BMTS safety *ACTION* plan

Draft Report

January 2026

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ABBREVIATION USED	TERM DEFINED
AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act of 1990
BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ratio
BMTS	Binghamton Metropolitan Transportation Study
CIP	Capital Improvement Program
CLEAR	Crash Location & Engineering Analysis Repository (NYSDOT Crash Database)
CMF	Crash Modification Factor
CY	Cubic Yards
EA	Each (per element)
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
HAWK	High-Intensity Activated Crosswalk (Overhead Pedestrian Signal with Red Indication)
HIC	High Injury Corridors
HII	High Injury Intersections
HIN	High Injury Network (HIC & HII)
HRN	High Risk Network
K	Fatal Crash
KABC	All Injury Crashes – Fatal (K), Serious (A), Minor (B), and Possible (C)
KSI	Fatal (K) or Serious Injury (SI) Crash
LED	Light-Emitting Diode
LF	Linear Feet
LOSS	Level of Service of Safety

ABBREVIATION USED	TERM DEFINED
LPI	Leading Pedestrian Interval
LS	Ladder Style (High-Visibility Crosswalk)
Mph	Miles per Hour
MUT	Median U-Turn (Type of Reduced Left Turn Conflict Intersection)
NOFO	Notice of Funding Opportunity
NYSDOT	New York State Department of Transportation
PSCi	Proven Safety Countermeasures Initiative (FHWA)
RCUT	Restricted Crossing U-Turn (Type of Reduced Left Turn Conflict Intersection)
RLTCI	Reduced Left Turn Conflict Intersection
SHSP	Strategic Highway Safety Plan
SI	Serious Injury (Incapacitating) Crash
SS4A	Safe Streets and Roads for All (USDOT Discretionary Grant Program)
PSC	Project Steering Committee
PHB	Pedestrian Hybrid Beacon (Also Known As a "HAWK" Signal)
RRFB	Rectangular Rapid Flashing Beacon
TIP	Transportation Improvement Program
USDOT	United States Department of Transportation
VPD	Vehicles per Day
VRU	Vulnerable Road User (Person Walking, Biking, or Using Assistive Mobility Device)

1. Stakeholder Involvement

1.1 Modes of Engagement

The planning process employed a variety of outreach methods to capture input from local stakeholders and community members regarding road safety concerns, needs, and opportunities. These methods included the activities outlined below. Outreach activities kept stakeholders informed about the Safety Action Plan while collecting community insights to ground truth the plan's findings.

- Project Steering Committee (PSC) meetings
- Focus Group discussions with expert stakeholders
- Pop-up tabling at popular events in Broome and Tioga Counties
- An online public survey
- An online interactive safety concerns map
- A project website and mailing list

1.2 Project Steering Committee

A Project Steering Committee was established at the outset of the planning process to guide the development of the plan. Along with leadership and support from key BMTS staff, the seven person committee consisted of representatives from key government and community organizations (**Table 1**).

Table 1. Project Steering Committee - Organizations Represented

Organization Represented	*Person Representing*
City of Binghamton	Ron Lake
Broome County Department of Public Works	Scott Mastin
Tioga County Department of Public Works	Gary Hammond
Broome County Health Department	Devin Link
Broome County (BC) Transit	Greg Kilmer
NYSDOT Region 9	Tony Signorelli
Southern Tier Bicycle Club	Mark Goodwin

The PSC held hybrid meetings to review project deliverables and ensure the plan aligned with community safety needs and priorities. **Table 2** summarizes the topics discussed at each meeting.

Table 2. Overview of Project Steering Committee Meetings

Meeting Number	Date	Agenda / Summary
PSC #1	December 16, 2024	The kick-off meeting provided an overview of the USDOT's Safe Streets and Roads for All program, presented an analysis of crash types, contributing factors and trends within Broome and Tioga Counties, and unveiled the data-driven High-Injury and High-Risk networks (HIN & HRN) for both counties.
PSC #2	June 5, 2025	The second meeting established an overall vision and a set of thematic goals for the plan, explored the interim findings based on the HIN and HRN, and discussed project branding and outreach activities.
PSC #3	September 9, 2025	The next meeting summarized the summer-oriented outreach activities, results from the online survey and interactive map, identified potential project locations based on the HIN, and discussed local experiences with potential safety countermeasures at these preliminary locations.
PSC #4	February 5, 2026	The fourth meeting solicited feedback on the draft Safety Action Plan, which was distributed prior to the meeting. This venue covered the project development process, prioritization approach for capital projects, and policy approaches to institutionalizing safety within the MPO and municipal partner's organizational processes.

1.3 Focus Group Discussions

Three virtual focus groups were organized with local stakeholders, each with a different theme. The purpose of the focus groups was to better understand the safety needs and concerns of specific users, including vulnerable users (i.e., those traveling outside of a vehicle) and underrepresented groups.

These discussions focused on identifying specific locations where people felt unsafe while walking, biking, and/or driving. The discussions also explored participant's opinions and views with regard to contributing factors, including unsafe behaviors or road design, and potentially relevant safety interventions based on their direct experiences within the study area.

Table 3 summarizes the feedback received from each selected group of participants. **Table 4** details the safety issues and potential interventions solicited from attendees at each of the three focus groups.

Table 3. Focus Group Summaries

Focus Group Participants	Feedback Summary
Group 1: Traffic, Safety & Highway Officials	Focus Group 1 participants felt that areas with excessive speeding and traffic volumes caused unsafe conditions for drivers and pedestrians. They noted that transition areas, between highways and local roads or between downtown areas and less developed areas, for example, were particularly challenging.
Group 2: Vulnerable Road Users & Special Needs	Participants in Focus Groups 2 and 3 highlighted areas and conditions that created safety concerns for transit users and users with mobility, hearing, or sight impairments. They noted that uncontrolled pedestrian crossings, crossings where cars were making left turns, and poorly maintained pedestrian infrastructure were especially challenging for these users. Concerns were also raised over missing or disconnected bicycle lanes, sidewalk networks, and road shoulders, especially in rural areas. Both groups noted the unpredictable behavior of cyclists, who often travel on sidewalks and fail to follow traffic rules. Participants in Focus Group 2 highlighted "white cane behavior," in which a driver overreacts to a visually impaired pedestrian when they are crossing and stops before necessary, and beeps at the pedestrian to encourage them to cross. This behavior disrupts traffic and startles the pedestrian.
Group 3: County Services, Senior Services & Rural Health Transit	Several Focus Group participants observed that distracted and aggressive driving contributed to unsafe conditions, as well as drivers and bicyclists failing to follow road signs and designated pathways. Suggested interventions included visual or tactile cues that grab drivers' attention, including speed humps , and self-enforcing road design elements that slow traffic and help increase the visibility of pedestrians, including bump-outs or raised crossings. Participants also advocated for additional protected crossings to provide safer passage across area roadways, greater investment in (i.e., more rapid build-out of) accessible infrastructure, expanded bicycle and pedestrian infrastructure, and new safety education programs.

Table 4. Focus Group Issues and Interventions Associated with Safe System Elements

Safe Systems Concern	Focus Group 1A		Focus Group 2		Focus Group 3	
	Issues	Interventions	Issues	Interventions	Issues	Interventions
Safe Road Users	Drivers' inattention due to car screens or phones Disregard of installed signage The unsafe behavior of young E-bikers on the road, such as riding on sidewalks at 30-40 MPH	Flashing signs to grab drivers' attention (Rectangular Rapid Flashing Beacons, LED stop signs) Education, specifically, Governor Hochul's traffic safety program workshops to educate bicyclists	Lack of security and visibility at crosswalks, and visually impaired pedestrians cannot see the white lines Pedestrian buttons are needed in various locations (intersections in Endicott and Binghamton) During winter, unmaintained sidewalks (ice/ snow) cause wheelchair users to travel on the street.	Textured crosswalks, safety islands Install more pedestrian buttons across the county, which is in progress Business owners and homeowners manage snow and ice on sidewalks	Inattentive and distracted driving Unmaintained sidewalks, uneven surfaces, and a lack of bicycle infrastructure	Speed tables / humps Adding greenways protected or grade-separated bike lanes
Safe Roads	Higher traffic congestion occurs near schools when they are in session, and more crashes are reported during the school year	Implementing a survey for parents to capture ideas on how to address traffic during school pick-up and drop-off	Rural areas are inaccessible, especially for wheelchair users, since there are no sidewalks.	Access to transport, increasing access to transport for those with limited mobility e.g., to and from medical clinics for wheelchair users	There are no sidewalks outside of villages, which causes pedestrians to walk in the road, and there are no curb cuts or crosswalks	Adequate shoulders that aren't too narrow
Safe Speeds	Excessive speeding and traffic volumes caused unsafe conditions for drivers and pedestrians.	Removable rubber speed humps and bumps to alleviate plowing challenges			Due to speeding drivers, pedestrians still feel unsafe because they are unsure if a vehicle will stop at crossings.	Bump-outs, safety Islands, mid-crossing signs, Rectangular Rapid Flashing Beacons, stop signals with flashing lights

1.4 Pop-Up Event Tabling

The Project Team further engaged with the public by meeting them where they were – at popular summer events located across Broome and Tioga Counties. During tabling sessions, the Project Team promoted the online survey and interactive map and shared information about the BMTS Safety Action Plan. The Project Team gained additional feedback at these events through conversations with community members, as summarized in **Figure 1**.

Figure 1. Pop-Up Events – Feedback Summary from Each Event

1.5 Survey

The project team developed an online BMTS Safety Action Plan Survey to capture broad public feedback about transportation safety concerns in Broome and Tioga Counties. The qualitative community input complemented quantitative data on fatal and serious injury crashes to help identify opportunities for safety improvements.

The survey opened on June 20th, 2025, and closed on August 25th, 2025. This tool was promoted throughout the summer through tabling at community events, a radio commercial on Cool 106.7 FM, emails to stakeholders, and posts on the BMTS website and social media accounts.

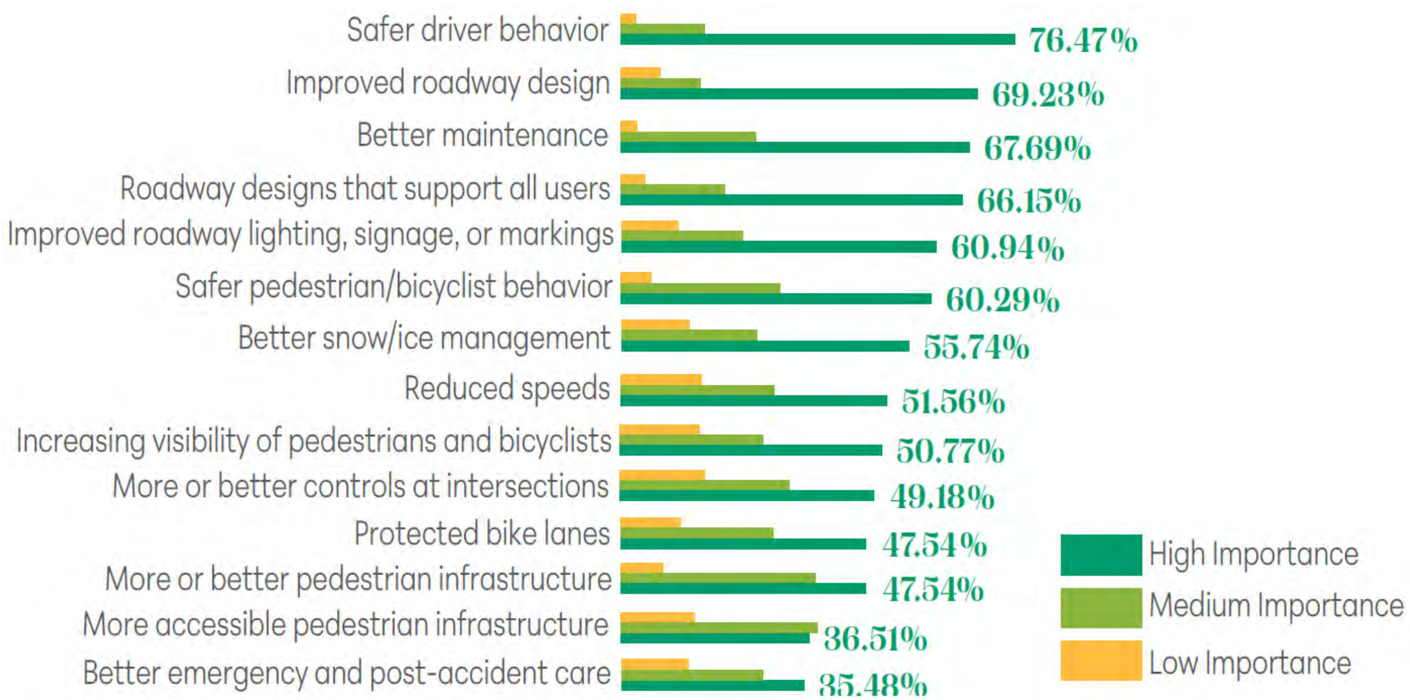
The survey asked respondents to complete a series of multiple choice questions related to unsafe behaviors and conditions they have encountered while driving, walking, biking, and/ or using a mobility device. Quantitative road safety data informed the list of safety concerns and contributing factors that were presented to respondents in the multiple choice questions.

The survey yielded a **total of 76 responses**.

1.5.1 Survey Results

When asked what changes they felt were most important for improving road safety, survey respondents focused on addressing their top safety concerns (**Figure 2**). Safer driver behavior was ranked highest, followed by improved roadway design (e.g., to reduce speeding and blind spots), better maintenance, and multimodal roadway design. A majority also prioritized interventions to promote safer pedestrian and cyclist behaviors, improve visibility and signage/markings, improve snow and ice management, and reduce speeds. Accessibility improvements were a priority for users most impacted by these challenges. These improvements coincide with the unsafe behaviors and conditions survey respondents have encountered, which are discussed in the following pages.

Figure 2. Priority Changes to Improve Safety



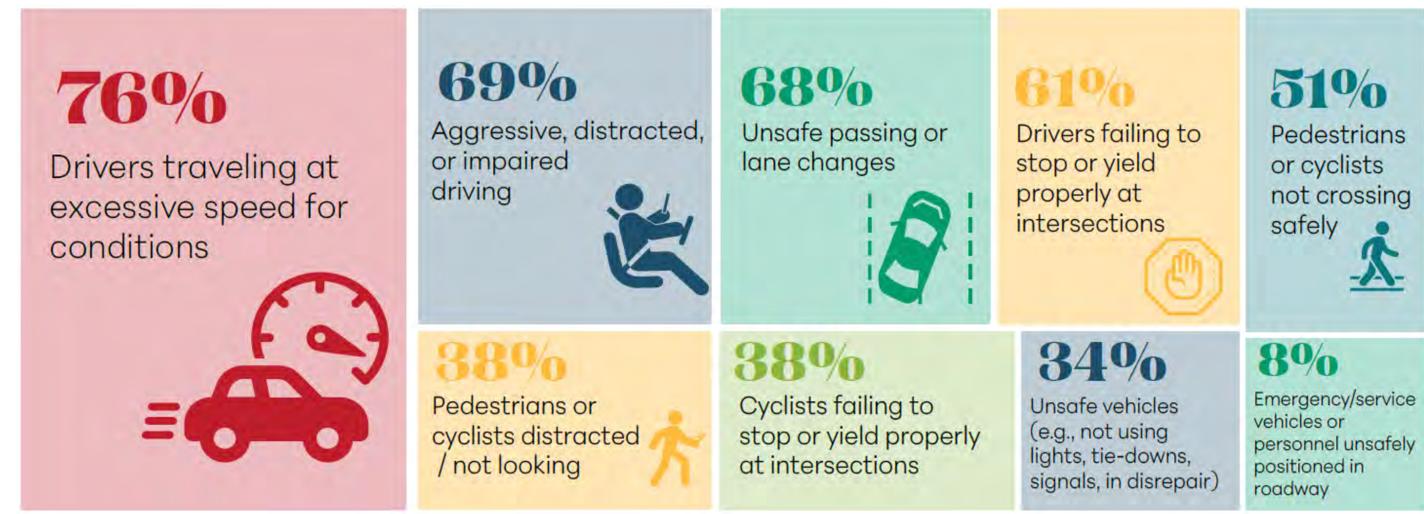
1.5.2 Common Unsafe Behaviors

Drivers speeding was the most common unsafe behavior encountered by survey respondents across all modes of travel. Other behaviors commonly encountered across all modes were aggressive, distracted, or impaired driving and drivers failing to stop or yield properly at intersections. Unsafe bicyclist and pedestrian behaviors were also observed at a similar, less frequent rate for all groups. About one-third of respondents had observed distracted cyclists and pedestrians, and cyclists failing to yield.

1.5.2.1 Experienced by People Traveling in Automobiles

For survey respondents traveling in automobiles, unsafe lane changes was a commonly observed behavior (**Figure 3**). Over 50% had encountered pedestrians or cyclists not crossing safely, compared with 25% for other modes.

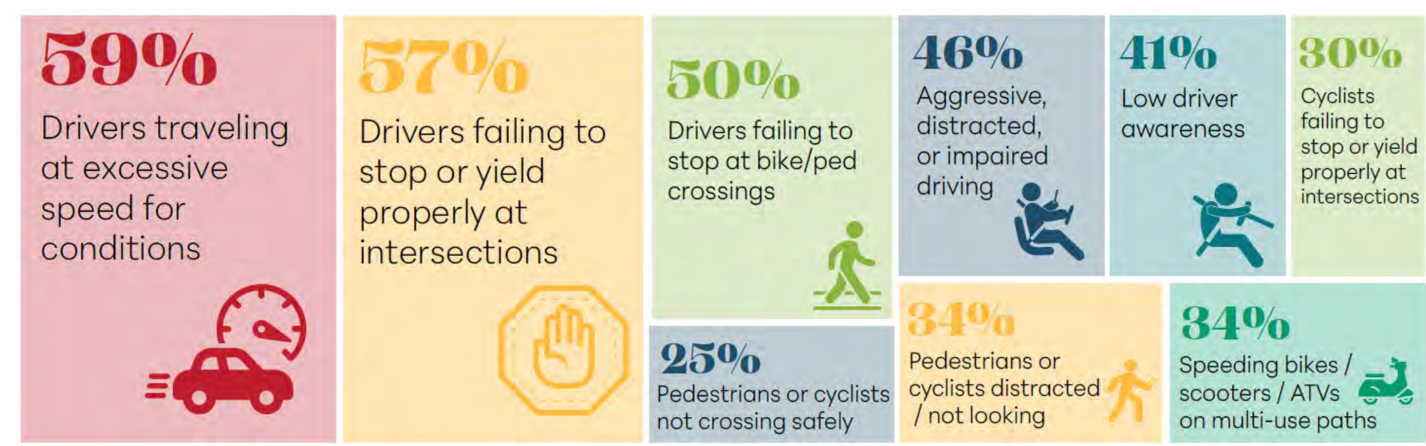
Figure 3. Unsafe Behaviors Respondents Encountered While Traveling in an Automobile in Broome and/or Tioga Counties



1.5.2.2 Experienced by Vulnerable Road Users

For pedestrians, bicyclists, and persons using a mobility assistive device users, about half had experienced drivers failing to stop at (mid-block) bicycle or pedestrian crossings (**Figure 4**). Between 30 and 40% reported low driver awareness, drivers failing to share the road, and speeding bikes/scooters/ATVs on multi-use paths.

Figure 4. Unsafe Behaviors Respondents Encountered as a Pedestrian, Bicyclist, or Assistive Mobility Device User in Broome and/or Tioga Counties



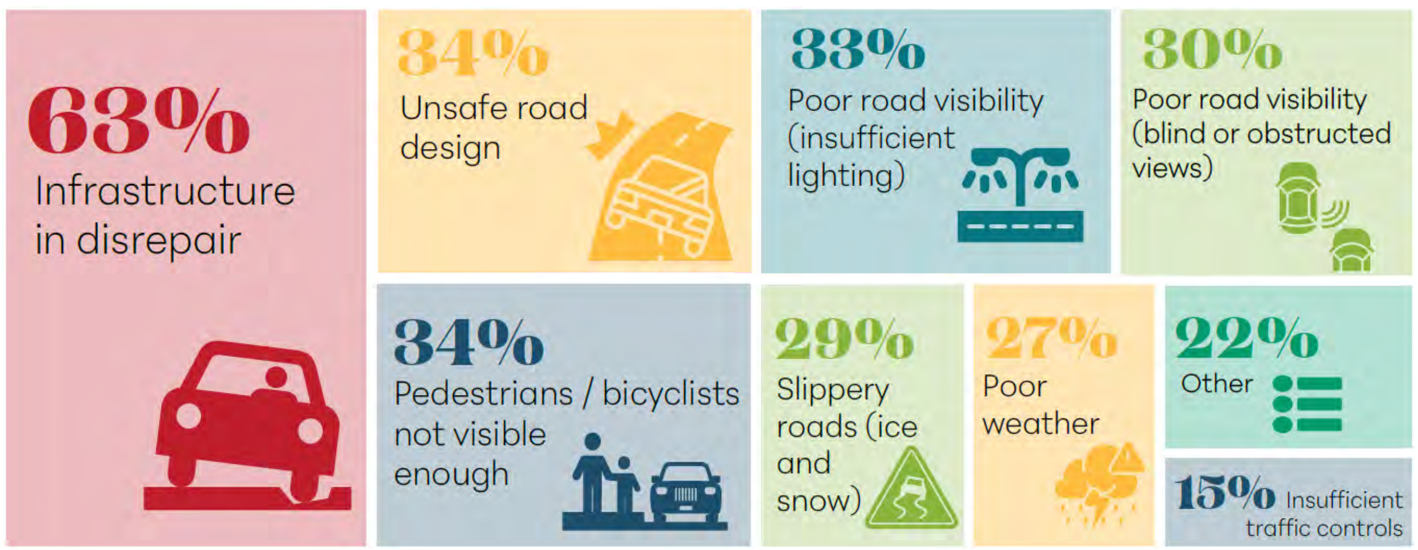
1.5.3 Common Unsafe Road Conditions

Infrastructure in disrepair was the most frequently cited unsafe conditions across all travel modes. A close second for pedestrians, bicyclists, and mobile device users was a lack of pedestrians and cyclist infrastructure. Although survey respondents use infrastructure differently, the results underscore that maintaining roads, sidewalks, and bike lanes is essential to ensure everyone can travel safely. Unsafe road designs were the next most common safety problem for all groups.

1.5.3.1 Experienced by People Traveling in Automobiles

For people traveling in automobiles, 34% had encountered unsafe road designs while 34% of other users had encountered poor crossing designs (**Figure 5**). Poor road visibility was a challenge for one-third of automobile users, who reported difficulty seeing pedestrians and cyclists, insufficient lighting, and blind spots or obstructed views. Poor weather conditions were mentioned by 28%.

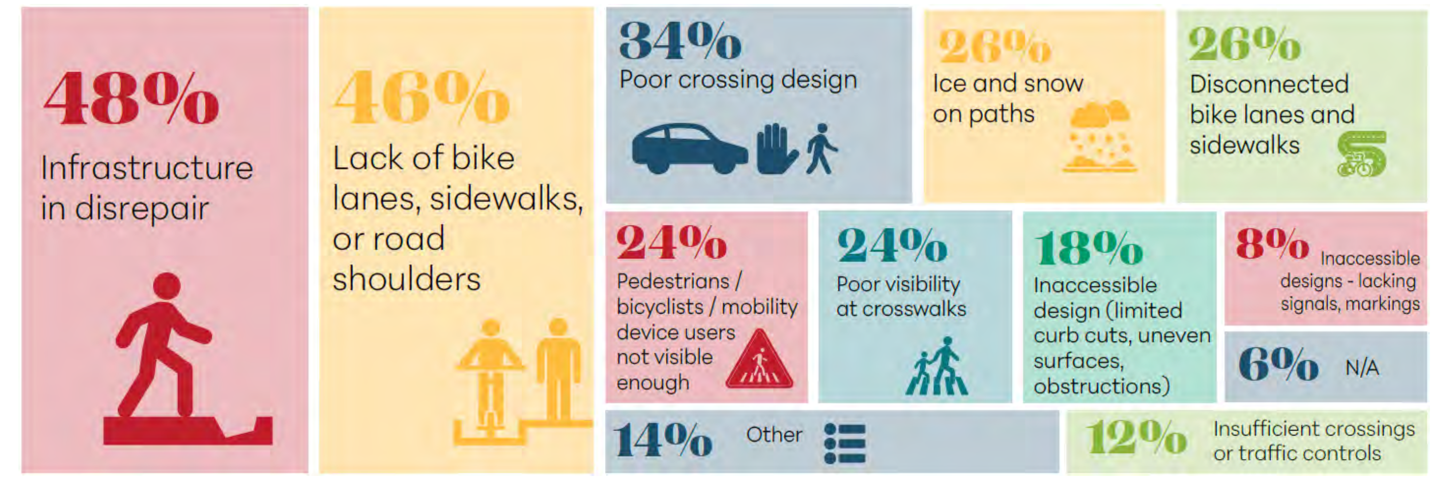
Figure 5. Unsafe Conditions Respondents Encountered While Traveling in an Automobile in Broome and/or Tioga Counties



1.5.3.2 Experienced by Vulnerable Road Users

Meanwhile, about a quarter of pedestrians, cyclists, and people using assistive mobility devices felt they were not visible enough to drivers at times, or experienced poor visibility at crosswalks (**Figure 6**). A similar number reported gaps in bike lanes or sidewalks and ice or snow on paths, reinforcing infrastructure and maintenance concerns. Inaccessible designs and insufficient crossing areas had impacted roughly one out of six respondents.

Figure 6. Unsafe Conditions Respondents Encountered as a Pedestrian, Bicyclist, or Assistive Mobility Device User in Broome and/or Tioga Counties



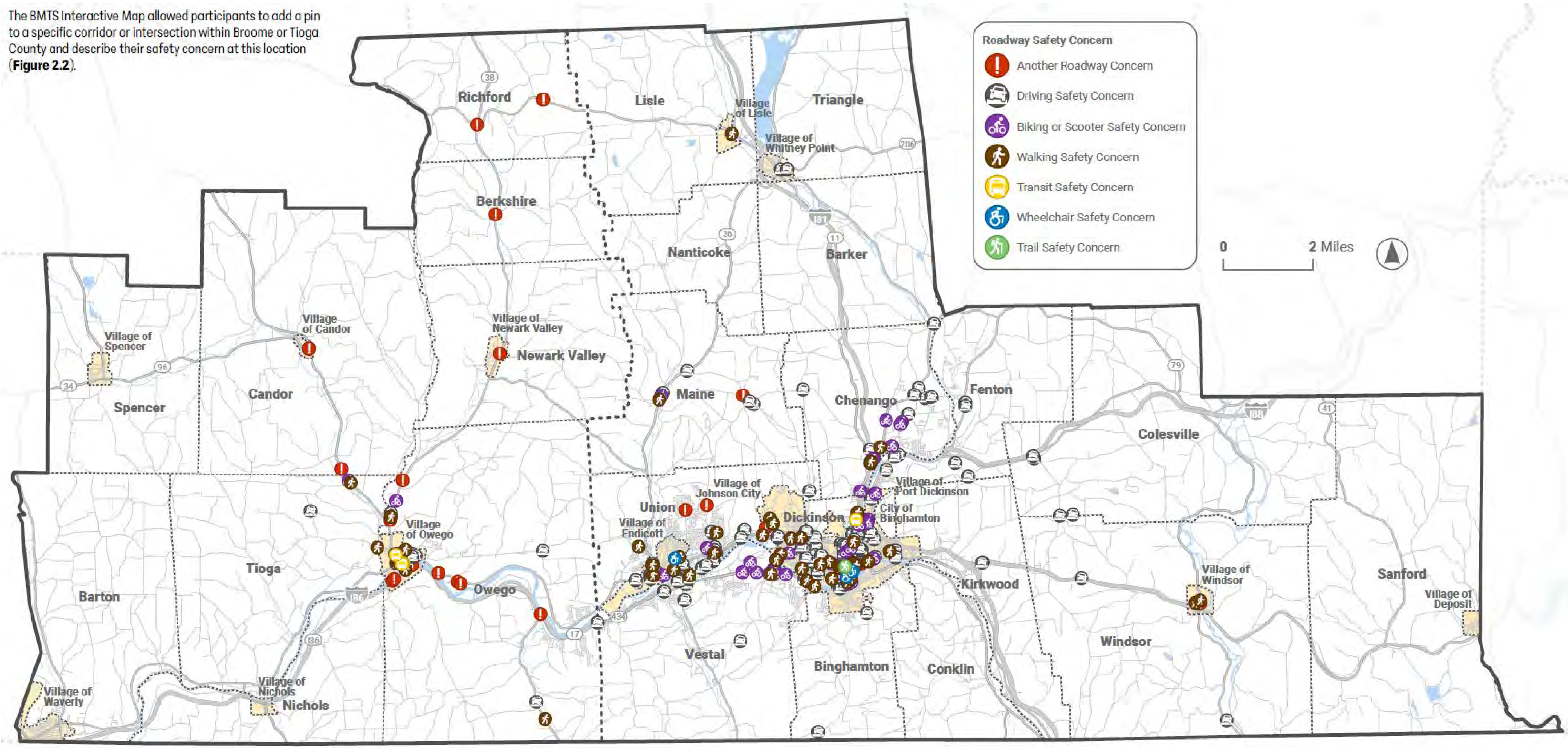
1.6 Interactive Map

The project team developed an interactive map in conjunction with the BMTS Safety Action Plan Survey to address location-specific concerns in Broome and Tioga Counties. The interactive map was open from June 20th, 2025, to August 25th, 2025, and was promoted through various channels alongside the survey.

The BMTS Interactive Map allowed participants to add a pin to a specific corridor or intersection within Broome or Tioga County and describe their safety concern at this location (**Figure 7**).

The map closed with 365 location-specific comments. Of these, 126 were added by participants directly, and 239 were captured through other outreach channels, including survey comments, pop-up events, and stakeholder discussions.

Figure 7. Interactive Web Map Pins in Tioga and Broome Counties



1.6.1 Broome County

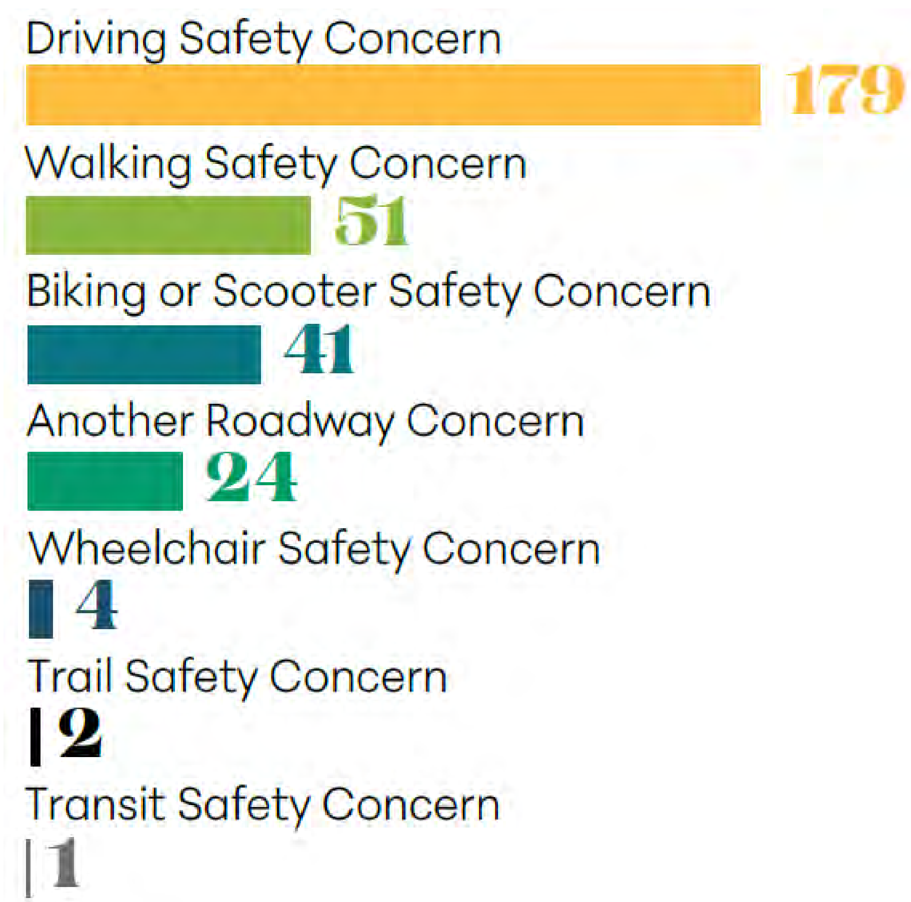
Broome County received 302 comments across 18 municipalities as shown in **Figure 8**. At 59%, driving safety concerns were the most frequent type of concern countywide (Figure 4) and throughout the following municipalities:

- City of Binghamton (67/121 comments)
- Town of Union (17/24 comments)
- Village of Johnson City (15/28 comments)
- Town of Dickinson (12/16 comments)
- Town of Vestal (12/25 comments)
- Town of Chenango (11/22 comments)
- Town of Fenton (8/8 comments)

Figure 8. Interactive Web Map Responses in Broome County Municipalities

As shown in **Figure 9**, walking safety concerns (17%) were the second most frequent in Broome County. Respondents mapped 51 comments in this category: 47% were placed in the City of Binghamton, 11% in the Village of Johnson City, 8% in the Town of Union and the Village of Endicott, and 26% in other municipalities.

Figure 9. Interactive Web Map Responses in Broome County by Concern Type



Many comments mentioned road disrepair, speeding vehicles, and aggressive driving behavior, sometimes in residential areas.

Many comments also noted a lack of bike lanes, unsafe crossing designs, and insufficient pedestrian signals. Respondents indicated that the absence of sidewalks and bike lanes makes it difficult for them to navigate safely. Some comments referred to the unsafe behaviors of E-bike users, including riding at high-speeds on pedestrian-first facilities like sidewalks. Respondents would like improved facilities and infrastructure for cyclists and pedestrians, emphasizing their safety and access. Locations in Broome County that received the most comments are listed in **Table 5**.

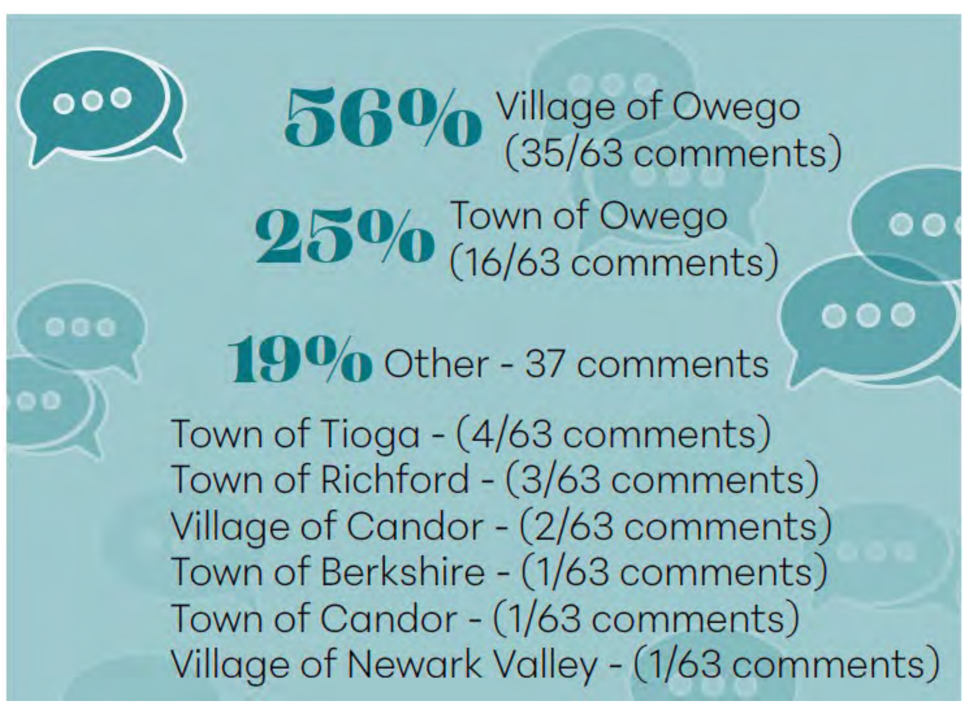
Table 5. Areas in Broome County with the Highest Concentration of Interactive Map Comments

Cluster Location	No. of Comments	Municipality	Concern Type
Route 17	17	City of Binghamton, Towns of Vestal, Dickinson, and Union	Unsafe driver behaviors and roadway conditions
Court Street	9	City of Binghamton	Drivers failing to yield to pedestrians, and insufficient pedestrian facilities (lighting, infrastructure in disrepair, and lack of sidewalks past Tompkins St.)
Upper Front Street Roundabouts	8	Town of Dickinson	Drivers failing to yield to pedestrians and other drivers, and poor crossing design
Vestal Parkway	8	Town of Vestal / City of Binghamton	Unsafe driver behavior
NY-201 Bridge	6	Town of Vestal / Village of Johnson City	Lack of pedestrian / cyclist access and speeding

1.6.2 Tioga County

Tioga County received 63 map comments across eight municipalities (**Figure 10**). The Village of Owego received 35 comments (56%), and the Town of Owego received 16 comments (25%). The Towns of Berkshire, Candor, Richford, Tioga and the Villages of Candor and Newark Valley received between one and four comments each.

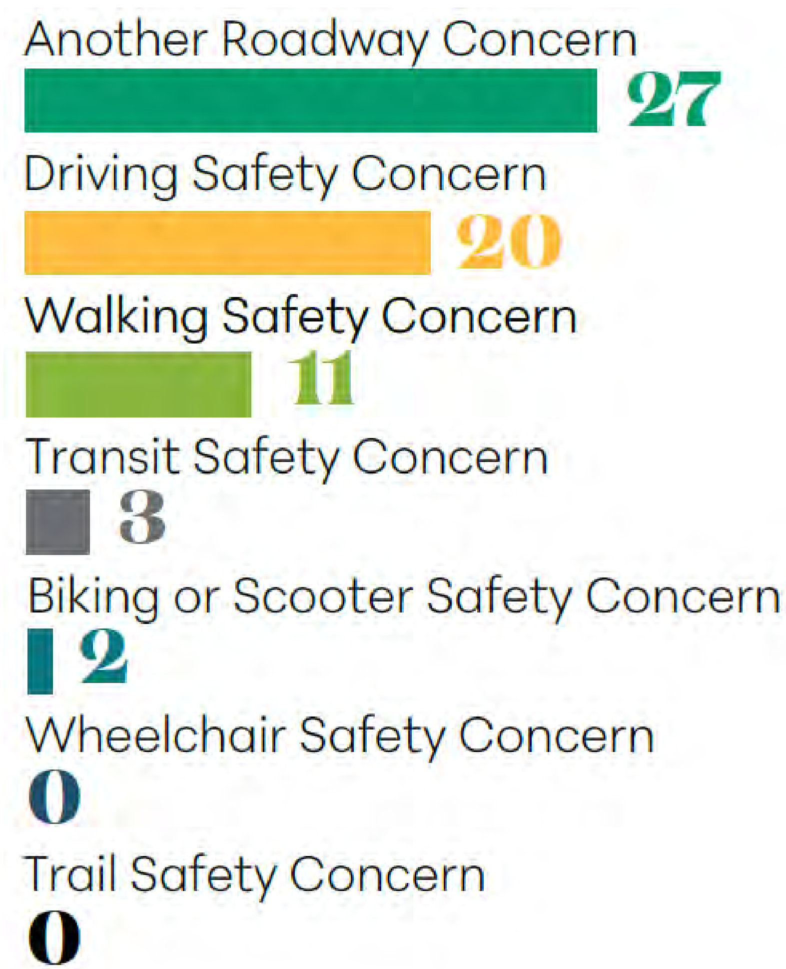
Figure 10. Interactive Web Map Responses in Tioga County Municipalities



As summarized in **Figure 11**, "Other" roadway concerns were the type of comment received (43%) for Tioga County, followed by driving safety concerns (32%).

Comments about disrepair and inadequate infrastructure were prevalent, including poor road and shoulder conditions, and insufficient lighting. Respondents also noted the risks that pedestrians and cyclists face, such as inadequate crossings, poor visibility, and limited access for mobility devices.

Figure 11. Interactive Web Map Responses in Tioga County by Concern Type



Comments mentioned railroad trains blocking intersections and flooding during heavy rainfall as significant impediments to traffic flow. Respondents pointed out that low visibility conditions, especially at intersections and during nighttime driving, are a recurring concern. There were several mentions of speeding and unsafe driving behaviors, along with comments about road design, including improperly painted white lines that allow vehicles to park in turning lanes and turning lanes that obstructed views. Locations in Tioga County that received the most comments are listed in **Table 6**.

Table 6. Areas in Tioga County with the Highest Concentration of Interactive Map Comments

Cluster Location	No. of Comments	Municipality	Concern Type
North Ave Underpass	5	Village of Owego	Poor visibility/poor underpass infrastructure
E. Front St & Main St	5	Village of Owego	Blocked roads for long periods of time due to trains and poor visibility
Main St (Route 17C)	4	Village of Owego	Sidewalk conditions
Front St	4	Village of Owego	Incorrectly painted road lines that cause vehicles to park in turning lanes

1.7 Key Findings: What Did We Hear?

Through PSC meetings, focus groups, pop-up events, and online tools including a survey and interactive web map, the public and stakeholder engagement process generated a broad range of input regarding roadway safety concerns across Broome and Tioga Counties. Many concerns focused on unsafe driving behaviors, road maintenance, and the lack of pedestrian and cyclist access. The findings provide qualitative context to complement quantitative crash data and highlight common concerns.

1.7.1 General Observations

1.7.1.1 Driving Behaviors

Safe Speeds Safe Road Users

The most consistent concern raised throughout the outreach process was the prevalence of unsafe driving behaviors. Speeding and aggressive driving were frequently mentioned by community members, survey respondents, and interactive web map users. Distracted driving and drivers failing to yield to pedestrians at crosswalks were also commonly raised concerns.

1.7.1.2 Multimodal Concerns

Safe Road Users Safe Roads

Across both counties, missing or disconnected sidewalks, insufficient crosswalks, and poor pedestrian signalization were recurring concerns for all users. Cyclists reported unsafe conditions based on the lack of bike lanes and road shoulders. Community members also identified unsafe behaviors including speeding e-bike users and pedestrians and bicyclists failing to cross the road safely. In both Broome and Tioga Counties, participants desired more accessible pedestrian and bicycle facilities to support safer multimodal travel for all modes, ages, and abilities.

1.7.1.3 Road Conditions (Maintenance & Visibility)

Safe Roads

Unsatisfactory roadway conditions and maintenance were also prominent concerns. Throughout the outreach process, community members described deteriorating pavement, shoulders, markings, and sidewalks. These presented a barrier for drivers as well as vulnerable users with mobility, sight, and hearing impairments. Poor visibility of bicyclists, pedestrians, and the roadway due to poor lighting or obstructed views was a common theme.

1.7.1.4 Focus Areas for Improvement

Based on collective observations and suggestions from community members, key interventions to improve safety include promoting safer driver behavior, designing roadways that support all users, and investing in maintenance. These areas of improvement could alleviate many of the concerns raised by the public such as aggressive driving and speeding, missing bike lanes and sidewalks, inadequate visibility for all users, and poorly maintained roads and sidewalks.

1.7.2 Broome County – Common Issues & Frequently Noted Locations

Safe Road Users

In Broome County, the most frequently mapped safety concern was unsafe driving behavior. Many respondents felt unsafe while traveling in the county due to hazardous driving behaviors, including speeding, aggressive driving, drivers failing to yield to pedestrians, and driver inattention.

Frequently mapped locations included portions of Route 17, Court Street and the Upper Front Street roundabouts in the Town of Dickinson, Vestal Parkway, and the NY-201 bridge in the Village of Johnson City and the Town of Vestal. Insufficient facilities for pedestrians and/or cyclists were identified at the NY-201 bridge, as well as on Court Street and Front Street. Comments noted that the sidewalks are in disrepair and there is a lack of bike lanes. Their comments further explain that driver behavior increases the dangers of insufficient facilities for vulnerable road users, particularly when drivers speed or fail to yield to pedestrians or cyclists, as well as when there is a lack of maintenance during snowfall on the NY-201 bridge.

