



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968
Tel. (617) 973-7100
Fax (617) 973-8855
TTY (617) 973-7089
www.bostonmpo.org

Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Karl H. Quackenbush
Acting 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 May 19, 2011
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, CTPS Acting Director
RE Work Program for: Impacts of Walking Radius on Transit Frequency
and Reliability

ACTION REQUIRED

Review and approval

PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization vote to approve the work program for Impacts of Walking Radius on Transit Frequency and Reliability in the form of the draft dated May 19, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Technical Support/Operations Analysis Projects

CTPS Project Number
11374

Client
Metropolitan Planning Organization

CTPS Project Supervisors
Principal: Elizabeth M. Moore
Manager: Robert Guptill

Funding
MassDOT §5303 3C Transit Planning Contract #67436

IMPACT ON MPO WORK

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

BACKGROUND

The MBTA currently operates two bus rapid transit (BRT) lines (comprising four branches) and approximately 200 bus routes with variations totaling over 550 distinct services. Much of the existing system has its origins as streetcar lines built before 1900. Over time, the bus system has grown in response to customer demand and now operates a large number of routes with high-frequency service in dense urban areas and fewer routes with less frequent service in suburban areas, where auto ownership is greater. Bus routes have also been designed, allocated, and eliminated in response to measures of service quality and productivity established by the MBTA Service Delivery Policy.

One service standard governed by the MBTA Service Delivery Policy concerns coverage, i.e., how far a customer has to walk to reach a transit service. The existing MBTA standard for coverage states that access to transit service will be provided within a quarter-mile walk to residents in areas served by bus, light rail, and/or heavy rail transit that have a population density greater than 5,000 persons per square mile. This standard is for weekdays and Saturdays. On Sundays, the allowable walking distance increases to a half mile. Other service standards in the Service Delivery Policy concern frequency and span of service (how often and in which hours transit operates), vehicle loading (the number of passengers per vehicle), schedule adherence, and net cost per passenger.

More than any other service standard, the standard for coverage governs the design of bus routes in terms of where service is provided. However, the coverage level and resulting allocation of service also have implications for how that service is provided given the other service standards. For example, any relaxation of the coverage standard, in which fewer bus routes would be provided, could cause the remaining bus routes to fail the vehicle-load and/or schedule-adherence standards if the total ridership remained constant. This might require an increase in the frequency of service.

The MBTA Core Service Evaluation (referred to as the Core Efficiencies Study, project # 11366), which CTPS is currently completing for the MPO, proposes several potential concepts for the reallocation of bus service in the MBTA service area. One of the proposed concepts is a reduction in the total number of bus routes, with more frequent service to provide greater capacity, as well as more bus priority measures in place. In essence, the bus system would have fewer routes, but the concept would apply various BRT characteristics to the remaining routes to improve service reliability and attract ridership.

OBJECTIVE

The objective of this project is to analyze the potential route modifications and suggest several possible system designs for local bus system consolidation if the quarter-mile coverage standard was relaxed to one-third mile, four-tenths mile, and one-half mile, and the consolidated bus routes adhered to rapid-transit-service standards that would require more frequent service operated over a longer service span than local bus service standards. This modeling-based effort will build on the Core Efficiencies Study and will help the MPO better understand the implications of the trade-off between eliminating poor-performing local bus routes and increasing service on a smaller number of transit corridors. It will consider the best option for providing mobility and access through the bus network. The study will also consider the equity implications and potential trade-offs of any of the potential consolidated systems.

WORK DESCRIPTION

Task 1 Develop Consolidated Bus Route Networks

In this task, consolidated bus route networks will be developed for each of the three proposed alternative coverage standards, and accompanying levels of service will be defined. These networks will be developed with the participation of MBTA Service Planning. The base-case network, with the quarter-mile coverage standard, will be the current MBTA bus network.

Product of Task 1

Bus route design and accompanying service levels for consolidated networks with coverages of one-third mile, four-tenth mile, and one-half mile

Task 2 Model the Networks

CTPS will use the Boston Region MPO's travel model to analyze the potential impact of the consolidated plans on transit ridership by transit mode, bus route, and transportation analysis zone (TAZ). New bus routes will be coded into the model and new matrices will be developed to reflect changes in transit costs, the number of transfers, and out-of-vehicle and in-vehicle travel times. Note that the travel model currently assumes a maximum walking distance, or catchment area, of one mile to access all transit modes. As part of this modeling effort, CTPS will use results from the 2009 Systemwide Passenger Survey to calculate the distribution of stated walking-access distances in the AM-peak and midday time periods. CTPS will use the surveyed data to set the catchment area for each transit mode in the AM-peak and midday time periods for the base-case network and each proposed network. The travel model will calculate TAZ-to-TAZ transit trip-flow matrices for the existing transportation system as well as for each of the proposed networks.

