Randolph, Massachusetts

Town Wide Traffic Evaluation

Phase 2: East-Northeast of Route 28

October 2018

TRAFFIC EVALUATION STUDY

BETA

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Prepared by: BETA GROUP, INC.
Prepared for: Town of Randolph

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1.0 INTRODUCTION

The Town of Randolph engaged BETA Group, Inc. (BETA) to assist in methodically addressing various traffic operational issues. Of particular concern are issues of speeding, cut-through traffic, and congestion at traffic signals. While issues are spread throughout the Town, the approach is to phase services in order to meet budgetary constraints, as well as to implement measures and test results.

Phase 1 focused on the northwest quadrant that included the area east of Route 24, consisting of the High Street/Lafayette Street corridor between Scanlon Drive and West Street, and the Route 28 corridor between Russ Street and West Street. The Phase 1 assessment was summarized in a September 2017 Town Wide Traffic Evaluation prepared by BETA. **Phase 2** focuses on the area east-northeast of Route 28, with the remaining areas of Town to be evaluated by future phases of work.

The primary focus of this Phase 2 traffic evaluation is on vehicular operational issues in the area east-northeast of Route 28, particularly speeding and cut-through traffic due to congestion along Route 28 and Interstate 93 (I-93) as well as traffic traveling between Randolph and Braintree. Although pedestrian and bicycle components will not be part of the scope of services, recommended improvements will be compatible with the Town's Pedestrian and Bicycle Master Plan.

An intent of this Traffic Evaluation Study is also to evaluate existing traffic volumes, crash history, and transportation conditions and amenities, as well as to recommend improvements in an effort to alleviate deficiencies. Traffic counts were collected to understand current multi-modal travel, speeds, and patterns in the area. With the goal of improving transportation efficiency, measures have been developed to minimize conflict, enhance connectivity, and reduce vehicular speeds along the corridor.

2.0 PROJECT LOCATION

The Phase 2 project location focuses on the Pacella Park Drive, Oak Street, and North Street corridors as shown in **Figure 1**. The project limits for Phase 2 consist of the following:

- Northern Area:
  - Russ Street between Route 28 (North Main Street) and Lavally Road
  - Lavally Road, Dennis Avenue, and Pacella Park Drive between Russ Street and Pond Street
  - Pond Street between Route 28 (North Main Street) and the Braintree Town Line
- Southern Area:
  - Oak Street between Route 28 (North Main Street) and the Braintree Town Line
  - North Street between Route 28 (North Main Street) and the Braintree Town Line

The northern area is residential in nature with an industrial region located near the Braintree Town Line. Pond Street connects with West Street in Braintree that is being used by vehicles as a cut-through to avoid the congested Interstate 93 (I-93) corridor. In addition, the Lavally Road, Dennis Avenue, and Pacella Park Drive corridor is used by heavy vehicles as a cut-through due to the congestion along Route 28.

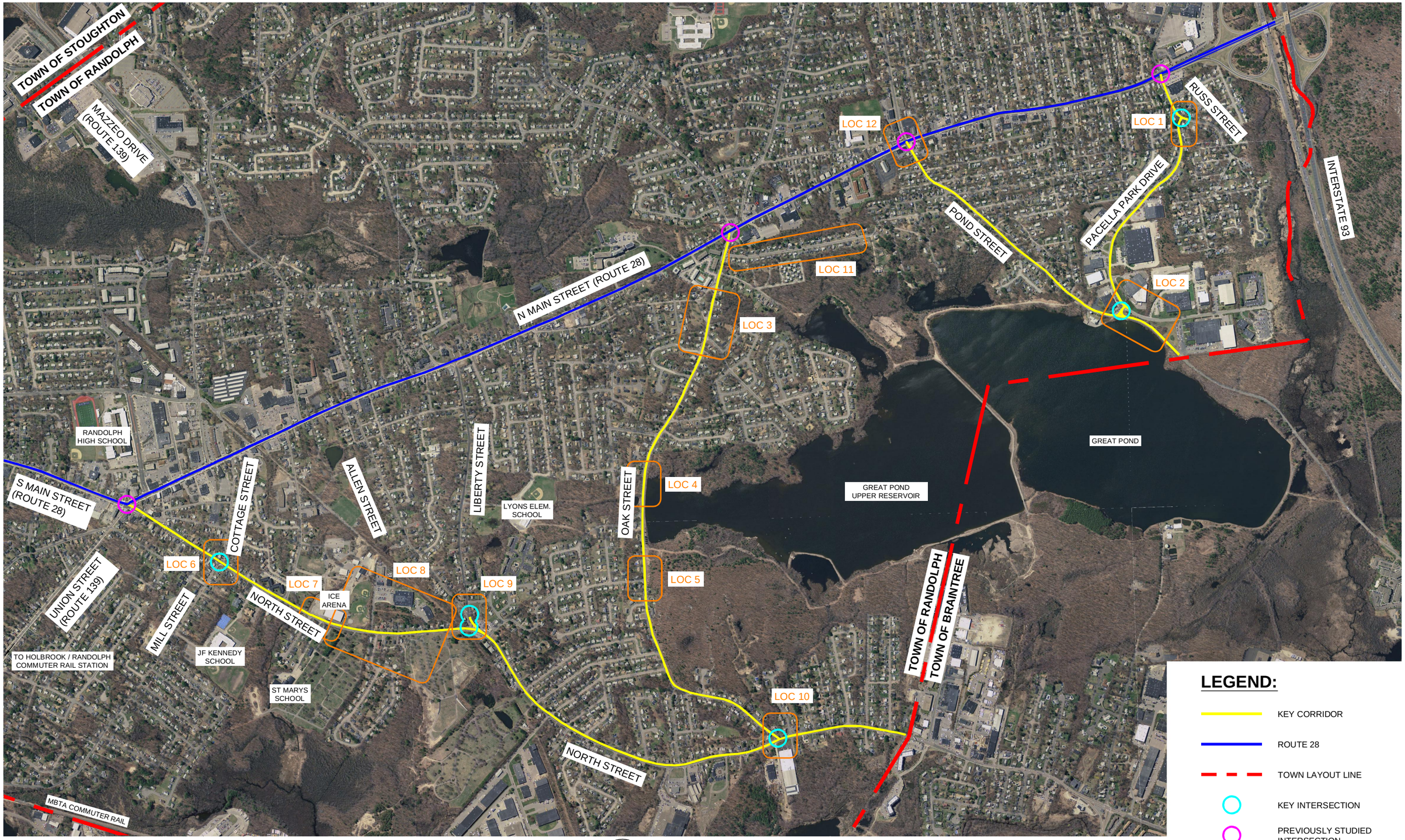

Figure 1 - Phase 2 Project Location

North

Scale Reduced

Scale: 1" = 550'

0 550 1,375 2,750

Town-wide Traffic Evaluation

12/14/2018

Randolph, MA

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The southern area is primarily residential in nature with institutional and industrial regions interspersed throughout. North Street connects with Pond Street that vehicles use as a cut-through to avoid the congested I-93 corridor. North Street also provides a link to an industrial region in Braintree located beyond the Town Line. Due to the congestion along the Route 20 corridor, Allen Street, Liberty Street, and Oak Street have also been reported to experience cut-through traffic. Three schools are located within the southern study area, as well as an ice arena:

- John F. Kennedy School – 20 Hurley Drive
- Saint Mary's School – 30 Seton Way (being used as the Parish Religious Education Center and by The Learning Center for Deaf Children in Framingham)
- Elizabeth G. Lyons Elementary School – 60 Vesey Road
- Joseph J. Zapustas Ice Arena – 240 North Street

The roadways within the study area are under Town of Randolph jurisdiction, with Pond Street, North Street; Liberty Street functionally classified as Urban Minor Arterials and Oak Street, Pleasant Street, Cottage Street, and Mill Street functionally classified as Urban Collectors; and the other roadways functionally classified as Local Roads.

