



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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MEMORANDUM

DATE March 7, 2013
TO Boston Region MPO
FROM Anne McGahan, MPO Staff
RE The Development of Performance Measures and
Performance-Based Planning

1 PURPOSE

The federal Moving Ahead for Progress in the 21st Century Act (MAP-21) establishes performance-based planning as an integral part of the metropolitan planning process. It requires that each metropolitan planning organization (MPO) establish performance measures and targets that track progress toward attainment of critical outcomes for its region. The performance-based planning approach reflects best practices for transportation planning and programming and can enhance an MPO's effectiveness in many ways. The Boston Region MPO staff has begun the process of integrating this approach into the MPO's practices.

The purpose and organization of this memorandum are threefold:

- First, to provide as background a detailed explanation of performance-based planning.
- Second, to provide overviews of the Boston Region MPO's work to date in implementing this planning approach, including performance monitoring activities, and of such work currently underway at MassDOT and the MBTA.
- Finally, to propose the next steps for the MPO to take in developing and applying performance measures for the region and to describe additional activities known by staff to be taking place at state transportation agencies at this time.

This memorandum is intended to be an instrumental step in the long-term process of the MPO and its staff continuing to develop performance measures and beginning to implement robust performance-based planning in our region. This work will be funded through the Long-Range Transportation Plan work program.

As required by MAP-21, MPO staff will coordinate with MassDOT and the MBTA during the development of these performance measures.

2 BACKGROUND: CONCEPTS, DEFINITIONS, AND LEGISLATION

2.1 CONCEPTS AND DEFINITIONS

Performance measures are intended to be used by MPOs at both broad and more focused levels. At a broad level, they can help to demonstrate how well a region's transportation system as a whole or segments of the system are doing in meeting the visions adopted by the MPO and reflecting its policies. Many states and metropolitan areas are already monitoring how close they are to achieving specific goals related to access to key regional population, employment, cultural, and recreational centers; the mobility of disadvantaged populations; air quality; and economic health. Common methods used to measure performance include tracking average speeds and crash rates.

At a more focused level, performance measurement can gauge the impacts of the decision-making process on the transportation system. It can answer questions about whether the performance of components of the transportation system is getting better or worse over time and whether the stated goals of specific transportation investments are achieved.

Performance-based planning at an MPO means bringing all of these various kinds of information into its planning process. The data are useful to both regional and local decision makers and are critical for assessing the level of success of the region's management of its transportation network and the level of effectiveness of its transportation investments.

Key terms related to performance-based planning may be defined as follows:

- *Performance management*: "A strategic approach that uses transportation system information to make investment and policy decisions to achieve performance goals."¹
- *Performance-based planning and programming*: Practices that apply performance management principles to transportation system policy and investment decisions, including long-range ones; a system-level, data-driven process for identifying strategies and investments.²

¹ *Performance-Based Planning and Programming*, white paper, Cambridge Systematics, prepared for Federal Highway Administration Office of Planning, Environment and Realty, February 15, 2012.

² Ibid.

- *Performance measure*: A metric used in the ongoing monitoring of and reporting on a transportation characteristic, particularly to assess progress toward a pre-established goal. Examples include:
 - Mode share
 - Mean miles between bus vehicle breakdowns
 - Number of vehicle crashes
- *Performance target*: A specific goal that has been committed to, for a performance measure to meet by a certain time. Examples of targets for the example performance measures cited above are:
 - Mode share: MassDOT's current target is to triple travel by bicycle, by transit, and by walking by 2030.
 - Mean miles between bus breakdowns: The MBTA's current target is 6,000 miles between bus breakdowns.
 - Number of vehicle crashes: Currently there is no official specific goal at MassDOT or the Boston Region MPO, but an example would be to reduce crashes by half by 2030.

2.2 LEGISLATION REGARDING PERFORMANCE MEASURES

As will be described in section 3, the Boston Region MPO has been engaged in performance measurement through its Congestion Management Process (CMP). The impetus for developing and operating a CMP began with the federal Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. ISTEA required state departments of transportation and metropolitan planning organizations to implement such a process. The successor legislation to ISTEA, the Transportation Equity Act for the 21st Century (TEA-21), adopted in 1998, continued to require each transportation management area with a population of over 200,000 to maintain a CMP as part of its metropolitan planning process.

According to 23 CFR 500.109a, an effective CMP is a systematic process for managing congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet state and local needs. The CMP leads an MPO to seriously consider implementation of strategies that use existing and future transportation facilities most efficiently and effectively.³

³ Mobility in the Boston Region, Existing Conditions and Next Steps, 2004 Congestion Management System Report, Chapter 2, Boston Region Metropolitan Planning Organization, December 2004.

MAP-21, which took effect on October 1, 2012, promotes performance-based investment decisions in support of national goals. It requires MPOs to establish performance targets that spur progress towards attainment of outcomes critical for the MPO's area. These targets should be coordinated with those of relevant state agencies and public transportation providers to ensure consistency. The MPO is required to establish its performance targets no later than 180 days after the date on which the state agencies and the public transportation providers establish theirs.