1.7.3 Tioga County – Common Issues & Frequently Noted Locations

Safe Roads

Interactive web map comments showed that the frequently noted locations are in the Village of Owego. The most frequently mapped comments in Tioga County related to visibility, roadway designs, and sidewalk conditions.

Multiple comments were collected for locations in the Village of Owego, including a handful for the North Avenue underpass, Front Street, and Main Street. These comments highlighted disruptions in traffic flow. At Front Street, incorrectly painted white lanes mislead drivers into parking in turning lanes, while at East Front Street and Main Street, drivers are stopped for extended periods of time due to the

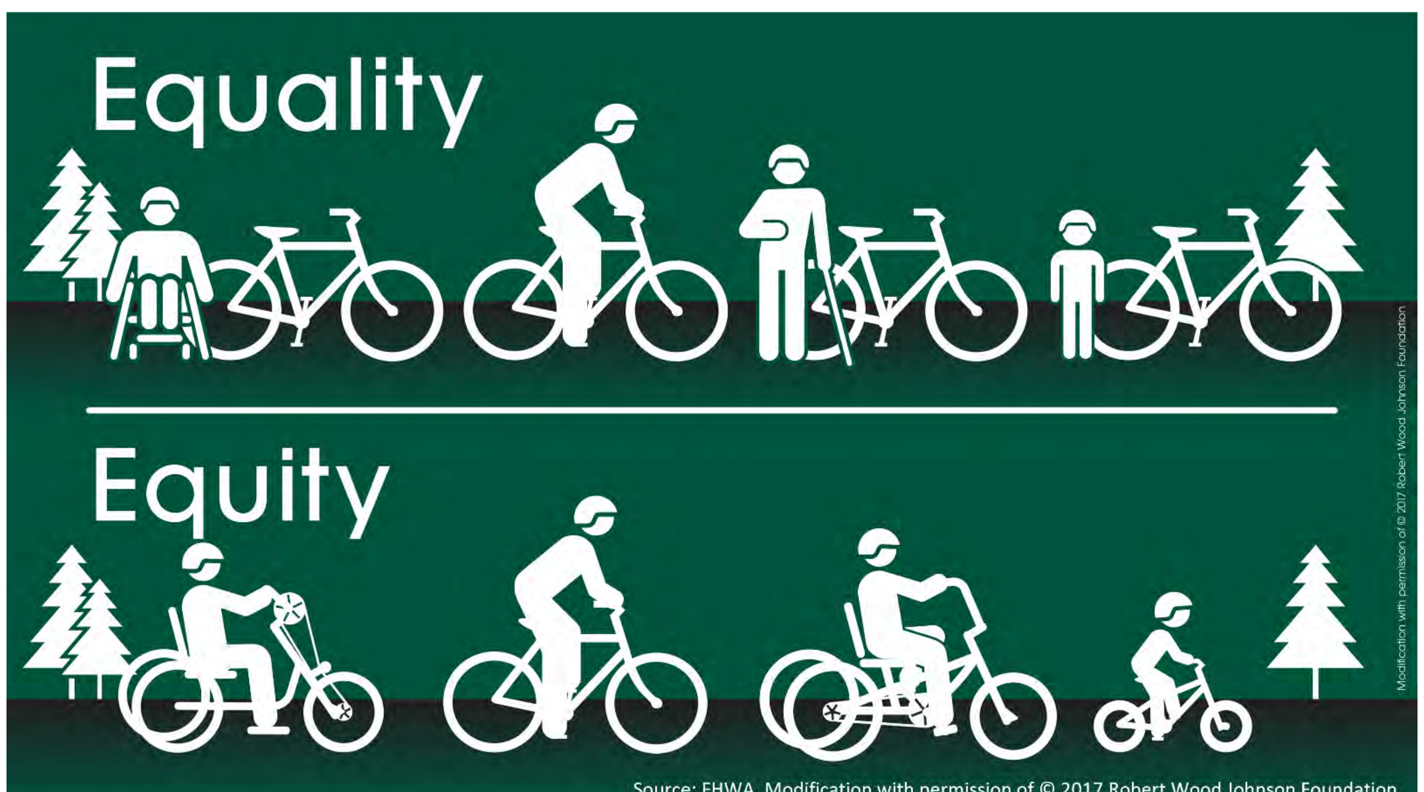
Conrail Railroad. Similarly, at the underpass below the railroad at North Avenue, comments indicate that the location frequently floods during heavy rainfall, with no signage notifying drivers of any detours. Comments also mentioned poor visibility due to obstructed views in the area, which increases hazardous conditions for drivers during rainfall.

2. Equity & Vulnerable Communities Analysis

This chapter provides information on the extent to which fatal and serious injury crashes across Broome-Tioga tended to occur within communities that are home to vulnerable populations. Following a description of this study's seven-factor methodology, as well as the federal tool for Underserved communities, a series of county-level maps depicting the identified areas is provided. After a discussion of the similarities and differences in coverage across the two methods, the section concludes with a detailed summary regarding the relative share or prevalence of injury crashes within vulnerable communities, as identified within this study's seven-factor assessment.

As summarized concisely in **Figure 12**, equity focuses on creating the conditions necessary so that all can achieve similar outcomes, regardless of their abilities, beliefs, identity, etc. Equity is an important topic to assess within transportation safety studies given the historic pattern of both limited public investment and high crash rates within areas that have traditionally housed communities of low-income and minority individuals.

Figure 12. "Equity" Recognizes Differences and Focuses on Achieving Equal Outcomes While "Equality" Views All Users as Identical and Ignores Results (Source: FHWA, Robert Wood Johnson Foundation)



As demonstrated at the end of this chapter (section 2.5), vulnerable communities in both Broome and Tioga Counties were home to a disproportionately high share of fatal and serious injury crashes. Recognizing the comparatively high levels of road injury risk that persistently lingers in the background for residents of these vulnerable communities (i.e., the Top 40% of Census block groups in each county), will be used as one of several guides in crafting a prioritized list of safety improvement investments within this Safety Action Plan.

2.1 Study-Specific Approach

Using data from the American Community Survey (2023 Five Year Estimates), a vulnerability priority index was created for each of Broome and Tioga Counties. This vulnerability index leveraged the methodology developed by the Greater Nashville Regional Council within its 2045 Long Range Transportation Plan. The following **vulnerable populations were identified at the block group level**:

- Youth (individuals aged 17 or under)
- Senior (individuals aged 65 or older)
- Carless Households (household that does not have access to a working vehicle)
- Disabled
- Limited English Proficiency
- Low Income Households (at or below the federal poverty guidelines)
- Minority Status (individuals identifying as not "White Alone")

For each of the seven variables, a **county-level average and standard deviation was computed**, with each block group then assigned a degree of vulnerability score based on the following classifications:

- Well Below Average (0) – more than one standard deviation below the mean
- Below Average (1) – one to one half standard deviation below the mean
- Average (2) – one half a standard deviation above or below the mean
- Above Average (3) – one half to one standard deviation above the mean
- Well Above Average (4) – more than one standard deviation above the mean

Across a total of seven variables, the maximum vulnerability score a block group could receive was 28 points. **Based on the overall composite score, each area was then classified** as falling within the Top 20%, Top 21-40%, or outside of the Top 40% of block groups within each county, as summarized below.

- High Priority Equity Area – Top 20% (within each county)
- Equity Area – Top 21-40% (within each county)
- Not an Equity Area – Not within the Top 40% (within each county)

A breakdown summarizing the disproportionate rate at which these communities experience fatal and serious injury, as well as all injury, crashes is provided the end of this chapter (see Section 2.5).

In terms of geographic coverage across Broome County, the seven-factor assessment identified most block groups within the City of Binghamton, many block groups in Johnson City and Endicott, several in Vestal, Union, and Kirkwood, and minor representation in the towns of Binghamton, Dickinson, Port Dickinson, Maine, Fenton, Chenango. For Tioga County, nearly all the block groups within the villages of Waverly and Owego were identified, along with other clusters created by town-village pairs (Candor, Newark Valley, Spencer, Nichols) and minor representation in Tioga, Berkshire-Richford, and Barton.

2.2 Federal Approach ("Underserved" Communities)

Based on data obtained from the USDOT's Underserved Communities Tool, which was published in conjunction with the FY 2025 Notice of Funding Opportunity for the SS4A program, a total of 24 Census Tracts were identified as Underserved. All but one of these tracts is in Broome County, with the majority situated in and around the City of Binghamton. Beyond the city limits, there is also representation in Endicott, Vestal, Johnson City, Dickinson, and Port Dickinson. The lone community identified in Tioga County is located in Waverly.

2.3 Vulnerable Communities Maps

A pair of maps showing the location of Census block groups identified in this study's seven-factor, county-specific assessment, as well as Census tracts designated by the USDOT tool as Underserved, are provided in **Figure 13 (Broome)** and **Figure 14 (Tioga)**.

Figure 13. Community Vulnerability Analysis – Broome County –Seven-Factor Assessment (Blue) & USDOT Criteria (Orange)

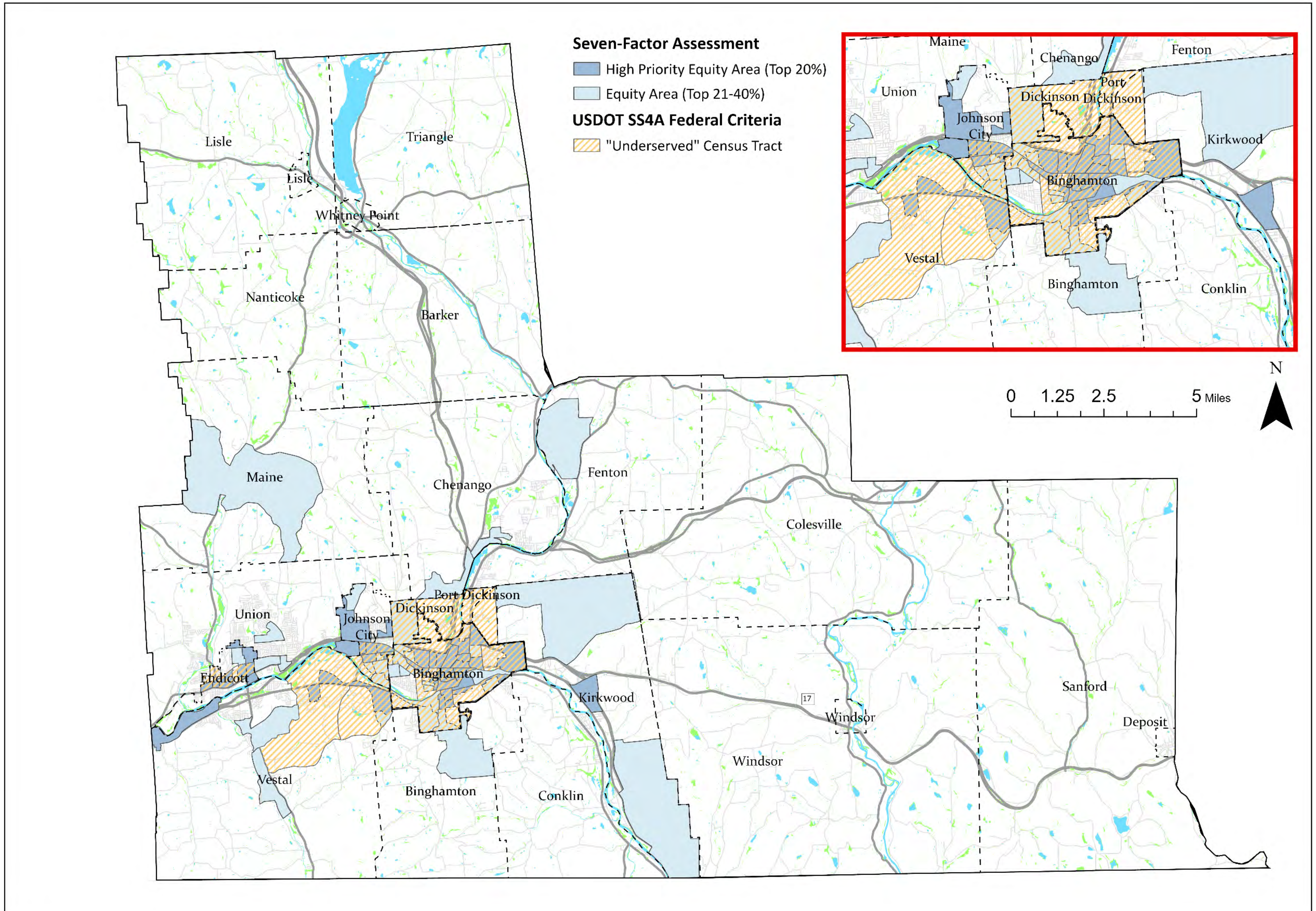
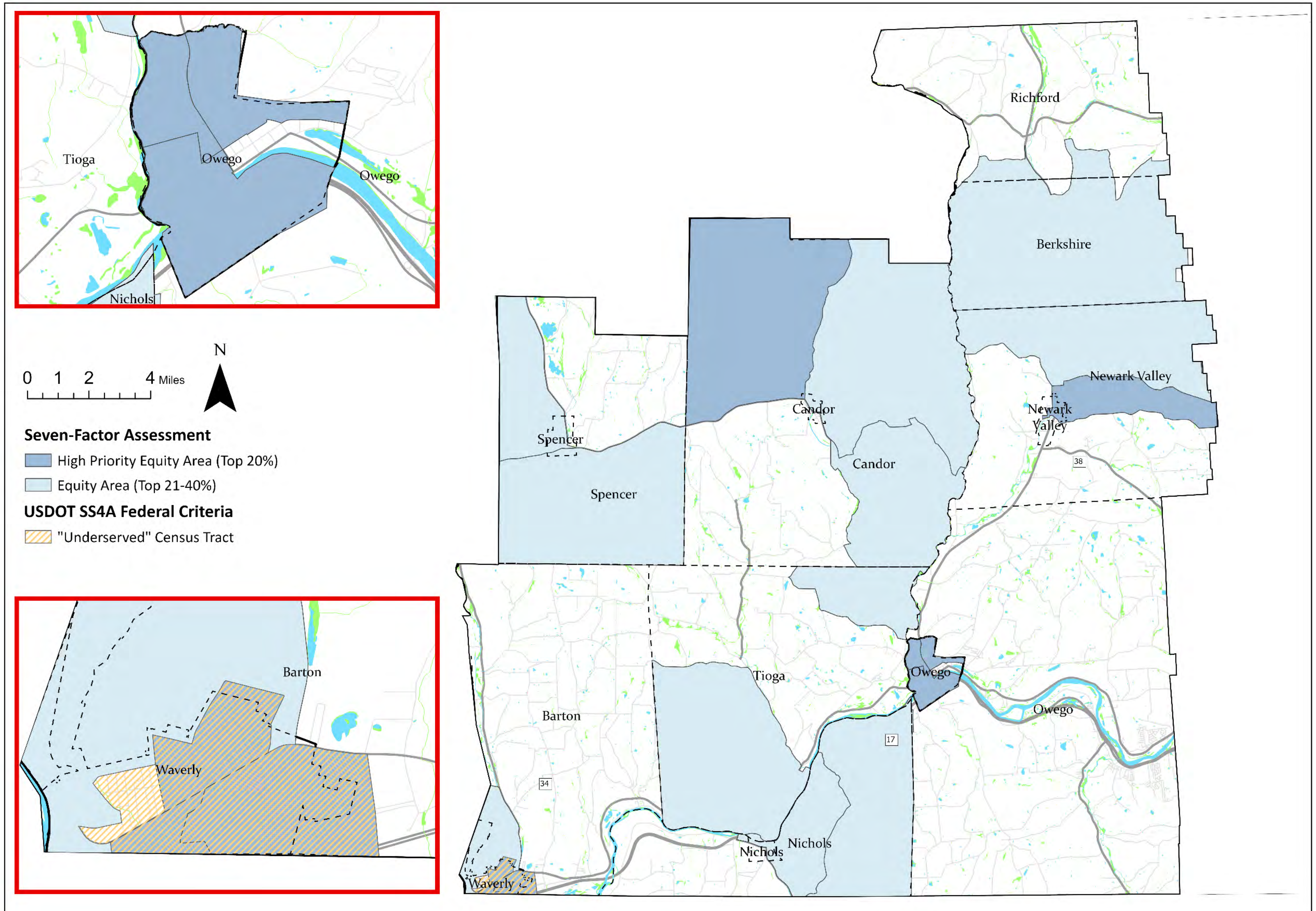


Figure 14. Community Vulnerability Analysis – Tioga County – Seven-Factor Assessment (Blue) & USDOT Criteria (Orange)



2.4 Comparison between the Two Frameworks

Both of these frameworks for assessing vulnerability were leveraged within the Project Prioritization process as means to steer road safety investments towards these communities. In addition, this study's seven-factor assessment was incorporated as one of several factors within this study's predictive High Risk Network. For more information, please refer to Section 6.1 (Prioritization Scheme) and Section 5.2.4 (Systemic Factors & Weights Included in the HRN) , respectively.

In general, this study's seven-factor, **county-based, block group-level assessment provided substantially more nuance in identifying vulnerable communities** than the USDOT's nationwide, census tract-level Underserved Communities Tool (i.e., identified 99 Census block groups compared to 24 Census tracts). The seven-factor internal analysis **identified many more potentially vulnerable areas in both counties, particularly for Tioga County**.

When looking only at areas designated as Underserved in the USDOT tool, there is substantial overlap with those identified in this study's seven-factor assessment as either High Priority Equity Areas (Top 20%) and Equity Areas (Top 21-40%). The only areas identified by the USDOT tool that are not at least partially captured in this study's seven-factor assessment are in Dickinson and Port Dickinson.

In terms of similar coverage or coincidence, within Tioga County, there is direct overlap between the three block groups identified in this study and the Underserved tract in Waverly. In Broome County, similar levels of overlap can be found for Endicott and Johnson City. There is general alignment between the two models in Vestal. In the City of Binghamton, there is strong correspondence, though there are some discrepancies (i.e., areas identified in one model but not the other).

Within Broome County, additional areas identified by this study's assessment include portions of Maine, Fenton, Chenango, and Kirkwood. In Tioga County, communities in Candor, Newark Valley, and Owego each had areas designated as High Priority Equity Areas that were not highlighted by the USDOT tool. In addition, other Equity Areas (Top 21-40%) in Tioga County were identified in Nichols, Tioga, Spencer, and Berkshire-Richford, despite an absence of coverage in the USDOT tool.

2.5 Seven-Factor Assessment Results

2.5.1 Broome County

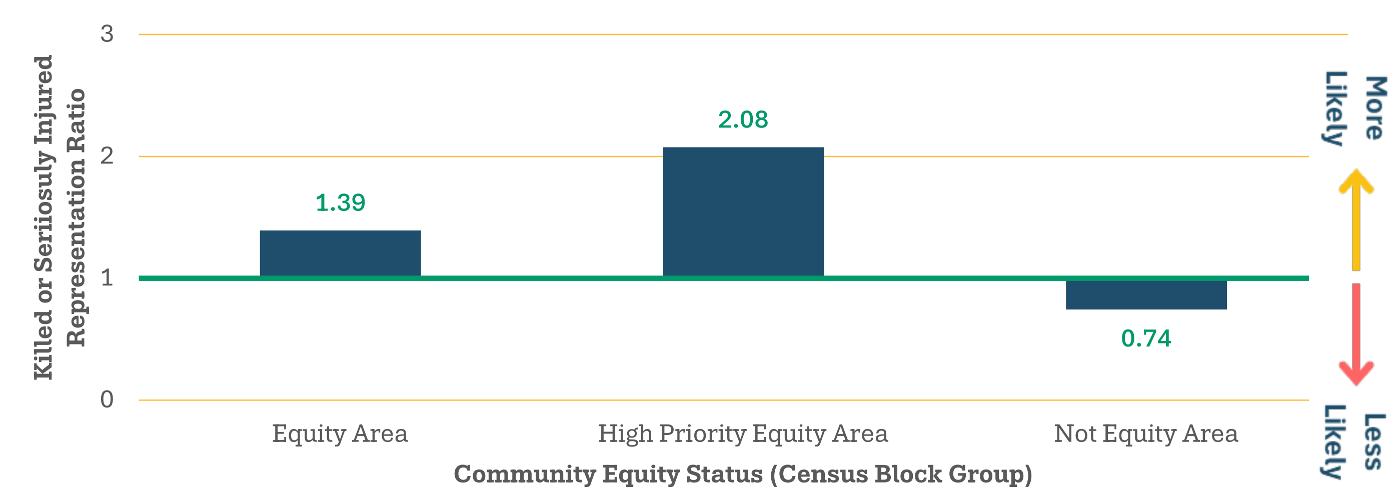
The Top 40% of block groups in Broome County were home to a disproportionate share of injury crashes. Based on the share of the county's road network, the **Top 40% were the site of 64% more fatal and serious injury (KSI) crashes and 94% more all injury collisions than expected**. As shown in **Table 7**, the Top 40% contained 28% of the county's mileage but were home to 47% of KSI and 55% of all injury crashes in Broome County. Adjusted for mileage, the **Top 20% experienced 108% more KSI (Figure 15) and 170% more all injury crashes than expected**. High Priority Equity Areas (Top 20% of block groups) saw 22% of KSI crashes and 28% of all injury collisions despite housing only 10% of the road network. Communities identified as Equity Areas (Top 21-40%) contained a larger share of the county's mileage and covered similar shares for both sets of injury crashes, with 39% more KSI and 49% more all injury collisions than expected.

Figure 15 shows the systemic representation ratio for each of the three vulnerability classes in Broome County based on fatal and serious injury collisions. These figures can be interpreted as a multiplying factor beyond the typical level of risk (1.0). For example, High Priority Equity Areas show a value of 2.08, reflecting that they saw 108%, or slightly more than double, the expected number of KSI crashes based on the share of county road mileage within the block groups.

Table 7. Vulnerability Analysis Summary – Broome County (Source: NYSDOT CLEAR, USDOT, Census)

	COUNT				RATE / PROPORTION			
Municipality	Block Groups	Mileage	KA Crash	KABC Crash (All Inj.)	Block Groups	Mileage	KA Crash	KABC Crash (All Inj.)
High Priority Equity Area (Top 20%)	44	212.2	72	510	22%	10%	22%	28%
Equity Area (Top 21-40%)	36	364.2	83	482	18%	18%	25%	27%
All Equity Areas (BOTH)	**80**	**576.4**	**155**	**992**	**41%**	**28%**	**47%**	**55%**
Not an Equity Area (Bottom 60%)	*117*	*1,447.4*	*176*	*808*	*59%*	*72%*	*53%*	*45%*
TOTAL	**197**	**2,023.8**	**331**	**1,800**	**100%**	**100%**	**100%**	**100%**

Figure 15. KSI Crash Representative Ratios (Broome County) – Community Equity Status (Source: WSP, Census)



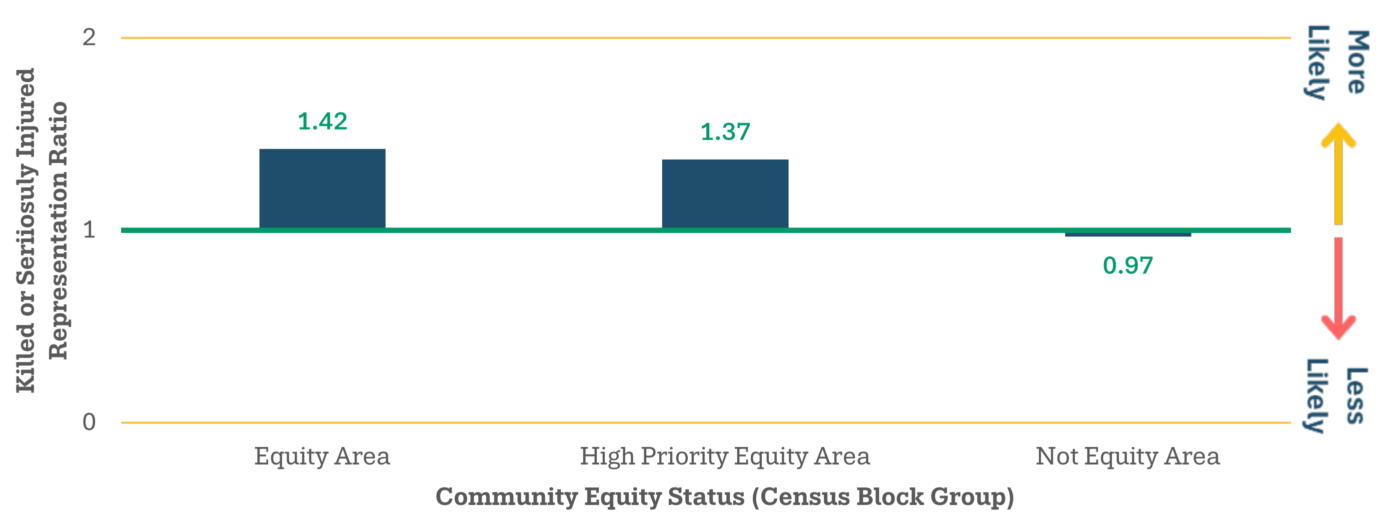
2.5.2 Tioga County

The **Top 40% of block groups in Tioga County experienced 41% more KSI and 41% more all injury collisions**. As seen in **Table 8**, these communities witnessed 10% of fatal and serious injury crashes despite housing only 7% of the county's road mileage. When compared to expected rates, the **Top 20% of block groups in Tioga County experienced 37% more KSI and 124% more all injury crashes**. High Priority Equity Areas contained 2% of the county's road network and were home to 2% of fatal and serious injury and 3% of all injury collisions. Adjusted for network coverage, communities identified as Equity Areas (Top 21-40%) witnessed 42% more fatal and serious injury crashes (**Figure 16**) and 19% more all injury collisions. These communities saw 8% of KSI and 7% of all injury collisions but contained 6% of Tioga's road mileage.

Table 8. Vulnerability Analysis Summary – Tioga County (Source: NYSDOT CLEAR, USDOT, Census)

	COUNT				RATE / PROPORTION			
Municipality	Block Groups	Mileage	KA Crash	KABC Crash (All Inj.)	Block Groups	Mileage	KA Crash	KABC Crash (All Inj.)
High Priority Equity Area (Top 20%)	8	19.2	3	21	18%	2%	2%	3%
Equity Area (Top 21-40%)	11	73.9	12	43	24%	6%	8%	7%
All Equity Areas (BOTH)	**19**	**93.1**	**15**	**64**	**42%**	**7%**	**10%**	**10%**
Not an Equity Area (Bottom 60%)	*36*	*1,168.1*	*129*	*552*	*58%*	*93%*	*90%*	*90%*
TOTAL	**45**	**1,261.2**	**144**	**616**	**100%**	**100%**	**100%**	**100%**

Figure 16. KSI Crash Representative Ratios (Tioga County) – Community Equity Status (Source: WSP, Census)



3. Crash Analysis

3.1 Introduction

3.1.1 The Vision Zero Approach

The purpose of this Safety Action Plan is to eliminate fatal and serious injury crashes in Broome and Tioga Counties. In contrast to historical highway safety-oriented approaches used by state DOTs, which tended to target safety investments towards locations that would reduce the highest volume of crashes, the paradigm shift within Vision Zero centers on narrowing the analytical lens to focus primarily on collisions that result in the most severe outcomes – when a community member is Killed (K) or suffers a Serious Injury (SI) that requires immediate medical transport.

Due to the substantive differences in terms of crash types and users involved between the two counties, this plan's analysis separates the data into two county-level frames, with the intention being a more accurate diagnosis of the relevant crash characteristics, underlying factors, and location types at play in each county.

3.1.2 Data Source

To understand the underlying data concerning crashes in Broome/Tioga, the New York State Department of Transportation (NYSDOT)'s Crash Location & Engineering Analysis Repository (CLEAR) Crash Data Viewer was accessed to obtain available crash data records. The dataset included the most recent five-year span of fully available data, spanning from January 1, 2019, to December 31, 2023.

The crash analysis for this Safety Action Plan did not include crashes occurring on interstates (e.g., Interstate 86) and limited access roadways (e.g., portions of NY State Route 363) in Broome and Tioga Counties. These cases were set aside and not subjected to further analysis within this Safety Action Plan for two primary reasons. First, such facilities are typically under the jurisdiction of the NYSDOT. While NYSDOT has been consulted in the development of this plan, the intent of the SS4A program is to equip non-state entities (i.e., municipalities, counties, MPOs) with an understanding of safety issues and recommendations most relevant to their local roadways. Second, the nature of the safety issues along such state-owned facilities (e.g., higher speed corridors with design elements that separate opposing directions of travel and feature substantial controls at intersections) are often substantially different from those found along local roadways. Thus, this analysis discounts crashes along interstates and other high-speed, limited-access facilities in order to arrive at a Safety Action Plan focused on roadway safety issues and improvement strategies that are most relevant for roadways under local jurisdiction. Tools within the CLEAR platform, as well as a manual Geographic Information System (GIS)-based screening, were employed to eliminate records from these types of roads.

In line with Vision Zero and in pursuit of a more cost-effective use of limited safety improvement funding, this crash analysis eliminated Property Damage Only (O) crashes to enable a more detailed examination of crashes resulting in at least one injury.

Given limitations in the underlying input data, demographic characteristics of those involved in the collisions were not available. Similarly, although motorcyclists are inherently more vulnerable than the typical motor vehicle user, crashes involving motorcycles could not be isolated and analyzed independently (in contrast to those involving other vulnerable users like those walking or biking).

3.1.3 Crash Severity Definitions (KABCO)

Consistent with federal standards for crash reporting, the NYSDOT CLEAR dataset reflects Injury Severity for each crash (i.e., the nature and extent of the collision's immediate impact on a person's physical, mental, and perceptual faculties while at the scene of the crash), using a standardized five-category scale. The KABCO scale definitions and description of injury severity are shown in **Table 9**.

Table 9. Crash Severity Level Table of Definitions

Injury Severity Level	Alternate Name	Severity Code	Definition/Examples
Fatal	Killed	K	Crash resulting in a death.
Serious Injury	Incapacitating Injury	A or SI	Injuries require emergency hospitalization and can include severe lacerations, broken or distorted limbs, skull fractures, crushed chest, internal injuries, unconscious when taken from the crash scene.
Minor Injury	Non-Incapacitating Injury	B	Visible, but non-severe injuries including lumps on head, abrasions, and minor lacerations.
Possible Injury	Complaint of Injury	C	Momentary unconsciousness, limping, and complaint of pain with no visible injury.
Property Damage Only	No Injury	O	No injury reported to any involved party – damage only to vehicle or other property.

Source: Federal Highway Administration, "KABCO Injury Classification Scale and Definitions" (https://highways.dot.gov/media/20141)

3.2 Crash Trends

3.2.1 5-Year Totals – All Injury Crashes

Over the most recent five-year period where crash data was available (2019 – 2023), there was a total of 3,910 injury-resulting crashes, with approximately one-in-five (19%) resulting in at least one severe or fatal injury (**Figure 17**). **Table 10** breaks down the geographic distribution and severity of crashes resulting in an injury over the five-year analysis period. **Figure 18** and **Figure 19** depict the county-level share of each severity level.

Figure 17. Broome/Tioga - Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

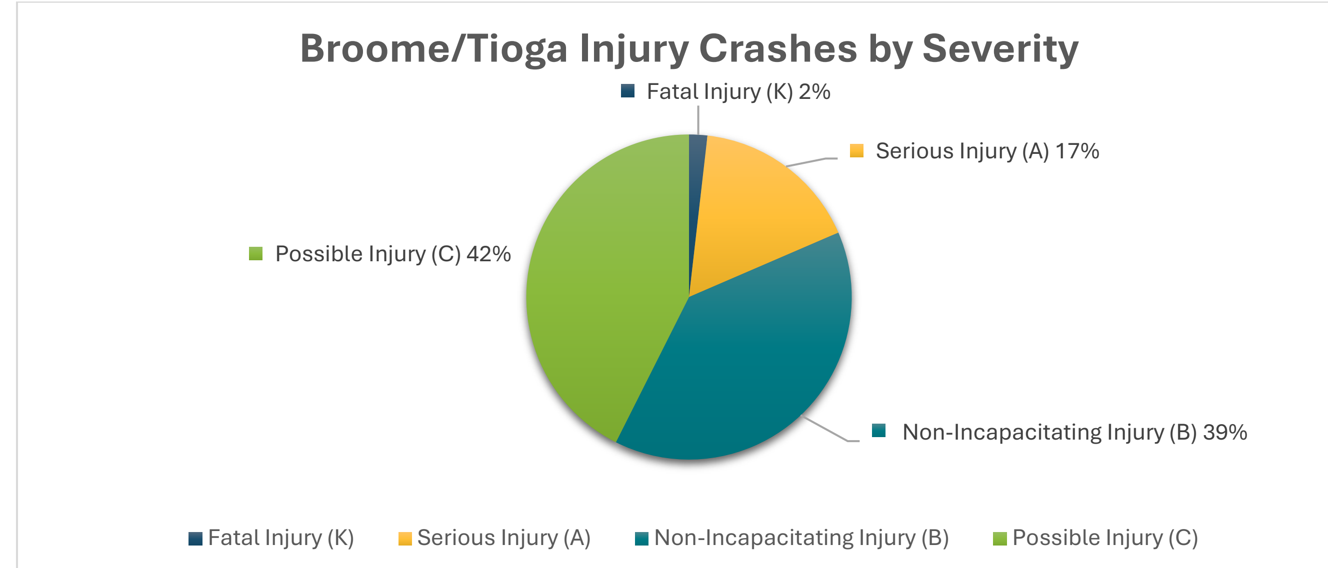


Table 10. Crashes by Injury Severity by Geographic Area (2019-2023) (Source: NYSDOT CLEAR)

Crash Severity	Tioga County	Broome County	Broome/Tioga
Fatal Injury (K)	25	46	71
Serious Injury (A / SI)	140	513	653
KSI CRASHES	**165**	**559**	**724**
Non-Incapacitating Injury (B)	274	1,247	1,521
Possible Injury (C)	278	1,387	1,665
TOTAL	**717**	**3,193**	**3,910**

Figure 18. Broome County - Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

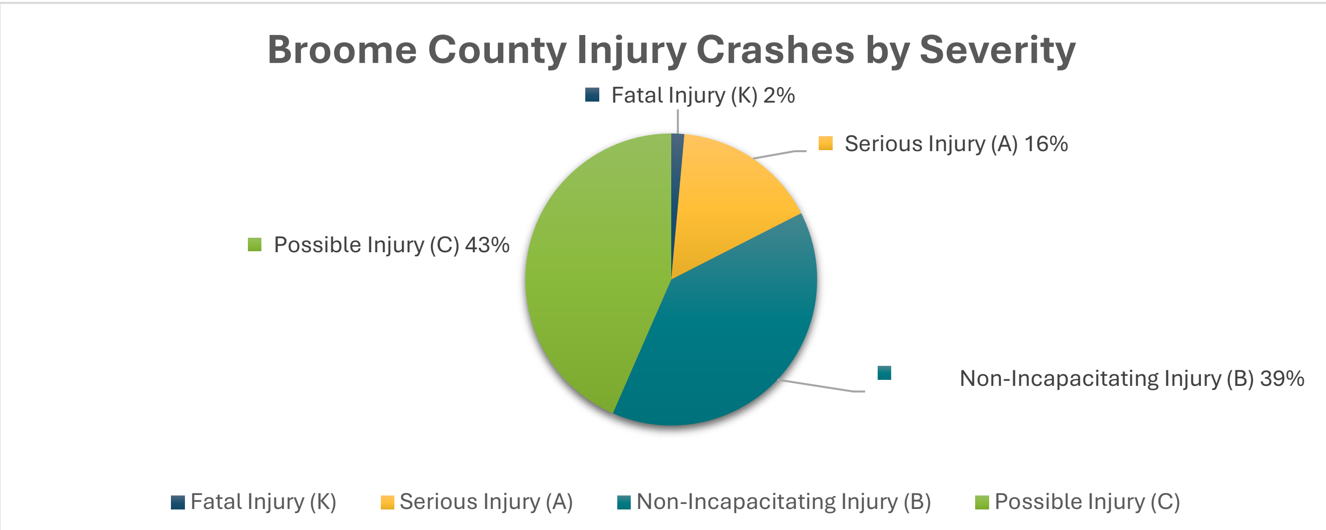


Figure 19. Tioga County - Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

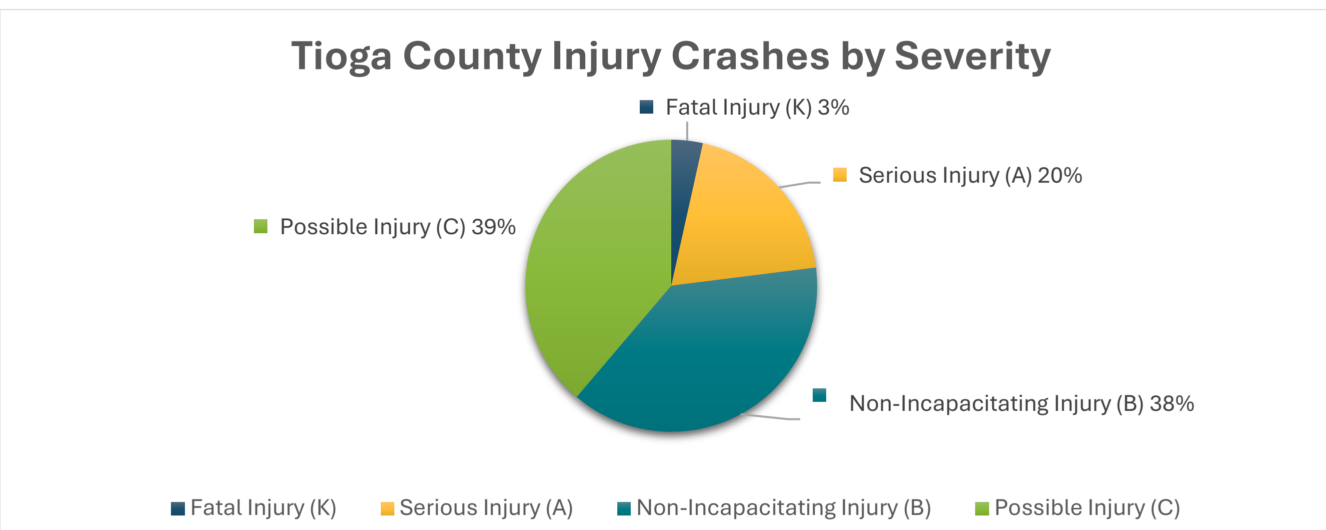
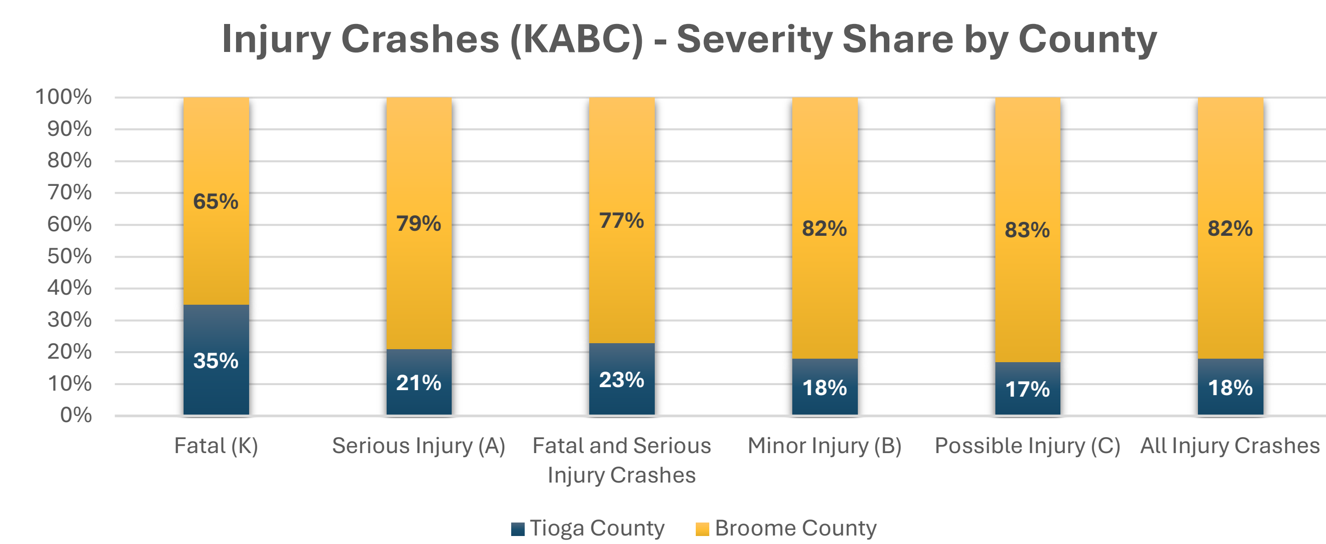


Figure 20 provides a county-to-county comparison for each severity level based on the two-county region's total crashes over the five-year period. Isolating only crashes that resulted in death or serious injury (724 cases), the majority of the worst crashes occurred within Broome County (77% of two-county region's KSI collisions). At the same time, Tioga County comprises a larger share of regional KSI crashes (23%) than it does for less severe crashes (18%). This suggests that an injury-resulting crash in Tioga County is comparatively more likely to be more severe (i.e., involve death or immediate medical transport) than a given injury crash in Broome.

Figure 20. Injury (KABC) Crashes - Share by County (2019-2023) (Source: NYSDOT CLEAR)



3.2.2 Year-to-Year Trends – Killed or Seriously Injured Crashes

Across the five-year span of the crash data analyzed, year-to-year counts show that the volume of KSI crashes within the region remained relatively steady (**Figure 21**), with a marginal, albeit noticeable dip in 2020 – the first year of the COVID-19 pandemic. Traffic patterns were distinctly different that year, which likely contributed to this marked, temporary decline in fatal and serious injury crashes.

Comparing the relative influence of fatal versus serious injury crashes, the overall KSI trend is largely influenced by the year-to-year variability for serious injury crashes. Fatal crashes, which accounted for approximately 10% of the region's KSI crashes, peaked in 2021, particularly within Broome County, followed by a steady decline over the subsequent two years assessed (**Figure 22**). In contrast, serious injury crashes showed an overall increase in the five-year period (**Figure 23**).

