



Somerset County Roadway Safety Study
Subregional Project

ROAD SAFETY AUDIT REPORT

GREENBROOK ROAD IN NORTH PLAINFIELD BOROUGH



November 2021

HP Inc.

Executive Summary

As part of the North Jersey Transportation Planning Authority (NJTPA)'s subregional studies grant program, Somerset County (the County) has conducted the Somerset County Roadway Corridor Safety Analysis study. The study will advance the County's efforts to address pedestrian/bicycle and intersection safety. Five (5) County roadway corridors have been selected to go through a comprehensive safety analysis following the Federal Highway Administration's Road Safety Audit (RSA) process to identify vehicle, pedestrian, and bicyclist safety issues and to develop safety improvement recommendations. This RSA report has been prepared for the Greenbrook Road corridor (Somerset County Route 636, CR 636), from Harrington Avenue at MP 0.7 to Somerset Street (CR 531) at MP 1.97, in North Plainfield Borough. According to the compiled crash data, 100 crashes occurred on the 1.27-mile segment analysis area during the 3-year vehicle and 5-year pedestrian crash analysis period.

The pre-audit meeting was held at 10:00 AM via video conferencing on Thursday, April 8th, 2021, on the morning of the in-field review meeting to introduce the audit team, cover the activities to complete the RSA, define the RSA process, cover existing conditions data, present safety measures under consideration, summarize crash data collected for the corridor, and go over ground rules for conducting the in-field portion of the audit safely. The in-field component of the RSA was conducted at 2:00 PM on the same day as the pre-audit meeting. Participants were paired off with each other to walk halves of the corridor. Utilizing aerial mapping, prompt lists, photography, and video, participants recorded their observations of the corridor, as well as safety measures to address potential safety concerns. On the following day (Friday, April 9th, 2021), the RSA team reconvened via video conferencing to view photos gathered during the in-field audit to discuss each potential safety concern, elaborate on potential ideas to mitigate, cover questions on travel pertaining to the overall corridor, and summarize next steps for this study.

Discussions from the RSA process helped to form the basis of the Implementation Matrix in the **Identified Issues & Observations** section of this report, which serves as a record of items discussed during the post-audit meeting. Major findings (or recommendations) from these discussions included:

- Potential locations for new/refreshed crossings by West End Elementary, with curb extensions and Rectangular Rapid Flashing Beacons (RRFBs);
- Measures for pedestrian safety at West End Avenue, including No Turn on Red (NTOR), Leading Pedestrian Intervals (LPIs), and overgrowth trimming;
- Striping (stop bars and crosswalks) on side street approaches from West End Avenue to Grove Street;
- Grove Street signal upgrades: signal equipment location, ADA compliance, and LPIs;
- Daylighting at Duer Street to improve sight distances between through vehicles and crossing movements;
- School events to encourage students to walk and bike to schools located along the corridor;
- Curb cut/parking management, Duer Street to Somerset Street, to improve sight lines and ped safety.

A key recommendation from this RSA was to enhance pedestrian safety through sidewalk upgrades and crosswalks at school locations. Due to location of the corridor near parks, schools, or other land uses that tend to have a relatively high share of active mode trip generation, it was discussed to stripe or construct curb extensions and refresh crosswalk striping and consider the installation of Rectangular Rapid-Flashing Beacons (RRFBs) at unsignalized crossing locations. Daylighting or other striping in shoulder would aid to prohibit parking, allocate bus standing, and calm traffic speeds. At nearby signalized intersections, push button upgrades, lighting, No Turn on Red (NTOR) restrictions, and Leading Pedestrian Intervals (LPIs) are recommended. Further investigation would be necessary to implement these recommendations appropriately.

Please note that recommendations cited in the Implementation Matrix are to reflect feedback received during the RSA process, and are meant to be a record of ideas discussed. As these recommendations are

considered for advancement into either a Concept Development (CD) study, or incorporation into an overlapping County or municipal project, the recommendations herein should be thoroughly evaluated for feasibility and practicability and designed as appropriate by the roadway owner and/or a professional engineer for conformance to all applicable codes, standards, and best practices.

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I. Introduction

As part of the North Jersey Transportation Planning Authority (NJTPA)'s subregional studies grant program, Somerset County (the County) has begun the Somerset County Roadway Corridor Safety Analysis. The Somerset County Roadway Corridor Safety Analysis will advance New Jersey's efforts to address pedestrian/bicycle and intersection safety. Five (5) County roadway corridors have been selected to go through a comprehensive safety analysis following the Federal Highway Administration's Road Safety Audit (RSA) process to identify vehicle, pedestrian, and bicyclist safety issues and to develop safety improvement recommendations. One of the locations that has been selected is the Greenbrook Road corridor (Somerset County Route 636, CR 636), from Harrington Avenue at MP 0.7 to Somerset Street (CR 531) at MP 1.97, in North Plainfield Borough.

The purpose of this RSA Report is to detail the site selection, road/multimodal inventory, land use investigation, crash data collection, crash analysis efforts, post/pre-audit meetings, and in-field RSA investigation conducted for the Greenbrook Road corridor. Flowing from this RSA is a list of potential recommendations proposed to improve safety. These recommendations were based on the investigated crash data and during the in-field RSA and post-audit meeting. This introduction serves to provide background on selection of the investigated corridor and covers the logistics of the RSA process that was performed. This RSA report also seeks to provide sample figures of improvements and crash countermeasures that could be considered as the County and/or municipality, seeks to move forward on its Concept Development (CD) and/or Local Safety Program grant (or other funding) application. Please note, in applying these ideas to the corridor, design of such improvements, conceptual or otherwise, is the responsibility of the designated jurisdiction as is standard RSA practice.

A. Site Selection

Selection of the Greenbrook Road corridor was based on a rigorous process which started with a list of top crash segments for the County from NJTPA's Network Screening Lists (NSL)¹ and used supporting collision data, equity data, recommendations from prior studies, and public/stakeholder input to develop a shortlist of top crash segments. Segments with recently-constructed safety improvements, or locations undergoing study/design were identified through discussions with County Engineering and removed from this shortlist to target segments not currently being considered. Remaining locations were further prioritized and ranked with more recent crash severity and frequency data (old crash data from NSL superseded with more recent crash data from Safety Voyager), traffic volume data from NJTPA's regional travel demand model (NJRTM-E), and environmental justice data from NJTPA.

Input on these top crash locations was obtained through the Public Involvement Plan for this project, which included gathering information from the public via a virtual mapping tool and project email address and gathering information from a Technical Advisory Committee (TAC)² via an initial virtual meeting conducted in August 2020. Based upon public and stakeholder input, the following (5) segment locations (including the segment being studied in this report) were selected to be advanced for RSA review:

1. Finderne Avenue/Main Street (CR 533) in Bridgewater Township, MP 29.60-30.60
2. Franklin Boulevard (CR 617) in Franklin Township, MP 0.00-1.00
3. Somerset Street (CR 626) in Raritan Borough, MP 0.00-0.67
4. Greenbrook Road (CR 636) in North Plainfield Borough, MP 0.70-1.97
5. Main Street (CR 533) in Millstone Borough, MP 25.14-25.87

¹ <https://www.njtpa.org/Projects-Programs/Local-Programs/Local-Safety-Rural-Roads/Local-Safety-Program/Network-Screening-Lists.aspx> Top crash segment lists on this webpage are based upon a programmatic analysis of statewide locations utilizing 2014-2018 crash data.

² Stakeholders on the TAC include NJDOT, NJ TRANSIT, FHWA, RideWise, AARP, Voorhees Transportation Center, and various County advocates.

Greenbrook Road was selected based on the relatively high crash frequency on this corridor, equity data, and pedestrian/cyclist crash frequency. Furthermore, this location was identified within the *WalkBikeHike* (2019) study as being one of the County’s corridors with frequent pedestrian and cyclist crashes. **Table 1** shows the portions of the selected segment, or intersections, that qualified as one of the top 100 crash locations¹ in the County based on either overall crash data for the years of 2016 through 2018 or pedestrian/cyclist crash data for the years of 2014 through 2018 as listed on the NSLs.

Table 1 – Greenbrook Road NJTPA 2019 NSL Rankings for Somerset County

Corridor Segments Overall Crash Data	Corridor Segments Ped/Bike Crash Data	Intersection Locations Overall Crash Data	Intersection Locations Ped/Bike Crash Data
#66 MP 0.55-1.55	#20 MP 0.84-1.55	Duer Street (#70)	Grove Street (#13)
			Somerset Street (#19)
			Wilson Avenue (#28-tied)
			Duer Street (#28-tied)
			West End Avenue (#36-tied)
			Stone Street (#36-tied)
			Glenside Pl (#76)

B. What is a Road Safety Audit (RSA)?

An RSA is a formal safety performance examination of an existing or future road or intersection by a multi-disciplinary audit team, including public works, law enforcement, emergency medical services, engineering, planning, and advocacy staff. It qualitatively estimates and reports on existing and potential road safety issues and identifies opportunities for improvements in safety for all road users. RSAs can be used on any size project, from minor maintenance to mega-projects, and can be conducted on facilities with a history of crashes or during the design phase of a new roadway or planned upgrade. RSAs consider all road users, account for human factors and road user capabilities, are documented in a formal report, and require a formal response from the road owner. **Figure 1** shows the steps employed by the County to complete the RSA, as informed by the Federal Highway Administration’s (FHWA’s) RSA process. The steps that traditionally consist of an in-field review of conditions with an RSA team are highlighted in green below.

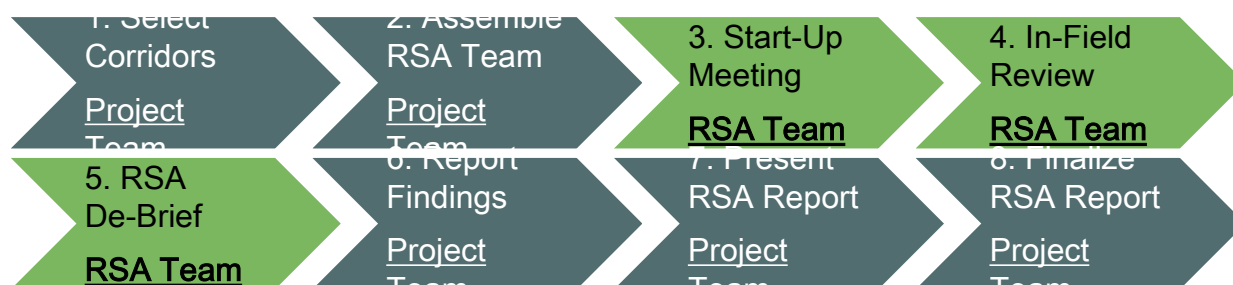


Figure 1 – Eight-Step RSA Process as Adopted from FHWA RSA Process

The RSA program is conducted to identify potential countermeasures for roadway segments demonstrating a history of, or potential for, a high frequency of crashes, or an identifiable pattern of crash types. Recommendations range from low-cost, quick-turnaround safety improvements to more complex strategies, which are all codified in this report within an Implementation Matrix, categorizing improvements by timeline, cost, and jurisdiction. Implementation of improvement strategies identified through this process may be eligible for Local Federal Aid Safety Funds. Because the RSA process is adaptable to local needs and conditions, recommendations can be implemented incrementally as time and resources permit. Please

note that the RSA process does not include the design or thorough evaluation of improvements that are being considered, conceptual or otherwise. Following the eighth and final step of the RSA process, it will be incumbent for the designated jurisdiction for each improvement proposed in the Implementation Matrix to start to evaluate and design the ideas presented herein as is standard RSA practice.

At the request of NJTPA, RSAs originally planned for Fall 2020 were postponed to Spring 2021 due to the COVID-19 pandemic. In addition to postponement, the County took additional steps to safely conduct this RSA. Both the start-up meeting and RSA de-brief (steps #3 and #5 shown in **Figure 1**), which are traditionally conducted in-person, were conducted virtually via video conferencing to reduce the exposure and potential risk of disease transmission. Furthermore, the essential step of in-field review was conducted in a socially-distanced manner with participants paired off in groups spaced more than six feet apart from each other. All in-field RSA participants were masked for the entire duration of the field visit to further reduce disease transmission. Through this process, the post-audit “de-brief” meeting benefitted from being held virtually after the day on which the in-field review was conducted.

Some notable benefits produced by a virtual post-audit included:

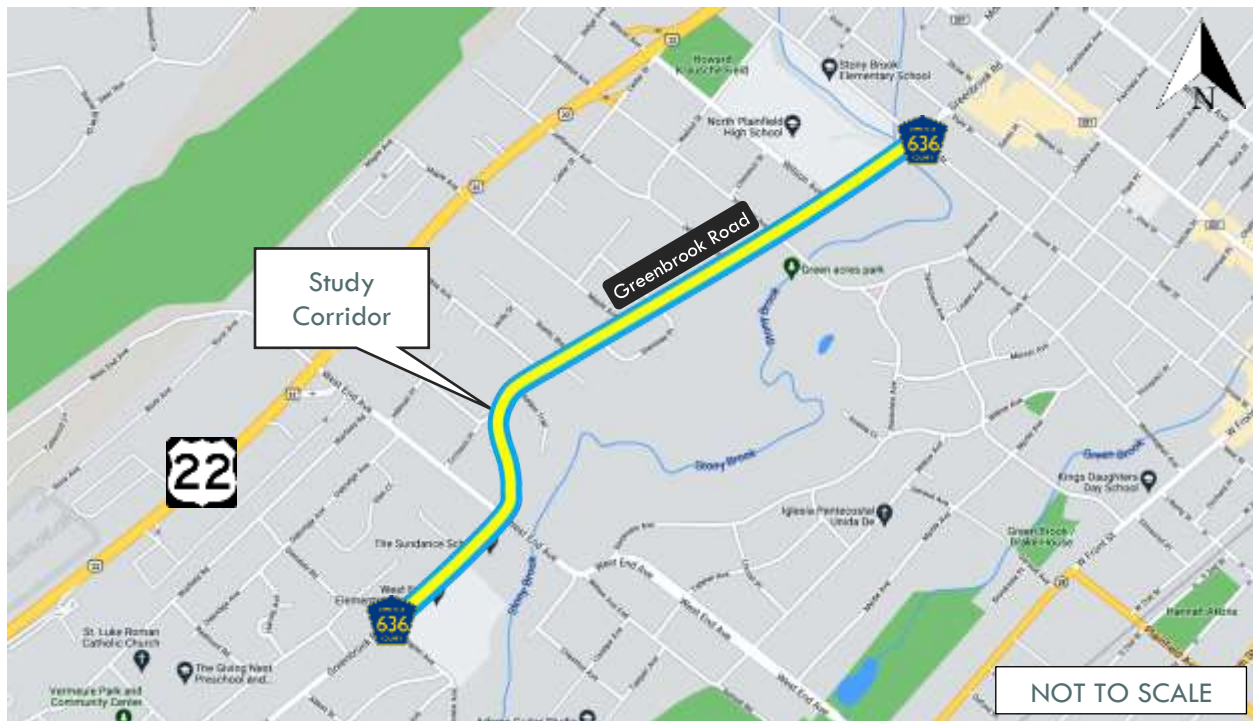
- Additional time for participants to share photos, videos, and scans of their observations;
- Available screensharing for quick review and consensus of RSA observations;
- An involved discussion of the observations and recommendations was well established by the wide audience of stakeholders;
- Additional time for participants to process their observations and organize their thoughts for discussion.

