



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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TECHNICAL MEMORANDUM

DATE: August 17, 2023
TO: Valerie Oorthuys, Town of Stow
FROM: Casey Cooper, Boston Region MPO
Julie Dombroski, Boston Region MPO
RE: Stow Intersection Improvement Study

This memorandum summarizes the analyses and improvement strategies for the intersection of Route 117 and Route 62 in Stow, also known as the intersection of Great Road, Library Hill Road, and Gleasondale Road.

This memorandum contains the following sections:

1. [Study Background \(p. 1\)](#)
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4. [Bicycle and Pedestrian Travel \(p. 7\)](#)
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The memorandum also includes technical appendices that contain data and methods applied in the study.

1 STUDY BACKGROUND

The purpose of this study is to improve safety and operations at intersections within the Boston Metropolitan Planning Organization (MPO) region with a focus on cost- and time-effective strategies. The intent of the work is to identify simple solutions that can be used to enhance intersection conditions in the short term. These changes have the potential to serve as a first step before municipalities secure funding for larger scale projects to improve conditions at the intersection in the future.

In 2014, the Boston Region MPO participated in an intersection improvement program with the Massachusetts Department of Transportation (MassDOT) Highway Division to provide low-cost, small scale, and quickly implementable

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improvements, including signal retiming, signing, and pavement markings. The program was funded in the Transportation Improvement Program with Congestion Mitigation and Air Quality Improvement Program dollars.

The primary goal of the program was to identify low-cost improvements that would help alleviate congestion at problem intersections. These types of small-scale improvements enjoy a high benefit-to-cost ratio. Through the 2014 iteration of the Intersection Improvement Program, MPO staff selected candidate intersections and contacted the relevant municipalities, using the Congestion Management Process. A consulting firm then visited 35 intersections around the region, implemented signal timing improvements, and proposed other low-cost improvement recommendations that municipalities could implement.

The Intersection Improvement Program was reintroduced through the Federal Fiscal Year 2021 Unified Planning Work Program with modifications to the original work. This project is on a smaller scale than the 2014 effort, conducted solely by MPO staff, and focused on providing recommendations that municipalities can implement themselves to improve the selected intersections.

This work gives the communities in which the intersections are located the opportunity to review the needs of the studied intersections, with a focus on changes that the municipalities themselves can implement quickly and within their current operating budgets to improve safety and operations. This project also highlights significant intersection needs before the municipality commits funds for design and engineering. Eventually, if the project qualifies for federal funds, this study's documentation will be useful to MassDOT. This study supports the MPO's visions and goals, which include increasing transportation safety, maintaining the transportation system, and advancing mobility.

This iteration of the Intersection Improvement Program began with the selection of municipality-owned intersections. MPO staff solicited recommendations from the community and compared the proposed locations based on crash averages, equity data, and consideration of which intersections' needs would be best addressed through this project. MPO staff consulted with municipal staff to validate the poor operations and safety issues at each intersection under consideration before finalizing the location selections. The following locations were selected for study:

1. Route 117 and Route 62 in Stow
2. Linden Street and Weston Road in Wellesley

This memorandum documents the MPO staff's analysis of the selected intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and

Gleasondale Road) in Stow. The recommendations for low-cost improvements outlined in this document can be used by Stow to develop a safety and traffic operation implementation plan for the location that the municipality would be responsible for funding.

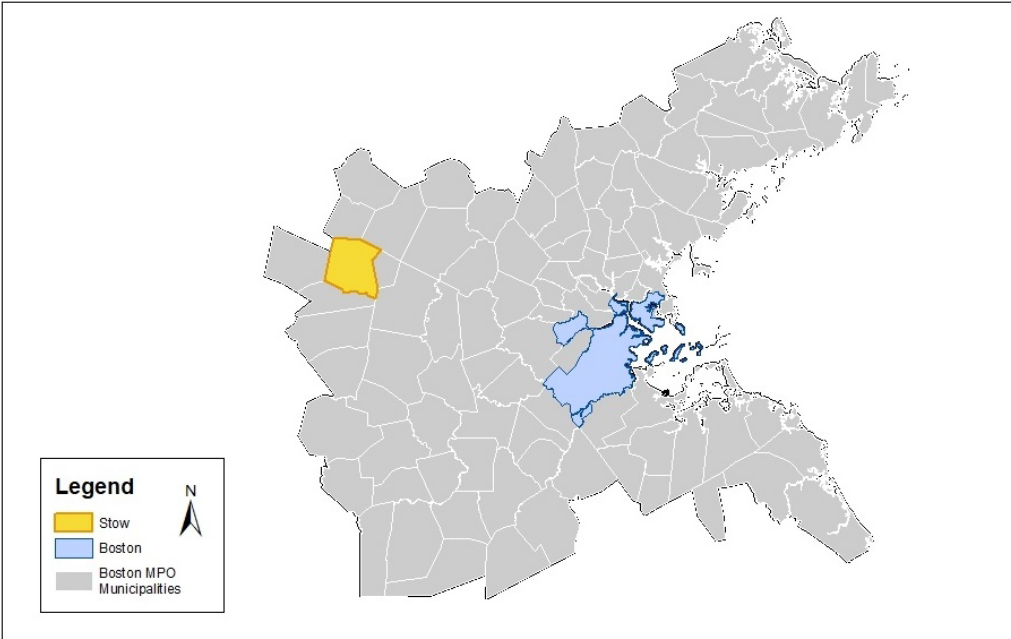
2 EXISTING CONDITIONS

2.1 Regional Transportation Context

Stow is a town located west of Boston with a 2020 population of 7,174. It has a land area of 18.1 square miles, giving it an average population density of 396 people per square mile. The Metropolitan Area Planning Council characterizes Stow as a developing suburb.

Stow is located east of Interstate 495 (I-495) in Bolton and south of the limited-access section of Route 2 in Acton. The study intersection is where Route 62 meets and joins Route 117 and is considered the town center. This location is about 23 miles west of downtown Boston (Figure 1).

**Figure 1
Stow within the Boston MPO Region**



Route 117 runs through the study intersection in an east-west alignment. Five miles to the west it connects with I-495 at an interchange in the town of Bolton. Two miles to the east Route 117 enters the town of Maynard and eventually reaches Waltham. In Stow Route 117 is called Great Road.

The southerly branch of the study intersection is Route 62, which is called Gleasondale Road in Stow. Five miles to the south it reaches the town center of the more densely populated community of Hudson. Route 62 leaves the study intersection via the easterly branch, which is designated as both Routes 62 and 117. In Maynard, Route 62 branches from Route 117 and continues north through Maynard center. Route 62 then connects with a signalized intersection of Route 2 in Concord.