Figure 21. Year over Year Fatal and Serious Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)

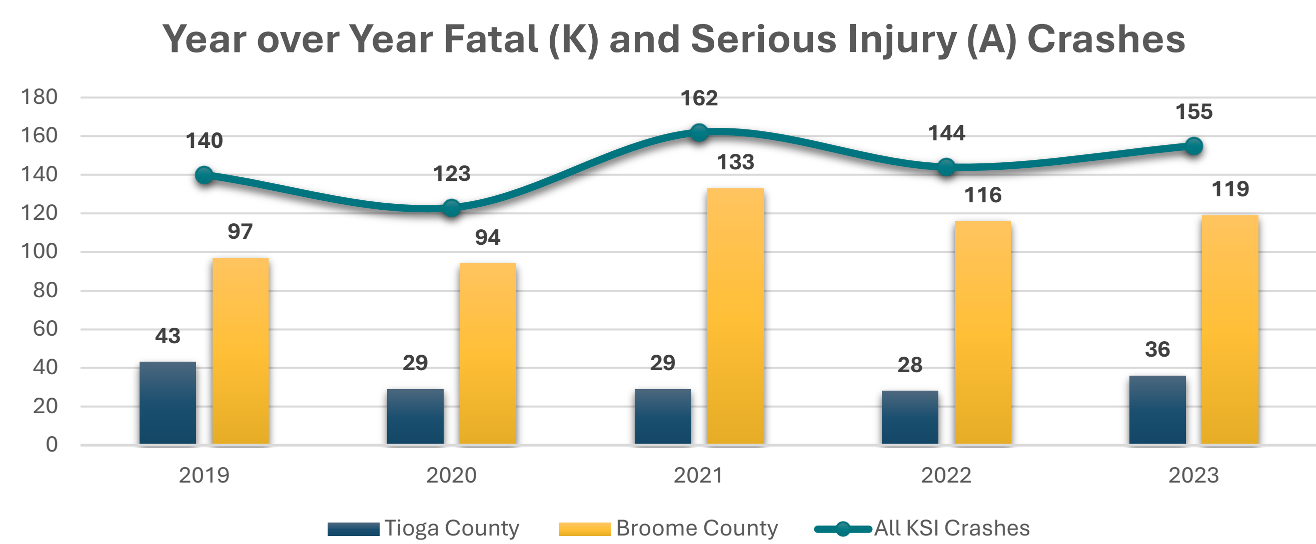


Figure 22. Year over Year Fatal Crashes (2019-2023) (Source: NYSDOT CLEAR)

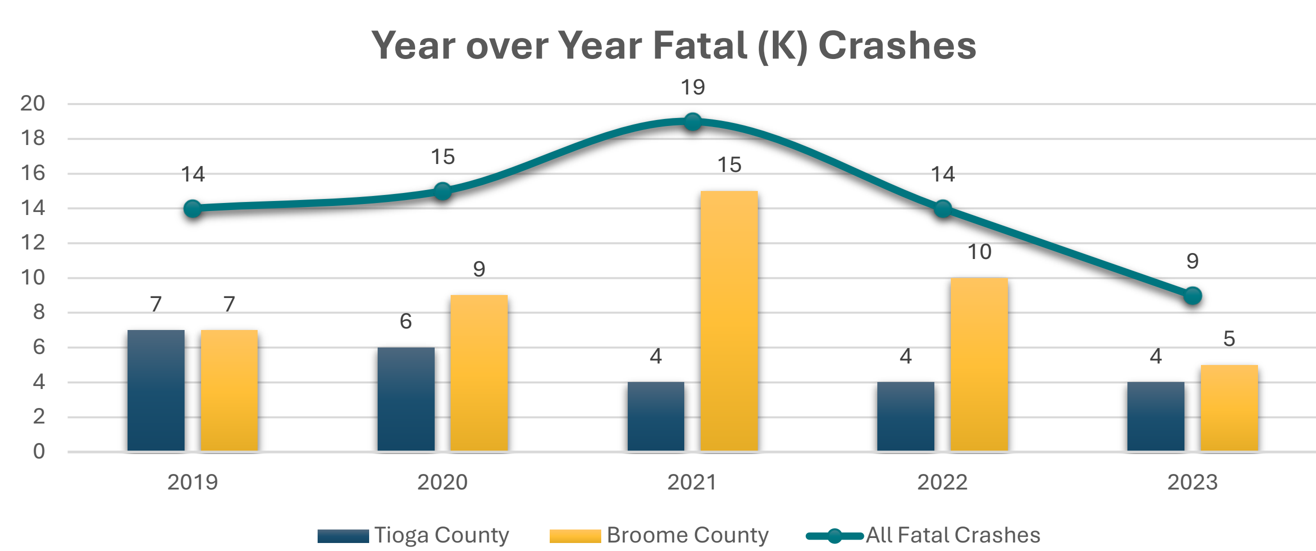
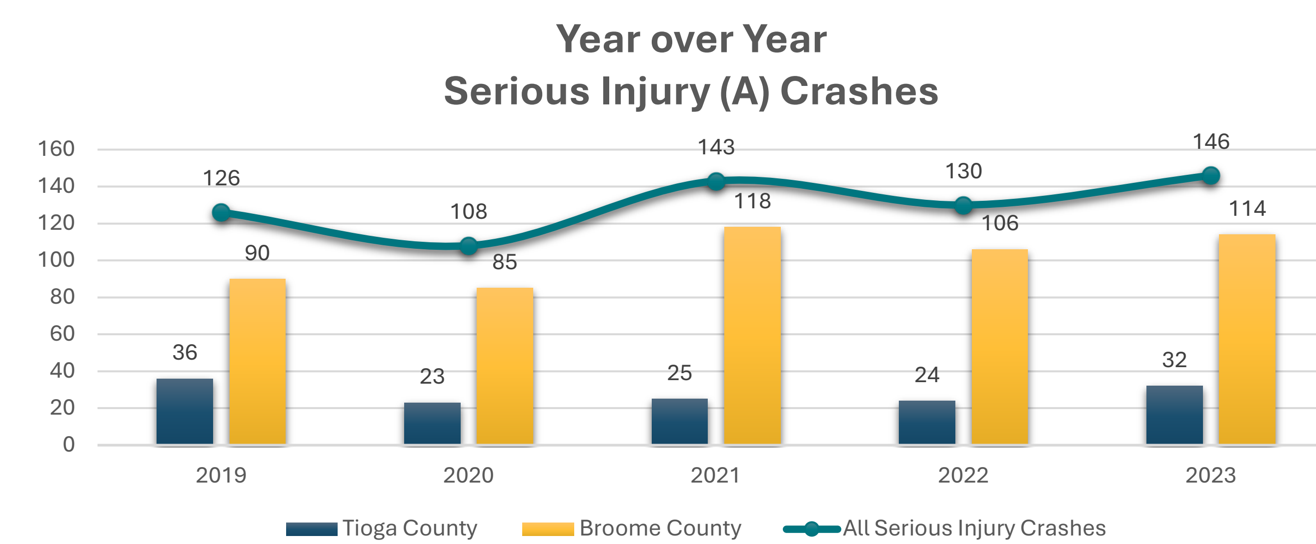


Figure 23. Year over Year Serious Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)



3.2.3 Distribution of Severity among Municipalities

To understand which municipalities experienced the highest shares of fatal and serious injury crashes, the tables below present the relative percentage for each municipality based on the total number of crashes county-wide. As shown in **Table 11**, the top three municipalities with the most fatal and serious injury crashes in Broome County – City of Binghamton (29%), Town of Vestal (11%) and Village of Endicott (10%) – combined to account for half of all KSI crashes. Similarly, as shown in **Table 12**, Tioga County's top three municipalities – The Towns of Owego (21%), Candor (15%), and Barton (12%) – covered 48% of all KSI crashes in the county.

Table 11. Relative Share of Crashes by Severity Type – Broome County (2019-2023) (Source: NYSDOT CLEAR)

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Share of County K	Share of County A	Share of County KA	Share of County KABC
City of Binghamton	6	158	164	872	13%	31%	29%	27%
Town of Vestal	6	54	60	592	13%	11%	11%	19%
Village of Endicott	1	55	56	377	2%	11%	10%	12%
Town of Union	5	43	48	261	11%	8%	9%	8%
Village of Johnson City	0	31	31	201	0%	6%	6%	6%
Town of Chenango	2	21	23	173	4%	4%	4%	5%
Town of Maine	5	18	23	91	11%	4%	4%	3%
Town of Kirkwood	2	19	21	80	4%	4%	4%	3%
Town of Colesville	5	13	18	90	11%	3%	3%	3%

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Share of County K	Share of County A	Share of County KA	Share of County KABC
Town of Windsor	3	15	18	66	7%	3%	3%	2%
Town of Conklin	2	15	17	58	4%	3%	3%	2%
Town of Fenton	2	11	13	51	4%	2%	2%	2%
Town of Dickinson	0	12	12	77	0%	2%	2%	2%
Town of Lisle	0	11	11	34	0%	2%	2%	1%
Town of Binghamton	1	9	10	34	2%	2%	2%	1%
Town of Barker	1	8	9	30	2%	2%	2%	<1%
Town of Sanford	1	7	8	18	2%	1%	1%	<1%
Town of Triangle	1	4	5	17	2%	<1%	<1%	<1%
Village of Port Dickinson	1	2	3	11	2%	<1%	<1%	<1%
Village of Whitney Point	0	3	3	22	0%	<1%	<1%	<1%
Village of Deposit	2	0	2	5	4%	0%	<1%	<1%
Town of Nanticoke	0	2	2	18	0%	<1%	<1%	<1%
Village of Lisle	0	1	1	5	0%	<1%	<1%	<1%
Village of Windsor	0	1	1	10	0%	<1%	<1%	<1%
TOTAL	46	513	559	3,193	100%	100%	100%	100%

Table 12. Relative Share of Crashes by Severity Type – Tioga County (2019-2023) (Source: NYSDOT CLEAR)

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Share of County K	Share of County A	Share of County KA	Share of County KABC
Town of Owego	4	31	35	201	16%	22%	21%	28%
Town of Candor	6	19	25	78	24%	14%	15%	11%
Town of Barton	3	16	19	54	12%	11%	12%	8%
Town of Tioga	1	17	18	65	4%	12%	11%	9%
Town of Nichols	0	17	17	47	0%	12%	10%	7%
Town of Newark Valley	3	9	12	37	12%	6%	7%	5%
Town of Richford	3	7	10	45	12%	5%	6%	6%
Town of Spencer	4	4	8	31	16%	3%	5%	4%
Village of Waverly	0	8	8	55	0%	6%	5%	8%
Village of Owego	0	7	7	61	0%	5%	4%	9%
Village of Spencer	0	3	3	10	0%	2%	2%	1%
Town of Berkshire	1	1	2	18	4%	<1%	1%	3%
Village of Newark Valley	0	1	1	6	0%	<1%	<1%	<1%
Village of Candor	0	0	0	2	0%	0%	0%	<1%
Village of Nichols	0	0	0	7	0%	0%	0%	1%
TOTAL	25	140	165	717	100%	100%	100%	100%

3.2.4 Distribution of Severity within a Municipality

To understand which municipalities experienced comparatively higher shares of the most severe crashes within their borders, **Table 13** (Broome County) and **Table 14** (Tioga County) detail the share of KSI crashes compared to all injury crashes within each municipality.

Compared to a county-wide share of 1% of injury crashes categorized as fatal and 16% as serious injury, several municipalities within Broome County exhibited much higher rates. KSI crashes within Sanford (44%), Deposit (40%), Lisle (32%), and Barker (30%) accounted for nearly double the Broome County rate of 18%. Similarly, within Tioga County, several municipalities also exhibited a relative share of KSI crash rate above 30%, including Nichols (36%), Barton (35%), Newark Valley (32%), Candor (32%), and Spencer (30%), compared to a county-wide rate of 23%.

It should be noted that although the outcomes in many smaller municipalities are more severe, there is also a substantially lower chance of experiencing a collision.

Table 13. Relative Share of Crashes by Severity Type by Municipality – Broome County (2019-2023) (Source: NYSDOT CLEAR)

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Pct. Fatal (Of All Inj. Crashes)	Pct. Ser. Inj. (Of All Inj. Crashes)	Pct. Fatal or Ser. Inj. (of All Inj. Crashes)
Town of Sanford	1	7	8	18	6%	39%	44%
Village of Deposit	2	0	2	5	40%	0%	40%
Town of Lisle	0	11	11	34	0%	32%	32%
Town of Barker	1	8	9	30	3%	27%	30%
Town of Binghamton	1	9	10	34	3%	27%	29%
Town of Triangle	1	4	5	17	6%	24%	29%
Town of Conklin	2	15	17	58	3%	26%	29%
Village of Port Dickinson	1	2	3	11	9%	18%	27%
Town of Windsor	3	15	18	66	5%	23%	27%
Town of Kirkwood	2	19	21	80	3%	24%	26%
Town of Fenton	2	11	13	51	4%	22%	26%
Town of Maine	5	18	23	91	6%	20%	25%

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Pct. Fatal (Of All Inj. Crashes)	Pct. Ser. Inj. (Of All Inj. Crashes)	Pct. Fatal or Ser. Inj. (of All Inj. Crashes)
Town of Colesville	5	13	18	90	6%	14%	20%
Village of Lisle	0	1	1	5	0%	20%	20%
City of Binghamton	6	158	164	872	<1%	18%	19%
Town of Union	5	43	48	261	2%	17%	18%
Town of Dickinson	0	12	12	77	0%	16%	16%
Village of Johnson City	0	31	31	201	0%	15%	15%
Village of Endicott	1	55	56	377	<1%	15%	15%
Village of Whitney Point	0	3	3	22	0%	14%	14%
Town of Chenango	2	21	23	173	1%	12%	13%
Town of Nanticoke	0	2	2	18	0%	11%	11%
Town of Vestal	6	54	60	592	1%	9%	10%
Village of Windsor	0	1	1	10	0%	10%	10%
TOTAL	46	513	559	3,193	1%	16%	18%

Table 14. Relative Share of Crashes by Severity Type by Municipality – Tioga County (2019-2023) (Source: NYSDOT CLEAR)

Municipality	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Pct. Fatal (Of All Inj. Crashes)	Pct. Ser. Inj. (Of All Inj. Crashes)	Pct. Fatal or Ser. Inj. (of All Inj. Crashes)
Town of Nichols	0	17	17	47	0%	36%	36%
Town of Barton	3	16	19	54	6%	30%	35%
Town of Newark Valley	3	9	12	37	8%	24%	32%
Town of Candor	6	19	25	78	8%	24%	32%
Village of Spencer	0	3	3	10	0%	30%	30%
Town of Tioga	1	17	18	65	2%	26%	28%
Town of Spencer	4	4	8	31	13%	13%	26%
Town of Richford	3	7	10	45	7%	16%	22%
Town of Owego	4	31	35	201	2%	15%	17%
Village of Newark Valley	0	1	1	6	0%	17%	17%
Village of Waverly	0	8	8	55	0%	15%	16%
Village of Owego	0	7	7	61	0%	12%	12%
Town of Berkshire	1	1	2	18	6%	6%	11%
Village of Candor	0	0	0	2	0%	0%	0%
Village of Nichols	0	0	0	7	0%	0%	0%
TOTAL	25	140	165	717	4%	20%	23%

3.2.4.1 County Peer Comparison of Fatal Crash Rates

To better understand how the counties compare to other adjacent jurisdictions with similar residential populations in central New York, **Table 15** shows annual population-adjusted rates for fatal, non-intestate crashes across three levels – all fatal crashes, pedestrian-involved fatal crashes, and bicyclist-involved fatal crashes – per 100,000 residents based on data obtained from the National Highway and Traffic Safety Administration's (NHTSA) Fatality and Injury Reporting System Tool (FIRST)

Table 15. Peer Comparison - Fatal Crash Rates per 100,000 County Residents – 2019-2023 (Source: NHTSA FIRST)

		FATAL CRASHES ALL		FATAL CRASHES PEDESTRIAN-INVOLVED		FATAL CRASHES BICYCLIST-INVOLVED	
County	Population	5-Year Annual Average	Annual Avg. Per 100K Residents	5-Year Annual Average	Annual Avg. Per 100K Residents	5-Year Annual Average	Annual Avg. Per 100K Residents
Broome	**198,591**	**9.4**	**4.7**	**2.2**	**1.1**	**0.8**	**0.4**
Tompkins	102,237	7.0	6.8	1.8	1.8	0.8	0.8
Chemung	84,115	5.2	6.2	1.4	1.7	0.4	0.5
Otsego	58,524	3.4	5.8	0.4	0.7	0.4	0.7
Tioga	**48,567**	**6.2**	**12.8**	**0.6**	**1.2**	**0.0**	**0.0**
Chenango	47,220	6.8	14.4	0.6	1.3	0.8	1.7
Cortland	46,809	3.0	6.4	0.2	0.4	0.4	0.9
Delaware	44,308	5.8	13.1	0.6	1.4	0.0	0.0
Schuyler	17,898	2.0	11.2	0.2	1.1	0.0	0.0
ALL ABOVE	648,269	48.8	7.5	8.0	1.2	3.6	0.6

Compared to the other eight counties, Broome had a relatively low overall fatal crash rate, a typical pedestrian-involved fatal crash rate, and a slightly lower than average bicyclist-involved fatal crash rate. Aside from Cortland, counties with under 50,000 residents, including Tioga County, had comparably higher overall fatal crash rates than the composite average, as well as those of the more populous counties assessed.

3.2.5 Jurisdictional Analysis

This section discusses the location of crashes by severity across both counties based on roadway ownership (e.g., NYSDOT, counties, cities / towns / villages, etc.).[1] **Table 16** and **Table 17** break down KABC crashes by jurisdiction for Broome and Tioga Counties respectively and includes the total share of roadway miles by jurisdiction.

Table 16. Relative Share of Crashes by Severity Type and Jurisdiction – Broome County (2019-2023) (Source: NYSDOT CLEAR)

Jurisdiction (% of Mileage)	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Owner Share of County K	Owner Share of County A	Owner Share of County KA	Owner Share of County KABC
State (14%)	20	162	182	1,123	43%	32%	33%	35%
County (17%)	9	84	93	408	20%	16%	17%	13%
Municipal (68%)	13	228	241	1,331	28%	44%	43%	42%
Unknown	4	39	43	331	9%	8%	8%	10%
TOTAL	46	513	559	3,193	100%	100%	100%	100%

Note: 1% of roadway miles classified as "Other."

Table 17. Relative Share of Crashes by Severity Type and Jurisdiction – Tioga County (2019-2023) (Source: NYSDOT CLEAR)

Jurisdiction (% of Mileage)	K Crash (Fatal)	A Crash (Ser. Inj.)	KA Crash	KABC Crash (All Inj.)	Owner Share of County K	Owner Share of County A	Owner Share of County KA	Owner Share of County KABC
State (13%)	16	52	68	326	64%	37%	41%	45%
County (13%)	4	26	30	122	16%	19%	18%	17%
Municipal (74%)	3	42	45	187	12%	30%	27%	26%
Unknown	2	20	22	82	8%	14%	13%	11%
TOTAL	25	140	165	717	100%	100%	100%	100%

Note: Less than 1% of roadway miles classified as "Other."

Regardless of the county assessed, most fatal crashes occur on state-owned roadways (43% in Broome, 64% in Tioga). State-owned roads accounted for 14% of non-interstate roadway mileage in Broome County and 13% in Tioga County. KSI crashes were relatively more common along state-owned roadways in Tioga County (41%) than Broome County (33%). The relative annual rates of a KSI crash per roadway mile were similar at one KSI crash per 7 state-owned miles in Broome County and 10 miles in Tioga County.

Crashes resulting in a fatality or serious injury occurred more often along municipally-owned roadways in Broome County (43%) than in Tioga County (27%). Municipal-owned roadways account for the majority of non-interstate roadways in both counties, including 68% in Broome County and 74% in Tioga County. In a given year, this equated to approximately one KSI crash for every 27 municipally-owned roadway miles in Broome County and one for every 90 municipally-owned miles in Tioga County.

For the county-owned roads, KSI crashes occurred at similar proportions in both counties (17% in Broome, 18% in Tioga), with a slightly higher representation of all injury crashes (KABC) on these roadways in Tioga County with 17% compared to 13% in Broome. This equated to one annual KSI crash for every 18 county-owned roadway miles in Broome and 23 county-owned miles in Tioga.

3.3 Crash Characteristics

To address safety issues through design, it is important to understand the underlying characteristics typical among fatal and serious injury crashes. This section offers details on the key characteristics listed below. As opposed to Contributing Factors (Section 3.4), which relate to the behavioral and decision-making elements of a crash, these two relatively objective sources of information serve as a technical foundation when developing and evaluating potential solutions to the safety problem at any given location.

1. Collision Type
2. Crash Type
3. Crash Location

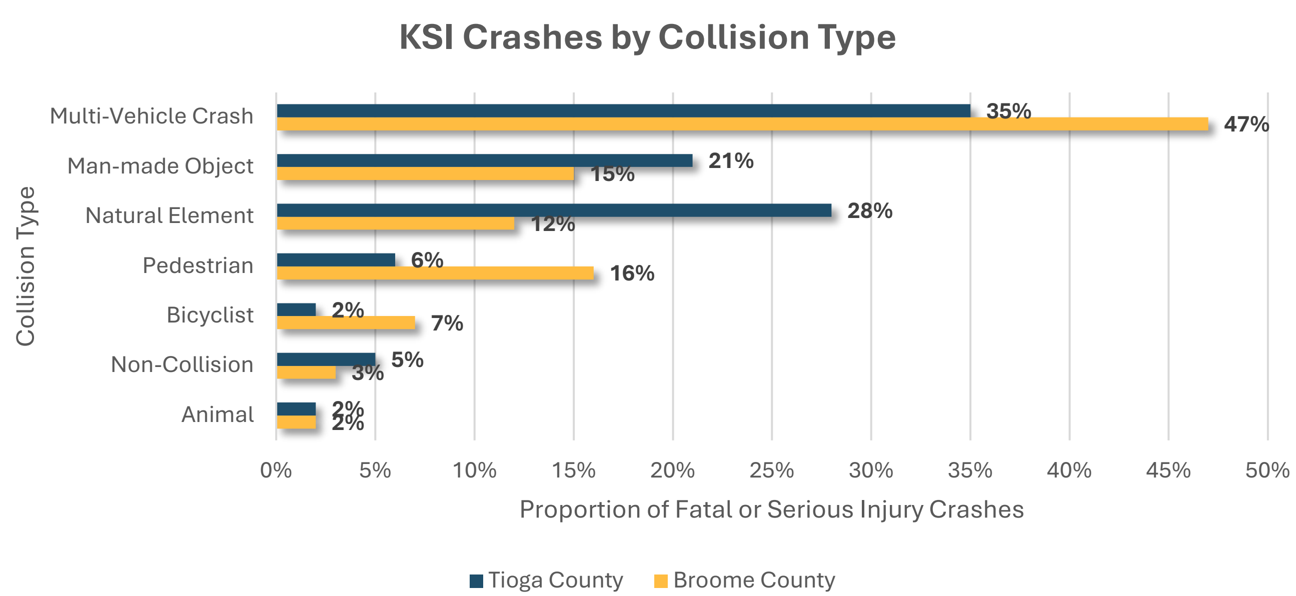
3.3.1 Collision Type

Figure 24 shows what the vehicle collided with (e.g., another vehicle, person walking or biking, a fixed object or natural element, an animal) when a crash resulted in a fatal or serious injury.

[1] "State" jurisdiction includes any crash coded in the CLEAR records as "NYSDOT" or "Other State Agency" jurisdiction. Similarly, crashes with a recorded jurisdiction of "City / Village" or "Town" were combined into a single "Municipal" category. The categories for "County" and "Unknown" include crashes where jurisdiction was formally recorded as such within the official crash records. Accounting for a small proportion of roadway miles within each county, "Other" jurisdictions (e.g., Private / Restricted Access, Army Corps of Engineers) were not included in this analysis. It should be noted that, within the crash records, there was one crash record where jurisdiction was coded as "Private / Restricted Access." However, all surrounding crashes were reflected as "Unknown." Given that the crash occurred on a public roadway and this study aims to cover all public accessways, that crash is reflected in the "Unknown" jurisdiction category within the subsequent tables for the sake of completeness and consistency.

Approximately 47% of all fatal and serious injury crashes in Broome County were the result of a collision between two or more Motor Vehicles in Operation (MVIO). Although Tioga County saw a lower share (35%), MVIO remained the primary collision type for KSI crashes in both counties. Beyond vehicle-on-vehicle crashes, collisions between a motor vehicle and a pedestrian, and collisions with fixed objects (i.e., utility pole, guardrail, etc.) or natural elements (e.g., tree, stone, embankment) comprised significant proportions of KSI crashes within both counties.

Figure 24. KSI Crashes by Collision Type (2019-2023) (Source: NYSDOT CLEAR)



Among KSI crashes, 23% involved someone walking or biking in Broome County compared to a share of 8% for Tioga County. For Broome, a high percentage of severe crashes involving people walking and biking is a concerning trend that warrants consideration for specific countermeasures oriented towards reducing impacts to this specific, inherently vulnerable set of user groups.

In Tioga County, collisions with fixed objects and collisions with natural elements, such as trees or stones, were far more prevalent than in Broome County, largely due to the rural, low-density nature of the county. Collisions with natural elements accounted for 28% of KSI crashes and collisions with a fixed object covering 21% of KSI crashes.

3.3.2 Crash Type

Crashes between two or more vehicles include many different crash types (e.g., head-on, sideswipe), each with their own set of relevant, effective, design-based safety countermeasures.

Among the fatal and serious injury collisions, crash types were largely consistent across both counties, with right-angle crashes comprising the largest proportion of KSI crashes in each – 22% in Broome (**Figure 25**) and 27% in Tioga (**Figure 26**), and rear-end coming in second with 20% in Broome County and 18% in Tioga.

Figure 25. KSI Crashes by Crash Type - Broome County (2019-2023) (Source: NYSDOT CLEAR)

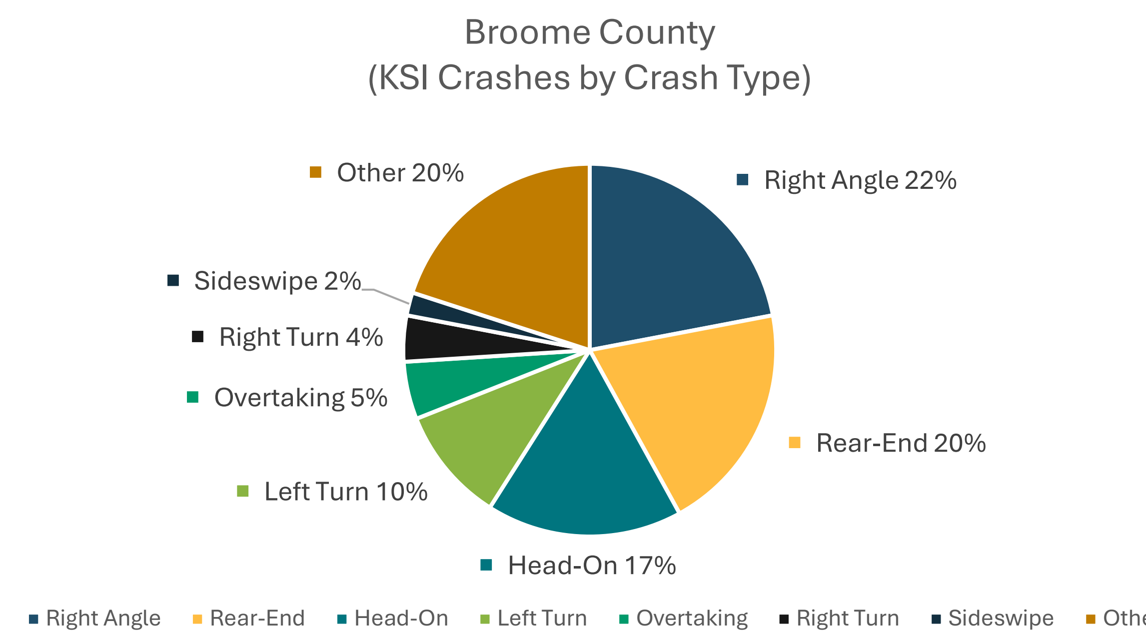
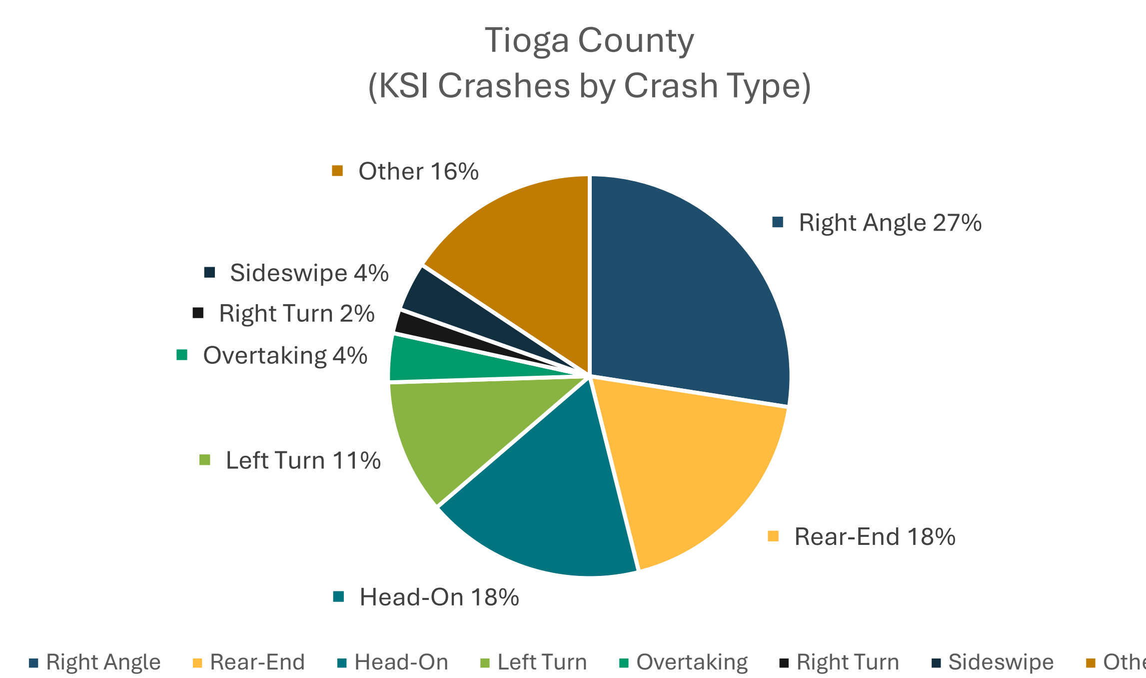


Figure 26. KSI Crashes by Crash Type – Tioga County (2019-2023) (Source: NYSDOT CLEAR)



3.3.3 Crash Location

Any potential engineering, design, or operational approach to addressing safety is fundamentally related to the nature of the location at which the crash occurred (i.e., near an intersection or along a segment). Understanding the prevalence of crashes by injury severity at these different location types is instrumental in helping determine both potential priority locations and the suite of relevant countermeasures that may be most appropriate to address the underlying crash risk. It should be noted that the NYSDOT CLEAR database defines three potential categories for crash location: At-Intersection, Intersection-Related and Not an Intersection (reflected as "Corridor" in the graphics).

Figure 27 and **Figure 28** shows the share of KSI crashes by location type in each county. In Broome County, approximately 40% of fatal and serious injury crashes were recorded as At-Intersection. The remaining 60% were classified as either Corridor (37%) or Intersection-Related (23%). Within the less dense, more rural Tioga County, 76% of KSI crashes were explicitly coded as Corridor.

Figure 27. KSI Crashes by Crash Location - Broome County (2019-2023) (Source: NYSDOT CLEAR)

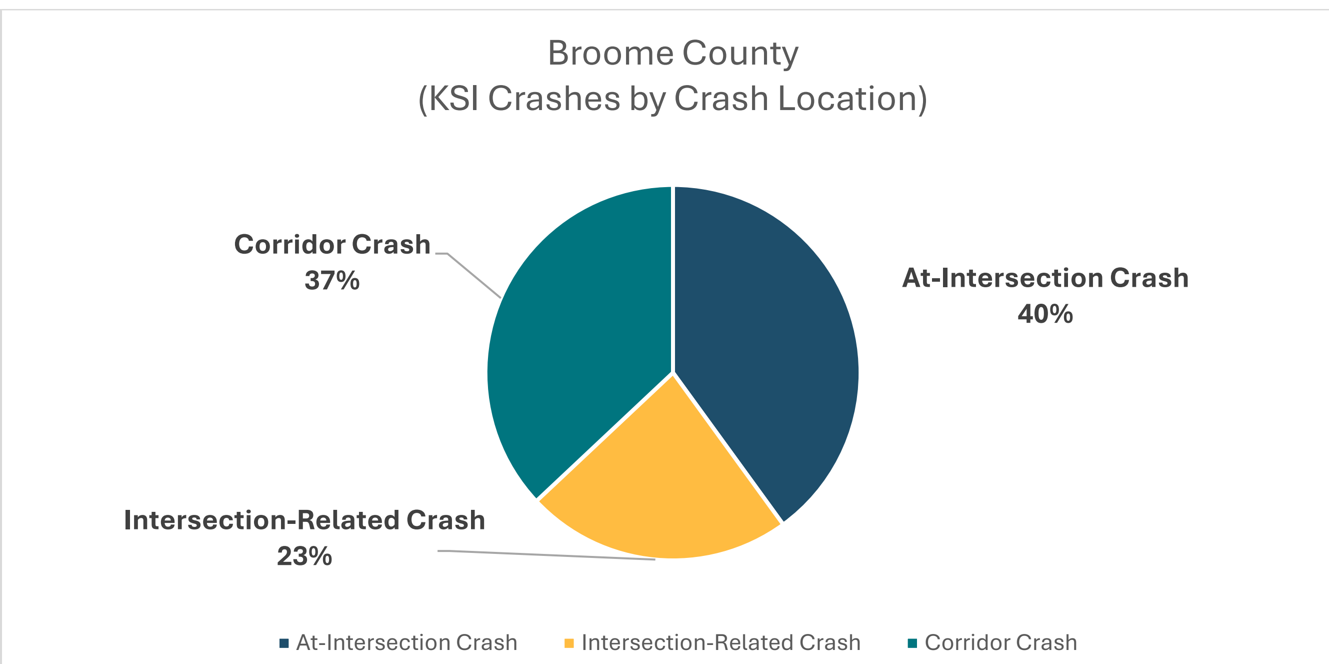
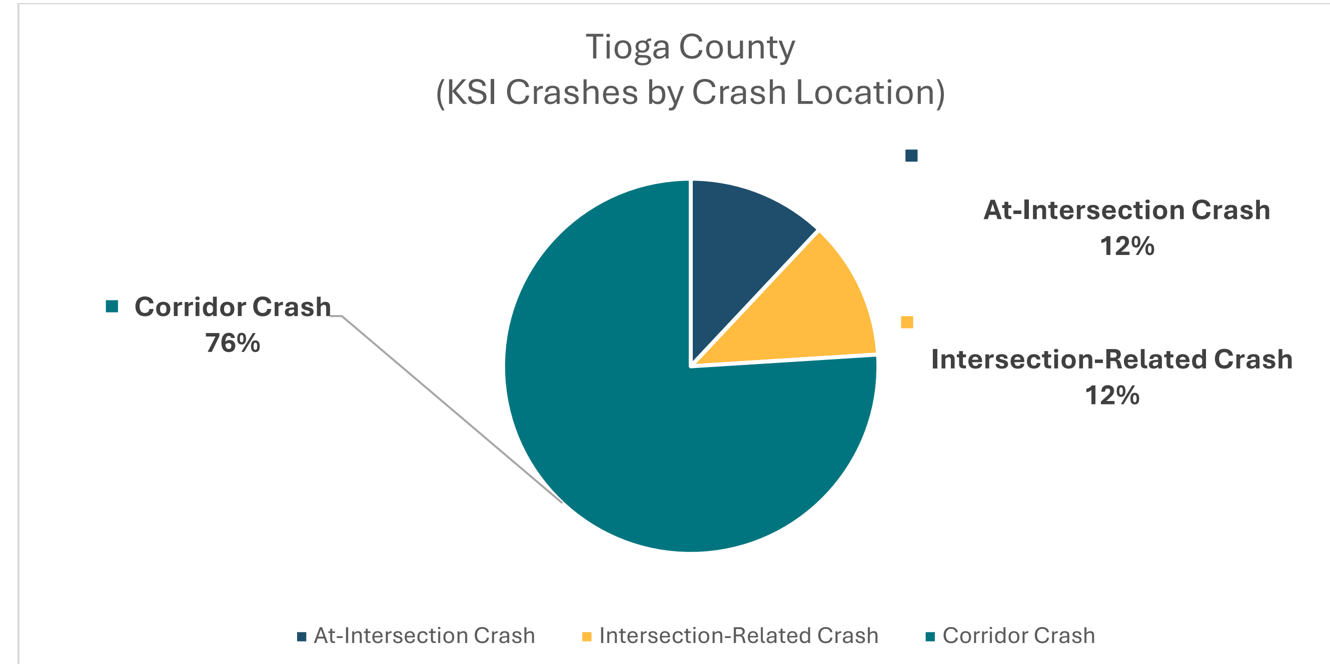


Figure 28. KSI Crashes by Crash Location - Tioga County (2019-2023) (Source: NYSDOT CLEAR)



3.4 Contributing Factors

Beyond the primary characteristics of a crash event – what was involved, how it took place, where it occurred – CLEAR data provides additional details related to other factors that may have contributed to the reported collision. The records provide insight into a variety of other elements that may have contributed to the crash, including those listed below.

- Physical Factors – roadway geometry, intersection control type, lighting presence
- Environmental Factors – time-of-day
- Traveler Behavior ("Contributing Actions") – unsafe speed, impairment (alcohol or illegal drugs), failure to yield, driver inattention, unsafe lane change, etc.

These factors directly impact the appropriate countermeasures for specific projects where a specific factor may be clustered. For example, if there are clusters of severe crashes occurring on a curved roadway, investigation into whether implementing guardrails, centerline rumble strips or other lane and roadway departure countermeasures would be warranted.

3.4.1 Physical Factors

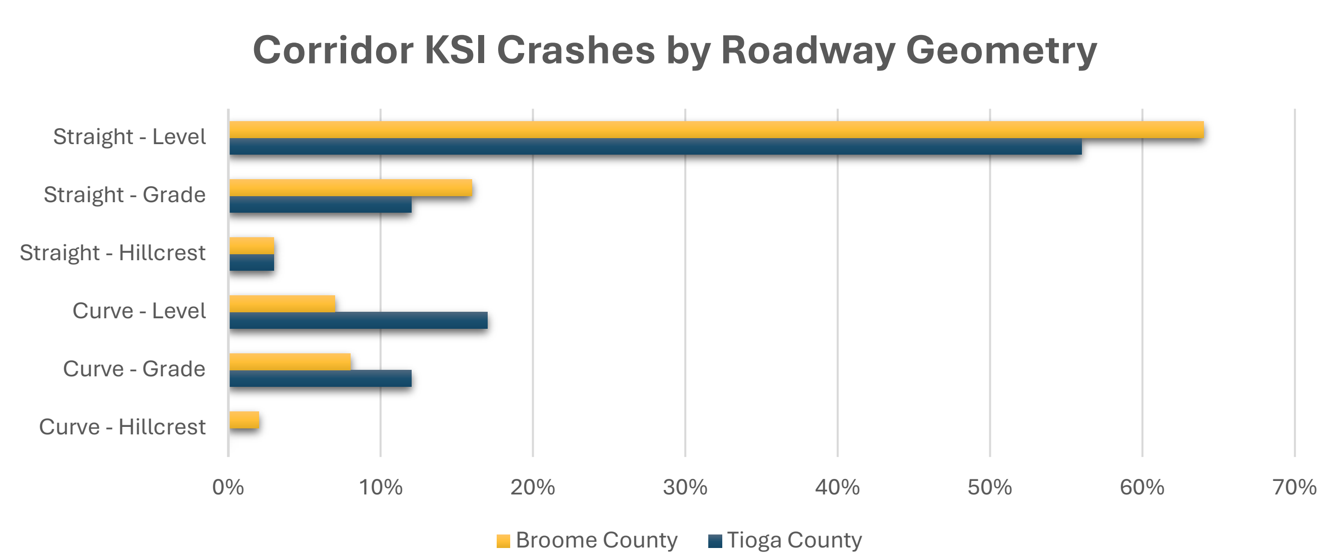
3.4.1.1 Roadway Geometry

One of the strengths of the NYSDOT CLEAR dataset is its data concerning horizontal and vertical curves. This information is particularly relevant given the topography of the region (i.e., a river valley with many hills and sharp bends).

Figure 29 shows the share of KSI crashes in each county based on the six unique combinations of horizontal and vertical curvature information. In both counties, corridor KSI crashes were most common on straight roadways (83% in Broome, 71% in Tioga). In Tioga County, the second most common were corridor crashes along horizontal curves at 29% of KSI crashes. By comparison, only 17% of Broome's KSI crashes were sited along a horizontal curve.

In both counties 24% of KSI crashes took place along a road segment with a vertical grade (i.e., up- or down-hill slope). KSI crashes at the top of a hillcrest were relatively uncommon (5% for Broome, 3% in Tioga). Roadways with both horizontal and vertical curvature (shown as "Curve – Grade" in the figure), which accounted for 8% KSI crashes in Broome County and 12% of KSI crashes in Tioga County, present a relatively unique and difficult case to address given the limited sight distance available.

Figure 29. Corridor KSI Crashes by Roadway Geometry (2019-2023) (Source: NYSDOT CLEAR)



3.4.1.2 Intersection Control Type

Figure 30 and **Figure 31** present the proportion of intersection-based KSI crashes based on the type of control installed in Broome and Tioga, respectively.

Figure 30. At-Intersection KSI Crashes by Control Type - Broome County (2019-2023) (Source: NYSDOT CLEAR)

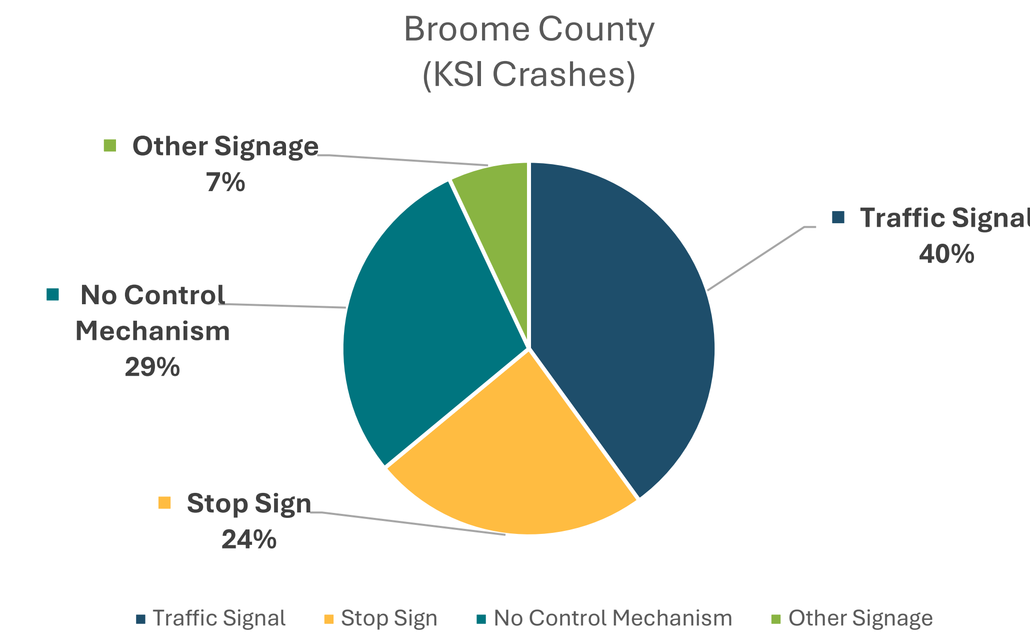
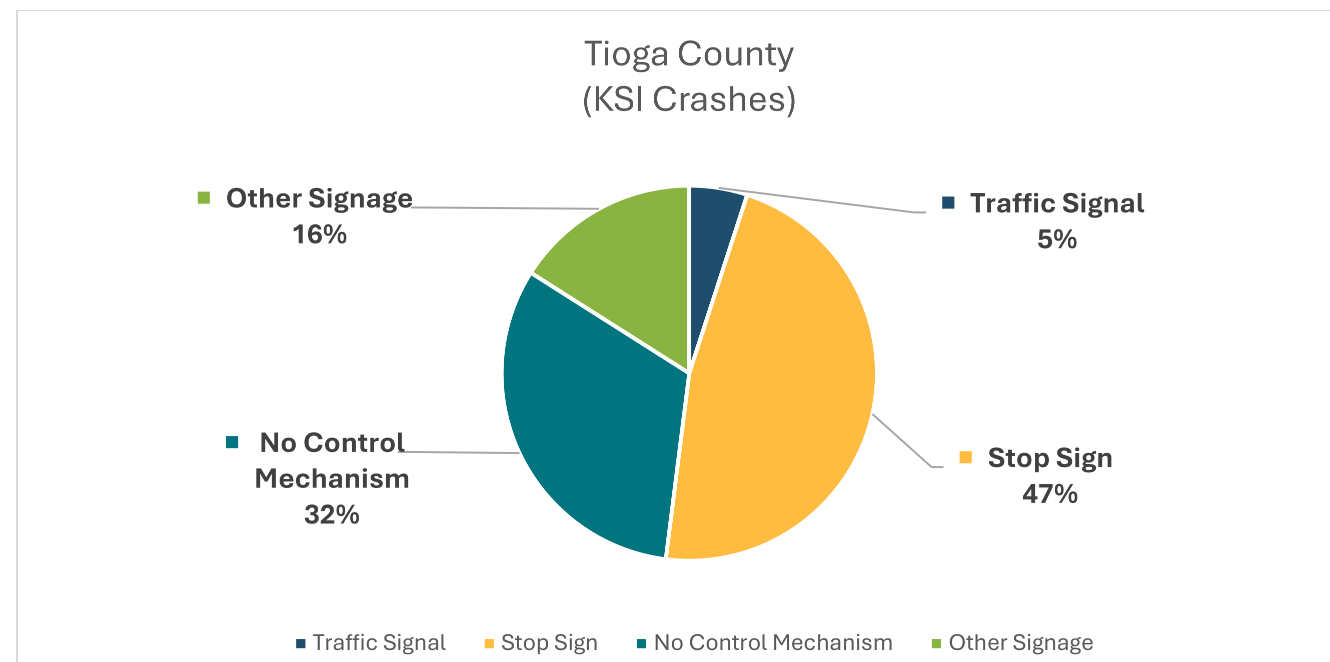


Figure 31. At-Intersection KSI Crashes by Control Type - Tioga County (2019-2023) (Source: NYSDOT CLEAR)



Broome County relies on a comparatively greater share of control devices at its intersections. Among Broome's intersection crashes, 40% occurred at a location where a traffic signal was present while 24% took place at a stop-controlled junction (**Figure 30**).

