



Commonwealth of Massachusetts  
Office of the State Auditor  
Suzanne M. Bump

*Making government work better*

Official Audit Report – Issued June 16, 2014

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## Massachusetts Bay Transportation Authority

For the period January 1, 2005 through December 31, 2012





Commonwealth of Massachusetts  
Office of the State Auditor  
Suzanne M. Bump

*Making government work better*

June 16, 2014

Dr. Beverly Scott, General Manager  
Massachusetts Bay Transportation Authority  
State Transportation Building  
10 Park Plaza, Suite 3910  
Boston, MA 02116

Dear Dr. Scott:

I am pleased to provide this performance audit of the Massachusetts Bay Transportation Authority (MBTA). This report details the audit objectives, scope, methodology, findings, and recommendations for the audit period, January 1, 2005 through December 31, 2012. My audit staff discussed the contents of this report with management of the MBTA, and their comments are reflected in this report.

I would also like to express my appreciation to the MBTA for the cooperation and assistance provided to my staff during the audit.

Sincerely,

A handwritten signature in blue ink, appearing to read "SMBump".

Suzanne M. Bump  
Auditor of the Commonwealth

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## EXECUTIVE SUMMARY

In accordance with Chapter 11, Section 12, of the Massachusetts General Laws, the Office of the State Auditor conducted an audit of certain activities of the Massachusetts Bay Transportation Authority (MBTA) for the period January 1, 2005 through December 31, 2012 to determine whether the MBTA was effectively and efficiently administering its Station Modernization Program. The audit reviewed (1) the MBTA's system of internal controls over planning, contract award, and construction activities related to the expenditure of station modernization funds; (2) the Request for Proposal and contract bid process for selecting designers and contractors, including an evaluation of initial cost estimates and accepted bids to determine their reasonableness; and (3) cost overruns and the cause and appropriateness of station modernization fund expenditures.

### *Summary of Findings*

- Our review of the MBTA's award of \$98 million in station modernization work at three stations on the Green, Blue, and Red Lines indicated that the MBTA did not properly oversee the activities of its design engineers; properly plan its Station Modernization Program; or adequately communicate with its various departments and end users to determine their needs before awarding modernization contracts for this work. As a result, it incurred over \$40 million in costs associated with additional work, some of which was excessive because it had to be procured through the more costly method of issuing change orders and negotiating rates for labor, materials, overhead, and profit rather than by competitively bidding the work under the initial construction contracts. The additional work drove the base cost of the contracts from \$98.4 million to over \$146 million (an increase of more than 48%).
- Because of inadequate recordkeeping, the MBTA had not properly billed and collected \$1,381,973 for construction work performed on behalf of the Boston Water and Sewer Commission (BWSC) and the City of Boston (the City) in accordance with two interagency agreements (IAs) with these entities. Currently, the BWSC owes \$150,307 and the City owes \$1,231,666 for these infrastructure improvements. These unpaid balances are the direct result of the MBTA's not billing for \$947,919 in eligible reimbursable expenses: \$92,429 from the BWSC and \$855,490 from the City. Because of this inadequate accounts-receivable recordkeeping, the MBTA is at risk of not recouping these unreimbursed construction costs.
- The MBTA did not properly plan for the proposed redevelopment of Ashmont Station. Specifically, it did not adequately address the concerns of the community surrounding Ashmont Station or give sufficient consideration to its own Transit-Oriented Development project to be built on MBTA land adjacent to Ashmont Station. By not adequately engaging the community or considering the TOD project before substantial completion of the design documents, the MBTA incurred additional design costs when the work completed to date was discarded and a new conceptual station design was commissioned. Moreover, the time and costs incurred to redesign the scope of work for this project did not prevent the MBTA from incurring the

additional \$13.7 million discussed in Finding 1 for unnecessary change orders due to inadequate planning and design errors.

### ***Recommendations***

We recommend that the MBTA take the following actions:

- Improve its oversight of, and communication with, its design engineers and consultants to ensure that final design specifications are clear and accurate and meet the needs of the MBTA and its end-user departments.
- Encourage greater participation by the various MBTA departments and end users during the design-specification stage to ensure that all critical needs have been incorporated into the final design specifications before awarding the contract.
- Ensure that proper funding is in place to meet all the requirements of a solidly planned design rather than adding to the scope of work through the costly change-order process as funding becomes available.
- Initiate discussions with design engineers to recoup extra costs that the MBTA incurred because of errors and omissions in the engineers' design documents.
- Invoice the BWSC for \$150,307 and ensure that funds are received.
- Invoice the City for \$1,231,666 and ensure that funds are received.
- Improve the billing and collection coordination between its Accounting department and its Design and Construction department to ensure that all milestone billings for future IAs are promptly made and that funds owed are received in a timely manner.
- Ensure that the proposed conceptual design and construction scope of work for all future station projects has considered the concerns of the local community, and that all major objectionable aspects of the project have been resolved, before authorizing substantial completion of the final design documents.
- Improve the planning and coordination of effort between the Development department and the Design and Construction department to ensure that all future station modernization efforts are properly aligned with the needs of future MBTA planned developments.

## OVERVIEW OF AUDITED AGENCY

### *Background*

The Massachusetts Bay Transportation Authority (MBTA) is a subdivision of the Commonwealth established in 1964 in accordance with Chapter 161A of the Massachusetts General Laws. The MBTA serves 175 communities, providing transportation to almost 4.7 million people over 3,200 square miles. The MBTA is the fifth-largest mass-transit system in the United States as measured by ridership and serves approximately 1.3 million passengers each day. MBTA ridership and total operating revenue for fiscal year 2012 were 401,616,849 and \$528,906,000, respectively.

The MBTA's Capital Investment Program (CIP) dedicates approximately \$4.2 billion in capital spending to maintaining transportation infrastructure and building expansion projects. The Station Modernization Program represents \$252 million, or approximately 6.4%, of that amount and comprises work on the Red and Blue Lines and improvements to station accessibility on the Green Line in accordance with the Americans with Disabilities Act of 1990. (See the appendix for a full description of the MBTA's infrastructure and the CIP.)

## AUDIT OBJECTIVES, SCOPE, AND METHODOLOGY

In accordance with Chapter 11, Section 12, of the Massachusetts General Laws, the Office of the State Auditor has conducted a performance audit of the Massachusetts Bay Transportation Authority (MBTA) for the period January 1, 2005 through December 31, 2012 to determine whether the MBTA was effectively and efficiently administering its Station Modernization Program. In some instances, it was necessary to review information outside this audit period in order to complete our audit testing.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The objectives of our audit were to (1) assess the adequacy of the system of internal controls established by the MBTA over planning, contract award, and construction activities related to the expenditure of station modernization funds; (2) review and evaluate the Request for Proposal (RFP) and contract bid process for selecting designers and contractors, including an evaluation of initial cost estimates and accepted bids to determine their reasonableness; and (3) review the design and construction cost overruns incurred, including the cause and appropriateness of these expenditures.

To achieve our audit objectives, we:

- Interviewed officials and personnel from the MBTA's Design and Construction department to gain an understanding of the systems, policies, procedures, and controls in place to properly control and monitor station modernization contract activities.
- Reviewed the MBTA's compliance with competitive-bidding requirements for selected construction contracts.
- Reviewed the MBTA's adherence to the requirements established by the Request for Qualifications and RFP process in awarding the contracts selected for review.
- Reviewed (based on a non-statistical random sample) contract costs as recorded in the MBTA's Capital Management System (CMS) and the supporting documentation contained in the contract files for selected payment estimates and approved change orders to ensure that all payments were accurate, properly approved, and properly recorded in CMS. We determined that the data

contained within CMS were sufficiently reliable for the purposes of this report and provided a reasonable basis for our findings and conclusions.

