



MEMORANDUM

Date: August 16, 2021

To: John Coderre, Town Administrator

From: Scott D. Charpentier, P.E., Public Works Director

Copy: Becca Meekins, Assistant Town Administrator
Fred Litchfield, P.E., Town Engineer
Kathy Joubert, Town Planner

Subject: Bartlett Street Traffic Mitigation Update

Town Staff have been working diligently to assist the residents of the Bartlett Street neighborhood with their traffic concerns, specifically related to truck traffic serving the adjacent industrial zone. This memorandum serves to provide a status update related to mitigation efforts thus far.

Concern: Tractor trailer trucks were parking on Bartlett Street across from the driveway for 200 Bartlett Street.

Response: The Board of Selectmen (BOS) approved at their January 11, 2021 meeting a no parking zone for both sides of the entire length of Bartlett Street. The regulatory signs have been installed and the parking prohibition is being enforced.

Concern: Truck drivers were missing the entrance to Amazon and turning around in the surrounding residential neighborhoods. When will Amazon be installing the permanent entrance sign as well as the directional signs across the street from their driveway?

Response: The permanent sign has been installed at the driveway. In addition, there are directional signs installed at the driveway, across from the driveway, and directional pavement markings at the driveway exit. The facility sign and additional measures have greatly reduced driver error entering from the east and incorrectly existing toward the west.

Concern: What is the status of the Amazon traffic mitigation funds and what will they be used for?

Response: Amazon has provided \$80,000 in mitigation funds for the Town of Northborough. Traffic mitigation measures and their status include, but are not limited to, the following:

- Central Massachusetts Regional Planning Commission (CMRPC) identifies dedication bicycle lanes as a means of traffic calming. The attached map presents bicycle lanes as laid out by our traffic engineering consultant between

Bartlett Street Traffic Mitigation Update
August 16, 2021

the intersection of Bartlett Street and Cedar Hill Street extending to the Algonquin Regional High School (ARHS). The bicycle lanes cannot connect Route 20 to the Town line at Marlborough due to inadequate pavement width. There is the potential to implement box widening east of Cedar Hill Street in the future to allow connectivity to the City of Marlborough. However, there is not adequate right of way width to continue a bicycle lane from the high school entrance to Route 20, so it would need to terminate at the entrance to ARHS. Potential implementation of this mitigation measure will await completion of the post occupancy study discussed later in this memorandum.

- Solar powered pedestrian activated rapid flashing beacons have been purchased for the ARHS crosswalk and the recreational trail crosswalk nearest Lyman Street. Installation is scheduled to occur prior to start of the new school year.
- Additional traffic signs have been installed at the intersection of Bartlett Street and Lyman Street directing traffic to the preferred route to I-495.
- The traffic engineering safety zone speed study for the segment of Bartlett Street in the ARHS area has been completed and is attached hereto.

Concern: Can the use of jake brakes be prohibited in Northborough?

Response: The Board of Selectmen proposed a Compression Brake Prohibition Bylaw at the May 1, 2021 Annual Town Meeting under Article 39, which was passed by the voters. The Town is now awaiting approval of the Bylaw by the Massachusetts Attorney General prior to implementation, which will require the Board of Selectmen to adopt the prohibition along specific roadway segments and for those to be properly posted.

Concern: Can the town install a safety speed zone around ARHS?

Response: The aforementioned engineering study supports implementation of a discretionary safety speed zone in the area of ARHS and during the times when vulnerable drivers are at a high concentration. The zone should extend 700-feet north and south of the entrance. While the engineering report recommends the safety speed zone be 90-minutes in duration focused on arrival and departure times, stakeholders, including the School Administration, support an extended afternoon duration. The alternate afternoon timeframe is proposed to be from 2:00 PM until 6:00 PM to capture the highest concentration of afterschool activities. It is important to note that school speed zones are limited by State regulation to the times of arrival and departure.

Concern: What is being done for traffic studies along Bartlett Street?

Response: The Town obtained traffic counts from CMRPC in late June at 8 locations in the Bartlett Street area. The results are provided in the accompanying memorandum but can be summarized as follows:

- Ridge Road meets the minimum 5% truck traffic criteria for consideration of a heavy commercial vehicle exclusion (HCVE). Alternate routes all lie entirely within the Town of Northborough; therefore, staff recommends pursuing a Ridge Road HCVE through MassDOT.
- Maple Street near Johnson Avenue did not meet the 5%-8% truck traffic, therefore a HCVE is not available for this roadway segment. However, the

Bartlett Street Traffic Mitigation Update
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Town will request MassDOT extend the existing Maple Street HCVE to the east end of Maple Street as a means to simplify the area due to the fact that all adjacent roadway segments have HCVEs.

Lastly, the Town has also engaged CMRPC to prepare an Amazon funded post occupancy traffic study for Bartlett Street in relation to the development of 330/350 Bartlett Street. The work will include analyses of turning movements, speed, volume, and vehicle type, as well as a walking audit, and comparison of current data to the data which was presented during the permitting phase for the property. A mitigation recommendations report will be provided to the Town for consideration.

Attachments:

1. Memorandum dated August 13, 2021 from the Town Engineer regarding the recently collected traffic counts and recommended truck exclusion on Ridge Road
2. Safety Zone Speed Study dated August 16, 2021 by Ron Muller & Associates for the segment of Bartlett Street surrounding the entrance to ARHS
3. Map of potential bicycle lanes on Bartlett Street



MEMORANDUM

Date: August 13, 2021

To: John Coderre, Town Administrator

C: Scott D. Charpentier, P.E., Public Works Director

From: Fred Litchfield, Town Engineer

Subject: 2021 Traffic Counts - Bartlett Street area

As discussed last winter, the Central Massachusetts Regional Planning Commission (CMRPC) was engaged to perform traffic counts in the Bartlett Street area. This data was collected for two reasons: first to reassess the need for Heavy Commercial Vehicle Exclusions (HCVE) along Ridge Road and easterly Maple Street now that warehouses have been put into operation in the area; and second, to capture local traffic patterns in support of a post occupancy study for the 330/350 Bartlett Street property. A heavy commercial vehicle is defined by regulation as those vehicles identified in the enclosed graphic as classes 5 through 13.

CMRPC installed and maintained traffic counters for a period of two weeks starting on Monday, May 17th at the following eight locations (as shown on the attached map):

- #1 - 43 Ridge Road
- #2 - 100 Ridge Road
- #3 - 115 Maple Street
- #4 - 225 Brigham Street (Juniper Hill Golf Course entrance)
- #5 - Bartlett Street (between Route 20 and Lyman Street)
- #6 - Bartlett Street (between #330 and Cedar Hill Street)
- #7 - Lyman Street (south of Bartlett Street)
- #8 - Bartlett Street (west of Lyman Street)

The purpose of this memorandum is to assess the possibility of expanded HCVEs along Ridge Road and Maple Street from Ridge Road to Bartlett Street. The image on the following page represents all vehicles classifications counted and, HCVs are those shows as types 5 through 13. It is important to understand that this assessment considers the single day with the highest percentage of trucks, which is often not the same day at all locations.