The northerly branch of the intersection is Library Hill Road and is not a numbered route. Library Hill Road connects with Crescent Street, which then connects with West Acton Road. Turning to South Acton Road leads to Route 27 and the South Acton commuter rail station. A mile beyond the rail station is the limited-access section of Route 2 and Kelly's Corner, the regional commercial center.

2.2 The Study Intersection

The intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) is located within the civic center of Stow, with many buildings within walking distance, including the Town Building, Randall Library, two churches, and two schools. The intersection is the most heavily traveled in Stow, with more than 15,000 vehicles passing through the location daily.

The study intersection is a four-legged, signalized intersection. Route 117, or Great Road, travels east and west while Route 62, which shares the easterly branch with Route 117, turns south at the study intersection and is called Gleasondale Road in Stow. Library Hill Road is the northerly branch of the study intersection.

Three of the intersection approaches include two lanes, one for through travel and the other an exclusive turning lane. Route 117's westbound approach features a dedicated left-turn lane while its eastbound approach and Route 62's northbound approach include dedicated right-turn lanes. The intersection approach for Library Hill Road southbound only includes one lane, however due to the existing width of this lane, drivers treat it as two lanes—a left-turn lane and a through right lane. All four legs of the intersection are striped with one departure lane.

On the northeast corner of the intersection is Randall Library. Common Road, which crosses near the library to connect Great Road (Routes 117 and 62) to Library Hill Road, includes four parking spaces for the library. One additional Randall Library parking space is located off Crescent Street. Town staff noted that parallel parking along Common Road is unofficial. Just east of Randall

Library, where Common Road meets Great Road (Routes 117 and 62), is the Children’s Horizon’s Preschool and the First Parish Church of Stow & Acton. Northwest of the library is Center School. Randall Library is a popular after-school destination because of the proximity of the church and schools.

The northwest corner of the intersection features the former One Main Street Studio florist building; the southwest corner of the intersection is home to a gas station; and the southeast corner of the intersection is residential, with a low stone wall marking the edge of the property. The study intersection and its surrounding destinations are illustrated in Figure 2.

Figure 2
Intersection Study Area



3 ISSUES AND CONCERNS

Stow suggested the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) for this study in anticipation of the impact that several development projects will bring to the location, which is already the most heavily trafficked intersection in Stow. A mixed-income redevelopment effort between the Town and a private developer at Stow Acres Country Club North Course will introduce approximately 190 residential units, and the study

intersection is expected to receive the bulk of traffic generated by the development.

There is also the potential for two developments to the west of the intersection. The first is a proposed boarding school for approximately 600 students at the former Bose facility, and the second is a mixed-income housing development on Hudson Road with approximately 140 units. In addition to these anticipated demands, Stow's Complete Street Prioritization Plan includes multiple projects within one-quarter mile of the intersection.

Despite the significance of the location in Stow, the Town is aware of several issues of concern. Pavement is failing in several areas of the intersection, which has led signal sensors to malfunction. The town believes that timing of the traffic signal needs to be adjusted and that the intersection's turning lanes could also use improvement. The current turning lane queues have not been updated in years and the Town of Stow explained that they affect sight lines from various approaches.

According to town staff, Library Hill Road, receives fairly heavy usage despite observed volumes being relatively low. The Town of Stow noted that the main issue on the northern leg of the intersection is the lack of a dedicated left-turn lane and arrow for the movement.

Approximately 500 feet west of the study location is the skewed angle, three-way, stop-controlled intersection of Great Road and Crescent Street. The location introduces complexity to traffic operations of the study area when eastbound Great Road vehicles wait for a break in traffic to turn left onto Crescent Street. The narrow width of Great Road at the location makes it difficult for traffic behind the waiting vehicle to pass around the right of the turning driver and continue traveling eastbound, causing traffic to slow and vehicles to back up along Great Road.

Stow recently received an assessment at the intersection of Great Road and Crescent Street for the installation of a crosswalk and Rectangular Rapid Flashing Beacon (RRFB). The nearest crosswalk currently crosses Great Road about 60 feet east of Crescent Street, which makes pedestrians difficult to see from Crescent Street and introduces an unexpected pedestrian crossing location for drivers traveling along Great Road.

The assessment recommended moving the crosswalk 50 feet to the west so that it would be located on the corner of Crescent Street and proposed adding a solar-powered RRFB to the crossing. The benefits of the crosswalk relocation include increased space for ADA-compliant ramps, which are not included with

the current crosswalk, and a more direct connection to the crosswalk that facilitates pedestrian travel across Crescent Street north of the Great Road intersection. This memorandum will not take into consideration the impact of these proposed improvements as they have not yet been implemented.

East of the Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) intersection is another skewed angle, three-way, stop-controlled intersection with Great Road. This instance features Common Road as the third leg, the street that crosses near Randall Library to connect Great Road (Routes 117 and 62) to Library Hill Road. Stow staff explained that vehicles often use Common Road as a cut-through route to avoid the light at the Great Road, Library Hill Road, and Gleasondale Road intersection, either to go north on Library Hill Road or to travel east along Great Road (Routes 117 and 62). This traffic competes with the Randall Library on-street parking on Common Road.

4 BICYCLE AND PEDESTRIAN TRAVEL

4.1 Bicycle and Pedestrian Overview

On Thursday, November 18, 2021, the AM Peak hour at the Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) intersection was 7:00 AM to 8:00 AM and the PM Peak hour was 4:30 PM to 5:30 PM. The overall peak hour of data collection for all modes occurred during this PM Peak period. During both the AM and PM Peak periods, no pedestrians were counted. The AM Peak featured three bicyclists in the road and zero people bicycling on the intersection’s crosswalks, while the PM Peak included two bicyclists in the road and again zero people bicycling on crosswalks.

The intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) includes pedestrian accommodations such as crosswalks, sidewalks, and curb ramps for some but not all four intersection legs. The location does not feature bicycle facilities. Although the intersection is signalized for motor-vehicle travel, there is an absence of pedestrian signals.

The northeast corner of the study intersection includes a sidewalk along Library Hill Road, but it does not continue along Great Road (Routes 117 and 62). There are two curb ramps on the northeast corner, both of which include a pedestrian detectable warning strip, but only Library Hill Road is painted with a crosswalk to direct pedestrians across the intersection and increase driver awareness of people walking.

Figure 3
View across Library Hill Road of Northeast Intersection Corner



Figure 4
View across Great Road (Routes 117 and 62) of Northeast Intersection Corner



**Figure 5
Pedestrian Facilities for Northeast Intersection Corner's
Library Hill Road Crossing**



**Figure 6
Great Road (Route 117 and 62) Crossing on Northeast Intersection Corner
with Pedestrian Detectable Warning Strip Lacking Crosswalk**



The northwest corner of the study intersection is the only corner that includes a sidewalk, a curb ramp, and both a crosswalk and a pedestrian detectable warning strip for both directions of travel, although the sidewalk does not extend up Library Hill Road and only travels west along Great Road (Route 117).

