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Study Process and Framework

This chapter describes the process and framework for this study – outlining the goals and objectives along with the mechanics of how these goals and objectives were achieved through the study process. Arguably the most crucial element of the study process was the public outreach plan. The public outreach plan is the Study Team’s approach to sharing information and ideas with the general public and an established Working Group throughout the study to ensure an open, transparent, and collaborative process.

The goal of the study is to improve multimodal transportation conditions with a primary focus on the bus service along Arsenal Street and locations where the bus service ties into other crossing bus routes, as well as other connections to the regional transit system.

Introduction

The Arsenal Street Corridor Transportation Study (the study) is a partnership between the Massachusetts Department of Transportation (MassDOT), Massachusetts Bay Transportation Authority (MBTA), the Town of Watertown, and surrounding municipalities. The consultant team is led by VHB with support from Regina Villa Associates (RVA) and RKG Associates, Inc. (RKG). This is a comprehensive state-sponsored study evaluating the existing and future multimodal transportation conditions along the Arsenal Street corridor in Watertown and its surrounding municipalities. The study develops and analyzes alternatives that are intended to improve transportation conditions, with a primary focus on the bus service along Arsenal Street and locations where the bus service interfaces with other crossing routes. Alternatives are evaluated for their impact on bus service, vehicular, bicycle and pedestrian use, land use, and cost, as well as in the context of impact on current users of the transportation network.

This study examined and analyzed mobility under existing conditions and under year 2040 conditions. Immediate-term, short-term, medium-term, and long-term recommendations have been developed using both quantitative information from analyses and also qualitative feedback provided by the Working Group established as part of this study (see more information below) and the public.

Public outreach has been an integral component of the study. The study has been guided by a Working Group comprised of local municipal representatives, state agency representatives, elected officials, members of the Watertown Public Transit Task Force (which was established in an effort to promote more efficient public transit through Watertown and surrounding towns), local advocacy groups, and individuals representing business, the environment, traditionally underserved populations, and transportation interests. The members of the Working Group and all meeting notes are included in the Appendix.

Over the course of the project, Working Group members met six times to discuss the methodology, data, analysis, and findings of the project. Comments from the Working Group were incorporated into the presentations at each of three public meetings.

This report documents all phases of the work effort for this study and is organized as follows:

- Chapter 1 – Study Process and Framework
- Chapter 2 – Existing Conditions
- Chapter 3 – Future Conditions, Issues and Opportunities
- Chapter 4 – Alternatives Development
- Chapter 5 – Alternatives Analysis
- Chapter 6 – Recommendations

Study Process and Background

A comprehensive corridor study involves a well-defined structure and process. The planning effort is organized into six tasks:

- Task 1: Framework – Develop the framework for the study, including study area, goals and objectives, evaluation criteria, and the public involvement plan.
- Task 2: Existing and Future Conditions and Issues Evaluation – Evaluate existing and anticipated future (2040) conditions for the study area, including transit services, traffic congestion, pedestrians, bicyclists, safety, environmental

issues, community effects, economic development, land use, public health. Identify existing issues, opportunities and constraints.

- Task 3: Alternatives Development – Develop and refine a range of potential alternatives based on the transportation deficiencies, issues, and constraints, particularly as they relate to bus service along Arsenal Street and locations where the bus service ties into other crossing bus routes. Identify immediate or near-term improvements that could be implemented with existing resources or at minimal cost.
- Task 4: Alternatives Analysis – Analyze potential alternatives based on the established evaluation criteria relative to multimodal mobility, safety, the environment, land use and economic development, the community, constructability, cost, and public health.
- Task 5: Recommendations – Develop a coordinated set of short-, medium-, and long-term recommendations as a result of the analysis completed in the previous tasks, presented in an implementation plan.
- Task 6: Final Report – Prepare draft and final Corridor Study report that documents the findings of Tasks 1 to 5.

A Public Involvement Plan was integrated throughout the six tasks and input from the Working Group and public were solicited throughout the process.

Study Area

The first step in the study framework development involved defining Local and Regional Study Areas, depicted in Figure 1-1. The Local Study Area includes Arsenal Street from Watertown Square to Leo Birmingham Parkway, as well as local streets in the vicinity of Arsenal Street and access to developments along Arsenal Street.

The Regional Study Area is more expansive to capture roadways, neighborhoods, and developments which can affect, or are affected by, travel along Arsenal Street. The study includes an analysis of bus service along Arsenal Street and locations where the bus service ties into other crossing bus routes (including Routes 57, 70/70A, 71, and 73). Additional municipalities in the Regional Study Area include Belmont, Newton, Waltham and Cambridge.

