

FUNCTIONAL DESIGN REPORT

Reconstruction of Mount Auburn Street (Route 16)

Project #607777

Watertown, MA



December 2019

June 2021 Update

Prepared for:

**Town of Watertown
Department of Public Works
124 Orchard Street
Watertown, MA 02472**

Prepared by:

WORLDTECH
ENGINEERING



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1.0 INTRODUCTION

Under a contract with the Town of Watertown Department of Public Works, WorldTech Engineering, has been retained to evaluate and prepare a design for roadway improvements along the Mount Auburn Street (Route 16) corridor in the Town of Watertown, Massachusetts. The proposed study area includes the length of Mount Auburn Street beginning east of the intersection with Summer Street and continuing east, ending at the Cambridge City line. The study area also includes a section of Arlington Street beginning north of its intersection with Mount Auburn Street and continuing south through the intersection with Grove Street and terminating at Merrifield Avenue.

An extensive public outreach program has been prepared dating back to a 2011 feasibility study prepared for the corridor and a subsequent Committee on Public Works recommendation in 2011 to proceed with the design of improvements to the corridor. Since these early coordination efforts were performed, a series of workshops, town council meetings and public forums have been conducted to help shape the design of the corridor. A “Complete Streets” concept has been adopted for the corridor to improve the operation and safety of all modes of transportation including vehicular traffic, pedestrians, bicyclists, and transit users. The corridor is also home to many local businesses that rely on on-street parking for their survival. The sometimes-competing interests of each of the users of the corridor required the presentation of series of alternatives to ensure that a consensus could be reached to present to MassDOT for funding and ultimately to build. The following summarizes the public outreach campaign to date performed by members of the WorldTech team, supported by Regina Villas Associates:

- 6 Open Houses/Workshops
- 7 Public works Committee Meetings
- 1 Town Council Meeting
- Mailings
 - Mailing to abutters (November 2017)
 - Town Newsletter
 - Flyers to business districts and residents of Kimball Road
- Project Website www.MountAuburnStreet.com
 - 7,500 visitors to the website since 2017
 - More than 20 e-blasts to email list with more than 2,900 subscribers
- Social Media
 - Follow @Watertown DPW on Twitter

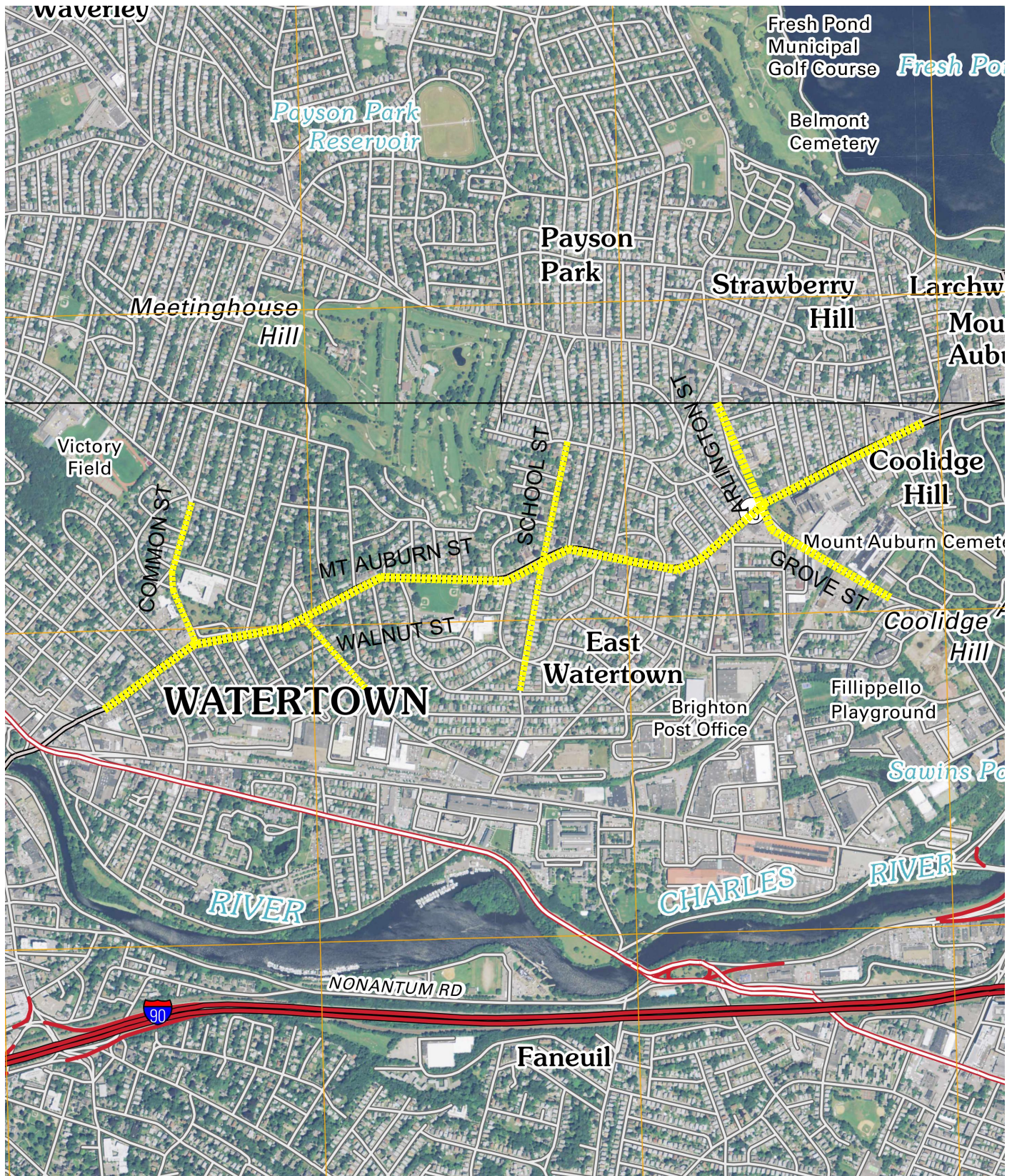
In January 2016, a preliminary Functional Design Report (FDR) was prepared and submitted to MassDOT / Boston Region Metropolitan Planning Organization for the Mount Auburn Street Corridor Project prior to beginning work on the 25% design to help gain early acceptance of a road diet concept for the corridor and to obtain funding for the project. During development of the concept plans for the corridor, it was evident that a revised FDR would be required to capture the changes in the design that have evolved with the robust public participation process employed on the project, recent changes in traffic volumes



projections and incorporation of bus priority efforts by the Barr Foundation to improve transit service in this heavily travelled corridor. Therefore, this updated Functional Design Report replaces the previous document in terms of updated crash data, revised traffic volumes and traffic operations analyses, concept plans for the corridor and ultimately supports the 25% design plans.

This FDR presents WorldTech’s evaluation of the current corridor from Patten Street, just east of Summer Street to the east to meet the Cambridge City limits. The FDR assesses existing conditions, identifies operational and safety deficiencies, and recommends an improvement strategy to address these deficiencies.

A locus map of the current project area is shown in Figure 1.



PREPARED FOR:



MOUNT AUBURN STREET (ROUTE 16)
CORRIDOR SAFETY IMPROVEMENTS

Project Location

NORTH



DATE:

10-18-2019

SCALE:

1"=1500'

PREPARED BY:

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Figure 1



2.0 EXISTING CONDITIONS

In this section, existing conditions such as roadway and intersection geometrics, traffic volumes, crash history, and parking are examined in detail. The existing conditions analysis is based on field visits and traffic counts conducted by WorldTech Engineering, and additional traffic data provided by the Town of Watertown Department of Planning and Community Development and the Massachusetts Department of Transportation (MassDOT). Information was collected regarding roadway geometric conditions, traffic control, traffic volumes, and peak period traffic operations. The results of these investigations are described below.

2.1 Existing Roadway Geometrics

The study area consists of the Mount Auburn Street (Route 16) corridor Street from east of Summer Street to the Cambridge city line, and a portion of the Arlington Street corridor between Mount Auburn Street and Merrifield Avenue. The total distance is 9,340 linear feet on Mount Auburn Street and 920 linear feet on Arlington Street. The classification and jurisdictional responsibility of the critical study area roadways is listed in Table 1.

Table 1 - Road Classification and Jurisdiction

ROADWAY SECTION	CLASSIFICATION	JURISDICTION
Mount Auburn Street	Urban Principal Arterial	Town of Watertown
Arlington Street	Urban Collector	Town of Watertown

The following section provides a description of the major study area roadways.

2.1.1 Roadway

Mount Auburn Street (Route 16) traverses the study area in a general east-west direction providing access to Route 2 and Route 3 to the east; and to Interstate 90 (via Centre Street in Newton), Route 20, and Arsenal Street to the west. It is a four-lane, urban principal arterial roadway under the jurisdiction of the Town of Watertown. Mount Auburn Street, within the study area, provides two travel lanes per direction separated by a double-yellow centerline. Additional turning lanes are provided at the intersection with Arlington Street. Within the study area, sidewalks are provided along both sides of Mount Auburn Street. Parking is permitted along the south side of Mount Auburn Street, except at bus stop locations, throughout the study area and along the north side between Kimball Road and Lloyd Road. The posted speed limit on Mount Auburn Street is 30 miles per hour (mph). Land use along Mount Auburn Street consists of residential and commercial uses and the Hosmer School, which was the subject of a recent “Safe Routes to School Project.”

Within the study area, Mount Auburn Street has seven signalized intersections and 42 minor side streets with stop sign control. In order to properly gauge the effects of the road diet concept, traffic operations analyses were performed at all



signalized intersections and at a select group of these minor side street intersections.

Arlington Street traverses the study area in a general north-south direction and is a two-lane roadway under the jurisdiction of the Town of Watertown. Within the study area, Arlington Street is classified as an urban collector and provides one travel lane per direction separated by a double-yellow centerline with no marked edge-lines. Arlington Street is intersected at three unsignalized local streets within the project limits. Additional turning lanes are provided at the intersection with Mount Auburn Street. Within the study area, sidewalks are provided along both sides of Arlington Street. The posted speed limit on Arlington Street is 30 miles per hour (mph). Land use along Arlington Street consists of residential and commercial uses and a public park.

2.1.2 Intersections

The following section provides a description of the study area intersections.

1. Mount Auburn at Irving Street/Palfrey Street

Irving Street intersects Mount Auburn Street from the south and Palfrey Street to the north to form this offset four-way, signalized intersection. Irving Street consists of a two-way roadway with a single approach lane. Palfrey Street is a one-way roadway away departing the intersection. Marked crosswalks are provided across Irving Street, Palfrey Street and Mount Auburn Street. Land use in the vicinity of this intersection consists of retail and residential uses.

2. Mount Auburn Street at Phillips Street

Phillips Street intersects Mount Auburn Street from the south to form this three-legged, unsignalized intersection. Phillips Street is a two-way roadway, although a centerline is not provided. Stop-signs and stop-lines are provided on the Phillips Street approach. A marked crosswalk is provided across Phillips Street. Land use in the vicinity of this intersection consists of retail and residential uses.

3. Mount Auburn Street at Marshall Street

Marshall Street intersects Mount Auburn Street from the north to form this three-legged, unsignalized intersection. Marshall Street is a two-way roadway, although a centerline is not provided. Stop-signs and stop-lines are provided on the Marshall Street approach. A marked crosswalk is provided across Marshall Street. Land use in the vicinity of this intersection consists of retail and residential uses.

4. Mount Auburn Street at Parker Street and Common Street

Parker Street intersects Mount Auburn Street from the south and Common Street intersects Mount Auburn Street from the north to form two three-legged signalized intersections, offset by approximately 100 feet. The two intersections are controlled by a single signal controller. The Parker Street is a two-way roadway, although a centerline is not provided. The southbound Common Street approach consists of a southbound left turn lane and a southbound right turn lane, separated from a single northbound departure lane by a double yellow center line. Stop lines



are provided on all three approaches at both intersections. Marked crosswalks and pedestrian signal heads are provided across Parker Street, Common Street, Mount Auburn Street west of Parker Street, and Mount Auburn Street east of Common Street. Parking is permitted along the south side of Mount Auburn Street and along both sides of Parker Street. Land use in the vicinity of this intersection consists of retail, residential, and cemetery uses, and the Phillips School is located approximately 300 feet north of the intersection on Common Street.

5. Mount Auburn Street at Bates Road East and Walnut Street

Walnut Street intersects Mount Auburn Street from the south and Bates Road East intersects Mount Auburn Street from the north to form a four-legged signalized intersection. Walnut Street consists of one northbound lane and one southbound departure lane separated by a double yellow center line. Bates Road East is a two-way roadway, although a centerline is not provided. Mount Auburn Street consists of two eastbound and two westbound lanes separated by a double yellow center line; additionally, along the eastbound approach, the parking lane functions as an exclusive right turn lane during peak periods. Stop lines are provided on all approaches. Marked crosswalks and pedestrian signal heads are provided across all approaches. Parking is permitted along the south side of Mount Auburn Street and along the west side of Bates Road East. Land use in the vicinity of this intersection is residential.

6. Mount Auburn Street at Boylston Street

Boylston Street intersects Mount Auburn Street from the south to form a three-legged unsignalized intersection. Boylston Street is a two-way roadway, although a centerline is not provided. A stop sign and stop line are provided for the Boylston Street approach. A marked crosswalk is provided across Boylston Street, and a marked crosswalk and pedestrian signal are provided across Mount Auburn Street approximately 300 feet east of the intersection. Parking is permitted along the south side of Mount Auburn Street and along the west side of Boylston Street. Land use in the vicinity of this intersection is residential, and the Hosmer Elementary School is located southeast of the intersection.

7. Mount Auburn Street at Winthrop Street

Winthrop Street intersects Mount Auburn Street from the south to form a three-legged unsignalized intersection. The Winthrop Street is a two-way roadway, although a centerline is not provided. A stop sign and stop line are provided for the Winthrop Street approach. Marked crosswalks are provided across Winthrop Street and across the eastern Mount Auburn Street leg of the intersection. Parking is permitted along the south side of Mount Auburn Street and along both sides of Winthrop Street. Land use in the vicinity of this intersection is residential, and the Hosmer Elementary School is located south of the intersection.

8. Mount Auburn Street at Chauncy Street

Chauncy Street intersects Mount Auburn Street from the south to form a three-legged unsignalized intersection. The Chauncy Street is a two-way roadway, although a centerline is not provided. A stop sign and stop line are provided for



the Chauncy Street approach. A marked crosswalk is provided across the Chauncy Street leg of the intersection. Parking is permitted along the south side of Mount Auburn Street and along both sides of Chauncy Street. Land use in the vicinity of this intersection is residential and commercial.

9. Mount Auburn Street at School Street

School Street intersects Mount Auburn Street to form a four-legged signalized intersection. The northbound School Street approach consists of one northbound lane and one southbound departure lane separated by a double yellow center line. The southbound School Street approach consists of one northbound lane and one southbound departure lane separated by a concrete island. Mount Auburn Street consists of two eastbound and two westbound lanes separated by a double yellow center line; additionally, the westbound right turn movement is channelized. Stop lines are provided on all approaches. Marked crosswalks and pedestrian signal heads are provided across all approaches. Parking is permitted along the south side of Mount Auburn Street. Land use in the vicinity of this intersection is residential.

10. Mount Auburn Street at Upland Road and Dexter Avenue

Upland Road and Dexter Avenue intersect Mount Auburn Street from the north and south to form a four-legged, unsignalized intersection. The Upland Road and Dexter Avenue southbound and northbound approaches consist of a single travel lane and accommodate two directions of traffic although a centerline is not painted along either roadway. Stop signs and stop lines are provided on both the Upland Road and Dexter Avenue approaches. Marked crosswalks are provided across Upland Road and Dexter Avenue. Land use in the vicinity of this intersection consists of retail and residential uses.

11. Mount Auburn Street at Melendy Avenue

Melendy Avenue intersects Mount Auburn Street from the south to form a three-legged, unsignalized intersection. The Melendy Avenue northbound approach consists of a single travel lane which accommodates two-way traffic, although a centerline is not provided. Stop-signs and stop-lines are provided on the Melendy Avenue approach. A marked crosswalk is provided across Melendy Avenue. Land use in the vicinity of this intersection consists of retail and residential uses.

12. Mount Auburn Street at Lloyd Road

Approximately 30 feet east of Melendy Avenue, Lloyd Road intersects Mount Auburn Street from the northwest to form a three-legged, unsignalized intersection. The Lloyd Road approach accommodates two-way traffic, although a centerline is not provided. A stop-sign and stop-line are provided on the Lloyd Road approach. Marked crosswalks are provided across Lloyd Road and across the eastbound Mount Auburn Street approach. Land use in the vicinity of this intersection consists of retail and residential uses.



13. Mount Auburn Street at Elton Avenue

Approximately 30 feet east of Lloyd Road, Elton Avenue intersects Mount Auburn Street from the southeast to form a three-legged, unsignalized intersection. Elton Avenue is a one-way south eastbound (away from the intersection) roadway. A marked crosswalk is provided across Elton Avenue. Land use in the vicinity of this intersection consists of retail and residential uses.

14. Mount Auburn Street at Irma Avenue

Irma Avenue intersects Mount Auburn Street from the northwest to form this three-legged, unsignalized intersection. Irma Avenue accommodates two-way traffic, although a centerline is not provided. A stop-sign and stop-line are provided on the Irma Avenue approach. A marked crosswalk is provided across Irma Avenue. Land use in the vicinity of this intersection consists of retail uses.

15. Mount Auburn Street at Bigelow Avenue and Kimball Road

Bigelow Avenue and Kimball Road intersect Mount Auburn Street from the south and northwest to form this four-legged, signalized intersection. Bigelow Avenue accommodates two directions of traffic divided by a double-yellow centerline. Entering traffic along Bigelow Avenue is divided by a raised delta island. Kimball Road accommodates two-way traffic, although a centerline is not provided. Marked crosswalks are provided across each leg of the intersection. Land use in the vicinity of this intersection consists of retail and residential uses.

16. Mount Auburn Street at Templeton Parkway

Templeton Parkway intersects Mount Auburn Street from the northwest to form this three-legged, unsignalized intersection. Templeton Parkway accommodates two-way traffic, although a centerline is not provided. A stop signs and stop line are provided on the Templeton Parkway approach. A marked crosswalk is provided across Templeton Parkway. Land use in the vicinity of this intersection consists of retail uses.

17. Mount Auburn Street at Arlington Street

Arlington Street intersects Mount Auburn Street from the north and south to form this four-legged, signalized intersection. The Mount Auburn Street east and westbound approaches consist of an exclusive left-turn lane, an exclusive through lane, and a shared through/right-turn lane. The Arlington Street north and southbound approaches consist of two travel lanes in each direction. Marked crosswalks are provided across each leg of the intersection. Land use in the vicinity of this intersection consists of retail, commercial and residential uses.

18. Arlington Street at Grove Street/ Tufts Health Plan Driveway

Grove Street/Tufts Health Plan driveway intersects Arlington Street from the south at a skewed angle to form this three-legged, unsignalized intersection. The Arlington Street southbound approach consists of a through lane and a free right turn. The Arlington Street northeast bound approach consists of a left-turn lane and a channelized right-turn. The Grove Street northbound approach consists of a single travel lane A marked crosswalk is provided across Grove Street. The Grove



Street north and southbound approaches consist of a single travel lane and accommodates two-way traffic. The Tufts Health Plan driveway westbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane. Traffic along the Tufts Health Plan driveway is divided by way of a raised island. A stop line is provided on the Tufts Health Plan driveway approach; however, a stop sign is not provided. There are no marked crosswalks provided at this intersection. Land use in the vicinity of this intersection consists of commercial and residential uses. Police control is used at the Tufts Health Plan Driveway during the evening peak hours.



3.0 ESTABLISHMENT OF BASIC DESIGN CONTROLS AND EVALUATION CRITERIA

Design controls established for this project include a combination of fundamental features of the project area and controls selected by the designer in conjunction with state/federal agencies and the surrounding communities. The three main elements of roadway context considered for design include roadway type, area type and access control. Mount Auburn Street is functionally classified as an Urban Principal Arterial, and Arlington Street is functionally classified as an Urban Collector. The area type where the project corridor is located is a mixture of Urban Residential and Urban Central Business District (CBD) at the two ends of the project. The existing access will be maintained.

Roadway users of this facility include pedestrians, bicyclists, motor vehicles traffic and transit. The design for this project area accommodates a tractor trailer. The project was designed to comply with MassDOT’s “Healthy Transportation Policy directive” and guidelines to comply with the Town’s policy for a “Complete Streets” compatible design.

3.1 Traffic Counts

To provide an updated evaluation of existing and future traffic operations, a traffic count program was conducted during 2018 for this FDR at major signalized intersections in the study area. The 2018 data is part of a town-wide traffic counting program conducted annually for the Town of Watertown. This project includes collection of Automatic Traffic Recorder (ATRs) and manual turning movement counts (TMCs) at various locations throughout Town. In addition to the 2018 counts, several of the minor unsignalized intersections were counted in 2014 and adjusted to 2018 existing conditions. It should be noted that recent trends in traffic volumes along the Mount Auburn Street corridor show a substantial reduction in automobile traffic between 2007 and 2018.

ATRs were collected for a seven-day period and include speed and vehicle classification. TMCs were collected during weekday peak periods (7:00 to 9:00 a.m., 4:00 to 6:00 p.m.) and include pedestrian and bicycle volumes. Data collection locations are as follows:

Automatic Traffic Recorder Counts

- ***Mt Auburn Street east of Common Street***
- ***Mt Auburn Street east of Irma Ave***
- ***Arlington Street south of Belmont St***
- ***Mt Auburn Street east of Arlington St***

Manual Turning Movement Counts

- ***Mt Auburn Street / Arlington Street***
- ***Mt Auburn Street / School Street***
- ***Mt Auburn Street / Boylston Street***
- ***MT Auburn Street / Winthrop Street***
- ***Mt Auburn Street / Common Street/Parker Street***



- ***Mt Auburn Street / Irving Street/ Palfrey Street***
- ***Arlington Street / Grove Street / Tufts Health Plan Dr***
- ***Mt Auburn Street / Chauncy Street-Adams Street***
- ***Mt Auburn Street / Elton Street***
- ***Mt Auburn Street / Irma Ave***
- ***Mt Auburn Street / Kimball Street-Bigelow Street***
- ***Mt Auburn Street / Lloyd Street-Melendy Street***
- ***Mt Auburn Street / Templeton Pkwy***
- ***MT Auburn Street / Upland Street-Dexter Street***
- ***Mt Auburn Street / Marshall Street***
- ***Mt Auburn Street / Phillips Street***

Passenger vehicles, trucks, pedestrians and bicycles were counted as part of the intersection TMCs and are detailed in the count data contained in the appendix.

Traffic data collection in Watertown has been conducted on a quarterly basis, beginning in Spring 2017. Traffic counts were incorporated into a Microsoft Access database which was used to analyze the data. Differences in volumes from quarter to quarter were used to determine seasonal variations for each count station.

In addition, historic counts as published in previous studies provided by the Department of Public Works and Department of Community Development and Planning, obtained by WorldTech for other projects in the Town of Watertown, or available from MassDOT were also incorporated into the database to further identify traffic volume trends in the Town of Watertown.

A summary of the 2018 traffic volumes is shown in Table 2.



Table 2- Existing 2018 Traffic volumes

Location	Daily volume ¹	Peak hour volume ²		K FACTOR (%) ³	DIRECTIONAL DISTRIBUTION ⁴
		AM:	PM:		
Mt Auburn east of Common St	16,200	AM:	1,260	7.8%	51% EB
		PM:	1,280	7.9%	55% WB
Mt Auburn east of Irma Ave	13,000	AM:	950	7.3%	60% EB
		PM:	1,100	8.3%	52% WB
Mt Auburn east of Arlington St	12,700	AM:	900	6.8%	58% WB
		PM:	1,050	8.1%	51% WB
Arlington St south of Belmont St	7,700	AM:	640	8.3%	62% SB
		PM:	630	8.2%	58% NB

¹ Daily traffic expressed in vehicles per day

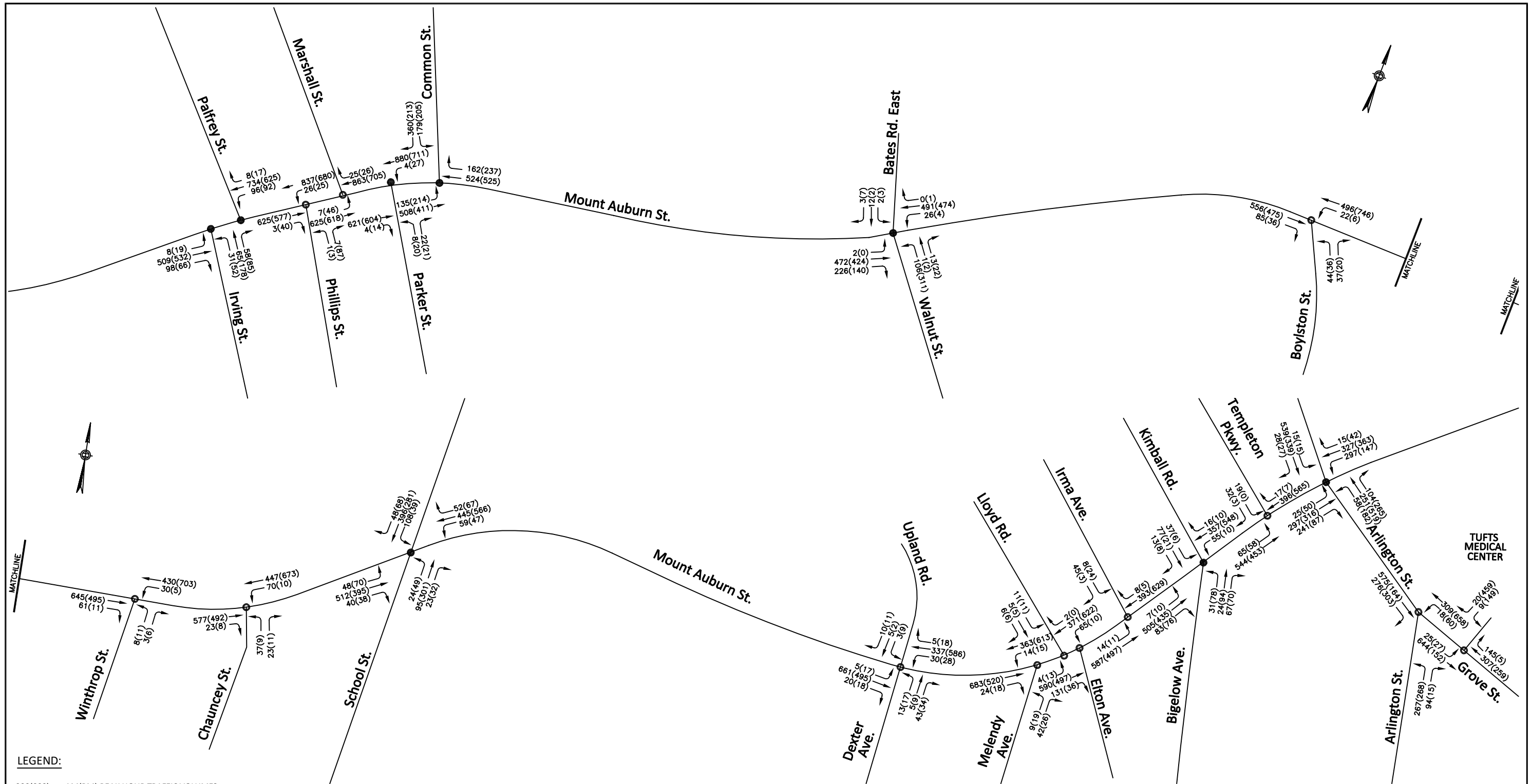
² Peak hour volume expressed in vehicles per hour

³ Percent of daily traffic that occurs during the peak hour

⁴ Directional distribution of peak hour traffic

The traffic volumes in Table 2 were seasonable adjusted (the traffic data was collected in (February 24 - March 2, March 27-April 2) to normalize the collected data to average traffic volume conditions.

