

ROXBURY • DORCHESTER • MATTAPAN

TRANSIT NEEDS STUDY

RDM



Roxbury-Dorchester-Mattapan Transit Needs Study

SEPTEMBER 2012



massDOT
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EXECUTIVE SUMMARY

INTRODUCTION

Roxbury, Dorchester and Mattapan are home to over 180,000 residents, many of whom rely on the public transportation service provided by the Massachusetts Bay Transportation Authority (MBTA) to access employment, education, shopping, and entertainment opportunities in addition to healthcare and government services. While some residents and workers in these neighborhoods are able to walk to rapid transit subway service on the Orange and Red Lines – in addition to complementary services provided on the Mattapan High Speed Line, Fairmount Commuter Rail Line and the Silver Line – more than half of neighborhood residents do not have convenient access to rapid transit. As a result, most transit riders rely on local bus service for at least a portion of their trips.

In recognition of the challenges faced by many bus passengers in Roxbury, Dorchester, and Mattapan, the Study Area for the Roxbury-Dorchester-Mattapan Transit Needs Study (RDM Study) was set to include those areas that lie between the Orange and Red Lines and are not within a half-mile (or approximately ten-minute walk) of stations on those line. These communities are served by several MBTA bus routes, many of which run at high frequencies. Of the fifteen bus routes that are designated by the MBTA as “Key Bus Routes” due to their high level of ridership, six provide service in Roxbury, Dorchester, or Mattapan. In fact, five of the MBTA’s seven highest ridership bus routes operate primarily within these neighborhoods. While these routes, and many other complementary bus routes, generally provide comprehensive coverage to the neighborhoods, they are also plagued by a variety of problems, including poor reliability, slow travel speeds, overcrowding, and a lack of customer amenities. Because of the challenges faced by the large numbers of bus riders in these communities, MassDOT designed the RDM Study to focus on the needs of these MBTA customers.

STUDY APPROACH

The RDM Study focused on providing a community-driven process that would identify transit improvements and recommendations for the Study Area. This process included an assessment of current and projected demographic, land use, and development characteristics and an evaluation of the existing MBTA network and its ability to meet current and future transportation needs. The end goal was to identify and evaluate a comprehensive list of improvements that would enhance the quality and reliability of the public transportation system for residents and businesses in the Study Area.

This was accomplished through a robust civic engagement process—establishing a 28-member Advisory Group that met monthly and represented a broad cross-section of interests within the Study Area: conducting a survey with over 1,300 respondents; setting up information tables at bus terminals

to collect recommendations; continuous dialogue with local, state, and federal elected officials; nine public meetings; and outreach to other stakeholder groups. This outreach campaign reached several hundred people and resulted in 150 unique alternatives for system improvements.

KEY TRANSIT ISSUES

The types of issues identified through the survey process and the review of existing MBTA performance data are typical for a mature transit market in a congested urban area, and relate more to the quality and quantity of service, rather than any immediately obvious service gaps.

Reliable Service-The need for improved reliability and on-time performance is one of the most important issues in the Study Area. This is hindered by existing traffic congestion since the study area is made up of neighborhoods with a complex set of relatively narrow arterial streets which do not have the capacity to carry significant volumes of traffic. Additionally, a number of complex, multi-legged intersections at key locations exacerbate congestion problems by requiring multi-phase traffic signal cycles with limited time allocated for each approach.

Service Plans- Although the Study Area is in very close proximity to downtown Boston, travel time analyses showed that traveling between these destinations using MBTA service can require a frustratingly long amount of time. Since commuting patterns and major destinations have changed over the decades, there are now certain travel markets that are not well served by the existing public transit network; many trips from the Study Area to major destinations currently require a transfer at either Dudley or Ruggles Stations. Due to the transit demand in the study area, there are also concerns regarding overcrowding and frequency of service on existing, high ridership routes. The need for more frequent service was identified as an issue along specific east-west corridors and during non-peak periods of the day when many riders rely on MBTA service for shopping, medical appointments, leisure, and school/work trips.

Technology- Technological advances can help to improve travel times and give riders more confidence in the reliability of the transit system. Advancements in fare collection will reduce the need for passengers to pay their fare as they are boarding the bus service which would eliminate the challenges of buses having to wait for large numbers of passengers to pay onboard before departing each stop. Additionally, for any public transportation system, reliable information about schedules and delays is important; at most bus stops in the Study Area, there is no provision of either schedule or real-time information.

Disconnect between Policy and Action- Although the MBTA has strict driver training and certification programs, regulations for driver etiquette, and has policies on issues such as snow removal, there is often a disconnect between the policies that are in place and what MBTA customers actually experience while waiting at stops or riding on the buses.

RECOMMENDATIONS

The final recommendations were reached collaboratively between MassDOT, the MBTA, the RDM Study Advisory Group, and Study Area elected officials. Recommendations were categorized into likely time frames for implementations- short (less than 2 years), medium (2-5 years), and long (greater than 5 years)- based on recognition of both MassDOT's and the MBTA's limited available funds to make major new investments in capital facilities and operations, as well as the timeline required to implement various types of improvements.

Short-Term Recommendations

- 1) **Improve Access to Off-Vehicle CharlieCard Loading-** Many bus passengers currently add value to their CharlieCards when boarding the bus in order to access the discounted bus fare. Dramatically increasing access to Retail Sales Terminals (RSTs) in the Study Area, creating a new incentive structure that is consistent with MBTA operations priorities, promoting the availability of RSTs in the Study Area, and setting a minimum "up-load" value at the farebox are recommended steps to reduce the likelihood of customers adding value onboard.
- 2) **Complete Key Routes Improvements-** The MBTA's Key Routes program is an attempt to address on-time performance, travel time, fare collection, safety, customer amenities, and customer information on the MBTA's busiest bus routes. Improvements on the four Key Routes in the Study Area- the 15, 22, 23, 28- are scheduled to be implemented by the end of 2013 (See www.mbta.com/keybusroutes for project updates).
- 3) **Assess Performance of Intra-Party Agreement for Bus Stop Snow Removal-** By the end of the winter of 2010-2011, the MBTA, MassDOT, and the City of Boston had developed an intra-party agreement for bus stop snow removal. MassDOT and the MBTA will closely monitor the performance under this intra-party agreement.
- 4) **Ensure City of Boston Signal Re-Design Includes Provisions for Buses-** During the Boston Transportation Department's design process to integrate 15 signalized intersections along Blue Hill Avenue and Warren Street into the City's central computer system, both the MBTA and MassDOT will work with the City of Boston to ensure that opportunities for Transit Signal Priority (TSP) are incorporated into the final project.
- 5) **Implement Real-Time Info at Dudley Station-** In 2013, the MBTA will implement a new real-time arrivals board at the station as part of its ongoing Dudley Station Improvements Project.
- 6) **Introduce a Targeted Marketing Campaign about the Availability of Phone-Based Real Time Info-** In 2012, the MBTA and MassDOT will develop a targeted promotional campaign focused on key transfer stations, bus shelters, and on-board announcements and advertising

panels to educate customers in the RDM Study Area about the benefits of real-time information, and the multiple ways (online, traditional cell phone, smart phone) this information can be accessed.

- 7) **Increase Monitoring of Operator Safety and Customer Service-** MassDOT and the MBTA both believe that the vast majority of operators conduct their work professionally, safely, and with a focus on serving their customers. Providing a clearly visible driver ID number and phone number for reporting incidents on-board buses can help remind drivers that they will be held accountable for following MBTA policies and encourage riders to report unsafe driver behavior.
- 8) **Develop a Stroller Policy-** Although there has been no consensus within the process for how to address strollers on buses, given the relatively high percentage of young children and the greater dependence on public transportation in the Study Area, the issue is likely to remain a focal point for MBTA customers in the three neighborhoods.

Medium-Term Recommendations

- 1) **Increase MBTA's Fleet of 60-foot Buses-** Concerns associated with overcrowding on Route 28 have dissipated with the introduction of new, higher capacity 60-foot articulated vehicles. The MBTA and MassDOT will continue to monitor the development of newer vehicles that perform better in winter conditions, as well as measures to mitigate performance issues and consider expansion of the 60-foot vehicle fleet.
- 2) **Increased Frequency on 16, 19, and 21-** Ridership modeling showed that increasing peak service on the 16, 19, and 21 will significantly increase ridership. When the MBTA initiates its Service Planning process again, these three routes should be considered for adjustments.
- 3) **Improve Stop Spacing on Non-Key Routes-** Implementing the Key Routes program's stop consolidation/elimination component to maintain four to seven stops per mile would improve reliability and travel time, and as a result help increase daily ridership.
- 4) **Study Circulation Patterns at Dudley Station and Identify Improvements-** In 2012, the Boston Transportation Department initiated an engineering and urban design streetscape project in Dudley Square that has an opportunity to evaluate bus circulation and accommodations.
- 5) **Integrate Fairmount Line Fare Policy with Other RDM Services-** Monthly pass customers on the Fairmount Line are able to ride the MBTA's rapid transit and bus network at no additional charge, while those who are either unable to afford the large outlay of money necessary to buy a monthly pass or do not ride the service frequently enough to merit buying one must pay for Fairmount Line trips separately from connecting bus or rail trips.

- 6) **Limited Stop/Express Bus Overlay Route on Route 28 Corridor-** A new overlay express bus route that would follow the same route as the Route 28 but makes fewer stops would provide a higher-speed option for those customers not making local trips.
- 7) **Continued Conversion to Cleaner, Energy Efficient Buses-** In addition to purchasing less polluting and more fuel efficient buses as new vehicles are procured, the MBTA has begun to retrofit existing buses, as part of their mid-life overhauls. The MBTA should continue studying and implementing alternative clean fuel/clean technology options for their fleet.
- 8) **Extend Route 28 to Brigham Circle-** Extend one of the more frequent bus routes serving the RDM Study Area into the Longwood Medical Area

Long-Term Recommendations

- 1) **Light Rail Extensions into Study Area-** Although there are barriers to implementing a light rail project, the population and land use characteristics of the Study Area would suggest that there are corridors within the three neighborhoods that could support such a service. Two concepts were studied that would extend the existing MBTA Green Line service south from Boylston Station with one alternative terminating at Dudley Station and a second alternative terminating at Mattapan Station. The light rail alternatives show high levels of ridership and a significant increase in the amount of “one-seat” rides to and from downtown Boston.
- 2) **High Frequency Service on the Fairmount Line-** Increased frequency of service is recommended to provide a level of service that could attract more riders and provide alternative access for Study Area residents.
- 3) **Alternate Vehicle Type on the Fairmount Line-** The use of alternative vehicle types on the Fairmount Line has the potential to improve operations and decrease costs. Replacing the existing push-pull locomotive equipment on the Fairmount Line with diesel multiple units (DMUs) has the potential to offer a quality of service that is closer to rapid transit in its service features, including faster acceleration which reduces running times, shorter station dwell times, and shorter headways.
- 4) **Self-Service/Barrier-Free Fare Collection on MBTA Buses-** Proof-of-payment (POP) fare collection is an honor-based structure implemented on both rail and bus systems around the world that requires passengers to carry a ticket or pass proving that they have paid the fare, although each individual is not checked every time they board a vehicle. By eliminating the on-board ticket transactions, it speeds up the boarding process, eliminates backups, and allows all doors to be used for boarding. Additionally, it results in lower labor costs for fare collection, simpler station design, and easier access for mobility-impaired passengers.

NEXT STEPS

The publication of this study represents a beginning rather than an end. With a road map of community-proposed and community supported ideas in place, MassDOT will convene the RDM Study Committee to meet quarterly beginning Fall of 2012 to monitor the success in implementing the recommendations of the RDM Study. While this study was intended to identify recommendations and be fiscally unconstrained, it is important to begin the process of identifying potential funding for these improvements, particularly for capital investments. There are two key steps to obtaining funding: coordination with the existing MassDOT/MBTA planning process and identifying (and applying for) potential funding sources from a variety of sources including state government, federal government, and user fees.

Roxbury, Dorchester, Mattapan Transit Needs Study

I. BACKGROUND

Roxbury, Dorchester, and Mattapan are three large Boston neighborhoods located to the south of downtown. Collectively, they comprise 26 percent of the city's land area and 30 percent of its population¹. In many respects, this subset of Boston mirrors the larger urban environment of which it is a part—dense housing gives way to streetcar suburbs as one moves away from downtown; historic and human-scaled commercial districts serve as neighborhood anchors; and residents rely on service provided by the Massachusetts Bay Transportation Authority (MBTA) for much of their daily travel, particularly to get to work.

But in other ways, these neighborhoods have a very different history—Roxbury, Dorchester, and Mattapan are the center of African-American life in Boston (60 percent of residents are African-American)², and are also more diverse than the city as a whole with large populations of immigrants from Haiti, Cape Verde, Vietnam, and the Dominican Republic. Residents of these neighborhoods are more likely to be low-income and to not own an automobile than are their fellow Bostonians. While Boston is in the small minority of American cities in which a significant percentage of public transit users choose transit over other available options for its convenience and relatively low cost, MBTA use in Roxbury, Dorchester, and Mattapan is often driven more by necessity than choice.

A Lack of Trust. The relationships between these three neighborhoods and the various levels of government that represent them have been strongly and negatively influenced by a legacy of mistrust. After bearing the brunt of the prevailing top-down approach to urban renewal for two decades, a coalition of Boston-area activists—including many from Roxbury—were instrumental in stopping the expansion of the interstate highway system through these and other communities in the 1970s. However, this success did not come without costs for the neighborhoods. The elimination of the proposed Inner Belt expressway halted what would have become a lasting physical barrier between Roxbury and downtown Boston, but not before a wide swath of residential and commercial buildings had been cleared to make way for the highway. Stopping the construction of the Southwest Expressway prevented another barrier from rising within these communities, but only after another round of demolition had taken place. The Southwest Expressway's elimination, while still viewed by many as an important success, has contributed to a lower level of access to regional opportunities for neighborhood residents who travel by automobile.

¹ 2010 U.S. Census- <http://factfinder2.census.gov>

² 2010 U.S. Census- <http://factfinder2.census.gov>

Perhaps the most emotionally charged issue to emerge from the victories over highway expansion in the 1970s was not directly related to a highway project. With federal funding originally intended for highway expansion suddenly available instead for investments in public transportation, and with the South End and Roxbury's elevated Orange Line rapid transit service above Washington Street in dire need of rehabilitation, the Commonwealth saw an opportunity to heal some of the scars from the abandoned roadway projects. Offering the promise of a modernized Orange Line and the return of sunlight to Washington Street, the state decided to relocate the Orange Line into the land obtained and partially cleared to accommodate the Southwest Expressway.

The Loss of Rapid Transit Service. The Orange Line's move to the Southwest Corridor in 1988 was an important accomplishment—nine modern stations accessible to all users; a new linear park system paralleling the rail line; spacious and efficient transfer facilities between rail and bus; a direct connection into the growing Back Bay/Copley business district—and one born out of a community process often pointed to for its success at being collaborative, inclusive, and responsive. However, the negative impacts for residents of Dorchester, Mattapan and, in particular, Roxbury—both real and perceived—were significant. Dudley Square, perhaps the city's most important commercial district outside of central Boston and once an economically and culturally vibrant area, as well as Lower Roxbury, Egleston Square, and portions of the South End, lost the direct access to rapid transit which these districts had enjoyed and benefited from for three quarters of a century. For the many thousands of MBTA riders transferring into the rapid transit system at Dudley or Egleston, the relocation of the Orange Line meant traveling several additional blocks on often congested streets, effectively lengthening commutes and marginalizing certain neighborhoods. And the reality was one of a city with several high-frequency rail lines radiating out from downtown in multiple directions, but with the largest gap between lines coinciding with the location of the city's highest concentration of minority, low-income, and transit-dependent residents.

Washington Street Replacement Service. At the time of the Orange Line's relocation, MBTA officials committed to mitigate the loss of rapid transit service to Dudley Square and other sections of Washington Street. Some of the historic architectural elements of the old elevated station at Dudley were incorporated into the design of a new, heavily-used bus terminal. Virtually all of the bus routes previously connecting to the rapid transit system at Dudley continued to serve this new bus terminal en route to the new bus/subway transfer station at Ruggles Station. Free fares were offered on the Dudley-to-Ruggles segment of bus routes, ensuring that Dudley residents would still pay a single fare for trips on the rapid transit system. A new bus route—the 49—was created to provide service along the old elevated Orange Line corridor between Dudley and downtown Boston. But in the eyes of many corridor residents and business owners, the single most important mitigation was the commitment to high-quality public transportation service along the Washington Street corridor.

From the beginning, “replacement service” meant something very specific for Roxbury residents—the introduction of light rail service, perhaps as a branch of the Green Line, connecting Dudley to downtown via Washington Street. This turned out to be a much more complicated and lengthy undertaking than anyone had imagined. There was a lack of agreement between the three neighborhoods through which the replacement service would pass (Roxbury, the South End, and Chinatown) about what form that service would take. The federal government indicated that it would not participate financially in a light rail extension given the amount of funding it had recently expended on the Orange Line relocation. Consequently, the interest in light rail on the part of the MBTA and state transportation officials’ wavered throughout the 1990s. The ultimate resolution was a new high-frequency bus line to downtown, branded as the Silver Line, featuring many of the elements of “bus rapid transit (BRT),” a hybrid mode of public transportation that had recently come into vogue nationally for bringing many of the benefits of rail transit – including dedicated lanes on surface streets to improved travel times, higher frequencies, and higher capacity vehicles – but with greater service flexibility and less time and money needed for implementation.

In many ways, the Silver Line Washington Street service has proven to be a success—carrying roughly 15,000 passengers per day, it is the MBTA’s busiest bus route. While the dedicated lanes on Washington Street cover just over half of the route, it still operates more reliably than the MBTA’s other high ridership bus routes, with on-time performance greater than 80 percent³. And the line’s amenities—attractively designed shelters with heating, information panels, and countdown clocks and spacious 60-foot articulated vehicles—are the envy of bus riders elsewhere in the system. But the Silver Line’s attributes that were valued by the MBTA at the time of implementation—its flexibility and relatively modest capital cost compared to light rail—contributed to a sense among many residents that the “replacement service” was essentially a money-saving second-class service.