Although the roadways within the study area are not on the National Highway System (NHS), Pond Street, Oak Street, North Street, Liberty Street, Pleasant Street, Cottage Street, and Mill Street are eligible for Surface Transportation Program (STP) Federal Aid Funding. Funding under the STP (80% federal and 20% non-federal) may be used for construction, reconstruction, rehabilitation, resurfacing, restoration, and operational and safety improvements on identified roadways. At least 10% of the STP funds must be used on Transportation Enhancements (TE), such as landscaping, historic preservation, and stormwater mitigation.

3.0 EXISTING CONDITIONS

A traffic-volume baseline within the study area has been developed to provide a foundation for assessing the transportation system to support existing and future traffic volumes. Base year traffic conditions within the study area were developed by collecting manual turning movement counts (TMCs), vehicle classification counts (i.e., separation of passenger vehicles, heavy vehicles, pedestrians, and cyclists), and automatic traffic recorder (ATR) counts in May 2018.

3.1 TRAFFIC VOLUMES

Based on discussions with Town of Randolph officials, intersection traffic counts (i.e., manual TMCs) were collected at the following locations to provide an understanding of the traffic volumes within the study area:

- Russ Street and Lavally Road
- Pacella Park Drive and Pond Street (2 locations)
- North Street, Oak Street, and Randolph Road
- North Street and Liberty Lane

- Liberty Lane and Allen Street
- North Street, Cottage Street, and Mill Street

These traffic counts were collected on Tuesday, May 22, 2018, during the Weekday AM peak period (7:00 to 9:00 AM) and during the Weekday PM peak period (4:00 to 6:00 PM). To evaluate traffic operations during school dismissal time for John F. Kennedy School, TMCs were also collected at the following locations between 2:00 and 3:00 PM:

- North Street and Liberty Lane
- Liberty Lane and Allen Street
- North Street, Cottage Street, and Mill Street

Once the individual peak hours were determined for each intersection during these critical time periods, the traffic volumes were examined to evaluate the need for seasonal adjustment. A review of the historical traffic growth data maintained by the Massachusetts Department of Transportation (MassDOT) Highway Division at a nearby Permanent Count Station indicated that traffic volumes in May are approximately 6.4% higher than average-month traffic volumes. To provide a more conservative (above average-month conditions) analysis, the May traffic counts were used as collected and not reduced. The peak hour turning movements are shown in **Figures 2 through 4**. Full traffic-volume summaries are shown in the Appendix.

In addition, ATR counts were collected for a 48-hour period between Tuesday, May 22, 2018, and Wednesday, May 23, 2018, at five locations within the study area. The ATR traffic counts were collected at the following locations.

- Pacella Park Drive east of Dennis Avenue
- Pond Street west of Pacella Park Drive
- North Street south of Pleasant Street
- North Street south of McAuliffe Road
- Oak Street east of Pine Avenue

The data collected included volume, classification, and speed and complete ATR data are included in the **Appendix**. The traffic-volume data are summarized in **Table 1**.