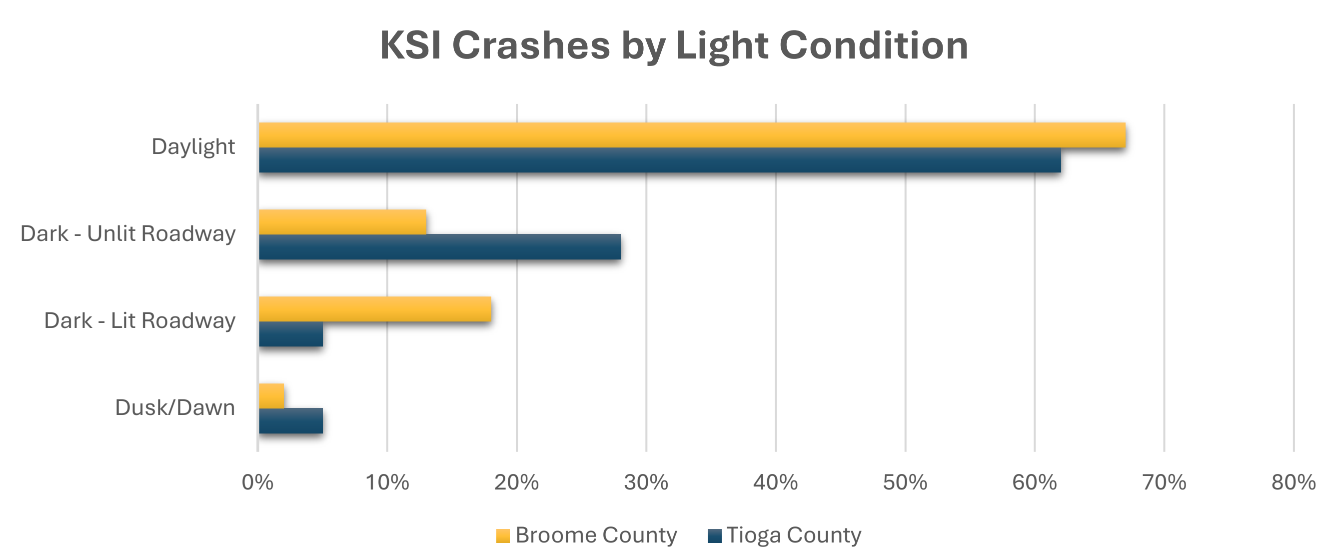
Tioga's more rural character results in more KSI crashes stop sign-controlled intersections, due to the more limited presence of traffic signal-controlled intersections. Nearly half (47%) of all "at-intersection" KSI crashes in Tioga County occurred at a stop sign-controlled intersection – nearly double the proportion for Broome County (**Figure 31**).

Across both counties, approximately 30% of intersection crashes took place at a location designated as having no control mechanism. Found commonly in more rural communities, as exhibited by the higher proportion in Tioga County, these intersections demand increased attention from drivers to avoid any potential conflicts.

3.4.1.3 Lighting Condition

Low visibility and poor lighting can contribute to more severe crash outcomes, particularly for crashes involving vulnerable road users and roadway departures. **Figure 32** presents the proportion of KSI crashes in each county based on time-of-day (daylight, dark, or dusk / dawn) and the presence of lighting elements during dark conditions (lit or unlit). In both counties, over 60% of KSI crashes took place during daylight hours. Tioga County exhibited a much more significant proportion of crashes that occurred in dark conditions along unlit roadways (28%). Surprisingly, 18% of KSI crashes in Broome County took place in an area that included lighting elements.

Figure 32. KSI Crashes by Light Condition (2019-2023) (Source: NYSDOT CLEAR)



3.4.2 Environmental Factors

3.4.2.1 Temporal Distribution (Time-of-Day & Day-of-Week)

Table 18 shows a time-based listing of all 724 KSI crashes to highlight hotspots and identify temporal trends by time-of-day and day-of-week. By time-of-day, the highest share of crashes occurred in the 2:00 to 3:00 PM window (9%), with Monday's count reflecting the highest single contribution (nearly 2%). Consistent with afternoon activities and commuter peak periods, other significant time windows for KSI crashes included early afternoon (12:00 to 2:00 PM) and early evening (4:00 to 6:00 PM), each of which saw approximately 7% of KSI crashes. By day-of-week, compared to a uniform baseline of just over 14% for each of the seven days of the week, Saturdays (16%) and Mondays (16%) saw more KSI crashes than expected, with Wednesday experiencing the least (11%).

Table 18. Temporal Distribution of KSI Crashes (2019-2023) (Source: NYSDOT CLEAR)

Hourly Window	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12:00 AM	2			1	2	2	4	11
1:00 AM	1	2		2	1	4	3	13
2:00 AM	3	1	1				6	11
3:00 AM	4	2	3	1	1	1	5	17
4:00 AM	2			2			4	8
5:00 AM	1	1		2		2	3	9
6:00 AM	1		2	2	1	1		7
7:00 AM		6	6	2	4	3	2	23
8:00 AM	2	4	4	6	4	3	3	26
9:00 AM	1	7	3	3	2	4	3	23
10:00 AM	4	3	8	3	3	3	10	34
11:00 AM	7	6	8	6	4	7	4	42
12:00 PM	8	7	7	4	8	4	11	49
1:00 PM	9	7	6	4	10	6	7	49
2:00 PM	4	13	9	8	11	8	11	64
3:00 PM	2	6	8	6	4	4	6	36
4:00 PM	4	12	10	6	12	3	6	53
5:00 PM	9	12	8	4	8	8	3	52
6:00 PM	7	5	9	7	7	8	2	45
7:00 PM	9	6	6	3	7	5	5	41
8:00 PM	3	2	2	2	7	6	6	28
9:00 PM	4	6	5	2	9	5	7	38
10:00 PM	2	6	1		3	7	4	23
11:00 PM	3	2	2	5	2	4	4	22
Total	92	116	108	81	110	98	119	724

3.4.3 Traveler Behavior ("Contributing Actions")

Across the 724 KSI crashes, a total of 1,094 contributing actions were reported. Thus, it should be recognized that the number of contributing actions reported for any given crash ranged from zero to multiple and was not limited to a single contributing action.

Table 19 highlights contributing factors that were reported in at least 10 KSI crashes over the five-year period. Taken together, the top three contributing factors – unsafe speed, failure to yield and driver inattention – were listed in over 50% of KSI crashes within both counties and amounted to 34% of all factors reported across KSI collisions in Broome/Tioga. Among the most reported contributing factors in KSI crashes, several involved driver behavior, particularly failure to yield, driver inattention, unsafe lane change, and following too close. These can be addressed by a combination of infrastructure-based countermeasures in addition to enforcement and education campaigns that serve to promote safer driving behaviors.

Table 19. Frequently Reported Contributing Actions for KSI Crashes (2019-2023) (Source: NYSDOT CLEAR)

Contributing Action	Total Count	% of All Reported Contributing Actions	% Share in Broome	% Share in Tioga	% of Broome KSI Crashes	% Tioga KSI Crashes
Unsafe Speed	131	12%	64%	36%	15%	28%
Failure to Yield	119	11%	80%	20%	17%	15%
Driver Inattention	117	11%	88%	12%	18%	8%
Unsafe Lane Change	72	7%	68%	32%	9%	14%
Following Too Close	71	6%	82%	18%	9%	7%
Passing / Unsafe Lane Usage	60	5%	68%	32%	7%	12%
Traffic Control Devices Disregarded	59	5%	88%	12%	9%	4%
Alcohol	51	5%	73%	27%	7%	8%
Failure To Keep Right	39	4%	69%	31%	5%	7%
Slippery Pavement	32	3%	69%	31%	4%	6%
Lost Consciousness	31	3%	87%	13%	5%	2%
Turning Improper	25	2%	60%	40%	3%	6%
Illness	24	2%	75%	25%	3%	4%
Obstructed View	23	2%	91%	9%	4%	1%
Illegal Drugs	20	2%	95%	5%	3%	1%
Animals	20	2%	80%	20%	3%	2%
Driver Inexperience	20	2%	80%	20%	3%	2%
Aggressive Driving / Road Rage	16	1%	69%	31%	2%	3%
Fell Asleep	14	1%	50%	50%	1%	4%

Some factors warrant additional description and discussion. For example, the difference between "Unsafe Lane Change" and "Passing / Unsafe Lane Usage." Typically, the former is related to merging or turning movements and not properly ensuring free space before making such a maneuver while the latter is broader and can include things such as inappropriate passing movements, weaving and other lane departures. Similarly, "Traffic Control Devices Disregarded" can include more than common actions like running a red light or stop sign. This contributing factor can also include cases such as disregarding "No Passing" signage or other safety control measures. "Obstructed View" can also encompass many conditions, ranging from a permanent physical obstruction (e.g., tree branch blocking view of stop sign) or a temporary condition (e.g., queued vehicle waiting to take a left-turn large truck preventing adequate sight distance for those making left-turns).

3.4.3.1 Unsafe Speeds

Speed acts as a direct input into crash severity. There are four main factors that contribute to the higher likelihood of severe outcomes among crashes involving unsafe speeds.

1. Higher Speed = More Kinetic Energy / Greater Impact Potential (**Figure 33**)
2. Higher Speed = Narrowed Field of Vision (**Figure 34**)
3. Higher Speed = Increased Reaction Distance (**Figure 35**)
4. Higher Speed = Increased Braking Distance (**Figure 35**)

For vulnerable road users who lack the protection of a vehicle (e.g., those walking, biking, rolling, or using a motorcycle), higher speeds means there is a higher likelihood of a severe crash outcome, with survivability hovering around 75% at 30 mph, dropping to 50% near 30 mph, falling to 25% at 50 mph and shrinking to 10% just below 60 mph (**Figure 33**).

Figure 33. Impact Speed and Risk of Death for Pedestrians (Source: USDOT & AAA Foundation for Traffic Safety)

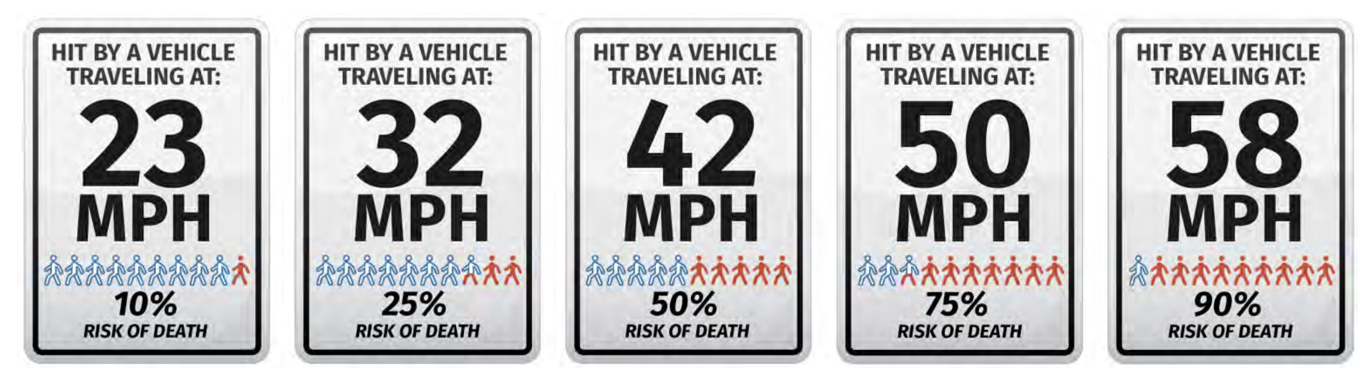


Figure 34. Field of Vision Decreases with Increases in Vehicle Speed (Source: Vision Zero Network & NHTSA)

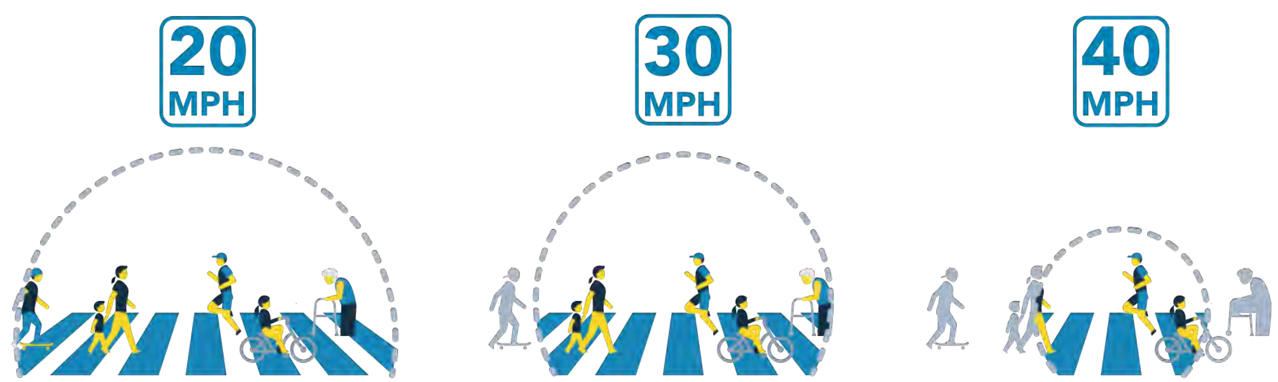
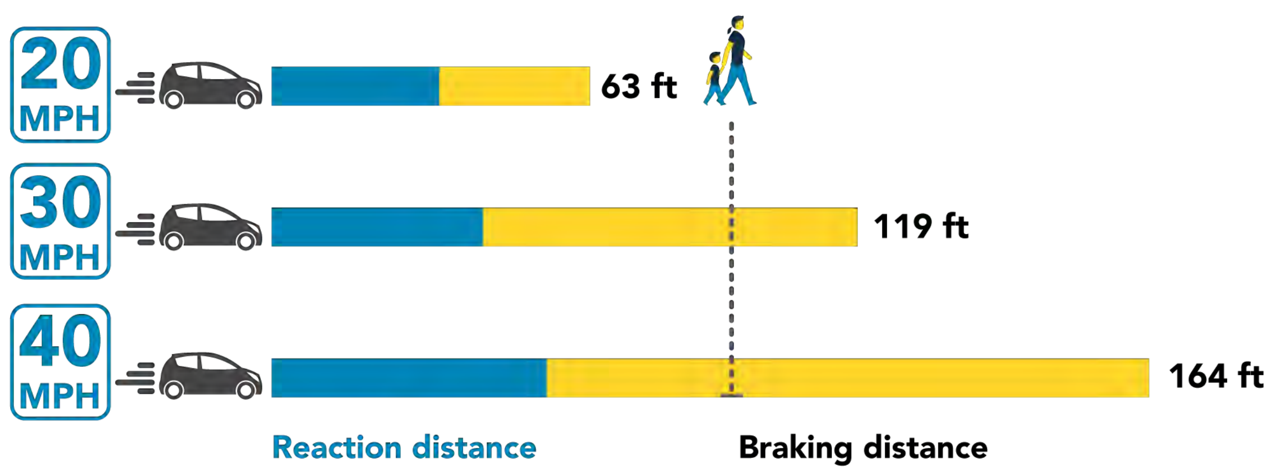


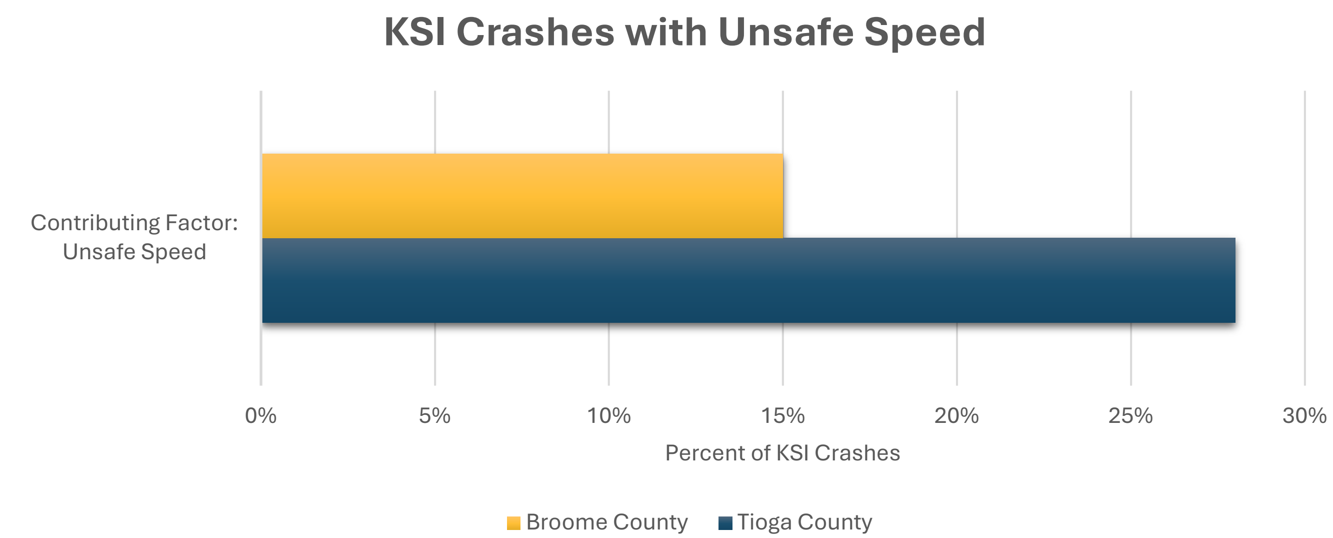
Figure 35. While Perception-Reaction Time May Be Consistent, Higher Vehicle Speeds Increase Distance Required to Avoid a Crash by Coming to a Complete Stop (Source: Vision Zero Network & NACTO)



The only effective near-term influence that roadway officials can have on safety outcomes comes through speed management. Speed is a factor largely linked to roadway design (e.g., number of lanes, presence of median), geometry (e.g., horizontal curvature, approach angle, skew, vertical grades), intersection spacing, and intersection control type. Roadways designed for higher speeds frequently feature vehicle-oriented safety infrastructure, such as guardrails, medians, and other deflection mechanisms.

Unsafe speed was listed as the top contributing factor, appearing in 12% of KSI crashes across both counties (**Table 19**). As seen in **Figure 36**, KSI crashes in Tioga County more frequently included unsafe speed as a contributing factor (28%), nearly double the share reported for Broome County (15%).

Figure 36. Proportion of KSI Crashes Involving Unsafe Speeds (2019-2023) (Source: NYSDOT CLEAR)



3.5 Pedestrian-Involved Crashes

3.5.1 Crash Severity

Across Broome/Tioga, 8% of all injury crashes involved a pedestrian, rising to 14% when observing only fatal and serious injury crashes. This trend highlights the increased risk of a severe crash outcome for the least protected and slowest of road users (i.e., people walking). **Figure 37** shows the combined breakdown of each severity type across Broome/Tioga. **Table 20** displays the count of pedestrian-involved crashes by severity in both counties and across Broome/Tioga as a whole.

Figure 37. Boome/Tioga – Pedestrian-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

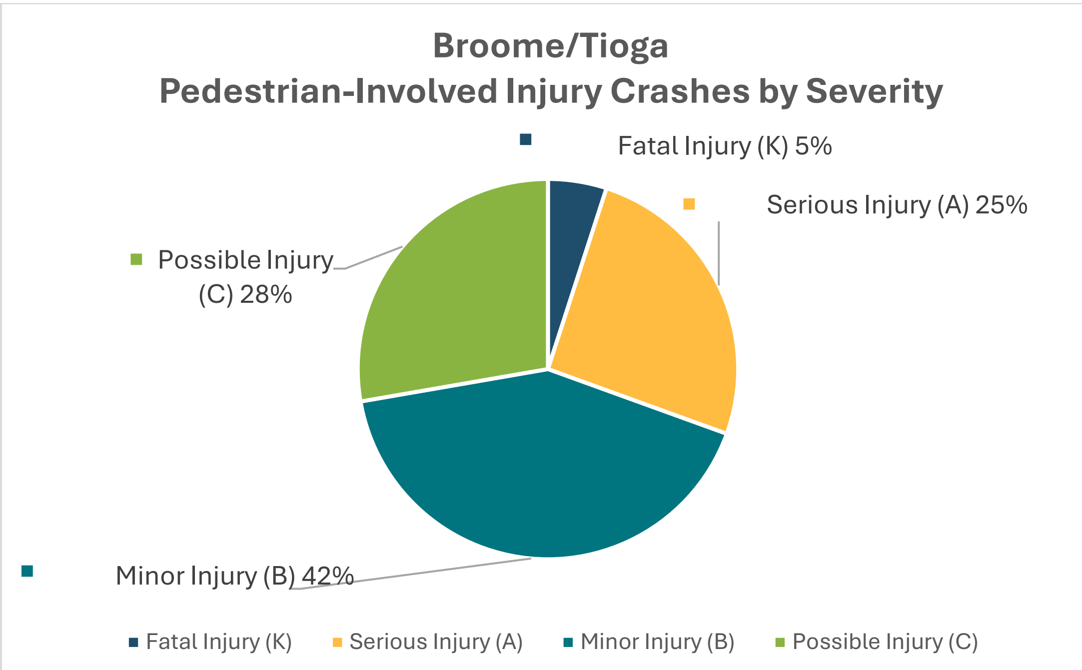


Figure 38. Broome County – Pedestrian-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

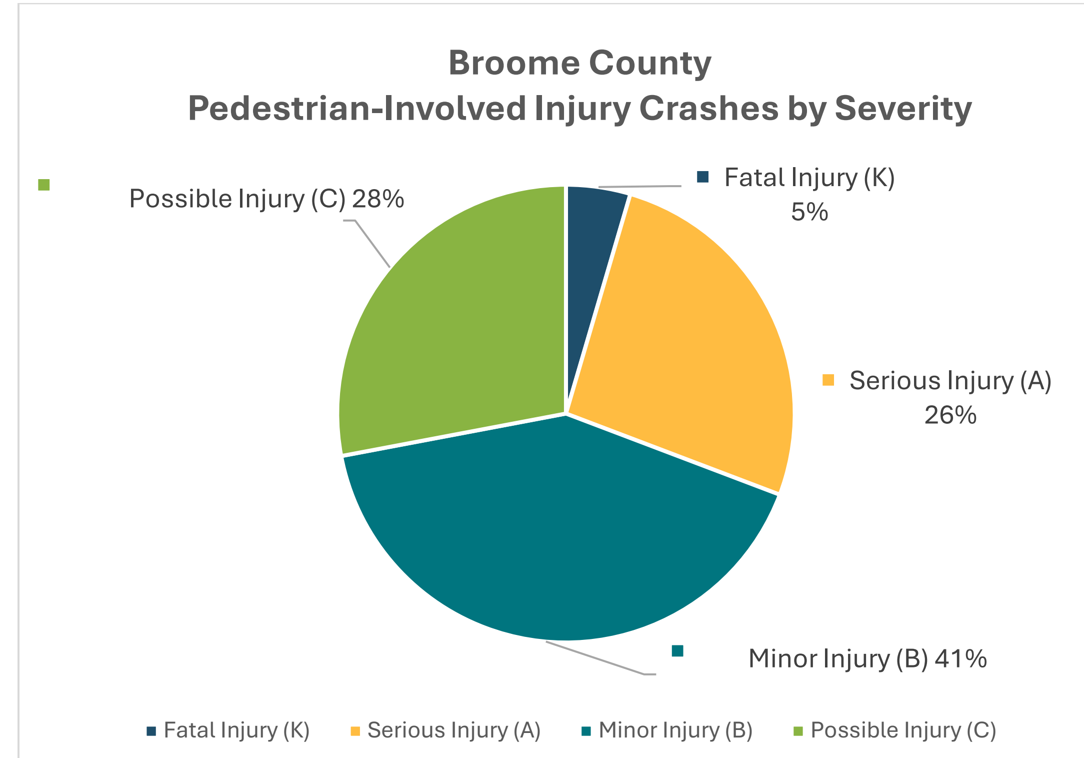


Figure 39. Tioga County – Pedestrian-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

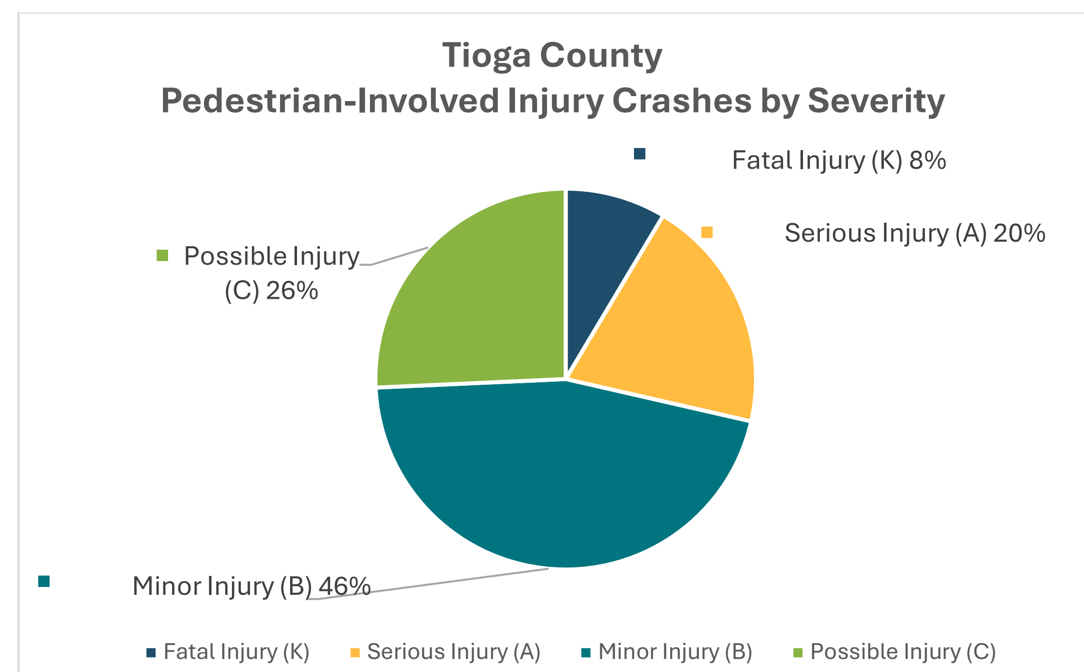


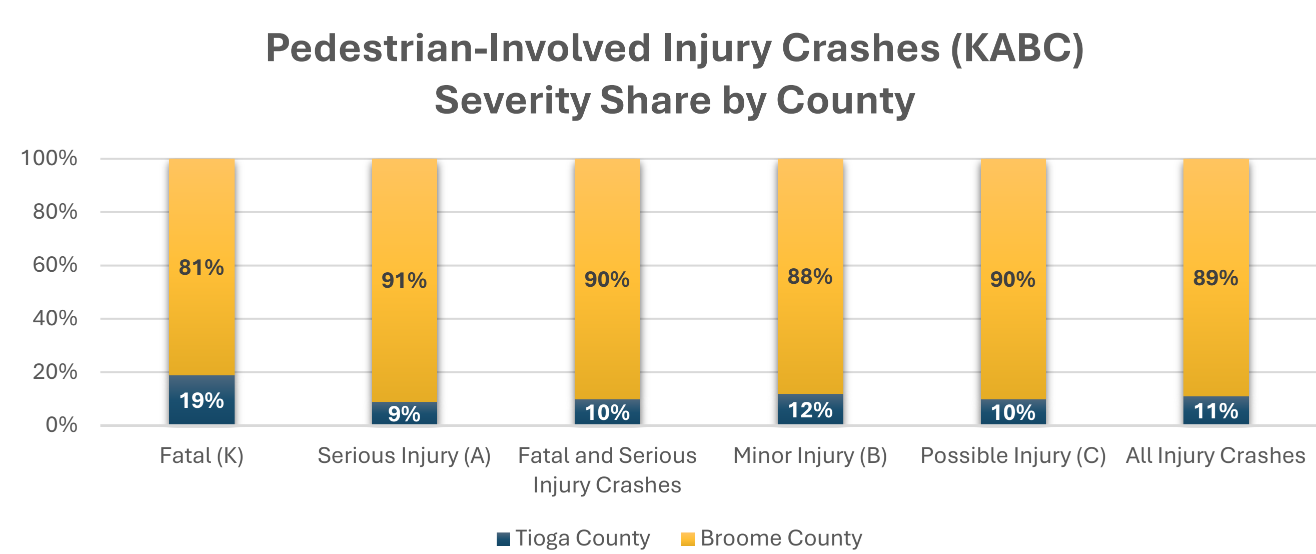
Table 20. Pedestrian-Involved Injury Crashes by Severity by Geographic Area (2019-2023) (Source: NYSDOT CLEAR)

Crash Severity	Tioga County	Broome County	Broome/Tioga
Fatal Injury (K)	3	13	16
Serious Injury (A / SI)	7	75	82
KSI CRASHES	**10**	**88**	**98**
Non-Incapacitating Injury (B)	16	118	134
Possible Injury (C)	9	80	89
TOTAL	**35**	**286**	**321**

Figure 38 and **Figure 39** present the relative share of injury crashes by severity for pedestrian-involved collisions in each of the counties over the five-year period. At a county level, pedestrian-involved collisions were more common in Broome (9% of all injury crashes, 16% of KSI crashes) compared to Tioga (5% of all injury crashes, 6% of KSI crashes). When a pedestrian was involved, 31% of Broome's injury crashes led to a fatality (5%) or serious injury (26%). For Tioga County, 28% of pedestrian-involved injury crashes led to a fatality (8%) or serious injury (20%).

The overwhelming majority of pedestrian-involved crashes occurred in Broome County, as shown in **Figure 40**.

Figure 40. Broome/Tioga – Pedestrian-Involved Injury Crashes – Severity Share by County (2019-2023) (Source: NYSDOT CLEAR)

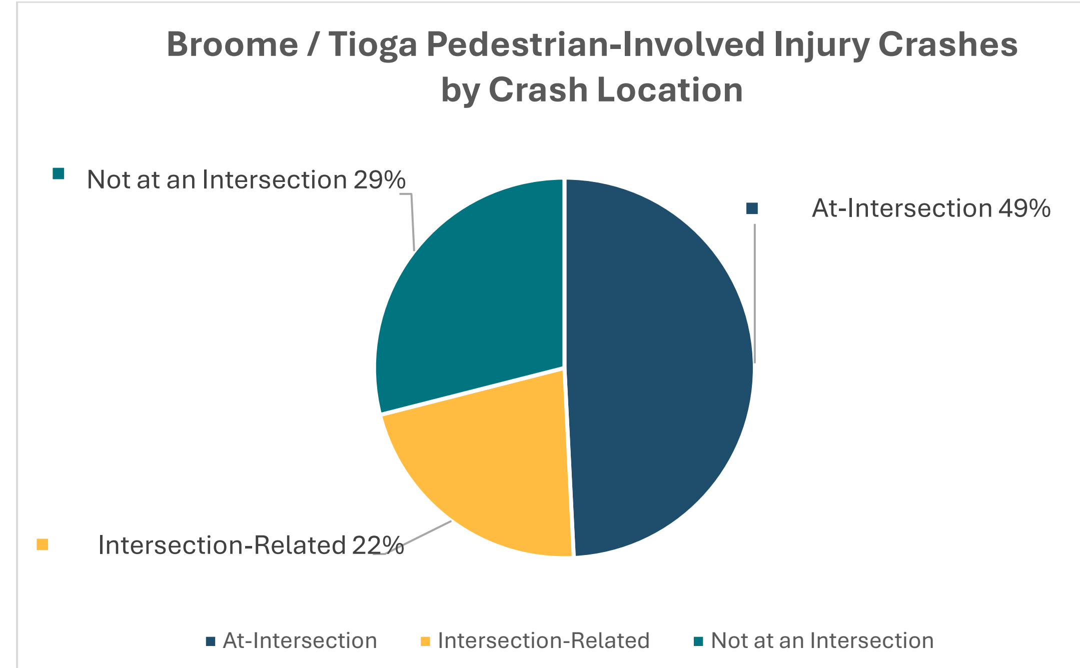


Given the relatively minor share of pedestrian-involved collisions in Tioga County, the analysis of conditions related to these types of crashes is summarized across Broome/Tioga as a whole. This pedestrian crash analysis is based on all injury crashes, with the exception of the traveler behavior (contributing actions) section which investigates KSI crashes specifically.

3.5.2 Crash Location

As shown in **Figure 41**, approximately half (49%) of all pedestrian-involved injury crashes occur at intersections – the most common locations where pedestrians and vehicles are expected to interact. An additional 22% were coded as intersection-related, which means the crash was proximate to an intersection (but was not reported by the responding officer as having taken place at the intersection). The remaining 29% of pedestrian-involved crashes occurred along a roadway segment. Many of these are likely related to mid-block crossings, roadside incidents, or pedestrian presence in unexpected locations (i.e. crossing at a non-designated location).

Figure 41. Broome/Tioga – Pedestrian-Involved Injury Crashes by Crash Location (2019-2023) (Source: NYSDOT CLEAR)



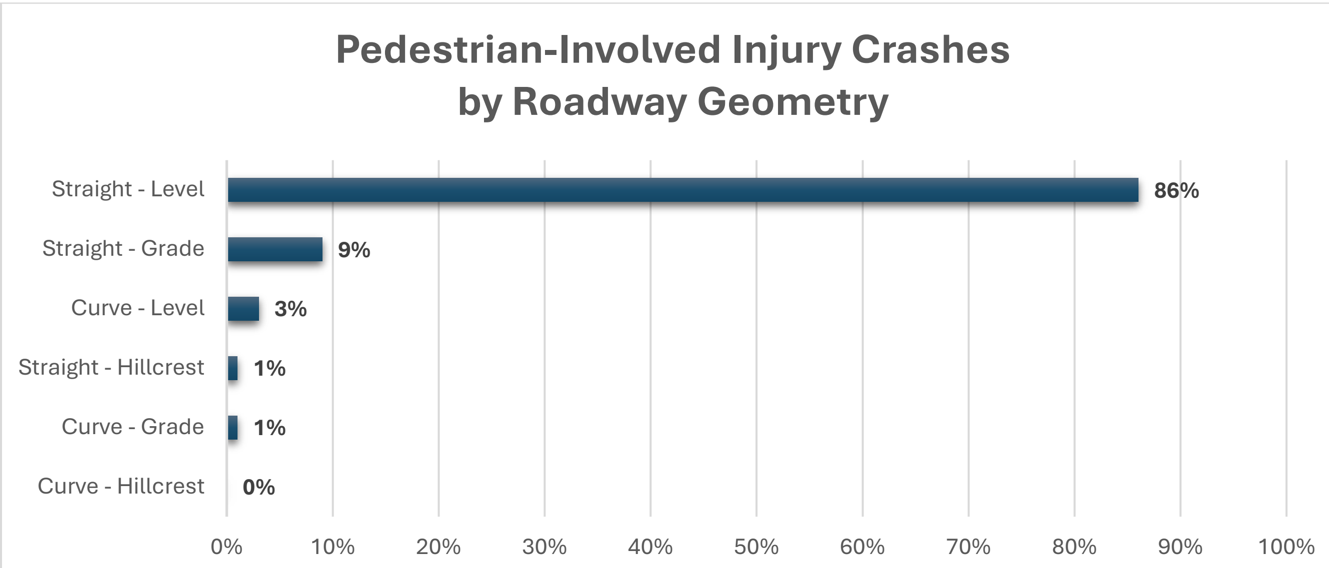
3.5.3 Contributing Factors

3.5.3.1 Physical Factors

3.5.3.1.1 Roadway Geometry

Roadway geometry does not appear to be a significant contributing factor to pedestrian-involved crashes, with 86% of injury crashes occurring on straight and level roadways (**Figure 42**). Hills along a straight road accounted for 9% of pedestrian-involved injury crash locations. Approximately 5% of pedestrian-involved injury collisions took place along a horizontal curve or hillcrest.

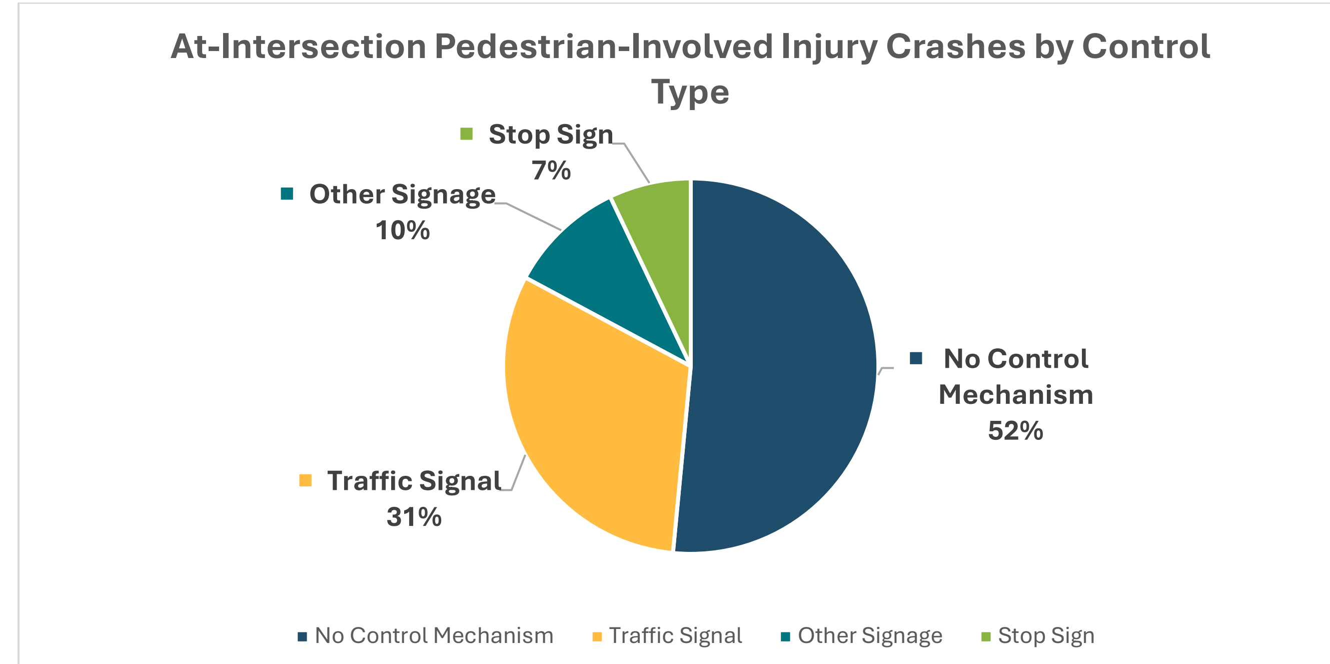
Figure 42. Broome/Tioga – Pedestrian-Involved Injury Crashes by Roadway Geometry (2019-2023) (Source: NYSDOT CLEAR)



3.5.3.1.2 Intersection Control Type

Of the pedestrian-involved injury crashes that occurred at intersections, 52% took place at locations without a formal traffic control device (**Figure 43**). Identification of potential problem locations and installation of control devices where they are currently absent may be an effective means of reducing these types of crashes. Intersections with no formal control can result in confusion between drivers and pedestrians and also fail to communicate the potential presence of pedestrians to approaching drivers. Intersections with traffic signal control accounted for 31% of pedestrian-involved injury collisions. Relatively few crashes involving pedestrians (7%) occurred at stop-controlled intersections.

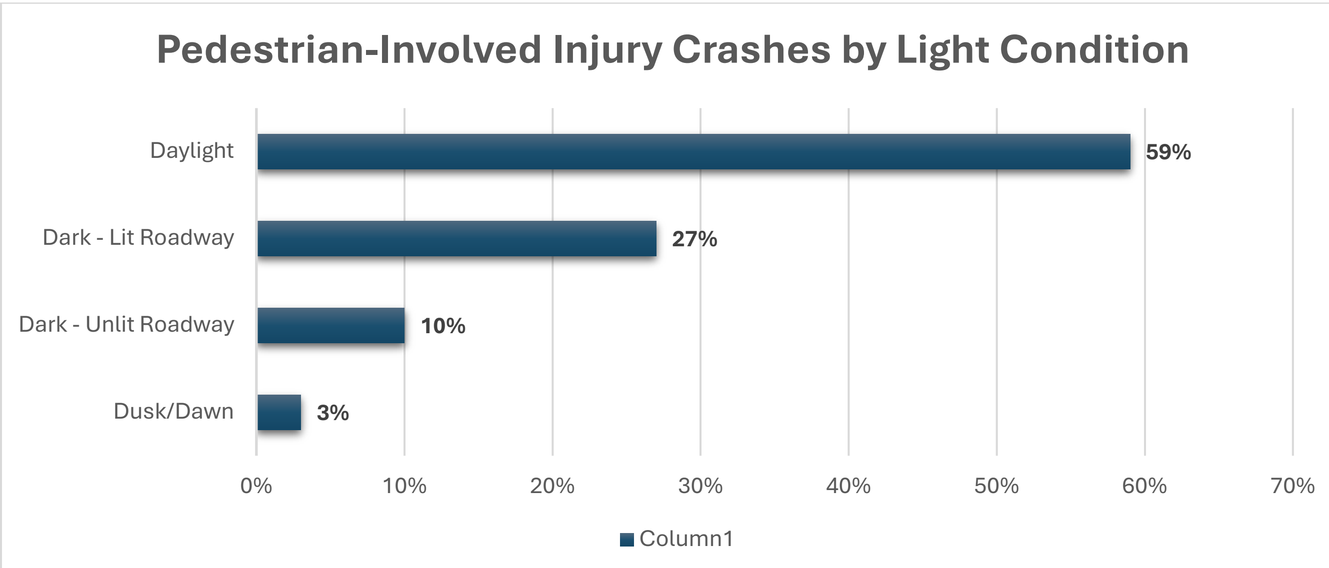
Figure 43. Broome/Tioga – At-Intersection Pedestrian-Involved Injury Crashes by Intersection Control Type (2019-2023) (Source: NYSDOT CLEAR)



3.5.3.1.3 Lighting Condition

Similar to vertical and horizontal curves, lighting conditions do not appear to be a major contributing factor to pedestrian-involved injury crashes. A combined total of 86% of these crash types occurred under lit conditions, with only 10% occurring on unlit roadways (**Figure 44**). The remainder took place during low or dimly lit periods (dusk/dawn), with these cases likely influenced by glare and, as a result, reduced sightlines / visibility.

