

# ROAD SAFETY AUDIT

Pembroke Street (Route 27) at  
Lake Street and Station Street  
Kingston, Massachusetts

May 11, 2021

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



Prepared by Old Colony Planning Council  
70 School Street, Brockton, MA. 02301



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## Background

This Road Safety Audit for Pembroke Street (Route 27) at Lake Street and Station Street in Kingston 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. This location was chosen due to its relatively high Equivalent Property Damage Only (EPDO) value in context sensitive relation to the Town of Kingston and its location adjacent to a school complex.

## Project Data

This Road Safety Audit was conducted on May 11, 2021. Due to the State of Emergency in Massachusetts, 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 chicle 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 of the intersection were 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.

Table 1: Participating Audit Team Members

<b>Audit Team Member</b>	<b>Agency/Affiliation</b>
Bill McNulty	Old Colony Planning Council
Ray Guarino	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Keith Hickey	Kingston Town Administrator
Maurice Splaine	Kingston Police Chief
Paul Basler	Superintendent, Kingston Department of Public Works
Kevin Fitzgerald	Massachusetts Department of Transportation Traffic Safety
Michelle Deng	Massachusetts Department of Transportation Traffic Safety
Bianca Marshall	Massachusetts Department of Transportation District Five Traffic
Monica Mullin	Office of Senator Susan Moran

## Project Location and Description

The intersection of Pembroke Street (Route 27) at Lake Street and Station Street is a four-legged, unsignalized intersection located adjacent to the Silver Lake Regional Middle School and High school campus in northwest Kingston. It is a two-way STOP controlled intersection with STOP sign controls on the Lake Street and Station Street approaches.

- **Pembroke Street:** Pembroke Street is part of state numbered Route 27 and is a two-lane roadway under local jurisdiction of the Town of Kingston, functionally classified as a Principal Arterial. The speed limit is 35 MPH in each direction on the approaches to the intersection. Pembroke Street is part of the designated National Highway System. There is a sidewalk on the southern edge (eastbound direction) of the roadway. There are no bicycle lanes, although there are shoulders.
- **Lake Street:** Lake Street is a two-lane roadway, and functionally classified as a Major Collector under local jurisdiction of the Town of Kingston. There is a sidewalk on the eastern edge (northbound direction) of the roadway. Lake Street does not have any bicycle lanes or sharrows.
- **Station Street:** Station Street is a two-lane roadway, and functionally classified as a Major Collector under local jurisdiction of the Town of Kingston. There are no sidewalks on Station Street, and the roadway does not have any bicycle lanes or sharrows.



Figure 1: Locus Map

## Audit Observations and Potential Safety Enhancements

The following safety issues along with potential safety enhancements were identified for the intersection of Pembroke Street (Route 27) at Lake Street and Station Street.

**Horizontal Curvature of Pembroke Street (Route 27):** There is a rather long curvature of Route 27 that begins west of the intersection and continues eastward through the intersection. Drivers approaching from the west have reduced sight lines of the intersection, and drivers entering from Lake Street and especially Station Street have restricted views of traffic approaching from the west.

*Potential Safety Enhancements: In the short-term, the Town should consider clearing vegetation in the right-of-way on the northwest corner, and further consider working with property owners to clear vegetation on private property that may be restricting sight lines. Options for relocating utility pole on northwest corner, which not only blocks sight lines but is also vulnerable to being struck by a vehicle, should be explored. Long term, reconstructing the intersection with either a roundabout or traffic signal may mitigate sight line challenges.*



**Image 1: Curvature of Route 27 restricts sight lines to the west. Utility pole on northwest corner is vulnerable to traffic.**

**Lake Street vertical curvature crests at intersection:** There is a vertical curvature of Lake Street which crests at the intersection. This forces drivers to inch up to STOP line and into Route 27 to see approaching traffic from Route 27.

*Potential Safety Enhancements: Long term, reconstructing the intersection with either a roundabout or traffic signal may mitigate sight line challenges from vertical curve. Evaluate if the roadway can be regraded if intersection is reconstructed.*

**Crashes during school dismissal:** A disproportionate number of crashes (44% of all crashes) at this intersection occur from 1400 to 1600 hours (2:00 PM to 4:00 PM), coinciding with school dismissal. Furthermore, the police department reports many of the drivers in crashes at this location are younger drivers.