- Analyzed 100% of the executed change orders and 100% of the issued design amendments for the stations selected to ensure that supporting documentation regarding the necessity of each change order or amendment was contained in the files; the scope of extra work was clearly defined; a cost proposal and analysis was available demonstrating how the final price was established and listing the approved rates; an independent cost estimate was obtained to verify the reasonableness of the approved payment amount; and all necessary authorizations and approvals were obtained before payment.
- Obtained and reviewed the MBTA's Project Management Manuals for policies and procedures regarding contract procurement, payments, change orders and amendments, and monitoring and reporting to determine the adequacy of these policies and procedures to properly control modernization contract funds.
- Reviewed (based on a non-statistical random sample) construction progress monitoring reports, construction contract payment reports, and design-contract milestones for reviewing and approving design work submitted from the conceptual-design phase through the final approved design.
- Obtained and reviewed all interagency agreements (IAs) executed by the MBTA in connection with the station modernization projects that we selected for review to determine the proposed scope of work to be performed by the MBTA on behalf of the requesting agency; the actual scope of work performed and the associated cost to complete this work; and the agreed-upon terms for reimbursement to the MBTA.
- Obtained and reviewed all accounts-receivable records, including all billings, reimbursements received, and outstanding amounts owed under these two IAs of December 31, 2012.

To obtain audit evidence, we used non-statistical, random sampling in the testing of contract costs as recorded in the MBTA's CMS for selected payments and supporting documentation for payment estimates. In addition, we randomly sampled construction monitoring reports, payment reports, and design-contract milestones. Accordingly, the results of these tests cannot be projected to those populations for the items tested.

Additionally, we gained an understanding of the internal controls that we deemed significant to our audit objectives and tested and evaluated those controls for operating effectiveness. Specifically, we performed procedures such as interviewing personnel, reviewing policies, analyzing records, and examining documentation supporting recorded transactions.

Our audit indicated that, except as noted in the Detailed Audit Results and Findings section of this report, the MBTA maintained adequate internal controls over its station modernization design and

construction contract process and complied with applicable laws, rules, and regulations for the areas tested.

**DETAILED AUDIT RESULTS AND FINDINGS WITH AUDITEE'S RESPONSE***Audit Findings*

- 1. The Massachusetts Bay Transportation Authority incurred cost overruns of \$40,402,802 due to inadequate planning and oversight of its design activities and inadequate communication with departments and end users.**

Our review of the Massachusetts Bay Transportation Authority's (MBTA's) award of \$98 million in station modernization work at three stations on the Green, Blue, and Red Lines indicated that the MBTA did not properly oversee the activities of its design engineers, properly plan its Station Modernization Program, or adequately communicate with its various departments and end users to determine their needs before awarding modernization contracts for this work. As a result, it incurred \$40,402,802 in costs associated with additional work, some of which was excessive because it had to be procured through the more costly method of issuing change orders and negotiating rates for labor, materials, overhead, and profit rather than by competitively bidding the work under the initial construction contracts. The additional work drove the base cost of the contracts from \$98.4 million to over \$146 million (an increase of more than 48%).

According to sound business practices and MBTA design and construction procurement policies and procedures, the most efficient and economical method of procurement is to ensure that all necessary work is included in the original contract specifications; this is the only way to award all of the work through a competitive bid process rather than negotiated change orders.

The following table summarizes these audited contracts' change-order activity and classifies these change orders as either at-fault change orders (whose costs could have been avoided if the contracts' scopes of work had been properly planned or monitored by the MBTA) or no-fault change orders (which were unforeseen and the result of factors outside the MBTA's control, such as third-party requests from municipalities for additional work to be added to the scope of the contract). The contract activity for the modernization construction work performed at these three stations is as follows.

**Station Modernization Contract Activity**

Combined Contracts	Kenmore	Maverick	Ashmont	Ashmont Finishes*	Totals
Original Combined Contract Prices	\$ 22,744,444	\$ 30,800,886	\$ 35,184,599	\$ 9,658,400	\$ 98,388,329
Combined At-Fault Change Orders	17,215,508	8,945,366	13,698,730	543,198	40,402,802
Adjusted Combined Contract Prices	<u>39,959,952</u>	<u>39,746,252</u>	<u>48,883,329</u>	<u>10,201,598</u>	<u>138,791,131</u>
Combined No-Fault Change Orders	307,287	3,436,171	4,296,441	57,523	8,097,422
Total Combined Change Orders	17,522,795	12,381,538	17,995,171	600,721	48,500,224
Total Combined Revised Contract Price	<u>\$ 40,267,239</u>	<u>\$ 43,182,423</u>	<u>\$ 53,179,770</u>	<u>\$ 10,259,121</u>	<u>\$ 146,888,553</u>

\* The term "finishes" covers the finish work such as doors, floors, and lights.

An analysis of the above table reveals the following:

- The Kenmore Square Light Rail Accessibility Program base contract of \$22.7 million increased by \$17.5 million to an approximately \$40.3 million contract. We determined that \$17.2 million, or 98%, of this increase was due to at-fault change orders that were the result of either designer error or omission, or inadequate planning by the MBTA.
- The Blue Line Maverick Station Project base contract of \$30.8 million increased by \$12.4 million to a \$43.2 million contract. We determined that \$8.9 million, or 72%, of this increase was the result of at-fault change orders by the designer and the MBTA.
- The Ashmont Station Project base contract of \$35.2 million increased by \$18 million to a \$53.2 million contract. We determined that \$13.7 million, or 76%, of this increase resulted from at-fault change orders by the designer and the MBTA.
- The base contract of \$9.7 million for the Ashmont Finishes Project (which covers the finish work such as doors, floors, lights, etc.) increased by \$601,000 to a \$10.3 million contract. Of the \$601,000 increase, \$543,000, or 90%, was due to at-fault change orders by the designer and the MBTA.

In order to ensure that there were no work and payment activities after the above contracts' completion dates, we reviewed the MBTA's Capital Management System status reports dated January 7, 2013. We also reviewed the supporting documentation for 100% of the approved change orders for these contracts, including all engineering and construction monitoring reports, payments, and contract correspondence files. A summary of the contract activity for each project, including an analysis of the cause and justification for each approved change order and the amounts questioned, follows.

**a. Kenmore Square Light Rail Accessibility Program**

The \$22,744,444 Kenmore Square Light Rail Accessibility Program contract was awarded on November 10, 2004, with a start date of January 14, 2005 and a projected completion date of June 17, 2011. This project was undertaken to modernize the station and make it compliant with the Americans with Disabilities Act of 1990 (ADA). The MBTA would achieve compliance by adding elevators and escalators and raising the platform to accommodate low-floor Green Line vehicles.

The following table is a summary of the contract activity for the Kenmore contract, including all approved change orders and the reasons for this extra work.

**Kenmore Square Light Rail Accessibility Program Contract Activity**

Original Contract Price	\$22,744,444
At-Fault Change Orders Due To:	
MBTA Inadequate Planning	9,928,528
Designer Error	3,251,468
MBTA/Designer Error	4,035,512
Total At-Fault Change Orders	<u>17,215,508</u>
No-Fault Change Orders Due To:	
Change of Scope	179,814
Boston Water and Sewer Commission	123,756
City of Boston	3,716
Total No-Fault Change Orders	<u>307,287*</u>
Total Change Orders	<u>17,522,795</u>
Total Revised Contract Price	<u>\$40,267,239</u>

\* The one-dollar difference in this total is the result of rounding.

The following is an example of an at-fault change order.

***Cost Claim for \$2.6 Million Due to MBTA/Designer Error***

This claim from the contractor for \$2.6 million in extra payments was approved by the MBTA's board of directors on December 1, 2010, for costs incurred by the contractor. The additional costs were caused by designer error and the MBTA's lack of communication with user departments. The errors resulted from project delays in re-sequencing the scope of work to

ensure public safety during the baseball season by maintaining two sets of open stairs instead of one as originally designed. Additional claims were made for design changes to a communications room and for cost escalations, including extensions of performance and payment bonds.

