ROAD SAFETY AUDIT

Central Street / North Central Street at Union Street / West Union Street

East Bridgewater, MA

September 21, 2021

Prepared through Old Colony MPO FFY 2021 Unified Planning Work Program – Road Safety Audits at Multiple Locations: Under Contract with MassDOT

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Background

This Road Safety Audit for Central Street / North Central Street at Union Street / West Union Street in East Bridgewater was prepared as part of the Old Colony Metropolitan Planning Organization's (MPO) Road Safety Audits at Multiple Locations project in the MPO's FFY 2021 Unified Planning Work Program. The objective of the Road Safety Audits at Multiple Locations project is to identify known issues and potential improvements that can be implemented at high crash locations in a continuing effort to achieve safety performance targets for reducing serious injuries and fatalities on the regional highway network. Locations were selected through a data driven process as part of the MPO's Safety Management System and consultation with the communities of the Old Colony MPO.

Project Data

This Road Safety Audit was conducted on September 21, 2021. Out of an abundance of caution and respect to health and safety of Audit participants, this Road Safety Audit was conducted virtually through a webinar format. Participants were provided crash data and associated analysis (crash characteristics charts, collision diagrams) prior to the Audit for review, and background traffic data (traffic volumes, speeds, heavy vehicle traffic) along with surrounding land use were discussed during the Audit.

During the audit, crash analysis, land use, and traffic data was discussed. Aerial photographs and dashboard camera video of each approach was provided. There was an Old Colony Planning Council staff planner on site at the intersection, providing live video links and commentary for each location, and responding to on-demand inquiries.

The RSA participants formed a multidisciplinary team representing many fields, including planning, engineering, law enforcement and emergency response, and advocacy. A list of RSA attendees is shown in Table 1.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Bill McNulty	Old Colony Planning Council
Mary Waldron	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Ray Guarino	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Paul O'Brien	East Bridgewater Chief of Police
John Haines	East Bridgewater Director of Department of Public Works
Kathy Keyes	Office of Massachusetts State Senator Walter Timilty
Michael Damon	Brockton Area Transit (BAT)
Ana Fill	MassDOT Traffic Safety Division
Michelle Deng	MassDOT Traffic Safety Division
Bianca Marshall	MassDOT District Five - Traffic

Project Location and Description

The intersection of Central Street and North Central Street at Union Street and West Union Street is a four-legged, unsignalized intersection located within East Bridgewater Center, located 150 yards northwest of the intersection of Route 18 at Central Street and Spring Street. It is a two-way STOP controlled intersection with STOP signs on the Union Street and West Union Street approaches. A flashing control beacon mounted on a mast arm flashes amber beacons towards the Central Street and North Central Street approaches and red beacons towards the Union Street and West Union Street approaches.

Development around the intersection is commercial, and transitions to thickly settled residential just west of the intersection. East Bridgewater High School, Middle School, and Center Elementary School are all located just east of the study area, on the other side of Route 18. The mix of commercial, educational, and municipal land uses located close to thickly settled residential areas generates large volumes of pedestrian traffic through the intersection.

- **Central Street / North Central Street**: Central Street / North Central Street is a two-lane roadway under local jurisdiction of the Town of East Bridgewater, functionally classified as an Urban Minor Arterial. Central Street has sidewalks on each side. The two roadways combine to form an important east-west connector in the region, connecting from Route 27 in Hanson and Route 106 to the east to Elm Street and Pleasant Street to the west. Elm Street and Pleasant Street provide connections into Brockton, including Massasoit Community College. North Central Street has a sidewalk on each side immediately adjacent to the intersection; however, the sidewalk on the northern edge of the roadway ends just northwest of the intersection. The sidewalk on the southern side of North Central Street is in poor condition and appears discontinuous in certain sports.

Zebra-striped crosswalks cross both approaches of Central Street and North Central Street at the intersection. None of the approaches include bicycle accommodations.

- **Union Street / West Union Street**: Union Street / West Union Street is a two-lane roadway under local jurisdiction of the Town of East Bridgewater, functionally classified as an Urban Collector. Union Street and West Union Street form a significant connector from northeast to southwest through the area. Union Street had sidewalks on each side. West Union Street has a sidewalk on each side immediately adjacent to the intersection; however, a sidewalk only on the southern side of the roadway just west of the intersection. The sidewalk on West Union Street is in poor condition. Zebra-striped crosswalks cross both approaches of Union Street and West Union Street at the intersection. None of the approaches include bicycle accommodations. The speed limit is 25 MPH in each direction, since East Bridgewater opted into Massachusetts general Laws Chapter 90 Section 17C in July 2020, establishing 25 MPH speed limits in thickly settled areas.

