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## Purpose and Need

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### 2.1 Overview

The Commonwealth of Massachusetts, in obtaining environmental permits for the Central Artery/Tunnel (CA/T) project in the early 1990s, committed to implement a number of transit improvement projects in the Boston region as mitigation measures. The transit project commitments included a Green Line Extension to Medford Hillside. The Green Line Extension Project is also a requirement of the Massachusetts Air Pollution Control Regulations (310 CMR 7.36).

The study area is generally bounded by I-93 and the Massachusetts Bay Transportation Authority (MBTA) Orange Line to the east, the MBTA Red Line and MBTA Fitchburg Line commuter rail right-of-way to the west and south, and the MBTA West Medford commuter rail station to the north. This area includes East Cambridge and portions of Somerville and Medford. The area consists of densely settled urban corridors with a large base of commuters and transit users, but is currently underserved by fixed-guideway transit. Figure 1-1 shows the study area for the Green Line Extension Project.

With approximately 18,870 people per square mile in Somerville, 15,760 in Cambridge, and 6,850 in Medford, the study area neighborhoods are among the densest in the Boston region.<sup>1</sup> In addition, approximately 60 percent of the residents of Cambridge, Somerville, and Medford live in state-defined environmental justice areas, which take up approximately 42.8 percent of the cities' combined area.<sup>2</sup> The region is currently underserved by transit, and U.S. Census data (2000) indicate that approximately 21 percent of study area households do not own a vehicle, which can create a need for reliable and efficient transit service. Although MBTA commuter rail lines passes through the study area corridor, there are no rail transit stops within these communities. In addition, roadway congestion in the study area impacts the

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<sup>1</sup> U.S. Census Bureau, *Census 2000*.

<sup>2</sup> Environmental justice areas are defined by thresholds for income, minority populations, foreign-born populations, and English proficiency. Therefore, most environmental justice areas contain a mix of environmental justice and non-environmental justice residents.

reliability of current on-street transit services and results in lengthy travel times (approximately 30 minutes) from Lechmere Station to Mystic Valley Parkway/Route 16 Station despite the relatively short distance (approximately four miles).

This chapter defines the purpose of, and need for, the Green Line Extension Project and identifies a number of related Project goals. The Purpose and Need statement is a simple method for outlining both the reasons for proposing a project and the underlying need for the Project.

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## 2.2 Project Purpose

Traffic congestion, mode transfer, and service delays hamper access from the study area to downtown Boston, as well as to employment and services within the study area. The Purpose of this Project is to improve corridor mobility, boost transit ridership, improve regional air quality, ensure equitable distribution of transit services, and support opportunities for smart growth initiatives and sustainable development.

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## 2.3 Need for Transit Improvements

Transit improvements are needed along the Green Line Extension corridor as a result of:

- Poor transit access and mobility;
- Limited transit capacity;
- Poor regional air quality; and
- Traffic congestion on local roads.

Existing transit service within the study area in Cambridge, Somerville, and Medford is currently offered by 15 MBTA bus routes with access to points within those communities as well as to Boston, Arlington, Woburn, and Winchester. However, existing bus routes operate within existing traffic, which hinders bus service and causes inefficient and unreliable transit service in the study area. Although MBTA commuter rail lines travel through the study area, with impacts to the environment within the study area, there are no rail transit stops within the area communities to provide the benefit of transit access. These deficiencies and needs are more fully defined in the following sections.

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### 2.3.1 Transit Access and Mobility

The study area neighborhoods are among the densest in the Boston region. Somerville is ranked among the densest cities in the United States and is the densest city in Massachusetts, with approximately 18,870 people per square mile; Cambridge ranks number three at roughly 15,760 people per square mile; and Medford number 18 at roughly 6,850 people per square mile.<sup>3</sup> By way of comparison, the City of Boston ranks number four in Massachusetts with a population density of approximately 12,170 people per square mile. Cambridge is well-served by transit, with one MBTA Green Line station (Lechmere), five MBTA Red Line stations, and one MBTA commuter rail station (Porter Square). Somerville is served by one MBTA Red Line station (Davis Square) and one MBTA Orange Line station (Sullivan Square), but these are located at the periphery of the City and do not serve the dense population within the study corridor. Medford has one commuter rail station (West Medford).

