 8:12AM between Norwood Central and Windsor Gardens. This conflict is resolved the same way as in Conflict 1.

- Conflict 4 - MBTA DH #715 traveling north to Foxborough conflicts with MBTA #717 heading south to Forge Park at 5:22PM in the vicinity of the Franklin layover facility. This conflict is resolved in the same manner as Conflict 2.

- Conflict 5 - MBTA #7726 heading north to Boston conflicts with MBTA #719 heading south to Forge Park at 5:52PM between Norwood Central and Windsor Gardens. This conflict is resolved the same way as in Conflict 1.

- Conflict 6 - MBTA #724 traveling north to Boston conflicts MBTA #721 heading south to Forge Park at 6:47PM in the vicinity of the Franklin layover facility. This conflict is resolved in the same way as Conflict 2.

- Conflict 7 - MBTA #724 traveling north to Boston conflicts MBTA #723 heading south to Forge Park at 7:15PM between Norwood Central and Windsor Gardens. This conflict is resolved the same way as in Conflict 1.

- Conflict 8 - MBTA #725 traveling south to Forge Park conflicts with MBTA #726 heading north to Boston at 8:08PM between Norwood Central and Windsor Gardens. This conflict is resolved the same way as in Conflict 1.

- Conflict 9 - MBTA #728 traveling north to Boston conflicts with MBTA #7731 heading south to Foxborough at 9:30PM between Norwood Central and Windsor Gardens. This conflict is resolved the same way as in Conflict 1.

  Although only weekday schedules were developed, it is assumed that weekend Foxborough service will be similar to existing Forge Park service, offering one-seat rides to Boston on a bi-hourly basis. Between Walpole and Readville, Foxborough service would complement Forge Park service; Inbound and outbound service would operate on an hourly basis. Weekend service

[98] The double track will end just north of Windsor Gardens. The station itself will remain a single platform station.

to Foxborough would have the added benefit of introducing weekend service onto the Dorchester Branch. Table 4.1.11 shows the estimated weekly service statistics for Option B.

Table 4.1.11:
Option B: Summary of Weekly Foxborough Service Statistics

	Route Miles	Daily Trips	Daily Rev. Miles	Daily Rev. Hours	Consists in Service
Weekday	22.5	32[99]	613	34:42	10
Saturday	22.5	18	405	23:42	2
Sunday	22.5	14	315	18:26	2
		Weekly	***3,785***	***215:38***	

4.1.4 Option C – Foxborough to South Station (one-seat ride)

Option C provides a full schedule of direct service between Foxborough and South Station via the Dorchester Branch. All Fairmont service would be extended beyond Readville to Foxborough.

Unlike Options A and B, this option requires the MBTA to field an additional train set in the regular weekday line up. It could be assembled by marrying a new locomotive with a string of coaches that are not presently required on other MBTA trains. It is assumed that as the MBTA starts receiving its new fleet of 75 Rotem bi-level coaches[100], and begins to retire some existing single-level coaches, that up to eight of these coaches would be reserved to continued use serving Foxborough and the Fairmount line.

Unlike Options A and B, Option C does not increase service to Walpole Station. All Forge Park trains would use the NEC for service to South Station; All Foxborough trains would travel on the Dorchester Branch, replacing and enhancing the existing Fairmont service. It is also assumed that all track and signal upgrades that are currently under construction on the Dorchester Branch are completed, and that the four new stations on the Dorchester Branch (Newmarket, Four Corners, Talbot Avenue, and Blue Hill Avenue) have been constructed and are operational.

Figure 4.1.5 shows a map of Option C.

[99] 26 one-seat rides and 8 shuttle trips
[100] Meeting with MBTA Railroad Operations. December 22, 2009.

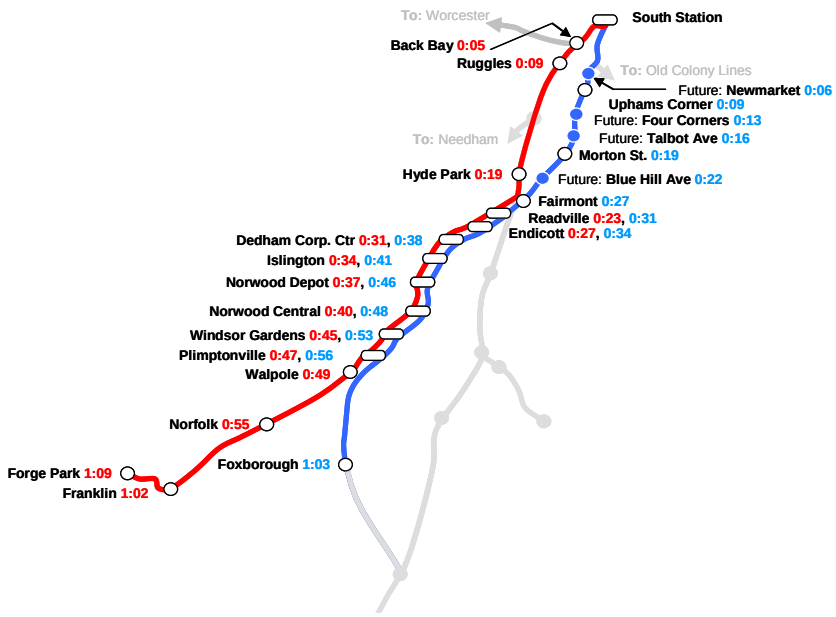

Figure 4.1.5:
Map of Service Option C (with travel times to South Station)

Schedule and Service Design – Modifications to existing offpeak Franklin Branch and Dorchester Branch services would be required. The new offpeak service was designed to offer hourly peak service to passengers using Windsor Gardens, Norwood Central, Norwood Depot, Islington, Dedham Corporate Center, Endicott, and Readville.

As described in Option B, the preferred approach to develop arrival and departure slots for any new Foxborough service extends the existing Fairmont service to Foxborough. This way, new arrival and departure slots do not need to be created, and minimize impacts on existing operations at South Station.[101,102]

Table 4.1.12 summarizes the number trips offered to Foxborough and Forge Park. Overall, the number of roundtrips between Forge Park and South Station would increase from a current weekday total of 13 to 16. Sixteen roundtrips would be operated between Foxborough and South Station.

[101] MBTA #708 (South Station arrival: 7:59) and the *current* Fairmont #748 (South Station arrival: 8:25) have swapped their arrival slots in the morning peak to make service delivery more evenly spaced.
[102] Current Fairmont trains are assumed to be able to be modified by ±5 minutes from their peak existing arrival and departure slots. Meeting with MBTA Railroad Operations. January 27, 2010.

Table 4.1.12: **Option C: Trip Summary**		
	Weekday Trips Operated	
Direction	**Foxborough**	**Forge Park**
Inbound	16	16
Outbound	16	16
Total	32	32

Table 4.1.13 outlines the number of peak direction trips by terminal.

Table 4.1.13: **Option C: Peak Period, Peak Direction Trip Summary**		
Time of Day	**Foxborough**	**Forge Park**
Morning Peak	4	5
Evening Peak	4	5
Total	8	10

Table 4.1.14 and Table 4.1.15, shown on the proceeding pages show the proposed inbound and outbound Foxborough and Forge Park schedules. Also shown are the morning peak stringlines for Foxborough service.

Table 4.1.14:

Option C: Inbound Foxborough & Forge Park Service

Trip	7702	700	702	7704	704	7706	706	7708	708	7710	710	7712	712	7714	714	7716
Cycle	**s**	**r**	**i**	**y**	**g**	**mm**	**v**	**s**	**h**	**m**	**r**	**y**	**c**	**s**	**r**	**h**
Forge Park	-	5:03 AM	5:31 AM	-	5:58 AM	-	6:28 AM	-	7:14 AM	-	7:51 AM	-	9:04 AM	-	10:37 AM	-
Franklin	-	5:10 AM	5:38 AM	-	6:05 AM	-	6:35 AM	-	7:21 AM	-	7:58 AM	-	9:11 AM	-	10:44 AM	-
Norfolk	-	5:19 AM	5:47 AM	-	6:14 AM	-	6:44 AM	-	7:30 AM	-	8:07 AM	-	9:20 AM	-	10:53 AM	-
Walpole (I495)	-	5:26 AM	5:54 AM	-	6:21 AM	-	6:51 AM	-	7:37 AM	-	8:14 AM	-	9:27 AM	-	11:00 AM	-
Foxborough	*4:56 AM*	-	-	*6:02 AM*	-	*6:28 AM*	-	*6:59 AM*	-	*7:52 AM*	-	*8:29 AM*	-	*10:03 AM*	-	*11:35 AM*
Plimptonville	-	-	-	-	-	-	6:54 AM	-	-	-	-	-	-	-	-	-
Windsor Gardens	5:06 AM	5:31 AM	5:59 AM	6:12 AM	6:26 AM	6:38 AM	6:58 AM	7:09 AM	7:42 AM	8:02 AM	-	8:39 AM	9:32 AM	10:13 AM	11:05 AM	11:45 AM
Norwood Central	5:11 AM	5:36 AM	6:04 AM	6:17 AM	6:31 AM	6:43 AM	7:03 AM	7:14 AM	7:46 AM	8:07 AM	-	8:44 AM	9:36 AM	10:18 AM	11:09 AM	11:50 AM
Norwood Depot	5:13 AM	5:39 AM	6:07 AM	6:19 AM	6:34 AM	6:45 AM	7:05 AM	7:16 AM	7:49 AM	8:09 AM	-	8:46 AM	-	10:20 AM	11:12 AM	11:52 AM
Islington	5:18 AM	5:44 AM	-	-	6:39 AM	6:50 AM	7:10 AM	-	7:54 AM	-	8:25 AM	8:51 AM	9:41 AM	10:25 AM	11:17 AM	11:57 AM
Dedham Corp. Center	5:21 AM	5:46 AM	6:14 AM	6:25 AM	6:41 AM	6:53 AM	7:13 AM	7:22 AM	7:57 AM	8:15 AM	-	8:54 AM	9:44 AM	10:28 AM	11:20 AM	12:00 PM
Endicott	5:25 AM	5:50 AM	-	-	6:45 AM	6:57 AM	7:17 AM	-	8:00 AM	-	8:29 AM	8:58 AM	9:48 AM	10:32 AM	11:23 AM	12:04 PM
Readville	5:28 AM	5:54 AM	-	6:30 AM	-	7:00 AM	7:20 AM	7:27 AM	8:04 AM	8:20 AM	8:33 AM	9:01 AM	9:52 AM	10:35 AM	11:27 AM	12:07 PM
Fairmont	5:32 AM	-	-	6:34 AM	-	7:04 AM	-	7:31 AM	-	8:24 AM	-	9:05 AM	-	10:39 AM	-	12:11 PM
Blue Hill Avenue	**5:37 AM**	**-**	**-**	**6:39 AM**	**-**	**7:09 AM**	**-**	**7:36 AM**	**-**	**8:29 AM**	**-**	**9:10 AM**	**-**	**10:44 AM**	**-**	**12:16 PM**
Morton Street	5:40 AM	-	-	6:42 AM	-	7:12 AM	-	7:39 AM	-	8:32 AM	-	9:13 AM	-	10:47 AM	-	12:19 PM
Talbot Avenue	**5:44 AM**	**-**	**-**	**6:45 AM**	**-**	**7:16 AM**	**-**	**7:42 AM**	**-**	**8:35 AM**	**-**	**9:17 AM**	**-**	**10:51 AM**	**-**	**12:23 PM**
Four Corners	**5:47 AM**	**-**	**-**	**6:49 AM**	**-**	**7:19 AM**	**-**	**7:46 AM**	**-**	**8:39 AM**	**-**	**9:20 AM**	**-**	**10:54 AM**	**-**	**12:26 PM**
Uphams Corner	5:51 AM	-	-	6:53 AM	-	7:23 AM	-	7:50 AM	-	8:43 AM	-	9:24 AM	-	10:58 AM	-	12:30 PM
Newmarket	**5:53 AM**	**-**	**-**	**6:55 AM**	**-**	**7:25 AM**	**-**	**7:52 AM**	**-**	**8:45 AM**	**-**	**9:26 AM**	**-**	**11:00 AM**	**-**	**12:32 PM**
South Station	6:00 AM	6:15 AM	6:50 AM	7:02 AM	7:09 AM	7:32 AM	7:41 AM	7:59 AM	8:25 AM	8:52 AM	8:54 AM	9:33 AM	10:13 AM	11:07 AM	11:48 AM	12:39 PM

Trip	716	7718	718	7720	720	7722	7724	7728	722N	7726	724M	726N	7730	728M	7732	730M
Cycle	**t**	**s**	**n**	**d**	**a**	**mm**	**t**	**ll**	**p**	**o**	**w**	**f**	**mm**	**c**	**p**	**x**
Forge Park	12:10 PM	-	2:07 PM	-	4:05 PM	-	-	-	5:14 PM	-	5:59 PM	6:41 PM	-	7:40 PM	-	8:50 PM
Franklin	12:17 PM	-	2:14 PM	-	4:12 PM	-	-	-	5:21 PM	-	6:09 PM	6:59 PM	-	7:47 PM	-	8:57 PM
Norfolk	12:26 PM	-	2:23 PM	-	4:21 PM	-	-	-	5:32 PM	-	6:21 PM	7:06 PM	-	7:56 PM	-	9:06 PM
Walpole (I495)	12:33 PM	-	2:30 PM	-	4:28 PM	-	-	-	5:39 PM	-		7:06 PM	-	8:03 PM	-	9:13 PM
Foxborough	-	*1:15 PM*	-	*3:30 PM*	-	*4:33 PM*	*5:28 PM*	*5:44 PM*	-	*6:20 PM*	-	-	*7:33 PM*	-	*8:20 PM*	-
Plimptonville	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Windsor Gardens	12:38 PM	1:25 PM	2:35 PM	3:40 PM	4:33 PM	4:43 PM	-	-	5:43 PM	-	6:36 PM	7:11 PM	7:43 PM	8:08 PM	8:30 PM	9:18 PM
Norwood Central	12:42 PM	1:30 PM	2:39 PM	3:45 PM	4:37 PM	4:48 PM	5:40 PM	-	-	-	6:40 PM	7:15 PM	7:48 PM	8:12 PM	8:35 PM	9:22 PM
Norwood Depot	12:45 PM	1:32 PM	2:42 PM	3:47 PM	4:38 PM	-	-	5:57 PM	-	-	6:42 PM	7:18 PM	7:50 PM	8:15 PM	8:37 PM	9:25 PM
Islington	12:50 PM	1:37 PM	2:47 PM	3:52 PM	4:43 PM	4:53 PM	-	-	5:51 PM	-	6:45 PM	7:23 PM	7:55 PM	8:20 PM	8:42 PM	9:30 PM
Dedham Corp. Center	12:53 PM	1:40 PM	2:50 PM	3:55 PM	4:43 PM	4:56 PM	5:46 PM	-	-	6:37 PM	6:48 PM	7:26 PM	7:58 PM	8:23 PM	8:45 PM	9:33 PM
Endicott	12:56 PM	1:44 PM	2:53 PM	3:59 PM	4:44 PM	-	-	-	-	6:40 PM	6:50 PM	7:29 PM	8:02 PM	8:26 PM	8:49 PM	9:36 PM
Readville	1:00 PM	1:47 PM	2:57 PM	4:02 PM	4:45 PM	5:01 PM	-	-	-	6:44 PM	6:53 PM	7:33 PM	8:05 PM	8:30 PM	8:52 PM	9:40 PM
Fairmont	-	1:51 PM	-	4:06 PM	-	5:05 PM	-	-	-	-	-	-	8:09 PM	-	8:56 PM	-
Blue Hill Avenue	**-**	**1:56 PM**	**-**	**4:11 PM**	**-**	**5:10 PM**	**-**	**6:10 PM**	**-**	**6:51 PM**	**-**	**-**	**8:14 PM**	**-**	**9:01 PM**	**-**
Morton Street	-	1:59 PM	-	4:14 PM	-	5:13 PM	-	6:13 PM	-	-	-	-	8:17 PM	-	9:04 PM	-
Talbot Avenue	**-**	**-**	**-**	**4:18 PM**	**-**	**5:16 PM**	**-**	**-**	**-**	**-**	**-**	**-**	**8:21 PM**	**-**	**9:08 PM**	**-**
Four Corners	**-**	**2:04 PM**	**-**	**4:21 PM**	**-**	**5:19 PM**	**-**	**6:18 PM**	**-**	**6:56 PM**	**-**	**-**	**8:24 PM**	**-**	**9:11 PM**	**-**
Uphams Corner	-	2:08 PM	-	4:25 PM	-	5:23 PM	-	6:22 PM	-	-	-	-	8:28 PM	-	9:15 PM	-
Newmarket	**-**	**-**	**-**	**4:27 PM**	**-**	**5:26 PM**	**-**	**-**	**-**	**-**	**-**	**-**	**8:30 PM**	**-**	**9:17 PM**	**-**
South Station	1:21 PM	2:15 PM	3:18 PM	4:34 PM	5:06 PM	5:33 PM	6:06 PM	6:29 PM	6:16 PM	7:05 PM	7:14 PM	7:54 PM	8:37 PM	8:51 PM	9:24 PM	10:01 PM

Table 4.1.15:

Option C: Outbound Foxborough & Forge Park Service

Trip	7701	703N	7703	7705	705M	7707	707	7709	709	7711	711	7713	713	7715	715	717
Cycle	**s**	**r**	**m**	**y**	**c**	**s**	**r**	**h**	**t**	**s**	**n**	**d**	**a**	**mm**	**p**	**w**
South Station	6:10 AM	6:27 AM	6:53 AM	7:18 AM	7:50 AM	8:09 AM	9:20 AM	8:45 AM	10:50 AM	11:47 AM	12:45 PM	2:05 PM	2:40 PM	3:20 PM	3:55 PM	4:20 PM
Newmarket	**-**	**-**	**-**	**7:24 AM**	**-**	**8:15 AM**	**-**	**8:51 AM**	**-**	**11:53 AM**	**-**	**2:11 PM**	**-**	**3:26 PM**	**-**	**-**
Uphams Corner	-	-	-	7:27 AM	-	8:18 AM	-	8:54 AM	-	11:56 AM	-	2:14 PM	-	3:29 PM	-	-
Four Corners	**-**	**-**	**-**	**7:31 AM**	**-**	**8:22 AM**	**-**	**8:58 AM**	**-**	**12:00 PM**	**-**	**2:18 PM**	**-**	**3:33 PM**	**-**	**-**
Talbot Avenue	**-**	**-**	**-**	**7:34 AM**	**-**	**8:25 AM**	**-**	**9:01 AM**	**-**	**12:03 PM**	**-**	**2:21 PM**	**-**	**3:36 PM**	**-**	**-**
Morton Street	-	-	7:04 AM	7:37 AM	-	8:28 AM	-	9:04 AM	-	12:06 PM	-	2:24 PM	-	3:39 PM	-	-
Blue Hill Avenue	**-**	**-**	**-**	**7:40 AM**	**-**	**8:31 AM**	**-**	**9:07 AM**	**-**	**12:09 PM**	**-**	**2:27 PM**	**-**	**3:42 PM**	**-**	**-**
Fairmont	-	-	7:09 AM	7:45 AM	-	8:36 AM	-	9:12 AM	-	12:14 PM	-	2:32 PM	-	3:47 PM	-	-
Readville	-	6:43 AM	7:13 AM	7:49 AM	8:11 AM	8:40 AM	9:41 AM	9:16 AM	11:09 AM	12:18 PM	1:06 PM	2:36 PM	3:01 PM	3:51 PM	4:14 PM	4:41 PM
Endicott	-	-	7:16 AM	-	-	8:43 AM	-	9:19 AM	11:12 AM	12:21 PM	1:09 PM	2:39 PM	3:04 PM	3:54 PM	-	4:44 PM
Dedham Corp. Center	-	6:47 AM	7:20 AM	7:54 AM	8:15 AM	8:47 AM	9:45 AM	9:23 AM	11:15 AM	12:25 PM	1:12 PM	2:43 PM	3:07 PM	3:58 PM	4:18 PM	4:47 PM
Islington	-	-	-	7:56 AM	-	8:50 AM	-	9:26 AM	11:18 AM	12:28 PM	1:15 PM	2:46 PM	3:10 PM	4:01 PM	4:21 PM	4:50 PM
Norwood Depot	-	-	7:25 AM	8:01 AM	-	8:55 AM	-	9:31 AM	11:23 AM	12:33 PM	1:20 PM	2:51 PM	3:15 PM	4:06 PM	4:26 PM	4:55 PM
Norwood Central	-	6:54 AM	7:28 AM	8:04 AM	8:22 AM	8:57 AM	9:52 AM	9:33 AM	11:26 AM	12:35 PM	1:23 PM	2:53 PM	3:18 PM	4:08 PM	4:29 PM	4:58 PM
Windsor Gardens	-	6:59 AM	-	-	-	9:02 AM	-	9:38 AM	11:31 AM	12:40 PM	1:28 PM	2:58 PM	3:23 PM	4:13 PM	4:33 PM	5:03 PM
Plimptonville	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Walpole	6:42 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Foxborough	*6:46 AM*	-	*7:40 AM*	*8:17 AM*	-	*9:12 AM*	-	*9:48 AM*	-	*12:50 PM*	-	*3:08 PM*	-	*4:23 PM*	-	-
Norfolk	-	7:08 AM	-	-	8:38 AM	-	10:06 AM	-	11:43 AM	-	1:40 PM	-	3:35 PM	-	4:46 PM	5:15 PM
Franklin	-	7:29 AM	-	-	8:46 AM	-	10:15 AM	-	11:52 AM	-	1:49 PM	-	3:44 PM	-	4:55 PM	5:24 PM
Forge Park	-	7:35 AM	-	-	8:54 AM	-	10:23 AM	-	12:00 PM	-	1:57 PM	-	3:52 PM	-	5:02 PM	5:32 PM