The Congressional conference report that accompanied MAP-21 stated that the nation's surface transportation programs had not provided sufficient accountability for how tax dollars were being spent on transportation projects and would benefit from a greater focus on key national priorities. The highway program should, it said, focus on key outcomes such as reducing fatalities, improving road and bridge conditions, reducing congestion, increasing system reliability, and improving freight movement and economic vitality. The report also stated that transportation improvement programs and long-range transportation plans should be developed through a performance-driven, outcome-based approach to planning for metropolitan areas.

3 THE BOSTON REGION MPO'S PROGRESS IN THE DEVELOPMENT OF PERFORMANCE MEASURES

3.1 BACKGROUND

Since the mid-1990s, the Boston Region MPO has been monitoring its transportation system through its Congestion Management Process (CMP), as described below. In this way it has been gathering, for use in performance management, information on freeways, arterial roadways, intersections, transit, park-and-ride lots, high-occupancy-vehicle (HOV) lanes, and bicycle and pedestrian transportation. The MPO has begun to expand this process so that performance management will eventually be used in all aspects of MPO planning, including the Long-Range Transportation Plan (LRTP), Transportation Improvement Program, and Unified Planning Work Program. It committed in its current LRTP and in the work scope for its next LRTP to carrying out this evolution of its planning methods.

Other foundational work, in addition to the CMP process, has been completed through the identification and adoption of visions and policies for the region in the LRTP. The next major step is to develop specific, detailed performance measures and to establish specific performance targets for a subset of the measures. Details on the ongoing and upcoming work are provided below.

3.2 WORK TO DATE

3.2.1. Congestion Management Process of the MPO

The Boston Region MPO's Congestion Management Process (CMP) has developed numerous performance measures and monitors them. CMP work has also included defining thresholds for these performance measures and using them to identify when congestion is occurring or to distinguish between desirable and undesirable outcomes. However, no specific performance targets have been established. The measures and their associated thresholds are presented in Table 1.

Table 1
Congestion Management Process Performance Measures and Thresholds
Roadways, Intersections, and Interchanges

Performance Measure	Threshold
Average observed travel speed	< 50 mph (limited-access roadways) ≤ 21 mph (partially limited-access arterials) ≤ 14 mph (other arterials)
Speed index – the ratio of the observed speed to the posted speed limit	< 0.70
Delay	≥ 55 seconds (arterials)
Traffic volumes (all modes)	Depends on roadway capacity of functional class
Volume-to-capacity ratio – the ratio of the traffic volume to roadway capacity	> 1.0
Level of service	E or F
Approach speed	Varies
Approach delay	Varies
Number of crashes	No threshold currently established
Crash rate	MassDOT Highway Division District average
Vehicle occupancy	No threshold

High-Occupancy-Vehicle Lanes and Parallel General-Purpose Lanes

Performance Measure	Threshold
Travel time savings in HOV lane	One minute per mile
Vehicle occupancies	No threshold

Transit Vehicles

Performance Measure	Threshold
On-time performance	Varies by transit mode and time of day
Passenger crowding	Varies by transit mode, vehicle type, and time of day

Park-and-Ride Facilities (MBTA and MassDOT)

Performance Measure	Threshold
Lot capacity and utilization	Full: $\geq 85\%$ Underutilized: $< 50\%$
Time a lot fills up	There is insufficient parking capacity if the lot fills to 100% before the departure time of the last AM peak-period train.
Bicycle parking capacity and utilization	Full: $\geq 85\%$ Underutilized: $< 50\%$

3.2.2. *Visions and Policies of the MPO*

The MPO's identifying and adopting visions and policies for the future of our region in its current LRTP, *Paths to a Sustainable Region*, was the next step toward performance-based planning. It adopted visions and policies in seven areas:

- System preservation, modernization, and efficiency
- Mobility
- Safety and security
- Climate change
- Environment
- Livability
- Transportation equity

Paths to a Sustainable Region also lists examples of performance measures that could be used to track our progress toward attaining success in each of the vision topic areas. These lists of measures have been employed in the work described immediately below.

3.2.3. *Performance Measures: Progress by the MPO Staff*

Staff in several groups within the MPO staff have been involved in the beginning stages of developing performance measures for the MPO. Building on the lists in the MPO's LRTP, *Paths to a Sustainable Region*, staff added a broad array of other potential measures to create a Draft Universe of Performance Measures, which is provided as Appendix A of this memorandum. Other resources used in producing this list included the Congestion Management Process, the LRTP Needs Assessment, TIP criteria, published lists of performance measures used by other MPOs and agencies, and ideas of the staff. The source(s) of the data that would be required to develop and monitor each measure are also included in the list.

