



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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and MPO Chairman

Arnold J. Soolman
Director, MPO Staff

The Boston Region MPO,
the federally designated
entity responsible for
transportation decision-
making for the 101 cities
and towns in the MPO
region, is composed of:

MassDOT Office of Planning and
Programming
City of Boston
City of Newton
City of Somerville
Town of Bedford
Town of Braintree
Town of Framingham
Town of Hopkinton
Metropolitan Area Planning Council
Massachusetts Bay Transportation
Authority Advisory Board
Massachusetts Bay Transportation
Authority
MassDOT Highway Division
Massachusetts Port Authority
Regional Transportation Advisory
Council (nonvoting)
Federal Highway Administration
(nonvoting)
Federal Transit Administration
(nonvoting)

MEMORANDUM

DATE January 21, 2010
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Arnold J. Soolman, CTPS Director
RE Work Program for: Green Line Extension FEIR/New Starts Analysis

ACTION REQUIRED

Review and approval

PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Department of Transportation, vote to approve the work program for Green Line Extension FEIR/New Starts Analysis in the form of the draft dated January 21, 2010.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Planning Studies

CTPS Project Number
22333

Client
Massachusetts Department of Transportation
Project Supervisor: Katherine Fichter

CTPS Project Supervisors
Principal: Karl Quackenbush
Manager: Scott Peterson

Funding
New MassDOT 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 other work in the UPWP.

BACKGROUND

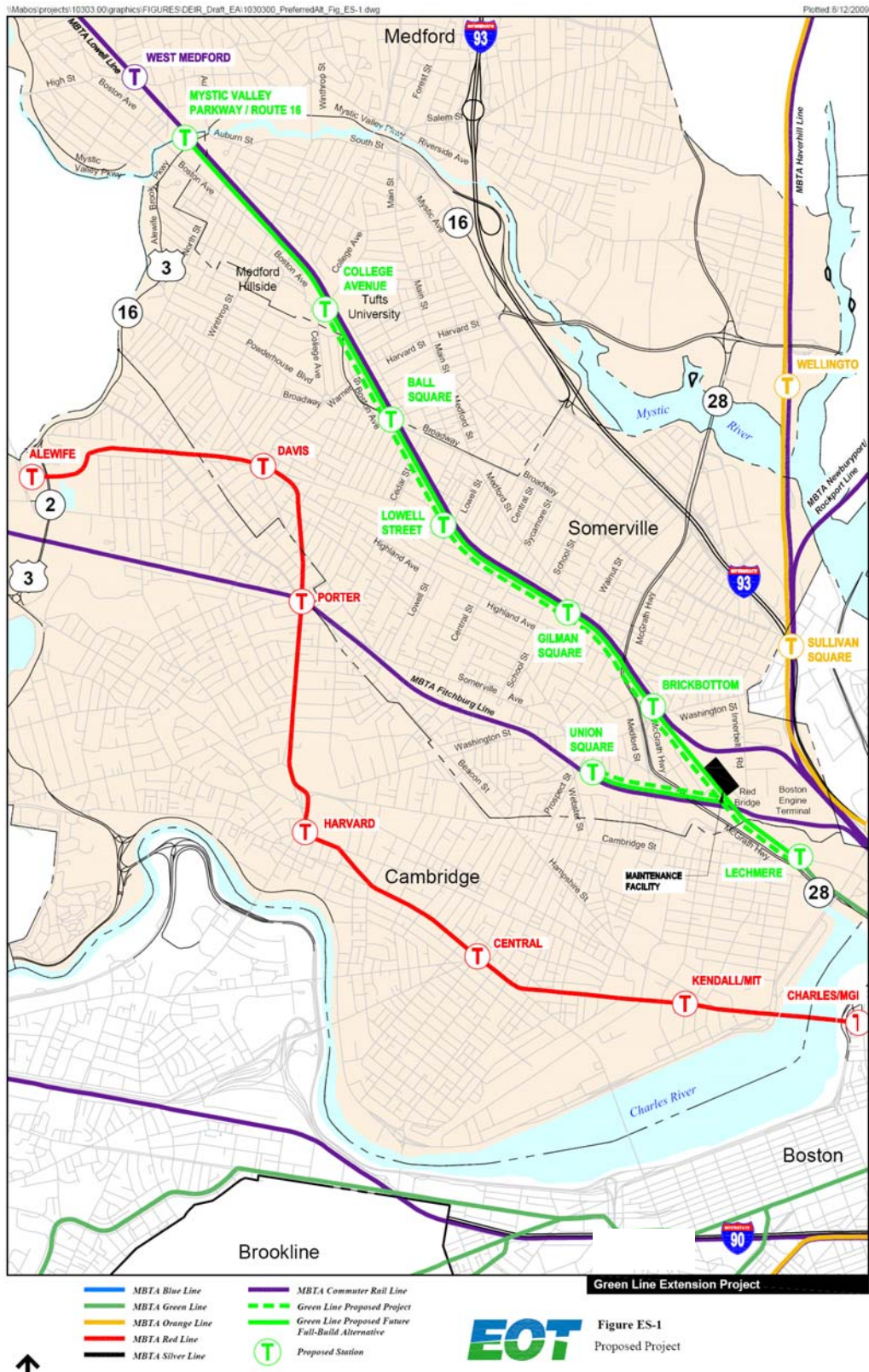
The work scope outlined below is intended to provide planning and modeling assistance to the client, the Massachusetts Department of Transportation (MassDOT), in the preparation of a Final Environmental Impact Report (FEIR) for the Green Line Extension. The results of the work undertaken by CTPS will be used to ensure that the project information requirements of the Federal Transit Administration (FTA) for evaluation in the New Starts Program are met. Since CTPS maintains the regional travel demand model that has produced previous Green Line ridership estimates and is capable of producing performance measures such as “user benefits,” which are currently required in New Starts submissions, CTPS is uniquely qualified to provide this assistance. Furthermore, CTPS has performed the modeling work for the State Implementation Plan (SIP), which the Green Line Extension is included in.