Transit services that currently operate in the study area provide inadequate links between centers of activity including private and public colleges and universities, medical facilities and specialties, cultural facilities, and sporting events within the corridor communities. Access constraints affect employment opportunities for the residents within the study area, as well. Although the City of Boston provides employment opportunities at all income levels, access to jobs in Boston is constrained by the congested roadways and lengthy travel times to the downtown core. The lack of easy connections to alternative transit modes in parts of the study area makes it necessary for transit patrons to make multiple transfers to reach jobs in Boston. Improvements to transit services would make public transportation a more compelling travel choice by reducing transit travel times throughout the study area and to downtown Boston.

The growth of area institutions is also constrained by the limitations of the transportation system. Improved transit services would make economic, educational, medical, and recreational opportunities within the study area and the region more accessible to corridor households.

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### 2.3.2 Transit Capacity and Service Quality

The existing bus network experiences poor service quality. Congestion in the corridor contributes to the inability of existing transit service to meet the standards for service delivery, which could be attributed to or exacerbated by the fact that 13 study area intersections experience a failing level of service (LOS), which delays

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<sup>3</sup> U.S. Census Bureau, *Census 2000*.

existing bus operations. For instance, currently only one of the 15 bus service routes in the study area meets the MBTA's Schedule Adherence Standard on weekdays.<sup>4</sup>

According to the Summary Analysis of Routes and Recommended Changes in the 2008 MBTA Service Plan, all study area bus routes except the Route 85 failed to meet the Schedule Adherence Standards from the 2008 MBTA Service Plan. Bus service is affected by the corridor's narrow streets, on-street parking, and numerous intersections, all of which create significant delay for motorists. MBTA buses that travel within the flow of traffic along these corridors are subject to the same delays, averaging speeds of nine mph through the corridor based on the current bus schedule and current bus stops. The potential to improve the reliability and capacity of the bus network in the study area is severely limited.

Existing bus service in the study area accommodates approximately 34,690 weekday daily riders.<sup>5</sup> The system cannot be expanded to provide more service due to the physical constraints of the area roads.

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### 2.3.3 Air Quality

The study area is located within an area designated non-attainment for ozone by the EPA, with a classification of "moderate." Motor vehicles are the predominant sources of ozone precursor emissions within the study area. These emissions are exacerbated by truck traffic through the area. Reducing vehicle miles traveled (VMT) and cutting consequent emissions of volatile organic compounds (VOCs) and carbon monoxide (CO) requires the need to improve transit options and promote a shift in travel mode from automobiles. The Project is also a requirement of the Massachusetts Air Pollution Control Regulations (310 CMR 7.36).

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### 2.3.4 Sustainable Development/Smart Growth

The study area presents opportunities for economic development around transit centers. Introducing enhanced transit, undertaken in coordination with smart-growth based local land use planning, may support Commonwealth goals in promoting concentrated mixed-use development and revitalizing urban centers.

There are a number of local development plans or master plans that are being undertaken by the communities in the study area, including transit-oriented development (TODs) such as NorthPoint and the Charles E. Smith residential development adjacent to Lechmere Station. The focus of smart growth efforts is to develop or revitalize neighborhoods. Any transportation investment undertaken by

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<sup>4</sup> MBTA's Schedule Adherence Rating – Final 2006 Service Plan Appendix A (Summary Analysis of Routes and Recommended Changes).

<sup>5</sup> Ridership and Service Statistics, Eleventh Edition (2007), MBTA Bus Schedule, March 2008.

the Commonwealth must be coordinated with local land use policies and regulatory structures that support smart growth aims of expanding the region's housing supply and employment base, concentrating development, and protecting environmental resources.

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### 2.3.5 Environmental Justice

The study area for the Green Line Extension Project contains a significant representation of environmental justice populations. More specifically, approximately 42.8 percent of Cambridge, Somerville, and Medford consist of environmental justice areas, which contain approximately 60 percent of the residents of the three cities.<sup>6</sup> Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires specific examination of environmental and human health effects on minority populations and low-income populations to ensure that these groups are not disproportionately affected by infrastructure projects. The U.S. Department of Transportation (DOT) Order 5610.2 on environmental justice defines a disproportionately high effect on minority and low-income populations as “an adverse effect that is predominately borne by minority population and/or a low-income population; or will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non low-income population.”