Figure 44. Broome/Tioga – Pedestrian-Involved Injury Crashes by Light Condition (2019-2023) (Source: NYSDOT CLEAR)



3.5.3.2 Environmental Factors

3.5.3.2.1 Temporal Distribution (Time-of-Day & Day-of-Week)

As expected, most pedestrian-involved injury crashes occurred during daytime or early evening hours, when pedestrian activity is at its peak. The 4:00 PM to 7:00 PM block, which includes the hotspot of 5:00 to 6:00 PM (**Table 21**), accounted for over one-quarter of all pedestrian-involved injury crashes. Thursday and Monday account for one-third of all pedestrian-involved injury crashes, with the fewest crashes represented on weekend days.

Table 21. Broome/Tioga – Temporal Distribution of Pedestrian-Involved Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)

Hourly Window	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12:00 AM	2			2				4
1:00 AM								0
2:00 AM	1		1					2
3:00 AM	2	1				1		4
4:00 AM							1	1
5:00 AM	1					1		2
6:00 AM					1		1	2
7:00 AM		3	1	3	1	1	1	10
8:00 AM	1	1	2	2	3	2	1	12
9:00 AM		2		1	1			4
10:00 AM		2	2	3	1		1	9
11:00 AM	2	7	6	4	2	6	2	29
12:00 PM	3	2	5	1	3	3	1	18
1:00 PM		1	3	5	5	2	3	19
2:00 PM	2	5	2	7	5	2	5	28
3:00 PM	1	3	3	6	3	2	1	19
4:00 PM		3	7		5	3	3	21
5:00 PM	4	9	4	4	6	9	4	40
6:00 PM	3	2	5	7	8	6		31
7:00 PM	4	3	3	1	1	2	1	15
8:00 PM	1	2	1	2	2	1	6	15
9:00 PM	2	4	4	3	5	3	2	23
10:00 PM	1	2		1	2	1	4	11
11:00 PM		1			1			2
Total	30	53	49	52	55	45	37	321

3.5.3.3 Traveler Behavior ("Contributing Actions")

Among the 98 KSI crashes that involved a pedestrian, there were a total of 83 reported contributing actions. These contributing actions were largely skewed towards a few common factors. **Table 22** outlines the Top 10 most reported contributing actions for KSI crashes involving a pedestrian. Nearly 90% of all reported actions among pedestrian-involved injury crashes fall within these ten categories. Driver Inattention was the most frequently reported contributing action for pedestrian-involved KSI crashes (27%), followed by Failure to Yield (13%).

Table 22. Broome/Tioga – Top 10 Contributing Actions in Pedestrian-Involved Fatal or Serious Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)

Contributing Action	Total Count	% of All Reported Contributing Actions	% of Broome/Tioga Pedestrian-Involved KSI Crashes
Driver Inattention	22	27%	22%
Failure to Yield	13	16%	13%
Obstructed View	9	11%	9%
Traffic Control Device Disregarded	7	8%	7%
Impairment (Drugs/Alcohol)	5	6%	5%
Aggressive Driving/Road Rage	4	5%	4%
Unsafe Speed	3	4%	3%
Unsafe Backing	3	4%	3%
Glare	3	4%	3%
Turning Improper	2	2%	2%

3.6 Bicyclist-Involved Crashes

3.6.1 Crash Severity

Across Broome/Tioga, 4% of all injury crashes involved a bicyclist, rising to 6% when focusing on fatal or seriously injured collisions. As with those walking, this higher representation of cyclists involved in KSI crashes compared to all injury crashes demonstrates the inherent vulnerability of this user. **Figure 46** shows the proportion of bicyclist-involved injury crashes by severity throughout Broome/Tioga. **Table 23** presents the count cyclist-involved crashes by severity level in each county and across Broome/Tioga as a whole.

Figure 45. Broome/Tioga – Bicyclist-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

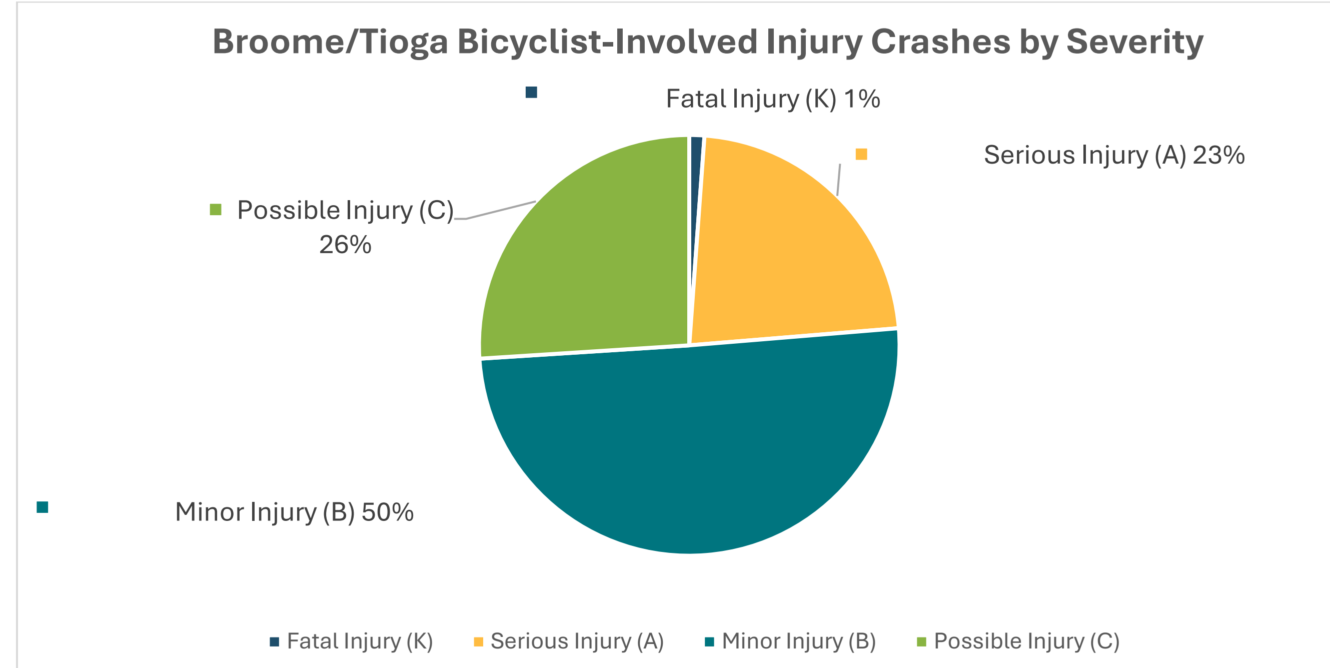


Table 23. Bicyclist-Involved Crashes by Severity by Geographic Area (2019-2023) (Source: NYSDOT CLEAR)

Crash Severity	Tioga County	Broome County	Broome/Tioga
Fatal Injury (K)	0	2	2
Serious Injury (A / SI)	4	35	39
KSI CRASHES	**4**	**37**	**41**
Non-Incapacitating Injury (B)	6	81	87
Possible Injury (C)	4	41	45
TOTAL	**14**	**159**	**173**

Figure 46 and **Figure 47** show the share of injury crashes by severity for bicyclist-involved collisions for Broome and Tioga, respectively. Continuing the trend seen for pedestrians, bicyclist-involved injury collisions were more common in Broome (5% of all injury crashes, 7% of KSI crashes) than Tioga (2% of all injury crashes, 2% of KSI crashes). When a bicyclist was involved in an injury crash, 23% of Broome's injury crashes led to a serious injury (22%) or fatality (1%). For Tioga County exhibited a higher share of KSI outcomes among bicyclist-involved collisions (28%) but did not experience any bicyclist-involved fatalities during the period analyzed.

Figure 46. Broome County – Bicyclist-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)

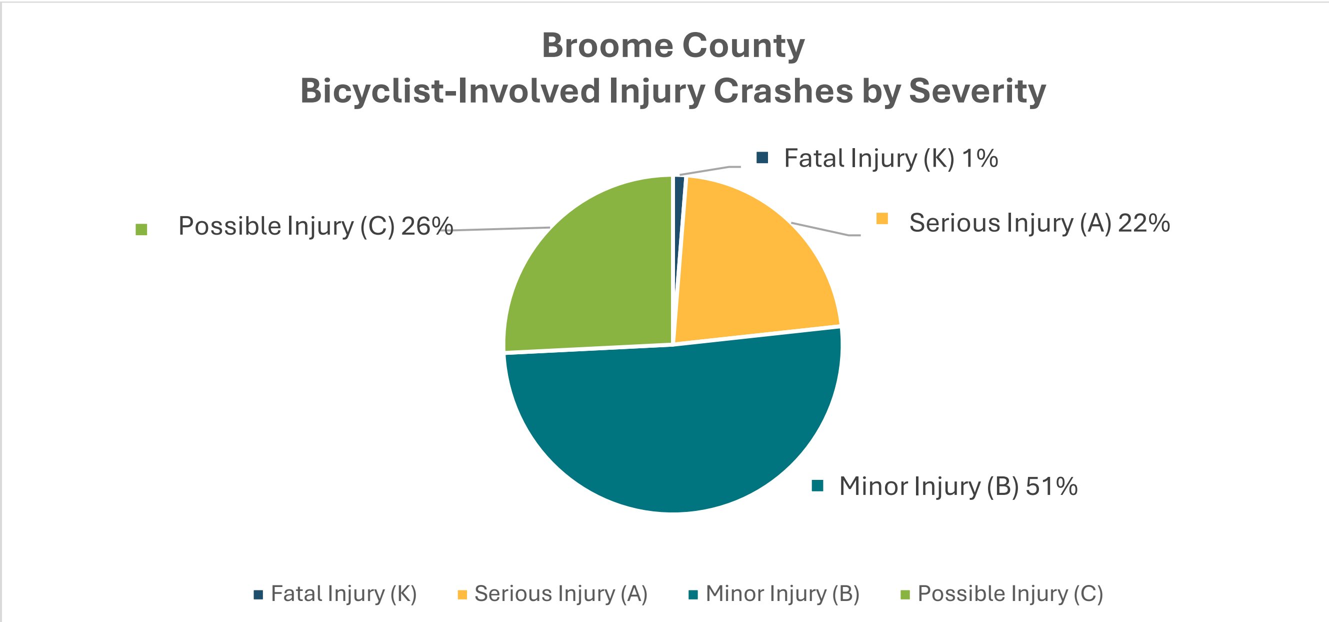
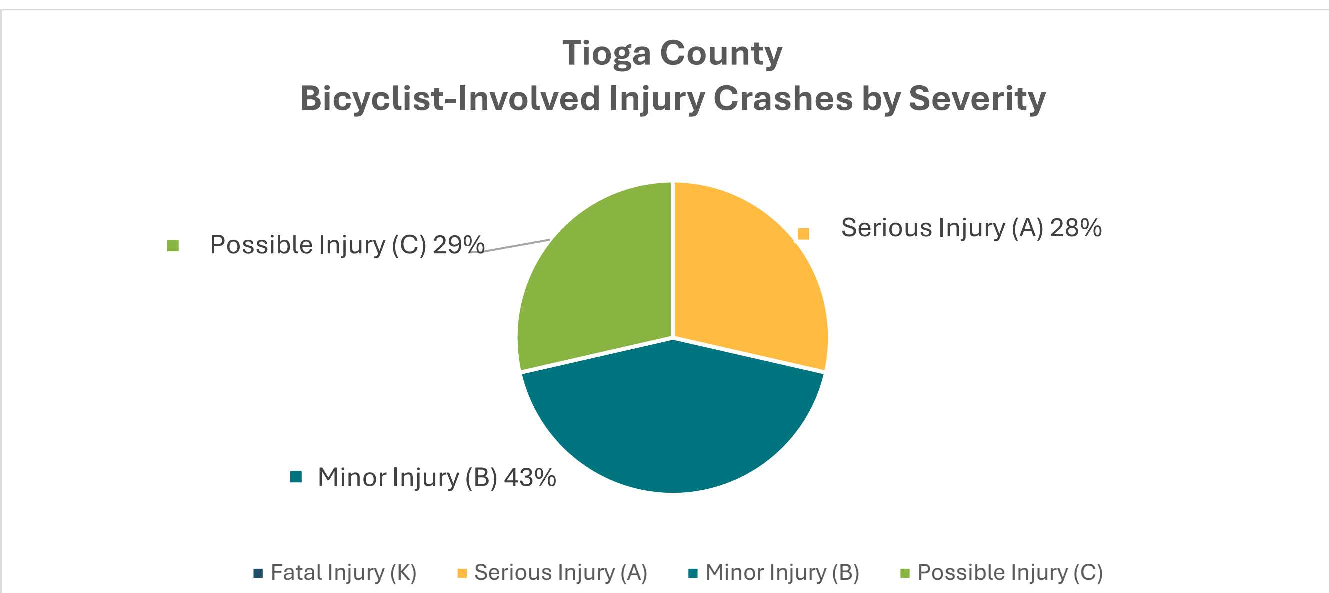
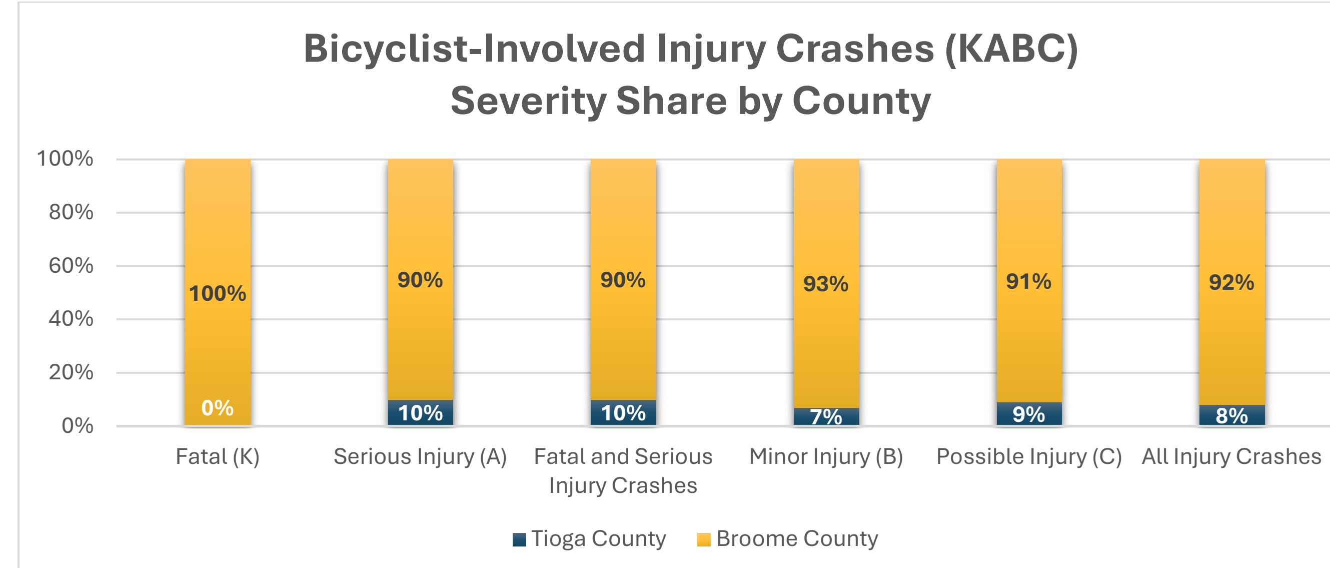


Figure 47. Tioga County – Bicyclist-Involved Injury Crashes by Severity (2019-2023) (Source: NYSDOT CLEAR)



Like the trend exhibited for pedestrian-involved injury crashes, Broome County was home to the majority of the bicyclist-involved injury crashes across Broome/Tioga (**Figure 48**).

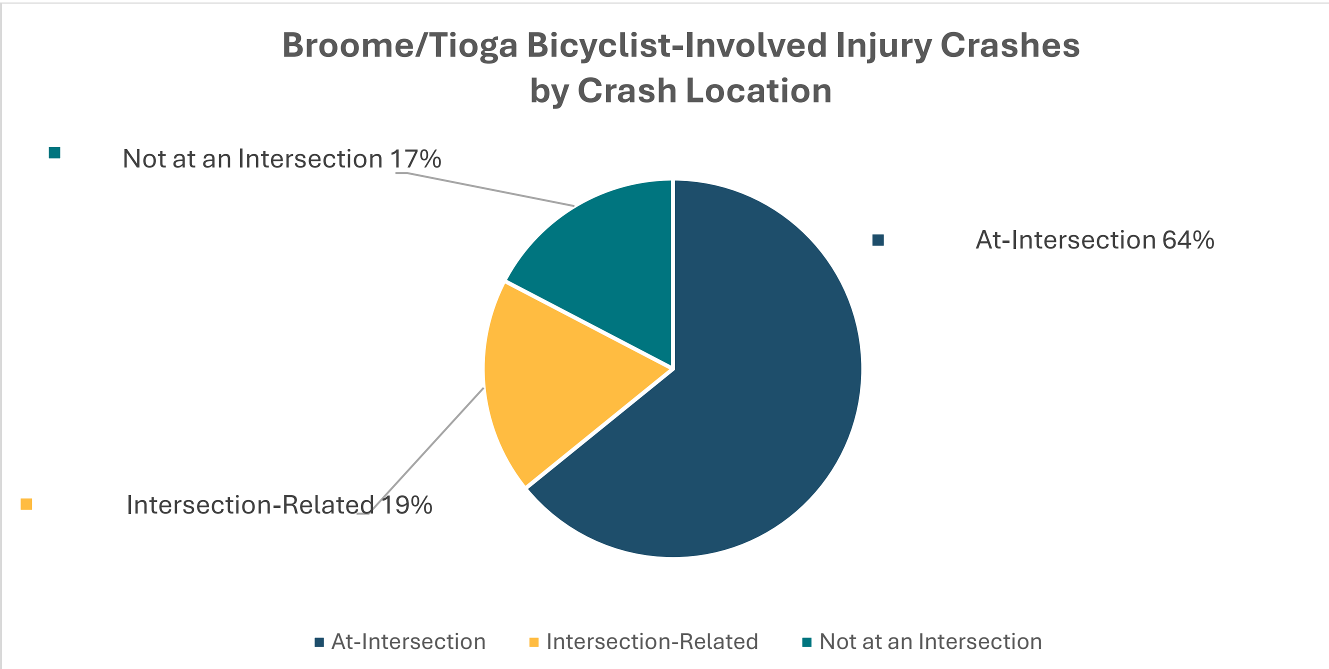
Figure 48. Bicyclist-Involved Crashes – Severity Share by County (2019-2023) (Source: NYSDOT CLEAR)



Based on a relatively small share of bicyclist-involved injury crashes taking place in Tioga County, the analysis of conditions related to these types of crashes is summarized at the regional level. This bicyclist-involved crash analysis assesses all injury crashes, except for the travel behavior (contributing actions) section which orients specifically to KSI collisions.

3.6.2 Crash Location

Figure 49. Broome/Tioga – Bicyclist-Involved Injury Crashes by Crash Location (2019-2023) (Source: NYSDOT CLEAR)



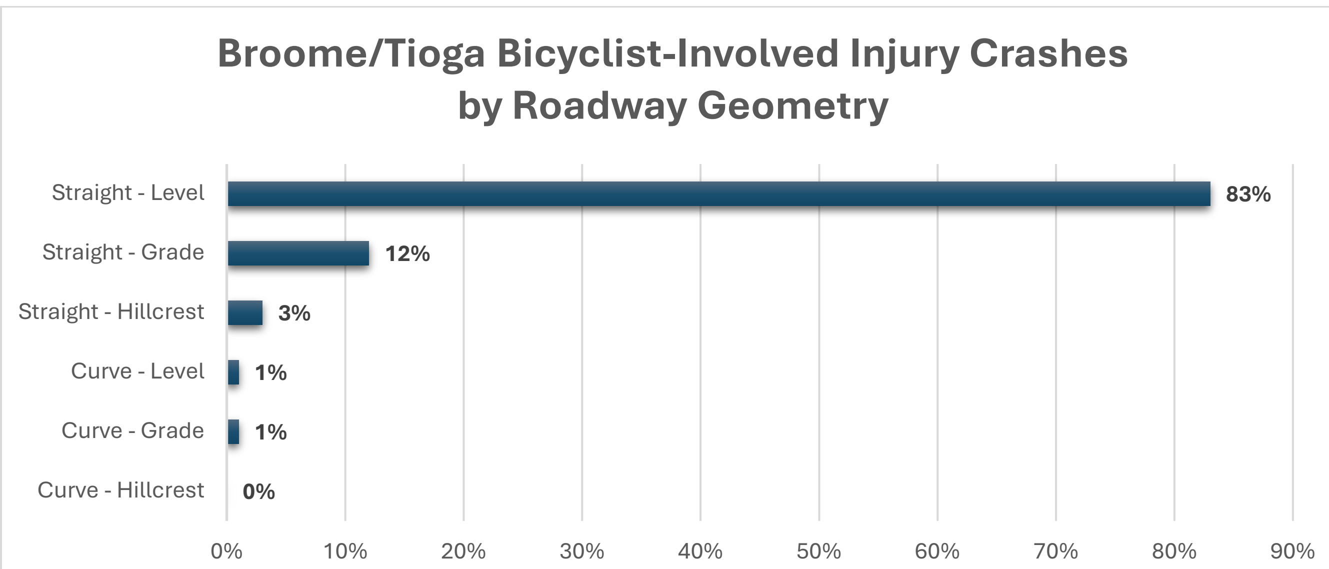
3.6.3 Contributing Factors

3.6.3.1 Physical Factors

3.6.3.1.1 Roadway Geometry

Similar to pedestrian-involved crashes, most bicyclist-involved injury crashes occurred on straight and level roadways (83%). As shown in **Figure 50**, 12% of injury crashes involving cyclists took place along a straight segment with a vertical grade. Relatively few crashes occurred along horizontal curves or at the peak of a hill.

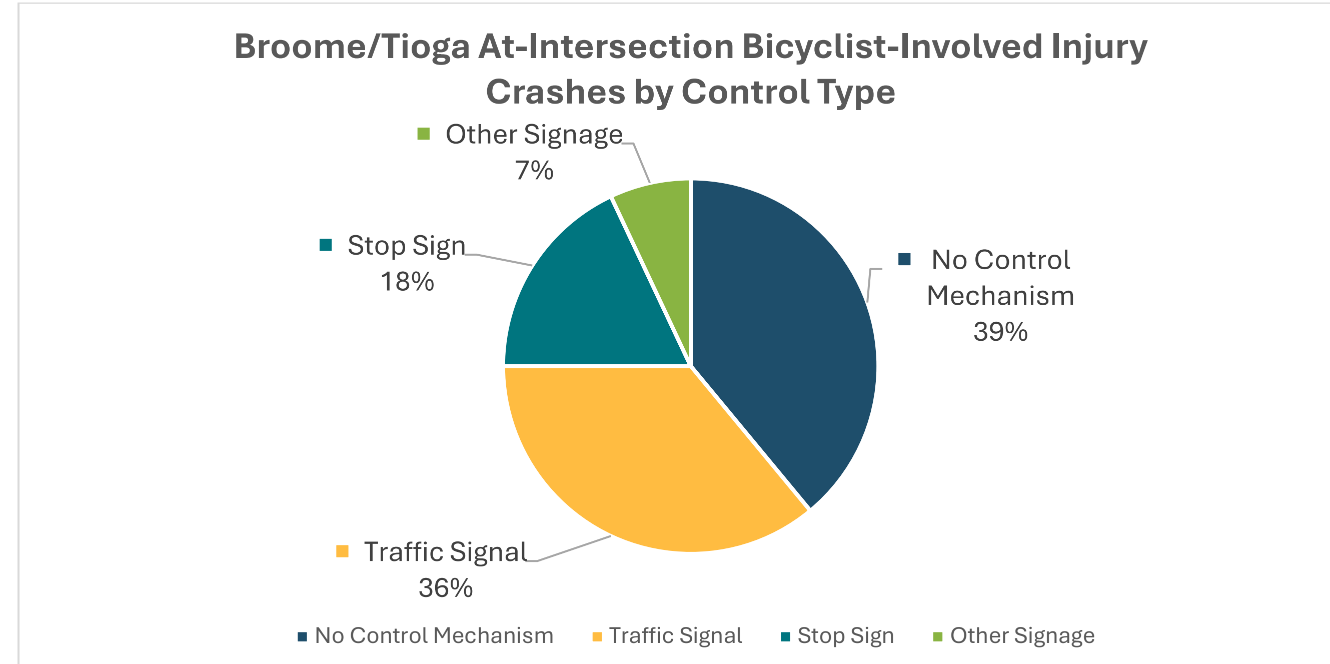
Figure 50. Broome/Tioga – Bicyclist-Involved Injury Crashes by Roadway Geometry (2019-2023) (Source: NYSDOT CLEAR)



3.6.3.1.2 Intersection Control Type

Figure 51 presents the type of control present at intersections where bicyclist-involved injury collisions occurred. When a bicyclist-involved injury crash took place at an intersection, 39% of the locations lacked formal control, followed closely by 36% of cases occurring at a signalized intersection.

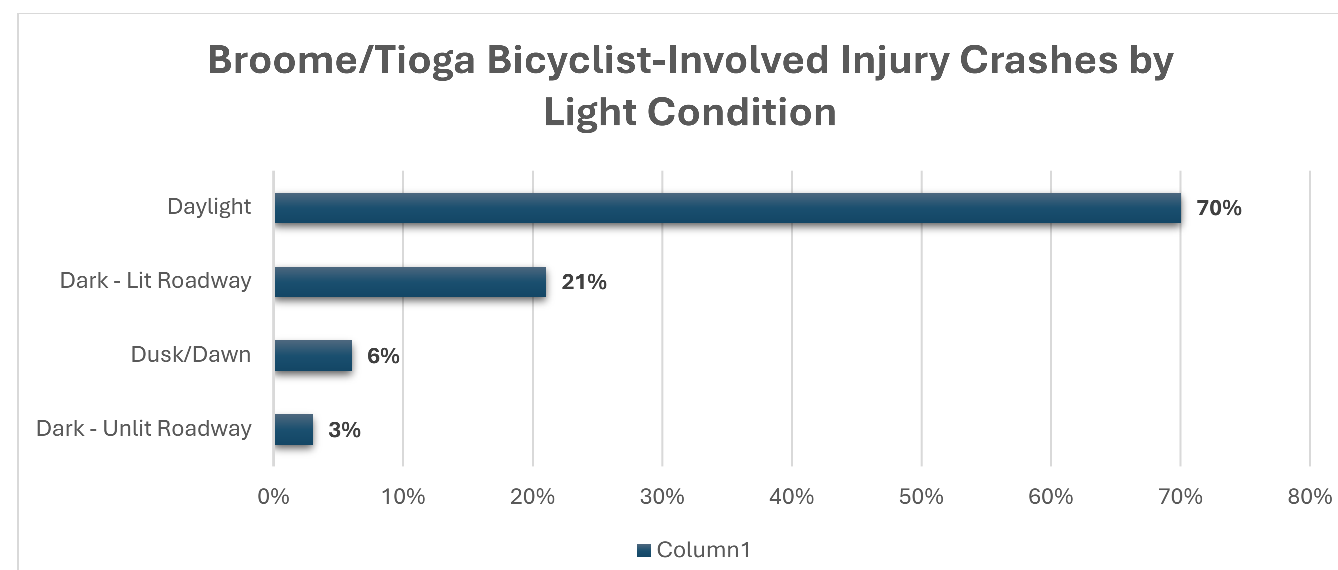
Figure 51. Broome/Tioga – At-Intersection Bicyclist-Involved Injury Crashes by Intersection Control Type (2019-2023) (Source: NYSDOT CLEAR)



3.6.3.1.3 Lighting Condition

As shown in **Figure 52**, light condition does not appear to be a major contributing factor for bicyclist-involved injury crashes. Only 3% of all bicycle crashes occurred along dark and unlit roadways; however, low-light conditions (dusk/dawn) accounted for an additional 6%.

Figure 52. Broome/Tioga – Bicyclist-Involved Injury Crashes by Light Condition (2019-2023) (Source: NYSDOT CLEAR)



3.6.3.2 Environmental Factors

3.6.3.2.1 Temporal Distribution (Time-of-Day & Day-of-Week)

Bicyclist-involved injury crashes across Broome/Tioga were largely clustered on weekdays, as shown in **Table 24**. Relatively few occurred on Saturdays and Sundays, accounting for just 9% of crashes, each. A relatively even distribution of bicyclist-involved injury crashes was found among Tuesday, Wednesday, Thursday, and Friday, with each of these days accounting for approximately 17%, each. Time-of-day distribution is largely clustered in the late afternoon and early evening, with the 3:00 PM to 7:00 PM block accounting for 37% of all crashes. The 3:00 PM to 4:00 PM block and 6:00 PM to 7:00 PM block are largely consistent with school and work commuting patterns, respectively, which may result in increased bicycle activity during these periods.

Table 24. Broome/Tioga – Temporal Distribution of Bicyclist-Involved Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)

Hourly Window	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
12:00 AM				1		1		2
1:00 AM						1	2	3
2:00 AM								
3:00 AM								
4:00 AM				1				1
5:00 AM			2					2
6:00 AM			1	2		2		5
7:00 AM	1	1		1		2		5
8:00 AM		1	3	1				5
9:00 AM		1	1	1			1	4
10:00 AM	2	1			1		1	5
11:00 AM	1	1	3				1	6
12:00 PM		1	2	1	2	1	2	9
1:00 PM	1		3	2	4	4		14
2:00 PM	1	1	2	3	2	2	1	12
3:00 PM		1	4	3	7	5	1	21
4:00 PM		7	1	1	2	2		13
5:00 PM		2		4	2	1	2	11
6:00 PM	4	2	3	6	2	2		19
7:00 PM	2		4	2	1		2	11
8:00 PM	2		2		2	3	1	10
9:00 PM		1	1	1	3			6
10:00 PM			1		1	3	1	6
11:00 PM	1				1	1		3
Total	15	20	33	30	30	30	15	173

3.6.3.3 Traveler Behavior ("Contributing Actions")

Among the 41 KSI crashes that involved a bicyclist, there were a total of 22 reported contributing actions. **Table 25** outlines the Top 10 contributing actions for bicyclist-involved KSI crashes. This list covers 100% of the contributing actions reported for these types of crashes. Reflecting a long-term struggle to be considered an equal user of the road, the leading contributing action for bicycle-involved KSI crashes was Failure to Yield (23%). Driver inattention was the second-most reported action for bicyclist-involved KSI crashes (18%).

Table 25. Broome/Tioga – Top 10 Contributing Actions in Bicyclist-Involved Fatal or Serious Injury Crashes (2019-2023) (Source: NYSDOT CLEAR)

Contributing Action	Total Count	% of All Reported Contributing Actions	% of Broome/Tioga Bicyclist-Involved KSI Crashes
Failure to Yield	5	23%	12%
Driver Inattention	4	18%	10%
Obstructed View	3	14%	7%
Unsafe Speed	2	9%	5%
Impairment (Drugs/Alcohol)	2	9%	5%
Passing/Unsafe Lane Usage	2	9%	5%
Turning Improper	1	5%	2%
Unsafe Lane Change	1	5%	2%
Passenger Distraction	1	5%	2%
Failure to Keep Right	1	5%	2%

3.7 Summary Insights

3.7.1 Collision Type Trends

- Broome County: Multi-vehicle crashes; vulnerable road user crashes.
- Tioga County: Single-vehicle collisions with natural elements (e.g., trees) and fixed objects.

3.7.2 Crash Type Trends

- Broome County: Head-on, rear-end and right-angle crashes.
- Tioga County: Right-angle, rear-end, and head-on crashes.

3.7.3 Crash Location Trends

- Broome County: Larger emphasis on intersection crashes, particularly traffic signal controlled intersections. Corridor crashes are primarily straight, level roadways, but some with elevation change.
- Tioga County: Primarily straight, level roadways, with some KSI crashes related to curved roadways, particularly those with elevation change.

3.7.4 Environmental Factors (Time-Based Trends)

- 2:00 PM to 3:00 PM: highest one hour block over the five-year period.
- Afternoon (12PM – 4 PM) and Evening peak (4PM – 8PM) periods accounted for largest proportion of crashes at 27% and 26%, respectively.
- Monday, Thursday, Saturday accounted for ~50% of KSI crashes.
- Tioga County: Dark, unlit roadway crashes.

3.7.5 Traveler Behavior (“Contributing Actions”) Trends

- Top three contributing actions for KSI crashes in Boome and Tioga Counties:
  - Unsafe Speed
  - Failure to Yield
  - Driver Inattention

3.7.6 Pedestrian-Involved Injury Crash Trends

- Primarily within Broome County, typically at-intersection crashes, particularly those with no control mechanism reported or traffic signal-controlled crossings.
- Driver Inattention is a commonly reported traveler behavior associated with these crashes.
- Most crashes occur late afternoon (12PM – 4PM) or early evening (4PM – 8PM), with 5PM – 6PM accounting for the highest single-hour block.

- Roadway geometry and lighting conditions do not appear to be major contributing factors.
- Intersection layout and control and driver awareness are major contributing factors.

3.7.7 Bicyclist-Involved Injury Crash Trends

- Primarily Broome County, at-intersection crashes, more commonly spread across control types (i.e. stop sign-controlled intersections do not see a significantly lower representation like they do for pedestrian crashes.
- Failure to yield is the single most reported contributing driver action, with driver inattention a close second.
- Similar pattern of afternoon and early evening period crashes accounting for the majority of crashes; 3PM – 4PM and 6PM – 7PM, in particular.

4. High Injury Network

A High Injury approach identifies road segments and intersections for safety improvements based on the injury crash history at a particular location over a given period of time. This reactive, spatially-based High Injury approach focuses only on the extent to which injury crashes of varying severities have clustered at or near a given site in the recent past.

The "High Injury Network" (HIN) developed within this Safety Action Plan synthesizes the same five-year NYSDOT crash dataset to identify crash hotspots for segments (High Injury Corridors) and intersections (High Injury Intersections), with an emphasis on the highest concentrations of serious injury and fatal crashes. Past the crash maps and methodology summary that follow, Sections 4.3 and 4.4 highlight the "High Injury Corridors" (segment-based crashes) and "High Injury Intersections" (intersection-based crashes) that comprise the overarching High Injury Network for each county.

4.1 Crash Maps

To provide an overall context for the High Injury Networks that follow, a series of county-level maps depicting the location of all injury crashes between 2019 and 2023 is provided in **Figure 53** (Broome) and **Figure 54** (Tioga).

Figure 53. Crashes by Severity – Broome County (2019-2023) (Source: NYSDOT CLEAR)

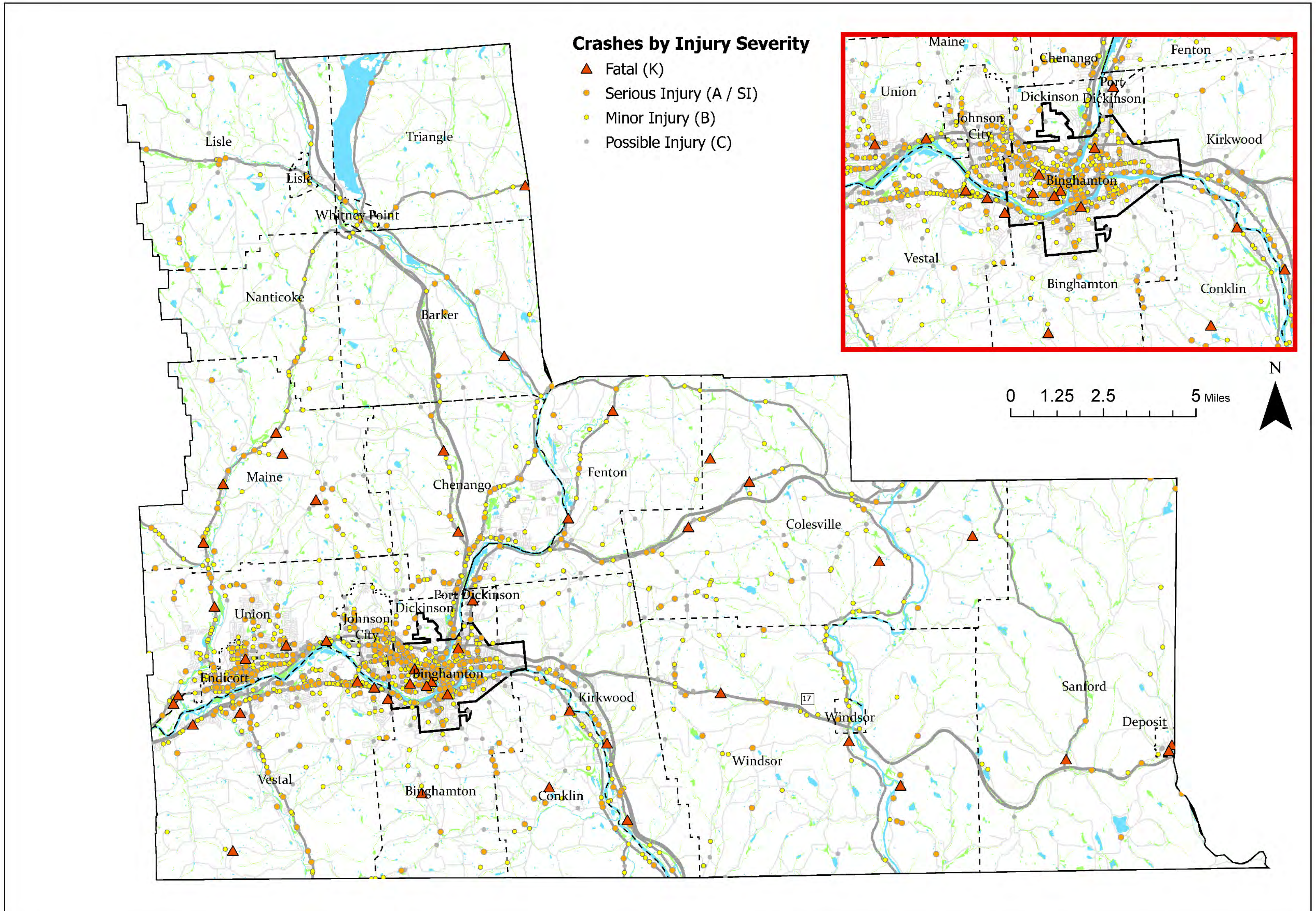
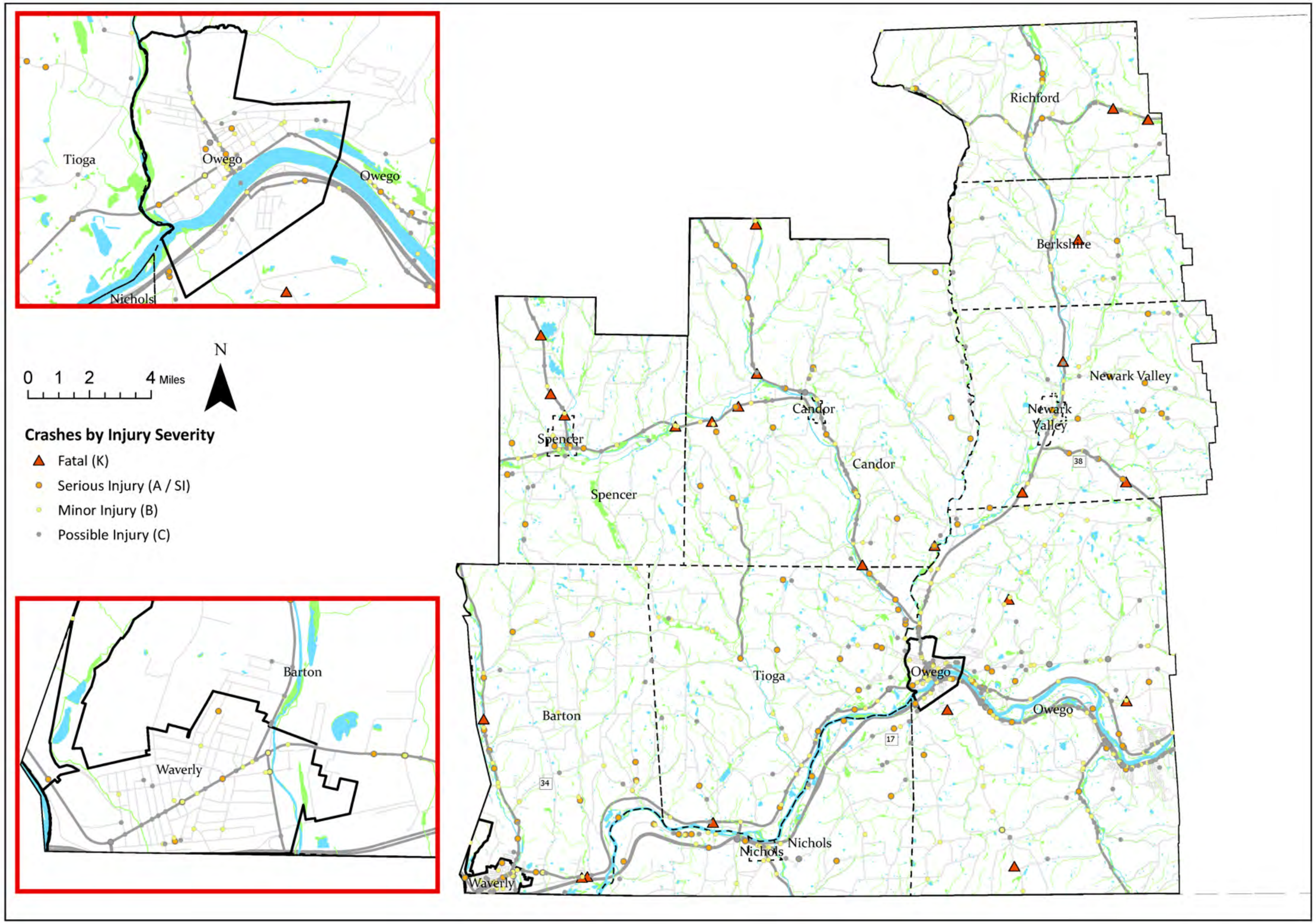


Figure 54. Crashes by Severity – Tioga County (2019-2023) (Source: NYSDOT CLEAR)



4.2 Overview of Methodology

Based on the highest injury severity level reported in the crash record, each collision with at least one injury (i.e. non-PDO) was assigned a maximum injury value (i.e., K, A, B or C). Like the crash analysis in Chapter 3, crashes occurring along interstate facilities and limited-access highways were filtered out from the underlying dataset that was used as the core input for the networks that follow. Each crash was assigned a weighting score based on the maximum injury severity for all parties involved, as shown in **Table 26**.

Table 26. High Injury Network – Injury Severity Weighting Scheme (Corridors & Intersections)

Crash Injury Severity Code	Severity Description	Other Terms Often Used	HIN Weight Applied
K	Fatal Injury	Killed	15
A / SI	Serious Injury	Incapacitating Injury	5
B	Minor Injury	Non-Incapacitating injury	2
C	Possible Injury	Complaint of Injury	1
O	No Injury	Property Damage Only	0

Each crash was then assigned to the most relevant nearby corridor or intersection based on the characteristics contained in the crash reports. For additional information on the methodology for the High Injury Network, please refer to Appendix – High Injury Network Methodology.

4.3 High Injury Corridors

A corridor **qualified for the HIC portion of the HIN if it ranked in the Top 15% of all corridors in its respective county**. To further understand the magnitude of the safety issue along each stretch and prioritize needs within the High Injury Corridors, segments were further subdivided to show the Top 10%, 5%, 3% and 1% of roadway segments in each county to identify key clusters of injury crashes.

As the HIC ranking expands from the Top 1% to the Top 15%, the share of injury crashes captured, regardless of severity, declines. This demonstrates that, based on the five-year crash history, the most critical, injury-causing locations are concentrated in the top segments of the HIC.

4.3.1 Broome County

Figure 55 displays the geographic distribution of all roadway segments comprising the HIC in Broome County by ranked percentile (e.g., Top 1%, Top 15%). The highest concentration of roadway segments that qualify as a High Injury Corridor can be found in the **City of Binghamton and the Village of Endicott**. While the highest ranked corridors are largely clustered in these more densely populated urban areas, **some key regional corridors situated outside of these municipal and village centers also account for roadway segments within the top tiers** of the HIC.