Extending Green Line service to Cambridge, Somerville, and Medford has been the subject of several studies over the last 40 years. In 2005, a Major Investment Study/Alternatives Analysis entitled “Beyond Lechmere” was prepared by the then Executive Office of Transportation (EOT) and the Massachusetts Bay Transportation Authority (MBTA) to define the most appropriate transit investment strategy for improving mobility and regional access for residents in Cambridge, Somerville, and Medford. Although this study did not identify a preferred alternative, the SIP identifies the mode, routing and appropriate terminus for the project based on the analysis and recommendation of EOT in 2006. Following public comment on the project in 2006, the secretary of the Massachusetts Executive Office of Environmental Affairs (EOEA) issued a certificate requiring the preparation of a Draft Environmental Impact Report/Environmental Assessment (DEIR/EA).

A study to prepare this DEIR/EA was begun in late 2007 by the MBTA and EOT with support from CTPS. After copious public input, many public meetings, and nearly two years of rigorous analysis, the DEIR/EA was filed in October 2009 with the Massachusetts Environmental Policy Act (MEPA) office and has now been completed.

The locally preferred alternative, shown in Exhibit 1, from the DEIR/EA consists of extensions of the Green Line along two MBTA commuter rail rights-of-way. The proposed service consists of two distinct branches: a “mainline” branch, which would operate within the existing MBTA Lowell Line commuter rail right-of-way, beginning at a relocated Lechmere Station in Cambridge and traveling north to Medford; and a branch line operating within the existing MBTA Fitchburg Line commuter rail right-of-way

Exhibit 1



EOT Figure ES-1 Proposed Project

to Union Square in Somerville. New stations along the “mainline” branch would exist at Brickbottom, Gilman Square, Lowell Street, Ball Square, and College Avenue, while a new station on the branch line would be erected at Union Square.

OBJECTIVE(S)

The principal objectives of this work program are:

- To assist in the refinement of the proposed project
- To measure its air quality impacts
- To measure its environmental justice impacts
- To measure its cost-effectiveness
- To provide the necessary components for an FTA New Starts submission

WORK DESCRIPTION

Green Line Extension modeling work is needed to support three distinct MassDOT planning efforts, each having its own guidelines. The regional travel demand model will be used to produce outputs to be used in an FTA New Starts submission and in the FEIR document, as well as for analyzing the extent to which the Green Line Extension project meets the SIP-related requirements contained within the EOECA Certificate for the development of the DEIR. The DEIR certificate can be found at <https://www.commentmgr.com/Projects/1228/docs/13886deir.pdf>.