II. Corridor Description & Analysis

A. Study Location

The study area consists of 1.27 miles of CR 636 (Greenbrook Road) extending from the intersection with Harrington Avenue at MP 0.7 to the intersection with CR 531 (Somerset Street) at MP 1.97 (**Figure 2**). A straight-line diagram of the corridor is provided in **Appendix A**. The identified segment is in the Borough of North Plainfield in the County of Somerset. From Harrington Avenue on the west end of the corridor to Grove Street, land adjacent to Greenbrook Avenue is zoned as residential and buildings tend to be single-family detached housing; schools are also located along the road throughout this segment of the corridor. Schools located on, or proximate to, the Greenbrook Avenue corridor include West End Elementary School (at Harrington Avenue), Sundance School (at West End Avenue), Harrison School (at Harrison Avenue), North Plainfield Middle School/High School (at Wilson Avenue), and Stony Brook Elementary School (at Grove Street). East of Grove Street, land is zoned as a “Business” district and consists of multi-family housing, mixed-use buildings, and retail/office.

Figure 2 – Study Area Location Map



Major vehicle and pedestrian trip generators on this corridor include the aforementioned schools located along the corridor during school arrival and dismissal times, but can also include the laundromat, stores, and neighborhood restaurants in the vicinity of the Grove Street and Somerset Street intersections, especially during afternoon to PM peak hour times. The area surrounding the corridor segment has been designated by the County as the “North Plainfield Town Center” Priority Growth Investment Area (PGIA) in its 2017 *Supporting Priority Investment in Somerset County, Phase III* study.

B. Roadway and Intersection Characteristics

Greenbrook Road is classified by the New Jersey Department of Transportation (NJDOT) as an urban minor arterial and has a posted speed of 35 mph with static 25 mph advisory speed signing on the westbound roadway in the vicinity of the middle/high school and flashing 25 mph advisory speed signing in the vicinity of West End Elementary School. The corridor consists of two 12’ travel lanes (one in each direction) undivided. Shoulder widths vary from eight feet wide shoulders on each side of the road with

parking permitted from Harrington Avenue to West End Avenue to five feet wide shoulders on each side of the road (shoulder narrower than 5' in certain areas) with parking restricted from West End Avenue to Grove Street.

East of Grove Street the eastbound lane has a minimal-width shoulder with no parking permitted while the westbound roadway lane is 20' wide to permit on-street parking. The parking lane is not striped. The road has a double S-curve immediately east of the intersection with West End Avenue; curve advisory signing is not provided. There are three signalized and 15 unsignalized intersections along the corridor. Left-turn bays are provided at signalized intersections with West End Avenue and Somerset Street.

C. Existing Bicycle/Pedestrian Accommodations

Sidewalks are provided on both sides of the road at the east and west ends of the corridor. However, sidewalks are only provided on the north side of the road between Hidden Trail and Grove Street. Sidewalks mostly consist of concrete but also consist of bituminous asphalt towards the east end of the corridor where wide curb cut driveways intersecting the street interrupt pedestrian space. Generally, marked crosswalks traversing Greenbrook Road are only provided at signalized intersections, resulting in long gaps in main street crossings provided for pedestrians. However, two marked crossings are provided at the following unsignalized locations: one at Harrington Avenue in the vicinity of West End Elementary School and one at Harrison Avenue in the vicinity of Harrison School. No accommodations are currently specified for cyclists on the corridor; however, a 5'-wide shoulder is provided on both sides of the roadway between Hidden Trail and Grove Street.

D. Traffic Volumes

According to traffic data available from NJDOT³ count station #111834, Average Annual Daily Traffic (AADT) on Greenbrook Road is approximately 9,000 vehicles per day. Supporting count data from NJDOT is provided in **Appendix B**. NJTPA's NJRTM-E travel demand model provides an AADT estimate of 11,000 based upon 2020 pre-COVID-19 conditions.

E. Transit Service⁴

There are no transit services on this section of Greenbrook Road. The NJ TRANSIT Plainfield Train Station with Raritan Valley Line service is located approximately 1 mile south of the corridor from the intersection with Somerset Street. The corridor is more directly served by both the County's CAT 2R bus service (which runs only during AM and PM peak periods with 90-minute headways from North Plainfield to Raritan Valley Community College, traveling through Bound Brook, Somerville, and Raritan in between) and NJ TRANSIT's 822 bus service (which runs weekday and Saturdays between AM and PM peak period times with one-hour headways between North Plainfield and Plainfield). Both bus lines travel along the corridor between intersections with West End Avenue and Somerset Street. Signed bus stops are present at intersections with Maple Avenue and Wilson Avenue with limited amenities.

F. Community Profile

Population and income characteristics from the American Community Survey (ACS), an update to the 2010 Census performed by the U.S. Census Bureau, were used to identify Environmental Justice populations. The latest ACS for this study area is a five-year estimate from 2015 through 2019 for County Census Tract 510. A summary of the demographics is listed in **Table 2**. Limited English Proficiency populations are twice the County average in the vicinity of the study corridor. Public transit commuting was noted to be significantly above the County average. Also, zero-vehicle households are a substantial portion of the nearby population (approximately three times the County average), perhaps due to the walkability of the

³ AADT data obtained from <https://www.njtrms.org/map/>.

⁴ Information as of Winter 2020.

eastern end of the corridor. The Equity Analysis conducted for the Somerset County Roadway Corridor Safety Analysis highlighted this corridor as an Environmental Justice focus area based upon the share of minority residents living within a ¼-mile buffer of the corridor.

Table 2 – Greenbrook Road RSA Study Area Demographics

Characteristic		Census Tract Average	County Average
Below Poverty Level⁵		11.1%	5.1%
Race/ Ethnicity⁶	White	51.7%	66.3%
	Asian American	3.6%	17.7%
	Black or African American	20.3%	9.7%
	American Indian/Alaskan	0.0%	0.3%
	Other	24.4%	6.0%
Hispanic/Latino (Ethnicity)		48.5%	14.7%
Limited English Proficiency (LEP)⁷		8.9%	4.4%
Use Public Transportation⁸		7.2%	5.3%
Zero Vehicle Households⁷		6.9%	2.1%

G. Redevelopment

The area surrounding the corridor segment has been designated by the County as a Priority Growth Investment Area (PGIA) by the County in its 2017 *Supporting Priority Investment in Somerset County, Phase III* study. As such, the Phase III study proposed transportation and land use improvements southeast of the study corridor, including the redevelopment of the Old Mill site, revitalization of land along Green Brook, and streetscaping of Watchung Avenue and nearby roadways (including curb extensions, green stormwater infrastructure, pedestrian lighting, and wayfinding). Redevelopment on Greenbrook Road has mainly consisted of expansion of existing commercial and institutional uses. There are no major applications currently pending along Greenbrook Road according to data delivered by County Planning.

H. Proposed Improvements from Previous Studies

Transportation improvements proposed specifically for the Greenbrook Road corridor are listed in the *Master Plan of Borough of North Plainfield, Somerset County, New Jersey* (2014). Recommendations at the intersection with Grove Street include capacity improvements, whether via turning bays or signal re-timing, to reduce vehicle delay. The West End Avenue intersection was also noted as an area of concern in the master plan due to limited sight distance for right turning traffic and pedestrian school crossing volumes; to address these concerns, “NO RIGHT TURN ON RED” restrictions are proposed for intersection approaches if feasible. Additionally, the master plan designates the Greenbrook Road corridor is a Safe Routes to School (SRTS) corridor and a “Bicycle Compatible Roadway.” A SRTS Travel Plan was produced by RideWise for West End Elementary School in 2011, which included signing and striping recommendations at the Harrington Avenue intersection to improve safety for pedestrian travel that have since been implemented.

Pertinent excerpts from these studies, and associated improvements, are provided in **Appendix C**.

I. Public Meeting #1

On Thursday, November 12, 2020, the first public meeting for this project was held via Zoom conferencing to obtain feedback from the public on the five locations selected for RSA review; Email blasts,

⁵ 2019: ACS 5-Year Estimates Data Profiles, TableID S1701, “Poverty Status in the Last 12 Months”

⁶ 2019: ACS 5-Year Estimates Data Profiles, TableID DP05, “ACS Demographic and Housing Estimates”

⁷ 2019: ACS 5-Year Estimates Data Profiles, TableID S1602, “Limited English-Speaking Households”

⁸ 2019: ACS 5-Year Estimates Data Profiles, TableID S0802, “Means of Transportation to Work by Selected Characteristics”

advertisements, and social media notifications were provided in advance of the meeting. This meeting introduced the project team, who provided an overview of the study, stating the purpose and need. Statistics of crashes on County jurisdiction roadways were reviewed, showing a steady increase of crashes over the past ten years. The Consultant Team explained the RSA process and the technical analysis used in the development of the shortlist of corridors. Due to the pandemic, virtual or socially distanced options for conducting the RSA were discussed.

The Consultant Team then explained the study's Public Involvement Plan (PIP), an iterative process designed to collect feedback and input. The opportunities to collaborate on the PIP were virtual, including public meetings and comments received through the project website and project email. The Consultant Team then explained the process of selecting the five corridors. The selection process was based on County roadway screenings for top crash locations, evaluation of equity data, and public/stakeholder input obtained from the initial virtual mapping outreach conducted in Fall of 2020. The virtual mapping tool allowed users to pin comments on areas of concern on a virtual map.

As part of the PIP, the public meeting included an opportunity to hear from attendees on comments specific to each corridor selected for RSA review by splitting the overall meeting into breakout rooms. The group in the Greenbrook Road breakout room discussed various concerns and suggestions regarding traffic calming and pedestrian safety. Comments received were as follows:

- Concerns for making roadway more accommodating for trucks as there are schools on the roadway; there are already a lot of trucks that use this roadway
- Speeding concerns and suggestions to add more traffic signs to slow traffic
- Concerns about bikers who use the roadways and a suggestion to add roadway sharing signage
- A request to reduce the speed limit to 25 miles per hour
- The number of vehicles accessing the nearby Costco causes a backup on Rt. 22.

J. Technical Advisory Committee Meeting #2

Following an August 2020 meeting with the TAC (Technical Advisory Committee) to select the five corridor locations for further review Somerset County held the second TAC meeting in February 2021. This meeting consisted of a 45-minute presentation followed by interactive breakout rooms with discussion centered around the corridors selected for further review. The presentation included the following topics: project background, summary of selected corridors, description of potential safety measures, and a discussion of demonstration projects.

A breakout room was dedicated solely to the discussion of potential safety measures to be implemented on the Greenbrook Road corridor in North Plainfield Borough. Participants were asked to review the ten safety measures discussed during the presentation. They were then asked to rate the effectiveness and ease of implementation of each safety measure based on their own opinion/perspective. Participants were also asked to identify specific areas within each corridor that were areas of concern. The following (**Table 3**) is a summary of those ratings and discussions. A table of each safety measure rating per corridor is found in each section, along with additional comments made by each group.

Table 3 – Perceived Effectiveness and Ease of Implementation for Various Safety Measures

Safety Measure	Effectiveness (1= not effective; 10= very effective)	Ease of Implementation (1=easy; 10= hard)
Lighting	6	10
Curb Extensions/Bus Bulbs	8	2

Safety Measure	Effectiveness (1= not effective; 10= very effective)	Ease of Implementation (1=easy; 10= hard)
Daylighting ⁹ and Crosswalks	8	8
Walkways for Sidewalk Gaps	6	2
Dedicated Turn Lanes	8	2
Leading Pedestrian Intervals (LPI)	10	10
High Visibility Crosswalks	9	7
Turn Restrictions	6	7
Bike Lanes	5	5
Lane Width Reduction/Road Diet	7	7

Breakout Group Additional Comments:

- Lighting:
 - Lighting was noted to be adequate and follows the standards (every other telephone pole).
- Curb Extensions, Daylighting, and Crossings:
 - Curb extensions can be difficult to implement, perhaps can be implemented at West End Avenue.
 - Daylighting and crosswalks should be implemented only at parking locations, near North Plainfield High School to access athletic field on the south side of Greenbrook Avenue. This measure could remove the temptation of mid-block crossing.
 - Daylighting and crosswalks should not be a problem implementing where width allows.
 - Walkways for sidewalk gaps should be implemented generally on the north side of the road.
 - Duer & Greenbrook, Rockview, Harrison, to bring more attention to crossing. These could be potential locations for daylighting.
 - Additional safety improvements could include increased crosswalk signing (down diagonal arrow below diamond).
- Turn Lanes & Turn Restrictions:
 - Dedicated turn lanes would make things safer but would be difficult as there is not enough width at Grove Street.
 - Turn restrictions already prohibited by the schools, but maybe there are other school applications.
- Intersections:
 - LPIs are most effective at the Grove Street and West End Avenue intersection. LPIs still might improve pedestrian safety at Somerset even with lack of capacity.
- Bicycling:
 - Ease of implementation varies based on parking presence and tightness of street.
- Road Diets:
 - Lane width reductions and road diets are effective based on context; they were wanted near schools
 - Lane width reductions and road diets could be implemented on the southern side of the corridor towards the western end of the study area (at drop-off areas). This safety measure would not eliminate on street parking and could assist with the speeding perceived by participants.
- Map specific comments include:
 - Need for pedestrian improvements in the vicinity of West End Elementary School.
 - Need for pedestrian improvements from Wilson Avenue to Duer Street.
 - Need to consider roadway dimensions for buses from Maple Avenue to Harrison Avenue.

⁹ Daylighting is the act of restricting parked or standing vehicles through striping or curbing to improve sight distance at crosswalks or intersections.