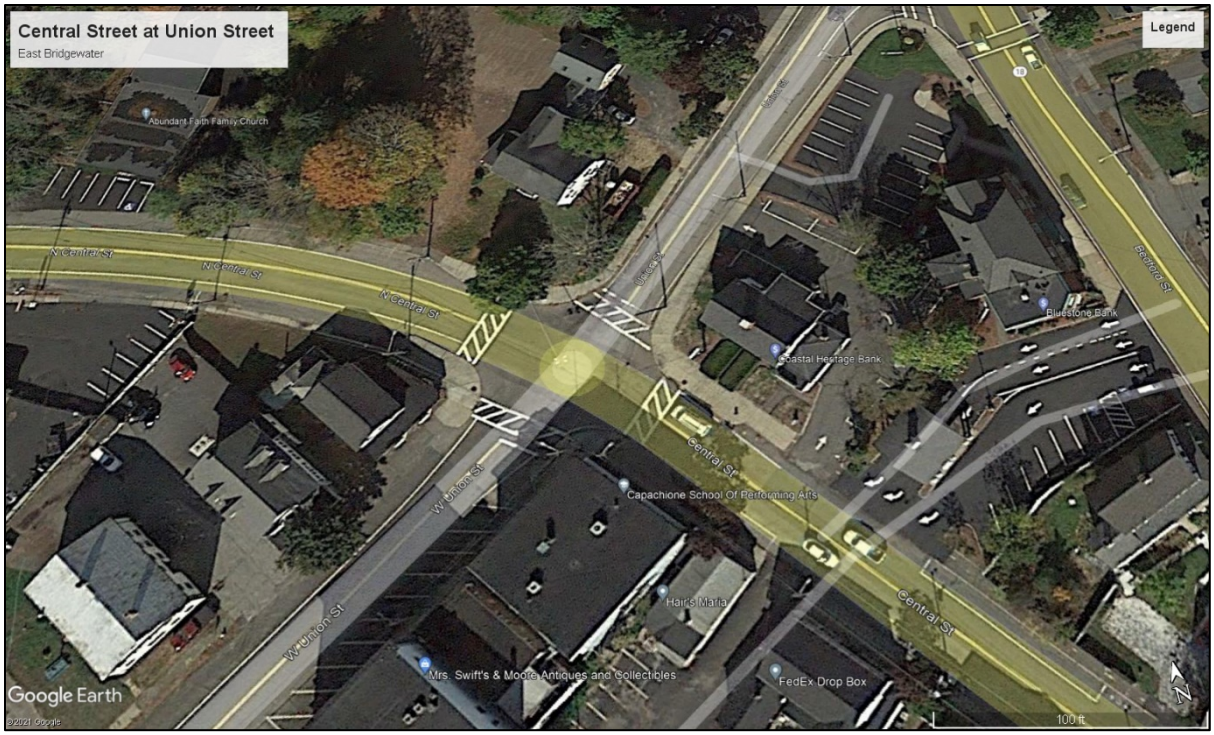


Figure 1: Locus Map

Audit Observations and Potential Safety Enhancements

Poor sight lines: The combination of curvature in North Central Street and high-profile buildings immediately abutting the intersection on the southeast and southwest corners creates major challenges to sight distance between North Central Street and West Union Street. Angled collisions between vehicles arriving on West Union Street and North Central Street comprise the majority of crashes at this location, and these obstructed sight lines combines with speed on North Central Street are the primary factors leading to these crashes.

> *Potential Safety Enhancements: Consider converting the intersection to an all-way stop controlled intersection, forcing drivers to stop on Central Street and North Central Street to mitigate sight line issues. However, this option needs to be assessed carefully to ensure queuing would not back into Route 18. Strict speed enforcement may also mitigate this issue. Evaluate the feasibility of traffic signals coordinated with Route 18 traffic signals. A warrant analysis must be completed before all-way stop or traffic signal controls can be installed.*

Drivers Stopping on Central Street and North Central Street Approaches: During site visits by Old Colony Planning Council staff, it was observed that some drivers on Central Street and North Central Street are stopping at the intersection, presumably believing it is a four-way stop. Audit participants also noted observing this behavior. Furthermore, narratives in some of the

crash reports for the intersection indicated a driver on Central Street or North Central Street had stopped unexpectedly.

Potential Safety Enhancements: Enhance flashing AMBER ("proceed with caution") flashing beacons for Central Street and North Central Street approaches with higher visibility LED bulbs, larger signal heads, and backplates with retroreflecting strips to improve signal visibility, especially during times of sun glare. on the signals. Consider converting intersection to four-way stop.

Speeding: Audit participants noted drivers operate at speeds in excess of speed limits on Central Street and North Central Street. A 2020 traffic count prepared by Old Colony Planning Council recorded an 85th percentile speed of 38 MPH on North Central Street, substantially above the 25 MPH speed limit. Furthermore, audit participants noted that due to the long traffic signal cycle at Route 18 and Central Street, as drivers approach on North Central Street when they see the green light up ahead at the Route 18 intersection they rapidly accelerate attempting to "make the light". Wide travel lanes on the approaches appear to be a factor in high travel speeds as well and increasing difficulty for drivers attempting to enter from Union Street and West Union Street.

Potential Safety Enhancements: Regular and strict traffic enforcement. Consider the use of speed trailers, or permanently mounted radar recorded "your speed" feedback signs. Consider traffic calming through narrowing wide travel lanes on the approaches with striping and the addition of bicycle lanes.

Poor Pedestrian and ADA Connectivity: Curb ramps at the intersection are worn, and do not include detectable surfaces. Some of the ramps are obstructed by utility poles in the receiving area. Sidewalks on North Central Street and West Union Street are narrow and in state of disrepair, making ADA mobility difficult if not impossible.

