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Executive Director, MPO Staff

The Boston Region MPO is  
composed of:

Massachusetts Department of  
Transportation  
Metropolitan Area Planning Council  
Massachusetts Bay Transportation  
Authority Advisory Board  
Massachusetts Bay Transportation  
Authority  
Massachusetts Port Authority  
Regional Transportation Advisory  
Council  
City of Boston  
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Town of Arlington  
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Town of Framingham  
Town of Lexington  
Town of Medway  
Town of Norwood  
Federal Highway Administration  
(nonvoting)  
Federal Transit Administration  
(nonvoting)

**MEMORANDUM**

**DATE** December 1, 2011  
**TO** Boston Region Metropolitan Planning Organization  
**FROM** Karl H. Quackenbush  
CTPS Executive Director  
**RE** Work Program for: Improving Transit Reliability to Increase  
Ridership

**ACTION REQUIRED**

Review and approval

**PROPOSED MOTION**

That the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Department of Transportation, vote to approve the work program for Improving Transit Reliability to Increase Ridership in the form of the draft dated December 1, 2011.

**PROJECT IDENTIFICATION**

**Unified Planning Work Program Classification**

Technical Support/Operations Analysis

**CTPS Project Number**

11383

**Client**

Massachusetts Department of Transportation  
*Project Supervisor:* Matt Ciborowski

**CTPS Project Supervisors**

*Principal:* Scott Peterson  
*Manager:* Bruce Kaplan

**Funding**

MassDOT §5303 Contract #70174

## **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 nor reduce the quality of other work in the UPWP.

## **BACKGROUND**

A better understanding of where and when in the MBTA system a lack of reliability is impacting ridership the most would inform decisions on how to prioritize efforts to reduce such impacts. In this study, CTPS will conduct a comprehensive review of on-time-arrival data for the MBTA commuter rail, rapid transit, and bus services. This review will identify what transit lines and routes have quantifiable and repetitive delays (including those caused by cancelled trips), which are the key ingredients of unreliable service, causing increases in wait times and travel times, and thus reducing ridership. It will also identify the times of day at which these delays occur and quantify them.

Using this information, CTPS will develop “service plans” that reflect the existing delays, model those services using the MPO’s regional travel demand model set, and match them to existing transit ridership. Once we have thus modeled the demand associated with transit service at the current level of reliability, we will use the model set to test what demand would be associated with transit service that adheres to the published schedules. This will tell us the transit lines and routes on which ridership is being smothered by delays, and when. Guided by this information, the MBTA can target investments to fix some of the problems.

## **OBJECTIVES**

The first basic objective of this study is to identify, by time of day and transit line/route, the delays on the MBTA transit system that have the greatest impact on total passenger-delay times on the system as a whole. The second is to quantify, using the model set, the impacts that the various delays have on passenger demand and use those data to identify and rank the lines and routes that could benefit the most from improved reliability.

## **WORK DESCRIPTION**

### **Task 1 Conduct Literature Review and Review of MBTA On-Time-Arrival Data**

A literature review will be performed to identify how other regional travel demand models incorporate delay/reliability into the modeling process. The results of this review will help us improve the capability of the Boston Region MPO’s regional travel demand model set in the future to account for transit delay that may be unpredictable or out of a transit agency’s control to fix. In addition, CTPS will conduct a review and analysis of MBTA on-time-arrival data by time of day and transit line/route in order to be able to

develop transit service “plans” that reflect the current level of reliability, which will be prepared in Task 2 for input into the travel demand model set.

***Products of Task 1***

- Peer review of how other agencies model transit delay/reliability
- List of delays regularly incurred by the MBTA showing where and when these delays occur

**Task 2 Incorporate Delay into Transit Service Plans**

This task will be to quantify the delays in the transit system from Task 1 and incorporate them into transit service plans that can be modeled.

***Product of Task 2***

Transit service plans reflecting quantified reoccurring delay

**Task 3 Calibrate Model to Existing Delay and Ridership (Base Case)**

CTPS will calibrate the regional travel model set to existing conditions using the most current estimates of travel times, from Task 2, and the most current transit ridership estimates on the various MBTA transit modes.

***Product of Task 3***

A well-calibrated regional travel demand model set using revised travel times

**Task 4 Model Ridership Impacts of On-Time Performance**

The regional travel model set will be used to estimate the increased ridership in a transit system that adheres to the schedules. This analysis will modify the model set calibrated in Task 3 by assuming transit service that reflects the schedules and intended travel times, without delay.

