

ROAD SAFETY AUDIT

Great Road (Route 117) at Hudson Road

Town of Stow

August 18, 2022

Prepared For:
MassDOT



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Background

The Federal Highway Administration (FHWA) defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. 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 local agencies to determine the responsibilities and when to make proposed enhancements.

Toole Design has conducted an RSA for the intersection of Great Road (Route 117) at Hudson Road in Stow, Massachusetts. The intersection of Great Road at Hudson Road has a motor vehicle crash rate of 1.28 which exceeds the Massachusetts Department of Transportation (MassDOT) statewide average crash rate of 0.57 for an unsignalized intersection and the District 3 average crash rate of 0.61 for an unsignalized intersection. Additionally, it is listed as a Highway Safety Improvement Program (HSIP) crash cluster for 2015-2017, indicating that the location fell within the top 5% of high crash locations in the Metropolitan Area Planning Council (MAPC) area for that time period. The RSA was conducted as part of mitigation commitments for the proposed 141-unit residential community to be located off Athens Street. The proposed project is located approximately 1 mile south of the study intersection.

Project Data

Toole Design conducted the RSA on Tuesday, July 19, 2022. The audit was held at the Stow Town Building located at 380 Great Road, Stow, 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 to the intersection of Great Road at Hudson Road and identified additional safety concerns. The team then discussed potential safety countermeasures for the subject intersection. 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**.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Daniel LaCivita	Vanasse & Associates, Inc.
Bill Kuttner	Boston Region MPO
Josh Coombs	MassDOT - Traffic and Safety Engineering Section
Dakota DelSignore	MassDOT - Traffic and Safety Engineering Section
Ana Fill	MassDOT - Traffic and Safety Engineering Section
Mia Gerbino	MassDOT - Traffic and Safety Engineering Section
Steve Nadeau	Town of Stow – Superintendent of Streets for Highway Department
Michael Sallese	Town of Stow – Chief of Police Department
Barry Evans	Town of Stow – Chief of Fire Department
Jesse Steadman	Town of Stow – Town Planner
Malcolm Ragan	Town of Stow – Assistant Planner
Dolores Hamilton	Town of Stow – Human Resources
Denise Demboski	Town of Stow – Town Administrator
Paul Kirchner	Stamski and McNary, Inc.
David Perloff	Green International Affiliates
Rosie Jaswal	Toole Design
Christopher Bach	Toole Design

Audit team members received a meeting packet prior to the RSA including a meeting agenda (**Appendix A**), study area details, crash data tabulation, collision diagrams of the study area intersection, and an RSA prompt list. A collision diagram is a graphical representation of the crash data showing both the crash type and approximate crash location within a study area, as well as injury severity type and whether the crash occurred in daylight or under dark lighting conditions. 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 study 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 Stow Police Department (SPD) and supplemented with crashes provided by MassDOT, 30 crashes were recorded within the Great Road at Hudson Road intersection from 2017 to 2021. Of the reported crashes, 6 (20%) resulted in injury. The most common crash types observed at the Great Road at Hudson Road intersection were rear-end crashes, angle crashes, and single vehicle crashes, representing 50%, 33%, and 10% of the total collisions, respectively. Crashes occurred most frequently in the early afternoon (2PM – 4PM, 23% of all crashes) and afternoon peak hours (4PM – 6PM, 17% of all crashes). Of all crashes, most happened in the daylight (80%), with clear weather conditions (63%), and on a dry road surface (67%). A fair number of crashes occurred under rainy (23%) and wet pavement (27%) conditions. Crashes were most prevalent in October (20%) and June (13%). Crashes were also most prevalent on Thursdays (27%) and least prevalent on Fridays (3%), with a generally uniform number of crashes the remaining days of the week.

Project Location and Description

The study area includes the intersection of Great Road (Route 117) at Hudson Road in Stow, MA. The average weekday traffic on Hudson Road, north of Athens Street, was approximately 4,800 vehicles per day (vpd) as counted by Vanasse & Associates, Inc. in June 2021 for the Transportation Impact Assessment (TIA). In 2021, the average daily traffic on Great Road, west of the Hudson Road intersection was 9,950 vpd, while the average daily traffic east of Hudson Road was approximately 11,900 vpd according to the Massachusetts Department of Transportation (MassDOT) Online Transportation Data Management System. The posted speed limit along Hudson Road is 40 miles per hour (mph) in both the northbound and southbound directions, however the speed limit is lowered to 25 mph in the northbound direction approximately 350 feet south of the intersection with Great Road (per Special Speed Regulation #357). The posted speed limit for Great Road within the study area is 40 mph in both the westbound and eastbound directions (per Special Speed Regulation #357-B). The study area is shown in **Figure 1** and described on the following pages.



Figure 1: Locus Map  RSA Location

Intersection

Great Road at Hudson Road is a three-legged unsignalized ‘T’ intersection located on the west side of the Town of Stow. Great Road (Route 117) runs in the east-west direction with Hudson Road intersecting from the south. The Town is pursuing signalization of this intersection, engaging with a consultant and applying for MassWorks grants for construction funding. Great Road provides connections to the Town of Bolton to the west and Town of Maynard to the east. Within the study area, Great Road is a two-lane roadway classified as an urban principal arterial under local jurisdiction. Approximately 150 feet east of the intersection is a bridge over Elizabeth Brook. This bridge is under MassDOT jurisdiction. Hudson Road is also a two-lane roadway, classified as an urban collector under local jurisdiction. The Hudson Road approach is under STOP control, while the two Great Road approaches are free flowing. A small mountable median is present on the Hudson Road approach to the intersection, measuring approximately 2 feet wide and 12 feet long.

Sidewalks are present on the south side of Great Road and for approximately 140 feet on the east side of Hudson Road. An approximately 75-foot-long marked crosswalk is provided across Hudson Road, the southern leg of the intersection. The curb ramps provided do not appear to be ADA-compliant. There are no bicycle facilities present at this intersection. The intersection and respective approaches lie within a constrained Right-of-Way consisting of Town Layout. The southeast quadrant contains a Gulf gas station with driveways located on both Great Road and Hudson Road. The southwest quadrant is an office building, also with driveways on both roadways. The northern segment of land is vacant land owned by the Lions Club of Stow. Of note, Stow Fire Department is located just over 0.5 miles to the east of the study intersection on Great Road.

Audit Observations and Potential Safety Enhancements

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

- Intersection geometry and operations
- Pedestrian and bicyclist accommodations
- Pavement markings, signage, and wayfinding
- Lighting
- Access management

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



Figure 2: Audit team members attending the Roadway Safety Audit on July 19th, 2022.

referenced throughout the report include but are not limited to the Manual on Uniform Traffic Control Devices, Americans with Disabilities Act, MassDOT and the Town of Stow 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.

