ROAD SAFETY AUDIT

South Washington Street (U.S. Route 1) at Draper Avenue,
South Washington Street (U.S. Route 1) at Allen Avenue,
&
South Washington Street (U.S. Route 1) at North Attleboro Market Place Access Road

Town of North Attleborough
September 5, 2017

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MassDOT

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Background

Toole Design Group (TDG) has conducted a Road Safety Audit (RSA) for the intersections of South Washington Street (U.S. Route 1) at Draper Avenue, South Washington Street (U.S. Route 1) at Allen Avenue, and South Washington Street (U.S. Route 1) at North Attleboro Market Place Access Road in North Attleborough, MA. The intersections of South Washington Street at Draper Avenue, South Washington Street at Allen Avenue, and South Washington Street at North Attleboro Market Place Access Road are High Crash Locations and are listed as Highway Safety Improvement Program (HSIP) crash clusters, indicating that the locations fall within the top 5% of high crash locations in the Southeast Regional Planning and Economic Development District (SRPEDD) area based on crash data from 2012 to 2014 in the MassDOT crash database. The RSA was conducted as part of mitigation commitments for the proposed Whispering Pines retail development to be located off of South Washington Street approximately one-quarter mile north of the intersection with Allen Avenue and approximately one-half mile south of the intersection with Draper Avenue.

The goal of an RSA is to identify safety issues and provide potential enhancements to improve safety for all roadway users. The potential enhancements are categorized by timeframe and cost, which helps responsible agencies to determine when to make proposed enhancements. Enhancements are categorized as short-, medium-, and long- term and low, medium, and high cost.

Project Data

Toole Design Group conducted the RSA on Wednesday, August 2nd, 2017. The audit was held at North Attleborough's Town Hall located at 43 South Washington Street in North Attleborough, MA. Members of the audit team first met at the Town Hall to discuss existing safety concerns and issues. The team then conducted a field visit and identified additional safety concerns. The team then discussed countermeasures during the audit for the subject intersections. The members of the audit team comprised of representatives from local and state agencies ranging from emergency responders to transportation planners and engineers. The audit team members and their affiliations are provided in **Table** 1 and their contact information is provided in **Appendix B RSA Audit Team Contact List**.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Elsa Chan	MassDOT Traffic Safety
Connor Keating	MassDOT Traffic Safety
Chris Falcos	MassDOT Traffic Safety
Jason Walters	MassDOT District 5 Projects
Robert Gregory	MassDOT District 5 Traffic
Nancy Runkle	North Attleborough Planning Department
Mark Hollowell	North Attleborough Department of Public Works
Shane Mckenna	North Attleborough Police Department
Jim Moriarty	North Attleborough Fire Department
Guoqiang Li	Southeastern Regional Planning and Economic Development District
Michael Sarazen	TranSystems
Teresa Sandell	TranSystems
Shaun Kelly	Vanasse & Associates, Inc.
Heather Georgallas	Toole Design Group
Preston Buehrer	Toole Design Group

Audit team members received a meeting packet prior to the RSA including a meeting agenda (Appendix A **RSA Meeting Agenda**), study area details, crash data analysis, a collision diagram of the study area intersections, and an RSA prompt list. A collision diagram is a graphical representation of the crash data showing both the crash type and crash location within a study area. The audit members were asked to review the packet and visit the RSA study area prior to the meeting. Safety issues were identified by the team at the beginning of the RSA, followed by a field visit to the subject intersections. The audit team finished the meeting by determining appropriate short-, medium- and long-term countermeasures for the safety issues discussed.

Per crash records provided by the North Attleborough Police Department (NAPD), 32 crashes were recorded at South Washington Street and Draper Avenue from 2014 to 2016. Of the reported crashes, 11 (34%) resulted in injury and none resulted in a fatality. One crash (3%) involved a cyclist and resulted in injury; no crashes involved pedestrians. The majority of crashes in the area were rear-end and angle crashes, representing 50% and 38% of all crashes in the area, respectively. Crashes were distributed throughout the daytime hours, with peaks in the midday (12PM – 2PM, 19% of all crashes) and evening peak (4PM – 6PM, 25% of all crashes) hours. Of all crashes, most happened in the daylight (69%), most happened with clear weather conditions (81%), and most happened on a dry road surface (78%). Crashes were most common in the months of August (19%) and November (22%), and occurred most frequently on Saturdays (40%).

Per crash records provided by the NAPD, 38 crashes were recorded at South Washington Street and Allen Avenue from 2014 to 2016. Of the reported crashes, seven (18%) resulted in injury and none resulted in a fatality. No pedestrians or cyclists were involved in any of the recorded crashes. The majority of crashes in the area were rear-end crashes, representing 63% of all crashes in the area. Crashes occurred most frequently in the midday hours (10AM – 4PM, representing 63% of all crashes) with a peak in the early afternoon hours (2PM – 4PM, representing 26% of all crashes). Of all crashes, most happened in the daylight (74%), most happened with clear weather conditions (68%), and most happened on a dry road surface (76%). Crashes were most common in the month of December (21%) and on the weekends (Saturday: 24% and Sunday: 21%).

Per crash records provided by the NAPD, 33 crashes were recorded at South Washington Street and North Attleboro Market Place Access Road from 2013 to 2015. Of the reported crashes, six (18%) resulted in injury and none resulted in a fatality. No pedestrians or cyclists were involved in any of the recorded crashes. The majority rear-end crashes and angle crashes, representing 61% and 27% of all crashes in the area, respectively. All crashes occurred in the daytime hours between 10AM and 10PM, with slightly more crashes occurring in the first half of the day (57% of all crashes, between 10AM and 4PM). Of all crashes, most happened in the daylight (63%), most happened with clear weather conditions (75%), and most happened on a dry road surface (79%). Crashes were most common in the month of November (21%), and heavily concentrated on Saturdays (39%).

Project Locations and Description

The study area includes the intersection of South Washington Street (U.S. Route 1) and Draper Avenue, South Washington Street (U.S. Route 1) and Allen Avenue, and South Washington Street (U.S. Route 1) and North Attleboro Market Place Access Road in North Attleborough, MA. Per the MassDOT Transportation Data Management System (TDMS), in 2017 the average daily traffic on South Washington Street was approximately 39,800 vehicles per day (vpd) near Allen Avenue and 27,100 vpd near Draper Avenue. In 2016, the average daily traffic on Allen Avenue was 1,900 vpd. The average daily traffic on Draper Avenue 3,000 vpd west of South Washington Street and 3,600 vpd east of South Washington Street. Traffic counts were not available for North Attleboro Market Place Access Road or South Washington Street near the intersection with North Attleboro Market Place Access Road. The posted speed limit on South Washington Street in the vicinity of all three intersections in the study area is 40 miles per hours (mph). A posted speed limit it not provided along Draper Avenue, Allen Avenue, or North Attleboro Market Place Access Road. The study area is shown in Error! Reference source not found., and described on the f ollowing pages.

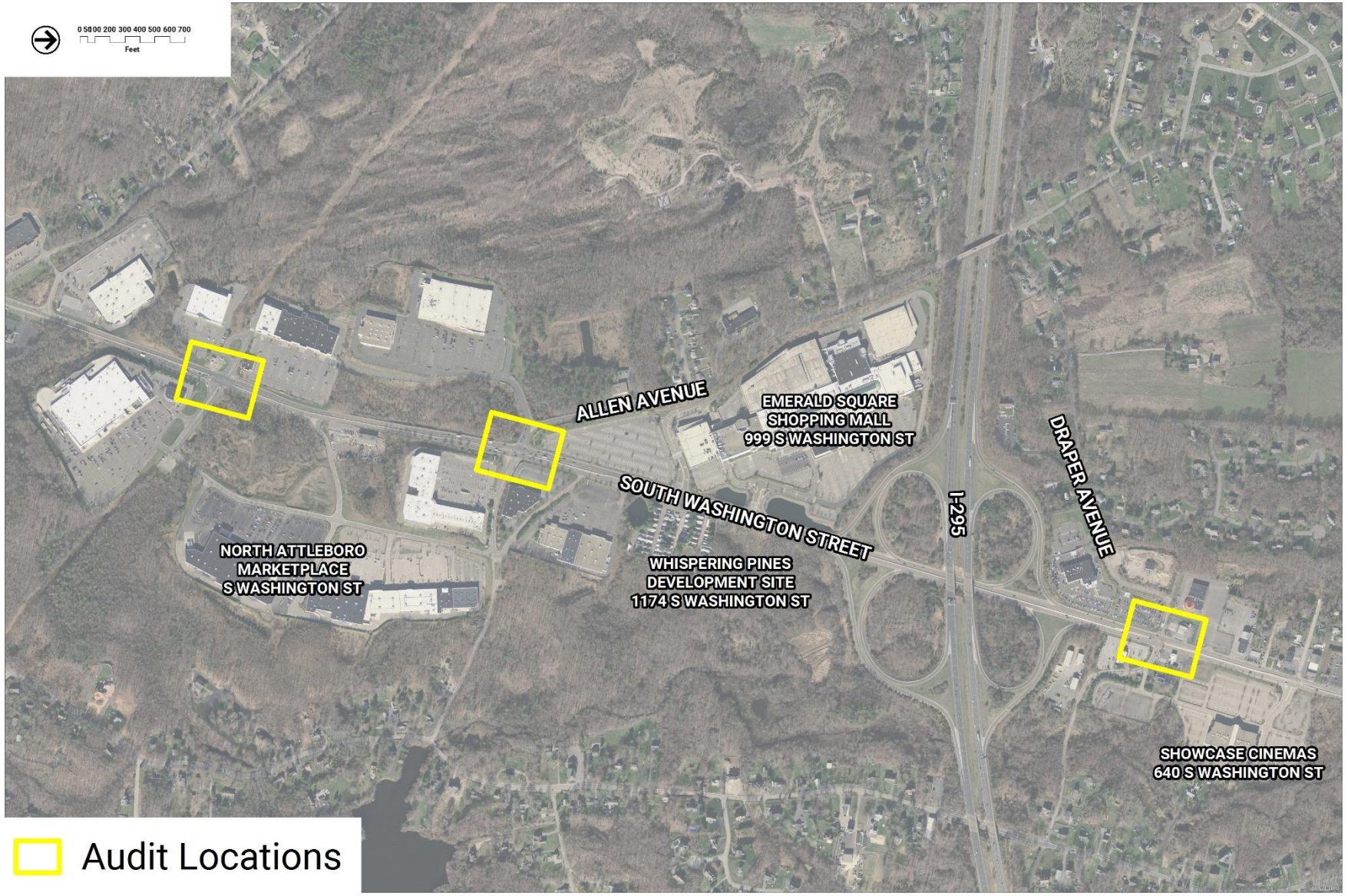


Figure 1 - RSA Locus Map

Roadways

South Washington Street (U.S. Route 1) is a north-south roadway, with a southern terminus at Broadway (U.S. Route 1) in Pawtucket, RI and a northern terminus at North Washington Street in North Attleborough. South Washington Street is classified as an urban minor arterial and is under MassDOT jurisdiction throughout the study area. Within the study area and to the immediate north and south, South Washington Street provides two travel lanes in each direction. The curb-to-curb width of South Washington Street is approximately 84' near the intersection with Draper Avenue, 74' near the intersection with Allen Avenue, and 78' near the intersection with North Attleboro Market Place Access Road. A 5' wide concrete median is provided along South Washington Street at both the Draper Avenue and Allen Avenue intersections while a crash cushion is provided in the median North Attleboro Market Place Access Road. No shoulders are provided and no on-street parking is allowed on either side of South Washington Street in the study area. A sidewalk is provided along the western side of South Washington Street and is generally an asphalt surface, with some concrete curb ramps, and approximately 5' in width.

Land use along South Washington Street in the vicinity of the study area intersections is primarily retail, with access being provided via signalized driveway intersections along South Washington Street and curb cuts along South Washington Street and the nearby roadways. Near the intersection with Draper Avenue are two gas stations, one restaurant, a car dealership and the Showcase Cinemas Theater. Access to the gas stations is provided from both South Washington Street and Draper Avenue, while access to the restaurant and car dealership are provided from Draper Avenue only. Access to the Showcase Cinema Theater is provided from South Washington Street only. Near the intersection with Allen Avenue are several shopping plazas and the Emerald Square shopping mall. Access to the shopping plazas is provided from both South Washington Street and Allen Avenue, but access to the Emerald Square shopping mall is provided exclusively from South Washington Street. Near the intersection with North Attleboro Market Place are several shopping plazas, access to all of which is provided via the Access Road only. South Washington Street provides direct access to the North Attleborough town center to the north and the Pawtucket, RI city center to the south.

The Greater Attleboro Taunton Regional Transit Authority (GATRA) provides fixed-route bus service along South Washington Street by way of the #10 (Attleboro/No. Attleboro), #11 (South Attleboro Connector), and #12 (Attleboro/So. Attleboro/No. Attleboro) buses. Service on the #10 bus between the Emerald Square Mall and the Attleboro Transit Center is provided hourly between approximately 6:00AM and 7:00PM on weekdays and between approximately 10:00AM and 5:00PM on Saturdays. Service on the #11 bus between the Emerald Square Mall and the intersection of Broadway and Benefit Street in Pawtucket, RI is provided hourly between approximately 5:30AM and 7:00PM on weekdays and between approximately 9:00AM and 4:30PM on Saturdays. Service on the #12 bus between the Emerald Square Mall and the Attleboro Transit Center is provided hourly between approximately 6:30AM and 6:30PM on weekdays and between 9:30AM and 5:00PM on Saturdays. GATRA service operates on a "Flag Stop" policy, allowing passengers to flag busses for stops at any safe location along the bus route. In addition to the Emerald Square Mall, service is also provided to many of the shopping plazas along South Washington Street, including North Attleboro Market Place.

Intersections

South Washington Street (U.S. Route 1) at Draper Avenue is a four-legged, signalized intersection located in the southern section of North Attleborough. South Washington Street runs north-south at the intersection and Draper Avenue runs east-west at the intersection. Draper Avenue is classified as a local road and is under Town jurisdiction. Draper Avenue is a single lane approach in both the eastbound and westbound directions, with left-turn, through, and right-turn movements permitted in both directions. In both the northbound and southbound approaches South Washington Street provides one marked, dedicated left-turn lane, one unmarked through-travel lane, and one unmarked through/right-turn lane.

The intersection is signalized with signal heads mounted to mast arms located on the northeast and southwest corners of the intersection and to poles located on the northwest, southwest, and southeast corners of the intersection, as well as poles located in the medians of the northbound and southbound approaches. The South Washington Street northbound left-turn lane uses a dedicated signal head located in the southbound approach median and the South Washington Street southbound left-turn lane uses a dedicated signal head located in the northbound approach median.

The signal phasing for the intersection are as follows: Leading protected left-turns for Route 1 northbound and southbound, Route 1 northbound and southbound, and Draper Avenue eastbound and westbound. Emergency Vehicle Preemption (EVP) is provided via optical detection for the Route 1 northbound and southbound approaches.

A sidewalk is provided along the western side of South Washington Street south of Draper Avenue, and along the southern side of Draper Avenue east of South Washington Street. Crosswalks and pedestrian signal heads are not provided across any of the intersection approaches. Pedestrian curb ramps are provided on the southeast and southwest corners of the intersection, but are not equipped with detectable warning pads. No bike facilities are provided on any of the intersection roadways.

South Washington Street (U.S. Route 1) at Allen Avenue is a four-legged, signalized intersection located in the southern section of North Attleborough. South Washington Street runs north-south at the intersection and Allen Avenue runs east-west at the intersection. West of the intersection Allen Avenue is classified as an urban collector and east of the intersection Allen Avenue is classified as a local road. Allen Avenue is under Town jurisdiction. Travel lane assignments are marked for both Allen Avenue approaches. Travel lane assignments are marked for both left-turn lanes, and the southbound right turn lane on South Washington Street. Both Allen Avenue approaches consists of one exclusive left-turn lane, one shared through/left-turn lane, and one exclusive right turn lane. The South Washington Street northbound approach consists of one exclusive left-turn lane, two through travel lanes, and one exclusive right-turn slip-lane. The South Washington Street southbound approach consists of one exclusive left turn lane, two through travel lanes, and one exclusive right-turn lane.

The intersection is signalized with signal heads hung from a span wire system stretched between two strain poles located on the northeast and southwest corners of the intersection. The Allen Avenue approaches both use secondary, pole-mounted signal heads located on the northwest, southwest, and southeast corners of the intersection. The South Washington Street southbound right-turn lane has a dedicated signal head which is mounted on a pole located on the southwest corner of the intersection.

The signal phasing for the intersection are as follows: Leading protected left-turns for Route 1 northbound and southbound with an overlapping Allen Avenue westbound right-turn phase, Route 1 northbound and

southbound, Allen Avenue westbound, and Allen Avenue eastbound with concurrent pedestrian crossing across the Route 1 northbound approach. The pedestrian crossing phase is activated via pedestrian pushbuttons. Emergency Vehicle Preemption (EVP) is provided via optical detection for the Route 1 northbound and southbound approaches.

A sidewalk is provided on both sides of South Washington Street north of Allen Avenue and along the western side of South Washington Street south of Allen Avenue. Pedestrian crosswalks are provided across three of the four intersection legs: the west, south, and east legs. There is no crosswalk provided across the northern leg. Curb ramps are provided for all crosswalks. Pedestrian signal heads are provided on both sides of the crosswalk across the southern leg; no pedestrian signal heads are provided for the crosswalks across the eastern and western leg. Push buttons are provided for the southern leg crosswalk only.

South Washington Street (U.S. Route 1) at North Attleboro Market Place Access Road is a four-legged, signalized intersection located in the southern section of North Attleborough. South Washington Street runs north-south at the intersection and North Attleboro Market Place Access Road runs east-west at the intersection. North Attleboro Market Place Access Road is a privately owned access road and not under town or state jurisdiction. Travel lane assignment markings and signs are missing for both the eastbound and westbound approaches on North Attleboro Market Place Access Road. Both the approaches currently operate as three lane approaches with one exclusive left-turn lane, one shared through/left-turn lane, and one exclusive right-turn lane. Both the northbound and southbound South Washington Street approaches consist of 4 travel lanes: one exclusive left-turn lane, two through travel lanes, and one exclusive right-turn slip lane.

The intersection is signalized with signal heads hung from a wire span stretched between two strain poles located on the northwest and southeast corners of the intersection. The northbound and southbound South Washington Street approaches use only the wire span mounted signals. There are also two secondary pole mounted signals, one on the northwest corner of the intersection and one on the southeast corner of the intersection. Both North Attleboro Market Place Access Road approaches use wire mounted and pole mounted signal heads.

The signal phasing for the intersection are as follows: Leading protected left-turns for Route 1 northbound and southbound with overlapping eastbound and westbound right-turn phases, Route 1 northbound and southbound with overlapping eastbound and westbound right-turn phases, Route 1 northbound and southbound through movements with concurrent pedestrian crossing across the westbound approach, Walmart driveway eastbound approach, and Market Place westbound approach. Emergency Vehicle Preemption (EVP) is provided via optical detection for the Route 1 northbound and southbound approaches.

A sidewalk is provided along the western side of South Washington Street. Pedestrian crosswalks are provided only across the western leg. Pedestrian signal heads and push buttons are provided at the southern portion of the crosswalk across the western leg of the intersection; no push button or signal heads are provided across the southbound right-turn slip lane.