Study Goals, Objectives, and Evaluation Criteria

During the study's initial months, goals, objectives, and evaluation criteria were developed and refined in conjunction with the Working Group. Goals define the general intentions and purposes for conducting the study based on the issues that have to be addressed. Objectives describe ways that the goals could be accomplished. The evaluation criteria are used to qualitatively and quantitatively measure how well each alternative meets the stated goals and objectives.

Through coordination with the Working Group, the following goals for the project were developed:

- Improve mobility and traffic flow
- Enhance safety
- Improve accessibility and connectivity for all modes
- Meet transportation goals while supporting economic development and improving quality of life
- Meet transportation goals while minimizing impacts to the environment
- Develop a range of multimodal recommendations that support ongoing changes and have lasting benefits
- Encourage consensus through an open and inclusive process
- Develop recommendations that target demonstrated needs

Table 1-1 summarizes the objectives and evaluation criteria related to each specific goal.

Table 1-1 Study Specific Goals, Objectives, and Evaluation Criteria

GOAL/OBJECTIVES	EVALUATION CRITERIA
Goal: Improve mobility and traffic flow	
<ul style="list-style-type: none"> Decrease congestion and reduce delays ^{PHO} Improve system reliability Minimize local street impacts Maintain emergency vehicle and first responder mobility 	<ul style="list-style-type: none"> Average speeds Delays/Level of service Travel time improvements Traffic demands by functional classification Vehicle-miles traveled (VMT) Vehicle-hours traveled (VHT) ^{PHO} Transit on-time performance
Goal: Enhance safety ^{PHO}	
<ul style="list-style-type: none"> Identify, eliminate, or mitigate locations and situations that pose hazards ^{PHO} Verify that the transportation infrastructure meets current design standards ^{PHO} Identify structurally deficient infrastructure 	<ul style="list-style-type: none"> 3-year crash data analysis High crash corridors/locations (vehicles, bikes, pedestrians) ^{PHO} Geometric design review Severity of crashes
Goal: Improve accessibility and connectivity for all modes	
<ul style="list-style-type: none"> Explore ways to reduce auto dependency ^{PHO} Seek opportunities to improve existing public transportation services ^{PHO} Coordinate existing transit services Improve bike and pedestrian connections ^{PHO} Promote active transportation ^{PHO} 	<ul style="list-style-type: none"> Transit travel time improvements Transit service/schedule enhancements Mode share ^{PHO} Expanding ridesharing opportunities ^{PHO} Quality and location of pedestrian/bicycle accommodations ^{PHO} Auto ownership
Goal: Meet transportation goals while supporting economic development and improving quality of life	
<ul style="list-style-type: none"> Support existing and projected economic development Minimize negative economic effects to tax bases, and seek opportunities to enhance local and regional economic activity where possible Improve non-motorized access and connectivity between business centers and employment centers ^{PHO} Improve access to the regional highway system Avoid/minimize/mitigate social equity impacts Incorporate healthy community design features ^{PHO} 	<ul style="list-style-type: none"> Impacts to businesses (access improvements, VMT, increased jobs creation) Tax base impacts (effects on jobs and employment) Impacts to residential/ schools/community facilities ^{PHO} Qualitative indirect effects on adjacent minority and disadvantaged populations (environmental justice) Site access/Access management Reduce travel time, improve wayfinding, enhance system performance reliability ^{PHO} Prioritize alternatives by identifying their health value ^{PHO} Consider both short and long-term health benefits ^{PHO}