Intersection Geometry and Operations

Observations

The section of Great Road in the vicinity of its intersection with Hudson Road, especially to the west, is straight in alignment which can lead to speeding. Audit team members mentioned that they have observed vehicles traveling at higher speeds than posted, particularly along Great Road. Higher speeds greatly increase the severity and potential for injury during a crash. High speeds can cause out of control crashes, such as crash 22 recorded in the collision diagram associated with this intersection, as well as contribute to the 13 rear-end crashes observed along Great Road as vehicles traveling at higher speeds may have more difficulty avoiding a collision with stopped vehicles. Audit team members noted that solar glare was a safety concern, as Great Road runs in an east-west direction, and could also contribute to rear-end crashes. Additionally, this solar glare was noted to be worst in the fall which coincides with heavier seasonal traffic volumes. Given that 20% of all crashes at this intersection occurred during the month of October, these factors are evident in the crash data.

The large radius on the southeast corner of the intersection encourages drivers on Hudson Road northbound use the existing stop sign effectively as a yield sign, as witnessed in the field by audit team members. This phenomenon may contribute to rear end crashes as drivers may not expect the driver ahead to come to a complete stop at this stop sign, similar to crash 2. The large corner radius also enables high speed turns. These high speeds combined with poor sight lines and driveway conflicts at the Gulf gas station can contribute to crashes, similar to that of crash 11. The median between travel lanes on Hudson Road is mountable and narrow (2 feet wide by 12 feet long), making it difficult for drivers to see it. Audit team members mentioned that the sign gets knocked over often due to the size of the median.

Intersection sight lines are poor throughout the intersection. Many northbound Hudson Road drivers nose out into the intersection with Great Road due to signage at the Gulf gas station, and surrounding vegetation obstructing the view of oncoming vehicles. Westbound Great Road vehicles have impacted sight lines due to a horizontal curve east of the intersection, as well as vegetation and signage. This vegetation includes trees and other upgrowth on the southwest and southeast corners of the intersection, as shown in Figure 3. Poor sight distance may have contributed to crashes 1, 12, 17, 21, 27, and 28. Although Hudson Road is striped as one general purpose lane, it is wide enough for two vehicles to stack side-by-side, which blocks sight lines for drivers both on Hudson Road and Great Road.

The most common crash type and movement was rear-end crashes involving a driver traveling westbound on Great Road waiting to turn left onto Hudson Road. Crashes matching this description include crashes 3, 6, 9, 13, 15, 18, 24, 27, and 29. Crash 10, which was a sideswipe, also involved a driver slowing to attempt a left turn onto Hudson Road when they were struck by a trailing vehicle who failed to stop in time behind them and slid to the right. As previously mentioned, the horizontal curve on Great Road coupled with high speeds may contribute to these crashes. The high volume of left turning drivers coupled with a lack of an exclusive westbound left-turn lane exacerbate this condition. Audit team members noted

the difficulty of creating a left turn lane at this intersection due to existing roadway width and the adjacent bridge over Elizabeth Brook.

Especially in the evening, heavy westbound commuter traffic on Great Road was noted, which can lead to multiple cars queuing to turn left onto Hudson Road, waiting for an adequate gap. The congestion can also lead to a lack of adequate gaps for drivers to exit from Hudson Road. This was a likely contributing factor to angle crashes such as crashes 1, 8, 12, 17, 20, and 21. Audit team members also highlighted the occurrence of courtesy crashes at this intersection. A courtesy crash is when a driver in one direction (westbound, at this intersection) slows or stops to let a driver from Hudson Road turn left, however the driver in the other direction does not slow and collides with the vehicle attempting to turn onto Great Road.

Future signalization of this intersection may impact intersection geometry and operations. Future consideration of a signal at this intersection should take into account all concerns raised by audit team members over the course of the RSA.



Figure 3: The vegetation and signage at this intersection causes Hudson Road northbound drivers to nose out into the intersection before making a turn onto Great Road.

Potential safety enhancements

- Evaluate options to mitigate the high speeds on Great Road, such as speed feedback signs, increased enforcement, and/or speed reduction pavement markings (optical speed bars)
- Evaluate the feasibility of adding a left turn lane to the Great Road westbound approach.
- Evaluate lane configuration on Hudson Road northbound approach.
- Evaluate intersection control and consider reconstructing as a modern roundabout, four-way stop, or as a signalized intersection (provided respective warrants are met).*
- Evaluate median on Hudson Road and modify or eliminate as needed. If possible, provide pedestrian refuge within the median.
- Coordinate with property owners to trim vegetation to improve intersection sight lines.
- Consider decreasing effective curb radii to slow high speed turns.

- Consider enhancing stop sign with an LED flashing stop sign to emphasize stop control at Hudson Road northbound.*
- Consider restriping shoulders on Hudson Road to slow high speed turns and reduce instances of double stacking.

*Enhancement not relevant if signal is implemented at this intersection

Pedestrian and Bicyclist Accommodations

Observations

There are sidewalks on the south side of Great Road. They are narrow (approximately 4' wide) and in acceptable condition. The sidewalks on the southeast intersection corner are concrete and the sidewalks on the southwest corner are asphalt. An approximately 75-foot-long painted crosswalk is provided across the southern leg of the intersection. The length of the crosswalk extends pedestrian exposure to vehicle conflicts while crossing the two lanes. There is no detectable warning panel at the southwest curb ramp, which does not appear to be ADA-compliant. The southeast curb ramp is also designed as an apex-style ramp, potentially giving the impression to low-sight individuals that there is a marked crosswalk across Great Road. Drivers were observed rolling through the stop sign at Hudson Road northbound and stopping on the crosswalk to get better sight lines before turning onto Great Road. Advanced signage was not provided to denote the pedestrian crossing. Audit team members noted that this intersection is frequented by pedestrians originating from the adjacent condos from the nearby Village at Stow. The existing mountable median does not meet current standards as a pedestrian crossing island. A crosswalk provided across Hudson Road roughly 300 feet south of the intersection also accommodates foot traffic from the Village at Stow. This crossing is not accompanied by signage or any additional pedestrian accommodations. Sidewalks extending from the intersection on the eastern side of Hudson Road terminate prior to this crosswalk, leaving a gap in the pedestrian network. Further pedestrian demand is generated by events held in the field north of the intersection at or near the intersection. A future catalyst of pedestrian demand will be the new coffee shop opening in the Gulf gas station lot.

Shared lane markings for bicyclists were observed on Hudson Road south of the intersection. Due to the 40 mph speed limit on Hudson Road, shared lane markings are not appropriate on this roadway. Bicycle facilities were not observed on Great Road, but audit team members highlighted the large quantity of bicyclists who ride in and around Stow. One bicyclist was observed on the audit traveling westbound on Great Road. Neither Hudson Road nor Great Road would be considered high comfort for cyclists due to high vehicle speeds, high vehicle volumes, and lack of separation. An audit team member also noted the lack of shoulders for bicyclists. Audit members brought attention to the town's complete streets plan and any improvements should work in concert with this plan. No bicycle or pedestrian involved crashes were reported at this location during the study period.