Trip	7717	7719	719	7721	721	7725	723	7723	725	7731	7733	727	731	7729	733	735
Cycle	**t**	**ll**	**f**	**o**	**i**	**mm**	**c**	**p**	**x**	**s**	**k**	**y**	**r**	**mm**	**p**	**f**
South Station	4:24 PM	4:42 PM	5:10 PM	5:10 PM	5:40 PM	5:45 PM	6:15 PM	6:30 PM	7:32 PM	7:45 PM	8:45 PM	8:22 PM	9:30 PM	9:50 PM	10:35 PM	11:30 PM
Newmarket	**4:30 PM**	**4:48 PM**	**-**	**5:16 PM**	**-**	**5:51 PM**	**-**	**6:36 PM**	**-**	**7:51 PM**	**8:51 PM**	**-**	**-**	**9:56 PM**	**-**	**-**
Uphams Corner	4:33 PM	-	-	5:19 PM	-	5:54 PM	-	6:39 PM	-	7:54 PM	8:54 PM	-	-	9:59 PM	-	-
Four Corners	**4:37 PM**	**4:52 PM**	**-**	**5:23 PM**	**-**	**5:58 PM**	**-**	**6:43 PM**	**-**	**7:58 PM**	**8:58 PM**	**-**	**-**	**10:03 PM**	**-**	**-**
Talbot Avenue	**4:40 PM**	**4:56 PM**	**-**	**5:26 PM**	**-**	**6:01 PM**	**-**	**6:46 PM**	**-**	**8:01 PM**	**9:01 PM**	**-**	**-**	**10:06 PM**	**-**	**-**
Morton Street	4:43 PM	-	-	5:29 PM	-	6:04 PM	-	6:49 PM	-	8:04 PM	9:04 PM	-	-	10:09 PM	-	-
Blue Hill Avenue	**4:46 PM**	**5:00 PM**	**-**	**5:32 PM**	**-**	**6:07 PM**	**-**	**6:52 PM**	**-**	**8:07 PM**	**9:07 PM**	**-**	**-**	**10:12 PM**	**-**	**-**
Fairmont	4:51 PM	-	-	5:37 PM	-	6:12 PM	-	6:57 PM	-	8:12 PM	9:12 PM	-	-	10:17 PM	-	-
Readville	4:55 PM	-	5:29 PM	5:41 PM	6:01 PM	6:16 PM	6:36 PM	7:01 PM	7:53 PM	8:16 PM	9:16 PM	8:43 PM	9:51 PM	10:21 PM	10:56 PM	11:51 PM
Endicott	-	5:08 PM	-	5:44 PM	6:04 PM	6:19 PM	6:39 PM	7:04 PM	-	8:19 PM	9:19 PM	8:46 PM	9:54 PM	10:24 PM	10:59 PM	11:54 PM
Dedham Corp. Center	5:00 PM	-	-	5:48 PM	6:07 PM	6:23 PM	6:42 PM	7:08 PM	7:57 PM	8:23 PM	9:23 PM	8:49 PM	9:57 PM	10:28 PM	11:02 PM	11:57 PM
Islington	-	-	-	5:51 PM	6:10 PM	6:26 PM	6:45 PM	7:11 PM	-	8:26 PM	9:26 PM	8:52 PM	10:00 PM	10:31 PM	11:05 PM	12:00 AM
Norwood Depot	-	5:15 PM	5:36 PM	-	6:15 PM	6:31 PM	6:50 PM	7:16 PM	-	8:31 PM	9:31 PM	8:57 PM	10:05 PM	10:36 PM	11:10 PM	12:05 AM
Norwood Central	5:06 PM	-	5:39 PM	-	6:18 PM	6:33 PM	6:53 PM	7:18 PM	8:04 PM	8:33 PM	9:33 PM	9:00 PM	10:08 PM	10:38 PM	11:13 PM	12:08 AM
Windsor Gardens	-	-	5:44 PM	5:59 PM	-	6:38 PM	6:58 PM	7:23 PM	-	8:38 PM	9:38 PM	9:05 PM	10:13 PM	10:43 PM	11:18 PM	12:13 AM
Plimptonville	-	-	5:48 PM	-	-	-	-	-	-	-	-	-	-	-	-	-
Foxborough	*5:19 PM*	*5:28 PM*	-	*6:09 PM*	-	*6:48 PM*	-	*7:33 PM*	-	*8:48 PM*	*9:48 PM*	-	-	*10:53 PM*	-	-
Walpole (I495)	-	-	5:52 PM	-	6:27 PM	-	7:05 PM	-	8:13 PM	-	-	9:12 PM	10:20 PM	-	11:23 PM	12:18 AM
Norfolk	-	-	6:01 PM	-	6:37 PM	-	7:12 PM	-	8:20 PM	-	-	9:19 PM	10:27 PM	-	11:31 PM	12:25 AM
Franklin	-	-	6:12 PM	-	6:47 PM	-	7:21 PM	-	8:29 PM	-	-	9:28 PM	10:36 PM	-	11:40 PM	12:34 AM
Forge Park	-	-	6:19 PM	-	6:55 PM	-	7:28 PM	-	8:37 PM	-	-	9:35 PM	10:43 PM	-	11:47 PM	12:42 AM

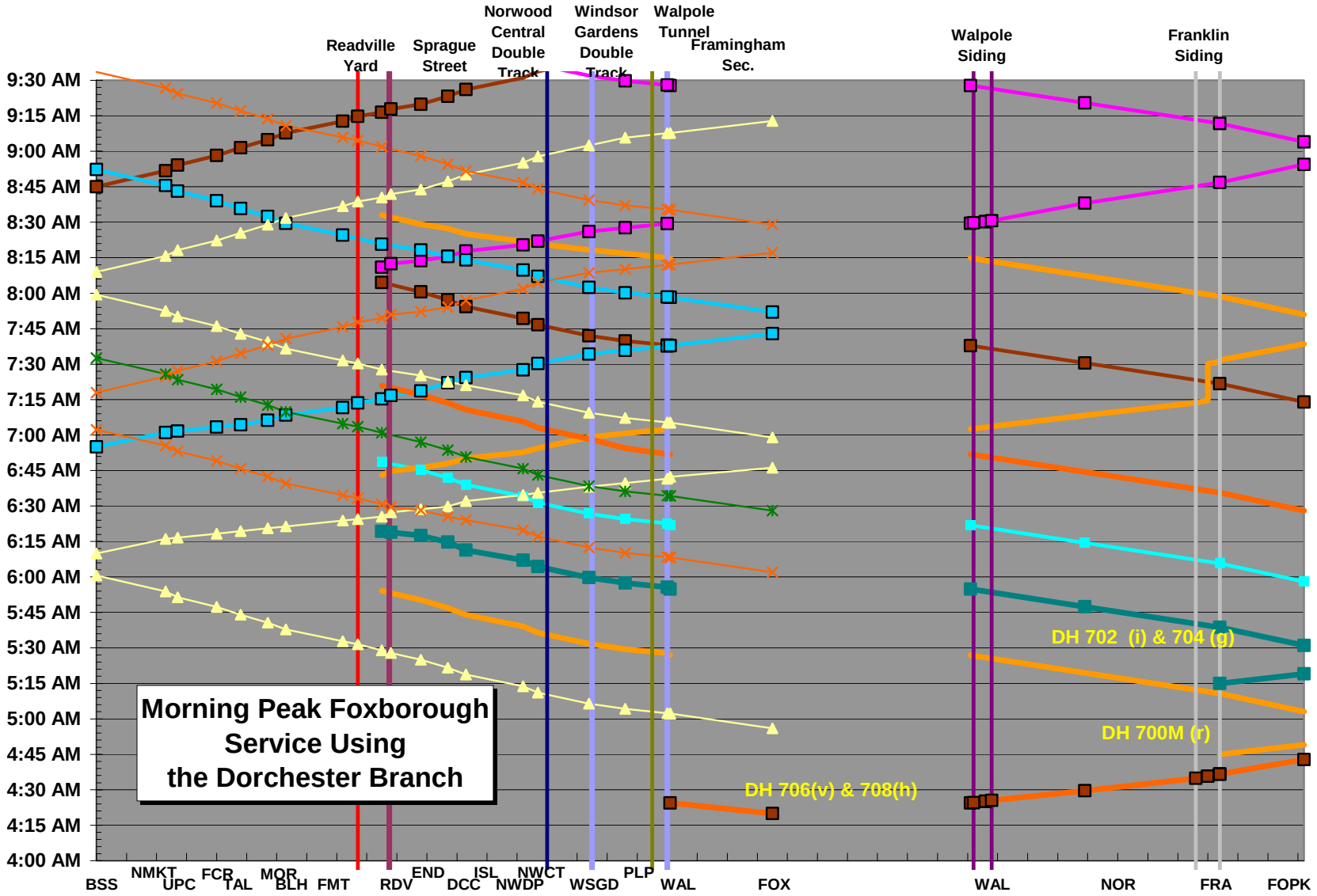

Figure 4.1.6:
Option C: Morning Peak Foxborough Shuttle Service

In addition to the one new train set required, the service design employs existing rolling stock to operate the service. Adjustments to the duty cycles of several train sets were required.

Table 4.1.16:
Option C Equipment Cycle Modifications

Set ID	Changes/Modifications
S	• Overnight layover at Foxborough. • No longer operates trip 703. • Currently almost exclusively Fairmont set. • Is almost exclusively used for Foxborough service
R	• Makes early AM peak trip to S. Sta and returns, to make #710
Y	• Overnight layover at Foxborough. • Makes 2 roundtrips to S. Sta, and 1 shuttle roundtrip to Walpole in AM peak. • Makes one late evening trip to Foxborough
I	• Double draft Deadhead from Franklin to Forge Park
G	• Double draft Deadhead from Franklin to Forge Park
M	• Am peak trip extended to Foxborough from Walpole
V	• No longer deadheads to Forge Park from S. Sta with Set H as DH6701. • Double draft deadhead from Foxborough to Forge Park • No longer makes trips #734 and #735. • Goes into reserve as a "rescue" train.
H	• No longer deadheads to Forge Park from S. Sta with Set H as DH6701. • Double draft deadhead from Foxborough to Forge Park • Makes 1 roundtrip to Foxborough in morning instead of going into layover at SH after #708
D	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip
O	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip • Makes 1 PM peak Foxborough roundtrip
T	• Comes out of South Hampton early to make 1 PM peak Foxborough roundtrip
LL	• Comes out of Readville Yard early to make 1 midday Foxborough roundtrip
U	• Reprogrammed to serve Foxborough instead of Norwood Central
W	• Does not operate Readville trips in the evening • Waits at South Station for #539 upon returning from Forge Park. • Can be used elsewhere
P	• After #715, instead of going into layover, Set P makes 3 shuttle roundtrips between Foxborough and Walpole
C	• No longer deadheads back as Double Draft #798
F	• No longer returns as a deadhead attached to #798. • “Found" time is used to operate #631 and #630 for Set B
B	• Does not operate #631 and #630. Makes one evening roundtrip to Foxborough
K	• Operates one outbound trip to Foxborough in late evening. • Overnight layover at Foxborough instead of S. Sta
MM	• New Set of Equipment. • Used exclusively for Foxborough service

When possible, meets on the Franklin Branch were scheduled to occur on the existing double track between Norwood Central and the “Sprague Street” interlocking. However, the new service design created multiple conflicts to be addressed. Of all the conflicts that occur throughout the

service day, two distinct types of conflicts arise as described in the discussion of Option B. Each conflict and its recommended resolution is described below:

- Conflict 1 - MBTA #7701 traveling south to Foxborough conflicts with MBTA #7706 at 6:38AM between Norwood Central and Windsor Gardens. This conflict is resolved by extending double track from Norwood Central to Windsor Gardens.[103]

- Conflict 2 - MBTA #703N traveling south to Forge Park conflicts with MBTA #708 traveling north to Boston at 6:59AM between Norwood Central and Windsor Gardens. This conflict is resolved in the same manner as Conflict 1.

- Conflict 3 - MBTA #703N traveling south to Forge Park conflicts with MBTA #710 traveling north to Boston at 7:22AM in the vicinity of Franklin layover facility. This conflict is resolved by constructing an interlocking at the northern end of the layover facility. This will allow the empty layover facility to be used as a passing siding for the duration of the service day and not cause any conflicts to existing MBTA service. MBTA #703N can wait at the passing siding for approximately eight minutes for #710 to reach and pass the layover facility.

- Conflict 4 - MBTA #7709 traveling south to Foxborough conflicts with MBTA #712 traveling north to Boston at 9:22AM between Norwood Central and Windsor Gardens. This conflict is resolved in the same manner as Conflict 1.

- Conflict 5 - MBTA #7711 traveling south to Foxborough conflicts with MBTA #716 at 12:39PM between Norwood Central and Windsor Gardens. This conflict is resolved in the same manner as Conflict 1.

- Conflict 6 - MBTA #711 traveling south to Forge Park conflicts with MBTA #7718 traveling north to Boston at 1:27PM between Norwood Central and Windsor Gardens. This conflict is resolved in the same manner as Conflict 1.

- Conflict 7 - MBTA #717 traveling south to Forge Park conflicts with MBTA #722N traveling north to Boston at 5:22PM in the vicinity of Franklin layover facility. This conflict is resolved similar to Conflict 3 with #722N waiting approximately 1 minute for #717 to reach the passing siding.

- Conflict 8 - MBTA #719 traveling south to Forge Park conflicts with MBTA #722N traveling north to Boston at 5:43PM between Norwood Central and Windsor Gardens. This conflict is resolved similar to Conflict 1.

- Conflict 9 - MBTA #719 traveling south to Forge Park conflicts with MBTA #724N traveling north to Boston at 6:12PM in the vicinity of Franklin layover facility. This conflict is resolved similar to Conflict 3.

[103] The double track will end just north of Windsor Gardens. The station will remain a single platform station.

- Conflict 10 - MBTA #7725 traveling south to Foxborough conflicts with MBTA #724N traveling north to Boston at 6:39PM between Norwood Central and Windsor Gardens. This conflict is resolved similar to Conflict 1.

- Conflict 11 - MBTA #721 traveling south to Forge Park conflicts with MBTA #726N traveling north to Boston at 6:50PM in the vicinity of the Franklin layover facility. This conflict is resolved similar to Conflict 3.

- Conflict 12 - MBTA #725 traveling south to Forge Park conflicts with MBTA #728M traveling north to Boston at 8:07PM between Norwood Central and Windsor Gardens. This conflict is resolved similar to Conflict 1.

Although only weekday schedules were developed, it is assumed that weekend Foxborough service will operate like Forge Park service currently does on a bi-hourly basis. Between Windsor Gardens and Readville, Foxborough service would complement Forge Park service; the combined inbound and outbound service would operate on an hourly regime. Option C would also introduce weekend service onto the Dorchester Branch. Table 4.1.17 shows the estimated weekly service statistics for Option C.

Table 4.1.17:
Option C: Summary of Weekly Service Statistics

	Route Miles	**Daily Trips**	**Daily Rev. Miles**	**Daily Rev. Hours**	**Consists in Service**
Weekday	22.5	32	720	39:53	11
Saturday	22.5	18	405	23:42	2
Sunday	22.5	14	315	18:26	2
		Weekly	***4,320***	***241:33***	

4.2 Infrastructure Upgrades

Track and signal improvements along the Framingham Secondary and Franklin Branch would be required to offer commuter rail service to Foxborough. As previously mentioned, infrastructure upgrades necessary for Foxborough service would benefit existing Franklin, Providence, and special event trains servicing Foxborough.

The extent of the upgrades depends on the alternative. In all cases, infrastructure upgrades to the Framingham Secondary and Franklin branch would be required. Only track between Walpole and Foxborough are considered for upgrades.

It is also assumed that all track, signal, and station construction currently occurring on the Dorchester Branch is complete. No additional improvements to the Dorchester Branch would be necessary for commuter service to Foxborough.

4.2.1 Option A

Track and Signal Upgrades – In Option A, track and signal upgrades are limited to the Framingham Secondary and to the existing Franklin Layover facility on the Franklin Branch. Figure 4.2.1 illustrates the required upgrades to the Franklin Branch and the Framingham Secondary for Foxborough shuttle service.

On the Franklin Branch, the existing Franklin Layover facility would be upgraded to allow for meets between trains headed to/from Foxborough. This improvement will provide the Franklin Branch with a passing siding west of Walpole. It will also help to increase the capacity and improve the service reliability on the Franklin Branch. A new interlocking at the northern end of the layover facility would create a passing siding for train meets. The passing siding will be operational only when the facility is empty of trainsets.

At Walpole Station, a new double track station at Walpole would be tied into the existing "Walpole" interlocking. The leg of the existing Walpole wye providing a southerly-easterly connection between the Franklin Branch and the Framingham Secondary would be upgraded to allow through train movements.

CETC upgrades are required for improvements to Walpole Station and the Franklin layover.

On the Framingham Secondary, all track between Walpole and Foxborough will be improved to FRA Class 3 allowing for speeds up to 60mph. The Secondary will be signalized to Foxborough. By adding two track circuits to between Foxborough and "Mansfield" the Framingham secondary to be completely signalized[104]. Signalizing the secondary will allow Providence trains to operate on the emergency bypass route without needing to be issued train orders.

The upgrade of Walpole Wye and the Framingham Secondary will allow for faster and more reliable special event service to Gillette Stadium than is currently operated. It also will provide the Providence line with additional service flexibility by being able to bypass problems that occur on the NEC between Readville and Mansfield.

[104] JEG engineers assume that the cost for adding the two track circuits between the new Foxborough interlocking and "Mansfield" interlocking is negligible.

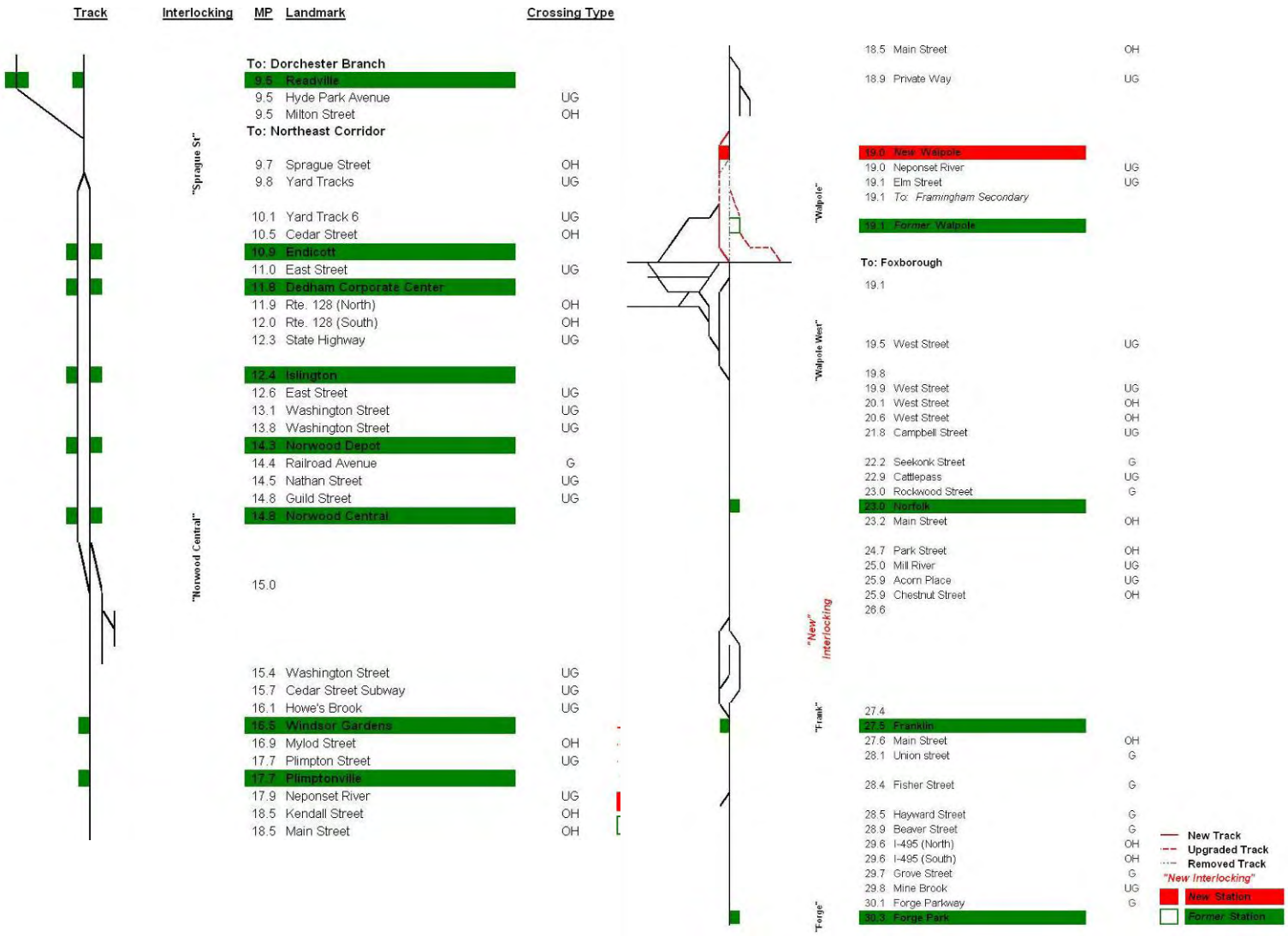

Figure 4.2.1(a):
Option A: Upgrades to the Franklin Branch

Figure 4.2.1(b):
Option A: Upgrades to the Framingham Secondary

Walpole Station – A new two track Walpole station east of the wye would be required allowing passengers to directly transfer from shuttle service to Forge Park trains in a cross platform configuration. The new station would be a few hundred feet east of the existing station platform. A high level accessible island platform will be built to allow for cross platform transfers for passengers. No parking upgrades are anticipated.

Foxborough Station – Option A upgrades to Foxborough station would be minimal. Station improvements are limited to amenities such as LED signs, trailblazers, and trash cans at the existing station. Station parking will be located across the Neponset River at the Gillette Stadium parking lot. No improvements to the parking lot are anticipated.

4.2.2 Option B

Track and Signal Upgrades – Upgrades in Option B build upon the track improvements described in Option A. In addition to upgrades on the Framingham Secondary and the Franklin Layover facility, additional investment would be required on the Franklin Branch. Figure 4.2.2 illustrates the required upgrades to the Franklin Branch and the Framingham Secondary for Foxborough service.

In addition to the Option A improvements, approximately 1.7 miles of second mainline track would be installed between Norwood Central and Windsor Gardens. As discussed above, multiple weekday meets would be scheduled along this segment. Like the conversion of the existing Franklin layover facility into a passing siding, double tracking beyond Norwood Central up to Windsor Gardens will further increase the reliability and capacity of the Authority's existing Franklin Branch service.

A new layover facility would be built in the vicinity of Foxborough Station. The layover facility is discussed later in this chapter.