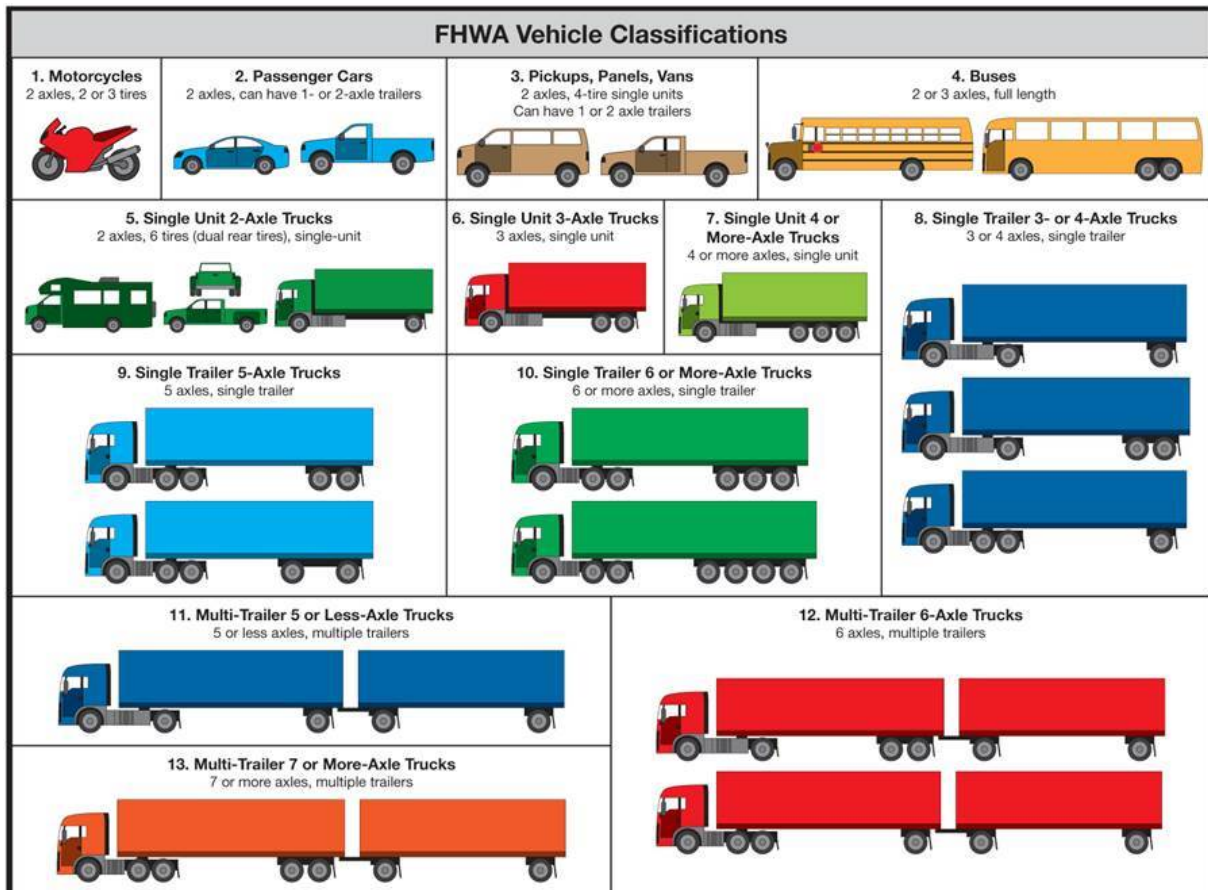
We have reviewed the data obtained from these locations (#1, #2, and #3) and found that the locations on Ridge Road (#1 and #2) exceeded the minimum 5% volume of trucks required to request a HCVE. Location #3 (Brigham Street) did not meet the minimum criteria. We will submit to MassDOT a request for a HCVE on Ridge Road. In support of this request, we will prepare an engineering study in accordance with the Massachusetts Amendments to the Manual on Uniform Traffic Control Devices and the Standard Municipal Traffic Code as required. Accompanying this submission will be a request for MassDOT to consider extending the current HVCE approved for

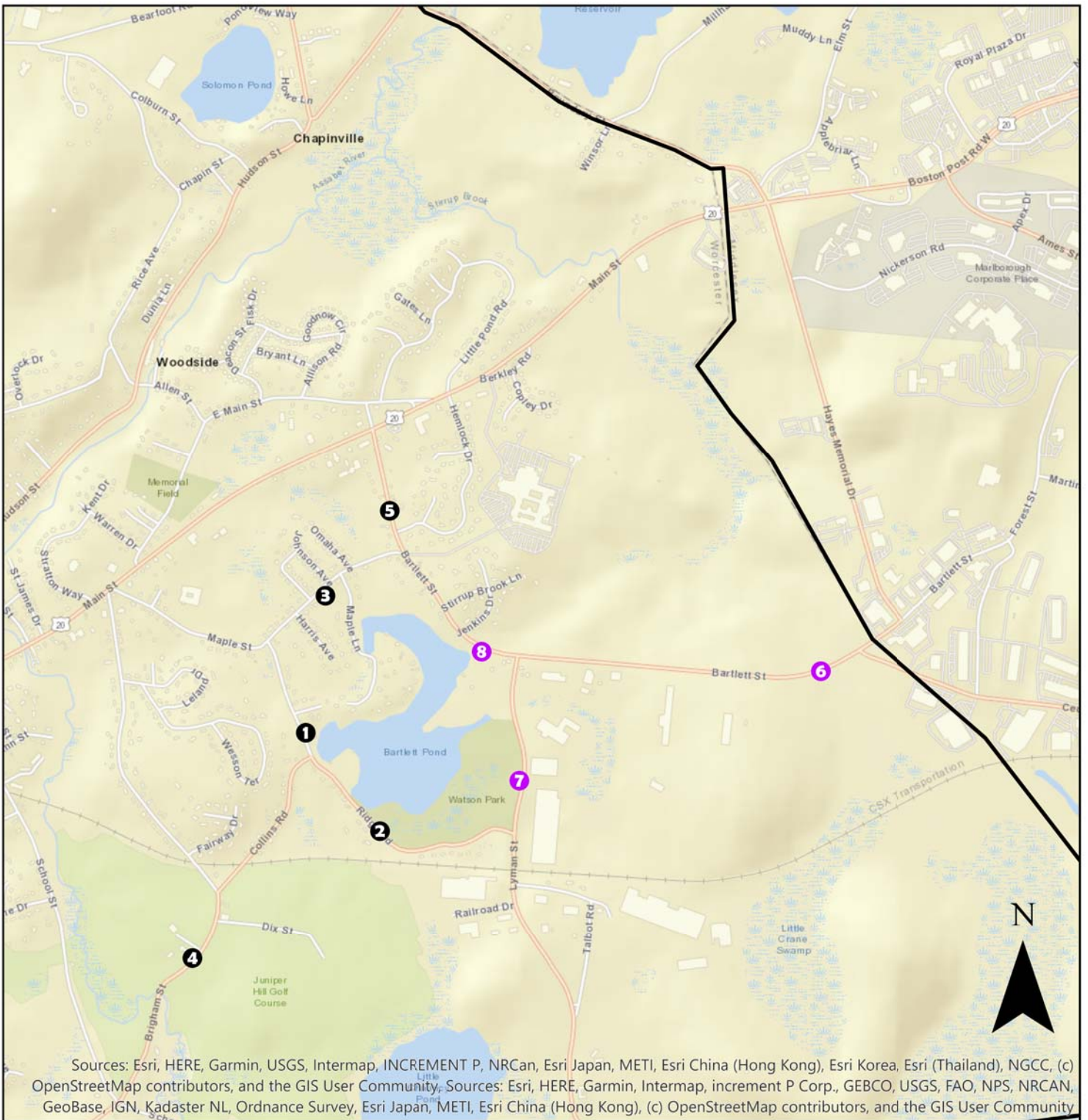
**Citizen Traffic Safety Concerns – Bartlett Street area
August 13, 2021**

Maple Street between Main Street and Ridge Road through to Bartlett Street, as there is no possible exit for trucks that might enter Maple Street from Bartlett Street once an HVCE is approved for Ridge Road.

We also reviewed the data obtained from each of the eight locations and present it in the table below which indicates the maximum percentage of vehicles classified as Heavy Commercial Vehicles (HVC%) which includes tractor trailers, the percentage of just Tractor Trailers (TT%) and the total volume of vehicles counted for the day in which the HCV count was at its maximum. Again, it is important to understand when looking at this data that the highest percentage at each location likely did not occur on the same day.

| | Counter Location | HCV% (TT included) | TT% | Total Volume |
|---|--|-------------------------------|------------|-------------------------|
| 1 | 43 Ridge Road | 7.69 | 0.00 | 663 |
| 2 | 100 Ridge Road | 6.19 | 0.47 | 1,502 |
| 3 | 115 Maple Street | 4.87 | 0.10 | 985 |
| 4 | 225 Brigham Street (Juniper Hill Golf Course) | 4.13 | 3.18 | 2,204 |
| 5 | Bartlett Street (between Route 20 & Lyman St) | 10.51 | 1.16 | 8,120 |
| 6 | Bartlett Street (between #330 & Cedar Hill St) | 19.29 | 10.23 | 6,815 |
| 7 | Lyman Street (south of Bartlett Street) | 10.06 | 3.00 | 4,800 |
| 8 | Bartlett Street (west of Lyman Street) | 8.82 | 2.19 | 6,087 |





Traffic Counting Locations Town of Northborough

- Northborough Requested Traffic Count Location
- CMRPC add on Count Location

| Town | Location | Number |
|--------------|---|--------|
| Northborough | 43 Ridge Road | 1 |
| Northborough | 100 Ridge Road | 2 |
| Northborough | 115 Maple Street | 3 |
| Northborough | 225 Brigham Street | 4 |
| Northborough | Bartlett Street between Route 20 and Lyman Street | 5 |
| Northborough | Bartlett Street West of Cedar Hill Street | 6 |
| Northborough | Lyman Street South of Bartlett Street | 7 |
| Northborough | Bartlett Street West of Lyman Street | 8 |



Ron Müller & Associates

Traffic Engineering and Consulting Services

56 Teresa Road
Hopkinton, MA 01748
Tel.: (508) 395-1576
Fax: (508) 435-2481
www.RonMullerAssociates.com

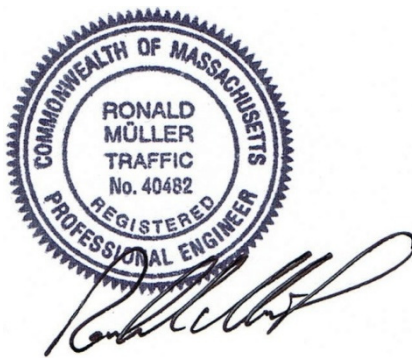
Safety Zone Speed Study

**Bartlett Street
Northborough, Massachusetts**

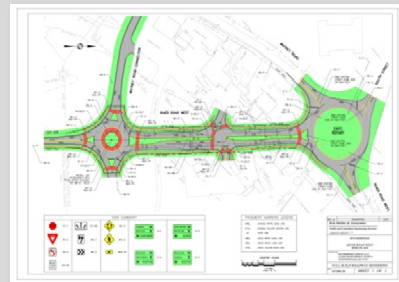
Prepared In Conjunction With:

**Woodard & Curran
40 Shattuck Road, Suite 110
Andover, MA 01810**

August 16, 2021



Quality



Accuracy



Integrity





Safety Zone Speed Study

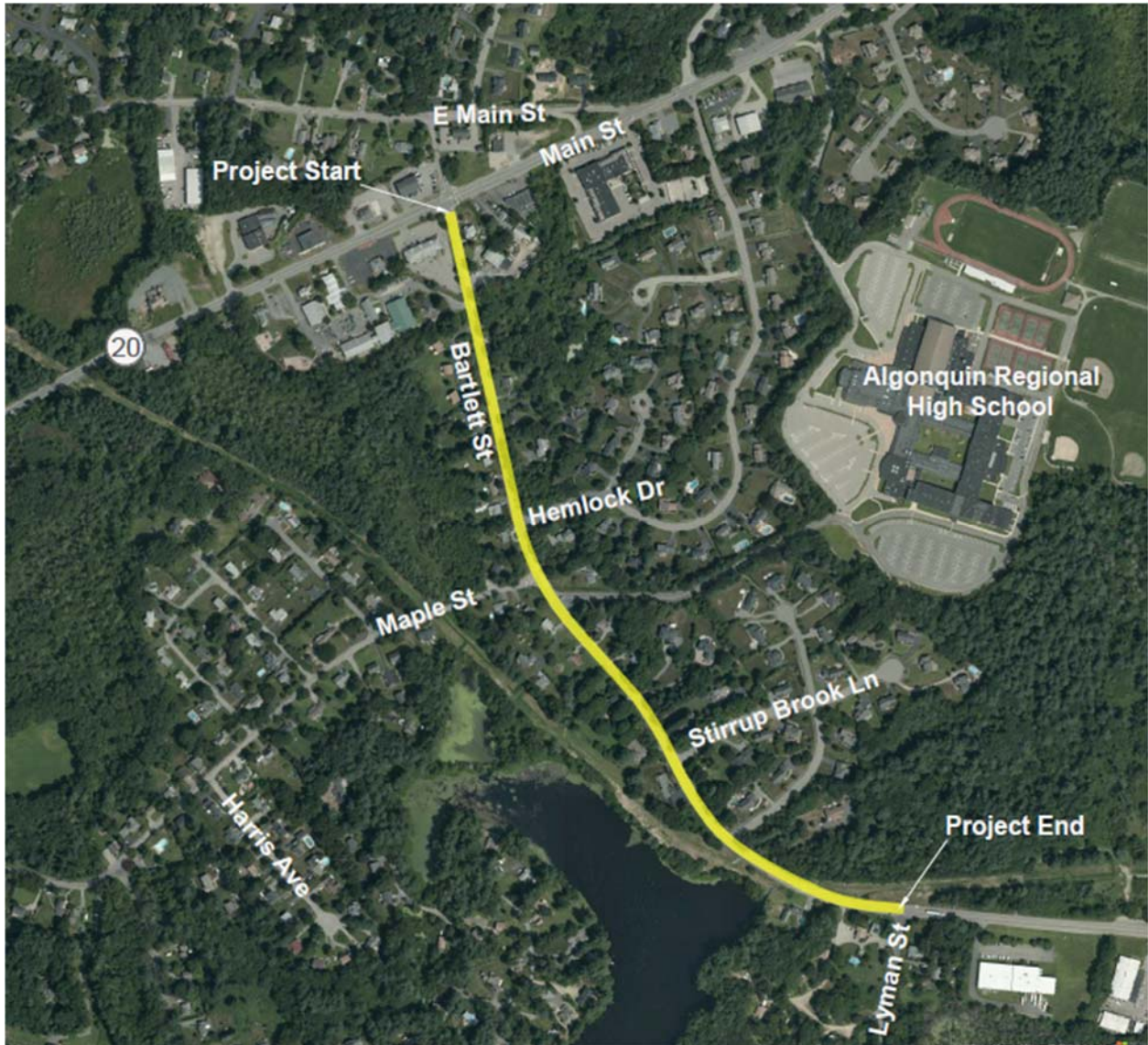
| | | | |
|-------|--|------------|--|
| To: | Mr. Scott D. Charpentier, P.E. Director of Public Works Town of Northborough Northborough, MA 01532 | Reg: | Safety Zone Speed Study Bartlett Street Northborough, MA |
| From: | Kirsten Braun, P.E., Associate Ron Müller, P.E., Principal | Date: | August 16, 2021 |
| | | Project #: | 21014 |

INTRODUCTION

Ron Müller & Associates (RMA) has conducted this Safety Zone Speed Study to evaluate the need for a 20 mph Safety Speed Zone Limit on Bartlett Street near the Algonquin Regional High School. Safety zone speed limits can be established on city and town owned ways without approval from the Massachusetts Department of Transportation (MassDOT). A safety zone speed limit should be established in areas where vulnerable road users are likely to be present, including in locations such as playgrounds, senior citizen housing center, hospitals, daycares and high schools. Given the proximity to the Algonquin Regional High School and the likelihood of potential vulnerable users along Bartlett Street, a safety zone speed study was performed. A safety zone speed study is required to assure that the zone is created in accordance with MassDOT and the Manual on Uniform Traffic Control Devices (MUTCD) guidelines. The study was completed in accordance with the MassDOT Procedures for Speed Zoning on State Highways and Municipal Roads. The speed study was completed along Bartlett Street between Main Street (Route 20) and Lyman Street. The study area is shown on Figure 1.

The safety zone speed study includes an inventory of Bartlett Street within approximately 700 feet, in both directions, of the Algonquin Regional High School driveway to collect information regarding road condition, lane and shoulder widths, intersecting streets and driveways, horizontal and vertical curves and adjacent land uses. Additionally, vehicle speed data were collected both north and south of the high school driveway to determine the current 85th percentile speeds traveling both northbound and southbound on Bartlett Street. Furthermore, accident data were collected for the latest five-year period on record throughout the corridor to determine if accident trends exist at locations along Bartlett Street. All of this information was used to make recommendations regarding the length of the safety zone and to determine appropriate signing.

Figure 1
Safety Zone Speed Study Map



EXISTING CONDITIONS

Bartlett Street is classified by the MassDOT Road Inventory database as an urban collector and is under Town of Northborough jurisdiction. Within the study area, Bartlett Street is a two-way street generally running in the north/south direction with one lane per direction separated by a double yellow centerline. Lane widths throughout the study area are variable ranging between approximately 13 feet and 17 feet north of the high school and approximately 13 feet and 21 feet south of the high school. Pavement along this section of Bartlett Street is in good condition. Sidewalks exist along the east side of the road. Variable width shoulders exist along either side of the road. These shoulder widths range between approximately one foot and three and a half feet north of the high school and approximately two feet and seven feet south of the high school. The posted speed limit is 35 miles per hour (mph) within the study area.

Land use along the northern segment of Bartlett Street is predominantly residential with industrial uses near the Marlborough City line. Within the vicinity of the study area there are a number of vertical and horizontal curves, including a reverse curve approaching the school from the south on Bartlett Street. There are a number of intersecting streets to Bartlett Street through the study area. North of the high school driveway, Hemlock Drive intersects Bartlett Street from the east and Maple Street intersects Bartlett Street from the west. South of the high school driveway, Stirrup Brook Lane and Jenkins Drive intersect Bartlett Street from the east and Lyman Street intersects Bartlett Street from the west. All intersecting streets operate under STOP control at their intersections with Bartlett Street.

SPEED STUDY

Trial Runs

As part of the speed zone study, trial runs were completed by three different engineers for a total of three runs in both directions on Bartlett Street between Main Street (Route 20) and Lyman Street. The posted speed limit on Bartlett Street is 35 mph traveling in both directions. Each driver was asked to operate the vehicle at the maximum comfortable safe speed and speeds were recorded every tenth of a mile. It should be noted that there are no traffic control devices throughout the corridor that may affect free-flow speeds. The median speeds at each tenth of a mile were recorded for each trial run and are shown in comparison to the measurement's approximate roadway location on Bartlett Street on Figure 2 below.