Figure 4: Non-compliant curb ramp on the southwest corner of the study intersection.

Potential safety enhancements

- Evaluate ADA compliance of all curb ramps and upgrade if necessary.
- Evaluate pedestrian desire lines to determine where and if additional accommodations are needed.
- Consider adding an ADA-compliant pedestrian crossing island to the crosswalk to reduce the crossing distance.
- Evaluate potential bicycle accommodations or alternate routes.

Pavement Markings, Signage, and Wayfinding

Observations

Double yellow centerlines and white edge lines are provided along all approaches. These lines are faded at the intersection. While no lane assignment markings were provided on Hudson Road northbound as it is currently striped as one lane, space for two lanes may exist. Observations during the field visit showed that vehicles were forming two lanes on this approach. Guardrails on the north side of Great Road are present to prevent drivers from exiting the roadway and traveling down a steep ditch. However, there were no reflective markers on them alerting drivers to their presence along the intersection. A faded object marker sign indicating the road ends was mounted on the utility pole. Crash 25 involved a vehicle striking this pole at night, highlighting safety concerns connected to this observation.

It was observed that the stop bar for Hudson Road is located too far back along the approach, causing drivers to encroach past it for better visibility prior to executing a turning maneuver. This may also contribute to the rolling stops noted in the previous section. This action could contribute to sideswipes from Great Road vehicles avoiding Hudson Road vehicles sticking out into the intersection. It was observed that the stop sign for Hudson Road northbound is located in the roadway.

Audit team members noted the difficulty in legibility of the Hudson Road street sign from the Great Road westbound direction. Advance intersection signage is not provided, which may be especially hazardous on Great Road with the horizontal curve east of the intersection limiting sight lines at the intersection. Drivers may be unaware that they need to turn left onto Hudson Road until almost after they pass it due to this signage deficiency. A lack of informational signage and destination signage may cause abrupt movements from drivers, such as hard braking, which was noted by audit team members. This phenomenon may contribute to rear-end crashes at this location such as crashes 3, 6, 9, 13, 15, 18, 24, 27, and 29.

Deer were also reported in this area by audit team members and were involved in crash 14. There was no existing deer crossing signage observed within the vicinity of the study area.



Figure 5: Existing guardrail with lack of reflective markers for visibility and faded object marker.

Potential safety enhancements

- Refresh all pavement markings as needed to improve visibility and compliance.
- Evaluate Hudson Road stop bar and crosswalk location in relation to the intersection.

- Evaluate all signage for MUTCD compliance and reflectivity; upgrade as needed.
- Improve guardrail visibility with reflective markers.
- Consider adding advanced intersection signage for all intersection approaches.
- Consider improving Hudson Road street sign location and size.
- Consider installing an overhead flashing beacon to increase awareness of the intersection.*

*Enhancement not relevant if signal is implemented at this intersection

Lighting and Drainage

Observations

Only one overhead light was observed at the Great Road and Hudson Road intersection. Light sources from the Gulf gas station are located on the private lot adjacent to the intersection, but only one light pole was observed specifically for the intersection. Overall, 20% of recorded crashes at this intersection from 2017 to 2021 occurred at night.



Figure 6: Single light at the intersection of Great Road at Hudson Road.

Audit team members noted drainage around the intersection to be an issue. Twenty-seven percent of crashes at the study intersection occurred under wet roadway conditions, and crash 10 was specifically cited to have occurred due to wet roadway conditions.

Potential safety enhancements

- Evaluate lighting at this intersection and consider installing lighting where necessary to improve visibility and safety in low-light conditions.
- Evaluate drainage at this intersection to ensure it is adequate.

Access Management

Observations

There are four driveways within the vicinity of the study intersection. Each driveway is at least 30 feet wide, potentially posing a safety concern for conflict between incoming and outgoing drivers. The Gulf gas station driveway on Great Road is the subject of various safety concerns. Drivers have been known to use the gas station driveways as a cut through when there is significant backup at the intersection. The proximity of Hudson Road and the gas station driveway on Great Road can result in conflicting movements between vehicles turning left out of the Gulf gas station exit and vehicles turning right from Hudson Road onto Great Road. Crash 11 is an example of this conflict occurring during the study period and leading to a crash. This proximity may also lead drivers to think that vehicles are turning left onto Hudson Road when they instead are turning left into the Gulf Station driveway, as observed in crashes 23 and 30.

Previously, a Dunkin Donuts franchise was located in the gas station building which generated significant traffic at the intersection. It was noted by an audit team member that there are plans for this vacancy to be filled by another coffee shop.



Figure 7: Wide gas station driveway used as a cut through onto Great Road.

Potential safety enhancements

- Evaluate reducing the width of driveways to reduce safety concerns near this intersection.
- Evaluate limiting movements from the Gulf gas station driveway onto Great Road to right-in/right-out only.
- Evaluate coordinating with property owners to merge the Gulf gas station exit on Hudson Road with that of the liquor store directly to the south in order to distance access from the intersection.

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 intersection of Great Road and Hudson Road. The timeframe and costs are categorized below in **Table 2**.

Table 2: Estimated Time Frame and Costs Breakdown

Time Frame		Costs	
Short-Term	<1 Year	Low	<\$10,000
Mid-Term	1-3 Years	Medium	\$10,001-\$50,000
Long-Term	>3 Years	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 sections. The table includes the safety benefit, estimated timeframe for completion, estimated construction cost, and jurisdiction 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	Jurisdiction
Intersection Geometry and Operations	Evaluate options to mitigate the high speeds on Great Road, such as speed feedback signs, increased enforcement, and/or speed reduction pavement markings (optical speed bars).	High	Short-term	Low	Town of Stow
	Evaluate the feasibility of adding a left turn lane to the Great Road westbound approach.	High	Mid-term	High	Town of Stow
	Evaluate lane configuration on Hudson Road northbound approach.	Medium	Mid-term	Medium	Town of Stow
	Evaluate intersection control and consider reconstructing as a modern roundabout, four-way stop, or as a signalized intersection.*	High	Long-term	High	Town of Stow
	Evaluate median on Hudson Road and modify or eliminate as adequate.	Medium	Mid-term	Medium	Town of Stow
	Coordinate with property owners to trim vegetation to improve intersection sight lines.	High	Short-term	Low	Town of Stow/Private
	Consider decreasing effective curb radii to slow high speed turns.	Medium	Mid-term	Medium	Town of Stow
	Consider enhancing stop sign with an LED flashing stop sign to emphasize stop control at Hudson Road northbound.*	Medium	Short-term	Low	Town of Stow
	Consider restriping shoulders on Hudson Road to slow high speed turns and reduce instances of double stacking.	Medium	Short-term	Low	Town of Stow
Pedestrian and Bicycle Accommodations	Evaluate ADA compliance of all curb ramps and upgrade if necessary.	Medium	Mid-term	Medium	Town of Stow
	Evaluate pedestrian desire lines to determine where and if additional accommodations are needed.	Medium	Mid-term	Medium	Town of Stow
	Consider adding an ADA-compliant pedestrian crossing island to the crosswalk to reduce the crossing distance.	Medium	Mid-term	Medium	Town of Stow