The MPO can select specific performance measures for its use from this Draft Universe of Performance Measures, and additional ones can be proposed, as well. More details on selecting performance measures are provided in section 4 of this memorandum, "Next Steps."

3.2.4. *Performance Measures: Progress by State Agencies*

MassDOT is currently working on performance measures under two separate programs:

- Performance Management
- GreenDOT Implementation Plan

The MBTA division of MassDOT is monitoring its system and service, also under two programs:

- MBTA Service Delivery Policy
- MBTA ScoreCard

A summary of the work in these four programs is provided below. Some of the measures identified in this work are pertinent to the MPO's activities and should be taken into consideration by the MPO when selecting its own performance measures from the Draft Universe.

MassDOT Performance Management

As part of the reorganization of MassDOT, its Office of Performance Management and Innovation was tasked with developing and reporting

performance metrics that will enhance the management of each of MassDOT's operating divisions and departments. MassDOT's performance management is an ongoing and systematic approach to improving results using evidence-based decision making and management. Under the program, numerous metrics have been identified for all divisions. Two of the divisions are members of the Boston Region MPO: the Highway Division and the MBTA. The metrics for these divisions focus on MassDOT goals under the following categories:

- Safety
- Customer service
- Employee engagement
- Fiscal responsibility
- Innovation

The latest data on these metrics are reported in MassDOT's Strategic Plan 2013–2015. Some of the metrics apply to the MPO's functions; a list of these is provided as Appendix B.

GreenDOT Implementation Plan

In December 2012, MassDOT published its GreenDOT Implementation Plan. This plan has three primary objectives:

- Reduce greenhouse gas emissions
- Promote the healthy transportation options of walking, biking, and public transit
- Support smart-growth development

The plan has 15 broad sustainability goals that are supported by tasks to be implemented through 2020. Several of these goals apply to activities in which the MPO is responsible for playing a role; they are presented in Appendix C. The MPO will consider these goals and their associated tasks in the development of its own performance measures.

An example of GreenDOT Implementation Plan goals that, with their associated tasks, are relevant to the MPO's work is that of tripling the shares of travel in Massachusetts by bicycling, transit, and walking by 2030. Progress toward this goal will be measured by person-miles traveled by auto, transit, bicycling, and walking. Table 2 shows the baseline person-miles traveled for 2010 and the goals for 2020 and 2030.

Table 2
MassDOT Mode Shift Goals

Mode	2010 Baseline (person-miles traveled)	2020 Goal (person-miles traveled)	2030 Goal (person-miles traveled)
Transit	1,830,000,000	3,994,000,000	5,926,000,000
Bicycling	150,200,000	333,000,000	516,000,000
Walking	101,100,000	223,900,000	333,600,000

MBTA Service Delivery Policy

The MBTA's Service Delivery Policy (SDP) is the primary tool that the Authority uses to guide the design and evaluation of transit services in its efforts to meet the needs of the riding public. The SDP establishes quantifiable service standards and associated performance measures and thresholds. The MBTA uses the performance measures in its service-planning process to identify which services need improvement and to determine whether past service changes have been effective. The types of standards found in the SDP are:

- Service coverage
- Span of service
- Frequency of service
- Schedule adherence (on-time performance)
- Vehicle load
- Net cost per passenger

MBTA ScoreCard

The MBTA's monthly ScoreCard gives its customers quantitative information that indicates how well the Authority is serving them. It furthers the MBTA's goals of transparency and accountability, and this practice of showing the public exactly how the system is performing reflects the Authority's commitment to safe and reliable transportation. The ScoreCard reports on the following metrics:

- Ridership
- On-time performance
- Infrastructure
- Dropped trips
- Vehicle reliability

More detail on the MBTA's metrics is provided in Appendix D.

4 NEXT STEPS

4.1 MPO Activities

4.1.1. *Approach*

Staff will continue to work toward recommendations on performance measures to be adopted by the MPO. The recommendations will be coordinated with measures that are being developed by MassDOT and the MBTA. It is the staff's goal at this time to recommend at least one performance measure and associated performance target for each vision topic. This set of measures and targets can be expanded in the future. A possible approach for developing the initial set of measures is represented by the following example:

Vision topic: System Preservation

- *Performance-tracking question(s)* are selected for the topic.
Example: Is the number of structurally deficient bridges in the region decreasing?
- *Performance measure* is established.
Example: Number of deficient bridges in the region.
- *Performance target* is established.
Example: The number of structurally deficient bridges will be reduced by X% by the year 20XX.
- *Monitoring cycle* is determined.
Example: Monitor annually.
- Data source is determined.
Example: MassDOT bridge information.

Additional examples of potential performance-tracking questions are:

- Are vehicle crashes declining in the region?
- Are our efforts to reduce air pollution working?
- Is transit ridership increasing?