Figure 2
Speed Trial Runs



| Trial 1 | 0.1 miles | 0.2 miles | 0.3 miles | 0.4 miles | 0.5 miles |
|----------------|-----------|-----------|-----------|-----------|-----------|
| Northbound | ← 39 | ← 39 | ← 39 | ← 39 | ← 39 |
| Southbound | 39 → | 39 → | 39 → | 36 → | 40 → |

| Trial 2 | 0.1 miles | 0.2 miles | 0.3 miles | 0.4 miles | 0.5 miles |
|----------------|-----------|-----------|-----------|-----------|-----------|
| Northbound | ← 37 | ← 38 | ← 38 | ← 39 | ← 37 |
| Southbound | 38 → | 37 → | 37 → | 38 → | 39 → |

| Trial 3 | 0.1 miles | 0.2 miles | 0.3 miles | 0.4 miles | 0.5 miles |
|----------------|-----------|-----------|-----------|-----------|-----------|
| Northbound | ← 38 | ← 38 | ← 39 | ← 40 | ← 36 |
| Southbound | 38 → | 36 → | 36 → | 38 → | 40 → |

As shown on Figure 2, the median travel speeds both north and south of the high school were slightly higher than the posted speed limit of 35 mph traveling in both directions. Travel speeds south of the high school were recorded to be slightly higher than north of the high school, likely due to wider travel lanes and shoulder widths. Additionally, south of Lyman Street the posted speed limit on Bartlett Street increases to 45 mph, resulting in faster travel speeds south of the high school.

Speed Data Collection

Vehicle speed information along Bartlett Street was also collected via speed radar detector on Wednesday, May 26, 2021. Spot speed measurements were taken both north and south of the driveway to the Algonquin Regional High School. The speed measurements north of the high school were taken near Hemlock Drive while south of the high school the speed measurements

were taken near Stirrup Brook Lane. A total of 100 measurements in both the northbound and southbound directions were taken at each location. Using the data collected the average speed, 85th percentile speed, 95th percentile speed, mode and pace were determined at each location for each travel direction. The 85th percentile travel speed is the speed at, or below which 85 percent of all observed vehicles were traveling. Similarly, the 95th percentile travel speed is the speed at, or below which 95 percent of all observed vehicles were traveling. The mode represents the most common travel speed along the corridor and the pace represents the 10-mph range that encompasses the greatest number of vehicles recorded. A summary of the speed data along Bartlett Street is summarized in Table 1 and the speed measurements are provided in the Appendix.

Table 1
Observed Travel Speeds ^a

| Location/Direction | Posted Speed Limit | Average Speed | 85 th Percentile Speed ^b | 95 th Percentile Speed ^c | Mode ^d | Pace ^e |
|---|--------------------|---------------|--|--|-------------------|-------------------|
| Bartlett Street north of the High School | | | | | | |
| Northbound | 35 | 36 | 40 | 42 | 37 | 31-40 |
| Southbound | 35 | 36 | 40 | 42 | 38 | 32-41 |
| Bartlett Street south of the High School | | | | | | |
| Northbound | 35 | 39 | 42 | 44 | 41 | 34-43 |
| Southbound | 35 | 38 | 40 | 44 | 38 | 33-42 |

^a In miles per hour (mph).

^b Speed at, or below which 85 percent of all observed vehicles travel.

^c Speed at, or below which 95 percent of all observed vehicles travel.

^d Most common observed travel speed.

^e The 10 mph range that encompasses the greatest number of vehicles recorded.

As shown, the average recorded speed along Bartlett Street near the high school is comparable to the posted speed limit of 35 mph with 36 mph traveling both northbound and southbound north of the high school. South of the high school, the average recorded travel speed was slightly higher than the posted speed limit with 39 mph traveling northbound and 38 mph traveling southbound. The 85th percentile speeds were also recorded to be slightly higher than the posted speed limit with 40 mph traveling both northbound and southbound north of the high school while south of the high school the 85th percentile travel speeds were recorded to be 42 mph traveling northbound and 40 mph traveling southbound.

The mode traveling in both directions at each location were also found to be higher than the posted speed limit. The mode traveling northbound north of the school was found to be 37 mph, while traveling southbound the mode was found to be 38 mph. South of the high school the mode was

found to be 41 mph traveling northbound, while traveling southbound the mode was found to be 38 mph.

The pace was also recorded for each travel direction both north and south of the high school. North of the high school, the 10 mph range in which most drivers were observed to be traveling northbound was found to be between 31 and 40 mph while traveling southbound the pace was found to be between 32 and 41 mph. South of the high school, the pace traveling northbound was found to be between 34 and 43 mph while traveling southbound the pace was found to be between 33 and 42 mph.

Crash History

Accident data along Bartlett Street were obtained from MassDOT for the period between 2014 and 2018, the most recent five-year period available for reporting purposes at the time this report was prepared. A summary of the MassDOT accident data is provided in Table 2 and the approximate crash locations are shown on Figure 3. There was a total of 22 crashes reported along the corridor within the most recent five years of available data. All crash data are included in the Appendix.

Figure 3
Crash Locations

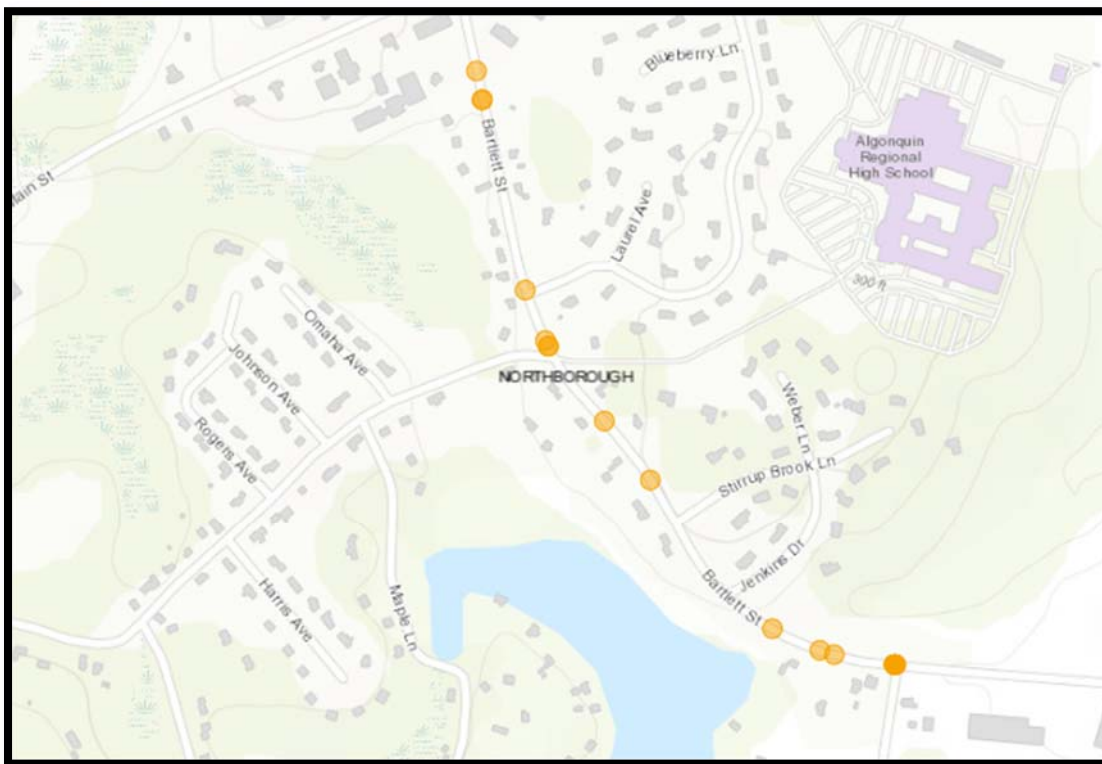


Table 2
Crash History

| Intersection / Roadway Segment | Number of Accidents | | Severity ^a | | | Accident Type ^b | | | | | | % During Wet/Icy Conditions |
|---|------------------------|---------------|-----------------------|----|---|----------------------------|----|----|----|----|-----|-----------------------------------|
| | Total | Avg./ Year | PD | PI | F | CM | RE | HO | SV | SS | Ped | |
| | | | | | | | | | | | | |
| Bartlett Street north of Hemlock Drive | 3 | 0.6 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0% |
| Bartlett Street at Hemlock Drive | 1 | 0.2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0% |
| Bartlett Street at Maple Street | 3 | 0.6 | 2 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 66% |
| Bartlett Street between Maple Street and Lyman Street | 5 | 1.0 | 5 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 80% |
| Bartlett Street at Lyman Street | 10 | 2.0 | 9 | 1 | 0 | 5 | 2 | 0 | 2 | 1 | 0 | 40% |

Source: MassDOT Traffic Operations Safety Management System – 2014 through 2018 data.

^a PD = property damage only; PI = personal injury; F = fatality.

^b CM = cross movement/angle; RE = rear end; HO = head on; SV = single vehicle; SS = sideswipe; Ped = pedestrian.

As shown in Table 2, Bartlett Street north of Hemlock Drive experienced a total of three accidents over the five-year period, averaging less than one accident per year. One crash was a rear-end type collision, another was a single vehicle collision and the remaining crash was a sideswipe collision. Two of the crashes involved property damage only while the other collision resulted in injury.