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
	Evaluate potential bicycle accommodations or alternate routes.	High	Long-term	High	Town of Stow
Pavement Markings, Signage, and Wayfinding	Refresh all pavement markings as needed to improve visibility and compliance.	Medium	Short-term	Low	Town of Stow
	Evaluate Hudson Road stop bar and crosswalk location in relation to the intersection.	Medium	Short-term	Low	Town of Stow
	Evaluate all signage for MUTCD compliance and reflectivity; upgrade as needed.	Medium	Short-term	Low	Town of Stow
	Improve guardrail visibility with reflective markers.	Low	Short-term	Low	Town of Stow
	Consider adding advanced intersection signage for all intersection approaches.	Medium	Short-term	Low	Town of Stow
	Consider improving Hudson Road street sign location and size.	Medium	Short-term	Low	Town of Stow
	Consider installing an overhead flashing beacon to increase awareness of the intersection.*	Medium	Mid-term	Medium	Town of Stow
Lighting and Drainage	Evaluate lighting at this intersection and consider installing lighting where necessary to improve visibility and safety in low-light conditions.	Medium	Long-term	Medium	Town of Stow
	Evaluate drainage at this intersection to ensure it is adequate.	Medium	Mid-term	Medium	Town of Stow
Access Management	Evaluate reducing the width of driveways to reduce safety concerns near this intersection.	Medium	Mid-Term	Medium	Town of Stow/Private

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
	Evaluate limiting movements at the Gulf gas station driveway onto Great Road to right-in/right-out only.	Medium	Short-Term	Low	Town of Stow/Private
	Evaluate coordinating with property owners to merge the Gulf gas station exit on Hudson Road with that of the liquor store directly to the south in order to distance access from the intersection.	Medium	Mid-Term	Medium	Town of Stow/Private

*Enhancement not relevant if signal is implemented at this intersection

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

Stow, MA

Great Road (Route 117) at Hudson Road

Meeting Location: Stow Town Building
380 Great Road
Stow, MA
Tuesday, July 19th, 2022
10:00 AM – 12:00 PM

Type of meeting: Road Safety Audit
Attendees: Invited Participants to Comprise a Multidisciplinary Team
Please bring: Thoughts and Enthusiasm!!!

10:00 AM **Welcome and Introductions**

10:15 AM **Discussion of Safety Issues**

- Crash history– provided in advance
- Existing Geometries and Conditions

10:45 PM **Site Visit**

- Drive to the study area.
- As a group, identify areas for improvement

11:30 AM **Discussion of Potential Improvements**

- Return to the Town Building
- Discuss observations and finalize safety issue areas
- Discuss potential improvements and finalize recommendations

12:00 PM **Adjourn for the Day – but the RSA has not ended**

Instructions for Participants:

- Before attending the RSA on July 19th, participants are encouraged to drive/walk through the intersections 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: July 19, 2022

Location: Stow Town Building, 380 Great Road, Stow, MA

Invited Team Members	Agency/Affiliation	Email Address
Michael Sallese	Police Department-Chief of Police	stowpolice@stow-ma.gov
John P Benoit	Fire/Rescue Department-Fire Chief	c1fire@stow-ma.gov
Steve Nadeau	Highway Department - Superintendent of	highway@stow-ma.gov
Jesse Steadman	Planning Board - Town Planner	planning@stow-ma.gov
Ana Fill	MassDOT - Safety Section	ana.fill@state.ma.us
Dakota DeSignore	MassDOT - Safety Section	dakota.d.designore@state.ma.us
David Loutzenheiser	Metropolitan Area Planning Council (MAPC)	dLoutzenheiser@mapc.org
Eric Bourassa	Metropolitan Area Planning Council (MAPC)	ebourassa@mapc.org
Julie Dombroski	CTPS/Boston Region MPO	jdombroski@ctps.org
Joe Frawley	MassDOT - District 3 - Traffic	joseph.frawley@dot.state.ma.us
Lori Shattuck	MassDOT - District 3 - Traffic	lori.shattuck@dot.state.ma.us
Samuel Oppong-Krampah	MassDOT	samuel.y.oppong-krampah@dot.state.ma.us
Michael Pezzulo	FHWA - Safety Engineer	michael.pezzullo@dot.gov
Ken Coelho	FHWA - Safety Engineer	ken.coelho@dot.gov
Stacy Beuttell	WalkBoston	sbeuttell@walkboston.org
Galen Mook	MassBike	galen@massbike.org
Tom Francis	MassBike	tom@massbike.org
Jeffrey S. Dirk, P.E.,PTOE	Vanasse & Associates, Inc. - Managing Partner	jdirk@rdva.com
Daniel LaCivita	Vanasse & Associates, Inc. - Transportation	dlacivita@rdva.com
Taylor Dennerlein	Toole Design	tdennerlein@tooledesign.com
Rosie Jaswal	Toole Design	rjaswal@tooledesign.com
Christopher Bach	Toole Design	cbach@tooledesign.com