Figure 2 - South Washington Street at Draper Avenue

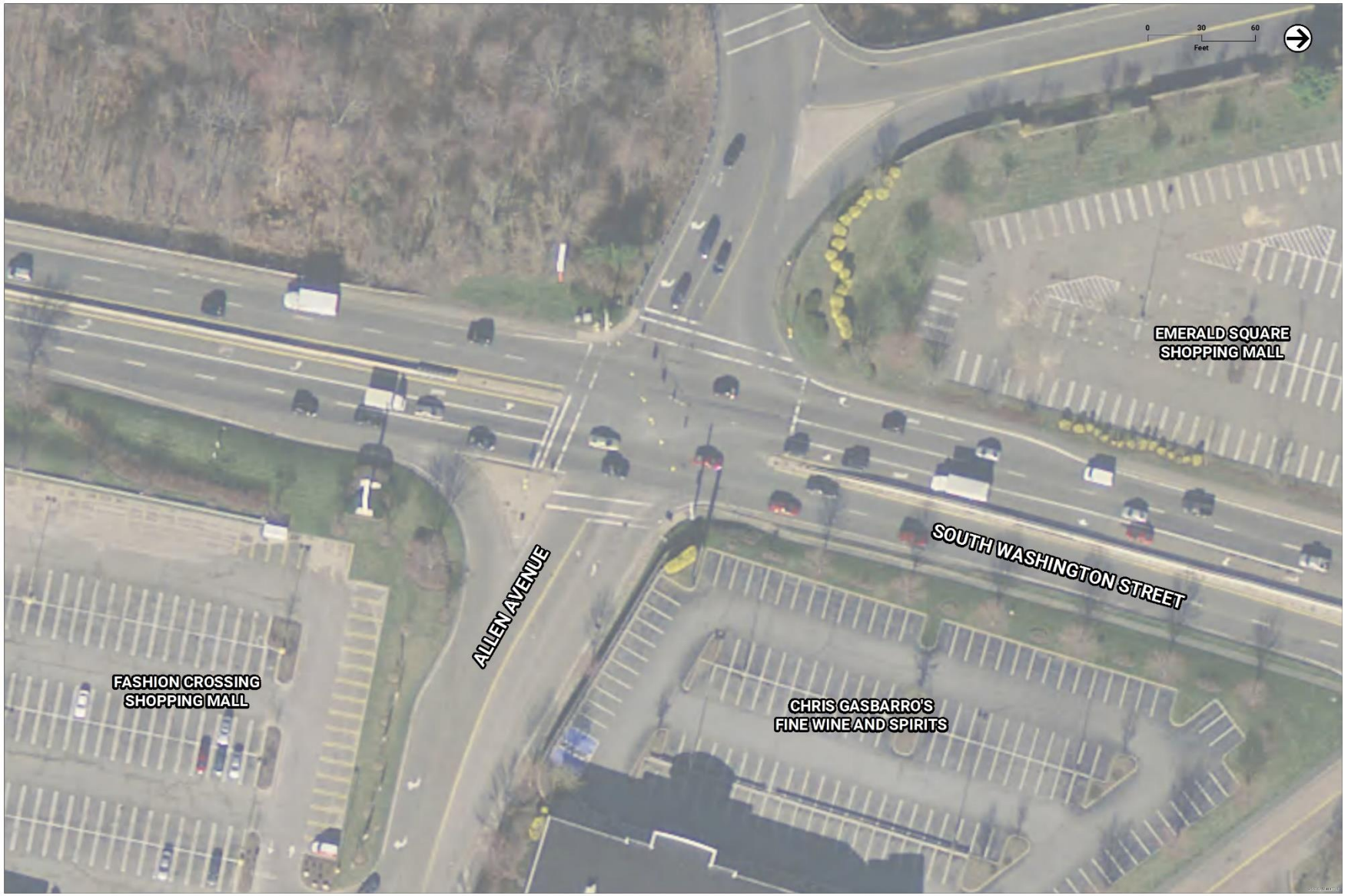


Figure 3 - South Washington Street at Allen Avenue

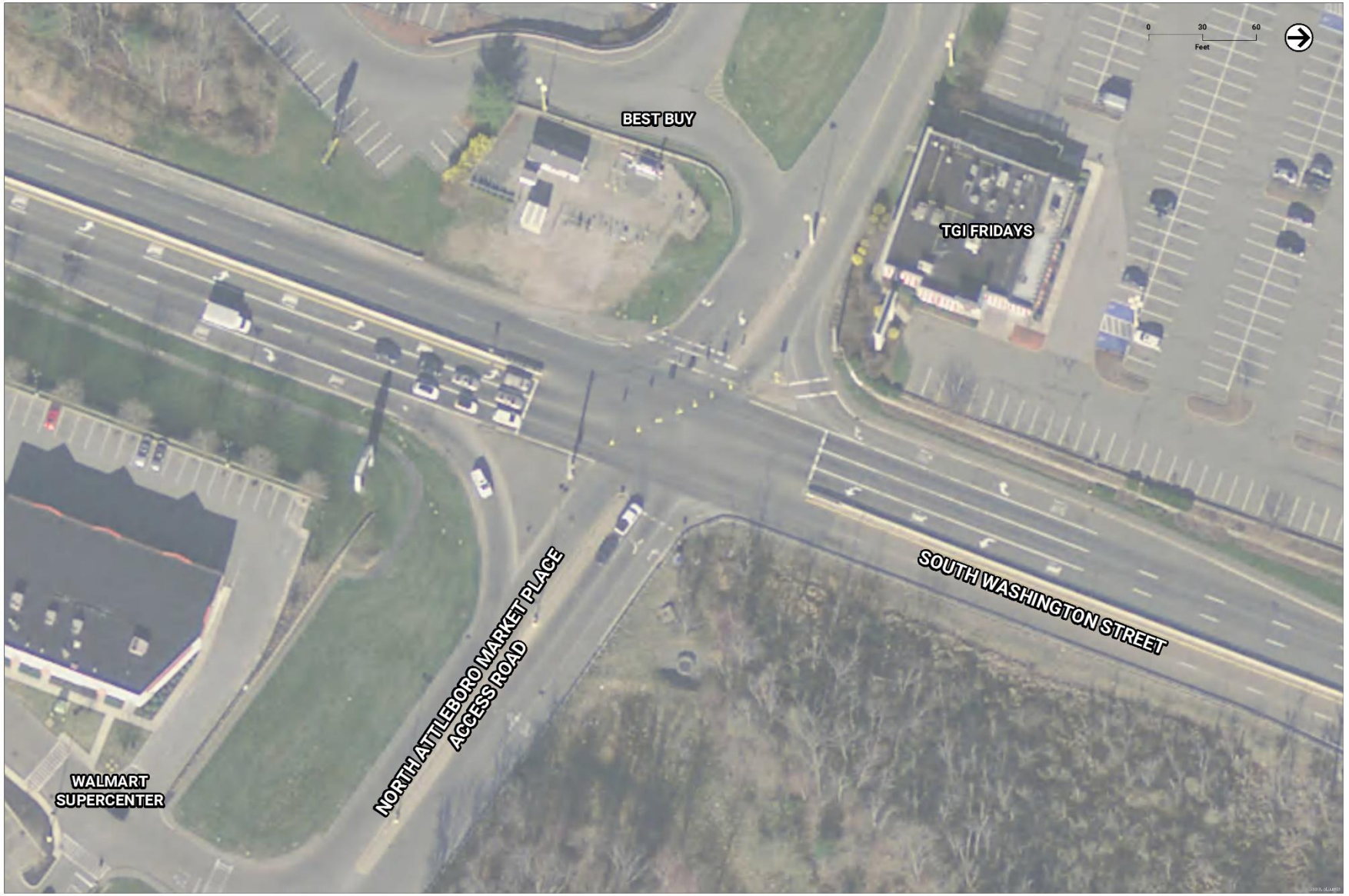


Figure 4 - South Washington Street at North Attleboro Market Place Access Road

Audit Observations and Potential Safety Enhancements

Following an introduction to the RSA process and a summary of existing geometry, signal operations and crash history data, the audit participants were asked to discuss safety concerns at the study area intersections. Audit team members then drove to the study area as team, at which time observations were offered in the field. Several of the safety issues identified by the audit team were:

- Intersection Control;
- Intersection Geometry;
- Intersection Sight Distance;
- Traffic Signal Equipment;
- Pedestrian Accommodations;
- Bicycle Accommodations;
- Signage; and
- Pavement Condition and Markings.

The following sections discuss in detail the safety issues and potential enhancements that were identified during the RSA. It should be noted that current, applicable design standards referenced throughout the report include but are not limited to the MUTCD, Americans with Disabilities Act, MassDOT and the Town of North Attleborough standards and specifications; in addition, consideration should be given to applicable local, state, and national guidelines. Several of the issues identified require further study and engineering judgment to determine the feasibility of implementing the improvements to address them.

South Washington Street at Draper Avenue

Safety Issue #1. Intersection Control & Lack of Signal Coordination

Observations:

The audit team noted that yellow light "sneakers" were common at the intersection and that signal timing and phasing could be a contributing factor to the behavior. Audit members indicated that a lack of coordination with other signals along the corridor meant that motorists are often required to stop at many red lights while travelling along South Washington Street, causing some motorists to attempt to beat red lights more frequently. The team also noted that while signal detection was present at the intersection, the signal phasing often did not match the demand through the intersection, particularly in regards to the South Washington Street left turn lanes which frequently have long queue lengths. These long queues could also encourage yellow light sneakers. This

behavior could lead to rear-end and sideswipe crashes with other vehicles that are stopped for the red light, or to angle crashes with vehicles entering the intersection from other approaches.

Audit members also noted that there are no protected turning movements off of Draper Avenue. As both Draper Avenue approaches are one lane and the intersection is large, it is often difficult for motorists to judge the path of an oncoming vehicle as it enters the intersection. This could lead to angle-crashes between vehicles from the eastbound and westbound approaches, such as in the case of crash six on the diagram provided at the RSA meeting. Team members also noted that the permissive right-turn movements off of Draper Avenue could conflict with u-turn movements on South Washington Street, and that both turning movements could be hard to predict for other motorists.

Potential Enhancements:

1. Consider implementing coordinated signal timing at Draper Avenue and along the South Washington Street corridor.

2. Review signal timing and phasing – evaluate changes to phasing and timing as appropriate to manage varying traffic patterns.

3. Evaluate the feasibility of dedicated signal phases for vehicles in each Draper Avenue approach to eliminate conflicting turning movements.

4. Consider restricting right-turns on red from Draper Avenue to eliminate the conflict of right-turning vehicles from Draper Avenue and u-turning vehicles from South Washington Street during the protected left-turn phase for South Washington Street.

Safety Issue #2. Intersection Geometry

Observations:

Audit team members noted that the presence of two gas stations and their associated curb cuts near the intersection meant that there were many conflicting movements immediately before and after the intersection. It was observed that motorists entering and exiting the gas station driveways on Draper Avenue often get stuck in queued traffic and block travel lanes while trying to use the driveways. These issues could be contributing factors to rear-end and angle crashes, such as was noted in crash 12 on the crash diagram.

Figure 5 - Gas station driveway immediately adjacent to the intersection on South Washington Street

It was also observed that the curb radius on the southeast corner of the intersection appeared

Figure 6 - Damaged curb ramps and markings on sidewalk from vehicle encroachment

Avenue. The encroachment would present a danger to pedestrians on the sidewalk, and damage to the curb ramp was clearly visible.

Audit team members observed that westbound motorists view to the south was obstructed by hedges and a fence on the Applebee's lot. Since right-turns on red are permitted off of Draper Avenue, this blocked motorist's view of the northbound traffic they are merging with.

insufficient to accommodate the truck traffic turning from northbound South Washington Street onto Draper Avenue eastbound. This could cause conflict between northbound, right-turning trucks and westbound queued traffic, as trucks may need to swing into the westbound travel lane in order to complete their right-turns. This also could lead to vehicle encroachment on the sidewalk and pedestrian curb ramp along the south side of Draper

Figure 7 - Blocked view to the south from eastbound Draper Avenue

Potential Enhancements:

1. Coordinate with property owners to investigate the possibility of closing one or more driveways for either of the two gas stations located at the intersection. Furthermore, investigate the possibility of relocating any of the driveways further from the intersection, or realigning them such that sight lines and vehicle movements are safer.

2. Evaluate the current curb radius on the southeast corner of the intersection, and the frequency of large trucks making the right turn from South Washington Street northbound onto Draper Avenue eastbound. If necessary, increase the curb radius or restripe the double yellow centerline along Draper Avenue to better accommodate the frequent truck traffic through the intersection.

3. Evaluate the feasibility of realigning the stop bar on the Draper Avenue westbound approach to give motorists a better view of on-coming northbound traffic on South Washington Street.

4. Consider trimming back vegetation and/or moving the fencing along the Applebee's property to increase motorists' visibility to the south.

Safety Issue #3. Inconsistent and Worn Traffic Signal Equipment

Observations:

Several audit team members observed that some of the traffic lights were not updated to the latest LED style lamps. It was noted that previously there had been a program to update all traffic signals along the corridor to LED style bulbs, but many of the yellow lights and some auxiliary lights were not updated as a cost-saving measure. As such, intersections along the corridor often have a combination of LED and incandescent bulbs in the traffic signals. It was also noted that some of the LED bulbs that had been installed were partially darkened and/or damaged, possibly making the signals more difficult to see.

Figure 8 - Signal head with partially lit green LED bulb and broken backing plate

Team members noted that backplates on several of the lights on the overhead mast arms were damaged. It was also observed that many of the auxiliary lights also had damaged backplates, or backplates that were missing entirely. Damaged or missing backplates could lead to signal visibility issues, resulting in motorists inadvertently running red lights and causing angle crashes or motorists not expecting stopped traffic and rear-ending vehicles already stopped at the intersection, such as in crashes 3 and 16 from the crash data.

Potential Enhancements:

1. Replace all non-LED traffic signal bulbs with newer LED bulbs to increase signal visibility.

2. Evaluate the existing traffic signal bulbs and replace and/or repair the partially lit LED style bulbs to increase signal visibility.

3. Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. New backplates should include a 3" reflective border in all locations.

Safety Issue #4. Speeding

Observations:

Audit team members noted that speeding was prevalent along the corridor. Despite current enforcement, the speed limit is not consistently posted throughout the corridor and the wide,

divided roadway encourages drivers to speed. It was also noted that some drivers carry speed off of the nearby I-295 ramps, and there is no speed limit posted between the exit ramps and the intersection with Draper Avenue. Speed was listed specifically as a contributing code for crashes 1 and 14 in the crash data provided by the NAPD, and could be a contributing factor in the high number of rear-end crashes at the intersection.

Potential Enhancements:

1. Consider installing additional speed limit signage to notify drivers exiting I-295 and throughout the corridor of the prevailing speed limit in the area.

2. Consider increased enforcement within the study area to decrease the prevalence of speeding.

Safety Issue #5. Pedestrian Accommodations

Observations:

It was noted that there are no crosswalks or pedestrian signals provided across any of the intersection approaches. Team members observed that, despite the lack of crosswalks, there is a continuous sidewalk along the western side of South Washington Street and a sidewalk is provided along the southern side of Draper Avenue. Audit team members also observed that curb ramps were provided on the southwestern and southeastern corners of the intersection, but the ramps were damaged, appeared to have non-ADA compliant grades and landings zones, and were missing tactile warning pads.

Figure 9 - Broken curb ramp with missing tactile warning pad and no adjoining crosswalk

Potential Enhancements:

1. Consider installing ADA-compliant pedestrian crosswalks, signal heads, and push-buttons to formalize pedestrian crossings.

2. Evaluate the existing curb ramps and repair and/or replace as necessary to meet current ADA guidelines. Additionally, in conjunction with enhancement #1, evaluate the need for and location of future pedestrian ramps to facilitate new crosswalks at the intersection.

Safety Issue #6. Lack of Bicycle Accommodations

Observations:

It was noted that there are no bicycle accommodations through the intersection on any roadways. Audit members noted that cyclist traffic was generally low through the area, but that there was a crash involving a cyclist in the crash data provided by the NAPD.

Potential Enhancements:

1. Evaluate the feasibility of installing bicycle facilities with the appropriate signage and pavement markings to provide a safe facility for cyclists through the area.

Safety Issue #7. Lack of Pavement Markings

Observations:

It was noted that pavement markings are extremely faded throughout the intersection. It was observed that on the northbound South Washington Street approach the solid white shoulder line is extremely faded and almost not visible at all, even in bright daylight conditions. Due to the lack of markings, some motorists are now using the northbound shoulder approaching the intersection as a right turn lane. This presents a conflict when a driver from the right travel lane turns without expecting another vehicle to be travelling to their right.

Figure 10 - Motorists using the faded shoulder as a right-turn lane

Audit team members also observed a lack of skip lines to guide turning motorists through the intersection. As there are no protected turning movements off of Draper Avenue, and the cross section of South Washington Street is wide, it was noted that motorists' paths through the intersection may not be to other vehicles.

It was also noted that there are no lane designation pavement markings, with the exception of the southbound left-turn lane. The lack of lane designation markings could lead to motorist making last-second swerving maneuvers to get in the correct lane for their intended direction of travel. This behavior appears to have been a contributing factor to crashes 7, 14, and 24 in the crash data.

Potential Enhancements:

1. Restripe all lane lines, shoulder lines, and stop bars to increase visual conspicuity and indicate to motorists where the intended travel lanes and shoulders are.

2. Install lane designation pavement markings to alert motorists to correct travel lane for their intended direction of travel.

3. Install advanced warning lane designation pavement markings to allow motorists increased time to merge into the correct lane for their intended direction of travel.

4. Install skip lines for turning movements off of Draper Avenue to help guide motorists through the intersection and clearly indicate to other vehicles where turning vehicles are headed.

South Washington Street at Allen Avenue

Safety Issue #1. Intersection Control

Observations:

Audit team members noted that the signal timing and phasing at Allen Avenue often causes backups along South Washington Street at peak travel periods. Specifically, it was noted that the long signal phase for through traffic on South Washington Street causes backups for the protected left turn movement. These backups cause many motorists to cut in and out the left turn lane approaching the intersection, and encourage yellow light sneakers who have been sitting in queued traffic for extended periods of time. This could lead to rear-end crashes, such as in crash 12 on the crash diagram, or to the numerous side-swipe crashes approaching the intersection. Team members also noted that the intersection with Allen Avenue is at the top of a hill when travelling along South Washington Street. This reduces motorists' ability to accelerate from a stop during the protected left-turn phase, further reducing the number of left-turning vehicles that are able clear the intersection.

It was observed that u-turns from both northbound and southbound South Washington Street are common during the protected left-turn phase. U-turns are currently restricted on the southbound approach, but are not prohibited on the northbound approach. Because the roadway onto which vehicles are turning onto is narrow, motorists are forced to make the u-turn movement much more slowly than a left-turn movement. The sudden tight turning and slow speed could be contributing to rear-end crashes at the intersection. It was also noted that the u-turn movements conflict with the exclusive and permissive right-turn movements off of Allen Avenue, which could potentially lead to angle crashes between turning vehicles.

Potential Enhancements:

1. Evaluate the current coordinated signal timing and investigate possibilities for adjusting signal timing and phasing to help left-turning traffic clear the intersection and reduce vehicle queuing.

2. Evaluate the existing clearance intervals and adjust if necessary to allow slow-accelerating vehicles time to clear the intersection after a signal change.

3. Consider restricting u-turn movements in both the northbound and southbound approaches to reduce the potential of rear-end crashes.

4. Evaluate the feasibility of eliminating the westbound right-turn only phase that is concurrent with the South Washington Street left-turn phases, and restricting right-turn on red movements to prevent conflicts between u-turning vehicles on South Washington Street and right-turning vehicles from Allen Avenue. Additional study will be required to evaluate the impact on traffic operations.