The intersection of Bartlett Street at Hemlock Drive experienced one crash over the five-year period. This crash was a rear-end type collision and resulted in property damage only.

The intersection of Bartlett Street at Maple Street experienced a total of three accidents over the five-year period, averaging less than one accident per year. Two crashes were rear-end type collisions and the remaining crash was a single vehicle collision. Two of the crashes involved property damage only while the other collision resulted in injury. Two of the three crashes occurred during wet or icy roadway conditions.

Bartlett Street between Maple Street and Lyman Street experienced a total of five accidents over the five-year period, averaging one accident per year. Two crashes were angle type collisions and the remaining three crashes were single vehicle collisions. All of the crashes resulted in property damage only and four of the five crashes occurred during wet or icy roadway conditions.

The intersection of Bartlett Street at Lyman Street experienced a total of 10 accidents over the five-year period, averaging two accidents per year. Five crashes were angle type collisions, two were rear-end type collisions, two were single vehicle type collisions and the remaining crash was a sideswipe type crash. Most of the crashes (90 percent) resulted in property damage only and 40 percent occurred during wet or icy roadway conditions.

No accidents were reported at the High School driveway intersection with Bartlett Street. It should also be noted that within the study area, none of the locations are listed as a top crash location in the MassDOT database of Highway Safety Improvement Program (HSIP) eligible clusters.

Safe Speed Range

The safe speed range is determined by analyzing all of the speed data collected along the corridor. The upper limit of the safe speed range is based on the observed 95th percentile speeds. The lower limit of the safe speed range is derived by subtracting seven from the 85th percentile travel speeds. Table 3 summarizes the upper and lower limits for speeds at locations north of the high school driveway as well as south of the high school driveway.

Table 3
Safe Speed Zone (mph)

| Roadway Segment | Posted Speed Limit | Upper Limit | Lower Limit |
|----------------------------|--------------------|-------------|-------------|
| Bartlett Street Northbound | | | |
| North of High School Drive | 35 | 42 | 33 |
| South of High School Drive | 35 | 44 | 35 |
| Bartlett Street Southbound | | | |
| North of High School Drive | 35 | 42 | 33 |
| South of High School Drive | 35 | 44 | 33 |

As shown in Table 3, north of the high school, the safe speed zone range is between 33 and 42 mph while south of the high school, the safe speed zone range is between 33 and 44 mph. These speed zone ranges correlate well with the trial runs performed to establish maximum comfortable safe speeds along the corridor.

RECOMMENDATIONS

Based on a review of the existing conditions and speed data, a number of recommendations are proposed to improve safety for all users along Bartlett Street. The 85th percentile speeds on Bartlett Street near the high school are slightly higher than the posted speed limit of 35 mph with 40 mph traveling southbound, both north and south of the high school, and 40 mph traveling northbound north of the high school and 42 mph traveling northbound south of the high school. The 95th percentile speeds along Bartlett Street are in the range of 42 to 44 mph.

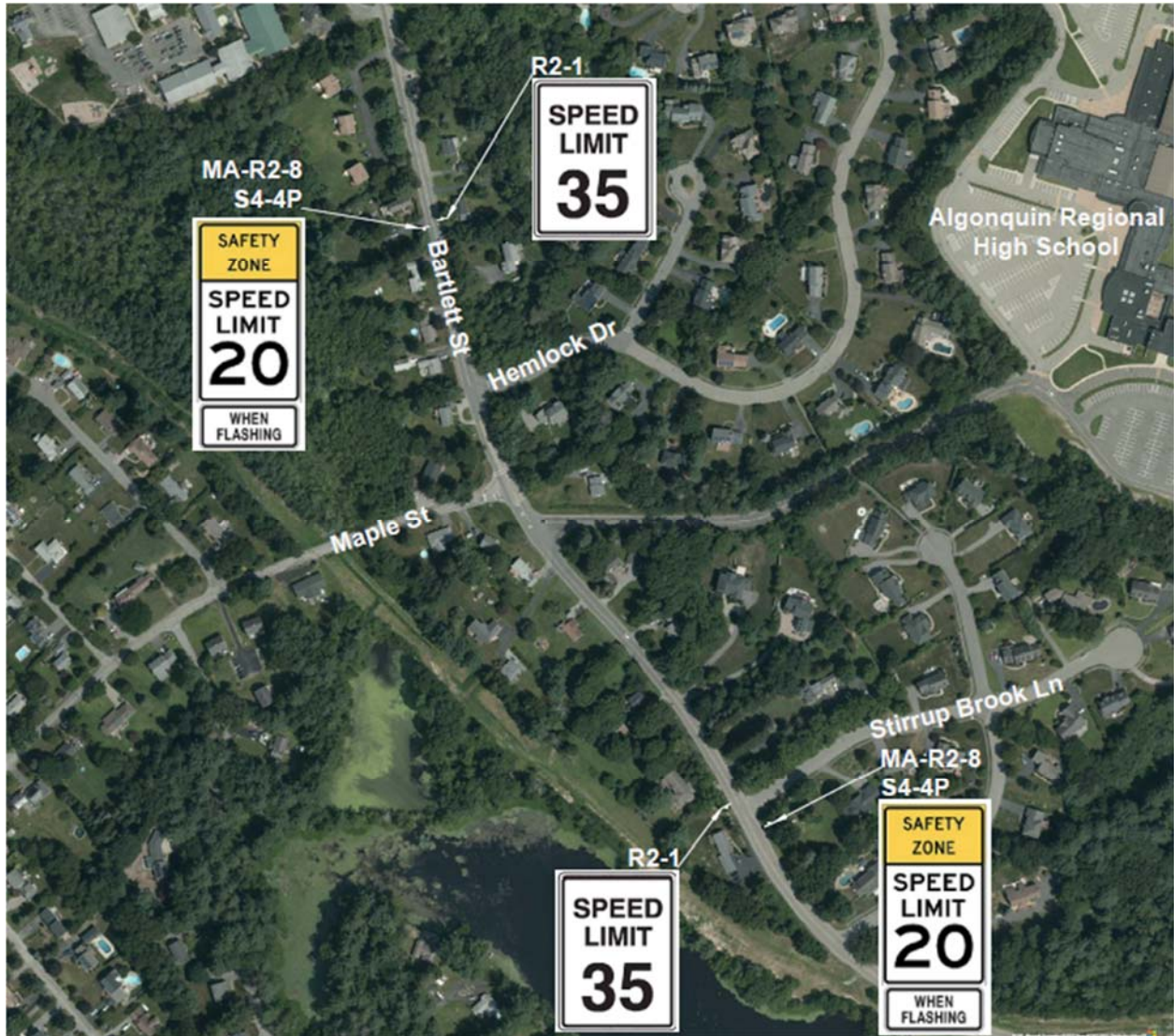
To improve pedestrian safety and accessibility to the school it is recommended that a safety speed zone be implemented approaching the school from both the northbound and southbound directions. The safety zone speed limit should be set at 20 mph. The safety speed zone sign (MA-R2-8) should be supplemented by 12-inch round flashing beacons and a “WHEN FLASHING” plaque (S4-4P), as shown on Figure 4. Given that the driving factor to the safety speed zone is the high school, it is recommended that the safety speed zone be restricted to weekdays during school arrival and departure times. Based on discussions with the Town of Northborough, classes start at 8:00 AM and end at 2:30 PM. It is therefore recommended that the flashing beacons activate between 7:00 and 8:30 AM and between 2:00 and 3:30 PM. While this is not a School Zone, it does mirror one closely and therefore it is suggested that it comply to the extent practicable with the Massachusetts Amendments to the Manual on Uniform Traffic Control Devices.

The sign assemblies should be installed on Bartlett Street approximately 700 feet north and south of the high school driveway. Additionally, to inform road users of the downstream end of the safety zone, it is recommended that speed limit (R2-1) signs be installed informing road users of the regulatory 35 mph speed limit. The approximate sign locations are shown on Figure 5.