Product of Task 2

Travel demand model matrices of ridership and transit-cost changes by mode, bus route, and TAZ

Task 3 Analyze Networks

Using the trip-flow matrices from the travel demand model, transit ridership will be broken down modally and geographically in order to analyze the modeled impacts on various parts of the MBTA service area and the trade-offs in terms of service levels that may be necessary in order to relax the coverage standard. The analysis will also consider the equity implications of changes to various transit costs and air quality for minority compared to nonminority areas and low-income compared to non-low-income areas.

Product of Task 3

Summaries of ridership changes by mode, bus route, and TAZ, and equity changes for minority and low-income areas

Task 4 Document Results

The description of networks developed in Task 1, the model outputs from Task 2, and the summary of the model outputs in Task 3 will be integrated into a technical report.

Product of Task 3

Final technical report

ESTIMATED SCHEDULE

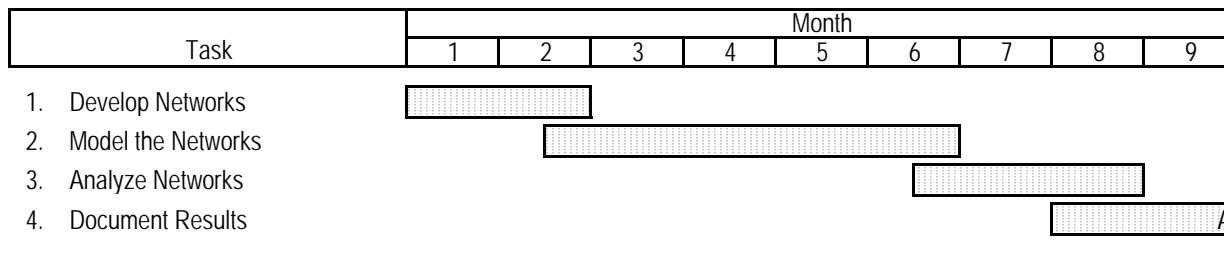
It is estimated that this project will be completed nine months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$49,991. This includes the cost of 18.5 person-weeks of staff time and overhead at the rate of 90.69 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/RSG/rsg

Exhibit 1
 ESTIMATED SCHEDULE
 Impacts of Walking Radius on Transit Frequency and Reliability



Products/Milestones
 A: Technical report

Exhibit 2
 ESTIMATED COST
 Impacts of Walking Radius on Transit Frequency and Reliability

Direct Salary and Overhead	\$49,991
-----------------------------------	-----------------

Task	Person-Weeks					Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-5	P-4	P-3	Total			
1. Develop Networks	1.5	0.0	3.0	0.0	4.5	\$6,116	\$5,546	\$11,662
2. Model the Networks	3.0	3.0	2.0	1.0	9.0	\$13,166	\$11,940	\$25,107
3. Analyze Networks	0.0	0.0	2.5	0.0	2.5	\$3,050	\$2,766	\$5,815
4. Document Results	2.0	0.0	0.5	0.0	2.5	\$3,884	\$3,523	\$7,407
Total	6.5	3.0	8.0	1.0	18.5	\$26,216	\$23,775	\$49,991

Other Direct Costs	\$0
---------------------------	------------

TOTAL COST	\$49,991
-------------------	-----------------

Funding
 MassDOT §5303 3C Transit Planning Contract #67436



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968
Tel. (617) 973-7100
Fax (617) 973-8855
TTY (617) 973-7089
www.bostonmpo.org

Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Karl H. Quackenbush
Acting 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 May 19, 2011
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, CTPS Acting Director
RE Work Program for: Early-Morning Transit Service

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 Early-Morning Transit Service Study in the form of the draft dated May 19, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Technical Support/Operations Analysis Projects

CTPS Project Number
14322

Client
Massachusetts Department of Transportation
Project Supervisor: Matthew Ciborowski

CTPS Project Supervisors
Principal: Elizabeth M. Moore
Manager: Jonathan Belcher

Funding
MassDOT §5303 3C Transit Planning Contract #67436

IMPACT ON MPO WORK

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

BACKGROUND

The MBTA operates a small network of eight “early-bird” bus routes, which provide service between 4:30 AM and 5:00 AM, prior to the typical start of operations on the regular transit network. Most of these routes operate direct to downtown Boston and follow slightly different paths than regular daytime service, in some cases combining sections of multiple regular routes. These early-bird routes generally provide one round-trip, and each appears on the schedule card for a regular route that has the same starting location for the first inbound trip of the day.