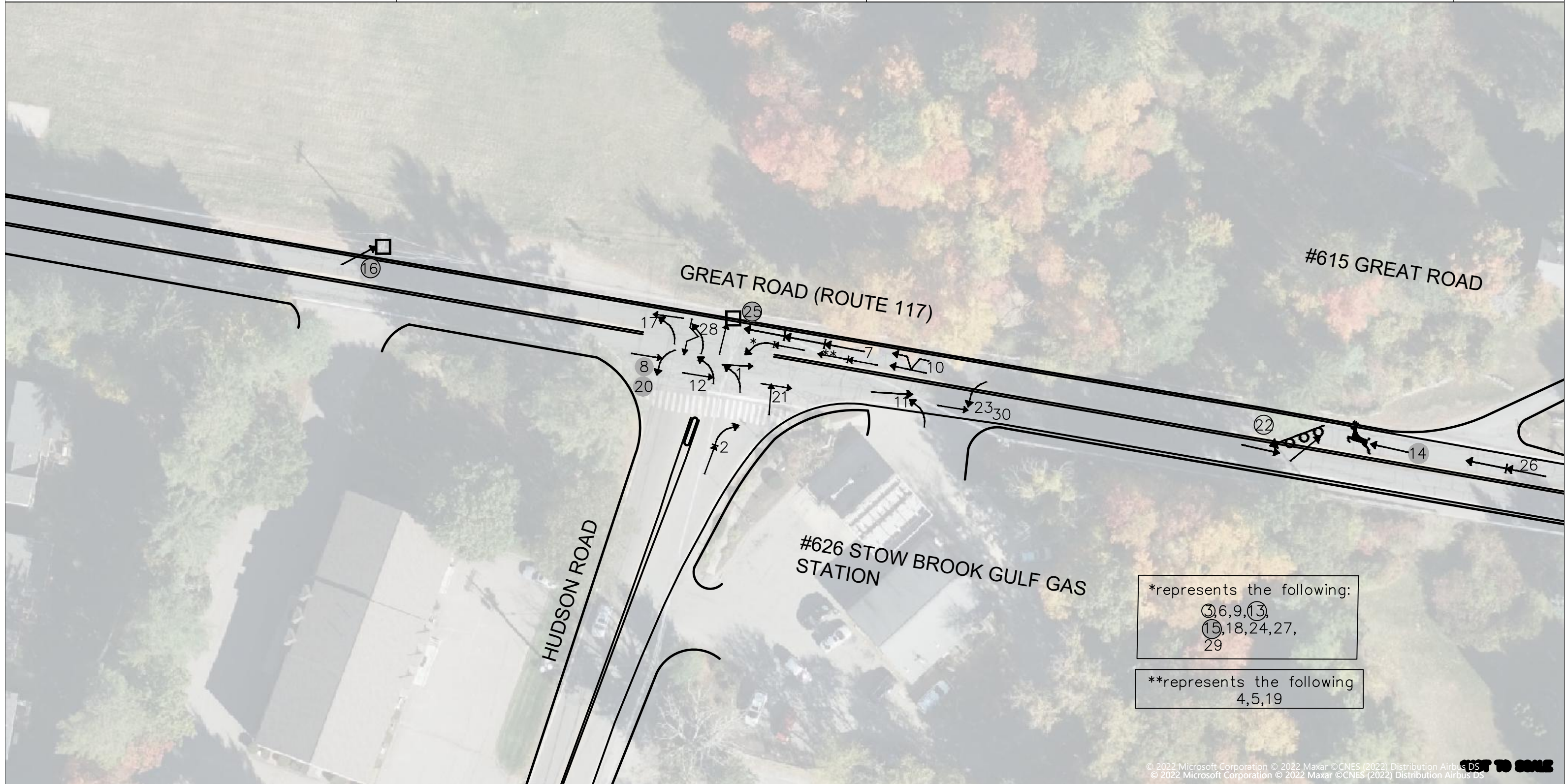
Appendix C. Detailed Crash Data

SYMBOLS	TYPE OF CRASH	SEVERITY
Moving Vehicle	Head on	Injury
Backing Vehicle	Rear End	Fatal
Non-Involved Vehicle	Angle	
Pedestrian	Turning Movement	
Bicycle	Sideswipe	
Animal	Out of Control	
Parked Vehicle	Night Time Crash	
Fixed Object		

TIME PERIOD ANALYZED: 2017-2021
 SOURCE OF CRASH REPORTS: STOW POLICE DEPARTMENT
 DATE PREPARED: 6/6/2022
 PREPARED BY: TOOLE DESIGN



COLLISION DIAGRAM



*represents the following:
 3, 6, 9, 13,
 15, 18, 24, 27,
 29

**represents the following
 4, 5, 19

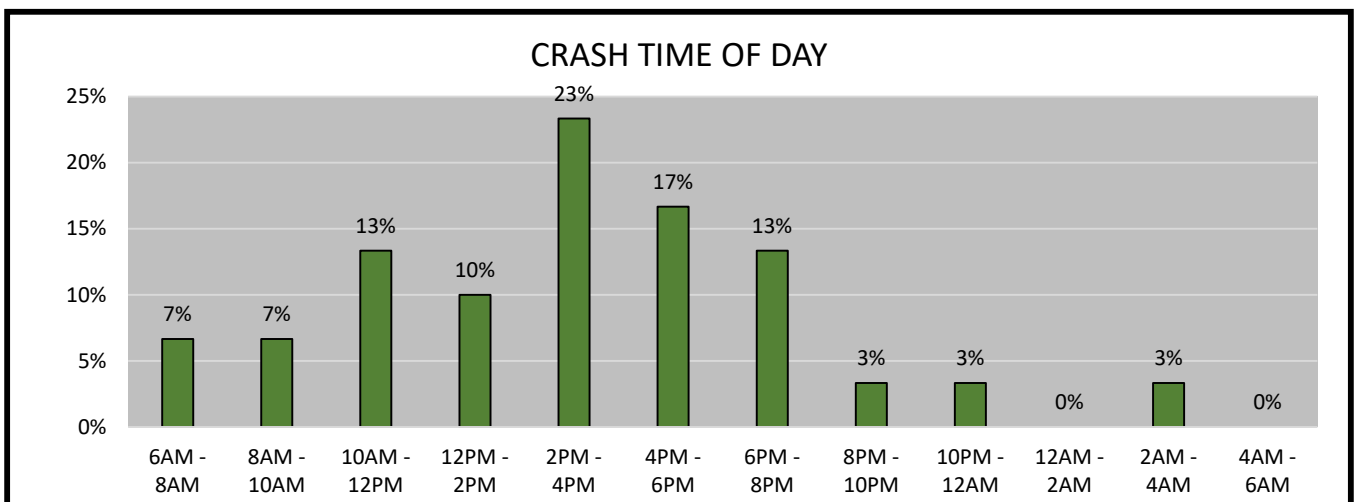
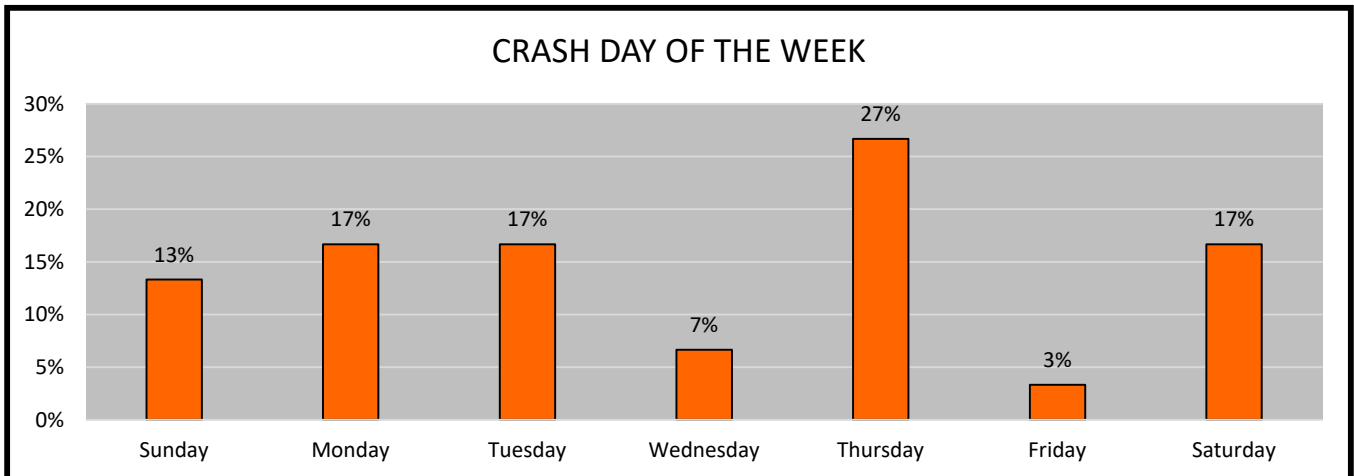
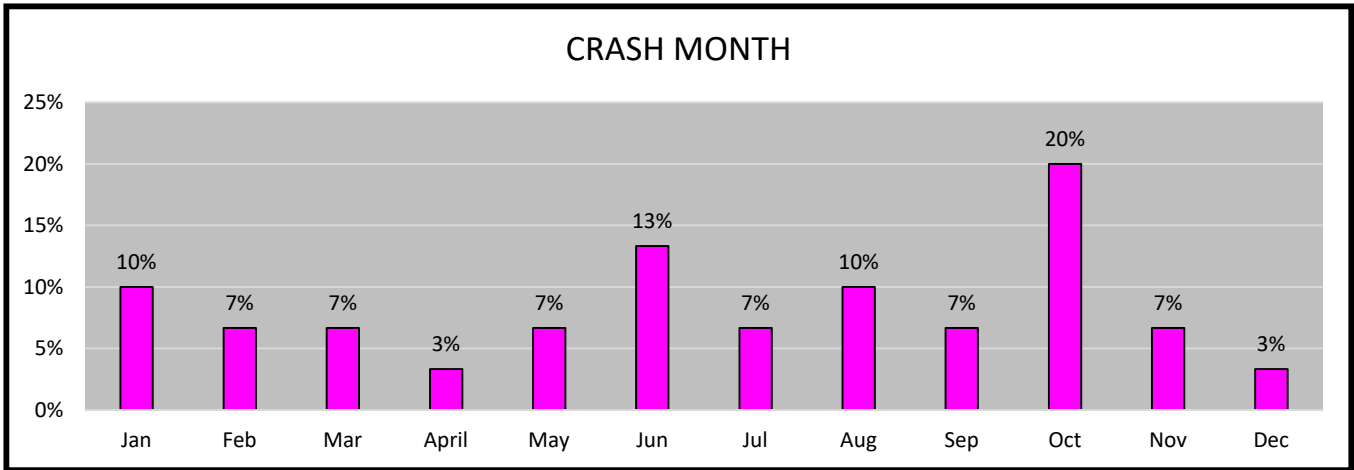
Crash Data Summary Table (2017-2021)