The 2018 peak hour traffic volumes are shown in Figure 2.



LEGEND:

000(000) AM(PM) PEAK HOUR TRAFFIC VOLUMES

● SIGNALIZED INTERSECTION ANALYZED

○ UNSIGNALIZED INTERSECTION ANALYZED



TITLE:
MOUNT AUBURN STREET (ROUTE 16) CORRIDOR IMPROVEMENTS
 2018 Existing Traffic Volumes

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DATE:
 02-06-2019

SCALE:
 1" = 250'

Figure 2



3.2 Vehicle Speeds

In addition to traffic volumes, vehicle speeds were collected along study area roadways to determine the average speed, 85th percentile speed, and 10 mph pace speed through the study intersections and along likely cut-through routes. The 85th percentile speed is the speed at or below which 85 percent of the vehicles on a given roadway are traveling. The 10-mph pace speed represents the 10-mph speed range at which the highest percentage of vehicles along a roadway are traveling. When the midpoint of the 10-mph pace corresponds with the average (mean) speed of the roadway, there is a uniform speed of traffic flow on a roadway and therefore increased safety.

The recorded speed in Table 3 below include all traffic, including during peak hours when congestion is likely. Therefore, care should be taken with this data as free-flow speed should be used to set regulatory speed limits.

Table 3 summarizes the average, 85th percentile, and pace speed collected along each study area roadway from February 24, 2018 to March 2, 2018 and from March 27, 2018 to April 2, 2018.

Table 3 - Roadway Speeds

Location	Direction	Posted Speed Limit	Average Speed	85th Percentile Speed	Pace Speed (%)
Mt Auburn Street, east of Common Street	EB	30 mph	30.5 mph	35.2 mph	25-35 (74%)
	WB		26.4 mph	33.3 mph	25-35 (55%)
Mt Auburn St at east of Irma Ave	EB	30 mph	22.5 mph	28.5 mph	18-28 (61%)
	WB		23.1 mph	27.9 mph	19-29 (73%)
Arlington St at south of Belmont St	NB	30 mph	26.0 mph	32.9 mph	25-35 (63%)
	SB		27.1 mph	32.7 mph	25-35 (72%)
Mt Auburn St at east of Arlington St	EB	30 mph	29.3 mph	34.5 mph	25-35 (68%)
	WB		24.8 mph	30.3 mph	21-31 (65%)

As indicated in Table 3, the 85th percentile speed along Mount Auburn Street and Arlington Street are above the posted speed limit, the average speed, 29.3 mph on eastbound, 24.8 mph on westbound, coincides with the midpoint of the 10 mph Pace Speed, around 68 percent of eastbound traffic travels within the 10 mph Pace Speed of 25 to 35 mph, while approximately 65 percent of westbound traffic travels within the 10 mph Pace Speed, indicating a smaller range of speeds (21 – 31 mph).

The 85th percentile speed along Mount Auburn Street and east of Common Street are below or slightly above the posted speed limit, the average speed, 30.5 mph on eastbound, 26.4 mph on westbound, coincides with the midpoint of the 10 mph Pace Speed, around 74 percent of eastbound and 55 percent of westbound traffic travels within the 10 mph Pace Speed of 25 to 35 mph.



3.3 Safety Analysis

3.3.1 Road Safety Audit

The intersections of Mount Auburn Street at Bigelow Avenue/Kimball Road and Arlington Street at Mt Auburn Street (Route 16) were identified as a 2007-2016 HSIP Pedestrian Cluster Location. A Road safety Audit was held on December 5th, 2017.

The FHWA, Federal Highway Administration, defines a Road Safety Audit, RSA, as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users.

The extents of this RSA, covering Mt. Auburn Street from Dexter Avenue/Upland Road from the west and Keenan Street to the east, including the intersection of Arlington Street at Grove Street, known as Coolidge Square, has previously been identified as a 2006-2015 Highway Safety Improvement Program (HSIP) Pedestrian cluster in Watertown.

A list of Safety Enhancements were identified as part of the Audit, most of which are addressed by the proposed improvements.

3.3.2 Crash History

To identify potential vehicle crash trends and/or roadway deficiencies in the project study area, the crash history for the most recent five years was investigated for the Mount Auburn Street corridor and Arlington Street corridor. The crash information analyzed was obtained from the MassDOT Crash Portal for the years 2012 through 2016, the most recent five full years of available data. Crash data is included in the appendix to this report.

To evaluate crash data effectively, the number of crashes must relate or be compared to the traffic volumes entering the intersection or traveling along the roadway. A procedure used for this purpose is the calculation of an intersection or roadway segment crash rate, which is a measure of the frequency of crashes compared to traffic volumes. Roadway segment crash rates are based on crashes per million vehicle miles traveled (C/MVMT).

3.3.3 Segment Crashes

Crash data throughout the corridor was summarized for the most recent five years of data available, 2012 through 2016. The crash history for the corridor has been compiled in tabular form and is included in the report Appendix. A total of 200 crashes occurred on Route 16 east of Irving Street/Palfrey Street to west of Arlington Street, and north of Grove Street to intersection Mt Auburn Street at



Arlington Street. The prevalent manner of collision for this time period were angle crashes (50%), followed by rear-end type crashes (23%). In addition, the majority of crashes occurred during daylight conditions (73%), under clear weather (54%), and with a dry road surface (77%). The highest crash time of day was from 8:00 to 10:00 a.m., 2:00 p.m. to 4:00 p.m. and 4:00 p.m. to 6:00 p.m. (31%). No crashes during the five-year period involved a fatal injury. The Safety Review prompt list was utilized when reviewing the safety of the corridor.

MassDOT releases official Statewide rates that can be used as an effective tool to compare safety hazards along a specific corridor. The functional classification of Mt Auburn Street (State Route 16) is urban principal arterial. The latest Statewide rates for urban principal arterial are 3.49 crashes per million vehicles miles traveled (C/MVMT). The calculated rate for the five-year analysis of the Route segment was 3.16 C/MVMT. It should be noted that the location for some crashes cannot be precisely determined from the database and that not all crashes are reported, particularly those with property damage less than \$1000.

Table 4 - MassDOT Crash Rates

Segment Crash Rates for Urban Principal Arterial (C/MVMT)	
Average	Study Corridor
Principal Arterial- other	Route 16 (Mt Auburn St)
3.49	3.57
Major/Minor Collector	Arlington Street
3.58	6.65

2016 Average Crash Rates, per Million Vehicle Miles Traveled, by Federal Functional Classification (Based upon crash information queried on June 22, 2018)

The crash rate of the Mt Auburn St study corridor (Route 16) is slightly above the statewide average for Urban Principal Arterial, meanwhile, the crash rate of the Arlington Street study segment is higher than the Major/Minor Collector. Crash rates higher than this average could indicate a potential safety issue. The signalized intersection at Mt Auburn St at Arlington St intersection (Route 16) skews the results of the Arlington Street segment. A crash summary sheet and crash rate calculation worksheet are included in the appendix.

3.3.4 Intersection Crashes

To evaluate crash data effectively, the number of crashes must relate or be compared to the traffic volumes entering the intersection or traveling along the roadway. A procedure used for this purpose is the calculation of an intersection or roadway segment crash rate, which is a measure of the frequency of crashes compared to traffic volumes. Intersection crash rates are based on crashes per million entering vehicles (C/MEV).

MassDOT releases official Statewide and District rates that can be used as an effective tool to compare safety hazards at a specific intersection. Table 5 shows the Statewide and District 6 crash rates for signalized and unsignalized intersections.



Table 5 - MassDOT Crash Rates

	Intersection Crash Rates (C/MEV)	
	Signalized Intersection	Unsignalized Intersection
Statewide	0.78	0.57
District 6	0.71	0.52

Average Crash Rates, by Intersection Type (Based upon crash information queried on June 22, 2018)

Based on the TMC (Intersection Turning Movement count) data, this study separates the intersection into signalized and unsignalized intersection.

Table 6 - Intersection locations of the Watertown study corridor:

	Intersection	
	Signalized Intersection	Unsignalized Intersection
Mt Auburn St / Arlington St	✓	
Mt Auburn St / School St	✓	
Mt Auburn St / Boylston St		✓
Mt Auburn St / Kimball Rd / Bigelow Ave	✓	
Mt Auburn St / Walnut Street / Bates Road East	✓	
Mt Auburn St / Common Street / Parker Street	✓	
Mt Auburn St / Irving Street / Palfrey Street	✓	
Arlington Street / Grove Street / Tufts Health Plan Driveway		✓

Signalized Intersections

Crash rates were calculated at intersections where 3 or more crashes per year were recorded. Collision diagrams and summary charts were developed for intersections with more than 3 crashes per year. A summary of the number of crashes and respective crash rate at each intersection is given in Table 7.

These signalized intersections were:

- Mt Auburn Street at Common Street at Parker Street;
- School Street at Mt Auburn Street;
- Arlington Street at Mt Auburn Street;

Common Street/Parker Street at Mt Auburn Street had 20 crashes in the five-year study period which equates to a rate of 0.38 C/MEV. Nine of the crashes were rear-end and 4 were angle. Thirteen of the crashes at this intersection occurred during the day, 14 occurred with clear weather and 16 crashes occurred on the dry pavement.

School Street at Mt Auburn Street had 18 crashes in the five-year study period which equates to a rate of 0.42 C/MEV. Six were angle crash and 5 crashes were single vehicle crash. Thirteen of the crashes at this intersection occurred during the day, 12 occurred with clear weather and 13 crashes occurred on the dry pavement.



Arlington Street at Mt Auburn Street had 22 crashes in the five-year study period which equates to a rate of 0.47 C/MEV. There were 5 rear-end crashes, 7 angle crashes, as well as 6 single vehicle crashes. Fourteen of the crashes at this intersection occurred during the day, 13 occurred with clear weather and 16 crashes occurred on the dry pavement.

The studied intersections both currently present crash rates and crash patterns that demonstrate an urgent need for safety improvements. In addition, a field review of the MassDOT Safety Review Prompt list at many of the project intersections identify physical features contributing to crashes. A review of the crash data reveals that a large percentage of the crashes that occurred at major intersections in the corridor were angle type crashes followed closely by rear-end type.

A reduction in the number of through lanes and the addition of exclusive left turn lanes at intersections will significantly reduce crashes along the corridor. New signs and pavement markings will decrease driver confusion in the corridor. Updated and improved signals and intersection improvements, including exclusive left turn lanes at signalized intersections will help improve traffic operations and safety. The addition of buffered bicycle lanes and increased clearance times for vehicles and pedestrians should improve the safety for all users of the corridor.

Table 7 – Intersection Crashes and Crash Rates

Crash Rates 2012-2016		
Mt Auburn Street	Crashes per year	Intersection Crash Rates (C/MEV)
		Signalized Intersection
At Irving Street / Palfrey Street	2.0	0.22
At Common Street / Parker Street	4.0	0.38
At Bates Road / Walnut Street	2.4	0.33
At School Street	3.6	0.42
At Bigelow Ave / Kimball Rd	1.4	0.17
At Arlington St	4.4	0.47

Unsignalized Intersection

During the five-year study period, there are three unsignalized intersection in the study area experiencing more than 2 crashes per year during the analysis period.

- Mt Auburn Street at Upland Road/Dexter Ave.
- Mt Auburn Street at Templeton Parkway
- Grove Street at Arlington Street

Upland Road/Dexter at Mt Auburn Street had 10 crashes in the five-year study period which equates to a rate of 0.28 C/MEV. Nine of the crashes occurred on a dry road surface (90%), eight crashes occurred during daylight conditions (80%), six crashes were angle type.

Templeton Pkwy at Mt Auburn Street had 11 crashes in the five-year study period which equates to a rate of 0.31 C/MEV. Nine of the crashes occurred on a dry road



surface (81%), nine crashes occurred during daylight conditions (81%), four crashes were sideswipe, with three (3) of the rear-end crashes involving slowing or stopped in traffic.

Grove Street at Arlington Street had 19 crashes in the five-year study period which equates to a rate of 0.57 C/MEV. thirteen of the crashes occurred on a dry road surface (68%), fifteen crashes occurred during daylight conditions (80%), thirteen crashes were angle collisions.

Two of the intersections described above with 2 or more crashes per year exhibited low crash rates when compared to average crash rates for unsignalized intersections in Massachusetts and more importantly in MassDOT District 6 where Watertown is located. The intersection of Grove Street at Arlington Street is a different story, with a relatively high crash rate for unsignalized intersections in District 6. In order to improve safety at this intersection, new traffic signals are proposed to help reduce the number of angle collisions resulting from drivers accepting less than safe gaps in thru traffic to enter the intersection.

3.3.5 Collision Diagram

A collision map was developed for the entire corridor as well as a collision diagram for the intersection of Route 16 (Mt Auburn Street) from Irving Street/Palfrey Street to Arlington Street. Collision map, diagram, and crash summary statistics are included in the Appendix.

3.4 Traffic Signal Warrants

A traffic signal warrants analysis is an engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of a location to help determine if a traffic signal installation is justified at an intersection. Traffic signal warrants are defined in the Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition published by Federal Highway Administration. Nine warrants are presented in the MUTCD:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Each warrant analysis compares existing conditions at the study location with established thresholds or criteria to establish whether the installation of a traffic signal is warranted. Although satisfaction of one warrant may not be enough to justify a



signal installation, the MUTCD states “the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.” Furthermore, before and after studies of unwarranted traffic signals typically indicate that an unjustified signal installation causes an increase in the number of crashes at the intersection. Furthermore, per Massachusetts amendments to the MUTCD regarding the factors for justifying traffic control signals, MassDOT views the satisfaction of Warrant 1 (eight-hour vehicular volume) as paramount when justifying a traffic control signal on vehicular flow.

The following warrants were satisfied (See the appendix for traffic signal warrant checklists).

Mount Auburn/ Irving-Palfrey Street - Location 1

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour

Mount Auburn/ Common Street – Location 4

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour

Mount Auburn/ Bates Road-Walnut Street – Location 5

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour

Mount Arlington/ Boylston Street – Location 6

- Warrant 5. Peak Hour – See below for additional information

Mount Auburn/ School Street – Location 9

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour

Mount Auburn/ Bigelow Avenue – Location 15

- Warrant 1. Eight-hour Vehicular Volume - Likely
- Warrant 2. Four-hour Vehicular Volume - Likely
- Warrant 3. Peak Hour

Mount Auburn/ Arlington Street – Location 17

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour

Arlington Street/ Grove Street – Location 18

- Warrant 1. Eight-hour Vehicular Volume
- Warrant 2. Four-hour Vehicular Volume
- Warrant 3. Peak Hour



As shown above, all of the proposed signalized intersections meet traffic signal warrants. The existing pedestrian signal east of Boylston Street experiences few pedestrians and will be removed.

Most of the proposed signals meet the critical 8-hour warrant (Warrant #1). The intersection of Mount Auburn Street/ Boylston Street does not meet the eight hour volume warrants.

A Traffic Impact Analysis for Elementary Schools Reconstruction in Watertown, Massachusetts was conducted by Pare Engineering in June 2018. The study collected data at the intersection of Mount Auburn Street/ Boylston Street in April 2018. These counts showed slightly higher volumes than were collected by WorldTech in February 2018. In addition, future analysis showed a projected increase in Hosmer School population of 22%.

Based on this new data, under existing conditions, this intersection does not meet any traffic signal warrants. Under future conditions with an expected increase in Hosmer School population, the intersection meets the threshold for the peak hour volume warrants, Warrant #3. The peak hour volume is exceeded for two hours of the day, during morning school drop-off and during school release.

3.5 Public Transportation

The Massachusetts Bay Transportation Authority (MBTA) operates a trackless trolley route (Route 71, Watertown Square – Harvard Station via Mount Auburn Street) along Mount Auburn Street between Watertown Square and the Harvard MBTA Rapid Transit station in Cambridge, the inbound and outbound distance from Watertown Square to Harvard Bus Tunnels is 3.7 mile.

As of Fall 2019, the most recent data available, this route has an average weekday daily ridership of 3,881 (1,854 inbound and 2,027 outbound). Average weekday boardings at each stop within the study area are given in Table 8. Schedule, fare, and ridership information is provided in the *Technical Appendix*.



Table 8 - Existing MBTA Route 71 Weekday Ridership (Winter 2017)

Trolley Stop	Inbound			Outbound		
	Boardings	Alightings	Total	Boardings	Alightings	Total
Summer Street/Patten Street	9	138	147	161	5	166
Marshall Street/Parker Street	13	154	167	172	15	187
Russell Avenue/Franklin Street	11	95	106	98	13	111
Bates Road East/Walnut Street	9	58	67	64	14	78
Boylston Street/ Amherst Road	82	18	100	18	82	100
Adams Avenue/ Adams Street	43	72	115	128	46	174
Winthrop Street	-	-	-	79	34	113
Winsor Avenue/School Street	27	88	115	81	32	113
Upland Road	36	91	127	-	-	-
Bigelow Avenue	-	-	-	247	98	345
Kimball Road/Keenan Street	98	264	362	47	205	252
Keenan Street	240	53	293	-	-	-
St. Mary's Street/Ralph Pietri Terrace	42	100	142	83	38	121
Main Street/Main Street	109	4	113	7	260	267
Total	719	1135	1854	1185	842	2027

It is important to note that the trackless trolley provides service via suspended wires located along Mount Auburn Street. These wires provide the electricity necessary to operate the trolley bus and, as such, play a critical role in any reconstruction alternatives. Bearing this in mind all geometric improvements suggested within this corridor have taken this very specific constraint into account.

The current plan is to remove the catenary wires poles during reconstruction and replace the poles following construction.

Additionally, Route 71 is one of fifteen routes identified by the MBTA as a “Key Bus Route.” These routes are characterized by high ridership and high service frequency seven days a week. Under its Key Bus Route Improvement Program, the MBTA has implemented improvements including stop consolidation, accessibility enhancements, and improved shelters.

The project team met with the MBTA and discussed bus stop locations in 2017 and 2018 as part of this project.

The proposed project will include additional enhancements along the route of the Route 71 Bus including marked off-street bus pull-outs, curb extensions, crosswalk improvements at key stops, and the capability for implementing transit signal priority. Several options were studied for consolidation and/or relocation of certain bus stop in the corridor. The stops at Russell/Franklin Streets, Baily Road/Lincoln Street, Oakley Road, and Lloyd Road were recommended to be removed. Bus stops at Parker Street, Bated Road East, Amherst Road, Adams Street, Kimball Road, Bigelow Avenue, St. Mary's Street and Ralph Pietri Terrace were recommended to be relocated, from near



side stops to far side stops. Queue jump lanes will be provided at the signalized intersections of Mount Auburn Street with School Street and Walnut Street to help facilitate bus travel in the corridor. The Town has engaged the MBTA during the conceptual phase and will continue to coordinate with MBTA throughout the design process.

3.6 Parking

Parking concerns were raised within the two business districts on either end of the Mount Auburn Street corridor. Within the Coolidge Square area east of Hillside Road, most of the parking is posted for short term use, for visitors and patrons of local businesses. The Town expressed great concern over the availability of parking in Coolidge Square and its impact on business. Currently, metered parking is provided along the south side of Mount Auburn Street from Boylston Street/Hillside Road to Arlington Street and along the north side from Lloyd Road to Kimball Road. One-hour unmetered parking is permitted between the hours of 7:00 AM and 7:00 PM along both sides of Arlington Street from Wells Avenue to Merrifield Avenue.

Similarly, on-street metered parking is provided along both sides of Mount Auburn Street in the Watertown Square area between Baptist Walk/Taylor Street and Summer Street and along the south side of Mount Auburn Street between Summer Street and Patten Street for businesses in the Watertown Square area. Within the study area east of Summer Street, metered parking spaces are provided along the south side of Mount Auburn Street with a time limit of two hours.

Between Patten Street and Hillside Road, parking is generally permitted along the south side of Mount Auburn Street in this predominantly residential section of the corridor. Based on observations of existing parking regulation signs, parking is unrestricted except at the following locations.

- Parker Street to Otis Street, one hour
- Otis Street to Walnut Street, two hours
- Lincoln Street to Spruce Street, two hours
- Adams Avenue to Chauncey Street, one hour
- School Street to Boylston Street/Hillside Road, one hour.

None of the design alternatives developed as a part of this 25% would negatively impact legal parking in the study area.



4.0 FUTURE CONDITIONS

In this section, existing traffic volumes are projected to a future design year and then evaluated with and without improvements to identify the impacts of the project. The development and analysis of these future traffic flows are described in the following sections.

4.1 Traffic Volume Projections

Future traffic demand volumes were developed to evaluate intersection operations after the project has been constructed. Further traffic volume projections generally consist of general background growth, and traffic generated from specially proposed developments impacting the study area intersections. In order to assess the potential traffic impacts occurring within the future, existing traffic volumes were projected to a future design year. Typically, general background growth is a function of population growth, future land development, increased economic activity and changes in travel patterns. A twelve-year (2030) traffic projection was utilized on the study area roadways.

Several methods are used to estimate this growth. To develop 2030 design year volumes, existing traffic volumes are typically increased by an annual growth rate based on historical traffic volume data and/or population forecasts. Historical traffic volumes were examined from Town of Watertown. Historical traffic volumes at three different sections of the Mount Auburn Street corridor were reviewed to estimate a general background traffic growth rate. Based on data summarized between 2007 and 2018, traffic volumes along Mount Auburn Street have been declining, based on information from this traffic counting monitoring stations. It was determined that a 0.5% per year general background growth for traffic was best suited to model anticipated traffic activity level in 2030. The recently published Arsenal Street Corridor Study in Watertown is using a 5% total growth rate from 2015 to 2040 to estimate traffic volumes in the 2030 time period, based on output from the CTPS regional travel demand model for Watertown.

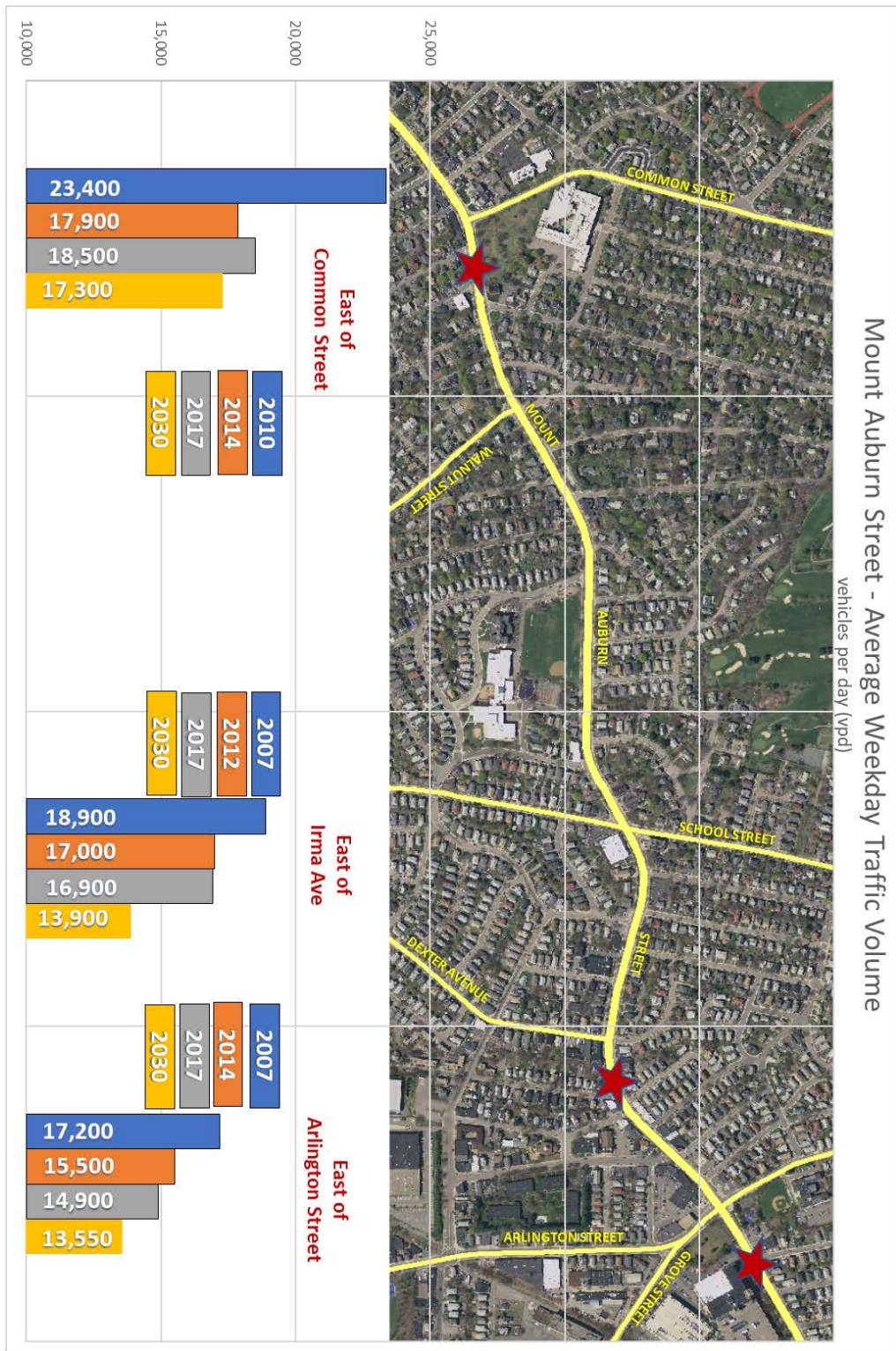


Figure 3



In addition, traffic volumes from several new developments in the vicinity of study area were added to the general background traffic. Additional information was obtained from a recent Traffic Study¹ prepared for the Town of Watertown identifying developments in the project area that might affect the growth rate.