K. Technical Advisory Committee Meeting #3

Following the RSAs in Spring 2021 and authoring of the draft RSA reports and accompanying recommendations soon thereafter, the County held the third and final TAC meeting for the study in August 2021. The virtual meeting format consisted of a 45-minute presentation with interactive breakout rooms. The presentation included the following topics: project background, project status, identification of needs, and proposed safety measures by corridor.

The meeting was then divided into five breakout rooms, one for each of the selected corridors. Each breakout room discussed a specific set of recommendations pertaining to that corridor. Participants were asked to provide their general reactions to the proposed recommendations and whether they would accomplish the goals of the study. Potential barriers or other ways to accomplish study goals were also discussed. The topic of discussion for the breakout room specific to the North Plainfield RSA were the bike lanes originally proposed for the Greenbrook Road corridor, between West End Avenue and Grove Street. Provided below is participant feedback received on this specific proposed safety measure:

- Participants urged the County to re-shift the study focus from bike lanes to pedestrian improvements for those attending schools along the corridor. Such improvements could include the following:
 - Leading Pedestrian Intervals (LPIs)
 - Rectangular Rapid Flash Beacons (RRFBs)
 - Shorter crossing distances
 - Curb extensions and/or bump-outs for school buses
 - Increased sidewalk widths
- A demonstration project could be proposed by the middle and high school that sets up temporary bike lanes for school children usage, all overseen by local police department. If a demonstration project is set up, it needs to take place in an area where a permanent bike lane is proposed.
- Bike lanes would conflict with roadway width that could be dedicated to prioritizing pedestrian crossings.
- The Department of Public Works can adjust its leaf pick-up schedule to prevent leaves blocking bike lane traffic should a bike lane be pursued.
- It was clarified that proposed bike lanes would not eliminate existing on-street parking provisions.
- If permanent bike lanes were installed, curbs would need to be pushed back in certain locations (along with narrowing of sidewalks) to accommodate standard bike lane widths.

Additional comments were received during the breakout room (not pertaining to the bike lanes):

- The Borough expressed interest in applying for grants to improve pedestrian environment.
- People speeding on Harrington Avenue was mentioned as a concern

This feedback allowed the County to re-focus the key study recommendation for the North Plainfield RSA to improved pedestrian infrastructure.

L. Public Meeting #2

On Wednesday, September 29, 2021, from 7:00 PM to 9:00 PM, Somerset County held the second and final public meeting for the study. The virtual meeting format consisted of a 45-minute presentation touching on the following topics: project background, project status, identification of needs, and proposed safety measures by corridor.

The meeting was then divided into seven breakout rooms, one for each of the selected corridors, one for county-wide general transportation comments and suggestions, and one for Spanish speakers. Participants were asked to provide their general reactions to proposed pedestrian infrastructure improvements in the

vicinity of West End Elementary and whether they would accomplish the goals of the study. Potential barriers or other ways to accomplish study goals were also discussed. Provided below is participant feedback received on this specific proposed safety measure:

- Participants were encouraged to see foliage management included as part of the pedestrian improvements near West End Elementary; tree overgrowth was noted to be a problem.
- Along with push button crossing upgrades near West End Elementary, it was recommended by participants that such crossings should be installed farther east near library and Green Acres Park.
- When asked, the participants were informed that the same types of improvements were being considered at the Grove Street intersection (LPIs, signal head upgrades, etc.)

Additional comments were received during the breakout room (not pertaining to the particular pedestrian improvements in question):

- Fences and utility poles alongside street approaches can obscure sight distance and worsen intersection safety; the side street approach for Rockview Terrace was mentioned as such a problem area.
- Drivers have been noted to speed down nearby Judges Lane and Warfield Road.
- Participants were informed that a speed study is recommended within the RSA to determine the particular enforcement and speed setting recommendations that are needed on Greenbrook Road, during school hours and at other times.
- Participants were informed that a bike lane was originally investigated; however, standard bike lane width was not available. Bike lanes would require narrowing of sidewalk and would conflict with same areas where pedestrian crossing movements are looking to be prioritized.
- Participants were informed that daylighting improvements are proposed at the Duer Street intersection to improve sight lines for crossing vehicles and pedestrians as another means to improve study area pedestrian safety.

III. Crash Findings

The analysis used to support the RSA process incorporated a data-driven effort to utilize reportable crash information resulting in any combination of fatality, injury, or property damage. The datasets used for this analysis are sourced from local law enforcement responses to reported vehicular crashes. These on-scene responses subsequently translate to official law enforcement generated reports. Concurrently, the individual reports are aggregated to render serviceable crash information. To be entirely inclusive in obtaining complete crash information, the data was accumulated using three distinct resources: NJDOT's Safety Voyager¹⁰, New Jersey Division of Highway Traffic Safety (NJDOTS) Numetrics¹¹, and the NJDOT raw crash tables¹². The three sources were compared against each of the other obtained sources to allow for duplicate records to be discarded and all distinct records to be included with the goal of producing a complete and comprehensive representation of the crashes within the boundaries of the corridor.

The datasets were obtained for a three-year analysis period from the beginning of January 2016 through the end of December 2018 for vehicle-vehicle crash incidents and from the beginning of January 2014 through the end of December 2018 for vehicle-pedestrian/cyclist crash incidents. According to the compiled crash data, 100 crashes occurred on the 1.27-mile segment analysis area during the analysis period. The following evaluation breaks down crash attributes as a percentage of the total crashes to achieve a stronger understanding of the localized trends compared to County roadway systems crash performance. Furthermore, all crashes along this segment were mapped onto collision diagrams, which can be found in **Appendix A**, providing a quick spatial overview of crash clustering patterns.

In reviewing the crash data, the following crash clusters and prevailing safety issues were noted:

- At the West End Avenue intersection
 - Numerous right angle and left-turn collisions, some involving injuries
 - Two pedestrian crashes have occurred at this intersection, located next to two schools
- Three fixed object collisions involving WB traffic heading into the double S-curve near Crosson Place
- Right angle collisions, including injury crashes, have occurred at the intersection with Harrison Avenue
- At the Wilson Avenue intersection
 - Right angle and left-turn collisions
 - Rear end crashes involving traffic on the SB approach
- At the Grove Street intersection
 - Four pedestrian crashes are clustered at this intersection location
 - Crashes with parked vehicles occurring on Grove Street north and south of the intersection
- At the Duer Street intersection
 - Right angle collisions, mainly involving EB traffic, clustered at this intersection
 - Bicycle and pedestrian crashes have been reported at this location
- Crashes between parked vehicles and WB traffic have occurred from Stone Street and Grove Street

A. Temporal Trends

Sorting the crashes by month reveals that the study segment generally experiences increased crashes during the Fall through Winter months from September to March. The Spring and Summer months from

¹⁰ <https://www.njvoyager.org/App/>

¹¹ <https://www.numeric.com/>

¹² <https://www.state.nj.us/transportation/refdata/accident/rawdata01-current.shtm>

April through August mostly show lower frequencies. During the seven (7) months of January, February, March, July, September, October, and December, the study segment experienced higher crash frequencies than the County-wide average, as shown highlighted in yellow in **Figure 3**.

Figure 4 below highlights the crash percent distributions by day of the week. Sundays, highlighted in yellow in **Figure 4**, show crashes occurring twice as frequently than County-wide, 15.9% versus 8.5%. The beginning of AM peak period, 7:00 AM, and the beginning of PM peak period, 4:00 PM, reveal a substantial increase in crash frequency than the County-wide averages, as shown highlighted in yellow in **Figure 5**. More specifically, the 7:00 AM hour has crash frequencies more than double the County-wide average, 13.1% local distribution versus a 6.7% County-wide distribution, perhaps due to school arrival related activity.

Figure 3 – Vehicular Crashes, Percent Distribution by Month

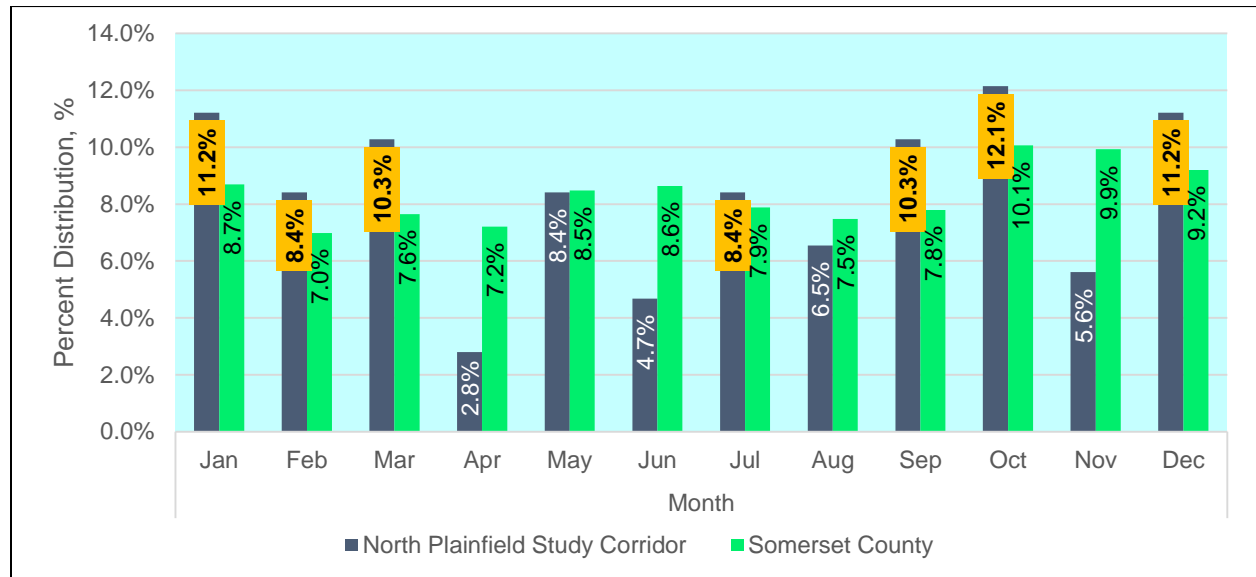


Figure 4 – Vehicular Crashes, Percent Distribution by Day

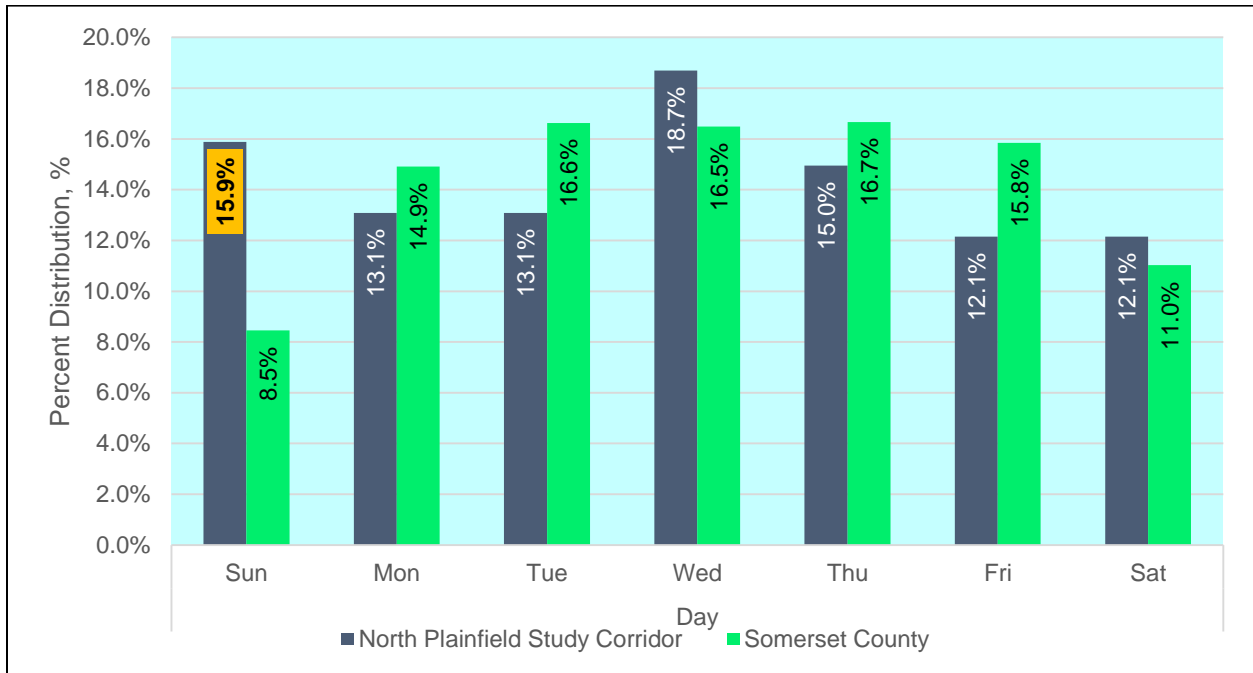
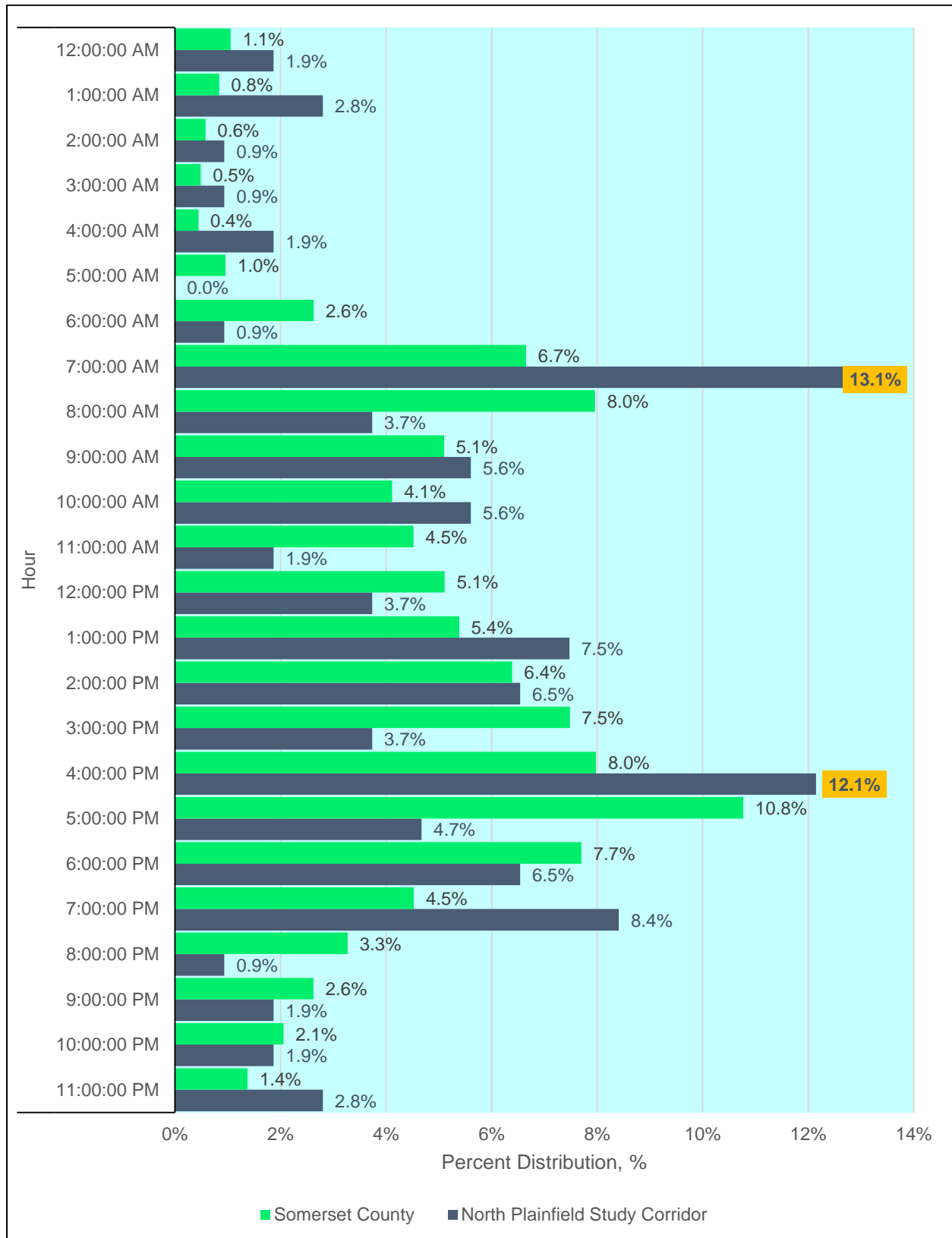