*Potential Safety Enhancements: Working with the school to enhance driver safety education for younger drivers may increase their awareness of the intersection and reinforce rules of the road such as right-of-way. A traffic officer may be used to control traffic, particularly if the issue is related to congestion. The Town and School District should also work with the State to create proper school zones to regulate speed during school arrival and dismissal and provide the police department with greater leverage for speed enforcement. It was noted during the Audit that restrictions in the design of school zones prevent the placement of school zones where they would be most effective in enhancing safety for motorists and pedestrians walking to school. The Town and School District should examine if a waiver is available based on the design of the school campus.*

**Low visibility of crosswalks:** The existing crosswalk design at the intersection is a standard parallel bar crosswalk. This design has reduced visibility, particularly with the presence of roadway curvature. The crosswalk east of the intersection, signed with Rectangular Rapid Flashing Beacons (RRDBs) is in the middle of a horizontal curve.

*Potential Safety Enhancements: Consider upgrading crosswalks with a Ladder or Continental design. Relocate crosswalk within horizontal curve further east. Consider using epoxy paint or thermoplastics for higher visibility.*

**Lack of bicycle accommodations:** None of the roadways (Route 27, Lake Street, and Station Street) studied in this Audit have bicycle lanes or sharrows. According to the Town of Kingston's Open Space Plan, Lake Street is part of the Town's cross town bicycle trail.

*Potential Safety Enhancements: Consider striping bicycle lanes on Route 27. Stripe bicycle lanes or paint sharrows on Lake Street and Station Street.*

**Substandard STOP Sign on Station Street:** The STOP sign on the southbound approach of Station Street does not meet the minimum 7' clearance. Furthermore, the sign is pulled back from the intersection away from the stop bar, and obstructed by a school zone speed limit sign.

*Potential Safety Enhancements: relocate school zone sign as to not obstruct STOP sign. Replace STOP sign with new retroreflective STOP sign and mount a minimum of seven feet above ground level. Move sign closer to stop bar if possible.*

**Outdated signage:** It was noted the northbound approach on Lake Street has a non-standard “STOP AHEAD” sign. Furthermore, there are old school zone flashing beacon 20 MPH fixtures that no longer correspond with a school zone and a non-functioning.

*Potential Safety Enhancements: The “STOP AHEAD” sign on the northbound approach of Lake Street should be replaced with an MUTCD compliant sign. Old and non-functioning school zone signs should be replaced, and the Town and School District should work with State to establish new school zones. Advance intersection warning signs on Route 27 can be enhanced by placing signs on both sides of roadway and adding street name placards underneath intersection warning signs. Similarly, advance warning of the STOP ahead on Station Street and Lake Street can be enhanced by placing signs on each side of roadway. Add distance plaques to advanced intersection warning signs on Route 27 to heighten awareness of intersection.*

**Placement of STOP sign on Lake Street:** There is a rather large gap between where the STOP sign is posted and the stop line on Lake Street. However, this may be due to the vertical curve.

*Potential Safety Enhancements: Assess potential of narrowing gap between STOP sign and stop line.*

**Incomplete sidewalk network:** There are no sidewalks on Station Street.

*Potential Safety Enhancements: Construction of sidewalks on Station Street should be considered, especially given its proximity to the Middle High School at its potential as a walk-to-school route. Consider completing sidewalk network on all approaches.*

**Faded striping:** Roadway striping on each approach is faded.

*Potential Safety Enhancements: repaint roadway striping.*

## 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 responsibility. 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		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

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**Table 3: Potential Safety Enhancement Summary**