The following provides a summary of the identified background development projects:

- **Residential Development - 101 North Beacon Street-** This project consists of a residential development to be located at 101 North Beacon Street.
- **Mixed Use Development- 33 Mount Auburn Street** - This project consists of the development of 15 condominium units and 1,924 sf of commercial space/retail space.
- **Elan/Union Market** - This project will consist of 282 apartment units and 11,000+/- sf of retail space.
- **Arsenal on the Charles** - This project includes the expansion of the Arsenal on the Charles mixed-use commercial, recreational, and cultural development occupying approximately 1,130,000 sf.
- **Arsenal Yards** - This project will include the redevelopment of 221,500 sf of retail space, 52,847 sf of medical office building 48,000 sf of restaurant space, a 16-lane bowling alley, an 8-screen movie theater, a 25,000-sf supermarket and approximately 500 apartment units.
- **Office Development- 65 Grove Street** - This project will include the redevelopment of 122,470 +/- of general office space.
- **85 Walnut Street-Commercial Development** - This project includes the development of 213,5000 sf of commercial office space.

Traffic volumes associated with the development projects cited above, were obtained from a traffic study prepared for 85 Walnut Street Commercial Development and were assigned to study area roadways based on the referenced TIA. Copies of these trip generation diagrams are included in the Appendix.

Applying the background growth rate and development projects to the 2018 traffic volumes resulted in the projected future (2030) peak hour volumes, which are shown in Figure 4 and Table 9.

¹ Transportation Impact Assessment-Proposed Commercial Development, 85 Walnut Street, VAI, September 2019.



4.2 ESTABLISHMENT OF BASIC DESIGN CONTROLS AND EVALUATION CRITERIA

Design controls established for this project include a combination of fundamental features of the project area and controls selected by the designer in conjunction with state/federal agencies and the surrounding communities.

4.2.1 Roadway Context

The three main elements of roadway context considered for design include roadway type, area type and access control. The roadway type for this project is major arterial (link cities and towns in urban areas and interconnect major arterial with urban areas). The existing access will be maintained.

4.2.2 Roadway Users

Roadway users of this facility include pedestrians, bicyclists, motor vehicles and bus transit. The design vehicle for this project is a tractor trailer (WB-50).

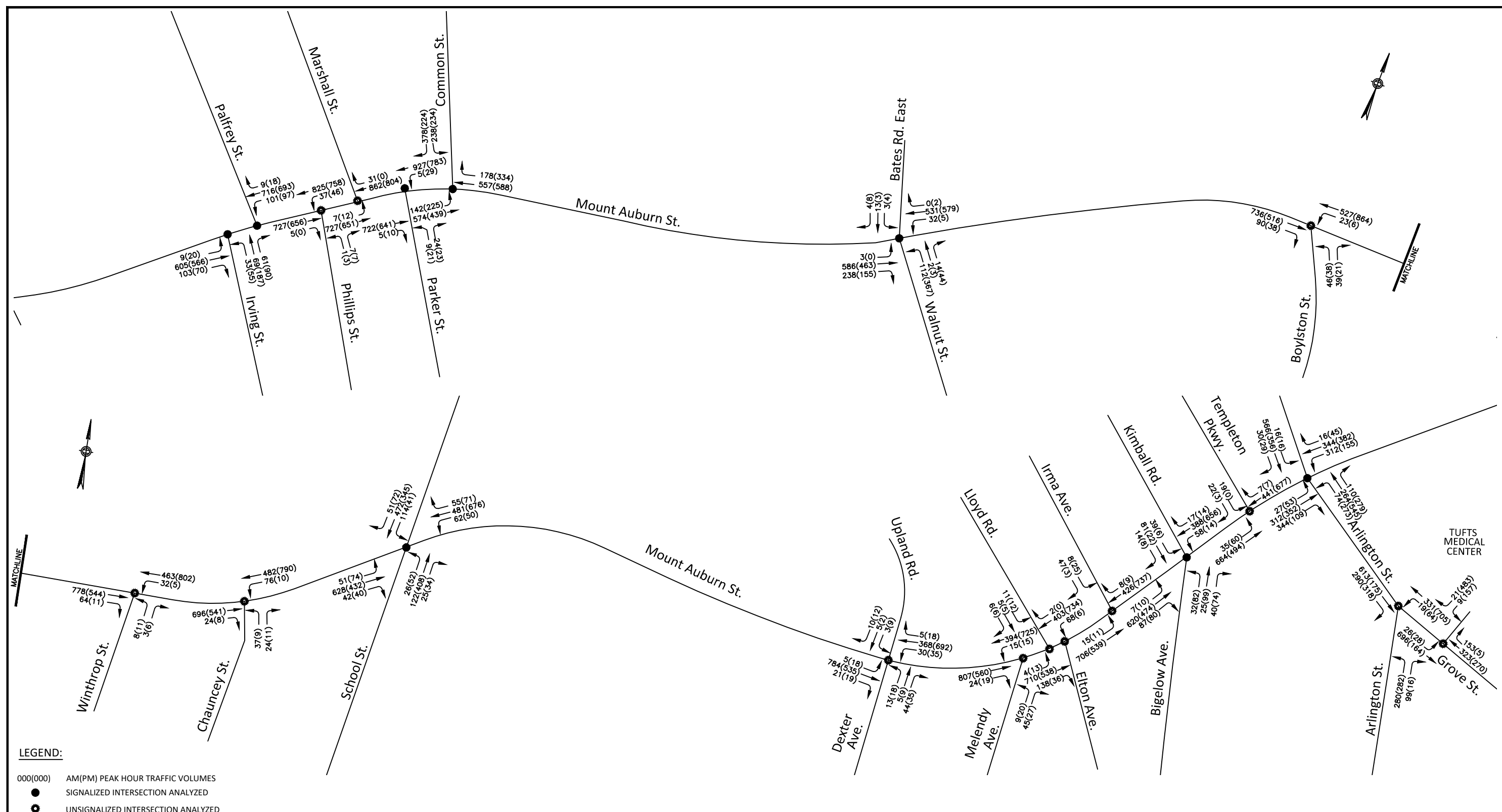
4.2.3 Measures of Effectiveness

The following measures of effectiveness related specifically to transportation function have been incorporated into the design:

- Existing deficiencies are being eliminated or improved
- Addressing known safety problems
- Increasing pedestrian/bicycle accommodations in the project area
- Increasing transit connectivity / reliability
- Improving or maintaining level of service

The following measures of effectiveness related specifically to the surroundings and community function have been incorporated into the design:

- Avoiding/minimizing impacts to legal parking spaces
- Improving accessibility meeting ADA requirements
- Improving aesthetics in the corridor

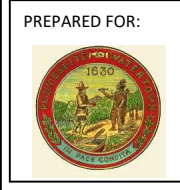


LEGEND:

000(000) AM(PM) PEAK HOUR TRAFFIC VOLUMES

● SIGNALIZED INTERSECTION ANALYZED

○ UNSIGNALIZED INTERSECTION ANALYZED



TITLE:
MOUNT AUBURN STREET (ROUTE 16) CORRIDOR IMPROVEMENTS
 2030 Design Year Traffic Volumes - No Build

PREPARED BY:
WORLDTECH ENGINEERING
 300 TRADE CENTER, SUITE 5580
 WOBURN, MASSACHUSETTS 01801
 PHONE: 781.933.4800
 FAX: 781.933.4801

DATE:
 10-15-2019

SCALE:
 1" = 250'

Figure 4



4.3 Traffic Operations and Queue Analysis

Existing peak hour traffic operations in the traffic study area were assessed from both a quantitative and qualitative perspective. The qualitative analysis is based on field observations made during peak traffic periods, while the quantitative analysis is based on calculated intersection operating levels of service as described in greater detail below.

4.3.1 Capacity Analysis Methodology

The capacity analysis methodology is based on the concepts and procedures described in the “Highway Capacity Manual” (HCM), 2010, Transportation Research Board, Washington, DC. A capacity analysis is used to assess the quality of traffic operations on a roadway or intersection as a result of traffic volume demands placed on the respective facility. The primary result of a capacity analysis is a level of service (LOS) assignment to the traffic operations of the respective facility. A LOS analysis results in assigning a letter index of A through F to describe the quality of traffic operations at a facility in terms of such factors as speed, traffic interruptions, freedom to maneuver, comfort, convenience and safety. The six letter designations of A through F define the operating conditions from best to worst, respectively. In general, a LOS C is used as the minimum design criteria although D is acceptable at urban, high volume locations.

LOS for either signalized or unsignalized intersections can be computed by the described methodology. LOS for signalized intersections is defined in terms of delay, which is a measure of driver discomfort, frustration, fuel consumption and lost travel time. The delay experienced by a motorist is made of factors that relate to intersection control, geometrics and traffic volumes. This delay is called “control delay” or “signal delay”. Control delay includes initial deceleration delay, queue move-up time, stopped delay and final acceleration delay. Specifically, LOS criteria at an intersection with traffic signals are stated in terms of the average control delay per vehicle.

The LOS for an unsignalized intersection (two-way stop control) is defined for each minor movement, not for the intersection as a whole. The LOS criteria for the unsignalized intersections are somewhat different from the criteria for the signalized intersections. The primary reason for the difference is that motorists expect different levels of performance from the two facilities. Due to these expectations, the control delay threshold for any given LOS is less for an unsignalized intersection than it is for a signalized intersection. Table 10 summarizes the LOS criteria associated with the letter index and the relationship between signalized and unsignalized intersections. The LOS delay criteria may be applied to individual lane groups, to individual intersection approaches or to the entire signalized or unsignalized intersections.



Table 10 - Intersection Level of Service Criteria 1

Level of Service	Average Stopped Delay per Vehicle (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	0 - 10	0 - 10
B	>10 - 20	>10 - 15
C	>20 - 35	>15 - 25
D	>35 - 55	>25 - 35
E	>55 - 80	>35 - 50
F	>80	>50

2010 Highway Capacity Manual, Transportation Research Board, Washington, DC

4.3.2 Level of Service Analyses

Level of Service (LOS) analyses were performed for the study area intersections under various conditions to arrive at proposed optimal improvements. The unsignalized and signalized intersection methodology was used to evaluate the various alternatives. To reiterate, the unsignalized intersection methodology evaluates only the conflict movements, that is, the major street left turns and the minor street approaches. It does not assign a LOS to the intersection.

Existing Queues

In addition to level of service, a review of the 95th percentile queue lengths were performed during each of the peak hours under existing conditions. While an intersection may show acceptable levels of service, extensive queue lengths may exist that impede operations elsewhere by extending into adjacent intersections or other conflict areas. A description of the critical queues at each intersection location is presented below.

Volume-to-Capacity Ratio

In addition to LOS, another factor to take into consideration when discussing operation is the “volume-to-capacity” ratio. The volume-to-capacity (v/c) ratio is the ratio of the volume travelling in a lane group to the capacity of the same lane group, a percentage of the lane group’s capacity being utilized. As with delay, this measure can be utilized for either the individual approach or the intersection. As opposed to delay there is no standard gauge to provide a specific point of reference for a certain volume-to-capacity ratio; however, a lower volume-to-capacity ratio indicates that backups are less likely. As the v/c ratio approaches 1.0, the operation worsens since the facility is reaching capacity. A volume-to-capacity ratio of 1.0 or greater indicates traffic volumes are exceeding capacity. A volume-to-capacity ratio under 1.0 is considered acceptable.

The various conditions and results are discussed below. The analysis worksheets are provided in the Appendix.



4.3.3 Capacity Analysis with Existing Geometry (Existing VS No Build)

Tables 11 and 12 summarize the results of the Existing 2018 and Future No Build Year 2030 traffic operational analysis assuming existing roadway and intersection geometry are to remain. For future conditions, it was assumed that existing signal equipment and phasing would remain, but signal timing would be optimized, and pedestrian intervals would be adjusted to comply with the latest MUTCD standards. Since most of the project consists of a road diet, the expected No-Build traffic operating conditions will be used as a baseline for comparison with proposed improvements (Build traffic operating conditions).

Capacity analysis worksheets can be found in the appendix.

4.3.4 Unsignalized Intersection Analysis Summaries (Existing Geometry)

With the existing roadway and intersection geometry, most of the unsignalized study area intersections are operating at acceptable levels of service under future No Build traffic volumes with the exception of the Grove Street intersection with Arlington Street. At the intersection of Grove Street and Arlington Street a large volume of NB left turns have insufficient gaps and suffer from a poor level of service. This intersection is anticipated to be signalized in the future build scenario, which should improve the traffic operations and safety at this location.



Table 11 - Unsignalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Phillips Street								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB T	0.26	0.0	A	0 50/127	0.27	0.0	A	0 34/98
Mount Auburn Street EB R	0.13	0.0	A	0 25/84	0.14	0.0	A	0 34/92
Mount Auburn Street WB L	0.03	1.0	A	2 29/74	0.04	1.5	A	3 33/77
Mount Auburn Street WB T	0.34	0.0	A	0 24/67	0.34	0.0	A	0 15/55
Phillips Street NB LR	0.01	10.2	B	1 7/29	0.01	10.0	B	1 8/31
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB T	0.24	0.0	A	0 136/224	0.27	0.0	A	0 155/155
Mount Auburn Street EB R	0.14	0.0	A	0 102/222	0.13	0.0	A	0 169/169
Mount Auburn Street WB L	0.03	1.1	A	2 20/72	0.05	1.8	A	4 63/67
Mount Auburn Street WB T	0.28	0.0	A	0 18/64	0.30	0.0	A	0 3/25
Phillips Street NB LR	0.12	10.2	B	10 222/468	0.02	11.6	B	1 256/433
Mount Auburn Street at Marshall Street								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB LT	0.28	0.4	A	1 65/101	0.29	0.4	A	1 54/102
Mount Auburn Street WB TR	0.36	0.0	A	0 32/94	0.36	0.0	A	0 22/70
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB LT	0.26	0.8	A	4 61/101	0.27	0.7	A	1 114/114
Mount Auburn Street WB TR	0.29	0.0	A	0 96/170	0.32	0.0	A	0 115/166

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Boylston Street								
Weekday Morning Peak Hour:								
Mount Auburn Street EB T	0.24	0.0	A	0 3/22	0.28	0.0	A	0 -
Mount Auburn Street EB R	0.17	0.0	A	0 2/13	0.20	0.0	A	0 -
Mount Auburn Street WB LT	0.20	0.5	A	2 14/43	0.21	1.4	A	2 9/32
Boylston Street NB LR	0.41	22.6	C	48 25/47	0.68	40.4	E	115 33/61
Weekday Evening Peak Hour:								
Mount Auburn Street EB T	0.19	0.0	A	0 -	0.21	0.0	A	0 -
Mount Auburn Street EB R	0.12	0.0	A	0 -	0.13	0.0	A	0 -
Mount Auburn Street WB LT	0.30	0.1	A	0 171/669	0.32	0.3	A	0 541/1080
Boylston Street NB LR	0.19	18.4	C	17 68/221	0.20	19.8	C	19 255/586
Mount Auburn Street at Winthrop Street								
Weekday Morning Peak Hour:								
Mount Auburn Street EB TR	0.28	0.0	A	0 9/44	0.30	0.0	A	0 8/43
Mount Auburn Street WB LT	0.19	0.8	A	3 21/65	0.20	2.2	A	4 13/51
Winthrop Street NB LR	0.05	20.4	C	4 13/35	0.05	22.0	C	4 7/27
Weekday Evening Peak Hour:								
Mount Auburn Street EB TR	0.21	0.0	A	0 -	0.22	0.0	A	0 -
Mount Auburn Street WB LT	0.29	0.1	A	0 25/109	0.30	0.1	A	0 66/140
Winthrop Street NB LR	0.05	15.1	C	4 7/26	0.05	15.8	C	4 61/176

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Chauncey Street								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB TR	0.25	0.0	A	0 2/18	0.26	0.0	A	0 7/41
Mount Auburn Street WB LT	0.19	1.6	A	7 27/62	0.20	3.9	A	8 23/62
Chauncey Street NB LR	0.36	24.8	C	39 36/70	0.38	26.7	D	43 35/63
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB TR	0.20	0.0	A	0 2/12	0.22	0.0	A	0 24/91
Mount Auburn Street WB LT	0.28	0.2	A	1 46/241	0.29	0.2	A	1 233/527
Chauncey Street NB LR	0.04	13.0	B	3 16/40	0.05	13.5	B	4 49/136

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Upland Road/Dexter Avenue								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB LTR	0.22	0.1	A	0 2/15	0.23	0.2	A	0 4/20
Mount Auburn Street WB LTR	0.11	0.9	A	3 15/49	0.11	1.7	A	3 18/71
Dexter Avenue NB LTR	0.17	16.4	C	15 31/54	0.17	16.6	C	16 31/63
Upland Road SB LTR	0.05	15.3	C	4 16/44	0.05	15.7	C	4 9/32
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB LT	0.17	0.4	A	1 3/20	0.17	0.4	A	2 4/26
Mount Auburn Street WB LT	0.19	0.5	A	2 5/22	0.20	0.6	A	3 115/334
Dexter Avenue NB LTR	0.20	19.2	C	19 28/60	0.22	20.7	C	21 110/345
Upland Road SB LTR	0.09	19.0	C	7 13/38	0.09	19.8	C	8 33/76
Mount Auburn Street at Melendy Avenue								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB TR	0.29	0.0	A	0 3/20	0.30	0.0	A	0 2/14
Mount Auburn Street WB LT	0.15	0.4	A	1 7/27	0.16	0.4	A	1 3/18
Melendy Avenue NB LR	0.11	13.3	B	9 14/32	0.12	13.7	B	10 15/30
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB TR	0.22	0.0	A	0 -	0.23	0.0	A	0 2/18
Mount Auburn Street WB LT	0.26	0.3	A	1 7/29	0.27	0.3	A	1 10/30
Melendy Avenue NB LR	0.11	13.9	B	9 13/33	0.12	14.4	B	10 48/145

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Lloyd Road/ Elton Avenue								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB LT	0.27	0.1	A	0 7/31	0.28	0.2	A	0 5/33
Mount Auburn Street WB TR	0.12	1.8	A	7 48/110	0.12	3.3	A	7 36/86
Lloyd Road SB LR	0.11	24.6	C	9 27/68	0.12	26.4	D	10 20/52
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB LT	0.18	0.3	A	1 3/21	0.02	0.8	A	2 6/33
Mount Auburn Street WB TR	0.19	0.2	A	1 6/26	0.01	0.2	A	0 58/180
Lloyd Road SB LR	0.11	23.4	C	9 16/49	0.14	29.2	D	12 59/183
Mount Auburn Street at Irma Avenue								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB LT	0.23	0.2	A	1 6/34	0.24	0.7	A	1 8/33
Mount Auburn Street WB TR	0.15	0.0	A	0 1/10	0.16	0.0	A	0 -
Irma Avenue SB LR	0.07	10.3	B	6 26/42	0.08	10.4	B	6 30/57
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB LT	0.19	0.2	A	1 4/23	0.20	0.2	A	1 1/10
Mount Auburn Street WB TR	0.25	0.0	A	0 -	0.26	0.0	A	0 51/167
Irma Avenue SB LR	0.08	16.1	C	6 19/47	0.08	16.8	C	7 36/113

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Mount Auburn Street at Templeton Parkway								
<i>Weekday Morning Peak Hour:</i>								
Mount Auburn Street EB LT	0.23	1.1	A	5 48/131	0.24	1.5	A	3 68/184
Mount Auburn Street WB TR	0.17	0.0	A	0 -	0.18	0.0	A	0 4/31
Templeton Parkway SB LR	0.09	11.3	B	7 29/56	0.07	11.4	B	6 21/49
<i>Weekday Evening Peak Hour:</i>								
Mount Auburn Street EB LT	0.19	1.2	A	5 20/64	0.20	1.2	A	5 12/45
Mount Auburn Street WB TR	0.24	0.0	A	0 1/10	0.25	0.0	A	0 36/118
Templeton Parkway SB LR	0.00	9.3	A	0 1/9	0.00	9.4	A	0 8/31

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Arlington Street at Grove Street								
<i>Weekday Morning Peak Hour:</i>								
Arlington Street EB T	0.35	0.0	A	0 3/20	0.35	0.0	A	0 5/33
Arlington Street EB R	0.17	0.0	A	0 -	0.17	0.0	A	0 -
Grove Street WB L	0.02	8.8	A	2 4/22	0.02	8.8	A	2 7/28
Grove Street WB T	0.19	0.0	A	0 3/16	0.19	0.0	A	0 1/10
Arlington Street NB L	1.03	103.4	F	267 76/109	1.03	103.8	F	268 82/111
Arlington Street NB R	0.18	13.3	B	17 19/60	0.18	13.3	B	17 28/73
<i>Weekday Evening Peak Hour:</i>								
Arlington Street EB T	0.11	0.0	A	0 1/10	0.11	0.0	A	0 3/21
Arlington Street EB R	0.19	0.0	A	0 -	0.21	0.0	A	0 -
Grove Street WB L	0.05	7.7	A	4 13/50	0.05	7.7	A	4 5/29
Grove Street WB T	0.43	0.0	A	0 73/89	0.45	0.0	A	0 69/88
Arlington Street NB L	1.23	175.5	F	361 93/97	1.39	240.6	F	438 91/99
Arlington Street NB R	0.02	9.2	A	2 -	0.02	9.3	A	2 3/24

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 11 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic
Grove Street at Tufts Health Plan Driveway								
<i>Weekday Morning Peak Hour:</i>								
Grove Street EB LT	0.03	0.8	A	2 18/66	0.03	0.8	A	2 -
Grove Street WB TR	0.31	0.0	A	0 -	0.31	0.0	A	0 -
Tufts Health Plan dwy SB L	0.06	28.7	D	5 13/41	0.06	28.8	D	5 -
Tufts Health Plan dwy SB R	0.04	11.1	B	3 13/37	0.04	11.1	B	3 -
<i>Weekday Evening Peak Hour:</i>								
Grove Street EB LT	0.03	1.4	A	2 19/60	0.03	1.5	A	2 -
Grove Street WB TR	0.19	0.0	A	0 56/117	0.20	0.0	A	0 -
Tufts Health Plan dwy SB L	0.40	18.1	C	48 139/204	0.44	19.7	C	56 -
Tufts Health Plan dwy SB R	0.78	25.0	D	190 166/203	0.85	31.7	D	241 -

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 12 - Signalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d	v/c ^a	Delay ^b	LOS ^c	Queue ^d
				95% Synchro 50%/ 95% Simtraffic				95% Synchro 50%/ 95% Simtraffic
Mt Auburn Street at Irving Street/Palfrey Street								
Weekday Morning Peak Hour:								
Mt. Auburn Street EB LTR	0.26	5.1	A	35/121 66/132	0.31	5.4	A	43/146 78/153
Mt. Auburn Street WB LTR	0.43	6.3	A	60/199 85/153	0.44	6.4	A	60/198 98/155
Irving St NB LTR	0.54	33.1	C	79/131 86/159	0.54	33.1	C	78/129 92/152
Overall	0.43	8.6	A		0.44	8.5	A	
Weekday Evening Peak Hour:								
Mt. Auburn Street EB LTR	0.29	7.7	A	66/173 325/723	0.31	8.3	A	72/185 517/520
Mt. Auburn Street WB LTR	0.41	8.8	A	89/231 54/125	0.36	8.8	A	85/217 9/54
Irving St NB LTR	0.72	41.7	D	196/264 553/1196	0.73	41.2	D	204/273 442/442
Overall	0.47	14.6	B		0.44	14.9	B	
Mt Auburn Street at Parker Street/Common Street								
Weekday Morning Peak Hour:								
Mt. Auburn Street EB LTR	0.56	18.2	B	107/199 58/68	0.72	22.4	C	140/223 77/96
Mt. Auburn Street WB LTR	0.67	34.9	C	200/349 220/343	0.73	36.9	D	217/376 226/349
Parker St NB LTR	0.02	48.4	D	0/0 8/28	0.02	48.5	D	0/0 12/29
Common St SB L	0.60	49.0	D	108/#225 612/620	0.63	50.4	D	114/#247 313/330
Common St SB R	0.71	39.1	D	178/#292 195/195	0.75	41.6	D	188/#279 195/195
Overall	0.61	31.5	C		0.69	33.6	C	
Weekday Evening Peak Hour:								
Mt. Auburn Street EB LTR	0.55	21.0	C	127/242 47/60	0.57	21.3	C	133/251 17/17
Mt. Auburn Street WB LTR	0.75	40.5	D	265/439 394/562	0.75	40.5	D	274/451 492/501
Parker St NB LTR	0.03	51.5	D	0/0 85/244	0.02	51.0	D	0/0 276/498
Common St SB L	0.61	50.6	D	147/279 396/772	0.64	51.8	D	152/288 276/276
Common St SB R	0.41	31.3	C	113/170 102/151	0.43	31.7	C	117/175 58/58
Overall	0.58	34.6	B		0.59	34.7	C	