**b. Maverick Station**

The \$30,800,886 Maverick Station accessibility and Blue Line air-vent contract was awarded on May 5, 2005, with a start date of September 22, 2005 and a projected completion date of May 21, 2008. This contract was intended to provide ADA accessibility from the station to Maverick Square Plaza, including an elevator to the Maverick Square Plaza station entrance, as well as an upgrade of existing air-vent shafts and construction of new ones.

The following table is a summary of the contract activity for the Maverick Station contract, including all approved change orders and the reasons for this extra work.

**Maverick Station Accessibility and Blue Line Air Vent Contract Activity**

Original Contract Price	\$ 30,800,886
At-Fault Change Orders Due To:	
MBTA Inadequate Planning	1,639,199
Designer Error	6,185,302
MBTA/Designer Error	1,120,865
Total At-Fault Change Orders	<u>8,945,366</u>
No-Fault Change Orders Due To:	
Change of Scope	3,036,383
Boston Water and Sewer Commission	75,279
City of Boston	324,509
Total No-Fault Change Orders	<u>3,436,171</u>
Total Change Orders	<u>12,381,538*</u>
Total Revised Contract Price	<u>\$ 43,182,423</u>

\* The one-dollar difference in this total is the result of rounding.

The following is an example of an at-fault change order.

***Change Order for \$322,044 Caused by MBTA/Designer Error***

This change order for \$322,044 was approved by the MBTA on January 22, 2009 for the modification of the two station elevators to bring them into compliance with a court judgment

granted to the Boston Center for Independent Living. The judgment stated that the elevators as designed and constructed did not meet ADA requirements for accessibility, size, and use.

**c. Ashmont Station Accessibility and Renovation Improvements Contract**

The \$35,184,599 Ashmont Station Accessibility and Renovation Improvements contract was awarded on June 9, 2005, with a start date of September 7, 2005 and a projected completion date of January 4, 2009. This was a contract for complete reconstruction of Ashmont Station, including a new Mattapan Station Green Line trolley viaduct and platform. The new station was designed to include two new lobbies, which would accommodate fare lines at each end of the station; a new public space to be built above the lobbies; a new bus turnaround; and revised design and construction of a drop-off/pick-up area.

The following table is a summary of the contract activity for the Ashmont Station contract, including all approved change orders and the reasons for this extra work.

**Ashmont Station Accessibility and Renovation Improvements Contract Activity**

Original Contract Price	\$ 35,184,599
At-Fault Change Orders Due To:	
MBTA Inadequate Planning	7,074,997
Designer Error	1,859,833
MBTA/Designer Error	4,763,900
Total At-Fault Change Orders	<u>\$13,698,730</u>
No-Fault Change Orders Due To:	
Change of Scope	4,296,441
Boston Water and Sewer Commission	-
City of Boston	-
Total No-Fault Change Orders	<u>4,296,441</u>
Total Change Orders	<u>17,995,171</u>
Total Revised Contract Price	<u>\$ 53,179,770</u>

The following is an example of an at-fault change order.

***Additional Costs of as Much as \$2.964 Million Due to Inadequate Planning by the MBTA***

Because of a lack of capital funding at the time of the original contract award in September 2004, the MBTA decided to eliminate the main roof deck and membrane over the platforms at

Ashmont Station from the contract scope of work. However, because it was determined later that many of the station elements required roofing for weather-exposure protection, the deleted roof items were added back into the contract for an additional cost of \$2,963,666, which could have been less if this aspect of the project had been included in the original scope. In our opinion, the MBTA should have determined whether it was feasible to remove this aspect of the project before awarding this contract.

**d. Ashmont Station Finishes**

The \$9,658,400 Ashmont Station Finishes contract was awarded on February 4, 2010, with a projected completion date of August 13, 2011. The intent of this contract was to complete the Ashmont Station Project with all necessary finishes, including roof sections, glass curtain walls, granite finishes, tile flooring, bus and trolley canopies, a complete signage package, and finished lighting.

The following table is a summary of the contract activity for the Ashmont Station Finishes contract, including all approved change orders and the reasons for this extra work.

**Ashmont Station Finishes Contract Activity**

Original Contract Price	\$ 9,658,400
At-Fault Change Orders Due To:	
MBTA Inadequate Planning	344,439
Designer Error	198,759
MBTA/Designer Error	-
Total At-Fault Change Orders	<u>543,198</u>
No-Fault Change Orders Due To:	
Change of Scope	57,523
Boston Water and Sewer Commission	-
City of Boston	-
Total No-Fault Change Orders	<u>57,523</u>
Total Change Orders	<u>600,721</u>
Total Revised Contract Price	<u>\$ 10,259,121</u>

The following is an example of an at-fault change order.

***Designer Omission Resulting in a Change Order for \$326,578***

This change order was issued to modify as-drawn footings and walls between the A and B Lines at the north end of Ashmont Station. The design change required a deeper excavation along the MBTA property line. The deeper excavation made it necessary to add an extensive support-of-excavation system to protect adjacent property in order to ensure safe working conditions. This change of design also delayed the start date of this work from September 2008 to December 2008, resulting in extensions of performance and payment bonds and added utility costs for work performed in the winter months.

***Recommendations***

To improve its procurement efficiency and cost effectiveness, the MBTA should:

- Improve its oversight of, and communication with, its design engineers and consultants to ensure that final design specifications are clear and accurate and meet the needs of the MBTA and its end-user departments.
- Encourage greater participation by the various MBTA departments and end users during the design-specification stage to ensure that all critical needs have been incorporated into the final design specifications before awarding the contract.
- Ensure that proper funding is in place to meet all the requirements of a solidly planned design rather than adding to the scope of work through the costly change-order process as funding becomes available.
- Initiate discussions with design engineers to recoup extra costs that the MBTA incurred because of errors and omissions in the engineers' design documents.

***Auditee's Overall Response***

In response to this report, the MBTA provided overall comments that are excerpted below.

*MBTA Design and Construction [D&C] Department underwent a rigorous six-part construction audit by Ernst & Young in 2011. In 2012 Ernst & Young returned to the MBTA to verify that the agreed upon management action plan had been implemented. As detailed in Ernst & Young's reports the MBTA implemented significant improvements and project control initiatives.*

***Audit Sample***

*The list of projects the State Auditor reviewed comprised . . . projects that started and were substantially complete prior to MBTA D & C reorganization.*

<i>Maverick Station</i>	<i>Design awarded March 1998</i> <i>Construction awarded May 2005</i>
<i>Kenmore Station</i>	<i>Design awarded May 1996</i> <i>Construction awarded November 2004</i>
<i>Ashmont Station</i>	<i>Design awarded May 2001</i> <i>Construction awarded May 2005</i>

...

*The MBTA respectfully disagrees with the Auditor's characterization that most change orders resulted from an MBTA error. These are not errors; they are a normal occurrence in construction associated with retrofitting the oldest rail system in the country. In some cases judgment calls were made to proceed without all the elements of a completed design knowing full well that there would be change orders as a result, but also understanding that the overall cost would be lower by proceeding than it would be to wait due to an increase in construction costs resulting from escalation. It is always preferable to have perfect information regarding construction scopes at the time of the bid to get the advantage of pricing through competition, but with an old station renovation that is simply not possible. In any event, the work in question done by change order would have been included in the original bid package. The added work may have been done at an incremental lower cost, maximum of 10%, not the total value of the change as the audit has indicated. In some cases the additional scope was unknown and could not have been known at the time of bid.*

#### ***Auditor's Reply to Overall Comments***

At the start of our audit, we asked the MBTA's Design and Construction department to provide us with a list of all modernization construction projects that were projected to be completed by December 31, 2012. Our intent was to audit those contracts for all completed phases, including the project design; construction bids and awards; construction work, including all approved change orders and payments; and the final contract completion and signed acceptance of the finished work. If we limited ourselves to projects that were designed and awarded after the final Ernst & Young report (August 30, 2011), we would have been limited to reviewing projects that were only partially complete, which would not have allowed us to meet our intended audit objectives.