Alleviating the burden on environmental justice communities, outlined below, and providing benefits to these populations in terms of air quality, mobility, and access to services and jobs are important goals of this Project. According to the Boston Region Metropolitan Planning Organization (MPO), the following transportation-related burdens impact environmental justice populations in the study corridor:<sup>7</sup>

- Commuter rail lines pass through the community without providing access to their service;
- The lack of reliable transit services constrains access to job opportunities outside of the immediate neighborhoods;
- The area lacks services such as radial bus connections that access employment centers; and
- Study area residents lack access to jobs outside of peak-period commuter hours (i.e., peak-periods that demonstrate commuting patterns of “9 to 5” jobs) because there is limited off-peak bus service.

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<sup>6</sup> Environmental justice areas are defined by thresholds for income, minority populations, foreign-born populations, and English proficiency. Therefore, most environmental justice areas contain a mix of environmental justice and non-environmental justice residents.

<sup>7</sup> *Regional Transportation Plan 2004-2025* of the Boston Region MPO.

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## 2.4 Goals and Objectives

In addition to the Commonwealth's commitments to provide transit service to this area as part of the CA/T Project and the State Implementation Plan (SIP), the Green Line Extension Project is also part of EOT's efforts to achieve a series of broad transportation goals to improve the quality and equity of transportation services. The goals, associated objectives, and potential evaluation measures are described below.

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### 2.4.1 Improve Regional Mobility and Capacity and Expand Transit Access and Intermodal Connections

Mobility improvements in the study area are expected to result in significant regional improvements by increasing accessibility for all users, including residents, employees, students, visitors, and shoppers. Residents of the study area would benefit from improved employment access and reduced commuting times, as well as reduced travel times and costs. Measures that will be used to evaluate the improved transit access and regional mobility include:

- The addition of seat-miles and vehicle-hours of system capacity service;
- Reliability of the service in the study area;
- User benefits, including travel time savings; and
- Congestion relief.

Increasing mode choice options will improve efficiency and effectiveness of the region's transportation system. Multimodal connections in the study area between commuter rail, bus services, and rapid transit or light rail would also benefit commuters by improving mobility and flexibility in route choice. Factors to be used in evaluating the effectiveness of increased mode choice options include:

- Mode shift;
- Transit ridership;
- Transit system capacity impacts; and
- Reductions in the number of transfers required.

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### 2.4.2 Maximize Transportation Capacity Efficiently

Given the need for increased transit capacity in the study area and the limited funding resources at all levels, transit improvements should be cost effective as well as provide a service to the customers that is reliable, comfortable, and attractive, thereby increasing ridership.

In order to identify an optimal service, factors to be used in evaluating this goal include:

- Total capital cost;
- Annual operating and maintenance costs; and
- The Federal Transit Administration (FTA) cost effectiveness index.<sup>8</sup>

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### 2.4.3 Improve Air Quality

Transit improvements should contribute to the attainment and long-term maintenance of conformity with National Ambient Air Quality Standards (NAAQS). Factors to be considered in evaluating the air quality benefits of alternatives include:

- Regional/mesoscale air quality;
- Energy consumption; and
- Vehicular travel/congestion.

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### 2.4.4 Advance Sustainable Development

Proposed transit improvements must advance the Commonwealth of Massachusetts' goals for sustainable development. While transportation improvements alone will not necessarily stimulate economic growth, congestion and the lack of access can be major impediments to implementing a smart growth vision of balanced housing, economic development, and open space recreation. Factors to be considered in evaluating sustainable design benefits of alternatives include:

- Mode shift;
- Transit ridership; and
- Congestion relief.

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### 2.4.5 Provide Services to Environmental Justice Populations

Improvements to transit services will need to be in conformance with environmental justice objectives to provide benefits to these populations in terms of air quality, mobility, and access to services and jobs. Mobility improvements should conform to the Federal, state, and local requirements that are intended to promote nondiscrimination in programs affecting human health and the environment.<sup>9</sup>

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<sup>8</sup> FY 2009 New Starts and Small Starts Evaluation and Rating Process, July 2007 (Prepared by Federal Transit Administration, Office of Planning and Environment, US Department of Transportation).

<sup>9</sup> Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.

Factors to be used in evaluating the effectiveness of providing services to environmental justice populations include:

- Service to environmental justice target areas;
- Access to opportunities for residents of environmental justice target areas;
- Improvement in mobility and connectivity and/or removal of barriers faced by environmental justice areas; and
- User benefits, including travel time savings.