Figure 7
View across Library Hill Road of Northwest Intersection Corner



Figure 8
View across Great Road (Route 117) of Northwest Intersection Corner



Figure 9
Northwest Intersection Pedestrian Facilities



The intersection’s southwest corner does not include sidewalks, curb ramps, or detectable warning strips, but it does feature a crosswalk for both intersection legs. Both crosswalks lead directly into landscaping surrounded by a low curb.

Figure 10
View of Southwest Intersection Corner



Figure 11
View across Great Road (Route 117) of Southwest Intersection Corner



Figure 12
View across Gleasondale Road (Route 62) of Southwest Corner



Figure 13
Lack of Pedestrian Facilities on Southwest Intersection Corner leading to Gleasondale Road (Route 62) Crosswalk



Figure 14
Lack of Pedestrian Facilities on Southwest Intersection Corner leading to Great Road (Route 117) Crosswalk



Finally, the southeast corner of the intersection features a narrow sidewalk with a steep curb that does not include curb ramps or pedestrian detectable warning strips. A crosswalk leads pedestrians across Gleasondale Road. There is no crosswalk to facilitate pedestrian travel across Great Road (Routes 117 and 62) to the northeast intersection corner.

Figure 15
View across Gleasondale Road (Route 62) of Southeast Intersection Corner



Figure 16
Southeast Intersection Corner Crosswalk Lacking Pedestrian Facilities



Generally, the Town of Stow is interested in improving conditions for people cycling at this intersection. The intersection is used by people cycling in the region, especially those traveling to and from neighboring communities, with the towns of Stow and Harvard being regional cycling destinations. It should be noted for safety and utility purposes, however, that bicycle accommodations should be prioritized corridor-wide, not just at this intersection, and connectivity should be improved throughout the Town.

MPO staff graded the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) in Stow using the Boston Region MPO's Pedestrian Report Card Assessment (PRCA) and Bicycle Report Card tools to assess the safety and comfort of the location for people walking and bicycling.^{1,2} The grading categories reflect the MPO's Long-Range Transportation Plan (LRTP) goals and assess the quality of four different aspects of the environment: Capacity Management and Mobility, Economic Vitality, Safety, and System Preservation. The report cards also prioritize locations based on Transportation Equity factors, incorporating another Boston region LRTP goal.

¹ Boston Region Metropolitan Planning Organization, "Pedestrian Level-of-Service" (Prepared by Ryan Hicks and Casey-Marie Claude, January 2017). <https://www.ctps.org/ped-report-card>. (Updated in 2019: Boston Region Metropolitan Planning Organization, "Pedestrian Report Card Assessment Interactive Database" [Prepared by Casey-Marie Claude, November 2019]. <https://www.ctps.org/PRCA-interactive-database>.)

² Boston Region Metropolitan Planning Organization, "Development of a Scoring System for Bicycle Travel in the Boston Region" (Prepared by Casey-Marie Claude, November 2018). <https://www.ctps.org/bicycle-level-of-service>.

4.2 Pedestrian Report Card Assessment (PRCA)

Figure 17
Signalized Intersection PRCA for Route 117 and Route 62
(Great Road, Library Hill Road, and Gleasondale Road)

Grading Categories: Scoring Breakdown Signalized Intersection

Capacity Management and Mobility			
Performance Measure	Percentage	Score (out of 3.0)	Rating
Pedestrian Delay	43%	0	Not Present
Sidewalk Presence	29%	1	Poor
Curb Ramp Presence	14%	2	Fair
Crosswalk Presence	14%	2	Fair
Total <small>(Pedestrian Delay Score * 0.43) + (Sidewalk Presence Score * 0.29) + (Curb Ramp Presence Score * 0.14) + (Crosswalk Presence Score * 0.14)</small>	100%	0.9	Poor

Economic Vitality			
Performance Measure	Percentage	Score (out of 3.0)	Rating
Pedestrian Volumes	100%	1	Poor

Meaning of Ratings
Good 3.0
Fair 2.0
Poor 1.0

Transportation Equity Priority
High Four (4) or Five (5) Factors
Moderate Two (2) or Three (3) Factors
Low Zero (0) or One (1) Factor

Safety			
Performance Measure	Percentage	Score (out of 3.0)	Rating
Sufficient Crossing Time (Index)	38%	0	Not Present
Pedestrian Crashes	38%	3	Good
Pedestrian Signal Phase	13%	0	Not Present
Vehicle Travel Speed	13%	2	Fair
Total <small>(Sufficient Crossing Time (Index) Score * 0.38) + (Pedestrian Crashes Score * 0.38) + (Pedestrian Signal Presence Score * 0.13) + (Vehicle Travel Speed Score * 0.13)</small>	100%	1.4	Poor

System Preservation			
Performance Measure	Percentage	Score (out of 3.0)	Rating
Sidewalk Condition	100%	1	Poor

Transportation Equity Priority	
Area Condition	Yes/No
Low Income Population \neq /> 32.32%	No
Minority Population \neq /> 28.19%	No
6.69%+ of Population > 75 Years of Age	Yes
16.15%+ of Householdsw/o Vehicle	No
Within ¼ Mile of School/College	Yes

The intersection received a poor score for Capacity Management and Mobility on its PRCA, which was most negatively influenced by the lack of pedestrian signals at the intersection. The existence of curb ramps, pedestrian detectable warnings, and crosswalks at some locations helped the intersection’s overall category grade, but the variability of their presence could only earn fair scores for those grading categories. Sidewalks, when present at the intersection, did not meet the minimum five-foot width requirement and lacked continuity, earning the intersection a poor score for sidewalk presence.

For Economic Vitality, the intersection received a poor score because no pedestrians were observed walking through the location during the AM and PM peak travel periods.

The intersection earned another poor score for the Safety category. The lack of pedestrian signals at the intersection made it impossible for the location to earn points for the Sufficient Crossing Time Index and Pedestrian Signal Phase

categories, which significantly affected the overall Safety score. Best practice recommends providing sufficient time for people walking to cross an intersection leg at a pace of 3.5 feet per second if they have left the curb at the end of the WALK phase.³ In areas known to have pedestrians who walk more slowly or areas with considerable numbers of people using mobility devices, slower speeds should be considered. By not providing pedestrian signals, the study intersection does not allow any time for pedestrians to cross.

The intersection received a fair score for vehicle travel speed in the Safety category because the posted speed limit at the location is 35 miles per hour, which is at the top of the fair range of 25 to 35 miles per hour for average vehicle travel speeds. Finally, there were no pedestrian crashes at the study intersection from 2015 through 2019, so the location earned the maximum number of points possible for the pedestrian crashes factor.

The Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) intersection received a poor score for System Preservation because the sidewalks at the location, when present, were narrow, lacked continuity, and were made up of variable quality pavement.

Overall, the intersection was considered a Moderate Priority area for pedestrian transportation equity. The proportion of the population older than 75 years of age at the study location exceeds the regional average and the intersection is located within one-quarter mile of a school.

³ Manual on Uniform Traffic Control Devices (MUTCD). 2009. "Pedestrian Control Features: Pedestrian Intervals and Signal Phases." Accessed October 4, 2022. <https://mutcd.fhwa.dot.gov/htm/2009/part4/part4e.htm>.

4.3 Bicycle Report Card

Figure 18
Bicycle Report Card for Route 117 and Route 62
(Great Road, Library Hill Road, and Gleasondale Road)

Grading Categories: Scoring Breakdown

Capacity Management and Mobility			
Performance Measure	Percentage	Points	Grade
Bicycle Facility Presence	50%	0	F
Proximity to Bike Network	33%	0	F
Proximity to Transit	17%	0	F
Total	100%	0	F

Economic Vitality			
Performance Measure	Percentage	Points	Grade
Bike Rack Presence	50%	0	F
Land Use	50%	100	A
Total	100%	50	F

Grading
A: 90–100 *Excellent*
B: 80–89 *Satisfactory*
C: 70–79 *Acceptable*
D: 60–69 *Needs Improvement*
F: 59–0 *Not recommended for bicycle travel*

Transportation Equity Priority
High: Four (4) or Five (5) Factors
Moderate: Two (2) or Three (3) Factors
Low: Zero (0) or One (1) Factor

Safety			
Performance Measure	Percentage	Points	Grade
Bicycle Facility Presence	33%	0	F
Absence of Bicycle Crashes	33%	100	A
Bicyclist Operating Space	17%	0	F
Number of Travel Lanes	17%	80	B
Total	100%	46.6	F

System Preservation			
Performance Measure	Percentage	Points	Grade
Bicycle Facility Continuity	50%	0	F
Bicycle Facility Condition	50%	0	F
Total	100%	0	F

Transportation Equity Priority	
Area Condition	Yes/No
Low Income Population \geq 32.32%	No
Minority Population \geq 28.19%	No
18.2%+ of Population < 16 Years Old	Yes
16.15%+ of Households w/o Vehicle	No
Within ¼ Mile of School/College	Yes

The intersection received a failing score for the Capacity Management and Mobility category of the Bicycle Report Card. This is a result of the lack of bicycle facilities at the study location, the fact that the location is not within one-quarter mile of bicycle facilities, and the absence of a bus stop, transit station, or commuter rail station within one-half mile of the study location. Bicycle travel is difficult from the study location to other destinations throughout the Boston region.

The intersection received another failing score in the Economic Vitality category, in this case because the location does not include bike racks. This performance metric accounts for half of the overall category score, so the lack of safe places to secure bicycles negated the location’s positive score for land use. The variety of destinations within the study area, such as Randall Library, Children’s Horizon’s Preschool, and the First Parish Church of Stow & Acton, indicate that there is reason for people to want to travel to the intersection.

The Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) intersection earned another failing score for the Safety category. The absence of bicycle facilities left the location with zero points for the associated performance metric. Without bicycle facilities at the intersection, the location is not eligible to receive points for the Bicyclist Operating Space performance metric because people riding bicycles are required to share space with people driving, leaving them without dedicated operating space. However, the location scored well in the Absence of Bicycle Crashes performance metric with 100 points because there were no bicycle crashes at the study intersection from 2015 through 2019. For the last Safety category performance metric, Number of Travel Lanes, the intersection received a score of 80 points. While roadways like Library Hill Road, which only include one travel lane per direction, would receive 100 points, the other three intersection legs lower the score for the intersection overall. Great Road and Gleasondale Road both feature two approach lanes and one departure lane. The intersection was deducted 20 points for the additional approach lane at three of its legs because they introduce more opportunities for conflicts between people driving and people bicycling.

The study intersection also failed the System Preservation category. This, once again, is a result of the lack of bicycle facilities at the study location. It is impossible to award points for bicycle facility continuity or condition without the presence of bicycle accommodations.

Overall, the intersection was considered a Moderate Priority area for bicycle transportation equity. The proportion of the population younger than 16 years of age at the study location exceeds the regional average and the intersection is located within one-quarter mile of a school.

5 CRASH DATA ANALYSIS

5.1 An Expanded Crash Analysis Area

The focus of this study is the four-way intersection where east-west Route 117 joins with north-south Route 62, with these two routes sharing the easterly branch of this intersection. The northerly branch of the intersection is Library Hill Road, which connects with Crescent Street, which then connects with West Acton Road, providing access to the South Acton commuter rail station, Route 2, and the Kelly’s Corner commercial area.

Vehicles travelling on Routes 117 or 62 that use this northerly corridor must travel on a leg of a triangle formed by three intersections, illustrated previously in Figure 2:

- The study intersection where Route 117 meets Route 62
- Crescent Street at Route 117 (Great Road)
- Crescent Street at Hartley and Library Hill Roads

Data for 41 crashes on or near this triangle were collected. An additional 12 crashes occurring within a one-quarter mile of the triangle, mostly to the east or west on Route 117, have also been included in the crash analysis.

5.2 Crash Location Summaries

Table 1 summarizes 53 crashes in the crash analysis area for the years 2015–19. The first column characterizes crashes for the entire crash analysis area, and the next four columns subdivide the 53 crashes into four subareas. The first three subareas are for crash locations at or near one of the points of the triangle described above, and the last column summarizes the 12 crashes not associated with the central road triangle.

There were no fatalities at these locations during the five-year period. Crashes with an injury occurred once for every five or six property-damage-only crashes at each of the subareas. At the bottom of Table 1 it shows that there were no pedestrian or bicycle injuries in these subareas. This implies that all the injuries cited above were to drivers or vehicle passengers.

Other than the numbers of crashes, which depend on the amount of traffic, there are some distinctions between the crash experience in the different subareas. For instance, the angle-type crash is the most frequent crash type at three triangle vertex locations. For other study area locations along Route 117, single-vehicle and rear-end crashes are the most numerous. Also, crashes are more likely to take place in the PM-peak period than during the AM peak. The exception is at Route 117 and Crescent Street where twice as many crashes occurred during the AM peak. Appendix A provides information about all 53 crashes in the analysis area.