These early-bird services exist in part because of a historical anomaly, most having been initiated over 50 years ago when the MBTA’s predecessor agency discontinued systemwide overnight and early-morning service in 1960, and then restored a limited amount of early-morning service in response to concerns raised by transit system employees who needed a way to get to their jobs as fare collectors at subway stations at the start of the service day. While originally intended for use by transit system employees to access their early-morning assignments, these routes were placed in public timetables for the first time in 1999, and in some cases, have seen a growth in ridership since then. But while some of these services have become well utilized, others have marginal ridership. There has been no study looking at where the greatest demand for early-morning service exists, and whether the present network is well positioned to meet that demand. Past service planning reviews have primarily only concentrated on the cost-effectiveness of individual trips of these unique routes, and have not reviewed service coverage and possible latent demand.

OBJECTIVES

This study will examine existing ridership patterns on all early-morning bus and rapid transit services, determine where the demand for early-morning service exists, and suggest possible changes to modify current early-bird routes to better meet the identified demand. As there is already an existing, if small, early-morning network, opportunities may exist to better meet demand without increasing overall costs.

WORK DESCRIPTION

The work required to accomplish the study objectives will be carried out in five tasks, as described below.

Task 1 Describe Existing “Early Bird” Routes and Ridership

CTPS will provide a description of the existing early-bird bus services, including a summary of ridership by trip. Automatic Passenger Counter (APC) information from the MBTA will be used to complete this analysis.

Products of Task 1

Summary tables of the existing early-bird bus routes, including ridership by stop.

Task 2 Identify Early-Morning Ridership Patterns on the Existing Regular Bus and Rapid Transit Network

CTPS will examine ridership patterns on the existing regular bus and rapid transit network between 5:00 AM and 5:30 AM. Ridership for buses will be examined on a trip-by-trip basis, while activity at rapid transit stations will be examined in boarding increments of 10 to 15 minutes. This examination will utilize APC information from buses and Automated Fare Collection (AFC) data from the rapid transit system.

Products of Task 2

- A summary table identifying ridership by trip between 5:00 AM and 5:30 AM on regular bus routes
- A summary table identifying boardings at rapid transit station in 10-to-15-minute increments between 5:00 AM and 5:30 AM.

Task 3 Analyze Service Coverage for All Existing Early-Morning Bus and Rapid Transit Services

Using the data collected in Tasks 1 and 2, CTPS will compare the activity on the existing early-bird routes to the demand on the regular bus and rapid transit network between 5:00 AM and 5:30 AM. CTPS will identify which route segments and stations on the regular network have strong demand before 5:30 AM, and whether the existing early-bird bus services provide coverage at those locations. Heavy demand on early trips would suggest a potentially strong latent demand for earlier service, especially on routes that do not have any coverage under the existing early-morning network. Conversely, low early-morning demand along routes that currently have early-morning service may suggest that existing early-morning service could be altered or reduced to provide service in other areas.

Products of Task 3

A summary comparison of all regular transit activity before 5:30 AM with the existing early-bird bus services.

Task 4 Identify Potential Unmet Early-Morning Transit Needs

CTPS will contact transportation management associations (TMAs), workforce investment boards, and large employers in industries with early-morning shifts (e.g., hospital, service, and hospitality industries) to assemble information and any existing

data on early-morning trip-making patterns that may represent demand for early-morning bus service. Employers with potentially large numbers of early workers, such as aviation facilities, postal or package-handling facilities, and medical facilities will be targeted to determine if there is enough demand to warrant the rerouting of an existing service. CTPS will request information about the start times of early-morning shifts (and end times of late-evening shifts) and where the early-morning and late-evening workers commute from.

Product of Task 4

A summary of locations that generate early-morning trips and any information gathered about the travel patterns of early-morning workers.

Task 5 Identify Possible Changes to the Early-Bird Bus Services

Using the data gathered in Tasks 1-4, CTPS will identify changes that can be made to the early-bird bus services to make them better match existing demand before 5:30 AM. In doing so, staff will primarily consider changes that would alter existing early-morning early-bird bus services to provide better coverage without increasing costs. Staff will also consider if entirely new services are justified based on potential demand, and if any existing early-bird bus services are candidates to either reduce or eliminate service coverage if demand is low. A cost-neutral package of possible service changes will be assembled if results suggest a need for alterations of the existing network to better meet demand.

Product of Task 5

An analysis summarizing possible alterations, additions, or reductions to the existing early-morning bus services.

Task 6 Produce a Technical Memorandum

Staff will summarize the results of the data gathered in Tasks 1-4 and the potential changes developed in Task 5 in a technical memo.