Safety Issue #2. Intersection Geometry

Observations:

Figure 11 - South Washington Street southbound approach median, with a buried end and no crash cushion

Audit team members noted that it is a common occurrence for motorists to leave the Emerald Square auxiliary parking lot and attempt to make a left turn from South Washington Street southbound. This requires motorists to quickly merge across multiple lanes of often fast-moving through traffic and before attempting to merge into a queue of stopped vehicles in the left-turn lane. This could be a contributing factor to the high number of sideswipe crashes observed on the southbound intersection approach.

It was also observed that on both Allen Avenue approaches left-turns are permitted from the left and middle lanes. The double-left turn lanes, in conjunction with conflicting vehicle movements from the opposite approaches, mean that it can be difficult for some motorists to navigate the intersection while making left-turns. This difficulty in making left-turns could potentially lead to various types of crashes, as motorists do not know where to expect other vehicles to travel.

An audit team member also noted that the South Washington Street southbound right-turn lane is short and does not provide adequate length for vehicles to slow down to make the right turn. As such, right-turning vehicles are forced to slow down while still travelling in one of the through lanes, which could lead to rear-end crashes.

Audit team members also noticed that the South Washington Street southbound approach median had a buried end and was missing a crash cushion. This could lead to vehicles ramping up onto the guardrail in the event of a crash.

Potential Enhancements:

1. Consider extending the southbound left-turn lane to give vehicles more space to queue when coming out of the Emerald Square parking lot exits.

2. Consider coordinating with the owner of the auxiliary parking lot to restrict/relocate/reconfigure the auxiliary parking lot exit for the Emerald Square Mall to prevent exiting traffic from accessing the left turn lane for Allen Avenue. Access from Emerald Square to Allen Avenue westbound would be provided via the signalized Emerald Square main exit to the north.

3. Evaluate the median design along the Route 1 southbound approach and consider replacing the current buried end with a crash cushion.

4. Install skip lines for turning movements off of Allen Avenue to help guide motorists through the intersection and clearly indicate to other vehicles where turning vehicles are headed.

Safety Issue #3. Intersection Sight Distance

Observations:

During the site visit it was observed that the eastbound Allen Avenue roadway has a horizontal curve – with vegetation on the inside of the curve – and a slight grade change approaching the intersection. This makes it difficult to see the signals or stopped traffic at the intersection with South Washington Street. The lack of visibility could potentially lead to future rear-end crashes at the intersection.

Potential Enhancements:

1. Trim back overgrown vegetation along the south side of the Allen Avenue eastbound approach to give better sight lines for motorists approaching the intersection.

2. Evaluate existing signal placement and consider moving signal equipment to provide better visibility to approaching eastbound motorists.

Safety Issue #4. Traffic Signal Equipment

Observations:

Audit team members noted that the Allen Avenue intersection signals were also not all updated to have LED bulbs – signal bulbs were a mix of tradition bulbs and LED's. It was also noted that backplates were present on all of the wire-span mounted signal heads, but not the post-mounted signal heads.

Team members also discussed that in general, no auxiliary post-mounted signal heads were present for the northbound and southbound intersection approaches; only overhead wire-span mounted signal heads are provided. Given the intersection's location at the crest of a hill on South Washington Street, this could make it difficult for approaching motorists to see the signal heads when travelling behind larger vehicles. The lack of signal head visibility could be a contributing factor in the 13 rear-end crashes on the northbound intersection approach. The only post-mounted

auxiliary signal head provided for South Washington Street was for the southbound protected right-turn phase.

Potential Enhancements:

1. Replace all non-LED traffic signal bulbs with newer LED bulbs to increase signal visibility.

2. Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. New backplates should include a 3" reflective border in all locations.

3. Consider installing post-mounted auxiliary signal heads for the northbound and southbound approaches to increase signal head visibility for motorists approaching the intersection behind large vehicles.

4. Consider upgrading the existing wire-span mounted signal head to mast-arm mounted signal heads to provide additional setback from the intersection stop lines and improve visibility

Safety Issue #5. Signage

Observations:

Audit team members noted that there is no advanced signage for indicating lane-use designations, or for indicating the approaching intersection cross-street on either of the South Washington Street approaches. Because motorists have no advanced warning, this could cause weaving, sudden slowing or stopping, and other unexpected motorist behavior when approaching the intersection. The unexpected maneuvers could be contributing to the high number of rear-end and angle crashes approaching the intersection. Team members also noted that a lack of advance warning signs for the no U-turn restriction on South Washington Street southbound could contribute to a lack of motorist compliance with the restriction. Given that motorists may be unaware of the restriction until they are nearly entering the intersection, they may choose to continue with the U-turn instead of complying with the posted signage.

It was also observed that the visibility of some signage for the southbound South Washington Street approach is severely limited. Specifically, audit team members noted that a "RIGHT LANE MUST TURN RIGHT" sign is completely obscured by a tree and unreadable by approaching motorists. Team members also noted that the Allen Avenue street name sign was

Figure 12 - Southbound lane use sign obscured by tree

small, placed far away from the intersection, and was set against a backdrop of greenery, making it almost impossible for approaching motorists to see. The obscured signage could cause motorists to be unaware of current lane designations, or unaware of the street they are approaching, leading to weaving and/or sudden slowing/stopping, creating danger roadway conditions.

Figure 13 - Difficult to see Allen Avenue street sign

It was also noted that the street sign for Allen Avenue was only present on the southbound side of the intersection, and there was a lack of wayfinding signage on all intersection approaches.

Audit team members also observed that the northbound right-turn slip lane was missing a yield sign where it merged with Allen Avenue, and that a westbound "DO NOT ENTER" sign at the slip lane was completely faded out.

Potential Enhancements:

1. Consider installing advance warning lane designations signage to Route 1 to alert motorist to lane use designations and restrictions at the upcoming intersection.

2. Consider installing advanced warning and increased intersection signage for the no U-turn restriction for the Route 1 southbound intersection approach to improve motorists' compliance.

3. Consider moving the right-turn lane designation sign to be in front of the tree to allow approaching motorists to see the sign, or trimming back the tree to provide visibility to the existing sign.

4. Consider replacing the existing Allen Avenue street sign with a larger, more prominent street sign.

5. Consider replacing the faded "DO NOT ENTER" sign and adding a yield sign for the northbound right-turn slip lane.

6. Consider installing guide signs on the eastbound and westbound intersection approaches to direct motorist to nearby highways and key routes. Guide signs could help direct motorists in the correct direction along South Washington Street and potentially reduce the prevalence of U-turns at other locations along the corridor.

Safety Issue #6. Pedestrian Accommodations

Observations:

Audit team members noted that pedestrian signal heads and push-buttons were provided for the southern leg crosswalk, but not for the crosswalks on the eastern and western intersection legs. Where provided, the signal heads do not meet current MUTCD guidelines and do not have count-down timers. It was also noted that the pedestrian push-buttons were out-of-date and do not meet current ADA standards. It was also noted that, where provided, the pedestrian curb ramps did not appear to be ADA compliant and did not have tactile warning pads.

Figure 14 - Non-ADA compliant pedestrian push-button

Potential Enhancements:

1. Consider installing crosswalks across the eastbound and westbound intersection approaches, with ADA-compliant pedestrian signal heads, ramps, and push-buttons, to allow safe pedestrian movement across three of the intersection.

2. Update all pedestrian signal heads to include countdown timers and comply with the most recent design standard. Update all pushbuttons to meet current ADA guidelines.

3. Evaluate existing curb ramps and reconstruct where necessary to meet ADA guidelines.

4. Install detectable warning pads to all accessible ramps.

Safety Issue #7. Lack of Bicycle Accommodations

Observations:

It was noted that there are no bicycle accommodations through the intersection on any roadways. Audit members noted that cyclist traffic was generally low through the area and that there were no recorded bike crashes in the previous 3 years crash data.

Potential Enhancements:

1. Evaluate the feasibility of installing bicycle facilities with the appropriate signage and pavement markings to provide a safe facility for cyclists through the area.

Safety Issue #8. Pavement Condition and Markings

Observations:

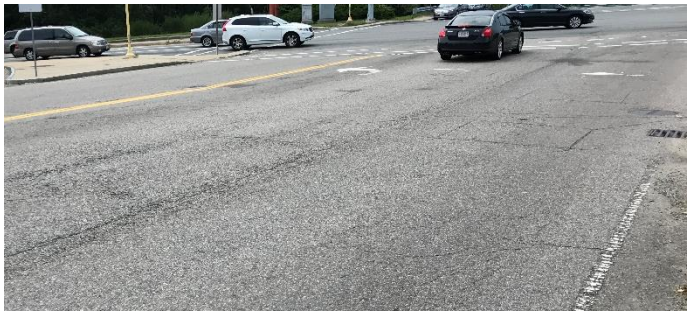


Figure 15 - Missing pavement markings on the westbound Allen Avenue approach

It was observed that pavement markings on all intersection approaches were faded. In the case of the Allen Avenue approaches, team members remarked that the pavement markings were nearly entirely faded and a motorist new to the intersection would likely not know either how many lanes there were in the approach, or what the lane designations would be. This could cause confusion with motorists approaching the intersection unsure of where their lane was, possibly leading to side-swipe, angle, or rear-end crashes. In conjunction with the lack of pavement markings on the intersection approach, it was also noted that a lack of guide lines through the intersection could cause confusion between motorists attempting to make conflicting movements through the large intersection, specifically from the Allen Avenue approaches.

In addition to the faded and/or missing lane designation signs at the intersection, team members also noted a lack of advanced warning lane designation signs as well. This could also contribute to last-minute lane changed approaching the intersection.

Team members noted pavement rutting on all four approaches, including severe pavement rutting on the northbound and southbound intersection approaches. In addition to the pavement rutting, many other cracks, potholes, and uneven pavement patches were noted throughout the intersection. These pavement irregularities could cause the pooling of water or collect ice and snow, which could contribute to future crashes at the intersection.

Potential Enhancements:

1. Consider restriping and repainting all pavement markings throughout the intersection to increase visibility to motorists.

2. Consider installing advanced warning lane designation markings on all intersection approaches to inform motorists to change lanes as required before approaching the intersection.

3. Consider adding skip-lines to help guide turning motorists through the intersection.

4. Evaluate current pavement conditions and consider filling potholes, ruts, and other irregularities, and sealing all cracks to prevent further pavement deterioration.

5. Evaluate current pavement conditions and consider milling and overlaying pavement throughout the intersection to address all pavement irregularities.

South Washington Street at North Attleboro Market Place Access Road

Safety Issue #1. Intersection Control

Observations:

It was observed by several audit members that U-turns are also prevalent at the North Attleboro Market Place Access Road intersection in both directions along South Washington Street, despite a no U-turn restriction in the northbound direction. Similar to the Allen Avenue intersection, audit members noted that the U-turn maneuver is tight, causing vehicles to slow down significantly in order to make the turn and possibly leading to increased rear-end crashes. The U-turn movements could also conflict with right-turn movements off of the North Attleboro Market Place Access Road approaches, leading to increased angle crashes.

Audit team members also noted that clearance times for the intersections seemed to be short, possibly leading to crashes with vehicles attempting to clear the intersection after their signal phase had ended. Vehicles speeding up to clear the intersection could be a contributing factor to the high number of rear-end crashes at the intersection.

Potential Enhancements:

1. Consider restricting U-turns from both the northbound and southbound intersection approaches. Where necessary, install additional signage to help enforce the existing U-turn restrictions

2. Evaluate the existing clearance intervals and adjust if necessary to give motorists a chance to clear the intersection before the next signal phase.

Safety Issue #2. Traffic Signal Equipment

Observations:

An audit team member observed that the overhead wire span for the intersection signal heads appeared to be sagging excessively. The sagging wire could allow signals heads to sway on windy days, decreasing visibility for approaching motorists. The sagging span could also mean that signal heads are mounted too low for good visibility for approaching motorists. In conjunction with the intersection behind at the top of a hill for northbound motorists, this would make the signal heads difficult to see when approaching the intersection behind a large vehicle. Several audit team members also noted that the

Figure 16 - Damaged backplates on signal heads

Emergency Vehicle Preemption (EVP) system did not consistently work for northbound approaching emergency vehicles, likely also due to the low mounted signal heads and the hill. It was also noted that there are no post-mounted auxiliary signals for either of the South Washington Street approaches to help with this issue.

Audit team members also noted that the signal backplates were also damaged or missing on many of the signal heads.

Potential Enhancements:

1. Evaluate the sag in the overhead wire span. If it is deemed excessive, tighten and/or re-hang the span to an appropriate tension.

2. Investigate changing to mast-arm signal heads in place of the overhead wire span. Mast arms should be mounted on the far side of the intersection for northbound and southbound approaches to increase signal visibility for approaching motorists.

3. Evaluate if existing EVP system is working properly, especially for the northbound and southbound South Washington Street approaches, and adjust and/or update the system as necessary.

4. Consider installing post-mounted auxiliary signals for the northbound and southbound approaches to increase signal head visibility for motorists approaching the intersection behind large vehicles.

5. Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. New backplates should include a 3” reflective border in all locations.

Safety Issue #3. Signage

Observations:

It was noted that there are no advanced warning lane designation signs on South Washington Street for either intersection approach, and no advanced warning sign on the eastbound North Attleboro Market Place Access Road approach. This does not allow motorists to know if they are approaching the intersection in the correct lane for their intended direction of travel. Audit team members also noticed that an incorrect advanced warning lane designation sign was provided on the westbound intersection approach. Where the westbound approach is striped and functions as 3 lanes (exclusive

Figure 17 - Eastbound North Attleboro Market Place Access Road lane designation signage that does not match pavement markings

left-turn / left-turn and through / exclusive right-turn), the advances warning sign only shows two lanes (exclusive left-turn / left-turn and through).

Audit team members also noted that there are no guide signs to direct motorists exiting the shopping area to nearby highways. Team members noted that much of the traffic through the area is seasonal only, and many motorists may not be familiar with the area. The additional confusion from attempting to navigate an unfamiliar roadway network may lead to motorists' inattention and contribute to the high number of crashes at the intersection. This could have contributed to crash six in the crash diagram, where a motorists crashed into another vehicle while attempting to reposition in the eastbound intersection approach.

Audit team members also observed that there was missing "YIELD" signage for the northbound right-turn slip lane off of South Washington Street. Team members also noted that the yellow paint on the end of the guardrail was faded, and there were several sign posts that appeared damaged or to be leaning over.

Potential Enhancements:

1. Consider installing advanced lane designation signage along the Route 1 northbound and southbound approaches and the eastbound North Attleboro Market Place Access Road approach give motorists more time to move to the appropriate lane.

2. Consider installing guide signs on the eastbound and westbound intersection approaches to direct motorist to nearby highways and key routes. Guide signs could help direct motorists in the correct direction along South Washington Street and potentially reduce the prevalence of U-turns at other locations along the corridor.

3. Consider replacing the missing Yield sign and yield markings for the channelized northbound right-turn lane to help reduce the risk of a crash where the slip lane merges with North Attleboro Market Place Access Road.

4. Consider installing additional U-turn restriction signage before and at the intersection to increase motorist compliance with the restriction.

5. Evaluate the guardrail along the northbound approach and repaint yellow as necessary.

6. Replace all damaged, leaning, and missing signage at the intersection.

Safety Issue #4. Pedestrian Accommodations

Observations:

Despite a lack of reported pedestrian crashes at the intersection for the 3 years in which crash data was provided, audit team members noted several issues relating to pedestrian safety.

It was first noted that a crosswalk is provided across the western leg of the intersection only. Pedestrian signal heads and push-buttons are only provided across the main trunk of the eastbound approach – there are no signal heads or push-buttons for pedestrians crossing the southbound right-turn slip lane. Where provided, the pedestrian signal heads are not compliant with the latest MUTCD guidelines and do not include count-down timers. Where provided, pedestrian push-buttons are not ADA compliant. Audit team members also noted that the curb ramps did not appear to be ADA compliant and did not have tactile warning pads.

Figure 18 - Missing pedestrian signal heads across the southbound right-turn slip lane

Potential Enhancements:

1. Update all pedestrian signal heads to include countdown timers and comply with the most recent design standard. Update all pushbuttons to meet current ADA guidelines.

2. Evaluate existing curb ramps. Where necessary, modify curb ramps to meet ADA guidelines and add tactile warning pads to all ramps.

3. Consider installing sidewalks and their adjoining crosswalks to the remaining 3 legs of the intersection to give pedestrians a safe crossing route between the shopping centers on all legs of the intersection.

Safety Issue #5. Lack of Bicycle Accommodations

Observations:

It was noted that there are no bicycle accommodations through the intersection on any roadways. Audit members noted that cyclist traffic was generally low through the area.

Potential Enhancements:

1. Evaluate the feasibility of installing bicycle facilities with the appropriate signage and pavement markings to provide a safe facility for cyclists through the area.

Safety Issue #6. Pavement Condition and Markings

Observations:

Audit team members noted that pavement throughout the intersection suffered from rutting, pot-holes, and cracking. It was also observed that pavement markings throughout the intersection were faded and/or missing entirely. This is especially true along the eastbound and westbound intersection approaches, and around some of the median and slip lane islands.

It was noted that no advanced warning pavement markings are provided for any intersection approaches, which in conjunction with the faded pavement markings at the intersection give motorists little indication of which lane they should use for any given direction of travel.

An audit team member also noted that the stop bars on South Washington Street appeared to be painted close to the signal heads, which could make it difficult to see the signal heads from behind a large vehicle.

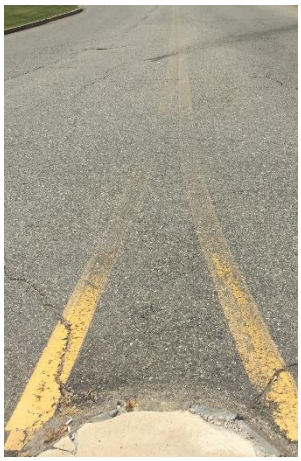


Figure 19 - Faded pavement markings on North Attleboro Market Place Access Road

Potential Enhancements:

1. Consider restriping and repainting all pavement markings throughout the intersection to increase visibility to motorists.

2. Consider adding advanced warning lane designation markings on all intersection approaches to give motorists a chance to change lanes as required before approaching the intersection.

3. Evaluate current pavement conditions and consider filling potholes, ruts, and other irregularities, and sealing all cracks to prevent further pavement deterioration.

4. Evaluate current pavement conditions and consider milling and overlaying pavement throughout the intersection to address all pavement irregularities.

5. Consider relocating the northbound and southbound approaches' stop bars back from the intersection to increase motorist's visibility to the signal heads.

6. Consider adding a yield line on the northbound right-turn slip lane in addition to the aforementioned missing yield sign to increase yielding compliance for right-turning vehicles.

Summary of Road Safety Audit

Based on observations and discussions, the RSA team identified the issues and potential enhancements that could improve safety at the intersections of South Washington Street (U.S. Route 1) at Draper Avenue, South Washington Street (U.S. Route 1) at Allen Avenue, and South Washington Street at North Attleboro Market Place Access Road in North Attleborough, Massachusetts. The timeframe and costs are categorized below in **Table 2.**

Table 2: Estimated Time Frame and Costs Breakdown

Time Frame	
Short-Term	<1 Year
Mid-Term	1-3 Years
Long-Term	>3 Years

Costs	
Low	<$10,000
Medium	$10,001-$50,000
High	>$50,000

Table 3 lists each safety issue and the corresponding potential safety enhancements that were discussed at the audit and within the previous section. The table includes the safety benefit, estimated timeframe for completion, estimated construction cost, and the responsible agency for each observed safety issue and potential safety enhancement. Safety payoff estimates are subjective and may be based on the relative percent of crashes that may be reduced by the enhancement based on known and documented crash reduction factors, if available or estimated crash reduction based on a stated source.