**Table 1
2015–19 Crash Summary**

	Study Area Total	Route 117 at Route 62	Route 117 at Crescent Street	Crescent Street at Hartley Road	Other Locations
Crash Severity					
Fatality	0	0	0	0	0
Injury	8	3	2	1	2
Property Damage Only	45	18	12	5	10
Total Crashes	53	21	14	6	12

<i>Manner of Collision</i>					
Single vehicle	12	5	2	1	4
Rear-end	14	5	4	1	4
Angle	18	7	4	4	3
Sideswipe, same direction	5	3	1	0	1
Sideswipe, opposite direction	1	1	0	0	0
Head-on	2	0	2	0	0
Not Reported/Unknown	1	0	1	0	0
Total Crashes	53	21	14	6	12
<i>Road Surface Condition</i>					
Dry	39	16	12	3	9
Wet	13	4	2	3	3
Ice	0	0	0	0	0
Snow	1	1	0	0	0
Total Crashes	53	21	14	6	12
<i>Ambient Condition</i>					
Daylight	43	19	13	2	9
Dark-lighted roadway	9	0	1	4	3
Dusk	0	0	0	0	0
Dawn	0	0	0	0	0
Dark-not-lighted roadway	1	2	0	0	0
Total Crashes	53	21	14	6	12
<i>Weather Conditions</i>					
Clear	32	14	11	2	7
Cloudy	12	3	2	1	4
Rain	8	3	1	3	1
Snow	1	1	0	0	0
Total Crashes	53	21	14	6	12
<i>Time Period</i>					
AM Peak (6:00 AM to 9:00 AM)	10	4	6	0	0
PM Peak (3:00 PM to 6:00 PM)	15	10	3	1	1
Off-peak	28	7	5	5	11
Total Crashes	53	21	14	6	12
<i>Crash Vehicle-Mix</i>					
Vehicle-only	53	21	14	6	12
Pedestrian	0	0	0	0	0
Bicycle	0	0	0	0	0
Total Crashes	53	21	14	6	12
Average Crashes per Year	10.6	4.2	2.8	1.2	2.4

Source: Central Transportation Planning Staff

5.3 Travel Direction and Improper Driving

Table 2 shows the total number of vehicles that were involved in the various crashes in each subarea. Each vehicle is characterized by the direction in which

it was traveling and whether its police report indicated any improper driving. The police reports only noted a specific type of improper driving (including inattention) for 37 of the 92 involved vehicles.

At the signalized intersection of Routes 117 and 62, there are 18 crash-involved vehicles traveling north or south, and 18 traveling east or west. The crash experience of vehicles traveling north is similar to those traveling south. However, vehicles traveling west are much more likely to crash than vehicles traveling east. Also, vehicles approaching this intersection from the east or west are more likely to be cited in police reports for improper driving than vehicles approaching from the north or south.

None of the other intersections in the expanded crash analysis area have signalized traffic control. The intersection of Crescent Street and Hartley Road has four-way stop signs. Crescent Street has a stop sign at Route 117 (Great Road), the only stop sign at this T-type intersection. Curb ramps and commercial activity at this intersection may contribute to the fact that 15 eastbound vehicles were involved in a crash here, the greatest number of any of the locations and approach directions.

**Table 2
2015–19 Crash Summary by Travel Direction and Driver Errors**

	All Vehicles	Traveling West	Traveling East	Traveling North	Traveling South
Study Area Total					
53 Crashes, 92 Vehicles					
All drivers	92	36	29	11	16
Improper driving noted	37	15	11	5	6
No improper driving noted	55	21	18	6	10
SR 117 / SR 62 Junction					
21 Crashes, 36 Vehicles					
All drivers	36	13	5	8	10
Improper driving noted	15	7	3	2	3
No improper driving noted	21	6	2	6	7
SR 117 at Crescent Street					
14 Crashes, 26 Vehicles					
All drivers	26	9	15	1	1
Improper driving noted	7	2	4	1	0
No improper driving noted	19	7	11	0	1
Crescent Street at Hartley Road					
6 Crashes, 10 Vehicles					
All drivers	10	4	2	2	2
Improper driving noted	7	3	0	2	2
No improper driving noted	3	1	2	0	0
Other Study Area Locations					
12 Crashes, 20 Vehicles					
All drivers	20	10	7	0	3
Improper driving noted	8	3	4	0	1
No improper driving noted	12	7	3	0	2

Source: Central Transportation Planning Staff.

6 INTERSECTION ANALYSIS

6.1 Vehicular Travel Patterns

MassDOT Highway Division’s Traffic Data Collection section collected traffic data for the study. Automatic traffic recorder (ATR) counts were collected during a seven-day period from midday Tuesday, November 16, 2021, to midday Monday, November 22, 2021. The ATR counts included daily traffic volumes and traffic

Figure 20
Average Weekday and Weekend Traffic Volumes



The intersection receives a greater amount of traffic during the AM peak than the PM peak travel period. The eastern branch of the intersection experiences the highest vehicle volumes during both peak periods, with the second-largest amount of traffic traveling along Great Road/Route 117 to the west of the intersection. The southern branch, Gleasondale Road/Route 62, is the third most traveled, and Library Hill Road, comprising the intersection’s northern branch, receives the lowest volumes.

While approximately 500 vehicles traveled northwest along Common Road during both peak periods (502 during the AM peak period and 469 during the PM peak period), only one vehicle was recorded traveling southeast along the roadway. This motorist turned left onto Great Road/Route 117/Route 62 to travel eastbound.

6.2 Intersection Vehicular Levels of Service (LOS)

MPO staff conducted traffic operations analyses consistent with the Highway Capacity Manual (HCM) methodologies.⁵ HCM methodology is used to assess traffic conditions at signalized and unsignalized intersections and to rate the LOS from A to F. LOS A represents the best operating conditions (little to no delay), while LOS F represents the worst operating conditions (long delay). LOS E represents operating conditions at capacity (the limit of acceptable delay). Table 3 presents the control delays (standards for comparison) associated with each LOS for signalized and unsignalized intersections.

**Table 3
Intersection Level of Service Criteria**

Level of Service	Signalized Intersection Control Delay (seconds per vehicle)	Unsignalized Intersection Control Delay (seconds per vehicle)
A	< 10	< 10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	> 80	> 50

Source: Highway Capacity Manual 2010.

Using Synchro traffic analysis software, MPO staff assessed the capacity and levels of service of the study area intersections. Appendix D presents the existing conditions LOS analysis worksheets. MPO staff observed a variable signal cycle and inconsistent signal durations for each leg of the Route 117/Route 62 intersection, indicating that the signals are actuated by the presence of vehicular traffic. The Town of Stow provided signal data that had been pulled from the traffic cabinet but there was limited signal information available. MPO staff did their best to approximate observed conditions at the study intersection and then used Synchro traffic analysis software to identify the optimal signal timing for the intersection given the AM and PM peak period volumes.

Based on the traffic operations analyses using approximated signal timing data, the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) has an AM peak period LOS of C and a PM peak period LOS of D. The surrounding unsignalized intersections experience the same LOS

⁵ Transportation Research Board of the National Academies, *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis*, Washington, DC, September 2020.

during both AM and PM peak periods. The Library Hill Road, Crescent Street, and Hartley Road intersection has a LOS of B while Great Road’s intersections with Crescent Street and Common Road both experience LOS A.