While we recognize that change orders are an expected occurrence on any construction project, the combined accepted bids for modernization work at the three stations in question totaled approximately \$98 million, while the at-fault change orders that the Office of the State Auditor (OSA) identified totaled over \$40 million, or 41% of the original accepted bid amount. We agree with the MBTA that the age of these stations could pose some unique instances where unforeseen conditions would result in no-fault change orders. However, OSA believes that, in order to minimize these no-fault orders, the MBTA should have more closely overseen the activities of its design engineers and ensured that they performed adequate pre-award testing before the completion

of their contract specifications. The design engineers for these projects received over \$25 million in design fees, of which over \$14 million was paid by the MBTA, before the start of construction. In OSA's opinion, adequate pre-award testing could have minimized these unforeseen change orders and also could have substantially reduced the \$40 million in additional costs for the at-fault change orders that were incurred by these projects. Although we recognize that increased construction costs of approximately 10% would not be abnormal, the projects reviewed incurred total change-order costs of over 40% of the original contract award, far more than what should have been expected.

Our audit does not state that the total value of the change orders in question could have been avoided, but rather that the MBTA incurred \$40,402,802 in additional costs by completing this extra work through the more costly method of issuing change orders and negotiating rates for labor, materials, overhead, and profit through contract change orders rather than by competitively bidding this work under the initial construction contracts. In its response, the MBTA suggests that the additional change order work was done at a maximum of 10% over what it would have cost had it been bid as part of the original contract but does not provide a rationale for this estimate.

#### ***Auditee's Response to Finding No. 1***

*Prior to the issues raised in this audit report, and after the above project issues identified in this audit report had occurred, the MBTA reorganized its construction department over two years ago to include a Project Controls Group. . . . Significant improvements have been made . . . These improvements were noted in audit reports conducted by Ernst and Young at the request of the Board of Directors. These improvements include:*

- ***New and Updated Policy and Procedures Manuals***—*The MBTA design & construction department updated its policy and procedures manuals to align with industry best practices. The following manuals are now online and available to the public, contractors, consultants and MBTA staff whether in the office or in the field. . . .*
  - *Project Controls Manual*  
*(November 2009, November 2011, November 2013)*
  - *Project Manager's Manual*  
*(January 2012)*
  - *Change Order Guidelines*  
*(March 2008, Feb. 2010, Nov. 2010, May 2012)*
  - *Assistant General Manager (AGM) Reports*
  - *Contract Specifications*

- **Project Development Group (PDG)**—MBTA PM Manual delineates a policy for conducting PDG meetings at which all relevant and impacted MBTA Departments attend design review meetings at the 30%, 60% and 90% design completion milestones. . . .
- **Risk management process and procedures guidelines (November 2010)**—MBTA Project Controls Group develops a risk register in conjunction [with] design consultants to qualitatively identify cost and schedule risks associated with the project that are included in a risk register and quantitatively determine the cost and schedule risk impacts to the project. This is a rigorous process that requires MBTA personnel and consultant [to] collaborate. This collaboration begins as early as the 30% design milestone and continues through 100% design completion. . . .
- **Pre-Bid Review Controls Sheet (PRCS) (December 2010)** requires Project Manager to provide cost lump sum breakdowns and obtain approval of designs from various MBTA departments, including operations, accessibility, environmental, risk management, and real estate. . . .
- **Third Party Estimators**—MBTA assigns third party estimators to perform independent cost estimates of select projects. . . .
- **Standardized Reporting Program**—Monthly Project Manager reports detailing project scope, cost, claims and change order status information. MBTA Project Managers work collaboratively with the design consultants and contractors to develop the monthly reports. The reporting format is contained in the Project Controls Manual. . . .
- **Lessons Learned Program**—Lessons learned are collected upon contract close-out and published on-line for public and Project Manager review. . . .
- **Monthly Bulletin**—MBTA publishes a monthly bulletin that is distributed to internal MBTA employees as well as consultants and contractors. This bulletin is posted on the MBTA website. . . .
- **Specifications Task Force**—2006 MBTA created a specifications committee to update standard specifications. MBTA specifications committee worked with MBTA user departments to incorporate operational and accessibility needs into specifications. In 2007 MBTA converted standard specifications to electronic format, uploaded the specifications to the MBTA website and made specifications available on-line to all consultants. . . .
- **Cost Resource Loaded Scheduling**—MBTA now incorporates a cost-resource loaded schedule requirement that is tied to milestones that are developed during design.
- **Lump Sum Contracting**—MBTA has incorporated lump sum contracting to help eliminate change orders by using a combination of allowance (potential unknown scope) and lump sum (known scope) payment items.

. . .

As part of the reorganization and policy and procedures updates, D&C improvements focused on the need to improve coordination among MBTA departments during design and construction. The significant improvements made to the policies and procedures also ensure departments such as systemwide accessibility, real estate, environmental, engineering and maintenance, power, signal, track, communications, security, safety operations and others are participants and

reviewers of projects early in the design phase through construction. The following procedures have been integrated into our Design Review and Construction processes.

- *Project Development Group*
- *Risk Assessments and Workshop*
- *Pre-Bid Review Controls Sheet*
- *Policy & Procedure Manuals*
- *D&C Monthly Bulletin*
- *Cost Resource Loaded Scheduling*
- *Lump Sum Contracting*

...

The issue noted in the audit report had been previously corrected before the audit and verified by Ernst and Young by an audit requested by the Board of Directors. Improvements include:

- **Procurement Manual**—The MBTA procurement manual requires projects to be funded prior to award.
- **Project Controls Manual**—The PC Manual requires funding prior to award. Additionally the Project Control Group performs risk assessment workshops to ensure project risks are identified early in the design phase and prior to construction. This assessment mitigates changes that previously were identified during construction.
- **Independent Cost Estimates**—Since 2010 reorganization MBTA requires that every contract action have an independent cost estimate developed prior to advertisement. In the event the bid is greater than 10% of the estimate then MBTA performs a root cause analysis to determine the reason for the variation.

...

- **MBTA Errors & Omissions Committee** met on January 15, 2014 to review the errors and omissions log prepared by the Project Manager for Maverick Station. MBTA scheduled a meeting with the design consultant to negotiate 36 errors and omissions with an approximate value of \$500,000.
- **Example Cited in Audit Report**—The audit specifically identified a change order for a value [of] \$322,044 for modification of two station elevators. The audit report erroneously states that the elevators were designed and constructed such that they did not meet ADA requirements. The MBTA respectfully takes exception to this claim for the following reason.
- The Maverick Station design was completed prior to award of the construction contract award in May 2005. The elevator design changes were made to comply with the accessibility requirements included in the Boston Center for Independent Living (BCIL) settlement agreement of 2006. Because construction procurement of the elevator elements of the station had not begun as of the signing of the BCIL settlement agreement, the MBTA took

*appropriate steps to revise the elevators to comply with the design requirements included in the BCIL settlement agreement.*

- *This BCIL settlement agreement elevator requirements exceed the applicable code and regulatory requirements.*
- *The design consultant complied with state and federal accessibility regulations when developing the construction documents.*
- *Therefore this change order should not be viewed as an error in the design of the original contract.*

### **Auditor's Reply**

Based on its response, the MBTA appears to have taken measures to address the deficiencies that existed in its design and construction processes and caused the issues we raise in this report. Since our current audit scope did not include any projects initiated under the new process, we cannot comment on the effectiveness of these measures, but will do so in subsequent audits at the MBTA. We also believe that the corrective actions taken by the MBTA to ensure that proper funding is in place to ensure the successful design and construction of all proposed projects, without relying on costly change orders as a means to complete the project as additional funds become available, were necessary and appropriate.