The MPO may want to consider having two tiers of targets: those that are measured at the systemwide level and monitored through the Long-Range Transportation Plan, and those that are measured at the project level and monitored through the Transportation Improvement Program (TIP). To apply this concept to the example above: in addition to the target of reducing the number of structurally deficient bridges by X% by the year 20XX, a target would be established for the total number of bridge projects funded in each TIP fiscal year. Regardless of how the MPO configures its performance targets, the TIP will likely be key in documenting annual progress toward meeting them and in tracking other trends.

4.1.2. *Implementing the Approach*

To implement the approach outlined in the bullet list above, the first step would be to establish for each vision topic a set of questions that covers all of the important facets of the MPO's vision. Once the questions have been established, the performance measures that best address the questions would be selected from the Draft Universe of Performance Measures, starting with one measure per vision topic, and performance targets would be determined.

(It should be noted that, although the categories in the universe of performance measures mostly correspond to the MPO's vision topics, there are some differences. Categories were chosen that best organized the measures. In any case, for each vision topic there are pertinent measures in more than one category.)

Staff are hoping to begin this process with the MPO over the next few months. The MPO may want to consider establishing a committee to provide guidance in the development of the performance questions and measures.

4.2 State Activities

The MBTA is developing a Transit Asset Management system as part of its Transit Asset Management Pilot Program, currently underway. This program is using the MBTA's State of Good Repair Database to help meet the new asset management requirements under MAP-21, including:

- Preparation of a transit asset management plan
- Development of a capital asset inventory
- Performing condition assessments, for assets and the system as a whole
- Implementing decision support tools for investment prioritization
- Establishing annual performance targets and a monitoring system for the targets

In addition to monitoring the performance measures reported through the ScoreCard and using its existing service standards, the MBTA is currently in the process of determining whether additional performance measures should be incorporated into the Service Delivery Policy.

MPO staff will continue to coordinate with MassDOT and the MBTA during the development of their performance measures.

AM/am

APPENDIX A
UNIVERSE OF PERFORMANCE MEASURES DEVELOPED FOR THE BOSTON REGION MPO

Mobility	Mode	Data Source
Mode Share by Trip Purpose	All	Model/ACS JTW, MBTA
Average Peak Period Travel Time by Mode	All	CMP, Model
Miles of Projected Vehicle Traveled Reduced per Dollar for Projects	All	CTPS
<i>Traffic Volume to Capacity Ratio</i>	Auto	DOT/CTPS, CMP, Model
Percent Lane Miles Operating under Level of Service E or F	Auto	CMP, Model
Average Vehicle Occupancy during Peak Periods	Auto	CMP, Model
<i>Travel Speed Index</i>	Auto	CMP, Model
<i>Total Weekday Travel Time Savings for HOV Users Compared to Non-HOV Users in</i>	Auto	CMP, Model
<i>Share of Park and Ride Lot Spaces Used by Lot</i>	Auto	CMP
<i>Share of Bridges with Sufficient Clearance for Double-Stack Trains (20' 8")</i>	Freight	GIS
Network Connectivity Index	Ped/Bike	GIS/Municipalities
<i>Bicycle parking availability and utilization at MBTA stops</i>	Ped/Bike	CMP, MBTA, GIS
<i>Share of Streets with Bicycle Facilities (non limited-access highways)*</i>	Ped/Bike	DOT, Municipalities, GIS
<i>Share of Streets with Sidewalks on Both Sides (non limited-access highways)*</i>	Ped/Bike	GIS
<i>Bridges Accommodating Bikes and Pedestrians</i>	Ped/Bike	GIS
Share of Region's Population Residing within 1/4 Mile Walk of a Retail Land Use	Ped/Bike	GIS
Share of Region's K-12 Students that Walk or Bike to School	Ped/Bike	TBD
<i>Transit Passenger Crowding (vehicle load factors) by Time Period</i>	Transit	MBTA
<i>Percentage of Land Area with More than 5,000 People per Square Mile that has Bus or Rapid Transit Service within ¼ Mile*</i>	Transit	GIS, MBTA
Average Bus Speeds by Peak and Non-Peak Period	Transit	MBTA, Model
<i>Percentage of Transit Stations that are Accessible to Persons with Disabilities*</i>	Transit	MBTA, CMP
Average Transit Waiting Times (by mode, line, time of day)	Transit	MBTA, Model
Average Weekday Transit Service Miles per Capita	Transit	MBTA, Model