In spite of these complicated and sometimes negative histories, there are signs that residents from these communities and the public agencies that represent them are now collaboratively working towards the fulfillment of mutually beneficial goals. Neighborhood residents have partnered with the Boston Redevelopment Authority on a number of comprehensive planning efforts, including the Mattapan Economic Development Initiative (MEDI), the Roxbury Strategic Master Plan, and the ongoing Dudley Vision process. Over the past decade, a series of historic commercial buildings in Dudley Square have been renovated and now contribute to renewed life in the business district—an evolution that is expected to continue with the completion of the City of Boston’s ongoing renovation and expansion of the Ferdinand Building in the heart of Dudley Square. The Boston Transportation Department is beginning a redesign of Melnea Cass Boulevard that will improve accommodations for pedestrians, bicyclists and transit vehicles and, when combined with the eventual redevelopment of large adjacent parcels cleared in advance of the Inner Belt Highway, should finally help to heal the scars of the cancelled highway project. Additional transit improvements will be realized as the Massachusetts Department of Transportation (MassDOT) and the

³ MBTA Fall 2010 On-Time Performance

MBTA finalize construction of four new stations along the Fairmount Commuter Rail Line to provide access to reliable, comfortable, and fast trips to downtown Boston from the areas of Roxbury, Dorchester, and Mattapan that are located furthest from the MBTA rapid transit system. Increasingly, public investments in these neighborhoods are being viewed as enhancements, rather than detracting from the quality of life, helping to rebuild trust between the communities and various levels of government.

The 28X Proposal. The American Recovery and Reinvestment Act (ARRA) provided Massachusetts with \$750 million to invest in transportation infrastructure. While the approach favored in many states was to simply expedite projects that were already in the implementation pipeline, Massachusetts’ transportation officials were instead interested in using this rare infusion of economic stimulus funds to pursue a project that might not otherwise be realistic given the Commonwealth’s constrained capital budget.

The 28X—the transit project selected by MassDOT to pursue with the economic stimulus funds—was a BRT line that would replace the MBTA’s existing Route 28 bus route, which connects Mattapan Square with Ruggles Station via Grove Hall and Dudley Square. Although the extent to which BRT amenities (dedicated and separated bus lanes, modern transit stations, etc.) would have been incorporated into the project varied along the proposed route, the project’s centerpiece was the creation of a three-mile long dedicated busway reservation in the median of Blue Hill Avenue, from just south of Grove Hall to Mattapan Square. The project was based on concepts for BRT extensions (branded as Silver Line extensions) that had been identified in both the MEDI and Roxbury Strategic Master Plan processes. But for most residents and business owners along the project’s proposed route, the project represented an entirely new, and not particularly welcome, idea. For many of these stakeholders, the project’s impacts—a reduction in on-street parking spaces, a loss of travel lanes in some sections, the elimination of recently added planters as well as decades-old trees from the avenue’s median, a new physical barrier (the median busway), and increased walking distance between bus stops—were too high a price to pay for faster and more reliable service, additional amenities, and other expected benefits. Although the Commonwealth’s 28X proposal was a well-intentioned effort to target improvements where they were arguably most needed, residents’ unfamiliarity with the idea, the unfamiliarity with the communities on the part of some of the transportation planners, and the rapid pace required by ARRA, recalled for many the memory of previous top-down government planning efforts.

Due to these factors, MassDOT was unable to secure the public support necessary to implement the proposed 28X project. The proposal was withdrawn by MassDOT from federal consideration in November 2009, but there was recognition by both MassDOT and those who participated in the 28X public process that a community-driven and community-supported vision for the future of public transportation in Roxbury, Dorchester, and Mattapan was needed.

This Transit Needs Study represents MassDOT's continued engagement in the public transit needs of the Roxbury, Dorchester, and Mattapan corridor. Its goal is to identify strategies through a community-driven process—from relatively modest ideas that could be implemented quickly, to major capital investments whose implementation is less certain—for improving public transportation service in these three neighborhoods that largely lack rapid transit and have a demonstrated demand for public transit service.

II. STUDY OVERVIEW

Roxbury, Dorchester and Mattapan are home to over 180,000 residents, many of whom rely on the public transportation service provided by the MBTA to access employment, education, shopping, and entertainment opportunities in addition to healthcare and government services. While some residents and workers in these neighborhoods are able to walk to rapid transit subway service on the Orange and Red Lines – in addition to complementary services provided on the Mattapan High Speed Line, Fairmount Commuter Rail Line and the Silver Line – more than half of neighborhood residents do not have convenient access to rapid transit. As a result, most transit riders rely on local bus service for at least a portion of their trips.

These communities are served by several MBTA bus routes, many of which run at high frequencies. Of the fifteen bus routes that are designated by the MBTA as “Key Bus Routes” due to their high level of ridership, six provide service in Roxbury, Dorchester, or Mattapan. In fact, five of the MBTA’s seven highest ridership bus routes operate primarily within these neighborhoods. While these routes, and many other complementary bus routes, generally provide comprehensive coverage to the neighborhoods, they are also plagued by a variety of problems, including poor reliability, slow travel speeds, overcrowding, and a lack of customer amenities. Because of the challenges faced by the large numbers of bus riders in these communities, MassDOT designed the Roxbury / Dorchester / Mattapan (RDM) Transit Needs Study to focus on the needs of these MBTA customers.

RDM Study Area

In recognition of the challenges faced by many bus passengers in Roxbury, Dorchester, and Mattapan, the Study Area was set to include those areas that lie between the Orange and Red Lines and are not within a half-mile (or approximately ten-minute) walk of stations on those lines, as shown in Figure 1. The boundaries are roughly Washington Street (Dorchester), Bowdoin Street, Hancock Street, and Columbia Road to the east; Massachusetts Avenue to the north; Washington Street (Roxbury), Columbus Avenue, Franklin Park, Morton Street, American Legion Highway, Walk Hill Street, Harvard Street, and Wood Avenue to the west; and the Boston city limits/River Street to the south.

The northern corner of the Study Area was designed to include portions of Boston’s South End neighborhood, roughly along the Washington Street corridor. Much of the South End is within a half-mile walk of the Orange or Green Lines, and several bus routes provide direct connections to either the Downtown or Back Bay business districts. However, the neighborhood’s location on the direct route to downtown from the RDM Study area suggested a need for some evaluation of transit demand in the South End. This area was considered in the context of evaluating downtown connections from Roxbury, Dorchester, or Mattapan, and not in isolation from improvements for the rest of the Study Area.



Figure 1: Study Area

Study Process

Early in the RDM Study process, MassDOT worked collaboratively with stakeholders to develop a shared understanding of expectations for this study. The process by which the RDM Study would identify recommendations included the following steps:

- Assess the Study Area's current and projected population and demographics, land use, and development characteristics.
- Evaluate the Study Area's existing MBTA network and the ability of the network to meet current and future transportation needs in the area.
- Obtain public input from various sources including current and potential MBTA customers, community organizations and businesses, the City of Boston, and state and local elected officials.
- Consider previous transportation studies and their recommendations in the development of recommendations for the RDM Study.
- Identify and evaluate a comprehensive list of improvements that would enhance the quality and reliability of the public transportation system for residents and businesses in the Study Area.
- Determine the projected costs of selected strategies and recommend approaches for securing funding for implementation.

Civic Engagement

The robust and often times passionate public debate over the merits of the 28X proposal in 2009 made it clear that future public discussion was required in order to identify a community-supported vision for future transportation investment in the corridor. From the outset, the RDM Study was designed to not only continue the conversation begun during the 28X process, but also expand upon it, particularly by ensuring that the perspective of the everyday MBTA bus rider (under-represented during the 28X process) was fully incorporated in the current study.

MBTA Customers. The perspectives of all interested parties within the Study Area were sought as part of the RDM Study process. Given that the RDM Study's focus was on improving service for current MBTA customers, a priority was placed on hearing from this group of stakeholders. MassDOT worked vigorously to reach out directly to bus riders —while they waited at bus stops and stations, and even while they rode MBTA buses. Whether through surveys administered in the field to gather riders' opinions on where or how the system was underperforming, or through information tables set up at bus terminals to collect riders' ideas for specific strategies or projects to improve their service, MassDOT wished to ensure that the needs and vision of everyday transit customers were reflected as part of the RDM Study. Figure 2 demonstrates discussions with the community to collect ideas and recommendations.

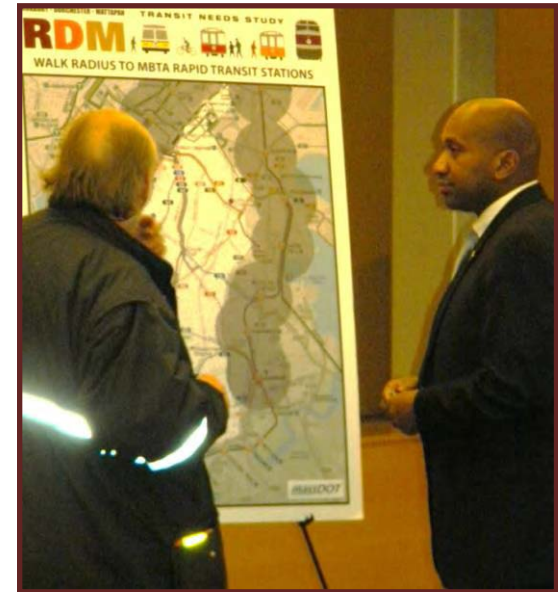


Figure 2: Civic Engagement at Mattapan Kick-Off Meeting

MBTA riders may have been viewed as the most critical stakeholders in the RDM Study process, but certainly not the only ones. As described below, a multi-pronged approach to civic engagement was employed to ensure that the ultimate recommendations of the study were the product of a truly open and collaborative process.

Advisory Group. MassDOT, in consultation with elected officials representing the Study Area, established an Advisory Group to assist in coordinating community input and inform MassDOT decision-making. This Advisory Group consisted of 28 members representing a broad cross-section of interests within the Study Area including neighborhood associations, community development corporations, key local institutions, and unaffiliated MBTA riders. Membership on the Advisory Group was balanced between the three neighborhoods, and at least half of the members considered themselves regular MBTA riders. (See Appendix A for Advisory Group Selection Criteria, Guidelines, and Member List)

The Advisory Group met approximately monthly between March 2011 and January 2012. The group provided input into the study on a range of topics, and was instrumental in:

- the design of the transit needs survey distributed to MBTA riders
- recommendations for civic engagement opportunities
- development of a set of criteria used to evaluate the effectiveness of potential study recommendations for meeting study goals; and a system for applying and weighting the criteria
- being one of the sources of potential study recommendations
- selection of a limited number of strategies for additional technical analysis
- development of the Study's ultimate recommendations

The members of the RDM Advisory Group volunteered a significant amount of their own time to the process, worked collaboratively with one another and with MassDOT, and were a critical asset to the study.

Public Meetings. Over the course of the RDM Study, MassDOT conducted nine public meetings at which attendees were given the opportunity to voice their concerns about the service currently provided by the MBTA and share their ideas for improving the system. Meetings were broadly advertised in the Study Area, through notices in local newspapers, announcements on local radio stations, and posters placed on all MBTA buses, bus stops, and transfer stations in the Study Area. Meeting locations rotated among the three neighborhoods in order to draw a wide range of attendees.

Elected Officials. Local, state and federal elected officials, who had jointly called for the continued dialogue to define a vision for public transit in the Study Area, were involved with the RDM Study from the outset. This involvement included input into the development of the scope of work, participation on the selection committee for consultant services, periodic update meetings with MassDOT to comment on study progress, and regular attendance and involvement at all Advisory Group and public meetings.

City of Boston. MassDOT met periodically with representatives of the Boston Transportation Department, the Boston Redevelopment Authority, the Mayor's Office of Neighborhood Services, and the Boston Public Works Department to secure input into the development of the RDM Study scope of

work, the identification of issues and potential recommendations. These meetings were also critical to MassDOT's understanding of the City's ongoing infrastructure projects and planning efforts, and their relationship to the RDM Study. City staff were regular participants in RDM public meetings.

Other Stakeholders. MassDOT and the project team met frequently during the early stages of the RDM Study to introduce the project to a broad range of community stakeholders. This outreach included business groups, neighborhood associations and houses of worship. In addition to the input each of these organizations provided on the unique transportation challenges faced by their customers or congregations, many of these organizations aided MassDOT's civic engagement efforts by spreading the word about RDM meetings, distributing the RDM Transit Needs Survey, and other opportunities for community input.

While the groups listed above represented the primary focus of the RDM Study's civic engagement effort, MassDOT used many other strategies to involve the public in the development of the study, including frequent appearances on community access television programs and radio broadcasts, information tables at large community events such as the Roxbury Homecoming/Juneteenth Festival event at Franklin Park, and through interactive tools on the project website at www.mass.gov/massdot/rdm.

III. EXISTING CONDITIONS

The RDM Study Area's proximity to downtown Boston—with its wealth of employment, shopping and other opportunities concentrated in an area of limited and expensive parking—alone makes it a strong market for public transportation. In addition, many of the demographic and land use characteristics of the Study Area contribute to a very high level of demand for MBTA service.

Demographic Characteristics of the Study Area

Population. The combined population of Roxbury, Dorchester, and Mattapan is over 180,000 with approximately 126,000 of those residents living in the RDM Study area⁴. The RDM Study Area population also has high percentages of seniors and children relative the rest of Boston. Ten percent of all Study Area residents are over the age of 65—an age group more likely to use public transportation than the general population, due to both the physical challenges of driving and the costs associated with auto ownership. Children make up a much higher proportion of the Study Area population than in the rest of the city (26.2 percent to 16.8 percent)⁵. High school age children, in particular, rely on MBTA service for a number of reasons—the City of Boston does not provide school bus service for high school students, the minimum age requirement for having a driver's license is 16 ½, and the high cost of automobile ownership.

Income. Although income levels vary across the RDM Study Area, as seen in Figure 3, on average, household income is lower in these three

⁴ 2010 U.S. Census- <http://factfinder2.census.gov>

⁵ 2010 U.S. Census- <http://factfinder2.census.gov>

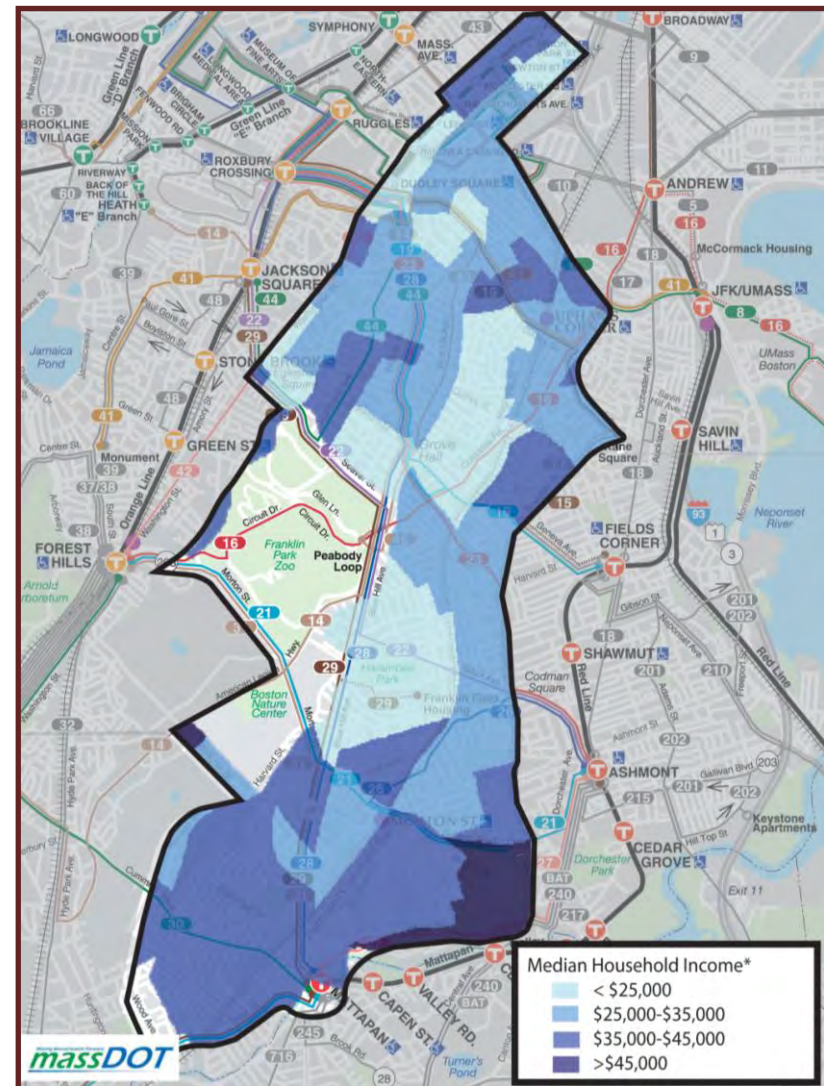


Figure 3: Median Household Income (*2010 US Census)

neighborhoods than in the other parts of Boston. Median household income levels in the Study Area (\$38,938) are 28 percent lower than in the City of Boston as a whole (\$54,031) and well below the statewide average of \$62,072⁶. While income levels are generally higher in the southern portion of the Study Area (particularly in Mattapan), even there, household income averages below \$45,000 in most census tracts. In the remainder of the Study Area, average household income levels rarely rise above \$35,000. Income disparity with the rest of the city is even greater when considered on a per capita basis (\$20,049 versus \$33,281)⁷. Many of the costs associated with owning and operating an automobile create significant barriers for the large low-income population of the RDM Study Area to rely upon cars for their transportation. Only 63 percent of households in the RDM Study Area have access to even one automobile⁸. And many of the high costs associated with driving in Boston in particular (high auto insurance rates and high parking costs) as well as recent increases in fuel costs, make driving an unrealistic choice for even residents of greater financial means.

Household Density. Residential density is another important factor in understanding an area's market for public transportation service. The densest areas, in number of dwelling units per acre, are primarily in the South End, Grove Hall and along Blue Hill Avenue and Seaver Street, as seen in Figure 4. Most of these areas are dominated either by large early 20th century apartment buildings, or dense subsidized housing developments built in the latter half of the 20th century.