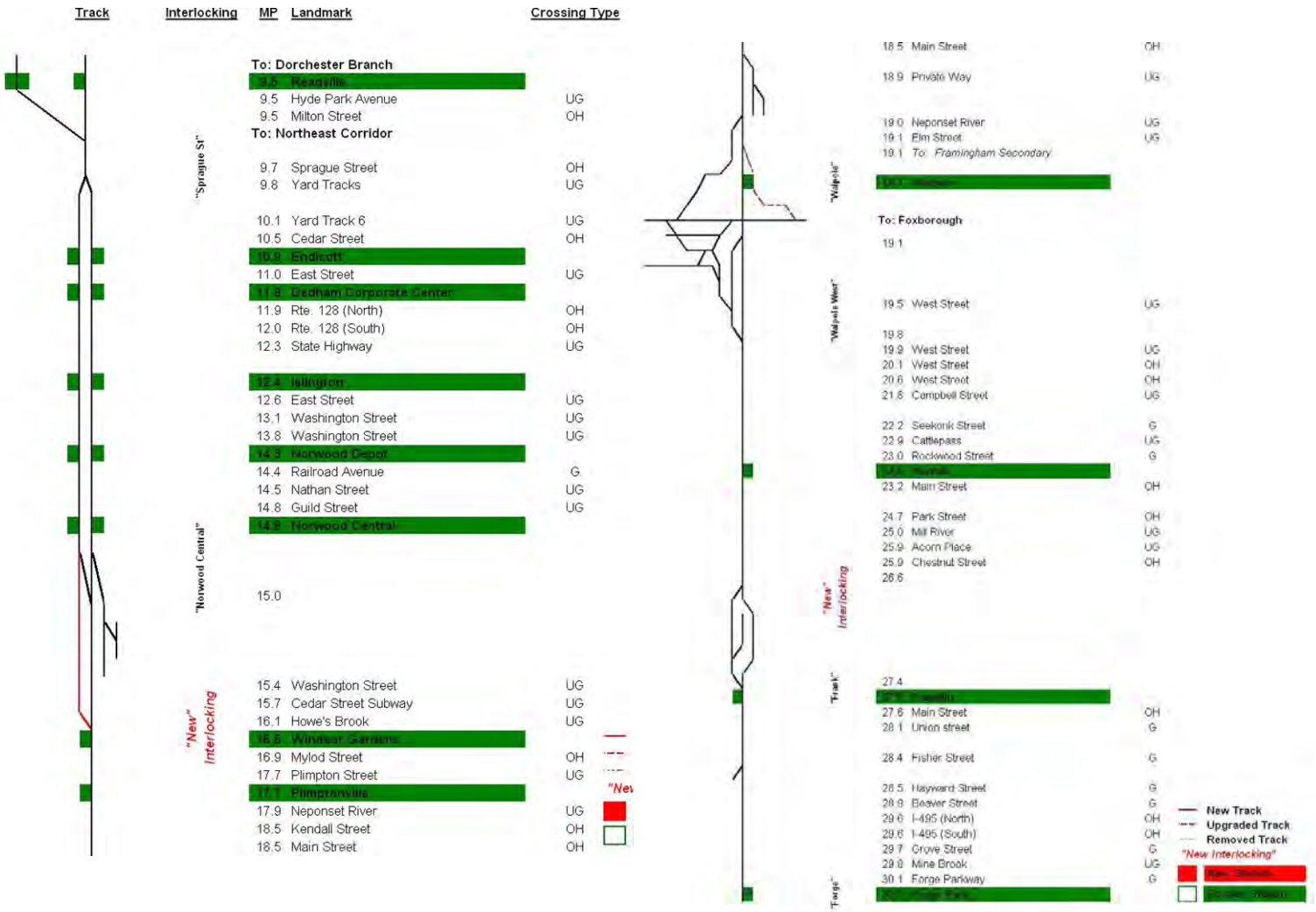

Figure 4.2.2(a):
Option B: Upgrades to the Franklin Branch

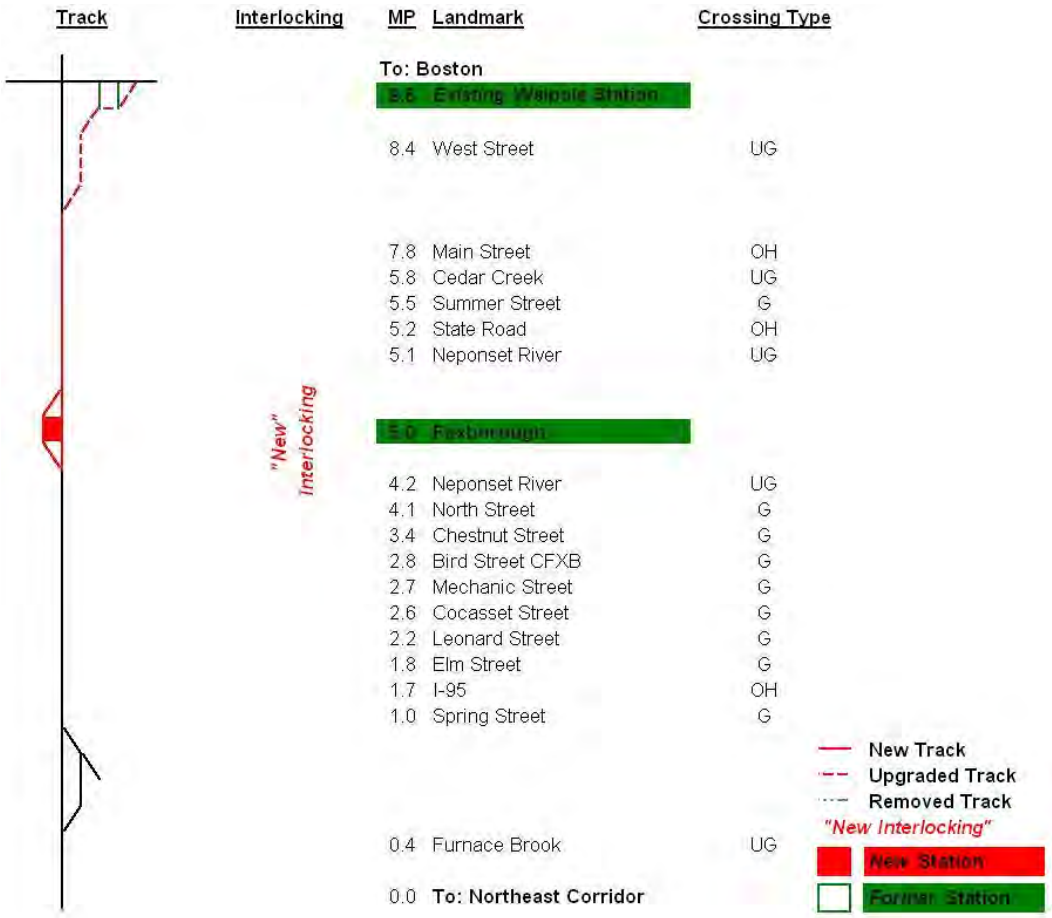

Figure 4.2.2(b):
Option B: Upgrades to the Framingham Secondary

Walpole Station – See Option A for a discussion of the upgrades to Walpole Station.

Foxborough Station – With the implementation of Option B, some trains would meet at Foxborough Station. Consequently, Foxborough would be upgraded to become a two track station with an island platform. Station parking will continue to be located across the Neponset River at Gillette Stadium. MBTA Railroad Operations Directorate has stated that passengers could cross over the tracks at the southern end of the platform, provided that an active pedestrian warning system is provided.[105] Converting the existing Foxborough Station into a two track station with an island platform will greatly improve the safety of special event service to Gillette Stadium.

Furthermore, adding two track circuits between the new Foxborough interlocking required for a two track station and the existing "Mansfield" interlocking will allow the entire secondary between Foxborough and "Mansfield" to be signalized.[106] Trains using the secondary as an emergency bypass will be able to run down the secondary without having to be issued train orders.

4.2.3 Option C

Track and Signal Upgrades – The infrastructure upgrades necessary to support Option C are the same as Option B, except that no improvements to Walpole Station are required. CETC modifications are still required for all upgrades. Figure 4.2.3 illustrates the required upgrades to the Franklin Branch and the Framingham Secondary for Foxborough service.

At Walpole, the existing wye connection will need to be upgraded to allow for train movements and tied into "Walpole" interlocking. However, the station reconstruction and reconfiguration is optional.

[105] For example, bells and flashers could be constructed at the end of the platform to allow for safe pedestrian passage. Conversation with MBTA Railroad Operations. January 28, 2010.
[106] JEG engineers assume that the cost for adding the two track circuits between the new Foxborough interlocking and "Mansfield" interlocking is negligible.

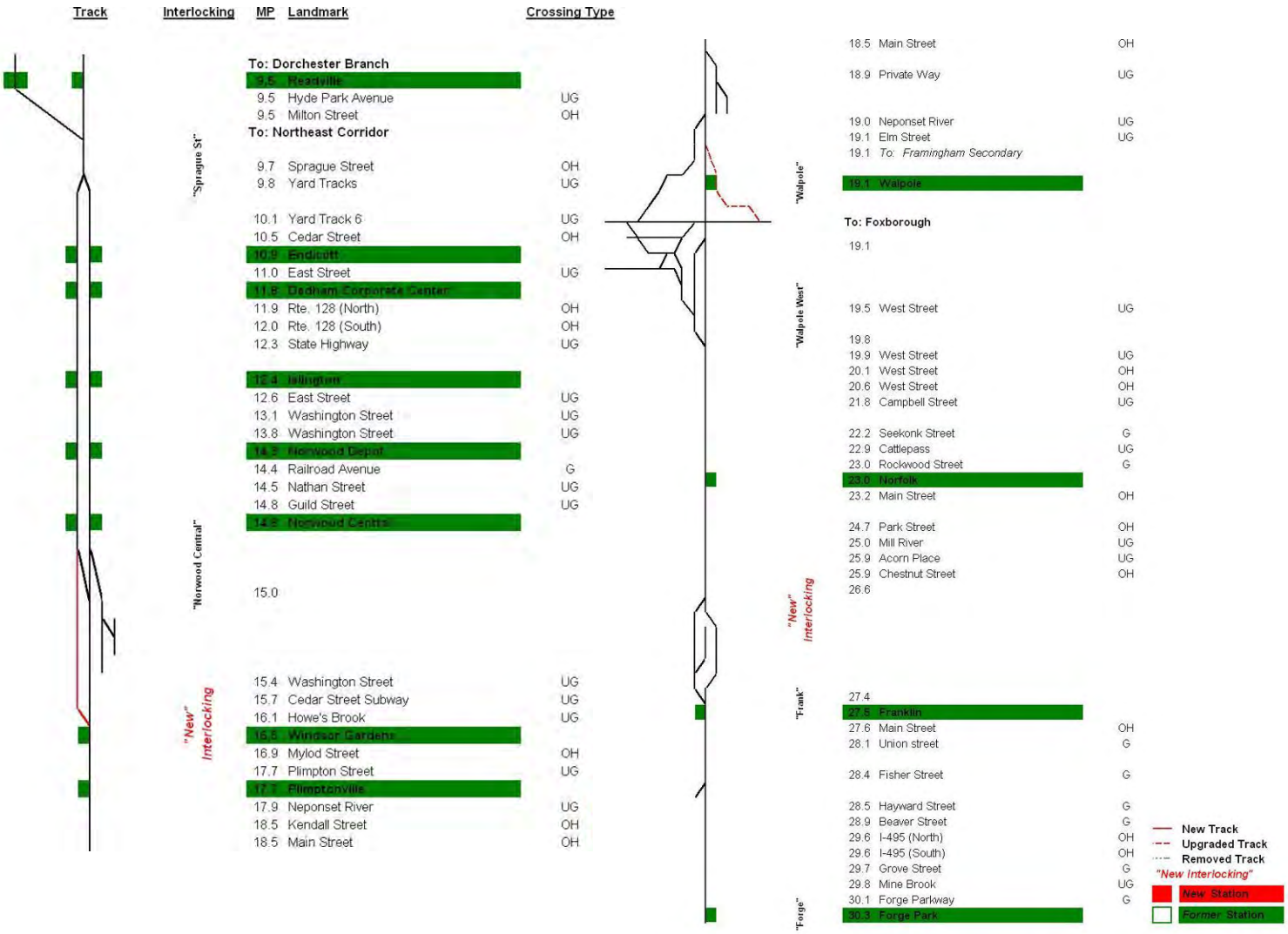

Figure 4.2.3(a):
Option C: Upgrades to the Franklin Branch

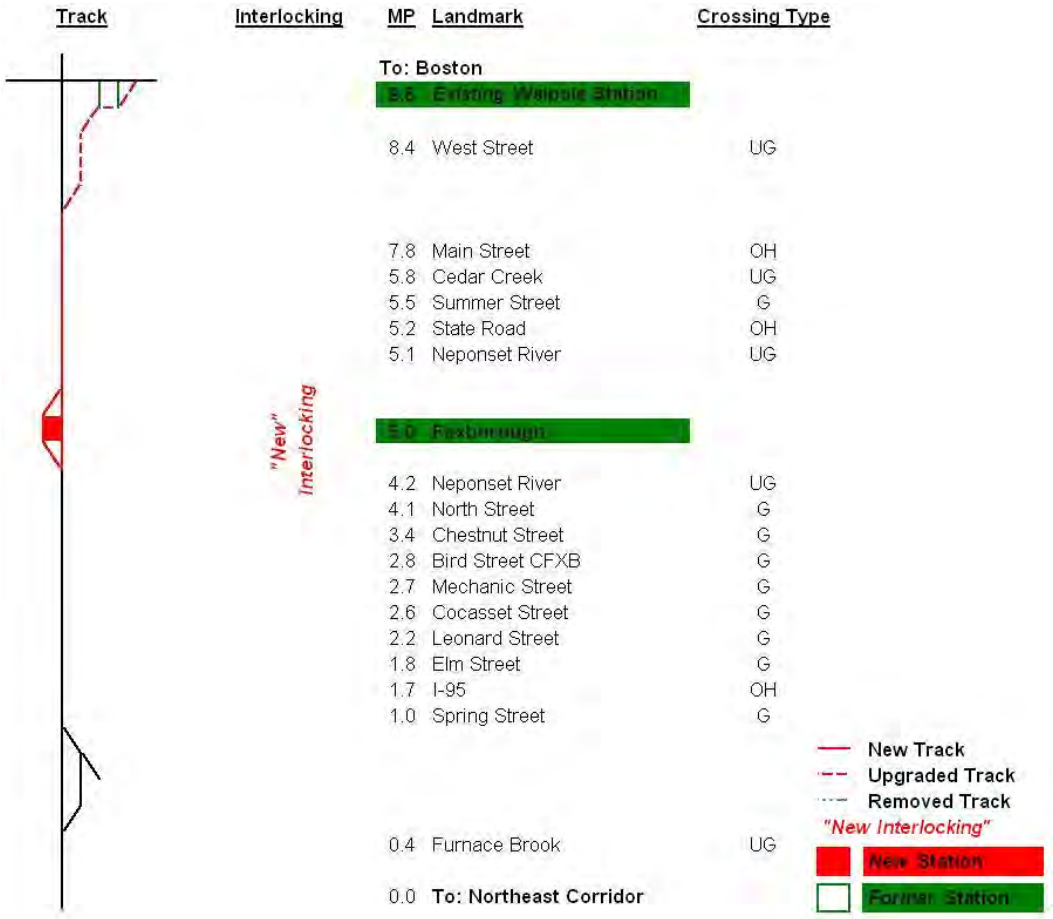

Figure 4.2.3(b):
Option C: Upgrades to the Framingham Secondary

Walpole Station – No modifications to Walpole Station are required.

Foxborough Station – See Option B for a discussion of the improvements to Foxborough Station.

4.3 Foxborough Layover Facility

The MBTA Railroad Operations directorate has specified that any new service to Foxborough must address the storage deficiencies that currently exist on the Franklin Branch. A new layover facility will be built in the vicinity of Foxborough. Three options for a potential layover have been explored.

Inventory of Potential Sites

The MBTA Railroad operations directorate has indicated that any fulltime service to Foxborough must address the existing layover deficiencies on the Franklin Branch. Three sites have been identified by the study team as potential locations for an overnight layover facility. The land available for each site ranges from 8 to 165 acres in size, and are all located within a one mile radius of the existing Foxborough station. See Figure 4.3.1 for a map of the three potential layover sites.

Wherever the facility is located, it is assumed the Authority would build a six track facility, capable of storing six 850 foot long trainsets (one locomotive and nine coaches). Railroad Operations has further stated that the new facility would not have to be a double ended facility[107]. While this would save some capital costs, the primary disadvantage of a single ended facility is that if there is a derailment at the facility entrance, rail traffic will not be able to exit or enter the facility.

A crew building would be constructed on site, which would include a materials and equipment storage locker. This will allow mechanical personnel to store materials onsite and perform running repairs to equipment. The facility's entrance would be paved, and have parking for at least 15 cars. There would be three 20 foot wide service lanes and four 4 foot wide walkways built between the tracks. High mast lighting with walkway lights would be located in the service walkways. The entire layover facility would be fenced in, and if necessary, noise walls would be constructed.

Spill pans would be required under the locomotive end of each track, complemented by oil/water separators. Near the locomotive end of the track, compressor and power hookups would be needed so that the locomotives would not have to do a cold startup each morning. Two separate buildings housing the power and compressor would be required.

An inspection pit should be located under the yard lead, prior to the ladder leading towards the tracks. Toilet dumping equipment would also be provided onsite.

[107] Meeting with MBTA Railroad Operations. December 22, 2009

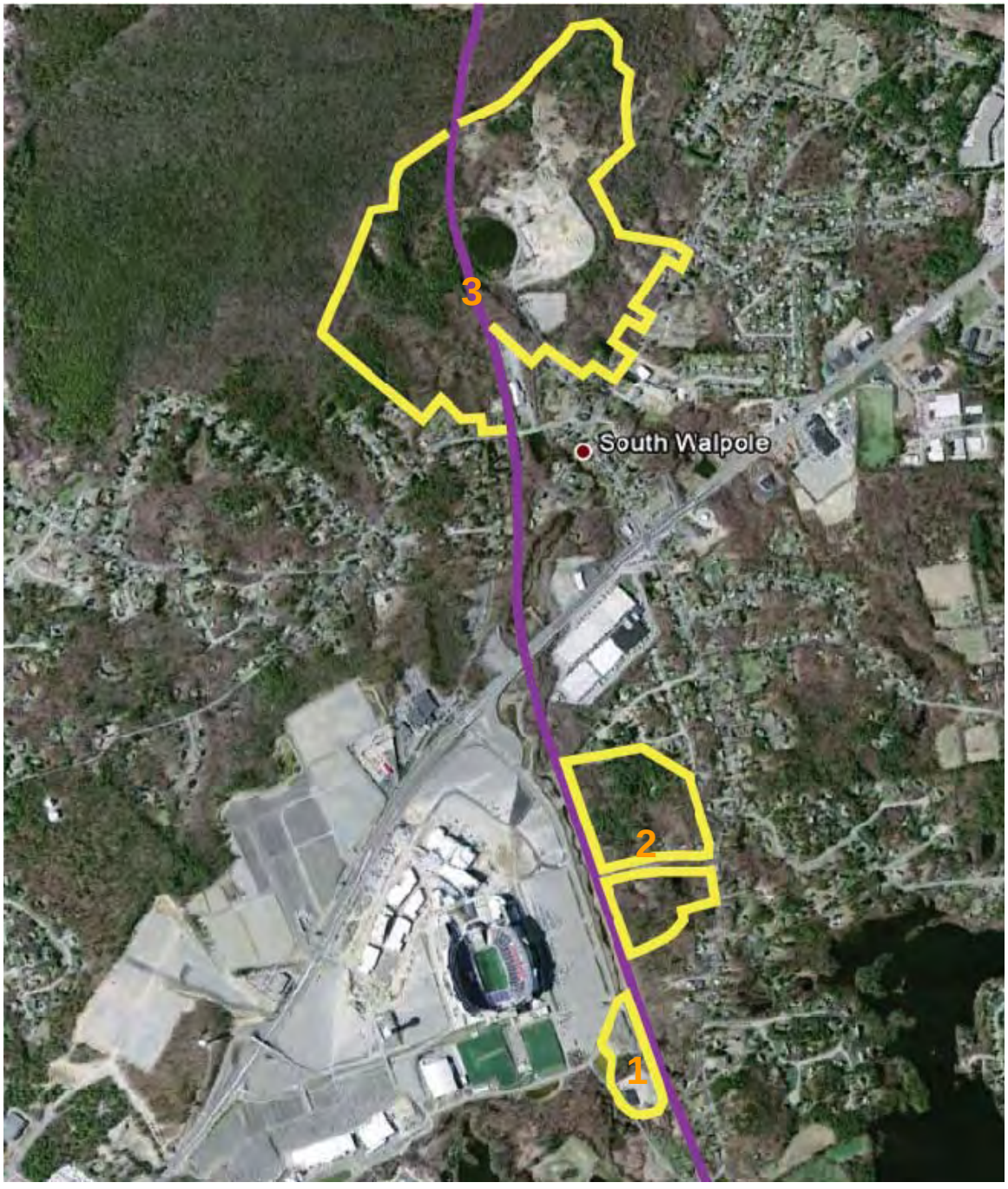

Figure 4.3.3(b):
Option C: Upgrades to the Framingham Secondary

4.3.1 Site 1

Site 1 is located off of the existing CSX owned Framingham Secondary approximately 0.4 miles south of the Foxborough station. The site is located on the Gillette Stadium parking lot property and is bounded by a wooded area to the south (residential property 80-84 North Street, Foxborough), the railroad and Neponset River to the east, and Gillette Stadium parking lots and driveways to the north and west. The site is currently used for stadium storage and event day parking. It is roughly 8 acres in size. There may potentially be wetland impacts in this location.[108]

Non-railroad access to the site is via the multiple existing entrances to the Gillette Stadium/Patriot Place property from Route 1. The property owner is NPS LLC, a subsidiary of the Kraft Group.

Operationally, access to the site would require two train moves. The first move would be a move south from Foxborough across the layover switch and clearing the North Street grade crossing. Once clear of North Street, the engineer of the train would change ends (taking at least 10 minutes to perform the FRA mandated brake test), and then proceed north across North Street and making a diverging move into the layover. Two moves would be required to exit the facility.

4.3.2 Site 2

Site 2 is located on the existing CSX owned Framingham Secondary, and is approximately 0.1 miles south of the proposed Foxborough Commuter Rail Station. The site is bounded by North Street to the east, a wooded area (residential property) to the south, the CSX rail line to the west and a wooded area (residential properties) to the north. Ashcroft Lane bisects the site going east to west. The site is a wooded area and a Town of Foxborough Water Department pump station sits on the western edge of the property. The site is approximately 33 acres in size. Not all of the land would be needed for the layover – approximately 10 to 15 acres would be required. Non-railroad access to the site would be via Ashcroft Lane. The property owner of the site is NPS LLC.