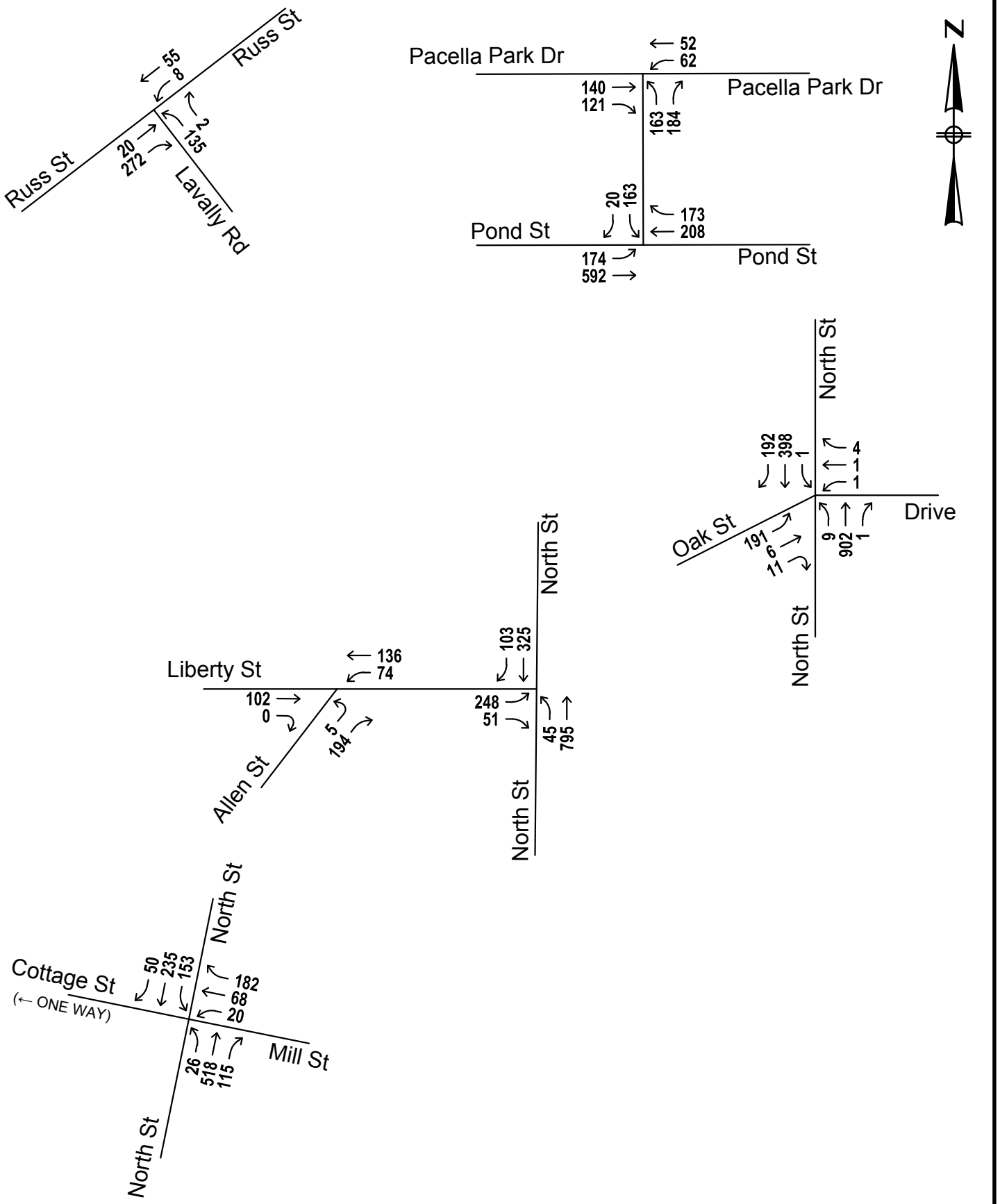

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Figure 2

2018 Existing Weekday AM
Peak Hour Traffic Volumes

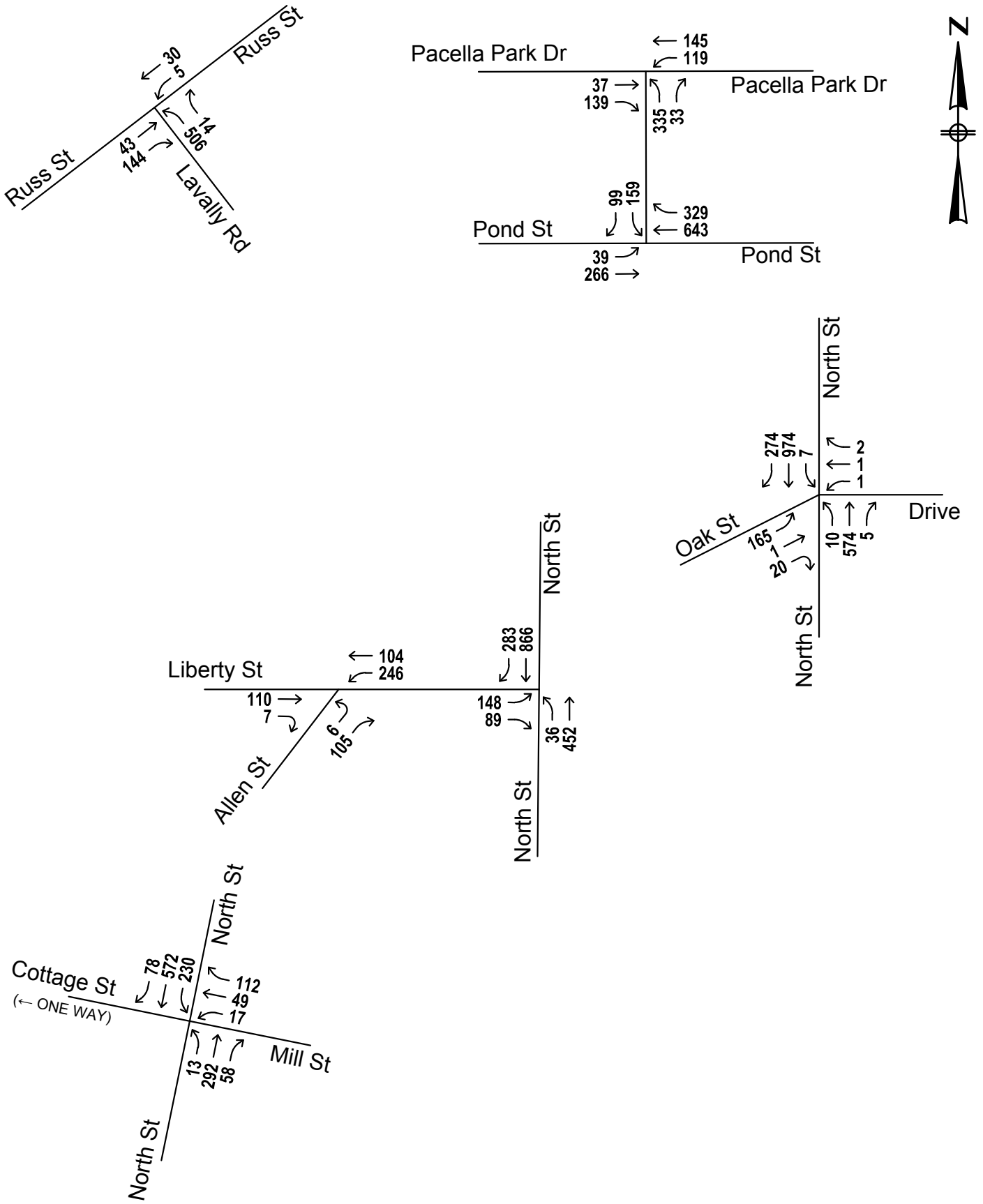

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Figure 3

2018 Existing Weekday PM
Peak Hour Traffic Volumes

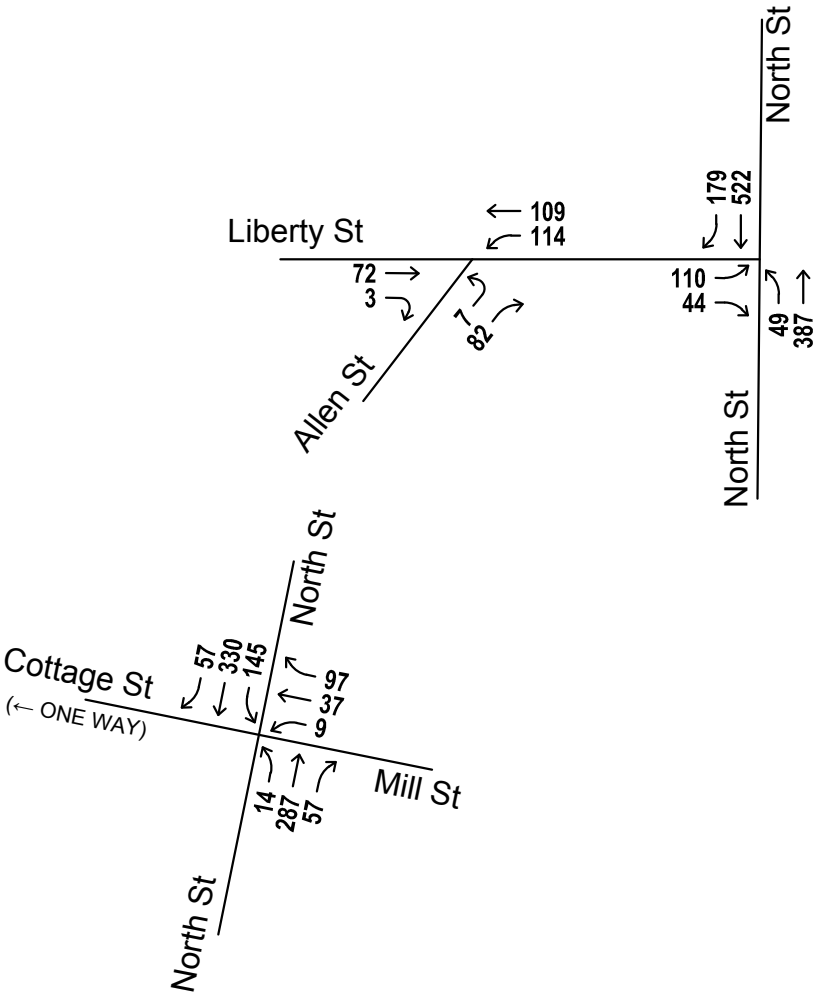

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Figure 4

2018 Existing Weekday School Dismissal
Peak Hour Traffic Volumes

Table 1 – Existing Traffic-Volume Summary

Location/Direction	Vehicles Per Day [a]	Weekday AM Peak Hour [b]	Weekday PM Peak Hour [b]	Percent Heavy Vehicles [c]
Pacella Park Road South of Dennis Avenue				
Northbound	2,734	126	508	3%
Southbound	2,124	296	152	3%
Pond Street West of Pacella Park Drive				
Eastbound	4,502	732	292	7%
Westbound	4,676	232	724	5%
North Street South of Pleasant Street				
Northbound	7,253	811	423	3%
Southbound	7,956	384	848	4%
North Street South of McAuliffe Road				
Northbound	9,020	1,028	524	9%
Southbound	9,145	427	1,014	9%
Oak Street East of Pine Avenue				
Eastbound	3,680	304	384	14%
Westbound	4,048	313	381	10%

[a] Average of traffic counts on May 22, 2018 (Tuesday) and May 23, 2018 (Wednesday).
[b] Average of traffic counts on May 22, 2018 (Tuesday) and May 23, 2018 (Wednesday).
[c] Percent of daily vehicles that include ≥2 axles and ≥6 tires (no motorcycles, buses, cars, or cars with trailers).

3.2 VEHICULAR SPEEDS

Vehicle speed is a basic measure of transportation performance that is defined as the rate of movement of a vehicle in distance per unit of time. Speed limits on roadways are typically established based on sound traffic engineering principles that consider actual motorist travel speeds in ideal driving conditions (i.e., free-flowing). Vehicle speeds are important as motorists relate travel speeds to safety, convenience, time, comfort, and economics. The intent for limiting vehicle speeds is to reduce traffic collisions, improve safety for non-motorized traffic, and alleviate environmental impacts (e.g., vehicle noise, vibration, emissions).

The travel speeds were recorded using automatic traffic recorders (ATRs) over 24-hour periods, thereby also capturing speeds during non-peak hours when vehicles are not affected by platooning. The speeds were determined by dividing the elapsed time by the measured distance between two checkpoints. In May 2018, speed measurements were conducted at the following locations. The speed measurement data are summarized in **Table 2** and provided in the **Appendix**.