Table 3: Potential Safety Enhancement Summary

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
South Washington Street at Draper Avenue					
Intersection Control	Consider implementing coordinated signal timing at Draper Avenue and along the South Washington Street corridor.	High	Long-term	High	MassDOT
Intersection Control	Review signal timing and phasing – evaluate changes to phasing and timing as appropriate to manage varying traffic patterns.	High	Short-term	Low	MassDOT
Intersection Control	Evaluate the feasibility of dedicated signal phases for vehicles in each Draper Avenue approach.	High	Short-term	Low	MassDOT
Intersection Control	Consider restricting right-turns on red from Draper Avenue.	Medium	Short-term	Low	MassDOT
Intersection Geometry	Investigate the possibility of closing one or more driveways for either of the two gas stations located at the intersection. Furthermore, investigate the possibility of relocating or realigning any of the driveways further from the intersection.	Medium	Long-term	Medium	Private Property Owner(s)
Intersection Geometry	Evaluate the current curb radius on the southeast corner of the intersection, and the frequency of large trucks making the right turn from South Washington Street northbound onto Draper Avenue eastbound. If necessary, increase the curb radius or restripe the double yellow centerline along Draper Avenue to better accommodate the truck turning radius.	Medium	Long-term	Medium	Town of North Attleborough
Intersection Geometry	Evaluate the feasibility of realigning the stop bar on the Draper Avenue westbound approach.	High	Short-term	Low	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Intersection Geometry	Consider trimming back vegetation and/or moving the fence along the Applebee's property.	Low	Short-term	Low	Town of North Attleborough
Traffic Signal Equipment	Replace all non-LED traffic signal bulbs with newer LED bulbs.	High	Short-term	Medium	MassDOT
Traffic Signal Equipment	Evaluate the existing traffic signal bulbs and replace and/or repair the partially lit LED style bulbs.	High	Short-term	Medium	MassDOT
Traffic Signal Equipment	Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. Backplates should include a 3" reflective border in all locations.	High	Short-term	Medium	MassDOT
Speeding	Consider installing additional speed limit signage.	Medium	Short-term	Low	MassDOT
Speeding	Consider increasing enforcement within the study area.	Medium	Short-term	Low	Town of North Attleborough
Pedestrian Accommodations	Consider installing ADA-compliant pedestrian crosswalks, signal heads and push-buttons to formalize pedestrian crossings.	High	Long-term	High	MassDOT
Pedestrian Accommodations	Evaluate the existing curb ramps and repair and/or replace as necessary to meet ADA guidelines. Additionally, in conjunction with enhancement #1, evaluate the need for and location of future pedestrian ramps to facilitate new crosswalks at the intersection.	High	Long-term	High	MassDOT/Town of North Attleborough
Bicycle Accommodations	Evaluate the feasibility of bicycle facilities with the appropriate signage and pavement markings.	High	Long-term	High	MassDOT/Town of North Attleborough

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Lack of Pavement Markings	Restripe all lane lines, shoulder lines, and stop bars.	High	Short-term	Low	MassDOT/Town of North Attleborough
Lack of Pavement Markings	Install lane designation pavement markings.	High	Short-term	Low	MassDOT
Lack of Pavement Markings	Install advanced warning lane designation pavement markings.	High	Short-term	Low	MassDOT
Lack of Pavement Markings	Install skip lines for turning movements off of Draper Avenue.	High	Short-term	Low	MassDOT/Town of North Attleborough
South Washington Street at Allen Avenue					
Intersection Control	Evaluate the current coordinated signal timing and investigate possibilities for adjusting signal timing and phasing.	High	Long-term	High	MassDOT
Intersection Control	Evaluate the existing clearance intervals and adjust if necessary at the intersection.	High	Long-term	High	MassDOT
Intersection Control	Restrict U-turn movements for both Route 1 northbound and southbound approaches.	Medium	Short-term	Low	MassDOT
Intersection Control	Evaluate the feasibility of eliminating the westbound right-turn only phase that is concurrent with the South Washington Street left-turn phases, and restricting right-turn on red movements. Will require additional study to evaluate impact on traffic operations.	Medium	Short-term	Low	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Intersection Geometry	Consider extending the southbound left-turn lane.	High	Long-term	High	MassDOT
Intersection Geometry	Consider coordinating with the owner of the auxiliary parking lot to restrict/relocate/reconfigure the auxiliary parking lot exit for the Emerald Square Mall.	Medium	Mid-term	Medium	Private Property Owner(s)
Intersection Geometry	Evaluate the median design along the Route 1 southbound approach and consider replacing the current buried end with a crash cushion.	High	Short-term	Low	MassDOT
Intersection Geometry	Install skip lines for turning movements off of Allen Avenue	High	Short-term	Low	MassDOT/Town of North Attleborough
Intersection Sight Distance	Trim back overgrown vegetation along the south side of the Allen Avenue eastbound approach.	Low	Short-term	Low	Town of North Attleborough
Intersection Sight Distance	Evaluate existing signal placement and consider moving signal equipment to provide better visibility to approaching eastbound motorists.	High	Mid-term	High	MassDOT
Traffic Signal Equipment	Replace all non-LED traffic signal bulbs with newer LED bulbs.	High	Short-term	Low	MassDOT
Traffic Signal Equipment	Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. Backplates should include a 3” reflective border in all locations.	High	Short-term	Low	MassDOT
Traffic Signal Equipment	Consider installing post-mounted auxiliary signal heads for the northbound and southbound approached.	High	Short-term	Medium	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Traffic Signal Equipment	Consider upgrading the existing wire-span mounted signal head to mast-arm mounted signal heads.	High	Mid-term	High	MassDOT
Signage	Consider installing advance warning lane designation signage.	Medium	Short-term	Low	MassDOT
Signage	Consider installing advanced warning and increase intersection signage for the no U-turn restriction for the Route 1 southbound approach.	Medium	Short-term	Low	MassDOT
Signage	Consider moving the right-turn lane designation sign to be in front of the existing tree to allow approaching motorists to see the sign, or trimming back the tree to provide visibility to the existing sign.	Medium	Short-term	Low	MassDOT
Signage	Consider replacing the existing Allen Avenue street sign with a larger, more prominent street sign.	Medium	Short-term	Low	Town of North Attleborough
Signage	Consider replacing the faded “DO NOT ENTER” sign and adding a yield sign for the northbound right-turn slip lane	Medium	Short-term	Low	Town of North Attleborough
Signage	Consider installing guide signs on the eastbound and westbound intersection approaches to direct motorist to nearby highways and key routes.	Medium	Short-term	Low	Town of North Attleborough
Pedestrian Accommodations	Consider installing crosswalks across the eastbound and westbound approaches, with ADA-compliant pedestrian signal heads, ramps, and push-buttons.	High	Long-term	High	MassDOT/Town of North Attleborough
Pedestrian Accommodations	Update all pedestrian signal heads to include countdown timers and comply with the most recent design standards. Update all pushbuttons to meet current ADA guidelines.	High	Long-term	High	MassDOT/Town of North Attleborough

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Pedestrian Accommodations	Evaluate existing curb ramps and reconstruct where necessary to meet ADA guidelines.	High	Long-term	High	MassDOT/Town of North Attleborough
Pedestrian Accommodations	Install detectable warning pads to all accessible ramps.	High	Short-term	Low	MassDOT/Town of North Attleborough
Bicycle Accommodations	Evaluate the feasibility of installing bicycle facilities with the appropriate signage and pavement markings.	High	Long-term	High	MassDOT
Pavement Condition and Markings	Consider restriping and repainting all pavement markings.	High	Short-term	Low	MassDOT/Town of North Attleborough
Pavement Condition and Markings	Consider installing advanced warning lane designation markings on all approaches.	High	Short-term	Low	MassDOT
Pavement Condition and Markings	Consider adding skip-lines to help guide turning motorists through the intersection.	High	Short-term	Low	MassDOT/Town of North Attleborough
Pavement Condition and Markings	Evaluate current pavement conditions and consider filling potholes, ruts, other irregularities, and sealing all cracks.	High	Short-term	Low	MassDOT
Pavement Condition and Markings	Evaluate current pavement conditions and consider milling and overlaying pavement throughout intersection.	High	Mid-term	High	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
South Washington Street at North Attleboro Market Place Access Road					
Intersection Control	Consider restricting U-turns from both the northbound and southbound approaches.	Medium	Short-term	Low	MassDOT
Intersection Control	Evaluate the existing clearance intervals and adjust if necessary.	High	Long-term	High	MassDOT
Traffic Signal Equipment	Evaluate the sag in the overhead wire span and either tighten and/or rehang to appropriate tension if deemed currently excessive.	Medium	Mid-term	Medium	MassDOT
Traffic Signal Equipment	Investigate changing to mast-arm signal heads in place of the overhead wire span to increase signal visibility for approaching motorists.	High	Long-term	High	MassDOT
Traffic Signal Equipment	Evaluate if existing EVP system is working properly, especially for the northbound and southbound South Washington Street approaches, and adjust and/or update the system as necessary.	High	Mid-term	Medium	MassDOT
Traffic Signal Equipment	Consider installing post-mounted auxiliary signals for the northbound and southbound approaches.	High	Short-term	Medium	MassDOT
Traffic Signal Equipment	Replace the broken or missing backplates at the necessary signal heads to increase signal visibility. Backplates should include a 3” reflective border in all locations.	High	Short-term	Low	MassDOT
Signage	Consider installing advance lane designation signage along the northbound, southbound, and eastbound approaches.	Medium	Short-term	Low	MassDOT
Signage	Consider installing guide signs.	Medium	Short-term	Low	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Signage	Consider replacing the missing Yield sign and yield markings the northbound channelized right-turn lane.	Medium	Short-term	Low	MassDOT
Signage	Consider installing additional U-turn restriction signage.	Medium	Short-term	Low	MassDOT
Signage	Evaluate the guardrail along the northbound approach and repaint yellow.	Medium	Short-term	Low	MassDOT
Signage	Replace all damaged, leaning, and missing signage.	Medium	Short-term	Low	MassDOT/Town of North Attleborough
Pedestrian Accommodations	Update all pedestrian signal heads to include countdown timers and comply with the most recent design standards. Update all pushbuttons to meet current ADA guidelines.	High	Long-term	High	MassDOT/Town of North Attleborough
Pedestrian Accommodations	Evaluate existing curb ramps and reconstruct where necessary to meet ADA guidelines.	High	Long-term	High	MassDOT/Town of North Attleborough
Pedestrian Accommodations	Consider installing sidewalks and their adjoining crosswalks to the remaining 3 legs of the intersection.	High	Long-term	High	MassDOT/Town of North Attleborough
Bicycle Accommodations	Evaluate the feasibility of installing bicycle facilities with the appropriate signage and pavement markings.	High	Long-term	High	MassDOT
Pavement Condition and Markings	Consider restriping and repainting all pavement markings.	High	Short-term	Low	MassDOT/Town of North Attleborough
Pavement Condition and Markings	Consider installing advanced warning lane designation markings on all approaches.	High	Short-term	Low	MassDOT
Pavement Condition and Markings	Evaluate current pavement conditions and consider filling potholes, ruts, other irregularities, and sealing all cracks.	High	Short-term	Low	MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Pavement Condition and Markings	Evaluate current pavement conditions and consider milling and overlaying pavement throughout intersection.	High	Mid-term	High	MassDOT
Pavement Condition and Markings	Consider relocating the northbound and southbound approaches' stop bars back from the intersection.	High	Short-term	Low	MassDOT
Pavement Condition and Markings	Consider adding a yield line on the northbound right-turn slip lane.	High	Short-term	Low	MassDOT

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

North Attleborough, MA

Route 1 at Draper Avenue

Route 1 at Allen Avenue (north and south)

Meeting Location: North Attleborough Town Hall
Room - TBD
43 South Washington Street
North Attleborough, MA
Wednesday, August 2nd, 2016
9:00 AM – Noon

Type of meeting:	**Road Safety Audit**
Attendees:	**Invited Participants to Comprise a Multidisciplinary Team**
Please bring:	**Thoughts and Enthusiasm!!!**
9:00 AM	**Welcome and Introductions**
9:15 AM	**Discussion of Safety Issues** • Crash history,– provided in advance • Existing Geometries and Conditions
9:45 AM	**Site Visit** • Drive to the study area. • As a group, identify areas for improvement
11:15 AM	**Discussion of Potential Improvements** • Return to the Town Hall • Discuss observations and finalize safety issue areas • Discuss potential improvements and finalize recommendations
Noon	**Adjourn for the Day – but the RSA has not ended**

Instructions for Participants:

- **Before attending the RSA on August 2nd, participants are encouraged to drive/walk through the intersection and complete/consider elements on the RSA Prompt List with a focus on safety.**
- **All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.**
- **After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.**

Appendix B. RSA Audit Team Contact List

Invited Audit Team Members

Date: August 2, 2017 Location: South Washington Street at Draper Avenue,
South Washington Street at Allen Avenue, and
South Washington Street at North Attleboro Market Place Access Road
in North Attleborough, MA

Audit Team Members	Agency/Affiliation	Email Address	Phone Number
Elsa Chan	MassDOT Safety Engineering Section	elsa.chan@state.ma.us	857-368-9648
Michelle Deng	MassDOT	michelle.deng@state.ma.us	857-368-9637
Edward Feeney	MassDOT District 5 Traffic	edward.feeney@state.ma.us	508-889-4892
Pamela Haznar	MassDOT District 5 Traffic	pamela.haznar@dot.state.ma.us	508-884-4260
Richard Fries	MassBike	richard@massbike.org	617-542-2453
Wendy Landman	WalkBoston	wlandman@walkboston.com	617-367-9255
Stephen Boudreau	Vanesse & Associates	sboudreau@rdva.com	978-474-8800
Michael Brousseau	North Attleborough Fire Department	mbrousseau@nattleboro.com	508-669-0140
John Reilly	North Attleborough Police Department	jreilly@nattleboro.com	508-695-1212
Nancy Runkle	North Attleborough Planning Department	nrunkle@nattleboro.com	508-699-0116
Mark Hollowell	North Attleborough Department of Public Works	mhollowell@nattleboro.com	508-695-9621
Lisa Estrela Pedro	Southern Regional Planning & Economic Development District	lestrala@srpedd.org	508-824-1367
Guoqiang Li	Southern Regional Planning & Economic Development District	gli@spredd.org	508-824-1367
Robert Hicks	TranSystems	rwhicks@transystems.com	857-453-5517
Shawn Holland	MassDOT	shawn.holland@state.ma.us	617-973-7242
Jason Walters	MassDOT District 5	jason.walters@state.ma.us	508-884-4370
Michael Weber	North Attleborough Department of Public Works	mweber@nattleboro.com	508-695-9621
Barbara Lachance	MassDOT District 5	barbara.lachance@state.ma.us	508-884-4260
Shaun Kelly	Vanesse & Associates	skelly@rdva.com	978-474-8800
Heather Georgallas	Toole Design Group	HGeorgallas@tooledesign.com	617-619-9910
Preston Buehrer	Toole Design Group	PBuehrer@tooledesign.com	617-619-9910

Appendix C. Detailed Crash Analysis

massDOT
Massachusetts Department of Transportation
Highway Division

Toole Design Group
2 OLIVER STREET SUITE 305
BOSTON MASSACHUSETTS 02109
PLANNING | ENGINEERING
617.619.9910

COLLISION DIAGRAM

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non–Involved Vehicle
- Pedestrian
- Bicycle
- Animal
- Parked Vehicle
- Fixed Object

TYPE OF CRASH

- Head on
- Rear End
- Angle
- Turning Movement
- Sideswipe
- Out of Control
- Night Time Crash

SEVERITY

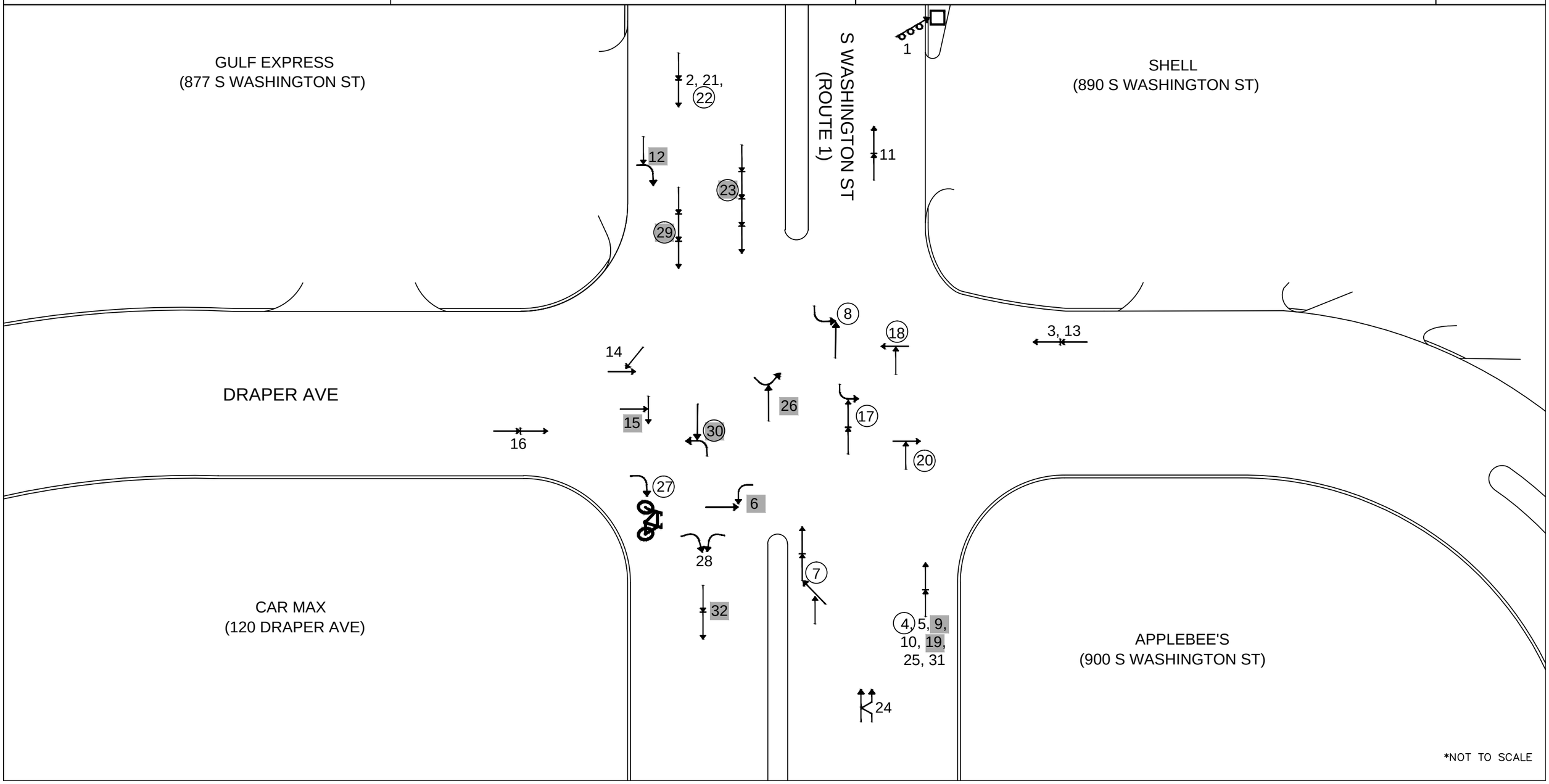
- Injury
- Fatal

NORTH ATTLEBOROUGH, MA

REGION: SRPEDD

SOUTH WASHINGTON STREET (ROUTE 1) & DRAPER AVENUE

TIME PERIOD ANALYZED: 2014–2016
SOURCE OF CRASH REPORTS: NORTH ATTLEBORO POLICE DEPARTMENT & MASSDOT
DATE PREPARED: 07/20/2017
PREPARED BY: J. BASTARDO/T. WONG