⁶ 2010 U.S. Census- <http://factfinder2.census.gov>

⁷ 2010 U.S. Census- <http://factfinder2.census.gov>

⁸ 2010 U.S. Census- <http://factfinder2.census.gov>

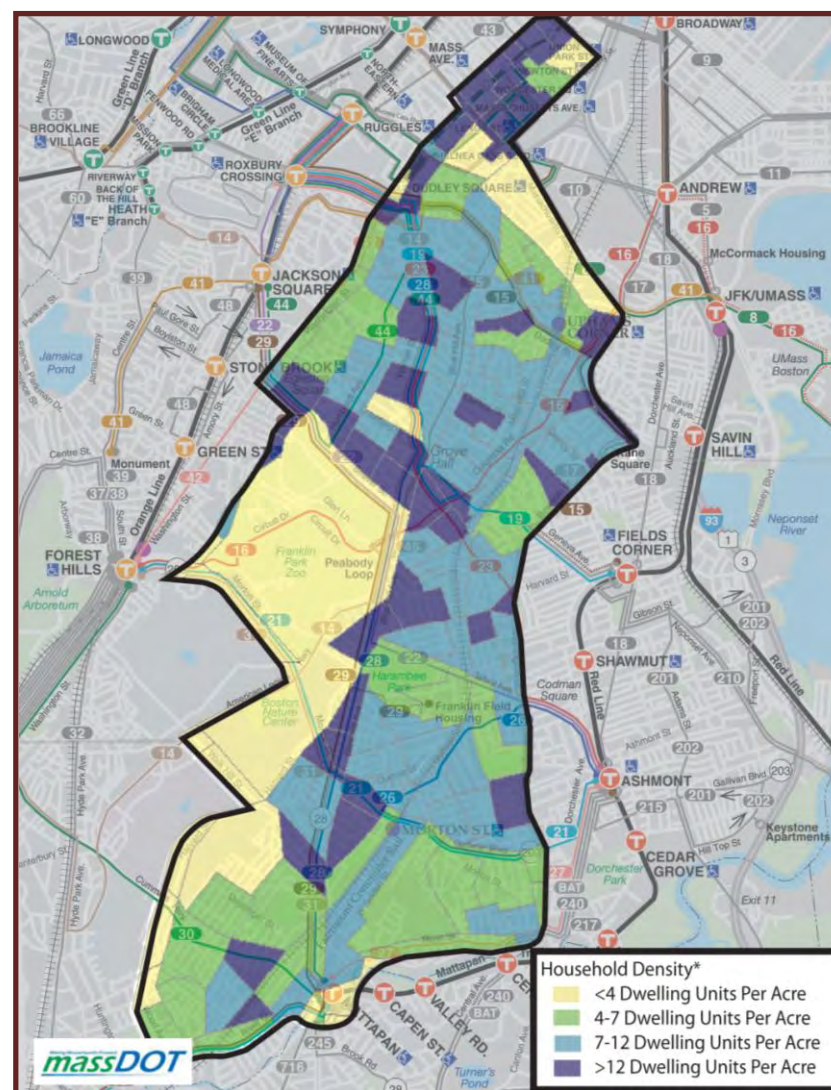


Figure 4: Household Density (*2010 US Census)

Because average household sizes are larger in the Study Area than is the citywide average, the overall population density in the Study Area is even greater relative to Boston as a whole (24.3 persons/acre in Study Area vs. 19.7 person/acre)⁹.

Commuting by Public Transit. Not surprisingly, considering all of the factors noted in this section—proximity to downtown Boston, population, age and density, and lower levels of income and automobile access—result in a high percentage of commuting trips being made by public transportation. Figure 5 shows that through much of the heart of the Study Area, more than a third of all work trips are being made using the MBTA service.

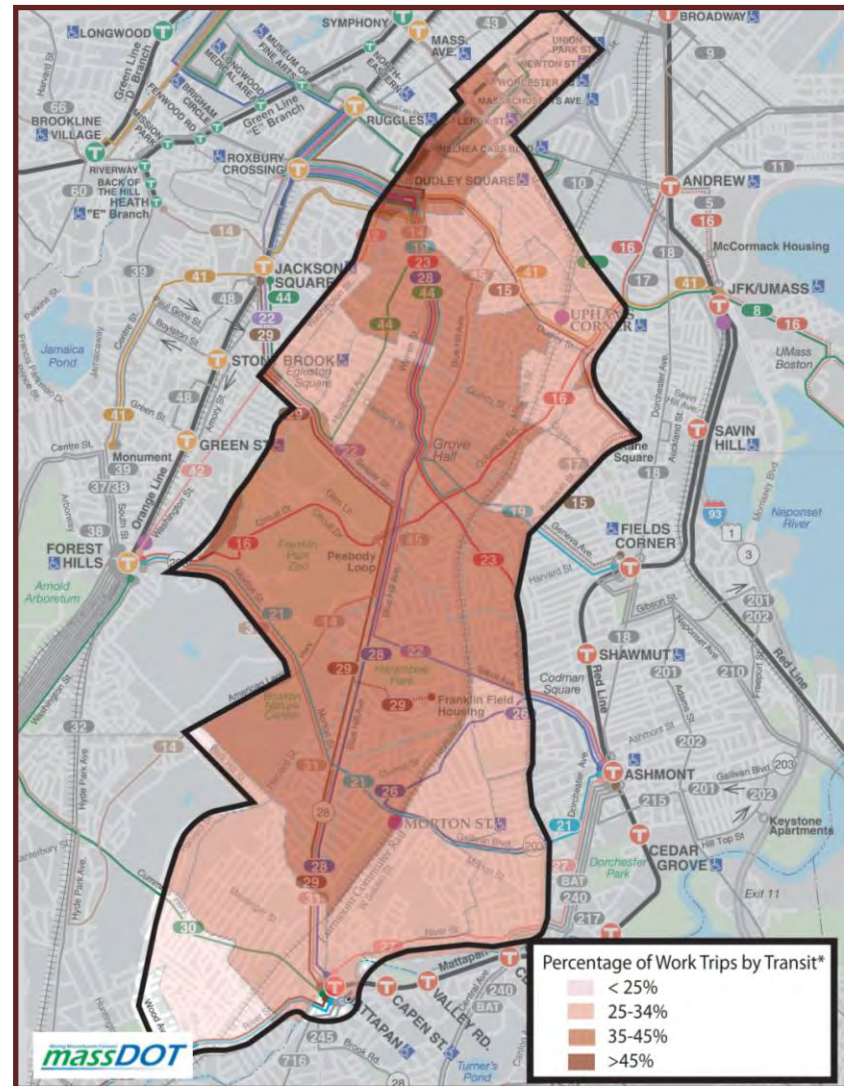


Figure 5: Percent of Work Trips by Transit (*2010 US Census)

⁹ 2010 U.S. Census- <http://factfinder2.census.gov>

MBTA Service Currently Provided in the Study Area

Despite the limitations of providing rapid public transit service within the Study Area today, the MBTA does provide a significant amount of service via various modes of transit in the three neighborhoods as described below.

Bus Service. The vast majority of MBTA service provided in the Study Area is bus service. A total of 26 routes provide service in at least a portion of the Study Area, and of these, 16 are operating primarily within Roxbury, Dorchester, and Mattapan with more than half of the route in the Study Area. Figure 6 demonstrates the portion of the Study Area that is within ¼ mile of MBTA bus stops that provide service every twelve minutes or less during the AM Peak Hour and within ½ mile of MBTA rapid transit stations. Together these Study Area bus routes carry 126,273 passengers on a typical weekday. Table 1 below summarizes the ridership and other features of the bus routes serving the RDM Study Area.

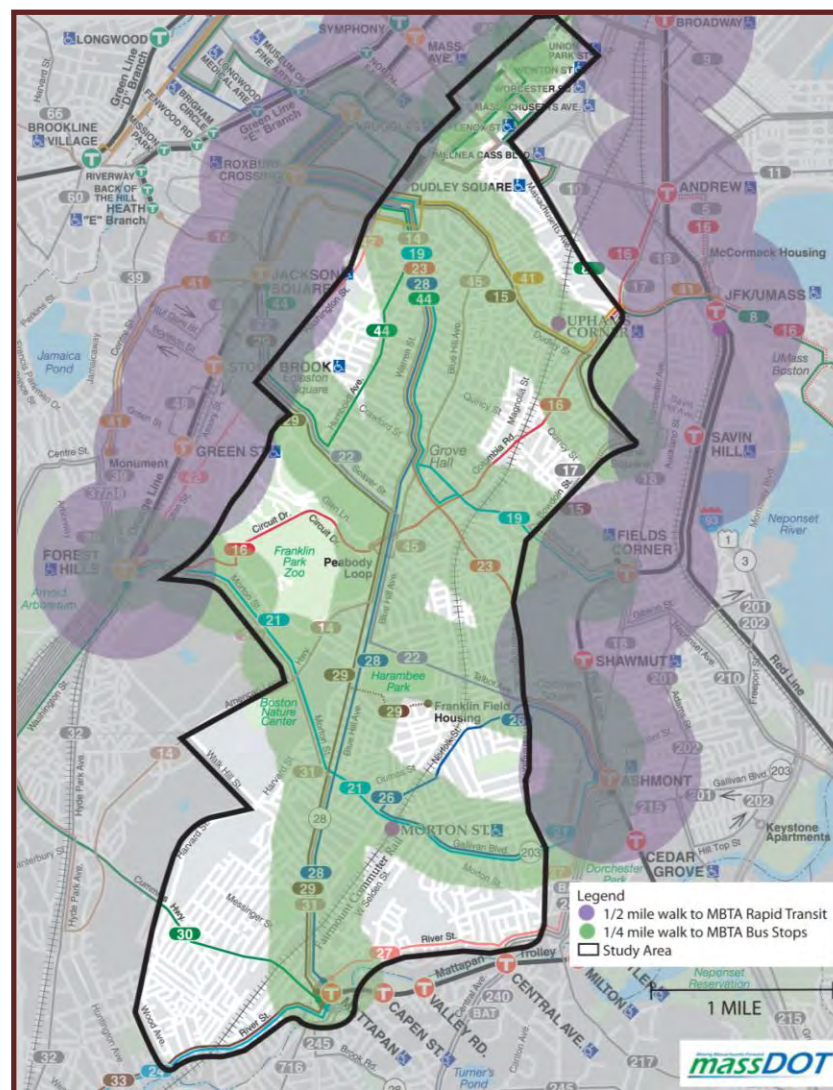


Figure 6: Walk Radius to MBTA Bus Stops and Subway Stations with Service Every 12 Minutes or Less During AM Peak Hour

Table 1: RDM Study Area Bus Routes¹⁰

Bus Route	Average Weekday Ridership	Ridership Rank	Morning Peak Frequency of Service	More than half of route in RDM Study Area?	Bus Route	Average Weekday Ridership	Ridership Rank	Morning Peak Frequency of Service	More than half of route in RDM Study Area?
SL5	14,709	1	Every 4 min	Yes	45	3,600	31	10 min	Yes
66*	14,676	2	8-9 min		19	3,376	19	12 min	Yes
1*	12,325	4	8-9 min		8	3,217	38	13-14 min	
23*	11,142	6	5-6 min	Yes	42	2,818	43	12 min	Yes
28*	10,607	7	6-7 min	Yes	17	2,781	44	14 min	
22*	7,047	10	8 min	Yes	41	2,234	53	22 min	
15*	6,951	11	6 min	Yes	29	2,072	60	16 min	Yes
SL4 ¹¹	5,799	15	8-10 min	Yes	30	2,033	61	15 min	
21	4,444	19	9 min	Yes	24	1,461	72	20 min	
16	4,350	21	15 min	Yes	26	1,336	80	30 min	Yes
47	4,341	22	20-22 min		14	1,291	84	35 min	
31	4,134	25	8 min	Yes	CT3	1,086	100	15 min	
44	3,791	28	12 min	Yes	27	451	142	35 min	Yes

*MBTA Key Routes

The MBTA has designated its 15 highest ridership, highest frequency bus routes as “Key Routes”. The Key Routes designation is intended to recognize the critical role that these routes play in complementing the MBTA’s rapid transit network and to look for opportunities to target improvements. Key Routes are now portrayed on the MBTA rapid transit map displayed in all rail stations, and the MBTA secured a \$10 million grant as part of the 2009

¹⁰ MBTA *Ridership and Service Statistics*, 13th Edition, 2010

¹¹ SL4 ridership information was not included in the 2010 Ridership and Service Statistics, because the route had not been in operation for a full year before that publication. The ridership figure used in the table is the most recent figure available and was provided by the MBTA Service Planning Department. The SL4’s rank is where it would have placed had its ridership figure been included in the 2010 document.

ARRA stimulus program to make capital improvements to these routes. As Table 1 shows, six of the MBTA's 15 Key Routes operate in the RDM Study Area, reinforcing the notion that the Study Area is dense with demand for reliable, high-frequency public transit service.

The vehicles providing bus service in the Study Area consist of a combination of 40-foot and 60-foot buses (with 39 and 57 seat capacities, respectively). Most of the service in the Study Area is provided out of the MBTA's Cabot Garage, where 80 percent of the fleet is powered by compressed natural gas (CNG). Three routes served by 60-foot articulated buses (the 28, and the two Washington Street Silver Line routes), are either hybrid vehicles powered by a combination of diesel fuel and electricity (28) or CNG (Silver Line). All buses in the Study Area are low-floor vehicles allowing easy access for passengers in wheelchairs or those using other mobility aids.

Bus service in the Study Area is provided at 439 bus stops across the three neighborhoods. Bus shelters are provided at 82 of these bus stops. In the City of Boston, bus shelters are provided as part of a contract between the city and a private vendor. Although the MBTA had the opportunity at the outset of the contract to prioritize a modest number of bus stops for shelters, the majority of the shelter locations within the city are determined by the private vendor, with a site's attractiveness from an advertising perspective driving the decision.

Mattapan High Speed Line. Connections between Mattapan Square in the southern end of the RDM Study Area, and the MBTA Red Line can be made on the Mattapan High Speed Line. This rail service is provided using streetcars from the 1940s, as seen in Figure 7, on a largely grade-separated right of way between Mattapan and Ashmont stations, serving six intermediate stations in Milton and Dorchester. The line carries roughly 4,500 passengers on an average weekday. The frequency of service on the line ranges from every five minutes (during the weekday peak period) to every 26 minutes (on portions of Saturdays and all day Sundays).



Figure 7: Mattapan High Speed Line

Nearby Rapid Transit Stations. While some bus riders in the Study Area are traveling to destinations within their immediate neighborhoods, many other bus riders in the Study Area are destined for nearby rapid transit stations in order to reach destinations or make connections elsewhere within the MBTA system. Table 2 below lists the most common destinations on the rapid transit network for bus passengers in the Study Area:

Table 2: Rapid Transit Stations Served by RDM Bus Routes

Station (Line)	Neighborhood	Daily Boardings	Number of connecting bus routes	RDM Bus Routes
Forest Hills (Orange)	Jamaica Plain	13,568	15	16, 21, 30, 31, 42
Ruggles (Orange)	Roxbury	8,378	13	CT3, 8, 15, 19, 22, 23, 28, 44, 45, 47
Ashmont (Red)	Dorchester	6,019	10	21, 22, 23, 26, 27
Roxbury Crossing (Orange)	Roxbury	3,693	8	15, 22, 23, 28, 44, 45, 66
Fields Corner (Red)	Dorchester	4,152	8	15, 17, 19
Andrew (Red)	South Boston	5,586	7	CT3, 16, 17
Jackson (Orange)	Jamaica Plain	4,968	6	22, 29, 41, 44
JFK/UMass (Red)	Dorchester	7,834	4	8, 41

MBTA Fairmount Line. The only rail service passing through the heart of the Study Area is the MBTA's Fairmount Commuter Rail Line. This relatively short, nine-mile line operates exclusively within the city limits of Boston, and currently serves two stations in the RDM Study Area—Morton Street Station in Mattapan and Uphams Corner Station in Dorchester. Compared to the high frequency bus service in the Study Area, Fairmount service is infrequent (every 40 minutes during rush hour) and consequently ridership at these two stations is modest: 203 daily riders at Morton Street and 154 at Uphams Corner¹². The MBTA is currently constructing three new stations in the Study Area (at Four Corners and Talbot Avenue in Dorchester and Newmarket in Roxbury) and expects to begin construction soon on a fourth new station at Blue Hill Avenue in Mattapan. The completion of this construction work will allow for some increases in service frequency as compared to what has been provided over the past several years of construction, while also expanding access to the line for more RDM Study Area residents.

¹² MBTA *Ridership and Service Statistics*, 13th Edition, 2010

IV. ISSUES IDENTIFIED IN THE RDM STUDY AREA

By some measures, the level of service provided by the MBTA in the RDM Study Area is very good—there is fairly comprehensive coverage of the three neighborhoods by bus routes, and many of these routes are scheduled to operate at a high frequency. However, the RDM Study identified a number of critical problems in the actual operation of available public transit services that became the basis for identifying study recommendations.

How Issues Were Identified

The MBTA collects data on system performance across a number of metrics. These include on-time performance, crowding, and reliability. By comparing specific bus routes against these measures, a determination can be made as to whether the service being provided meets the MBTA's own standards as outlined in the MBTA's Service Delivery Policy¹³. Other statistics, such as travel times to downtown Boston from various locations within the Study Area, can be generated by using the MBTA's own published schedules. However, these quantitative measures only present a part of the story. Direct outreach to Study Area residents through public meetings, the Advisory Group process, and broad distribution of a survey was equally important in identifying qualitative issues that relate to the daily experience of using MBTA services in the Study Area since service does not always operate according to posted schedules.

RDM Transit Needs Survey. MassDOT, with input received at public meetings and from the Advisory Group, developed a ten-question survey, shown in Figure 8, to help understand the transportation needs of Study Area residents. Two versions of the survey were developed—one for frequent riders and one for infrequent or non-riders. Both surveys focused on the respondents' most common trips, and the types of improvements to the MBTA experience and service that would be most important to them or, in the case of infrequent riders, be most likely to encourage more frequent use of the MBTA. Surveys were distributed via hard copies at meetings and through the study website, and were available in English, Spanish, and Haitian Creole. In addition, MassDOT met with many organizations in the RDM Study Area who agreed to distribute the survey to their constituencies. These organizations included community groups, neighborhood associations, houses of worship, and business groups.

In keeping with the RDM Study's focus on reaching out directly to MBTA customers, MassDOT deployed a team of surveyors using portable electronic devices to interview riders directly. Targets (see Appendix B) were established to capture a minimum number of respondents from high-transfer locations such as Dudley and Ruggles, at busy bus stops including many on Blue Hill Avenue, as well as on-board Study Area bus routes.

¹³ The purpose of the Service Delivery Policy is to ensure that the MBTA provides quality transit services that meet the needs of the riding public and are consistent with the MBTA's enabling legislation and other external mandates. The Service Delivery Policy establishes service objectives that define the key performance characteristics of quality transit services.

The RDM transit needs survey ultimately gathered 1,344 responses. Roughly half of these were due to MassDOT’s partnership with Study Area organizations, and nearly 500 were collected directly from MBTA customers in the field with portable devices. Of the total number of survey responses, 69 percent were completed by individuals who indicated that they ride the MBTA almost every day. See Appendix C for survey results.

