



# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Richard A. Davey, MassDOT Secretary and CEO and MPO Chairman  
Karl H. Quackenbush, Executive Director, MPO Staff

## MEMORANDUM

**DATE** January 9, 2014  
**TO** Boston Region Metropolitan Planning Organization  
**FROM** Karl H. Quackenbush  
CTPS Executive Director  
**RE** Work Program for: MBTA 2014 Review of Fare Structure, Tariffs, and Policy

### Action Required

Review and approval

### Proposed Motion

That the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Bay Transportation Authority, vote to approve the work program for MBTA 2014 Review of Fare Structure, Tariffs, and Policy presented in this memorandum

### Project Identification

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

11378

Client

Massachusetts Bay Transportation Authority  
*Project Supervisor:* Charles Planck

CTPS Project Supervisors

*Principal:* Annette Demchur  
*Manager:* Steven Andrews

Funding

Future MBTA contract

## Impact on MPO Work

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

## Background

The MBTA implemented several changes to its fare and services on July 1, 2012. Fares were increased by an average of slightly less than 23 percent, four bus routes were completely eliminated, and service on several other bus routes, commuter rail lines, and ferries was reduced. Revenue realized from the fare increase and the decrease in operating costs resulting from the service changes was needed in order to address a substantial budget shortfall in fiscal year 2013 and anticipated shortfalls in subsequent years. These shortfalls were caused by, and in large part continue to occur because of, the gaps between anticipated and actual dedicated revenue from the state sales tax. The increased costs of labor, materials, and interest payments on debt also contribute to budget gaps.

The MBTA had projected a budget deficit for SFY 2014 and once again considered raising fares, but the Massachusetts Legislature passed a budget that enabled the MBTA to avert a fare increase. However, the projected budget deficit for SFY 2015 requires that the MBTA once again evaluate the options for increasing revenue by changing fares.

In recognition of the long-term gap between revenues and statewide transportation needs, the Massachusetts Legislature passed a transportation finance bill (Bill H3535) in June 2013, which raises new revenue both by raising existing taxes and creating new ones. It invests revenue in transportation by shifting the revenue currently raised through the motor vehicle sales tax and the Underground Storage Tank fees from the General Fund to the Commonwealth Transportation Fund, raises the gas tax by 3 cents and indexes it to inflation, and creates “own source” revenue (defined on page 3) targets for MassDOT and the MBTA while putting restrictions on the ways to reach those targets. For the MBTA, the bill states:

- In fiscal year 2014, the authority shall contribute 31.5 percent of the authority's operating budget;
- In fiscal year 2015, the authority shall contribute 33 percent of the authority's operating budget;
- In fiscal year 2016, the authority shall contribute 33.25 percent of the authority's operating budget;

- In fiscal year 2017, the authority shall contribute 32.75 percent of the authority's operating budget; and
- In fiscal year 2018, the authority shall contribute 34 percent of the authority's operating budget.

The MBTA is expected to be able to meet those contributions by implementing the following "own source" increases in revenue, as well as by decreasing the operating budget.<sup>1</sup>

- Increases in nonfare revenues
- Increases in total fare revenues through ridership growth
- Increases in fare levels while accounting for potential loss of ridership from fare increases

The bill also specifies that the MBTA "shall not increase fares at intervals of less than 24 months or at an annual rate greater than 5 percent."<sup>2</sup>

The MBTA has requested that CTPS analyze the impacts of potential changes in fare structure and tariffs at this time. CTPS has provided technical assistance related to such changes in the past, most recently in 1991, 2000, 2004, 2007, and 2012, and in 2013, CTPS initiated an analysis of the impacts of potential changes in fare structure, tariffs, and service for SFY 2014. This work was halted when the Legislature produced the necessary funding. Prior to the most recent fare increase, CTPS produced analyses, much like the ones proposed in this work program, that included projections of revenue, ridership, environmental, and socioeconomic impacts related to the proposed fare increase alternatives. It is expected that CTPS will perform the current analysis by relying on the Boston Region MPO's regional travel demand model set, along with various other data sources and analysis tools. Preliminary work on the current analysis was initiated under a previous (2013) contract. This work program describes the work needed to complete the analysis of the impacts of potential changes in the fare structure and tariffs for SFY 2015.