Figure 5 – Vehicular Crashes, Percent Distribution by Hour



B. Collision Types

Eighteen rear end and 26 right angle collisions make up more than 43% of the crash distribution along the study segment. When compared to County-wide averages, the study segment has less frequent rear end crashes than the County as a whole by 16.7%. However, right angle crashes are more frequent on the study segment than the County, by approximately 8.2%, as shown highlighted in yellow in **Figure 6**. Crashes involving parked vehicles account for 12.1% of crash occurrences, nearly four times the County average. The most significant information that can be discerned from **Figure 6** is the high frequency of pedestrian involved crashes highlighted in yellow. 0.8% of crashes that occur on County roads involve pedestrians, compared to a 12.1% frequency, more than the County-wide averages. A breakdown of frequency by crash type is provided on **Table 4**.

Figure 6 – Vehicular Crashes, Percent Distribution by Crash Type

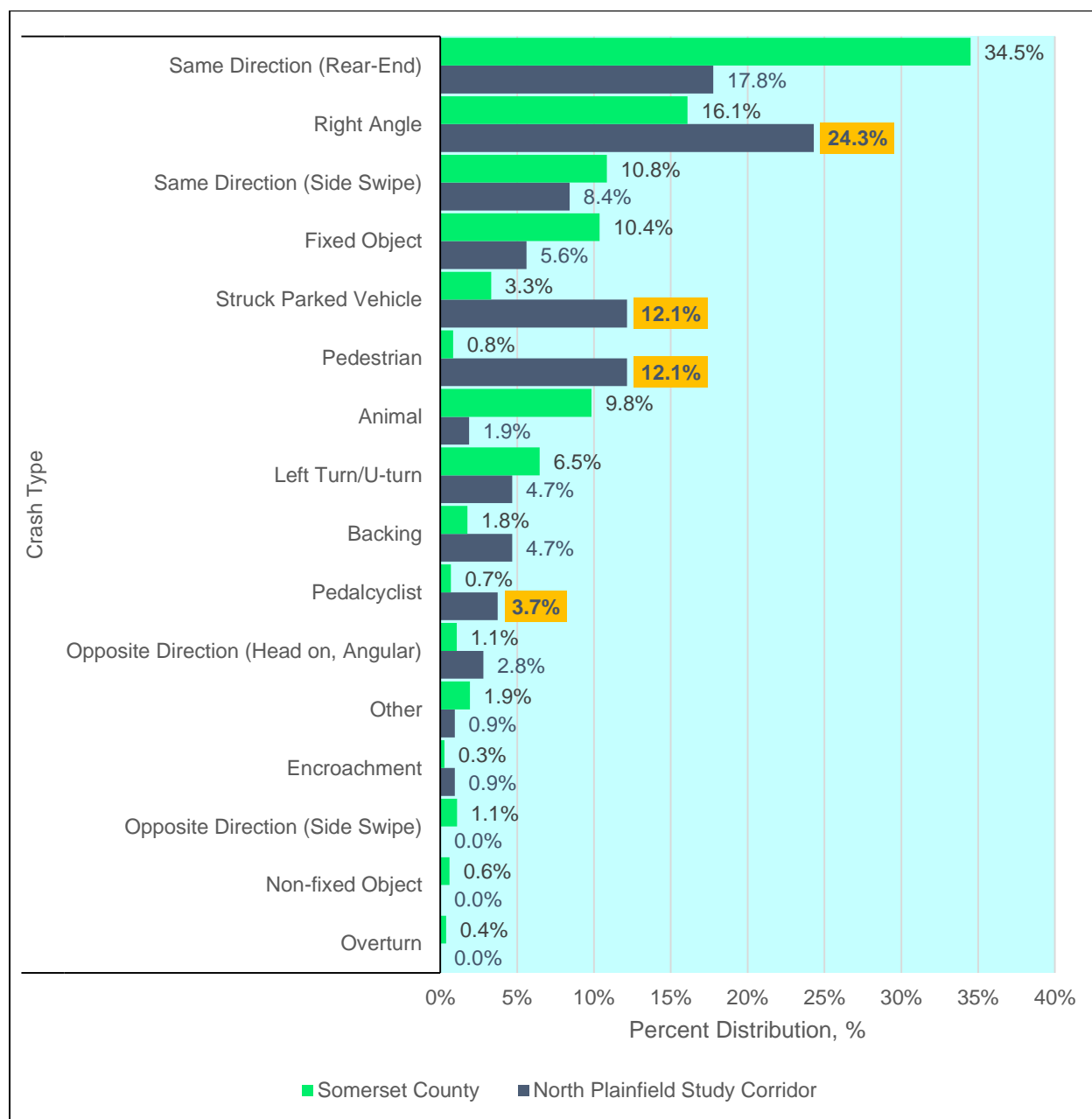


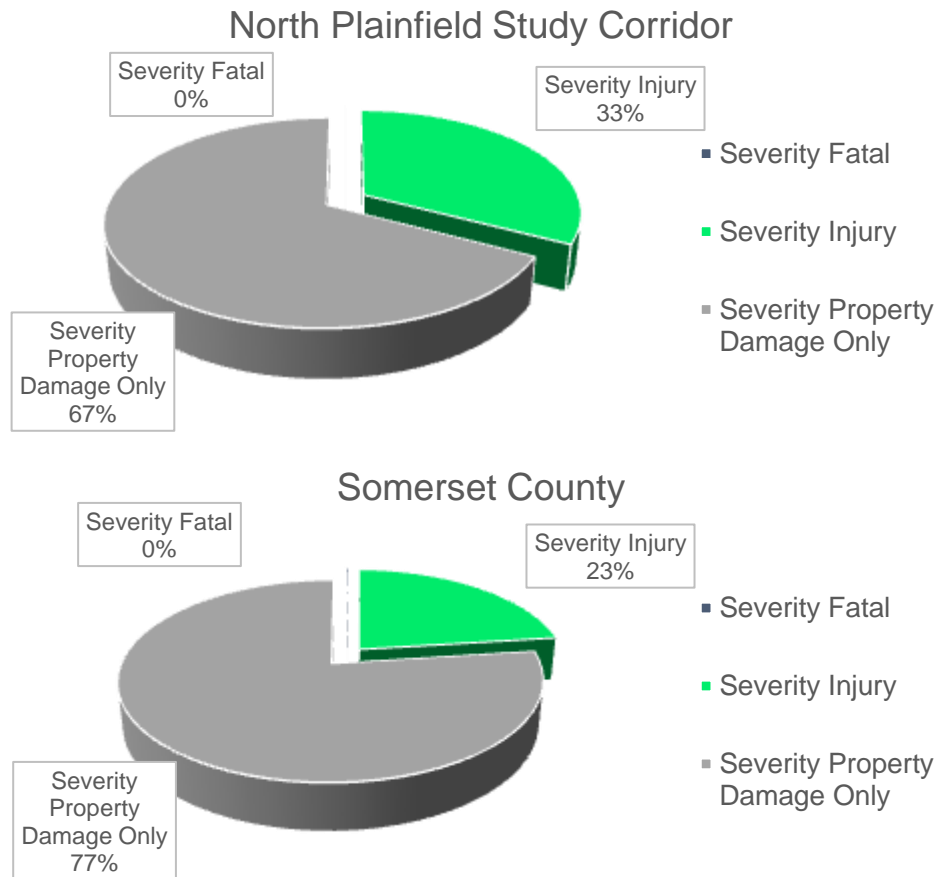
Table 4 – Vehicular Crashes by Type

Crash Type	Total
Animal	2
Backing	3
Fixed Object	6
Left Turn/U-turn	4
Opposite Direction (Head on, Angular)	3
Other	1
Pedalcyclist	4
Pedestrian	12
Right Angle	26
Same Direction (Rear-End)	18
Same Direction (Side Swipe)	9
Struck Parked Vehicle	12
Total	100

C. Crash Severity

Data shows a considerable increase in crashes resulting in injuries rather than property damage only when compared to the County, perhaps due to the relatively high share of pedestrian crashes at this location. The analysis period had no fatalities along the selected roadway study segment.

Figure 7 – Vehicular Crashes, Percent Distribution by Severity



D. Roadway Surface & Light Condition

Crashes occurred more frequently during dry driving conditions on the study segment than the County-wide average. Wet road-related crashes are the second most overrepresented roadway surface condition during crashes, 12.4%, which is approximately 4% less frequent than the County-wide average at 16.1% (highlighted in yellow in **Figure 8**).

Figure 8 – Vehicular Crashes, Percent Distribution by Surface Condition

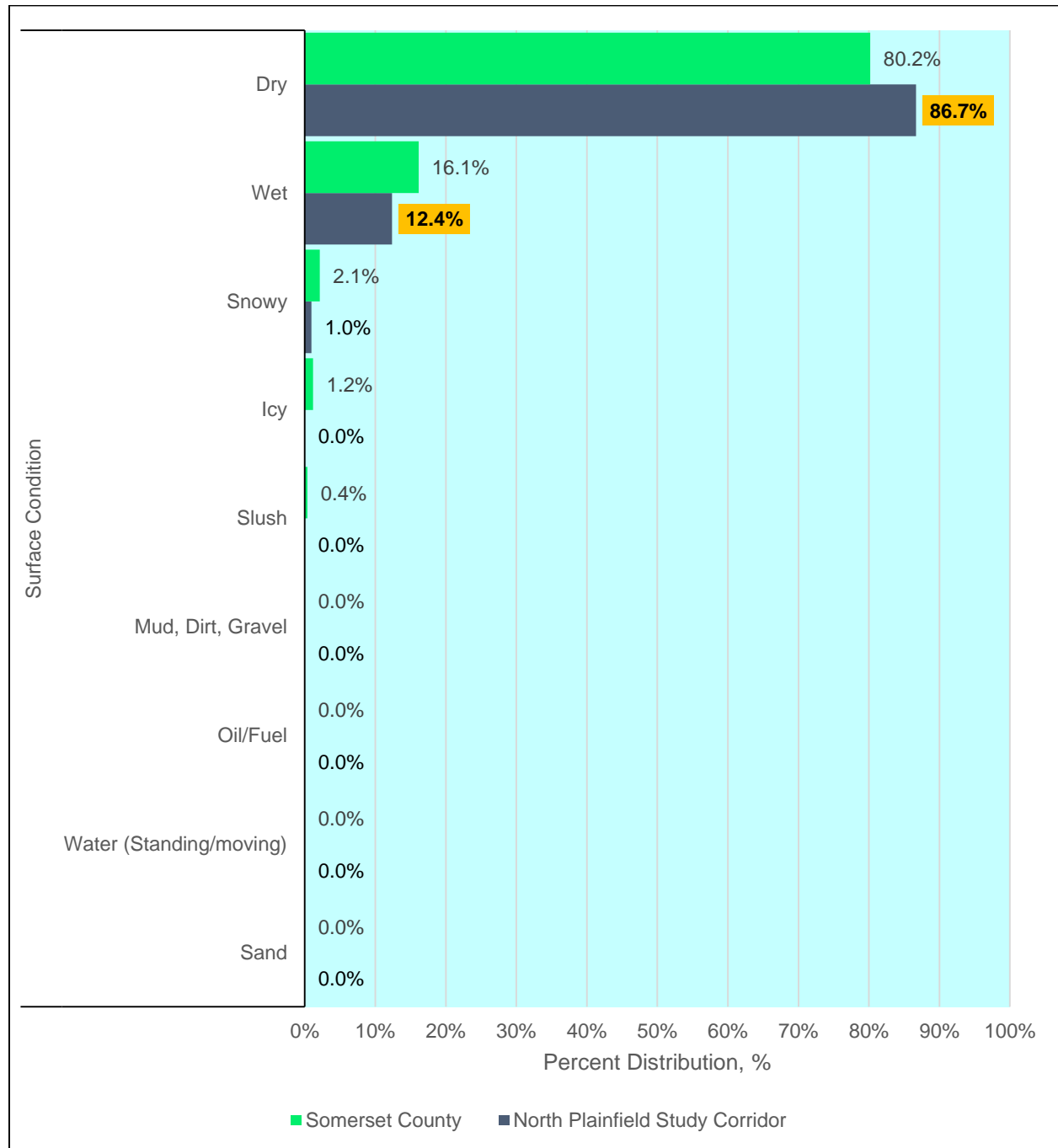
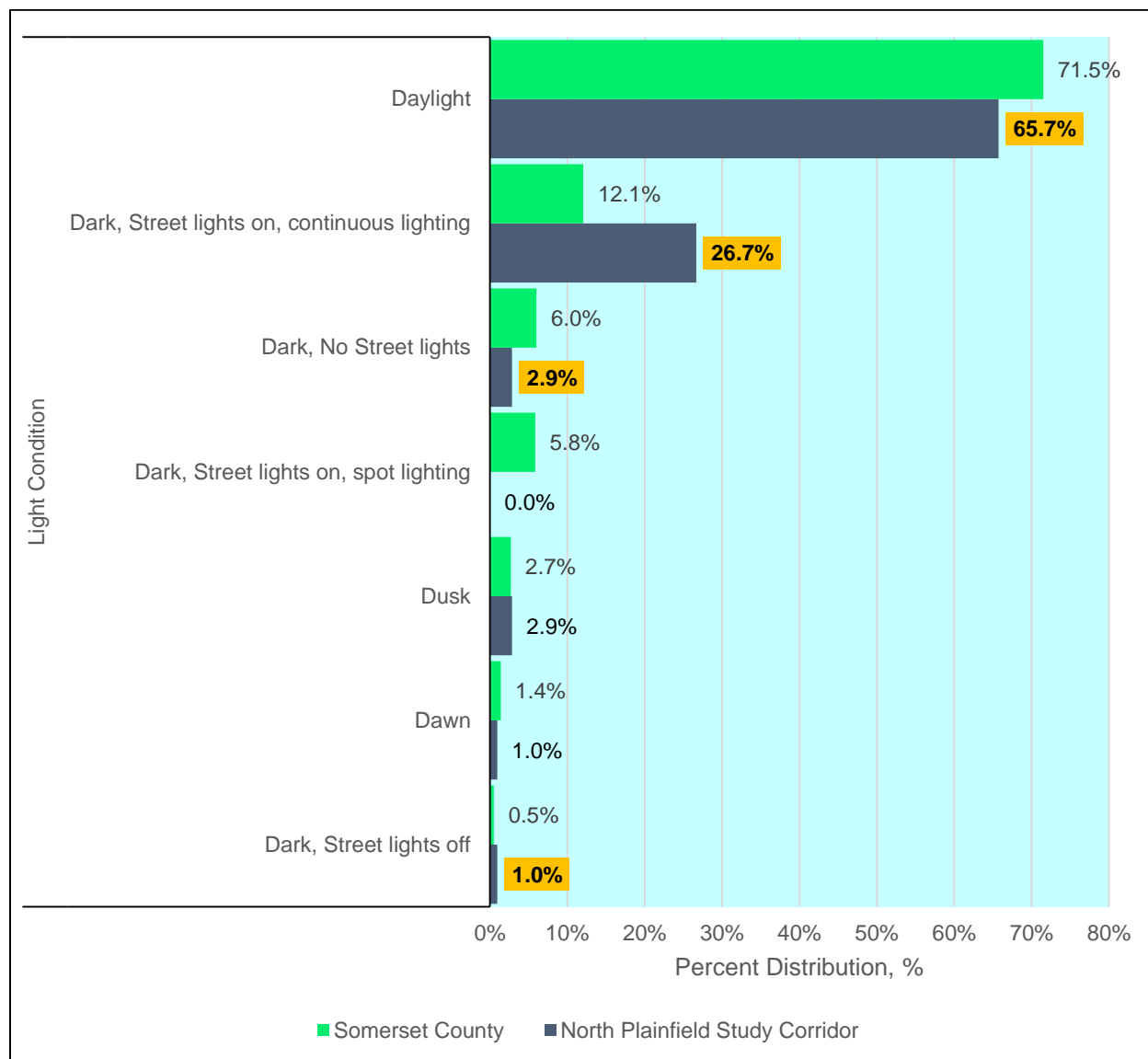