Town of Stow: Great Road at Hudson Road

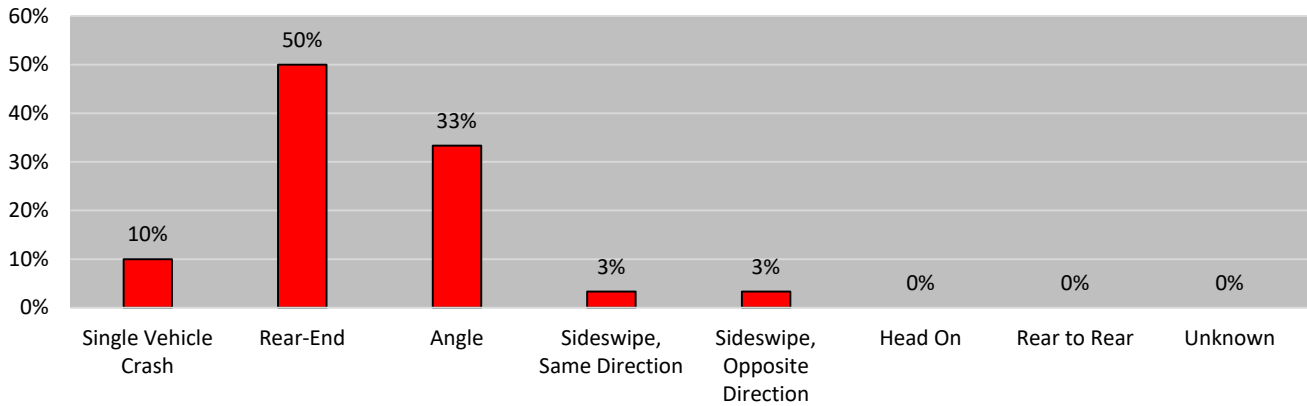
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
1	8/3/2017	Thursday	5:29 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent or aggressive manner	60	52		V1 traveling westbound on Great Road was struck by V2 who attempted to turn left from Hudson Road
2	8/23/2017	Wednesday	6:36 AM	PDO	Rear-end	Daylight	Clear	Dry	Unknown	53	59		V1 stopped at the stop sign on Hudson Road attempting to turn right. V1 was about to proceed when they had to stop due to a truck who had turned left onto Great Road from the gas station. V1 was then rear ended by V2.
3	10/2/2017	Monday	12:22 PM	Non-fatal injury (NF)	Rear-end	Daylight	Clear	Dry	Inattention	56	46		V1 traveling westbound on Great Road was slowing to take a left onto Hudson Road when V2 rear ended V1. V2 operator was distracted by vehicles turning around a construction area and encroaching on the WB lane of Great Road.
4	10/9/2017	Monday	4:42 PM	PDO	Rear-end	Daylight	Rain	Wet	No improper driving	75	18		V1 traveling westbound on Great Road was stopping for traffic ahead when V2 rear ended V1. V2 operator distracted by vehicles turning around a construction area and encroaching the WB lane of Great Rd.
5	11/16/2017	Thursday	3:46 PM	PDO	Rear-end	Daylight	Rain	Wet	Unknown	76	33		V1 traveling westbound on Great Road was slowing for traffic was rear ended by V2 unable to stop in time
6	1/17/2018	Wednesday	9:00 PM	PDO	Rear-end	Daylight	Snow	Snow	No improper driving	34	44		V1 stopped in traffic traveling westbound was waiting to turn left onto Hudson Road when V2 rear ended V1. V2 was unable to stop in time due to the snowy conditions
7	5/17/2018	Thursday	2:56 PM	PDO	Rear-end	Daylight	Clear	Dry	Inattention	20	17	21	V1 and V2 traveling westbound on Great Road and slowed for a turning vehicle at the intersection with Hudson Road when V3 rear ended V2, who subsequently rear ended V1
8	10/20/2018	Saturday	6:39 PM	PDO	Angle	Dark - roadway not lighted	Clear	Dry	Failed to yield right of way	17	27		V1 was traveling eastbound on Great Road when V2 attempted to take a left turn from Great Road on to Hudson Road. V1, unable to stop in time, struck V2. V2 operator stated they did not see V1.
9	10/27/2018	Saturday	11:04 AM	PDO	Rear-end	Daylight	Rain	Wet	No improper driving	28	75		V2 traveling westbound on Great Road was slowing to turn left on to Hudson Road when they were rear ended by V1
10	11/20/2018	Tuesday	8:44 AM	PDO	Sideswipe, same direction	Daylight	Sleet, Hail, Freezing rain	Wet	No improper driving	22	31		V1 traveling westbound on Great Road was slowing to turn left on to Hudson Road when V2, who was unable to stop in time due to the conditions skidded into the side of V1 and the guard rail
11	2/7/2019	Thursday	8:43 AM	PDO	Angle	Daylight	Rain	Wet	Failed to yield right of way	40	41		V1 traveling eastbound on Great Road was struck on the front left side by V2 who was making a left from the gas station on to Great Road
12	2/17/2019	Sunday	12:16 PM	PDO	Angle	Daylight	Clear	Dry	Made an improper turn	30	43		V2 traveling eastbound on Great Road struck V1 who pulled out in front of them taking a left turn from Hudson Road on to Great Road
13	3/18/2019	Monday	4:30 PM	NF	Rear-end	Daylight	Clear	Dry	Unknown	51	43		V1 was facing westbound attempting to take a left turn on to Hudson Road when V2 rear ended V1
14	3/18/2019	Monday	7:12 PM	PDO	Single Vehicle Crash	Dark - roadway not lighted	Clear	Dry	No improper driving	49			V1 traveling westbound on Great Road struck a deer who jumped in the middle of the roadway
15	4/23/2019	Tuesday	6:00 PM	NF	Rear-end	Dusk	Cloudy	Dry	Operating defective equipment	57	58		V1 traveling westbound on Great Road approaching the intersection of Hudson Road. V2 was stopped in traffic attempting to turn left onto Hudson Road. V1's brakes failed while stopping and rear-ended V2.
16	6/11/2019	Tuesday	3:16 AM	NF	Single Vehicle Crash	Dark - lighted roadway	Rain	Wet	Unknown	64			V1 traveling eastbound on Great Road crossed over the double yellow line and the opposing travel lane and struck a utility pole
17	7/25/2019	Thursday	4:14 PM	PDO	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	19		V1 traveling westbound on Great Road was struck on the drivers side by V2 turning left from Hudson Road on to Great Road
18	7/27/2019	Saturday	7:07 PM	PDO	Rear-end	Daylight	Clear	Dry	No improper driving	22	21		V1 was facing westbound attempting to take a left turn on to Hudson Road when V2 rear ended V1
19	9/8/2019	Sunday	11:54 AM	PDO	Rear-end	Daylight	Clear	Dry	No improper driving	43	53		V1 traveling westbound on Great Road was stopping for traffic ahead when V2 rear ended V1