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Through; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 12 - Signalized Intersection Level of Service Summary-Continued

Intersection/Peak Period/Movement along	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d	v/c ^a	Delay ^b	LOS ^c	Queue ^d
				95% Synchro 50%/ 95% Simtraffic				95% Synchro 50%/ 95% Simtraffic
Mt Auburn Street at Bates Road / Walnut Street								
<i>Weekday Morning Peak Hour:</i>								
Mt. Auburn Street EB LT	0.22	4.7	A	33/63 76/163	0.15	8.0	A	36/154 121/231
Mt. Auburn Street EB R	0.22	5.0	A	15/49 42/60	0.13	8.2	A	18/118 46/57
Mt. Auburn Street WB LTR	0.25	4.8	A	35/67 71/134	0.16	8.2	A	41/171 92/158
Walnut Street NB LTR	0.56	24.6	C	35/75 66/118	0.10	26.1	C	38/119 53/98
Bates Road SB LTR	0.08	19.9	B	6/16 14/46	0.01	21.7	C	6/28 17/44
Overall	0.32	6.8	A		0.34	10.0	A	
<i>Weekday Evening Peak Hour:</i>								
Mt. Auburn Street EB LT	0.33	13.2	B	40/166 51/152	0.35	13.7	B	44/176 3/19
Mt. Auburn Street EB R	0.20	12.8	B	13/93 23/61	0.22	13.3	B	15/102 4/25
Mt. Auburn Street WB LTR	0.39	13.8	B	49/199 405/1075	0.40	14.1	B	51/200 850/1375
Walnut Street NB LTR	0.74	22.7	C	80/253 649/1773	0.75	23.1	C	85/267 452/653
Bates Road SB LTR	0.04	12.6	B	4/14 43/117	0.03	12.5	B	3/18 109/226
Overall	0.52	15.6	B		0.53	16.1	B	

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 12 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement along	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d	v/c ^a	Delay ^b	LOS ^c	Queue ^d
				95% Synchro 50%/ 95% Simtraffic				95% Synchro 50%/ 95% Simtraffic
Mt Auburn Street at School Street								
<i>Weekday Morning Peak Hour:</i>								
Mt. Auburn Street EB TR	0.41	14.1	B	83/190 113/193	0.45	14.6	B	93/211 121/201
Mt. Auburn Street WB TR	0.38	13.9	B	74/171 118/191	0.45	14.6	B	85/197 135/230
School Street NB T	0.31	22.4	C	49/128 115/286	0.37	23.5	C	55/143 84/177
School Street SB T	1.00	65.8	E	244/#605 1041/1406	1.14	112.2	F	~325/#704 1103/1211
Overall	0.61	29.8	C		0.69	44.4	D	
<i>Weekday Evening Peak Hour:</i>								
Mt. Auburn Street EB TR	0.37	13.8	B	67/158 59/135	0.39	14.0	B	71/166 22/70
Mt. Auburn Street WB TR	0.43	14.4	B	94/211 129/311	0.45	14.6	B	98/220 655/1483
School Street NB T	0.73	32.3	C	154/#390 644/1067	0.83	39.2	D	176/#452 999/1008
School Street SB T	0.70	31.0	C	152/#378 836/1478	0.81	37.1	D	179/#454 1026/1381
Overall	0.53	21.1	C		0.58	24.1	C	

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 12 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement along	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d	v/c ^a	Delay ^b	LOS ^c	Queue ^d
				95% Synchro 50%/ 95% Simtraffic				95% Synchro 50%/ 95% Simtraffic
Mt Auburn Street at Bigelow Ave/Kimball Rd								
Weekday Morning Peak Hour:								
Mt. Auburn Street EB LTR	0.29	5.4	A	43/162 46/103	0.31	5.5	A	46/172 56/123
Mt. Auburn Street WB LTR	0.23	5.0	A	30/118 60/124	0.24	5.1	A	32/125 54/125
Bigelow Ave NB LTR	0.68	54.2	D	86/142 64/120	0.56	47.7	D	67/116 53/107
Kimball Rd SB LTR	0.68	53.7	D	86/144 65/114	0.67	52.9	D	91/149 84/130
Overall	0.34	14.8	B		0.35	13.3	B	
Weekday Evening Peak Hour:								
Mt. Auburn Street EB LTR	0.29	8.9	A	62/154 29/74	0.31	9.2	A	64/191 24/65
Mt. Auburn Street WB LTR	0.30	9.0	A	72/172 57/131	0.32	9.3	A	73/212 101/191
Bigelow Ave NB LTR	0.76	48.7	D	162/#277 87/119	0.79	50.8	D	175/245 97/135
Kimball Rd SB LTR	0.08	33.3	C	15/43 18/42	0.08	33.1	C	16/39 102/344
Overall	0.40	16.6	B		0.42	17.2	B	

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 12 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement along	2018 Existing Conditions				2030 No Build Conditions			
	v/c ^a	Delay ^b	LOS ^c	Queue ^d	v/c ^a	Delay ^b	LOS ^c	Queue ^d
				95% Synchro 50%/ 95% Simtraffic				95% Synchro 50%/ 95% Simtraffic
Mt Auburn Street at Arlington St								
<i>Weekday Morning Peak Hour:</i>								
Mt. Auburn Street EB L	0.09	28.4	C	12/38 17/51	0.08	25.4	C	12/43 25/80
Mt. Auburn Street EB TR	0.45	32.5	C	104/182 108/138	0.43	29.4	C	105/#235 101/143
Mt. Auburn Street WB L	0.58	17.8	B	95/#362 116/178	0.68	20.0	B	97/#267 123/198
Mt. Auburn Street WB TR	0.19	14.0	B	55/126 77/185	0.20	13.8	B	55/129 68/173
Arlington Street NB L	0.34	28.9	C	28/58 33/73	0.34	29.6	C	29/61 50/83
Arlington Street NB TR	0.67	35.4	D	201/303 164/264	0.68	35.8	D	210/316 155/230
Arlington Street SB LTR	0.87	50.8	D	208/#293 268/422	0.94	62.5	E	220/#334 282/405
Overall	0.67	33.0	C		0.75	35.5	D	
<i>Weekday Evening Peak Hour:</i>								
Mt. Auburn Street EB L	0.14	22.8	C	20/64 25/68	0.16	23.3	C	22/67 15/46
Mt. Auburn Street EB TR	0.30	24.0	C	82/167 70/121	0.32	24.6	C	89/177 43/109
Mt. Auburn Street WB L	0.30	15.5	B	42/116 66/122	0.35	15.9	B	46/127 50/118
Mt. Auburn Street WB TR	0.23	15.8	B	66/148 62/119	0.25	16.0	B	70/156 119/262
Arlington Street NB TR	1.11	99.7	F	~381/511 329/365	1.20	136.5	F	~432/#564 324/341
Arlington Street SB LTR	0.41	27.9	C	105/150 132/235	0.46	28.5	C	114/161 211/473
Overall	0.65	53.6	D		0.72	69.1	E	

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Through; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



4.3.5 Signalized Intersection Analysis Summaries (Existing Geometry)

Under No Build conditions, all study area signalized intersections will continue to operate at an overall LOS D or better, with the exception of the following intersection:

- Mount Auburn Street at Arlington Street.

At the Mount Auburn Street with Arlington Street signalized intersection, under future 2030 conditions, Arlington Street southbound operations are expected to worsen, operating at LOS E during the morning peak hour, the southbound experiences a v/c ratio of 0.94 with 95th percentile queue of 334 feet (17 vehicles). During the evening peak hour, the v/c ratio of the northbound Arlington Street through movement is 1.20, with LOS F and the 95th percentile queue of 564 feet (28 vehicles).

At Mount Auburn Street at Common/Parker Street intersection, although overall level of service is LOS D, the queues formed on the Common Street SB right turn lane are a problem under Existing and No Build traffic volumes due to the large volumes on turning traffic on that approach. The Common Street approach has been recently reconstructed to allow additional queueing space.



5.0 PROPOSED IMPROVEMENTS / ALTERNATIVES

With the objective of improving pedestrian and bicycle mobility, traffic operations and safety along the Mount Auburn Street corridor, design alternatives were developed prior to preparation of this report.

The main theme of these design alternatives was the incorporation of a road diet type project to eliminate a travel lane in each direction, while retaining parking and bus stops where possible and adding bicycle facilities. These alternatives were shared with Town officials and residents in a series of meetings. Alternative 1 was chosen as the preferred alternative and is discussed further below.

Each alternative involved providing a single through lane in each direction along Mount Auburn Street between Common Street and the Cambridge City line.

West of Common Street, Mount Auburn Street carries higher traffic volumes and would retain four travel lanes (two lanes in each direction) under each alternative. Also, east of Elton Avenue, a second eastbound thru lane will be developed and continued along Mount Auburn Street, past Arlington Street and terminate at Prentiss Street.

One unique consideration to this corridor is the overhead catenary wires along the corridor, that are used for the electrified buses. If the wires become disconnected from the bus, the bus becomes immediately disabled, until it can be reconnected by the driver. Therefore, extra “emergency” roadway width is important to prevent gridlock during these situations.

5.1 Alternative 1 - Buffered Bike Lanes Alternative

The bike lanes were designed as five-foot wide bike lanes with a two-foot painted buffer adjacent to the travel lanes, and parking lane as space permits.

The benefits of the buffered bike lanes include the creation of horizontal separation for cyclists from through lanes and car door openings. This alternative allows for curb extensions that reduce pedestrian crossing lengths. The design creates a layout that is better anticipated by the visually impaired as this project is in close proximity to the Perkins School for the Blind. This cross section also allows for maneuverability of vehicles to allow the passage of emergency response vehicles including trucks from the fire station located within the project limits. It also provides width in case of a bus breakdown.

The drawbacks to this layout include the lack of any physical or barrier between bicycles and travel lanes, it has the potential for double parking in the bike lane, and creates a conflict point between bicycles and cars that are parking along the road. Despite these drawbacks this was determined to be the best option for all users of the roadway system.

5.2 Alternative 2 - Separated Bicycle Lane Alternative

Sidewalk level separated bike lanes as described by the MassDOT Separated Bike Lane Design Guide were considered for the roadway.



Due to the high number of driveways along the corridor, raised bicycle lanes with limited street buffer were not desired due to the uncomfortable vertical changes that would be required for cyclists and/or driver at each driveway.

The need to provide a buffer for transitions from driveways was not able to be met while maintaining sufficient width for emergency response vehicles.

5.3 Alternative 3 - Parking Protected Bike Lanes Alternative

Parking protected bike lanes were considered for the corridor. This was designed with a 3-foot buffer adjacent to the parking lane, a five-foot bike lane and a one-foot shoulder between the bike lane and the vertical curb.

The benefits of the parking protected bike lane are that it gives bicyclist a perception of safety being between parked cars and the curb. It also reduces dooring incidents by placing cars on the passenger side of the car and in this alternative, it also provides a wider parking lane buffer than the separated or buffered options.

The key drawbacks of the parking protected option are;

- The lack a sufficient width for emergency response vehicles to bypass vehicles.
- The inability for traffic to bypass disabled electric buses.
- Firetrucks parking at the scene of a fire would be further away from buildings. The ability of ladder trucks to reach the adjacent buildings was raised as a concern by the fire department.
- Due to parking, there are a high number of conflict points and limited visibility between turning vehicles and cyclists at driveways and unsignalized intersections. To improve sight distance, many parking spaces would need to be eliminated.
- Additional maintenance needs by the Town to clear snow and leaves from the separated bike lane. In addition, trash pickup would be more difficult.

5.4 Proposed Design-Road Diet with Buffered Bike Lanes

The proposed design was developed to incorporate buffered bike lanes throughout the corridor. On the eastbound (southern) side of Mount Auburn Street, the cross section would consist of an 11-foot travel lane, a 5-foot bike lane and an 8-foot parking lane. Most of the corridor has 2-foot buffers between the bike lane and 2-foot buffer between the bike lane and traffic. Some of the corridor has a buffer only on the traffic side of the bike lane.

On the westbound (north) side, a 5-foot bike lane and 2-foot buffer and 11-foot travel lane would be proposed.

Conventional on-street bike lanes were selected as part of the preferred alternative due to sight distance concerns at the numerous intersecting side streets and driveways. Additional turn lanes (left or right) would be constructed at major



intersections. Bike lane extension markings will be provided through all side street intersections. Concrete sidewalks will be reconstructed, and curb extensions employed where practical to shorten crosswalks where parking lanes exist.

5.4.1 Traffic Operations with Proposed Improvements (Future Build)

Future Build traffic operating conditions are the anticipated traffic operating conditions of the roadway network assuming the construction of the proposed roadway and traffic control improvements associated with this Project and under the demand of future build traffic volumes. Proposed improvements incorporated into the traffic operations analysis include the optimization of traffic signal timing of the eight study area traffic signals, the implementation of increased traffic signal clearance intervals and other geometric changes, including a reduction in the number of through lanes throughout most of the corridor.

The results of the Synchro capacity analyses for existing and future No-Build conditions are shown in Table 11 and 12 above. To provide a direct comparison with Future Build Conditions, Future No-Build results are also repeated in Tables 13 and 14. Capacity analysis worksheets can be found in the Appendix.

Also, under the proposed design alternative, a new traffic signal would be provided at the intersection of Arlington Street with Grove Street, including the relocated driveway from the Tuft's Health Plan, and a new school crossing signal at Mount Auburn Street and Boylston Street. Each of the existing traffic signals on Mount Auburn Street would be replaced with all new equipment. Curb extensions would be provided at crosswalks wherever possible, and all exclusive pedestrian signal phases would be retimed to comply with the latest MUTCD guidelines for walk, pedestrian clearance, and buffer intervals. West of Common Street, four lanes of travel are required to accommodate Future Year traffic volumes; therefore, this segment would remain in its current configuration.

The future 2030 peak hour traffic volumes resulting from changes to the roadway network are shown on Figure 5.



Table 13 - Unsignalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2030 No Build Conditions				2030 Build Conditions				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mount Auburn Street at Phillips Street									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB T	0.27	0.0	A	0 34/98	0.31	0.0	A	0 17/60	-
Mount Auburn Street EB R	0.14	0.0	A	0 34/92	0.16	0.0	A	0 136/236	-
Mount Auburn Street WB L	0.04	1.5	A	3 33/77	0.05	1.7	A	4 30/67	-
Mount Auburn Street WB T	0.34	0.0	A	0 15/55	0.35	0.0	A	0 16/49	-
Phillips Street NB LR	0.01	10.0	B	1 8/31	0.01	10.2	B	1 16/43	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB T	0.27	0.0	A	0 155/155	0.27	0.0	A	0 5/30	-
Mount Auburn Street EB R	0.13	0.0	A	0 169/169	0.14	0.0	A	0 27/93	-
Mount Auburn Street WB L	0.05	1.8	A	4 63/67	0.08	2.7	A	6 48/110	-
Mount Auburn Street WB T	0.30	0.0	A	0 3/25	0.31	0.0	A	0 34/99	-
Phillips Street NB LR	0.02	11.6	B	1 256/433	0.01	10.1	B	1 12/36	-
Mount Auburn Street at Marshall Street									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB LT	0.29	0.4	A	1 54/102	0.31	0.4	A	1 34/46	-
Mount Auburn Street WB TT	0.36	0.0	A	0 22/70	0.37	0.0	A	0 46/104	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB LT	0.27	0.7	A	1 114/114	0.27	0.6	A	1 48/116	-
Mount Auburn Street WB TR	0.32	0.0	A	0 115/166	0.34	0.0	A	0 22/78	-

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 13 - Unsignalized Intersection Level of Service Summary-CONTINUED

Intersection/Peak Period/Movement	2030 No Build Conditions				2030 Build Conditions				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mount Auburn Street at Winthrop Street									
Weekday Morning Peak Hour:									
Mount Auburn Street EB TR	0.30	0.0	A	0 8/43	0.54	0.0	A	0 332/794	-
Mount Auburn Street WB L	0.20	2.2	A	4 13/51	0.06	11.4	B	5 19/47	70
Winthrop Street NB LR	0.05	22.0	C	4 7/27	0.06	22.6	C	4 16/41	-
Weekday Evening Peak Hour:									
Mount Auburn Street EB TR	0.22	0.0	A	0 -	0.35	0.0	A	0 52/230	-
Mount Auburn Street WB L	0.30	0.1	A	0 66/140	0.01	8.9	A	0 3/18	70
Winthrop Street NB LR	0.05	15.8	C	4 61/176	0.06	18.5	C	5 27/76	-
Mount Auburn Street at Chauncey Street									
Weekday Morning Peak Hour:									
Mount Auburn Street EB TR	0.26	0.0	A	0 7/41	0.46	0.0	A	0 88/161	-
Mount Auburn Street WB L	0.20	3.9	A	8 23/62	0.11	10.5	B	10 29/58	100
Chauncey Street NB LR	0.38	26.7	D	43 35/63	0.25	23.0	D	24 59/143	-
Weekday Evening Peak Hour:									
Mount Auburn Street EB TR	0.22	0.0	A	0 24/91	0.34	0.0	A	0 46/134	-
Mount Auburn Street WB L	0.29	0.2	A	1 233/527	0.01	8.9	A	1 4/20	100
Chauncey Street NB LR	0.05	13.5	B	4 49/136	0.07	18.1	B	6 17/43	-

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 13 - Unsignalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement	2030 No Build Conditions				2030 Build Conditions				Storage Length
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	
Mount Auburn Street at Upland Road/Dexter Avenue									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB L	0.23	0.2	A	0 4/20	0.00	8.1	A	0 2/14	130
Mount Auburn Street WB L	0.11	1.7	A	3 18/71	0.05	10.6	B	4 13/35	80
Dexter Avenue NB LTR	0.17	16.6	C	16 31/63	0.35	33.3	D	37 35/68	-
Upland Road SB LTR	0.05	15.7	C	4 9/32	0.11	27.7	D	9 13/42	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB L	0.17	0.4	A	2 4/26	0.02	9.6	A	2 12/55	130
Mount Auburn Street WB L	0.20	0.6	A	3 115/334	0.04	8.9	A	3 12/34	80
Dexter Avenue NB LTR	0.22	20.7	C	21 110/345	0.24	22.5	C	23 55/141	-
Upland Road SB LTR	0.09	19.8	C	8 33/76	0.11	22.8	C	9 24/48	-
Mount Auburn Street at Melendy Avenue									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB TR	0.30	0.0	A	0 2/14	0.53	0.0	A	0 9/38	-
Mount Auburn Street WB LT	0.16	0.4	A	1 3/18	0.02	0.6	A	2 16/46	-
Melendy Avenue NB LR	0.12	13.7	B	10 15/30	0.21	20.9	C	19 24/51	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB TR	0.23	0.0	A	0 2/18	0.36	0.0	A	0 79/284	-
Mount Auburn Street WB LT	0.27	0.3	A	1 10/30	0.02	0.4	A	1 7/28	-
Melendy Avenue NB LR	0.12	14.4	B	10 48/145	0.26	29.7	D	25 30/89	-

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 13 - Unsignalized Intersection Level of Service Summary-Continued

Intersection/Peak Period/Movement	2030 No Build Conditions				2030 Build Conditions				Storage Length
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	
Mount Auburn Street at Lloyd Road/ Elton Avenue									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB LT	0.28	0.2	A	0 5/33	0.00	0.1	A	0 24/64	-
Mount Auburn Street WB L	0.12	3.3	A	7 36/86	0.10	10.4	B	8 35/69	60
Lloyd Road SB LR	0.12	26.4	D	10 20/52	0.19	40.3	E	17 24/72	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB LT	0.02	0.8	A	2 6/33	0.02	0.6	A	2 31/79	-
Mount Auburn Street WB L	0.01	0.2	A	0 58/180	0.01	8.7	A	0 1/9	60
Lloyd Road SB LR	0.14	29.2	D	12 59/183	0.28	61.4	F	25 42/98	-
Mount Auburn Street at Irma Avenue									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB L	0.24	0.7	A	1 8/33	0.01	8.4	A	A 5/24	60
Irma Avenue SB LR	0.08	10.4	B	6 30/57	0.37	24.0	C	C 39/58	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB L	0.20	0.2	A	1 1/10	0.01	9.8	A	1 5/24	60
Irma Avenue SB LR	0.08	16.8	C	7 36/113	0.22	32.5	D	20 42/95	-

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 13 - Unsignalized Intersection Level of Service Summary-Continued

Intersection/Peak Period/Movement	2030 No Build Conditions				2030 Build Conditions				Storage Length
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	
Mount Auburn Street at Templeton Parkway									
<i>Weekday Morning Peak Hour:</i>									
Mount Auburn Street EB LT	0.24	1.5	A	3 68/184	0.20	0.0	A	0 42/123	-
Mount Auburn Street WB TR	0.18	0.0	A	0 4/31	0.29	0.0	A	0 14/60	-
Templeton Parkway SB (Right only)	0.07	11.4	B	6 21/49	0.13	11.8	B	11 29/49	-
<i>Weekday Evening Peak Hour:</i>									
Mount Auburn Street EB LT	0.20	1.2	A	5 12/45	0.20	0.0	A	0 151/261	-
Mount Auburn Street WB TR	0.25	0.0	A	0 36/118	0.43	0.0	A	0 36/113	-
Templeton Parkway SB (Right only)	0.00	9.4	A	0 8/31	0.04	13.9	B	3 12/36	-

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 14 - Signalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mt Auburn Street at Irving Street/Palfrey Street									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB LTR	0.31	5.4	A	43/146 78/153	0.38	10.7	B	70/267 166/342	90
Mt. Auburn Street WB LTR	0.44	6.4	A	60/198 98/155	0.58	6.7	A	33/#390 91/151	-
Irving St NB LTR	0.54	33.1	C	78/129 92/152	0.71	49.6	D	103/#188 122/210	-
Overall	0.44	8.5	A		0.61	12.5	B		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB LTR	0.31	8.3	A	72/185 517/520	0.40	14.5	B	90/277 132/261	90
Mt. Auburn Street WB LTR	0.36	8.8	A	85/217 9/54	0.62	7.2	A	43/m#460 69/111	-
Irving St NB LTR	0.73	41.2	D	204/273 442/442	0.87	56.0	E	220/#367 216/374	-
Overall	0.44	14.9	B		0.70	18.9	B		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.

- 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary-Continued

Intersection/Peak Period/Movement	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mt Auburn Street at Parker Street/Common Street									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB L	0.72	22.4	C	140/223	0.50	21.8	C	33/m#171 64/107	-
Mt. Auburn Street EB T				77/96	0.78	26.9	C	280/#654 91/110	-
Mt. Auburn Street WB LTR	0.73	36.9	D	217/376 226/349	0.69	31.5	C	197/#425 503/510	-
Parker St NB LTR	0.02	48.5	D	0/0 12/29	0.02	45.4	D	0/0 27/53	-
Common St SB L	0.63	50.4	D	114/#247 313/330	0.89	64.5	E	153/#290 191/357	-
Common St SB R	0.75	41.6	D	188/#279 195/195	0.26	27.7	C	0/38 199/341	25
Overall	0.69	33.6	C		0.83	32.8	C		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB L	0.57	21.3	C	133/251	0.61	43.3	D	98/m#318 85/111	-
Mt. Auburn Street EB T				17/17	0.56	23.3	C	121/m#480 86/115	-
Mt. Auburn Street WB LTR	0.75	40.5	D	274/451 492/501	1.00	64.9	E	285/#536 466/550	-
Parker St NB LTR	0.02	51.0	D	0/0 276/498	0.03	46.2	D	0/0 27/57	-
Common St SB L	0.64	51.8	D	152/288 276/276	0.93	76.3	E	160/#308 188/327	-
Common St SB R	0.43	31.7	C	117/175 58/58	0.15	23.5	C	0/32 113/229	25
Overall	0.59	34.7	C		0.80	50.2	D		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.
 NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;
 L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;
 LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.
 # - 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary-Continued

Intersection/Peak Period/Movement	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/95% Simtraffic	Storage Length
Mt Auburn Street at Bates Road / Walnut Street									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB L	0.15	8.0	A	36/154	0.02	10.5	B	0/8	130
Mt. Auburn Street EB T				121/231	0.83	22.7	C	98/#611 305/501	-
Mt. Auburn Street EB R	0.13	8.2	A	18/118 46/57	0.25	6.7	A	0/52 104/171	55
Mt. Auburn Street WB L	0.16	8.2	A	41/171	0.24	12.3	B	4/45	30
Mt. Auburn Street WB TR				92/158	0.74	18.2	B	85/#534 312/503	-
Walnut Street NB LTR	0.10	26.1	C	38/119 53/98	0.45	22.5	C	27/#147 69/128	-
Bates Road SB LTR	0.01	21.7	C	6/28 17/44	0.52	40.3	D	3/29 16/42	-
Overall	0.34	10.0	A		0.66	18.6	B		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB L	0.35	13.7	B	44/176	0.01	13.0	B	0/4	130
Mt. Auburn Street EB T				3/19	0.78	23.4	C	87/#453 183/316	-
Mt. Auburn Street EB R	0.22	13.3	B	15/102 4/25	0.14	6.3	A	0/24 69/154	55
Mt. Auburn Street WB L	0.40	14.1	B	51/200	0.03	13.1	B	1/10	30
Mt. Auburn Street WB TR				850/1375	0.98	49.0	D	119/#597 905/1179	-
Walnut Street NB LTR	0.75	23.1	C	85/267 452/653	1.06	82.3	F	97/#475 1441/2172	-
Bates Road SB LTR	0.03	12.5	B	3/18 109/226	0.27	32.7	C	1/20 5/30	-
Overall	0.53	16.1	B		0.93	45.9	D		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Through; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.