Figure 9 – Vehicular Crashes, Percent Distribution by Light Condition



Approximately 65.7% of the crashes on the study segment occurred during daylight conditions, which is slightly lower than the County-wide average of 71.5% (as shown highlighted in yellow in **Figure 9**). Crashes occurring during “Dark, Street lights on, continuous lighting” is noticeable higher than the County average, more than double the frequency. However, it should be noted that some of these County crashes were recorded as occurring in dark conditions with either no streetlights, or with streetlights off (as shown highlighted in yellow in **Figure 9**).

E. Location

Crash visualization by the use of the histogram, grouped in 0.02-mile segments, **Figure 10** below indicates that the signalized intersections of Grove Street and West End Avenue experience the highest occurrence rate of crashes, shown highlighted in yellow in **Figure 10**. Duer Street and Wilson Avenue presents the highest crash totals at unsignalized intersections, with 11 crashes, shown highlighted in yellow in **Figure 10**. A three-dimensional representation of this crash histogram for the 2016 through 2020 timeframe, imposed onto a map of the study area, is shown on **Figure 11**.

Figure 10 – Vehicular Crash Counts by Milepost

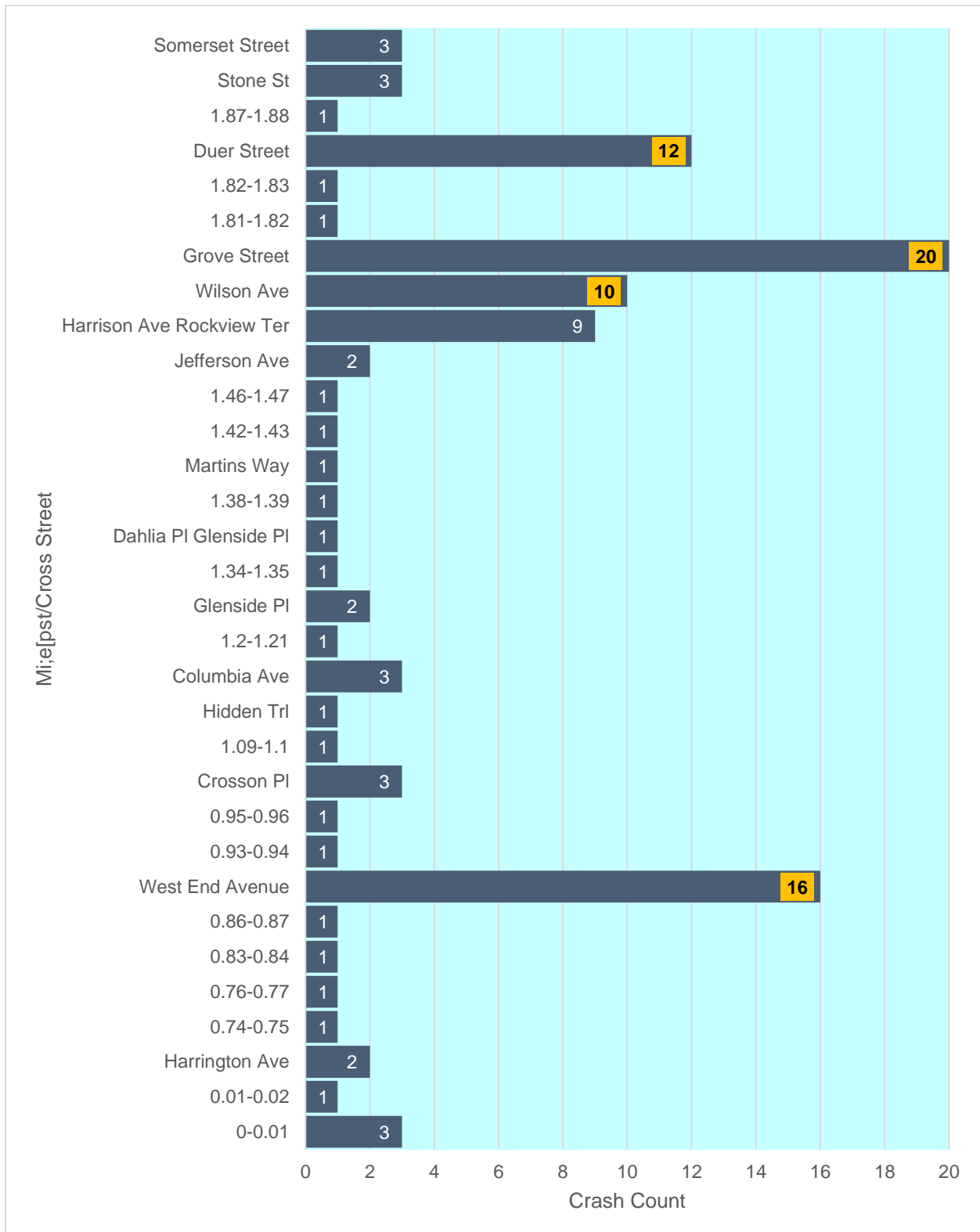
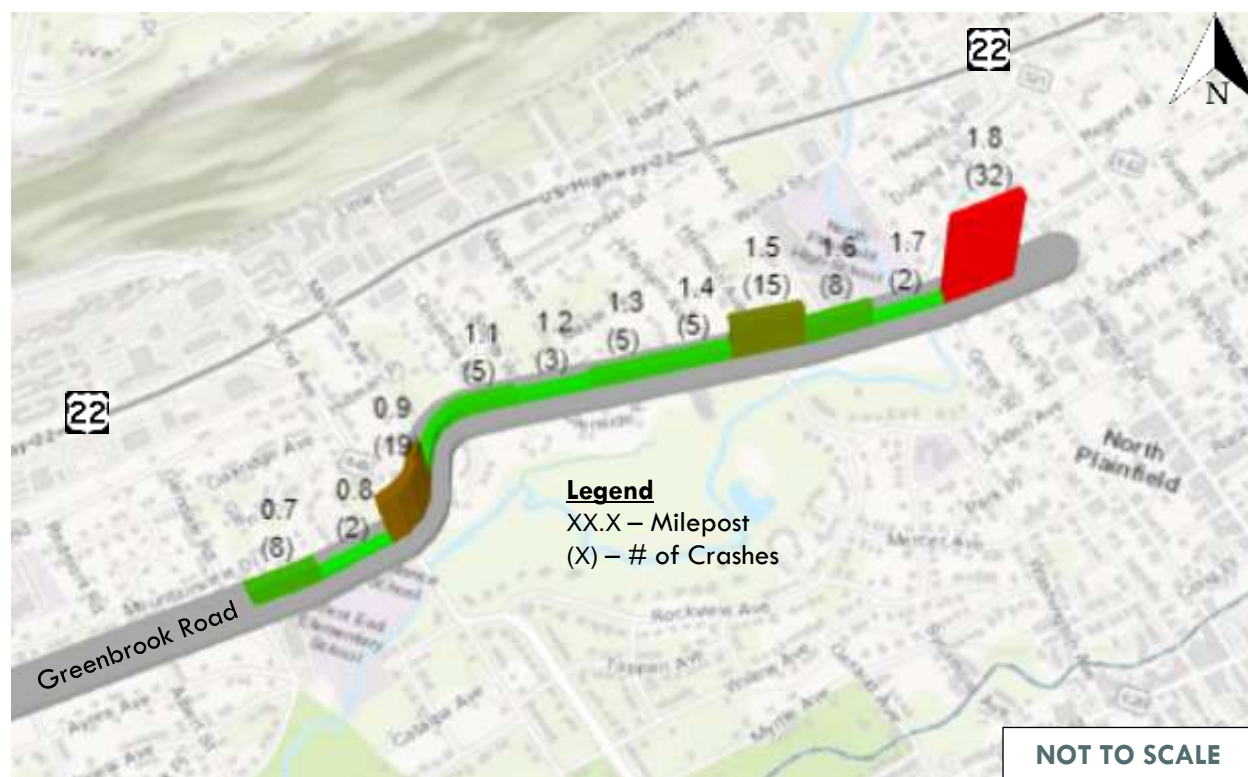


Figure 11 – Visual Estimation of 5-Year (2016 - 2020) Crash History Obtained from Safety Voyager¹³

F. Age of Those Involved

Driver-, occupant-, and pedestrian-involved data was also accessible from the NJDOT crash tables. A normal distribution table was developed (**Figure 12**) utilizing the age data provided by NJDOT. Amongst the eighty-eight crashes reported, the average person(s) involved age was determined to be approximately 33 years old. Approximately 68% of person(s) involved were between the ages of 14 and 51 years old. **Table 5** outlines the percent distribution of the age(s) of those involved in the vehicular crashes, grouped by ten years of age. Data from the table indicates that crashes with driver groups of 26-55 years old occur with a higher frequency on the study segment than the County average for the same age groups. Ages 16-25 and 46-55 account for the highest frequency of those involved at 21.4 percent each. Notably, the under 16 age group average was higher than the County, 8.6 percent versus 7.9 percent.

¹³ Five-year crash totals shown on histogram from Safety Voyager may vary from crash report data obtained from municipality's police department and do not include crashes recorded as occurring on side street approaches, which are included in the record of analyzed collected crash data.