Task 1 Perform Base-Year Model Calibration

The transit component of the current CTPS travel model is calibrated to 2006 ridership data. For the purposes of this study, CTPS will update the base-year model to the year 2008. For model calibration, CTPS will utilize the most current transit ridership data, pedestrian information, and traffic counts, and the recently completed transit on-board survey data.

The model will be calibrated and validated to 2008 conditions. The transportation services being calibrated include the transit lines (focusing on the Green Line), existing bus routes, and commuter rail lines. Also, key intersections in the corridor—those for which traffic volume impacts will be required—will be examined, as necessary, in order to properly replicate existing observed volumes. Travel times and speeds on the roadways will be examined as well.

The results of running the base-year model will be summarized in sufficient detail to provide certain systemwide statistics, daily boardings and access-mode shares at major stations on the Green Line, boardings on groups of bus lines, and traffic volumes at key intersections.

Product(s) of Task 1

A well-calibrated travel demand model set, with outputs showing the transit, highway, air quality, and travel characteristics of the transportation system.

Task 2 Prepare Inputs for Forecast Years

CTPS will forecast two horizon years: the 2014 opening year and the 2030 design year. Model inputs—socioeconomic data, congested highway travel times, auto-operating costs, CBD parking costs, transit fares, and travel times—will be consistent with the currently adopted land use and background transportation projects assumed in the 2008 amended Regional Transportation Plan (RTP) and in the SIP. MAPC and other relevant agencies such as other MPOs, as well as MassDOT, will be consulted about the best demographic and land use assumptions to use in this planning effort in conducting the opening year analysis and responding to FTA's request to quantify uncertainty in demographic forecasts in New Starts submissions.

Product(s) of Task 2

Model inputs for both the opening and horizon years.

Task 3 Conduct No-Build Model Runs for the Forecast Years

Using the model work done for the RTP, CTPS will create no-build networks for the two forecast years: the 2014 opening year and the 2030 design year. Forecast-year model runs will be conducted for these no-build scenarios, and the results will be summarized at the same levels of detail as for the base year.

Product(s) of Task 3

A complete summary of travel and air quality forecasts for the no-build scenarios.

Task 4 Refine Locally Preferred Alternative through Sensitivity Analyses

The locally preferred alternative from the DEIR/EA will be refined through a series of sensitivity analyses for the design year (2030). Up to 10 different build alternatives, identified by MassDOT and composed of service plan variations to the Green Line and other transit services, will be tested. The variants might consist of testing different bus service plans in the corridor to optimize demand as well as testing different headways on the different alignments based on feedback from MBTA Operations. The no-build scenario trip patterns will be held constant across the different alternatives for a given year. Service levels will be examined and equilibrated to match demand in the corridor. Once the best variant of the preferred alternative is chosen, it will be tested for the opening year (2014).

Forecasts of air quality impacts and vehicle-miles traveled will be produced for each scenario. Mode choice and highway assignment results will be summarized in tabular

form. Aggregate statistics such as total linked and unlinked transit trips will be summarized by submode. These statistics will form the basis for determining the utilization of the proposed service. Traffic volume forecasts for the immediate areas around the proposed stations will be extracted and summarized.

Product(s) of Task 4

A complete summary of travel and air quality forecasts for the build scenarios.

Task 5 Develop, and Run Model for, Transportation System Management/Baseline Alternative

FTA guidance mandates the development of a Transportation System Management/Baseline alternative for the design year (2030). Such a scenario will be constructed in conformity with FTA regulations. This same alternative will also be tested in the opening year (2014).

Outputs from the model similar to the no-build in Task 4 will be processed and examined.

Product(s) of Task 5

A complete summary of travel and air quality forecasts for this alternative for the forecast and opening years of analysis.