While believe that it was prudent of the MBTA to review and negotiate with the design consultant concerning 36 errors and omissions, totaling approximately \$500,000, for the Maverick Station Project, it is important to note that this amount is a fraction of the more than \$11 million in additional costs we determined that the MBTA had incurred because of errors and omissions for the projects subject to our review, as follows:

Kenmore	\$ 3,251,468
Maverick	\$ 6,185,302
Ashmont	\$ 1,859,833
Ashmont Finishes	\$ 198,759
Total Design Error	\$ 11,495,362

Further, contrary to its assertions, the MBTA was aware of the pending litigation regarding equal access to the elevators at Maverick Station before the award of the construction contract in May 2005, since the BCIL filed its class-action lawsuit in federal court in July 2002 alleging that the

MBTA had discriminated by not providing all citizens with equal access to public buses and subways, in violation of Title II of the ADA. Moreover, contrary to the MBTA's assertions that the elevator design standards adopted by the MBTA's Design and Construction department were ADA compatible, testimonial evidence filed with the court by aggrieved users of the MBTA's elevators documented repeated instances in which these users were unable to reach the button panels because of improper height and angle placement and actually became trapped in an elevator because they could not reach the emergency button on the panels. Other riders experienced access issues where doors were too narrow and elevator cabins were too small, preventing them either from entering the elevator or from turning their wheelchairs around in order to exit the elevator properly. We believe these were indications of improper design and not in compliance with the ADA. It is for these reasons that the MBTA decided to settle the lawsuit and agreed to spend over \$100 million, including this additional \$322,044 at Maverick Station, to bring the MBTA's elevator and escalator equipment and facilities into ADA and settlement compliance.

The ADA was passed in 1990, well before the design of Maverick Station was completed. In OSA's opinion, if the MBTA had reached out to the BCIL before the award of the construction contract and attempted to meet BCIL's concerns as well as the requirements of the ADA during the design phase, these elevators could have been designed in a manner that would have satisfied the requirements of the ADA, thereby eliminating the need for this \$322,044 change-order modification.

**2. The MBTA did not bill or collect \$1,381,973 for construction work performed under two interagency agreements with the Boston Water and Sewer Commission and the City of Boston.**

During our audit period, because of inadequate recordkeeping, the MBTA had not properly billed and collected \$1,381,973 for construction work that it performed at Maverick Station on behalf of the Boston Water and Sewer Commission (BWSC) and the City of Boston (the City) in accordance with two interagency agreements (IAs) that the MBTA entered into with these entities. These agreements were made to facilitate efficiency in necessary infrastructure improvements by incorporating them into the scope of the MBTA's reconstruction work at these stations so that the BWSC and the City did not have to perform them separately. Currently, the BWSC owes \$150,307 and the City owes \$1,231,666 for these infrastructure improvements. These unpaid balances are the direct result of the MBTA's not billing for \$947,919 in eligible reimbursable expenses: \$92,429 from

the BWSC and \$855,490 from the City. Because of this inadequate accounts-receivable recordkeeping, the MBTA is at risk of not recouping these unreimbursed construction costs.

***IA between the BWSC and the MBTA***

Through an IA executed on January 30, 2006, between the MBTA and the BWSC, the MBTA agreed, as part of the Maverick Station modernization project, to replace all existing BWSC water and sewer distribution piping, fittings, and valves within Maverick Square Plaza. The scope of work included the procurement of, and payment for, police details, construction management, trenching, demolition, backfilling, temporary water services, public notices, testing, piping materials, and erecting of temporary barriers. As compensation for these services, the BWSC agreed to reimburse the MBTA for an estimated project cost of \$248,050 plus any associated change orders and quantity overruns. Per the IA, the MBTA was to invoice the BWSC monthly for all costs incurred.

***IA between the City and the MBTA***

As part of the Maverick Station modernization project, on August 12, 2008, the City and the MBTA executed an IA for requested improvements in public areas, including roadways, concrete sidewalks, medians, landscaping, street lighting, new signals, paving, striping, granite cubing, concrete-brick crosswalks, and associated work that enhanced the accessibility and appearance of the Maverick Square area.

The IA established that the City would pay for 50% of the estimated \$1.83 million in reconstruction costs, up to a maximum of \$1 million. In addition, the City agreed to pay for any scope-of-work changes that it directed the MBTA to perform.

The IA stated that the MBTA would submit 10 invoices in the amount of \$91,676.50 each (\$916,765 in total) as the work was completed. All invoices were to be accompanied by supporting documentation and a report on the status of construction.

Although the MBTA was required under the IAs to invoice the BWSC and the City per the agreed-upon monthly payment conditions, we found that it had not submitted the required bills, as shown below.

**Interagency-Agreement and Change-Order Amounts Invoiced, Paid, and Owed**

Agreement Co-party	Interagency-Agreement Amount	Change-Order Amount	Total	MBTA Invoice (one invoice for each interagency agreement)	Amount Paid	Balance Owed as of December 31, 2012
BWSC	\$ 248,050	\$ 75,279	\$ 323,329	\$ 230,900	\$ 173,022	\$ 150,307
City of Boston	916,765	314,901	1,231,666	376,176	0	1,231,666
Totals	<u>\$ 1,164,815</u>	<u>\$ 390,180</u>	<u>\$ 1,554,995</u>	<u>\$ 607,076</u>	<u>\$ 173,022</u>	<u>\$ 1,381,973</u>

The table above shows that, as of December 31, 2012, the MBTA had not billed these entities for \$947,919 (\$1,554,995 minus \$607,076) and had not collected the \$1,381,973 owed under the IAs. MBTA should have submitted invoices as various project milestones were achieved, but its Design and Construction department did not notify its Accounting department when those milestones were reached so that the work could be properly billed under these IAs as it progressed. Although the initial agreement amounts were properly recorded as accounts receivable by the Accounting department, the lack of further communication between the Accounting department and the Design and Construction department to issue monthly invoices under these IAs as amounts were earned resulted in these unbilled and uncollected balances.

Ultimately, by not adhering to the billing terms of these IAs, the MBTA risks not recouping the \$1,381,973 owed from the City and the BWSC.

***Recommendations***

We recommend that the MBTA take the following actions to ensure the prompt and full collection of these outstanding receivables:

- Invoice the BWSC for \$150,307 and ensure that funds are received.
- Invoice the City for \$1,231,666 and ensure that funds are received.
- Improve the billing and collection coordination between its Accounting department and its Design and Construction department to ensure that all milestone billings for future IAs are promptly made and that funds owed are received in a timely manner.

**Auditee's Response****Invoice the BWSC for \$150,307 and ensure that funds are received.**

*MBTA received \$173,022.00 payment dated March 20, 2012. . . . MBTA will pursue \$57,878.00 remaining balance, plus any over-runs and approved changes in the work.*

*The contractor, J.F. White proposed a modified routing of the water piping work from the design shown on the contract documents, and for what the original scope and value of work was based on. Boston Water and Sewer approved the contractor's revised pipe routing before the work began. The MBTA and Boston Water and Sewer Commission (BWSC) agreed to use the existing line items and cost values for the work . . . anticipating that the contractor's proposal would be less than the originally estimated. The net result was a decrease in some of the material quantities and costs to complete the work.*

*In May 2011, the MBTA prepared and submitted an invoice in the amount of \$230,900.00 for payment by BWSC. The MBTA provided a billing summary by line item and detailed back up as part of the invoice. MBTA received payment of \$173,022.00 against the invoiced amount of \$230,900.00 leaving an unpaid balance of \$57,878.00. BWSC had taken exception to portions of the invoice that did not exactly match to quantities and scope itemized in the base agreement with MBTA that predated the construction contract award . . . with J.F. White.*

*Upon receipt of the \$173,022.00 payment [the Project Manager and Acting Chief Engineer] met with Boston Water and Sewer to review why they did not pay what was invoiced. BWSC refused to pay for several items because offsets had to be used in the piping to work around the existing utilities in the street. BWSC refused to pay for any overrun of quantities on the invoice, although the agreement allows for quantity overrun. BWSC refused to pay for the temporary water line because they argued that it was not required to perform the work.*