- 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary – Continued

Intersection/Peak Period/Movement	2030 No Build			2030 Build (Road Diet)					
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mount Auburn Street at Boylston Street									
Weekday Morning Peak Hour:									
Mount Auburn Street EB T	0.28	0.0	A	0 -	0.75	11.3	B	163/#756 341/703	-
Mount Auburn Street EB R	0.20	0.0	A	0 -					100
Mount Auburn Street WB L	0.03	1.4	A	2 9/32	0.11	5.2	A	3/26 20/59	45
Mount Auburn Street WB T	0.21	0.0	A	0 9/32	0.48	7.0	A	80/357 113/213	-
Boylston Street NB LR	0.68	40.4	E	115 33/61	0.32	29.8	C	17/67 39/75	-
Overall					0.64	10.7	B		
Weekday Evening Peak Hour:									
Mount Auburn Street EB T	0.21	0.0	A	0 -	0.54	8.9	A	80/356 157/281	-
Mount Auburn Street EB R	0.13	0.0	A	0 -					100
Mount Auburn Street WB L	0.01	0.3	A	0 537/1079	0.02	5.9	A	1/9 9/47	45
Mount Auburn Street WB T	0.32	0.0	A	0 541/1080	0.83	16.6	B	166/#756 636/891	-
Boylston Street NB LR	0.20	19.8	C	19 255/586	0.17	23.5	C	11/55 29/63	-
Overall					0.650	14.0	B		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.

- 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary – Continued

Intersection/Peak Period/Movement	2030 No Build			2030 Build (Road Diet)					Storage Length
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	
Mt Auburn Street at School Street									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB L	0.45	14.6	B	93/211 121/201	0.34	18.2	B	16/69 82/211	130
Mt. Auburn Street EB T					0.89	34.8	C	260/#722 320/368	-
Mt. Auburn Street EB R					0.03	15.0	B	0/14 50/161	130
Mt. Auburn Street WB L	0.45	14.6	B	85/197 135/230	0.71	43.0	D	23/#127 82/197	100
Mt. Auburn Street WB TR					0.78	26.4	C	206/#588 422/677	-
School Street NB L	0.37	23.5	C	55/143 84/177	0.23	18.5	B	8/42 39/122	100
School Street NB TR					0.26	18.4	B	47/138 53/137	-
School Street SB L	1.14	112.2	F	~325/#704 1103/1211	0.29	18.7	B	37/117 93/183	65
School Street SB TR					0.88	36.7	D	222/#622 754/1329	-
Overall	0.69	44.4	D		0.83	30.4	C		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB L	0.39	14.0	B	71/166 22/70	0.82	57.0	E	27/#149 104/151	130
Mt. Auburn Street EB T					0.49	15.1	B	123/341 236/400	-
Mt. Auburn Street EB R					0.03	11.5	B	0/10 25/87	130
Mt. Auburn Street WB L	0.45	14.6	B	98/220 655/1483	0.15	12.3	B	12/53 27/92	100
Mt. Auburn Street WB T					0.87	28.4	C	281/#823 723/1115	-
School Street NB L	0.83	39.2	D	176/#452 999/1008	0.45	25.9	C	20/#91 50/123	100
School Street NB T					0.84	37.8	D	194/#533 948/1061	-
School Street SB L	0.81	37.1	D	179/#454 1026/1381	0.49	28.3	C	16/#85 87/101	65
School Street SB T					0.89	44.4	D	187/#526 830/1061	-
Overall	0.58	24.1	C		0.83	30.9	C		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.



Table 14 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic 50 th /95 th	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mt Auburn Street at Bigelow Avenue / Kimball Road									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB LTR	0.31	5.5	A	46/172 56/123	0.45	7.7	A	44/#219 75/143	-
Mt. Auburn Street WB L	0.24	5.1	A	32/125 54/125	0.32	7.4	A	12/#98 46/91	100
Mt. Auburn Street WB TR					0.49	8.2	A	56/#324 93/170	-
Bigelow Ave NB LTR	0.56	47.7	D	67/116 53/107	0.09	19.9	B	1/41 24/50	-
Kimball Road SB LTR	0.67	52.9	D	91/149 84/130	One way NB				
Overall	0.35	13.3	B		0.38	8.8	A		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB LTR	0.31	9.2	A	64/191 24/65	0.38	9.3	A	51/174 94/159	-
Mt. Auburn Street WB L	0.32	9.3	B	73/212 101/191	0.07	7.7	A	4/27 23/80	100
Mt. Auburn Street WB TR					0.79	17.2	B	163/#650 128/199	-
Bigelow Ave NB LTR	0.79	50.8	D	175/245 97/135	0.68	30.2	C	62/#247 72/133	-
Kimball Road SB LTR	0.08	33.1	C	16/39 102/344	One way NB				
Overall	0.42	17.2	B		0.71	16.3	B		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.
 NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;
 L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;
 LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.
 # - 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement along Mt Auburn Street	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Mt Auburn Street at Arlington Street									
<i>Weekday Morning Peak Hour:</i>									
Mt. Auburn Street EB L	0.08	25.4	C	12/43 25/80	0.23	28.2	C	16/59 36/89	180
Mt. Auburn Street EB TR	0.43	29.4	C	105/#235 101/143	0.72	34.6	C	85/#240 106/144	-
Mt. Auburn Street WB L	0.68	20.0	C	97/#267 123/198	0.99	66.5	E	102/#440 111/176	170
Mt. Auburn Street WB TR	0.20	13.8	B	55/129 68/173	0.51	18.3	B	119/313 107/203	-
Arlington Street NB L	0.34	29.6	C	29/61 50/83	0.41	20.7	C	22/75 31/62	350
Arlington Street NB T	0.68	35.8	D	210/316 155/230	0.41	19.7	B	88/233 109/194	-
Arlington Street NB R					0.09	10.8	B	6/25 39/64	40
Arlington Street SB LTR	0.94	62.5	E	220/#334 282/405	1.02	70.3	E	172/#440 316/562	-
Overall	0.75	35.5	D		0.99	43.3	D		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB L	0.16	23.3	C	22/67 15/46	0.72	40.1	D	103/#295 94/113	180
Mt. Auburn Street EB TR	0.32	24.6	C	89/177 43/109	0.42	28.3	C	102/206 162/207	-
Mt. Auburn Street WB L	0.35	15.9	B	46/127 50/118	0.50	20.1	C	57/148 104/225	170
Mt. Auburn Street WB TR	0.25	16.0	B	70/156 119/262	0.57	22.7	C	185/421 180/292	-
Arlington Street NB L	1.20	136.5	F	~432/#564 324/341	0.93	60.4	E	120/#414 138/241	350
Arlington Street NB T					0.79	33.2	C	286/#671 373/391	-
Arlington Street NB R					0.39	19.4	B	73/162 46/64	40
Arlington Street SB LTR	0.46	28.5	C	114/161 211/473	0.76	41.2	D	132/#288 228/387	-
Overall	0.72	69.1	E		0.85	33.1	C		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.
 NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;
 L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;
 LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.
 # - 95th percentile volume exceeds capacity; reported queues may not be accurate



Table 14 - Signalized Intersection Level of Service Summary - Continued

Intersection/Peak Period/Movement along Mt Auburn Street	2030 No Build				2030 Build (Road Diet)				
	v/c ^a	Delay ^b	LOS ^c	Queue ^d 95% Synchro 50%/ 95% Simtraffic	v/c	Delay	LOS	Queue ^d 95% Synchro 50%/ 95% Simtraffic	Storage Length
Arlington Street at Grove Street									
<i>Weekday Morning Peak Hour:</i>									
Arlington Street EB L					0.91	44.6	D	84/#361 107/145	55
Arlington Street EB T	0.35	0.0	A	0 5/33	0.65	19.6	B	129/#389 179/319	-
Arlington Street EB R	0.17	0.0	A	0 -	0.31	8.5	A	0/29 125/258	145
Grove Street WB L	0.02	8.8	A	2 7/28	0.49	25.5	C	49/#120 155/295	-
Grove Street WB TR	0.19	0.0	A	0 1/10					-
Arlington Street NB L	1.03	103.8	F	268 82/111	0.41	25.1	C	45/125 57/67	55
Arlington Street NB TR	0.18	13.3	B	17 28/73	0.43	25.4	C	43/124 57/67	-
Health Plan Driveway SB L				6/29	0.10	29.5	C	3/20 13/39	-
Health Plan Driveway SB TR				15/39	0.08	29.4	C	2/32 17/40	-
Overall					0.70	22.8	C		
<i>Weekday Evening Peak Hour:</i>									
Mt. Auburn Street EB L					0.07	18.6	B	3/19 10/32	55
Mt. Auburn Street EB T	0.11	0.0	A	0 3/21	0.54	22.1	C	65/#200 101/198	-
Mt. Auburn Street EB R	0.21	0.0	A	0 -	0.25	12.7	B	0/28 93/179	145
Grove Street WB L	0.05	7.7	A	4 5/29	0.72	24.6	C	93/#253 1271/1724	-
Grove Street WB TR	0.45	0.0	A	0 69/88					-
Arlington Street NB L	1.39	240.6	F	438 91/99	0.40	23.9	C	36/109 77/109	55
Arlington Street NB TR	0.02	9.3	A	2 3/24	0.42	24.3	C	34/107 77/109	-
Health Plan Driveway SB L				106/225	0.62	27.2	C	59/#196 87/135	-
Health Plan Driveway SB TR				155/204	0.64	28.3	C	43/#222 147/216	-
Overall					0.56	22.8	C		

^aVolume to Capacity Ratio; ^bAverage Delay Time in Seconds; ^cLevel-of-Service; ^dQueue Length in Feet.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound;

L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn;

LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.

- 95th percentile volume exceeds capacity; reported queues may not be accurate



A detailed discussion of operations at each study intersection follows.

5.4.2 Mount Auburn Street at Irving Street/Palfrey Street

Analysis of the 2030 Future build conditions indicate that the intersection is projected to operate at a LOS B during both the morning and evening peak hours. The Irving Street northbound approaches operate LOS E, with the v/c ratio 0.87 and 95th percentile vehicle queues of 367 feet (15 vehicles) during the evening peak hour.

5.4.3 Mount Auburn Street at Parker Street/Common Street

Many approaches of this intersection operate poorly (LOS D-E) during the evening peak hour in both traffic conditions. Analysis of the 2030 Future build conditions indicate that the intersection is projected to operate at a LOS C during the morning peak and a LOS D in the evening peak hours. Especially, Common Street southbound left-turn approach operates LOS E during morning and evening peak hours, with the v/c ratio 0.89 and 95th percentile vehicle queues of 290 feet (15 vehicles) during the morning peak hour and v/c ratio 0.93 and 95th percentile vehicle queues of 308 feet (16 vehicles) during the evening peak hour.

WorldTech reviewed the potential for a roundabout at this location as an alternative to a traffic signal. Given that Mount Auburn Street is an urban principal arterial, an appropriate roundabout would need a non-mountable center median for driver visibility/recognition and a radius/diameter sufficient to permit heavy vehicles to navigate the roundabout. The available diameter within available right-of-way at the Mount Auburn Street intersections with Common Street is 104 feet. To build a roundabout at this location would impact the business on the eastern side of the intersection and/or the cemetery to the north. Therefore, a roundabout is not a viable alternative at this location.

5.4.4 Mount Auburn Street at Bates Road East and Walnut Street

Analysis of the 2030 Future build conditions indicate that the intersection is projected to operate at a LOS B during the morning peak and a LOS D in the evening peak hours. The Mt Auburn Street eastbound through movement operates LOS C, with the v/c ratio 0.83 and 95th percentile vehicle queues of 611 feet (30 vehicles) during morning park hour. The Mt Auburn Street westbound through/right movement operates LOS B, with the v/c ratio 0.74 and 95th percentile vehicle queues of 534 feet (25 vehicles) during morning park hour and LOS D, with the v/c ratio 0.98 and 95th percentile vehicle queues of 597 feet (30 vehicles) during evening park hour.

WorldTech reviewed the potential for a roundabout at this location as an alternative to a traffic signal. The available diameter within available right-of-way at the Mount Auburn Street intersection with Walnut Street is 86 feet. This is not sufficient width for a roundabout. To build a roundabout at this location would



impact the residential homes on the eastern and western sides of the intersection. Therefore, a roundabout is not a viable alternative at this location.

5.4.5 Mount Auburn Street at Boylston Street

Analysis of the 2030 Future build conditions indicate that the intersection is projected to operate at a LOS B during the morning peak and a LOS B in the evening peak hours. Each approach of this intersection operates good (LOS A-C) during both peak hours. The Mt Auburn Street eastbound through movement operates LOS B, with the v/c ratio 0.75 and 95th percentile vehicle queues of 756 feet (38 vehicles) during morning peak hour. The Mt Auburn Street westbound left/through movement operates LOS B, with the v/c ratio 0.83 and 95th percentile vehicle queues of 756 feet (38 vehicles) during evening peak hour.

5.4.6 Mount Auburn Street at School Street

Analysis of the 2030 Future Build conditions indicate that this intersection is projected to operate at a LOS C during both morning and evening peak hours.

During the morning peak hour, Mt Auburn Street eastbound through movement operates LOS C, with the v/c ratio 0.89 and 95th percentile vehicle queues of 722 feet (36 vehicles), Mt Auburn Street westbound through movement operates LOS C, with the v/c ratio 0.78 and 95th percentile vehicle queues of 588 feet (24 vehicles), School Street southbound through movement operates LOS D, with the v/c ratio 0.88 and 95th percentile vehicle queues of 622 feet (31 vehicles).

During the evening peak hour, Mt Auburn Street westbound through movement operates LOS C, with the v/c ratio 0.87 and 95th percentile vehicle queues of 823 feet (33 vehicles), School Street southbound through movement operates LOS D, with the v/c ratio 0.84 and 95th percentile vehicle queues of 533 feet (26 vehicles).

WorldTech reviewed the potential for a roundabout at this location as an alternative to a traffic signal. The available diameters within available right-of-way at the Mount Auburn Street intersection with School Street is 95 feet. To build a roundabout at this location would impact the Youth Center on the eastern side of the intersection. Therefore, a roundabout is not a viable alternative at this location.

5.4.7 Mount Auburn Street at Kimball Road and Bigelow Avenue

Analysis of the 2030 Future Build conditions indicate that this intersection is projected to operate at a LOS A during the morning peak hour and a B LOS during the evening peak hour. All the approaches of this intersection operate well. However, during evening peak hour, Mt Auburn Street westbound through/right movement has a 95th percentile vehicle queues of 650 feet (32 vehicles).



5.4.8 Mount Auburn Street at Arlington Street

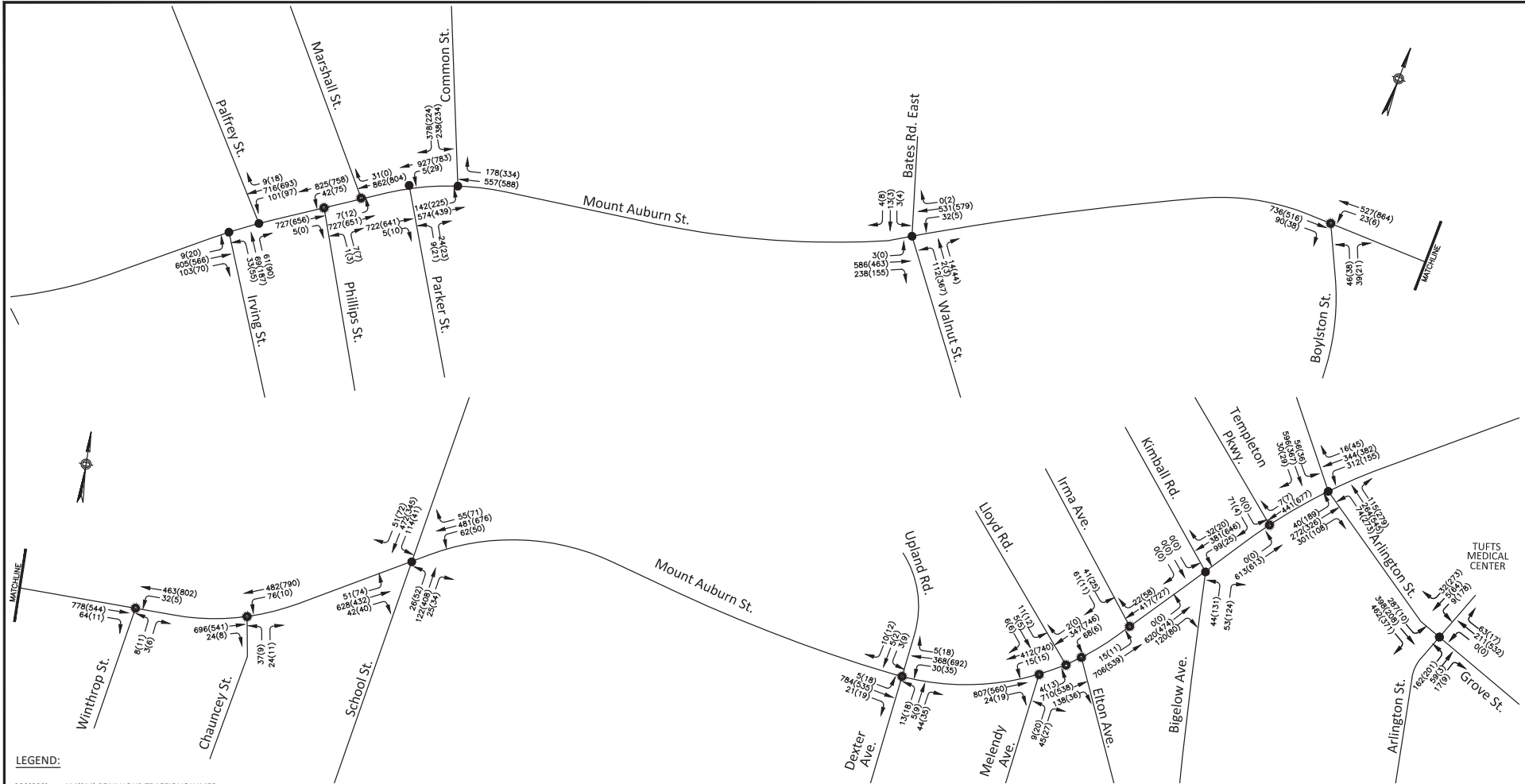
During the morning peak hour, the eastbound approach would operate at C with a v/c ratio of 0.72, the 95th percentile queues are at 240 feet (12 vehicles), the westbound approach would operate at LOS E with a v/c ratio of 0.99, and the 95th percentile queues are at 440 feet (22 vehicles). The southbound Arlington Street approach would operate at LOS E with a v/c ratio exceeding 1.02, indicating oversaturated conditions, the 95th percentile queues are at 440 feet (22 vehicles). During the evening peak hour, the overall LOS is better than morning peak hour.

5.4.9 Arlington Street at Grove Street



The proposed improvement at this intersection consists of signaling, while including the Tufts Health Plan Driveway into the signalized intersection.

Analysis of the 2030 Future Build conditions indicate that this intersection is projected to operate at a LOS C during both peak hours. Most of the approaches operate at LOS C. However, the Arlington eastbound left approach would operate at D with a v/c ratio of 0.91, the 95th percentile queues are at 361 feet (18 vehicles) during morning peak hour.

A roundabout was considered at this location; however, a roundabout could not incorporate the Tufts Health Plan driveway without significant impacts to the adjacent cemetery.



LEGEND:
 000(000) AM(PM) PEAK HOUR TRAFFIC VOLUMES
 ● SIGNALIZED INTERSECTION ANALYZED
 ○ UNSIGNALIZED INTERSECTION ANALYZED

PREPARED FOR: 	TITLE: MOUNT AUBURN STREET (ROUTE 16) CORRIDOR IMPROVEMENTS 2030 Design Year Traffic Volumes - Build	PREPARED BY:  300 TRADE CENTER, SUITE 5580 WOBURN, MASSACHUSETTS 01801 PHONE: 781.933.4800 FAX: 781.933.4801	DATE: 12-19-2019 SCALE: 1" = 250'	<h1>Figure 5</h1>
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5.5 Pedestrian Accommodations

Eliminating one travel lane in each direction for a majority of the corridor improves safety for pedestrians by shortening the crossing distance across Mount Auburn Street. Furthermore, unsignalized pedestrian crossings across Mount Auburn Street will feature Rectangular Rapid Flashing Beacon (RRFB) assemblies. All signalized pedestrian crossings are equipped with APS push buttons, and pedestrian signal heads.

5.6 Construction Management Outline

The project will involve staged construction. The work will include, but is not limited to, removing the existing pavement, fine grading existing loose material, placing new hot mix asphalt, some areas of full depth reconstruction, new sidewalks, curbing, wheelchair ramps, pavement markings, signs, drainage improvements, and all other incidental work associated with the above work.

The traffic management closures include typical shoulder closures, one lane alternating traffic, right lane closure of a double lane, and a quadrant closure. A pedestrian bypass will be created with jersey barriers at areas where the sidewalk is being constructed. The project will provide temporary ADA compliant wheelchair ramps where necessary. Clear signage will also be provided.

5.7 Complete Streets

The proposed project involves a road diet and implementation of on-road bicycle lanes. Pedestrian accommodations will be improved by the reduction in crossing distance across Mount Auburn Street through the road diet and implementation of curb extensions and rectangular rapid flashing beacons. Bicycle accommodations are improved by the installation of the buffered bike lanes. Therefore, the project provides a major upgrade in both pedestrian and bicycle accommodations and is consistent with Complete Streets guidelines.

5.8 GreenDOT

The proposed project consists of the inclusion of on-road bicycle lanes. Therefore, this project is consistent with and addresses the following two of the primary goals of the GreenDOT Policy Directive.

Reduce Greenhouse Gas (GHG) Emissions – By providing significant improvements to alternative modes of transportation without significantly impacting vehicular capacity, this project presents an ability to reduce greenhouse gases.



Promote The Healthy Transportation Options of Walking, Bicycling, and Public Transit
Healthy transportation options will be greatly improved in the corridor by constructing the proposed project.

Support Smart Growth Development – Due to the nature of this project, the ability to support smart growth development is limited.

5.9 Construction Costs

A detailed cost estimate is being submitted with the 25% submission.

5.10 Recommendations from Road Safety Audit

As previously noted, the Town has conducted a Road Safety Audits (RSA) with the MassDOT Traffic and Safety Engineering Section to identify appropriate corrective measures which will be incorporated into the design. Table 15 shows a summary of the recommended countermeasures as well as a listing of what was incorporated into the proposed design.



Table 15: Road Safety Audit Recommendations

Safety Issue	Potential Safety Enhancement	Addressed by Project	Comment
Substandard Pedestrian Facilities	Consider the feasibility of a road diet to Mt. Auburn Street corridor. A road diet would potentially reduce the cross-sectional distance of roadway that a pedestrian would need to cross.	Yes	
Substandard Pedestrian Facilities	Consider curb extensions at marked crosswalk locations. A curb extension would reduce the cross-section of roadway that a pedestrian would need to cross.	Yes	
Substandard Pedestrian Facilities	Consider incorporating pedestrian signals (HAWK) at marked crosswalk locations. Pedestrian signals could potentially inform a driver of a pedestrian that is attempting to cross the roadway.	No	RRFB's will be used for mid-block crossings
Substandard Pedestrian Facilities	Consider additional signage and improved pavement markings for crosswalks. During the audit, advanced signage was limited for crosswalk locations. The increased signage includes W11-2 (Pedestrian Crossing), W16-7P (Diagonal Downward Pointing Arrow), "AHEAD" plaques and R1-5 (Yield Here to Pedestrians) signs. Inclusion of signage should conform with MUTCD compliance.	Yes	
Substandard Pedestrian Facilities	Provide an American with Disabilities Act (ADA) compliant wheelchair ramp in front of the Post Office crosswalk at 595 Mt. Auburn Street on the north side of the street. This crosswalk currently leads to a curb. Image 4 shows the curb at the crosswalk location.	Yes	
Substandard Pedestrian Facilities	Provide detectable warning panels at curb ramps for the marked crosswalks and median island located at Grove Street at Arlington Street for ADA compliance.	Yes	
Substandard Pedestrian Facilities	Consider updating mid-block crosswalk to a more visible treatment, such as ladder style.	Yes	
Substandard Pedestrian Facilities	Consider a "Gateway Treatment" to portray to entering vehicles that they are entering a business district with potential pedestrian conflicts. Business districts are noted as having large foot traffic. In order to promote the increased safety of pedestrian movements in the area, developing a Gateway Treatment, e.g., wider sidewalks and ladder style crosswalks for all crosswalks; should be incorporated into any large-scale design. Incorporating landscaping and lighting could help to highlight the transition into this district. This enhancement combines aspects of road diets and curb extensions.	Yes	
Substandard Pedestrian Facilities	Consider decreasing turning radii of side street connections to Mt. Auburn Street. Decreasing the turning radii to a maximum of 15 feet would force turning vehicles to slow down when entering or exiting the side street.	Partial	Radius was decreased at many of the corners. However, the radius is greater than 15 feet at some crossings to allow vehicular access.
Substandard Pedestrian Facilities	Consider raising side street crosswalks parallel with roadway. Raising the crosswalks to a level surface would force turning vehicles to slow down when entering or exiting the side street.	No	Due to grading/drainage, raised sidewalks were not implemented.