Italics - indicates an Existing Measure used by the MPO

**Italics - indicates a form of an Existing Measure used by the MPO*

APPENDIX A
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Preservation, Modernization, Efficiency	Mode	Data Source
<i>Percent of Bridges by Each Condition Category (excellent/good/deficient)</i>	All	GIS, MassDOT, MBTA
Percent of Traffic Signals in a State of Good Repair	All	MassDOT/CMP
Percent Highway Lane Miles by Condition Category (excellent/good/deficient)	Auto	CMP, PMS, MassDOT
Average Age of Transit Fleet (buses, locomotives, etc.)	Transit	MBTA
<i>Mean Miles between Transit Vehicle Breakdowns</i>	Transit	MBTA
Percent of Rapid Transit and Commuter Rail Track Miles under a Speed Restriction	Transit	MBTA
Climate Change	Mode	Data Source
<i>Annual Pounds of Greenhouse Gas Emissions Produced by the Transportation System*</i>	All	Model
Annual Emission Reduced by the Use of Alternatives to Single-Occupancy Vehicles (transit, rideshare, walking & biking)	All	Model, GHG Program
<i>Vehicle Miles Traveled per Capita*</i>	Auto	Model
Average Vehicle Occupancy	Auto	Model, CMP
Fuel Consumption per Capita	Auto	DEP
Number of Publically Available Electric Vehicle Recharging Stations	Auto	TBD
Number of Electrified Truck Stops along Key Freight Routes	Freight	MassDOT
Percent of Land in Region Covered by Forest	Land Use	GIS
Transit Miles per Gallon of Fuel Consumed	Transit	MBTA
Environment	Mode	Data Source
<i>VOC, NOX, and CO Emissions per Day</i>	All	Model
Number of Days per Year Meeting Ozone Standard	All	NWS
Number of Days per Year Meeting PM 2.5 Standard	All	NWS
Miles of Noise Barriers in Residential Areas along Highways and Rail Lines	All	MassDOT, GIS
Acres of Greenfield Development	All	GIS
<i>Number of Green Communities in the Region</i>	Land Use	EOEEA
Percent of Households in the Region Living within 200 Meters of a Major Roadway (defined by a AWDT threshold to be determined)	Auto	GIS, Model
Percent of People in the Region Working within 200 Meters of a Major Roadway	Auto	GIS, Model

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APPENDIX A
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Public Health and Safety	Mode	Data Source
<i>Number of Crashes at Railroad Grade-Crossings</i>	All	MBTA
<i>Average Time from Crash Report until Removal of Vehicles Involved in the Crash</i>	All	Registry
<i>Percent of Bridges by Each Condition Category (excellent/good/deficient) for Bridges on the Evacuation Network</i>	All	MassDOT
<i>Percent of Crashes Resulting in an Injury*</i>	Auto	Registry, MassDOT
<i>Percent of Crashes Resulting in a Fatality*</i>	Auto	Registry, MassDOT
<i>Percent of Signals with Emergency Vehicle Pre-Emption</i>	Auto	MassDOT
<i>Number of Truck Crashes per Capita</i>	Freight	Registry, MassDOT
<i>Number of Crashes Involving a Pedestrian per Capita</i>	Ped/Bike	Registry, MassDOT, EOPS
<i>Number of Crashes Involving a Bicyclist per Capita</i>	Ped/Bike	Registry, MassDOT, EOPS
<i>Number of Transit Accidents per Transit Mile</i>	Transit	MBTA, NTD, MassDOT
Livability	Mode	Data Source
<i>Population Density by Transportation Analysis Zone (TAZ)</i>	All	Census, Model, GIS
<i>Developed Acres per Capita</i>	All	GIS/MAPC
<i>Percent of Center-Line Miles that are Considered a Complete Street</i>	All	TBD
<i>Households to Jobs Ratio by Transportation Analysis Zone (TAZ)</i>	All	GIS
<i>Registered Automobiles per Household*</i>	Auto	Registry, Census
<i>ADA Compliant Intersections</i>	Ped/Bike	MassDOT
<i>Percent of Transit Stations with Bicycle Accommodations*</i>	Ped/Bike	CMP
<i>Percent of Transit Stations with Full Sidewalk Coverage within 1/4 mile radius</i>	Ped/Bike	GIS
<i>Percent of Population within 1/2 Mile of a Shared-Use Path or On-Road Bicycle Facility</i>	Ped/Bike	GIS
<i>Percent of Population within 1/4 mile of a Transit Station</i>	Transit	Model, GIS
<i>Percent of Employment within 1/4 mile of a Transit Station</i>	Transit	Model, GIS