<b>Safety Issue</b>	<b>Potential Safety Enhancement</b>	<b>Safety Payoff</b>	<b>Time Frame</b>	<b>Cost</b>	<b>Jurisdiction</b>
Horizontal curvature of Pembroke Street (Route 27)	Clear vegetation on northwest corner.	High	Long -erm	High	Town of Kingston
Difficulty entering intersection due to restricted sight lines	Reconstruct intersection with a roundabout or traffic signals.	High	Long Term	High	Town of Kingston
Lake Street vertical curvature crests at intersection	Reconstruct intersection with a roundabout or traffic signals.	High	Long-Term	High	Town of Kingston
Crashes during school dismissal	Create proper school zone to regulate speed. Enhance driver education in school. Police officer traffic control.	Moderate	Mid-Term	Medium	Town of Kingston
Low visibility of crosswalks	Consider enhancing visibility of crosswalks with a Ladder or Continental crosswalk design. Relocate crosswalk.	High	Short-Term	Low	Town of Kingston
Lack of bicycle accommodations	Stripe bicycle lanes.	High	Short-Term	Low	Town of Kingston
Substandard STOP sign on Station Street	Replace and upgrade STOP sign.	High	Short term	Low	Town of Kingston
Outdated signage	Upgrade advance warning signage on approaches.	Moderate	Short-Term	Low	Town of Kingston
Placement of STOP sign on Lake Street	Bring STOP sign closer to stop line	Moderate	Short-Term	Low	Town of Kinston
Incomplete sidewalk network	Complete sidewalk network with new sidewalks.	High	Long Term	High	Town of Kingston
Faded striping	Repaint roadway striping	Moderate	Short Term	Low	Town of Kingston

## Appendix A. RSA Meeting Agenda

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<b>Agenda</b>	<b>Road Safety Audit for Pembroke Street (Route 27) at Lake Street, Kingston, MA Tuesday, May 11, 2021 10:00 AM – 11:00 AM</b>
<b>Contact:</b>	Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org
<b>Attendees:</b>	Invited Participants Include a Multidisciplinary Team including Kingston Officials (Chief Elected Officials, DPW, Police, Fire, Administration, Schools), MassDOT, Safe Routes to School, FHWA, Legislative Delegation
<b>Please Bring:</b>	Thoughts and Suggestions
<b>Meeting Location:</b>	<b>Virtual Meeting (Zoom):</b> <a href="https://us02web.zoom.us/j/84227967332?pwd=WW9HK2RaQ1IyQVNLVGQwekwrQSsxdz09">https://us02web.zoom.us/j/84227967332?pwd=WW9HK2RaQ1IyQVNLVGQwekwrQSsxdz09</a> <b>Webinar ID:</b> 842 2796 7332 <b>Password:</b> 041009
<b>10:00 AM</b>	Welcome and Introductions
<b>10:10 AM</b>	Virtual Road Safety Audit of Pembroke Street (Route 27) at Lake Street <ul style="list-style-type: none"> <li>• Review of Traffic Data</li> <li>• Existing Conditions and Known Challenges</li> <li>• Identification of Potential Safety Improvements</li> </ul>
<b>10:40 AM</b>	Wrap-Up Site Audit; Discussion of Next Steps
<b>Instructions For Participants:</b> <ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> <li>• 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</li> </ul>	

## Appendix B. RSA Audit Team Contact List

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## Participating Audit Team Members

Date:	May 11, 2021	Location:	Virtual (Zoom)
<b>Audit Team Members</b>		<b>Agency/Affiliation</b>	
Bill McNulty		Old Colony Planning Council	
Ray Guarino		Old Colony Planning Council	
Charles Kilmer, AICP		Old Colony Planning Council	
Shawn Bailey		Old Colony Planning Council	
Kyle Mowatt		Old Colony Planning Council	
Keith Hickey		Kingston Town Administrator	
Maurice Splaine		Kingston Police Chief	
Paul Basler		Superintendent, Kingston Department of Public Works	
Kevin Fitzgerald		Massachusetts Department of Transportation Traffic Safety	
Michelle Deng		Massachusetts Department of Transportation Traffic Safety	
Bianca Marshall		Massachusetts Department of Transportation District Five Traffic	
Monica Mullin		Office of Senator Susan Moran	