Safety Issue	Potential Safety Enhancement	Addressed by Project	Comment
Substandard Pedestrian Facilities	Check signal timing and the total waiting time for the pedestrian phase in a cycle. Consider concurrent pedestrian phasing to reduce the wait time for pedestrians. Discussions and outreach with the Perkins School for the Blind will be required for consideration of concurrent pedestrian phasing.	No	Exclusive pedestrian phasing is proposed.
Substandard Pedestrian Facilities	Consider adding a crosswalk across Arlington Street at the intersection with Grove Street. Currently, a marked crosswalk is not provided across Arlington Street at Grove Street.	Yes	
Substandard Pedestrian Facilities	Provide delineation between sidewalk and driveway at Mobil. The curb cut is located near the pedestrian queuing area for the crosswalks. Consider highlighting the sidewalk portion at this conflict point.	Partial	The sidewalk and driveway are being reconstructed.
Substandard Pedestrian Facilities	Consider adding/updating lighting along the corridor, especially at marked pedestrian crossings.		
Substandard Pedestrian Facilities	Update signs to be posted at MUTCD compliant heights.	Yes	
Substandard Pedestrian Facilities	As a long-term enhancement, consider moving utilities underground or to the back of sidewalk where applicable. Moving the utilities would provide a consistent pathway for pedestrians with less obstructions, in addition to removing potential roadside hazards for vehicles.	Yes	
Lack of Bicycle Accommodations	Consider a road diet that would provide wider shoulders that would allow for bicycle facilities to be included on Mt. Auburn Street and Arlington Street. A road diet would potentially reallocate space for the non-vehicular users of the corridor.	Yes	
Lack of Bicycle Accommodations	Consider including sharrows and R4-11 signage “Bikes May Use Full Lane” on roadways where a bike lane is not feasible. Incorporating bicycle infrastructure could potentially make bicycle travel more safe and comfortable as well as increase visibility to motorists.	Yes	
Lack of Bicycle Accommodations	Consider incorporating bike detection into the traffic signals. Incorporating bicycle infrastructure could potentially make bicycle travel more safe and comfortable.	Yes	
Lack of Bicycle Accommodations	Consider incorporating bike boxes. Incorporating bicycle infrastructure could potentially make bicycle travel more safe and comfortable. Bike boxes are only allowed if bike lanes are provided.	Yes	
Lack of Bicycle Accommodations	Consider introducing separated/buffered bike lanes. Separated/buffered bike lanes will help to delineate areas for bicycles and vehicles.	Yes	
Conflicts with Parked Vehicles	Consider installing wayfinding sign for the Wells Avenue public parking lot behind CVS. Drivers might not be aware of the parking lot and will attempt to drive along Mt. Auburn Street until they find a spot. Removing vehicles from the roadway will potentially reduce the number of conflicts.	No	Outside project scope.
Conflicts with Parked Vehicles	Consider increasing parking enforcement patrols to deter double parking.	No	Outside project scope.
Conflicts with Parked Vehicles	Consider developing a loading program for delivery trucks and commercial establishments to make deliveries during non-peak hours to potentially avoid conflicts with Mt. Auburn Street traffic.	No	Outside project scope.



Safety Issue	Potential Safety Enhancement	Addressed by Project	Comment
Conflicts with Parked Vehicles	Consider updating some parking limits to shorter-term to reflect the types of establishments that are located in the immediate area. Shorter parking limits could help with the parking turnover that is expected at some locations. Drivers that need to park for the maximum term should allow for shorter parking in front of establishments that expect a higher turnover. Short-term parkers would be allowed to more easily get in and get out without having to search for a parking spot, reducing the time spent searching for a parking spot and creating conflicts for other users.	No	Outside project scope.
Conflicts with Parked Vehicles	Encourage employees to not park in the Square. Employees are taking desirable spots away from customers. Patrons are then forced to continue searching for a spot or will attempt to double park if a spot is not available.	No	Outside project scope.
Conflicts with Parked Vehicles	Consider removing parking near the street crossings. Removing vehicles from the crossings would improve sight distance between drivers and pedestrians. Incorporating curb extensions could potentially help in delineating the available parking space on Mt. Auburn Street.	Yes	
Conflicts with Parked Vehicles	Consider striping the on-street parking areas to better define the allowable parking zones and that parking close to intersections or crossings is not allowed.	Yes	
Conflicts with Parked Vehicles	Remove the parking spot that is located at the northwest corner inside the intersection of Mt. Auburn Street at Bigelow Avenue/Kimball Road.	Yes	
Left-Turns at Grove Street at Arlington Street	Consider changing the geometry of the Arlington Street northbound approach to allow for better visibility of drivers and pedestrians and the potential conflicts from Grove Street and Arlington Street southbound. The geometric change would be to make this approach more perpendicular with the mainline.	Yes	
Left-Turns at Grove Street at Arlington Street	Consider incorporating a mini-roundabout at Grove Street and Arlington Street. Incorporating roundabouts have shown to reduce the number and severity of crashes at an intersection. Truck traffic turning radii will need to be analyzed to determine if expected traffic will be able to travel through a potential roundabout.	No	Due to the need to control the Tufts Health Plan Driveway, a signal was selected.
Left-Turns at Grove Street at Arlington Street	Consider signaling the intersection. A signal could potentially deconflict the Arlington Street northbound conflicts from the Grove Street traffic. Signaling the Tufts parking lot approach should be considered if this option is pursued. A signal warrant analysis would be required to determine if a signal is feasible.	Yes	
Left-Turns at Grove Street at Arlington Street	Consider allowing a right turn on red condition for the Arlington Street northbound approach at Mt. Auburn Street. The northbound approach experiences large queues, especially during the p.m. peak hour. Allowing a right turn on red could potentially alleviate the queue from backing up to the Arlington Street at Grove Street intersection. Removing this queue could potentially mitigate driver frustration for the drivers at the Arlington Street northbound approach at Grove Street. Additional analysis is required to determine if a right on red condition is feasible with respect to pedestrian safety. A right-turn prohibition signal could be installed to deconflict right-turning vehicles and pedestrian intervals when the pedestrian signal is on.	No	Due to visibility concerns, the turn on red prohibition has been maintained.



Safety Issue	Potential Safety Enhancement	Addressed by Project	Comment
Left-Turns at Grove Street at Arlington Street	Coordinate with Tufts to evaluate the feasibility of using the Mt. Auburn Street driveway as an exit. Allowing direct access onto Mt. Auburn Street could potentially remove some traffic that would otherwise travel through the intersections of Grove Street at Arlington Street and Mt. Auburn Street at Arlington Street.	No	Coordination is ongoing.
Left-Turns at Grove Street at Arlington Street	Consider reconfiguring the Tufts driveway closer to the intersection of Arlington Street at Grove Street. Relocating the driveway closer could potentially allow the operations to improve, reducing congestion in the area.	Yes	
Lane Drop on Northbound Arlington Street Departure	Consider adding W4-2 (Lane Ends) signage for Arlington Street northbound approach at Mt. Auburn Street. This could potentially indicate to drivers of the lane drop condition and the need to merge with drivers in the adjacent lane.	Yes	Lane configuration is being changed to provide exclusive turn lanes.
Lane Drop on Northbound Arlington Street Departure	Consider lane management solution. Currently, there is a left-turn/through lane and a through/right-turn lane configuration. Determine if it is feasible to provide either an exclusive left-turn or exclusive right-turn lane at this approach in order to make sure only one through lane exists. Level of Service analysis would need to be conducted based on these options.	Yes	
Lane Drop on Northbound Arlington Street Departure	Consider adding advanced lane designation signs on the Arlington Street southbound approach. Advanced signage could help drivers to queue in the correct lane for the Arlington Street at Grove Street intersection.	No	
Transit Facilities	Consider updating bus stop locations throughout corridor to coincide with current/future operational needs. Locating bus stops near pedestrian desire routes could potentially help to mitigate conflicts with vehicles if a pedestrian uses a marked crosswalk, rather than crossing unprotected.	Yes	
Transit Facilities	Consider updating bus stop/crosswalk pairing to provide safe movements for pedestrians throughout corridor. Ideally, a crosswalk should be located in conjunction with a bus stop since pedestrian desire routes might entail crossing the street.	Yes	
Transit Facilities	Consider repainting bus stop pavement marking and evaluate feasibility of increasing the size of the bus stop area. Buses require large berthing areas to safely operate.	Yes	
Transit Facilities	Consider bus stops at each end of Coolidge Square instead of middle of business zone. This would coincide with the Gateway Treatment that focuses on multimodal accessibility to the Business District.	No	Coordination with MBTA is ongoing.
Transit Facilities	Consider moving outbound bus stop to the east of Templeton Parkway and providing bus shelter. The current location of the bus stop, in front of the 7-Eleven, might not be appropriately located for passenger accessibility and safety.	Yes	
Transit Facilities	Consider incorporating Transit signal priority (TSP) or transit queue jump lanes into the corridor. TSP would hold the green light longer or shorten red lights. A queue jump lane would provide a leading transit interval and reduced delay for buses by avoiding congestion. Incorporating these transit centric designs would allow buses to move more freely through the corridor.	Yes	
Transit Facilities	Ensure all bus stops and transit facilities meet current MBTA design guidelines.	Yes	



Safety Issue	Potential Safety Enhancement	Addressed by Project	Comment
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider removing the channelized right-turn for Mt. Auburn Street eastbound. Removing this area could potentially reduce the confusion for northbound Bigelow Avenue drivers. Additional analysis will need to be conducted with regards to the utility pole and street light that is located on the median island. The utility pole hosts a transformer and the trackless trolley wires. Will also need to evaluate Mt. Auburn Street eastbound right-turn volumes with regards to operations.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Remove OM1-1 sign that indicates to northbound vehicles that they can operate only on the right side of the median.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider posting R5-1 “Do Not Enter” sign for northbound Bigelow Avenue traffic to instruct drivers to not enter Mt. Auburn Street eastbound channelized right turn.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider making Kimball Road one-way away from the intersection or closing off Kimball Road from the intersection. Closing Kimball Road could allow for a T-intersection for Bigelow Avenue and Mt. Auburn Street.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider installing retroreflective backplates to signals. Retroreflective backplates increase the visibility of signals.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider making the signal heads a more visible color instead of the current green. Standard colors are more easily recognized by drivers.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider adding additional signal heads inside the cone of vision for all approaches. More signal heads could provide more visibility to drivers at the intersection.	Yes	
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider adding yield sign and pavement markings for the Mt. Auburn Street eastbound right-turning vehicles onto Bigelow Avenue and the potential conflict with Mt. Auburn street westbound left-turning vehicles.	Yes	The intersection is being reconfigured.
Conflicts at Mt. Auburn Street at Bigelow Avenue/Kimball Road	Consider adding pavement markings to highlight the median area. The potential markings would include marking the east side of the median with white pavement markings and the west side of the median with yellow pavement markings and extending towards the conflict area and the proposed yield sign.	Yes	The intersection is being reconfigured.
Emergency Response	Confirm Opticom is installed and properly working at the two signalized intersections to improve emergency vehicle responsive times. Install Opticom if existing signals are not equipped.	Yes	

6.0 TECHNICAL APPENDIX



6.1 Updated Appendix Material – Simtraffic Results

Queuing and Blocking Report
Existing AM Peak Hour

02/22/2021

Intersection: 75: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	WB	NB	SB
Directions Served	LT	LT	LTR	LTR
Maximum Queue (ft)	29	68	74	54
Average Queue (ft)	2	15	31	16
95th Queue (ft)	15	49	54	44
Link Distance (ft)	1180	277	637	94
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 85: Melendy Avenue & Mt. Auburn Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	52	32	55
Average Queue (ft)	3	7	14
95th Queue (ft)	20	27	32
Link Distance (ft)	277	19	388
Upstream Blk Time (%)		3	
Queuing Penalty (veh)		6	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 86: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	SB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	46	53	149	89	78
Average Queue (ft)	7	4	48	5	27
95th Queue (ft)	31	23	110	38	68
Link Distance (ft)	19	19	149	149	428
Upstream Blk Time (%)	1	0	0		
Queuing Penalty (veh)	3	1	1		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report
Existing AM Peak Hour

02/22/2021

Intersection: 88: Mt. Auburn Street & Irma Avenue

Movement	EB	EB	WB	SE
Directions Served	LT	T	T	LR
Maximum Queue (ft)	72	42	31	50
Average Queue (ft)	6	1	1	26
95th Queue (ft)	34	14	10	42
Link Distance (ft)	149	149	131	610
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 89: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	93	116	153	158	119	132
Average Queue (ft)	28	46	60	44	64	65
95th Queue (ft)	73	103	124	105	120	114
Link Distance (ft)	131	131	157	157	111	518
Upstream Blk Time (%)		0	0	0	3	
Queuing Penalty (veh)		0	0	0	4	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 90: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	SE
Directions Served	LT	T	LR
Maximum Queue (ft)	156	157	74
Average Queue (ft)	35	48	29
95th Queue (ft)	90	131	56
Link Distance (ft)	157	157	463
Upstream Blk Time (%)	0	1	
Queuing Penalty (veh)	0	2	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 91: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	TR
Maximum Queue (ft)	99	119	142	174	262	203	113	269	491	351
Average Queue (ft)	17	78	108	116	77	51	33	164	268	216
95th Queue (ft)	51	131	138	178	185	117	73	264	422	344
Link Distance (ft)		104	104		217	217	321	321	476	476
Upstream Blk Time (%)	0	6	16		1	0			0	
Queuing Penalty (veh)	0	18	44		3	0			0	
Storage Bay Dist (ft)	75			150						
Storage Blk Time (%)		14		4	0					
Queuing Penalty (veh)		4		6	0					

Intersection: 92: Arlington Street & Grove Street

Movement	EB	WB	WB	NB	NB
Directions Served	T	L	T	L	R
Maximum Queue (ft)	55	31	29	105	56
Average Queue (ft)	3	4	3	76	19
95th Queue (ft)	20	22	16	109	60
Link Distance (ft)	321		65	80	80
Upstream Blk Time (%)				12	
Queuing Penalty (veh)				22	
Storage Bay Dist (ft)		100			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 93: Grove Street & Tufts Health Plan

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	94	46	29
Average Queue (ft)	18	13	13
95th Queue (ft)	66	41	37
Link Distance (ft)	65		147
Upstream Blk Time (%)	1		
Queuing Penalty (veh)	6		
Storage Bay Dist (ft)		150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
Existing AM Peak Hour

02/22/2021

Intersection: 98: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	184	108	79	81	31
Average Queue (ft)	50	25	29	24	7
95th Queue (ft)	127	84	74	67	29
Link Distance (ft)	123	123	65	65	380
Upstream Blk Time (%)	1	0	1	1	
Queuing Penalty (veh)	3	0	5	5	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 100: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB	B258	B258
Directions Served	LT	T	T	TR	T	T
Maximum Queue (ft)	105	103	115	135	24	63
Average Queue (ft)	65	46	32	26	2	4
95th Queue (ft)	101	100	94	84	13	24
Link Distance (ft)	65	65	53	53	-25	-25
Upstream Blk Time (%)	17	6	2	3	0	
Queuing Penalty (veh)	55	20	10	14	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 104: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	LT	T	R	LT	TR	LTR	LTR
Maximum Queue (ft)	176	194	50	137	155	137	73
Average Queue (ft)	59	76	42	66	71	66	14
95th Queue (ft)	125	163	60	127	134	118	46
Link Distance (ft)	491	491		1007	1007	1745	258
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				25			
Storage Blk Time (%)			23	7			
Queuing Penalty (veh)			52	16			

Queuing and Blocking Report
Existing AM Peak Hour

02/22/2021

Intersection: 107: Boylston Street & Mt. Auburn Street

Movement	EB	EB	WB	NB
Directions Served	T	TR	LT	LR
Maximum Queue (ft)	51	31	53	48
Average Queue (ft)	3	2	14	25
95th Queue (ft)	22	13	43	47
Link Distance (ft)	1007	1007	752	524
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 109: Chauncey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	26	50	90	30	100
Average Queue (ft)	1	2	27	1	36
95th Queue (ft)	8	18	62	10	70
Link Distance (ft)	104	104	339	339	361
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 111: School Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	202	224	253	208	402	1157
Average Queue (ft)	77	113	118	96	115	1041
95th Queue (ft)	158	193	191	175	286	1406
Link Distance (ft)	339	339	1180	1180	996	1135
Upstream Blk Time (%)						37
Queuing Penalty (veh)						208
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
Existing AM Peak Hour

02/22/2021

Intersection: 114: Winthrop Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	50	76	92	89	28
Average Queue (ft)	7	9	21	10	13
95th Queue (ft)	29	44	65	47	35
Link Distance (ft)	752	752	98	98	305
Upstream Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 119: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	108	184	138	155	214
Average Queue (ft)	49	66	77	85	86
95th Queue (ft)	94	132	151	153	159
Link Distance (ft)	517	517	123	123	442
Upstream Blk Time (%)			3	3	
Queuing Penalty (veh)			11	13	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 257: Parker Street/Common Street & Mt. Auburn Street

Movement	EB	EB	B258	B258	WB	WB	NB	SB	SB
Directions Served	LT	TR	T	T	LT	TR	LTR	L	R
Maximum Queue (ft)	57	77	131	94	292	418	59	621	195
Average Queue (ft)	41	58	87	74	163	220	8	612	195
95th Queue (ft)	53	68	120	104	267	343	28	620	195
Link Distance (ft)	-25	-25	53	53	490	490	460	600	
Upstream Blk Time (%)			44	19				41	
Queuing Penalty (veh)			138	61				355	
Storage Bay Dist (ft)									120
Storage Blk Time (%)								9	99
Queuing Penalty (veh)								32	178

Zone Summary

Zone wide Queuing Penalty: 1296

Queuing and Blocking Report
Existing PM Peak Hour

02/22/2021

Intersection: 75: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	WB	NB	SB
Directions Served	LT	LT	LTR	LTR
Maximum Queue (ft)	50	29	70	31
Average Queue (ft)	3	5	28	13
95th Queue (ft)	20	22	60	38
Link Distance (ft)	1180	277	617	94
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 85: Melendy Avenue & Mt. Auburn Street

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	35	51
Average Queue (ft)	7	13
95th Queue (ft)	29	33
Link Distance (ft)	19	800
Upstream Blk Time (%)	1	
Queuing Penalty (veh)	2	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 86: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	EB	WB	SB
Directions Served	LT	TR	LT	LTR
Maximum Queue (ft)	41	19	40	66
Average Queue (ft)	3	1	6	16
95th Queue (ft)	21	6	26	49
Link Distance (ft)	19	19	149	428
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	1	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Existing PM Peak Hour

02/22/2021

Intersection: 88: Mt. Auburn Street & Irma Avenue

Movement	EB	SE
Directions Served	LT	LR
Maximum Queue (ft)	51	68
Average Queue (ft)	4	19
95th Queue (ft)	23	47
Link Distance (ft)	149	610
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 89: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	97	124	157	160	121	50
Average Queue (ft)	27	29	57	55	87	18
95th Queue (ft)	68	74	131	125	119	42
Link Distance (ft)	131	131	157	157	111	518
Upstream Blk Time (%)		0	1	0	5	
Queuing Penalty (veh)		0	2	0	6	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 90: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	WB	SE
Directions Served	LT	T	T	LR
Maximum Queue (ft)	106	31	29	28
Average Queue (ft)	20	1	1	1
95th Queue (ft)	64	10	10	9
Link Distance (ft)	157	157	110	463
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 91: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	LT	TR	LT	TR
Maximum Queue (ft)	100	122	118	139	113	136	338	362	242	293
Average Queue (ft)	25	70	64	66	53	62	326	329	120	132
95th Queue (ft)	68	121	121	122	112	119	364	365	203	235
Link Distance (ft)		110	110		211	211	320	320	476	476
Upstream Blk Time (%)	0	2	1				28	26		
Queuing Penalty (veh)	0	5	3				137	127		
Storage Bay Dist (ft)	75			150						
Storage Blk Time (%)		11		0						
Queuing Penalty (veh)		6		0						

Intersection: 92: Arlington Street & Grove Street

Movement	EB	WB	WB	NB
Directions Served	T	L	T	L
Maximum Queue (ft)	31	65	92	99
Average Queue (ft)	1	13	73	93
95th Queue (ft)	10	50	89	97
Link Distance (ft)	320		65	80
Upstream Blk Time (%)		0	23	75
Queuing Penalty (veh)		0	172	135
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		0	23	
Queuing Penalty (veh)		0	15	

Intersection: 93: Grove Street & Tufts Health Plan

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (ft)	74	138	167	199
Average Queue (ft)	19	56	139	166
95th Queue (ft)	60	117	204	203
Link Distance (ft)	65	557		147
Upstream Blk Time (%)	0		25	83
Queuing Penalty (veh)	1		0	0
Storage Bay Dist (ft)			150	
Storage Blk Time (%)			25	83
Queuing Penalty (veh)			120	130

Queuing and Blocking Report
Existing PM Peak Hour

02/22/2021

Intersection: 98: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	184	185	79	76	378
Average Queue (ft)	136	102	20	18	222
95th Queue (ft)	224	222	72	64	468
Link Distance (ft)	124	124	65	65	380
Upstream Blk Time (%)	61	48	3	2	47
Queuing Penalty (veh)	189	148	10	7	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 100: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB	B258	B258
Directions Served	LT	T	T	TR	T	T
Maximum Queue (ft)	85	125	111	130	106	90
Average Queue (ft)	70	61	80	96	30	48
95th Queue (ft)	80	101	153	170	72	104
Link Distance (ft)	65	65	48	48	-27	-27
Upstream Blk Time (%)	76	52	61	61	16	17
Queuing Penalty (veh)	252	174	231	233	61	63
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 104: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	B44	SB
Directions Served	LT	T	R	LT	TR	LTR	T	LTR
Maximum Queue (ft)	164	177	50	1007	1007	1787	777	139
Average Queue (ft)	38	51	23	401	405	649	106	43
95th Queue (ft)	109	152	61	1079	1075	1773	513	117
Link Distance (ft)	491	491		1007	1007	1717	777	258
Upstream Blk Time (%)				25	25	18	7	
Queuing Penalty (veh)				100	99	52	20	
Storage Bay Dist (ft)			25					
Storage Blk Time (%)		17	3					
Queuing Penalty (veh)		24	6					

Queuing and Blocking Report
Existing PM Peak Hour

02/22/2021

Intersection: 107: Boylston Street & Mt. Auburn Street

Movement	WB	WB	NB
Directions Served	LT	T	LR
Maximum Queue (ft)	766	752	393
Average Queue (ft)	171	171	68
95th Queue (ft)	669	666	221
Link Distance (ft)	752	752	524
Upstream Blk Time (%)	15	15	
Queuing Penalty (veh)	54	55	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 109: Chauncey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	28	30	400	397	30
Average Queue (ft)	1	2	46	45	16
95th Queue (ft)	9	12	241	242	40
Link Distance (ft)	72	72	339	339	361
Upstream Blk Time (%)			8	8	
Queuing Penalty (veh)			27	27	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 111: School Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	201	185	648	618	1006	1156
Average Queue (ft)	51	59	124	129	644	836
95th Queue (ft)	141	135	310	311	1067	1478
Link Distance (ft)	339	339	1180	1180	996	1135
Upstream Blk Time (%)					4	29
Queuing Penalty (veh)					21	128
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
Existing PM Peak Hour

02/22/2021

Intersection: 114: Winthrop Street & Mt. Auburn Street

Movement	WB	WB	NB
Directions Served	LT	T	LR
Maximum Queue (ft)	136	137	28
Average Queue (ft)	23	25	7
95th Queue (ft)	100	109	26
Link Distance (ft)	130	130	305
Upstream Blk Time (%)	13	13	
Queuing Penalty (veh)	47	48	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 119: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	B15
Directions Served	LT	TR	LT	TR	LTR	T
Maximum Queue (ft)	586	533	137	134	1002	95
Average Queue (ft)	325	286	34	54	553	34
95th Queue (ft)	723	666	118	125	1196	104
Link Distance (ft)	527	527	124	124	931	82
Upstream Blk Time (%)	45	43	4	4	40	38
Queuing Penalty (veh)	140	134	15	13	0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 257: Parker/Common Street & Mt. Auburn Street

Movement	EB	EB	B258	B258	WB	WB	NB	SB	SB
Directions Served	LT	TR	T	T	LT	TR	LTR	L	R
Maximum Queue (ft)	36	56	95	94	500	504	358	606	195
Average Queue (ft)	25	47	71	36	366	394	85	396	102
95th Queue (ft)	40	60	91	103	598	562	244	772	151
Link Distance (ft)	-27	-27	48	48	486	486	355	600	
Upstream Blk Time (%)			83	10	50	51	2	52	
Queuing Penalty (veh)			256	32	184	189	0	341	
Storage Bay Dist (ft)									120
Storage Blk Time (%)								68	1
Queuing Penalty (veh)								146	3

Zone Summary

Zone wide Queuing Penalty: 4390

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 201: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	294	370	137	149	244
Average Queue (ft)	37	166	84	91	122
95th Queue (ft)	122	342	148	151	210
Link Distance (ft)	528	528	124	124	473
Upstream Blk Time (%)			3	5	
Queuing Penalty (veh)			12	19	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 202: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	112	206	93	64	53
Average Queue (ft)	17	136	30	16	16
95th Queue (ft)	60	236	67	49	43
Link Distance (ft)	124	124	23	23	380
Upstream Blk Time (%)	0	17	10	3	
Queuing Penalty (veh)	0	56	44	15	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 203: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB
Directions Served	LT	T	T	TR
Maximum Queue (ft)	79	55	99	97
Average Queue (ft)	12	34	46	34
95th Queue (ft)	47	46	104	91
Link Distance (ft)	23	23	79	79
Upstream Blk Time (%)	4	37	2	1
Queuing Penalty (veh)	15	136	9	4
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 204: Mt. Auburn Street & Common Street

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	T	TR	LTR	L	R
Maximum Queue (ft)	111	119	508	275	50	423	325
Average Queue (ft)	64	91	503	274	27	191	199
95th Queue (ft)	107	110	510	278	53	357	341
Link Distance (ft)	79	79	493		608	693	
Upstream Blk Time (%)	7	40	51				
Queuing Penalty (veh)	26	145	370				
Storage Bay Dist (ft)				200			250
Storage Blk Time (%)			50	83		4	12
Queuing Penalty (veh)			228	231		14	28

Intersection: 207: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	L	T	R	L	TR	LTR	LTR
Maximum Queue (ft)	99	512	125	100	612	158	52
Average Queue (ft)	6	305	104	42	312	69	16
95th Queue (ft)	36	501	171	107	503	128	42
Link Distance (ft)		495			1002	1751	388
Upstream Blk Time (%)		2					
Queuing Penalty (veh)		12					
Storage Bay Dist (ft)	75		100	75			
Storage Blk Time (%)	0	45	0	7	56		
Queuing Penalty (veh)	0	107	1	39	18		

Intersection: 208: Boylston Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	828	74	266	111
Average Queue (ft)	341	20	113	39
95th Queue (ft)	703	59	213	75
Link Distance (ft)	1002		756	501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		50		
Storage Blk Time (%)		3	19	
Queuing Penalty (veh)		14	4	

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 209: Winthrop Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	766	49	159	53
Average Queue (ft)	332	19	23	16
95th Queue (ft)	794	47	91	41
Link Distance (ft)	756		98	316
Upstream Blk Time (%)	3		1	
Queuing Penalty (veh)	22		3	
Storage Bay Dist (ft)		25		
Storage Blk Time (%)		10	1	
Queuing Penalty (veh)		47	0	