It should be noted that many of the bridge crossings, as well as their adjacent roadways, are ranked highly within the Broome County High Injury Corridors (e.g., Route 201, Tompkins St, Vestal Pkwy E., Court St, Chenango Bridge Rd). The following **corridors span multiple municipal jurisdictions and feature substantial stretches of highly-ranked segments** within the Broome County HIC, reflecting a well-established history of severe crash outcomes.

- Vestal Parkway East (Vestal – Binghamton)
- Union Center-Maine Highway (Endicott – Union – Maine) / Route 26 (Nanticoke)
- East Main Street (Endicott – Union)
- Front St (Binghamton) / Upper Front St (Dickinson – Chenango)
- Smith Hill Road (Chenango – Union)
- Route 79 (Windsor Town – Village)

Based on a qualitative review of the HIC map, **Table 27** lists up to four facilities in each municipality ranked among the top segments within the Broome County HIC.

Table 27. High Injury Corridors – Broome County – Notable Facilities by Municipality

Town Name	HIC Facility #1	HIC Facility #2	HIC Facility #3	HIC Facility 4
Barker	Barker Rd	Route 79	Walters Rd	Route 11
Binghamton (C)	Main St	Clinton St	Tompkins St	Glenwood Ave
Binghamton (T)	Hawleyton Rd	Pierce Creek Rd	Morgan Rd	Park Ave
Chenango	Upper Front St	Route 12	Castle Creek Rd	Smith Hill Rd
Colesville	Route 79	Welton St	Colesville Rd	Route 7
Conklin	Conklin Rd (North)	Conklin Rd (South)	Pierce Creek Rd	Montrose Dr
Deposit	Oquaga Lake Rd	Second St	-	-
Dickinson	Airport Rd	Upper Front St	I-81 NB Exit 5 Ramps	-
Endicott	East Main St	N. Nanticoke Ave	Jennings St	Oak Hill Ave
Fenton	Route 369	Route 7B	Chenango St	Pigeon Hill Rd

Town Name	HIC Facility #1	HIC Facility #2	HIC Facility #3	HIC Facility 4
Johnson City	Route 201 North	Riverside Dr	Reynolds Rd	Harry L. Dr
Kirkwood	Route 11 South	Route 11 North	Colesville Rd	Main St
Lisle (T)	Route 79	Church Rd	Caldwell Hill Rd	Route 11
Lisle (V)	River St	Main St	-	-
Maine	Route 26 South	Route 26 North	East Maine Rd	Farm to Market Rd
Nanticoke	Route 26 South	Route 26 North	Caldwell Hill Rd	-
Port Dickinson	-	-	-	-
Sanford	Route 41 near SR 17	Old Route 17 near SR 17	Stillson Rd	North Sanford Rd
Triangle	Chestnut Dr	Route 206 East	Route 206 West	-
Union	Union Center-Maine Hwy	East Main St	Hooper Rd	Watson Blvd
Vestal	Vestal Parkway	Vestal Rd	Route 201 North	Sycamore Rd
Whitney Point	Route 11 North	East Main St	Route 11 South	Route 26
Windsor (T)	Route 79 (North of Village)	State Line Rd	Fox Farm Rd	Route 79 (South of Village)
Windsor (V)	Main St (North of SR 17)	Main St (South of SR 17)	Chapel St	-

Figure 55. High Injury Corridors – Broome County

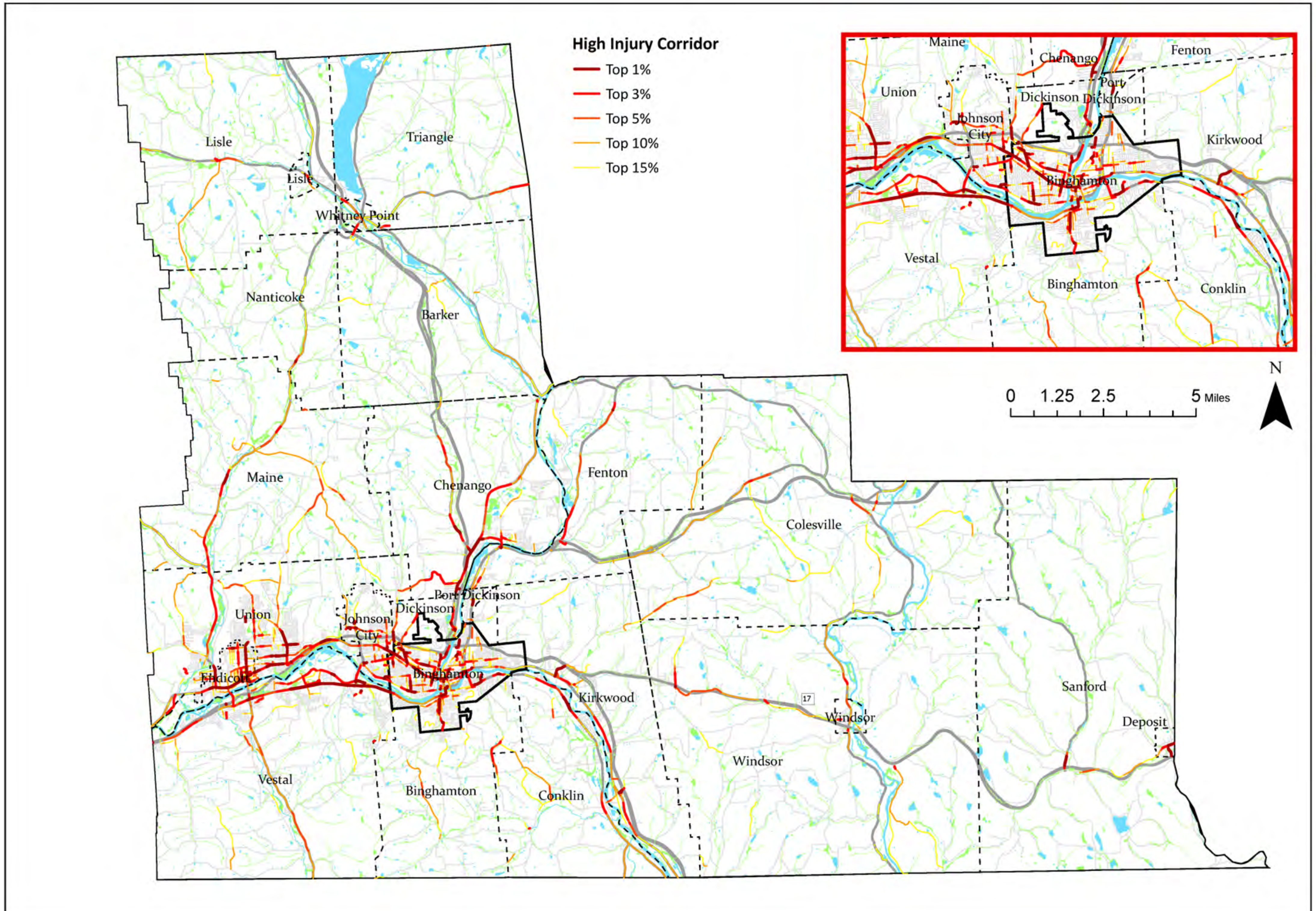


Table 28 shows the representation of fatal, serious injury, and all injury crashes within each rank of the Broome County High Injury Corridors. **In Broome County, the Top 15% of corridors covered 100% of fatal, 96% of serious injury, and 89% of all injury, corridor-based crashes** over the five-year period. The bottom 85 percent (i.e., roads outside of the HIC or beyond the Top 15%) covered relatively few serious injury (4%) and only 11% of all injury crashes. The Top 1% in Broome includes 38% of fatal, 33% of serious injury, and 29% of all injury crashes. In aggregate, **the Top 3% captures 68% of fatal, 59% of serious injury, and 50% of all injury crashes** along corridors in Broome.

Table 28. Proportion of Segment-Based Crashes Covered by the HIC (by Severity Type) – Broome County

HIC Ranking	Fatal Injury (K) Crashes	Aggregate Share of K Crashes (%)	Serious Injury (A) Crashes	Aggregate Share of A Crashes (%)	KSI Combined	Aggregate Share of KSI Crashes (%)	All Injury Crashes (KABC)	Aggregate Share of Injury Crashes (%)
Top 1%	14	38%	98	33%	112	34%	534	29%
Top 3%	11	68%	76	59%	87	60%	379	50%
Top 5%	4	78%	33	70%	37	71%	227	63%
Top 10%	8	**100%**	51	87%	59	88%	338	81%
Top 15%	0	*100%*	28	96%	28	97%	142	89%
HIC TOTAL	37	*100%*	286	96%	323	97%	1,618	89%
Not In HIC	0	*100%*	11	4%	11	3%	202	11%
TOTAL	37	100%	297	100%	334	100%	1,820	100%

Table 29 examines how different towns within Broome County are represented within each rank across the HIC. For example, of the 22.4 roadway miles that comprise the Top 1% of the segment-based portion of the HIN, 24% are located within the **Town of Vestal**.

The **Town of Vestal, City of Binghamton, and Town of Union** accounted for the majority of roadway mileage falling within the aggregate **Top 3%** of HIN segments, indicating specific corridors in these municipalities are likely critical locations for safety interventions. Despite combining to account for 27% of the county's mileage, **corridors in these three jurisdictions covered 58% of mileage in the Top 1% of the HIC, and 49% within the Top 3%**. Other notable municipalities within the Top 10% and 15% ranks include **Windsor, Maine, and Colesville**. The "Not in HIC" column reflects segments with a crash history that fall outside the designated HIC.

Table 29. Relative Share of HIC Mileage by Municipality – Broome County

Town Name	Top 1%	Top 3%	Top 5%	Top 10%	Top 15%	Not in HIC	Total Mileage
Barker	0%	0%	0%	2%	5%	5%	4%
Binghamton (C)	22%	18%	14%	12%	12%	8%	9%
Binghamton (T)	0%	1%	2%	2%	3%	4%	3%
Chenango	10%	12%	7%	5%	2%	5%	5%
Colesville	0%	0%	6%	8%	12%	8%	8%
Conklin	2%	3%	4%	6%	4%	3%	3%
Deposit	2%	1%	0%	0%	0%	0%	0%
Dickinson	2%	3%	3%	2%	1%	1%	1%
Endicott	15%	6%	4%	5%	4%	2%	2%
Fenton	0%	4%	3%	4%	3%	5%	5%
Johnson City	4%	5%	5%	3%	3%	3%	3%
Kirkwood	3%	5%	3%	5%	6%	5%	5%
Lisle (T)	0%	0%	1%	5%	3%	4%	4%
Lisle (V)	0%	0%	0%	0%	0%	0%	0%
Maine	1%	4%	7%	11%	6%	4%	5%
Nanticoke	0%	0%	1%	1%	2%	2%	2%
Port Dickinson	1%	0%	0%	0%	0%	0%	0%
Sanford	1%	0%	1%	1%	2%	9%	8%
Triangle	0%	2%	2%	0%	2%	3%	3%
Union	12%	15%	13%	11%	8%	7%	8%
Vestal	24%	16%	16%	10%	10%	9%	10%
Whitney Point	0%	0%	1%	1%	1%	0%	0%
Windsor (T)	0%	2%	5%	7%	11%	9%	9%
Windsor (V)	0%	0%	1%	1%	0%	0%	0%
TOTAL MILEAGE	22.4 mi.	45.2 mi.	45.3 mi.	112.4 mi.	113.3 mi.	1,928.3 mi.	2,266.9 mi.

4.3.2 Tioga County

Figure 56 shows all HIC road segments in Tioga County based on ranked percentile. The highest concentration of High Injury Corridors is located in the **Village of Owego**. While the highest ranked corridors are largely clustered in these more densely populated villages (Owego, Spencer, Newark Valley, Candor, and Nichols), **some key regional corridors situated outside of the village centers also account for high ranked segments** of the HIC, including **the towns of Owego, Spencer, Richford, Candor, and Newark Valley**.

The following **corridors cross municipal lines and appear prominently** within the Tioga County HIC, demonstrated a substantial record of fatal and serious injury crashes.

- Waverly Rd / State Route 17C (Tioga – Owego Town – Village)
- Spencer Rd (Candor – Spencer)
- State Route 96 (Tioga – Candor)
- West River Rd (Nichols Town – Village)
- Ithaca Rd (Spencer Town – Village)
- Chemung St (Barton – Waverly – Barton)

Table 30 shows up to four facilities in each municipality ranked among the top segments within the Tioga County HIC based on a qualitative review of the map.

Table 30. High Injury Corridors – Tioga County - Notable Facilities by Municipality

Town Name	HIC Facility #1	HIC Facility #2	HIC Facility #3	HIC Facility 4
Barton	SR 34 (North of Camptown Rd)	Route 17C	SR 34 (South of Talmadge Hill Rd)	Oak Hill Rd
Berkshire	East Berkshire Rd	West Creek Rd	-	-
Candor (T)	Spencer Rd	Park Settlement Rd	Owego Rd (Near Village)	Ithaca Rd
Candor (V)	Owego St	-	-	-
Newark Valley (T)	SR 38B	SR 38 (South of Village)	Newark Valley Maine Rd	Ketchumville Rd
Newark Valley (V)	Whig St	North Main St	South Main St	-
Nichols (T)	West River Rd	Stanton Hill Rd	East River Rd	Decker Hill Rd
Nichols (V)	West River Rd	South Main St	-	-
Owego (T)	SR 434 & SR 434 Connector	SR 17C	East Campville Rd	Lisle Rd
Owego (V)	North Ave	West Main St	Park St – Court St Couplet	Susquehanna River Bridge Rd
Richford	SR 79 East	SR 38 North	SR 79 West	West Creek Rd
Spencer (T)	Ithaca Rd	Candor Rd East	Sabin Rd	Dean Creek Rd
Spencer (V)	North Main St	Owego St	East Tioga St	Center St
Tioga	SR 96	Glenmary Dr	Waverly Rd	West Beecher Hill Rd
Waverly	Chemung St (near Barton)	Ithaca St	Pine St	Waverly St

Figure 56. High Injury Corridors – Tioga County

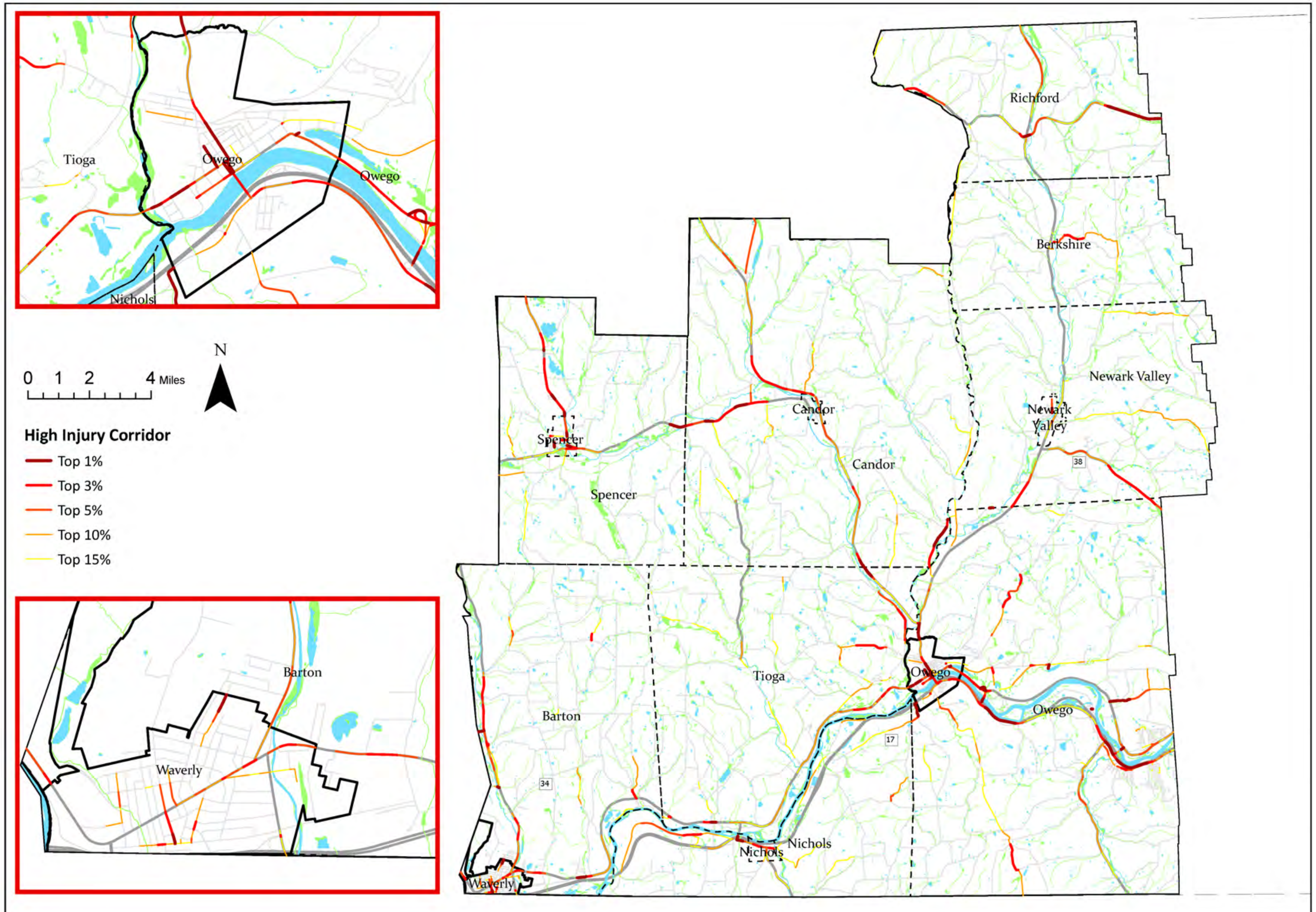


Table 31 shows how fatal, serious, and all injury crashes are concentrated at different levels within the Tioga County HIC. The Top 1% of corridors account for 50% of fatal, 25% of serious injury, and 17% of all injury crashes in Tioga County, indicating a high concentration of severe incidents in a small portion of the network. The **Top 3% covers a combined 92% of fatal, 42% of serious injury, and 34% of all injury crashes**. All but one fatal and serious injury crash was captured in the Tioga County HIC, with only 16% of all injury crashes distributed across the bottom 85% (i.e., off the HIC).

Table 31. Proportion of Segment-Based Crashes Covered by the HIC (by Severity Type) – Tioga County

HIC Ranking	Fatal Injury (K) Crashes	Aggregate Share of K Crashes (%)	Serious Injury (A) Crashes	Aggregate Share of A Crashes (%)	KSI Combined	Aggregate Share of KSI Crashes (%)	All Injury Crashes (KABC)	Aggregate Share of Injury Crashes (%)
Top 1%	12	50%	31	25%	43	29%	107	17%
Top 3%	10	92%	24	45%	34	53%	104	34%
Top 5%	2	**100%**	18	60%	20	66%	81	47%
Top 10%	0	*100%*	34	88%	34	90%	152	71%
Top 15%	0	*100%*	14	99%	14	99%	76	84%
HIC TOTAL	24	100%	121	99%	145	99%	520	84%
Not In HIC	0	*100%*	1	1%	1	1%	101	16%
TOTAL	24	100%	122	100%	146	100%	621	100%

Table 32 shows the distribution of each HIC category across Tioga County municipalities. For example, of the 13.0 roadway miles that comprise the Top 1% of the segment-based portion of the HIN, 38% are located within the **Town of Owego**.

The **Town of Owego** is substantially over-represented within the Top 10%, particularly the Top 1% (38%), Top 5% (24%), and Top 10% (27%). The **Town of Candor** also shows consistently high shares, notably for the Top 3% (19%) and Top 5% (19%). Given its relatively small share of county mileage, the **Town of Richford** also has a notable share in the Top 1% (16%) and Top 5% (11%). In addition to these, the towns of **Tioga, Newark Valley, and Barton** also had strong showings within the higher ranks of the HIC (Top 10% and Top 15%). The "Not in HIC" column reflects segments with a crash history that fall outside the designated HIC.

Table 32. Relative Share of HIC Mileage by Municipality – Tioga County

Town Name	Top 1%	Top 3%	Top 5%	Top 10%	Top 15%	Not HIC	Total Mileage
Barton	4%	12%	10%	9%	6%	13%	13%
Berkshire	0%	3%	2%	3%	3%	5%	4%
Candor (T)	13%	19%	19%	11%	16%	15%	15%
Candor (V)	0%	0%	0%	1%	0%	0%	0%
Newark Valley (T)	1%	10%	4%	9%	8%	7%	7%
Newark Valley (V)	1%	0%	1%	0%	1%	1%	1%
Nichols (T)	2%	2%	7%	10%	12%	8%	8%
Nichols (V)	0%	2%	1%	1%	1%	0%	0%
Owego (T)	38%	21%	24%	27%	21%	21%	22%
Owego (V)	10%	4%	4%	4%	1%	2%	2%
Richford	16%	4%	11%	5%	6%	6%	6%
Spencer (T)	7%	8%	2%	5%	5%	8%	7%
Spencer (V)	3%	3%	2%	1%	1%	0%	1%
Tioga	4%	9%	8%	12%	17%	11%	11%
Waverly	2%	2%	4%	3%	1%	2%	2%
TOTAL MILEAGE	13.0 mi.	26.4 mi.	26.3 mi.	66.5 mi.	66.2 mi.	1,124.1 mi.	1,322.5 mi.

4.4 High Injury Intersections

4.4.1 Broome County

Figure 57 shows the geographic distribution of the Top 100 intersections in Broome County. The HII is highly concentrated in Union, Vestal and the City of Binghamton. As shown in **Table 33**, **the Top 100 intersections capture 58% of all "At-intersection" crashes that resulted in a fatal or serious injury**, as well as 42% of all injury crashes. **All nine fatal crashes occurred within the Top 40.**

Table 33. Broome County High Injury Intersections – Injury Crashes Coverage Summary

County Intersection Ranking	Fatal Injury (K) Crashes	Aggregate Share of K Crashes (%)	Serious Injury (A) Crashes	Aggregate Share of A Crashes (%)	KSI Combined	Aggregate Share of KA Crashes (%)	All Injury Crashes (KABC)	Aggregate Share of Injury Crashes (%)
Top 10	0	0%	26	12%	26	12%	120	9%
Top 20	3	33%	14	19%	17	19%	60	13%
Top 40	6	**100%**	27	31%	33	34%	97	20%
Top 60	0	*100%*	24	42%	24	44%	122	29%
Top 80	0	*100%*	16	50%	16	52%	91	36%
Top 100	0	*100%*	14	56%	14	58%	80	42%
HII TOTAL	**9**	***100%***	**121**	**56%**	**130**	**58%**	**570**	**42%**
Not In HII	0	*100%*	95	44%	95	42%	801	58%
TOTAL	**9**	**100%**	**216**	**100%**	**225**	**100%**	**1,371**	**100%**

Table 34 shows the share of intersections in each municipality for different ranks within the HII. The **City of Binghamton** accounts for the single largest representation of intersections within each HII category, accounting for half of the intersections included in each with the exception of the Top 40 (i.e., for ranks 21 – 40). Outside of the City of Binghamton, urbanized areas, including **Endicott** and **Vestal**, account for significant shares of intersections falling within the intersection component of the HIN. **Many of the Top 20 intersections fall within these three communities, with minor representation from Johnson City (two in Top 10), Union (two in Top 11-20), and Dickinson (1 in Top 10)**.

Table 34. Relative Share of HII by Municipality – Broome County

Town Name	Top 1 – 10	Top 11 – 20	Top 21 – 40	Top 41 – 60	Top 61 – 80	Top 81 – 100	Not in HII	Total
Barker	0%	0%	0%	0%	0%	0%	1%	1%
Binghamton (C)	50%	50%	45%	50%	55%	55%	22%	23%
Binghamton (T)	0%	0%	0%	0%	0%	0%	3%	3%
Chenango	0%	0%	0%	0%	0%	10%	5%	5%
Colesville	0%	0%	5%	0%	0%	0%	3%	3%
Conklin	0%	0%	0%	0%	0%	0%	3%	3%
Deposit	0%	0%	0%	0%	0%	0%	1%	1%
Dickinson	10%	0%	0%	0%	0%	0%	2%	2%
Endicott	10%	20%	15%	25%	20%	20%	7%	7%
Fenton	0%	0%	0%	0%	0%	0%	3%	3%
Johnson City	20%	0%	5%	0%	5%	10%	9%	8%
Kirkwood	0%	0%	0%	0%	0%	5%	3%	3%
Lisle (T)	0%	0%	0%	0%	0%	0%	1%	1%
Lisle (V)	0%	0%	0%	0%	0%	0%	0%	0%
Maine	0%	0%	0%	5%	0%	0%	2%	2%
Nanticoke	0%	0%	0%	0%	0%	0%	1%	0%
Port Dickinson	0%	0%	0%	0%	5%	0%	1%	1%
Sanford	0%	0%	0%	0%	0%	0%	1%	1%
Triangle	0%	0%	0%	0%	0%	0%	1%	1%
Union	0%	20%	0%	0%	0%	0%	17%	16%
Vestal	10%	10%	30%	20%	15%	0%	13%	13%
Whitney Point	0%	0%	0%	0%	0%	0%	1%	1%
Windsor (T)	0%	0%	0%	0%	0%	0%	2%	2%
Windsor (V)	0%	0%	0%	0%	0%	0%	1%	0%
TOTAL INTERSECTIONS	**10**	**10**	**20**	**20**	**20**	**20**	**4,714**	**4,814**

Figure 57. Top 100 High Injury Intersections – Broome County

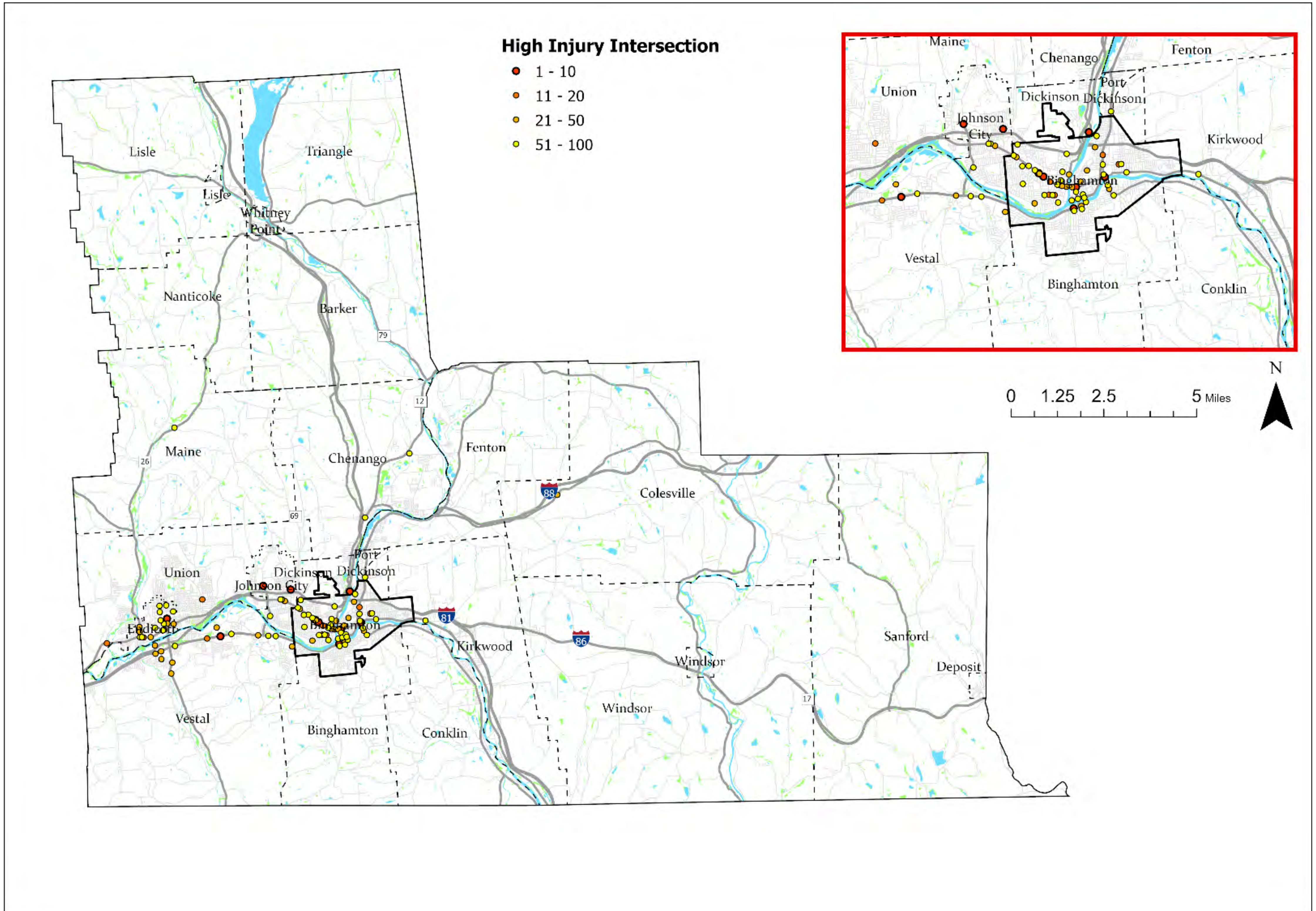


Table 35 lists the Broome County HII's Top 20 intersections with the most severe crash history based on the same injury severity scheme that was used for the HIC. Most locations have no fatal crashes, but many have multiple serious injury crashes, indicating that while deadly crashes are relatively rare, the most severe outcomes tend to be clustered at a limited number of specific intersections.

The **Vestal Parkway East, Court Street, and Main Street** corridors each had two intersections listed in the Top 10 entries. Several intersections, such as Leroy Street and Chapin Street, show fewer total crashes but a high number of serious injuries, signaling severity hotspots or the location of a fatal crash. The "Two-County Rank" reflects the intersection's overall position across the combined Broome/Tioga study area. **The top 32 HII locations in the Broome/Tioga region are located in Broome County**, though the table below only shows the Top 20.

Table 35. Intersection-Based Crash Counts and Rankings for the Top 20 HII (by Severity Type) – Broome County

County Rank	Two-County Rank	Cross-Streets	Fatal Injury (K) Crashes	Serious Injury (A / SI) Crashes	KSI Crashes Combined	All Injury (KABC) Crashes
1	1	Court St & Brandywine Ave	0	3	3	22
2	2	Vestal Parkway E. & S. Washington St	0	5	5	14
3	3	Vestal Parkway E. & Sycamore St	0	1	1	18
4	4	Main St & Beethoven St	0	4	4	9
5	5	State Highway 201 & Harry L. Dr	0	0	0	14
6	6	Court St & State St	0	2	2	13
7	7	Upper Front St & Bevier St	0	2	2	8
8	8	North St & McKinley Ave	0	3	3	8
9	9	Main St & Jarvis St	0	3	3	7
10	10	Harry L. Dr & Lester Ave	0	3	3	7
11	11	Leroy St & Chapin St	1	1	2	2
12	12	Main St & Edwards St	0	3	3	7
13	13	E. Main St & S Loder St	0	2	2	9
14	14	State Rte. 7 & Frederick St	0	0	0	11
15	15	N. Nanticoke St & Jennings Ave	0	3	3	5
16	16	Vestal Parkway E. & N. African Road	0	1	1	9
17	17	Hooper Dr & Country Club Rd	1	0	1	3
18	18	Leroy St & Chestnut St	0	2	2	6
19	19	Robinson St & Ely St	0	2	2	6
20	20	W. Main St & Glendale Dr	1	0	1	2
TOTAL FOR TOP 20 (SHARE OF ALL INTERSECTION CRASHES)			**3 (33%)**	**40 (19%)**	**43 (19%)**	**180 (13%)**

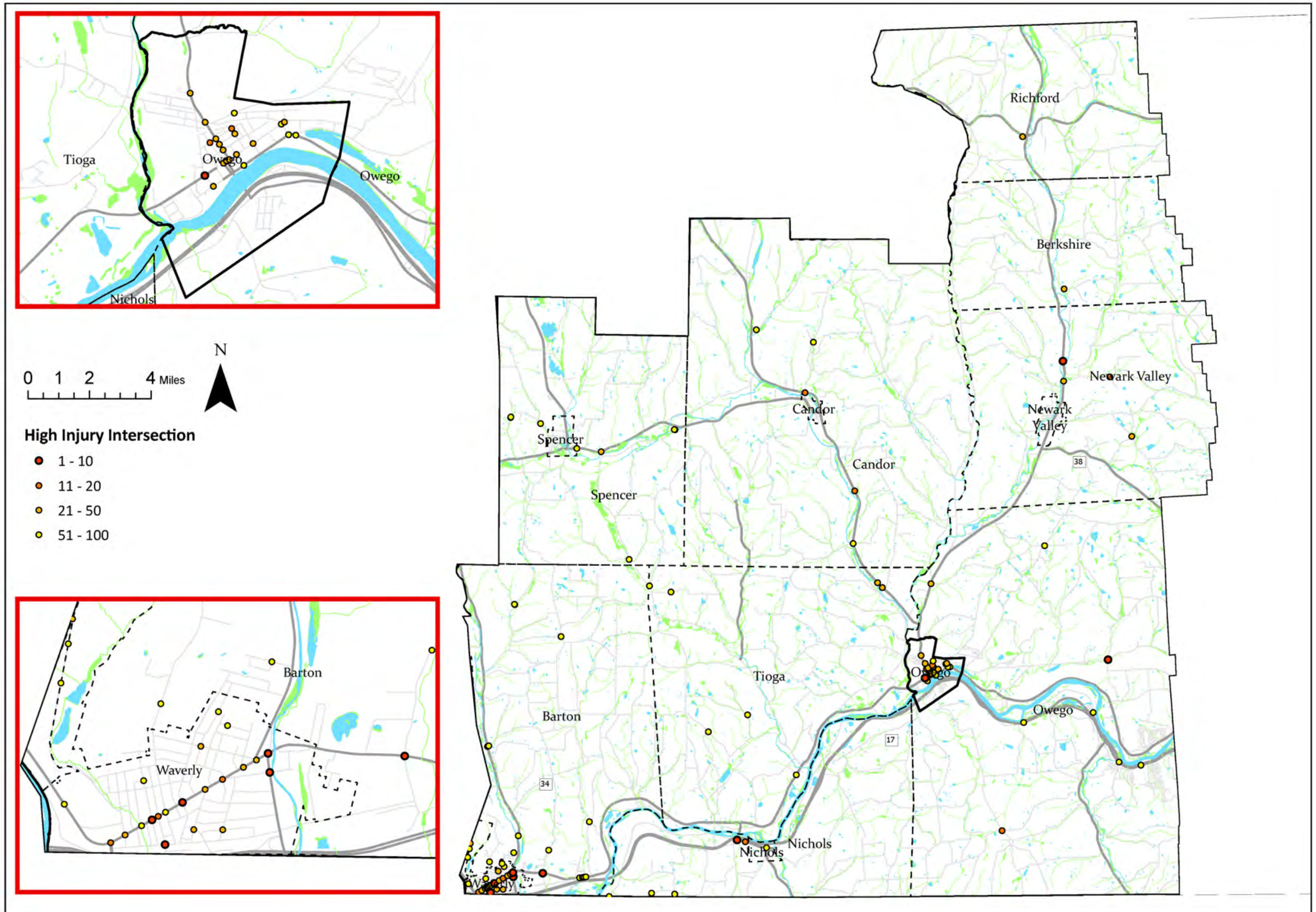
4.4.2 Tioga County

Figure 58 shows the Top 100 High Injury Intersection locations within Tioga County. There are **clusters of HII locations within Waverly, Owego (both town and village), and Barton**. Except for the Village of Candor, each municipality in Tioga County had at least one intersection identified within the Top 100, demonstrating a more widespread distribution than Broome. As shown in **Table 36**, the lone At-intersection fatal crash in Tioga County is captured in the Top 10; all severe injury crashes are accounted for within the Top 20; and **all injury crashes, regardless of severity, are accounted for within the Top 80 intersections**. This indicates that most At-intersection crashes resulting in an injury in Tioga County are clustered in relatively few geographic locations.

Table 36. Tioga County High Injury Intersections – Injury Crashes Coverage Summary

County Intersection Ranking	Fatal Injury (K) Crashes	Aggregate Share of K Crashes (%)	Serious Injury (A) Crashes	Aggregate Share of A Crashes (%)	KSI Combined	Aggregate Share of KSI Crashes (%)	All Injury Crashes (KABC)	Aggregate Share of Injury Crashes (%)
Top 10	1	**100%**	9	50%	10	53%	27	28%
Top 20	0	*100%*	9	**100%**	9	**100%**	16	45%
Top 40	0	*100%*	0	*100%*	0	*100%*	25	71%
Top 60	0	*100%*	0	*100%*	0	*100%*	22	94%
Top 80	0	*100%*	0	*100%*	0	*100%*	6	**100%**
Top 100	0	*100%*	0	*100%*	0	*100%*	0	*100%*
High Injury Intersections Total	**1**	***100%***	**18**	***100%***	**19**	***100%***	**96**	***100%***
Not In HII	0	*100%*	0	*100%*	0	*100%*	0	*100%*
Total	**1**	**100%**	**18**	**100%**	**19**	**100%**	**96**	**100%**

Figure 58. Top 100 High Injury Intersections – Tioga County



As shown in **Table 37**, 22% of the Top 100 intersections in Tioga County are located within the **Village of Waverly**, while only accounting for 8% of the County's intersections. Similarly, despite a relatively small share of county-wide mileage, the **Village of Owego** accounts for another 21% of the Top 100, with strong representation within the Top 40. Intersections falling within the Top 100 clustered around the urbanized village centers.

Table 37. Relative Share of High Injury Intersections by Municipality – Tioga County

Town Name	Top 1 – 10	Top 11 – 20	Top 21 – 40	Top 41 – 60	Top 61 – 80	Top 81 – 100	Not in HII	Total
Barton	10%	0%	5%	5%	35%	35%	11%	11%
Berkshire	0%	0%	0%	5%	0%	0%	3%	3%
Candor (T)	0%	20%	0%	5%	0%	10%	10%	9%
Candor (V)	0%	0%	0%	0%	0%	0%	2%	2%
Newark Valley (T)	10%	10%	5%	5%	0%	0%	4%	4%
Newark Valley (V)	0%	0%	0%	0%	0%	0%	2%	2%
Nichols (T)	10%	10%	0%	0%	15%	0%	5%	5%
Nichols (V)	0%	0%	0%	5%	0%	0%	1%	1%
Owego (T)	10%	10%	5%	15%	0%	10%	28%	27%
Owego (V)	10%	20%	60%	20%	10%	0%	6%	7%
Richford	0%	0%	5%	0%	0%	0%	4%	4%
Spencer (T)	0%	0%	5%	5%	25%	5%	6%	6%
Spencer (V)	0%	0%	0%	0%	0%	0%	2%	2%
Tioga	0%	0%	10%	5%	0%	20%	9%	9%
Waverly	50%	30%	5%	30%	15%	20%	7%	8%
TOTAL INTERSECTIONS	10	10	20	20	20	20	1,498	1,598

Table 38 shows the **Top 20 intersections in Tioga County** based on the weighted injury score. Most locations have a history of serious and other injury crashes, but **no fatal crashes, with the exception of State Route 38**. Several intersections, such as **Cayuta Avenue and Ithaca Street** and **State Route 17 and Talmadge Hill Road**, had multiple serious injury crashes during the five-year period. Many of Tioga's Top 20 intersections can be found along **Chemung Street**, which indicates a broader, corridor-level safety concern. **Tioga County had less severe injuries at intersections than Broome County**, as indicated by the relatively low ranks for Tioga shown in the "Two-County Rank" column. In fact, the highest-ranked intersection in Tioga County came in 33rd overall on the Broome/Tioga combined list. Four of Tioga's Top 20 intersections fell within the Top 100 list for Broome/Tioga.

Table 38. Intersection-Based Crash Counts and Rankings for the Top 20 HII (by Severity) – Tioga County

County Rank	Two-County Rank	Cross-Streets	Fatal Injury (K) Crashes	Serious Injury (A / SI) Crashes	KSI Crashes Combined	All Injury (KABC) Crashes
1	33	State Rt 38 & Green Valley Mobile Home Community [Newark Valley]	1	0	1	1
2	56	Cayuta Ave & Ithaca St	0	2	2	3
3	60	State Rt 17 & Talmadge Hill Rd	0	2	2	3
4	90	Tilbury Hill Rd & Day Hollow Rd	0	1	1	3
5	109	State Highway 282 & W River Rd	0	1	1	2
6	112	Broad St & Fulton St	0	0	0	5
7	113	Chemung St & Clark St	0	0	0	4
8	114	Chemung St & Park Ave	0	1	1	2
9	134	Chemung St & Cayuta Ave	0	1	1	2
10	135	W. Main St & McMaster St	0	1	1	2
11	144	Fox St & Central Ave	0	1	1	2
12	145	Chemung St & I-220	0	1	1	2
13	146	Chemung St & Fulton Ave	0	0	0	5
14	167	Owego Rd & Hamar's Estates Mobile Home & Jewel Trailer Park [Candor]	0	1	1	1
15	169	W. River Rd & Exit 62 Southbound Off-Ramp (I-86 / State Rt 17)	0	1	1	1
16	173	Chestnut Ridge Rd & Montrose Pkwy	0	1	1	1
17	174	Spencer Ave & Fox St	0	1	1	1
18	175	Chemung St & Sawyer Pl	0	1	1	1
19	230	Owego Rd & Cole Book Rd	0	1	1	1
20	243	Bailey Hollow Rd & Delaney Rd	0	1	1	1
TOTAL FOR TOP 20 (SHARE OF ALL INTERSECTION CRASHES)			1 (100%)	18 (100%)	19 (100%)	43 (45%)

5. Systemic Analysis & High-Risk Network

This chapter offers an introductory discussion of systemic analysis, then focuses primarily on the predictive High Risk Network (HRN), which leverages the results of the systemic analysis to predict crash risk across the entire roadway network. For detailed results from the systemic analysis results, please refer to APPENDIX –Systemic Analysis.

5.1 Introduction to Systemic Analysis

To better understand the roadway characteristics that contribute to the most severe traffic safety outcomes in Broome/Tioga, a **systemic analysis** was conducted using a range of variables drawn from both NYSDOT's Road Inventory and other relevant data sources (e.g., Census). The systemic approach goes beyond traditional hotspot analysis by examining **network-wide patterns** that may indicate elevated risk for **Fatal or Seriously Injured (KSI)** crashes, even in locations with no crash history.

To **explore how each roadway characteristic is related to the risk for both KSI and all types of injury crashes**, the characteristics were assessed individually and a representation ratio, or index, was calculated using the following formula:

$$\frac{\text{Fatal or Serious}_{\text{roadway type}}}{\text{Fatal or Serious}_{\text{region}}} \Big/ \frac{\text{Miles}_{\text{roadway type}}}{\text{Miles}_{\text{region}}}$$

A representation ratio of 1 reflects the typical rate of crashes, averaged across the entire road network. **Ratios greater than 1 reflect characteristics that were frequently present (i.e., overrepresented)** at the site of KSI or All Injury crashes, **indicating a higher relative crash risk**. Features with ratios less than 1 appeared less often (i.e., underrepresented) at the site of KSI or All Injury crashes, which indicates comparatively lower risk.

The **variables selected for this systemic analysis** span the categories outlined below.

- Roadway Operations – Daily Vehicle Volumes, Pedestrian-Bicycle Activity Levels
- Roadway Regulations – Posted Speed Limit, Functional Classification
- Roadway Capacity – Total Number of Vehicle Lanes
- Area Context – Area Type, Community Vulnerability Status

5.2 High Risk Network

While the High Injury Network is reactive and heavily location-based**, the High Risk Network (HRN) is a predictive, risk-based systemic approach that seeks to estimate where future injury crashes are most likely to occur** based on a host of factors that appear to be influential to fatal and serious injury crashes (e.g., speed limit, lane count, vehicle volumes). In other words, it **leverages the characteristics-based systemic analysis to target facilities that are expected to have a heightened crash risk now and into the future (in the absence of safety-oriented change)**.