Crash Data Summary Table (2014-2016)

Town of North Attleborough: S Washington Street (Route 1) at Draper Avenue

Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages				Comment
									D1	D2	D3	D4	
1	2/15/14	Saturday	5:14 PM	Single Vehicle Crash	Daylight	Snow	Snow	Driving too fast for condition	55				NB Veh on S Washington near shell station lost control of vehicle (snow) and swerved off road and struck a snow bank
2	2/18/14	Tuesday	3:25 PM	Rear-end	Daylight	Snow	Snow		51	29			(No detailed narrative provided)
3	4/19/14	Saturday	12:13 PM	Rear-end	Daylight	Clear	Dry	Inattention	37	Unk			WB V1 on Draper rear ended WB V2 waiting at S Washington Light
4	5/4/14	Sunday	2:00 PM	Sideswipe, same direction	Daylight	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent or aggressive manner; Emotional	49	64			NB V1 on S Washington stopped closely behind NB V2 at Draper light, driver of V2 got out of car and started yelling and hitting V1 driver, V1 tried to flee and struck V2
5	5/6/14	Tuesday	4:46 PM	Rear-end	Daylight	Clear	Dry	Inattention, Distracted	17	49			NB V1 on S Washington rear ended NB V1 that was slowing to a stop at Draper intersection
6	8/22/14	Friday	10:07 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	16	18			V1 was attempting a left onto S Washington SB when she turned into V2
7	9/4/14	Thursday	2:03 PM	Angle	Daylight	Clear	Dry		32	33	22	38	NB V1 on S Washington approaching Draper in right lane cut over to left lane and was struck by NB V2 in middle lane, causing V1 to strike NB V3 in left lane, V3 then rear ended NB V4
8	11/19/14	Wednesday	8:27 AM	Angle	Daylight	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent or aggressive manner; Disregarded traffic signs, signals, road markings	32	87			SB V1 on S Washington turning left onto Draper collided with NB V2
9	11/24/14	Monday	7:27 PM	Rear-end	Dark - lighted roadway	Clear	Wet	Distracted	42	25			NB V1 on S Washington stopped at Draper rear ended by NB V2 who was looking down
10	12/24/14	Wednesday	11:54 AM	Rear-end	Daylight	Cloudy/Rain	Wet		27	Unk			NB V1 on S Washington stopped at Draper rear ended by NB V2. Hit and Run
11	12/27/14	Saturday	12:33 PM	Rear-end	Daylight	Clear	Dry	Followed too closely	40	55			NB V1 on S Washington near 890 rear ended NB V2
12	3/21/15	Saturday	8:52 PM	Angle	Dark - lighted roadway	(Cloudy/Rain)	Wet	Failed to yield right of way; Inattention	42	21			V1 turning right out of 877 S Washington driveway struck by SB V2
13	4/25/2015	Saturday	12:34 PM	Rear-end	Daylight	Clear	Dry	Followed too closely	44	20			WB V1 stopped on Draper at S Washington waiting to turn left rear ended by WB V2 when light turned green who planned to turn right
14	5/2/2015	Saturday	9:00 AM	Angle	Daylight	Clear	Dry	Driving too fast for condition; Failure to keep in proper lane or running off road	17	47			SB V1 on S Washington in left lane sped up to merge right to turn right onto Draper and struck EB V2 stopped on Draper
15	5/23/15	Saturday	9:28 PM	Angle	Dark - lighted roadway	Clear	Dry	Disregarded traffic signs, signals, road markings; Failed to yield right of way	18	20			SB V1 on S Washington passing through Draper intersection struck by EB V2 on Draper that ran red
16	8/1/15	Saturday	12:08 PM	Rear-end	Daylight	Clear	Dry	Inattention	22	46			EB V1 stopped on Draper St at S Washington intersection rear ended by EB V2
17	8/4/15	Tuesday	1:53 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	52	78	27		NB V1 on S Washington trhough Draper intersection cut off by SB V3 turning left. V1 was then rear ended by NB V2
18	9/26/15	Saturday	5:45 PM	Angle	Daylight	Clear	Dry	Inattention	63	25			NB V1 on S Washington ran red light in Draper intersection and hit WB V2
19	11/12/15	Thursday	5:22 PM	Rear-end	Dark - lighted roadway	Rain	Wet	Inattention	23	57			NB V1 on S Washington approaching Draper rear ended NB V2 stopped at light
20	6/4/16	Saturday	7:45 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings; Failed to yield right of way	33	61			EB V1 on Draper traveling through S Washington intersection struck by NB V2
21	7/8/16	Friday	5:52 PM	Rear-end	Daylight	Clear	Dry		33	Unk			(No detailed narrative provided)
22	8/6/16	Saturday	1:44 PM	Rear-end	Daylight	Clear	Dry		47	60			SB V1 on S Washington stopped at Draper intersection rear ended by SB V2
23	8/26/16	Friday	8:58 PM	Rear-end	Dark - lighted roadway	Clear	Dry		31	30	22	31	SB V1 on S Washington approaching Draper intersection rear ended SB V2 when brakes fail. V2 rear ended SB V3. V3 rear ended SB V4
24	8/29/16	Monday	5:32 PM	Sideswipe, same direction	Daylight	Clear	Dry	Inattention	18	21			NB V2 near 900 S Washington attempted to merge into left lane and struck NB V1
25	9/12/16	Monday	8:08 AM	Rear-end	Daylight	Cloudy	Dry	Inattention; Followed too closely	52	50			NB V1 on S Washington approaching Draper stopped and was rear ended by NB V2
26	9/13/16	Tuesday	10:20 PM	Angle	Dark - lighted roadway	Clear	Dry		67	22			SB V1 on S Washington at Draper attempted a U-turn on red light and was struck by NB V2
27	11/11/16	Friday	8:36 AM	Angle	Daylight	Clear	Dry		Unk	Unk			NB cyclist traveling on SB side of S Washington crossing Draper collided with EB Veh on Draper making a right turn onto S Washington. Hit and Run
28	11/26/16	Saturday	11:41 AM	Angle	Daylight	Clear	Dry	Failure to yield right of way; Unknown	35	64			EB V1 on Draper turning right onto S Washington collides with WB V2 turning left into same lane
29	11/26/16	Saturday	4:54 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Inattention	29	18	43		SB V1 on S Washington approaching Draper intersection rear ended SB V2, V2 then rear ended SB V3
30	11/27/16	Sunday	8:25 PM	Head-on	Dark - lighted roadway	Clear	Dry		24	23			NB V1 on S Washington attempting to turn left was struck on the passenger side by SB V2
31	12/1/16	Thursday	6:51 AM	Rear-end	Daylight	Clear	Wet		46	66			NB V1 on S Washington approaching Draper rear ended NB V2 stopped at light. V1 stated it was hard to stop on wet road

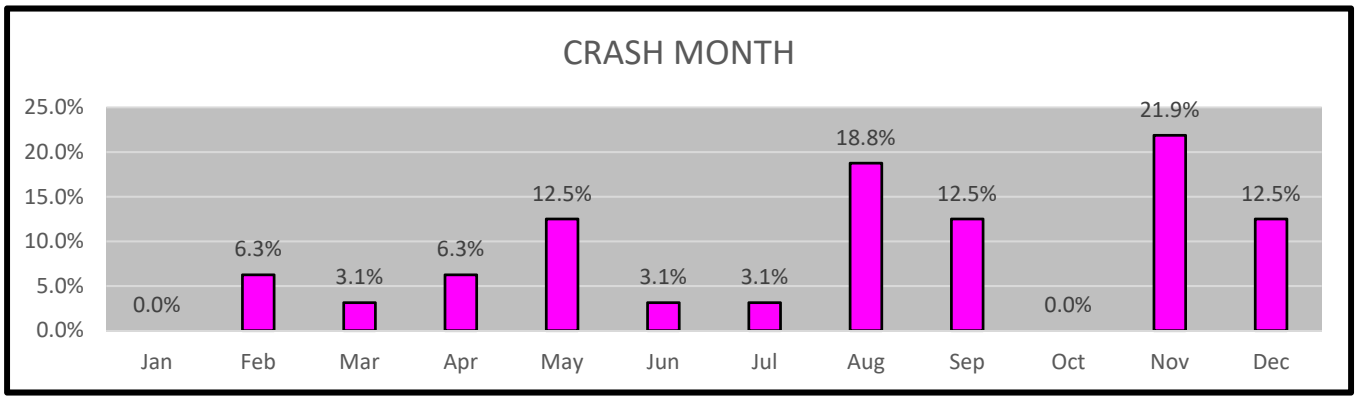
Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages				Comment
									D1	D2	D3	D4	
32	12/23/16	Friday	4:51 PM	Rear-end	Dark - lighted roadway	Clear	Dry		35	32			SB V1 on S Washington south of the Draper intersection was unable to stop in time and rear ended SB V2

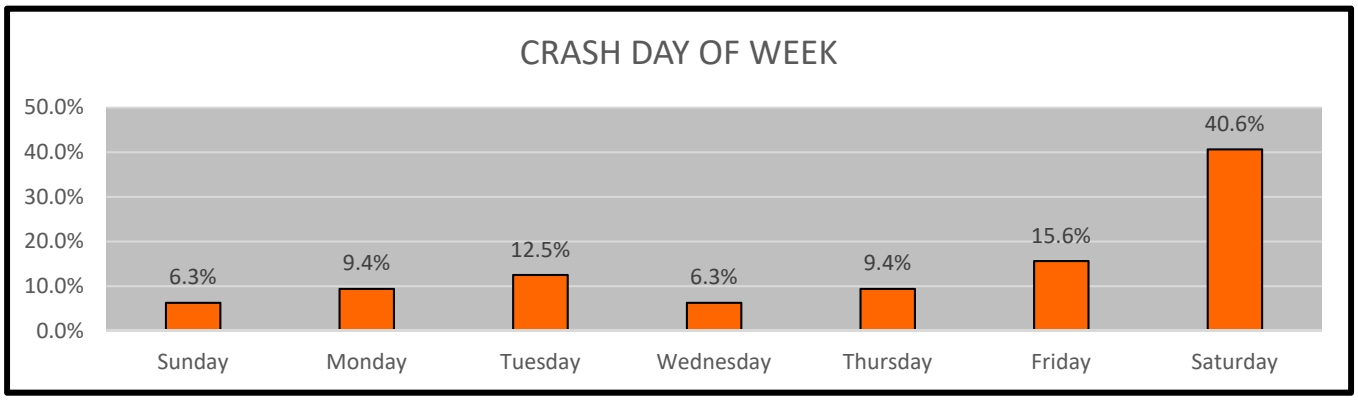
*(Parenthesis) - Field manually entered due to being left blank using online data or overided based on crash narrative

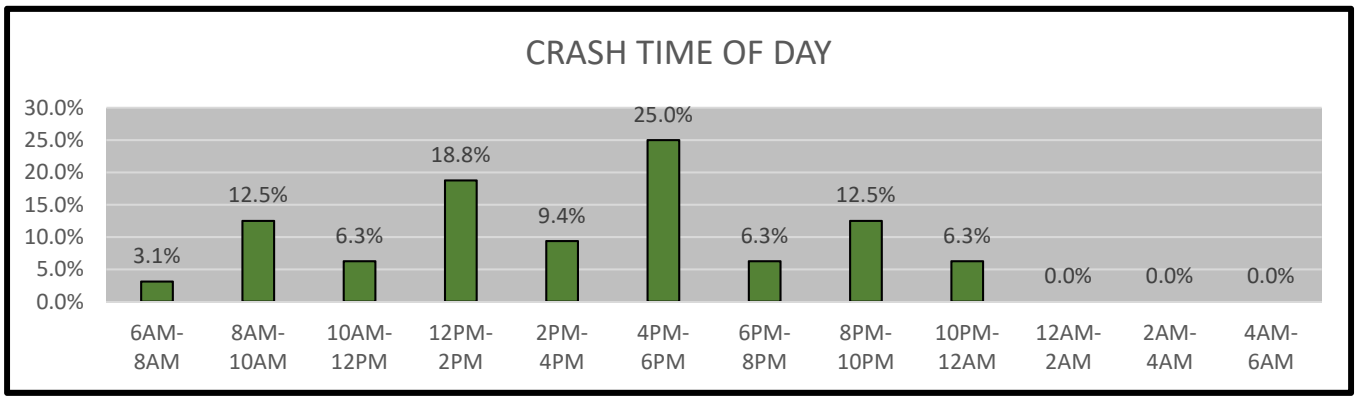
**Courtesy Crash – A crash that occurs when a vehicle traveling along the main roadway yields to a turning vehicle attempting to cross multiple lanes of traffic, however a second vehicle traveling in the adjacent travel lane does not yield, causing a crash.

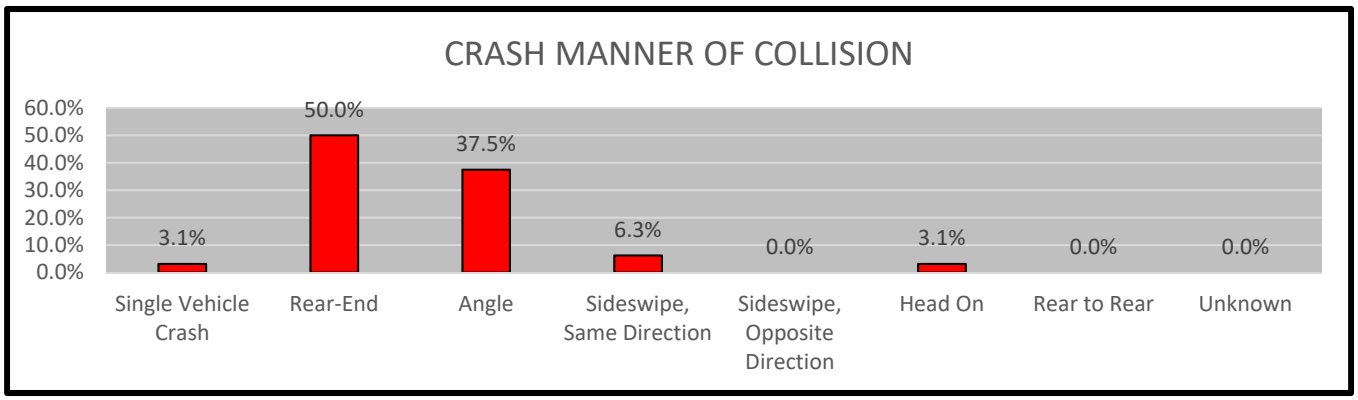
Crash Data Summary Tables and Charts (2014-2016)

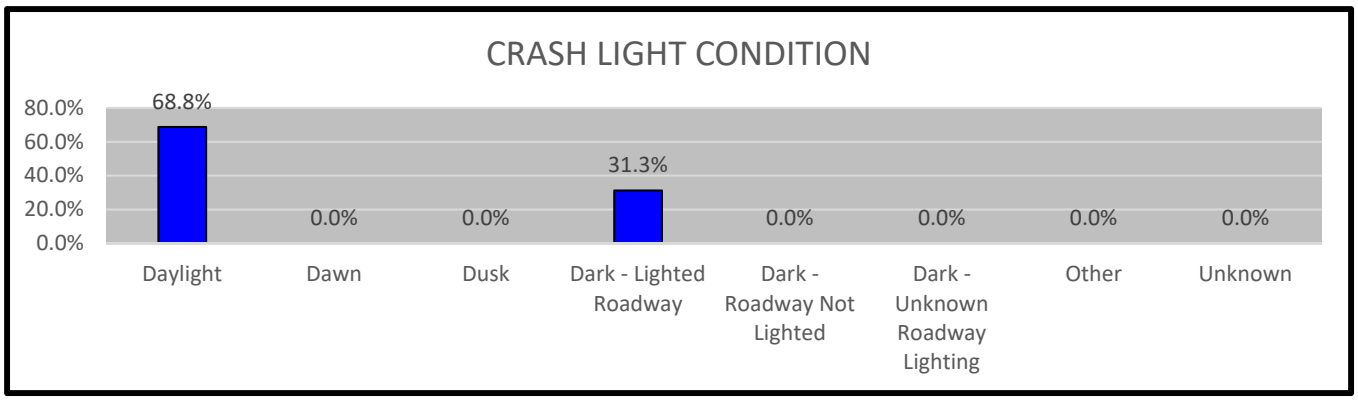
S Washington Street at Draper Avenue, North Attleborough, MA