Task 6 Estimate Transportation User Benefits

For the variants of the preferred alternative identified by MassDOT, CTPS will use the results of the travel demand model forecasts to run the FTA-developed SUMMIT software and produce tables showing transportation user benefits. User benefits are similar to travel time savings and are used in the cost-effectiveness formula that FTA considers in the New Starts submission. Several maps showing the pattern of travel-time savings will be generated using the results of the SUMMIT software. Additionally, the transit trip flows by mode for each alternative will be analyzed to determine the origins and destinations of the markets in the study area. Graphics will be produced to show the spatial distribution of the primary beneficiaries of each of the build alternatives examined.

Product(s) of Task 6

Tables and maps summarizing results obtained using the SUMMIT software.

Task 7 Estimate Passenger Revenue

Travel model results will serve as the starting point for estimating likely passenger revenue associated with each alternative. The revenue estimates will take into

consideration the different regional transit agencies' fare structures and parking revenue by operating entity. CTPS will also assist the projects team's financial consultant in the development of its finance plan.

Product(s) of Task 7

Passenger revenue estimates for each transit alternative.

Task 8 Analyze Green Line Capacity

CTPS will analyze, by time period, existing and future-year (both 2014 and 2030) peak load and capacity concerns on the currently highly used Green Line rapid transit service, specifically in the heavily traveled Central Subway portion shared by the four different Green Line branches. The ridership demand under the build alternatives being examined in Task 4 will be measured against the carrying capacity of each of the Green Line branches. In addition, capacity issues related to station configuration, such as pedestrian movement at the new Lechmere station, will also be examined.

Product(s) of Task 8

Memorandum explaining the peak load and capacity analysis.

Task 9 Perform Environmental Justice Analysis

CTPS will conduct an environmental justice analysis for the preferred build alternative for the opening and design years. After identifying communities of concern, performance measures—accessibility to health care, higher education, and jobs; mobility and congestion; and environmental impacts—will be used as indicators of benefits and burdens for environmental-justice and non-environmental-justice communities.

Product(s) of Task 9

Memorandum on environmental justice analysis.

Task 10 Assist with Traffic Analysis

CTPS will provide necessary data to the project team for conducting level-of-service analyses for a subset of alternatives: up to four of those tested in Task 4. The data will consist of approach volumes by time period for up to 40 intersections that will be identified by the project team.

Product(s) of Task 10

Traffic forecasts for the major intersections in the study area.

Task 11 Coordinate with MIT Team

MIT's Transit Research Program is conducting an academic research project to assist MassDOT (through its planning contractor, Vanasse Hangen Brustlin, Inc.) with the station area planning, scenario development, and operations planning for the Green Line Extension and related transit services in the area of the Green Line project. The designated faculty and staff will also advise MassDOT on various related multimodal transportation policy issues. CTPS will work with the MIT research team in their endeavors to model highway and transit use in the study corridor using innovative modeling approaches.

Product(s) of Task 11

Provide technical assistance and data when appropriate, with guidance from MassDOT.

Task 12 Assist with Livability and Economic Measures of the Project

The FTA New Starts Program is starting to shift away from the user benefit measure and to look at the topic of livability in more detail. At this time FTA has not identified a specific way of measuring livability, but one possible definition relates to economic growth and job creation generated by improved mobility through transit investment. MassDOT will work with FTA to identify measures that CTPS and the consultant team can quantify via an economic impact analysis. CTPS will work with the project team in developing and analyzing data on the livability and economic benefits of the proposed project.

Product(s) of Task 12

Technical assistance and data to support the project team.

Task 13 Quantify Uncertainties

The travel demand model set that CTPS will use in this study will be developed based on a set of assumptions that cover a broad spectrum of topics. The confidence in many of these assumptions decreases the further we go into the future. Assumptions such as costs, land use, and other transit investments are all major inputs into the travel demand modeling process and can potentially be a major area of uncertainty in relation to future conditions. Sensitivity testing will be undertaken to test the degree to which these assumptions could impact future Green Line Extension ridership and other performance measures. Additionally, the current climate of fiscal austerity and rising debt payments by the MBTA may lead to some changes in the supporting bus network. Assessments will be undertaken to see how tied the predicted Green Line Extension ridership is to local bus service.