5.2.1 Overview of Methodology

In generating the High Risk Network, a total of 100 potential HRN points were allocated among six key variables. Each of the characteristics selected for the HRN was found to occur more often than expected within fatal and serious injury crashes. Based on the magnitude of the KSI crash risk ratios, maximum weights were assigned among the variables. For each characteristic considered, sub-scores were developed for different categories based on a combination of the risk ratio and the category's prevalence across the regional road network. Any roadway data found to be missing or not reported was assigned zero points.

The roadways in the region are varied, and no single roadway received the maximum possible number of points, with the greatest HRN score assigned being 90 points. Roadways with equal points were then aggregated and the total length of roadway mileage for each score was calculated to develop a cohesive network-level ranking, or percentile, based upon categories of roadway mileage. The top 3% of all region roadways comprised the highest rankings, with total scores ranging from 44 to 90.

Table 39 shows the rubric used to classify each road segment into one of five HRN designations based on its percentile ranking among all roadway centerline miles.

Table 39. HRN Scoring Matrix

HRN Category	Share of Centerline Miles	Scoring Threshold
Highest	Top 3%	**44 +**
Higher	Top 5%	41 – 43
High	Top 10%	34 – 40
Moderate	Top 25%	31 – 33
Low	Top 50%	29 – 30
Not in HRN	Bottom 50%	0 – 28

5.2.2 HRN Evaluation Rubric & Systemic Analysis Summary

Table 40 summarizes the systemic analysis results and the data underlying the HRN, including the variables used, network coverage, HRN points assigned, and risk ratios for KSI and All Injury crashes.

Table 40. High Risk Network (Broome/Tioga) – Systemic Risk Results & HRN Weighting Scheme

Category	Variable Assessed	Risk Factor	Share of Center-line Miles	HRN Points Assigned	KSI Crash Risk Ratio	All Injury (KABC) Crash Risk Ratio
Roadway Operations	*Daily Vehicle Volumes (AADT)*	15,000 or More	<1 %	**36**	9.29	30.43
		10,000 - 14,999	1%	24	8.11	15.44
		5,000 - 9,999	3%	18	5.76	6.45
		2,500 - 4,999	5%	12	4.20	3.53
		Less than 2,500	81%	2	0.62	0.49
		No Data	10%	0	0.22	0.16
	Pedestrian – Bicycle Activity Levels	High Activity	3%	**12**	4.76	6.08
		Moderate Activity	7%	6	2.82	3.80
		Low Activity	78%	2	0.84	0.72
		No Data	13%	0	0.18	0.09
Roadway Regulations	*Posted Speed Limit*	65+ mph	0%	**24**	4.00	0.80
		55 – 60 mph	56%	21	0.85	0.63
		45 - 50 mph	5%	18	2.85	3.22
		35 - 40 mph	7%	6	1.18	1.67
		0- 30 mph	29%	0	1.03	1.23
		No Data	4%	0	0.50	0.88
Roadway Capacity	*Total Number of Vehicle Lanes*	4+ Lanes	1%	**12**	4.63	9.93
		3 Lanes	< 1%	4	1.61	4.02
		2 Lanes	93%	2	0.97	0.88
		1 Lane	2%	2	1.38	1.77
		No Data	4%	0	0.41	0.58
Area-Specific Variables	*Area Type*	Cluster	3%	**10**	1.36	1.53
		Urban	27%	6	1.73	2.15
		Rural	70%	3	0.70	0.52
	Community Vulnerability Status	High Priority Equity Area (Top 20%)	13%	**6**	2.24	3.12
		Equity Area (Top 21-40%)	7%	3	1.50	1.63
		Not an Equity Area	80%	0	0.81	0.71

5.2.3 HRN Maps

Figure 59 and **Figure 60** provide county-level maps of the HRN in Broome and Tioga, respectively.

Figure 59. High Risk Network Map – Broome County

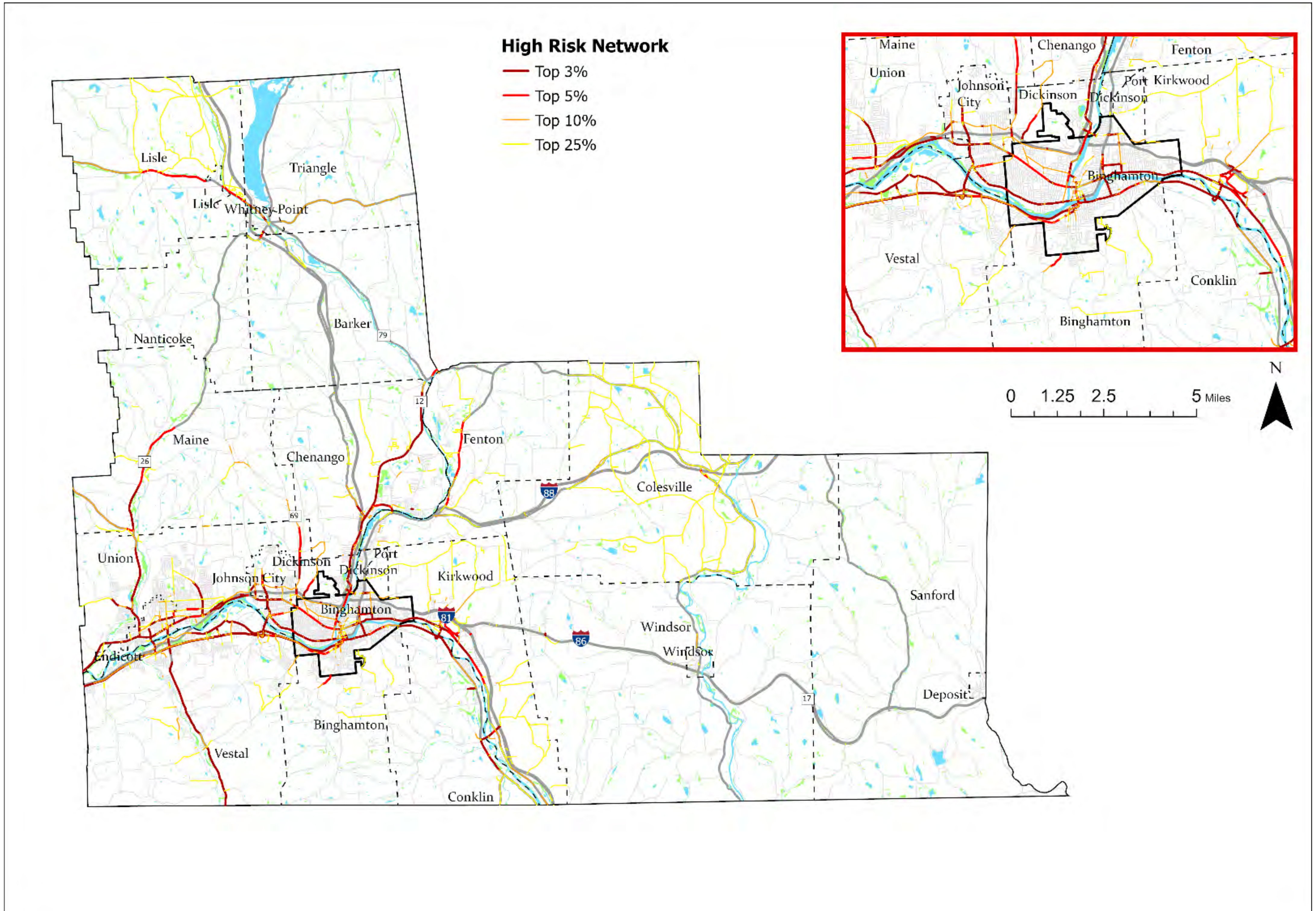
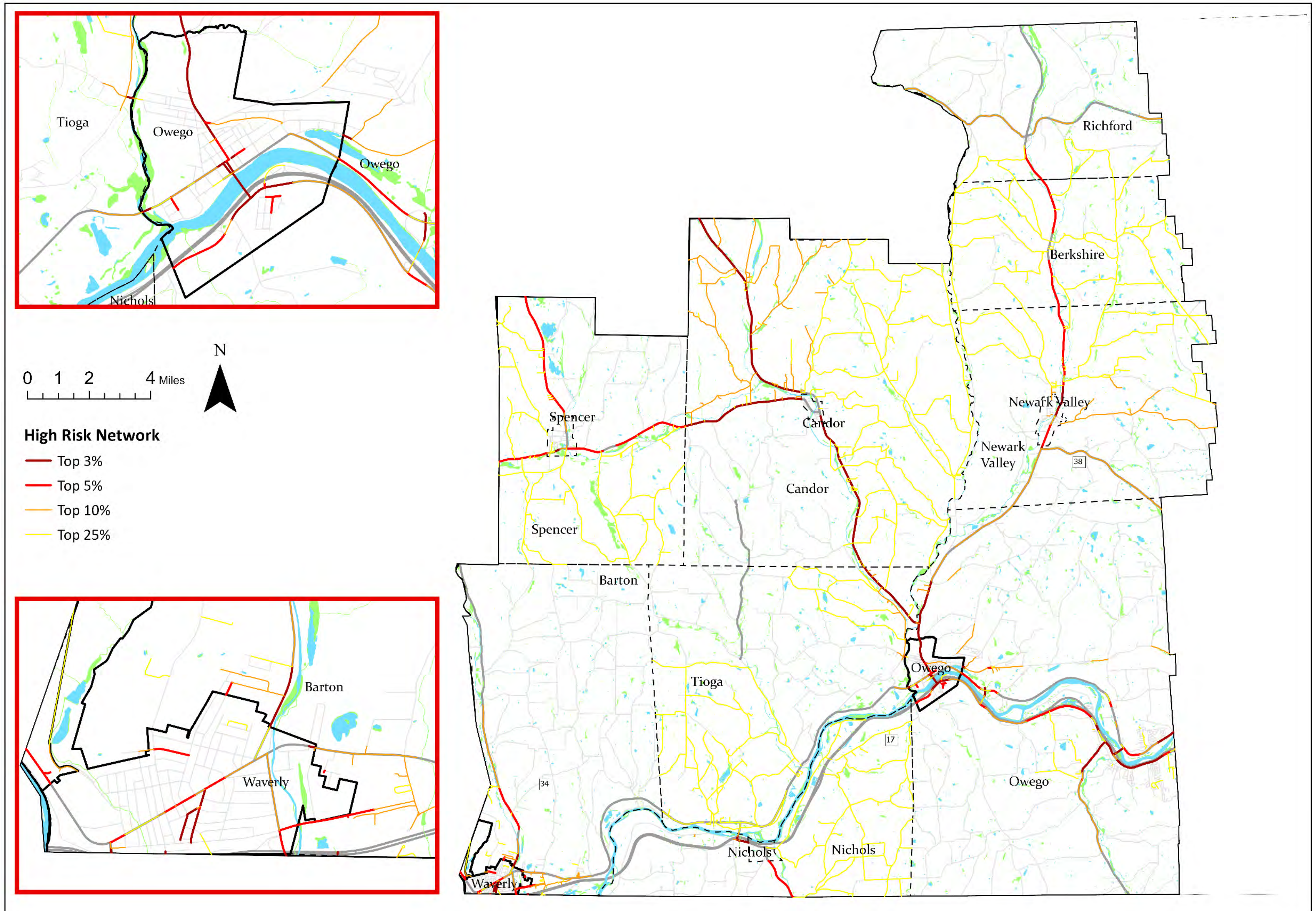


Figure 60. High Risk Network Map –Tioga County



5.2.4 Systemic Factors & Weights Included in the HRN

5.2.4.1 Daily Vehicle Volumes (AADT)

Average Annual Daily Traffic (AADT) refers to the typical daily volumes along a roadway derived from an estimate of annual traffic. Higher AADT is strongly associated with increased crash risk. As traffic volumes rise, so does the number of vehicle interactions, which naturally increases the potential for collisions. Roads with high AADT often support faster-moving traffic and may feature complex roadway designs, such as multi-lane arterials or interchanges, which can contribute to more severe crashes.

The combination of speed, volume and complexity means that, even though high-AADT roads may represent a small share of total roadway length, they were disproportionately represented in crash statistics. In addition, such corridors may carry a greater share of heavy vehicle trips. Depending on adjacent land uses, high AADT roadways may also feature relatively high activity levels for pedestrians and cyclists, particularly in urban settings.

As demonstrated in the systemic analysis, roadways with increased AADT are typically at higher risk for KSI and All Injury crashes. With some of the highest risk ratios seen within this analysis (e.g., the third highest class (5,000 – 9,999 vehicles per day) still carried ratios above 5x for both KSI and All Injury crashes), a total of 36 potential HRN points were allocated based on AADT.

5.2.4.2 Pedestrian / Bicycle Activity Levels

Pedestrian and bicycle activity can influence crash risk and injury severity due to the lack of protection that vulnerable road users have compared to motor vehicle occupants. When crashes involving pedestrians and cyclists occur, the outcomes for those outside of the vehicle are disproportionately severe (i.e., they have a higher rate of fatal and serious injury) when compared to all roadway users. Roadways with increased levels of pedestrian and bicycle activity pose a higher risk for interactions between vehicles and non-motorists.

Most BMTS roadways have low volumes of pedestrians and bicyclists. While less common, roadways with activity levels categorized as Moderate (2.8x KSI, 3.8x All Injury) or High (4.8x KSI, 6.1x All Injury) carried a comparatively greater risk for fatal and serious injury crashes. A total of 12 of potential HRN points were assigned based on Pedestrian and Bicycle Activity Levels.

5.2.4.3 Posted Speed Limit

As detailed in Section 3.4.3.1, higher speeds tend to play a greater role in fatal and serious injury crashes due to the multiple ways in which they inhibit a driver's ability to respond to unexpected conditions. Higher speeds lead to greater impact forces during a collision, thereby increasing the likelihood that a crash will result in a fatality or serious injury (Figure 33). Higher speeds also reduce drivers' field of vision (Figure 34), thereby decreasing their ability to perceive obstacles and the movements of other roadway users. In addition, at higher speeds, vehicles travel comparatively further by the time the driver reacts to a change in conditions and comes to a complete stop (Figure 35).

As demonstrated in the systemic analysis, roadways with posted speed limits of 35 mph or above tended to have higher injury risk for all roadway users, not just VRUs. For instance, roadways with a speed limit of 45 or 50 mph had a 2.8x KSI crash risk and a 3.2x All Injury risk.

As noted previously, "Unsafe Speed" was the leading contributing action reported in KSI crashes (28% of Tioga, 15% of Broome). Given the direct relationship between operating speed and crash injury severity, a total of 24 potential HRN points were allocated based on Posted Speed Limit.

5.2.4.4 Total Number of Vehicle Lanes

Though the number of vehicle lanes is not a direct proxy for activity levels (like AADT), with each lane comes another opportunity for conflict.

As demonstrated in the systemic analysis, four-lane roadways carried a 4.6x KSI and 9.9x All Injury ratio, followed by three-lane at 1.6x KSI and 4.0x All Injury. The majority of roadways in Broome/Tioga (93%) are typical two-lane roadways. Recognizing the limited number coverage of 3+-lane roadways, a total of 12 potential HRN points were assigned based on Total Number of Vehicle Lanes.

5.2.4.5 Area Type

Across Broome-Tioga, roadways within large, urbanized areas (defined by the Census as "Urban" with more than 200,000 residents) had a slightly greater KSI crash compared to those in smaller, urbanized areas (designated by the Census as "Cluster" with between 50,000 and 200,000 residents).

Most of the roadways across Broome/Tioga traverse areas classified as Rural (70%), with the majority of the rest (23%) classified as Urban. A few Cluster areas are present within Tioga County; however, none exist within Broome County. Responding to the desire to balance investments between urban and rural areas while addressing the transitional zones between them, a total of 10 potential HRN points were allocated based on Area Type, with a relatively greater weight applied to facilities located within the transitional Cluster areas.

5.2.4.6 Community Vulnerability Status

Using the tract-level designations developed within the seven-factor community vulnerability assessment (Chapter 2 – Equity & Vulnerable Communities Analysis), systemic results revealed that roads running through the Top 40% of tracts had injury crash risk ratios of at least 1.5x compared to non-equity areas, with tracts falling in the Top 20% experiencing a higher relative risk than the Top 21-40%.

The majority of the road network (80%) traverses areas that were not classified as vulnerable within this study's assessment. Given greater coverage across the road network and a higher KSI crash risk ratio (2.2x KSI, 3.1x All Injury), tracts classified in the Top 20% were awarded more points than those in the Top 21-40%. A total of 6 potential HRN points were assigned based on Community Vulnerability Status.

6. Capital Projects to Address the High Injury Network

6.1 Prioritization Scheme

Table 41 outlines the evaluation rubric used within this prioritization scheme. The prioritized list of capital projects accounts for each location's crash history (HIN), relative risk (HRN and LOSS), potential to impact safety for vulnerable road users, proximity to equity communities, and relative competitiveness based on estimates of capital cost and expected crash reductions. This prioritization scheme awarded a total of 100 points across four categories and eight evaluation criteria, as summarized in the list below.

1) Safety Impacts (50%)
2) Project Competitiveness (20%)
3) Vulnerable Road User & Community Facilities (15%)
4) Equity (15%)

Table 41. Prioritization Score Evaluation Rubric

Category / Theme	Category Weight	Prioritization Criteria	Criteria Weight	Rankings / Classifications	Points Awarded
Safety Impact	50%	High Injury Network Ranking (Corridors / Intersection)	30%	Top 1% / Top 3	30 / 30
				Top 3% / Top 5	25 / 24
				Top 5% / Top 10	20 / 18
				Top 10% / Top 15	15 / 12
				Top 15% / Top 20	10 / 6
				Top 25% / Not Top 20	5 / 0
		High Risk Network Score	15%	Highest (Top 3%)	15
				Higher (Top 5%)	12
				High (Top 10%)	9
				Moderate (Top 25%)	6
				Low (Top 50%)	3
		CLEAR Level of Safety Service (LOSS)	5%	Highest (4)	5
				2nd Highest (3)	3
Project Competitiveness	20%	Benefit-Cost Ratio	20%	45	20.0
				15	13.3
				3	6.7
VRU & Community Facilities	15%	Vulnerable Road User Injury Crashes (KABC)	10%	2	10
				1	5
		Proximity to Schools & Parks	5%	Within 1/8 Mile	5
Equity	15%	Vulnerable Community Analysis	10%	High Priority (Top 20%)	10
				Priority (Top 21-40%)	5
		Federal Designation (Underserved)	5%	Meets Federal Criteria	5
4 Categories	**100%**	**8 Evaluation Criteria**	**100%**	**MAX SCORE**	**100**

The total prioritization score was used as the primary ranking metric, with ties broken based on prioritization score component for High Injury Network Ranking, followed by benefit-cost ratio value. Order of magnitude capital cost estimates were used to define the implementation timeframe for each project. For more information, please consult APPENDIX – Project Development & Prioritization and APPENDIX - Benefit-Cost Analysis.

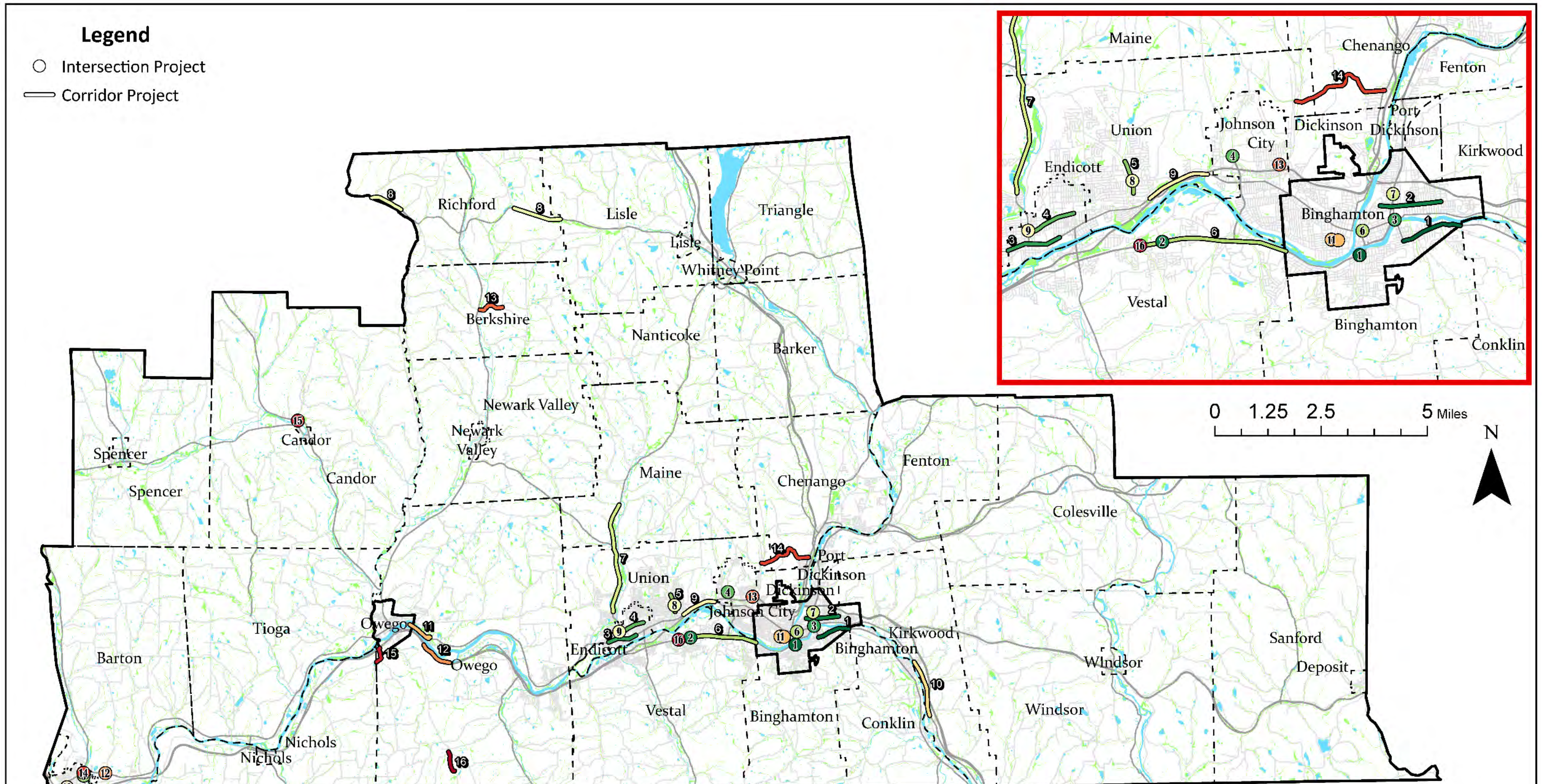
6.2 Project List

The project locations and countermeasures proposed in this chapter reflect a comprehensive set of safety-oriented projects and strategies that have been informed by a thorough assessment of historical crash records, ample stakeholder input, on-the-ground insights gathered during field visits, and the application of federal guidance related to safe roadway design and operations. A total of 32 projects were recommended for safety improvements, including 16 corridors and 16 intersections spread across 11 municipalities. A map showing the location of the prioritized projects across Broome/Tioga is provided in **Figure 61**.

Nearly two-thirds (21 / 32) of the project locations are sited in Broome County, including 10 corridors and 11 intersections. Just over one-third (11/32) of the projects are in Tioga County, including six corridors and five intersections. For the Corridors, multiple projects were recommended in each of Union, Owego, and Binghamton. For the Intersections, Binghamton, Barton, Union, and Vestal each had multiple projects recommended.

A series of two tables present the safety countermeasures proposed and the individual criteria-specific prioritization scores that make up the total prioritization score. Corridor-based projects are shown in **Table 42** and **Table 43** while Intersections are covered in **Table 44** and **Table 45.** Within each table, the project's overall rank can be seen in the far-left column.

Figure 61. Prioritized Capital Projects – Corridors & Intersections



Priority Rank	Project Code	County	Municipality	Corridor	From	To
1	BIN6	Broome	Binghamton	Conklin Ave	Tompkins Street	City / Town Line
2	BIN7	Broome	Binghamton	Robinson Street	Chenango Street	Fairview Avenue
3	UNI5	Broome	Union	East Main Street	Bassett Avenue	Lincoln Avenue
4	UNI8	Broome	Union	North Street	South Nanticoke Street	North McKinley Street
5	UNI7	Broome	Union	Hooper Road	Pheasant Lane	Hoover Avenue
6	VES3	Broome	Vestal	Vestal Parkway East	State Highway 26	Club House Road
7	UNI6	Broome	Union	Union Center-Maine Highway	Daugherty Road	Nanticoke Creek
8	LIS2	Tioga	Lisle / Richford	State Route 79	Michigan Hill Road West Branch Owego Creek	Shafer Road Brigham Road
9	UNI9	Broome	Union	George F Highway West	East of Argonne Avenue	Main Street
10	KIR1	Broome	Kirkwood	Route 11	Meadow Lane	Main Street
11	OWE1	Tioga	Owego	State Route 17C	State Route 17C On-Ramp	East of Taylor Road
12	OWE2	Tioga	Owego	State Route 434	South of Route 17	Degroat Road
13	BER1	Tioga	Berkshire	East Berkshire Road	East of State Route 38	Eastman Road
14	CHE1	Broome	Chenango	Lewis Road	Middle Stella Ireland Road	Upper Front Street
15	OWE3	Tioga	Owego	Sulphur Springs Road	West of Montrose Avenue	Sulphur Springs Road
16	OWE4	Tioga	Owego	Montrose Turnpike	Arbor Glade Road	South Apalachin Road

Priority Rank	Project Code	County	Municipality	Intersection Name
1	BIN1	Broome	Binghamton	Vestal Pkwy E & S Washington St
2	VES1	Broome	Vestal	Vestal Pkwy E & Rano Blvd
3	BIN2	Broome	Binghamton	Court St & Brandywine Ave
4	UNI1	Broome	Union	Harry L Dr & Reynolds Rd
5	BAR1	Tioga	Barton	Cayuta Ave & Ithaca St
6	BIN3	Broome	Binghamton	Court St & State St
7	BIN4	Broome	Binghamton	S 363 & Frederick St
8	UNI4	Broome	Union	Country Club Rd & Hooper Rd
9	UNI2	Broome	Union	N Nanticoke Ave & Jennings St
10	BAR2	Tioga	Barton	Broad St & Fulton St
11	BIN5	Broome	Binghamton	LeRoy St & Chestnut/Chapin St
11	BIN5	Broome	Binghamton	LeRoy St & Chestnut/Chapin St
12	BAR4	Tioga	Barton	State Rt 17 C & Talmadge Hill Rd
13	UNI3	Broome	Union	Harry L Dr & Lester Ave & Zoa Ave
14	BAR3	Tioga	Barton	Chemung St & Cayuta Ave
15	CAN1	Tioga	Candor	Ithaca Rd & Honeypot Rd
16	VES2	Broome	Vestal	Vestal Pkwy E & N African Rd

Table 42. Prioritized Capital Projects – Corridors – Proposed Countermeasures

						SPEED MANAGEMENT		ROADWAY DEPARTURE						INTER-SECT-IONS	VULNERABLE ROAD USERS (PEDESTRIANS & BICYCLISTS)							CROSS-CUT-TING
Project Rank (Corr-idors)	**County**	**Municipality**	**Corridor**	**From**	**To**	**Speed Cameras**	**New Speed Limit**	**Edge Lines**	**Enhanced Delineation for Curves**	**Rumble Strip**	**Safety Edge**	**Curve Design Improvements**	**Median Barrier**	**Retroreflective Backplates**	**Crosswalks**	**Bike Lanes**	**Rectangular Rapid Flashing Beacon (RRFB)**	**Refuge Islands**	**High-Intensity Activated Crosswalk (HAWK)**	**Road Diet**	**Sidewalks**	**Lighting**
1	Broome	Binghamton	Conklin Ave	Tompkins St	City / Town Line				✓					✓		✓	✓					
2	Broome	Binghamton	Robinson St	Chenango St	Fairview Ave									✓	✓	✓	✓					
3	Broome	Union	E. Main St	Bassett Ave	Lincoln Ave									✓	✓	✓	✓				✓	
4	Broome	Union	North St	S. Nanticoke St	North McKinley St									✓	✓	✓	✓					
5	Broome	Union	Hooper Rd	Pheasant Ln	Hoover Ave									✓	✓	✓						
6	Broome	Vestal	Vestal Pkwy E.	State Highway 26	Club House Rd	✓							✓				✓	✓				
7	Broome	Union	Union Center-Maine Highway	Daugherty Rd	Nanticoke Creek						✓	✓				✓	✓					
8	Tioga	Lisle / Richford	State Route 79	MI Hill Rd / West Branch of Owego Creek	Shafer Rd / Brigham Rd				✓	✓												
9	Broome	Union	George F. Highway W.	East of Argonne Ave	Main St							✓			✓	✓			✓		✓	✓
10	Broome	Kirkwood	Route 11	Meadow Ln	Main St					✓	✓	✓										✓
11	Tioga	Owego	State Route 17C	State Route 17C On-Ramp	East of Taylor Rd									✓		✓					✓	
12	Tioga	Owego	State Route 434	South of Route 17	Degroat Rd				✓					✓								✓
13	Tioga	Berkshire	E. Berkshire Rd	East of State Route 38	Eastman Rd		✓	✓	✓			✓										
14	Broome	Chenango	Lewis Rd	Middle Stella Ireland Rd	Upper Front St			✓	✓		✓	✓										
15	Tioga	Owego	Sulphur Springs Rd	West of Montrose Ave	Sulphur Springs Rd		✓	✓	✓		✓	✓										
16	Tioga	Owego	Montrose Turnpike	Arbor Glade Rd	South Apalachin Rd			✓			✓	✓										

Table 43. Prioritized Capital Projects – Corridors – Prioritization Metrics & Benefit-Cost Estimates

							COST & TIMEFRAME		CRASH REDUCTION POTENTIAL & BENEFIT-COST COMPETITIVENESS				PRIORITIZATION SCORES								
Project Rank (Corr-idors)	County	Municipality	Corridor	From	To	Length (mi.)	Project Timeframe (Based on Scale of Capital Cost)	Order-of-Magnitude Capital Cost ($2025)	Total Injury Crashes Reduced (KABC)	Total Crashes Reduced (KABCO)	Benefits from Total Crashes Reduced (KABCO)	Benefit-Cost Ratio (7% Discount Rate)	Prioritization Score (100 Points)	Benefit-Cost Ratio (7%)	High Injury Network Ranking	High Risk Network Score	NYSDOT CLEAR LOSS Rating	Vulnerable Road User Injury Crashes	Proximity to Schools & Parks	BMTS Customized Vulnerability Criteria	USDOT Criteria for Underserved Communities
1	Broome	Binghamton	Conklin Ave	Tompkins St	City / Town Line	1.44	Short-Term	$228,300	27	152	$5,756,500	25.2	**93.3**	13.3	30	15	5	10	5	10	5
2	Broome	Binghamton	Robinson St	Chenango St	Fairview Ave	1.45	Mid-Term	$747,900	50	379	$11,399,000	15.2	**88.3**	13.3	25	15	5	10	5	10	5
3	Broome	Union	E. Main St	Bassett Ave	Lincoln Ave	1.28	Long-Term	$1,251,000	60	247	$12,535,500	10.0	**86.7**	6.7	30	15	5	10	5	10	5
4	Broome	Union	North St	S. Nanticoke St	North McKinley St	1.21	Short-Term	$271,800	50	253	$10,647,000	39.2	**78.3**	13.3	20	15	5	10	0	10	5
5	Broome	Union	Hooper Rd	Pheasant Ln	Hoover Ave	0.78	Short-Term	$91,200	29	172	$6,403,500	70.2	**75.0**	20	30	15	0	5	0	5	0
6	Broome	Vestal	Vestal Pkwy E.	State Highway 26	Club House Rd	3.48	Long-Term	$6,307,100	71	355	$18,346,500	2.9	**75.0**	0	30	15	0	10	5	10	5
7	Broome	Union	Union Center-Maine Highway	Daugherty Rd	Nanticoke Creek	4.95	Mid-Term	$589,400	32	201	$26,522,500	45.0	**73.3**	13.3	25	15	0	5	5	10	0
8	Tioga	Lisle / Richford	State Route 79	MI Hill Rd / West Branch of Owego Creek	Shafer Rd / Brigham Rd	2.13 / 1.46	Short-Term	$71,000	14	62	$36,026,000	507.4	**69.0**	20	30	9	5	0	5	0	0
9	Broome	Union	George F. Highway W.	East of Argonne Ave	Main St	1.52	Long-Term	$1,716,000	11	54	$15,238,000	8.9	**61.7**	6.7	30	15	0	5	5	0	0
10	Broome	Kirkwood	Route 11	Meadow Ln	Main St	2.53	Mid-Term	$497,700	8	36	$10,744,000	21.6	**60.3**	13	25	12	5	0	5	0	0
11	Tioga	Owego	State Route 17C	State Route 17C On-Ramp	East of Taylor Rd	0.97	Long-Term	$2,375,000	15	118	$3,340,000	1.4	**55.0**	0	25	12	3	10	5	0	0
12	Tioga	Owego	State Route 434	South of Route 17	Degroat Rd	1.45	Short-Term	$146,100	8	26	$1,590,500	10.9	**53.7**	7	30	9	3	5	0	0	0
13	Tioga	Berkshire	E. Berkshire Rd	East of State Route 38	Eastman Rd	1.15	Short-Term	$281,800	1	8	$10,834,500	38.4	**52.3**	13	25	6	3	0	0	5	0
14	Broome	Chenango	Lewis Rd	Middle Stella Ireland Rd	Upper Front St	2.59	Mid-Term	$506,600	13	40	$2,679,500	5.3	**48.7**	7	25	9	3	0	0	5	0
15	Tioga	Owego	Sulphur Springs Rd	West of Montrose Ave	Sulphur Springs Rd	0.75	Mid-Term	$819,700	5	18	$1,037,500	1.3	**46.0**	0	30	3	3	0	0	10	0
16	Tioga	Owego	Montrose Turnpike	Arbor Glade Rd	South Apalachin Rd	0.93	Short-Term	$280,000	1	3	$9,274,000	33.1	**43.3**	13	25	0	5	0	0	0	0

Table 44. Prioritized Capital Projects – Intersections – Proposed Countermeasures

					SPEED MANA-GEMENT	ROADWAY DEPARTURE			INTERSECTIONS			PEDESTRIANS & BICYCLISTS							CROSS-CUT-TING
Project Rank (Intersec-tions)	County	Municipality	Major Street	Minor Street	New Speed Limit	Edge Lines	Enhanced Delineation for Curves	Median Barrier	Retroreflective Backplates	Dedicated Turn Lanes	Systemic Low-Cost Improvements	Crosswalks	Bike Lanes	Rectangular Rapid Flashing Beacon (RRFB)	Leading Pedestrian Interval (LPI)	Refuge Islands	Road Diet	Sidewalks	Lighting
1	Broome	Binghamton	Vestal Pkwy E.	S. Washington St					✓			✓			✓	✓			
2	Broome	Vestal	Vestal Pkwy E.	Rano Blvd								✓				✓			
3	Broome	Binghamton	Court St	Brandywine Ave									✓		✓	✓	✓		
4	Broome	Union	Harry L. Dr	Reynolds Rd				✓				✓		✓		✓		✓	
5	Tioga	Barton	Cayuta Ave	Ithaca St							✓	✓		✓					
6	Broome	Binghamton	Court St	State St						✓		✓	✓		✓				
7	Broome	Binghamton	S 363	Frederick St						✓		✓		✓	✓	✓			
8	Broome	Union	Hooper Rd	Country Club Rd					✓	✓		✓			✓				
9	Broome	Union	N. Nanticoke Ave	Jennings St								✓		✓		✓		✓	
10	Tioga	Barton	Broad St	Fulton St							✓	✓						✓	
11	Broome	Binghamton	LeRoy St	Chestnut St & Chapin St					✓			✓						✓	
12	Tioga	Barton	State Rt 17 C	Talmadge Hill Rd							✓								✓
13	Broome	Union	Harry L. Dr	Lester Ave & Zoa Ave								✓	✓					✓	✓
14	Tioga	Barton	Chemung St	Cayuta Ave					✓			✓							✓
15	Tioga	Candor	Ithaca Rd	Honeypot Rd		✓					✓								
16	Broome	Vestal	Vestal Pkwy E.	N. African Rd					✓			✓			✓	✓			

Table 45. Prioritized Capital Projects – Intersections – Prioritization Metrics & Benefit-Cost Estimates

					COST & TIMEFRAME		CRASH REDUCTION POTENTIAL & BENEFIT-COST COMPETITIVENESS				PRIORITIZATION SCORES								
Project Rank (Intersec-tions)	County	Municipality	Major Street	Minor Street	Project Timeframe (Based on Scale of Capital Cost)	Order-of-Magnitude Capital Cost ($2025)	Total Injury Crashes Reduced (KABC)	Total Crashes Reduced (KABCO)	Benefits from Total Crashes Reduced (KABCO)	Benefit-Cost Ratio (7% Discount Rate)	Prioritization Score (100 Points)	Benefit-Cost Ratio (7%)	High Injury Network Ranking	High Risk Network Score	NYSDOT CLEAR LOSS Rating	Vulnerable Road User Injury Crashes	Proximity to Schools & Parks	BMTS Customized Vulnerability Criteria	USDOT Criteria for Underserved Communities
1	Broome	Binghamton	Vestal Pkwy E.	S. Washington St	Short-Term	$155,700	21	101	$4,432,500	28.5	**93.3**	13.3	30	15	5	10	5	10	5
2	Broome	Vestal	Vestal Pkwy E.	Rano Blvd	Short-Term	$163,200	35	190	$7,515,000	46.0	**93.0**	20	30	15	3	10	0	10	5
3	Broome	Binghamton	Court St	Brandywine Ave	Long-Term	$483,100	7	27	$1,461,000	3.0	**79.7**	6.7	30	15	3	10	0	10	5
4	Broome	Union	Harry L. Dr	Reynolds Rd	Mid-Term	$353,000	25	229	$5,971,000	16.9	**72.3**	13	24	15	5	5	0	10	0
5	Tioga	Barton	Cayuta Ave	Ithaca St	Short-Term	$157,900	5	6	$884,500	5.6	**70.7**	6.7	30	9	5	0	5	10	5
6	Broome	Binghamton	Court St	State St	Mid-Term	$392,800	19	96	$4,091,500	10.4	**67.7**	6.7	18	15	3	10	0	10	5
7	Broome	Binghamton	S 363	Frederick St	Mid-Term	$205,700	16	98	$3,434,000	16.7	**55.3**	13.3	12	15	0	0	0	10	5
8	Broome	Union	Hooper Rd	Country Club Rd	Short-Term	$31,800	5	30	$13,835,000	435.1	**54.0**	20	6	15	3	10	0	0	0
9	Broome	Union	N. Nanticoke Ave	Jennings St	Mid-Term	$190,000	11	33	$2,148,500	11.3	**53.7**	6.7	12	15	5	10	0	0	5
10	Tioga	Barton	Broad St	Fulton St	Long-Term	$492,900	9	43	$1,953,500	4.0	**52.7**	6.7	18	0	3	5	5	10	5
11	Broome	Binghamton	LeRoy St	Chestnut St & Chapin St	Long-Term	$637,900	12	43	$13,063,000	20.5	**50.3**	13.3	12	0	5	10	0	5	5
12	Tioga	Barton	State Rt 17 C	Talmadge Hill Rd	Short-Term	$63,500	3	4	$625,000	9.8	**48.7**	6.7	30	9	3	0	0	0	0
13	Broome	Union	Harry L. Dr	Lester Ave & Zoa Ave	Mid-Term	$274,100	10	23	$1,894,500	6.9	**46.7**	6.7	18	9	3	5	0	5	0
14	Tioga	Barton	Chemung St	Cayuta Ave	Long-Term	$589,100	3	8	$512,500	0.9	**45.0**	0	18	9	3	0	0	10	5
15	Tioga	Candor	Ithaca Rd	Honeypot Rd	Short-Term	$15,200	4	11	$815,000	53.6	**45.0**	20	6	6	3	0	0	10	0
16	Broome	Vestal	Vestal Pkwy E.	N. African Rd	Mid-Term	$177,500	11	62	$2,460,000	13.9	**37.7**	6.7	6	12	3	0	5	0	5

6.3 Project Profiles

The remainder of this chapter consists of four-page profiles that present existing safety issues, crash histories, proposed countermeasures, and estimated capital costs for many of the projects ranked previously. The project profiles are shown in order of priority ranking within each county, beginning with Corridor projects for Tioga, then Broome, and concluding with Intersection projects for Tioga and Broome.

These summary packages are intended to help advance these priority locations and safety concepts for future capital funding awards within the context of future federal or state discretionary grant solicitations (e.g., SS4A Implementation FY 26), or formula-based funding via the Highway Safety Improvement Program (HSIP).

Project Profiles:

Corridors

Corridor Broome County

PRIORITY 1

Conklin Ave. (NY-7)

City of Binghamton

Existing Conditions

The segment of Conklin Avenue (NY-7) is 1.44 miles long and is located within the City of Binghamton. The corridor spans from the intersection with Tompkins Street to the Binghamton City Line. The surrounding area is both residential and commercial with numerous businesses, residential homes, and an elementary school located along the corridor. A total of 184 crashes occurred during the study period between 2019 and 2023, with 34 of these crashes resulting in injury. Thirteen of the crashes during the study period for this corridor involved a bicyclist or pedestrian, with one of those resulting in serious injury.

The crash types most prevalent for this corridor during the study period were rear end and right-angle crashes. Conklin Avenue maintains one travel lane and bicycle lane in each direction from Tompkins Street to Holmes Place and transitions to one shared use travel lane in each direction to the City Line. This corridor features two intersections with traffic control by span wire traffic signals which are Tompkins Street and Burr Avenue. Two intersections feature traffic control by mast arm traffic signals which are Broome Street and Hayes Street.

This corridor features sixteen streets that meet Conklin Avenue at an intersection where stop control is only on the minor approach while Conklin Avenue is uncontrolled. The Conklin Avenue intersections with Duke Street, Iva Avenue, and the Sandy Beach Park parking lot all feature uncontrolled pedestrian crossings that have pedestrian warning signage present. Curb ramps are present at all intersections throughout the corridor that feature plastic detectable warning units, with the exception of the uncontrolled crossing at the Sandy Beach Park which has no detectable warning unit on the southern curb ramp. Type LS crosswalks are present at all intersections along Conklin Avenue. Sidewalks are present on the south side of Conklin Avenue from Tompkins Street to the Sandy Beach Park crossing and on the north side from Tompkins Street to Iva Avenue. The corridor features street lighting throughout the corridor with most of the lighting on the south side of Conklin Avenue and some supporting lights on the north side of the road.