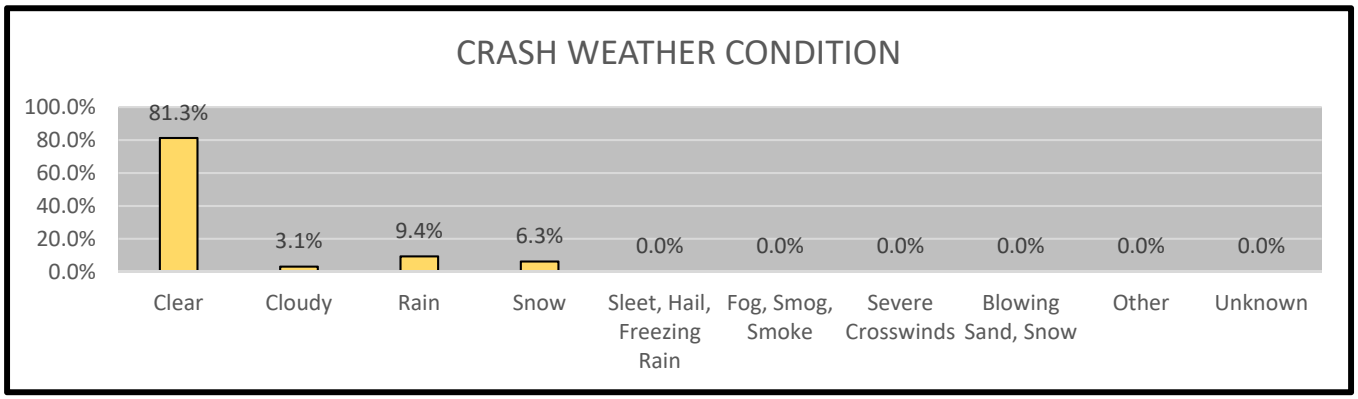


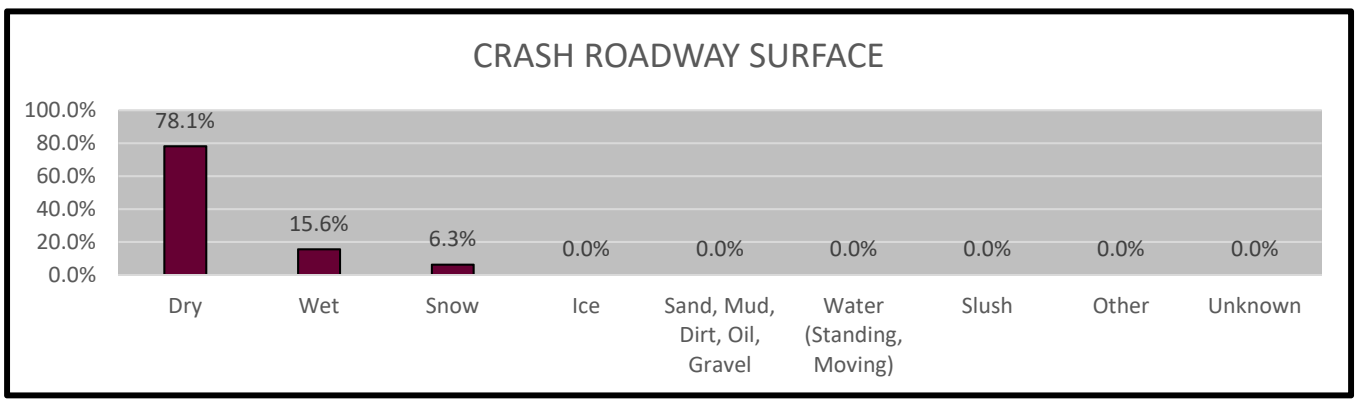


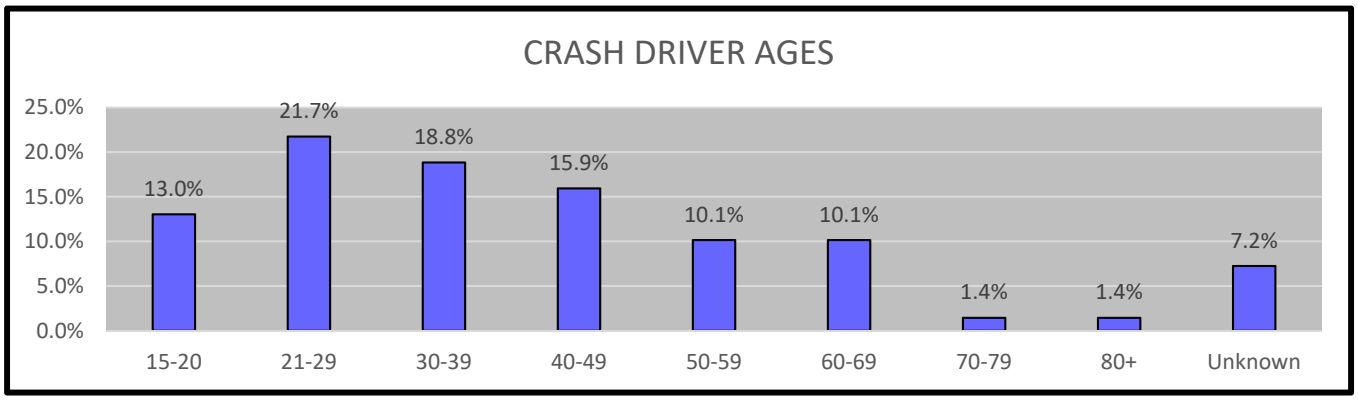





CRASH LIGHT CONDITION
80.0%
60.0%
40.0%
20.0%
0.0%
68.8%
0.0%
0.0%
31.3%
0.0%
0.0%
0.0%
0.0%
Daylight
Dawn
Dusk
Dark - Lighted Roadway
Dark - Roadway Not Lighted
Dark - Unknown Roadway Lighting
Other
Unknown


CRASH WEATHER CONDITION
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
81.3%
3.1%
9.4%
6.3%
0.0%
0.0%
0.0%
0.0%
0.0%
0.0%
Clear
Cloudy
Rain
Snow
Sleet, Hail, Freezing Rain
Fog, Smog, Smoke
Severe Crosswinds
Blowing Sand, Snow
Other
Unknown


CRASH ROADWAY SURFACE
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
78.1%
15.6%
6.3%
0.0%
0.0%
0.0%
0.0%
0.0%
0.0%
Dry
Wet
Snow
Ice
Sand, Mud, Dirt, Oil, Gravel
Water (Standing, Moving)
Slush
Other
Unknown


CRASH DRIVER AGES
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
13.0%
21.7%
18.8%
15.9%
10.1%
10.1%
1.4%
1.4%
7.2%
15-20
21-29
30-39
40-49
50-59
60-69
70-79
80+
Unknown

massDOT
Massachusetts Department of Transportation
Highway Division

Toole Design Group
2 OLIVER STREET SUITE 305
BOSTON MASSACHUSETTS 02109
PLANNING / ENGINEERING
617.619.9910

COLLISION DIAGRAM

SYMBOLS
- Moving Vehicle
- Backing Vehicle
- Non–Involved Vehicle
- Pedestrian
- Bicycle
- Animal
- Parked Vehicle
- Fixed Object

TYPE OF CRASH
- Head on
- Rear End
- Angle
- Turning Movement
- Sideswipe
- Out of Control
- Night Time Crash

SEVERITY
- Injury
- Fatal

NORTH ATTLEBOROUGH, MA

REGION: SRPEDD

SOUTH WASHINGTON STREET (ROUTE 1) & ALLEN AVENUE

TIME PERIOD ANALYZED: 2014–2016
SOURCE OF CRASH REPORTS: NORTH ATTLEBORO POLICE DEPARTMENT & MASSDOT
DATE PREPARED: 07/20/2017
PREPARED BY: J. BASTARDO/T. WONG

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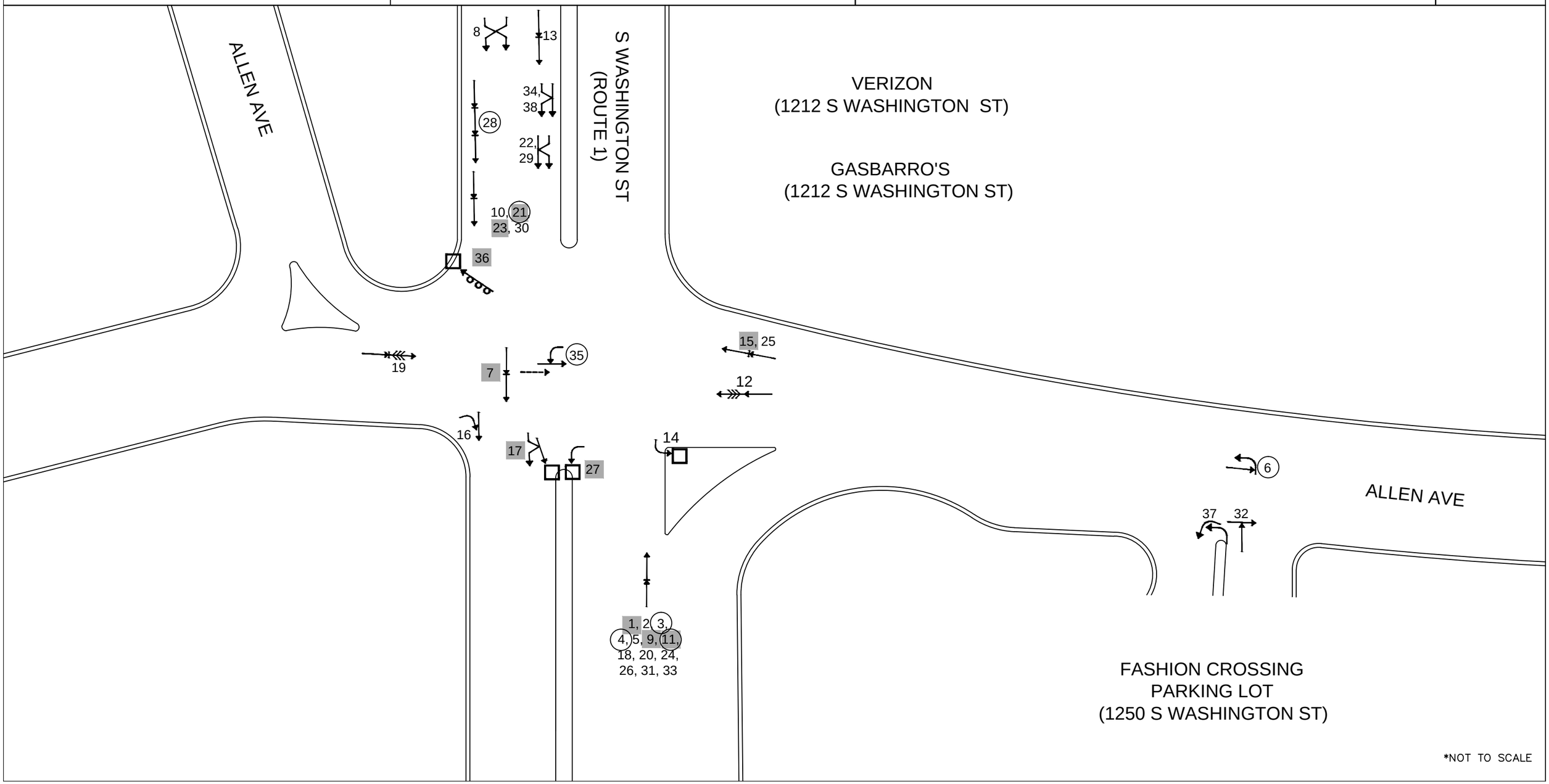


*NOT TO SCALE

Crash Data Summary Table (2014-2016)

Town of North Attleborough: S Washington (Route 1) at Allen Avenue (North and South)

Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comment
									D1	D2	D3	
1	2/28/14	Friday	9:39 PM	Rear-end	Dark - lighted roadway	Clear	Dry		57	17		NB V1 on S Washington rear-ended V2 before the intersection with Allen
2	5/17/14	Saturday	1:40 PM	Rear-end	Daylight	Clear	Dry	Followed too closely	20	23		NB V1 on S Washington was following NB V2 too closely and rear ended V2 stopping at Allen intersection
3	6/29/14	Sunday	11:58 AM	Rear-end	(Daylight)	(Clear)	(Dry)	Illness, Inattention	46	54		NB V1 on S Washington stopped at Allen intersection rear ended by NB V2 who sneezed at the time of the crash
4	10/9/14	Thursday	5:10 PM	Rear-end	Daylight	Clear	Dry	Distracted	26	25		NB V1 on S Washington got distracted while waiting at Allen intersection and rear-ended NB V2
5	10/15/14	Wednesday	11:07 AM	Rear-end	Daylight	Clear	Dry		51	47		NB V1 on S Washington stopped at Allen rear ended by NB V2
6	10/19/14	Sunday	2:07 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	18		NB V1 exiting 1250 S Washington driveway turning left onto Allen struck by EB V2 on Allen
7	11/23/14	Sunday	10:09 PM	Rear-end	Dark - lighted roadway	Clear	Wet		39	Unk		SB V1 on S Washington traveling through Allen intersection rear-ended by SB V2. Hit and run
8	12/9/14	Tuesday	3:22 PM	Sideswipe - same direction	Daylight	Cloudy	Wet	Inattention/Failure to keep in proper lane or running off road	19	54		SB V1 on S Washington near 1212 traveling in left lane collided with SB V2 in right lane when both attempted to merge into the middle lane
9	12/12/14	Friday	5:27 PM	Rear-end	Dark - unknown roadway lighting	Clear	Dry	Inattention	45	Unk		NB V1 on S Washington stopping at Allen intersection rear ended NB V2 stopped at light
10	12/15/14	Monday	11:57 AM	Rear-end	Daylight	Clear	Dry	Inattention	54	Unk		SB V1 on S Washington approaching Allen attempting to merge into left lane rear ended SB V2
11	12/16/14	Tuesday	8:02 PM	Rear-end	Dark - lighted roadway	Cloudy	Dry	Followed too closely	60	29		NB V1 stopped on S Washington at Allen rear ended by NB V2
12	12/22/14	Monday	2:10 PM	Rear-end	Daylight	Cloudy	Wet	Inattention	33	53		WB V1 on Allen near S Washington backed up in traffic and struck WB V2
13	12/22/14	Monday	3:22 PM	Rear-end	Daylight	Cloudy/Rain	Wet		Unk	Unk		SB V1 on S Washington near 1200 rear ended by SB V2. Hit and Run
14	2/17/15	Tuesday	3:14 PM	Single Vehicle Crash	Daylight	Cloudy	Wet	Other improper action	70			(No detailed narrative provided)
15	2/23/15	Monday	6:41 PM	Rear-end	Dark - lighted roadway	Clear	Dry		45	27		WB V1 on Allen stopped at S Washington intersection rear ended by WB V2 when light turned green
16	3/28/15	Saturday	1:38 PM	Angle	Daylight	Clear	Snow/Rain		51	Unk		SB V1 on S Washington traveling through Allen intersection struck by EB V2 on Allen taking a right on red
17	4/5/15	Sunday	7:37 PM	Sideswipe, same direction	Dark - lighted roadway	Rain	Wet		18	Unk		SB V1 in middle lane of S Washington sideswiped by SB V2 in right lane attempting to merge into middle lane, V1 veered left and struck utility pole
18	5/15/2015	Friday	12:44 PM	Rear-end	Daylight	Clear	Dry	Distracted	44	42		NB V1 on S Washington stopped at Allen intersection rear ended by NB V2 who was distracted by a butterfly in the vehicle
19	5/23/15	Saturday	12:08 PM	Rear-end	Daylight	Clear	Dry	Illness	25	23		EB V1 operator was driving ill & vomiting stopped on Allen at Washington and accidentally used reverse, hitting EB V2 while waiting to take a left
20	6/26/15	Friday	4:16 PM	Rear-end	Daylight	Clear	Dry		39	47		NB V1 on S Washington stopped at the intersection with Allen rear ended by NB V2 that unintentionally rolled forward
21	9/25/15	Friday	8:25 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Unknown	53	50		SB V1 on S Washington stopped at Allen intersection rear ended by SB V2
22	11/3/15	Tuesday	2:06 PM	Sideswipe, same direction	Daylight	Clear	Dry	Failed to yield right of way; Failure to keep in proper lane or running off road	17	22		SB V1 on S Washington approaching Draper in middle lane struck by SB V2 in left lane attempting to merge right
23	11/23/15	Monday	7:32 PM	Rear-end	Dark - lighted roadway	Cloudy	Dry	Other improper action	23	25		SB V1 stopped on S Washington at Allen rear ended by SB V2 when light turned green
24	12/13/15	Sunday	3:11 PM	Rear-end	Daylight	Clear	Dry		20	35		NB V1 on S Washington slowing down approaching Allen intersection rear ended by NB V2
25	1/4/16	Monday	12:31 PM	Rear-end	Daylight	Cloudy	Dry		36	35		WB V1 on Allen approaching S Washington intersection rear ended WB V2
26	1/10/16	Sunday	3:20 PM	Rear-end	Daylight	Clear	Dry		24	52		NB V1 on S Washington approaching Allen intersection rear-ended NB V2
27	2/27/16	Saturday	10:18 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry		38			WB V1 on Allen took a left onto S Washington SB and collided with a sign on the median while looking down at radio
28	4/23/16	Saturday	10:17 AM	Rear-end	Daylight	Rain	Wet	Inattention	34	38		SB V1 on S Washington approaching Allen got distracted by group picketing on side of roadway and rear ended SB V2, V2 then rear ended SB V3

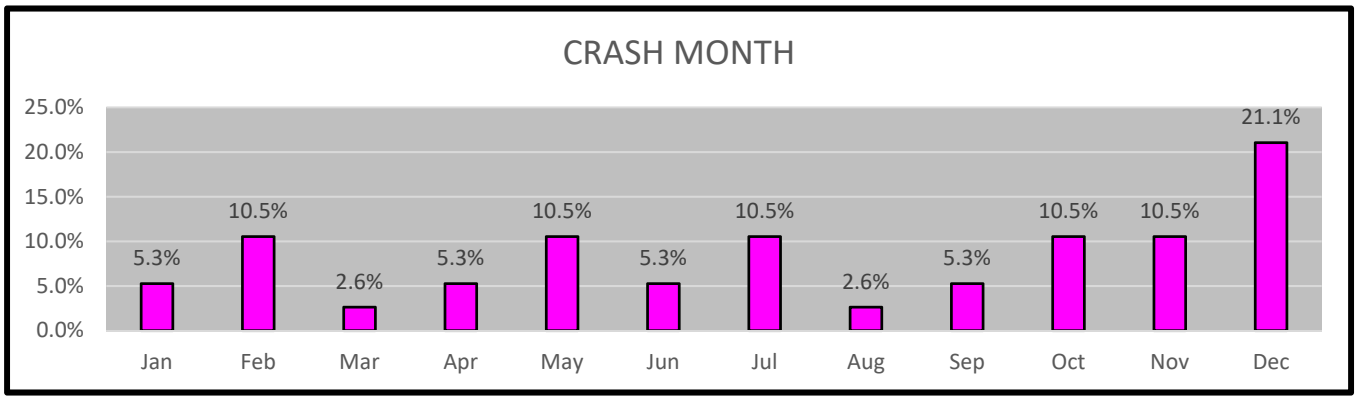
Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comment
									D1	D2	D3	
29	5/7/16	Saturday	2:40 PM	Sideswipe, same direction	Daylight	Clear	Dry		50	65		SB V2 on S Washington approaching Allen intersection attempting to change lanes into middle lane struck SB V1
30	7/9/16	Saturday	10:51 AM	Rear-end	Daylight	Cloudy	Dry	Distracted	32	50		SB V2 on S Washington stopped at Allen intersection rear ended by V1 who got distracted by the radio
31	7/10/16	Sunday	11:10 AM	Rear-end	Daylight	Cloudy	Dry		Unk	28		NB V1 on S Washington stopped at Allen intersection rear ended by NB V2 whose his foot slipped off the brake
32	7/13/16	Wednesday	4:10 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	44	85		EB V1 on Allen toward plaza struck by NB V2 exiting Fashion Crossing Plaza driveway
33	7/17/16	Sunday	6:02 PM	Rear-end	Daylight	Clear	Dry		43	40		NB V1 on S Washington approaching Allen intersection rear ended NB V2
34	8/5/16	Friday	12:30 PM	Sideswipe, same direction	Daylight	Clear	Dry		85	55		SB V1 on S Washington approaching Allen intersection attempted to merge into left lane and sideswiped SB V2
35	9/17/16	Saturday	1:40 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	66	59		EB V1 (motorcycle) on Allen traveling through S Washington intersection struck by WB V2 attempting to turn left, and yielded to by another EB vehicle. Courtesy Crash
36	10/1/16	Saturday	12:11 AM	Single Vehicle Crash	Dark - lighted roadway	Rain	Wet	Failure to keep in proper lane or running off road; Other improper action	21			NB V1 on S Washington drove through puddle and lost control approaching Allen and drove over SB side of road into a light post on side of road
37	11/22/16	Tuesday	11:34 AM	Angle	Daylight	Clear	Dry		Unk	71		WB V2 on Allen making a left turn into Fashion Crossing Plaza driveway collided with NB V1 pulling out of driveway
38	12/12/16	Monday	3:40 PM	(Sideswipe, Same Direction)	Daylight	Clear	Dry		28	46		SB V1 in the middle lane of S Washington approaching Allen was cut off by SB V2 merging from the right turn only lane, V2 struck the passenger front corner of V1