Figure 12 – Histogram of Age(s) Involved

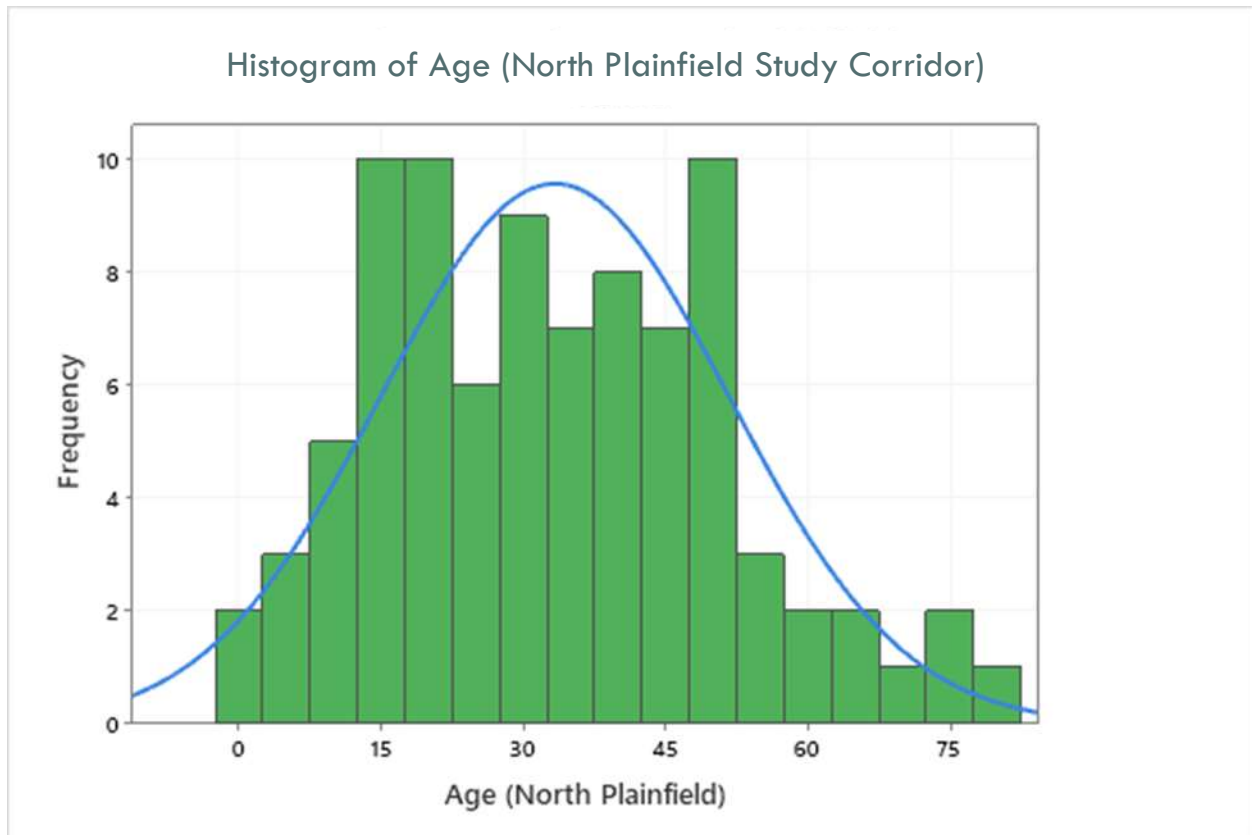


Table 5 – Age(s) Involved, percent distribution

Age Involved	North Plainfield Borough Study Corridor	Somerset County
Under 16	8.6%	7.9%
16-25	21.4%	23.1%
26-35	18.6%	16.9%
36-45	17.1%	15.8%
46-55	21.4%	16.7%
56-65	8.6%	11.3%
66-75	2.9%	5.1%
76-85	1.4%	2.5%
86-95	0.0%	0.7%
96-105	0.0%	0.0%
106-116	0.0%	0.0%

IV. RSA Logistics

All data previously discussed in this report was used to inform the RSA conducted on this corridor. All participants involved in this RSA, whether in attendance during the pre-audit meeting, in-field review, and/or post-audit meeting, are listed in **Appendix E**. The pre-audit meeting was held at 10:00 AM via video conferencing on Thursday, April 8th, 2021, on the morning of the in-field review meeting to introduce the audit team, cover the activities to complete the RSA, define the RSA process, cover existing conditions data, present safety measures under consideration, summarize crash data collected for the corridor, and go over ground rules for conducting the in-field portion of the audit safely. The PowerPoint used to facilitate this discussion is provided in **Appendix F**.

The in-field component of the RSA was conducted at 2:00 PM on the same day as the pre-audit meeting. The audit team met in a social-distanced manner, while masked, in the parking lot of Green Acres Park for a flipbook RSA orientation presentation to reiterate the ground rules of the audit. Upon conclusion of the orientation, participants were paired off with each other to walk halves of the corridor, seeking to pair each Somerset County Roadway Safety Study project team member (whether with the County or Consultant team) with each of the stakeholders. Utilizing aerial mapping, prompt lists, photography, and video, participants recorded their observations of the corridor, as well as potential safety measures to address potential safety concerns. After walking the corridor, the RSA team met back in the parking lot to share overall thoughts on the corridor and fill out a survey on corridor identity, crossings, pedestrian-vehicle interactions, sidewalk and roadway conditions, and streetscape amenities, the answers of which were compiled and are averaged in **Appendix G**. Based on survey results, the corridor had the following perceived concerns:

- Sidewalk potentially nearing end of service life;
- Lack of benches, places to rest, trash cans, etc.

On the following day (Friday, April 9th, 2021), the RSA team reconvened via video conferencing to view photos gathered during the in-field audit, some of which are presented in the following section, to discuss each observation, elaborate on potential ideas to mitigate, cover questions on travel pertaining to the overall corridor, and summarize next steps for this study. This discussion helped to form the basis of the Implementation Matrix in the **Identified Issues & Observations** section of this report. The PowerPoint used to facilitate this discussion is provided in **Appendix H**.

V. Identified Issues & Observations

This section depicts a sampling of overall issues identified during the RSA. Please refer to the Implementation Matrix in the following section of the report for a comprehensive listing of identified corridor issues.

Pedestrian & Cyclist	Pedestrian & Cyclist
	
<p>Steep driveway pitch that slopes toward street near Judges Lane</p>	<p>Branches and foliage obstruct pedestrian ROW approaching West End Avenue</p>
	
<p>Opportunity for midblock crossing at West End Elementary School near Harrington Avenue</p>	<p>Crosswalk opportunity from North Plainfield High School to athletic field across Greenbrook Road</p>
	
<p>Sidewalk in front of liquor store interrupted by wide asphalt curb cuts and encroach on pedestrian space</p>	<p>Bus stop in front of North Plainfield High School lacks pedestrian access</p>

Operations & Visibility	Maintenance
	
<p>Branches and foliage at the NW corner of West End Avenue and Greenbrook Road limit sight distance of approaching traffic</p>	<p>Crosswalk at Martin's Way needs maintenance repair and ADA-compliant upgrades</p>
	
<p>Decorative planting blocks motorist sight line to pedestrians traversing Somerset Street</p>	<p>Steep access to/from Stahl's Way causing vehicles to scrape pavement. Intersection also lacks crosswalk striping and ADA-compliance</p>
	
<p>Older signals at West End Avenue and Greenbrook Road lacking countdown pedestrian countdown.</p>	<p>Severe sidewalk heaving on Greenbrook Road near Maple Avenue</p>

VI. Findings & Recommendations

This section summarizes the site-specific and corridor-wide safety issues, potential strategies, and recommendations to improve safety. An Implementation Matrix is provided that summarizes the recommendations and provides qualitative information on time frame, cost, and responsible jurisdiction. Please note that recommendations cited in the Implementation Matrix are to reflect feedback received during the RSA process and are meant to be a record of ideas discussed. Symbols used in the Implementation Matrix are defined in **Table 6** as follows:

Table 6 – Legend of Symbols in Implementation Matrix

Symbol	Meaning	Definition
\$	Low cost	Could be accomplished through maintenance
\$\$	Medium cost	May require some engineering or design and funding may be readily available
\$\$\$	High cost	Longer term; may require full engineering, ROW acquisition, and new funding
🕒	Short term	Could be accomplished within 1 year
🕒🕒	Medium term	Could be accomplished in 1 to 3 years; may require some engineering
🕒🕒🕒	Long term	Could be accomplished in 3 years or more; may require full engineering

A. Implementation Matrix

The following represents the specific findings and recommendations made by the interdisciplinary RSA team, which were subsequently evaluated via discussions with County Engineering on Wednesday, June 2nd, 2021, and Thursday, June 3rd, 2021. As these recommendations are considered for advancement into either a CD study, or incorporation into an overlapping County and/or municipal project, the recommendations herein should be thoroughly evaluated for feasibility and practicability and designed as appropriate by the roadway owner and/or a professional engineer for conformance to all applicable codes, standards, and best practices. Corridor-wide recommendations, requiring a review of all important applicable infrastructure along the corridor pertinent to these specific topics, are provided in **Table 7**. Further defined recommendations at specific intersection or mid-block locations are provided in **Table 8**. **Recommendations bolded within the Implementation Matrix below feature one of the twenty Proven Safety Countermeasures from the FHWA¹⁴, which means that the recommendation is shown to have a significant safety benefit as proven by substantial traffic safety research.** These recommendations are tied to Crash Modification Factors (CMFs) showing a substantial reduction in crashes, as well as research documented on the Crash Modification Factor Clearinghouse website that has a high-quality ranking. This high ranking indicates the quality of study design, sample size, statistical methodology, statistical significance, etc. for the research backing each CMF. Mapping of proposed location-specific recommendations is provided in **Appendix I**.

Table 7 – Corridor-Wide Recommendations

No.	Recommendation	Cost	Time Frame	Jurisdiction
Maintenance				
1	Perform maintenance to clear overgrowth and debris on sidewalks and curb ramps.	\$	🕒	Municipality
Operations				

¹⁴ <https://safety.fhwa.dot.gov/provencountermeasures/>

No.	Recommendation	Cost	Time Frame	Jurisdiction
2	Assess stop bar placement and intersection sight distance at all unsignalized intersections.	\$\$	⌚	Municipality
Pedestrian				
3	Conduct a sidewalk assessment to determine the extent of sidewalk that needs to be replaced, repaired, and constructed.	\$\$	⌚⌚	Municipality
4	Perform curb ramp assessment to determine the number of curb ramps that need to be replaced, repaired, and constructed.	\$\$	⌚⌚	County/ Municipality
5	Perform a crosswalk assessment to determine where crosswalks need to be restriped, resurfaced, and installed. Upgrade crosswalks to high-visibility type.	\$\$	⌚⌚	County
6	Consider performing a Walking Bus demonstration project	\$	⌚	Municipality
Transit				
7	Consider coordinating with NJ TRANSIT to provide amenities and information at bus stops.	\$	⌚⌚	County / NJ TRANSIT

Table 8 – Location-Specific Recommendations

No.	Recommendation	Cost	Time Frame	Jurisdiction
KEY STUDY RECOMMENDATION – from West End Avenue to Harrington Avenue				
8	Investigate feasibility to stripe or construct curb extensions and refresh crosswalk striping and consider the installation of Rectangular Rapid-Flashing Beacons (RRFBs) at unsignalized crossing locations. Daylighting or other striping in shoulder would aid to prohibit parking, allocate bus standing, and calm traffic speeds. At signalized intersection, consider push button upgrades, lighting, No Turn on Red (NTOR), and Leading Pedestrian Intervals (LPIs).	\$\$	⌚⌚	County/ Municipality
9	Investigate feasibility of a complete streets redesign to narrow cartway widths at crossing locations by constructing curb extensions and/or dedicated road width for bus pick-up/drop-off and bikes.	\$\$\$	⌚⌚⌚	County/ Municipality
10	Install updated approach signage to elementary school including more modern school advisory flashing LED signs.	\$	⌚	County/ Municipality
11	Perform a speed study to determine if targeted enforcement and/or improved school advisory speed signing is warranted. Study should be performed when flashing school signs are both in use and not in use.	\$	⌚	County/ Municipality
12	Install radar speed feedback sign on each end of this segment.	\$	⌚	Municipality
Harrington Avenue				
13	Schedule maintenance to clear overgrowth around utility pole on SE corner.	\$	⌚	Municipality
14	Resurface and restripe crosswalks.	\$	⌚	County
15	Stripe/Construct curb extensions to reduce width of crosswalk.	\$	⌚	County

No.	Recommendation	Cost	Time Frame	Jurisdiction
16	Relocate school crossing signs (S1-1) in both directions closer to crosswalk. Replace with fluorescent yellow-green panels and add diagonal downward-pointing arrow plaque.	\$	⌚	County
17	Refresh stop bar striping and relocate STOP sign to stop bar on NB approach.	\$	⌚	Municipality
West End Elementary School				
18	Consider crosswalk with RRFB and crossing guard around elementary school and/or at Judges Lane	\$\$	⌚⌚	County/ Municipality/ School
19	Consider daylighting to prohibit parking in specific areas around elementary school.	\$	⌚	County/ Municipality/ School
20	Consider dedicated pick-up/drop-off zones. Possibly off Greenbrook Road	\$	⌚	County/ Municipality/ School
21	Consider dedicated parking for ball field east of elementary school.	\$	⌚	County/ Municipality/ School
22	Consider striping techniques to reduce speeds around elementary school.	\$	⌚	County/ Municipality/ School
23	Upgrade school signing and striping on Greenbrook Road approaching High School to MUTCD standards	\$	⌚	County/ Municipality
Judges Lane				
24	Schedule maintenance to clear overgrowth around WB flashing beacon.	\$	⌚⌚	Municipality
25	Consider adding a crosswalk with RRFB at this intersection for school and church crossings.	\$	⌚⌚	County
West End Avenue				
26	Clear overgrowth on NW corner to improve turning sight distance.	\$	⌚	County/ Property owner
27	Conduct lighting analysis and coordinate with utility company to install LED lighting.	\$\$	⌚⌚	Municipality/ Utility company
28	Explore NO TURN ON RED restrictions.	\$\$	⌚	County
29	Evaluate existing signal timing to determine if LPIs and longer flashing don't walk times can be accommodated.	\$\$	⌚	County
30	Upgrade push buttons.	\$	⌚⌚	County
31	Upgrade 8" signal heads to 12" signal heads.	\$	⌚⌚	County
32	Coordinate with utility companies to possibly relocate utility poles on SE corner to improve sight distance.	\$\$	⌚⌚	County/ Municipality
33	Replace bench on SW corner due to poor condition.	\$	⌚	Municipality/ Church
Double Curve				
34	Explore adding raised pavement markers and/or reflectors to obstructions within clear zone to make double curve more visible at night.	\$\$	⌚	County