***Product of Task 4***

A regional travel demand model set that assumes adherence to schedules and ideal travel times

**Task 5 Examine Results and Identify Opportunities for Increasing Ridership**

The model results from Task 4 will be compared to those from Task 3 (the base-year calibration) to identify the services and times of day for which improved reliability has the greatest impact on ridership. The comparison would estimate, in effect, the ridership that is “lost” by services’ not operating as scheduled. The largest differences between the two modeled scenarios would indicate where improvements in reliability could potentially result in the greatest ridership increases. Finally, CTPS will investigate the effectiveness and potential of the use of express trips, a typical delay-management

strategy regularly used by the MBTA and other transit properties to minimize unreliable operations.

***Product of Task 5***

Assessment of impacts of unreliability on transit passenger demand and identification of services and times of day that have the greatest potential for improvement of reliability and thus for increased transit ridership

**Task 6 Document Results**

A technical report will be produced that summarizes the results of Tasks 1–5.

***Product of Task 6***

Technical report

**ESTIMATED SCHEDULE**

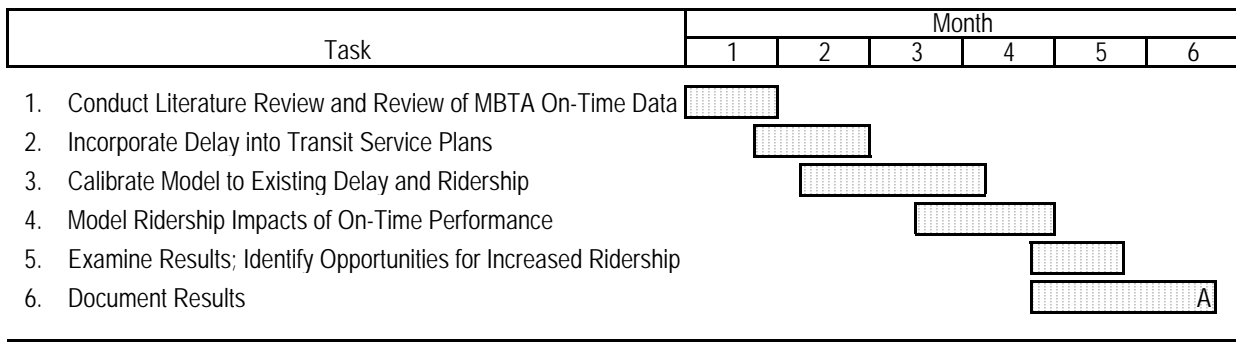
It is estimated that this project will be completed six months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

**ESTIMATED COST**

The total cost of this project is estimated to be \$50,000. This includes the cost of 20.3 person-weeks of staff time and overhead at the rate of 94.57 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/SAP/BK/sap

Exhibit 1  
 ESTIMATED SCHEDULE  
 Improving Transit Reliability to Increase Ridership



Products/Milestones  
 A: Technical report

Exhibit 2

ESTIMATED COST

Improving Transit Reliability to Increase Ridership

<b>Direct Salary and Overhead</b>	<b>\$50,000</b>
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Task	Person-Weeks					Direct Salary	Overhead (@ 94.57%)	Total Cost
	M-1	P-5	P-4	P-3	Total			
1. Conduct Literature Review and Review of MBTA On-Time Data	0.3	0.0	0.5	1.0	1.8	\$2,056	\$1,944	\$4,000
2. Incorporate Delay into Transit Service Plans	0.3	0.0	0.5	2.0	2.8	\$3,084	\$2,916	\$6,000
3. Calibrate Model to Existing Delay and Ridership	0.5	0.0	3.5	1.5	5.5	\$6,630	\$6,270	\$12,900
4. Model Ridership Impacts of On-Time Performance	0.5	1.0	2.0	0.0	3.5	\$4,934	\$4,666	\$9,600
5. Examine Results; Identify Opportunities for Increased Ridership	0.5	0.5	1.8	0.0	2.8	\$3,855	\$3,646	\$7,500
6. Document Results	1.0	0.0	2.0	1.0	4.0	\$5,140	\$4,861	\$10,000
Total	3.0	1.5	10.3	5.5	20.3	\$25,698	\$24,302	\$50,000

<b>Other Direct Costs</b>	<b>\$0</b>
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<b>TOTAL COST</b>	<b>\$50,000</b>
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*Funding*

*MassDOT \$5303 Contract #70174*