Figure 4: Safety Zone Speed Sign

Figure 5
Proposed Sign Locations

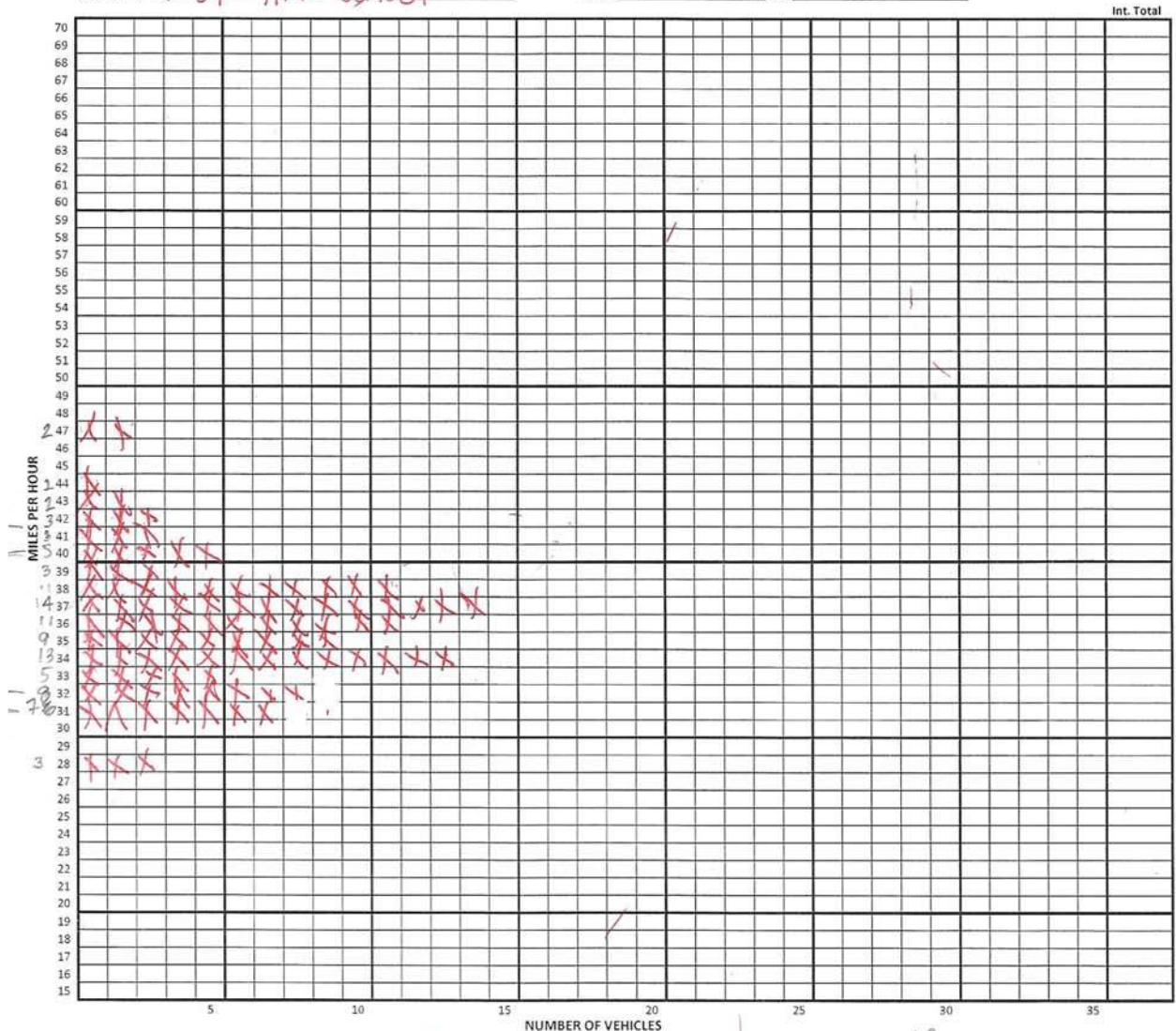


APPENDIX

Spot Speed Measurements
Crash Data

SPEED DISTRIBUTION WORKSHEET

Location: _____ Town: _____
 Direction of Travel: NB Station: _____
 Location: N. of High School Time: _____ To: _____



LEGEND
 X = PAX CAR
 T = TRUCK
 S = SEMI TRAILER
 B = BUS

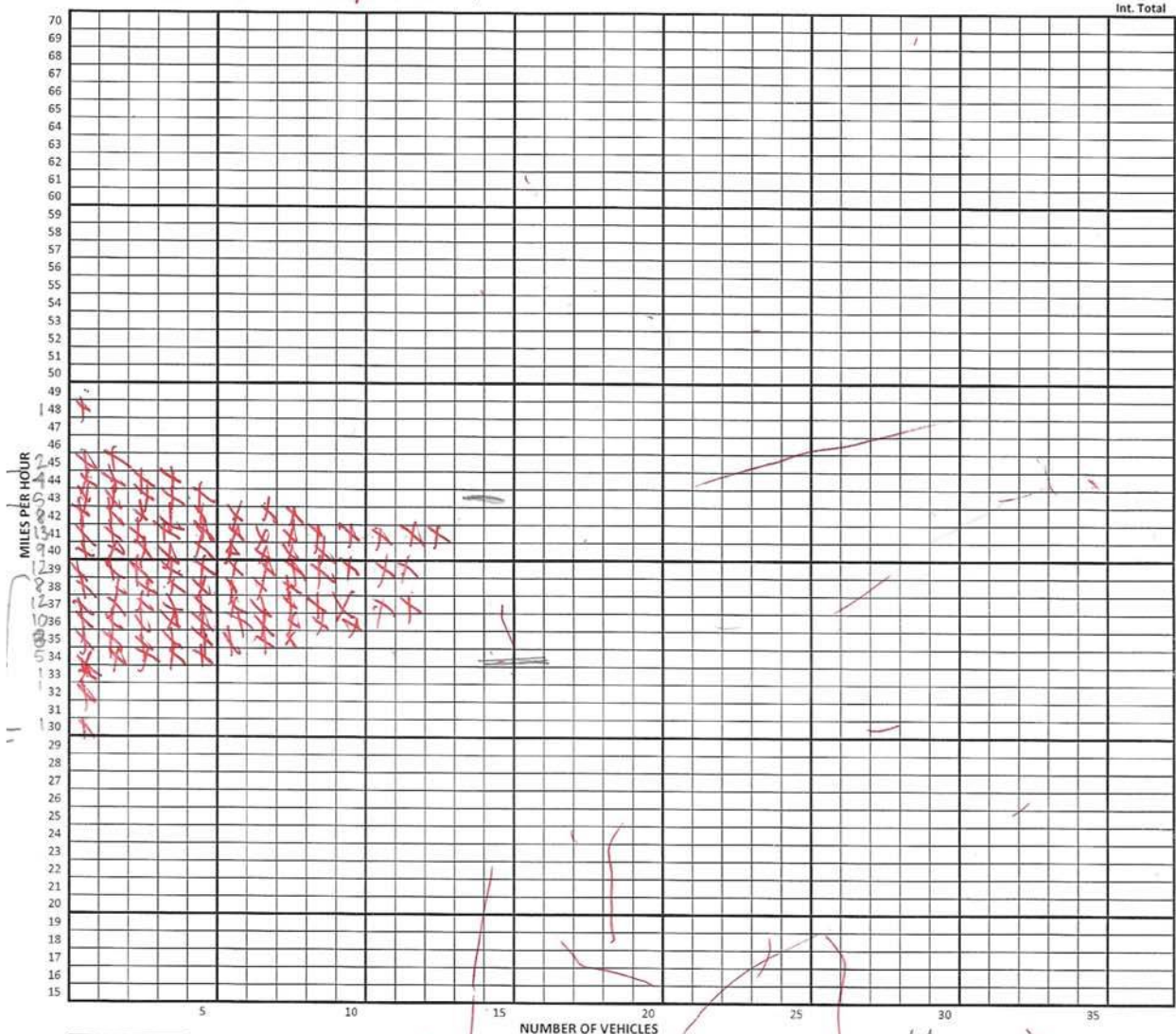
ROAD SURFACE: Dry
 WEATHER: Sunny
 EXISTING POSTED SPEED LIMIT: 35
 OBSERVED BY: LB

95th % Speed: 42 MPH
 85th % Speed: 40 MPH
 50th % Speed: 31 MPH
 Mode: 31 MPH
 Pace: _____ MPH ← 31-40

Handwritten notes:
 10-12-18

SPEED DISTRIBUTION WORKSHEET

Location: _____ Town: _____
 Direction of Travel: _____ Station: _____
 Location: NO S. of HIGH SCHOOL Time: _____ To: _____