As part of the 2004 fare increase, the MBTA Board of Directors created the Rider Oversight Committee (ROC) to discuss customer-service improvements and service-quality issues. This committee is composed of members from three different groups: MBTA staff, transportation advocacy organizations, and riders at large. Since 2004,

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<sup>1</sup> The bill specifies that the revenue generated to meet the benchmarks "may be derived from any funds collected by the authority through fees and fares and any other funds directly collected by the authority; provided, however, that such revenue shall not include funds contributed to the Massachusetts Bay Transportation Authority State and Local Contribution Fund under section 35T of chapter 10 of the General Laws," H3535 Section 61(c).

<sup>2</sup> H3535 Section 61(d).

the ROC Finance Committee has been involved in discussions about potential fare and service changes, and CTPS has provided them with technical assistance.

## Objective

To forecast the ridership, revenue, environmental, and socioeconomic impacts of potential changes in the MBTA's fare structure and tariffs

## Work Description

### Task 1 Participate in Meetings and Provide Technical Support

CTPS will meet regularly with representatives of the MBTA to receive direction concerning the project, including potential scenarios for changing MBTA fares and feedback on the preliminary results of the analyses conducted by CTPS. Upon the MBTA's request, CTPS will participate in additional meetings related to the MBTA's fare policy and meetings with members of the MBTA Board of Directors or other interested parties.

Currently, CTPS provides professional staff support for each of the full ROC monthly meetings and also participates in the monthly meetings of the ROC Capital Improvement and Finance Subcommittee under a separate ongoing work program (MBTA Rider Oversight Committee Support). Under the work program that is proposed here, CTPS will attend any additional ROC meetings that may be necessary to provide technical support and to respond to any technical questions that may arise regarding the fare increase proposals, especially if they pertain to ridership statistics, the current fare structure, adherence to the standards of the Service Delivery Policy, or the Boston region's capital planning process. CTPS will also model, to the extent possible, the ridership and revenue impacts of fare levels and structures suggested by the ROC.

In addition, CTPS will participate in meetings of, and provide technical support to, the ad hoc committee that was established by the MBTA, composed of representatives of various advocacy organizations and the MBTA, to discuss policy and strategy for achieving the required SFY2015 fare revenue target.

### Task 2 Forecast the Ridership Impacts of Potential Changes in Fare Structure, Tariffs, and Policy

CTPS uses two methodologies to forecast ridership. The first is a spreadsheet-based model that CTPS originally used to analyze the 2007 fare increase and restructuring. The spreadsheet-based model lists the number of unlinked trips for each product type (cash, LinkPass, bus pass, and others) on each mode, including parking utilization. This model then applies price changes to each fare category (cash on a bus, LinkPass on a Green Line train, and others), along with various elasticities of demand with respect to fares. These elasticities are based

on past experiences with fare changes at the MBTA and at peer transit properties in North America, and they are updated to reflect demonstrated elasticities after fare increases. The second methodology uses the MPO's model set, a four-step model that estimates the frequency of origins and destinations of trips in each travel zone by trip purposes (trip generation), matches origins with destinations (trip distribution), assigns a specific transportation mode (such as private vehicle, public transportation, and walking) to each origin-destination trip pair (mode choice), and determines the route between the origin and destination using the chosen mode (route assignment).

The chief strengths of the CTPS spreadsheet-based model are that it accounts for every distinct fare that can be paid for an MBTA transit service and that it properly assigns the fare to the correct number of passengers who are in that fare-payment and modal category (for example, those who use the LinkPass to ride both a bus and train during one trip). In comparison, the regional model set does not permit the analysis of fares at this detailed level; instead it assigns an average modal fare across all fare types. The spreadsheet-based model also estimates the diversion of riders between modal and fare-payment categories—for example, when some transit users, faced with a fare increase, choose to continue using the MBTA, but switch to a different route or mode in order to lessen the financial impact of the fare increase.

The regional model set can be used to predict the number of riders who leave the system due to a fare increase and switch to the drive-alone, carpooling, or walking mode. The regional model set also provides the outputs necessary for conducting environmental and socioeconomic impact analyses.

Using the spreadsheet-based model, CTPS will analyze one or two fare-pricing and fare-structure scenarios, with possible recommendations from the MBTA, MassDOT, or the ROC Capital Improvement and Finance Subcommittee. Summaries of each scenario will describe the potential fare changes for each fare-payment category and each transit mode. CTPS will use the regional model set to analyze one or two scenarios that reflect possible combinations of changes in fare structure, tariffs, and policy.