## Appendix C. Detailed Crash Data

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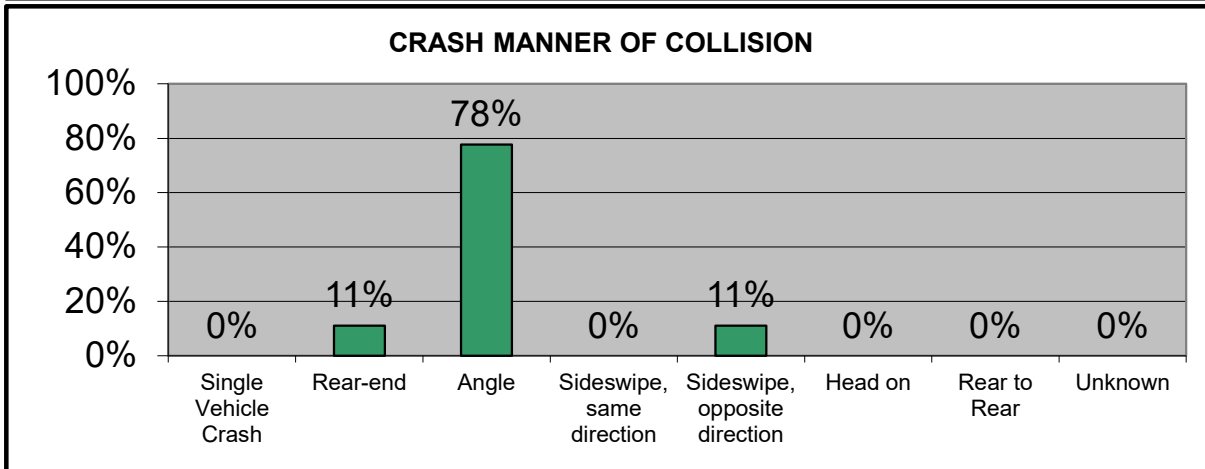