*The MBTA is addressing the concerns raised by BWSC and is preparing an invoice for the work that was performed. The invoice will include all outstanding charges and credits. MBTA will actively pursue reimbursement.*

**Invoice the City for \$1,231,666 and ensure that funds are received.**

*In November 2010, an invoice in the amount of \$376,176.00 was prepared and submitted for payment by City of Boston (COB). There was a billing summary by line item and detailed back up provided as part of the invoice. MBTA received \$376,176.00 payment dated July 2011. . . . The MBTA is actively pursuing \$495,338.66 remaining balance due to the MBTA and any additional reimbursable cost due to changes in the work or line item overruns. . . .*

*A final summary of the City of Boston reimbursable cost was prepared for a total value of \$1,744,219.31. In accordance with the City of Boston Agreement the City is responsible for 50% of this value for a total of \$871,514.66 [sic]. An invoice in the amount of \$495,338.66 is being prepared to be submitted for payment by City of Boston (COB). There is a billing summary by line item and detailed back up to be attached to the invoice.*

*There were several overruns of line items in the City of Boston Agreement and two change orders for changes in the scope of work directed and approved by the City of Boston. This additional cost will be summarized and a request for the additional cost will be submitted to the City of Boston.*

*The MBTA is preparing an invoice that will include all outstanding charges and credits. MBTA will actively pursue reimbursement.*

***Improve the billing and collection coordination between its accounting department and its design and construction department to ensure that all milestone billings for future interagency agreements are promptly made and that funds owed are received in a timely manner.***

*As part of the MBTA Design & Construction Department reorganization the Assistant General Manager hired a Senior Project Coordinator to improve the drafting, coordination and administration of interagency agreements and payments. This individual implemented monthly meetings to review status of interagency agreements between MBTA project and budget offices. She also monitors interagency payment milestones and receivables. The Coordinator incorporated the Contract Administration Department into the process to maintain an activity report to track the agreement approval process. . . .*

*The City of Boston Public Improvement Commission (PIC), which is comprised of numerous City of Boston agencies, often takes the opportunity to make surface and subsurface utility improvements at sites near MBTA construction zones. While it makes sense to perform construction in an area all at the same time, it puts the MBTA in a financial bind in that the PIC will provide permits only if MBTA agrees to assign the PIC construction work to the MBTA contractor. Because the PIC scope is not included in the MBTA original bid, MBTA must process change orders to accomplish the work. The audit report suggests that many of these change orders are MBTA errors while they are actually City of Boston imposed changes that are unknown to MBTA until after contract award. Not only do the PIC improvements result in costly change orders, they also result in costly schedule delays to MBTA projects.*

### ***Auditor's Reply***

We believe that the MBTA's efforts to pursue all funds owed by BWSC under the IA, including all necessary change orders and quantity and cost overruns, are appropriate.

As of the completion of our audit field work, the MBTA had billed the City \$376,176; however, neither MBTA's Design and Construction department nor its Accounting department could verify that it had ever received this payment from the City under the IA. Subsequently, the MBTA produced evidence that the City had actually paid the \$376,176. However, as stated in our report, the MBTA should have submitted invoices as various project milestones were achieved, and this late collection clearly indicates a communication problem between the two MBTA departments responsible for monitoring and collecting all funds owed to the MBTA under these IAs.

Furthermore, the MBTA Design and Construction department now claims to have reduced the IA's reimbursable value from \$916,765 to \$871,514.66. If this is the case, the MBTA needs to ensure that all proper approvals are in place to reduce the reimbursement amounts under this IA and ensure that its Accounting department adjusts its accounts-receivable records to properly reflect this

reduced amount. This situation highlights the need for the MBTA to strengthen its controls over IAs and properly communicate all billings, payments, and IA amendments with its Accounting department.

We believe the MBTA's decision to establish a position to oversee its IAs is responsive to our concerns in this area. However, we also believe that the MBTA should ensure the prompt recognition, billing, and collection of all money it is owed under these IAs.

**3. The MBTA incurred \$2,216,842 in unnecessary costs by not coordinating with the local community or giving sufficient consideration to its own nearby project.**

In the course of our review of the construction change orders and associated design activities for the redevelopment of Ashmont Station, we determined that the MBTA did not properly plan for its proposed redevelopment. Specifically, it did not adequately address the concerns of the community surrounding Ashmont Station or give sufficient consideration to its own Transit-Oriented Development (TOD) project to be built on MBTA land adjacent to Ashmont Station. These oversights cost the MBTA \$2.216 million in additional design fees when it later agreed to redesign the project. By not adequately engaging the community or considering the TOD project before substantial completion of the design documents, the MBTA incurred additional design costs when the work completed to date was discarded and a new conceptual station design was commissioned. Moreover, the time and costs incurred to redesign the scope of work for this project did not prevent the MBTA from incurring the additional \$13.7 million discussed in Finding 1 for unnecessary change orders due to inadequate planning and design errors.

On May 3, 2001, the MBTA's board of directors authorized the execution of a design contract for the accessibility and renovation improvements to Ashmont, Shawmut, and Fields Corner Stations for an amount not to exceed \$4,254,416.

This project was intended to renovate and modernize these three Red Line Stations to ensure that they complied with the ADA. The initial design specifications were to include both accessibility issues and general improvements, such as the following:

- Barrier-free paths of travel from entrance to platforms
- Addition of elevators

- Installation of LED signage and Braille identification
- Warning strips along platforms
- New or upgraded platforms
- Improvements in landscaping
- Modernization of stations and improvements to surrounding areas

On January 22, 2002, the MBTA's Development department issued a Request for Proposals (RFP) related to the development of a parcel of MBTA land adjacent to Ashmont Station. The MBTA entered into lease negotiations with a selected developer in June 2002. The parties entered into an 85-year lease for this 30,000-square-foot parcel for a mixed-use development, and the MBTA received an upfront payment of \$1.425 million from the developer. The Ashmont Station Project as originally designed was a minimal restoration project. After the preferred developer was named in June 2002, both the developer and the community expressed concerns to the MBTA about the conceptual plans for the Ashmont Station as well as the detailed design specifications that the MBTA had approved to date. The community was concerned that the Ashmont Station Project as originally designed was inferior to the completely new stations that were built at Savin Hill, Shawmut, and Fields Corner Stations.

However, the MBTA continued to authorize additional design work to be completed without addressing these concerns or revising the scope and specifications for the Ashmont Station Project as best business practices would dictate.

As of January 10, 2003, the designs for Shawmut and Fields Corner Stations were 100% complete, and the rehabilitation design of Ashmont Station was approximately 90% complete when all further design work was ordered to be stopped by the MBTA. This stop-work order was given to address the design concerns raised by both the community and the preferred developer. At the time of the stop-work order, approximately \$2,216,842 had been paid to the design engineer for his original, now-unusable design work.

The MBTA authorized a revised scope of design services in the amount of \$3,323,628 for a totally new station design at Ashmont Station. This amendment to the contract authorized the design and construction of an entirely new station in place of the original rehabilitation-only design. The MBTA

agreed to build a new station with a clear, identifiable entrance from Peabody Square, better coordination and transfers between transportation modes, and improved station lighting. Also included in the redesign were a full replacement and reconfiguration of the south viaduct with a new track and power system, partial demolition of the north viaduct and covering of the tunnel roof, relocation of the platforms, and a complete reconstruction of the roof.

Finally, the MBTA directed its design engineer to coordinate his design activities on the new Ashmont Station Project with the development plan for the adjacent TOD parcel.

### **Recommendations**

To improve its station construction process, the MBTA should:

- Ensure that the proposed conceptual design and construction scope of work for all future station projects has considered the concerns of the local community, and that all major objectionable aspects of the project have been resolved, before authorizing substantial completion of the final design documents.
- Improve the planning and coordination of effort between the Development department and the Design and Construction department to ensure that all future station modernization efforts are properly aligned with the needs of future MBTA planned developments.