Due to their complementary nature, the regional model set and the spreadsheet-based model will be used together. As the regional model set's fare categories are much more limited than those used in the spreadsheet-based model, the more detailed fare categories in the spreadsheet-based model will be aggregated and averaged to provide the inputs used in the regional model set. These averaged fares will be used in the regional model set to forecast ridership changes resulting from the changes in fare structure and tariffs, by line and mode, and these changes will be compared to the estimates from the

spreadsheet-based model. The two models' results will be summarized in tabular and graphical form for review by the MBTA.

*Products of Task 2*

- Forecasts of ridership changes by line and mode of the proposed fare-structure and tariff scenario
- Forecasts of diversions to the drive-alone, carpool, and walk modes
- Forecasts of the change in vehicle-miles traveled (VMT) due to diversions to the drive-alone and carpool modes

**Task 3 Forecast the Revenue Impacts of Potential Changes in Fare Structure, Tariffs, and Policy**

The spreadsheet-based model described above calculates fare-revenue changes along with ridership changes resulting from a fare-structure and/or tariff change. The regional model set also estimates revenue, based on the average-fare inputs. As was done for ridership, the changes in revenue forecast by the two models will be summarized in tabular and graphical form for review by the MBTA.

*Product of Task 3*

Forecasts of the fare-revenue impact of the proposed fare-structure and tariff scenario

**Task 4 Forecast the Air Quality Impacts of Potential Changes in Fare Structure and Tariffs**

The environmental analysis will consist of forecasting changes in vehicular emissions of ozone precursors (volatile organic compounds and nitrogen oxides) and other pollutants that might result from changes in fare structure and tariffs. This will entail forecasting the changes in both transit-vehicle and automobile emissions; CTPS has well-established procedures for doing both. The VMT-by-roadway-link output from the regional model set will be combined with the latest Motor Vehicle Emission Simulator(MOVES)<sup>3</sup> emissions rates to estimate the total change in emissions for the region.

*Product of Task 4*

Forecasts of emission changes resulting from the proposed fare-structure and tariff scenario

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<sup>3</sup> MOVES is an emission modeling system that was recently developed by the United States Environmental Protection Agency's Office of Transportation and Air Quality. The EPA now requires that MOVES be used to estimate emissions from mobile sources.

## Task 5 Forecast the Title VI and Environmental Justice Impacts of Potential Changes in Fare Structure, Tariffs, and Policy

In this task, the potential impact of changes in fare structure, tariffs, and policy on different socioeconomic groups will be analyzed in accordance with the requirements of the Federal Transit Administration (FTA) Circular 4702.1B (Title VI Requirements and Guidelines for FTA Recipients) and Circular 4703.1 (Environmental Justice Policy Guidance for FTA Recipients). This work will be closely related to ongoing work at CTPS in the areas of Title VI and environmental justice, and some of the analytical approaches used in that work will be brought to bear in this project. The MBTA measures the impacts of service changes on Title VI and environmental justice populations (target populations) and compares them to the impacts on all other populations as part of its biennial service-planning process and ongoing Title VI monitoring program.

As was done for the 2012 pre-fare-increase impacts analysis, the average fare-structure and/or tariff changes, in both absolute and percentage terms, will be computed and compared to existing conditions using the regional model set for both target populations and non-target populations. This comparison will be performed for the entire MBTA service area.

The regional model set is needed for performing the previously mentioned equity analyses. However, an additional equity analysis will be performed using the spreadsheet model and the MBTA's 2008–2009 systemwide passenger survey. While not as comprehensive as the analysis performed by the regional model set, this analysis can be performed much more quickly, permitting the MBTA to use it in its planning process. This analysis will estimate and compare the projected increase in the average fare for minority and nonminority passengers, and for low-income and non-low-income passengers.

CTPS will prepare a fare equity analysis of each of the proposed scenarios, using the results from both the regional model set and the spreadsheet model, which will evaluate the impacts of the proposed changes on minority and low-income populations.

### *Products of Task 5*

- Comparative analysis of fares from the proposed fare-structure, tariff, and policy change scenarios
- Additional equity analysis using the spreadsheet model and the systemwide passenger survey
- Draft Fare Equity report

**Task 6 Produce a Draft Report for Public Review**

In this task, CTPS will compile the results of the analyses performed in Tasks 1-5 into a draft report that will be released for review prior to the public meeting process.

*Product of Task 6*

Draft report in electronic format

**Task 7 Assist the MBTA in Preparing Communication Materials for Public Hearings and Fare Change Implementation**

In this task, CTPS will provide the MBTA with explanatory materials in appropriate formats for use at public meetings and hearings and for general customer communication in advance of the potential fare increase, and will conduct analyses to advise the MBTA about the need for translating materials and providing interpreters at meetings. In the past, such materials have explained the need for a fare increase, summarized the impacts of the proposed increase, and listed the new fares in tabular format.