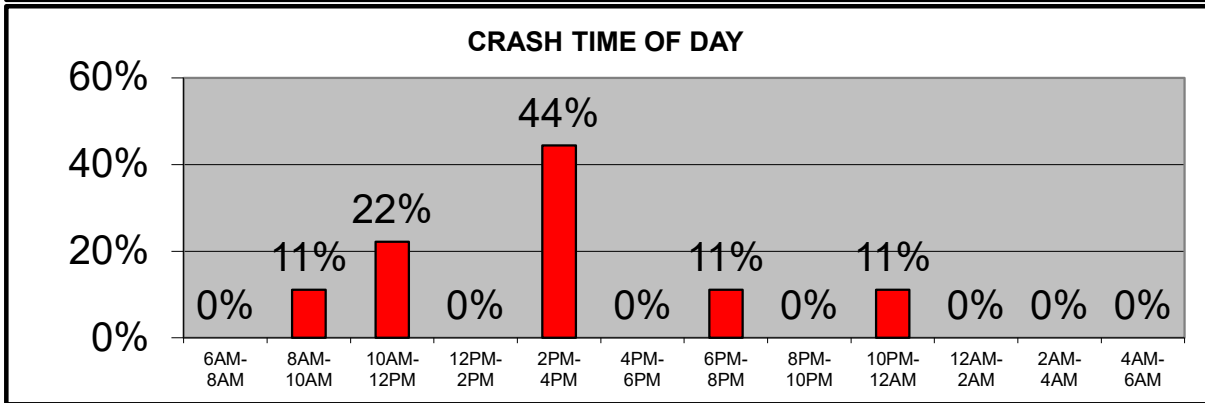
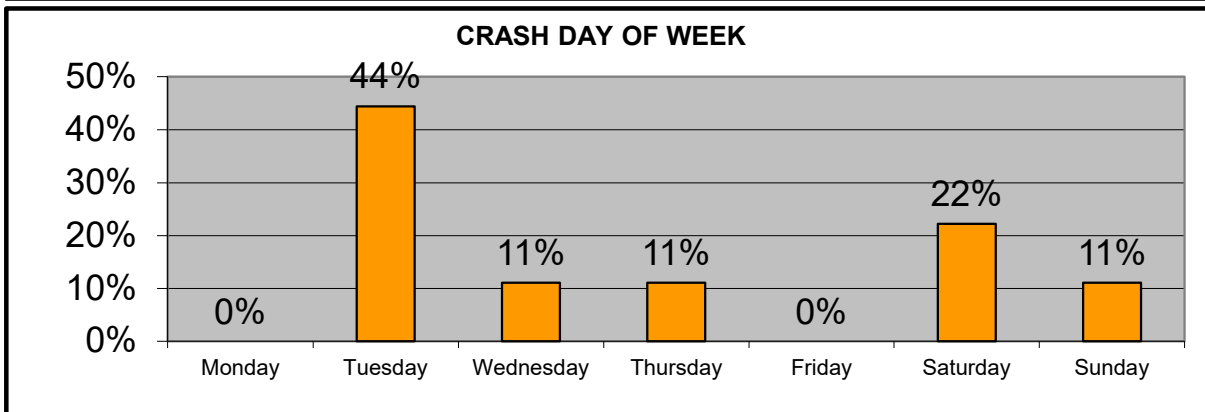
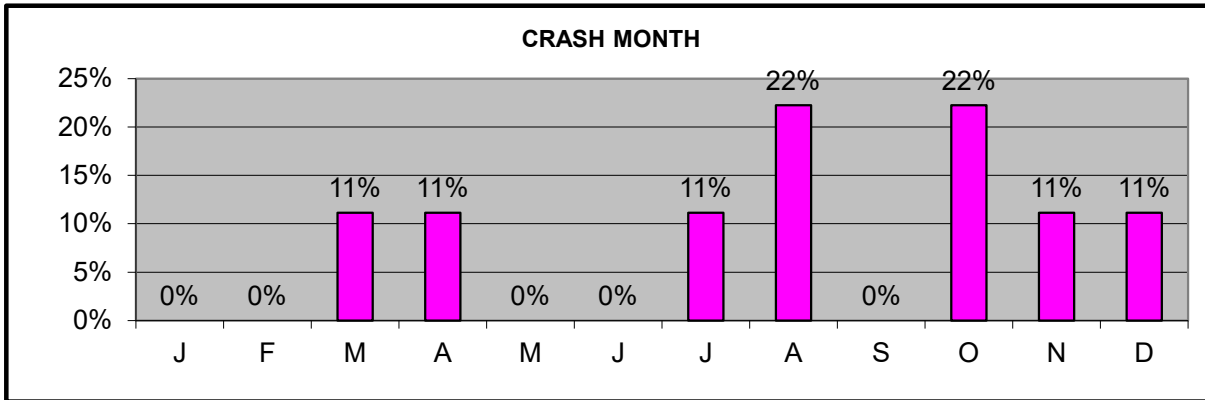
# Crash Data Summary Table