<p style="text-align: center;">ROXBURY • DORCHESTER • MATTAPAN</p> <p style="text-align: center;">RDM</p> <p style="text-align: center;">TRANSIT NEEDS STUDY</p> <p style="text-align: center;">Roxbury / Dorchester / Mattapan Transit Study Survey</p> <p>1. Do you ride the MBTA...</p> <ul style="list-style-type: none"> ☐ Almost every day (Regular Rider) ☐ At least once a week (Occasional Rider) ☐ Less than once a week (Infrequent Rider) <i>[if selecting this option please go to Side 2 of the survey]</i> <p>2. Which bus or rail lines do you use the most? (NOTE: choosing more than 3 will invalidate your response)</p> <p>3. Do you have access to an automobile? (circle one) Yes No</p> <p>4. Why do you use the MBTA? (check all that apply)</p> <ul style="list-style-type: none"> ☐ It is my fastest option ☐ It is my cheapest option ☐ MBTA use is good for the environment ☐ Other _____ <p>5. What types of trips do you use the MBTA for? (check all that apply)</p> <ul style="list-style-type: none"> ☐ Work ☐ School ☐ Shopping/entertainment ☐ Medical appointments ☐ Church <p>6. What areas do you typically use the MBTA to get to? (check all that apply)</p> <ul style="list-style-type: none"> ☐ Downtown ☐ Back Bay/South End ☐ Longwood Medical Area ☐ Roxbury ☐ Dorchester ☐ Mattapan ☐ Other _____ <p>7. What improvement to MBTA service would be most important to you? (check one):</p> <ul style="list-style-type: none"> ☐ Buses/trains that run on time ☐ Buses/trains that travel their route faster ☐ Easier to pay fares ☐ More service to the places I'm going <p>8. What improvement to the MBTA experience would be most important to you? (check one):</p> <ul style="list-style-type: none"> ☐ More comfortable vehicles, bus shelters and stations ☐ Better accommodations for baby strollers ☐ Better accommodations for bicycles (on vehicles and at stations) ☐ Safer and cleaner vehicles, bus shelters and stations ☐ More schedule and "next bus/train" information at stations and stops <p>9. How long does it take you to walk from your house to the bus or train? _____ minutes (if you don't walk enter N/A) <i>[If N/A, skip to Question 11]</i></p> <p>10. Would you be willing to walk further if your overall travel time was shorter? (circle one) Yes No</p> <p>11. Please share the following:</p> <p>Zip code _____ Gender (circle one) M F</p> <p>Age (circle one) <18 19-24 25-44 45-64 >64</p> <p>Email Address _____ (so we can add you to our contact list)</p> <p>THANK YOU FOR COMPLETING THE RDM TRANSIT STUDY SURVEY!</p> <p>www.mass.gov/massdot/rdm</p>	<p>Side 2: ANSWER THESE QUESTIONS ONLY IF YOU ANSWERED "Less Than Once A Week" to Question 1</p> <p>(Do not fill out this side if you completed the front of the survey!)</p> <p>1. Why don't you use the MBTA more often? (check all that apply)</p> <ul style="list-style-type: none"> ☐ I can reach my destination faster in a car ☐ It costs me less to drive ☐ Hours that buses and trains run are not convenient for me ☐ MBTA buses/trains do not serve the places I travel to ☐ I am more comfortable when traveling in my car <p>2. What are your most common destinations? (check all that apply)</p> <ul style="list-style-type: none"> ☐ Downtown ☐ Back Bay/South End ☐ Longwood Medical Area ☐ Roxbury ☐ Dorchester ☐ Mattapan ☐ Other _____ <p>3. What MBTA service improvement would cause you to switch some of your trips to the MBTA? (check one)</p> <ul style="list-style-type: none"> ☐ Buses/trains that run on time ☐ Buses/trains that travel their route faster ☐ Easier to pay fares ☐ More service to the places I'm going <p>4. What improvements to the MBTA experience would be most likely to cause you to switch some of your trips to the MBTA? (check one)</p> <ul style="list-style-type: none"> ☐ More comfortable vehicles, bus shelters and stations and better accommodations for baby strollers ☐ Better accommodations for bicycles (on vehicles and at stations) ☐ Safer and cleaner vehicles, bus shelters and stations ☐ More schedule and "next bus/train" information at stations and stops <p>5. Please share the following:</p> <p>Zip code _____ Gender (circle one) M F</p> <p>Age (circle one) <18 19-24 25-44 45-64 >64</p> <p>Email Address _____ (so we can add you to our contact list)</p> <p>THANK YOU FOR COMPLETING THE RDM TRANSIT STUDY SURVEY!</p> <p>www.mass.gov/massdot/rdm</p> <p>Over the next several months, the Massachusetts Department of Transportation (MassDOT) will be reaching out to the public to learn more about the types of improvements in MBTA service they would like to see in the Roxbury, Dorchester, and Mattapan neighborhoods. An important first step in reaching out will be this RDM Transit Survey.</p>
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Figure 8: RDM Transit Needs Survey

Key Transit Issues

The types of issues identified through the survey process and the review of existing MBTA performance data are typical for a mature transit market in a congested urban area, and relate more to the quality and quantity of service, rather than any immediately obvious service gaps. These issues, which are listed below, were used as an input into the development of evaluation criteria, which in turn were one of the tools used to evaluate the merits of the various strategies to improve system performance which were considered as potential study recommendations.

On-Time Performance. The need for improved reliability and on-time performance — whether to reduce the occurrence of bus bunching, long headways, or excessive delays¹⁴ — is one of the most important issues in the Study Area. Better on-time performance was the most important service improvement identified by survey respondents, with 63 percent of frequent riders noting it as their biggest concern and 38 percent of infrequent or non-riders listing it as something that prevented them from using the system more often.

Many of the bus routes along Blue Hill Avenue and Warren Street have difficulty adhering to their schedules, as do a number of the “crosstown” routes that cut east-west through the Study Area, such as the 16, 22, and 30. The MBTA measures on-time performance using Automated Vehicle Location systems¹⁵ on the buses. The MBTA establishes checkpoints at the origin, various mid-points, and the destination of each route. As described in Table 3, the MBTA’s Service Delivery Policy (June 2010) defines “on-time” differently based on whether the bus is operating at headways less than or greater than ten minutes and whether it is at an origin, midpoint, or destination along the route.

Table 3: MBTA Service Delivery Policy On-Time Performance

Schedule	Origin	Mid-Point	Destination
>10 Min Headway	Start 0 minutes early to 3 minutes late	Depart 0 minutes early to 5 minutes late	Arrive 3 minutes early to 5 minutes late
<10 Min Headway	Start within 1.5 times scheduled headway	Leave within 1.5 times scheduled headway	Running time within 20% of scheduled run time

¹⁴ Bus bunching refers to incidents where two or more buses on a particular route travel in close proximity to one another, rather than maintaining the even spacing suggested by the schedule. Headways refer to the time between vehicle arrivals on a given route.

¹⁵ Automated Vehicle Location systems (or AVL) are GPS-based systems that can pinpoint the location of a monitored vehicle at a given time.

Figure 9 shows the on-time performance on bus routes in the MBTA Study Area. The only local bus route in the Study Area (excluding Silver Line service) that is on time more than 80 percent of the time is Route 27 which travels on River Street between Mattapan Station and Ashmont Station. Generally, on-time performance gets worse as the distance to downtown Boston decreases, which is likely due to the traffic congestion in the denser areas closer to downtown.

Service Frequency. Bus service on many routes in the Study Area operates at a very high frequency. Many routes operate every 12 minutes or less during peak periods, with the Key Routes operating even more frequently. However, the need for more frequent service was identified as an issue along certain corridors and at certain times of day.

East-west corridors, such as Columbia Road, American Legion Highway, Cummins Highway, Norfolk Street, and River Street have the lowest frequency service with trips scheduled to arrive every 15 minutes or longer during peak periods. The notable gaps in access to high frequency service are in portions of Mattapan that are not within a short walk of either Blue Hill Avenue or Morton Street; portions of Dorchester south of Talbot Avenue; and in the blocks around the Columbia Road/Quincy Street intersection.

Although frequent service is provided along most major corridors during the peak periods¹⁶, many riders use MBTA service during non-peak hours for shopping, medical appointments, leisure, and school/work trips. During the midday base time frame (9:00 AM to 1:29 PM) and on



Figure 9: MBTA On-Time Performance

¹⁶ The MBTA defines the AM peak period as the hours of 7am to 8:59am and the PM peak period as the hours of 4pm to 6:29pm (MBTA June 2010 Service Deliver Policy).

Saturdays, frequent service (every 12 minutes or less) is provided only along Blue Hill Avenue, Warren Street, Morton Street, Talbot Avenue, Dudley Street, Seaver Street, and Washington Street between Codman Square and Grove Hall. The remainder of the Study Area has lower frequency service with buses scheduled to arrive at intervals of 15 minutes or more.

The only route that does not operate on weekends is the 19, which provides weekday service between Fields Corner and Ruggles Station along Geneva Avenue and Blue Hill Avenue. The 14 and 29 do not operate on Sundays.

Travel Time to Downtown Boston. The RDM Study Area is very close to downtown Boston, yet traveling there using MBTA service can require a frustratingly long amount of time. Long travel times to downtown impact a large proportion of Study Area riders—over 70 percent of frequent MBTA riders responding to the Transit Needs Survey identified downtown Boston as their most common destination. As Figure 10, based on schedule travel times, demonstrates that areas closer to the MBTA Orange and Red Lines have the shortest trip times to Downtown Crossing (25 to 30 minutes), while areas south of Warren Street on Blue Hill Avenue and the southwest corner of the Study Area in Mattapan are in the 35–45 minute range. Areas of particular concern are along the Columbia Road corridor where travel times to downtown exceed 35 minutes, despite being fewer than four miles away from downtown. Of all survey respondents, 16 percent identified improved travel time as the most important MBTA service improvement.

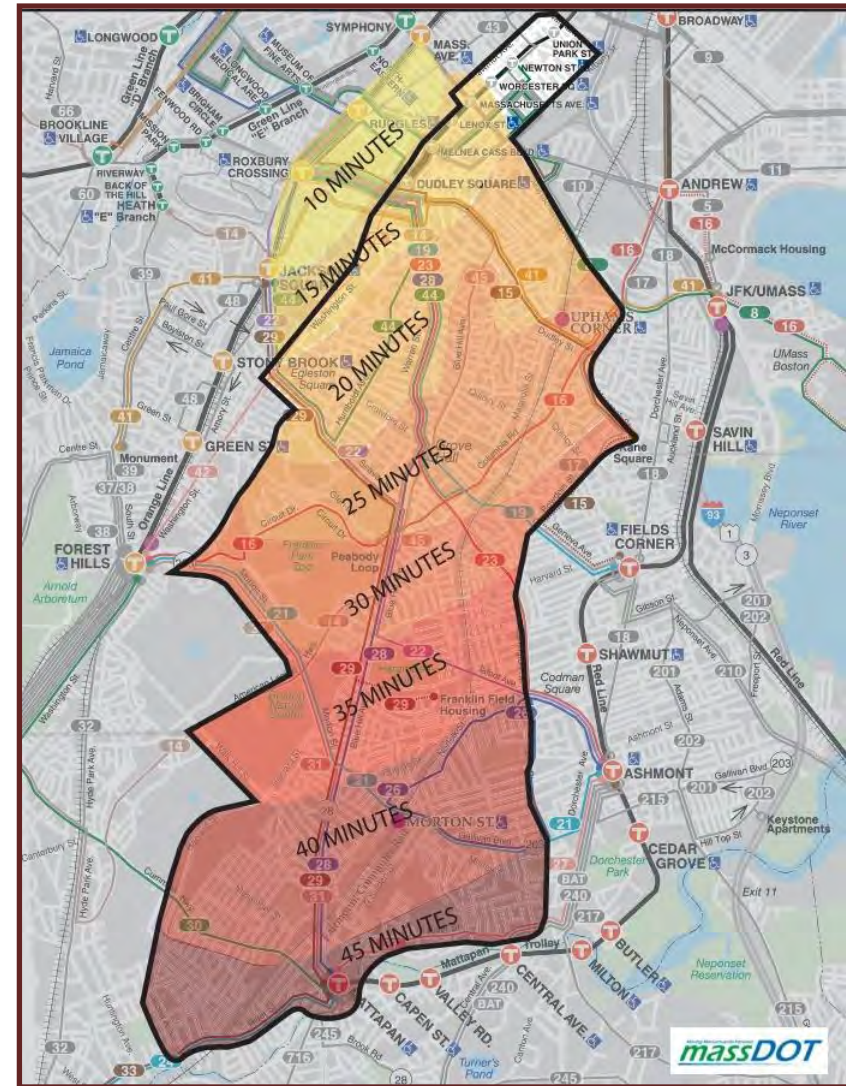


Figure 10: Travel Time to Downtown Boston (Downtown Crossing Station)

Direct Connections. As commuting patterns and major destinations have changed over the decades, there are now certain travel markets that are not well served by the existing public transit network, which is focused on radial trips and that largely follows the same route paths as the original streetcar network. In particular, most trips from the Study Area to two of the major destinations outside of downtown Boston—Boston Medical Center and the Longwood Medical Area—currently require a transfer at either Dudley or Ruggles Stations. As these two employment destinations have grown in importance for the neighborhoods in the Study Area, there is an increasing need for additional connections to these medical destinations, for access to both jobs and health care. The need for more service to new destinations was identified as one of their most important service improvements by 34 percent of infrequent riders (those using the MBTA less than once a week) completing the survey as shown in Figure 11.

Fare Collection. The process of collecting fares contributes to delays and frustration for MBTA passengers. Unlike at rapid transit stations, where passengers pay their fare before boarding the vehicle, passengers pay their fare as they are boarding all bus service in the RDM Study Area. This creates challenges on the highest ridership bus routes, and during peak periods on all routes, as buses must wait for large numbers of passengers to pay before departing each stop.

Passengers can pay with either cash or a stored-value card (“CharlieCard”). Cash fares are \$2.00, but discounted fares of \$1.50 are provided for those paying with a CharlieCard. When the CharlieCard system was introduced in 2006, riders were given the ability to add value to their CharlieCards on the bus farebox. This allows bus passengers who do not live close to a rapid transit station (where most of the CharlieCard vending machines are located) to add value to their cards and thus access the lowest fares. These farebox transactions, however, consume more time than typical fare collection, and contribute to delays.

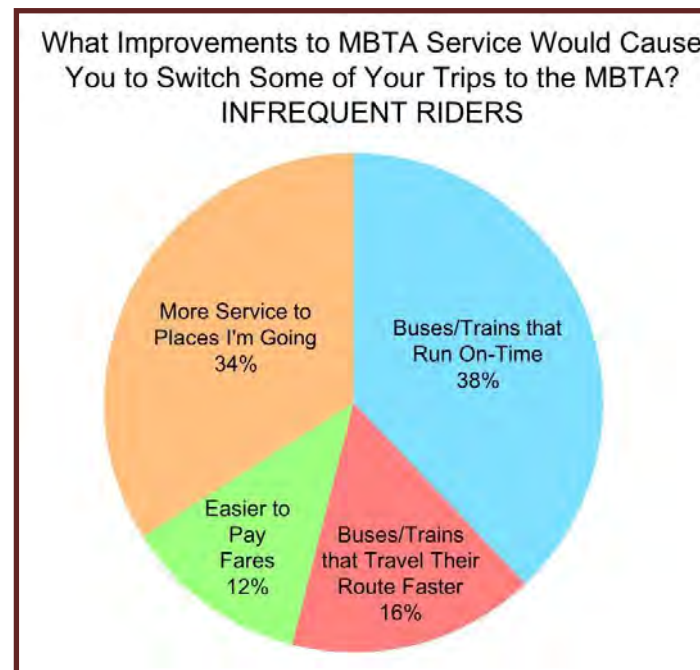


Figure 11: Service Improvements- Infrequent Riders

The MBTA, in an effort to discourage adding value to CharlieCards at the bus farebox, has worked with local shopkeepers to host retail sales terminals (RSTs). Similar to lottery transactions, the RSTs are operated by the store clerk and can process all transactions that a CharlieCard vending machine can. As Figure 12 demonstrates, however, there is relatively poor access to RSTs within the RDM Study Area. In addition to poor access, there is also a lack of clear information from the MBTA on the location and benefits of using these devices.

Customer Information. For any public transportation system, reliable information about schedules and delays is important. In areas like the Study Area, where transit service is provided exclusively by buses, reliable/accurate information becomes essential to customers' ability to use and have confidence the system. Access to schedule information is critical for riders using lower-frequency bus routes, and real-time bus location information is important for all riders. At most bus stops in the Study Area, there is no provision of either schedule or real-time information. Since most bus stops lack basic amenities found at rapid transit stations and do not have MBTA personnel on site, the lack of certainty in how long a customer will wait for a bus can be frustrating, create safety concerns and act as a disincentive to using the MBTA system.

Disconnect between Policy and Action. Although the MBTA has strict driver training and certification programs, regulations for driver etiquette, and has policies on issues such as snow removal, there is often a disconnect between the policies that are in place and what MBTA customers actually experience while waiting at stops or riding on the buses. While there was general recognition during the RDM Study process

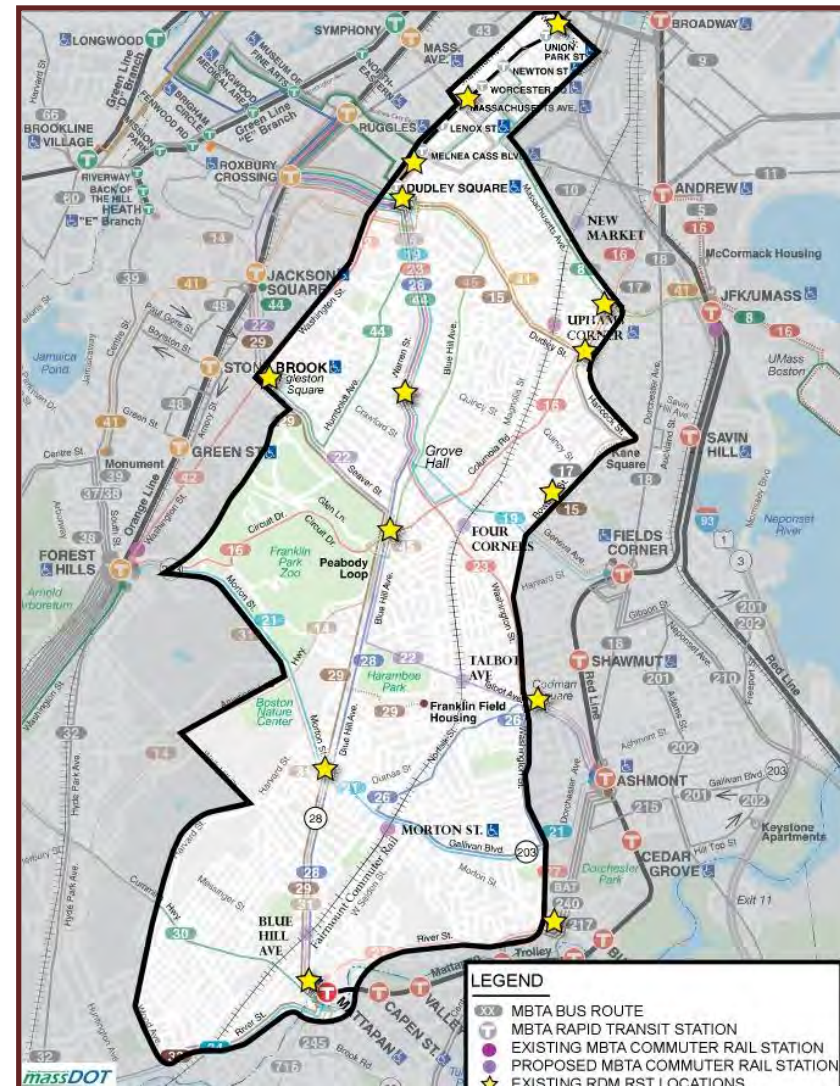


Figure 12: Existing Retail Sales Terminal (RST) Locations

that most MBTA bus operators do their job well, concerns about the unsafe operation of MBTA buses, compliance with accessibility regulations, and driver courtesy to customers were regular themes raised throughout the process and during public meetings.