LEGEND
 X = PAX CAR
 T = TRUCK
 S = SEMI TRAILER
 B = BUS

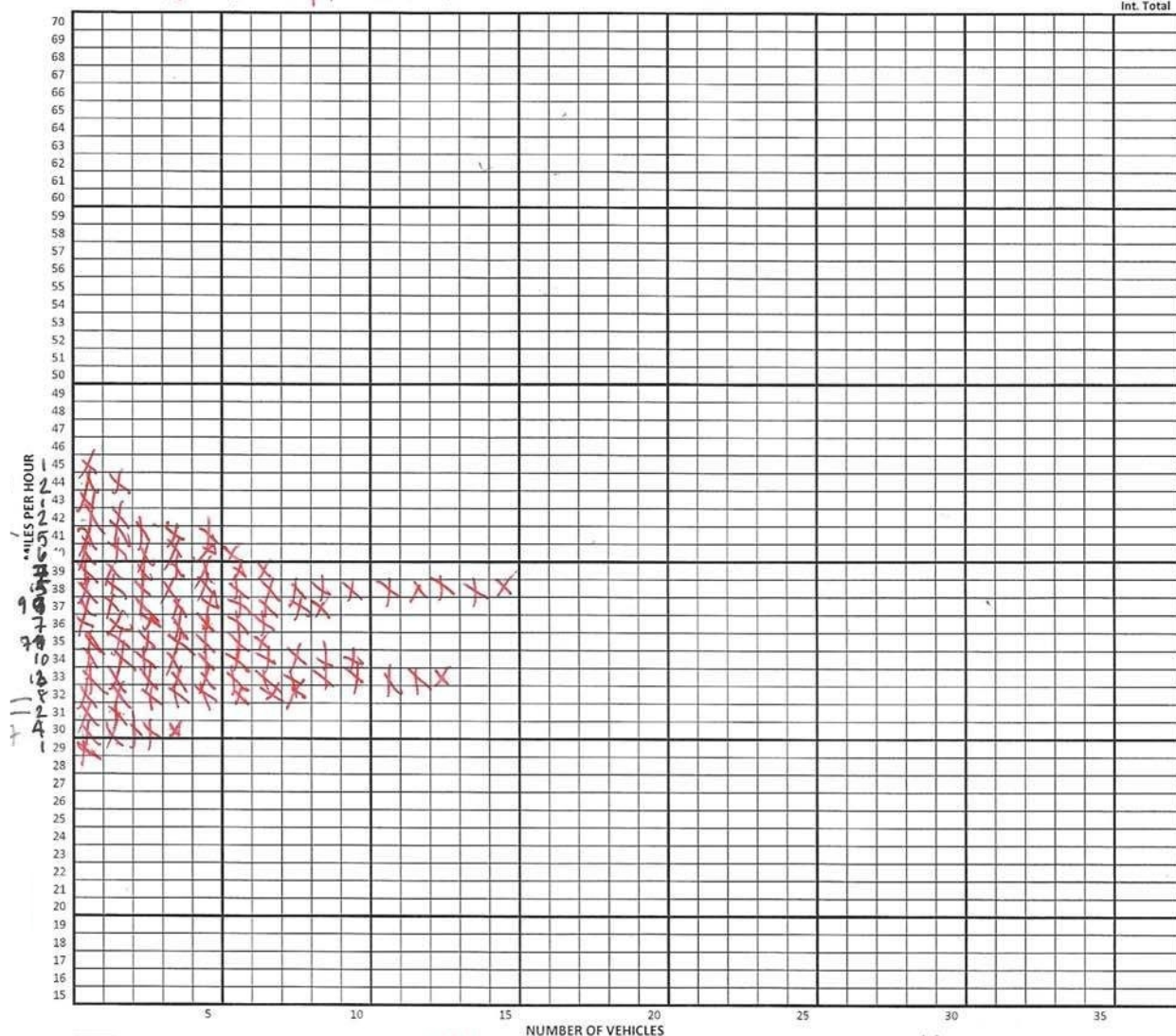
ROAD SURFACE: DN
 WEATHER: sunny
 EXISTING POSTED SPEED LIMIT: 35
 OBSERVED BY: KS

95th % Speed: 44 MPH
 85th % Speed: 42 MPH
 50th % Speed: 34 MPH
 Mode: 41 MPH
 Pace: _____ MPH

← 34 - 43

SPEED DISTRIBUTION WORKSHEET

Location : _____ Town : _____
 Direction of Travel : SB Station : _____
 Location : N. of High School Time : _____ To : _____



11
 10
 9
 8
 7
 6
 5
 4
 3
 2
 1

LEGEND
 X = PAX CAR
 T = TRUCK
 S = SEMI TRAILER
 B = BUS

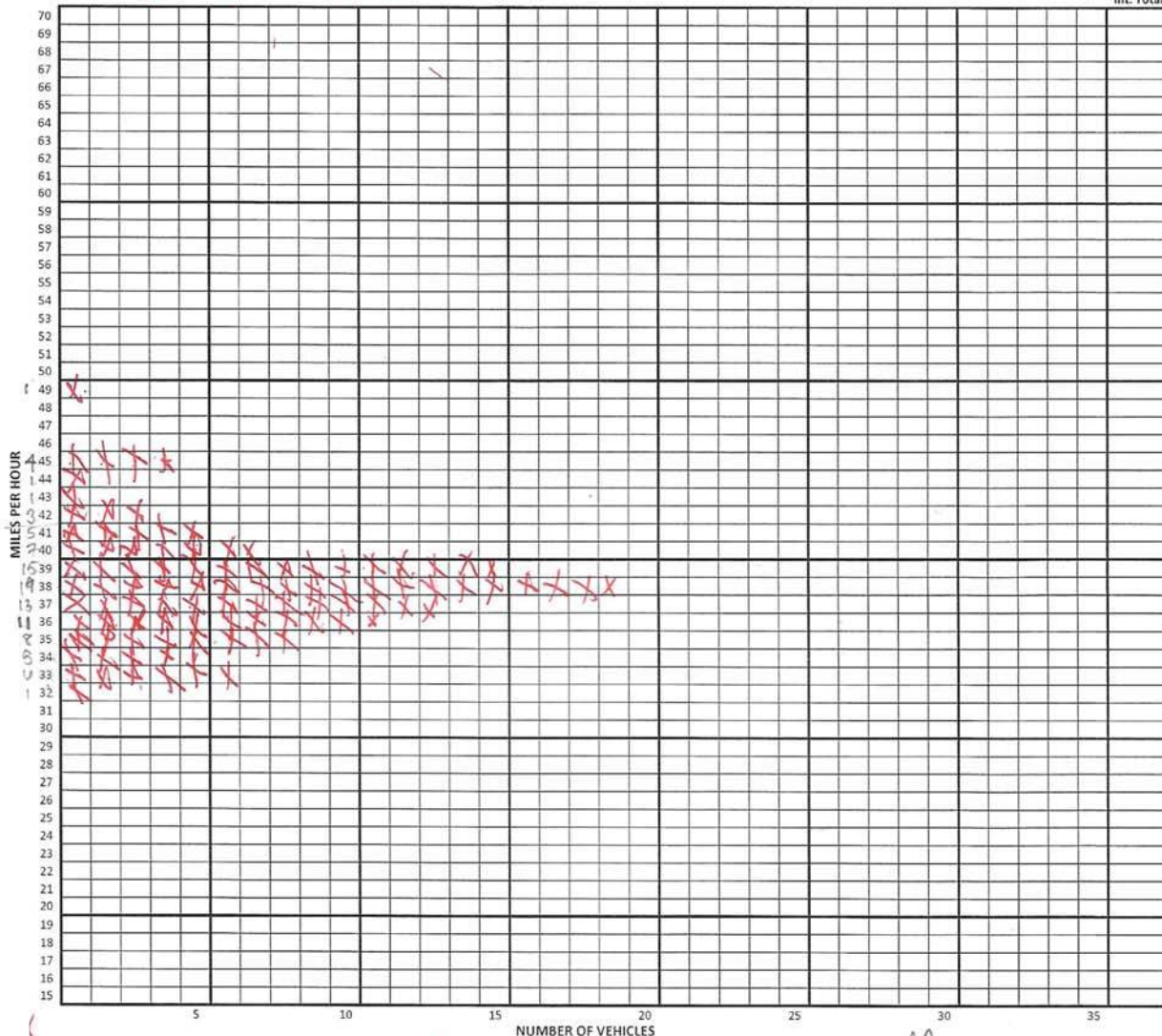
ROAD SURFACE : HW
 WEATHER : JUNNY
 EXISTING POSTED SPEED LIMIT : 35
 OBSERVED BY : 143

95th % Speed: 42 MPH
 85th % Speed: 40 MPH
 50th % Speed: 38 MPH
 Mode: 38 MPH
 Pace: _____ MPH 32-41

SPEED DISTRIBUTION WORKSHEET

Location : _____ Town : _____
 Direction of Travel : _____ Station : _____
 Location : SD S. of High School Time : _____ To : _____