- Pacella Park Drive east of Dennis Avenue
- Pond Street west of Pacella Park Drive
- North Street south of Pleasant Street
- North Street south of McAuliffe Road
- Oak Street east of Pine Avenue

Traffic speed data are summarized with average (median) speed and 85th percentile speeds. The 85th percentile speed represents the speed at which 85% of vehicles are traveling at or below. Since this speed more accurately represents the overall travel speed, 85th percentile speeds are typically used to verify speeding concerns. In addition, the pace was noted of the vehicles traveling in each of the specific sections. The pace is the 10 mph range containing the largest number of sample vehicles.

Based on discussions with Town of Randolph officials, the Town-wide enforced speed limit was recently regulated to be 25 mph unless otherwise posted. The results of the speed study are summarized in **Table 2**.

Table 2 – Speed Data Summary

Location/Direction	Regulated Speed Limit [a]	Average Speed [b]	85th Percentile Speed [c]	Pace [d]
Pacella Park Road South of Dennis Avenue				
Northbound	25	30	35	27-36
Southbound	25	30	34	27-36
Pond Street West of Pacella Park Drive				
Eastbound	25	33	39	31-40
Westbound	25	32	38	31-40
North Street South of Pleasant Street				
Northbound	25	26	35	26-35
Southbound	25	26	33	26-35
North Street South of McAuliffe Road				
Northbound	25	35	39	31-40
Southbound	25	33	39	31-40
Oak Street East of Pine Avenue				
Eastbound	25	39	46	36-45
Westbound	25	39	44	36-45

[a] Town-wide enforced speed limit recently set to 25 mph unless otherwise posted.
[b] Average of speeds on May 22, 2018 (Tuesday) and May 23, 2018 (Wednesday).
[c] Average of speeds on May 22, 2018 (Tuesday) and May 23, 2018 (Wednesday). Speed at, or below which, 85% of observed vehicles travel.
[d] The 10 mph speed range containing the greatest number of vehicles.

Average vehicular speeds along the majority of study roadways were found to be higher than the regulated speed limits, with the exception of North Street south of Pleasant Street that was generally consistent. The 85th percentile speeds along all of the study roadways were observed to be higher than the regulated speed limit. Oak Street east of Pine Avenue showed faster vehicular travel speeds in the range of 76-84% higher than the regulated speed limit. The 10 mph pace ranges were found to be consistently higher than the posted speed limits which suggests that many of the observed motorists ignored the regulatory signs. The higher speeds are representative of the roadway classifications, widths, and alignments, indicating that physical traffic calming measures could be considered to help reduce travel speeds.

3.3 SAFETY ANALYSIS

Crash data for the study area intersections were obtained from MassDOT for the most recent six-year period available (between 2010 and 2015). A summary of the MassDOT crash data at the study area intersections is provided in **Table 3**.

3.3.1 PACELLA PARK DRIVE AND POND STREET

Pacella Park Drive and Pond Street intersect to form two unsignalized intersections. The MassDOT crash data indicate that these intersections have experienced a combined average of just over 1 reported collision per year over the six-year period (8 reported incidents). Of the reported incidents, the following were contributing factors:

- 1 occurred during snowy weather conditions with an icy roadway surface.
- 4 involved the youngest motorist being between 16 and 20 years of age.
- 2 involved motorist inattention.
- 2 involved motorists failing to yield right of way.
- 1 involved a motorist following too closely.
- 1 involved a motorist disregarding traffic signs and road markings.

3.3.2 NORTH STREET, OAK STREET, AND RANDOLPH ROAD

The MassDOT crash data indicate that the High Street and Reed Street unsignalized intersection has experienced an average of just over 2 reported collisions per year over the six-year period (13 reported incidents). Of the reported collisions, the following were contributing factors:

- 1 occurred during snowy weather conditions with a snowy roadway surface.
- 2 involved the youngest motorist being between 16 and 20 years of age.
- 1 occurred with a parked vehicle.
- 1 involved a school bus.
- 9 involved motorists failing to yield right of way.
- 1 involved a motorist using “improper action.”
- 1 involved a hit and run with the motorist driving on the wrong side of the road and disregarding signs.
- 1 involved a motorist traveling too fast for conditions.

Table 3 – Crash Data Summary

Year	Collision Type								Severity Type				Road Surface Condition					Weather Condition					Total Crashes
	Angle	Rear-End	Head On	Sideswipe, Same Dir	Sideswipe, Opp. Dir	Pedestrian/Bike	Single Vehicle Crash	Unknown	Property Damage	Non-Fatal Injury	Fatal Injury	Not Reported	Dry	Wet	Snowy	Icy	Unknown	Clear	Cloudy	Rain	Snow	Unknown	
Pacella Park Drive and Pond Street (2 Unsignalized Intersections)																							
2010	2	--	--	--	--	--	--	--	1	1	--	--	2	--	--	--	--	1	1	--	--	--	2
2011	1	--	--	--	--	--	--	--	--	1	--	--	1	--	--	--	--	1	--	--	--	--	1
2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2014	1	1	1	--	--	--	--	--	3	--	--	--	2	--	--	1	--	2	--	--	1	--	3
2015	1	1	--	--	--	--	--	--	2	--	--	--	2	--	--	--	--	2	--	--	--	--	2
Total	**5**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**6**	**2**	**0**	**0**	**7**	**0**	**0**	**1**	**0**	**6**	**1**	**0**	**1**	**0**	**8**
North Street, Oak Street, and Randolph Road (Unsignalized Intersection)																							
2010	3	1	--	--	--	--	--	--	2	2	--	--	1	3	--	--	--	3	--	1	--	--	4
2011	1	--	--	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	1	--	1
2012	1	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	1	--	--	--	--	1
2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2014	--	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	1	--	--	--	--	1
2015	1	1	1	--	3	--	--	--	3	3	--	--	4	2	--	--	--	4	--	2	--	--	6
Total	**6**	**3**	**1**	**0**	**3**	**0**	**0**	**0**	**8**	**5**	**0**	**0**	**7**	**5**	**1**	**0**	**0**	**9**	**0**	**3**	**1**	**0**	**13**

Table 3 (continued) – Crash Data Summary

Year	Collision Type								Severity Type				Road Surface Condition					Weather Condition					Total Crashes
	Angle	Rear-End	Head On	Sideswipe, Same Dir	Sideswipe, Opp. Dir	Pedestrian/Bike	Single Vehicle Crash	Unknown	Property Damage	Non-Fatal Injury	Fatal Injury	Not Reported	Dry	Wet	Snowy	Icy	Unknown	Clear	Cloudy	Rain	Snow	Unknown	
North Street and Liberty Street (Signalized Intersection)																							
2010	--	1	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	1	--	--	--	--	1
2011	1	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	1	--	--	--	--	1
2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2014	2	--	--	1	--	--	--	--	2	1	--	--	3	--	--	--	--	2	1	--	--	--	3
2015	1	2	--	--	--	--	1	--	3	1	--	--	2	1	1	--	--	2	--	1	1	--	4
Total	**4**	**3**	**0**	**1**	**0**	**0**	**1**	**0**	**7**	**2**	**0**	**0**	**7**	**1**	**1**	**0**	**0**	**6**	**1**	**1**	**1**	**0**	**9**
Liberty Street and Allen Street (Unsignalized Intersection)																							
2010	2	--	--	--	--	--	--	--	1	1	--	--	1	1	--	--	--	1	1	--	--	--	2
2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
Total	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**2**