7 IMPROVEMENT RECOMMENDATIONS

The Town of Stow expressed interest in adding a dedicated left-turn lane to the study intersection’s southbound approach on Library Hill Road. MPO staff tested the impact of simply adding a left-turn lane but keeping the signal permissive, with both Library Hill Road and Gleasondale Road turning green simultaneously, and the impact of making the Library Hill Road left turn protected and permitted, giving the left turn an exclusive green phase within the signal cycle.

The Town of Stow also discussed the idea of turning Common Road into a one-way street. The idea Stow presented was to allow motorists to turn onto the street from Great Road (Routes 117 and 62) to travel northwest, with the one-way designation preventing vehicles from entering Common Road from Library Hill Road to travel in a southeast direction.

MPO staff modeled the impact of these changes on LOS at the study area intersections and found that modifications to the signalized intersection did not affect conditions at any of the unsignalized intersections. Modeled queues from the study intersection, especially those on Library Hill Road, do not spill into the adjacent unsignalized intersections. Traffic analyses using approximated signal timing data found that every scenario generated the same LOS: C for the AM Peak Travel period and D for the PM Peak Travel period.

Optimizing the signal timing did not change morning conditions but improved LOS during the PM Peak Travel period. While the service increased by one letter grade, from a D to C, when Library Hill Road was given a protected left-turn lane, the greatest LOS improvement occurred for the scenarios without the protected left turn, changing from a D to a B (Table 4).

Table 4
Route 117 at Route 62 Intersection LOS in a Variety of Scenarios

Scenario	AM Peak Travel Period		PM Peak Travel Period	
	<i>Approximated Signal Timing</i>	<i>Optimized Signal Timing</i>	<i>Approximated Signal Timing</i>	<i>Optimized Signal Timing</i>
Existing Layout	C	C	D	B
Add Permissive Left-Turn Lane to Library Hill Road	C	C	D	B
Add Protected Left-Turn Lane to Library Hill Road	C	C	D	C
Common Road as One-Way Street	C	C	D	B
Add Permissive Left-Turn Lane and Turn Common Road into a One-Way Street	C	C	D	B
Add Protected Left-Turn Lane and Turn Common Road into a One-Way Street	C	C	D	C

LOS = Level of Service.

7.1 Short-Term Recommendations

MPO staff suggest that the Town of Stow optimize the intersection’s signal timing. Table 5 compiles the maximum green phases generated by the Synchro modeling software for the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road). MPO staff also recommend that Stow does not introduce a protected left turn to the Library Hill Road approach. Adding a permissive left-turn lane to Library Hill Road and converting Common Road to a one-way street, however, are both changes that are not expected to negatively impact LOS at the study intersection, so the Town of Stow should feel comfortable introducing one element or both without concerns about intersection LOS. MPO staff recommend maintaining the existing turn lanes at each intersection approach with the exception of Library Hill Road, where the solitary approach lane should be split into two lanes, one for left turning movements, the other for through and right-turn movements.

MPO staff propose that the Town consider changing Common Road from a two-way street to a one-way street due to traffic volumes. Very little vehicular traffic uses Common Road, especially vehicles traveling southeast towards Great Road. Converting the road to a one-way street will also allow the library to have more space for future landscape or parking changes. These roadway uses, especially if used to add a pinchpoint, chicanes, or a lane shift to the roadway, could be combined with narrowing the travel lane to a maximum width of 11 feet to create a more pleasant environment for library patrons and help discourage speeding along Common Road.

Staff do not believe this change would have significant impact on current traffic patterns nor on Common Road’s usage as a cut-through. Existing volumes are low, and converting the street to a one-way would likely not increase the number of northwest-bound drivers using it as a cut-through to avoid the intersection. It should be noted, however, that Sunday traffic data were not collected during this study. Staff recommend a study of Sunday volumes due to the location of the First Parish Church.

**Table 5
Optimized Signal Timing**

Maximum Green Phase Duration									
(Minimum Green Duration: 6 Seconds Yellow Duration: 3 Seconds Red Duration: 2 Seconds)									
Scenario		Existing Conditions		Add Permissive Left Turn		Turn Common Road into One-Way Street		Add Permissive Left-Turn Lane and Turn Common Road into One-Way Street	
		AM	PM	AM	PM	AM	PM	AM	PM
Peak Travel Period									
Eastbound Approach	All Directions	25	14	27	17	25	15	27	17
Westbound Approach	Left-Turn Lane	6	10	6	11	6	11	6	11
Westbound Approach	Straight and Right Turns	36	29	38	33	36	31	38	33
Northbound Approach	Straight and Left Turns	14	11	12	12	14	14	12	12
Northbound Approach	-Right-Turn Lane	25	26	23	28	25	30	23	28
Southbound Approach	All Directions	14	11	12	12	14	14	12	12

Listed below are additional low-cost, quickly implementable changes that Stow could make to the study intersection to improve safety. These recommendations are illustrated in Figure 21.

- Restripe travel lanes that are currently wider than 11 feet to ensure 11-foot widths for all lanes. Tightening the visual appearance of the vehicle travel lanes encourages greater driver awareness and slows driving speeds.

Narrowing the roadway space allocated to vehicle travel also creates more areas that could be dedicated to pedestrian and bicycle travel. The widest lanes at the intersection are listed below.

- The northbound right-turn lane currently measures 19 feet wide.
- The southbound intersection approach currently measures 22-feet wide and should be split into two 11-foot lanes, one for left turning movements, the other for through and right-turn movements.
- The southbound departure lane currently measures 26 feet wide.
- Repaint all existing intersection crosswalks.
- Add a crosswalk to the eastern leg of the study intersection.
- Paint pedestrian zones that narrow curb radii at each intersection corner to slow turning vehicle speeds, increase pedestrian visibility, and reduce crosswalk distances. The amount of right-turning heavy vehicles at the study intersection is minimal, so corner radii at the intersection should accommodate vulnerable road users (such as pedestrians and bicyclists) rather than cater to occasional turning trucks (Table 6).
 - Ideally, vertical separation in the form of large planters, flexible bollards, traffic cones, or moveable curbs would separate the pedestrian zones from vehicle traffic. A stronger barrier, such as a temporary traffic barricade, could provide greater protection from trucks and other heavy vehicles.
- Use paint and vertical separation to better define the pedestrian refuge island between the approach and departure lanes of the Gleasondale Road crossing.