Depending on the orientation of the facility, one or two moves would be required. For a head in facility, only a diverging move would be needed to access the facility. One move would also be necessary to exit the facility. A disadvantage of this layout is that the locomotives would be located near private residences.

For a non head-in facility, two moves are required. The train would head south until it is clear of the facility switch. The engineer would then change ends (again, taking approximately 10 minutes), and then proceed north making a diverging move into the layover facility. Two moves would be required to leave the facility. An advantage of this layout is that the locomotives would be located away private residences.

4.3.3 Site 3

Site 3 is located on the existing CSX owned Framingham Secondary, in neighboring Walpole. It is approximately 0.8 miles north of the proposed Foxborough Commuter Rail Station. The site is

[108] Should this option be recommended for further evaluation, consultation with a wetlands scientist is required to determine the full scope of environmental impacts.

bounded by Summer Street (Walpole) some commercial property on the south, a wooded area on the west, a wooded area on the north and Washington Street (Walpole)/residential properties to the east. The Framingham Secondary bisects the site. The site is partially wooded and is the location of the former Bird Machine Company in Walpole, MA. The site is approximately 165 acres. Not all of the land would be needed for the layover – approximately 10 to 15 acres would be required. Non-railroad access to the site is via Neponset Street. The property owner of the site is Baker Hughes.

This site has the most acreage of the three sites identified, and has the least amount of residential properties surrounding it. This site could be a double ended facility.

4.4 Capital Costs

Depending upon the option chosen, up to four significant capital investments would be required to offer commuter rail service to Foxborough:

1. Track and Signal upgrades to the Framingham Secondary and Franklin Branch,
2. Improvements to Walpole and/or Foxborough stations,
3. New Foxborough layover facility, and
4. Additional locomotive to power an extra trainset.

Details presented in this section relate to the costs required to improve the infrastructure to allow for commuter rail service to Foxborough, and to acquire the rolling stock necessary to do so. All infrastructure unit costs have a 10% materials contingency, all vehicle acquisition will have a 15% contingency, and the project will have an overall 25% project contingency.

In addition to the infrastructure contingencies, an allowance has been included in the estimate for "soft costs" or professional services. These are project management and engineering costs, which are added to the total cost of each alternative. These soft costs include typical project management and engineering costs and are determined based on a percentage of the projected capital cost. The estimated soft costs are based on the guidebook in *TCRP Report 138: Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects.* The average actual historical soft costs for each component that have been used are included Table 4.4.1.

Table 4.4.1:
Project "Soft Costs" Contingencies

Service	**Anticipated Percentage**
Preliminary engineering and final design	14%
Project management for design and construction	7.5%
Construction administration and management	5%
Professional liability and other non-construction insurance	2%
Legal; permits; review fees by other agencies, cities, etc.	0.3%
Surveys, testing, investigation, inspection	0.3%
Start Up	0.3%

Table 4.4.2:
Capital Cost Elements for Proposed Service Options

Cost Elements	Unit Costs	Option A		Option B		Option C	
		Quantity	Total	Quantitiy	Total	Quantitiy	Total
Track Upgrades							
Framingham Secondary							
Framingham Branch Walpole to Foxboro - Single Track - 4.1 MI	$5,647,000	1	$5,647,000	1	$5,647,000	1	$5,647,000
Framingham Branch Walpole to Foxboro - Second Track	$6,371,000	0	$0	0	$0	0	$0
Framingham Branch Foxboro to Mansfield - Single Track	$5,749,000	0	$0	0	$0	0	$0
Franklin Branch							
Franklin Branch Double Track Norwood to Windsor Gardens - 1.5 MI	$2,096,000	0	$0	1	$2,096,000	1	$2,096,000
Franklin Branch Franklin Passing Siding - .7 MI	$1,776,000	1	$1,776,000	1	$1,776,000	1	$1,776,000
Walpole Wye Upgrade - 0.3 MI	$768,000	1	$768,000	1	$768,000	1	$768,000
Walpole Station							
Franklin Branch Double Track Through New Walpole Station - .3 MI - Side Platforms	$16,315,000	0	$0	0	$0	0	$0
Franklin Branch Double Track Through New Walpole Station - .3 MI - Center Island Platform	$17,429,000	1	$17,429,000	1	$17,429,000	0	$0
Foxboro Station							
Foxboro Station Island Platform	$5,775,000	0	$0	1	$5,775,000	1	$5,775,000
Foxboro Station Double High Level Platform	$6,325,000	0	$0	0	$0	0	$0
Foxboro Station Upgrade	$50,000	1	$50,000	0	$0	0	$0
Signal Upgrades							
Relocate Norwood Interlocking	$330,000	0	$0	1	$330,000	1	$330,000
Upgrade Walpole Interlocking	$2,200,000	1	$2,200,000	1	$2,200,000	1	$2,200,000
New Franklin Interlocking	$1,650,000	1	$1,650,000	1	$1,650,000	1	$1,650,000
New Foxboro Interlocking	$1,650,000	0	$0	1	$1,650,000	1	$1,650,000
Signalize Walpole to Foxboro (Cab Signals)	$290,000	1	$290,000	1	$290,000	1	$290,000
Signalize Foxboro to Mansfield (Cab Signals)	$271,000	1	$271,000	1	$271,000	1	$271,000
CETC Modifications	$165,000	0	$0	0	$0	0	$0
Grade Crossings Upgrades							
Grade Crossing Upgrades - Walpole to Foxboro	$880,000	1	$880,000	1	$880,000	1	$880,000
Grade Crossing Upgrades - Foxboro to Mansfield - Quiet Zone	$3,575,000	0	$0	0	$0	0	$0
Grade Crossing Upgrades - Foxboro to Mansfield - Gates & Surface	$2,255,000	0	$0	0	$0	0	$0
Layover Facility							
Layover Facility	$11,168,000	0	$0	1	$11,168,000	1	$11,168,000
Infrastructure Subtotal			$30,961,000		$51,930,000		$34,501,000
Project Contingency	25%		$7,740,250		$12,982,500		$8,625,250
Infrastructure Total			*$38,701,300*		*$64,912,500*		*$43,126,300*
Vehicles							
Locomotive	$5,000,000	0	$0	0	$0	1	$5,000,000
Bi-Level Coach	$2,260,000	0	$0	0	$0	0	$0
Vehicle Subtotal			$0		$0		$5,000,000
Vehicle Contingency	15%		$0		$0		$750,000
Vehicle Total			*$0*		*$0*		*$5,750,000*
Professional Services							
Preliminary Engineering	14%		$5,418,200		$9,087,800		$6,842,700
Project Management	7.5%		$2,902,600		$4,868,400		$3,665,700
Construction Administration and Management	5%		$1,935,100		$3,245,600		$2,443,800
Professional liability and other non-construction insurance	2%		$774,000		$1,298,300		$977,500
Legal; permits; review fees by other agencies, cities, etc.	0.3%		$116,100		$194,700		$146,600
Surveys, testing, investigation, inspection	0.3%		$116,100		$194,700		$146,600
Start Up	0.3%		$116,100		$194,700		$146,600
Professional Services Subtotal			*$11,378,200*		*$19,084,200*		*$14,369,500*
Project Total			***$50,079,500***		***$83,996,700***		***$63,245,800***

Note: Some values may not add due to rounding

Forecast capital costs for all three options range from $50.1 million to $84.0 million, including the cost of acquisition for additional rolling stock for Option C. Both Option A and Option B can be implemented with the Authority's existing fleet and have no rolling stock costs associated with them. Option C includes costs for one additional locomotive. As previously described, no additional coaches are assumed.

As previously described, Option B requires improvements at both Foxborough and Walpole stations. Option B is the most capital intensive option of the three options under consideration – with station upgrades accounting for more than 35% of the total cost. Table 4.4.3 summarizes the capital cost forecasts for all options.

Table 4.4.3:
Summary of Capital Costs for All Options
(millions)

Cost Driver	Option A	Option B	Option C
Track and Signal	$16.9	$21.9	$21.9
Stations	$21.8	$29.0	$7.2
Layover Facility	$0.0	$14.0	$14.0
Rolling Stock	$0.0	$0.0	$5.8
"Soft Costs"	$11.4	$19.1	$14.4
Total Cost	***$50.1***	***$84.0***	***$63.2***

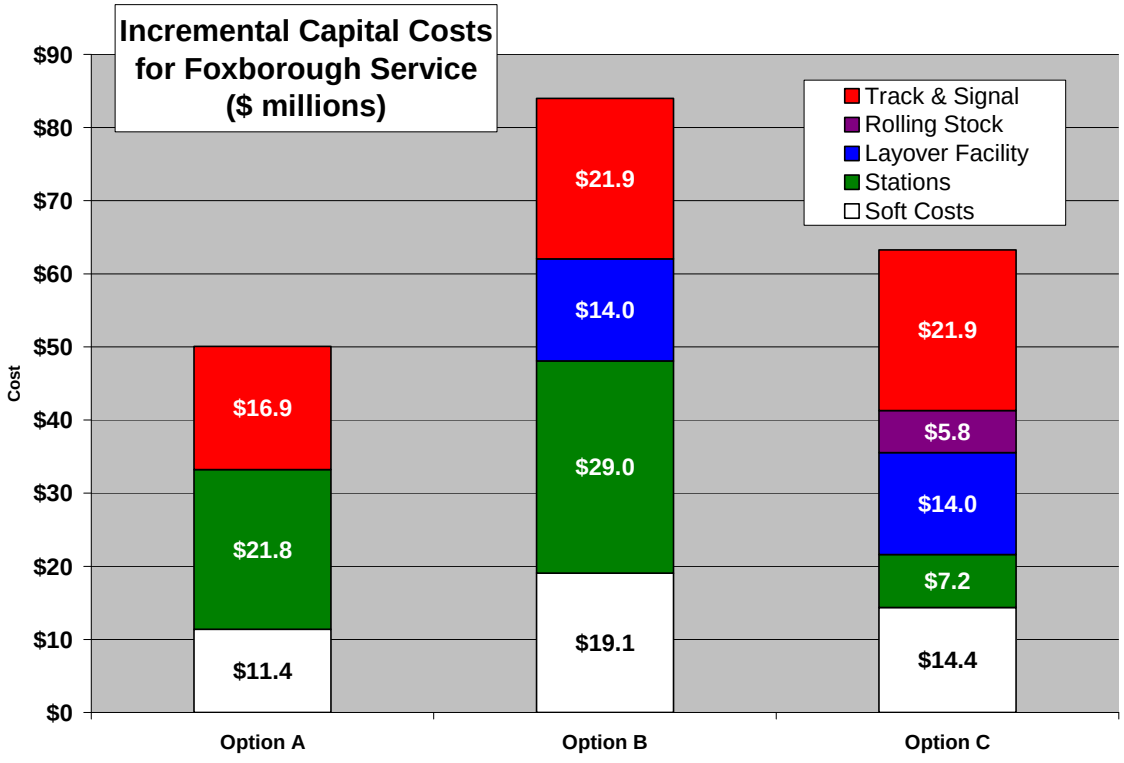

Figure 4.4.1

4.5 Operating and Maintenance Costs

The operating costs involved with offering commuter rail service to Foxborough fall into four categories: transportation operations, maintenance of way, vehicle maintenance, and administration. The study team employed the following sources and assumptions to prepare conceptual, order-of-magnitude incremental operating costs forecasts for the three service scenarios.

- Operating costs over the last few years provide a reliable basis for predicting future operating costs. MBTA NTD 2008 operating data was used to calculate unit costs.
- Incremental transportation-related operating costs include additional train-miles and coach-miles operated due to additional trips for Foxborough, Forge Park, and Readville services.
- Mechanical maintenance costs vary with the number of coaches and locomotives in the fleet.
- Maintenance of way expense varies with the extent of infrastructure investment.
- MBTA administration expense is 15% of the incremental transportation, vehicle maintenance and engineering costs.
- No CSX trackage charges between Walpole and Mansfield are anticipated.

The unit costs for each of the four categories is shown in Table 4.5.1.

Table 4.5.1:
Unit Costs based Upon 2008 NTD Data

Transportation	$ 23.09	train mile
Maintenance of Way	$ 62,233	track mile
Vehicle Maintenance		
Coach	$ 96,001	vehicle[109]
Locomotive	$ 384,005	vehicle[110]
Administration	15%	direct expense

Reviewing the status quo service and the three service options, the study team determined the annual change in train miles operated, track miles maintained and rolling stock maintained for each option compared with the do-nothing alternative. Table 4.5.2 summarizes the results for each option.

[109] Derived from 2008 MBTA data from the National Transportation Database. Data is available at: http://www.ntdprogram.gov/ntdprogram/datbase/2008_database_NTD_database_2008.exe
[110] Ibid

Table 4.5.2:
Incremental Quantities for Foxborough Service

	Option A	Option B	Option C
Incremental Train Miles	35,317	199,402	259,193
Incremental Track Miles	3.5	5.2	5.2
Additional Locomotives	0	0	0

The incremental train mileage for each option increases with the frequency of trips. The incremental track mileage includes the new 8.5 miles of upgrades to the Framingham Secondary for all options. In Option B and Option C, the additional 1.7 miles of double track between Norwood Central and Windsor Gardens is also included. Order of magnitude estimates for the annual operating costs are calculated and shown in Table 4.5.3.

Table 4.5.3:
Estimated Annual Operating Costs for All Options

			Option A		Option B		Option C	
Cost Item	**Unit Cost**	**Units**	**Qty**	**Annual Cost**	**Qty**	**Annual Cost**	**Qty**	**Annual Cost**
Transportation	$23.09	train mile	35,317	$815,500	199,402	$4,604,200	259,193	$5,984,800
Vehicle Maintenance								
Coaches	$ 96,001	vehicle	0	$0	0	$0	0	$384,000
Locomotive	$ 384,005	vehicle	0	$0	0	$0	1	$0
Maint. Of Way	$62,233	track mile	3.5	$217,800	5.2	$323,600	5.2	$323,600
Subtotal				$1,033,300		$4,927,800		$6,692,400
Administration (15%)				$155,000		$739,200		$1,003,900
Est. Annual Op. Cost				$1,188,300		$5,667,000		$7,696,300

Note: Some values may not add due to rounding

The incremental operating costs range from $1.2 million to $7.7 million. Since the operating costs are primarily driven by the incremental train and track miles, it is not surprising that Option A has the lowest incremental operating cost and that Option C has the highest incremental costs.

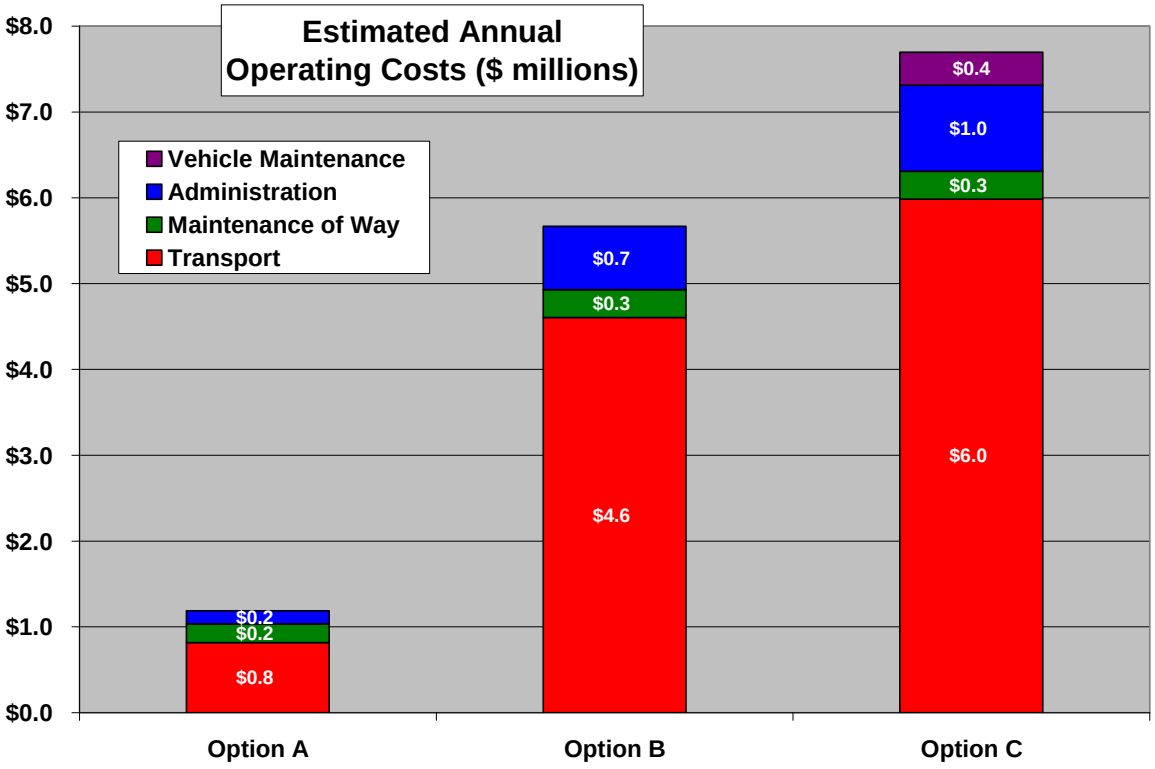
Estimated Annual Operating Costs ($ millions)
Vehicle Maintenance
Administration
Maintenance of Way
Transport
$8.0
$7.0
$6.0
$5.0
$4.0
$3.0
$2.0
$1.0
$0.0
$0.2
$0.2
$0.8
$0.7
$0.3
$4.6
$0.4
$1.0
$0.3
$6.0
Option A
Option B
Option C

Figure 4.5.1

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CHAPTER 5: TRAVEL DEMAND FORECASTING RESULTS

Introduction

This chapter presents travel demand forecasts prepared by the Central Transportation Planning Staff (CTPS). The travel demand analysis includes an existing conditions scenario, a 2030 no-build, and the three 2030 build scenarios described in Chapter 4.

This analysis is consistent with all other travel demand forecasts prepared by CTPS as well as with transportation planning best practices. Travel demand on weekends as well as for special events, such as football games and concerts, was not examined. For a detailed discussion of the travel demand forecasting methodology, please refer to Appendix C on modeling methodology.

The chapter is organized in seven subsections:

- Demographic Assumptions
- System Summary
- Forecast Weekday Boardings
- Foxborough Park and Ride Lot Fee Sensitivity Testing
- Fare Revenue Estimates (Upper Bound)
- Local Street Traffic Impacts (Upper Bound)
- Air Quality Analysis

5.1 Demographic Assumptions

To account for the uncertainty associated with the proposed development in Foxborough, CTPS developed both upper and lower bound demand estimates for the proposed commuter rail station based on upper and lower bound land use build out assumptions. In the travel demand forecasting process, land use assumptions drive demographics, which in turn drives trip activity, which in turn drives ridership. The Massachusetts Executive Office of Housing and Economic Development has designated the area in the vicinity of the stadium as a Economic Development Overlay District, pursuant to Section 2C of Chapter 303 of the Acts of 2008. This area covers more than 500 acres along Route 1 in the Town of Foxborough.

The proposed development is located in Transportation Analysis Zone (TAZ) 2417 which has seen significant commercial development in recent years with more development planned in the years to come. In addition to commercial development, there are also plans for residential development in the vicinity of the proposed station. Based on conversations with the key stakeholders, CTPS learned that the planned development consists of 1.5 million square feet of laboratory/office space, 150 thousand square feet of retail space, and up to 1,000 units of housing.

CTPS converted the land use assumptions into demographics, which were inputs into the modeling process. Table 5.1.1 presents the demographic assumptions for the transportation analysis zone 2417 including the stadium and planned development are located. Figure 5.1.1 depicts the regional model zone system in the area of the proposed

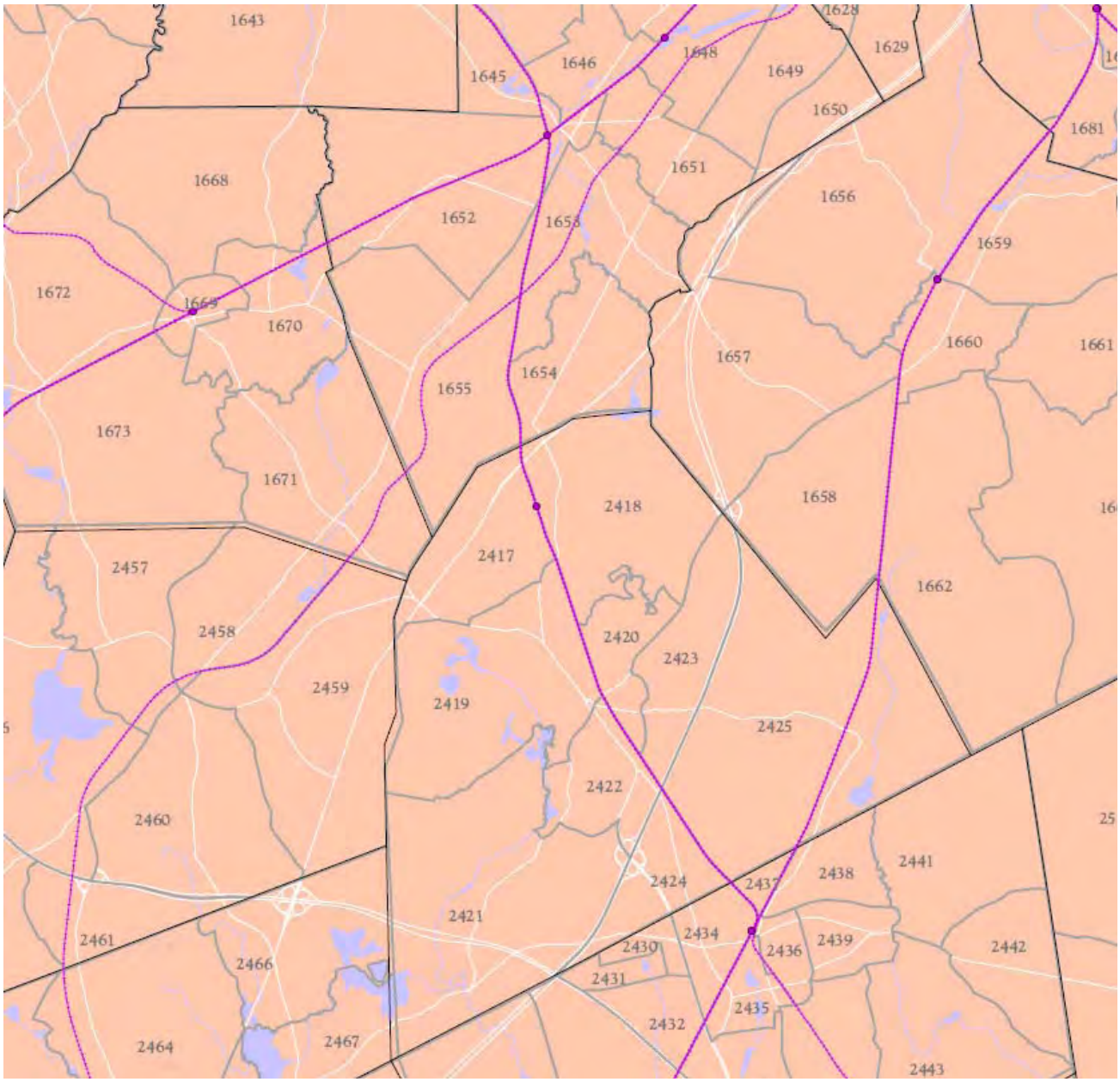
new Foxborough station. It should be noted that the regional model highway network is more detailed than the network depicted in Figure 5.1.1.