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APPENDIX A
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Transportation Equity	Mode	Data Source
<i>Average Travel Time to Industrial, Retail, and Service Jobs</i>	All	CTPS
<i>Average Travel Time to Hospitals</i>	All	CTPS, Model
<i>Average Travel Times to 2 and 4 year Institutes of Higher Learning</i>	All	CTPS, Model
Average Commute Time for Those Earning Less than 200% of the Federally-Defined Poverty Level Compared with Those Earning More than this Level	All	CTPS
Share of Household Income Spent on Transportation by Income Category	All	Census, CTPS
Attendance at MPO Transportation Equity Forums	None	CTPS
Number of Small-Group Discussions Held in Environmental Justice Areas	None	CTPS/DOT
Average Wait Time at Bus Stations in Environmental Justice Areas Compared to Non-Environmental Justice Areas	Transit	Model, MBTA
Average Number of Transfers per Transit Trip for Trips Originating in Environmental Justice Areas Compared to Trips Originating in Non-Environmental Justice Areas	Transit	Model, MBTA
Percent of Population with Access to a Paratransit Service	Transit	GIS
<i>Average Number of Industrial, Retail, and Service Jobs within a 40-Minute Transit and 20-Minute Auto Trip</i>	Transit, Auto	CTPS
<i>Average Number of Industrial, Retail, and Service Jobs Within a 40-Minute Transit and 20-Minute Auto Trip</i>	Transit, Auto	CTPS
Economic Benefit	Mode	Data Source
Cost/Benefit Ratio for Major Projects (benefits include reduced emissions, new transit riders, reduced toxics exposure, HH income to transportation, travel time to jobs, etc.)	All	Model/GIS
Average Weekday Vehicle Hours of Travel (VHT) under Congested Condition	Auto	Model Plus
Freight Volume by Weight and Value	Freight	FHWA FAF
Freight Mode Share	Freight	FHWA FAF, MassDOT
Fare Box Recovery Ratio	Transit	MBTA
Revenue Generated per Transit House	Transit	MBTA
MBTA Ratio of Debt Service to Farebox Revenue	Transit	MBTA

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APPENDIX B

MASSDOT PERFORMANCE MANAGEMENT GOALS AND INDICATORS PERTINENT TO MPO PERFORMANCE MEASURE DEVELOPMENT⁴

1) Highway Division

a) Safety

- Prevent the number of structurally deficient bridges from exceeding 463
- Maintain at least an 81.89 system-wide bridge health index (bridge health index is the ratio of the current condition of each element to perfect condition, expressed in a score from 0 to 100, with 0 indicating all of a particular bridge's elements are in the worst condition)
- Reduce average incident clearing times by 5% from the previous year (minimum)
- Ensure that at least 80% of the National Highway System roadways are in good or excellent condition. (IRI – a standardized measurement used to estimate the roughness of the road)
- Reduce total number of crashes and traffic fatalities from the previous year

b) Customer Service

- Ensure that at least 80% of the National Highway System roadways are in good or excellent condition. (PSI – An overall pavement condition indicator that encompasses pavement roughness and distress, including cracking, rutting, and raveling)
- Ensure that at least 80% of construction projects are completed on-time
- Develop a travel speed data collection pilot program on Interstate 93 to inform statewide congestion metrics by July 2013.

c) Fiscal Responsibility

- Advertise at least 80% of projects that are planned (STIP)

2) Rail and Transit Division

a) Customer Service

- Ensure that at least 95% of Red Line trips run on time
- Ensure that at least 95% of Orange Line trips run on time
- Ensure that at least 95% of Blue Line trips run on time
- Ensure that at least 95% of Commuter Rail trips run on time
- Maintain at least 99% level of MBTA escalator availability
- Maintain at least 99% level of MBTA elevator availability

⁴ Selected by MPO staff. Source of text: MassDOT.

APPENDIX C

MASSDOT'S GREENDOT GOALS AND TASKS PERTINENT TO MPO PERFORMANCE MEASURE DEVELOPMENT⁵

1) Air

a) Improve air quality

- 100% of the transit bus fleet will be replaced or retrofitted with hybrid systems or best in class fuel efficiency vehicles by 2020
- 20 new high efficiency commuter rail diesel locomotives will be in service by 2015
- 40 new high efficiency commuter rail locomotives will be purchased by 2020
- Planned bridges and right-of-ways will be designed to increase options for double-tracked lines and will allow for double-stack cars by 2020
- Six rail corridors will be upgraded to increase speed including separated grade crossings or other improvements by 2015
- ITS will be deployed in critical locations to manage congestion and encourage transit by 2015

b) Reduce greenhouse gas emissions (GHG)

- Cumulative progress of GHG reductions is projected annually in State Implementation Plan utilizing best available tools by 2013
- MassDOT's GHG emission target of 40% reduction from a 2002 baseline is met by 2020

2) Planning and Policy Design:

a) Design a multi-modal transportation system

- Increase delivery of Complete Streets projects
 - Bicycle and pedestrian facilities featured and prioritized in designs, rather than accommodated, by 2013
- Increase bicycle parking and access to transit
 - Number of bicycle racks doubled in municipalities participating in bike rack programs by 2013
 - Transit stations with significant customer car parking (> than 50 spaces) have covered and/or secure bicycle parking by 2013
 - All MBTA and RTA buses equipped with bicycle racks by 2013

⁵ Selected by MPO staff. Source of text: MassDOT.