20	9/28/2019	Saturday	11:05 PM	PDO	Angle	Dark - lighted roadway	Clear	Dry	Other improper action	Unknown	51		V2 traveling eastbound on Great Road struck V1 who pulled out in front of them taking an abrupt left turn from Great Road on to Hudson Road
21	12/17/2019	Tuesday	10:24 AM	PDO	Angle	Daylight	Cloudy	Snow	Failed to yield right of way	60	47		V1 traveling eastbound on Great Road was struck by V2 entering traffic from Hudson Road on to Great Road
22	1/16/2020	Thursday	7:59 AM	NF	Angle	Daylight	Rain	Wet	Failure to keep in lane or running off road	60	52	29	V1 traveling eastbound on Great Road in the area of 615 Great Road crossed over the double yellow line, striking the front left of V2 (traveling westbound), who swerved and struck the back left of V3 (traveling eastbound)
23	8/30/2020	Sunday	4:30 PM	PDO	Angle	Daylight	Clear	Dry	Unknown	17	73		V1 traveling eastbound on Great Road was struck by V2 on the front left side attempting to make a left into the gas station
24	10/23/2020	Friday	3:43 PM	PDO	Rear-end	Daylight	Clear	Dry	Inattention	31	68		V1 traveling westbound stopped to turn left on to Hudson Road was rear ended by V2
25	1/3/2021	Sunday	3:14 PM	NF	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	Physical Impairment	21			V1 traveling northbound on Hudson Road failed to stop for the stop sign at Great Road and continued forward, striking the guard rail
26	5/17/2021	Monday	2:56 PM	PDO	Rear-end	Daylight	Rain	Wet	Inattention	23	51		V1 traveling westbound on Great Road was rear ended by V2 in the proximity of 615 Great Road
27	6/5/2021	Saturday	12:16 PM	PDO	Rear-end	Daylight	Clear	Dry	No improper driving	18	43		V1 traveling eastbound on Great Road was stopping to take a left turn at the gas station when V2 rear ended V1
28	6/17/2021	Thursday	10:12 AM	PDO	Sideswipe, opposite direction	Daylight	Clear	Dry	No improper driving	78	22		V1 traveling westbound on Great Road turned left on to Hudson Road and was struck on the side by V2, who was turning left from Hudson Road on to Great Road
29	6/29/2021	Tuesday	3:19 PM	PDO	Rear-end	Daylight	Clear	Dry	Inattention	71	17		V1 stopped on Great Road waiting to take a left turn was rear ended by V2 who failed to stop in time
30	10/28/2021	Thursday	2:53 PM	PDO	Angle	Daylight	Clear	Dry	Failed to yield right of way	24	56		V1 traveling westbound on Great Road was attempting to turn in to the gas station when V2, traveling eastbound on Great Road struck the front right of V1

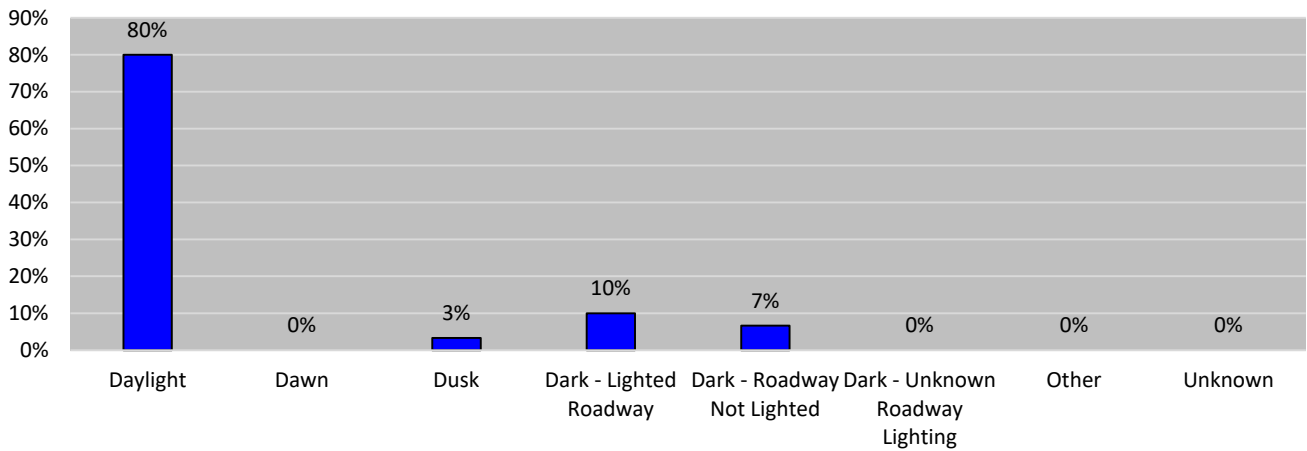
Crash Data Summary Charts (2017-2021)
Town of Stow: Great Road at Hudson Road