Product(s) of Task 13

Memorandum explaining the uncertainty analysis.

Task 14 Assist with FTA New Starts Program Grant Submission

CTPS will provide coordination and assistance to the client and its consultant in an FTA New Starts grant submission process.

Product(s) of Task 14

Memoranda; data needed by the client, in spreadsheets and other forms as appropriate.

Task 15 Produce Technical Memorandum

CTPS will produce a technical memorandum describing the modeling method and the results of the travel demand analysis.

Product(s) of Task 15

A technical memorandum documenting the project.

Task 16 General Support to MassDOT

Provide general support to MassDOT, via planning, modeling, and/or coordination with stakeholders, in the development of the Green Line Extension FEIR and New Starts documents.

Product(s) of Task 16

General support.

ESTIMATED SCHEDULE

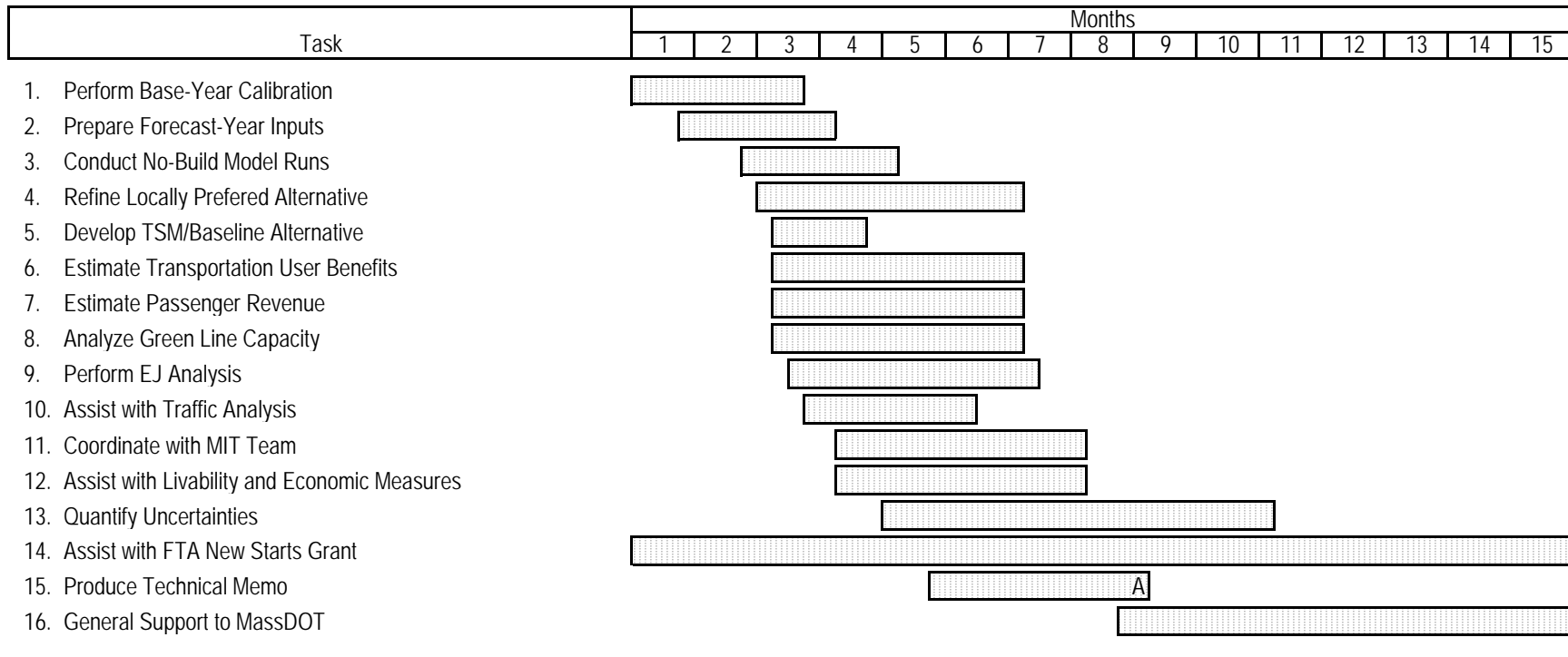
It is estimated that this project will be completed 15 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 2.