Potential Safety Enhancements: reconstruct sidewalks and curb ramps with detectable panels.

Lack of Advance Warning Signage / Non-MUTCD Compliant Signs: The approaches to the intersection do not include MUTCD compliant advance warning signs. The "CAUTION Intersection Ahead" sign on Central Street northbound from Route 18 is antiquated. The double use of STOP signs on Union Street features a non-traditional design of one sign on top of another.

Potential Safety Enhancements: Install "STOP Ahead" signs (MUTCD W3-1) on Union Street and West Union Street approaches, and "Intersection Warning" (MUTCD W2-1) on Central Street and North Central Street approaches. Consider replacing STOP signs on Union Street and West Union Street with larger signs, placed on each side of the roadway (rather than one on top of another).

On-Street Parking: On-street parking adjacent to the intersection interferes with intersection operations and creates additional obstacles to sight distance and hazard to pedestrians. Diagonal pull-in / back-out parking on West Union Street creates a hazard to bicyclists, and also for drivers backing into traffic flow.

Potential Safety Enhancements: Long term, search for potential opportunities to create centralized, off-street parking. Consider replacing existing parking with revers angle parking, which provides motorists with better visibility of pedestrians, bicycles, and other motorists.

Lack of Bicycle Accommodations: None of the approaches contain accommodations for bicycles.

Potential Safety Enhancements: With any roadway improvement, consider the inclusion of bike lane.

Poor Drainage: Debris on the corners of the intersection indicate there is ponding occurring at the intersection during heavy rain events. Audit participants confirmed this.

Potential Safety Enhancements: Improve drainage with some combination of relocation of existing catch basins, construction of new catch basins, or enhancing crown of the roadway and edge curbing.

Queuing from Route 18 into Intersection: The traffic signal cycle at Route 18 and Central Street results in traffic queues extending into intersection of Central / North Central at Union / West Union during peak demand hours. The queues from make it difficult for vehicles from Union Street and West Union Street to enter the intersection and obstructs sight distance.

Potential Safety Enhancements: Install reminders to drivers through signage and/or pavement markings to not block intersection. Evaluate traffic signal design and phasing at Route 18 intersection to assess possibility of mitigating querying through shorter RED signal times for Central Street.

Poor Pavement Conditions: Pavement is in fair to poor condition through the intersection, with rutting and surface wear observed.

Potential Safety Enhancements: Resurface roadway.

Sun Glare: Sun glare was reported as occluding on the approaches during certain times of the year.

Potential Safety Enhancements: Install back-plates on flashing control beacons. Replace exiting bulbs with LED bulbs in flashing beacons.

Summary of Road Safety Audit

Based on the review of data, observations of the intersection made in the field, and group discussion, the RSA team identified possible enhancements that could improve safety at the intersection. Further study and design work will need to be conducted to determine the feasibility of improvements. Table 2 summarizes the estimated time frame and costs, and Table 3 summarizes the safety issues, possible enhancements, estimated safety payoff, time frame, cost, and jurisdiction. Safety payoff estimates are based on engineering judgment and are categorized as low, medium, and high. The time frame is categorized as short-term (<1 year), midterm (1 to 3 years), or long-term (typically >3 years). Long-term improvements are typically considered to be substantial improvements with an expected time frame for implementation greater than 3 years. The costs are categorized as low (<$10,000), medium ($10,001 to $50,000), or high (>$50,000)."

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: Potential Safety Enhancement Summary

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Poor sight lines.	Converting intersection to All-Way STOP controlled. Assess potential for coordinated signals with Route 18 signals.	High	Mid-Term (STOP Signs) / Long Term (Signals)	Low (Signs / High (Signals)	Town of East Bridgewater
Drivers stopping unexpectedly on Central Street	Enhance AMBER beacons. Consider making intersection All-Way STOP Controlled.	Medium	Mid-Term	Low	Town of East Bridgewater
Speeding	Regular and strict speed enforcement. Speed trailers or feedback signs. Traffic calming by narrowing lanes and adding bike lanes	Medium	Short-Term	Low	Town of East Bridgewater
Poor pedestrian connectivity and ADA access	Reconstruct sidewalks and curb ramps.	High	Long-Term (Mid-Term for Ramps)	High (Medium for Ramps)	Town of East Bridgewater
Lack of advance warning signs / Non MUTCD supported signs	Install new signage. Replace outdated signage.	Medium	Short-term	Low	Town of East Bridgewater
On-street parking	Relocate parking to centralized, off-street facility.	Medium	Long Term	High	Town of East Bridgewater
Lack of bicycle accommodations	Install bike lanes or sharrows.	High	Mid-term	Medium	Town of East Bridgewater
Poor drainage	Construct drainage improvements	Medium	Long Term	High	Town of East Bridgewater
Queuing from Route 18	Traffic signal improvements at Route 18 and Central Street. Add “Do Not Block the Box” signage and markings	High / Low	Long Term / Short Term	Low	MassDOT