PHO Denotes public health goal, objective, or criteria

Table 1-1 (continued) Study Specific Goals, Objectives, and Evaluation Criteria

GOAL/OBJECTIVES	EVALUATION CRITERIA
Goal: Meet transportation goals while minimizing impacts to the environment	
<ul style="list-style-type: none"> ▪ Support smart growth, anti-sprawl initiatives ^{PHO} ▪ Avoid/minimize/mitigate impacts to the natural environment ▪ Minimize greenhouse gas emissions ^{PHO} ▪ Reduce CO and particulate matter impacts ^{PHO} ▪ Minimize transportation-related noise impacts along the corridor ^{PHO} 	<ul style="list-style-type: none"> ▪ Impacts to natural environment (wetland/habitat/open space/historic areas/conservation areas/others) ▪ Estimated reduction of greenhouse gas emissions ^{PHO} ▪ Estimated reduction of CO and PM ^{PHO} ▪ Effects of alternatives on NOx and VOC ^{PHO} ▪ Effects of alternatives on sound levels ^{PHO}
Goal: Develop a range of multimodal recommendations that support ongoing changes and have lasting benefits	
<ul style="list-style-type: none"> ▪ Identify solutions that include both short-term and long-term actions to improve traffic flow, mobility and operational efficiency ^{PHO} ▪ Identify solutions that are cost-effective in the context of state transportation planning ▪ Identify solutions that comply with MAP-21¹ and incorporate sustainable growth principles ^{PHO} ▪ Identify solutions that meet criteria for federal funding ▪ Identify steps necessary to advance priority projects 	<ul style="list-style-type: none"> ▪ Improved level of service, reduced VMT/VHT to 2035 ▪ Mode share, trip distribution by roadway functional classification ^{PHO} ▪ Preliminary costs ▪ FAST Act¹ compliance and sustainable growth compatibility ▪ Federal agency funding assessment
Goal: Encourage consensus through an open and inclusive process	
<ul style="list-style-type: none"> ▪ Document and consider the input of the Working Group and the public ▪ Attempt to reach reasonable consensus on study recommendations ▪ Keep adjacent communities and the public informed throughout the study ▪ Provide opportunities for public comment throughout the study ▪ Encourage feedback from traditionally underserved population(s) 	<ul style="list-style-type: none"> ▪ Develop and implement Public Outreach Plan ▪ Develop study website for public access ▪ Ensure transparency by posting study documents on the website (including meeting notes) ▪ Form a diverse Working Group for the study ▪ Encourage consensus
Goal: Develop recommendations that target demonstrated needs	
<ul style="list-style-type: none"> ▪ Quantify or qualify the needs – such as safety, traffic flow, reliability – as clearly as possible ▪ Provide justification for any additional recommended actions over and above what analyses show is necessary 	<ul style="list-style-type: none"> ▪ Documentation of analyses and recommendations throughout the study (Task 1 through Task 6)

PHO Denotes public health goal, objective, or criteria

1 Fixing America's Surface Transportation (FAST) Act was passed by Congress in December 2015 and replaces the transportation funding bill known as MAP-21.

Public Health

As noted in the goals, objectives, and evaluation criteria discussion in Chapter 1, public health is incorporated into many different criteria used to assess the alternatives developed. The alternatives analysis discussion below speaks specifically to the potential benefits or impacts of public health. This section outlines the specific methodology used to qualify benefits/impacts based on available data.

Public Health Assessment Criteria

The public health assessment criteria are developed based upon research review of healthy community design principles and the existing conditions public health analysis of the Arsenal Street Corridor, particularly the public health contributors and barriers identified in Chapter 2. The purpose of the criteria is to help understand:

1. Whether the alternatives enhance the existing public health contributors and/or create additional contributing effects, such as:
 - Enhance existing bus services and increase bus service capacity
 - Enhance transit connectivity with nearby communities and the regional transit systems
 - Improve pedestrian facilities and increase walking in the corridor
 - Improve bicycle facilities and increase biking in the corridor
 - Enhance traffic control at intersections
 - Encourage mixed land uses along the corridor
 - Enhance safe pedestrian and bicyclist connections to community amenities in the corridor (trails, parks and open spaces, schools, health care facilities, health food establishments, community/cultural facilities, retail establishments, businesses, employment centers, etc.)
2. Whether the alternatives mitigate or eliminate the negative impacts of the existing public health barriers, such as:
 - Increase bus service capacity
 - Improve bus stop amenities
 - Improve pedestrian safety and accessibility
 - Reduce automobile accidents
 - Reduced curb cuts
 - Reduce congestion and delay
 - Reduce traffic volume
 - Encourage mixed land uses

The assessment criteria are structured in a way that they address specific public health related objectives established for the Arsenal Street Corridor Study. These criteria intend to offer qualitatively measurable indexes that can be used to assess how each alternative can contribute to the overall goals and objectives upon successful design

and implementation. Below is a list of public health related objectives and their corresponding public health assessment criteria.

Objectives on mobility and connectivity:

- Decrease congestion and reduce delays
 - Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Reduced vehicle hours traveled
 - Reduced traffic queuing
 - Reduced vehicle idling
- Improve non-motorized access and connectivity to community amenities (trails, parks and open spaces, schools, health care facilities, health food establishments, community/cultural facilities, retail establishments, businesses, employment centers, etc.)
 - Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Improved walking and biking facilities
 - Improved connections to existing community amenities
 - Improved pedestrian-scale wayfinding signage
 - Reduced pedestrian, bicycle, and vehicle conflicts, such as at intersections, crosswalks, and curb cuts
 - Increased walking activities
 - Increased biking activities

Objectives on healthy transportation options:

- Reduce auto dependency
- Improve existing public transportation services
- Improve bike and pedestrian connections
- Promote active transportation
 - Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Improved bus stop facilities
 - Increased bus services and ridership
 - Improved/safer walking facilities
 - Improved/safer biking facilities
 - Improved walking and biking connections to community destinations
 - Improved transitions among different modes of traveling