Product of Task 5

A technical memorandum, which will review the existing early-morning transit network, will examine where potential demand is, and will suggest possible methods of modifying the existing network to meet demand.

ESTIMATED SCHEDULE

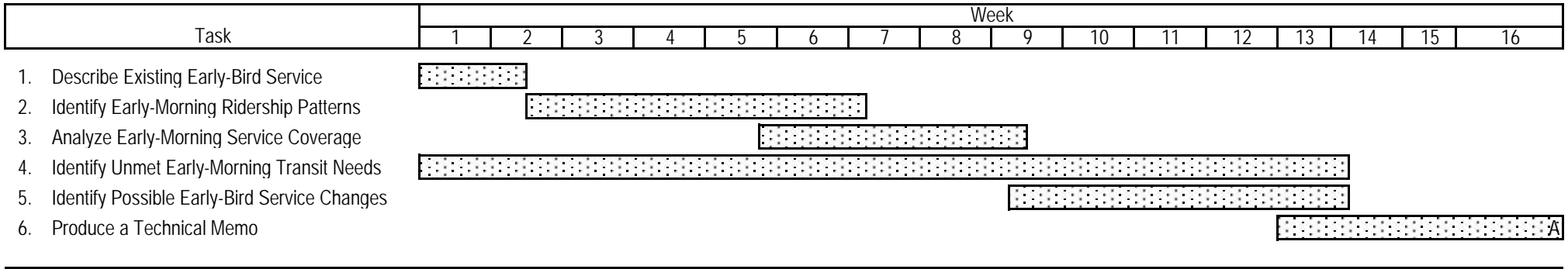
It is estimated that this project will be completed 16 weeks after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$20,000. This includes the cost of 8.5 person-weeks of staff time, and overhead at the rate of 90.69 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/JB/jb

Exhibit 1
 ESTIMATED SCHEDULE
 Early-Morning Transit Service



Products/Milestones

A: Technical memorandum

Exhibit 2
 ESTIMATED COST
 Early-Morning Transit Service

Direct Salary and Overhead \$20,000

Task					Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-4	P-3	Total			
1. Describe Existing Early-Bird Service	0.1	0.5	0.0	0.6	\$774	\$702	\$1,475
2. Identify Early-Morning Ridership Patterns	0.1	1.0	0.0	1.1	\$1,384	\$1,255	\$2,638
3. Analyze Early-Morning Service Coverage	0.2	1.0	0.0	1.2	\$1,547	\$1,403	\$2,951
4. Identify Unmet Early-Morning Transit Needs	0.2	0.0	3.0	3.2	\$3,480	\$3,156	\$6,636
5. Identify Possible Early-Bird Service Changes	0.2	1.0	0.0	1.2	\$1,547	\$1,403	\$2,951
6. Produce a Technical Memo	0.7	0.5	0.0	1.2	\$1,756	\$1,593	\$3,349
Total	1.5	4.0	3.0	8.5	\$10,488	\$9,511	\$20,000

Other Direct Costs \$0

TOTAL COST \$20,000

Funding
 MassDOT §5303 3C Transit Planning Contract #67436



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968
Tel. (617) 973-7100
Fax (617) 973-8855
TTY (617) 973-7089
www.bostonmpo.org

Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Karl H. Quackenbush
Acting 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 May 5, 2011
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, Acting CTPS Director
RE Work Program for: State Fiscal Year 2012 National Transit Database
Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates

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 Bay Transportation Authority, vote to approve the work program for State Fiscal Year 2012 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates in the form of the draft dated May 5, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

14326

Client

Massachusetts Bay Transportation Authority

Project Supervisor: Melissa Dullea

CTPS Project Supervisors

Principal: Liz Moore

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 other work in the UPWP.

BACKGROUND

For many years, in support of the MBTA's National Transit Database (NTD) submittals to the Federal Transit Administration (FTA), CTPS has produced passenger-miles and boardings estimates for the MBTA's bus and trackless trolley system. In state fiscal year (SFY) 1996, the scope of the analysis expanded to include the heavy rail and light rail transit systems. In SFY 2000, the scope expanded again to include the MBTA commuter rail system.