Traffic Congestion. The Study Area is made up of neighborhoods with a complex set of relatively narrow arterial streets that do not have the capacity to carry significant volumes of traffic. Complex, multi-legged intersections exacerbate congestion problems by requiring multi-phase traffic signal cycles with limited time allocated for each approach. While the long-term land development patterns have created ideal conditions for public transit use, buses must contend with the same levels of congestion experienced by private automobiles, creating the potential for significant delays and service disruptions. Locations within the Study Area that have been identified as particularly congested include Dudley Square, Mattapan Square, Grove Hall, and a majority of Dudley Street.

Overcrowding. The very high ridership levels on many bus routes in the Study Area, coupled with the difficulty buses have staying on-time in congested city traffic, can result in trips that are delayed and overcrowded. This was a common concern raised during the study's civic engagement process. The MBTA's Service Delivery Policy considers trips to be overcrowded when they are carrying more than 54 passengers in peak periods (on a traditional 40-foot bus). Early in the study process, the MBTA addressed overcrowding on one of the Study Area's busiest bus routes—the 28—by dedicating a fleet of larger 60-foot vehicles to the route while maintaining the existing frequency of service. Many participants in the study also suggested that buses feel overcrowded even when the MBTA's designated crowding thresholds are not being exceeded, because the interior design of vehicles does not provide space for baby strollers to clear the aisle allowing passengers to filter into open sections of the bus.

V. ALTERNATIVES DEVELOPMENT AND EVALUATION

Addressing the issues identified in the previous section requires a diversified approach. Existing constraints on both the MBTA's capital and operating budgets mean solutions that can be achieved with low or no cost should be prioritized. At the same time, some of the more fundamental issues faced by both current and potential MBTA riders in the RDM Study Area can only be addressed with system investments that may be beyond today's means. In developing alternatives for evaluation, and in the evaluation process itself, the need to think of solutions in both the short and long-terms was recognized.

Alternatives Development

RDM Study issues were identified by those that best understand the system and how it serves Roxbury, Dorchester, and Mattapan—residents and riders from these communities (Figure 13 shows community involvement through Advisory Group meetings). Likewise, the identification of possible strategies to address these issues was also a community-driven process. In addition to considering the many good ideas proposed through previous planning efforts (most consisting of their own extensive civic engagement programs), several techniques were used to ensure that the ultimate list of alternatives represented the ideas of a broad group of MBTA riders, residents, businesses, and other interested parties. This included hours of direct outreach to MBTA passengers at busy bus terminals, direct outreach to residents at local events, an interactive comment tool on the study website, as well as through the study's traditional public outreach meetings. The focus throughout this outreach was to get people talking about *specific* improvements they would like to see, rather than restating complaints and concerns with existing services. Table 4 identifies each of the sources used during the RDM Study process to identify alternative strategies to improve transit service.



Figure 13: Advisory Group Meeting

Table 4: Sources for Ideas for RDM Study Proposed Alternatives

Previous Studies/Reports/Comments Evaluated in RDM Transit Needs Study	New Ideas Collected During the RDM Transit Needs Study
1977 MBTA Study on Transit Improvements in Study Area	Advisory Group Meetings
Various alternatives analysis documents prepared by the Washington Street Corridor Coalition (WSCC)	Information/Outreach Tables (Juneteenth, Ashmont Station, Dudley Station, Mattapan Station, Forest Hills Station)
Dudley Square Transportation and Air Quality Study	Outreach to Elected Officials, City of Boston, MBTA, and other Stakeholders
Dudley Square Action Plan	Project Team
Beyond Dudley Study	Public Meetings
Mattapan Economic Development Initiative	RDM Transit Survey
2009 28X proposal	RDM Website
Memos submitted by advocates during the 28X process	
Roxbury Strategic Master Plan	

This outreach campaign reached several hundred people and resulted in 150 unique ideas for system improvements; many of recommendations on improved service were heard repeatedly throughout the study process. The ideas ranged from modest suggestions for improving the experience of using the MBTA (such as adding a bench to a specific bus stop) to major capital investment projects (such as new Orange Line subway extensions). A full list of the 150 ideas suggested is provided in Appendix D.

Alternatives Evaluation

Using the input received through the RDM Transit Needs Survey, and in partnership with the RDM Advisory Group, MassDOT established a set of 13 evaluation criteria against which alternatives were measured (see Table 5 below).

Table 5: Evaluation Criteria

Criterion	Measures
Accessibility	<ul style="list-style-type: none"> • Decreased distance to access bus/transit service • Bus/transit service provided to neighborhoods without previous service • Improvement in access for persons with disabilities
Connectivity	<ul style="list-style-type: none"> • More connections to destinations in the Study Area • More connections to destinations/employment hubs outside the Study Area (i.e., Boston Medical Center, downtown Boston, LMA) • Increase in frequency of service
Passenger Amenities	<ul style="list-style-type: none"> • More amenities for MBTA users (i.e., shelters, benches, lighting, passenger amenities)
Reliability	<ul style="list-style-type: none"> • Reduced variability of travel time from route origin to destination • Improvement in on-time performance
Ridership	<ul style="list-style-type: none"> • Increase in ridership as a result of enhancement
Safety	<ul style="list-style-type: none"> • Improvement in vehicular, pedestrian, bicycle, or transit rider safety
Travel Time	<ul style="list-style-type: none"> • Decreased travel time from origin to destination
Community Feasibility	<ul style="list-style-type: none"> • Public support for alternatives • No impact on nearby residents (i.e., no right of way taking, no disruption to homes or businesses)
Construction Impacts	<ul style="list-style-type: none"> • No impact caused by construction activities (i.e., to residents, businesses, or travel patterns)
Environmental Benefits	<ul style="list-style-type: none"> • Improvement in air quality • Reduction in noise/vibration • No influence on any other environmental resources (i.e., wetlands, animal habitats)
Parking Impacts	<ul style="list-style-type: none"> • No reduction in number of on-street and off-street parking spaces
Technical Feasibility	<ul style="list-style-type: none"> • MassDOT and the MBTA are capable of physically and technically implementing the enhancements
Traffic Flow Impacts	<ul style="list-style-type: none"> • No impact on signalized intersections (i.e., reduced level of service, increased delays, or increased queues) • No reduction in lane or turning movement capacity • No impact to bicycling or pedestrian environments

The RDM Advisory Group was instrumental in the application of this set of criteria to the 150 alternatives. The group worked with MassDOT and the MBTA to develop a weighted scoring system¹⁷ that would allow the many alternatives to be compared against each other. To ensure that the scoring system was applied consistent with the study goals, four members of the Advisory Group (representing the geographic diversity within the Study Area) also volunteered to serve on a subcommittee that spent several hours reviewing and scoring each of the alternatives with MassDOT.

Before scoring, alternatives were also designated as short-term, medium-term or long-term improvements depending on their likely implementation horizon. This designation prevented shorter-term, more modest alternatives from being overshadowed by longer-term alternatives. Table 6 demonstrates how these determinations were made:

Table 6: Timeline for Implementation Criteria

Time Frame	Criteria	Number of Ideas Collected
Short Term	<ul style="list-style-type: none"> • Can be implemented quickly • No planning/design necessary • No/minimal capital cost or impact on operating budget 	20
Medium Term	<ul style="list-style-type: none"> • Require some level of planning/design • Larger impact on capital and/or operating budget 	107
Long Term	<ul style="list-style-type: none"> • Significant planning/design (likely subject to environmental review) • Significant impact on capital and/or operating budget- may require outside funding 	19

The scores arrived at by the Advisory Group subcommittee were reviewed with the entire Advisory Group membership and shared at public meetings, and received general support. A full listing of the 150 alternatives and how each of them scored is available in the Appendix. The scoring was used to help guide MassDOT, the MBTA, and the RDM Advisory Group in identifying RDM Study recommendations.

¹⁷ Criteria that were given additional weight by the Advisory Group were Accessibility, Reliability, Safety, Community Feasibility, Parking Impacts, and Traffic Flow Impacts.

VI. RECOMMENDATIONS

The RDM Study was understood from its outset to represent a vision for future public transit improvements in the three neighborhoods of Roxbury, Dorchester, and Mattapan. Throughout the process, expectations were managed—study participants understood that the ultimate recommendations would require sustained advocacy and pursuit of scarce funding in order to become reality. But the study itself has emerged from a shared understanding—by MassDOT; the MBTA; elected officials from Roxbury, Dorchester, and Mattapan; and neighborhood residents—that having a *shared vision* is essential to avoiding the pitfalls that have so often characterized transportation investment decisions in these areas of Boston. The recommendations outlined in this section represent the shared vision of improvements that all stakeholders believe would address mobility issues in the Study Area, and do so in a way that would be sensitive to community concerns.

In January 2012, during the final months of the RDM Study civic engagement process, the MBTA began a dialogue with all of its customers about the need to close a \$161 million operating budget deficit for fiscal year 2013. The choices were stark—fare increases of more than 40 percent, or less severe increases coupled with a dramatic scaling back of service. Although the ultimate resolution resulted in comparatively modest impacts for most MBTA riders¹⁸ (due in part to the identification of some one-time savings from other areas of state government), MassDOT and the MBTA emphasized throughout the process that its operating budget deficit would continue to increase in future years. The passionate advocacy of thousands of MBTA customers appears to have also reinvigorated the debate within the Commonwealth over how to sufficiently fund not only the MBTA system, but the entire transportation network in Massachusetts.

Ironically, given both the MBTA's financial challenges and the lack of confidence that federal funding for public transportation will increase, the vision put forth by the RDM Study may have come at an opportune time. At a time when major capital investments in the MBTA network have had to be scaled back or suspended due to a lack of funding—the Urban Ring and the Red Line / Blue Line Connector are but two examples—it is exactly the types of low-cost operational improvements identified as short-term recommendations by this study that have the best hope for bringing meaningful benefits to today's MBTA riders. At the same time, when the financial state of MassDOT and the MBTA improves to the point where major investments in capital or operational expansions can once again be considered, this study has also outlined a vision for those kinds of improvements. The study is also intended to make clear that when the MBTA is again positioned to expand, the neighborhoods of the RDM Study Area should be at or near the top of the MassDOT/MBTA's list of priorities.

¹⁸ In April 2012 the MBTA Board of Directors approved a 23 percent fare increase accompanied by modest service cuts. The only service cut impacting the RDM Study Area was a reduction in the frequency of the Mattapan High Speed Line on Sundays and for portions of the day on Saturdays.

Identifying Final Recommendations

The final recommendations described in this section were reached collaboratively between MassDOT, the MBTA, the RDM Study Advisory Group, and Study Area elected officials (See Figure 14 showing the community outreach effort). Input on the feasibility and timeframe of various alternatives was provided by relevant departments within the MBTA. The City of Boston Transportation Department and the Boston Redevelopment Authority were also included in the discussions of recommendations. Once all stakeholders had agreed to the list of proposed recommendations, they were presented to the public in a series of three community meetings held in March and April 2012. Comments received at those three meetings were used to refine and finalize the list of recommendations presented in this report.

To help inform the decision-making on alternatives that should move forward as recommendations, a technical analysis of five of the alternatives selected in collaboration with the Advisory Group was conducted by the Central Transportation Planning Staff (CTPS) —See Appendix E for proposed service plans for each alternative and corresponding model results. CTPS is the staff to the Boston Region Metropolitan Planning Organization, the entity charged with allocating federal transportation funds in the Boston area. The analysis conducted by CTPS as part of this process relied on the regional travel demand model, a sophisticated tool used to project future ridership, travel times, and air quality impacts of potential transportation investments. Where applicable, the recommendations described in this section present the results of the regional travel demand model application.



Figure 14: Community Outreach

Short-Term Recommendations

In recognition of both MassDOT and the MBTA's limited available funds to make major new investments in capital facilities and operations, and the pressing need for improved service for today's riders, much of the RDM Study focused on short-term alternatives. The short-term recommendations outlined below all represent improvements that can be pursued immediately, even within the current financial climate, and in many cases work has already commenced on them.

Improve Access to CharlieCard Vending Machines. A key finding of the study was that the system put into place to encourage bus passengers to add value to their CharlieCards before boarding buses was not feasible in the RDM Study Area due to the limited availability of CharlieCard vending machines. As Figure 15 has demonstrated, very few of the MBTA's 167 RSTs were hosted by merchants within the RDM Study Area, and only six are located away from rapid transit station where they're needed the most. This results in many bus passengers choosing to add value to their CharlieCards when boarding the bus in order to access the discounted bus fare. This in turn has negative impacts for passengers already on-board the bus due to the increased time spent at bus stops while passengers conduct these relatively lengthy transactions on-board.

Merchants in suburban locations served by commuter rail host a disproportionate number of the RST devices. This is likely due to the fact that merchants in these towns had previously sold commuter rail tickets or passes as an agent to the MBTA, and also may reflect the commission structure—merchants are paid a 1.8 percent commission on total sales

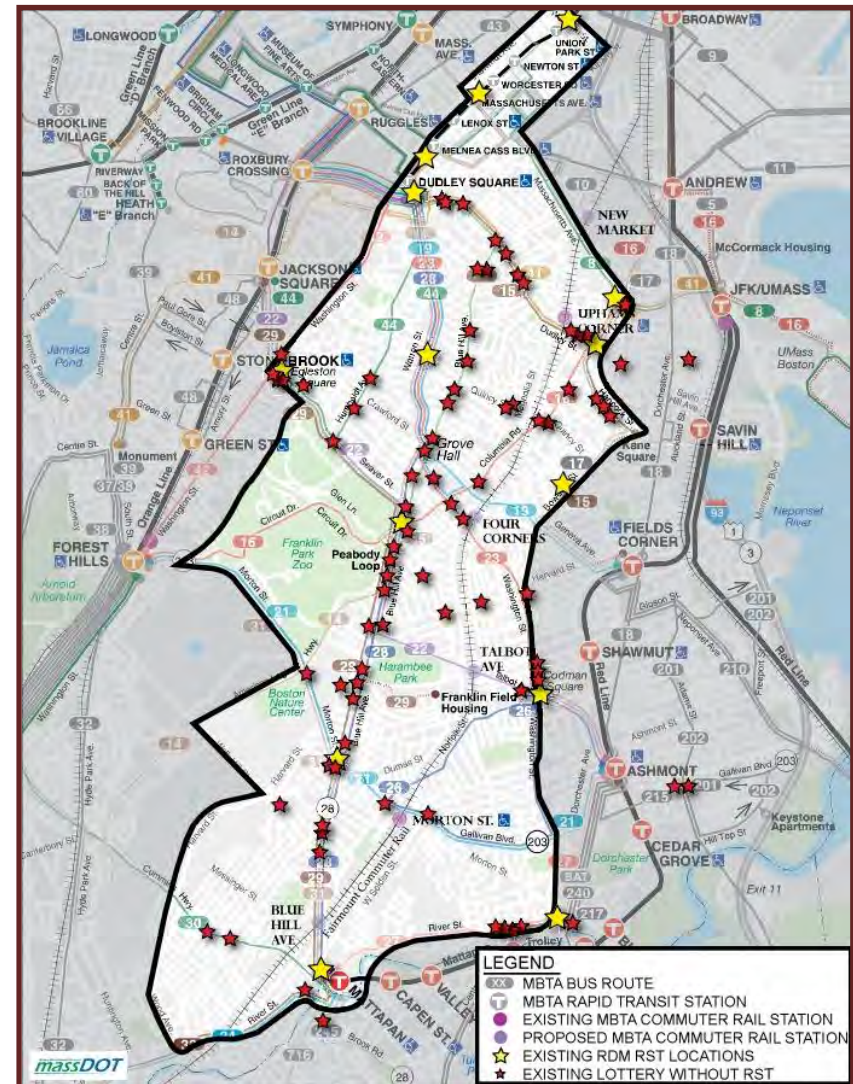


Figure 15: Existing RST and Lottery Locations

revenue they conduct on an RST. This means a merchant is paid \$3.60 for every \$200/month commuter rail pass sold, but only two cents for a single bus fare being added. When the impacts on the MBTA's operations are considered (the commuter rail rider who bypasses an RST can pay their fare to a conductor while the train is moving at full speed; the bus rider who bypasses an RST adds value to their CharlieCard at the bus farebox while the bus is stopped waiting for them to complete the transaction), it is clear that the current incentive structure should be revisited.

The RDM Study recommends a four-step approach to improving CharlieCard upload-related delays on buses:

1. **Dramatically increase access to RSTs in the Study Area.** The MBTA received its final shipment of 100 new RSTs from its vendor at the beginning of 2012. The priority for distributing these should be to target the gaps in the current distribution of RSTs in the RDM Study Area (and other areas with high dependency on bus service and with a lack of rapid transit stations). Goals for locating them along bus routes at intervals that would minimize the need for customers to go far out of their way (perhaps every ½ mile along bus routes, or more frequently along Key Routes) should be established.
2. **Create a new incentive structure that is consistent with MBTA operational priorities.** Since the cost of conducting a \$1 transaction versus a \$200 transaction on an RST is the same for both the MBTA and the merchant, the commission structure should be based on the number of transactions conducted, or some hybrid of the current structure.
3. **Promote the availability of RSTs in the Study Area.** Most study participants said they were unaware that the devices existed and did not know how to find information on them. Although there are limited opportunities to devote more advertising space to these devices inside the stores and in store windows where they are hosted (due to competing demands of other products), the MBTA can do more to point customers to the nearest RST from its bus stops, including in-vehicle advertising panels, signage at bus stops, information on the MBTA website, and other methods.
4. **Set a minimum “up-load” value at the farebox.** Once steps 1 – 3 have been implemented, and concerns about equitable access to CharlieCard fare machines has been addressed, the MBTA will be in a much better position to set a minimum value—say \$5 or \$10—for farebox transactions. This would preserve the ability for bus passengers to have access to CharlieCard transactions on the vehicle, but dramatically reduce the number of farebox transactions by requiring passengers to add sufficient value to cover multiple trips.