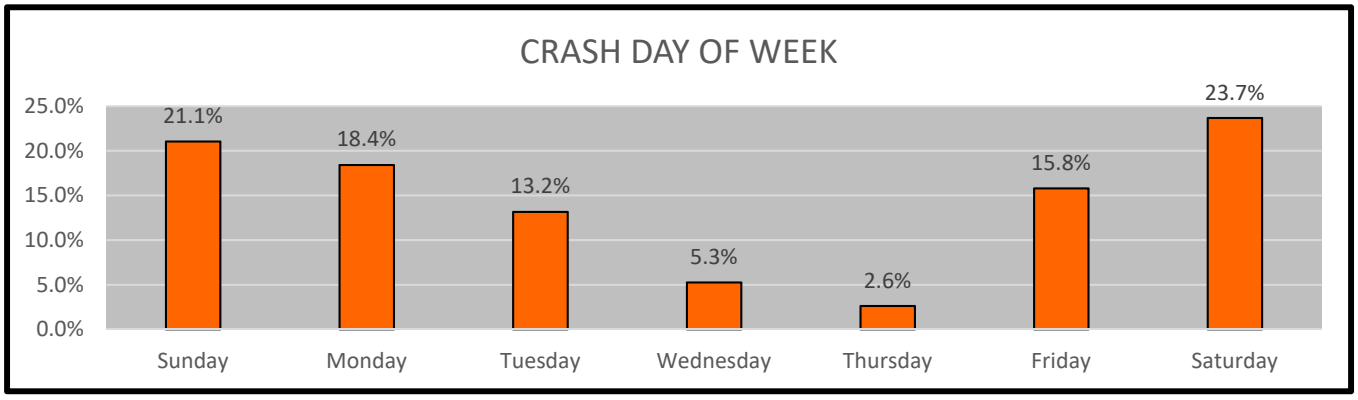
*(Parenthesis) - Field manually entered due to being left blank using online data or overided based on crash narrative

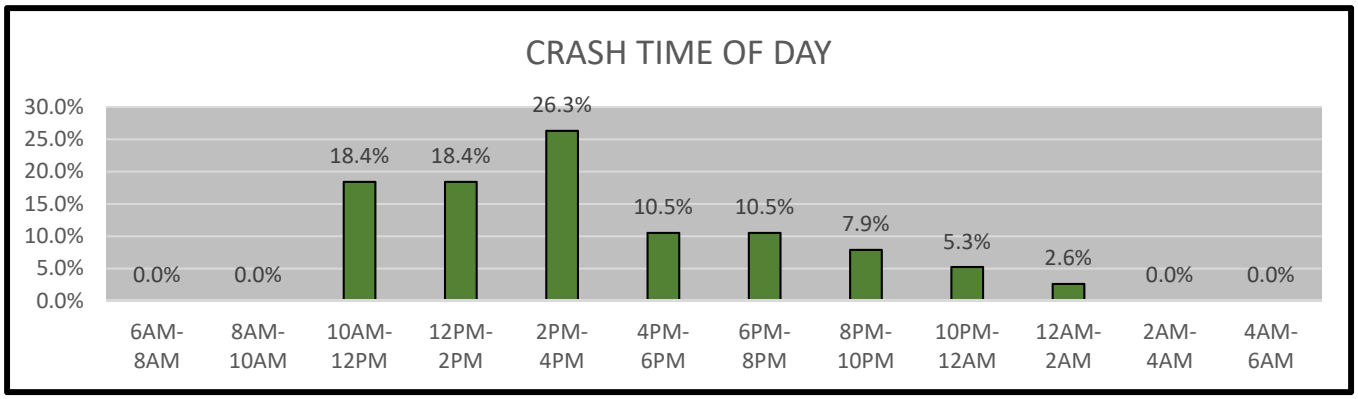
**Courtesy Crash – A crash that occurs when a vehicle traveling along the main roadway yields to a turning vehicle attempting to cross multiple lanes of traffic, however a second vehicle traveling in the adjacent travel lane does not yield, causing a crash.

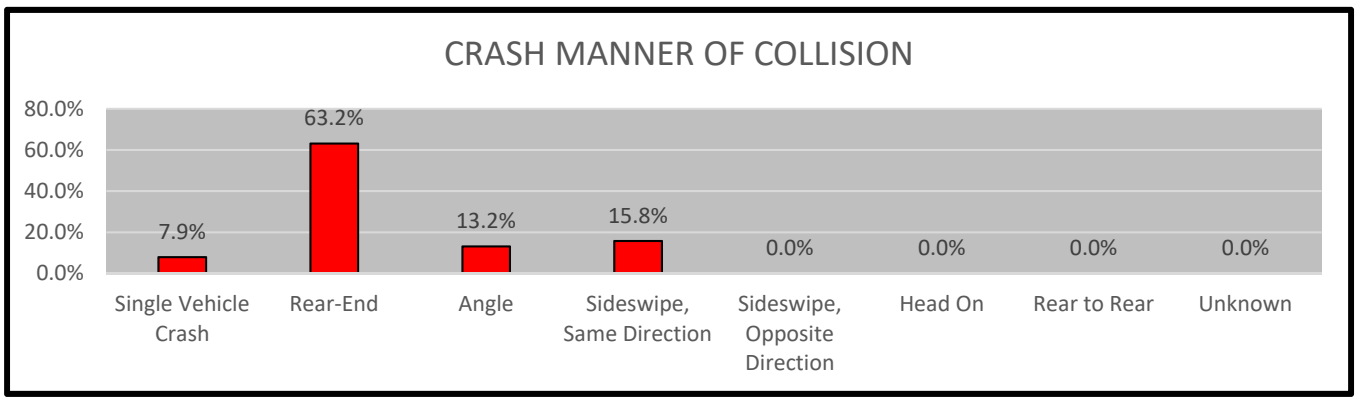
Crash Data Summary Tables and Charts (2014-2016)

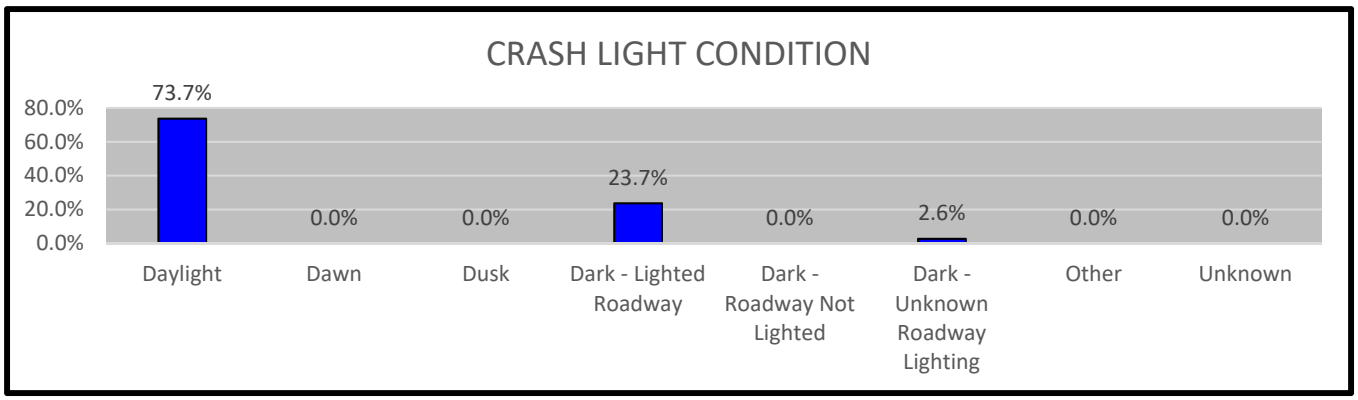
S Washington Street at Allen Avenue, North Attleborough, MA

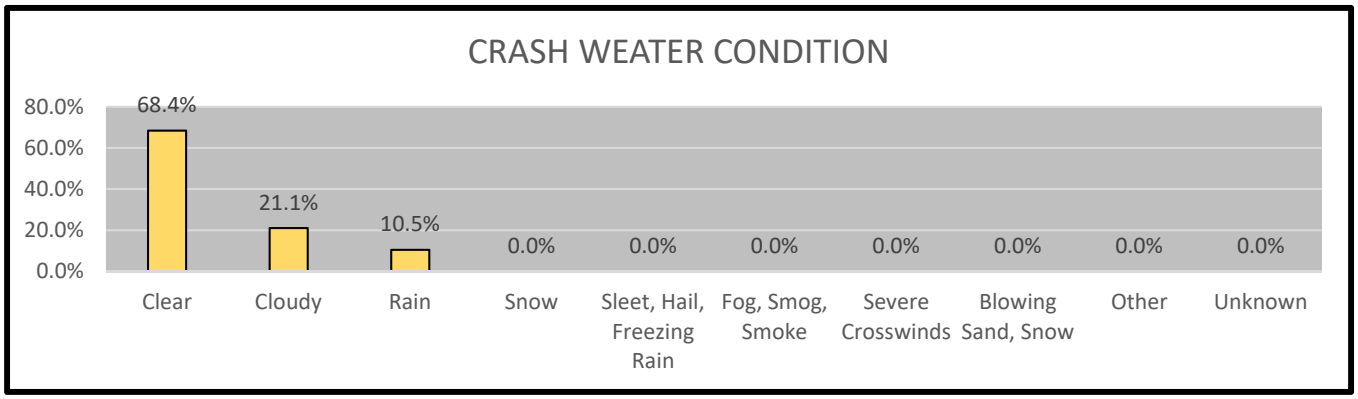


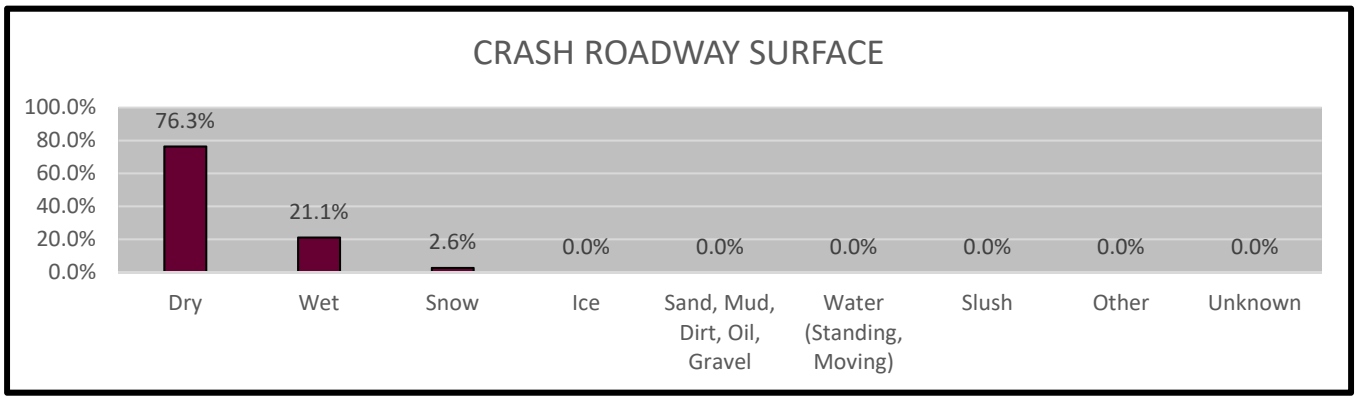


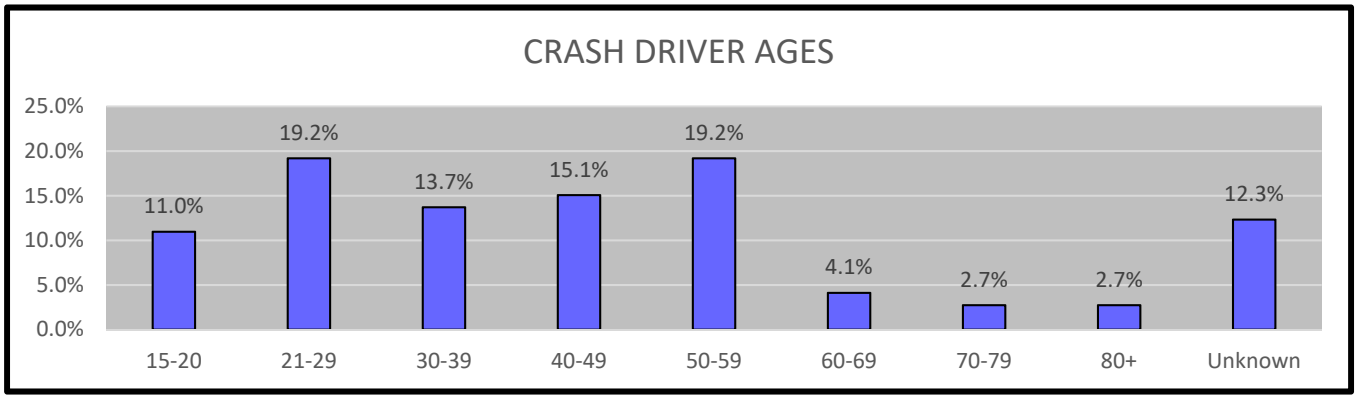





CRASH LIGHT CONDITION
80.0%
60.0%
40.0%
20.0%
0.0%
73.7%
0.0%
0.0%
23.7%
0.0%
2.6%
0.0%
0.0%
Daylight
Dawn
Dusk
Dark - Lighted Roadway
Dark - Roadway Not Lighted
Dark - Unknown Roadway Lighting
Other
Unknown


CRASH WEATER CONDITION
80.0%
60.0%
40.0%
20.0%
0.0%
68.4%
21.1%
10.5%
0.0%
0.0%
0.0%
0.0%
0.0%
0.0%
0.0%
Clear
Cloudy
Rain
Snow
Sleet, Hail, Freezing Rain
Fog, Smog, Smoke
Severe Crosswinds
Blowing Sand, Snow
Other
Unknown


CRASH ROADWAY SURFACE
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
76.3%
21.1%
2.6%
0.0%
0.0%
0.0%
0.0%
0.0%
0.0%
Dry
Wet
Snow
Ice
Sand, Mud, Dirt, Oil, Gravel
Water (Standing, Moving)
Slush
Other
Unknown


CRASH DRIVER AGES
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
11.0%
19.2%
13.7%
15.1%
19.2%
4.1%
2.7%
2.7%
12.3%
15-20
21-29
30-39
40-49
50-59
60-69
70-79
80+
Unknown

massDOT
Massachusetts Department of Transportation
Highway Division

CRASH DIAGRAM

SYMBOLS

Moving Vehicle
Backing Vehicle
Non–Involved Vehicle
Involved / Non–Involved
Pedestrian
Bicycle
Animal
Direction of Motion
Parked Vehicle
Fixed Object

TYPE OF CRASH

Head on
Rear End
Angle
Turning Movement
Sideswipe
Out of Control
Night Time Crash

SEVERITY

(#) Injury
(#) Fatal
Property Damage Only

NORTH ATTLEBOROUGH, MA

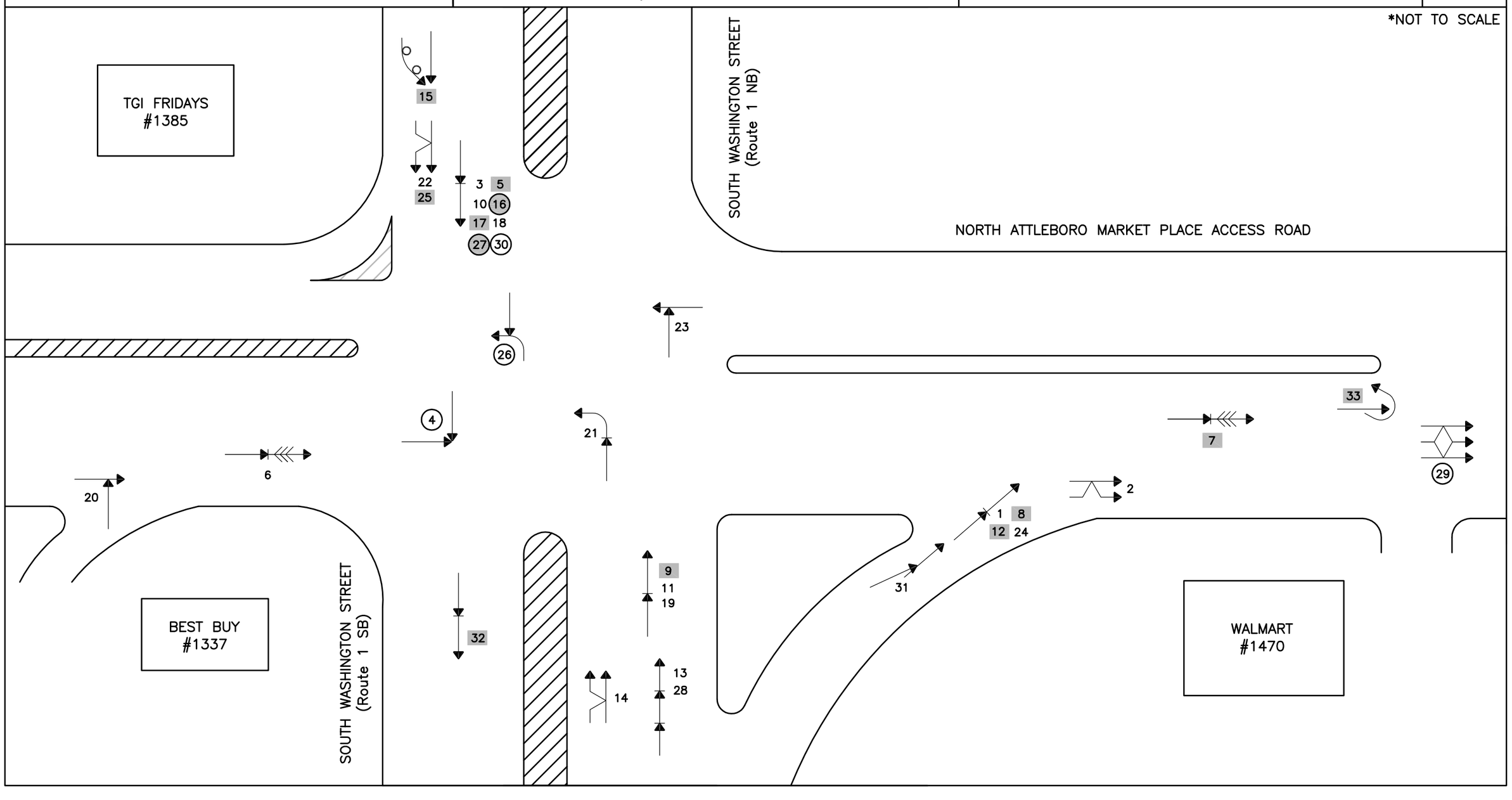
SOUTH WASHINGTON STREET (ROUTE 1) AT NORTH ATTLEBORO MARKET PLACE

REGION: SRPEDD

TIME PERIOD ANALYZED: 2013–2015
SOURCE OF CRASH REPORTS: NORTH ATTLEBORO POLICE DEPARTMENT
DATE PREPARED: 7/21/2017
PREPARED BY: KAB

N

*NOT TO SCALE



Crash Data Summary Table

South Washington Street (Route 1) at Market Plaza, North Attleborough, MA
2013 - 2015