OBJECTIVES

The primary objective of this project is to develop estimates of passenger-miles and boardings for the following MBTA transportation modes: motor bus, trackless trolley, heavy rail, light rail, and commuter rail. CTPS will also verify MBTA estimates of the average passenger trip length for the commuter rail mode. The data that will form the basis of these estimates will be collected in a variety of ways:

- Ridechecks on buses and trackless trolleys, through both the ongoing bus data collection program and supplementary data collection
- Electronic passenger fare-mix counts from automated fare-collection (AFC) faregates at heavy rail and light rail subway stations and fareboxes on motor bus and trackless trolley routes
- Fare-mix counts of passengers on surface light rail, including counts of passengers boarding through rear doors or otherwise failing to interact with the farebox
- Passenger surveys on the heavy rail and light rail systems and on the Silver Line Waterfront to determine origin and destination information
- Commuter rail ridership data provided by the Massachusetts Bay Commuter Railroad Company (MBCR) and CTPS ridership data

WORK DESCRIPTION

Task 1 Develop Sampling Plans

For the heavy rail and light rail systems, as well as the Silver Line Waterfront service, a sampling plan for passenger surveys will be devised to ensure a random selection of stations

across all parts of each system over the entire year for all days of the week and all time periods.

For light rail service at surface stops, onboard observations are necessary because not all passengers interact with fare collection equipment when boarding Green Line and Mattapan High-Speed Line vehicles. Counts of passengers boarding through rear doors and failing to interact with the farebox will be conducted. Two ridecheckers will be necessary: one to count the number of rear boardings and the other to note the number of passengers boarding through the front door who do not interact with the farebox (flash-pass trips, children, and fare evaders). A sampling plan will be devised to ensure that these observations are conducted on surface light rail over the entire year for all days of the week and all time periods.

For the bus system, a sampling plan for ridechecks will be devised to ensure a random selection of trips across all parts of the system over the entire year for all days of the week and time periods. Ridecheckers will also note the number of passengers who board through rear doors or otherwise fail to interact with the farebox.

For the trackless trolley system, a sampling plan will be developed to conduct full-route ridechecks of each route. These ridechecks involve CTPS staff members riding each scheduled trip for each route over the course of a single quarter in SFY 2012. The specific quarter will be determined based on CTPS staffing availability.

No direct data collection is planned for commuter rail. However, a sampling of some trips may be necessary to verify the figures reported by the contract operator.

CTPS will continue to collect as much data as possible through electronic means. CTPS's palmtop computers support the following CTPS-developed applications:

- Light rail, heavy rail, and Silver Line Waterfront passenger surveys
- Faregate noninteraction count
- Surface light rail rear door boarding count
- Surface light rail front door farebox noninteraction count
- Bus and trackless trolley farebox noninteraction count

Products of Task 1

- Heavy rail and light rail sampling plan for SFY 2012 passenger surveys
- Surface-light-rail sampling plan for SFY 2012 observations
- Bus and trackless trolley sampling plan for SFY 2012 ridechecks

Task 2 Collect Data

The heavy rail, light rail, Silver Line Waterfront, bus, and trackless trolley assignments generated by the sampling plan created in Task 1 will be executed. CTPS will conduct

passenger surveys at each of the heavy rail, light rail, and Silver Line Waterfront survey locations. Counts of the number of passengers passing through faregates, and specifically those who do not interact with the faregate, at station survey locations will also be conducted. Along Green Line and Mattapan High-Speed Line surface routes, onboard observations of passengers, and specifically those who do not interact with the farebox, will be conducted. CTPS will also conduct ridechecks on selected bus and trackless trolley trips using palmtop computers, and will note the number of passengers who do not interact with the farebox.

All ridechecks, passenger surveys, and passenger counts will be performed by CTPS personnel, using palmtop computers. The data collected on ridechecks will be uploaded directly to the CTPS bus ridership information database, where they will be checked for completeness and accuracy. Passenger survey results and passenger count data will be uploaded directly to the CTPS non-palm database, where they will similarly be checked for completeness and accuracy.

AFC data will be requested from the MBTA for total heavy rail and light rail subway station boardings, as well as for total surface light rail, motor bus, and trackless trolley boardings. In addition, AFC data will be requested for total farebox deposits for each sampled bus and trackless trolley trip.

Products of Task 2

- Completed passenger survey assignments for heavy rail, light rail, and Silver Line Waterfront stations in electronic form
- Completed passenger count assignments for surface light rail, motor bus, and trackless trolley in electronic form
- Ridecheck data in electronic form
- AFC data on total boardings for light and heavy rail stations and surface light rail, motor bus, and trackless trolley routes
- AFC revenue data for motor bus and trackless trolley fareboxes for ridechecked trips

Task 3 Clean, Code, and Key punch Survey, Passenger Count, and Ridecheck Data

CTPS will clean the heavy rail and light rail passenger survey data as necessary after downloading them into a spreadsheet program. The program will allow for the processing of the origin-destination data, as well as any other data included on the form. The farebox noninteraction passenger count data for surface light rail, motor bus, and trackless trolley will also be entered into a spreadsheet for processing. Ridecheck data will also be cleaned.