Intersection: 211: Chauncey Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	120	49	297	203
Average Queue (ft)	88	29	55	59
95th Queue (ft)	161	58	166	143
Link Distance (ft)	106		323	625
Upstream Blk Time (%)	25			
Queuing Penalty (veh)	160			
Storage Bay Dist (ft)		25		
Storage Blk Time (%)		18	1	
Queuing Penalty (veh)		87	1	

Intersection: 212: School Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (ft)	175	343	200	174	644	150	189	150	1185
Average Queue (ft)	82	320	50	82	422	39	53	93	754
95th Queue (ft)	211	368	161	197	677	122	137	183	1329
Link Distance (ft)		323			1171		981		1170
Upstream Blk Time (%)		33							30
Queuing Penalty (veh)		236							0
Storage Bay Dist (ft)	100		125	100		75		75	
Storage Blk Time (%)	34	58		9	58	20	7	11	67
Queuing Penalty (veh)	227	54		50	36	29	2	59	76

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 213: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	L	LTR	LTR
Maximum Queue (ft)	29	21	29	78	74
Average Queue (ft)	2	1	13	35	13
95th Queue (ft)	14	10	35	68	42
Link Distance (ft)		1171		643	100
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	75		75		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 214: Melendy Avenue & Mt. Auburn Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	74	65	62
Average Queue (ft)	9	16	24
95th Queue (ft)	38	46	51
Link Distance (ft)	281	20	396
Upstream Blk Time (%)		4	
Queuing Penalty (veh)		14	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	WB	WB	SB
Directions Served	LTR	L	TR	LTR
Maximum Queue (ft)	62	93	121	133
Average Queue (ft)	24	35	22	24
95th Queue (ft)	64	69	83	72
Link Distance (ft)	20		145	434
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	9			
Storage Bay Dist (ft)		50		
Storage Blk Time (%)		4	2	
Queuing Penalty (veh)		14	1	

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 216: Mt. Auburn Street & Irma Avenue

Movement	EB	EB	SE
Directions Served	L	T	LR
Maximum Queue (ft)	31	154	74
Average Queue (ft)	5	5	39
95th Queue (ft)	24	51	58
Link Distance (ft)		145	623
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		1	
Storage Bay Dist (ft)	50		
Storage Blk Time (%)	0	1	
Queuing Penalty (veh)	0	0	

Intersection: 217: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	L	TR	LTR
Maximum Queue (ft)	137	159	100	151	77
Average Queue (ft)	43	75	46	93	24
95th Queue (ft)	92	143	91	170	50
Link Distance (ft)	142	142		136	92
Upstream Blk Time (%)	0	1		2	0
Queuing Penalty (veh)	0	5		12	0
Storage Bay Dist (ft)			75		
Storage Blk Time (%)			2	9	
Queuing Penalty (veh)			9	9	

Intersection: 218: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	WB	SE
Directions Served	T	T	TR	R
Maximum Queue (ft)	162	92	96	55
Average Queue (ft)	42	23	14	29
95th Queue (ft)	123	75	60	49
Link Distance (ft)	136	136	117	476
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	4			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
 2030 Future AM Peak Hour Road diet

02/22/2021

Intersection: 219: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	TR	L	T	R	LT	TR
Maximum Queue (ft)	100	140	122	175	241	82	217	66	540	522
Average Queue (ft)	36	106	98	111	107	31	109	39	316	233
95th Queue (ft)	89	144	138	176	203	62	194	64	562	508
Link Distance (ft)		117	117		183	306	306		488	488
Upstream Blk Time (%)	0	16	7	0	1				10	6
Queuing Penalty (veh)	0	51	22	0	6				0	0
Storage Bay Dist (ft)	75			150				25		
Storage Blk Time (%)	2	41		3	3		38	4		
Queuing Penalty (veh)	3	16		12	8		38	12		

Intersection: 220: Arlington Street & Grove Street

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	T	TR	LTR	L	TR
Maximum Queue (ft)	125	322	339	150	317	79	47	44
Average Queue (ft)	107	179	125	33	155	57	13	17
95th Queue (ft)	145	319	258	130	295	67	39	40
Link Distance (ft)		306	306		679	-16	294	294
Upstream Blk Time (%)		0	1			64		
Queuing Penalty (veh)		2	3			151		
Storage Bay Dist (ft)	50			75				
Storage Blk Time (%)	44	22			40			
Queuing Penalty (veh)	174	62			44			

Zone Summary

Zone wide Queuing Penalty: 3321

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 201: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	151	292	94	107	438
Average Queue (ft)	59	132	51	69	216
95th Queue (ft)	126	261	104	111	374
Link Distance (ft)	528	528	84	84	423
Upstream Blk Time (%)			5	12	2
Queuing Penalty (veh)			20	45	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 202: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	76	166	120	127	29
Average Queue (ft)	5	27	48	34	12
95th Queue (ft)	30	93	110	99	36
Link Distance (ft)	84	84	99	99	472
Upstream Blk Time (%)	0	1	3	1	
Queuing Penalty (veh)	0	3	13	4	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 203: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB
Directions Served	LT	T	T	TR
Maximum Queue (ft)	117	114	97	96
Average Queue (ft)	38	48	17	22
95th Queue (ft)	97	116	70	78
Link Distance (ft)	99	99	84	84
Upstream Blk Time (%)	2	5	1	1
Queuing Penalty (veh)	8	17	4	3
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 204: Parker/Common Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	T	TR	LTR	L	R
Maximum Queue (ft)	97	118	483	275	67	435	325
Average Queue (ft)	85	86	466	274	27	188	113
95th Queue (ft)	111	115	550	280	57	327	229
Link Distance (ft)	84	84	466		451	604	
Upstream Blk Time (%)	22	19	46				
Queuing Penalty (veh)	73	63	369				
Storage Bay Dist (ft)				200			250
Storage Blk Time (%)			25	81		6	
Queuing Penalty (veh)			155	238		14	

Intersection: 207: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	L	T	R	L	TR	LTR	LTR
Maximum Queue (ft)	99	384	125	100	1016	1766	73
Average Queue (ft)	7	183	69	6	905	1441	5
95th Queue (ft)	39	316	154	38	1179	2172	30
Link Distance (ft)		495			1002	1751	264
Upstream Blk Time (%)					7	51	
Queuing Penalty (veh)					67	0	
Storage Bay Dist (ft)	75		100	75			
Storage Blk Time (%)		31	0		78		
Queuing Penalty (veh)		48	1		4		

Intersection: 208: Boylston Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	386	74	776	89
Average Queue (ft)	157	9	636	29
95th Queue (ft)	281	47	891	63
Link Distance (ft)	1002		756	501
Upstream Blk Time (%)			11	
Queuing Penalty (veh)			91	
Storage Bay Dist (ft)		50		
Storage Blk Time (%)		0	59	
Queuing Penalty (veh)		0	4	

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 209: Winthrop Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	421	31	119	94
Average Queue (ft)	52	3	45	27
95th Queue (ft)	230	18	123	76
Link Distance (ft)	756		97	316
Upstream Blk Time (%)			8	
Queuing Penalty (veh)			55	
Storage Bay Dist (ft)		25		
Storage Blk Time (%)		0	18	
Queuing Penalty (veh)		1	1	

Intersection: 211: Chauncey Street & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	119	29	397	50
Average Queue (ft)	46	4	43	17
95th Queue (ft)	134	20	200	43
Link Distance (ft)	105		324	369
Upstream Blk Time (%)	13		2	
Queuing Penalty (veh)	68		14	
Storage Bay Dist (ft)		25		
Storage Blk Time (%)		1	7	
Queuing Penalty (veh)		5	1	

Intersection: 212: School Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (ft)	124	333	100	124	1150	99	988	100	891
Average Queue (ft)	104	236	25	27	723	50	948	87	830
95th Queue (ft)	151	400	87	92	1115	123	1061	101	1061
Link Distance (ft)		324			1171		976		876
Upstream Blk Time (%)		18					30		84
Queuing Penalty (veh)		99					158		0
Storage Bay Dist (ft)	100		75	100		75		75	
Storage Blk Time (%)	59	30	0		60	0	79	91	36
Queuing Penalty (veh)	272	34	1		30	2	41	378	15

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 213: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	99	856	28	21	236	53
Average Queue (ft)	12	101	12	1	55	24
95th Queue (ft)	55	487	34	7	141	48
Link Distance (ft)		1171		281	643	100
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		75			
Storage Blk Time (%)		12				
Queuing Penalty (veh)		2				

Intersection: 214: Melendy Avenue & Mt. Auburn Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	295	30	145
Average Queue (ft)	79	7	30
95th Queue (ft)	284	28	89
Link Distance (ft)	281	20	395
Upstream Blk Time (%)	10	2	
Queuing Penalty (veh)	57	13	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	WB	WB	SB
Directions Served	LTR	L	TR	LTR
Maximum Queue (ft)	95	18	146	138
Average Queue (ft)	31	1	14	42
95th Queue (ft)	79	9	76	98
Link Distance (ft)	20		146	434
Upstream Blk Time (%)	18		0	
Queuing Penalty (veh)	108		3	
Storage Bay Dist (ft)		50		
Storage Blk Time (%)			1	
Queuing Penalty (veh)			0	

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 216: Mt. Auburn Street & Irma Avenue

Movement	EB	EB	WB	SE
Directions Served	L	T	TR	LR
Maximum Queue (ft)	31	167	55	156
Average Queue (ft)	5	82	4	42
95th Queue (ft)	24	209	23	95
Link Distance (ft)		146	116	617
Upstream Blk Time (%)		17		
Queuing Penalty (veh)		95		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0	26		
Queuing Penalty (veh)	0	3		

Intersection: 217: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	L	TR	LTR
Maximum Queue (ft)	150	144	114	168	120
Average Queue (ft)	94	63	23	128	72
95th Queue (ft)	159	137	80	199	133
Link Distance (ft)	116	116		152	98
Upstream Blk Time (%)	25	4		6	27
Queuing Penalty (veh)	71	12		42	70
Storage Bay Dist (ft)			75		
Storage Blk Time (%)			0	20	
Queuing Penalty (veh)			0	5	

Intersection: 218: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	WB	SE
Directions Served	T	T	TR	R
Maximum Queue (ft)	242	208	121	31
Average Queue (ft)	151	68	36	12
95th Queue (ft)	261	210	113	36
Link Distance (ft)	152	152	110	476
Upstream Blk Time (%)	37	11	3	
Queuing Penalty (veh)	112	33	18	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
 2030 Future PM Peak Hour Road diet

02/22/2021

Intersection: 219: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	TR	L	T	R	LT	TR
Maximum Queue (ft)	100	200	129	205	269	364	386	63	397	435
Average Queue (ft)	94	162	54	104	180	138	373	46	228	228
95th Queue (ft)	113	207	108	225	292	241	391	64	380	387
Link Distance (ft)		110	110		205	365	365		488	488
Upstream Blk Time (%)	5	56	1	0	12	0	18			
Queuing Penalty (veh)	0	172	3	0	70	0	90			
Storage Bay Dist (ft)	75			150				25		
Storage Blk Time (%)	48	44		3	18		57	5		
Queuing Penalty (veh)	79	84		11	28		158	26		

Intersection: 220: Arlington Street & Grove Street

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	T	TR	L	LTR	L	TR
Maximum Queue (ft)	31	309	215	150	1403	78	96	172	172
Average Queue (ft)	10	101	93	131	1271	31	77	87	147
95th Queue (ft)	32	198	179	208	1724	63	109	135	216
Link Distance (ft)		365	365		1350		78	156	156
Upstream Blk Time (%)					78	0	29	1	33
Queuing Penalty (veh)					0	0	61	0	0
Storage Bay Dist (ft)	50			75		75			
Storage Blk Time (%)	0	26		2	82	0	33		
Queuing Penalty (veh)	0	3		5	219	0	33		

Zone Summary

Zone wide Queuing Penalty: 4103

Queuing and Blocking Report
 Future No Build AM Peak Hour

02/22/2021

Intersection: 201: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	165	202	134	166	196
Average Queue (ft)	62	78	75	98	92
95th Queue (ft)	128	153	140	155	152
Link Distance (ft)	517	517	123	123	442
Upstream Blk Time (%)			2	3	
Queuing Penalty (veh)			9	11	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 202: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	130	94	78	76	31
Average Queue (ft)	34	34	33	15	8
95th Queue (ft)	98	92	77	55	31
Link Distance (ft)	123	123	65	65	380
Upstream Blk Time (%)	0		2	0	
Queuing Penalty (veh)	0		9	2	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 203: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB	B204	B204
Directions Served	LT	T	T	TR	T	T
Maximum Queue (ft)	124	82	77	53	36	44
Average Queue (ft)	54	34	22	22	6	3
95th Queue (ft)	102	82	70	56	28	21
Link Distance (ft)	65	65	53	53	-4	-4
Upstream Blk Time (%)	10	4	1	1		
Queuing Penalty (veh)	35	15	5	4		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
 Future No Build AM Peak Hour

02/22/2021

Intersection: 205: Parker Street/Common Street & Mt. Auburn Street

Movement	EB	EB	B204	B204	WB	WB	NB	SB	SB
Directions Served	LT	TR	T	T	LT	TR	LTR	L	R
Maximum Queue (ft)	89	112	96	94	339	352	38	341	195
Average Queue (ft)	63	77	72	54	183	226	12	313	195
95th Queue (ft)	77	96	113	112	302	349	29	330	195
Link Distance (ft)	-4	-4	53	53	470	470	374	291	
Upstream Blk Time (%)			31	14				92	
Queuing Penalty (veh)			101	47				0	
Storage Bay Dist (ft)									120
Storage Blk Time (%)								17	98
Queuing Penalty (veh)								65	184

Intersection: 208: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	LT	T	R	LT	TR	LTR	LTR
Maximum Queue (ft)	243	293	64	169	209	113	52
Average Queue (ft)	94	121	46	72	92	53	17
95th Queue (ft)	181	231	57	126	158	98	44
Link Distance (ft)	491	491		1016	1016	520	258
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		26	7				
Queuing Penalty (veh)		61	18				

Intersection: 209: Boylston Street & Mt. Auburn Street

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	88
Average Queue (ft)	9	33
95th Queue (ft)	32	61
Link Distance (ft)	752	524
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Winthrop Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	91	92	114	98	28
Average Queue (ft)	8	8	13	12	7
95th Queue (ft)	40	43	51	48	27
Link Distance (ft)	752	752	98	98	305
Upstream Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 212: Chauncey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	70	96	90	30	73
Average Queue (ft)	3	7	23	2	35
95th Queue (ft)	24	41	62	14	63
Link Distance (ft)	104	104	339	339	361
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		0			
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 213: School Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	208	256	258	199	276	1138
Average Queue (ft)	99	121	135	113	84	1103
95th Queue (ft)	180	201	230	192	177	1211
Link Distance (ft)	339	339	1188	1188	996	1100
Upstream Blk Time (%)						93
Queuing Penalty (veh)						0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
 Future No Build AM Peak Hour

02/22/2021

Intersection: 214: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	30	51	114	78	73	30
Average Queue (ft)	4	2	18	3	31	9
95th Queue (ft)	20	17	71	26	63	32
Link Distance (ft)	1188	1188	277	277	637	94
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 215: Melendy Avenue & Mt. Auburn Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	30	31	40
Average Queue (ft)	2	3	15
95th Queue (ft)	14	18	30
Link Distance (ft)	277	19	388
Upstream Blk Time (%)		1	
Queuing Penalty (veh)		3	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 216: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	SB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	63	19	124	64	53
Average Queue (ft)	5	2	36	2	20
95th Queue (ft)	33	13	86	21	52
Link Distance (ft)	19	19	149	149	428
Upstream Blk Time (%)	1	1			
Queuing Penalty (veh)	2	2			
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report
 Future No Build AM Peak Hour

02/22/2021

Intersection: 217: Mt. Auburn Street & Irma Avenue

Movement	EB	EB	SE
Directions Served	LT	T	LR
Maximum Queue (ft)	53	55	94
Average Queue (ft)	7	8	30
95th Queue (ft)	31	33	57
Link Distance (ft)	149	149	610
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 218: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	103	144	175	157	121	137
Average Queue (ft)	33	56	54	54	53	84
95th Queue (ft)	82	123	125	125	107	130
Link Distance (ft)	131	131	157	157	111	518
Upstream Blk Time (%)		1	1	1	2	
Queuing Penalty (veh)		4	3	2	2	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 219: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	WB	WB	SE
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	156	186	74	53	53
Average Queue (ft)	59	68	4	2	21
95th Queue (ft)	152	184	31	17	49
Link Distance (ft)	157	157	104	104	463
Upstream Blk Time (%)	0	3			
Queuing Penalty (veh)	1	10			
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report
 Future No Build AM Peak Hour

02/22/2021

Intersection: 220: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	TR
Maximum Queue (ft)	100	136	122	175	256	217	90	226	482	441
Average Queue (ft)	25	96	101	123	102	68	50	155	282	234
95th Queue (ft)	80	147	143	198	243	173	83	230	405	364
Link Distance (ft)		104	104		217	217	321	321	476	476
Upstream Blk Time (%)	0	13	20		2	0			0	
Queuing Penalty (veh)	0	39	59		6	0			0	
Storage Bay Dist (ft)	75			150						
Storage Blk Time (%)		32		9	1					
Queuing Penalty (veh)		9		15	3					

Intersection: 221: Arlington Street & Grove Street

Movement	EB	WB	WB	NB	NB
Directions Served	T	L	T	L	R
Maximum Queue (ft)	77	31	30	97	79
Average Queue (ft)	5	7	1	82	28
95th Queue (ft)	33	28	10	111	73
Link Distance (ft)	321		65	80	80
Upstream Blk Time (%)				20	0
Queuing Penalty (veh)				37	0
Storage Bay Dist (ft)		100			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 222: Grove Street & Tufts Health Plan

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (ft)	99	23	51	29
Average Queue (ft)	21	1	6	15
95th Queue (ft)	74	11	29	39
Link Distance (ft)	65	557		147
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	9			
Storage Bay Dist (ft)			150	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 772

Queuing and Blocking Report
 Future No Build PM Peak Hour

02/22/2021

Intersection: 201: Irving Street/Palfrey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	LT	TR	LT	TR	LTR
Maximum Queue (ft)	526	520	122	131	442
Average Queue (ft)	517	517	4	9	442
95th Queue (ft)	520	518	40	54	442
Link Distance (ft)	517	517	123	123	442
Upstream Blk Time (%)	98	98	0	1	100
Queuing Penalty (veh)	318	319	0	3	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 202: Phillips Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	155	169	65	76	395
Average Queue (ft)	155	169	63	3	256
95th Queue (ft)	155	169	67	25	433
Link Distance (ft)	123	123	65	65	380
Upstream Blk Time (%)	100	100	100	1	22
Queuing Penalty (veh)	325	325	384	4	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 203: Mt. Auburn Street & Marshall Street

Movement	EB	EB	WB	WB	B204
Directions Served	LT	T	T	TR	T
Maximum Queue (ft)	114	61	140	133	133
Average Queue (ft)	114	61	140	115	103
95th Queue (ft)	114	61	140	166	153
Link Distance (ft)	65	65	53	53	-30
Upstream Blk Time (%)	100	100	100	91	26
Queuing Penalty (veh)	328	328	393	359	104
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report
 Future No Build PM Peak Hour

02/22/2021

Intersection: 205: Parker/Common & Mt. Auburn Street

Movement	EB	B204	WB	WB	NB	SB	SB
Directions Served	LT	T	LT	TR	LTR	L	R
Maximum Queue (ft)	17	84	504	510	435	276	58
Average Queue (ft)	17	84	491	492	276	276	58
95th Queue (ft)	17	84	497	501	498	276	58
Link Distance (ft)	-30	53	491	491	420	292	
Upstream Blk Time (%)		100	93	96	23	100	
Queuing Penalty (veh)		322	374	387	0	0	
Storage Bay Dist (ft)							120
Storage Blk Time (%)						100	
Queuing Penalty (veh)						224	

Intersection: 208: Walnut Street/Bates Road East & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	LT	T	R	LT	TR	LTR	LTR
Maximum Queue (ft)	47	48	54	1024	1018	522	269
Average Queue (ft)	3	3	4	842	850	452	109
95th Queue (ft)	19	19	25	1389	1375	653	226
Link Distance (ft)	491	491		1016	1016	520	258
Upstream Blk Time (%)				74	74	82	0
Queuing Penalty (veh)				305	306	0	0
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		2	0				
Queuing Penalty (veh)		3	1				

Intersection: 209: Boylston Street & Mt. Auburn Street

Movement	WB	WB	NB
Directions Served	LT	T	LR
Maximum Queue (ft)	764	765	522
Average Queue (ft)	537	541	255
95th Queue (ft)	1079	1080	586
Link Distance (ft)	752	752	524
Upstream Blk Time (%)	65	66	23
Queuing Penalty (veh)	238	240	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
 Future No Build PM Peak Hour

02/22/2021

Intersection: 210: Winthrop Street & Mt. Auburn Street

Movement	WB	WB	NB
Directions Served	LT	T	LR
Maximum Queue (ft)	98	98	219
Average Queue (ft)	66	65	61
95th Queue (ft)	140	141	176
Link Distance (ft)	98	98	305
Upstream Blk Time (%)	63	63	
Queuing Penalty (veh)	230	230	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 212: Chauncey Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB
Directions Served	T	TR	LT	T	LR
Maximum Queue (ft)	64	117	378	405	160
Average Queue (ft)	4	24	217	233	49
95th Queue (ft)	27	91	501	537	136
Link Distance (ft)	104	104	339	339	361
Upstream Blk Time (%)		12	57	57	
Queuing Penalty (veh)		32	204	204	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 213: School Street & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	142	152	1194	1191	1013	1115
Average Queue (ft)	20	22	644	655	999	1026
95th Queue (ft)	68	70	1489	1483	1008	1381
Link Distance (ft)	339	339	1188	1188	996	1100
Upstream Blk Time (%)			40	40	76	86
Queuing Penalty (veh)			128	128	394	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
 Future No Build PM Peak Hour

02/22/2021

Intersection: 214: Dexter Avenue/Upland Road & Mt. Auburn Street

Movement	EB	WB	WB	NB	SB
Directions Served	LT	LT	TR	LTR	LTR
Maximum Queue (ft)	51	282	281	434	92
Average Queue (ft)	4	115	110	110	33
95th Queue (ft)	26	334	334	345	76
Link Distance (ft)	1188	277	277	637	94
Upstream Blk Time (%)		36	36		11
Queuing Penalty (veh)		120	118		0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 215: Melendy Avenue & Mt. Auburn Street

Movement	EB	WB	WB	NB
Directions Served	T	LT	T	LR
Maximum Queue (ft)	54	31	30	205
Average Queue (ft)	2	10	7	48
95th Queue (ft)	18	30	24	145
Link Distance (ft)	277	19	19	388
Upstream Blk Time (%)		37	36	
Queuing Penalty (veh)		135	132	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 216: Elton Avenue/Lloyd Road & Mt. Auburn Street

Movement	EB	WB	WB	SB
Directions Served	LT	LT	TR	LTR
Maximum Queue (ft)	69	167	165	305
Average Queue (ft)	6	58	56	59
95th Queue (ft)	33	180	176	183
Link Distance (ft)	19	149	149	428
Upstream Blk Time (%)	1	34	34	
Queuing Penalty (veh)	3	112	111	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 217: Mt. Auburn Street & Irma Avenue

Movement	EB	WB	WB	SE
Directions Served	LT	T	TR	LR
Maximum Queue (ft)	30	162	165	201
Average Queue (ft)	1	51	51	36
95th Queue (ft)	10	167	167	113
Link Distance (ft)	149	131	131	610
Upstream Blk Time (%)		33	33	
Queuing Penalty (veh)		109	110	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 218: Bigelow Avenue/Kimball Road & Mt. Auburn Street

Movement	EB	EB	WB	WB	NB	SB
Directions Served	LT	TR	LT	TR	LTR	LTR
Maximum Queue (ft)	79	84	175	161	119	528
Average Queue (ft)	24	16	96	101	97	102
95th Queue (ft)	65	49	189	191	135	344
Link Distance (ft)	131	131	157	157	111	518
Upstream Blk Time (%)			31	31	35	1
Queuing Penalty (veh)			93	93	43	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 219: Mt. Auburn Street & Templeton Parkway

Movement	EB	EB	WB	WB	SE
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	73	56	111	116	52
Average Queue (ft)	12	3	35	36	8
95th Queue (ft)	45	21	119	118	31
Link Distance (ft)	157	157	110	110	463
Upstream Blk Time (%)			28	28	
Queuing Penalty (veh)			85	84	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 220: Arlington Street & Mt. Auburn Street

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	LT	TR	LT	TR
Maximum Queue (ft)	55	117	118	141	243	259	336	371	480	491
Average Queue (ft)	15	47	43	50	115	119	324	276	196	211
95th Queue (ft)	46	102	109	118	244	262	341	481	469	473
Link Distance (ft)		110	110		211	211	320	320	476	476
Upstream Blk Time (%)		0	1		25	25	40	22	21	22
Queuing Penalty (veh)		1	2		74	74	204	115	0	0
Storage Bay Dist (ft)	75			150						
Storage Blk Time (%)		5		0	26					
Queuing Penalty (veh)		3		1	40					

Intersection: 221: Arlington Street & Grove Street

Movement	EB	WB	WB	NB	NB
Directions Served	T	L	T	L	R
Maximum Queue (ft)	55	54	78	97	52
Average Queue (ft)	3	5	69	91	3
95th Queue (ft)	21	29	88	99	24
Link Distance (ft)	320		65	80	80
Upstream Blk Time (%)		0	39	81	
Queuing Penalty (veh)		0	310	147	
Storage Bay Dist (ft)		100			
Storage Blk Time (%)		0	39		
Queuing Penalty (veh)		0	26		

Intersection: 222: Grove Street & Tufts Health Plan

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (ft)	72	565	201	210
Average Queue (ft)	11	129	106	155
95th Queue (ft)	50	428	225	204
Link Distance (ft)	65	557		147
Upstream Blk Time (%)	0	10	18	81
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)			150	
Storage Blk Time (%)			18	81
Queuing Penalty (veh)			93	134