Int. Total



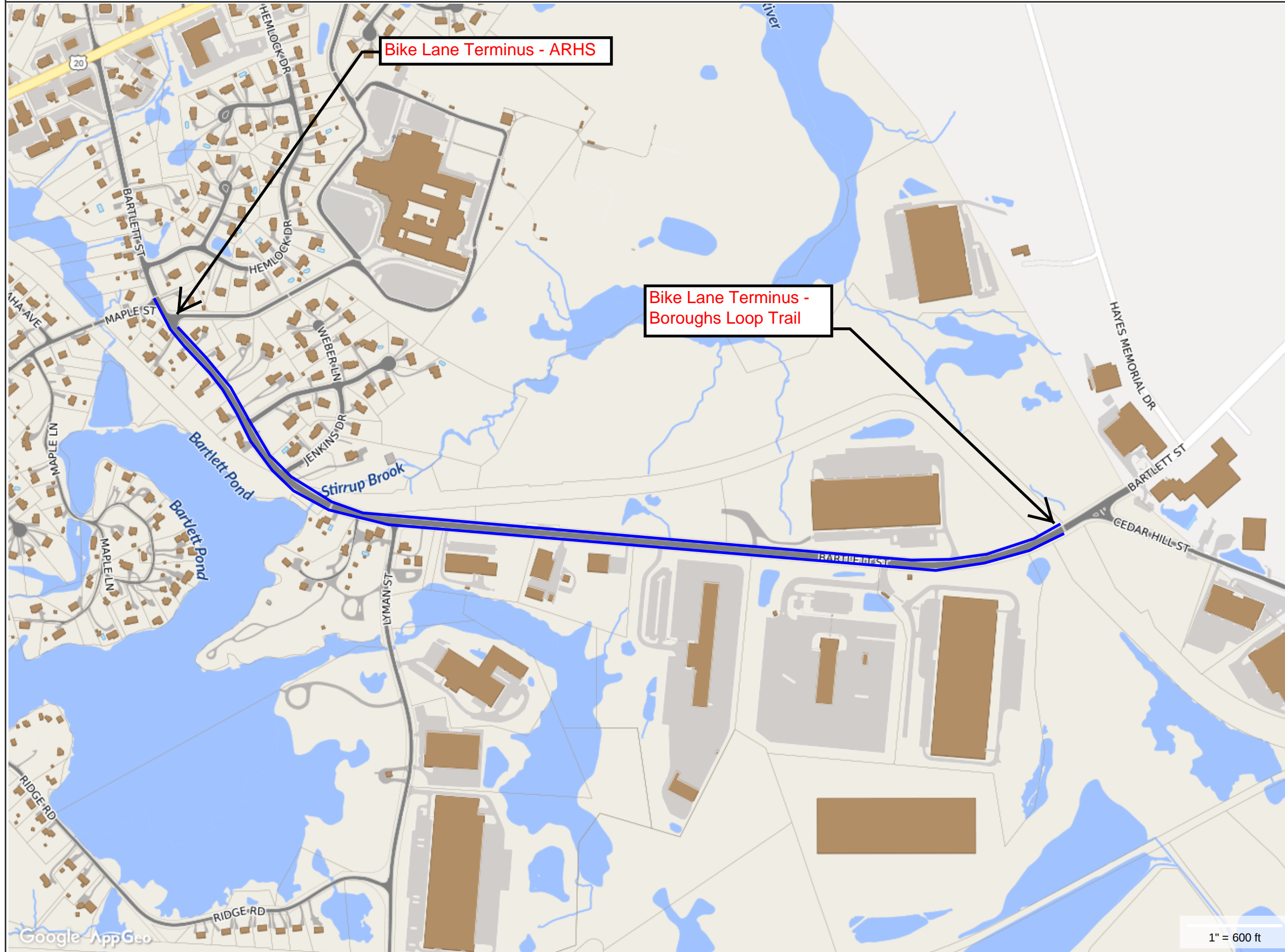
LEGEND
 X = PAX CAR
 T = TRUCK
 S = SEMI TRAILER
 B = BUS

ROAD SURFACE : Dry
 WEATHER : Sunny
 EXISTING POSTED SPEED LIMIT : 35
 OBSERVED BY : LB

95th % Speed: 44 MPH
 85th % Speed: 40 MPH
 50th % Speed: 38 MPH
 Mode: 38 MPH
 Pace: _____ MPH 33-42

| Crash Date | Crash Severity | Crash Time | Max Injury | Number of Age of Driv | Driver Con | Dist First Harmful Event | Light Cond | Manner of Collision | Road Surf | Total Non-Fata | Weather C | Roadway |
|------------|-------------------------------------|------------|-------------|-----------------------|------------------|---|--------------|-------------------------------|-----------|----------------|-----------|--------------------------------|
| 01/02/2014 | Property damage only (none injured) | 9:31 AM | No injury | 1 25-34 | D1: (Drivin | Collision with embankment | Daylight | Single vehicle crash | Snow | 0 Snow/Snow | 0 | BARTLETT STREET |
| 09/18/2014 | Non-fatal injury | 4:15 PM | Non-fatal i | 4 25-34 | D1: (No im D4: | Manue Collision with motor vehicle in traffic | Daylight | Rear-end | Dry | 3 Clear | 2 | BARTLETT STREET |
| 12/05/2014 | Non-fatal injury | 8:13 AM | Non-fatal i | 2 21-24 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Rear-end | Dry | 2 Clear | 2 | BARTLETT STREET |
| 11/17/2014 | Property damage only (none injured) | 5:14 PM | No injury | 1 45-54 | D1: (No im D1: | Not Di: Collision with animal - deer | Dark - roac | Single vehicle crash | Wet | 0 Rain | 0 | BARTLETT STREET |
| 03/31/2015 | Property damage only (none injured) | 2:12 PM | No injury | 1 16-17 | D1: (Over-D1: | Other : Collision with motor vehicle in traffic | Daylight | Single vehicle crash | Dry | 0 Clear | 0 | BARTLETT STREET |
| 02/03/2015 | Property damage only (none injured) | 8:39 AM | No injury | 2 25-34 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Angle | Snow | 0 Clear | 0 | LYMAN STREET / BARTLETT STREET |
| 01/22/2015 | Property damage only (none injured) | 5:27 PM | No injury | 1 35-44 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Sideswipe, opposite direction | Dry | 0 Clear | 0 | BARTLETT STREET / LYMAN STREET |
| 05/20/2015 | Property damage only (none injured) | 6:48 PM | No injury | 2 16-17 | D1: (No im | Collision with motor vehicle in traffic | Daylight | Rear-end | Dry | 0 Clear | 0 | LYMAN STREET / BARTLETT STREET |
| 10/09/2015 | Property damage only (none injured) | 4:38 PM | No injury | 2 16-17 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Rear-end | Wet | 0 Rain | 0 | BARTLETT STREET / MAPLE STREET |
| 12/17/2015 | Non-fatal injury | 4:45 PM | Non-fatal i | 2 16-17 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Dark - light | Angle | Wet | 2 Rain | 2 | BARTLETT STREET / LYMAN STREET |
| 02/05/2016 | Property damage only (none injured) | 9:11 AM | No injury | 2 55-64 | D1: (Drivin D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Angle | Snow | 0 Snow | 0 | BARTLETT STREET |
| 04/11/2016 | Property damage only (none injured) | 5:23 PM | No injury | 2 45-54 | D1: (No im | Collision with motor vehicle in traffic | Daylight | Single vehicle crash | Dry | 0 Clear | 0 | LYMAN STREET / BARTLETT STREET |
| 09/23/2016 | Property damage only (none injured) | 9:13 PM | No injury | 2 35-44 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Dark - light | Angle | Wet | 0 Rain | 0 | BARTLETT STREET |
| 12/17/2016 | Property damage only (none injured) | 1:33 PM | No injury | 2 18-20 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Angle | Snow | 0 Cloudy/Sle | 0 | LYMAN STREET / BARTLETT STREET |
| 04/26/2017 | Property damage only (none injured) | 2:08 PM | No injury | 2 16-17 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Single vehicle crash | Snow | 0 Rain/Cloud | 0 | BARTLETT STREET / MAPLE STREET |
| 12/14/2017 | Property damage only (none injured) | 8:34 AM | No injury | 2 35-44 | D1: (finatte D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Rear-end | Dry | 0 Clear | 0 | LYMAN ST / BARTLETT STREET |
| 10/03/2017 | Property damage only (none injured) | 9:55 AM | No injury | 2 65-74 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Single vehicle crash | Dry | 0 Clear | 0 | BARTLETT STREET |
| 11/03/2017 | Property damage only (none injured) | 8:27 AM | No injury | 2 25-34 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Angle | Dry | 0 Clear | 0 | BARTLETT ST. / LYMAN STREET |
| 11/29/2017 | Property damage only (none injured) | 9:08 AM | No injury | 2 55-64 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Rear-end | Dry | 0 Clear | 0 | BARTLETT ST. |
| 01/31/2018 | Property damage only (none injured) | 2:00 PM | No injury | 2 45-54 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Daylight | Sideswipe, same direction | Dry | 0 Clear | 0 | BARTLETT ST. |
| 02/07/2018 | Property damage only (none injured) | 5:49 PM | No injury | 1 55-64 | D1: (finatte D1: | Not Di: Collision with guardrail | Dark - light | Single vehicle crash | Slush | 0 Sleet, hail | 0 | BARTLETT ST. |
| 05/22/2018 | Property damage only (none injured) | 7:36 PM | No injury | 2 75-84 | D1: (No im D1: | Not Di: Collision with motor vehicle in traffic | Dusk | Angle | Dry | 0 Clear | 0 | BARTLETT ST. / LYMAN ST |

Bicycle Lane Layout Map



**MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT**

Town of Northborough, MA makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated Jan 28, 2020
Data updated Jan 28, 2020

Print map scale is approximate. Critical layout or measurement activities should not be done using this resource.

1" = 600 ft