Products of Task 3

- Heavy rail and light rail passenger survey data in electronic form
- Surface light rail, motor bus, and trackless trolley passenger count data in electronic form
- Cleaned ridecheck data in electronic form

Task 4 Estimate Passenger-Miles and Boardings

Information on the total number of passengers boarding at subway stations on the heavy rail and light rail systems will be obtained from the MBTA through AFC faregate passenger counts. Factors that account for the number of transfers between each mode will then be estimated based on the origin-destination passenger surveys conducted in Task 2. Additionally, a faregate noninteraction factor will be developed from the observations at station survey locations. These factors will be applied to the AFC faregate counts to estimate total unlinked heavy rail and light rail riders attributable to subway boardings.

For light rail surface stops, counts of passengers boarding through rear doors and failing to interact with the farebox will be used to develop a farebox noninteraction factor. This factor will be applied to the AFC farebox counts of total passengers on surface light rail, which will then be increased to account for transfers made to other heavy rail or light rail lines, resulting in an estimate of total unlinked light rail and heavy rail riders attributable to light rail surface boardings.

Meanwhile, the origin-destination data generated by the passenger surveys will be converted into estimates of the average passenger-miles per passenger for both the heavy rail and light rail systems. This conversion will make use of procedures developed a number of years ago for the Systemwide Rapid Transit Survey. Multiplying the average passenger-miles per passenger by the total number of passengers will yield estimates of total passenger-miles for each mode.

As was done for surface light rail, a farebox noninteraction factor developed as part of the ridecheck sample will be applied to the AFC farebox count of total motor bus and trackless trolley passengers to estimate total boardings. Total passenger-miles will be estimated, as in previous years, using the ridecheck sample of trips to develop an average trip distance: this distance multiplied by total boardings results in total passenger-miles.

For the commuter rail system, ridership counts supplied by MBCR will provide the basis for the estimate of passenger boardings. Counts by station, in conjunction with data indicating the percentage of alightings prior to North Station and South Station (from the 2000 Commuter Rail Peak Load Counts report), will provide the basis for the estimate of average passenger trip length.

Product of Task 4

Estimates of passenger-miles and boardings for all MBTA modes discussed above

Task 5 Document Results

The results of Task 4 will be documented in a technical memorandum. This memorandum will include a statistical analysis confirming that the true values for passenger-miles and

boardings have a 95 percent probability of falling within 10 percent of the estimates, as required by the FTA.

Product of Task 5

A technical memorandum describing the data collection and analysis processes, summarizing results, and presenting a statistical analysis of the results

Task 6 Assist with Compliance Audit

The FTA requires an independent auditor to review and verify the MBTA's directly operated bus and rail passenger-miles and boardings estimates. As the agency responsible for these estimates, CTPS will provide any materials and assistance necessary for the audit.

ESTIMATED SCHEDULE

It is estimated that this project will be completed in November 2012, approximately 17 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

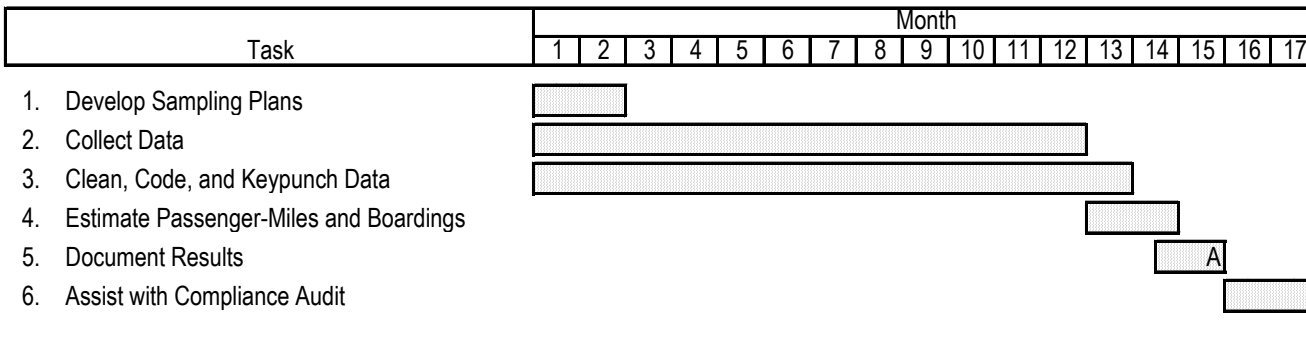
The total cost of this project is estimated to be \$92,980. This includes the cost of 73.9 person-weeks of staff time, overhead at the rate of 90.69 percent and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KHQ/SPA/spa