Table 3 (continued) – Crash Data Summary

Year	Collision Type								Severity Type				Road Surface Condition					Weather Condition					Total Crashes
	Angle	Rear-End	Head On	Sideswipe, Same Dir	Sideswipe, Opp. Dir	Pedestrian/Bike	Single Vehicle Crash	Unknown	Property Damage	Non-Fatal Injury	Fatal Injury	Not Reported	Dry	Wet	Snowy	Icy	Unknown	Clear	Cloudy	Rain	Snow	Unknown	
North Street, Mill Street, and Cottage Street (Signalized Intersection)																							
2010	3	--	--	--	--	--	--	--	3	--	--	--	2	1	--	--	--	2	1	--	--	--	3
2011	3	1	--	--	--	1	--	--	4	1	--	--	5	--	--	--	--	4	1	--	--	--	5
2012	1	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	1	--	--	--	--	1
2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
2014	1	--	--	--	--	--	--	--	--	1	--	--	1	--	--	--	--	1	--	--	--	--	1
2015	2	--	--	--	--	--	--	--	2	--	--	--	2	--	--	--	--	2	--	--	--	--	2
Total	**10**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**10**	**2**	**0**	**0**	**11**	**1**	**0**	**0**	**0**	**10**	**2**	**0**	**0**	**0**	**12**

3.3.3 North Street and Liberty Street

The MassDOT crash data indicate that the North Street and Liberty Street signalized intersection has experienced an average of 1.5 reported collisions per year over the six-year period (9 reported incidents). Of the reported collisions, the following were contributing factors:

- 1 occurred during snowy weather conditions with a snowy roadway surface.
- 2 involved the youngest motorist being between 16 and 20 years of age.
- 2 involved the oldest motorist being between 75 and 84 years of age.
- 1 involved a motorist suffering from an illness.
- 1 involved a motorist with a physical impairment.
- 1 involved a motorist failing to yield right of way.
- 2 involved motorists disregarding traffic signs and road markings.
- 1 involved a motorist failing to keep in proper lane.
- 1 involved a motorist operating in an erratic, reckless, careless, negligent, or aggressive manner.
- 1 involved a motorist traveling too fast for conditions.

3.3.4 Liberty Street and Allen Street

The MassDOT crash data indicate that the Liberty Street and Allen Street unsignalized intersection has experienced a total of 2 reported collisions over the six-year period. Of the reported incidents, the following were contributing factors:

- 1 involved the youngest motorist being between 16 and 20 years of age.
- 2 involved motorists failing to yield right of way.

3.3.5 North Street, Mill Street, and Cottage Street

The MassDOT crash data indicate that the North Street signalized intersection with Mill Street and Cottage Street has experienced an average of 2 reported collisions per year over the six-year period (12 reported incidents). Of the reported collisions, the following were contributing factors:

- 1 occurred with a pedestrian in a crosswalk.
- 3 involved the youngest motorist being between 16 and 20 years of age.
- 2 involved the oldest motorist being between 75 and 84 years of age.
- 1 involved a motorist older than 84 years of age.
- 7 involved motorists failing to yield right of way.
- 1 involved a motorist disregarding traffic signs and road markings.
- 1 involved a motorist being inattentive.

4.0 RECOMMENDATIONS

A holistic approach was used in developing measures to improve vehicular flow and improve vehicular and pedestrian safety within the area east-northeast of Route 28. These recommendations are conceptual in nature and further engineering design is required prior to construction and implementation (e.g., truck and bus turn accommodations, precise location of traffic calming devices, grading and drainage, rights-of-way, on-street parking analysis, full signal warrant analysis, utilities, and intersection analyses). For reference, conceptual sketches are provided in the **Appendix**. Preliminary construction costs were estimated for each of the study area locations as shown in the conceptual sketches. A table summarizing these preliminary cost estimates is provided in the **Appendix**.

4.1 RUSS STREET, LAVALLY ROAD, DENNIS AVENUE, AND PACELLA PARK DRIVE

Lavally Road intersects Russ Street from the east to form a three-legged, unsignalized intersection with the Lavally Road westbound approach under STOP-sign control. Russ Street is positioned in a north-south alignment and Lavally Road in an east-west alignment.

Approximately 105 feet to the east of the Russ Street intersection, Lavally Road and Dennis Avenue intersect to form a three-legged, unsignalized intersection with the Lavally Road northbound approach under STOP-sign control. The mainline consists of the Lavally Road west leg and the Dennis Avenue east leg, with the Lavally Road south leg as the minor street.

Approximately 400 feet to the east of the Lavally Road intersection, Dennis Avenue changes names to Pacella Park Drive.

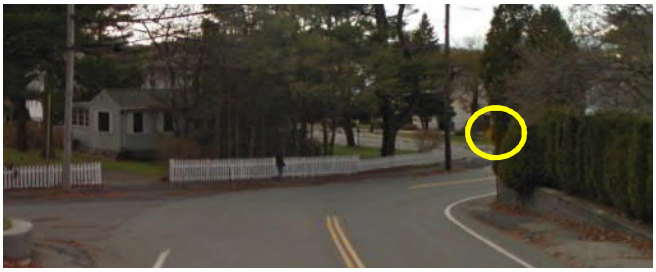
- At the Lavally Street and Dennis Avenue intersection:
  - There is no STOP-line on the Lavally Street westbound minor street approach to indicate where vehicles should stop. In addition, the sight lines looking north (right) from the Lavally Street approach may be limited depending on where vehicles stop prior to entering the intersection.
  - No Truck signs (R5-2) are posted on the southeast and northeast corners of the intersection (facing Russ Street northbound approaching vehicles).
    - The intent of these signs is to provide notice that trucks are excluded from using Russ

Street north of Lavally Road and Lavally Road east of Russ Street.

- These signs are located approximately 630 feet northeast of Route 28 and the Russ Street and Lavally Road intersection has a 20- to 25-foot internal radius, which make it difficult for truck drivers to reverse direction and return to Route 28.

- At the Lavally Street and Dennis Avenue intersection:
  - Motorists travelling eastbound along Lavally Road may be unsure of which direction to travel due to the lack of signage and striping.

  - There are no pavement markings or signs on the Lavally Street northbound minor street approach to indicate stop control. In addition, the sight lines looking east (right) from the Lavally Street northbound approach may be limited depending on where vehicles stop prior to entering the intersection.
  - There is a Stop Ahead (W3-1) sign posted facing Dennis Avenue westbound vehicles that continue westbound on Lavally Road to Russ Street. The sign, however, is blocked by overgrown vegetation along the north side of Dennis Avenue/Lavally Road.



4.1.1 Short-Term Recommendations

- At the Russ Street and Lavally Road intersection, it is recommended that:
  - A STOP-line is striped on the Lavally Road westbound approach at a location to maximize sight lines to indicate where motorists should stop prior to entering the intersection.

- At the Lavally Road and Dennis Avenue intersection, it is recommended that:
  - The solid white edge line is continued along the south side of Lavally Road closer to the intersection to help provide better alignment at and through the intersection for eastbound motorists.
  - A STOP-sign and a STOP-line are installed on the Lavally Road northbound approach at a location to maximize sight lines.
  - Vegetation along the north side of Dennis Avenue/Lavally Road is trimmed and maintained for westbound vehicle visibility of the advance traffic control sign (Stop Ahead).

4.1.2 LONG-TERM RECOMMENDATIONS

Based on discussions with Town of Randolph officials, concerns have been raised by residents along Russ Street, Lavally Road, Dennis Avenue, and Pacella Park Drive with the volume of truck traffic that uses these local roadways as a cut-through between Route 28 and the industrial park located near the Braintree Town Line. The high volume of truck traffic in these neighborhoods has created safety concerns for families who live in the area. These vehicles have also presented difficulties for motorists to navigate streets with roadway geometries that were not intended to accommodate heavy commercial trucks.

As previously documented in Table 1 (Existing Traffic-Volume Summary), approximately 3% of the daily traffic volumes along Pacella Park Drive (south of Dennis Avenue) that currently travel southbound from the Russ Street area are heavy vehicles and approximately 3% of the northbound daily traffic volumes to the Russ Street area are heavy vehicles.

In accordance with *The Massachusetts Amendments to the Manual on Uniform Traffic Control Devices and the Standard Municipal Code* (MA-MUTCD) Section 10A-9, "A truck exclusion from a municipal way may be authorized provided a suitable alternate route is available. The alternate route shall have an effective width and pavement structure which can safely accommodate the additional truck traffic. In addition, the alternate route must meet one of the following conditions:

1. Lie wholly within the community making application,
2. Lie partially in an adjacent community but only on State Highway, or
3. Lie partially in an adjacent community but have the adjacent community's written approval."