Table 3: Potential Safety Enhancement Summary, continued

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Poor pavement conditions	Resurface.	Low	Mid-Term	Medium	Town of East Bridgewater
Sun Glare	Install backplates with retroreflecting strips on flashing beacon heads. Install LED signal heads	Medium	Short-Term	Low	Town of East Bridgewater

Appendix A. RSA Meeting Agenda

Agenda	Virtual Road Safety Audit for Central Street at Union Street/West Union Street East Bridgewater, MA Tuesday, September 21, 2021 1:30 PM – 3:00 PM
Contact:	Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org (or Ray Guarino, rguarino@ocpcrpa.org)
Attendees:	Invited Participants Include a Multidisciplinary Team including East Bridgewater Officials (Chief Elected Officials, DPW, Police, Fire, Administration, Planning), MassDOT, FHWA, Legislative Delegation
Please Bring:	Thoughts and Suggestions
Meeting Location:	Virtual Meeting (Zoom): **Registration Link** https://us02web.zoom.us/webinar/register/WN_qzqX4QmbRyq1CHPl9zI5uQ Webinar ID - 897 4527 9926 **Password - 941321**
1:30 PM	Welcome and Introductions
1:40 PM	Study Background and Review of Study Area
2:00 PM	Virtual Road Safety Audit of Central Street at Union Street/West Union Street • Review of Crash Data • Existing Conditions and Known Challenges • Identification of Potential Safety Improvements
2:30 PM	Wrap-Up Site Audit; Discussion of Next Steps

Instructions For Participants:

- Before attending the Road Safety Audit, participants are encouraged to familiarize themselves with the study area, and make note of existing conditions and any deficiencies they observe
- 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 Road Safety Audit process
- After the meeting, participants will be asked to comment and respond to the document materials to ensure it is reflective of the Road Safety Audit completed by the multidisciplinary team

Appendix B. RSA Audit Team Contact List

Participating Audit Team Members

Date: September 21, 2021	Location: *Central Street at Union Street, East Bridgewater*
Audit Team Members	**Agency/Affiliation**
Bill McNulty	Old Colony Planning Council
Mary Waldron	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Ray Guarino	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Paul O'Brien	East Bridgewater Chief of Police
John Haines	East Bridgewater Director of Department of Public Works
Kathy Keyes	Office of Massachusetts State Senator Walter Timilty
Michael Damon	Brockton Area Transit (BAT)
Ana Fill	MassDOT Traffic Safety Division
Michelle Deng	MassDOT Traffic Safety Division
Bianca Marshall	MassDOT District Five - Traffic

Appendix C. Detailed Crash Data

Crash Data Summary Table

Central Street/North Central Street at Union Street/West Union Street - East Bridgewater, MA