- Increase total miles and connectivity of bicycle and pedestrian facilities
 - Bike sharing programs expanded within and beyond Boston Inner Core by 2015
 - Critical pedestrian and bicycling network gaps are prioritized for project funding by 2013
 - Bicycle and pedestrian facilities upgraded across all bridge projects by 2015
 - Contemporary bicycle facilities such as cycle tracks, painted lanes, and bike signals are considered in Complete Street designs by 2013
 - Mileage of dedicated on-road bicycle facilities is doubled across the Commonwealth by 2015
 - At least 45 miles of shared use bike paths on the Bay State Greenway corridors are under construction by 2015
 - Bay State Greenway Priority 100 are completed by 2020
 - Improve traffic controls to reduce vehicle emissions and support walking and bicycling
 - All signalized corridors evaluated for optimal operations for all users, including bike-specific signs, signals, and detectors, by 2020
 - Pedestrian countdowns installed at 50% of MassDOT traffic intersections with crosswalks by 2015
 - Pedestrian countdowns installed at all MassDOT traffic intersections with crosswalks by 2020
 - All signals evaluated and adjusted for optimal operations for all users by 2020
 - Improve transit system performance statewide
 - Green Line Extension and South Coast Rail service completed by 2020
 - Transit Signal Priority for all new traffic signals implemented by 2015
- b) Promote healthy transportation and livable communities
- Encourage walking, biking, and transit as active transportation
 - Selection of public meeting venues prioritizes locations with transit, pedestrian, and bicycle access by 2013
 - Information on transit, bicycle, and pedestrian travel provided on public meeting announcements by 2013
 - Expand commuter options programs
 - Parking spots at major transit stations with parking reserved for car sharing by 2013
 - Covered and/or secure bicycle parking installed at major park and ride facilities by 2015
 - Urban high capacity roadway segments analyzed for HOV and express lanes by 2015

- c) Triple mode share of bicycling, transit, and walking
- Connect land use planning with transportation planning and investments
 - GreenDOT Implementation Plan activities incorporated into MPO's Unified Planning Work Programs by 2013
 - Project evaluation criteria that prioritize mode shift, GreenDOT, and GHG reduction adopted by MPOs by 2013
 - Transit authorities participate in all MassDOT and MPO corridor studies by 2013
 - All MassDOT owned roads 'master planned' for Complete Street improvements during future repaving and reconstruction by 2015
 - Complete Commuter Rail Master Plan to evaluate options to expand capacity and increase ridership along each line by 2015
 - Priority Development Areas (PDAs) and Priority Protection Areas (PPAs) approved by HED established in all MPOs by 2015
 - Strategic regional visions for 'zero' single-occupant-vehicle growth and GHG reduction adopted by MPOs by 2015
 - Land use and transportation planning strategies to support mode shift incorporated into 2016 LRTPs by 2015
 - State-of-the-practice metric for measuring bicycle and pedestrian quality of roadways utilized in corridor planning and design by 2015
 - Stabilize travel demand growth on roadways from single-occupancy vehicles
 - MEPA mitigations focus on multi-modal efforts to reduce Automobile Trips Generated (ATG) by 2013
 - Standard operating procedure memorandum to promote the delivery of high quality bicycle and pedestrian facilities issued by 2013
 - Establish guidelines for when multi-modal enhancements or land use imperatives outweigh benefits from LOS improvement by 2013
 - Transportation Demand Management programs expanded by 20% by 2015
 - All rail stations are accessed by Complete Streets by 2020
 - Collect data regarding factors influencing mode choices and utilize better planning tools
 - Person Miles Traveled (PMT) for all modes measured and/or estimated annually at state and regional levels by 2013
 - Traffic forecasting GHG impact analysis tools updated to reflect induced travel demand by SOVs by 2015
 - VMT and automobile ownership rates are tracked and published by region by 2013
 - Public health impacts of major transportation projects considered in project selection criteria by 2015

- New methods for collecting travel data for bicycles and pedestrians piloted by 2013
- Scenario planning methods utilized by MassDOT and MPOs instead of traditional growth trend forecasts by 2015
- Traffic model assumptions for road design revised to assume limited traffic growth rather than historic VMT growth trends by 2013
- MassDOT conducts travel demand forecasts with an activity based model by 2015

APPENDIX D

MBTA'S SERVICE DELIVERY POLICY AND SCORECARD PERFORMANCE MEASUREMENTS PERTINENT TO MPO PERFORMANCE MEASURE DEVELOPMENT⁶

1. Service Coverage Guidelines (Bus & Rapid Transit)

An important aspect of providing the region with adequate access to transit services is the geographic coverage of the system. The minimum coverage guideline is that access to transit service will be provided within a ¼- or ½-mile walk, depending on the service day, to residents of areas served by bus, light rail, and/or heavy rail with a population density of greater than 5,000 persons per square mile.

2. Span of Service Standards (All Modes)

Span of service refers to the hours during which service is available. The MBTA has established span-of-service standards that define the minimum period of time that any given service will operate. This provides customers with the confidence that particular types of service will be available throughout the day.

3. Frequency of Service Standards (All Modes)

To maintain accessibility to the transportation network within a reasonable waiting period, the MBTA has established minimum frequency-of-service levels for each mode, by time of day. On less heavily traveled services, these minimum levels dictate the frequency of service, regardless of customer demand.