### **Auditee's Response**

*The issue identified by this audit was that the Ashmont parcel included a Transit Oriented Development (TOD).*

*The developer, at the time that the MBTA station design was complete and ready to be constructed, lacked funding to advance the TOD project. The MBTA's project schedule faced costly delays if the project waited for the developer to obtain funding. The MBTA was well into construction when the developer was ready to start construction of the TOD. . . . Some of [the additional] costs would have been in the MBTA construction bid if the TOD developer was financially prepared at the time of bid procurement.*

*The alternative would have had the MBTA stop the bidding process and wait for the TOD developer to start. The MBTA was willing to delay the Ashmont Station project; however, the TOD developer was unable to forecast when or if funding would become available. Therefore the MBTA elected to proceed with the station project. Developers are often forced to move quickly to capitalize on a funding opportunity, and it is not uncommon for the MBTA to absorb a cost during construction to facilitate city and regional economic development.*

*The MBTA Ashmont Station project team worked very closely with the Ashmont community throughout the project beginning at conceptual design. The red line modernization program began the formal MBTA community outreach program used by the Design & Construction Department today. This type of outreach program is now a requirement per the MBTA Project Manager's Manual as well as incorporated into the MBTA specifications for large projects. The*

*MBTA project management requires a robust community outreach program on all its projects. Please see below policies and examples.*

**Model Request for Proposals**—(2010) MBTA created a model RFP that incorporates and requires the inclusion of community outreach tasks in every scope of work. . . .

**Project Manager's Manual**—(2012) The Project Manager's Manual Outreach requirements. . . .

**Example—Green Line Extension Project**—The MBTA Green Line Extension Project is one example that demonstrates the MBTA commitment to community involvement during design. The project office consistently meets with all the communities involved in the project. . . .

. . . .

*The MBTA has implemented a series of senior staff meetings that lead to development of the Capital Investment Program. Project Development, Planning Operations, Maintenance and Design & Construction collaborate to develop priorities and program needs.*

*The MBTA has also hired a Director of Transit Oriented Development and Facilities, and one of their responsibilities is to facilitate coordination between third-party development projects and MBTA projects. In Beverly, Massachusetts, a new garage has been coordinated with a future development site adjacent, as is true in Salem, Massachusetts where a garage and station improvements are under construction. The situation described in Ashmont remains true for many situations, however: that there is no perfect timing, developers are often forced to move quickly to capitalize on a funding opportunity, and it is not uncommon for the MBTA to absorb costs during construction to facilitate city and regional economic development.*

**Project Development Group Meetings**—PDG have proven to be an invaluable tool in engaging other MBTA departments, specifically the development and planning departments, into the project development process.

**Project Controls Group**—The Project Controls Group reviews scope, schedule and budget for every D&C contract. This review has brought other departments into the process to ensure collaboration.

**Project Manager's Manual**—The updated PM Manual contains a section instructing Project Managers on how to initiate projects. This process involves the Budget Department and Planning Departments to better align new station and other projects with the overall Authority development plans.

**Capital Investment Program (CIP) Process**—The CIP process at the MBTA requires that all MBTA departments submit a comprehensive list of both new project funding and supplemental funding requests for existing approved projects. All requests are vetted within individual departments and submitted to MBTA Budget Office ranked in two ways:

1. A low-medium-high ranking for each project.
2. An ordinal ranking of priority highest to lowest.

*MBTA Budget Office uses a recently developed Decision Support Tool to analyze and prioritize all requests. The prioritization methodology uses several metrics that were determined by senior management to select projects. These projects are combined into a revised 5 Year Plan*

*incorporating the existing CIP. This revised overall plan is presented and approved by the MBTA Board of Directors. . . .*

***Auditor's Reply***

On May 3, 2001, the MBTA board of directors authorized the execution of a design contract for accessibility and renovation improvements to Ashmont, Shawmut, and Fields Corner Stations for an amount not to exceed \$4,254,416. The MBTA then issued an RFP for a TOD at Ashmont Station approximately eight months later, on January 22, 2002. The timing indicates that the various MBTA departments involved in these projects should have had ample opportunity to collaborate on the design of the station and the TOD before authorizing substantial completion of the design documents. The MBTA's decision to proceed without the TOD's acceptance resulted in \$2.216 million in additional design fees. Based on its response, the MBTA has implemented new procedures to ensure collaboration between the Development and Design and Construction departments and has also appointed a director of TOD to facilitate coordination between third-party development projects and MBTA development projects. These measures should help to ensure that all future TOD projects will be properly integrated into all future MBTA station development work.

Finally, although based on its response, the MBTA's community outreach process is now in place, at the time that the final design for the Ashmont Station was authorized and paid for, it was done without sufficient consideration of the ongoing concerns of the Ashmont community that its station proposal was markedly inferior to the final designs of the Shawmut and Fields Corner Stations. Ultimately, these concerns were satisfied, but only through costly redesign amendments.

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## APPENDIX

### AUDIT BACKGROUND

The Massachusetts Bay Transportation Authority (MBTA) is a subdivision of the Commonwealth and was established in 1964 in accordance with Chapter 161A of the Massachusetts General Laws. The MBTA serves 175 communities, providing transportation to almost 4.7 million people over 3,200 square miles. The MBTA is currently the fifth-largest mass-transit system in the United States as measured by ridership and serves approximately 1.3 million passengers each day. MBTA ridership and total operating revenue for fiscal year 2012 were 401,616,849 and \$528,906,000, respectively.

The MBTA system provides passenger service via bus, subway, light rail streetcars, trackless trolleys, a commuter rail, ferries, and paratransit vehicles. With over 2,500 vehicles, 258 stations, 885 miles of track, almost 500 bridges, 20 miles of tunnels, and 19 maintenance shops, the MBTA's infrastructure is extensive and has major capital needs.

The MBTA has embarked on a large-scale capital investment program (CIP) dedicated to station renovations. The MBTA's report *Capital Investment Program FY2013 – FY2017* states that the program “authorizes approximately \$4.2 billion in capital spending to reinvest in its transportation infrastructure and to build authorized expansion projects. . . . Projects in the Capital Investment Program are selected through an ongoing prioritization process that strives to balance capital needs across the entire range of MBTA transit services.” One of the MBTA's highest priorities is the pursuit of a “state of good repair,” wherein all capital assets function at their ideal capacity during their design life. State-of-good-repair projects improve the condition of the MBTA's existing infrastructure and are critical to providing reliable service.

Of the current CIP of \$4.2 billion, about \$252 million—approximately 6.4%—is designated for the MBTA's Station Modernization Program. The MBTA is completing extensive work at stations on the Red and Blue Lines that serve communities in Dorchester, Mattapan, East Boston, and downtown Boston. Most of the funding is invested in subway station improvements and system-wide replacement of escalators and elevators, including modernizing the Blue Line stations (Maverick, State Street, and Airport Stations) to allow for six-car trains, as well as completing the renovations of Savin Hill, Fields Corner, Shawmut Avenue, and Ashmont Stations along the Dorchester branch of the Red Line. Other station modernization investments were driven by the

Americans with Disabilities Act of 1990 (ADA) to provide station accessibility. The majority of ADA accessibility funding is devoted to the Light Rail Accessibility Program (LRAP) to modernize stations, install elevators, and raise platforms on the Green Line.

The Station Modernization Program includes all MBTA heavy rail, light rail, commuter rail, Silver Line, and bus stations. Stations comprise the basic structure, roofs, platforms, lights, shelters, elevators, escalators, fare-collection equipment, and collector booths. Stations typically have a useful life of 50 years.

As stated in its *Capital Investment Program FY2013 – FY2017* report, the MBTA “operates four subway lines (the Red, Green, Orange, and Blue Lines) over 38 route miles of heavy rail routes and 44 stations. Service is also provided by streetcars and light rail vehicles on 26 miles of additional rail routes (the Green Line and the Mattapan Line), serving 70 stations.”