Complete Key Routes Improvements. The \$10 million capital investment in the MBTA's Key Routes program, described previously in the *Existing MBTA Service* section of this report, is an attempt to address many of the issues that have been identified in the RDM Study Area—on-time performance, travel time, fare collection, safety, customer amenities, and customer information—on the MBTA's busiest bus routes. In 2009, the MBTA initiated a public process on Route 23, focusing on the Grove Hall to Ashmont Station portion of the route. The result of that process was the design of improvements including:

- Consolidation of closely spaced bus stops
- Elimination of some low ridership stops
- Lengthening of bus stops so buses can pull all the way to the curb
- Upgraded traffic signals
- Locating new bus shelters
- Other passenger amenities including benches, improved signage, and waste receptacles (See Figure 16 for examples)



Figure 16: Potential MBTA Key Routes Improvements

The MBTA will begin implementing these improvements to the Route 23 in late 2012. Although the improvements are specifically slated for Key Routes, passengers on non-Key Bus Routes will also benefit from improvements and will be affected by changes made at Key Bus Route stops where those bus stops also serve other non-key routes.

The biggest operational benefits of the Key Routes program come from the reduction in the number of bus stops—the current MBTA average is roughly 10 stops per mile, and the goal of the program is to bring that number down to 4 to 7 stops per mile. By focusing on the lowest ridership bus stops or consolidating the most closely spaced bus stops, the goal is to improve reliability and travel time by reducing the amount of time lost in boarding, alighting, and vehicles maneuvering in and out of stops without impacting large numbers of riders. Other elements of the program are designed to

create stronger deterrents for illegal parking in bus stops, such as upgraded signage or pavement markings delineating the bus stop. It is important to note that while ridership is a starting point to determine stop elimination/consolidation, each stop is studied thoroughly to understand its users and physical characteristics (for example, stops may need to be located closer together in areas with greater senior citizen populations or locations with variable terrain).

Once a commitment was made to conduct the RDM Study, the MBTA decided to delay the initiation of the Key Routes process on the 15,22, and 28, until after the completion of the Study. The MBTA began holding public meetings on the design of Key Routes improvements to these routes in April 2012 and will implement improvements in 2013.

Assess Performance of Intra-Party Agreement for Bus Stop Snow Removal. The RDM Study, which began in late 2010 and was completed in 2012, covered one of the snowiest winters in Boston history (as seen in Figure 17) as well as one of the lightest winters. During the 2010-11 winter, 79 inches of snow fell in Boston¹⁹, bringing the lack of clarity and consistency about the responsibility for clearing snow from MBTA bus stops into sharp relief. The RDM Study, which is focused on an area of the system where bus service is often the only option, was an obvious flashpoint for these concerns.

By the end of the winter of 2010-2011, the MBTA, MassDOT, and the City of Boston had developed an intra-party agreement for bus stop snow removal. Under this agreement, the City would work with the vendor providing bus shelters within the city limits to make sure snow was removed not only from within shelters but also to and from the shelters and the curb and the cleared path on the sidewalk. Although the MBTA does not have the capacity to shovel all 8,500 bus stops in the MBTA system, it committed to allocating resources sufficient to clear snow from all bus stops along the 15 Key Routes. In the RDM Study Area, this means that bus stops along Dudley Street, Warren Street, Blue Hill Avenue (Grove Hall to Mattapan Square), Washington Street (Grove Hall to Codman Square), Seaver Street and Talbot Avenue would be cleared per the new agreement.

The RDM Study Advisory Group was interested in monitoring the performance of this new



Figure 17: Snow Removal at MBTA Bus Stops

¹⁹ National Weather Service, Seasonal Snowfall Totals for Boston, MA: <http://www.erh.noaa.gov/box/climate/bossnw.shtml>

agreement when the winter of 2011-12 arrived. But with only one or two days of modest snow accumulation (which then quickly melted within days), it was impossible to evaluate the effectiveness of the new program. As progress on implementing RDM Study short-term recommendations is evaluated, MassDOT and the MBTA will closely monitor the performance under this intra-party agreement.

Ensure City of Boston Signal Re-Design Includes Provisions for Buses. In 2012, the Boston Transportation Department began design work to integrate 15 signalized intersections along Blue Hill Avenue and Warren Street into the City's central computer system. This will give the City flexibility to respond to traffic conditions throughout this congested corridor in real time from its central traffic control center at City Hall. The City is committed to re-designing these signals in ways that will allow for the introduction of transit signal priority (TSP). When MBTA buses fall behind schedule, TSP would allow them to send a signal to the City's central control system requesting that a green signal be held at the next intersection until the bus has passed (provided this would not unduly disrupt other congestion issues in the roadway network). During the design process, and as the signal improvements are implemented in 2013, both the MBTA and MassDOT will work with the City of Boston to ensure that opportunities for TSP are incorporated into the final project.

Implement Real-Time Info at Dudley Station. Over the past several years, the MBTA has begun to introduce real-time arrival information at a number of its facilities—Orange, Blue, and Red Line stations, Silver Line Washington Street stops, and at Logan Airport, as seen in Figure 18. In 2011, a pilot device was implemented at Ruggles Station identifying the next departure for each of the 13 bus routes serving the station.

For many reasons, there may not be a better place in the MBTA system than Dudley Station to provide this level of information to passengers—for example, since buses often start out on schedule only to fall behind once traveling the route, riders tend to be more interested in real-time information than scheduled information when boarding at an intermediate stop (which Dudley Station is for all but four of the 15 routes serving it). Also, many of the routes heading outbound from Dudley Station serve corridors that roughly parallel each other—by providing the customer with real-time information on which routes will be arriving and when, it allows them to make better decisions on which route to choose. Although the RDM Study identified



Figure 18: MBTA Real-Time Information Signage

other locations that would benefit from this technology (Forest Hills, Ashmont, Mattapan Square) there was an agreement that this would be most essential at Dudley Station. In 2013, the MBTA will implement a new real-time arrivals board at the station as part of its ongoing Dudley Station Improvements Project.

Introduce a Targeted Marketing Campaign about the Availability of Phone-Based Real Time Info. In an ideal world, the MBTA would be able to provide real-time information to its customers at all 8,500 system bus stops. Cost is an obvious barrier to doing so, but the recent success of the MBTA's provision of its real-time vehicle location data to private developers for the creation of Web and mobile phone applications has also reduced the need for information physically provided at stops.

A common concern raised during the RDM Study was that many residents in the Study Area that rely on buses did not own smart phones. When participants were informed that they could access real time information via text message on traditional cell phones, many noted that this information was not well publicized by the MBTA.

While concerns that many low-income residents relying on bus service in the RDM Study Area do not own smart phones are valid, the proliferation of these devices continues to grow—as of 2012, 88 percent of all adults own some kind of cell phone, and more than half of all cell phone owners own smart phones²⁰. Despite the growth in the availability of these devices, and the enormous benefit to riders who take advantage of real-time information, both anecdotal information gathered during the RDM Study and internal MBTA reviews of which routes see the most real-time information requests through mobile devices, it is clear that more needs to be done to promote this program in the Study Area.

In 2012, the MBTA and MassDOT will develop a targeted promotional campaign (a sample flier is shown in Figure 19) focused on key transfer stations, bus shelters, and on-board announcements and



Figure 19: MBTA Advertisement for Real-Time Applications

²⁰ http://pewinternet.org/~media/Files/Reports/2012/PIP_Just_In_Time_Info.pdf

advertising panels to educate customers in the RDM Study Area about the benefits of real-time information, and the multiple ways (online, traditional cell phone, smart phone) this information can be accessed.

Increase Monitoring of Operator Safety and Customer Service. There were many positive comments about the work of MBTA bus operators during the RDM Study process. However, many participants also shared concerns about their own experiences witnessing unsafe driving behavior or poor customer service skills. Safety issues included running red lights, speeding, and not pulling all the way to the curb to pick up passengers even when the bus stop was clear of obstructions. Customer service complaints focused on a lack of respect for passengers.

The MBTA has comprehensive, industry-standard policies in place for bus operators that cover all aspects of safety and customer service. MassDOT and the MBTA both believe that the vast majority of operators conduct their work professionally, safely, and with a focus on serving their customers. The reality is that not every operator respects or follows all MBTA policies. In some cases, what is perceived as unsafe behavior—such as not pulling fully to the curb—may be necessitated by illegally parked vehicles in the bus stop, or a bus stop that is not physically long enough to accommodate a bus. Whatever the reasons, MBTA customers in the RDM Study Area, and across the system, deserve a transportation system that is both safe and focused on providing good customer service. As MassDOT and the MBTA update RDM Study participants on their progress in implementing the recommendations of this study (see the RDM Study Oversight Committee section on page 58), these updates will include the presentation of safety and customer service complaints and their resolution to determine whether the incidences of these behaviors are being addressed. Providing a clearly visible driver ID number and phone number for reporting incidents on-board buses can help remind drivers that they will be held accountable for following MBTA policies and encourage riders to report unsafe driver behavior.

Develop a Stroller Policy. One issue that often generated spirited debate during the process was that of baby strollers on MBTA buses. While there was uniform recognition of the challenges facing parents traveling with children on the MBTA, many complained about the size of modern baby strollers and how a variety of factors—the design of MBTA buses, the indifference of some parents, the insensitivity of some patrons to the needs of traveling parents—created bottlenecks on buses and artificially constrained the capacity of vehicles by preventing passengers from moving deeper into the vehicle. There was no consensus within the process for how to address this issue—in fact, during the RDM Study the MBTA conducted a survey to get riders’ opinions on a new systemwide policy that would require strollers to be folded before boarding, and was met with passionate and organized opposition from parents’ groups. Still, throughout the RDM Study, the issue was repeatedly raised, and given the relatively high percentage of young children and the greater dependence on public transportation in the Study Area, the issue is likely to remain a focal point for MBTA customers in the three neighborhoods.

Medium-Term Recommendations

The following section outlines eight improvements to MBTA service identified by the RDM Study that have projected capital or operating costs that are likely to make their implementation over the next two years unlikely. Each of these could be considered within reach over a five-year period or longer, provided that funding sources become available and interest in pursuing them remains high.

Increase MBTA's Fleet of 60-foot Buses. As noted earlier in the report, concerns associated with overcrowding on the Route 28 have dissipated with the introduction of new, higher capacity 60-foot articulated vehicles, shown in Figure 20, in early 2011. Although some participants had initially expressed concerns about the on-street parking spaces lost when bus stops were lengthened along the 28 route to accommodate the new, longer buses, by the end of the process many more comments were received asking that the longer buses be introduced on more routes.

The 25 higher capacity vehicles dedicated to the Route 28 were purchased using nearly \$23 million in ARRA funds, a one-time funding opportunity. The \$915,000 vehicles are more expensive than traditional 40-foot vehicles (\$479,000²¹), so simply focusing future fleet replacement on purchasing new 60-footers has a cost implication. Other issues make a significant expansion in the MBTA's reliance on longer vehicles difficult in the short term. First, the current depot and maintenance facility that can accommodate 60-foot vehicles is at capacity, so a new facility would have to be constructed or an existing one retrofitted in order to significantly expand the fleet size. Second, there is an issue with the longer vehicles' performance on hilly terrain during snowy conditions. When storms have resulted in accumulating snow, the MBTA has had to swap in traditional 40-foot buses to replace 60-foot vehicles that were not handling slippery conditions well. The MBTA's flexibility of swapping vehicles would be compromised with an increase in the number of 60-foot vehicles.

The MBTA and MassDOT will continue to monitor the development of newer vehicles that perform better in winter conditions, as well as measures to mitigate performance issues. When the opportunity to expand the 60-foot vehicle fleet presents itself, the Route 23 should be one of the routes the MBTA targets for new vehicles.



Figure 20: MBTA 60-Foot Bus

²¹ APTA 2011 Vehicle Report

Increased Frequency on 16, 19, and 21. Study participants believed that many of the bus routes in the Study Area with moderate ridership would see significant increases in ridership if the MBTA provided more frequent service. As part of CTPS' technical analysis, eight routes (14, 16, 19, 21, 29, 31, 44, 45) were evaluated to project what the impacts would be if the frequency of service on these routes were doubled.

Although all eight routes were projected to experience increases in ridership (See Appendix X for complete results), the greatest increases in ridership by far were on the Routes 16, 19, and 21. Increasing peak service frequency on Route 16 from every 15 minutes to every eight minutes would result in a 42 percent increase in ridership²². Doubling service on the 19 from every 14 minutes to every seven minutes generated a 49 percent increase in ridership. Ridership on the Route 21 increased by 24 percent when peak frequencies were reduced from an average of every 11 minutes to an average of every six minutes. The relatively modest increase on the other five routes evaluated suggests that the MBTA may already be providing a sufficient level of service during most periods of the day on those corridors. For the 16, 19 and 21 (and particularly the first two), it appears there is potential demand for additional service.

When the MBTA initiates its Service Planning process again (this biennial process was suspended in late 2011 due to the MBTA's looming budget deficit) these three routes should be considered for adjustments to service levels as lower-performing service is identified elsewhere in the system. Should the MBTA have the ability in the future to conduct the Service Planning process in a less financially constrained environment (recent Service Planning processes have assumed that all changes within the system would have a neutral impact on the overall operating budget), the 16, 19, and 21 would appear to be strong candidates for additional service.

Improve Stop Spacing on Non-Key Routes. Many Advisory Group members were interested in first experiencing the changes made to the Study Area's Key Routes before recommending a dramatic expansion of the program to other routes (implementation of changes to the first route—the 23—will not begin until late 2012). The Advisory Group did recommend that CTPS analyze the impact of the Key Routes program's stop consolidation/elimination component of four to seven stops per mile if it were applied to all routes in the RDM Study Area.

The results in terms of ridership impacts were modest for this alternative—a daily increase of about 3,310 bus riders in the Study Area, or about a six percent increase. The regional travel demand model is not the ideal tool, however, to measure the reliability impacts that are expected to accrue from better stop spacing since the model is not particularly sensitive to reliability improvements, so the expectation is that actual ridership increases may be even greater.

²² As is typical for CTPS applications of the regional travel demand model, the service changes and impacts were projected roughly 20 years into the future. In this case, all projections are for the year 2035.

The Key Routes program includes much more than simply changing the locations of bus stops. The MBTA is spending roughly \$500,000 in capital funds per route as part of the existing Key Routes grant. This money is spent on accessibility improvements to bus stops, new signage, shelters, benches, waste receptacles and pavement markings to clarify the location of bus stops. All of these program elements are items that study participants would like to see on all routes in the Study Area. During the study process in 2011, the MBTA applied for a new federal grant that would have resulted in an additional \$12.6 million to expand the Key Routes improvements to 20 additional routes (including the 8, 16, 21 and 31 in the RDM Study Area). Although that grant application was ultimately unsuccessful, the MBTA and MassDOT should continue to explore opportunities to secure the capital funding necessary to expand the provision of Key Routes improvements to the Study Area's other important routes.

Study Circulation Patterns at Dudley Station and Identify Improvements. Dudley Square, shown in Figure 21, is known for its dual identity as an important commercial district within the City of Boston²³ and a critical public transportation hub are inextricably linked. The rise of commercial activity in this part of Roxbury actually followed its establishment as a streetcar hub in the late 1800s. While the commercial district declined in the latter half of the 1900s, and its role as an intermodal transit hub was altered by the 1980s relocation of the Orange Line, the ongoing renewal of Dudley Square will continue to depend on access to a very high level of service provided by the MBTA.

A common concern raised in the RDM Study process about Dudley Station itself was the often circuitous routes that buses must follow as they enter and exit the station. The circuitous routing is required by the two one-way streets bordering the station (Washington and Warren Streets) and the circulation patterns within the off-street bus terminal. Ten of the 14 routes serving Dudley Station are not terminating at the station. Of the 19,874 average weekday passengers on those ten routes as they pull into Dudley Station and the 20,931 as they pull out, 43 percent of inbound riders and 45 percent of outbound



Figure 21: MBTA Buses at Dudley Station

²³ Dudley Square has seen over \$200 million in private and public investment since 2000. Another \$510 million; representing over one million square feet of new retail, office and residential construction; is currently being invested in ongoing construction projects or active proposals in the approval process. (Source: Boston Redevelopment Authority).

are on the vehicle as it both enters and leaves Dudley²⁴. This significant number of passengers on board passing through the station but not exiting or transferring there, experience this circuitous routing and the delays caused by navigating multiple signalized intersections. The ongoing reconstruction of the Ferdinand Building which will relocate over 500 new jobs to the area, and the additional activity and traffic generated by this project and others in Dudley Square will only add to the congestion and potentially further extend MBTA trip times.

A number of challenges exist to resolving this problem in a way that does not negatively impact the transit accessibility of Dudley Square itself. Many competing interests must be balanced—the speed of trips for through passengers versus the ease and comfort of transfers for the many thousands of riders who transfer at the station; and the challenges of creating dedicated bus accommodations on streets (many of which are relatively narrow) or at intersections (which are already closely spaced) that are shared with so many other users. In 2012, the Boston Transportation Department initiated an engineering and urban design streetscape project in Dudley Square that has an opportunity to evaluate these issues.

Integrate Fairmount Line Fare Policy with Other RDM Services. As mentioned earlier, MassDOT and the MBTA are in the process of adding four new stations to the Fairmount Commuter Rail Line, which runs across the RDM Study Area. The new stations will add to the two that already exist in the Study Area—Uphams Corner and Morton Street—and provide new direct access to South Station and downtown Boston for thousands of residents of Roxbury, Dorchester and Mattapan. Although this connection has existed for Uphams Corner and Morton Street for the past 30 years, ridership at these two stations has always been modest. There are multiple reasons for this—the lack of frequency compared to other MBTA services available to residents, the relative lack of visibility of the service, fare policy and other factors.

While monthly pass customers on the Fairmount Line are able to ride the MBTA’s rapid transit and bus network at no additional charge, those who are either unable to afford the large outlay of money necessary to buy a monthly pass or do not ride the service frequently enough to merit buying one must pay for Fairmount Line trips separately from connecting bus or rail trips. For example, someone boarding the Fairmount Line at Uphams Corner for a trip to Kendall Square would pay \$2 to take the commuter rail to South Station, and then another \$2 for the Red Line trip from South Station to Kendall (a total of \$4). The same trip could be made by taking the Route 16 bus to Andrew and switching to the Red Line there; Under the MBTA’s current transfer policy, this second scenario would only cost \$2. The same issue is faced by Fairmount passengers traveling into the RDM Study Area and transferring to the bus.

²⁴ MBTA Service Planning load profiles

There are equity and logistical concerns associated with creating different fare policies on different segments of the MBTA's commuter rail system, but the Fairmount Line is unique in that it operates exclusively in urban areas where there are multiple competing transit options. As the four new stations are completed beginning in 2013, MassDOT should work with the MBTA to identify opportunities to create a fare policy that incentivizes the use of the Fairmount Line for those customers for whom it represents the best travel option. This will benefit the traveling public and the MBTA, by encouraging riders to use the most efficient option to make their trips.