Exhibit 1

ESTIMATED SCHEDULE

State Fiscal Year 2012 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates



Products/Milestones

A: Technical memorandum

Exhibit 2

ESTIMATED COST

State Fiscal Year 2012 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates

Direct Salary and Overhead	\$92,252
-----------------------------------	-----------------

Task	Person-Weeks							Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-4	P-2	SP-3	SP-1	Temp	Total			
1. Develop Sampling Plans	0.0	0.2	0.8	2.1	0.0	0.5	3.6	\$2,836	\$2,572	\$5,407
2. Collect Data	0.0	0.1	0.2	7.0	25.5	23.5	56.3	\$33,338	\$30,234	\$63,572
3. Clean, Code, and Key punch Data	0.0	0.5	2.5	3.8	0.0	2.2	9.0	\$6,858	\$6,220	\$13,078
4. Estimate Passenger-Miles and Boardings	0.0	0.5	2.2	0.0	0.0	0.0	2.7	\$2,489	\$2,258	\$4,747
5. Document Results	1.0	0.2	0.8	0.0	0.0	0.0	2.0	\$2,565	\$2,326	\$4,890
6. Assist with Compliance Audit	0.0	0.1	0.2	0.0	0.0	0.0	0.3	\$293	\$266	\$558
Total	1.0	1.6	6.7	12.9	25.5	26.2	73.9	\$48,378	\$43,874	\$92,252

Other Direct Costs	\$728
---------------------------	--------------

Travel	\$728
--------	-------

TOTAL COST	\$92,980
-------------------	-----------------

Funding
Future MBTA Contract



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968
Tel. (617) 973-7100
Fax (617) 973-8855
TTY (617) 973-7089
www.bostonmpo.org

Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Karl H. Quackenbush
Acting 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 May 5, 2011
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, Acting CTPS Director
RE Work Program for: State Fiscal Year 2012 National Transit Database
Purchased Bus Transportation Passenger-Miles and Boardings Estimates

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 Bay Transportation Authority, vote to approve the work program for State Fiscal Year 2012 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates in the form of the draft dated May 5, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

14325

Client

Massachusetts Bay Transportation Authority
Project Supervisor: Lauren Coughlin

CTPS Project Supervisors

Principal: Liz Moore
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 other work in the UPWP.

BACKGROUND

For a number of years, in support of the MBTA's National Transit Database submittals to the Federal Transit Administration, CTPS has produced passenger-miles and boardings estimates for the MBTA's directly operated bus and trackless trolley system and, since state fiscal year (SFY) 1996, for the heavy rail and light rail transit systems. In SFY 2001, the scope of analysis was expanded to include bus routes operated as part of the Interdistrict Bus Program and Suburban Transportation Program and other contracted MBTA local bus service. In SFY 2010, the Interdistrict Bus Program was discontinued and removed from the scope of analysis.

With a smaller universe of bus routes, CTPS conducted both random and full-route ridechecks in SFY 2010 to determine which method provided better data. The random-ridecheck approach, which was used in previous years, sampled a predetermined number of randomly selected trips each week across all MBTA-funded private-carrier bus routes. The full-route-ridecheck approach, which is the approach used to estimate boardings and passenger-miles on directly operated trackless trolley routes, involves conducting a full-route ridecheck for each MBTA-funded private-carrier bus route. It was determined that the methodology employing full-route ridechecks does satisfy the FTA requirement that the true values for passenger-miles and boardings have a 95 percent probability of falling within 10 percent of the estimates. In addition, this methodology provides ridership and schedule adherence data for each purchased bus route that can be used for other planning purposes. Therefore, with the provisional approval of the FTA, the MBTA decided to use only full-route ridechecks in SFY 2011 to estimate total passenger-miles and boardings. In SFY 2012, CTPS will continue to use full-route ridechecks to estimate total passenger-miles and boardings.

OBJECTIVE

To develop estimates of passenger-miles and boardings for bus routes operated as part of the Suburban Transportation Program and all other contracted MBTA local bus service.

WORK DESCRIPTION

The data that will form the basis for the passenger-miles and boardings estimates will be collected through onboard ridechecks. These ridechecks will be conducted as part of the ongoing bus data collection program that CTPS performs for the MBTA.

Task 1 Develop Sampling Plan

A sampling plan will be developed to conduct full-route ridechecks of each private-carrier bus route. These ridechecks involve CTPS staff members riding each scheduled trip for each route over the course of a single quarter in SFY 2012. The specific quarter will be determined based on CTPS staffing availability.