Table 5.1.1:
Demographics Assumption Used for TAZ 2417

	2000	**2010**	**2030 MAPC Forecast**	**2030 Full-Build**
Population	650	736	853	4,186
Service Employment	880	1,240	1,583	6,743
Retail Employment	215	675	1,350	4,696
Basic Employment	210	216	336	336

The lower bound demographic forecast used for the Foxborough Commuter Rail Feasibility Study is the default land use forecast developed by the Metropolitan Area Planning Council (MAPC). MAPC is the regional planning agency responsible for developing forecast year demographics for Foxborough. The MAPC future land use forecast, known as "MetroFutures," is characterized by compact development around transit stations. When MAPC developed its land use forecasts, the Foxborough commuter rail station was not assumed to be a full time stop.

Also, at that time, MAPC did not have specific information regarding development plans in the study area. Thus MAPC forecasts for zone 2417 do not necessarily include the most robust growth for the forecast year. The demographics listed under the full build column in Table 5.1.1 do represent the most robust growth conditions for TAZ 2417 and thus constitute "upper bound" demographics for this project, while the demographics listed under the 2030 MAPC Forecast column, in Table 5.1.1 represent the "lower bound" demographics.



Note: The regional travel demand model covers 182 communities in eastern MA

Figure 5.1.1:
The Transportation Analysis Zone System in the Foxborough Study Area

5.2 Forecast Summary

Table 5.2.1 and Table 5.2.2 summarize the forecast results. Table 5.2.1 presents the upper bound transit usages for each option, side by side. Table 5.3.1 is formatted identically to Table 5.3.2 and presents the lower bound transit demand for each option, side by side. These upper and lower bound transit demand forecasts are a by-product of the upper and lower bound demographic forecasts that feed the travel demand forecasting process.

The second to last row in Table 5.2.1 lists new linked transit trips. New linked transit trips represent the number of auto diversions the mode choice model forecasts for a given alternative. For this project, the mode choice model forecasts that the highest number of additional linked transit trips (1,100) will occur in Option C.

The "links" in a linked transit trip are the individual segments of a transit trip. For example, if a transit user uses commuter rail to get to Boston then transfers to a subway line, such a trip can be broken down into five (more or less) links—the user's walk or drive to the commuter rail station, the user's ride on the commuter rail, the user's walk transfer to a subway station, the user's ride on the subway and the user's walk to their final destination. These individual links are referred to as unlinked transit trips and collectively they make up one linked transit trip. For a detailed discussion of the mode choice model please refer to Appendix C on modeling methodology.

The boardings detailed in Table 5.2.1 correspond with unlinked transit trips. As can be seen, in the build options, commuter rail boardings generally increase from Option A to B to C, as does activity on the rapid transit system. Local and express bus usage generally declines. Auto diversions generally increase from Option A to B to C. As commuter rail service in the Franklin/Fairmount/Foxborough Line corridor is improved, those lines attract more passengers. Many of the local buses that experience a decrease are buses in the Fairmount Line corridor. Also, private express bus usage from Foxborough is forecast to decrease.

The model predicts that as commuter rail service is improved in the Fairmount Line corridor, users will switch from the local buses to the improved commuter rail, although some Fairmount stations do experience a decrease in service in the off-peak directions. Many local buses routes in the Fairmount Line corridor provide transfers with the Orange Line, thereby indirectly providing access to the city core. The model suggests that as the Fairmount commuter rail line is improved, the Orange Line and the local buses that serve as its feeders would see a reduction in demand.

The overall increase in commuter rail boardings is due to a combination of increased auto diversions, increased bus diversions and an increase in transit users utilizing outbound trains from South Station to Back Bay. This increase in reverse flow trip making from South Station to Back Bay is due to the reduction in the number of Franklin Line trains that stop at Back Bay in the build options, relative to the no-build.

Table 5.2.1:
Upper Bound - Based on Full Build Land Use

Average Weekday Boardings By Mode	2009 Base	2030 No-build	Change from Base	2030 Option A Upper	Change from upper No-Build	2030 Option B Upper	Change from upper No-Build	2030 Option C Upper	Change from upper No-Build
Commuter Rail	111,360	142,780	28%	144,780	2,000	145,110	2,330	145,470	2,690
North Side Lines	38,640	46,000	19%	46,000	0	46,000	0	46,000	0
Other South Side Lines	38,030	50,960	34%	50,960	0	50,960	0	50,960	0
Corridor South Side Lines	34,690	45,820	32%	47,820	2,000	48,150	2,330	48,510	2,690
Attleboro	22,850	30,100	32%	29,880	-220	29,810	-290	29,720	-380
Franklin	10,760	14,320	33%	14,920	600	9,090	-5,230	9,470	-4,850
Fairmont	1,080	1,400	30%	1,430	30	790	-610	0	-1,400
Shuttle	na	na	na	1,590	1,590	150	150	na	0
Foxboro	na	na	na	na	na	8,310	8,310	9,320	9,320
Rapid Transit	777,700	861,300	11%	861,330	30	861,790	490	861,600	300
Blue Line	64,500	73,000	13%	73,000	0	73,000	0	73,000	0
Red Line	242,900	252,600	4%	252,660	60	253,280	680	253,050	450
Green Line	288,200	337,200	17%	337,230	30	337,400	200	337,450	250
Orange Line	182,100	198,500	9%	198,440	-60	198,110	-390	198,100	-400
BRT (Silver Line)	25,700	60,500	135%	60,540	40	60,690	190	60,740	240
Bus	358,800	412,700	15%	412,400	-300	411,210	-1,490	411,270	-1,430
Local Bus	337,300	387,900	15%	387,700	-200	386,890	-1,010	387,000	-900
Express Bus	21,500	24,800	15%	24,700	-100	24,320	-480	24,270	-530
Ferry Service	4,400	5,200	18%	5,200	0	5,200	0	5,200	0
Unlinked Transit Trips	1,277,960	1,482,480	16%	1,484,250	1,770	1,484,000	1,520	1,484,280	1,800
Linked Transit Trips	945,800	1,085,600	15%	1,085,700	100	1,086,540	940	1,086,700	1,100
Transfer Rate	1.35	1.37	1%	1.37	0.00	1.37	0.00	1.37	0.00

Source CTPS Regional Travel Demand Model (April 2010)

Table 5.2.2:
Lower Bound - Based on MAPC Regional Land Use Forecasts

Average Weekday Boardings By Mode	2009 Base	2030 No-Build Lower	Change from Base	2030 Option A Lower	Change from Lower No-Build	2030 Option B Lower	Change from Lower No-Build	2030 Option C Lower	Change from Lower No-Build
Commuter Rail	111,360	141,940	27%	143,400	1,460	143,790	1,850	144,340	2,400
North Side Lines	38,640	46,000	19%	46,000	0	46,000	0	46,000	0
Other South Side Lines	38,030	50,940	34%	50,950	10	50,950	10	50,950	10
Corridor South Side Lines	34,690	45,000	30%	46,450	1450	46,840	2,840	47,390	2,690
Attleboro	22,850	29,600	30%	29,380	-220	29,310	-290	29,220	-380
Franklin	10,760	14,000	30%	14,570	570	8,660	-5,340	9,050	-4,950
Fairmont	1,080	1,400	30%	1,430	30	760	-640	0	-1,400
Shuttle	na	na	na	1,070	1070	100	100	0	0
Foxboro	na	na	na	na	na	8,010	8,010	9,120	9,120
Rapid Transit	777,700	860,940	11%	860,940	0	861,220	280	861,050	110
Blue Line	64,500	73,000	13%	73,000	0	73,000	0	73,000	0
Red Line	242,900	252,440	4%	252,490	50	253,010	570	252,820	380
Green Line	288,200	337,100	17%	337,120	20	337,240	140	337,270	170
Orange Line	182,100	198,400	9%	198,330	-70	197,970	-430	197,960	-440
BRT (Silver Line)	25,700	60,400	135%	60,440	40	60,570	170	60,610	210
Bus	358,800	411,300	15%	410,980	-320	409,740	-1,560	409,800	-1,500
Local Bus	337,300	387,100	15%	386,890	-210	386,040	-1,060	386,150	-950
Express Bus	21,500	24,200	13%	24,090	-110	23,700	-500	23,650	-550
Ferry Service	4,400	5,200	18%	5,200	0	5,200	0	5,200	0
Unlinked Transit Trips	1,277,960	1,479,780	16%	1,480,960	1,180	1,480,820	1,040	1,481,000	1,220
Linked Transit Trips	945,800	1,083,100	15%	1,083,190	90	1,084,000	900	1,084,150	1,050
Transfer Rate	1.35	1.37	1%	1.37	0.00	1.37	0.00	1.37	0.00

Source: CTPS Regional Travel Demand Model (April 2010)

5.3 Forecast Weekday Boardings

The CTPS regional travel demand forecasting model can be used to track transit usage from origin to destination and by mode of access. In addition to tracking transit usage at the line level, the travel demand forecasting model also tracks transit usage at the station level.

Table 5.3.1 shows modeled boardings at the new Foxborough Station for the forecast year build options A, B and C for the upper bound demographics. The table breaks out these boardings by their mode of access—either walk access, drive access park and ride, or drive access kiss and ride, and also by community of origin.

The forecast walk market for the new station will be limited to Foxborough and a small part of Walpole. Passengers are forecast to walk from the existing residential areas in the vicinity of the stadium (South Walpole and residential areas along North Street in Foxborough) as well as from the new residential development that is expected near and around the stadium.

Table 5.3.1:
Upper Bound Forecast of Foxborough Station Boardings
By Town of Origin and by Sub-Mode

SCENARIO	Option A				Option B				Option C			
Town of Origin	**Total**	**Walk**	**PNR**	**KNR**	**Total**	**Walk**	**PNR**	**KNR**	**Total**	**Walk**	**PNR**	**KNR**
Foxborough	261	194	48	20	370	258	79	33	393	278	81	34
Walpole	62	2	43	18	105	4	72	30	92	2	64	27
Mansfield	40	0	28	12	64	0	45	19	68	0	48	20
Sharon	29	0	21	9	52	0	37	15	53	0	38	16
North Attleborough	27	0	19	8	41	0	29	12	44	0	31	13
Wrentham	22	0	15	6	36	0	25	11	37	0	26	11
Franklin	20	0	14	6	30	0	21	9	29	0	20	8
Norton	17	0	12	5	25	0	18	7	26	0	19	8
Easton	16	0	11	5	25	0	17	7	25	0	18	7
Attleborough	11	0	11	0	14	0	14	0	15	0	15	0
Norfolk	15	0	10	4	25	0	18	7	24	0	17	7
Plainville	12	0	9	4	19	0	14	6	20	0	14	6
Medfield	8	0	6	2	13	0	9	4	12	0	9	4
Bellingham	7	0	5	2	10	0	7	3	11	0	8	3
Taunton	5	0	5	0	5	0	5	0	5	0	5	0
Millis	5	0	3	1	7	0	5	2	8	0	5	2
Other	40	0	37	3	61	0	60	2	63	0	61	2
TOTAL	**637**	**196**	**334**	**107**	**963**	**262**	**533**	**168**	**990**	**279**	**540**	**170**

PNR indicates "Park and Ride": KNR indicates "Kiss and Ride"
Source: CTPS Regional Travel Demand Model (April 2010)

The Foxborough drive access market is expected to be more broad and far reaching than other existing park and ride lots in the MBTA system because, unlike nearly every other park and ride lot in the MBTA commuter rail system, the Foxborough lot will offer free parking with virtually unlimited capacity.

Because the expected future commercial development near the station will be significant, there will be a small reverse commute phenomenon whereby employees in or near the urban core use the new commuter rail service to access employment in Foxborough.

However, this flow is expected to be relatively small.

Table 5.3.1 show forecasts for the upper bound demographic forecast. Foxborough residents represent the largest market segment using the station, with other market segments feeding the proposed station roughly according to their proximity to the new station. Table 5.3.2 shows predictions for the lower bound demographic forecasts.

Table 5.3.2:
Lower Bound Forecast of Foxborough Station Boardings
By Town of Origin and by Sub-Mode

SCENARIO	Option A				Option B				Option C			
Town of Origin	**Total**	**Walk**	**PNR**	**KNR**	**Total**	**Walk**	**PNR**	**KNR**	**Total**	**Walk**	**PNR**	**KNR**
Foxborough	75	8	48	20	122	10	79	33	126	11	81	34
Walpole	62	2	43	18	105	4	72	30	92	2	64	27
Mansfield	40	0	28	12	64	0	45	19	68	0	48	20
Sharon	29	0	21	9	52	0	37	15	53	0	38	16
North Attleborough	27	0	19	8	41	0	29	12	44	0	31	13
Wrentham	22	0	15	6	36	0	25	11	37	0	26	11
Franklin	20	0	14	6	30	0	21	9	29	0	20	8
Norton	17	0	12	5	25	0	18	7	26	0	19	8
Easton	16	0	11	5	25	0	17	7	25	0	18	7
Attleborough	11	0	11	0	14	0	14	0	15	0	15	0
Norfolk	15	0	10	4	25	0	18	7	24	0	17	7
Plainville	12	0	9	4	19	0	14	6	20	0	14	6
Medfield	8	0	6	2	13	0	9	4	12	0	9	4
Bellingham	7	0	5	2	10	0	7	3	11	0	8	3
Taunton	5	0	5	0	5	0	5	0	5	0	5	0
Millis	5	0	3	1	7	0	5	2	8	0	5	2
Millis												
	40	0	37	3	61	0	60	2	63	0	61	2
TOTAL	**451**	**10**	**334**	**107**	**715**	**14**	**533**	**168**	**723**	**13**	**540**	**170**

Source: CTPS Regional Travel Demand Model (April, 2010)

Table 5.3.3 shows modeled boardings by station for the base year, the forecast year no-build and for the forecast year build options, A, B and C. As can be seen in the table the outer stations on the Franklin line—Forge Park, Franklin and Norfolk—experience a decrease in boardings in options A, B and C. This occurs because service levels decrease slightly at these outer stations as service levels for the shuttle and for the Foxborough line is increased. Likewise, Mansfield and Sharon also experience a slight decrease as shuttle and Foxborough line service levels are increased across the options.

In the build options, the stations between Walpole and Readville experience varying levels of demand. These variations in demand are driven by the corresponding level of service those stations receive under the respective build service plans. The primary factors that influence demand at the stations in this stretch of the line are fare, parking fees, runtimes to Boston and headway. Walpole sees a significant increase in ridership in

option A over the future year no-build because of the shuttle service to and from Walpole in option A. That increase in ridership is dissipated somewhat in options B and C because the shuttle serves other stations or is absent in those options.

See Table 5.3.3 for a summary of the forecast daily boardings at Foxborough and the new transit riders.

Table 5.3.3:
Upper Bound Weekday Boardings at Foxborough

Service Option	Daily Foxborough Boardings	New Daily Transit Riders
Option A	637	100
Option B	963	940
Option C	990	1,100

5.3.1 Regional Parking Demand

Drive access demand (both park and ride and kiss and ride) is a subset of total demand for a given transit station. Thus, drive access demand for a given station is tied to overall demand for that station. With regard to the Franklin line outer stations of Forge Park, Franklin and Norfolk, demand for parking at those stations will experience a corresponding decrease in lock step with the overall decrease for demand at those stations because of improved service to and from Foxborough. Likewise, the parking demand at Mansfield and Sharon will also be siphoned because of improved service to Foxborough.

Table 5.3.4:
Upper Bound Station Boardings

Station Name	Daily 2009 Boardings			2030 No-build Boardings			2030 Option A Boardings			2030 Option B Boardings			2030 Option C Boardings		
	Total	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**
Forge park/I-495	620	620	na	920	920	na	880	880	na	750	750	na	770	770	na
Franklin	610	610	nm	820	820	nm	750	750	nm	620	620	nm	660	660	nm
Norfolk	740	740	nm	720	720	nm	600	600	nm	560	560	nm	600	600	nm
Foxboro	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**880**	**880**	**na**	**990**	**990**	**na**
Walpole	670	670	nm	1,050	1,050	nm	1,640	1,520	120	1,270	1,170	100	980	980	nm
Plimpton	10	10	nm	10	10	nm	10	10	nm	10	10	nm	10	10	nm
Windsor	300	300	nm	550	550	nm	580	580	nm	630	630	nm	700	700	nm
Norwd.Cen.	870	870	nm	990	990	nm	970	970	nm	1,040	1,010	30	1,060	1,030	30
Norwd.Dep.	300	300	nm	400	400	nm	440	440	nm	490	480	10	520	500	20
Islington	130	120	10	230	220	10	230	230	10	270	260	10	270	260	10
Dedham Cp.	520	520	nm	740	740	nm	750	750	nm	850	810	40	870	820	50
Endicott	240	240	nm	330	330	nm	340	340	nm	400	400	nm	380	380	nm
Readville-Franklin	250	250	nm	250	250	nm	210	210	nm	230	200	30	320	290	30
Fairmount	170	170	nm	120	120	nm	130	130	nm	70	70	nm	140	140	10
Blue Hill Ave	na	na	na	na	150	na	na	150	na	100	100	na	160	160	10
Morton St.	130	130	nm	150	150	nm	150	150	nm	120	120	nm	160	160	20
Talbot Ave	na	na	na	na	60	na	na	60	na	50	50	na	60	60	na
Four Corners	na	na	na	na	40	na	na	40	na	50	50	na	60	60	na
Uphams Cnr	70	70	nm	70	70	nm	70	70	nm	70	70	nm	80	80	10
New Market	na	na	na	na	50	na	na	50	na	40	40	na	50	50	20
Providence	1,490	1,490	na	2,250	1,980	270	2,250	1,980	270	2,250	1,980	270	2,250	1,980	270
S.Attleboro	1,280	1,270	10	2,010	1,990	20	2,010	1,990	20	2,000	1,980	20	2,000	1,980	20
Attleboro	1,270	1,250	20	1,530	1,490	40	1,520	1,480	40	1,500	1,460	40	1,500	1,460	40
Mansfield	1,560	1,520	40	1,500	1,450	50	1,430	1,380	50	1,430	1,380	50	1,390	1,340	50
Sharon	900	860	40	880	830	50	850	800	50	850	800	50	840	790	50
Stoughton	1,030	1,030	na	1,120	1,120	na	1,120	1,120	na	1,120	1,120	na	1,120	1,120	na
Canton Ctr.	560	560	nm	780	780	nm	780	780	nm	780	780	nm	780	780	nm
Canton Jct.	1,400	1,370	30	1,350	1,310	40	1,350	1,310	40	1,350	1,310	40	1,350	1,310	40
Route 128	1,320	1,270	50	3,220	3,140	80	3,220	3,140	80	3,220	3,140	80	3,220	3,140	80
Hyde Park	600	570	30	630	590	40	630	590	40	630	590	40	630	590	40
Foxborough Shuttle															
Foxboro	na	na	na	na	na	na	640	640	na	80	80	na	na	na	na
Walpole	na	na	na	na	na	na	720	120	600	80	na	80	na	na	na
Windsor	na	na	na	na	na	na	120	20	100	na	na	na	na	na	na
Norwd.Cen.	na	na	na	na	na	na	100	10	90	na	na	na	na	na	na

Table 5.3.4:
Upper Bound Station Boardings

Station Name	Daily 2009 Boardings			2030 No-build Boardings			2030 Option A Boardings			2030 Option B Boardings			2030 Option C Boardings		
	Total	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**
Ruggles-Total	1,020	120	900	1,210	160	1,050	1,260	170	1,090	1,250	150	1,100	1,250	160	1,090
Back Bay-Total	6,280	250	6,030	8,150	520	7,630	8,320	520	7,800	8,520	890	7,630	8,690	850	7,840
S.Station Total	10,190	na	10,190	13,780	na	13,780	13,660	na	13,660	14,460	na	14,460	14,560	na	14,560
Foxboro-Total	na	na	na	na	na	na	1,580	790	790	160	80	80	na	na	na
Other Existing Stations	17,210	16,980	230	22,680	22,380	600	22,990	22,580	720	23,770	22,960	810	24,020	23,290	810
Corridor Total	**34,530**	**17,180**	**17,350**	**45,760**	**23,000**	**23,060**	**47,730**	**23,980**	**24,060**	**48,020**	**23,940**	**24,080**	**48,420**	**24,200**	**24,290**

nm = not modeled

Table 5.3.5 compares 2010 parking supply with forecast 2030 parking demand to show excess demand forecast by station. In the No-Build (Do-Nothing) condition a deficit of 1,084 parking spaces is forecast among stations in the study area. The forecast change in ridership patterns with an investment in Foxborough service would be expect to reduce overall parking demand at study area stations by 330 spaces and reduce excess demand by 286 spaces each weekday. The changes in excess demand (e.g. reduction in overcrowd parking lots) is expected to be greatest west of Walpole where some passengers substitute plentiful low free parking at Foxborough for scarce expensive parking at Forge Park, Franklin and Norfolk. A similar smaller effect is forecast at Sharon and Mansfield Stations along the NEC.

Table 5.3.5
Forecast Parking Demand

Station	2010 Parking Supply	2030 Demand Forecast	2030 Parking Demand	Percent Parking	Excess Parking Demand	Option B Change In Total Demand	Option B Change In Excess Demand
Forge park/I-495	716	1,100	910	83%	194	-170	-170
Franklin	232	890	275	31%	43	-200	-43
Norfolk	495	730	540	74%	45	-160	-45
Walpole	360	1,075	800	74%	440	40	30
Norwood Central	675	1,005	795	79%	120	20	16
Norwood Depot	221	400	220	55%	0	80	44
Islington	39	225	50	22%	11	40	9
Dedham	497	670	430	64%	0	70	3
Endicott	50	350	75	21%	25	70	15
Readville	354	490	365	74%	11	-50	-11
Fairmount	52	365	125	34%	73	-50	-50
Mansfield	805	1,500	855	57%	50	-70	-50
Sharon	603	905	675	75%	72	-30	-30
Total	5,104	9,705	6,120	63%	1,084	-330	-286

5.4 Foxborough Park and Ride Lot Fee Sensitivity Testing

The study assumed that parking at the new Foxborough station park and ride lot would be free of charge. The developer, The Kraft Group, has asserted that parking would be free, at least initially, and that there would be a virtually unlimited amount of parking made available for commuter rail usage on non-event days.