Pembroke Street (Route 27) at Lake Street/Station Street, Kingston, MA  
2017-2020

Crash Diagram Ref #	Crash Date <i>m/d/y</i>	Crash Day	Time of Day	Manner of Collision <i>Type</i>	Light Condition <i>Type</i>	Weather Condition <i>Type</i>	Road Surface <i>Type</i>	Driver Contributing Code <i>Type</i>	Comments
1	10/24/17	Tuesday	3:15 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	17-222-AC
2	3/27/18	Tuesday	3:19 PM	Angle	Daylight	Clear	Dry	Inattention	18-71-AC
3	8/29/18	Wednesday	11:51 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	18-172-AC
4	11/25/18	Sunday	7:16 PM	Sideswipe, opposite direction	lighted	Clear	Dry	Made an improper turn	18-243-AC
5	4/6/19	Saturday	8:48 AM	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	19-46-AC
6	8/17/19	Saturday	11:33 PM	Rear-end	Dark - lighted roadway	Clear	Dry	No Improper Driving	19-133-AC
7	12/7/19	Tuesday	3:51 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19-219-AC
8	7/14/20	Tuesday	11:53 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	20-108-AC
9	10/8/20	Thursday	2:05 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	20-151-AC

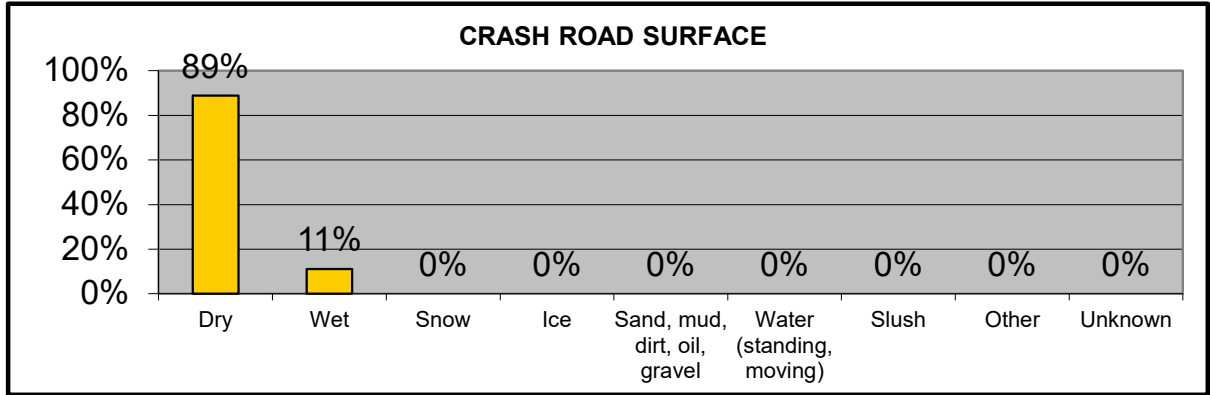
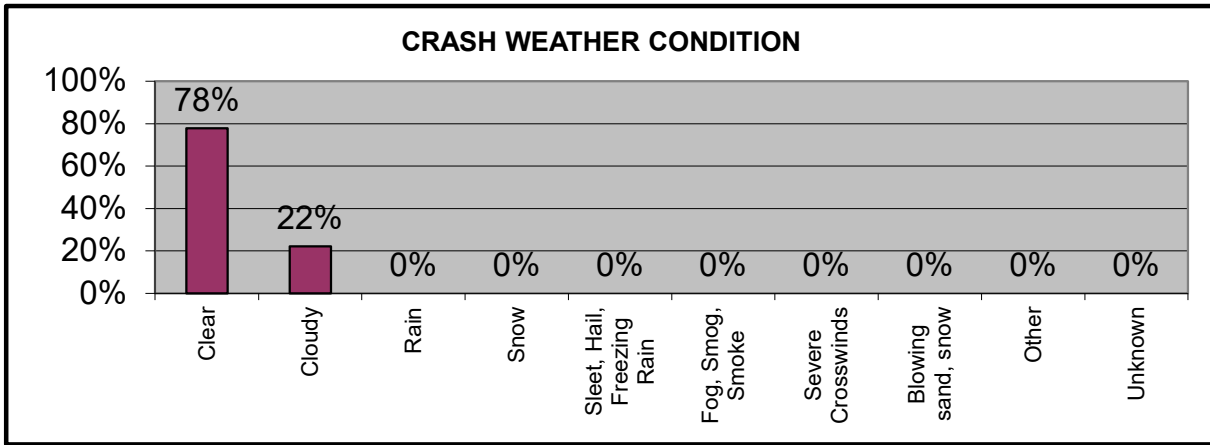
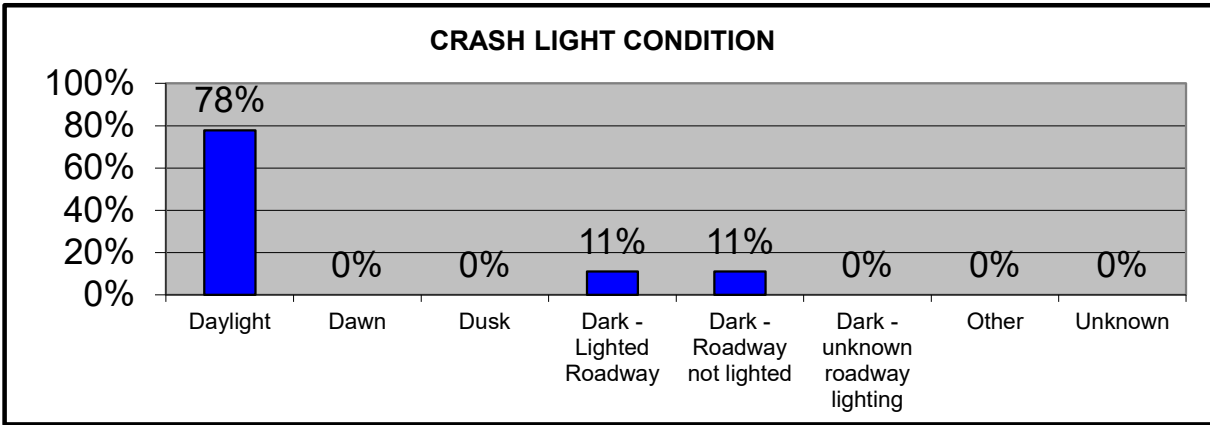
\*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road