No.	Recommendation	Cost	Time Frame	Jurisdiction
35	Consider adding S-curve warning signs at each end of the curve.	\$	⌚	County
36	Investigate potential for high-friction surface treatment.	\$\$	⌚⌚	County
37	Replace sidewalk west of intersection to correct non-compliant cross slope through driveway.	\$	⌚	Municipality
Crosson Place				
38	Investigate feasibility of realigning approach to improve sight distance and grade.	\$\$\$	⌚⌚⌚	County/ Municipality
39	Consider making right-in, right-out to discourage cut-through traffic.	\$\$	⌚⌚⌚	County/ Municipality
Hidden Trail				
40	Remove tree overgrowth at SW corner to improve sight distance.	\$	⌚	County/ Municipality
41	Extend sidewalk on south side of street from Hidden Tr to Columbia Ave to provide a crosswalk across Greenbrook Rd with a better sight distance and better pedestrian connectivity.	\$\$	⌚⌚⌚	Municipality
42	Stripe crosswalk and stop bar.	\$	⌚	County/ Municipality
Columbia Avenue				
43	Relocate stop bar to improve sight distance.	\$	⌚	Municipality
44	Restripe crosswalk.	\$	⌚	Municipality
Sweetbriar Lane				
45	Stripe crosswalk across Greenbrook Road to connect cul-de-sac.	\$	⌚⌚	County
Stahls Way				
46	Investigate improvements to drainage due to evidence of ponding.	\$\$	⌚⌚⌚	County/ Municipality
47	Stripe stop bar and restripe crosswalk.	\$	⌚	Municipality
48	Explore one-way pair options due to steep grade of this roadway. Evidence of vehicles "bottoming out".	\$\$	⌚⌚	County/ Municipality
Glenside Place				
49	Stripe stop bar.	\$	⌚	Municipality
50	Fix sidewalk on north side of roadway that exhibits major heaving from tree.	\$\$	⌚⌚	Municipality
Martins Way				
51	Driveway access on NE corner should be evaluated to determine if driveway width needs to be reduced.	\$\$	⌚⌚	County
52	Reduce curb radii by striping or curb reconstruction.	\$\$	⌚⌚	County/ Municipality
Jefferson Avenue				
53	Replace bench south of intersection due to poor condition.	\$	⌚	Municipality
Harrison Avenue				
54	Install STOP FOR PEDESTRIANS in-street signage. Signage can remain in the roadway at all times.	\$	⌚	Municipality
Rockview Terrace				
55	Install fluorescent yellow-green S1-1 signs with diagonal downward-pointing arrow plaques in each direction at the crosswalk.	\$	⌚	County

No.	Recommendation	Cost	Time Frame	Jurisdiction
56	Upgrade crosswalks to high visibility.	\$	🕒	County
57	Coordinate with property owner of 34 Rockview Terrace to relocate fence to improve sight distance.	\$\$	🕒🕒	Municipality
Wilson Avenue				
58	Pending bus stop ADA compliance, construct crosswalk at this intersection for NJ TRANSIT bus stop access across the street.	\$	🕒	Municipality/ NJ TRANSIT
59	Coordinate with school to restrict access to faculty parking lot to prevent parent/child pick-up/drop-off.	\$\$	🕒🕒	County/School
60	Coordinate with school to reduce driveway apron width to minimize crossing distance for students and slow vehicle speeds of ingress/egress movements.	\$\$	🕒🕒	County/School
North Plainfield High School				
61	Upgrade school signing and striping on Greenbrook Road approaching High School to MUTCD standards	\$	🕒	Municipality
Fromm Field				
62	Install mid-block crossing and curb ramps where south side sidewalk drops off to connect sidewalk across the street. Pending county engineering approval.	\$\$	🕒🕒	Municipality
Grove Street				
63	Evaluate existing signal timing to determine if LPIs can be accommodated.	\$\$	🕒	County
64	Coordinate with property owner to add NO PARKING striping/daylighting in front of Grove BBQ and restrict deliveries to Grove St.	\$	🕒	Municipality/ Property owner
65	Add planter boxes to separate pedestrian area from parking area in front of the business on the northeast corner of the intersection.	\$	🕒	Municipality/ Property Owner
66	Add WB speed limit sign 300' east of the intersection.	\$	🕒	County
67	Install more no parking signage closer to intersection and refresh parking striping.	\$	🕒	Municipality
68	Review signal timing to determine if 3.5fps¹⁵ flashing don't walk time can be accommodated.	\$\$	🕒	County
69	Consider adding dotted double yellow striping or white edge line striping through intersection to assist with right turns.	\$\$	🕒	County
70	Explore loading zone restrictions close to the intersection.	\$\$	🕒🕒	County/ Property Owner
71	Coordinate with utility company to remove guy wire hazard.	\$	🕒🕒	County
72	Conduct a traffic study to determine if existing volumes warrant a dedicated SB left turn lane.	\$\$	🕒🕒	County

¹⁵ 3.5 ft/s (3.5 feet per second) refers to the typical pedestrian walking pace/speed

No.	Recommendation	Cost	Time Frame	Jurisdiction
73	Investigate relocating signal pedestal pole on NW corner of intersection that blocks sight distance between SB vehicles and pedestrians crossing EB leg.	\$\$	⌚⌚⌚	County
Duer Street				
74	Add curb extensions and/or daylighting on Greenbrook Rd approaches to provide pedestrians with better sight distance and prevent parking too close to the intersection.	\$	⌚⌚	County
75	Move stop bars forward to improve intersection sight distance.	\$	⌚	Municipality
76	Add crosswalk striping for Duer Street	\$	⌚	Municipality
Between Duer Street and Stone Street				
77	Perform lighting analysis to determine if more lighting needs to be installed in this very dark area.	\$\$	⌚⌚	Municipality
Liquor Store				
78	Coordinate with liquor store property owner to improve access to site by reducing width of driveways, reconfiguring parking, and defining pedestrian ROW around and through the site.	\$\$\$	⌚⌚⌚	County/ Municipality/ Property Owner
Stone Street				
79	Install ONE WAY signs.	\$	⌚	Municipality
80	Stripe stop bar on Stone Street	\$	⌚	Municipality
81	Coordinate with businesses on northwest corner of intersection to encourage parking lot use rather than on-street parking.	\$	⌚	Municipality
82	Install NO PARKING signs to denote where on-street parking begins adjacent to businesses on northwest corner of intersection. Consider no parking within 25' of crosswalk.	\$	⌚	Municipality
83	Restrict WB parking between Stone Street and Somerset Street	\$	⌚⌚	Municipality
Somerset Street				
84	Narrow the EB sidewalk in front of the hair cutting place (SW corner) to improve EB vehicle storage.	\$	⌚	County/ Municipality
85	Offset intersection presents bad sight lines for pedestrian visibility. Consider phasing improvements, including LPIs.	\$\$	⌚⌚	County

B. Road Owner Response

An essential final step of the RSA process (see **Figure 1**) is a response from the roadway owner, which provides accountability between the funding body and the participating jurisdiction who acknowledges the findings within the RSA and their planned steps to address concerns. In responding to the RSA's findings, the road owner, in this case the County, must weigh the safety benefits posed by the recommendations within this report against the available resources to implement such improvements to make an informed decision. Because the audit process generated a long and wide-ranging list of potential improvements, the road owner is expected to implement these recommended improvements as time and funds allow in coordination with other projects and priorities.

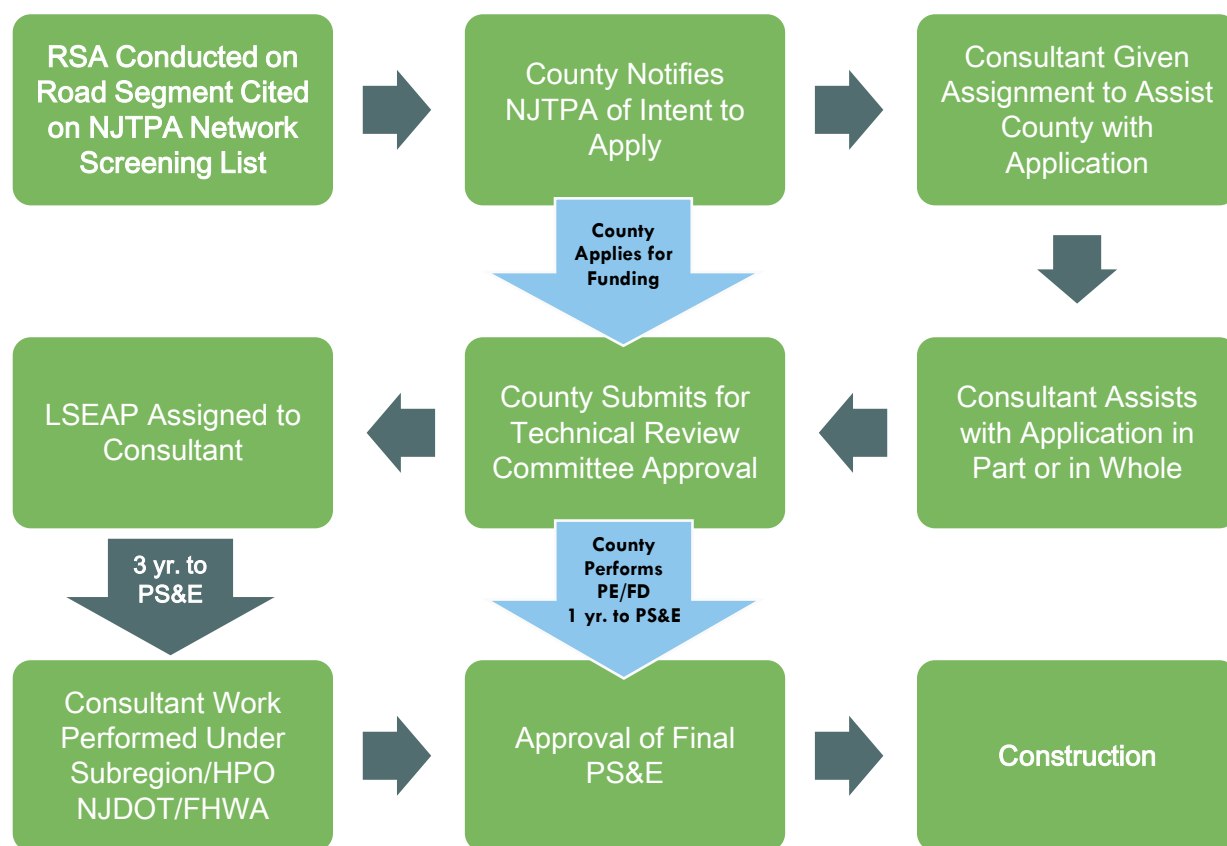
Somerset County delivered their response following the finalization of the findings and recommendations table (see **Appendix J**). However, while the County has overseen this RSA process, by no means should this report be considered as a commitment to address some or all concerns and implement some or all improvements listed within this report. All potential recommendations must be fully studied. It is acknowledged that some recommendations may not be feasible.

C. Potential External Funding Sources

Local Safety Program

The County has previously used RSAs as a “launching pad” for pursuing funding for corridor safety improvement projects, such as Main Street in Manville and Hamilton Street in Franklin, via the Local Safety Program (LSP) offered through NJTPA. Should the County desire to pursue funding of safety improvements on this corridor, the RSA can help to scope the specific safety improvements to be conceptualized and designed for eventual funding and construction. The RSA can also be appended to Section 4 of the funding application¹⁶ submitted to NJTPA as a further substantiation and documentation of the understanding of the existing safety issues and proposed safety measures. This application, which also requests information on scope, location ranking, HSM analyses, estimated costs, and environmental impacts, may be filled out by the County itself or with assistance from a consultant designated by NJTPA. Pending determination of eligibility by NJTPA’s Technical Review Committee, the County can choose to either perform the Preliminary Engineering and Final Design work in-house or obtain assistance for such work through NJTPA’s Local Safety Engineering Assistance Program. It should be noted that implementation of improvements through the LSP often takes around five to six years from corridor selection to construction. A simplified flowchart of this process from RSA to construction is shown in **Figure 13**. If faster implementation is desired, County, and municipal operating and capital budgets could be relied upon if internal funding is available.

Figure 13 – Project Development Process for Local Safety Program after RSA Completion



¹⁶ Application for FY 2020 provided here: https://www.njtpa.org/NJTPA/media/Documents/Projects-Programs/Local-Programs/Local-Safety-Rural-Roads/FY-2020-LSHRRRP-Application-Rev_191003.doc?ext=.doc

Transportation Alternatives Program

The purpose of the Transportation Alternatives Set-Aside Program (TA Set-Aside) federal grant initiative is to support the construction of “non-traditional” surface transportation projects, which typically involves the designing of infrastructure for active modes such as pedestrians, cyclists, and other non-motorized forms of travel. Supported projects can also have elements that bolster the recreational, historic, cultural, or environmental assets of the project area. Grant funding for a given project can range from \$150,000 to \$1,000,000. The amount of funding is determined on a project-by-project basis with award of prior grant money, and successful execution of prior funded projects, playing a factor. The County would not be prohibited from applying for both Safe Routes to School and TA Set-Aside funding at the same time.

TA Set-Aside lists the following activities that are eligible for funding under its “Pedestrian/Bicycle Facilities” and “Community Improvement” categories:

- New/reconstructed sidewalks/curb ramps;
- Bike lane striping;
- Wide paved shoulders;
- Bike parking and bus racks;
- New or reconstructed off-road trails;
- Bike/pedestrian bridges and underpasses;
- Lighting;
- Historic sidewalk paving;
- Benches;
- Planting containers;
- Decorative walls; and,
- Walkways.

The recommendations within the Implementation Matrix touch on many of the prior elements listed. To best position itself to attain approval for funding, the applying jurisdiction, whether County or municipal, should pass a resolution of support showing the commitment of maintenance of the proposed complete streets elements. Furthermore, the applicant should have data supporting that the implementation of similar improvements elsewhere within its jurisdiction has resulted in the increase of non-motorized transportation, the stimulus of economic activity, and the improvement in quality of life. A handbook summarizing the process of applying for these funds can be found at NJDOT Local Aid website¹⁷.

Safe Routes to School (SRTS)

SRTS is a federally-funded application program established to assist County, municipalities, school districts, and individual schools with programmed reimbursements for the implementation of improvements that would:

- Enable/encourage children in grades K-8, including those with disabilities, to walk/bicycle to school;
- Make bicycling and walking to school a safer and more appealing transportation alternative, thereby encouraging a healthy and active lifestyle from an early age; and,
- Facilitate the planning, development and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption and air pollution in the vicinity of schools.

Such improvements can include the construction of hard infrastructure, such as bridging sidewalk gaps, providing new crosswalks, specifying new traffic control for new school crossing movements (signals, RRFBs, etc.), proposing new traffic calming devices, and implementing bike lanes or other bike facilities to encourage alternate modes of travel to school. Design assistance programs are also provided for the applicant to work with a NJDOT-selected consultant to design such infrastructure improvements. Funding can also be used for non-infrastructure events and services, such as walking school buses, traffic safety lessons, increased enforcement, etc. A handbook specifying the application process for SRTS FY 2022

¹⁷ <https://njdotlocalaidrc.com/perch/resources/Uploads/2020-ta-set-aside-handbook-8-12-20.pdf>

funding can be found on NJDOT's SRTS website¹⁸. Webinars are also available to learn more about the program.

D. Demonstration Project

Demonstration projects are where an example improvement is completed for a selected corridor with foresight to prepare for larger rollouts. The improvement(s) should highlight the concept and illustrate the benefits of RSAs and how RSAs may improve the overall level of safety for the road users. The selected demonstration projects should be of strategic importance, and which is representative of the general safety theme suggested for the selected corridor.