Zone Summary

Zone wide Queuing Penalty: 9709



6.2 Updated Appendix Material – MBTA Data

MBTA Ridership by Stop - By Load Out

Stop #	Stop Name	Municipality	Routes	Wkdy On + Wkdy On	Wkdy Off	Sat On	Sat Off	Sun On	Sun Off	Wkdy Load Out	Sat Load Out	Sun Load Out	
2038	MT AUBURN ST @ ADAMS AVE		8 71	116	43	72	18	23	4	22	1,228	642	420
2058	MT AUBURN ST @ ADAMS ST		8 71	174	128	46	46	13	39	9	1,541	799	496
2040	MT AUBURN ST @ AMHERST RD		6 71	100	18	82	2	49	4	29	1,163	595	395
2047	MT AUBURN ST @ BATES RD E		4 71	67	9	58	3	26	2	19	1,114	573	378
2060	MT AUBURN ST @ BIGELOW AVE		12 71	344	247	98	127	42	89	32	1,690	884	554
2054	MT AUBURN ST @ BOYLSTON ST		6 71	100	82	18	43	11	28	7	1,365	732	440
2051	MT AUBURN ST @ FRANKLIN ST		3 71	111	98	13	48	5	31	4	1,253	670	404
2033	MT AUBURN ST @ KEENAN ST		13 71	253	47	205	15	49	10	26	1,537	806	571
2034	MT AUBURN ST @ KIMBALL RD		13 71	362	98	264	39	136	27	91	1,372	708	507
2048	MT AUBURN ST @ MAIN ST	WATERTOWN	71	112	109	4	73	2	41	0	859	481	280
2046	MT AUBURN ST @ MAIN ST	WATERTOWN	71	266	7	260	4	150	1	71	508	259	176
2043	MT AUBURN ST @ MARSHALL ST		2 71	167	13	154	3	63	0	50	889	474	297
2050	MT AUBURN ST @ PARKER ST		2 71	187	172	15	80	3	44	1	1,173	627	377
2049	MT AUBURN ST @ PATTEN ST		1 71	166	161	5	71	1	55	2	1,017	551	334
2062	MT AUBURN ST @ RALPH PITERI T		14 71	121	83	38	41	18	26	9	1,921	942	604
2042	MT AUBURN ST @ RUSSELL AVE		3 71	106	11	95	2	42	3	35	1,030	533	347
2032	MT AUBURN ST @ SAINT MARYS ST		14 71	142	42	100	25	56	19	33	1,696	840	587
2057	MT AUBURN ST @ SCHOOL ST		9 71	113	81	32	34	15	21	9	1,459	766	467
2044	MT AUBURN ST @ SUMMER ST		1 71	146	9	138	2	72	0	53	761	405	245
2036	MT AUBURN ST @ UPLAND RD		10 71	127	36	91	17	56	11	49	1,318	669	470
2052	MT AUBURN ST @ WALNUT ST		4 71	79	64	14	32	3	18	3	1,302	699	419
2037	MT AUBURN ST @ WINSOR AVE		9 71	116	27	88	15	36	4	36	1,257	647	437
2056	MT AUBURN ST @ WINTHROP ST	8 inbound	71	113	79	34	23	7	18	3	1,410	747	455
2061	MT AUBURN ST OPP KEENAN ST		13 71	293	240	53	54	18	42	10	1,878	920	586



6.3 Updated Appendix Material – Signal Warrants

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Mt Auburn St / Irving Street/ Palfrey Street**

City/Town: **Everett, MA**

Project Number:

Engineer: **0**

Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:

Mt Auburn St

Minor Street:

Irving Street/ Palfrey Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1298
8-9 AM	1443
9-10 AM	1240
10-11 AM	1166
11-12 N	1126
12-1 PM	1291
1-2 PM	1155
2-3 PM	1298
3-4 PM	1351
4-5 PM	1374
5-6 PM	1496
6-7 PM	1420
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)
0
0
0
0
0
0
0
129
142
150
158
167
235
232
225
198
214
247
230
0
0
0
0
0

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
80	80	x
80	80	x
80	80	x
80	80	x
78	80	x
80	80	x
75	80	x
80	80	x
80	80	x
80	80	x
80	80	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Four Hour Vehicular Volume



Warrant 3: Peak Hour

WARRANT MET

Project Name: **Mt Auburn St / Irving Street/ Palfrey Street**
 Project Number:

City/Town: **Everett, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Irving Street/ Palfrey Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1298
8-9 AM	1443
9-10 AM	1240
10-11 AM	1166
11-12 N	1126
12-1 PM	1291
1-2 PM	1155
2-3 PM	1298
3-4 PM	1351
4-5 PM	1374
5-6 PM	1496
6-7 PM	1420
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)
0
0
0
0
0
0
0
129
142
150
158
167
235
232
225
198
214
247
230
0
0
0
0
0

Peak Hour Warrant		
Minor Street Criteria (NCHRP 562 Table O-1)	Minor Street Criteria (MUTCD Figure 4C-3)	Meets Minor Street Criteria (1 hour needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
126	150	x
100	120	x
139	150	x
156	175	x
166	175	x
128	150	x
159	175	x
126	150	x
100	120	x
100	120	x
100	120	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Peak Hour

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Mt Auburn St / Common Street/Parker Street**
 Project Number: _____

City/Town: **Watertown, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Common Street/Parker Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1390
8-9 AM	1422
9-10 AM	1201
10-11 AM	1174
11-12 N	1134
12-1 PM	1318
1-2 PM	1158
2-3 PM	1305
3-4 PM	1328
4-5 PM	1297
5-6 PM	1422
6-7 PM	1352
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)
0
0
0
0
0
0
0
425
214
341
295
250
214
302
159
245
291
327
290
0
0
0
0
0

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
80	80	x
80	80	x
80	80	x
80	80	x
77	80	x
80	80	x
75	80	x
80	80	x
80	80	x
80	80	x
80	80	x
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Four Hour Vehicular Volume

Warrant 3: Peak Hour

WARRANT MET

Project Name: **Mt Auburn St / Common Street/Parker Street**
 Project Number: _____

City/Town: **Watertown, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Common Street/Parker Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1390
8-9 AM	1422
9-10 AM	1201
10-11 AM	1174
11-12 N	1134
12-1 PM	1318
1-2 PM	1158
2-3 PM	1305
3-4 PM	1328
4-5 PM	1297
5-6 PM	1422
6-7 PM	1352
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)	Total
	0
0	
0	
0	
0	
0	
0	
425	
214	
341	
295	
250	
214	
302	
159	
245	
291	
327	
290	
0	
0	
0	
0	
0	

Peak Hour Warrant		
Minor Street Criteria (NCHRP 562 Table O-1)	Minor Street Criteria (MUTCD Figure 4C-3)	Meets Minor Street Criteria (1 hour needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
100	120	x
100	120	x
147	150	x
154	175	x
164	175	x
123	120	x
158	175	x
125	120	x
121	120	x
127	150	x
100	120	x
100	120	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Peak Hour

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Mt Auburn St / Walnut Street/Bates Road East**
 Project Number:

City/Town: **Everett, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Walnut Street/Bates Road East

Lanes (each way): **1**

Lanes (approach): **1**

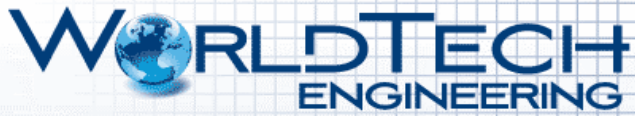
Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1242
8-9 AM	1128
9-10 AM	923
10-11 AM	971
11-12 N	958
12-1 PM	1090
1-2 PM	935
2-3 PM	1153
3-4 PM	1075
4-5 PM	1052
5-6 PM	1116
6-7 PM	1086
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)	
	Total
	0
	0
	0
	0
	0
	0
	0
	78
	116
	113
	128
	115
	145
	140
	133
	191
	215
	264
	225
	0
	0
	0
	0
	0

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
80	80	
78	80	x
114	134	
104	124	x
106	126	x
83	103	x
111	131	x
75	80	x
85	105	x
89	109	x
80	80	x
84	104	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **10**

Four Hour Vehicular Volume



Warrant 3: Peak Hour

WARRANT MET

Project Name: **Mt Auburn St / Walnut Street/Bates Road East**

City/Town: **Everett, MA**

Project Number:

Engineer: **0**

Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:

Mt Auburn St

Minor Street:

Walnut Street/Bates Road East

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1242
8-9 AM	1128
9-10 AM	923
10-11 AM	971
11-12 N	958
12-1 PM	1090
1-2 PM	935
2-3 PM	1153
3-4 PM	1075
4-5 PM	1052
5-6 PM	1116
6-7 PM	1086
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)	
	Total
	0
	0
	0
	0
	0
	0
	0
	0
	78
	116
	113
	128
	115
	145
	140
	133
	191
	215
	264
	225
	0
	0
	0
	0
	0

Peak Hour Warrant		
Minor Street Criteria (NCHRP 562 Table O-1)	Minor Street Criteria (MUTCD Figure 4C-3)	Meets Minor Street Criteria (1 hour needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
138	150	
166	175	
229	245	
213	245	
217	245	
176	200	
225	245	
159	175	
181	200	x
187	200	x
169	175	x
177	200	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **4**

Peak Hour

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Mt Auburn St / School St**
 Project Number:

City/Town: **Everett, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
School St

Lanes (each way): **1**

Lanes (approach): **1**

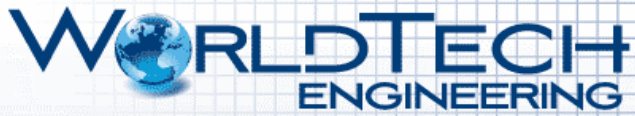
Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	973
8-9 AM	1156
9-10 AM	836
10-11 AM	835
11-12 N	846
12-1 PM	962
1-2 PM	808
2-3 PM	1013
3-4 PM	993
4-5 PM	1130
5-6 PM	1150
6-7 PM	1151
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Hour	Approach (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	145
8-9 AM	153
9-10 AM	129
10-11 AM	129
11-12 N	133
12-1 PM	177
1-2 PM	160
2-3 PM	178
3-4 PM	240
4-5 PM	317
5-6 PM	314
6-7 PM	318
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
103	123	x
75	80	x
136	156	
137	157	
134	154	
106	126	x
144	164	x
96	116	x
99	119	x
78	80	x
76	80	x
75	80	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **9**

Four Hour Vehicular Volume



Warrant 3: Peak Hour

WARRANT MET

Project Name: **Mt Auburn St / School St**
 Project Number:

City/Town: **Everett, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
School St

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	973
8-9 AM	1156
9-10 AM	836
10-11 AM	835
11-12 N	846
12-1 PM	962
1-2 PM	808
2-3 PM	1013
3-4 PM	993
4-5 PM	1130
5-6 PM	1150
6-7 PM	1151
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)	
	Total
	0
	0
	0
	0
	0
	0
	0
	145
	153
	129
	129
	133
	177
	160
	178
	240
	317
	314
	318
	0
	0
	0
	0
	0

Peak Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-3)	(1 hour needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
212	245	
158	175	
262	285	
262	285	
258	285	
216	245	
273	285	
199	200	
206	245	x
165	175	x
160	175	x
160	175	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **4**

Peak Hour



Warrant 1A: Minimum Vehicular Volume

WARRANT NOT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer:
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Bigelow Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
122
173
174
131
106
61
89
119
178
229
230
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Eight Hour Warrant		
Meets Major Street Criteria	Meets Minor Street Criteria	Hours Met By Both Criteria
500 vph	150 vph	(8 hours needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
x		
x	x	x
x	x	x
x		
x		
x		
x		
x		
x	x	x
x	x	x
x	x	x
x	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Total hours met: **5**

Minimum Vehicular Volume (CONDITION A-100%)

*Estimated Volumes

Warrant 1B: Interruption of Continuous Traffic

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Bigelow Street

Lanes (each way): **1**

Lanes (approach): **1**

Eight Hour Warrant		
Meets Major Street Criteria	Meets Minor Street Criteria	Hours Met By Both Criteria
750 vph	75 vph	(8 hours needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
x	x	x
x	x	x
x	x	x
x	x	x
	x	
x		
x	x	x
x	x	x
x	x	x
x	x	x
x	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
122
173
174
131
106
61
89
119
178
229
230
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Total hours met: **9**

Interruption of Continuous Traffic (CONDITION B-100%)

Combination of Warrants 1A & 1B

WARRANT NOT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street: **Major Street**
Arlington Street
 Lanes (each way): **1**

Minor Street: **Minor Street**
Bigelow Street
 Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)	Total
	#DIV/0!
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
122	
173	
174	
131	
106	
61	
89	
119	
178	
229	
230	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	

Warrant 1A		Warrant 1B		Hours Met By
Meets Major Street Criteria	Meets Minor Street Criteria	Meets Major Street Criteria	Meets Minor Street Criteria	All Criteria
400 vph	120 vph	600 vph	60 vph	(8 hours needed)
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X		X	X	
X		X	X	
X		X	X	
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	#DIV/0!	X	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!
#####	#DIV/0!	#DIV/0!	#####	#DIV/0!

Total hours met: **7**

Combination of Warrants 1A & 1B (80%)

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Bigelow Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
122
173
174
131
106
61
89
119
178
229
230
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
134	154	
90	110	x
130	150	x
157	177	
174	194	
141	161	
146	166	
128	148	
93	113	x
85	105	x
80	80	x
85	105	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!

Total hours met: **5**

Four Hour Vehicular Volume

Warrant 3: Peak Hour

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Bigelow Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)	Total
	#DIV/0!
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
122	
173	
174	
131	
106	
61	
89	
119	
178	
229	
230	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	

Peak Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-3)	(1 hour needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
259	285	
189	200	
253	285	
290	325	
312	325	
268	285	
275	285	
249	285	
195	200	
181	200	x
155	175	x
180	200	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Total hours met: **2**

Peak Hour

Warrant 7 - Crash Experience

WARRANT NOT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street: **Major Street**
Arlington Street
 Lanes (each way): **1**

Minor Street: **Minor Street**
Bigelow Street
 Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	843
8-9 AM	1047
9-10 AM	859
10-11 AM	767
11-12 N	714
12-1 PM	820
1-2 PM	802
2-3 PM	868
3-4 PM	1026
4-5 PM	1075
5-6 PM	1170
6-7 PM	1077
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)	Total
	#DIV/0!
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
122	
173	
174	
131	
106	
61	
89	
119	
178	
229	
230	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	

Warrant 1A		Warrant 1B		Hours Met By Both Criteria (8 hours needed)
Meets Major Street Criteria	Meets Minor Street Criteria	Meets Major Street Criteria	Meets Minor Street Criteria	
400 vph	120 vph	600 vph	60 vph	
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X		X	X	X
X		X	X	X
X		X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	#DIV/0!	X	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!
#####	#DIV/0!	#DIV/0!	####	#DIV/0!

Number of Crashes per Year: **3**

Total hours met: **11**

Crash Experience (80%)

Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Mt Auburn St / Arlington St**
 Project Number: _____

City/Town: **Watertown, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Arlington St

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1038
8-9 AM	1194
9-10 AM	991
10-11 AM	875
11-12 N	899
12-1 PM	1039
1-2 PM	923
2-3 PM	956
3-4 PM	1015
4-5 PM	1110
5-6 PM	1053
6-7 PM	932
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)
0
0
0
0
0
0
0
276
415
439
373
388
379
474
594
721
735
757
705
0
0
0
0
0

Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
91	111	x
80	80	x
100	120	x
126	146	x
120	140	x
91	111	x
114	134	x
107	127	x
95	115	x
80	80	x
89	109	x
112	132	x
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Four Hour Vehicular Volume

Warrant 3: Peak Hour

WARRANT MET

Project Name: **Mt Auburn St / Arlington St**
 Project Number:

City/Town: **Watertown, MA**
 Engineer: **0**
 Data Source: **2018 TMC Counts**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Mt Auburn St

Minor Street:
Arlington St

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	0
1-2 AM	0
2-3 AM	0
3-4 AM	0
4-5 AM	0
5-6 AM	0
6-7 AM	0
7-8 AM	1038
8-9 AM	1194
9-10 AM	991
10-11 AM	875
11-12 N	899
12-1 PM	1039
1-2 PM	923
2-3 PM	956
3-4 PM	1015
4-5 PM	1110
5-6 PM	1053
6-7 PM	932
7-8 PM	0
8-9 PM	0
9-10 PM	0
10-11 PM	0
11-12 M	0

Approach (vph)	Total
	0
0	
0	
0	
0	
0	
0	
276	
415	
439	
373	
388	
379	
474	
594	
721	
735	
757	
705	
0	
0	
0	
0	
0	

Peak Hour Warrant		
Minor Street Criteria (NCHRP 562 Table O-1)	Minor Street Criteria (MUTCD Figure 4C-3)	Meets Minor Street Criteria (1 hour needed)
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	
192	200	x
149	175	x
206	245	x
247	285	x
238	285	x
191	200	x
229	245	x
218	245	x
199	200	x
171	175	x
187	200	x
226	245	x
-	-	
-	-	
-	-	
-	-	
-	-	

Total hours met: **12**

Peak Hour

Warrant 1A: Minimum Vehicular Volume

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer:
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Grove Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	1034
8-9 AM	1252
9-10 AM	967
10-11 AM	739
11-12 N	733
12-1 PM	836
1-2 PM	849
2-3 PM	782
3-4 PM	794
4-5 PM	724
5-6 PM	748
6-7 PM	759
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)	Total
	#DIV/0!
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
199	
311	
301	
226	
183	
172	
251	
335	
500	
652	
639	
549	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	
#DIV/0!	

Eight Hour Warrant		
Meets Major Street Criteria	Meets Minor Street Criteria	Hours Met By Both Criteria
500 vph	150 vph	(8 hours needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Total hours met: **12**

Minimum Vehicular Volume (CONDITION A-100%)



Warrant 1B: Interruption of Continuous Traffic

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Grove Street

Lanes (each way): **1**

Lanes (approach): **1**

Eight Hour Warrant		
Meets Major Street Criteria	Meets Minor Street Criteria	Hours Met By Both Criteria
750 vph	75 vph	(8 hours needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
x	x	x
x	x	x
x	x	x
	x	
	x	
x	x	x
x	x	x
x	x	x
	x	
	x	
x	x	x
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	1034
8-9 AM	1252
9-10 AM	967
10-11 AM	739
11-12 N	733
12-1 PM	836
1-2 PM	849
2-3 PM	782
3-4 PM	794
4-5 PM	724
5-6 PM	748
6-7 PM	759
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
199
311
301
226
183
172
251
335
500
652
639
549
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Total hours met: **8**

Interruption of Continuous Traffic (CONDITION B-100%)



Combination of Warrants 1A & 1B

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Grove Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	1034
8-9 AM	1252
9-10 AM	967
10-11 AM	739
11-12 N	733
12-1 PM	836
1-2 PM	849
2-3 PM	782
3-4 PM	794
4-5 PM	724
5-6 PM	748
6-7 PM	759
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

	Approach (vph)
	Total
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!
	199
	311
	301
	226
	183
	172
	251
	335
	500
	652
	639
	549
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!
	#DIV/0!

Warrant 1A		Warrant 1B		Hours Met By All Criteria (8 hours needed)
Meets Major Street Criteria	Meets Minor Street Criteria	Meets Major Street Criteria	Meets Minor Street Criteria	
400 vph	120 vph	600 vph	60 vph	
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!
#####	#####	#DIV/0!	#####	#DIV/0!

Total hours met: **12**

Combination of Warrants 1A & 1B (80%)



Warrant 2: Four Hour Vehicular Volume

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Grove Street

Lanes (each way): **1**

Lanes (approach): **1**

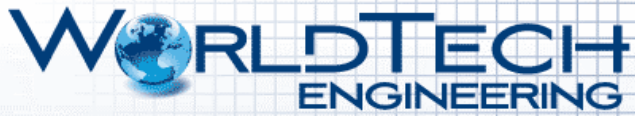
Four Hour Warrant		
Minor Street Criteria	Minor Street Criteria	Meets Minor Street Criteria
(NCHRP 562 Table O-1)	(MUTCD Figure 4C-1)	(4 hours needed)
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
92	112	x
80	80	x
105	125	x
166	186	x
168	188	x
136	156	x
133	153	x
152	172	x
149	169	x
171	191	x
163	183	x
159	179	x
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	1034
8-9 AM	1252
9-10 AM	967
10-11 AM	739
11-12 N	733
12-1 PM	836
1-2 PM	849
2-3 PM	782
3-4 PM	794
4-5 PM	724
5-6 PM	748
6-7 PM	759
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
199
311
301
226
183
172
251
335
500
652
639
549
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Total hours met: **12**

Four Hour Vehicular Volume



Warrant 3: Peak Hour

WARRANT MET

Project Name: **Watertown Mt Auburn Street**
 Preliminary Design
 Project Number: **18-008.08**

City/Town: **Watertown**
 Engineer: **0**
 Data Source: **11/18/2018**

Located within the built-up area of an isolated community having a population of less than 10,000 (Y/N): **N**

85th percentile speed of major street traffic exceeds 40 mph (Y/N): **N**

Major Street:
Major Street
Arlington Street

Minor Street:
Minor Street
Grove Street

Lanes (each way): **1**

Lanes (approach): **1**

Hour	Volumes (vph)
	Total
12-1 AM	#DIV/0!
1-2 AM	#DIV/0!
2-3 AM	#DIV/0!
3-4 AM	#DIV/0!
4-5 AM	#DIV/0!
5-6 AM	#DIV/0!
6-7 AM	#DIV/0!
7-8 AM	1034
8-9 AM	1252
9-10 AM	967
10-11 AM	739
11-12 N	733
12-1 PM	836
1-2 PM	849
2-3 PM	782
3-4 PM	794
4-5 PM	724
5-6 PM	748
6-7 PM	759
7-8 PM	#DIV/0!
8-9 PM	#DIV/0!
9-10 PM	#DIV/0!
10-11 PM	#DIV/0!
11-12 M	#DIV/0!

Approach (vph)
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
199
311
301
226
183
172
251
335
500
652
639
549
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!

Peak Hour Warrant		
Minor Street Criteria (NCHRP 562 Table O-1)	Minor Street Criteria (MUTCD Figure 4C-3)	Meets Minor Street Criteria (1 hour needed)
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
193	200	x
136	150	x
214	245	x
301	325	
304	325	
262	285	
257	285	
283	325	x
278	325	x
308	325	x
298	325	x
293	325	x
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!
#DIV/0!	#####	#DIV/0!

Total hours met: **8**

Peak Hour

HCS7 Warrants Report

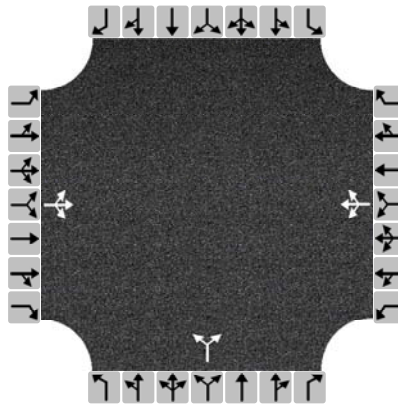
Project Information

Analyst	ATC	Date	2/8/2021
Agency	WorldTech	Analysis Year	2018
Jurisdiction	Watertown	Time Period Analyzed	2018
Project Description	Mount AUburn Street		

General

Major Street Direction	East-West	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	35	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Number of Lanes, N	0	1	0	0	1	0	0	0	0	0	0	0
Lane Usage		LTR			LTR			LR				
Vehicle Volumes Averages (veh/h)	0	141	16	2	154	0	15	0	9	0	0	0
Pedestrian Averages (peds/h)	0			0			0			0		
Gap Averages (gaps/h)	0			0			0			0		
Delay (s/veh)	0.0			0.0			0.0			0.0		
Delay (veh-hrs)	0.0			0.0			0.0			0.0		

School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)		Tractor-Trailer Trucks (%)	10

HCS7 Warrants Report

Volume Summary

Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)	4A (100%)	4B (100%)
07 - 08	1357	101	1458	0	0	No	No	Yes	Yes	Yes	No	No	No	No
08 - 09	0	0	0	0	0	No	No	No	No	No	No	No	No	No
09 - 10	0	0	0	0	0	No	No	No	No	No	No	No	No	No
10 - 11	0	0	0	0	0	No	No	No	No	No	No	No	No	No
11 - 12	0	0	0	0	0	No	No	No	No	No	No	No	No	No
12 - 13	0	0	0	0	0	No	No	No	No	No	No	No	No	No
13 - 14	0	0	0	0	0	No	No	No	No	No	No	No	No	No
14 - 15	1085	142	1227	0	0	No	Yes	Yes	Yes	Yes	No	No	No	No
15 - 16	0	0	0	0	0	No	No	No	No	No	No	No	No	No
16 - 17	0	0	0	0	0	No	No	No	No	No	No	No	No	No
17 - 18	1343	51	1394	0	0	No	No	No	No	No	No	No	No	No
18 - 19	0	0	0	0	0	No	No	No	No	No	No	No	No	No
Total	3785	294	4079	0	0	0	1	2	2	2	0	0	0	0

Warrants

Warrant 1: Eight-Hour Vehicular Volume	
A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	
B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	
80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	
Warrant 2: Four-Hour Vehicular Volume	
Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)	
Warrant 3: Peak Hour	
A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--	
B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	
Warrant 4: Pedestrian Volume	
A. Four Hour Volumes --or--	
B. One-Hour Volumes	
Warrant 5: School Crossing	
Gaps Same Period --and--	
Student Volumes	
Nearest Traffic Control Signal (optional)	
Warrant 6: Coordinated Signal System	
Degree of Platooning (Predominant direction or both directions)	
Warrant 7: Crash Experience	
A. Adequate trials of alternatives, observance and enforcement failed --and--	
B. Reported crashes susceptible to correction by signal (12-month period) --and--	
C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied	
Warrant 8: Roadway Network	
A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--	
B. Weekend Volume (Five hours total)	
Warrant 9: Grade Crossing	
A. Grade Crossing within 140 ft --and--	
B. Peak-Hour Vehicular Volumes	