Product of Task 1

Bus sampling plan and traffic checkers' assignments

Task 2 Collect Data

CTPS staff members will carry out the assignments created in Task 1. As in the past, ridecheck data to be collected include boardings and alightings by stop, farebox readings, trip-level travel times, departure and arrival times, and intermediate-stop arrival times. These data will be collected using palmtop computers and uploaded directly to the CTPS bus ridership information database, where they will be checked for completeness and accuracy.

Product of Task 2

Ridecheck data in electronic form

Task 3 Estimate Passenger-Miles and Boardings

Estimates of passenger-miles and boardings for private-carrier bus services will be produced using revenue data from the MBTA and output from the CTPS bus ridership information database. Specifically, estimates of the average farebox deposit will be generated, along with the average passenger trip length, based on ridecheck observations. By dividing the average farebox deposit into total revenue, an estimate of total boardings may be made. Multiplying this total by the average trip length yields total passenger-miles.

Product of Task 3

Estimates of passenger-miles and boardings for private-carrier bus services

Task 4 Document Results

The results of Task 3 will be documented in a technical memorandum. The memorandum will also discuss the FTA requirement that the true values for passenger-miles and boardings have a 95 percent probability of falling within 10 percent of the estimates. As discussed above, meeting this requirement through the use of the full-route-ridecheck approach will be used rather than the random-sampling approach outlined in FTA Circular 2710.4A.

Product of Task 4

A technical memorandum describing the data collection and analysis processes, summarizing results, and discussing FTA's statistical validation requirements

Task 5 Assist with Compliance Audit

The FTA requires an independent auditor to review and verify the MBTA's purchased bus passenger-miles and boardings estimates. As the agency responsible for these estimates, CTPS will provide any materials and assistance necessary for the audit.

ESTIMATED SCHEDULE

It is estimated that this project will be completed in November 2012, approximately 17 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

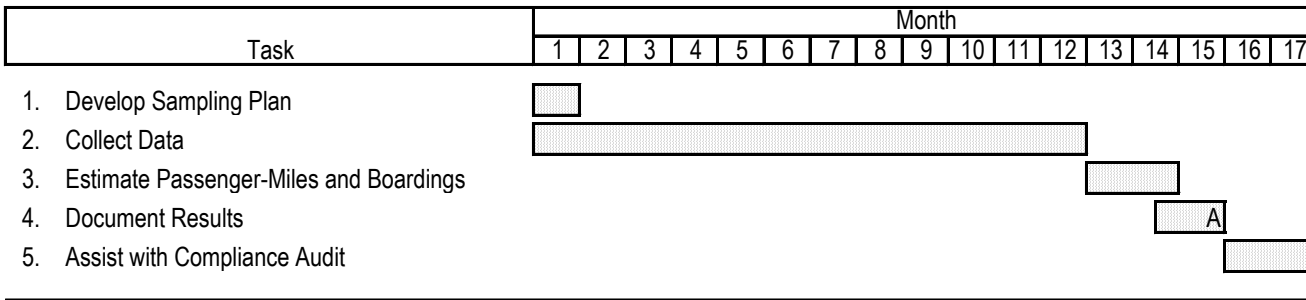
The total cost of this project is estimated to be \$20,003. This includes the cost of 11.4 person-weeks of staff time, overhead at the rate of 90.69 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KHQ/SPA/spa

Exhibit 1

ESTIMATED SCHEDULE

State Fiscal Year 2012 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates



Products/Milestones

A: Technical memorandum

Exhibit 2

ESTIMATED COST

State Fiscal Year 2012 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates

Direct Salary and Overhead	\$19,003
-----------------------------------	-----------------

Task	Person-Weeks								Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-5	P-4	P-2	SP-3	SP-1	Temp	Total			
1. Develop Sampling Plan	0.0	1.0	0.0	0.0	0.0	0.0	1.2	2.2	\$2,206	\$2,001	\$4,207
2. Collect Data	0.5	0.0	0.0	0.0	2.0	2.0	2.0	6.5	\$4,633	\$4,202	\$8,834
3. Estimate Passenger-Miles and Boardings	0.0	0.0	0.1	1.0	0.0	0.0	0.0	1.1	\$976	\$885	\$1,862
4. Document Results	1.0	0.0	0.0	0.5	0.0	0.0	0.0	1.5	\$2,064	\$1,872	\$3,937
5. Assist with Compliance Audit	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	\$85	\$77	\$163
Total	1.5	1.0	0.1	1.6	2.0	2.0	3.2	11.4	\$9,965	\$9,037	\$19,003

Other Direct Costs	\$1,000
---------------------------	----------------

Travel	\$1,000
--------	---------

TOTAL COST	\$20,003
-------------------	-----------------

Funding

Future MBTA Contract