*Product of Task 7*

Information and materials needed by the MBTA for public hearings

**Task 8 Perform Additional Analysis as Requested by the MBTA and as Suggested at Public Hearings**

There may be ideas presented during the public process that the MBTA will ask CTPS to analyze. CTPS will use the spreadsheet-based model to analyze the projected ridership, revenue, and fare-equity impacts of these ideas. The MBTA may request that CTPS perform the full analysis described in Tasks 2 through 5 for one additional scenario.

*Product of Task 8*

Additional analysis, if requested by the MBTA following the public hearings

**Task 9 Prepare Final Report and Equity Analysis**

If the scenario selected by the MBTA for implementation is the same scenario that was analyzed in the draft report, the final report will include whatever edits and/or revisions are needed to finalize the draft report. If the MBTA selects a scenario that differs from that analyzed in the draft report, the final report will reflect only the analysis of this final scenario.

*Products of Task 9*

- Final report
- Final Fare Equity report



## Estimated Schedule

It is estimated that this project will be completed six months after work commences. The proposed schedule, by task, is shown in Exhibit 1.

## Estimated Cost

The total cost of this project is estimated to be \$141,042. This includes the cost of 51.1 person-weeks of staff time and overhead at the rate of 97.42 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

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**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**MBTA 2014 Review of Fare Structure, Tariffs, and Policy**

Task	Month					
	1	2	3	4	5	6
1. Participate in Meetings and Provide Technical Support	[Task bar spanning months 1-6]					
2. Forecast Ridership Impacts	[Task bar spanning months 1-2]					
3. Forecast Revenue Impacts	[Task bar spanning months 1-2]					
4. Forecast Air Quality Impacts	[Task bar spanning months 1-2]					
5. Forecast Title VI and Environmental Justice Impacts	[Task bar spanning months 1-2]		A			
6. Produce Draft Report	[Task bar spanning months 1-2]		B			
7. Prepare Communication Materials	[Task bar spanning months 1-2]		[Task bar spanning months 3-4]			
8. Perform Additional Analysis	[Task bar spanning months 1-2]		[Task bar spanning months 4-5]			
9. Prepare Final Report and Equity Analysis	[Task bar spanning months 1-2]		[Task bar spanning months 5-6] C			

Products/Milestones

- A: Draft Fare Equity report
- B: Draft report
- C: Final report and final Fare Equity report

**Exhibit 2**  
**ESTIMATED COST**  
**MBTA 2014 Review of Fare Structure, Tariffs, and Policy**

<b>Direct Salary and Overhead</b>									<b>\$141,042</b>
Task	Person-Weeks						Direct Salary	Overhead (97.42%)	Total Cost
	M-1	P-5	P-4	P-3	P-2	Total			
1. Participate in Meetings and Provide Technical Support	1.0	0.0	0.2	1.5	0.0	2.7	\$3,546	\$3,455	\$7,001
2. Forecast Ridership Impacts	0.6	2.3	0.2	2.0	0.0	5.1	\$7,288	\$7,100	\$14,388
3. Forecast Revenue Impacts	0.4	1.3	0.2	2.0	0.0	3.9	\$5,255	\$5,120	\$10,375
4. Forecast Air Quality Impacts	0.4	1.0	0.0	0.1	0.0	1.5	\$2,479	\$2,415	\$4,894
5. Forecast Title VI and Environmental Justice Impacts	0.4	1.0	0.0	1.5	0.0	2.9	\$3,964	\$3,862	\$7,826
6. Produce Draft Report	4.6	0.0	0.0	3.0	0.0	7.6	\$11,012	\$10,728	\$21,740
7. Prepare Communication Materials	0.7	3.5	0.0	2.0	0.0	6.2	\$9,236	\$8,998	\$18,234
8. Perform Additional Analysis	2.4	2.9	0.2	6.0	0.0	11.5	\$15,610	\$15,208	\$30,818
9. Prepare Final Report and Equity Analysis	4.0	0.5	0.2	4.0	1.0	9.7	\$13,051	\$12,714	\$25,766
Total	14.5	12.5	1.0	22.1	1.0	51.1	\$71,443	\$69,600	\$141,042
<b>Other Direct Costs</b>									<b>\$0</b>
<b>TOTAL COST</b>									<b>\$141,042</b>

**Funding**  
 Future MBTA contract