When travel costs decline, mobility tends to increase. Similarly, when travel costs increase, mobility tends to decrease. Price changes can have a variety of impacts on travel, affecting the number of trips people make, their destination, route, mode, travel time, type of vehicle (including size, fuel efficiency and fuel type), parking location and duration, and which type of transport services they choose. Even a small price difference can have a large effect on travel decisions, particularly if consumers have many competitive options. For example, in an area with many destination and travel options, modest parking fees can significantly affect where and how people travel.

If a parking fee were assumed at the new Foxborough park and ride lot, many travelers from communities further away from Foxborough would likely no longer use the Foxborough park and ride lot because parking would still be available at existing commuter rail stations, such as Walpole, Mansfield, and Sharon. A two-dollar fee could reduce Park and Ride use at the proposed Foxborough Station by 20%, and a four-dollar fee could reduce Park and Ride traffic by up to 45%.

5.5 Fare Revenue Estimates (Upper Bound)

CTPS examined how the fare revenue the MBTA normally collects would change, if the proposed Foxborough station was made a full time stop. Table 5.5.1 presents the results of this analysis for the upper bound scenarios. The fare revenue presented assumes a mix of cash fare and discounts associated with monthly passes, students, and seniors, based upon current MBTA fare and revenue data. In all instances, revenue from the bus mode declines, but is more than off set by an increase in revenue on the commuter rail and rapid transit modes. As would be expected Option A produces the smallest change in typical weekday fare revenue, about $550, with Options B and C producing greater changes in fare revenue, between $6,809 and $7,905 per weekday, respectively.

Parking revenue was included in the modeling work but was not itemized in this analysis given the varying ownership of parking lots in the study area. The analysis did show that parking usage at nearby commuter rail stations experienced minor reductions in demand, which would likely result in reductions in parking revenue for the MBTA.

Using a standard annualization factor of 293 weekday equivalents per year, the total revenue gain from Option A would be $161,000 with much larger gains of $2.0 million to $2.3 million for Options B and C respectively.

Table 5.5.1:
Typical Weekday Passenger Fare Revenue for the Upper Bound Scenario

Daily Boardings Fare Revenue (in 2009 $)	2009 Base	2030 No-build	Change from Base	Option A	Change from NB	Option B	Change from NB	Option C	Change from NB
Commuter Rail	$ 454,349	$ 592,537	30%	$ 593,251	$ 714	$ 599,816	$ 7,279	$ 601,010	$ 8,473
avg CRR fare	$ 4.08	$ 4.14		$ 4.13		$ 4.13		$ 4.12	
Rapid Transit Line	$ 835,536	$ 958,672	15%	$ 958,745	$ 73	$ 959,379	$ 707	$ 959,234	$ 562
avg RTL fare	$ 1.04	$ 1.04		$ 1.04		$ 1.04		$ 1.04	
Bus	$ 269,100	$ 326,033	21%	$ 325,796	$ (237)	$ 324,856	$ (1,177)	$ 324,903	$ (1,130)
avg Bus fare	$ 0.75	$ 0.79		$ 0.79		$ 0.79		$ 0.79	
Ferry	$ 19,052	$ 22,516	18%	$ 22,516	$ -	$ 22,516	$ -	$ 22,516	$ -
avg Ferry fare	$ 4.33	$ 4.33		$ 4.33		$ 4.33		$ 4.33	
Ride	$ 1.90	$ 2.4	25%	$ 2.4	$ -	$ 2	$ -	$ 2	$ -
avg Ride fare	$ 2.00	$ 2.00		$ 2.00		$ 2.00		$ 2.00	
Total	$ 1,578,039	$ 1,899,760	20%	$ 1,900,310	$ 550	$ 1,906,570	$ 6,809	$ 1,907,665	$ 7,905
avg total fare									

* Foxboro parkings is assumed to be free in option 1,2 & 3.

5.6 Local Street Traffic Impacts (Upper Bound)

Studying the highway assignments and traffic patterns for each option, CTPS developed a local roadway traffic impact analysis for the AM peak period (6:00 AM to 9:00 AM). With the regional model it is possible to identify roadways that passengers boarding at the new Foxborough commuter rail station would likely use to reach the station. Based on an examination of drive access routes, CTPS determined that the road segments with the greatest increase in traffic volumes would be: southbound Route 1 (just north of the Water/North Street intersection), northbound Route 1 (south of Patriot Place), eastbound Water Street (at its intersection with Route 1) and westbound North Street (at its intersection with Route 1).

Table 5.6.1 summarizes the forecast traffic impacts at these four locations. It is notable that local peak traffic is expected to increase by 72% of the next twenty years without the new service. The new commuter rail service would be expected to add 3% to 5% more peak traffic to local roadways over the no-build condition. Table 5.6.1 also shows that on a percentage basis, westbound North Street, where it approaches Route 1 in Foxborough, can be expected to see the largest increase in traffic volumes. All of that increase on westbound North Street would be turning left/south onto Route 1 in the AM peak period. Northbound Route 1 would see the smallest increase in traffic on a percentage basis.

All of the traffic volume presented in Table 5.6.1 is destined to the new station; however, a certain portion of that traffic volume is composed of kiss and ride trips and would thus be leaving the station after dropping off a passenger or passengers. This from-the-station kiss and ride traffic would also contribute to increased traffic volumes on local roadways, but these increases would, in all cases, be smaller than the to-the-station volumes listed in Table 5.6.1. In the PM peak period (3:00 PM to 6:00 PM) traffic impacts due to project implementation and

station construction would be a mirror image of the AM peak period traffic impacts—traffic would be utilizing the same routes except that it would be traveling away from the station.

Table 5.6.1:
Four Local Street Locations Examined for Traffic Impacts in the Upper Bound Scenario
Three Hour AM Peak Traffic Counts

Locations	2009	2030 No Build	Option A	% Growth	Option B	% Growth	Option C	% Growth
Southbound Route 1	2,035	3,500	3,615	3.2%	3,730	6.2%	3,709	5.6%
Northbound Route 1	3,790	6,525	6,628	1.6%	6,688	2.4%	6,702	2.6%
Eastbound Water St	790	1,360	1,412	3.7%	1,438	5.4%	1,434	5.1%
Westbound North St	1,045	1,800	1,914	6.0%	1,972	8.7%	1,980	9.1%
Total	**7,660**	**13,185**	**13,569**	**384**	**13,828**	**643**	**13,825**	**640**
% Change		**72%**		**3%**		**5%**		**5%**

5.7 Air Quality Analysis

Using the same methods employed for the most recent Boston Metropolitan Planning organization air quality conformity determination CTPS conducted an air quality analysis for the project. The air quality analysis forecasts on-road emissions inventories for all vehicular traffic, including as transit services, such as commuter rail, that have their own right-of-way. The pollutants examined include:

- Volatile Organic Compounds (VOC),
- Nitrous Oxide (NOx), and
- Carbon Dioxide (CO_2).

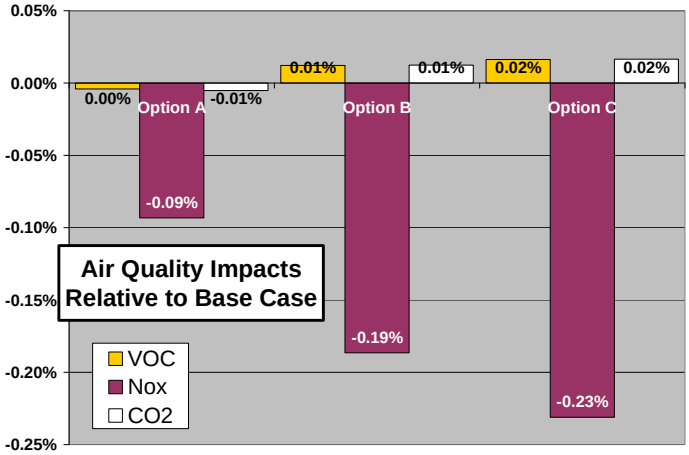


Figure 5.7.1

This analysis was conducted for each build option for the upper bound scenario using MOBILE 6.2, the latest air quality model provided by the Environmental Protection Agency. The analysis showed between 2009 and the forecast year of 2030 emissions are expected to decrease primarily due to the introduction of cleaner vehicles. Forecasts for Options A, B, and C show further improvement in air quality due to auto diversions. However, transit emissions trend

upward because of the additional revenue miles associated with increased service in the forecast year and with the build options. Overall, the predicted air quality impacts tend to be positive with respect to Carbon Dioxide and Volatile Organic Compounds but negative with respect to Nitrous Oxide.

Table 5.7.1:
Air Quality Analysis

		Upper Bound - Based on Full Build Land Use							
MBTA Daily VMT/Air Quality Analysis	2009 Base	2030 No-build	Change from Base	Option A	Change from NB	Option B	Change from NB	Option C	Change from NB
Vehicle Trips Assigned									
auto	11,985,100	14,206,600	19%	14,206,500	-100	14,205,700	-900	14,205,550	-1,050
Vehicle Miles of Travel									
auto	107,871,000	125,490,500	16%	125,488,400	-2,100	125,466,200	-24,300	125,461,100	-29,400
Vehicle Hours of Travel									
auto	3,349,900	4,211,300	26%	4,211,230	-70	4,210,485	-815	4,210,313	-987
Average Speed									
auto	32.20	29.8	-7%	29.8		29.8		29.8	
VOC (kilogram)	47,364.8	24,596.2	-48%	24,596.4	0.2	24,592.8	-3.4	24,592.1	-4.1
auto	47,032	24,094	-49%	24,094	-0.4	24,090	-4.7	24,089	-5.6
transit	333	502	51%	502.6	0.6	503.3	1.3	503.6	1.6
Nox (kilograms)	125,433.1	24,659.5	-80%	24,682.4	22.9	24,705.0	45.5	24,716.5	57.0
auto	119,521	19,577	-84%	19,576	-0.3	19,573	-3.8	19,572	-4.6
transit	5,912	5,083	-14%	5,106.2	23.2	5,132.3	49.3	5,144.6	61.6
CO2	60,443,922.2	71,911,450	19%	71,915,180.1	3,729.9	71,902,539.5	-8,910.7	71,899,635.5	-11,814.7
auto	60,046,392	71,454,291	19%	71,453,095	-1,195.7	71,440,454	-13,836.4	71,437,550	-16,740.4
transit	397,530	457,160	15%	462,085.2	4,925.7	462,085.2	4,925.7	462,085.2	4,925.7

* Foxboro parkings is assumed to be free in option 1,2 & 3.

CHAPTER 6: EVALUATION OF ALTERNATIVES

Introduction

Chapter 4 identified three full time service development options for Foxborough station, each option was studied relative to costs, benefits and impacts. Prior to the development of these alternatives, the Project Steering Committee agreed upon a set of evaluation measures, as presented in Table 3.2.1. These include a mix of factors, based largely upon:

- The MBTA's Program for Mass Transportation (PMT) and the specific criteria used therein to evaluate potential System Enhancement and Expansion projects.
- Factors considered by EOHED to be desirable characteristics for designated Growth Districts
- Other measures affecting the State of Good Repair and operational effectiveness of MBTA operations.

The evaluation measures to be applied in the assessment of Foxborough Commuter Rail alternatives include both quantitative and qualitative measures. Quantitative measures are based on the travel demand modeling process used to develop projected ridership and other outputs for the study, as well as the capital and operating cost estimates developed for each of the alternatives. Other measures are more qualitative in nature, and are based on known conditions along the rail corridor, including demographics, land use plans and environmental conditions. For these more qualitative measures, the assessment involved developing a High, Medium or Low rating to characterize the relative benefit of each of the three alternatives. These qualitative assessments are intended to help judge the overall effectiveness of each of the alternatives in meeting project goals, and are not intended to be used to compare the effectiveness of these alternatives with other potential MBTA improvements.

The methodology used to apply each of the approved evaluation measures is detailed below, along with the individual assessment results. An overall summary of this evaluation is provided in Table 6.12.1 at the end of this chapter.

As previously documented, there are several inherent capacity issues in the MBTA's existing Southside network on which Foxborough station is located. These issues limit service levels on the network, including terminal capacity at South Station, Northeast Corridor capacity, existing equipment maintenance schedules, and existing MBTA commuter rail equipment cycles. It is important to note that while the criteria developed here do not reflect the inherent capacity limitations on the system, the Commonwealth of Massachusetts and the MBTA must determine whether dedicating its limited Southside network capacity to fulltime Foxborough service is the best use of these finite transportation resources.

Table 6.1.1:
Evaluation Criteria for Foxborough Commuter Rail Service

PMT CRITERIA	*DESCRIPTION*	*MEASURE*
Regional Transportation Impacts	Projected number of weekday boardings on Foxborough commuter rail service	# passengers
	Projected number of passengers diverted from auto mode, systemwide (new transit riders)	# passengers
	Projected % increase in weekday transit mode share, systemwide	% increase
	Projected reduction in weekday auto vehicle miles traveled, regionwide	miles
	Projected reduction in VOC, NOx, CO and CO_2 emissions	tons
System Configuration	Expansion of transit access to geographical areas underserved by transit	Hi-Med-Low
Expediency	Improvements to service frequency (net # additional peak hour inbound rail trips)	# train trips
	Increase in travel speed; time savings for all rail users in the corridor	minutes
Fairness/Elimination of Travel Barriers	Elimination of barriers to efficient travel between key destinations and neighborhoods with substantial minority or low-income population (# peak period trains in reverse-peak direction)	# trains
	Provision of benefits that outweigh burdens in neighborhoods with substantial minority or low-income populations	Hi-Med-Low
Job Accessibility	Expansion of access to major activity centers (% increase in number of industrial, retail and service jobs within a 65 minute transit trip	% increase in jobs
Land Use Impacts/Consistency w/ Local Goals	Consistency with local plans promoting TOD and sustainable land use patterns	Hi-Med-Low
	Contribution to brownfield and infill development	Hi-Med-Low
OTHER CRITERIA	DESCRIPTION	MEASURE
Job Opportunities	Potential for reverse commute /access to jobs (# peak hour trains in reverse-peak direction)	Hi-Med-Low
Fairness to Existing Neighbors	Traffic (and air quality impacts) within traffic analysis zones	% increase VMT
	Ability to limit noise impacts in neighborhoods adjacent to ROW	Hi-Med-Low
Community Enhancement	Assesses whether alternatives would have a positive impact on future residential growth	Hi-Med-Low
Environmental Sensitivity/Land Reuse	Ability to limit environmental impacts and preserve open space.	Hi-Med-Low
	Ability of project to re-use land or avoid development on previously undisturbed land.	Hi-Med-Low
State of Good Repair Benefits	Involves replacement of aging assets or provides critical infrastructure	Hi-Med-Low
Systemwide Operational Benefits	Secondary benefits in terms of layover space, operational flexibility, system capacity, etc.	Hi-Med-Low
Capital and Operating Cost Effectiveness	Total Capital Cost (for fixed assets such as land, track, stations, etc.)	$
	Capital Cost per New Transit Trip	$/trip
	Net Operating Cost (operations less incremental fare and parking revenues)	$
	Net Operating Cost per New Transit Trip	$/trip

6.1 Regional Transportation Impacts

Methodology

Regional Transportation Impacts utilize outputs from the regional travel demand model to identify the number of transit riders using the new service, the number of new transit riders (or those diverted from automobile), and the impacts on regional mode share and emissions. Essentially, this section summarizes Chapter 5 which summarizes projected ridership and other model results in more detail.

Evaluation

The number of passengers boarding each weekday at the new Foxborough Station ranges is lowest under Option A, with 637 boardings, and significantly higher but similar under Options B and C, with 963 and 990 boardings, respectively[111]. Only 100 of the passengers boarding at a new Foxborough Station under Option A represent new transit riders, or those diverted from automobile to transit due to the attractiveness of the new service. The number of new transit riders is significantly higher under Options B and C, with 940 and 1,100 respectively. These diversions from auto to transit represent fairly small changes (1.2% to 3.5%) in transit mode share for trips originating in the Foxborough station area[112].

The impacts on regional VMT (or vehicle miles of travel) and regional emissions are also relatively small for all three of the alternatives.

In summary, the number of passengers boarding at a new Foxborough station and the number of new weekday transit riders under each alternative are considered the critical factors related to this measure. The shift in transit mode share in the Foxborough station area, as well as daily VMT and air quality impacts, are relatively small when viewed on a regional basis. Due to the quantitative nature of these factors, no overall rating is provided (see Table 6.1.2).

Table 6.1.2:
Regional Transportation Impacts

Measure	Option A	Option B	Option C
Average Weekday Boardings at new Foxboro Sta	637	963	990
New Transit Riders – Daily	100	940	1,100
% increase in non-auto commutes (transit mode share) from Foxboro	1.2%	3.0%	3.5%
Reduction in daily VMT	Less than 0.002%	Less than 0.020%	Less than 0.024%
Air quality / Changes in emissions of VOC, NOx and CO2	Less than 0.02% change in emissions for all factors		

[111] For comparison purposes, boarding levels under Option A are similar to 2009 daily boardings at Canton Center (600), Dedham Corporate (562) and Readville (506); boarding levels under Options B and C are similar to 2009 boardings at Walpole (802), Norwood Central (1,040) and Sharon (1,061). Source: MBTA.

[112] Based on projected changes in mode share in Traffic Analysis Zone 2417, which includes the area around Foxborough Station and bounded roughly by Route 1, Route 140 and North Street.

6.2 System Configuration

Methodology

This evaluates the ability of each alternative to improve system connectivity and minimize the need for transfers. The evaluation focuses on potential new connections between downtown Boston and Foxborough. South Station and Back Bay Station in downtown Boston are considered key destinations for Foxborough travelers, providing connections to the Red Line, Silver Line, Orange Line and Amtrak intercity rail. Particular emphasis is placed on whether service is provided to Back Bay Station, a key downtown destination, and whether trips to Boston require a transfer, which involves a "time penalty" limiting the attractiveness and convenience of the transit trip.

The measure of System Configuration also considers the impact on accessibility for persons with disabilities living in the Foxborough area. Currently, accessible rail stations in the Foxborough vicinity include Forge Park, Norfolk and Norwood Central on the Franklin Branch, and Attleborough and Mansfield on the Providence line. There is also a mini-high platform at Foxborough station, providing accessibility for individuals with disabilities using the station during Gillette Stadium game-day operations. Walpole Station currently provides only low-platform boarding and is not accessible.

Evaluation

With 40 daily trains, Option A provides the greatest number of connections between Foxborough and Boston. However, passengers would be required to transfer in Walpole or Norwood to connect with Franklin line service and travel to downtown Boston.

Option B provides 34 daily trains between Foxborough and Boston. A total of 26 trains (or 13 roundtrips) would provide direct service to Boston without a transfer, but would not serve Back Bay Station. Eight (8) trains operating at peak times and requiring a transfer in Walpole, would serve both Back Bay and South Station. Option C provides 32 direct trains between Foxborough and South Station, with no direct access or timed transfers providing access between Back Bay and Foxborough.

In terms of accessibility, all three alternatives would provide full weekday service from the accessible station located in Foxborough. Options B and C would enhance the level of accessibility at Foxborough station with a full high level island platform. Options A and B would also involve reconstruction of Walpole Station with a full high-level center platform, thereby providing two additional fully accessible stations in the Foxborough area with weekday commuter rail service.

In summary, all options meet minimum MBTA service standards with at least three peak-period trips serving downtown Boston. However, there are trade-offs related to their relative effectiveness in terms of Systems Configuration (see Table 6.3.1). This is largely because two of the key evaluation factors – access to Back Bay and whether transfers are required – are mutually exclusive. Option A has the greatest number of trains, serving both Back Bay and South Station with 20 daily roundtrips, but a transfer is required for all trips. Option C has the fewest number of trains and no Back Bay connections, yet provides 16 direct roundtrips between Foxborough and South Station without a transfer. Option B represents the middle-ground, offering Back Bay

access during peak periods (with a transfer) and direct service to South Station during the off-peak.

Options A and B offer a higher level of regional accessibility by providing two additional fully accessible stations to the commuter rail network, in both Foxborough and Walpole. Option C would provide fulltime weekday commuter rail service from only one additional accessible station in Foxborough.

None of the alternatives is given a high rating, as none provide full direct service between Foxborough and both downtown stations without a transfer. Option C is rated lower than Options A and B due to the lower number of daily trains, the inability to access Back Bay, and the fact that it provides only one additional access point for the mobility impaired.

Table 6.3.1:
System Configuration

MEASURE	Option A	Option B	Option C
Expansion of transit access to Foxborough (# weekday trains to Boston)	40 daily trains 4 AM peak trips 4 PM peak trips	34 daily trains 4 AM peak trips 5 PM peak trips	32 daily trains 4 AM peak trips 4 PM peak trips
Transfers required to access key destinations (South Station and Back Bay)?	All Foxborough passengers must transfer in Walpole; almost all trips (37) serve Back Bay	Peak period service (8 trains) requires transfer, but serves both Back Bay and South Station. Off-peak service is direct, but these 26 trains serve South station only.	All trains provide direct service to South Station, without transfer, but no Back Bay service is provided.
Expanded access for individuals with disabilities	Access from mini-high platform in Foxborough	Access from full high-level island platform in Foxborough	Access from full high-level island platform in Foxborough
	Walpole Station becomes fully accessible.	Walpole Station becomes fully accessible.	No change
RATING:	Medium	Medium	Low

6.3 System Expediency

Methodology

This measure evaluates improvements to the frequency of transit services on existing lines, savings in travel time for all travelers in the region, and the ability of each alternative to reduce the automobile travel time advantage. The alternatives under consideration use one or both of two existing commuter rail lines, the Franklin and/or Fairmont branches. Schedule adjustments made to accommodate a new Foxborough Station vary under each of the alternatives and are evaluated below. Impacts to travel time for commuters within the region are evaluated based on the results of the regional travel demand model used to identify ridership and travel patterns for this study.

Evaluation

The only new commuter rail services operated under Option A are the shuttle trains running along the Framingham Secondary between Foxborough and Walpole. There would be no change in service frequency at existing stations, and only minor adjustments to the existing Franklin Branch schedule to accommodate the transfer in Walpole.