Limited Stop/Express Bus Overlay Route on Route 28 Corridor. A common critique during the 28X process was that MassDOT should simply introduce a limited stop bus service without all of the proposed infrastructure changes to Blue Hill Avenue and Warren Street that had proven to be unpopular. The RDM Advisory Group directed CTPS to evaluate a new express/limited stop bus route that would follow the same route as the Route 28 but makes only 11 stops (see Figure 22) compared to the 41 inbound or 46 outbound stops on the existing route. This would be an overlay service offered during traditional commuting hours in addition to the service already provided by the 28. Trips could run every eight to 10 minutes during the morning and afternoon peak periods, less frequently during the middle of the day (every 30 minutes) and would not run in the evenings.

The CTPS analysis projected that a new express bus service would serve 2,450 riders per day, and that the overall ridership on the combined Route 28/Express corridor would increase by 10 percent with this type of service. The express bus was projected to be the choice of almost half of all riders on the Route 28 corridor during peak periods, with 40 percent of riders projected to select the express service.

Since the express bus route was designed as an additional service (previous analyses had demonstrated that splitting the Route 28's current service into local and express

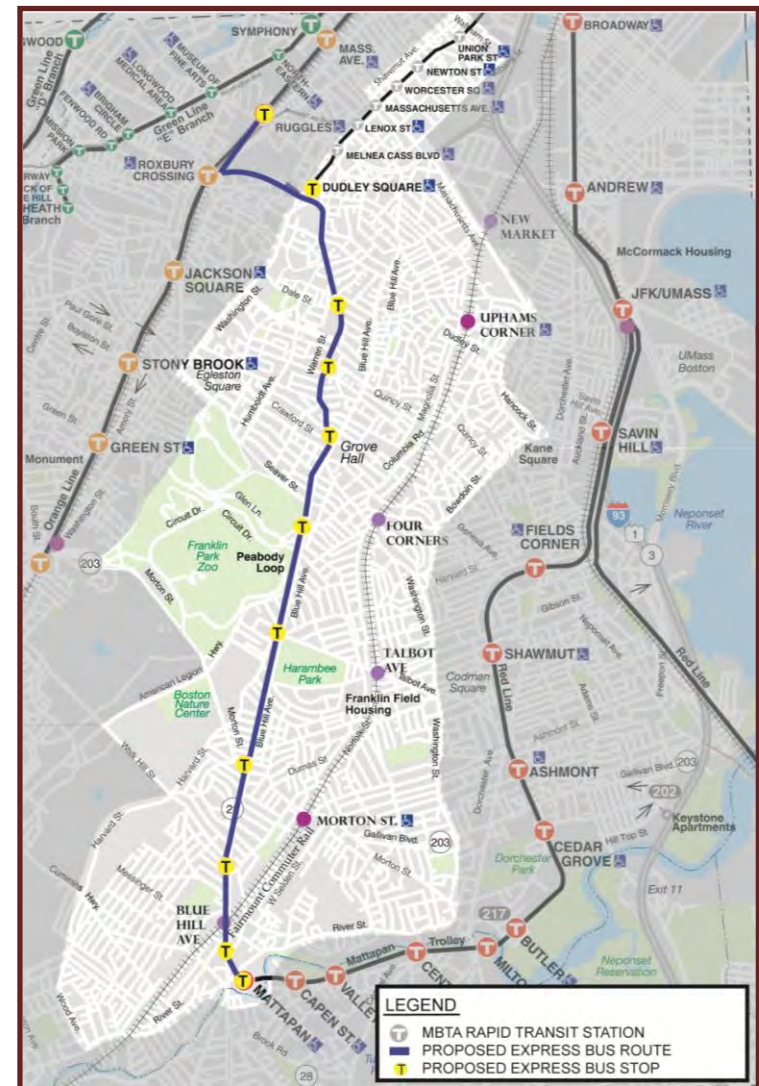


Figure 22: Express Bus Alternative

services would serve neither market well), the implementation of this idea would carry both significant operational costs (approximately \$1.6 million annually)²⁵ and new capital costs associated with purchasing additional vehicles (\$2.8 million for six additional 40-foot vehicles: four for daily operations and two spares for maintenance/inspection). As resources become available, MassDOT and the MBTA should evaluate alternative approaches to running traditional limited stop express bus service along this and potentially other RDM Study Area corridors to provide a higher-speed option for those customers not making local trips.

Since the proposed express bus service would operate in mixed traffic, use the standard 40-foot MBTA buses, and provide service to existing MBTA bus stops as part of the overlay service, bus stop amenities should be upgraded to help differentiate stops that provide this limited stop service. Figure 23 shows the existing conditions at the Blue Hill Avenue/Morton Street inbound stop, while Figure 24 represents some of the potential upgrades to accommodate and distinguish express bus service—upgraded passenger amenities including a shelter and benches, upgraded signage, striped decals on bus shelters, and colored pavement markings to delineate the bus stop.



Figure 23: Existing Blue Hill Avenue/Morton Street Inbound Bus Stop



Figure 24: Express Bus Alternative for Blue Hill Avenue/Morton Street Inbound Bus Station

²⁵ 43 daily bus-hours * 260 weekdays in operation * \$142.96 operating cost per vehicle revenue hour = \$1,598,293 annually

Continued Conversion to Cleaner, Energy Efficient Buses. Over the past ten years, the MBTA has increased its commitment to more fuel efficient and less polluting vehicles. The existing MBTA fleet of 1,067 active buses and trackless trolleys contains diesel, compressed natural gas (CNG), electric trolleybus, and diesel-electric hybrid fueled vehicles²⁶. CNG buses can have a significant reduction in emissions of particulate matter and nitrogen oxides versus diesel engines, although they typically cost around \$30,000 more than a diesel bus²⁷. Currently, the MBTA has 622 active diesel buses, 360 compressed natural gas (CNG) buses, and 25 hybrid vehicles, in addition to the 60 trackless trolleys. Over 95 percent of the CNG supply has been procured in the last 10 years. The MBTA has also upgraded its bus emissions testing process in order to quickly flag buses whose emissions exceed standards so that they can be brought in for repair²⁸.

In addition to purchasing less polluting and more fuel efficient buses as new vehicles are procured, the MBTA has begun to retrofit existing buses, as part of their mid-life overhauls. A retrofitted engine is cleaner since it has either been fitted with a device designed to reduce pollution and/or it uses a cleaner fuel. There are a variety of ways, resulting in variable costs, to retrofit a diesel engine. United States Environmental Protection Agency programs have been established to verify retrofit technology and certify cleaner fuels. Alternative clean fuel/clean technology options such as biodiesel fuel, in addition to the CNG buses, should be studied and piloted.

Extend Route 28 to Brigham Circle. The Longwood Medical Area (LMA) was the most frequently cited destination by Transit Needs Survey respondents outside of the Study Area and Boston's central business district. Although 23 percent of survey respondents said they frequently need to get to the LMA, there is not a high level of service provided from the RDM Study Area to the LMA—Routes 8, 47 and CT3 provide moderately frequent service from Dudley Square and/or the Melnea Cass Boulevard corridor, and the 19 provides peak hour trips into the district to serve Kenmore Square and high school students destined for Boston Latin School.

One idea that emerged from the study process was to extend one of the more frequent bus routes serving the RDM Study Area into the LMA. Due to the congested nature of streets within the heart of the LMA, Brigham Circle was identified as a reasonable terminal for a bus route extension. One of the many bus routes currently traveling between Dudley and Ruggles could instead provide an Orange Line connection at Roxbury Crossing station before continuing up Tremont Street for another 10 blocks to Brigham Circle. In this way, most existing riders would still be well served as they would maintain their direct Orange Line connection, but much better access to the LMA would represent a meaningful improvement for Study Area residents destined for that area.

²⁶ MBTA Ridership and Service Statistics, 13th Edition, 2010

²⁷ U.S. EPA New England Retrofits & Cleaner Fuels: <http://www.epa.gov/region1/eco/diesel/retrofits.html>

²⁸ Riding the T: http://www.mbta.com/riding_the_t/whats_new/

Any changes to routes should be preceded by a thorough analysis by the MBTA on origin/destination patterns for the RDM Study Area to LMA travel market, but given the Route 28's central location within the Study Area, the study recommends this route as being a reasonable one to evaluate for this change.

Long-Term Alternatives

The project recommendations in this section would carry with them major increases in capital and operating costs for the MBTA, and are therefore unlikely to be implemented within at least the next ten years. Even with the MBTA's current financial constraints, it is nevertheless important for MassDOT and the MBTA to continue to consider ideas for major expansion projects where they have the potential to make dramatic improvements to mobility and quality of life within our region. The ideas presented in this section are necessarily general and high-level, as the nature of this study did not allow for a refined and rigorous level of detail. Each of the ideas represents a concept that MassDOT and study participants believe holds the promise of a transformative change for MBTA customers in Roxbury, Dorchester and Mattapan (and in some cases, for a much larger set of MBTA customers). Should Massachusetts' and the MBTA's fiscal state allow for a renewal of major investments in new public transportation infrastructure, the need for improved service in the RDM Study Area argues for consideration of major investments (such as those described below) in these neighborhoods.

Light Rail Extensions into Study Area. As the introduction of this study notes, many Roxbury residents have long argued that the only satisfactory replacement service along the Washington Street corridor for the relocated Orange Line would be a light rail connection into downtown Boston. While the cost to implement a light rail project remains the largest challenge, many of the issues present during the 1990s pursuit of light rail—lack of strong support from the South End and Chinatown; concerns about reusing the old trolley portal in downtown; and the narrowness of Washington Street on the approach into Dudley Station—remain.

The RDM Study, however, was designed as a community-driven process and study participants clearly communicated their desire to have potential light rail extensions evaluated along with other long-term strategies. Although there are barriers to implementing a light rail project, the population and land use characteristics of the Study Area would suggest that there are corridors within the three neighborhoods that could support such a service. Figure 25 shows ranges of household and

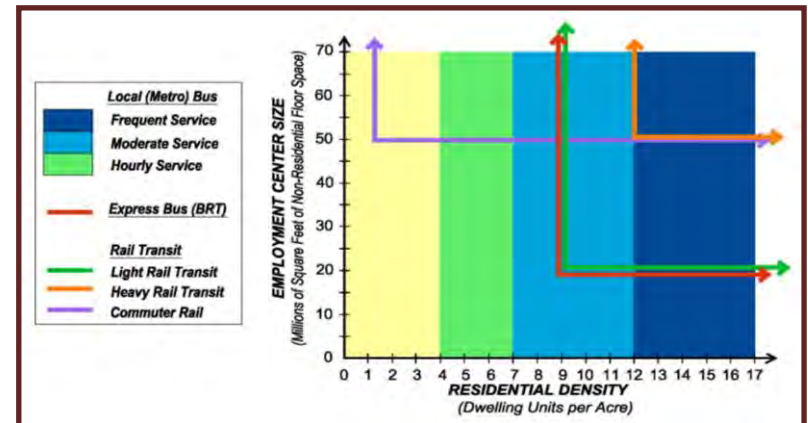


Figure 25: Residential/Employment Densities to Support Transit

employment densities that can generally support specific types of public transit service, while the figure below shows the corresponding densities in the Study Area. Residential densities greater than nine dwelling units per acre can generally support express bus service or light rail service, while residential densities greater than twelve dwelling units per acre are necessary to support heavy rail. A majority of the Study Area falls within residential density ranges that suggest the market exists for higher capacity transit service (blue areas).

For these reasons, CTPS evaluated two variations of potential light rail extensions. Both concepts would extend the existing MBTA Green Line service south from Boylston Station along an abandoned trolley tunnel, with a transition to a surface operation somewhere in the vicinity of the old tunnel portal near the intersection of Tremont and Shawmut streets. Both variations would then cross into the South End where they would follow Washington Street to Dudley Station in Roxbury. One concept would terminate there, while a second alternative would continue the service down the highest ridership corridor in the Study Area—Warren Street to Grove Hall, then Blue Hill Avenue south to Mattapan Station. Map encompassing the two alignments are shown in Figure 26 and 27.

Although many segments of the corridor are not wide enough to accommodate a dedicated light rail line absent the elimination of existing on-street parking or travel lanes (Washington Street

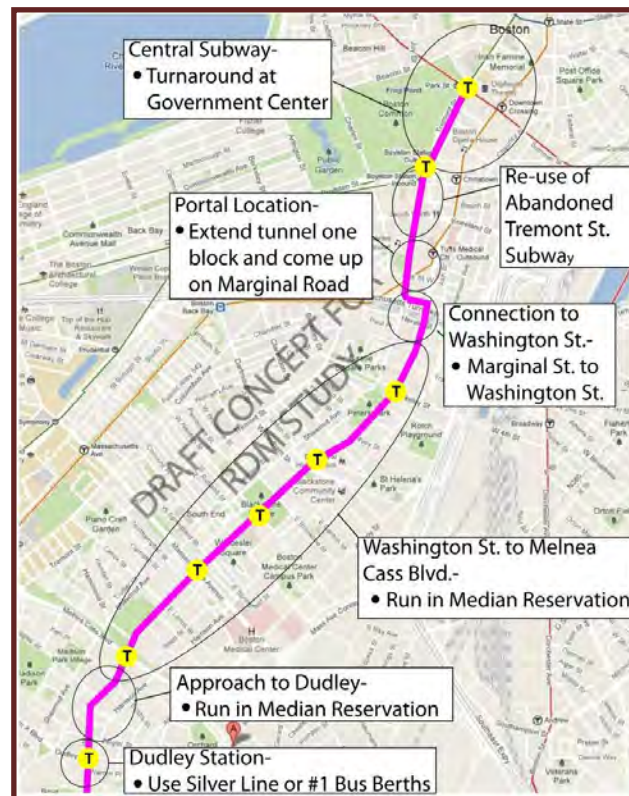


Figure 26: LRT to Dudley Concept

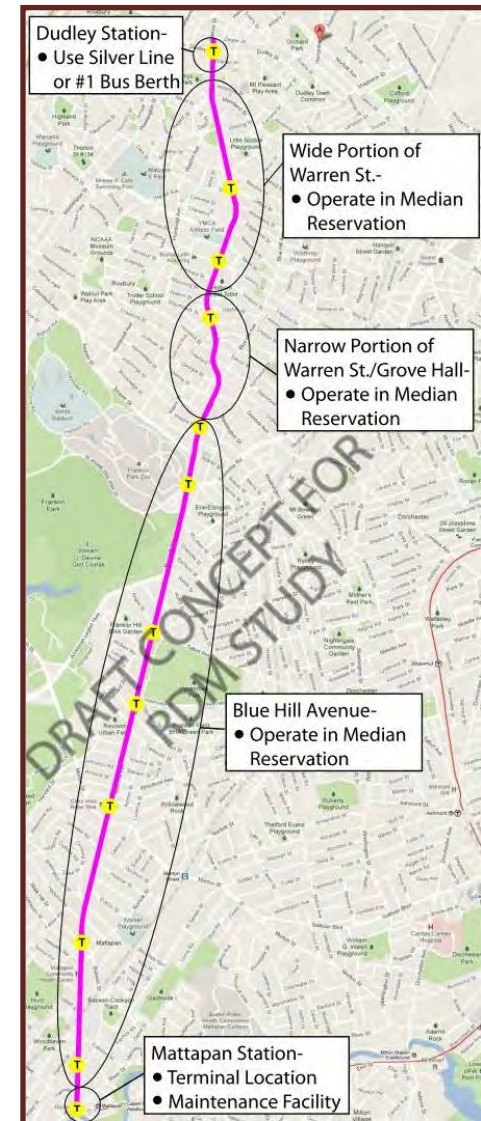


Figure 27: LRT to Mattapan Concept

between Melnea Cass Boulevard and Dudley Station, Warren Street between Quincy Street and Grove Hall) for evaluation purposes CTPS assumed that light rail service would operate as if it was in its own dedicated right of way. This allowed the evaluation to focus on what the actual market for the service was. The analysis also assumed that many of the existing bus services paralleling the light rail corridor (Silver Line service on Washington Street, the Warren Street portion of Route 23, the entire Route 28, etc.) would no longer operate.

A summary of the ridership and air quality impacts of the two light rail alternatives reviewed by CTPS are shown below in Table 7 and Table 8²⁹. The analysis suggests that the number of riders on the two light rail lines would be comparable to those using existing surface Green Line branches (the Downtown-Dudley route's ridership is projected to be comparable to existing Beacon Street/C-Line surface boardings, and the Downtown-Mattapan route's ridership is comparable to existing Commonwealth Avenue/B-Line surface boardings). The table shows that these high levels of ridership do come at the cost of losing some existing public transit riders. This is not unexpected, given that much of the paralleling bus service was assumed to be eliminated.

Table 7: Light Rail to Dudley Square Modeling Results

Measure	Impact
Overall Ridership	14,500 Daily Riders
Ridership Impacts	Decrease in 4,950 Unlinked Trips
Decrease in Transit Trips	-600 Trips
Increase in Auto Trips	380 Trips
Increase in Walk/Bike Trips	220 Trips
Decreased Net Emissions	VOC, NOx, CO2
Increased Net Emissions	CO
Decreased Travel Time (vs. Silver Line)	1-10 Minutes (Varies by Time of Day)

²⁹ Emissions Reported: Volatile Organic Compounds (VOC), Nitrogen Oxide (NOx), Carbon Dioxide (CO2), Carbon Monoxide (CO); Allowable emissions per vehicle set by Clean Air Act

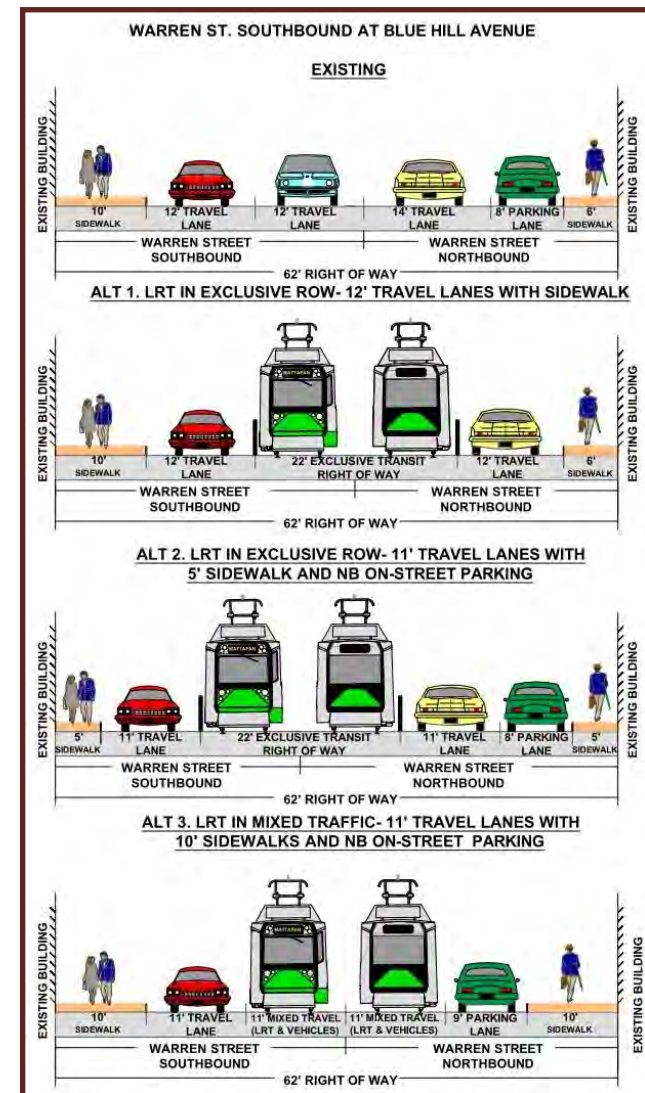


Figure 28: Concept Plan for LRT on Warren Street at Blue Hill Avenue

While light rail would be an improvement for most MBTA riders in the corridor, there are a number of characteristics of the current bus service (comparatively close stop spacing, higher frequency service along some segments than would be provided by light rail, and lower fares) that may be valued more highly by some riders. The table also shows a significant reduction in unlinked trips under each alternative. Unlinked trips represent each leg of a transit trip (for example, a trip consisting of the Silver Line and the Route 28 would represent two unlinked trips) and the majority of the reduction in unlinked trips can be attributed to transfers that are no longer made because of the more direct trips provided by light rail service.