**Table 6
Heavy Vehicles during Peak Travel Periods**

Intersection Approach	Direction	Movement	Number of Heavy Vehicles		Heavy Vehicle Percent of Total Volume	
			AM	PM	AM	PM
Library Hill Road	Southbound	Right	0	0	0%	0%
		Thru	5	1	5%	1%
		Left	3	0	4%	0%
		U-Turn	0	0	0%	0%
		Total	8	1	5%	1%
Great Road (Route 62/117)	Westbound	Right	0	1	0%	14%
		Thru	16	20	7%	3%
		Left	8	1	10%	0%
		U-Turn	0	0	0%	0%
		Total	24	21	17%	17%

		Total	24	22	8%	2%
Gleasondale Road (Route 62)	Northbound	Right	4	3	3%	2%
		Thru	5	3	5%	3%
		Left	3	2	20%	6%
		U-Turn	0	0	0%	0%
		Total	12	8	4%	3%
Great Road (Route 117)	Eastbound	Right	3	1	12%	5%
		Thru	24	4	4%	1%
		Left	0	0	0%	0%
		U-Turn	0	0	0%	0%
		Total	27	5	4%	1%

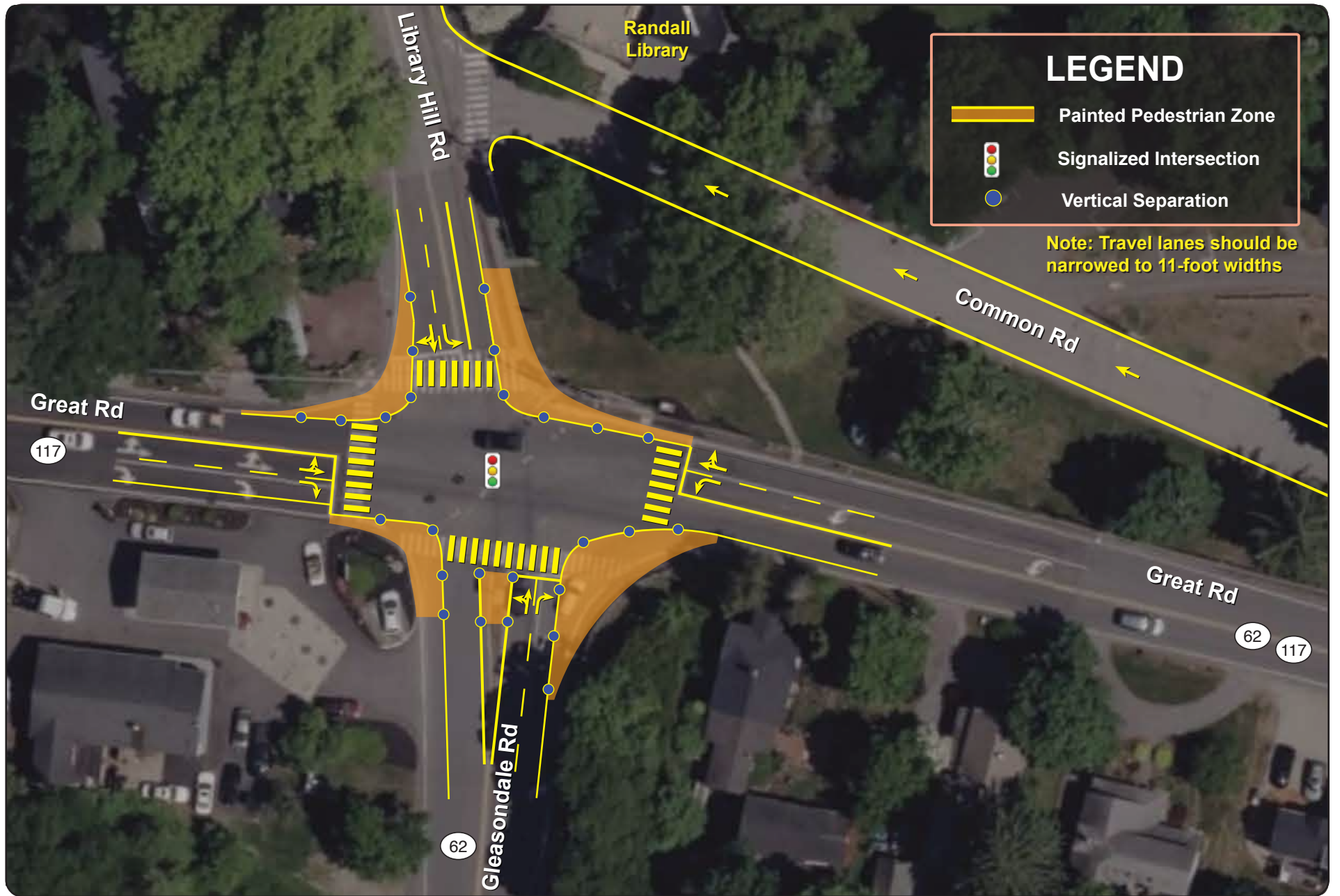
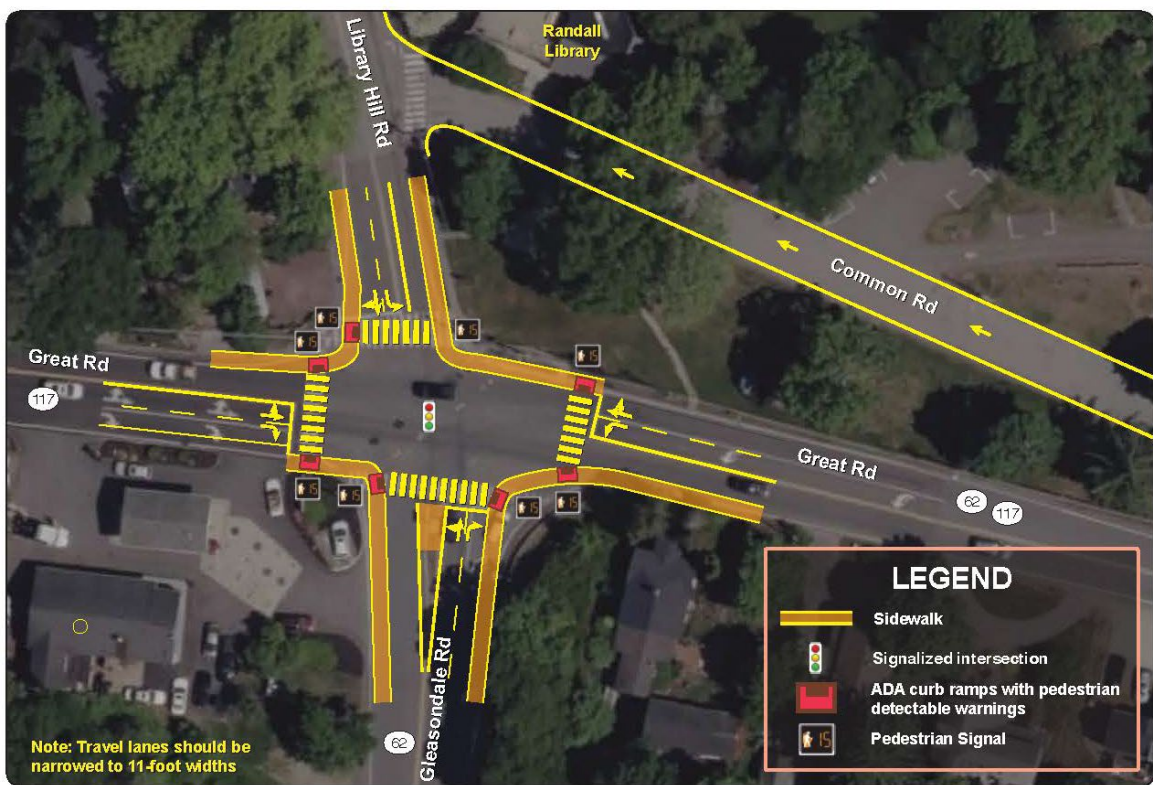