It is recommended that the Town of Randolph pursue a Heavy Commercial Vehicle Exclusion for this area.

- The truck exclusion would not apply to heavy commercial vehicles destined for or originating from locations along the subject area roadways while delivering goods, materials, or merchandise or collecting goods from abutting land uses.
- The truck exclusion would not apply to vehicles used for construction, maintenance, or repair of the subject roadways or public utilities within the subject area.
- The truck exclusion would not apply to Federal, State, Municipal, or public service vehicles.

4.2 POND STREET AND PACELLA PARK DRIVE

Pond Street and Pacella Park Drive intersect to form two unsignalized intersections. At the western intersection, the Pacella Park Drive northbound and southbound approaches each consist of a single general-purpose travel lane that operates under free-flow traffic control. The Pond Street (extension) westbound approach consists of a single general-purpose travel lane that operates under STOP-sign control.

At the eastern intersection, the Pond Street northbound approach consists of a single general-purpose travel lane that operates under free-flow traffic control. The Pond Street southbound approach consists of a single travel lane operating under free-flow traffic control with right-turns channelized by a striped island. The Pacella Park Drive (extension) eastbound approach consists of a single general-purpose travel lane that operates under STOP-sign control.

- At the western intersection, long delays and vehicular queues are currently experienced on the Pond Street (extension) westbound approach to Pacella Park Drive during the Weekday AM and Weekday PM peak hours.
- At the eastern intersection, long delays and vehicular queues are currently experienced on the Pacella Park Drive (extension) eastbound approach to Pond Street during the Weekday PM peak hour.

Traffic signal warrant analyses are conducted to determine if signal control is or will be warranted in accordance with MUTCD guidelines. Available traffic data are generally compared with the requirements established in the MUTCD for the following volume-related warrants:

- Warrant 1 – Eight Hour Vehicular Volume
  - Condition A – Minimum Vehicular Volume
  - Condition B – Interruption of Continuous Traffic
  - Combination of Conditions A and B
- Warrant 2 – Four-Hour Vehicular Volume; and
- Warrant 3 – One-Hour Vehicular Volume.

Although other warrants should be considered, MassDOT prefers that at least one of the eight hour warrants (Warrant 1, Condition A or B) is satisfied to confirm consideration of installing a traffic signal. The peak-hour volume warrant (Warrant 3) is generally applied only in unusual cases such as driveways serving large office/industrial complexes, manufacturing plants, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short period of time. Based on the available traffic count data, the following MUTCD Traffic Signal Warrants are satisfied for the Pond Street and Pacella Park Drive eastern intersection:

- Warrant 2 (Four-Hour Warrant)
- Warrant 3 (One-Hour Warrant)

4.2.1 Long-Term Recommendations

- A full traffic signal system is recommended to be evaluated for the Pond Street and Pacella Park Drive intersections that would include the Pond Street and Pacella Park Drive western intersection.
  - As part of the final design, we recommend that an eight-hour warrant be conducted to further validate the installation of a full traffic signal system.
  - Due to the close proximity of these intersections, a smart signal, Adaptive Signal System, or Peer-to-Peer responsive system should also be considered.

- An alternative design would be the consideration of constructing a second connection between Pacella Park Drive and Pond Street to the north.
    - Both connector roadways would allow for two-way traffic flow, with the northern connection accommodating passenger vehicles only (i.e., no heavy vehicles).
    - Wayfinding signs should be posted to help guide motorists through the area destined to I-93 and Route 128.
    - As part of the final design, we recommend that a full survey be conducted to identify property lines and utilities.

Intersection analysis results with the identified improvement measures implemented are provided in the **Appendix**.

4.3 North Street, Oak Street, and Randolph Road

Oak Street and Randolph Road intersect North Street from the west and east, respectively, to form a slightly offset unsignalized intersection. The North Street northbound and southbound approaches each consist of a single general-purpose travel lane that operates under free-flow traffic control. The Oak Street eastbound and Randolph Road westbound approaches each consist of a single general-purpose travel lane that operates under STOP-sign control.

- Long delays and vehicular queues are currently experienced on the Oak Street eastbound approach during the Weekday AM and Weekday PM peak hours.
- On the southwest corner of the intersection, the geometric grade of North Street, a utility pole, and property lines do not feasibly allow realignment of Oak Street to be across from Randolph Road without land acquisition and construction of a retaining wall.

Based on the available traffic count data, the following MUTCD Traffic Signal Warrants are satisfied for the North Street, Oak Street, and Randolph Road intersection:

- Warrant 2 (Four-Hour Warrant)
- Warrant 3 (One-Hour Warrant)

4.3.1 Short-Term Recommendations

- A STOP-sign is recommended to be posted on the Randolph Road westbound approach to bring motorist attention to the current traffic control at the unsignalized intersection.

- Vegetation along the northwest corner of the intersection is recommended to be trimmed and maintained to ensure minimum required sight lines are met.

4.3.2 Long-Term Recommendations

- A traffic signal is proposed at this location with the construction of a North Street southbound right-turn lane onto Oak Street.
- As part of the final design, we recommend that an eight-hour warrant be conducted to further validate the installation of a traffic signal and a full survey be conducted to identify property lines and utilities.
- The North Street southbound approach would be restriped to provide an exclusive right-turn lane.
- Do Not Block Intersection signage (R10-7) and pavement markings are proposed to be implemented along the North Street southbound approach to the Alward Drive and Fuller Avenue intersection in accordance with MUTCD guidelines.
    - The pavement markings would be used to mark the edges of the intersection to define the area that is not to be blocked.
    - These measures are recommended due to the proximity to the recommended North Street, Oak Street, and Randolph Street signalized intersection that may cause vehicles to queue through the upstream intersection and impede vehicles from entering the intersection (e.g., Alward Drive eastbound left turns onto North Street northbound).

Intersection analysis results with the identified traffic signal improvement measures implemented are provided in the **Appendix**.

4.4 North Street and Liberty Street

Liberty Street intersects North Street from the west to form a three-legged signalized intersection. The North Street northbound approach consists of an exclusive left-turn lane and a through lane. The North Street southbound approach consists of a through lane with right turns channelized by way of a raised island that operate under YIELD-sign control. The Liberty Street eastbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane. The traffic signal operates with two vehicular phases (North Street northbound/southbound permissive phase and a Liberty Street eastbound phase) and an exclusive pedestrian phase. Crosswalks are striped across the North Street north leg and across the Liberty Street leg of the intersection. Sidewalks are provided along both sides of North Street north and south of the intersection and along both sides of Liberty Street at the intersection. The following items were noted based on field reconnaissance:

- The long radius of the North Street southbound channelized right-turn lane appears to allow vehicles to travel at faster speeds onto Liberty Street. This event is of concern when North

Street northbound left turns enter onto Liberty Street and when stopped vehicles are waiting downstream to turn left onto Allen Street.

- The North Street southbound right turns are under YIELD-sign control that is blocked by overgrown vegetation.
- The area within the intersection along the north-south alignment appears to be rather large. There is concern with this layout combined with the permissive traffic signal phasing (North Street northbound and southbound vehicles enter the intersection at the same time).
    - When a North Street northbound left-turn vehicle proceeds into the intersection on a green indication, that vehicle may not be able to complete the maneuver onto Liberty Street due to oncoming traffic (North Street southbound through).
    - This vehicle would then become trapped in the intersection when the North Street approaches receive a red indication and the Liberty Street phase is activated.
- The existing crosswalks do not appear to be in compliance with Americans with Disabilities Act (ADA) standards with respect to pedestrian signal indications (none provided crossing Liberty Lane) and tip downs (aka, wheelchair ramps).
- There is a utility pole located within the sidewalk along the west side of North Street south of the intersection.
- There are two signal heads facing the Liberty Street eastbound approach, of which one is located center of the left-turn lane (post mounted) and the other is located to the left (vertical pole on a mast arm). There is no signal head for the exclusive right-turn lane.
- There are two signal heads facing the North Street northbound approach, of which the left is located center of the left-turn lane and the right is located center of the through lane. Additional traffic signal heads may be required should future consideration be given for a North Street northbound protected phase (lead phase or lag phase).