Under Options B and C, some or all Fairmont Branch trains are extended to serve Foxborough station. Trains extended from Fairmont would operate in a skip-stop manner along the Franklin Branch, providing varying levels of additional service at existing stations. Under Option C, an additional trainset would also be added to further supplement this service. Norwood Central and Dedham Corporate stations would see a significant increase in peak period trips under either scenario. Walpole would be served by three additional inbound trains in the AM peak but, due to scheduling complexities, would have AM peak service reduced by one train under Option C. This would reduce inbound AM peak period service from Walpole from its current six train schedule to five, but would still meet minimum MBTA service standards for peak period service with at least three trains.

Implementation of Option A would be the only alternative resulting in overall time savings for commuter rail users in the corridor southwest of Boston, with an average of 0.7 minutes saved per traveler. This represents a travel time savings of 2 percent for rail users in the corridor, based on a projected average travel time of 28.7 minutes in 2030.

Implementation of Option B or C would be anticipated to increase average trip time for those traveling in the corridor, by a little over three minutes, or about 11 percent. This increase is due to the attraction of free parking offered at Foxborough station, causing certain commuters to drive out of their way to save $4/day in parking fees (or an estimated $1,000 annually for each regular commuter). Additionally, with extra trains on the line under Options B and C, the commuter rail running time into downtown becomes longer, adding to the travel time burden for existing riders.

In summary, there are again trade-offs with each of the alternatives under consideration. Option A would not increase service frequency on existing lines, but is the only option resulting in a time savings for commuters. Options B and C provide a significant amount of additional service to Norwood Central and Dedham Corporate, provide more weekend service on the Franklin Branch, and introduce weekend service on the Fairmont Branch. However, both have a negative impact on travel time in the corridor. As shown in Table 6.3.2, all three alternatives are given a medium rating, reflecting the trade-offs in benefits.

Table 6.3.2:
System Expediency

Measure	Option A	Option B	Option C
Additional peak hour trips at:			
Walpole station	None	+3 AM trips	-1 AM trip
Norwood Station	None	+3 AM trips / +2 PM trips	+4 AM trips / +2 PM trips
Dedham Corporate	None	+3 AM trips	+4 AM trips / +3 PM trips
Expanded weekend service on existing lines	None	New weekend service on Fairmont Line; More weekend trips on Franklin Line.	New weekend service on Fairmont Line; More weekend trips on Franklin Line.
Change in avg. trip time for all rail users in the corridor	- 0.7 minutes (-2.4 %)	+3.3 minutes (+11.5 %)	+3.1 minutes (+10.8 %)
RATING	Medium	Medium	Medium

6.4 Fairness / Elimination of Travel Barriers

Methodology

This measure is evaluates the ability of each alternative to enhance travel between key destinations and areas with substantial low income or minority populations. US Census 2000 data were used to identify areas in the travel corridor with households earning less than $25,000 as well as those with relatively large minority populations.

As shown in Figures 6.4.1 and 6.4.2, areas with relatively significant numbers of low income households include neighborhoods to the east of the rail line in Franklin Center, neighborhoods in the Walpole Center area, particularly east of the rail line, and areas surrounding Norwood Center. Once the rail corridor enters Boston, north of Readville, there are significant clusters of low income populations along both the Northeast Corridor (Franklin Line) and the Fairmont Branch. As shown in Figure 6.4.2, areas with relatively significant numbers of minority (non-white) residents include the southwestern quadrant of Norfolk and the Windsor Gardens area of Walpole. Again, once the rail corridor enters Boston, there are significant clusters of minority populations along the both potential routes (Northeast Corridor and Dorchester Branch).

These identified populations are all currently served by existing commuter rail stations providing access into downtown Boston and its key employment, medical and educational centers. This measure focuses on the ability of each alternative to provide access between these neighborhoods and the emerging commercial and employment center planned for the Foxborough Station area.

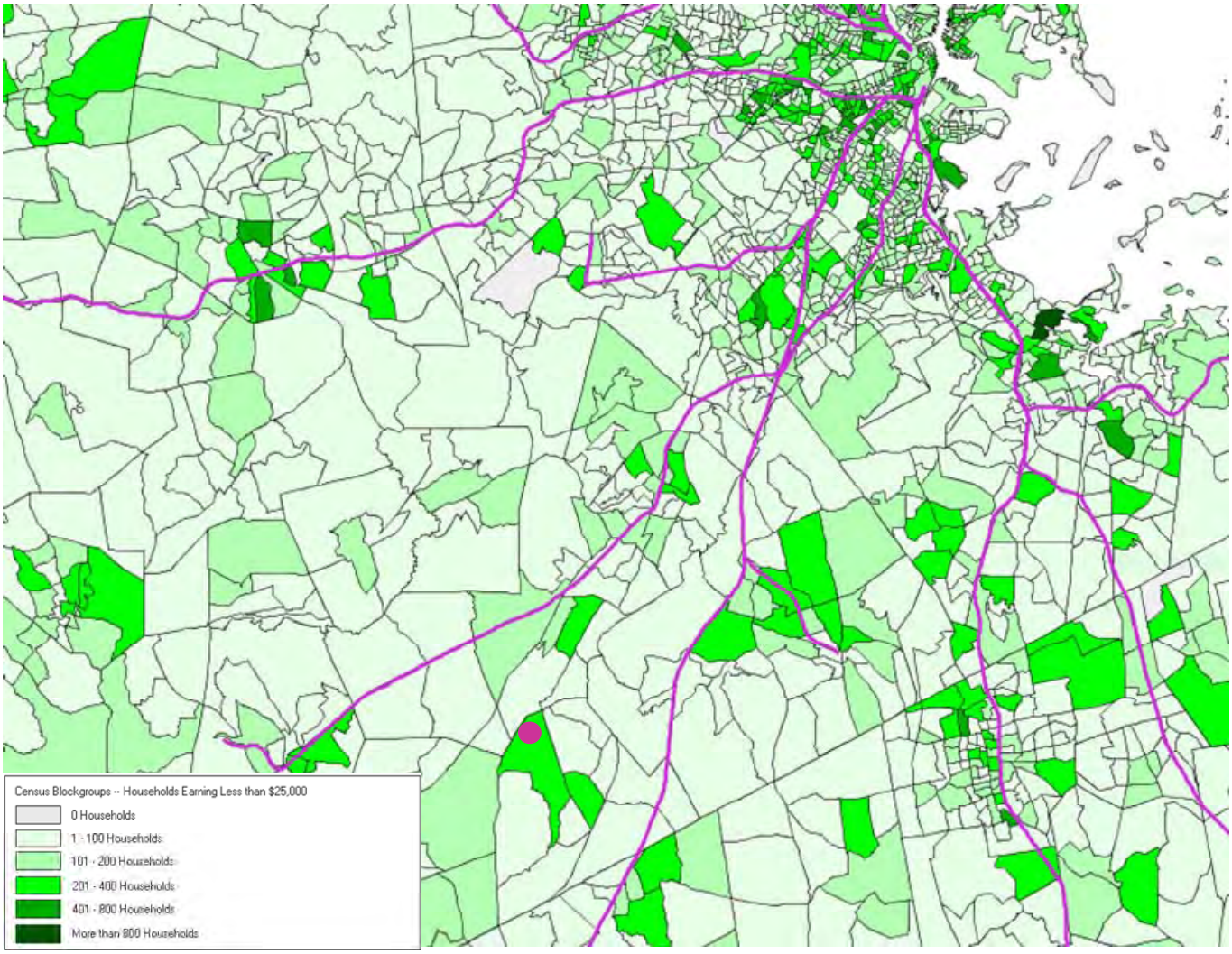


Figure 6.4.1:
Households with Average Annual Income Less than $25,000 (US Census 2000)

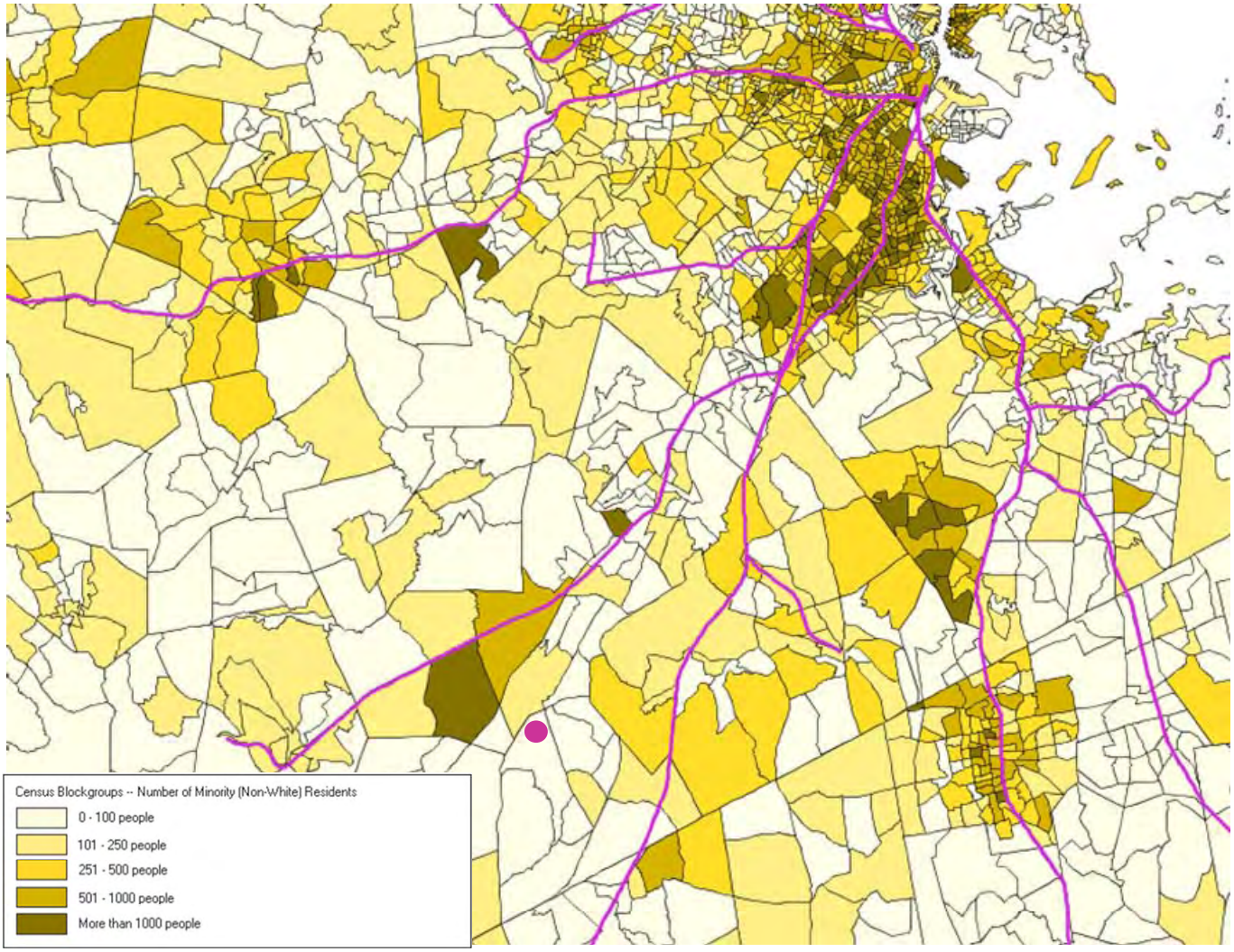


Figure 6.4.2:
Minority Residents (US Census 2000)

Table 6.4.1:
Fairness and Elimination of Travel Barriers to Foxborough Growth District

Neighborhood	Option A	Option B	Option C
Franklin Center/Norfolk	-	1 reverse peak roundtrip via X-fer at Walpole	-
Windsor Gardens	-	2 reverse peak roundtrips to Foxboro.	1 reverse peak roundtrip to Foxboro.
Norwood Center	-	2 reverse *shoulder*-peak roundtrips to Foxboro.	2 reverse peak roundtrips to Foxboro.
Dorchester	-	2 reverse peak round trips serving Foxboro.	3 reverse peak round trips serving Foxboro.
Benefits outweigh burdens?	No impacts	Yes	Yes
RATING:	Low	Medium	High

6.5 Job Accessibility and Opportunities

Methodology

Job Accessibility is a measure used within the MBTA's Program for Mass Transportation (PMT) and is also considered a desirable characteristic within EOHED Growth Districts. This assessment measures the ability of transit improvements to enhance or expand access to major activity centers and employment areas. Based on the Metropolitan Area Planning Council's (MAPC's) future employment projections, there will be an estimated 1.3 million jobs within a 65 minute transit trip of Foxborough Station (including in-vehicle time driving to a transit stop) in the year 2030. The regional travel demand model was used to evaluate the ability of each alternative to increase the range of jobs available within a 65 minute trip. This assessment also considers the potential to support a reverse commute to the potential growth district surrounding Gillette Stadium in Foxborough.

Evaluation

As indicated in Table 6.5.1, each of the Foxborough commuter rail alternatives would significantly expand access to jobs for Foxborough station users. In other words, when full time commuter rail service provides a more convenient access point for Foxborough commuters, the number of jobs within a 65 minute transit trip increases dramatically in the range of 57% to 68%. The ability of each alternative to support a reverse commute between low income and/or minority neighborhoods and the Gillette stadium area was considered under in Table 6.4.1 above, and the assessment results are similar in Table 6.5.1 below.

Option C provides the best opportunity to increase the number of jobs accessible by transit from the Foxborough Station area and to support a reverse commute to access future employment opportunities in the Gillette Stadium area. It is given the highest rating.

Table 6.5.1:
Job Accessibility & Opportunity

MEASURE	Option A	Option B	Option C
Increase in access to jobs within a 65-min. transit trip of Foxborough	57% increase	65% increase	68% increase
Supports "reverse commuters" going to EOHED Growth District?	No	Limited potential	Good opportunity for Dorchester residents; limited potential for other areas.
RATING	Low	Medium	High

6.6 Land Use Impacts / Consistency with Local Land Use Goals

Methodology

This measure evaluates whether the three alternatives are consistent with local planning goals promoting transit-oriented development and sustainable land use patterns, and whether they would contribute to brownfield or infill development. Since transit projects are generally supportive of sustainable land use patterns, this assessment focuses on compatibility with local land use plans and the potential for brownfield or infill development.

The two local communities anticipated to realize potential land use impacts as a result of new commuter rail service would be Foxborough and Walpole. The new service would entail potential station improvements and construction of a train layover facility in Foxborough. In Walpole, reconstruction of the existing commuter rail station is considered under Options A and B. North (east) of Walpole, all new service would use existing right-of-way and station facilities.

Evaluation

Foxborough station is located along the eastern boundary of Foxborough's Economic Development Area Overlay District[113] (see Figure 6.6.1). This Overlay District was established to encourage the innovative and creative office and industrial development, to promote economic development, and to attract desired land uses (professional office and research and development uses) along the Route One corridor.

The existing station, Gillette Stadium parking lots (which would be used for commuter parking), and two of the three potential layover facility sites fall within the boundaries of this Overlay District. A third potential layover site, located east of the right-of-way, would fall just outside the district. At this time, it is assumed that all Foxborough improvements could be designed to fall within the Overlay District, resulting in a high rating for all three alternatives.

The Town of Walpole's Master Plan[114] establishes a goal to revitalize Walpole Center with higher densities of residential and commercial activity. The Master Plan specifically considers the

[113] Town of Foxborough Zoning Bylaws, Section 9.0 Special District Regulations and Appendix A.
[114] Walpole Master Plan and EO 418 Community Development Plan, 2004 – 2024. Master Plan Study Committee and Walpole Planning Board, 2004

existing commuter rail station to be one of several "public assets" that could be leveraged to help implement desired improvements and promote mixed-use or transit-oriented development. The town hopes to establish a Downtown Opportunity Overlay District and to provide a pedestrian link between downtown businesses and the MBTA station, a proposal that might be facilitated by reconstruction of Walpole Station under Option A or B.

In terms of brownfield re-use, the only land development potentially involved with this project, as proposed, would be the construction of a layover site at Foxborough. None of the sites considered for a layover facility are known brownfields. However, the presence of transit has been shown to stimulate increased densities of development, *if local zoning permits*. With both Foxborough and Walpole having developed plans to support increased densities, it is assumed that infill development would occur.

In summary, all options are considered to be consistent with Foxborough's stated land use goals. Additionally, Options A and B support the Town of Walpole's desire to take advantage of its existing commuter rail station to encourage transit oriented development and higher development densities in the downtown area. Option B would do the most to support these goals (see Table 6.6.1), by providing the highest levels of additional peak period rail service and the opportunity to use reconstruction of the station to implement desired design details. Option C is given the lowest rating, as rail traffic through Walpole would increase, without making any additional stops at Walpole Center or without providing the opportunity for station reconstruction in the downtown area.

Table 6.6.1:
Consistency with Local Land Use Goals

Measure	Option A	Option B	Option C
Consistent with local TOD plans and sustainable land use patterns?	Foxboro: YES Walpole: Weekday transit access to Foxboro and a rebuilt station.	Foxboro: YES Walpole: Weekday transit access to Foxboro, more service to Boston, and a rebuilt station.	Foxboro: YES Walpole: Rail traffic increases without providing additional service to Walpole center or the opportunity to reconstruct the downtown station.
Contributes to infill development?	Positive impact anticipated (transit has been shown to stimulate higher densities of development, as local zoning permits).		
RATING	Medium	High	Low

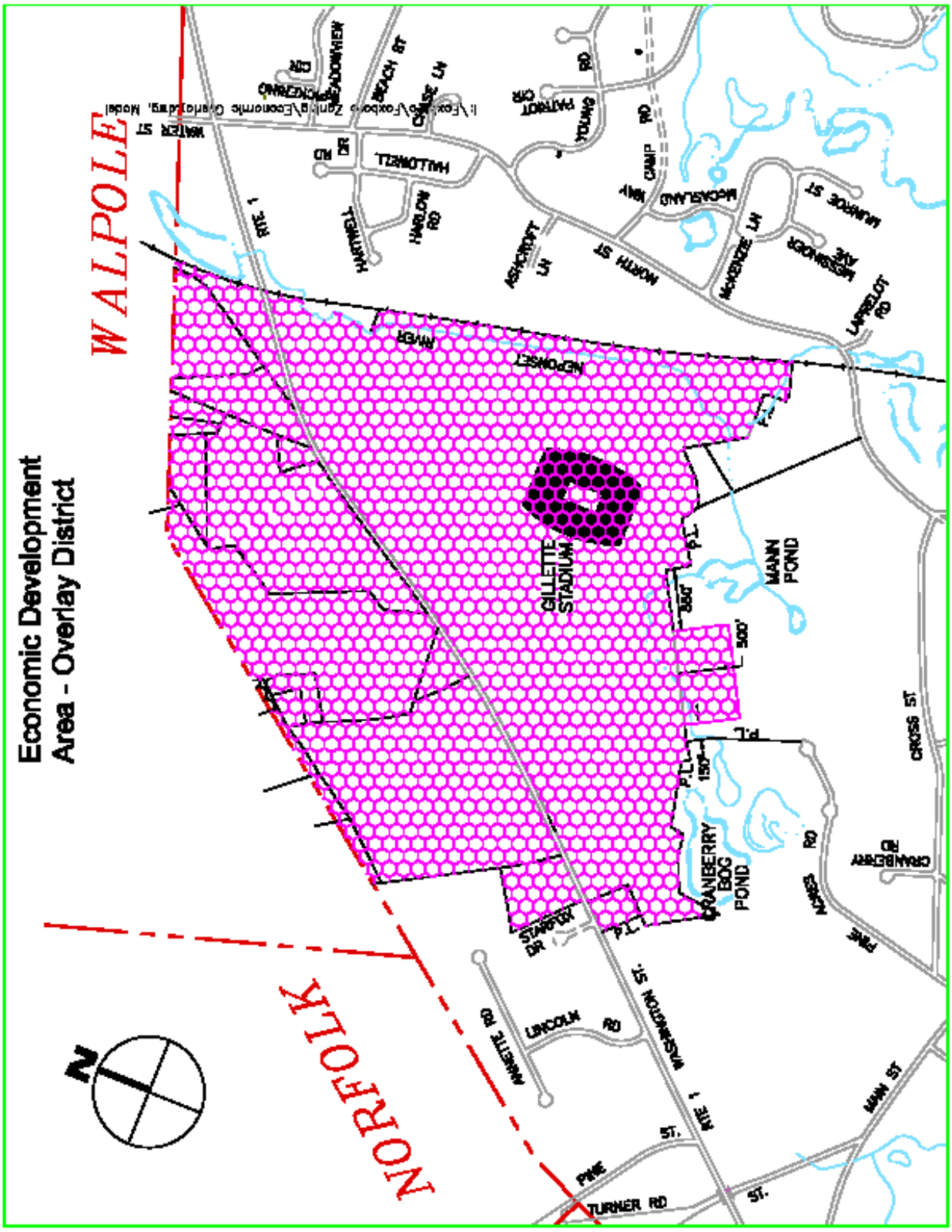


Figure 6.6.1:
Town of Foxborough: Economic Development Area Overlay District

6.7 Fairness to Existing Neighbors / Community Enhancement

Methodology

These measures assess the potential impact of commuter rail service alternatives on existing neighborhoods along the Framingham Secondary, and along the Franklin Branch south of Readville. The level of potential impact north of Readville is not considered, due to the minimal level of changes proposed to existing service along the Northeast Corridor and Fairmont Right of Ways.

The regional travel demand model was used to assess the level of change in local VMT (vehicle miles traveled) in both Foxborough and Walpole. Potential noise impacts are assessed based on the relative increase in daily train traffic along existing corridors. The impact on residential growth – or "community enhancement" is difficult to assess and is certainly influenced by traffic and noise, but is perhaps more likely influenced by local zoning and other factors. However, the number of individuals identified by the regional model as "walking" to board trains at Foxborough Station each weekday is identified.

Evaluation

Increases in local traffic would be relatively small under all three alternatives, or less than three-tenths of a percent (0.03%) in Foxborough and less than one-tenth of a percent (0.01%) in Walpole. There is some loss in local VMT (vehicle miles of travel) associated with people living in Foxborough that would be able to walk to the commuter rail station or who passed through town on their way to other stations, but this is offset by the new trips going to the new station. All options would have similar noise impacts in Foxborough: Option A would have the greatest number of trains passing along the secondary line to Foxborough; Options B and C would have fewer daily trains on the secondary line but more trains on the Franklin Branch and would include the train layover facility. Option A would also have the lowest noise impact for Walpole and points north, with shuttle service running only to Walpole Center.