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	mm/dd/yy	Day	hh:mm	Type	Type	Type	Type	Type	#	#	#	#	
1	01/01/13	Tuesday	10:26 AM	Rear-end	Daylight	Clear	Wet	Driving too fast for conditions	57	62			V1 EB on entrance road to Walmart rear-ended V2. V1 attempted to brake but slid due to wet road surface.
2	01/12/13	Saturday	11:59 AM	Sideswipe, same direction	Daylight	Cloudy	Wet	Failed to yield right of way	45	88			SB V1 had green arrow and turned left into the acess road, NB V2 also turning right from the exclusive right turn lane, did not yield at yield sign, and struck V1.
3	02/08/13	Friday	3:02 PM	Rear-end	Daylight	Snow	Snow	Other improper action	28	24			V2 SB on Rt. 1 slid on snowy pavement and rear-ended V1.
4	02/10/13	Sunday	2:11 PM	Angle	Daylight	Clear	Wet	Disregarded traffic signs, signals, road markings	21	44			V1 SB on Rt. 1 ran the red light and struck V2 EB.
5	05/01/13	Wednesday	9:07 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Followed too closely	32	44			V1 SB on Rt. 1 rear-ended V2.
6	05/28/13	Tuesday	10:30 AM	Rear-end	Daylight	Clear	Dry	Inattention	37	40			V1 backed up to reposition vehicle and struck V2 EB on the exit from Best Buy.
7	06/24/13	Monday	8:10 PM	Unknown	Dusk	Cloudy	Dry	Other improper action	44	63			V1 (TT) rolled slightly downhill and struck V2 EB on entrance road to Walmart. V1 could not see V2.
8	09/14/13	Saturday	8:48 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Followed too closely	25	38			V2 NB just off of Rt. 1 on entry road to Walmart rear-ended V1.
9	09/28/13	Saturday	8:04 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Inattention	15	53			V1 NB on Rt. 1 rear-ended V2. V1 did not have a driver's license.
10	10/10/13	Thursday	2:32 PM	Rear-end	Daylight	Clear	Dry	Inattention	20	53			V1 SB on Rt. 1 rear-ended V2.
11	11/02/13	Saturday	12:54 PM	Rear-end	Daylight	Cloudy	Dry	Other improper action	46	25			V2 NB on Rt. 1 rear-ended V1.
12	11/02/13	Saturday	7:01 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Followed too closely	64	21			V2 EB on entry road to Walmart did not notice V1 yielding to traffic and rear-ended V1.
13	11/27/13	Wednesday	11:53 AM	Rear-end	Daylight	Rain	Wet	Other improper action	41	27	46		V3 NB on Rt. 1 rear-ended V2 which was pushed into V1.
14	12/14/13	Saturday	1:54 PM	Sideswipe, same direction	Daylight		Dry	Inattention	58	33			V1 NB on Rt. 1 sideswiped V2.
15	01/21/14	Tuesday	8:58 PM	Angle	Dark - lighted roadway	Snow	Snow	Driving too fast for conditions	66	26			SB V1 lost control of vehicle due to snow covered roadway, V1 was unable to avoid hitting V2. Noted weather was below 20 degree and actively snowing.
16	01/23/14	Thursday	5:43 PM	Rear-end	Dark - lighted roadway	Clear	Dry	No improper driving	26	57			V1 SB on Rt. 1 rear-ended V2.
17	02/08/14	Saturday	5:41 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	44	55			V2 SB on Rt. 1 rear-ended V1.
18	02/22/14	Saturday	1:37 PM	Rear-end	Daylight	Clear	Dry	Inattention	30	18			V2 SB on Rt. 1 rear-ended V1.
19	03/01/14	Saturday	12:17 PM	Rear-end	Daylight	Clear	Dry	Followed too closely	27	37			V1 rear-ended V2 NB on Rt. 1.
20	04/18/14	Friday	4:12 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	18	30			V1 EB exiting Best Buy did not yield at intersection and struck V2.
21	06/26/14	Thursday	10:55 AM	Rear-end		Clear	Dry	Inattention	68	60			V2 rear-ended V1 while turning left from Rt. 1 NB.
22	08/23/14	Saturday	11:27 AM	Sideswipe, same direction	Daylight	Clear	Dry	Inattention	20	21			V2 attempted to make a lane change SB on Rt. 1, did not see V1, and sideswiped V1.
23	09/29/14	Monday	12:40 PM	Angle	Daylight	Cloudy	Dry	Disregarded traffic signs, signals, road markings	82	47			V1 WB ran a red light and struck V2 NB on Rt. 1.
24	11/21/14	Friday	10:31 AM	Rear-end	Daylight	Clear	Dry	Followed too closely	64	37			V1 was looking at oncoming traffic off of Rt. 1 NB on the entrance to Walmart and rear-ended V2.
25	11/23/14	Sunday	4:30 PM	Angle	Dark - lighted roadway	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	44	47	60		V2 entered left turn lane at a high rate of speed, sideswiping V3 and rear-ending V1 infront of it.
26	12/21/14	Sunday	3:29 PM	Angle	Daylight	Cloudy	Dry	Made an improper turn	29	53			V1 NB on Rt. 1 attempted to turn left and struck V2 SB.
27	12/26/14	Friday	5:20 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Followed too closely	37	17			V1 rear-ended V2 SB on Rt. 1.
28	01/28/15	Wednesday	1:50 PM	Rear-end	Daylight	Clear	Wet	Followed too closely	24	69	63		V1 and V2 NB on Rt. 1 stopped in traffic. V2 rear-ended V2 which was pushed into V1.
29	04/25/15	Saturday	6:33 PM	Angle	Daylight	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	27	26	63		V1 fleeing the police drove and between V2 and V3 EB on the entry drive to Walmart.
30	08/08/15	Saturday	2:33 PM	Rear-end	Daylight	Clear	Dry	Distracted	27	40			V1 operator said shoe got caught and could not brake, rear-ending SB V2.
31	09/04/15	Friday	2:26 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	69	78			V1 attempted to pass V2 NB on the entry road to Walmart, misjudged distance, and struck V2.
32	11/21/15	Saturday	6:55 PM	Rear-end	Dark - lighted roadway	Clear	Dry	No improper driving	45	17			V1 rear-ended V2 SB on Rt. 1.

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2013 - 2015

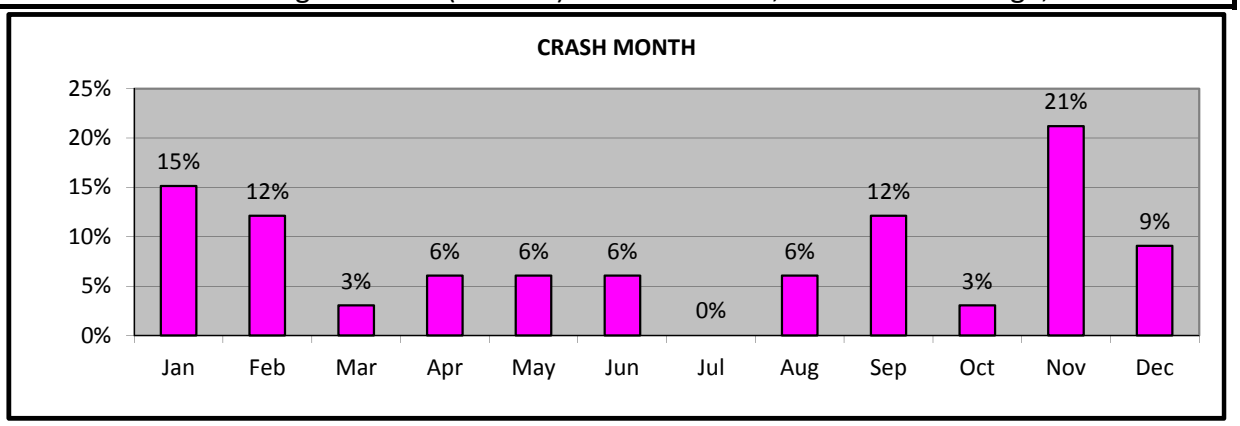
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	*mm/dd/yy*	*Day*	*hh:mm*	*Type*	*Type*	*Type*	*Type*	*Type*	*#*	*#*	*#*	*#*	
33	11/25/15	Wednesday	6:43 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	20	52			EB V2 pulled to the right, attempting to make a U-turn on the access road after seeing no vehicle is coming, strucking EB V1 while turning.

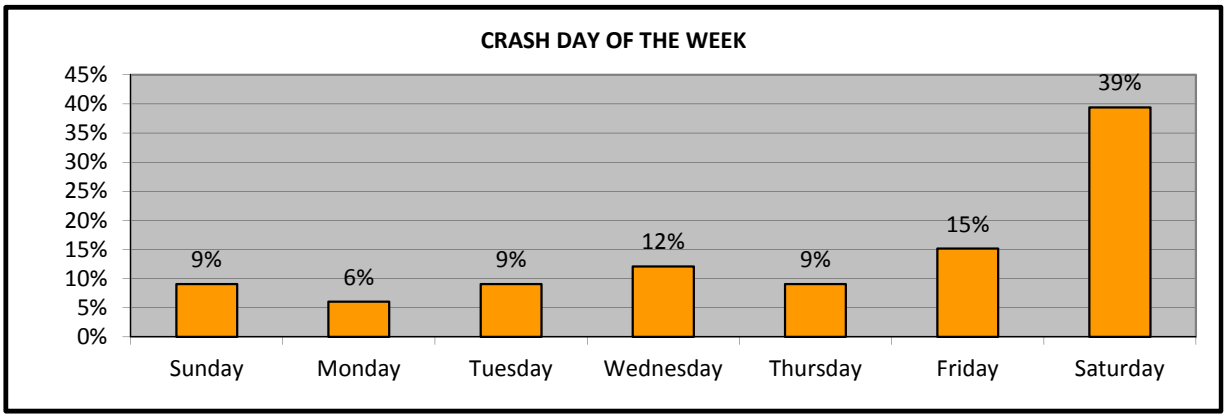
*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another driver.

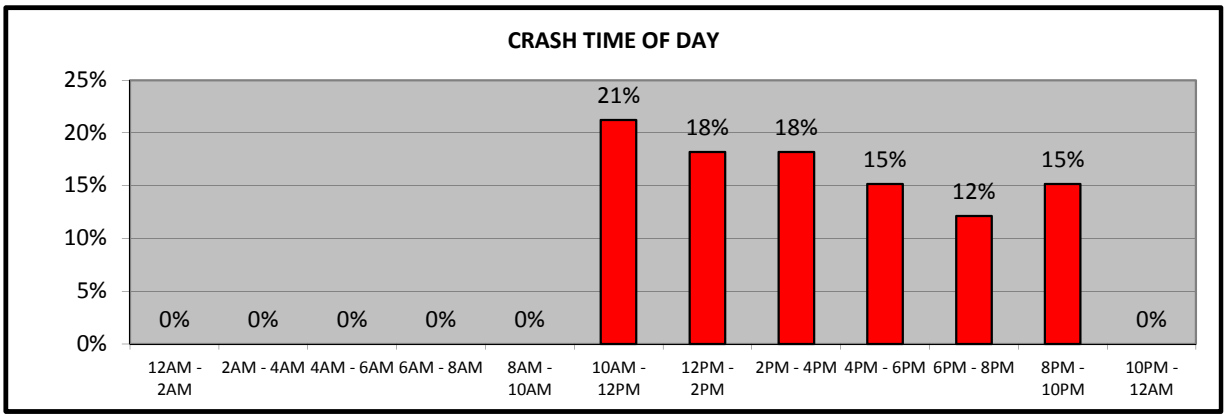
Summaries based on crash reports obtained from the North Attleboro Police Department.

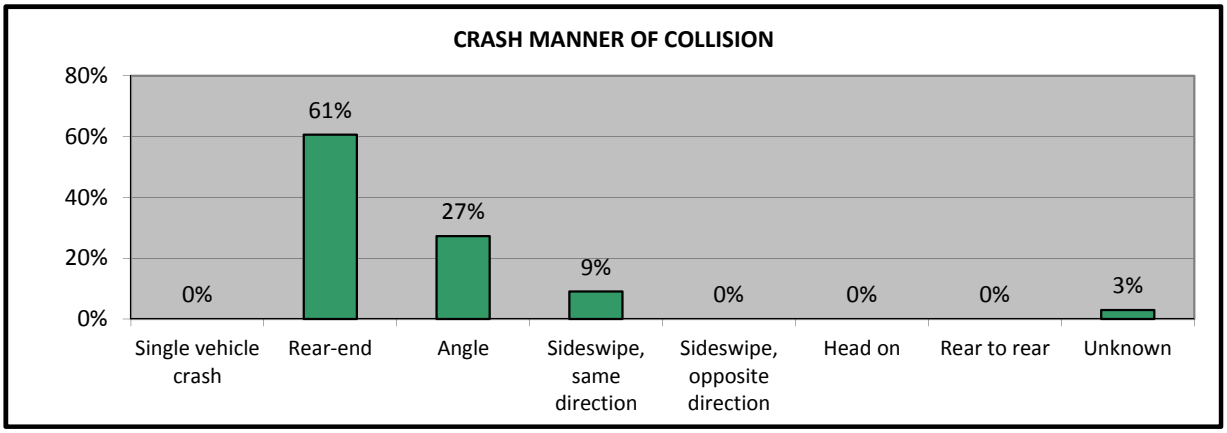
Crash Data Summary Charts

South Washington Street (Route 1) at Market Plaza, North Attleborough, MA



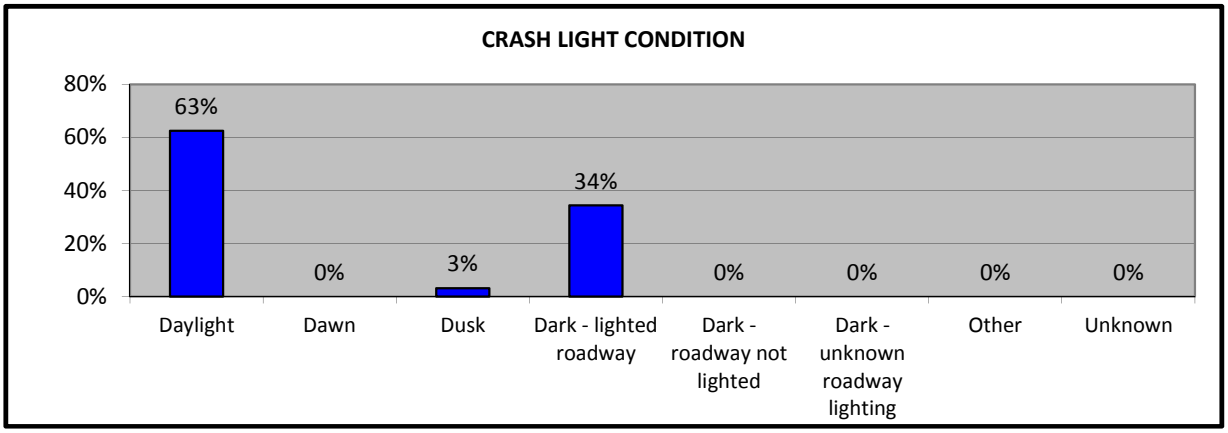


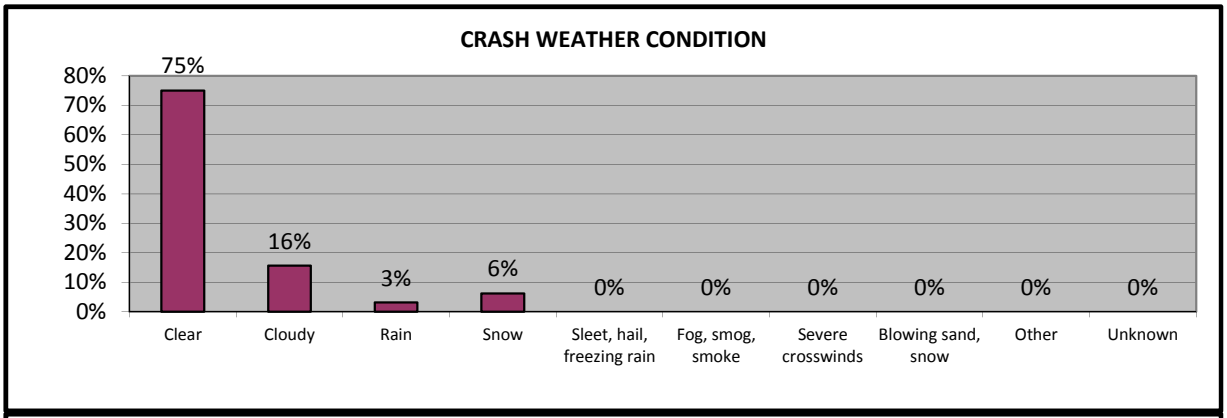


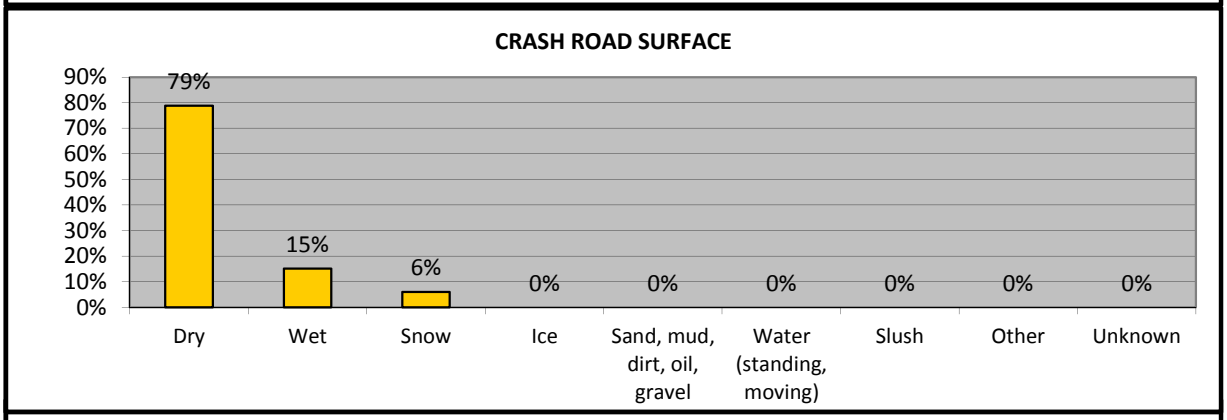


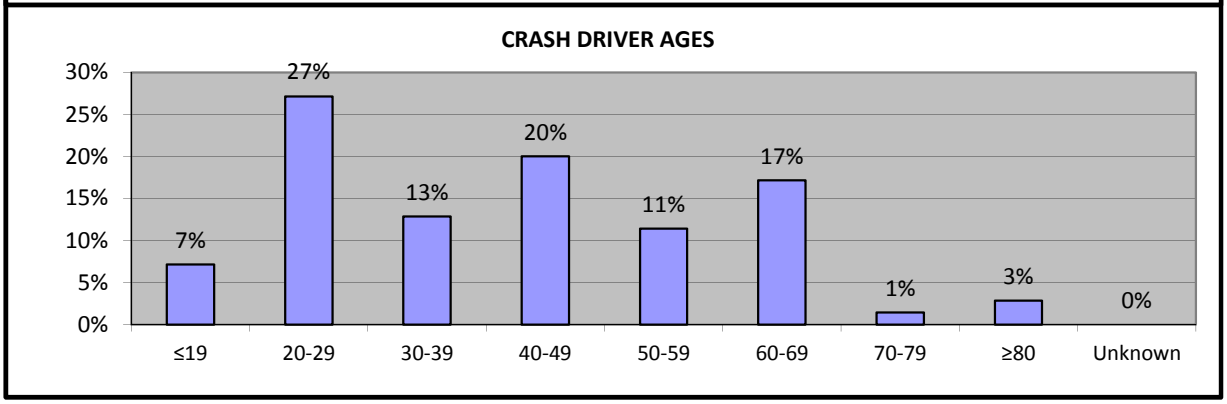
Crash Data Summary Charts

South Washington Street (Route 1) at Market Plaza, North Attleborough, MA









Appendix D. Road Safety Audit References

Road Safety Audit References

Massachusetts Traffic Safety Toolbox, Massachusetts Highway Department, www.mhd.state.ma.us/safetytoolbox.

Road Safety Audits, A Synthesis of Highway Practice. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

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FHWA Road Safety Audit Guidelines. U.S. Department of Transportation, Federal Highway Administration, 2006.

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