- With the exception of the post mounted signal head provided on the southwest corner of the intersection (facing North Street southbound), the traffic signal heads appear to be 8-inch signal indications.
- The intersection operates with semi-actuated traffic control in which vehicular detection is only provided for the minor movements (i.e., not the mainline through movements). In these types of systems, the green signal indication is provided to the major street movements until the controller receives a detection call that a vehicle is waiting on the minor street movement. A major disadvantage of semi-actuated traffic signal control is that the continuous demand on the minor movements can cause excessive delay to the mainline movements.

- The traffic signal operates with an outdated type of controller in which card slots are available to dictate the traffic signal parameters instead of more current controllers that allow more flexibility in detection and processing.

4.4.1 Short-Term Recommendations

- Trim/clear overgrown vegetation on the northwest area of the intersection that hinders view of the YIELD-sign for North Street southbound right-turning vehicles.
- Stripe dashed pavement markings for North Street northbound left-turning vehicles onto Liberty Street to provide vehicles with guidance when making this turning path within the open area along the north-south alignment of the intersection.
- Relocate the STOP bar (line) on the North Street southbound through lane closer to the intersection. This measure would assist in providing more separation between North Street southbound through and right-turning vehicles.
- Recalculate traffic signal clearance intervals to ensure conformance with MUTCD guidelines due to the open area along the north-south alignment of the intersection.

4.4.2 Long-Term Recommendations

- Upgrade pedestrian facilities and equipment to be in conformance with current ADA standards.
- Restripe and/or redesign the North Street southbound channelized right-turn lane to provide a tighter radius onto Liberty Street in an attempt to reduce vehicular speeds.
- Based on Manual on Uniform Traffic Control Devices (MUTCD) guidelines, a minimum of two traffic signal heads shall be provided for the through movement or, in the case where a through movement does not exist, for the major turning movement (MUTCD Section 4D.11). Consideration should be given to upgrading the number of signal heads to be in conformance with MUTCD guidelines.
- MUTCD guidelines recommend that 12-inch signal indications shall be used for all signal sections (MUTCD Section 4D.07). Consideration should be given to upgrading the type of signal heads to be in conformance with MUTCD guidelines.
- The traffic signal controller should be upgraded to a fully-actuated traffic signal, in which detection is provided on all approaches such that vehicles would be detected regardless of direction approaching an intersection.
- The green interval for the phases can vary in duration depending on demand, and signal phases could be skipped if there is no vehicular or pedestrian demand detected.
- Additional detection (loop or video) may be required to determine the presence of vehicles along the North Street approaches.
- Re-phase the traffic signal parameters to provide a North Street northbound lead phase (advance) with a Liberty Street eastbound right-turn overlap.

- Additional detection and a signal head may be required for the operations of the Liberty Street eastbound right-turn lane.

Intersection analysis results with the identified traffic signal improvement measures implemented are provided in the **Appendix**.

4.5 LIBERTY STREET AND ALLEN STREET

Allen Street intersects Liberty Street from the south to form an unsignalized intersection with the Allen Street northbound approach under STOP-sign control. This intersection is located approximately 160 feet west of the North Street and Liberty Street signalized intersection.

- Allen Street intersects Liberty Street at an acute angle that requires northbound motorists to look over their left shoulder to see Liberty Street eastbound approaching vehicles.
- Based on the traffic counts collected as part of this study, there appear to be more vehicles that travel along Allen Street than along Liberty Street originating from/destined to Route 28.
    - During the Weekday AM peak hour, more vehicles turn right from Allen Street onto Liberty Street eastbound than originate on Liberty Street to the west and continue through along Liberty Street eastbound (194 vehicles per hour vs. 102 vehicles per hour).
    - During the Weekday PM peak hour, more vehicles turn left from Liberty Street westbound onto Allen Street than continue along Liberty Street westbound destined to the west (246 vehicles per hour vs. 104 vehicles per hour).

4.5.1 SHORT-TERM RECOMMENDATIONS

- Do Not Block Intersection signage (R10-7) and pavement markings are proposed to be implemented along the Liberty Street eastbound approach to Allen Street in accordance with MUTCD guidelines.
    - The pavement markings would be used to mark the edges of the intersection to define the area that is not to be blocked.
    - These measures are recommended due to the proximity to the North Street signalized intersection that may cause vehicles to queue through the Allen Street intersection and impeded vehicles from entering the intersection (i.e., Liberty Street westbound left turns onto Allen Street, Allen Street left turns onto Liberty Street westbound, and Allen Street right turns onto Liberty Street eastbound).

4.6 NORTH STREET, MILL STREET, AND COTTAGE STREET

Mill Street and Cottage Street intersect North Street from the east and west, respectively, to form a four-legged signalized intersection. The North Street northbound and southbound approaches each consist of a single general-purpose travel lane. The Mill Street westbound approach consists of a single general-purpose travel lane. The Cottage Street west leg is a one-way roadway departing the intersection. The traffic signal operates with two vehicular phases (North Street northbound/ southbound permissive phase and a Mill Street westbound phase) and an exclusive pedestrian phase. Crosswalks are striped across all legs of the intersection. Sidewalks are provided along both sides of North Street north and south of the intersection, the south side of Mill Street, the north side of Mill Street for approximately 55 feet, and both sides of Cottage Street. The following items were noted based on field reconnaissance:

- The majority of the vehicles turning from North Street onto Mill Street were noted to be traveling past John F. Kennedy School and headed to the Massachusetts Bay Transportation Authority (MBTA) Holbrook/Randolph Commuter Rail station.
- A crossing guard for John F. Kennedy School is present at the intersection during school arrival and dismissal time periods to activate the exclusive pedestrian crossing phase.

- There are utility poles located within the sidewalks along the east side of North Street, the south side of Mill Street, and the south side of Cottage Street.
- There is overgrown vegetation within the sidewalk along the northern side of Mill Street (119 North Street).
- The intersection operates with semi-actuated traffic control in which vehicular detection is only provided for the Mill Street westbound approach.
- The area within the intersection along the north-south alignment appears to be rather large. There is concern with this layout combined with the permissive traffic signal phasing (North Street northbound and southbound vehicles enter the intersection at the same time).
    - Due to opposing traffic, a North Street northbound or southbound left-turn vehicle may not be able to complete the maneuver onto Cottage Street or Mill Street, respectively.
    - This vehicle would then become trapped in the intersection when the North Street approaches receive a red indication and the Mill Street phase is activated.

4.6.1 SHORT-TERM RECOMMENDATIONS

- Trim/clear overgrown vegetation on the southeast area of the intersection that hinders pedestrian travel along the north side of Mill Street.
- Recalculate traffic signal clearance intervals to ensure conformance with MUTCD guidelines due to the open area along the north-south alignment of the intersection.

4.6.2 LONG-TERM RECOMMENDATIONS

- Upgrade pedestrian facilities in accordance with ADA requirements.
- The traffic signal controller should be upgraded to a fully-actuated traffic signal, in which detection is provided on all approaches such that vehicles would be detected regardless of direction approaching an intersection. Additional detection (loop or video) may be required to determine the presence of vehicles along the North Street approaches.
- Re-phase the traffic signal parameters to provide a North Street southbound lead phase (advance).

Intersection analysis results with the identified traffic signal improvement measures implemented are provided in the **Appendix**.