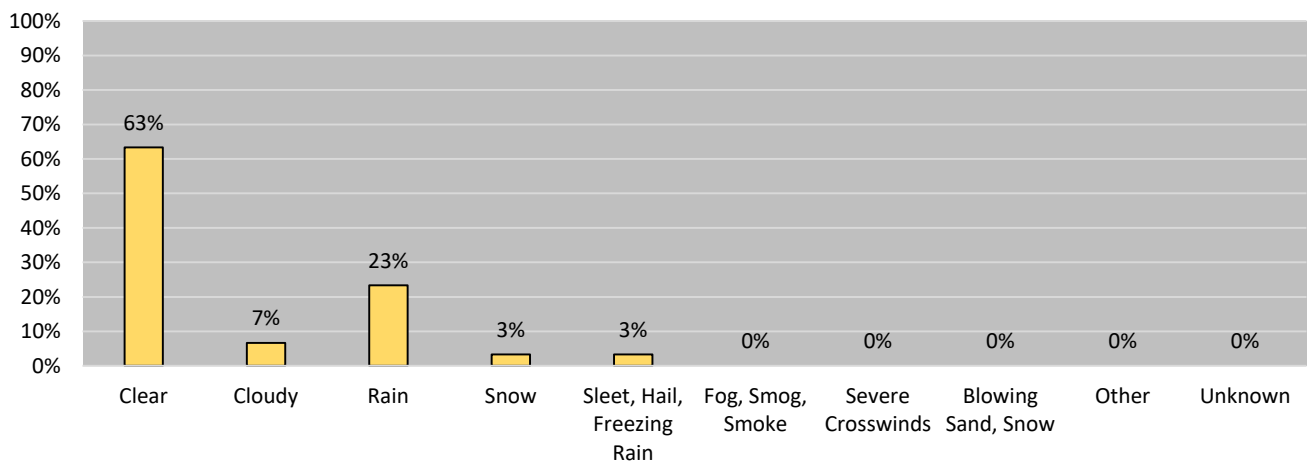
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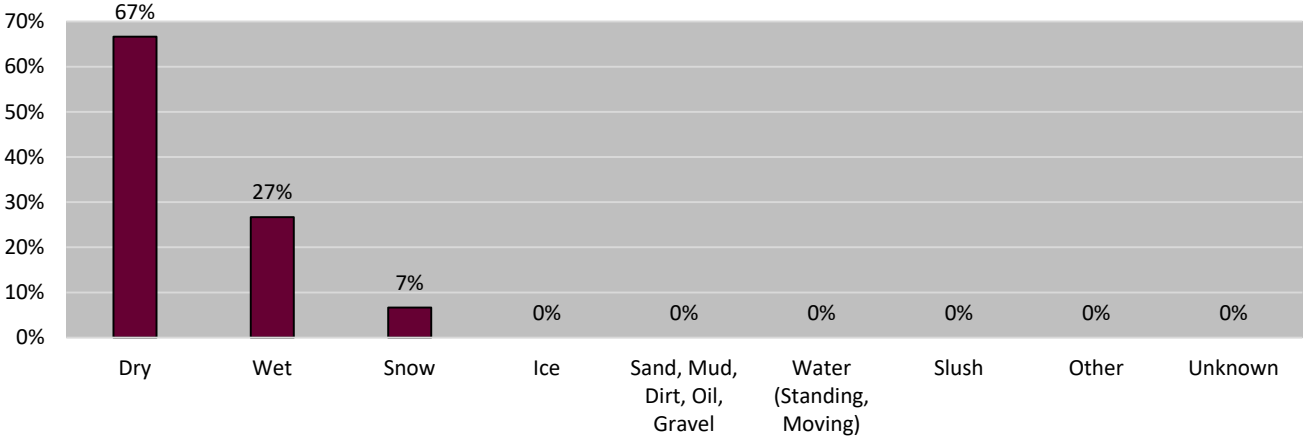
CRASH LIGHT CONDITION



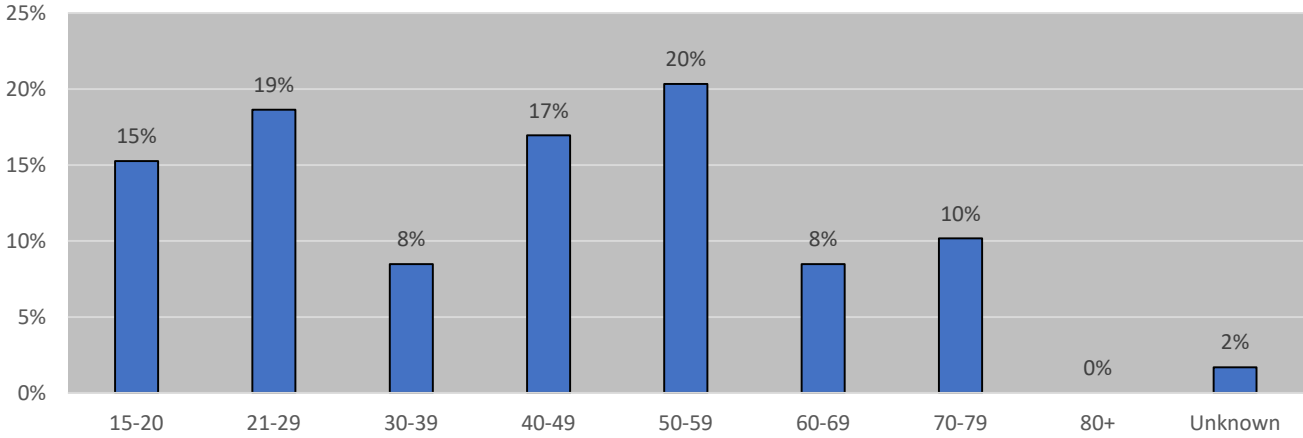
CRASH WEATHER CONDITION



CRASH ROADWAY SURFACE



CRASH DRIVER AGE



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/>.

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

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