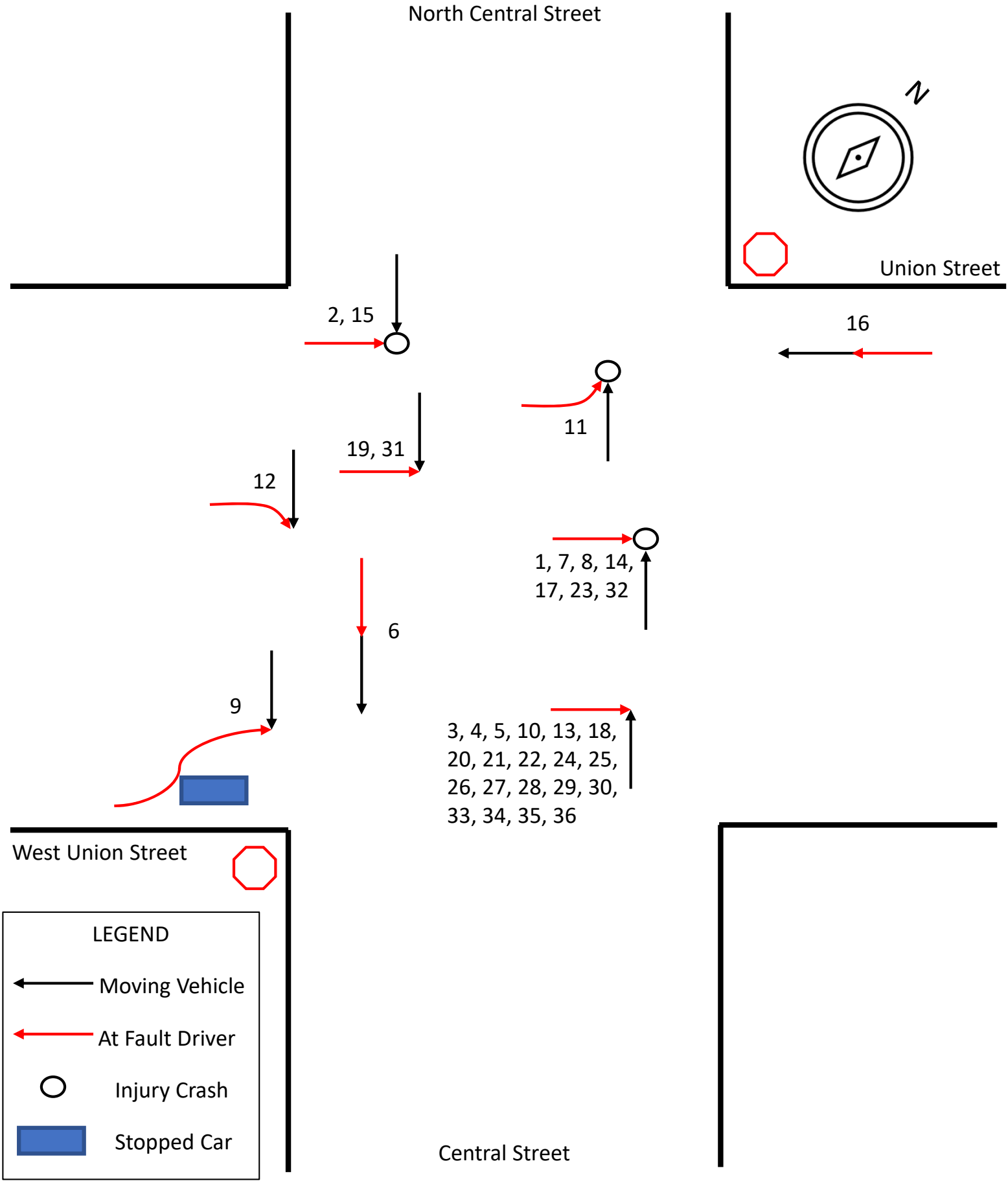
2017-2020

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages		Comments
	m/d/y			*Type*	*Type*	*Type*	*Type*	*Type*	*D1*	*D2*	
1	1/19/17	Thursday	3:30 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	18	36	17-19-AC
2	2/17/17	Friday	8:22 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	35	26	17-50-AC
3	4/30/17	Sunday	12:45 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	58	26	17-125-AC
4	10/20/17	Friday	9:50 AM	Angle	Daylight	Clear	Dry	Glare	40	38	17-285-AC
5	10/23/17	Monday	4:25 PM	Angle	Daylight	Clear	Dry	Unknown	19	42	17-290-AC
6	11/2/17	Thursday	5:42 PM	Rear-end	Dusk	Clear	Dry	Inattention	35	26	17-304-AC
7	11/3/17	Friday	3:33 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	46	30	17-306-AC
8	11/6/17	Monday	1:57 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	40	31	17-310-AC
9	1/9/18	Tuesday	3:38 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	38	35	18-9-AC
10	2/8/18	Thursday	4:10 PM	Angle	Daylight	Clear	Dry	Unknown	21	22	18-39-AC
11	3/24/18	Saturday	12:15 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	53	34	18-84-AC
12	3/30/18	Friday	9:34 AM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	65	70	18-90-AC
13	4/3/18	Tuesday	3:41 PM	Angle	Daylight	Rain	Wet	Failed to yield right of way	26	50	18-96-AC
14	4/3/18	Tuesday	6:25 PM	Angle	Daylight	Rain	Wet	Inattention	20	50	18-98-AC
15	4/20/18	Friday	7:18 PM	Angle	Dusk	Clear	Dry	Disregarded traffic signs, signals, road markings	69	26	18-121-AC
16	7/21/18	Saturday	7:40 AM	Rear-end	Daylight	Clear	Dry	Inattention	60	23	18-195-AC
17	8/2/18	Thursday	11:41 AM	Angle	Daylight	Clear	Dry	Inattention	52	51	18-202-AC
18	9/26/18	Wednesday	6:28 AM	Angle	Daylight	Rain	Wet	Disregarded traffic signs, signals, road markings	19	54	18-248-AC
19	11/1/18	Thursday	8:17 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	37	51	18-293-AC
20	11/26/18	Monday	5:27 PM	Angle	Dark - lighted roadway	Rain	Wet	Failed to yield right of way	56	32	18-329-AC
21	12/11/18	Tuesday	6:32 AM	Angle	Dawn	Clear	Dry	Unknown	51	31	18-337-AC
22	1/10/19	Thursday	3:42 PM	Sideswipe, opposite direction	Daylight	Cloudy	Dry	Visibility Obstructed	49	19	19-10-AC
23	2/22/19	Friday	4:52 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	24	27	19-52-AC
24	3/13/19	Wednesday	2:05 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	39	17	19-70-AC
25	3/13/19	Wednesday	3:44 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	23	25	19-71-AC
26	3/23/19	Saturday	7:38 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	57	17	19-77-AC
27	6/17/19	Monday	9:36 AM	Angle	Daylight	Clear	Dry	Unknown	61	20	19-154-AC
28	7/2/19	Tuesday	1:07 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	22		19-164-AC
29	11/4/19	Monday	2:29 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	42	26	19-266-AC
30	12/27/19	Friday	1:23 PM	Angle	Daylight	Cloudy	Dry	Inattention	43	38	19-328-AC
31	2/11/20	Tuesday	10:17 AM	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	28	85	20-35-AC
32	9/15/20	Tuesday	8:40 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	61	47	20-141-AC
33	11/5/20	Thursday	5:12 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	43	24	20-187-AC
34	11/19/20	Thursday	8:10 AM	Angle	Daylight	Clear	Dry	Glare	35	32	20-197-AC
35	12/18/20	Friday	12:02 AM	Angle	Dark - lighted roadway	Clear	Ice	Failed to yield right of way	36	45	20-224-AC
36	12/22/20	Tuesday	9:57 AM	Angle	Daylight	Clear	Wet	Failed to yield right of way	38	53	20-231-AC

*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.