In concert with the Borough Police Department, the Borough's School District and RideWise TMA could plan a one-day event to conduct a Walking Bus activity along select neighborhood streets, and a selected length of Greenbrook Road with students and parents (**Figure 14**). The goals of this demonstration project are to reduce vehicular travel to school and improve the safety of students walking or biking to school. The North Plainfield School District is encouraged to coordinate with RideWise (the County's TMA) to set up this demonstration project to improve the walkability of the Greenbrook Road corridor.

Figure 14 – Walking Bus Demonstration Project in Bound Brook¹⁹



E. Visualization of Potential Safety Measures

Provided in this section of the report are visualizations of some of the larger reaching proposed safety measures on the corridor in the Implementation Matrix (**Table 7** and **Table 8**). Visualizations of these safety measures, along with accompanying descriptions on how these ideas seek to improve safety for vehicular, pedestrian, and cyclist travel, are adapted from the following publications:

- New Jersey Pedestrian and Bicycle Resource Center video library, 2021²⁰
- Cross County Connection TMA video library, 2021²¹
- NJDOT Technology Transfer video library, 2021²²
- NJDOT Safe Routes to School video library, 2021²³
- 2017 State of New Jersey Complete Streets Design Guide, NJDOT, 2017
- Proven Safety Countermeasures, FHWA, 2017
- Small Town and Rural Multimodal Networks, FHWA, 2016

¹⁸ <https://www.njdotlocalaidrc.com/perch/resources/Uploads/2022-srts-handbook-06-10-2021.pdf>

¹⁹ Safe Routes New Jersey. Walking School Bus. YouTube. Civic Eye Collaborative. <https://www.youtube.com/watch?v=38vFiOw2WQY>.

²⁰ https://www.youtube.com/channel/UCMsSU487ZPfA0AicC7K8_SQ

²¹ <https://www.youtube.com/channel/UC5C0fODzuDqT9yckMYv0C3Q>

²² <https://www.youtube.com/channel/UC-L3YfzFHcuDw6al7wDrJQ>

²³ <https://www.youtube.com/channel/UCijvrPjwNZ97MkX5IRol4ow>

- *Separated Bike Lane Planning and Design Guide*, FHWA, 2015
- *New Jersey School Zone Design Guide*, NJDOT, 2014
- *Urban Bikeway Design Guide 2nd Edition*, National Association of City Transportation Officials, 2014
- *Urban Street Design Guide*, National Association of City Transportation Officials, 2012

Key Study Recommendation – Pedestrian Safety Improvements in the Vicinity of Schools

A key recommendation from this RSA is to enhance pedestrian safety through sidewalk upgrades and crosswalks at school locations, such as West End Elementary (**Figure 15**). Due to location of the corridor near parks, schools, or other land uses that tend to have a relatively high share of active mode trip generation, it was discussed to stripe or construct curb extensions and refresh crosswalk striping and consider the installation of Rectangular Rapid-Flashing Beacons (RRFBs) at unsignalized crossing locations.

Figure 15 – Sample of Pedestrian Safety Improvements Near West End Elementary



Daylighting or other striping in shoulder would aid to prohibit parking, allocate bus standing, and calm traffic speeds. At nearby signalized intersections, push button upgrades, lighting, No Turn on Red (NTOR) restrictions, and Leading Pedestrian Intervals (LPIs) are recommended.

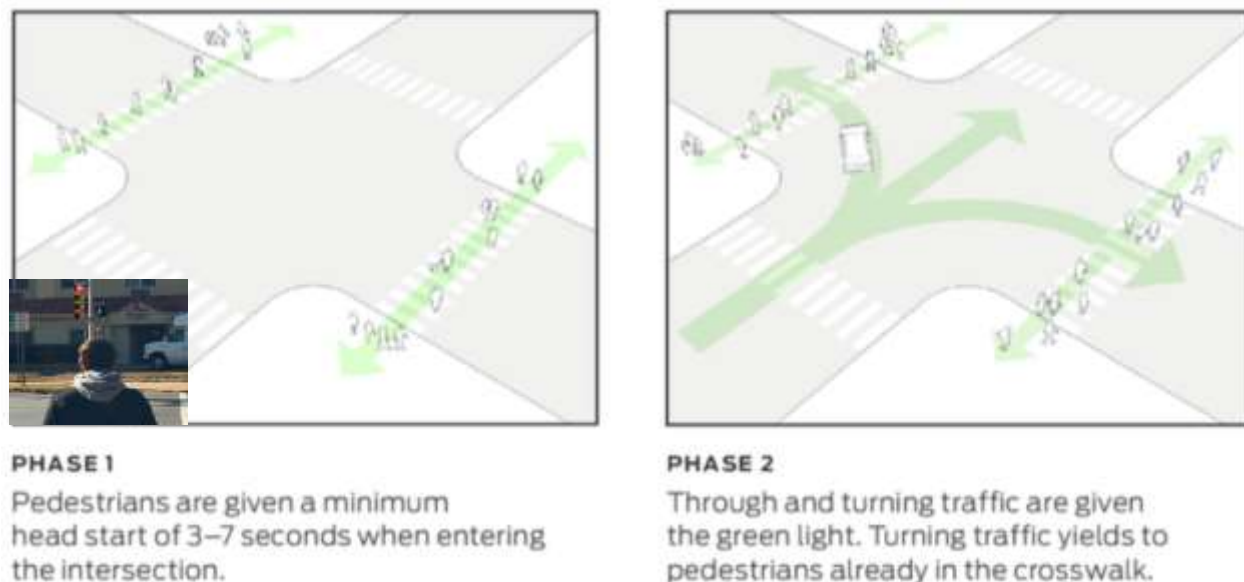
Leading Pedestrian Intervals (LPIs) & Signal Phasing

LPIs are a low-cost, effective way to help pedestrians establish their presence at signalized crossing locations before conflicting vehicles have the right-of-way (**Figure 16**). This is one of FHWA's Proven Safety Countermeasures, boasting an approximate reduction of 13%²⁴ of pedestrian-vehicle crashes with proper implementation. Vehicular capacity is noted to be a barrier to implementation, which is why the

²⁴ FHWA. (2017). Proven Safety Countermeasures. <https://safety.fhwa.dot.gov/provencountermeasures/>.

County would need to conduct capacity analysis at intersections before implementation. However, Greenbrook Road signalized intersections with West End Avenue and Grove Street are prime candidates for LPI implementation due to the simple two-phase timing at these intersections and since both intersections facilitate walking routes to school. Student pedestrians are vulnerable users and have difficulty establishing their presence at an intersection, which is why LPIs could be warranted here to help students get a three to four-second start into the intersection that allows them to be better seen by drivers.

Figure 16 – Leading Pedestrian Interval (from NACTO and Lakewood Township)²⁵



Rectangular Rapid Flashing Beacons (RRFBs)

At locations where new midblock crosswalks are proposed in this RSA report, such as those near West End Elementary School and Fromm Field, pedestrian-actuated RRFBs could further increase the visibility of students and other pedestrians crossing at these locations. Installing RRFBs at crossing locations could reduce the risk of vehicle-pedestrian crashes to as little as 10% (average crash reduction seen is 47.4%²⁶).

Figure 17 – RRFB Installation in Metuchen Borough by Middlesex County²⁷

²⁵ Figure from National Association of City Transportation Officials. (2012). *Urban Street Design Guide*. Photo from NJDOT Technology Transfer. (2019). *What is an LPI?* YouTube. Civic Eye Collaborative. <https://www.youtube.com/watch?v=xk8hn7rdHds>.

²⁶ <http://www.cmfclearinghouse.org/detail.cfm?facid=9024>

²⁷ NJDOT / FWHA. (2012). *The Complete Streets Movement*. YouTube. Civic Eye Collaborative. <https://www.youtube.com/watch?v=lKAKxQvpeHk>.

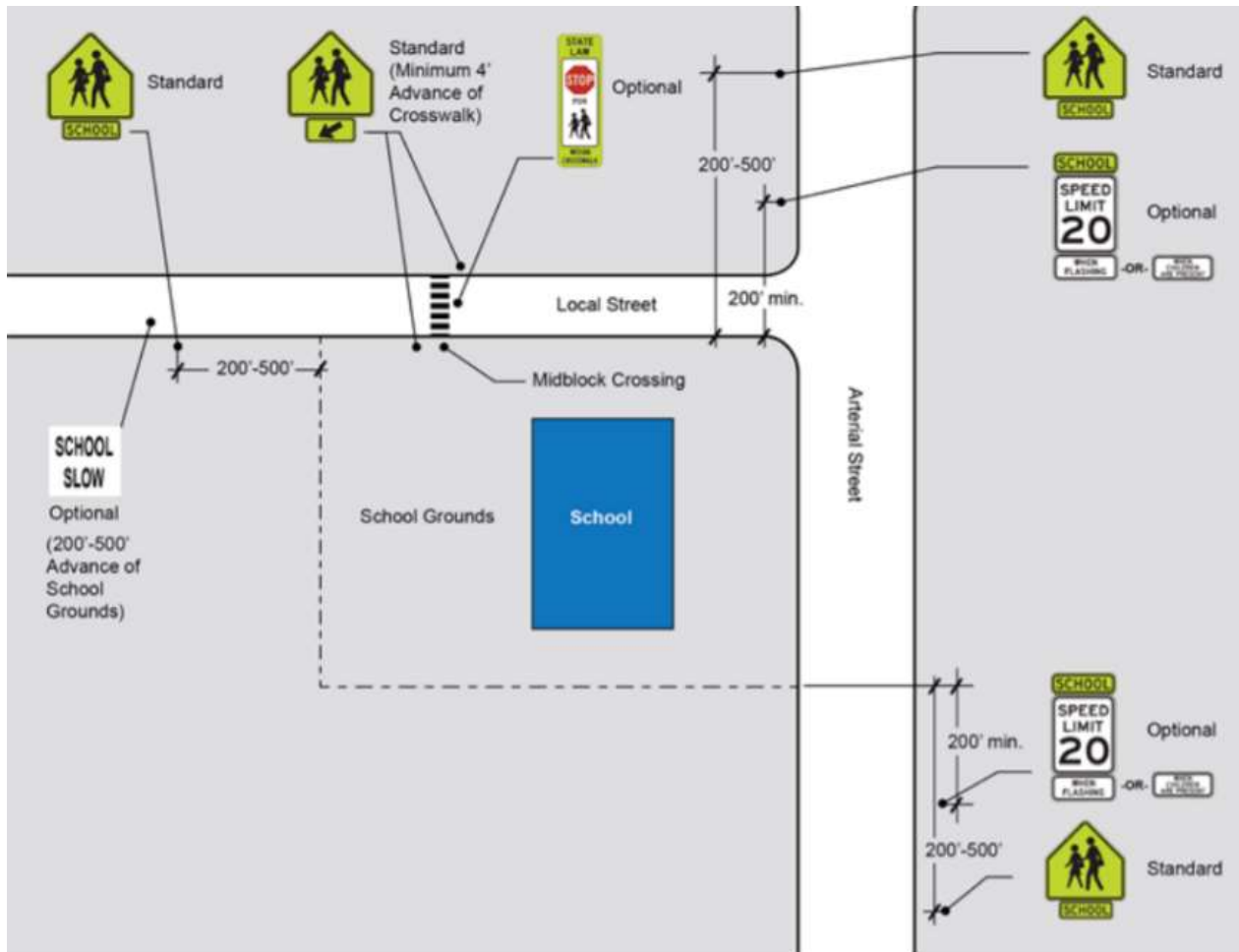


School Signing on Greenbrook Road

School signing and striping on Greenbrook Road on approach to West End Elementary School, and on approach to the Middle approach to the Middle School/High School, needs upgrade to MUTCD standards (placement distance, fluorescent yellow-green fluorescent yellow-green signing, etc.) and state school signing practices. More clear and consistent messaging is needed at nearby intersections. Messages striped on the pavement, like "SCHOOL" and "SLOW," better catch the cone of "SLOW," better catch the cone of vision for drivers passing the school. Wider crosswalk bars also better alert drivers to potential alert drivers to potential crossing pedestrian traffic. For the re-signing and re-striping of school advisory messages on Franklin messages on Franklin Boulevard, the designer should refer to NJDOT's New Jersey School Zone Design Guide (2014, key figure shown Guide (2014, key figure shown on

Figure 18) and the MUTCD for best practices.

Figure 18 – Figure from New Jersey School Zone Design Guide Showing Signing Placement



VII. Conclusion

This RSA Report seeks to describe the process undertaken by the County to investigate potential traffic safety issues along the Greenbrook Road corridor (CR 636), extending from the intersection with Harrington Avenue at MP 0.7 to the intersection with CR 531 (Somerset Street) at MP 1.97, located in North Plainfield Borough. From survey of prior County, municipal, or regional studies to public and stakeholder outreach conducted as part of this study to the crash data that was reviewed report-by-report to the observations made during in-field audits, potential concerns were observed and recorded, not only for corridor-wide issues, but for location-specific issues.

In order to address these potential concerns, discussions were held with the RSA team and County Engineering to develop a list of tasks to improve traffic safety on the corridor, which are codified in the Implementation Matrix (Chapter VI, Subsection A) in this report. To assist the responsible jurisdictions (whether municipal, County, or separate agency) to schedule and prioritize these improvements, such were classified by anticipated timeline, and cost magnitude. It is encouraged that the improvement recommendations are shared with all responsible jurisdictions to increase the benefits to be seen from the recommendations in this report.

While the recommendations in the Implementation Matrix are centered around the engineering (and associated maintenance) of roadway features, changes to hard infrastructure alone will fall shy of the benefit that would be seen by implementing the 5E's of highway safety²⁸:

- Engineering: highway design, traffic, maintenance, operations, and planning professionals;
- Enforcement: State and local law enforcement agencies;
- Education: communication professionals, educators, and citizen advocacy groups;
- Emergency response: first responders, paramedics, fire, and rescue; and,
- Equity: prioritizing the safety of vulnerable roadway users.

This approach recognizes a shared responsibility across numerous professions to see improved benefits in corridor crash performance, beyond the anticipated reduction in crashes with the implementation of proven crash countermeasures. RideWise (the County's TMA), law enforcement, and EMS are encouraged to continue their efforts in educating the local driving population, holding driving behaviors accountable to Title 39, improving the response times to severe crash incidents, and reaching underserved communities with these safety strategies.

²⁸ Adapted from FHWA, https://safety.fhwa.dot.gov/hisp/resources/fhwasa1102/flyr3_in.cfm