ESTIMATED COST

The total cost of this project is estimated to be \$267,600. This includes the cost of 106.6 person-weeks of staff time, overhead at the rate of 88.99 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 3.

AJS/BK&SP/sp

Exhibit 2
 ESTIMATED SCHEDULE
 Green Line Extension



Products/Milestones
 A: Technical Memorandum

Exhibit 3
ESTIMATED COST
Green Line Extension

| | |
|-----------------------------------|------------------|
| Direct Salary and Overhead | \$267,500 |
|-----------------------------------|------------------|

| Task | Person-Weeks | | | | | Direct Salary | Overhead (@ 88.99%) | Total Cost |
|--|--------------|------|------|------|-------|---------------|---------------------|------------|
| | M-1 | P-5 | P-4 | P-3 | Total | | | |
| 1. Perform Base-Year Calibration | 1.1 | 3.9 | 3.5 | 1.5 | 10.0 | \$13,836 | \$12,312 | \$26,148 |
| 2. Prepare Forecast-Year Inputs | 0.2 | 1.3 | 1.5 | 1.0 | 4.0 | \$5,260 | \$4,681 | \$9,941 |
| 3. Conduct No-Build Model Runs | 0.4 | 1.4 | 2.0 | 0.2 | 4.0 | \$5,534 | \$4,925 | \$10,458 |
| 4. Refine Locally Preferred Alternative | 1.8 | 4.0 | 13.5 | 2.2 | 21.5 | \$28,061 | \$24,971 | \$53,032 |
| 5. Develop TSM/Baseline Alternative | 0.5 | 1.1 | 1.0 | 0.4 | 3.0 | \$4,205 | \$3,742 | \$7,947 |
| 6. Estimate Transportation User Benefits | 0.5 | 1.0 | 3.0 | 3.0 | 7.5 | \$9,161 | \$8,152 | \$17,312 |
| 7. Estimate Passenger Revenue | 0.5 | 1.3 | 0.1 | 0.0 | 1.9 | \$3,014 | \$2,683 | \$5,697 |
| 8. Analyze Green Line Capacity | 0.5 | 0.0 | 4.5 | 0.0 | 5.0 | \$6,308 | \$5,614 | \$11,922 |
| 9. Perform EJ Analysis | 0.5 | 0.5 | 3.0 | 0.0 | 4.0 | \$5,319 | \$4,733 | \$10,052 |
| 10. Assist with Traffic Analysis | 0.4 | 0.5 | 3.6 | 0.5 | 5.0 | \$6,307 | \$5,613 | \$11,920 |
| 11. Coordinate with MIT Team | 0.5 | 0.0 | 1.7 | 0.2 | 2.4 | \$3,129 | \$2,785 | \$5,914 |
| 12. Assist with Livability and Economic Measures | 0.5 | 1.5 | 2.0 | 0.0 | 4.0 | \$5,651 | \$5,029 | \$10,680 |
| 13. Quantify Uncertainties | 0.5 | 2.5 | 11.3 | 2.0 | 16.3 | \$20,649 | \$18,376 | \$39,025 |
| 14. Assist with FTA New Starts Grant | 2.8 | 0.5 | 3.2 | 0.0 | 6.5 | \$9,286 | \$8,263 | \$17,549 |
| 15. Produce Technical Memo | 1.5 | 1.5 | 2.5 | 0.0 | 5.5 | \$7,898 | \$7,029 | \$14,927 |
| 16. General Support to MassDOT | 1.0 | 0.5 | 4.5 | 0.0 | 6.0 | \$7,924 | \$7,052 | \$14,976 |
| Total | 13.2 | 21.5 | 60.9 | 11.0 | 106.6 | \$141,542 | \$125,959 | \$267,500 |

| | |
|---------------------------|--------------|
| Other Direct Costs | \$100 |
|---------------------------|--------------|

| | |
|--------|-------|
| Travel | \$100 |
|--------|-------|

| | |
|-------------------|------------------|
| TOTAL COST | \$267,600 |
|-------------------|------------------|

Funding
New MassDOT Contract