**Crash Data Summary Tables and Charts**  
 Pembroke Street (Route 27) at Lake Street/Station Street, Kingston, MA

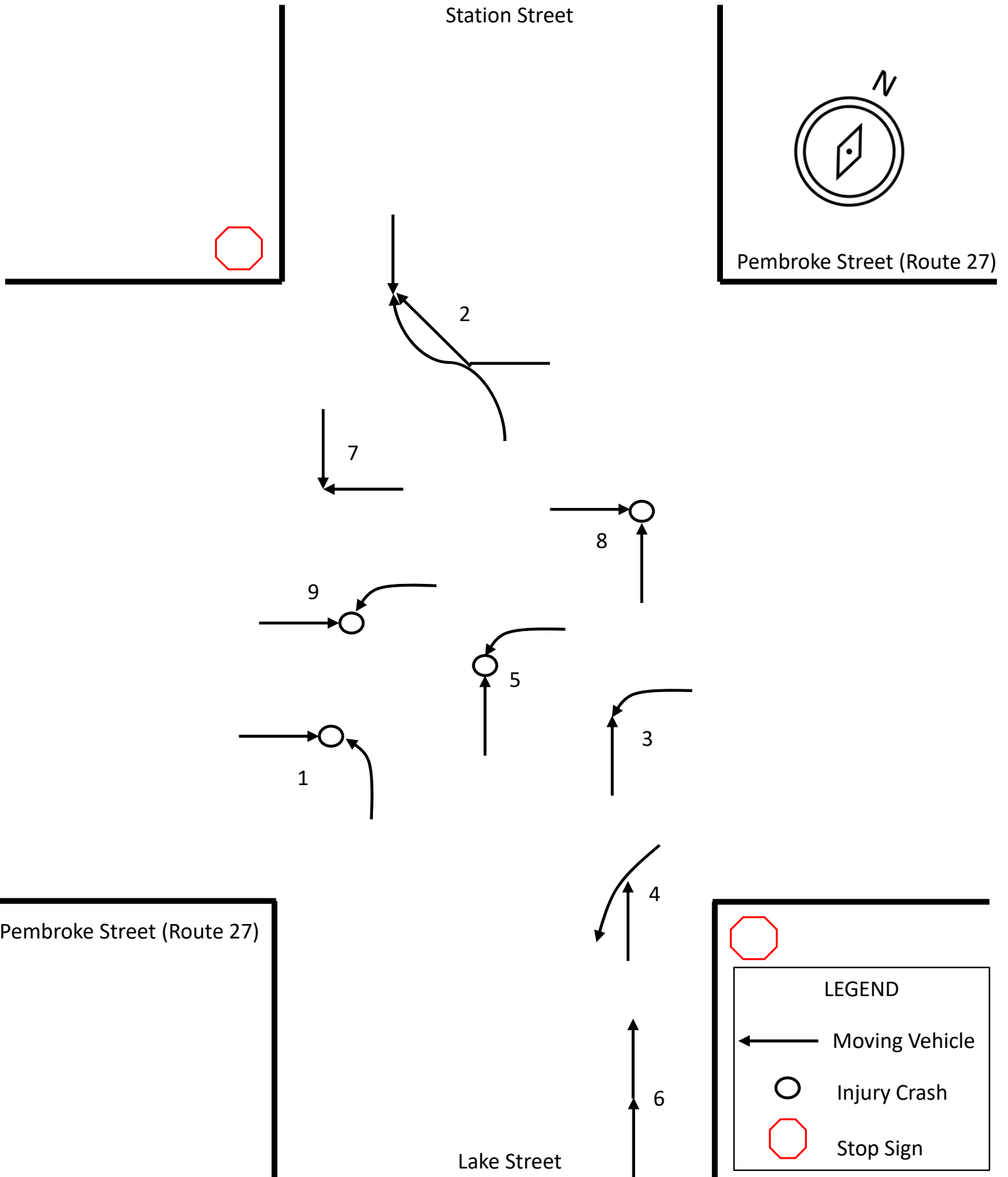




**Crash Data Summary Tables and Charts**  
 Pembroke Street (Route 27) at Lake Street/Station Street, Kingston, MA



**COLLISION DIAGRAM**  
 Pearl Street at School Street  
 Collision Diagram for Crashes (2017-2020)  
 Prepared by OCPC (SB 04/2021) (Source: Kingston Police Dept.)



## Appendix D. Road Safety Audit References

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