### **1. Green Line LRAP at Kenmore Station**

The ADA prohibits public transportation systems from discriminating against persons with disabilities. The ADA required that certain key MBTA stations be made accessible to all. The MBTA Key Station Plan, approved by the Federal Transit Administration, included 80 key stations (including 29 light rail stations) that must comply with ADA guidelines.

The MBTA LRAP was initiated in 1996 with the award of consultant contracts for the design of station accessibility components for all stations that were designated as “key stations.” Under the LRAP, 13 subway and elevated stations and all light rail surface lines would be made fully accessible. Tracks, ramps, elevators, platforms, fare-collection equipment, station lobbies, clearance and structural analyses, parking, surrounding street-level areas, and other related improvements were included in the scope of work. To date, the MBTA has spent over \$176 million on accessibility improvements under the LRAP.

Kenmore Station was designated as a key station for modernization/accessibility improvements. The project’s preliminary design began in 1996, and the station has remained in service during construction, which began in 2005. Upon completion of the project in January 2013, at a total project cost of approximately \$50,562,330, the station was deemed ADA accessible.

The scope of the construction work consisted of renovations to the existing Kenmore Station, including the installation of elevators, escalators, LED signs, tactile warning tiles, and the raising of the platforms to accommodate new low-floor Green Line light rail vehicles. In addition, surface improvements included landscaping; sidewalk curb realignment; streetlights, traffic signals, and crosswalks; and a new steel and glass bus canopy.

Also, at the request of the Massachusetts Highway Department (MHD) and the Boston Water and Sewer Commission (BWSC), the MBTA performed certain infrastructure improvements at Kenmore Station in accordance with two interagency agreements (IAs) executed between the MBTA and each party. The scope of work that the MBTA was required to perform under the IAs included MHD's request for improvements and enhancements to public streets, sidewalks, and subway entrances and the BWSC's request for improvements to the water-distribution system. For undertaking these improvements as part of the project, the MBTA was reimbursed \$7 million by MHD and \$562,250 by the BWSC.

## **2. Blue Line Station Modernization Program at Maverick Station**

The Blue Line Station Modernization Program began in the mid-1990s in response to the need to update the Blue Line, provide structural improvements to correct existing deteriorating conditions, provide barrier-free access for all potential users in accordance with federal and state laws, and allow future growth of the Blue Line by lengthening platforms to operate six-car trains. Originally, the Blue Line operated with four-car trains at all times, primarily because of the short platforms at several Blue Line stations.

The Blue Line is one of three heavy rail lines in the MBTA's subway system and is approximately six miles long, running from Bowdoin Station in Boston to Wonderland Station in Revere. Of the 12 Blue Line stations, 5 stations north of Airport Station were rebuilt in the 1990s and deemed accessible, with the exception of Orient Heights Station (which was not rebuilt in the 1990s and was only recently deemed accessible). Through the Blue Line Station Modernization Program, work has been performed at Aquarium, Orient Heights, Government Center, State, Airport, and Maverick Stations to accommodate six-car trains. To date, the MBTA has spent \$258,465,732 on the Blue Line Station Modernization Program.

The Blue Line's Maverick Station, located at Maverick Square Plaza in East Boston, was one of the last stations to be converted to six-car train service under the MBTA's Blue Line Station Modernization Program. The Maverick Station Project consisted of a single construction contract based on two distinct design-engineering contracts. The initial scope of design work was for the installation of ventilation shafts (which began in 1991), and the second scope, initiated in 1998, included the overall modernization of Maverick Station. The station remained open during construction, which began in 2005. Upon completion in 2009, at a total project cost of approximately \$56,320,000, the station was brought into ADA compliance and the operation of six-car trains increased the line's peak passenger-carrying capacity by 50%.

As part of the project, through two separate IAs, the MBTA made desired improvements at the request of the City of Boston (the City) and the BWSC. The integration of this work performed in the area of Maverick Square Plaza was based on the City's request for the reconstruction of roadways and sidewalks and the BWSC's request for improvements to the sewer and drainage system. For these improvements, the MBTA was to be reimbursed by the City for 50% of the actual costs (up to a maximum of \$1 million) and by the BWSC for agreed-upon estimated costs of \$248,050.

### **3. Red Line Station Rehabilitation Project at Ashmont Station**

The MBTA Red Line Station Rehabilitation Project totaled \$156 million in modernization work at Fields Corner, Savin Hill, Shawmut, and Ashmont Stations and was initiated in 2000. All four of these stations on the Dorchester branch had been in various stages of deterioration since the 1980s and were chosen by the MBTA for accessibility and renovation improvements.

The Red Line Station Rehabilitation Project work included all upgrades for accessibility and barrier-free access in accordance with the requirements of the ADA as well as compliance with all state and local building codes.

Under the Ashmont Station Project, which cost approximately \$83 million, Ashmont Station was the last of these four stations on the Dorchester branch to be either renovated or entirely rebuilt as part of the Red Line Station Rehabilitation Project. The project consisted of one design contract awarded May 31, 2001, and two separate construction contracts: Phase I, awarded June 9, 2005, and Phase II, awarded February 3, 2010.

On May 3, 2001, the MBTA's board of directors awarded a contract to Cambridge Seven Associates for design services for Ashmont, Fields Corner, and Shawmut Stations. The total contract award for design for these three stations was \$4,199,500 and covered the period May 15, 2001 to July 15, 2004. The portion of this design contract allocated to design work for rehabilitation and viaduct repair at Ashmont Station was \$1,278,733. Ultimately, nine amendments, totaling \$5,409,286, were approved and added to the original Ashmont Station base contract award, bringing the total design fees to approximately \$6.688 million, and the completion date was extended to March 6, 2012.

On January 22, 2002, the MBTA issued a Request for Proposals regarding the reuse and redevelopment of approximately 30,000 square feet of land adjacent to Ashmont Station.

On May 31, 2006, the MBTA entered into a Transit-Oriented Development (TOD) land-lease agreement with a private developer, Trinity Financial, to redevelop the adjacent parcel of land into a residential housing and retail mixed-use development space.

On January 10, 2003, with 90% of the original design work completed for the Ashmont Station rehabilitation, the MBTA decided to stop all further design work because of concerns raised by the surrounding community and Trinity Financial. An amendment to the design contract was approved by the MBTA's board of directors on February 12, 2004, and encompassed a new scope of services that would require the complete reconstruction of Ashmont Station, including an all-new station viaduct. Ultimately, the MBTA and the designer decided that none of the previous rehabilitation design work could be incorporated into this redesigned project.

The revised scope of services would be based on a totally new design for Ashmont Station agreed to by the MBTA's general manager and the surrounding community. The station design included a clear, identifiable entrance connected to a redesigned Peabody Square; better coordination and transfers between transportation modes; a smaller roof over the platform; a well-lit and safe station; and better coordination with the TOD parcel.

Because of the decision to redesign the station, Ashmont Station was packaged for construction separately from the other two stations in the contract, Fields Corner Station and Shawmut Station. To mitigate the delay in construction, it was agreed that an aggressive design schedule would be followed.

The station remained in service during construction, and upon completion on June 14, 2011, the Federal Transit Administration deemed it a fully ADA-accessible transit facility with new platforms to accommodate six-car trains, new communications and security systems, a reconfigured busway, and a redesigned Peabody Square Park.

During the design and bid phase, the Commonwealth's Secretary of the Department of Transportation and the MBTA's general manager decided that the Ashmont Station Project would be broken into two separate construction projects because funding was not available for the entire project. The project scope was reworked and a number of items were deleted to stay within the available budget. Phase I work comprised the complete demolition and reconstruction of Ashmont Station, which included the completion of a new Mattapan Trolley viaduct and platform. Phase II finish work included finishes for ceilings, walls, floors, signs, and lighting.