Table 8: Light Rail to Mattapan Square Modeling Results

Measure	Impact
Overall Ridership	30,400 Daily Riders
Ridership Impacts	Decrease in 14,500 Unlinked Trips
<i>Decrease in Transit Trips</i>	-1,600 Trips
<i>Increase in Auto Trips</i>	1,180 Trips
<i>Increase in Walk/Bike Trips</i>	430 Trips
<i>Decreased Net Emissions</i>	VOC, NOx, CO2
<i>Increased Net Emissions</i>	CO
<i>Decreased Travel Time</i>	2-7 Minutes (Varies by Time of Day)

Since the light rail alternatives show high levels of ridership and a significant increase in the amount of one-seat rides to and from downtown Boston, concept plans were developed at two locations (See Figure 28 and Figure 29) to evaluate the potential feasibility and constraints of a light rail system in the existing route right-of-way. These plans are intended to represent potential modifications in the roadway cross-section to accommodate light rail, although if funding were to become available, a detailed study with community outreach would be conducted to determine the design of the roadway and corresponding lanes that would be eliminated.

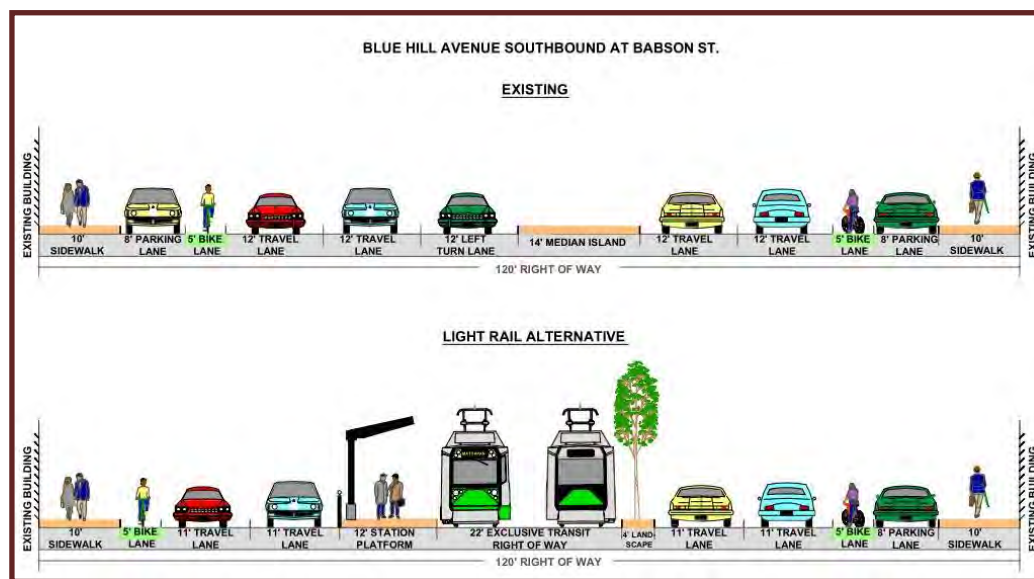


Figure 29: Concept Plan for LRT on Blue Hill Avenue at Babson Street

High Frequency Service on the Fairmount Line. Currently, the Fairmount Line Service is operating with five stops between Readville and South Station with weekday peak hour frequencies at once every 40 minutes (morning peak inbound, afternoon peak outbound), and once every one to two hours throughout the remainder of the day. The addition of the four new stations will make the Fairmount Line accessible for a larger percentage of Study Area residents. Although the Fairmount Line provides a trip to downtown Boston in fewer than 30 minutes, the long headways make it an inconvenient option for some types of trips.

In order to make the Fairmount Line a more reliable mode of transit to and from downtown, increased frequency of service is recommended. With 10-12 minute headways in the peak hour, 20-minute headways midday, and 30 minute headways on nights and weekends, the Fairmount Line can provide a level of service that could increase ridership and provide alternative access for Study Area residents.

Alternate Vehicle Type on the Fairmount Line. The use of alternative vehicle types on the Fairmount Line has the potential to improve operations and decrease costs. Replacing the existing push-pull locomotive equipment on the Fairmount Line with diesel multiple units (DMUs) (see NipponSharyon model in Figure 30) has the potential to offer a quality of service that is closer to rapid transit in its service features, including faster acceleration which reduces running times, shorter station dwell times, and shorter headways.

DMUs are self-propelled rail cars that essentially combine a diesel locomotive and coach in the same piece of equipment. Historically, they operated on the Boston area commuter rail system from the late 1940s through the 1970s. DMUs present a number of operational advantages over conventional equipment, including ability to operate shorter trains, fuel savings from using lighter cars and smaller trains, improved acceleration profile (0.8 to 2.4 mph per second compared to 0.5 mph per second for conventional push-pull service), and shorter train platforms. Newer versions of the traditional DMU also offer improved emissions profiles. The disadvantages relate primarily to maintenance-related concerns and vehicle procurement constraints, particularly given current Federal Railroad Administration standards for crash strength and increasingly stringent diesel emissions regulations. In recent years, there have been various attempts to develop and sell a DMU that



Figure 30: NipponSharyon DMU Train

meets these current standards—including a limited number of vehicles made by Colorado Railcar prior to bankruptcy—but no reliable source of fully-compliant DMUs has been available. Based on the nine stations that will be in place on the Fairmount Line after the current station construction project is completed, a DMU service could save up to six minutes in travel time over existing commuter rail vehicles, accounting for reductions in accelerations/deceleration time, station dwell times, and time at maximum speed.

Self-Service/Barrier-Free Fare Collection on MBTA Buses. Proof-of-payment (POP) fare collection is an honor-based structure implemented on both rail and bus systems around the world that require passengers to carry a ticket or pass proving that they have paid the fare, although each individual is not checked every time they board a vehicle. Ticket collectors make periodic checks to deter fare evasion and issue penalty fees for passengers riding without a pass. The distinguishing characteristics of such a system are (1) barrier-free platforms, (2) boarding without needing to take any payment-related action in view of a driver/conductor, and (3) inspection for valid proof of payment³⁰. POP strategies have become increasingly popular over the past 20 years for their ability to substantially speed up vehicle boarding; as of 2002, 15 of the 18 existing North American light rail networks use this system, along with nine other commuter rail services.

By eliminating the on-board ticket transactions, it speeds up the boarding process, eliminates backups, and allows all doors to be used for boarding. Additionally, it results in lower labor costs for fare collection, simpler station design, and easier access for mobility-impaired passengers. Although there are many benefits to this type of system, there are several issues that would have to be addressed before the MBTA would decide to pursue it, including policy and enforcement issues (i.e., inspection strategies, fare evasion), operational issues (i.e., fare structures, station monitoring), and capital and equipment issues (ticket sale and validation equipment). Given all of the potential benefits, however, the MBTA should evaluate the potential of transitioning to a POP system in order to reduce operating costs and improve on-board operations.

³⁰ TCRP Report 80, *A Toolkit for Self-Service, Barrier-Free Fare Collection* (2002)

VII. NEXT STEPS

RDM Study Committee

The publication of this study represents a beginning rather than an end. With a road map of community-proposed and community supported ideas in place, the real work now begins. In order to monitor the success in implementing the recommendations of the RDM Study, MassDOT will convene the RDM Study Committee. This committee, which will consist of MassDOT, relevant MBTA departments (Bus Operations, Automatic Fare Collection, Police, Service Planning, and other departments as needed), elected officials, members of the Advisory Group and other interested parties, will meet on at least a quarterly basis beginning in Fall 2012.

Initial meetings of the group will focus on the development of a work plan for implementing short-term recommendations, and a committee review of MBTA/MassDOT progress on this front. For those recommendations that still need to be refined (such as the best approach to a marketing campaign around real-time info accessibility) the committee will be a forum through which the MBTA gets community input on best approaches. The RDM Study Committee would provide an opportunity to discuss potential grant or other funding opportunities that arise that have the potential to further study goals. As short-term recommendations are implemented, the committee will advise the MBTA on setting new priorities for pursuing medium-term or longer-term goals.

Funding RDM Recommendations

One of the most challenging aspects of moving forward with the improvements identified in the RDM study is funding these important projects. Current budget realities for MassDOT and the MBTA make it difficult to add new capital projects, with the MBTA's operating budget assumed to be roughly fixed for the near future. This means that any expansion of service on one route must be roughly balanced out by reductions in service on another route. Nonetheless, it is important to begin the process of identifying potential funding for these improvements, particularly for capital investments. There are two key steps to obtaining funding: coordination with the existing MassDOT/MBTA planning process and identifying (and applying for) potential funding sources.

Step 1: Coordination with the Planning Process. The initial step in funding most public transit capital projects is inclusion of the project in the local Metropolitan Planning Organization (MPO) planning process. MPOs, which are made up of representatives from the local government and state and regional transportation agencies, are required for urban areas with a population greater than 50,000 to ensure that existing and future expenditures for

transportation projects are based on a continuing, cooperative, and comprehensive process. The RDM Study Area is part of the Boston Region MPO, which is comprised of 101 cities and towns in Eastern Massachusetts.

There are four capital planning documents that require projects be listed in order for transportation funding to be obtained in Massachusetts. The first two are prepared by the Boston Region MPO, while the last two are prepared by the MBTA. The last two only apply for transit projects, while the first two apply to all projects that are regionally significant for air quality and/or *federally-funded*.

Long Range Transportation Plan (LRTP). The LRTP is created by the MPO to guide investment and provide a vision for the future of the transportation system in the Boston metropolitan region. The LRTP must cover a planning horizon of at least 20 years. The LRTP is updated every four years, taking into consideration changing conditions and travel demand forecasts, and must be fiscally constrained. The current LRTP for the Boston Region MPO, *Paths to a Sustainable Region*, was adopted in September 2011 and covers the period through 2035.

Transportation Improvement Program (TIP). The TIP is a program of transportation improvements that will occur over a five-year period based on projects listed in the LRTP. The TIP is fiscally constrained, which means that the MPO can only include projects for which funds are expected to be available. It programs all transit and roadway project that are receiving federal-aid funds, as well as any project that is considered regionally-significant from an air quality perspective. The current Boston Region MPO TIP was adopted in September 2011 and covers federal fiscal years 2012-2015. The TIP is updated on an annual basis.

MBTA Program for Mass Transportation (PMT). The PMT is the MBTA's long-range capital planning document, which defines a 25-year vision for public transportation in Eastern Massachusetts. It is financially unconstrained and required by state law. The PMT is updated every five years and policies/priorities are implemented through the MBTA's Capital Investment Program.

MBTA Capital Improvement Plan (CIP). The CIP is financially constrained and outlines transit projects with MBTA, State, and federal funding over a five-year time period.

Step 2: Identify Potential Funding Sources. Funding for transportation plans and projects comes from a variety of sources including state government, federal government, and user fees. Federal funding has been the primary funding source for major capital investments in public transportation over the past several decades. Most federal funding requires a non-federal match from state or local governments. The amount of the local match is established by legislation, as well as by regulations and agency guidance. The MPO, MassDOT, and MBTA are required to cooperatively develop revenue forecasts to determine how much funding is likely to be available for transportation projects in their respective areas.

The MBTA receives funding for its operations through a portion of the state sales tax, assessments from municipalities in the MBTA service district, passenger fares, and parking and other revenue.

Federal funds for transit improvements are authorized by Congress and are currently governed by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)³¹. SAFETEA-LU allocated \$286.4 billion to improve and maintain the surface transportation infrastructure in the United States and was signed into law on August 10, 2005 and expired on September 30, 2009. Congress has renewed the funding formulas used in SAFETA-LU multiple times since its expiration date through a series of short-term extensions and is currently working on creating a long-term surface transportation reauthorization bill. The lack of a new multi-year reauthorization bill creates uncertainty when projecting future federal funding availability, or even the continued existence of current grant programs. The following discussion of federal funding programs should be considered in that context.

Most surface transportation programs administered by the Federal Transit Administration (FTA) are funded by the Highway Trust Fund, which includes funds from federal motor fuel tax (18.3 cents/gallon of gasoline) in addition to other transportation related taxes and fees. FTA distributes funds through both formula grants and discretionary grants. Formula grants are funded to states based on demographics and travel volumes, while discretionary grants are typically awarded through a competitive application process that involves complying with application requirements and a selection based on specific criteria. In recent years, there has been a trend towards greater use of discretionary programs that are under the control of the U.S. Department of Transportation (and its subsidiary agencies), as a means of directing transportation funding towards projects that directly achieve economic development and sustainability/livability objectives. Note that discretionary funds cannot be added to the LRTP or the TIP until the funds have been awarded, so close coordination with the Boston Region MPO is critical to accessing those grants quickly once they have been awarded.

Other potential grant opportunities exist through the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE). Table 9 provides a list of potential federal funding sources.

³¹ It should be noted that Public Law 112-141, the Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law by President Obama on July 6, 2012. MAP-21 authorizes and level funds the federal transit program for two years through September 30, 2014. MAP-21 maintains the traditional 80/20 highway/transit funding split and introduces reforms to accelerate project delivery. Several programs are eliminated while certain programs are consolidated. MAP-21 also converts several popular discretionary programs such as State of Good Repair and Bus and Bus Facilities to formula-driven distribution programs.

Table 9: Potential Federal Funding Opportunities

Funding Program	Source of Funding	Uses of Funding
Surface Transportation Program (STP) Funds ³²	FHWA - Formula	Flexible funding for construction, reconstruction, rehabilitation, resurfacing, restoration, and operational improvements for highways and bridges, including any such construction or reconstruction necessary to accommodate other transportation modes
Transportation and Community and System Preservation Grant (TCSP) ²	FHWA – Discretionary	Planning, developing, and implementing strategies to integrate transportation, community, and system preservation plans and practices
Transportation Enhancement Program (TEP) ²	FHWA – Formula	Strengthen the cultural, aesthetic, and environmental aspects of the Nation's intermodal transportation system
USDOT TIGER ⁴	USDOT – Discretionary	Fosters innovative, multi-modal and multi-jurisdictional transportation projects that promise significant economic and environmental benefits to an entire metropolitan area, a region, or the nation.
Congestion Mitigation and Air Quality Improvement Program (CMAQ) ²	FHWA	Projects that address congestion and air quality issues, including pedestrian/bicycle facilities, traffic management/monitoring/congestion relief, transit (new system/, service expansion, or operations), alternative fuel projects, travel demand management, rideshare programs
Fixed Guideway Modernization Program ³³	FTA – Formula	Modernization of existing rail systems
Urbanized Area Formula Program ³	FTA – Formula	Transit capital and operating assistance in urbanized areas and for transportation-related planning
Bus and Bus Facilities Grant ⁴	FTA – Discretionary	New and replacement buses, related equipment, and facilities
Cleans Fuels Grant Program ⁴	FTA – Discretionary	Emerging clean fuel and advanced propulsion technologies for transit buses and markets for those technologies

³² Guide to Federal-Aid Programs and Projects- <http://www.fhwa.dot.gov/federalaid/projects.cfm>

³³ FTA Formula Grant Program- <http://www.fta.dot.gov/grants/13093.html>

Funding Program	Source of Funding	Uses of Funding
New Starts ³⁴	FTA – Discretionary	Construction of new or extensions to existing fixed guideway systems
Small Starts/Very Small Starts ⁴	FTA – Discretionary	Capital projects less than \$75 million and total capital costs less than \$250 million that either (a) meet the definition of a fixed guideway for at least 50% of the project length in peak period or (b) are corridor-based bus projects with 10 minute peak/15 minute off-peak headways or better while operating at least 14 hours per weekday
TIGGER Program ⁴	FTA – Discretionary Grant	Works directly with public transportation agencies to implement new strategies for reducing greenhouse gas emissions and/or reduce energy use within transit operations
Pollution Prevention Grant Program ³⁵	EPA – discretionary	Assist in identifying better environmental strategies and solutions for complying with Federal and State environmental regulations
Clean Cities - Implementation Initiatives to Advance Alternative Fuel Markets ³⁶	DOE – discretionary	Expanded use of alternative fuel vehicles and domestically produced alternative transportation fuels

Based on current conditions, the most likely source of federal funding for improvements identified in the RDM study include the New Starts³⁷ and/or Small Starts/Very Small Starts program, CMAQ, Bus and Bus Facilities, and TIGER. All of these discretionary programs bring “new money” to the region, as opposed to requiring reallocation of formula funds from other projects, allowing RDM improvements to be funded without directly impacting other aspects of the MassDOT and MBTA capital programs (assuming local match funding can be identified).

³⁴ FTA Discretionary Grants <http://www.fta.dot.gov/grants/13094.html>

³⁵ US EPA Grants- <http://www.epa.gov/epahome/grants.htm>

³⁶ U.S. Department of Energy Clean Cities- <http://www1.eere.energy.gov/cleancities/>

³⁷ FTA’s New Starts Fixed Guideway discretionary grant program has been a popular way for states and transit authorities to fund major capital expansions of rail and bus rapid transit service in recent decades. The program is extremely competitive, with a much higher level of interest than available funding. Historically, FTA has only infrequently considered multiple New Starts grant applications from the same transit system. Given MassDOT and the MBTA’s pursuit of New Starts funding for the legally-mandated Green Line Extension (to Somerville and Medford) Project, and that project’s expected completion in 2018 to 2020, it will be close to a decade before Massachusetts will be well-positioned to pursue another New Starts grant. As noted earlier in the document, the uncertainty around a new reauthorization bill means that the ultimate form of the New Starts program that far into the future is unknown.