FIGURE 21
Proposed Short-Term Improvements
Routes 117 and 62, Stow MA

7.2 Long-Term Recommendations

There are several investments in pedestrian travel that the Town of Stow could make to improve safety at the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road). As shown in Figure 22, these include the construction of proper sidewalks at least five feet in width along all intersection legs, adding curb ramps with pedestrian detectable warning strips where the sidewalk meets each intersection crosswalk, and installing audible, vibrotactile pedestrian signals with countdown timer displays.

Figure 22
Recommended Future Investments



This last investment would require adding a pedestrian crossing phase to the existing traffic signals to allow people who are walking to safely cross the intersection. The intersection’s longest current crossing is Gleasondale Road at the southern approach with a width of approximately 90 feet. It is recommended to allow pedestrians to travel at a pace of 3.5 feet per second, so the duration of the intersection’s pedestrian phase should last at least 25.7 seconds. Table 6 documents the optimized signal timings and LOS for the study intersection if a 26 second pedestrian phase is added to the signal cycle. This duration could be shortened if the Town of Stow narrows travel lane widths and creates larger pedestrian zones, reducing the distance that pedestrians need to cross.

**Table 7
Optimized Signal Timing and LOS with Pedestrian Phase**

Maximum Green Phase Duration and LOS									
(Pedestrian Phase Duration: 26 Seconds Yellow Duration: 2 Seconds Red Duration: 1 Second)									
(Minimum Green Duration: 6 Seconds Yellow Duration: 3 Seconds Red Duration: 2 Seconds)									
Scenario	Existing Conditions		Add Permissive Left Turn		Turn Common Road into One-Way Street		Add Permissive Left-Turn Lane and Turn Common Road into One-Way Street		
	AM	PM	AM	PM	AM	PM	AM	PM	
Peak Travel Period									
Eastbound Approach <i>Great Road (Route 117)</i>	All Directions	42	21	28	22	42	21	28	22
Westbound Approach <i>Great Road (Route 117/Route 62)</i>	Left-Turn Lane	8	8	6	11	8	8	6	11
	Straight and Right Turns	55	34	39	38	55	34	39	38
Northbound Approach <i>Gleasondale Road (Route 62)</i>	Straight and Left Turns	26	17	12	13	26	17	12	13
	Right-Turn Lane	39	30	23	29	39	30	23	29
Southbound Approach <i>Library Hill Road</i>	All Directions	26	17	12	13	26	17	12	13
LOS		C	C	C	B	C	C	C	C

LOS = level of service.

One element that may warrant additional analysis prior to implementing the pedestrian signal recommendations is the impact of school drop-off and pick-up volumes on intersection queues with the new pedestrian signal timing. However, this will require a greater understanding of the impact that the short-term recommendations have on travel behavior in the area. There is the potential that the improvements to the pedestrian environment encourage more people to walk and even bike to school, reducing roadway congestion at school drop-off and pick-up times.

Finally, to accommodate bicycle travel, Stow could consider adding bicycle facilities to the study intersection. The Town could paint five-foot-wide bike lanes in each direction of travel if roadway width allows after creating pedestrian zones and narrowing vehicle travel lanes. Through this effort, Stow could explore adding a contraflow bike lane to Common Road if the Town converts the

roadway to a one-way street. Ideally, Stow’s bike lanes would be accompanied by a painted buffer with a width of at least one foot and vertical separation to prevent motorists from entering the bike lanes. Finally, Stow could consider adding a bike box to Gleasondale Road’s intersection approach lane because bicyclists at the location must stop on a steep and potentially dangerous slope.

These bicycle facilities would need to be accompanied by similar bike lanes corridor-wide to encourage bicyclist safety, comfort, and connectivity throughout Stow. Bicycle volumes are currently low at the study intersection, but providing safe bicycle accommodations in the form of buffered bike lanes may encourage more people to travel through the intersection via bicycle. Volumes of people bicycling are even more likely to increase if the intersection becomes part of a larger bicycle-friendly network throughout the Town of Stow.

8 CONCLUSIONS AND NEXT STEPS

8.1 Conclusions

There are several quick fixes that can be made at the intersection of Route 117 and Route 62 (Great Road, Library Hill Road, and Gleasondale Road) that have the potential to improve conditions for all road users. These rapidly implementable improvements can be accomplished using affordable materials, which should keep the overall cost of the short-term updates low. If Stow finds that these intersection modifications yield positive results, the Town could consider allocating funds to construct more permanent versions of the projects to create lasting safety and comfort benefits for all who travel through the intersection.

8.2 Next Steps

The Town of Stow could begin its intersection improvements by implementing the signal timing recommendations documented in this memorandum. This should be accompanied by the roadway paint and striping recommendations to provide more space for and better visibility of people walking and bicycling through the intersection. Stow would need to determine which type of temporary vertical separation feels most appropriate for the study location and the Town as a whole.

Before long-term interventions are explored, the Town should consider collecting vehicle count data on Sundays to better understand impacts of converting Common Road to a one-way street. In addition, Stow should conduct speed studies along Great Road if there is interest in implementing corridor-wide safety improvements.

Stow has reported an interest in exploring microtransit options throughout the Town, including at this intersection. MPO Staff recommend researching current municipal microtransit pilots, specifically the Salem Skipper and NewMo programs. MassDOT offers a Community Transit Grant Program that is used to provide transit to seniors and individuals with disabilities, which Stow could pursue.

Looking ahead at implementing the long-term study recommendations, the travel volume by mode, and turning movement count data provided through this work may be used by Stow to complete applications for regional, state, and federal funding to support infrastructure improvements. If Stow is interested in constructing bicycle facilities within the study area, the town may consider applying for Community Connections Program funding through the Boston Region MPO.

Appendices

- Crash Data
- Traffic Data
- Existing Conditions LOS
- Proposed Conditions LOS

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