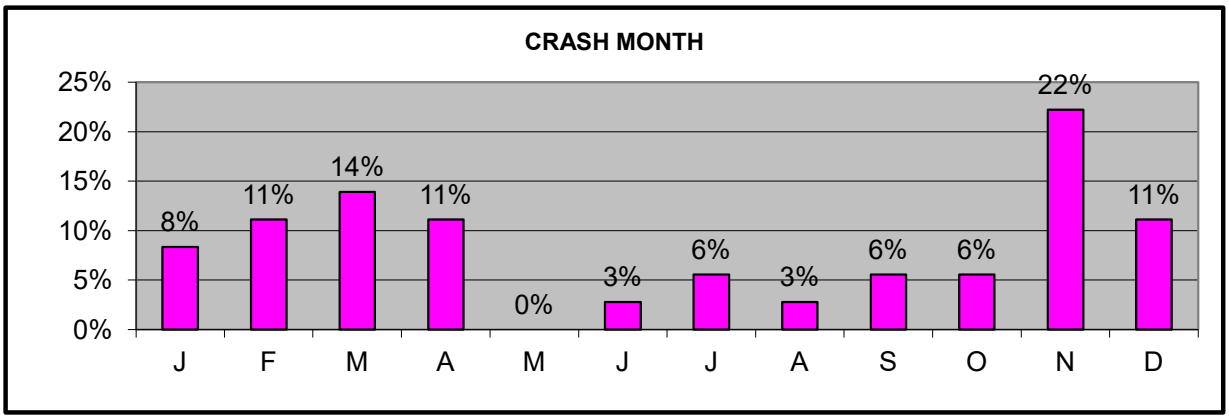
COLLISION DIAGRAM

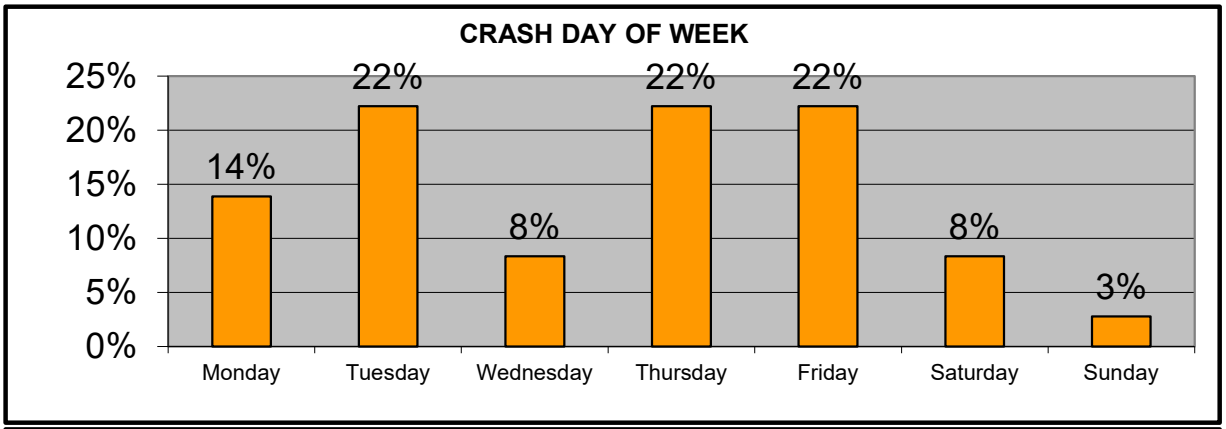
North Central Street/Central Street at Union Street/West Union Street
Collision Diagram for Crashes (2017-2020)
Prepared by OCPC (SB 07/2021) (Source: East Bridgewater Police Dept.)