4.7 NORTH STREET AT ZAPUSTAS ICE ARENA

North Street adjacent to Zapustas Ice Arena is a two-lane roadway that includes one northbound travel lane and one southbound travel lane with directional flow separated by a double yellow centerline. Sidewalks are located along both sides of North Street, with crosswalks striped across the North Street north leg at Seton Way, as well as across Seton Way and Regina Road. The following items were noted based on field reconnaissance:

- MBTA Bus Route 238 provides stops located on the east and west sides of North Street adjacent to the Zapustas Ice Arena parking lot (i.e., between Seton Way and Regina Road).
- The crosswalk across North Street is approximately 45 feet in length.
- North of Zapustas Ice Arena, the sidewalk along the west side of North Street terminates and the sidewalk along the east side of North Street continues.

4.7.1 LONG-TERM RECOMMENDATIONS

- With the wide pavement width (45 feet) on North Street, a road diet should be considered to reduce vehicular travel speeds and provide a safer area for pedestrian crossings.
    - Along the west side of North Street, bump outs are recommended to be constructed to narrow the roadway width and reduce the pedestrian crossing to approximately 24 feet.
    - Town of Randolph officials should coordinate with MBTA representatives to provide defined bus stops along the west side of North Street (between the Zapustas Ice Arena driveways) and along the east side of North Street (between Regina Road and Seton Way).

- Upgrade pedestrian facilities in accordance with ADA requirements by realigning the North Street crosswalk at a 90-degree angle and defining ramps.

4.8 TRAFFIC CALMING MEASURES

Based on discussions with local officials and our data collection efforts, there are safety concerns with vehicles traveling at higher speeds within the study area. In an effort to improve safety and livability in the area, different traffic calming measures have been evaluated to reduce vehicle speeds.

Traffic volumes along arterials, collectors, and local roadways can provide guidance on the type or types of traffic calming measures to be considered in reducing vehicle speeds or traffic volumes. For a roadway similar to North Street (i.e., a local roadway with a posted speed limit ≤35 mph and that carries <20,000 vehicles per day), roadway narrowing measures are generally considered.[1]

As is the case with implementing different traffic calming techniques, it is important to monitor and evaluate the effects of each measure to determine if the desired results were achieved. Minimum or low impact monitoring includes vehicle operating speed observations before and after implementation along different sections of the roadway to determine if the desired results were achieved, communication with the residents, and an evaluation of any unexpected impacts that may be created (e.g., drainage concerns, increased speeding along other sections of the roadway, significant travel time delays to emergency vehicles, etc.).

4.8.1 CENTER ISLAND NARROWINGS

Raised islands placed along the centerline of a roadway can narrow the width of travel lanes. Center islands can help provide a pedestrian refuge area at a midpoint of the crossing to allow pedestrians to cross the roadway in two stages (i.e., one direction of traffic at a time). These types of traffic calming measures are effective in speed reductions when located sporadically along an open section of the major roadway to provide short interruptions, rather than a long median to continuously separate directional flow.

A pedestrian refuge area should be designed in conformance with American Association of State Highway and Transportation Officials (AASHTO) guidelines to provide space for pedestrian passage, turning, or platooning while allowing for the placement of detectable warnings. In addition, the refuge island should be sized to accommodate bicyclists and people pushing strollers without being hindered by poles, sign posts, or other obstructions. Pavement markings should be striped based on MUTCD guidelines, with edge line striping delineated around the pedestrian refuge area and tapered lines extending from the existing double yellow centerlines to the raised obstruction.

4.8.1.1 OAK STREET CORRIDOR SHORT-TERM RECOMMENDATIONS

- Construct median islands (aka, midblock median, median slow point, median choker) along Oak Street between Orchard Street and Ralph Stubbs Road to slow vehicular speeds by narrowing the travel lanes. This design would:

[1] Brown, Steve J., and Reid Ewing. *U.S. Traffic Calming Manual*. Chicago: American Planning Association, 2009.

  - Maintain the two travel lanes (one per direction),
  - Provide a raised median west of Oakland Street, and
  - Provide mountable median islands between Oakland Street and Ralph Stubbs Road to accommodate emergency vehicles and passenger vehicles turning to/from driveways.

- Place a raised island along Oak Street adjacent to Great Pond near Pine Avenue to slow vehicular speeds by narrowing the travel lanes. This design would:
  - Maintain the existing fence between Oak Street and Great Pond,
  - Provide a connection with a future trail the Town of Randolph is considering,
  - Relocate the existing guardrail,
  - Provide two travel lanes (one per direction), and
  - Construct a raised median island.

- Construct raised islands along Oak Street east and west of Cedar Avenue to slow vehicular speeds by narrowing the travel lanes. This design would:
  - Maintain the two travel lanes (one per direction), and
  - Construct raised median islands.

4.8.2 Speed Cushions

Vertical deflections are devices used to control vehicle speeds, but the type and location should be considered before implementation. These types of traffic calming measures include speed humps and speed tables in which motorists are required to slow while traversing the object within the travel way. When located along emergency routes, however, another type of vertical device can be considered. Unlike speed humps and speed tables, speed cushions are lower in profile and include wheel cutouts that allow large emergency vehicles to pass the area unaffected with their tires on either side of the raised area. To accompany speed cushions, it is recommended that warning signs be posted (MUTCD W17-1). Prior to installation of any vertical treatments within the roadway system, it is recommended that coordination efforts take place with emergency response officials.

4.8.2.1 Webster Street Corridor Short-Term Recommendations

- Due to concerns raised by Town of Randolph officials, residents have noted motorists traveling at faster speeds along Webster Street. These faster speeds result in safety concerns for children waiting for school buses and pedestrians walking within the residential neighborhood.
- To address these concerns and not hinder large emergency vehicles from traveling through the area, it is recommended that a series of speed cushions be placed along Webster Street to slow cars and allow large emergency vehicles to straddle.

4.8.3 Increased Law Enforcement

In addition to traffic calming measures, increased levels of law enforcement may encourage motorists to maintain an enforced/posted speed limit and would penalize those who do not. For enforcement to be effective, a strong presence should be maintained.

4.9 SIDEWALKS

Based on field reconnaissance, sidewalks are provided along North Street between Route 28 and the Braintree Town Line.

- Between Route 28 and Joseph J. Zapustas Ice Arena (north of the Ice Arena building): sidewalks are provided along both sides of North Street.
  - This segment is ±2/3 miles long with residences to the west and east of North Street.
- Between Joseph J. Zapustas Ice Arena and 368 North Street: a sidewalk is provided only along the east side of North Street.
  - This segment is ±1/4 miles long with ball fields, automotive uses, and residences to the west of North Street and residential roadways and Central Cemetery to the east of North Street.
- Between 368 North Street and Dyer Avenue: sidewalks are provided along both sides of North Street.
  - This segment is ±1/3 miles long with residences and commercial uses to the west of North Street and residences and Central Cemetery to the east of North Street.
- Between Dyer Avenue and the Braintree Town Line: a sidewalk is provided only along the west side of North Street.
  - This segment is ±1.15 miles long with the majority of the residential roadways to the west of North Street and warehouse/distribution uses to the east of North Street.

4.9.1 LONG-TERM RECOMMENDATIONS

- To provide pedestrian connectivity along North Street, it is recommended that sidewalks be pursued along both sides of North Street between the Ice Arena and 368 North Street (i.e., a new sidewalk be constructed along the west side).
  - As part of the final design, we recommend that a full survey be conducted to identify property lines and utilities.
  - Due to property grades, retaining walls may be needed in some areas of the potential new sidewalk along the west side of North Street.

4.10 NORTH MAIN STREET (ROUTE 28), POND STREET, AND REED STREET

As part of the Phase 1 Town Wide Traffic Evaluation, recommendations were made to provide a North Main Street (Route 28) southbound lead phase to allow southbound left-turning vehicles an opportunity to move unimpeded onto Pond Street. Based on discussions with Town of Randolph officials, the Pond Street westbound approach to the North Main Street (Route 28) and Reed Street signalized intersection operates with long queues and delays.

4.10.1 SHORT-TERM RECOMMENDATIONS

- Provide a Pond Street westbound lead (advance) traffic signal phase.

APPENDIX