4. Schedule Adherence (All Modes)

On-time performance (OTP) or schedule adherence shows how well MBTA service follows the schedules. For each type of service, the MBTA measures on-time performance differently, to reflect the way the customer experiences it. For rapid transit services and bus routes with very frequent service, the OTP standard is based on how close the waiting time between vehicles is to the scheduled time between vehicles. For bus routes with less frequent service, the OTP standard is

⁶ Selected by MPO staff.

based on how well the route adheres to the scheduled departure and arrival times at the beginning and end of the route, respectively, as well as at multiple time points along the way. Similarly, the commuter rail and boat standards are based on how well the service adheres to the scheduled departure and arrival times at the beginning and end of the route, respectively.

There are two parts to the bus service schedule adherence standard: the time point test and the route test. For bus routes with headways ≥ 10 minutes, customers would presumably check the schedule before going to the bus stop, so the time point test is based on how well the buses adhere to the published schedule at the beginning and end of the route, as well as at multiple time points along the way. For bus routes with headways ≤ 10 minutes, customers know that the service is frequent enough that they can go to the stop at any time with the expectation that a bus will arrive soon. For these routes, the time point test requires that service adheres to headways that are within 1.5 times the scheduled headway at the route's beginning and midpoints, and that running time is within 20% of scheduled running time at the end of the route. For both types of service, route-level schedule adherence is determined by whether or not 75% of all time points on the route meet the time point test.

5. Vehicle Load (All Modes)

The public's perception of comfort and the reality of public safety are influenced by the number of passengers on the vehicle and whether or not a seat is available to each rider for all or most of a trip. Vehicle load standards vary by mode and time of day and establish the maximum number of passengers allowed per vehicle, to provide a safe and comfortable ride.

6. Net Cost per Passenger (Bus)

The operation of MBTA service must be conducted within the resource level budgeted for each mode. It is important to have a measure that can compare the economic productivity of any given route in relation to other routes or to the system average for that mode. This standard was developed for buses only because bus service can be easily adjusted to accommodate changes in ridership patterns and demand. The MBTA will consider development of similar standards for other modes in the future.

7. Ridership (All Modes)

Ridership is the measure of how many trips customers take on the MBTA. Specifically, it counts "unlinked trips." (The trip of a customer who transferred from a

bus to the subway would count as two unlinked trips, one on bus and one on subway.) Increasing ridership is always a goal at the MBTA.

Total ridership counts for bus and subway come from the fare collection equipment and are adjusted to account for those who ride without interacting with it (such as young children.) Commuter rail and boat counts are collected by the conductor or captain.

8. Vehicle Availability (Subway, Bus, Commuter Rail)

Vehicle availability measures whether there are enough vehicles available to run all the service that is scheduled each day. A vehicle might not be available if it has a mechanical problem or if it is undergoing routine maintenance. MBTA vehicle maintenance personnel work to have enough buses and trains available each day. The number of vehicles required for service varies seasonally and over time as schedules change.

9. Mean Miles Between Failures (Subway, Bus, Commuter Rail)

Mean miles between failures (MMBF) measures vehicle reliability. It is the average number of miles a vehicle travels between breakdowns. If one vehicle travels 5,000 miles in a month and breaks down twice during that time, that vehicle has an MMBF of 2,500. Values can fluctuate greatly from month to month if the total number of failures is already small. High MMBF is achieved through ongoing vehicle maintenance, which includes everything from oil changes to major midlife overhauls, and through the periodic purchase of new vehicles to replace old ones as they reach the end of their useful life.

10. Speed Restrictions (Subway)

Speed restrictions measure the amount of slowdown caused by track conditions. If a section of track falls below standards in some way, such as if the rail is worn down, a speed restriction is put in place to ensure safe operation. Trains operate at a reduced speed when traveling that section of track until the issue is addressed, and the impact of that restriction is reported. If, for example, the reported impact of speed restrictions on the Orange Line for a month is three minutes, that means that speed restrictions added three minutes to the fastest possible round-trip. Trains do not actually operate at the maximum speed allowed by track conditions at all times (they slow down to a stop to pick up passengers, for instance), so the actual impact on travel time may be less than the theoretical impact that is shown.

11. Percent of Scheduled Service Operated (Subway, Bus)

The MBTA strives to come as close as possible to operating every scheduled trip on every day. That requires having enough operators, well-maintained vehicles and track, and good schedules, and also keeping a certain number of extra operators and vehicles on standby to fill in if there is a problem. If a trip is nonetheless “dropped” on a bus route or subway line with short headways, the MBTA will spread out other trips on the route to try to fill the gap as much as possible. If there is no way to avoid missing a trip on a bus route with long headways, the MBTA will notify as many customers as it can via T-Alerts, mbta.com, and the customer support hotline.

On the subway system, the trains on standby are sometimes used to run extra trips, so more trips may be operated than scheduled.