Options B and C attract a slightly higher number of individuals walking to transit at Foxborough Station.

In summary, there would be minimal increases in local traffic under any of the three alternatives. Both traffic and noise impacts would be lowest under Option A, with little difference between Options B and C. The quantitative difference in the number of transit riders walking to Foxborough Station is also minimal. As shown in Table 6.7.1, Option A was given the highest rating.

6.8 Environmental Sensitivity and Land Reuse

Methodology

This measure evaluates the ability to implement the project in a manner that is sensitive to the environmental and in a way that preserves open space.

Foxborough and Walpole Station are already in place today. Parking to support fulltime weekday service from Foxborough would use the existing surface parking adjacent to the station. The only

land development associated with the project would be the potential development of a new layover facility in either Foxborough or neighboring South Walpole.

Table 6.7.1:
Fairness to Existing Neighbors & Community Enhancements

Measure	Option A	Option B	Option C
Traffic impacts in Foxborough	+ 0.02% VMT	+ 0.3% VMT	+ 0.3% VMT
Traffic impacts in Walpole	No impact	+ 0.1% VMT	+ 0.1% VMT
Noise impacts: Foxborough	+40 trains	+34 daily trains, and layover facility	+32 daily trains, and layover facility
Noise impacts: Walpole	+40 trains to Walpole Ctr,	+26 trains n. of Walpole Ctr. +34 trains s. of Walpole Ctr.	+32 daily trains
Noise impacts : Norwood to Readville	No impact	+26 daily trains	+ 32 daily trains
Positive impact on Foxboro residential growth?	196 walk to station	262 walk to station	279 walk to station
RATING:	High	Medium	Medium

Evaluation

Option A is given the highest rating as, without a proposed layover facility, it does not involve the development of any new land.

Three potential sites have been proposed as potential locations for a layover facility under Options B and C. The first potential site would use currently developed land to the west of the right of way and adjacent to Gillette Stadium. The second site would use currently undisturbed land to the east of the right of way just south of Foxborough Station. The third potential layover site would be located in South Walpole, on a large parcel that includes both developed and undeveloped land. Given that some development of open land may be involved, these latter two options are assigned a lower rating (see Table 6.8.1).

Table 6.8.1:
Environmental Sensitivity & Land Reuse

Measure	Option A	Option B	Option C
Ability to limit environmental impacts and preserve open space	High	Medium	Medium
Ability to re-use land or avoid previously undisturbed land.	High	Medium	Medium
RATING	High	Medium	Medium

6.9 State of Good Repair and Benefits

Methodology
In addition to the established PMT criteria used to establish potential service enhancement and system expansion opportunities, the MBTA also considers State of Good Repair criteria when evaluating potential improvements. These criteria measure whether a project will: a) replace an asset that has reached or exceeded its useful life; b) correct an existing deficiency for passengers and/or employees with regards to safety, health and/or the environment; and/or c) improve an operationally critically asset.

Evaluation
Option A would not entail upgrades or improvements at the existing Foxborough Station. The Framingham Secondary trackbed, currently not owned by the MBTA or used for full-time service, would be upgraded to support connecting train service between Foxborough and Walpole stations; however this is not an asset in need of repair unless this project were to be implemented. Reconstruction of Walpole Station to accommodate shuttle service and the transfer of passengers represents the primary State of Good Repair benefit realized under Option A.

Option B would involve an upgrade to Foxborough Station to accommodate a second track needed to allow movement in and out of a new layover facility. The addition of this second track would also improve safety, by eliminating the existing condition in which two trains are parked "back-to-back" on one track during game day service to Gillette. Walpole Station would also be upgraded to accommodate passengers transferring from a Foxborough shuttle trains.

Option C involves the addition of a second track and upgraded station facilities in Foxborough but, with direct service to Boston on all trains, does not require any modifications in Walpole.

In summary, Option B involves all three potential State of Good Repair improvements and is given the highest relative rating (see Table 6.9.1). Options A and C involve only one or two of three State of Good Repair improvements, and are assigned lower ratings.

Table 6.9.1:
State of Good Repair Benefits

Measure	Option A	Option B	Option C
Upgrades Foxborough Station		✓	✓
Provides two tracks at Foxborough Station		✓	✓
Rebuilds Walpole Station	✓	✓	
RATING	Low	High	Medium

6.10 MBTA Systemwide Operational Benefits

Methodology
This measure evaluates the secondary benefits that implementation of full weekday commuter rail service from Foxborough would have on other MBTA operations. The assessment compares the relative opportunity each alternative would provided in terms of alleviating existing operational constraints or increasing overall MBTA operating efficiency.

Evaluation
There are three potential operational improvements to be realized from this project:

1) Alternate Route for Northeast Corridor & Franklin Branch: All three alternatives would involve an upgrade to the Framingham Secondary providing an alternative rail connection between the Franklin Branch and the Northeast Corridor (Providence/Attleboro line). This would provide the MBTA with an alternate route in and out of Boston in the event of an emergency or blocked rail between Mansfield and Readville.

2) Additional Franklin Branch Capacity: All three alternatives would involve the construction of an interlocking at the north end of the Franklin layover to be used as a passing siding and to facilitate meets during the service day. Options B and C also require the extension of double track between Norwood Central and Windsor Gardens to facilitate meets in this area. These improvements result in increased capacity for service and greater operational/scheduling flexibility on the Franklin Branch.

3) New South Side Layover Facility: The construction of a layover facility under Options B or C would eliminate one early AM and one late PM deadhead/positioning train between South Station and Forge Park. These two trains would be able to layover in Foxborough, reducing overall MBTA train miles and offsetting operating costs for these alternatives. (If only the layover were built, the cost savings to the MBTA would approach $100,000 annually.)

In summary, Options B and C are given relatively high ratings in this category due to the fact they provide all three potential operational benefits. Option A is given a lower relative rating due to the

fact that it would not provide the opportunity to realize the operational and cost savings benefits that a new Southside layover facility would provide (see Table 6.10.1).

Table 6.10.1:
MBTA Systemwide Operational Benefits

Measure	Option A	Option B	Option C
Ties into Providence/Attleboro line providing alternate route in case of emergency or blocked line	✓	✓	✓
Provides additional capacity on Franklin branch	✓	✓	✓
Provides additional evening layover capacity on south side		✓	✓
RATING	Medium	High	High

6.11 Capital and Operating Effectiveness

Methodology

The development of Capital and Operating & Maintenance (O&M) cost estimates for the three alternatives was detailed in Chapter 5. This section summarizes these estimates and develops a more relevant measure of cost-effectiveness by calculating the costs that would be incurred for each new transit rider.

Total estimated Capital Costs are divided by the projected number of new daily linked transit trips to calculate the Capital Cost per New Transit Trip. The Capital Cost is also divided by the projected number of new annual linked trips to see the impact over a one year period.

To present a similar measure of cost effectiveness in terms of annual operations, the Net Annual O&M Costs are first calculated by deducting projected fare and parking revenues from the estimated Annual O & M Costs. This analysis has assumed that Foxborough would fall into commuter rail fare zone 5, which currently has a one-way cash fare of $6.25, and parking at Foxborough Station would be free of charge. However, these revenue estimates do account for changes in ridership and parking demand at other neighboring stations. Results are presented in terms of the net annual operating cost, or required operating subsidy, per new transit trip.

Evaluation

The assessment of Cost Effectiveness is shown in Table 6.11.1 below.

Option A would require the lowest levels of capital investment. Walpole Station would be reconstructed to accommodate a center-island platform, but there would be minimal upgrades to Foxborough Station and limited modifications to track and signal along the Franklin Branch. Option B would involve the highest level of capital investment, requiring major upgrades at two stations, a layover facility and several modifications along the Franklin Branch to increase capacity. From a capital cost perspective, Option C is the mid-range alternative, requiring the purchase of an additional locomotive and upgrades to capacity along the Franklin Branch, but station platform modifications would only be required in Foxborough; Walpole Station would remain as-built today.

When looked at in terms of cost per new transit riders over a one-year period, Option A would be the least cost-effective, due to the limited number of new transit riders attracted to the system. Option C would be the most effective.

Annual Operating & Maintenance Costs are largely a function of train miles and, with the greatest amount of new service on the line. In terms of overall annual costs, Option A would be the least costly to operate, with connecting trains simply running back and forth between Foxborough and Walpole. However, when looked at in terms cost per new rider, the low ridership impact of Option A results in high operating subsidies of $35.06 per new transit trip. Option B would be the most cost-effective with a required operating subsidy of $13.33 per new linked transit trip. Option C would require slightly higher subsidy than Option, at $16.69 per new transit trip.

No overall rating is provided for these quantitative factors. The two key measures – Capital Cost per New Transit Trip and Operating Support per New Transit Trip – are carried into the summary table at the end of this section as used to develop overall assessment of the alternatives.

Table 6.11.1:
Capital and Operating Cost Effectiveness

Measure	Option A	Option B	Option C
Total Capital Cost	$50.1	$84.0	$63.2
New Linked Transit Trip (daily)	100	940	1,100
New Linked Transit Trips (annually)	29,300	275,420	322,300
Capital Cost per New Transit Trip	$501,000	$89,362	$57,455
Capital Cost per New Transit Trip (over one year)	$1,710	$305	$196
Annual Operating Cost	$1.2 M	$5.7 M	$7.7 M
Operating Cost per New Linked Trip	$40.56	$20.58	$23.88
Revenue per new linked trip	$5.50	$7.24	$7.19
Required Operating Support per New OW Transit Trip	$17.53	$6.67	$8.35

6.12 Summary of Evaluation

This summary provides a relative comparison of the benefits, impacts and overall effectiveness the three alternatives considered for implementation of full weekday commuter rail service from Foxborough Station. The evaluation measures used to assess the alternatives included: 1) factors used within the MBTA's Program for Mass Transportation (PMT) to assess Service Enhancements and System Expansion; 2) desirable characteristics for EOHED Growth Districts; and, 3) other MBTA considerations including upgrades that would provide secondary benefits to the MBTA's State of Good Repair and the overall efficiency of commuter rail system operations. Results of the comparative evaluation are presented in Table 6.12.1 and briefly summarized below.

Table 6.12.1:
Summary of Foxborough Commuter Rail Alternatives Evaluation

Measure	Option A	Option B	Option C
Daily Foxborough Station Boardings	637	963	990
New Transit Riders (systemwide)	100	940	1,100
System Configuration (new access)	Medium	Medium	Low
System Expediency	Medium	Medium	Medium
Fairness/Elimination of Travel Barriers	Low	Medium	High
Job Accessibility & Opportunities	Low	Medium	High
Consistency w/ Land Use Goals	Medium	High	Medium
Fairness to Existing Neighbors/Community Enhancement	High	Medium	Medium
Environmental Sensitivity/Land Reuse	High	Medium	Medium
State of Good Repair Benefits	Low	High	Medium
Systemwide Operational Benefits	Medium	High	High
Capital Cost per New Transit Trip (over one year)	$1,338	$238	$148
Operating Support per New Transit Trip	$35.06	$13.33	$16.69

Option A

This alternative proposes to operate connecting train service between Foxborough Station and Walpole, where passengers would transfer at a reconstructed Walpole Station to use Franklin Branch service for travel to and from Boston.

Without the need for a layover facility and with no change in existing conditions north of Walpole Center, Option A performs best overall in terms of Fairness to Existing Neighbors and

Environmental Sensitivity/Land Reuse (two desired characteristics of EOHED Growth Districts). However, due to the time and inconvenience associated with the transfer at Walpole Station, only 100 new transit riders would be attracted to the service and Option A scores the lowest in terms of regional transportation benefits and overall cost-effectiveness. It is also the lowest performing alternative in terms of eliminating travel barriers, increasing job accessibility and supporting MBTA State of Good Repair needs.

Option B

Option B is the "hybrid option" combining peak-period connecting service to Walpole Station with direct off-peak service to Boston. It would attract an estimated 963 daily boardings at Foxborough and, due to increased service at existing stations, would attract an even greater number of new transit riders (940) to the system.

Option B performs the best overall in terms of Consistency with Local Land Use Goals, and in terms of providing the MBTA with secondary benefits associated with State of Good Repair upgrades and other Systemwide Operational Benefits. With a relatively high number of new transit riders and mid-range Operating & Maintenance Costs, this alternative would require the lowest level of Operating Support per New Transit Trip and would be the most cost-effective to operate.

Option C

Option C extends future Fairmont Branch commuter rail service south to Foxborough via the Franklin Branch, and supplements this service with one additional trainset. It would attract the greatest number of riders to the system, with a forecast 990 daily boardings at Foxborough and a total of 1,100 new transit riders (meaning other new riders would be attracted to higher service levels at existing stations). With a lower capital investment level needed to implement the service, it would also have a lower capital cost per new linked trip.

Option C performs the best overall in terms of Job Accessibility, its ability to support a reverse commuter and Eliminating Travel Barriers from neighborhoods with high numbers of low income households and/or minority populations. Along with Option B, it also provides a high level of secondary Systemwide Operational Benefits for the MBTA.

Option C was assigned a low ranking in only one category – System Configuration – largely because it provides the lowest level of daily service to Foxborough Station and would not provide any service to Back Bay Station.

Summary

Options B and C attract a higher number of Foxborough boardings and new transit riders to the MBTA system and, as a result, would present more cost-effective service alternatives than Option A. Option C would attract the most passengers and require the lowest level of capital investment per new trip. Option B attracts nearly the same level of passengers as Option C, would provide service to Back Bay, and would require the lowest overall operating subsidy per new trip.

A review of the more qualitative factors used in this evaluation show that there would be trade-offs in the relative benefits associated with any of the alternatives. Option A requires fewer capital improvements and would have less impact on the surrounding communities. Option B appears to be most consistent with local land use goals, while Option C would do a better job of

supporting Job Accessibility and reverse commute options. Options B and C would help the MBTA realize additional secondary benefits including State of Good Repair upgrades and other operational improvements.

Finally, in order to provide a further basis for considering the overall effectiveness of fulltime weekday commuter rail service from Foxborough station, a comparison of other projected commuter rail conditions to current MBTA operating statistics is provided Table 6.12.2.

Table 6.12.2:
Comparison of Foxborough Operating Subsidies to Current MBTA Averages

Measure	MBTA 2008 CR Avg.	Option A	Option B	Option C
Fare Box Recovery Rate	54%	14%	35%	30%
O&M Cost per Commuter Rail Boarding	$5.86	$9.89	$15.60	$9.76
Subsidy per Commuter Rail Boarding	$2.69	$8.55	$10.11	$6.83
O&M Cost per CR Passenger Mile	$0.29	$0.35	$0.64	$0.68

It is notable that none of the options outperforms the typical MBTA commuter rail service. This, despite all the positive evaluations above, indicates that none of the projects is especially attractive with respect to basic economic operating performance. The costs and subsidies required are simply high above MBTA norms. This suggests that further planning should explore new options with lower operating costs.

The most attractive of which might be a variant on Option C where most of the off peak service to Foxborough is offered via a bus connection to and from Sharon Station. This new Option D would cost dramatically less to operate compared with extending all Fairmount service to Foxborough but would still provide attractive peak travel options from Foxborough when most mobility is required and address deficiencies in MBTA facilities for overnight equipment storage and servicing.

CHAPTER 7: NEXT STEPS

The analysis demonstrates the feasibility of offering fulltime commuter rail service to Foxborough and indicates that a substantial number of riders both within the immediate Foxborough station area as well as along the route to Boston can benefit from increased train service and parking opportunities. An expansion of service becomes more compelling particularly if the housing supply immediately surrounding the project area is expanded. In addition to drawing ridership from the surrounding households, the service would also support the Foxborough Growth District and create an attractive reverse commute option for the planned commercial and office expansion within the District. Approximately 1,000 weekday boardings are estimated as a result of new rail service to Foxborough.

The capital improvements necessary for Foxborough service would provide benefits beyond Foxborough:

- improved the reliability of operations on the Authority's Franklin branch,
- improved frequency of MBTA service to the communities of Walpole, Norwood and Dedham
- relieve some excess demand for parking at Sharon, Mansfield, Forge Park, Franklin and Norwood station as new parking comes available at Foxborough
- improved facilities for rolling stock storage and maintenance
- faster, more reliable and safer special event Foxborough service
- new flexibility options to respond to problems on the Northeast Corridor between Readville and Mansfield.

Planning for Foxborough commuter rail service as documented in this feasibility study indicates that several service options for Foxborough are possible. Ultimately, in making decisions on whether to advance any of the options into engineering and implementation, MassDOT and the MBTA face larger policy considerations inherent in setting a regional agenda for rail transit. Making decisions on spending priorities among a multitude of potential rail projects and among several regional Corridors of growing travel demand, by necessity, requires rational assessment of the most effective use of both limited transportation capital resources and constrained Southside rail infrastructure capacity.

The policy decision to advance a Foxborough commuter rail service project option has yet to be made. That decision-making procedure on rail transit capital priorities takes place within the context of transportation planning processes including development of the Massachusetts State Rail Plan, the MBTA Program for Mass Transportation (PMT) and the long-range regional transportation plans of the Metropolitan Planning Organizations (MPO). This feasibility study is intended not to make policy recommendations, but rather, to provide basic information on relative costs and benefits of a Foxborough rail service expansion, data that can inform subsequent regional transportation planning and priority-setting processes.

The option with the most favorable evaluation (Option B) would cost ~$84 million to construct and ~$6 million annual for operations. With anticipated passenger revenue of approximately $2 million the service improvement would cover approximately a third of its annual operating cost. In addition to the ridership generated by the new service, the operational costs will be offset to

some degree by the environmental and economic benefits of offering public transit service to an area that has essentially had none for several years. Daily commuter rail service to Foxborough with increased layover capacity outside of Boston meets the 3 goals of the GreenDOT initiative (reduce greenhouse gas (GHG) emissions); promote the healthy transportation options of walking, bicycling, and public transit; and support for smart growth development) which was launched by the Massachusetts Department of Transportation on June 2, 2010.

This study has explored and illuminated the Commonwealth's options for bringing commuter rail to the Foxborough Growth District but additional analysis will be needed before an investment program can be recommended.

1. **Stakeholder input** - More input from a wider array of stakeholders and constituencies will allow residents and municipal governments to voice their support and concerns regarding the proposed service. This feedback will allow the EOHED and MassDOT to better gauge support for the project and address stakeholder concerns.

2. **Explore options with more favorable operating economics –** The most attractive options explored by this project entail a 13-mile extension of the 10-mile Dorchester Branch service. The extension adds only one new station to the network while improving service to seven stations en-route. The revenue attracted from the one new station and from service improvements to seven others is not commensurate with the cost of operating the extension. To address this forecast imbalance between operating revenue and costs, an alternative option could be explored that reduces the cost of off peak service to Foxborough.

   An alternative option could offer a direct peak rail service to and from Foxborough with limited direct rail reverse peak service. The peak rail service could be supplemented with an offpeak bus service between Foxborough and Sharon Station. The bus could meet inbound and outbound offpeak Providence line trains at nearby Sharon Station.

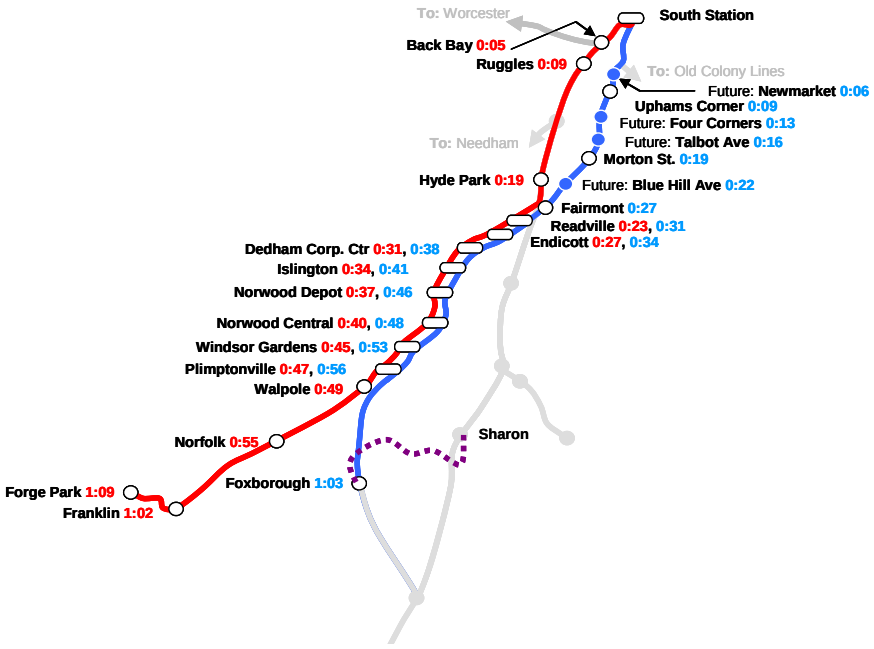


Figure 7.1.1:
Proposed Reduced Foxborough Service Option

This option could offer six morning rail trips for Foxborough including four inbound trips and two reverse peak trips. The evening peak would also feature four outbound trips from South Station and two reverse peak trips. Midday and evening service could be offered with bus connections to MBTA trains serving Sharon. Under this scenario, the volume of passengers using the offpeak Sharon bus increases and the Authority would gradually replace the bus service with off peak rail trips.

Table 7.1.1: **Proposed Reduced Service Operating Characteristics**	
Direction	**Number of Trips**
AM Peak Direction Rail	4
AM Reverse Peak Rail	2
Midday Bus Connections (via Sharon)	8
PM Peak Direction Rail	4
PM Reverse Peak Rail	2
Evening Bus Connections (via Sharon)	6
Total Trips	26

Preliminary analysis indicates that an alternative such as this could cost ~$41 million for infrastructure improvements and vehicle acquisition. It could entail ~$3 million in annual operating costs (approximately half of Option B's operating cost.) This option is likely to exhibit more positive operating economics compared with Options A through C. More detailed data regarding ridership, parking demand and revenue projections will require additional study.

While not exhaustive in its review of alternative solutions, this study provides important evidence that development and transportation are inextricably linked. The ridership data contained in this report provides a compelling argument that expanded MBTA service to the Foxborough Growth District will offer a number of benefits to the service region and MBTA system, but those benefits are only realized with additional development in the area.

New commercial development offers a negligible positive impact on ridership numbers, but new housing development and new commuters to this area are critical to justify a sizable investment in expanded commuter rail service in the region. EOHED will continue working with the Town of Foxborough on its goals for development in this area, and the MBTA will evaluate the feasibility of expanded service and the benefits of a new layover facility as capital investments are planned in the future.