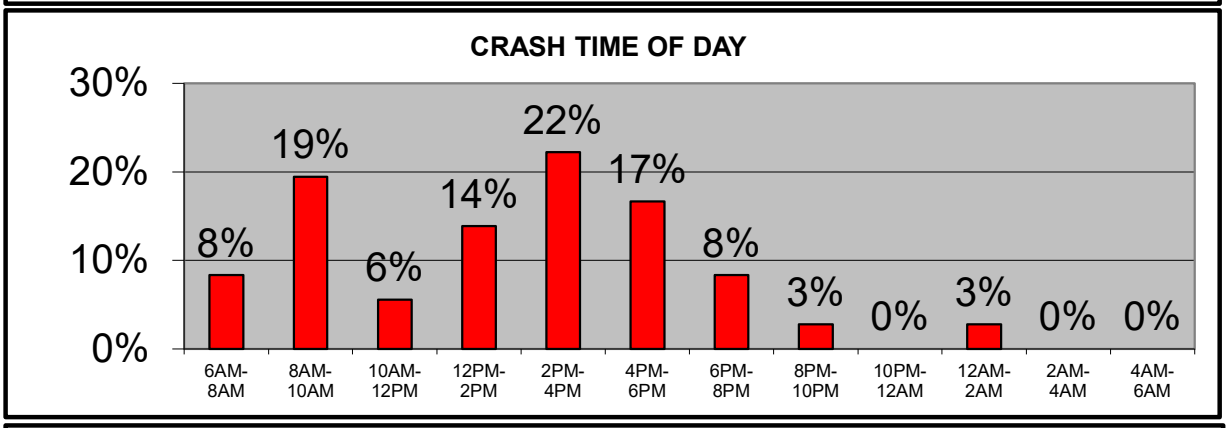


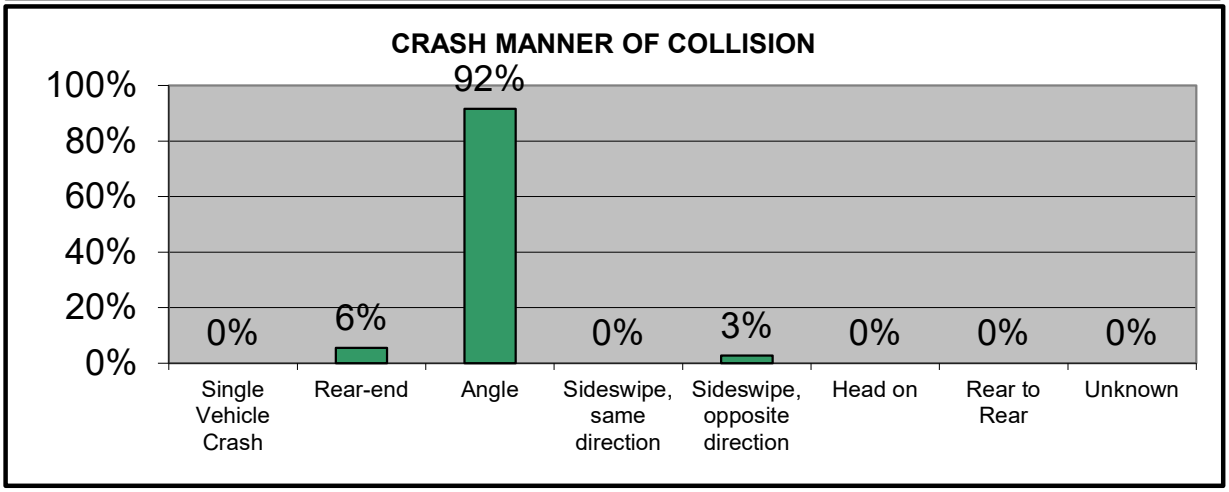
Crash Data Summary Tables and Charts

Central Street/North Central Street at Union Street/West Union Street - East Bridgewater, MA