Objectives on air quality and Greenhouse Gas (GHG):

- Minimize GHG emissions
- Reduce CO and particulate matter impacts

- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Reduced vehicle miles travelled
 - Reduced vehicle idling
 - Reduced vehicle slowing and accelerating
 - Reduced emission of GHG

Objective on noise level:

- Minimize transportation-related noise impacts along the corridor
- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Reduced vehicle traveling speed
 - Reduced vehicle miles traveled

Objectives on public safety:

- Identify, eliminate, or mitigate locations and situations that pose hazards
- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Reduced pedestrian, bicycle, and vehicle conflicts
 - Reduced automobile accidents
 - Improved/safer walking facilities
 - Improved/safer biking facilities
- Address current design standard deficiencies
- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Improved transportation infrastructures that meet current design standards
 - Improved system performance efficiency and reliability

Objectives on healthy and sustainable community design:

- Incorporate healthy community design features
- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...
 - Improved opportunities for recreation and physical activity
 - Improved non-motorized access to various community amenities
 - Improved access to public transportation options
 - Improved public safety
 - Improved streetscape designs, such as shade trees and landscaping
 - Improved air quality and traffic noise levels
- Support smart growth, anti-sprawl initiatives
- Assessment Criteria: alternatives will be evaluated based on whether their implementation will result in...

- Reduced vehicle miles traveled
- Increased mixed use and human-scale developments
- Improved opportunities for non-motorized travel

The outcome for the assessment of each alternative is discussed below.

Public Involvement Plan

Public outreach and involvement were key components of each study task. As discussed in the introduction, an extensive Public Involvement Plan was implemented to ensure an open, transparent, and collaborative study process and included a variety of outreach strategies such as Working Group and public meetings at key project milestones and internet and print communications.

Working Group and public informational meetings at key decision making points engaged stakeholders and the public and provided a forum to solicit opinions and feedback. Meeting materials and summaries from each of the public informational meetings are included in the Appendix. Table 1-2 summarizes the overall study outreach program.

To further ensure constant information exchange, a study website¹ was established to highlight study information including scope, study area, schedule, progress, and contacts for more information. All meeting notes, presentation materials, and study reports were posted on the study website and were compliant with Web Content Accessibility Guidelines 2.0 and Section 508 of the Rehabilitation Act. The website allowed visitors sign up to receive email updates from the project team.

Public comments and questions were welcomed through the website or email, via mail, or at public or Working Group meetings throughout the course of the study and during the 30-day public comment period on the Final Report.

Additional electronic communications included email blasts and social media posts on the MassDOT blog, Facebook, Twitter, YouTube, and Flickr accounts (by MassDOT) to publicize Working Group and public information meetings, and other project updates. Given the large Armenian population located within Watertown, meeting notices were translated into Armenian to capture input from potentially non-English speaking populations.

The project team worked with several community resources to ensure that the public process could be as inclusive as possible. The study website allowed users to translate content into other languages. All public meeting notices were available in Armenian, a non-English language spoken predominantly throughout the area. All meetings were

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¹ <https://www.mass.gov/massdot/arsenalstreet>

held in locations accessible by people with disabilities and audio/visual aids known as Computer Aided Real Time transcription (CART) were made available upon request.

Table 1-2 Study Outreach Program

Meeting	Date	Topics
Working Group Meeting 1	September 30, 2015	Study kick-off; review study area, goals/objectives, evaluation criteria, and public participation plan
Working Group Meeting 2	January 26, 2016	Review existing conditions evaluations (transit, traffic, safety, bike/pedestrian, land use and economic development, environmental resources, public health); 2040 future conditions discussions
Public Informational Meeting 1	February 24, 2016	Study kick-off; review study area, goals/objectives, evaluation criteria, and public participation plan; review existing conditions evaluations
Working Group Meeting 3	June 28, 2016	2040 future conditions forecasts, transit, and traffic analysis; evaluation of issues/opportunities; constraints identification; preliminary alternatives development
Working Group Meeting 4	August 3, 2016	Alternatives development and screening; preliminary alternatives analysis
Public Informational Meeting 2	October 4, 2016	2040 future conditions forecasts, transit, and traffic analysis; evaluation of issues/opportunities; constraints identification; alternatives development and screening
Working Group Meeting 5	January 24, 2017	Alternatives analysis; preliminary recommendations
Working Group Meeting 6	March 2, 2017	Study recommendations; Final Report
Public Informational Meeting 3	June 2017	Alternatives analysis; study recommendations