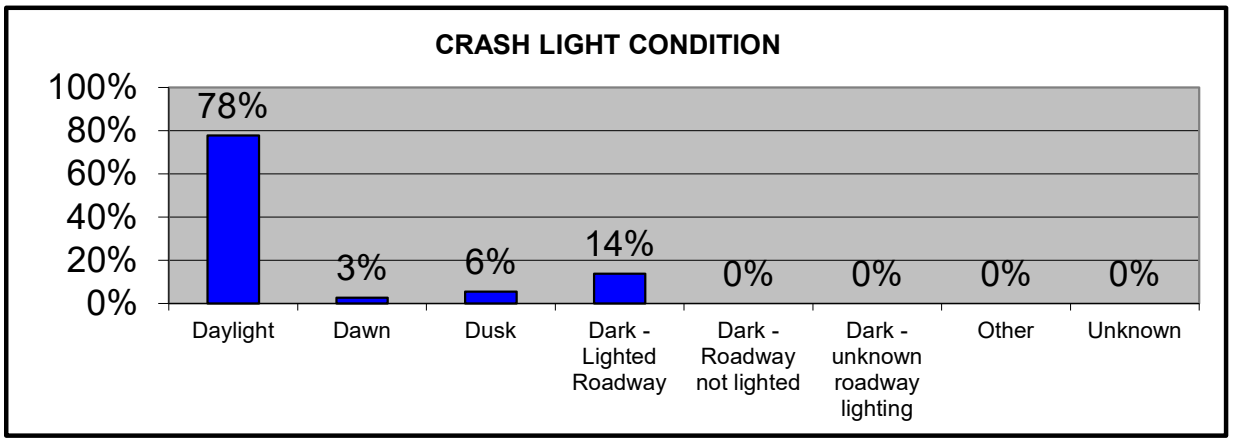


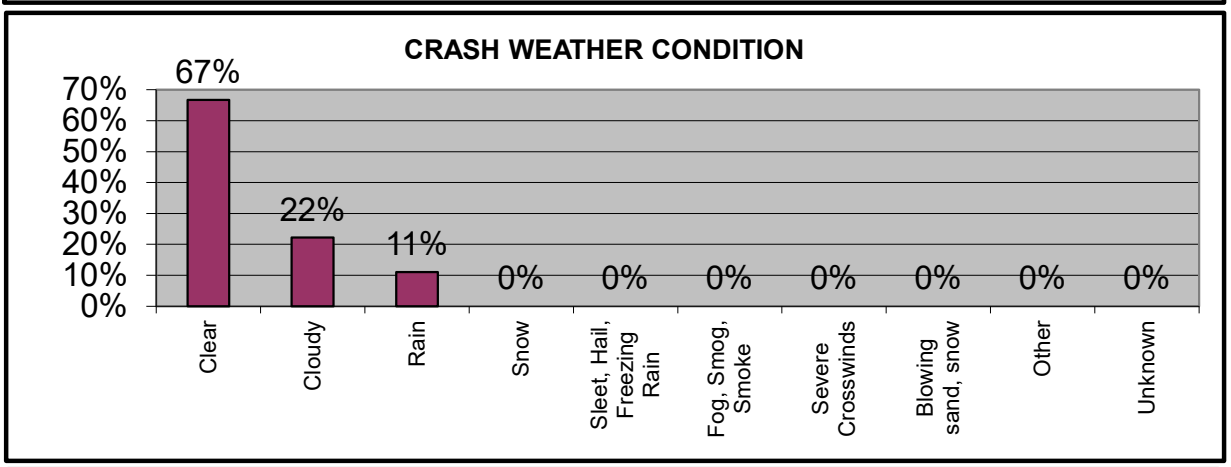


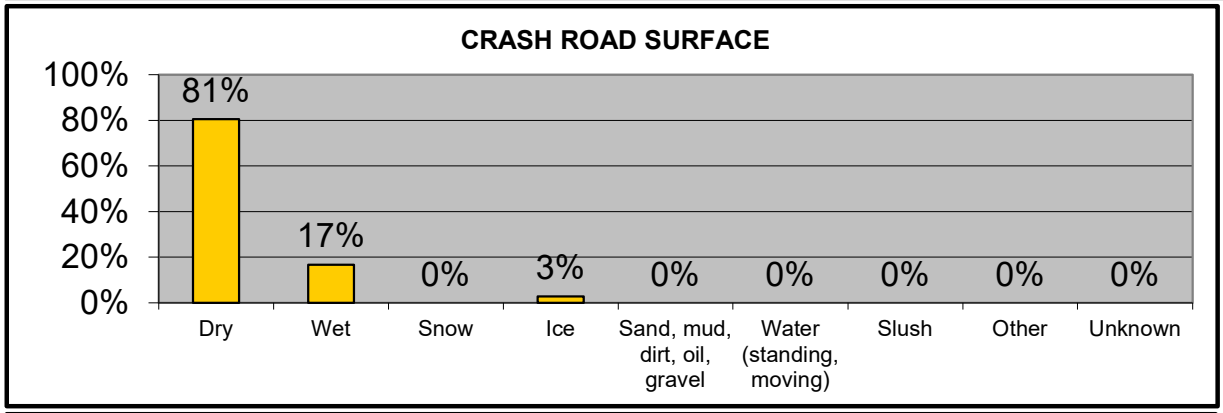


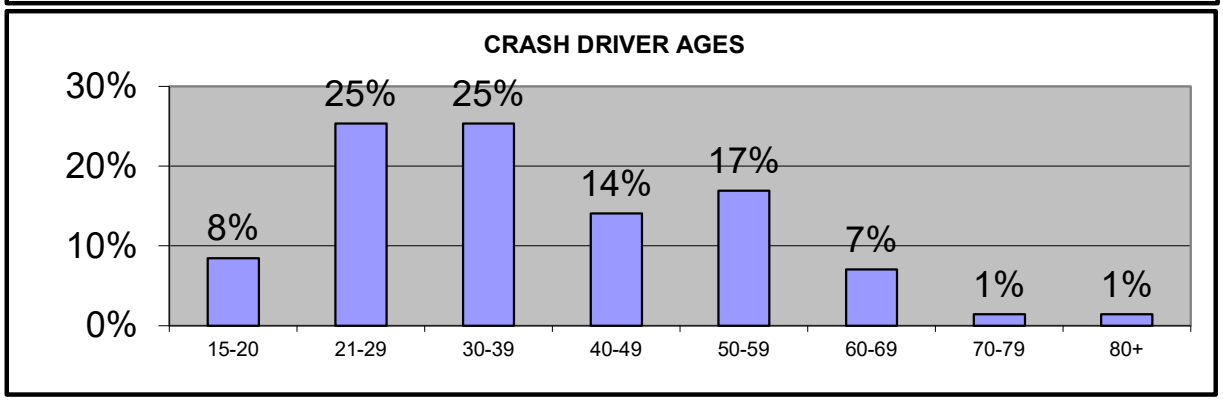
Crash Data Summary Tables and Charts

Central Street/North Central Street at Union Street/West Union Street - East Bridgewater, MA









Appendix D. Road Safety Audit References

Road Safety Audit References

FHWA Office of Safety - Proven Safety Countermeasures, U.S. Department of Transportation, Federal Highway Administration https://safety.fhwa.dot.gov/provencountermeasures/.

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

Road Safety Audits. U.S. Department of Transportation, Federal Highway Administration, https://safety.fhwa.dot.gov/rsa/

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

Road Safety Audit, 2nd edition. Austroads, 2000.

Road Safety Audits. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.