Highway Characteristics

Owner	City of Binghamton
Description	Two lane undivided urban road with bicycle lanes
Segment Length	1.44 miles
Speed Limit	30 mph
AADT	10,558 VPD
Functional Class	(16) Minor Arterial
LOSS	4
HRN Score	5
Equity Rank	Top 20

Photo 1: Conklin Ave over NYSW Railway looking west

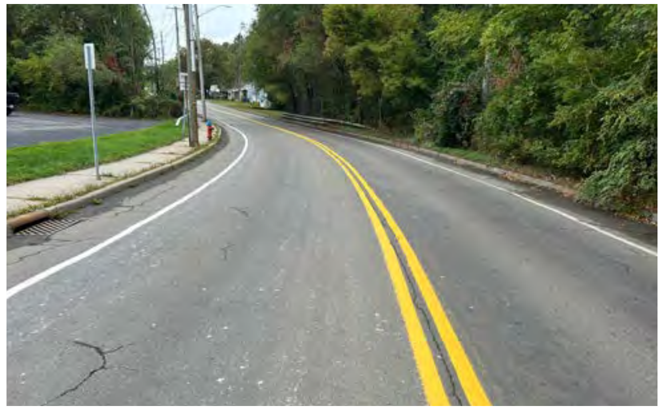
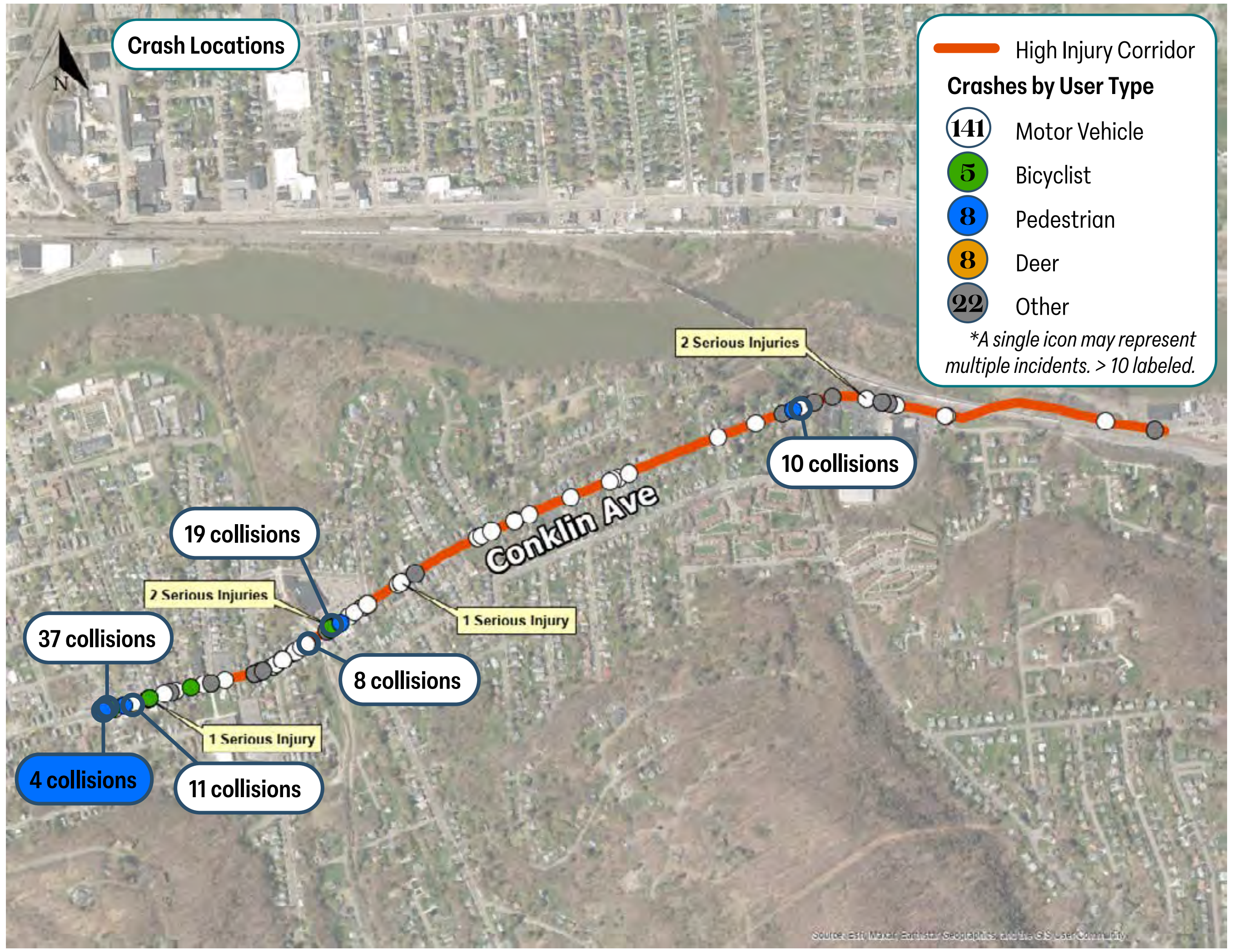


Photo 2: Conklin Ave east of Felters Rd looking east

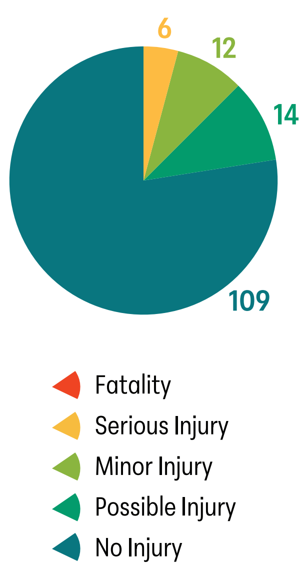
Crash Data



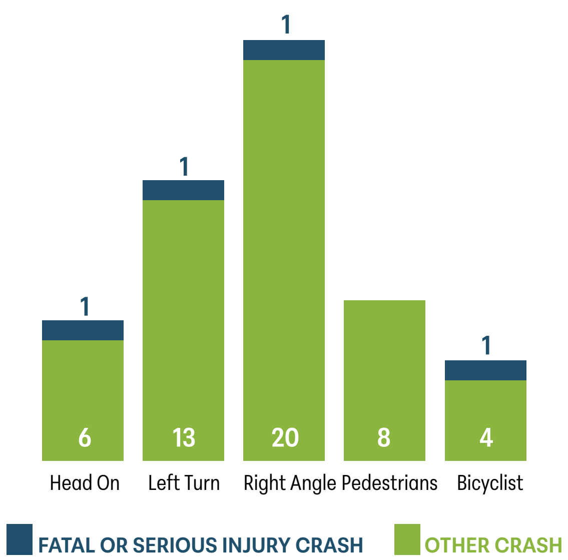
Contributing Factors

- Lack of advanced warning signage
- Lack of bicycle and shared use lane markings
- Lack of audible pedestrian signals at signalized intersections

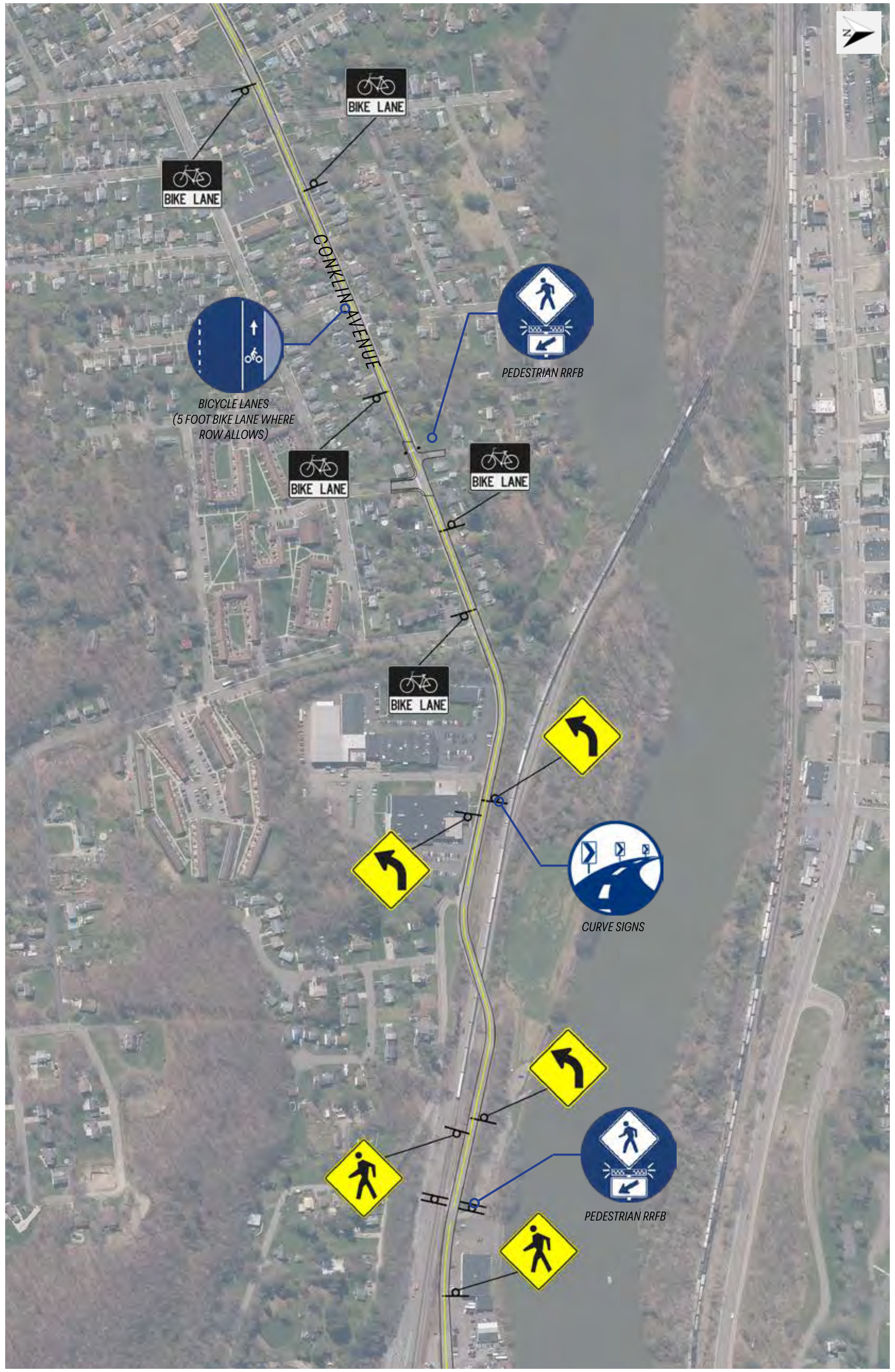
Crash Severity



Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures

Contributing factors at Conklin Avenue from the intersection with Tompkins Street to the Binghamton City Line included a lack of advanced warning signage, a lack of bicycle and shared use lane markings, and a lack of audible pedestrian signals at signalized intersections. Potentially relevant safety countermeasures at this location include, installation of rectangular rapid flashing beacons (RRFB) at an uncontrolled crossing with advanced warning signage, installation of audible pedestrian signals, installation of bicycle and shared use lane markings, installation of curve warning signage, and the addition of retroreflective traffic signal backplates. RRFBs will be installed on the existing pedestrian signs present at the uncontrolled crossing of Conklin Ave adjacent to Sandy Beach Park. Additional advanced warning signage accompanied by rapid flashing beacons will be installed for all other uncontrolled crossings along the corridor. This will ensure drivers are aware of potential pedestrians crossing the road and provide them with adequate warning time to stop and yield. Audible pedestrian signal infrastructure will be added at all traffic signal-controlled intersections throughout the corridor. Adding these ADA compliant pedestrian signals will contribute to increasing accessibility along the entire corridor. Compliant pedestrian signals are essential in preventing serious injury crashes involving pedestrians, especially those who are visually impaired. Bicycle lane markings and shared use markings will be added throughout the corridor. Where the shoulders are at least 5 feet in width, bike lane markings will be added to give bicycles a designated travel space. Where there is not adequate space for a bike lane, sharrow markings will be used to emphasize the need for drivers to share the road with bicyclists. The sharrow markings will allow bicycles to navigate the entire corridor and travel between designated bike lanes without needing to use the sidewalk. Advanced warning signage will be added to sharp horizontal curves warning road users of an upcoming bend in the road. This increased curve awareness will reduce the risk of vehicles straying out of their travel lane and decrease the potential for all types of collisions. At all existing traffic signals along the corridor, retroreflective borders will be installed to increase visibility of the signal heads and reduce the frequency of right angle and turning induced collisions at the intersections within the corridor.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Striping Symbols	85.00	EA	$300.00	$25,500.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EA	$15,000.00	$30,000.00
Warning Signage	10.00	EA	$1,250.00	$12,500.00
Installation of Audible Pedestrian Signals	20.00	EA	$2,500.00	$50,000.00
Traffic Signal Backplates	28.00	EA	$600.00	$16,800.00
			Construction Total	$134,800.00
			Contingency and Inflation (20%)	$27,000.00
			Subtotal	$161,800.00
			Work Zone Traffic Control (10%)	$16,200.00
			Mobilization (4%)	$6,500.00
			Survey (2%)	$3,300.00
			Engineering Design (10%)	$16,200.00
			Construction Inspection & Administration(15%)	$24,300.00
			Grand Total	**$228,300.00**

Corridor Broome County

PRIORITY 2

Robinson St.

City of Binghamton

Existing Conditions

The segment of Robinson Street is 1.45 miles long and is located within the City of Binghamton. The corridor spans from the intersection with Chenango Street to the intersection with Fairview Avenue. The surrounding area is both residential and commercial with numerous businesses, residential homes, and a school located along the corridor.

A total of 326 crashes occurred during the study period between 2019 and 2023, with 42 of these crashes resulting in injury. 20 of the crashes during the study period for this corridor involved a bicyclist or pedestrian, with 2 of those resulting in serious injury. The crash types most prevalent for this corridor during the study period were rear end and right-angle crashes. Robinson Street maintains one travel lane in each direction from Chenango Street to Brandywine Avenue and from Whitney Avenue to Fairview Avenue. From Brandywine Avenue to Whitney Avenue, Robinson Street maintains two eastbound travel lanes with one being a dedicated left turn lane and three westbound travel lanes with one being a dedicated left turn lane and one being a dedicated right turn slip ramp. This corridor features eight intersections with traffic control by span wire signals which are Chenango Street, Brandywine Avenue, Whitney Avenue, Griswold Street, Broad Avenue, Moeller Street, Mason Avenue, and Fairview Avenue. This corridor features fourteen streets that meet Robinson Street at an intersection where stop control is only on the minor approach while Robinson Street is uncontrolled. The Robinson Street intersections with Ely Street, Louisa Street, Gaylord Street, and Bigelow Street all feature two uncontrolled crossings across Robinson Street that have pedestrian warning signage present.

There are two uncontrolled pedestrian crossings in front of Calvin Coolidge School at the intersections of Robinson Street with Riverside Street and Glen Avenue which also have warning signage present. Curb ramps are present at all intersections throughout the corridor that feature plastic detectable warning units, with the exception of the intersection of Robinson Street and Brandywine Avenue which features NYSDOT standard cast iron detectable warning units. Type LS crosswalks are present at all intersections along Robinson Street with the exception of Emmett Street and Wales Avenue which lack crosswalks. Sidewalks are present for the entirety of the corridor on both sides of Robinson Street. The corridor features street lighting throughout the corridor with most of the lighting on the south side of Robinson Street and some supporting lights on the north side of the road.

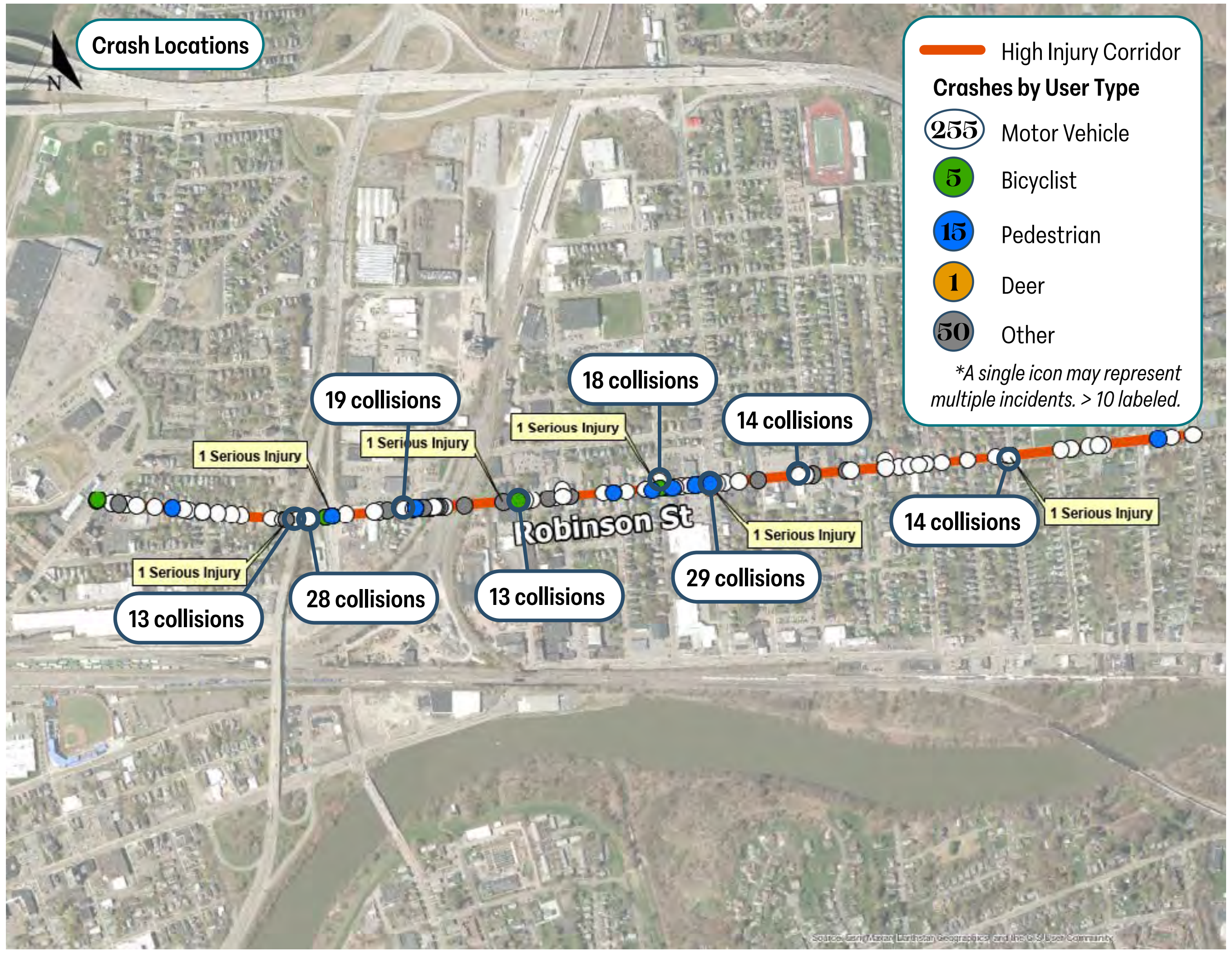
Highway Characteristics

Owner	City of Binghamton
Description	Two lane undivided urban road with sections parking on one side and one block of four lane undivided
Segment Length	1.45 miles
Speed Limit	30 mph
AADT	8,989 VPD
Functional Class	(17) Major Collector
LOSS	4
HRN Score	5
Equity Rank	Top 20

Photo 1: Robinson St Walgreens looking east

Photo 2: Robinson St and Griswold St looking northeast

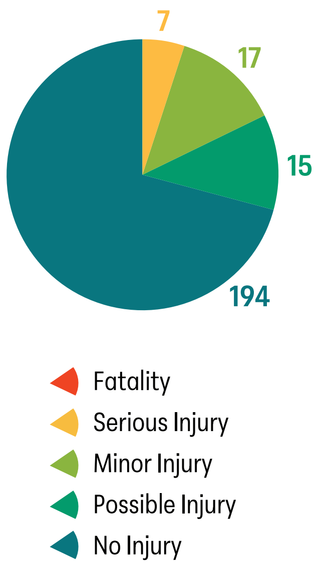
Crash Data



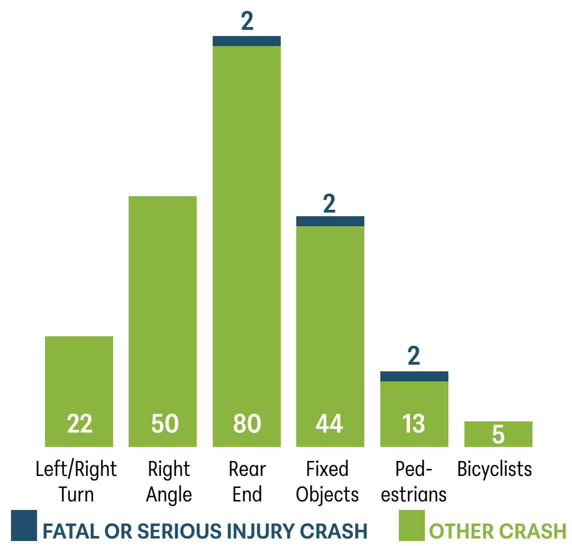
Contributing Factors

- Lack of advanced warning signage for uncontrolled pedestrian crossings
- Lack of bicyclist accommodations
- Pedestrian signal infrastructure is outdated

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at Robinson Street from the intersection with Chenango Street to the intersection with Fairview Avenue included a lack of advanced warning signage for uncontrolled pedestrian crossings, a lack of bicyclist accommodations, and pedestrian signal infrastructure is outdated. Potentially relevant safety countermeasures at this location include, installation of rectangular rapid flashing beacons (RRFB) at uncontrolled crossings with advanced warning signage, replacement of pedestrian signal infrastructure, installation of shared use lane markings, installation of high visibility crosswalks where missing, and addition of traffic signal backplates. RRFBs will be installed at the uncontrolled crossings adjacent to Calvin Coolidge School at Riverside Street and Glen Avenue. These systems will run on solar power, and the flashing beacons will activate when a button is pushed to alert drivers to stop and yield to pedestrians. Additional advanced warning signage will be installed at the other uncontrolled crosswalk locations in the corridor, to increase driver awareness of pedestrian crossings. The existing pedestrian signal infrastructure will be replaced, and audible pedestrian signals will be added at all intersections that are currently controlled by a traffic signal. These will create a more accessible corridor for vulnerable road users and the visually impaired. The existing pedestrian infrastructure at Brandywine Avenue will be maintained as the pedestrian signals there were recently updated. Shared use lane markings will be added throughout the corridor to emphasize drivers sharing the road with bicyclists. Implementing sharrows will allow bicyclists to utilize the travel lanes along with motor vehicles and will reduce the risk of future bicyclist accidents. Enhanced visibility crosswalks will be installed at all the intersections currently lacking them to increase pedestrian safety in the corridor. Traffic signal backplates with retroreflective borders will be installed at all signalized intersections. Retroreflective signal backplates will provide increased visibility of the signal heads at the intersections within the corridor and reduce the frequency of serious injury crashes taking place at intersections on Robinson St.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	110.00	LF	$24.00	$2,700.00
Striping Symbols	70.00	EA	$300.00	$21,000.00
Rectangular Rapid Flashing Beacon (RRFB)	4.00	EA	$15,000.00	$60,000.00
Pedestrian Warning Signage	15.00	EA	$1,250.00	$19,000.00
Replacing Pedestrian Signals and Pushbuttons	50.00	EA	$6,000.00	$300,000.00
Traffic Signal Backplates	65.00	EA	$600.00	$39,000.00

Construction Total	$441,700.00
Contingency and Inflation (20%)	$88,400.00
Subtotal	$530,100.00
Work Zone Traffic Control (10%)	$53,100.00
Mobilization (4%)	$21,300.00
Survey (2%)	$10,700.00
Engineering Design (10%)	$53,100.00
Construction Inspection & Administration(15%)	$79,600.00
Grand Total	**$747,900.00**

Corridor Broome County

PRIORITY 8

East Main St. (Route 17C)

Town of Union

Existing Conditions

East Main St (Route 17C) is located in the Town of Union, adjacent to the Village of Endicott. The high-injury corridor from Bassett Ave to Lincoln Ave is 1.26 miles long and has a speed limit of 30 mph. East Main St is utilized by many commuters going in between the tri-cities and Owego. It is also home to many commercial businesses, restaurants, as well as Union-Endicott High School.

There was a total of 164 crashes during the study period from 2019 to 2023 with 19 of those crashes resulting in some form of injury and 4 of them causing serious injuries. 5 crashes involved bicyclists, and 3 crashes involved pedestrians. The width of the road is between 40-50 ft wide and maintains two 11-foot travel lanes with dedicated turn lanes at some of the intersections. There is sidewalk present on both sides of the highway throughout.

To the east of this corridor, a road diet was recently performed which eliminated a travel lane to implement a two-way left turn median and create a bicyclist and pedestrian safety corridor. A previously performed capacity analysis showed a similar treatment would not be feasible within this study's limits.

Bike lanes are present on both sides of the street at the east end of the corridor until Badger Ave. The bike lanes pick up again at Adams Ave which is east of the high-injury corridor. The corridor includes several intersections where serious injury crashes have occurred such as the intersections with South Loder Ave and Vestal Ave.

There are type LS crosswalks present at some of these intersections. The asphalt pavement shows signs of deterioration, and the striping has faded slightly. Overhead lighting is present on both approaches throughout this corridor. Traffic lights and pedestrian signals are outdated and may no longer be within ADA compliance.

Highway Characteristics

Owner	NYSDOT
Description	Two-lane undivided urban road
Segment Length	1.26 miles
Speed Limit	30 mph
AADT	21,301 VPD
Functional Class	(16) Minor Arterial
LOSS	4
HRN Score	4
Equity Rank	Top 20 Worst

Photo 1: East Main St concrete arch looking west

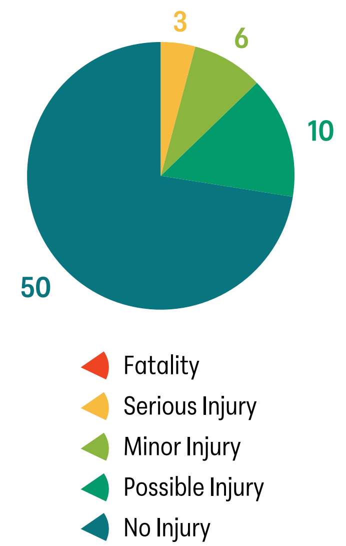
Photo 2: East Main St and Vestal Ave looking west

Crash Data

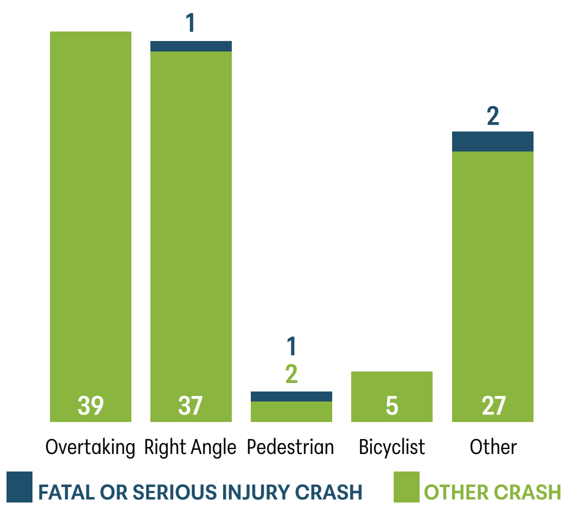
Contributing Factors

- Deteriorated pedestrian infrastructure
- Outdated traffic control systems
- Inconsistent bicyclist accommodations

Crash Severity

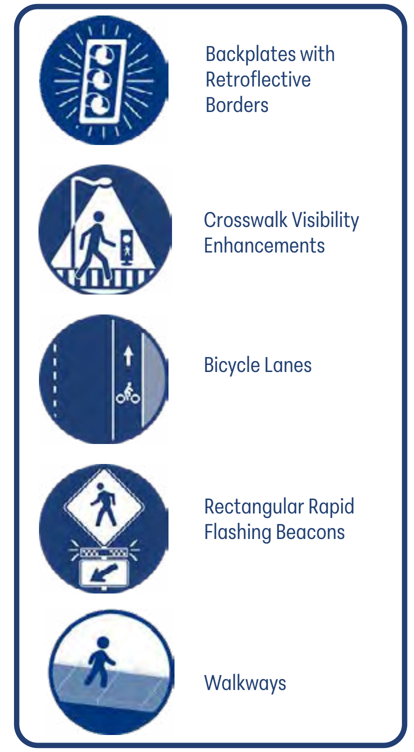


Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures



Contributing factors at East Main Street from Bassett Avenue to Lincoln Avenue included deteriorated pedestrian infrastructure, outdated traffic control systems, and inconsistent bicyclist accommodations. Potentially relevant safety countermeasures at this location include, traffic signal upgrades with retroreflective backplates, rectangular rapid flashing beacons, and enhanced type LS crosswalks. Also proposed is the addition of bike lane signs and sharrow pavement markings to allow bicyclists traveling in the bike lanes from the east and west to share the travel lanes with other traffic in a safe manner. The existing symbols for the bike lanes to the west have faded and will be repainted as part of the implementation project. Rectangular reflective flashing beacons will be added at the midblock crossings of Bassett Ave and Badger Ave. The beacons will enhance visibility for drivers and make them aware when pedestrians are attempting to cross an intersection that does not have pedestrian signals due to the absence of a traffic light. New curb ramps, type LS crosswalks, and sharrows will be installed at the intersections of East Main St and Page Ave, Badger Ave, Exchange Ave, Liberty Ave, and Vestal Ave. The crosswalks present at these locations have faded significantly, and most of the curb ramps have deteriorated to fall out of ADA compliance. Replacing these facilities will allow all road users to cross in a safe manner. Adding and improving the sharrows will allow bicyclists to safely navigate the corridor and effectively connect the bike lanes present to the east and west. Traffic signal improvements with reflective backplates will be constructed at Exchange Ave, S Loder Ave, Vestal Ave, Harrison Ave, and Lincoln Ave. Some of these signals are outdated and in need of replacements, all of them lack reflective backplates. Improvements to these traffic signals will enhance the safe and efficient flow of traffic, reducing the risk of high injury crashes.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete Sidewalk	69.44	SY	$1,500.00	$105,000.00
Granite Curb	2,500.00	LF	$80.00	$200,000.00
Curb Ramps and Warning Units	30.00	EA	$10,000.00	$300,000.00
LS Type Crosswalks	900.00	LF	$24.00	$22,000.00
Retroreflective Signal Backplates	40.00	EA	$600.00	$24,000.00
Rectangular Rapid Flashing Beacon (RRFB)	4.00	EA	$15,000.00	$60,000.00
Bike Lane Signs and Posts	12.00	EA	$1,250.00	$15,000.00
Bike Lane/Sharrow Pavement Markings	40.00	EA	$300.00	$12,000.00
			Construction Total	$738,000.00
			Contingency and Inflation (20%)	$148,000.00
			Subtotal	$886,000.00
			Work Zone Traffic Control (10%)	$89,000.00
			Mobilization (4%)	$36,000.00
			Survey (2%)	$18,000.00
			Engineering Design (10%)	$89,000.00
			Construction Inspection & Administration(15%)	$133,000.00
			Grand Total	**$1,251,000.00**

Corridor Broome County

PRIORITY 4

North St.

Village of Endicott

Existing Conditions

The segment of North Street is 0.94 miles long and is located within the Village of Endicott. The corridor spans from the intersection with Nanticoke Avenue to the intersection with McKinley Avenue. The surrounding area is both residential and commercial with numerous businesses located along and north of the corridor and numerous residential streets south of the corridor. A total of 184 crashes occurred during the study period between 2019 and 2023, with 38 of these crashes resulting in injury. Twelve of the crashes during the study period for this corridor involved a bicyclist or a pedestrian with three of those resulting in serious injury.

The crash type most prevalent for this corridor during the study period was rear end crashes with 59 crashes and 2 of those involving serious injury. North Street maintains one travel lane and bicycle lane in each direction from Nanticoke Avenue to Vestal Avenue. From Vestal Avenue to Harrison Avenue, North Street transitions to having one shared use travel lane and a narrow shoulder in each direction with an eastbound parking lane for only from Fillmore Avenue to Harrison Avenue. From Harrison Ave to Lincoln Avenue, North Street transitions to one shared use travel lane in each direction with a two-way left turn lane. From Lincoln Avenue to McKinley Avenue, North Street maintains one shared use travel lane in each direction with three blocks of eastbound parking and a mix of dedicated left turn lanes mostly alternating blocks in each direction due to the numerous intersections within a short length.

This corridor features four intersections that have traffic control by span wire traffic signal which are Nanticoke Avenue, Lincoln Avenue, Oak Hill Avenue/Madison Avenue, and Washington Avenue. An additional two intersections are controlled by a mast arm traffic signal which are Vestal Avenue and McKinley Avenue. This corridor features fifteen streets that meet North Street at an intersection where stop control is only on the minor approach while North Street is uncontrolled. The North Street and Jefferson Avenue intersection features two uncontrolled crossings across North Street that have pedestrian warning signage. There is another uncontrolled midblock crossing west of Grant Ave that features a rapid rectangular flashing beacon (RRFB).

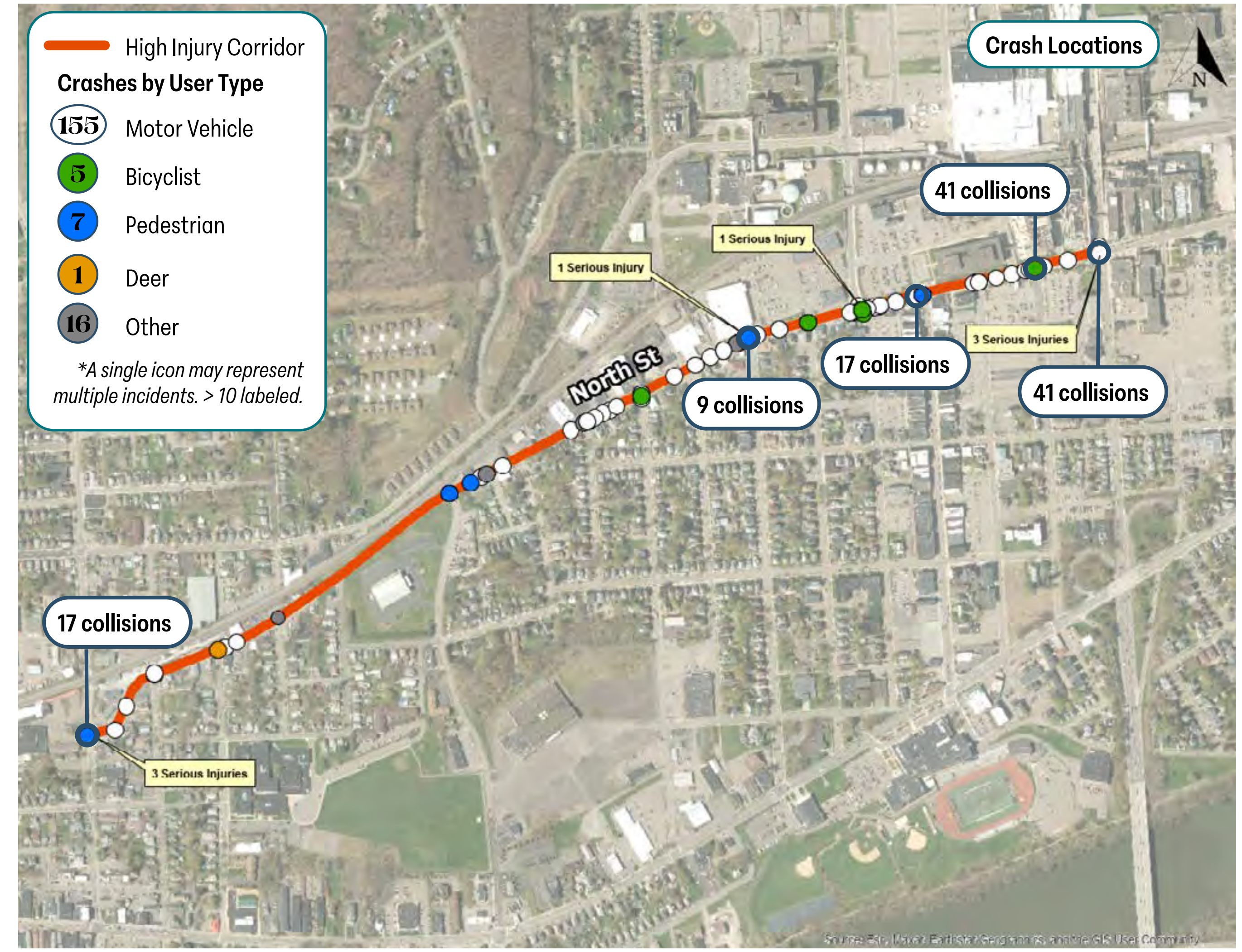
Curb ramps are present at all intersections throughout the corridor with detectable warning units present, but none of the intersections have NYSDOT standard cast iron detectable warning units. Crosswalks are present at all intersection with a variety of type L, S, and LS crosswalks being used throughout the corridor. Sidewalks are present for the entirety of the south side of the corridor. There are sidewalks present for the majority of the north side of the corridor with the exception of just east of Nanticoke Avenue to just west of Harrison Avenue. The corridor features street lighting throughout with lighting on both sides of the street and alternating for most of the corridor.

Highway Characteristics

Owner	Village of Endicott
Description	Two lane undivided urban road with sections of two-way left turn lane
Segment Length	0.94 miles
Speed Limit	30 mph
AADT	8,103 VPD
Functional Class	(17) Major Collector
LOSS	4
HRN Score	5
Equity Rank	Top 20

Photo 1: North street westbound looking northeast

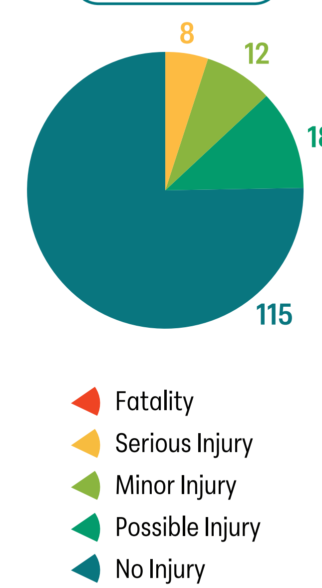
Crash Data



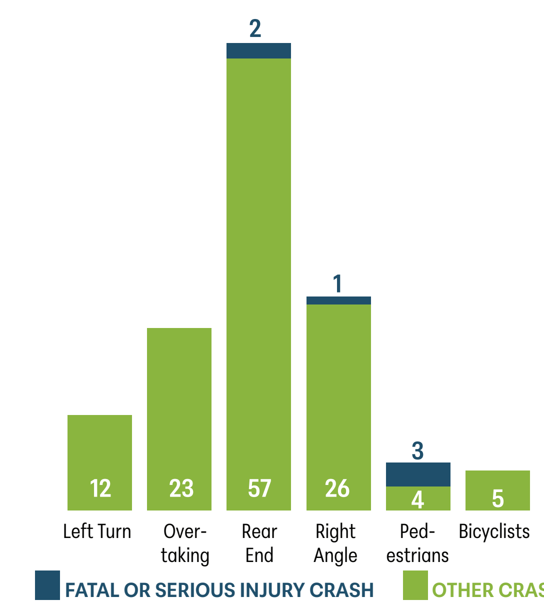
Contributing Factors

- Lack of high visibility crosswalks at numerous intersections
- Uncontrolled crossings at Jefferson Avenue
- Faded striping throughout corridor

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at North Street from the intersection with Nanticoke Avenue to the intersection with McKinley Avenue included a lack of high visibility crosswalks at numerous intersections, uncontrolled crossings at Jefferson Avenue, faded striping throughout corridor. Potentially relevant safety countermeasures at this location include, re-striping bicycle lanes and shared use lanes where applicable, installation of high visibility crosswalks, addition of traffic signal backplates, and install rapid reflective flashing beacons (RRFB) at Jefferson Avenue. Sections of the corridor with faded bicycle facility striping and symbols will be re-striped to provide increased visibility and awareness from roadway users. High visibility crosswalks would be installed at all intersections currently lacking them to increase pedestrian safety in the corridor. The installation of traffic signal backplates will provide increased visibility of the signal heads at the intersections within the corridor. Rapid reflective flashing beacons will be installed at the uncontrolled crossings at the intersection of North Street with Jefferson Avenue to provide increased visibility and safety for these crossings.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	1,800.00	LF	$24.00	$43,200.00
White Striping	6,000.00	LF	$2.00	$12,000.00
Striping Symbols	55.00	EA	$300.00	$16,500.00
Traffic Signal Backplates	48.00	EA	$600.00	$28,800.00
Rectangular Rapid Flashing Beacon (RRFB)	4.00	EA	$15,000.00	$60,000.00

Construction Total	$160,500.00
Contingency and Inflation (20%)	$32,100.00
Subtotal	$192,600.00
Work Zone Traffic Control (10%)	$19,300.00
Mobilization (4%)	$7,800.00
Survey (2%)	$3,900.00
Engineering Design (10%)	$19,300.00
Construction Inspection & Administration(15%)	$28,900.00
Grand Total	**$271,800.00**

Corridor Broome County

PRIORITY 5

Hooper Rd. (CR 33)

Town of Union

Existing Conditions

The segment of Hooper Road (CR 33) is 0.76 miles long and is located within the Town of Union. The corridor spans from the intersection with Hoover Avenue to the intersection with Pheasant Lane. The surrounding area is both residential and commercial with numerous businesses, myriad retail driveways, and residential homes located along the corridor. A total of 88 crashes occurred during the study period between 2019 and 2023, with 15 of these crashes resulting in injury. Two of the crashes during the study period for this corridor involved a bicyclist.

The crash type most prevalent for this corridor during the study period involved rear end crashes, which indicates a potential need for better access management. Hooper Road maintains one travel lane in each direction from Hoover Avenue to Beatrice Lane and from Pruyne Street to Pheasant Lane. From Beatrice Lane to Country Club Road, Hooper Road maintains two northbound travel lanes with one being a dedicated left turn lane and one southbound travel lane. From Country Club Road to Royal Road, Hooper Road maintains one northbound travel lane and three southbound travel lanes with one being a dedicated left turn lane and one being a dedicated right turn lane. From Royal Road to Pruyne Street, Hooper Road maintains one travel lane in each direction and a two-way left turn lane.

This corridor features three intersections with traffic control by span wire traffic signals which are Country Club Road, Smith Drive, and Pruyne Street. This corridor features six streets that meet Hooper Road at a three-leg intersection where stop control is only on the minor approach and Hooper Road is uncontrolled. Curb ramps are present at all intersections throughout the corridor, but only ramps at Country Club Road and the northeast corner of Beatrice Lane have plastic detectable warning units. Type S crosswalks are present at the intersection with Country Club Road, Royal Road, Smith Drive, Pruyne Street, and Pheasant Lane while the rest of the intersections lack crosswalks. Sidewalks are present for the entirety of the east side of the corridor. There are sidewalks present on the west side of the corridor from just south of Country Club Road to Pruyne Street. The corridor features street lighting throughout with most of the lighting based on the east side of Hooper Road.

Highway Characteristics

Owner	Broome County
Description	Two lane undivided urban road sections of a two-way left turn lane
Segment Length	0.76 miles
Speed Limit	30 mph
AADT	15,443 VPD
Functional Class	(16) Minor Arterial
LOSS	N/A
HRN Score	4
Equity Rank	Top 40

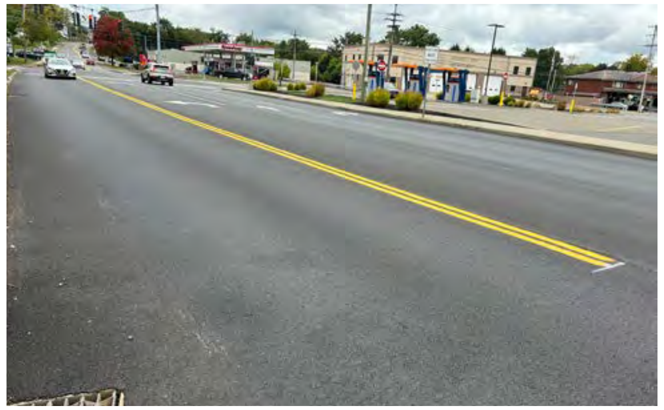


Photo 1: Hooper Rd looking southeast towards Country Club Rd

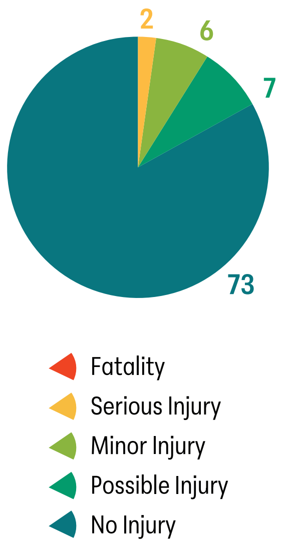
Photo 2: Hooper Rd and Smith Dr looking northwest

Crash Data

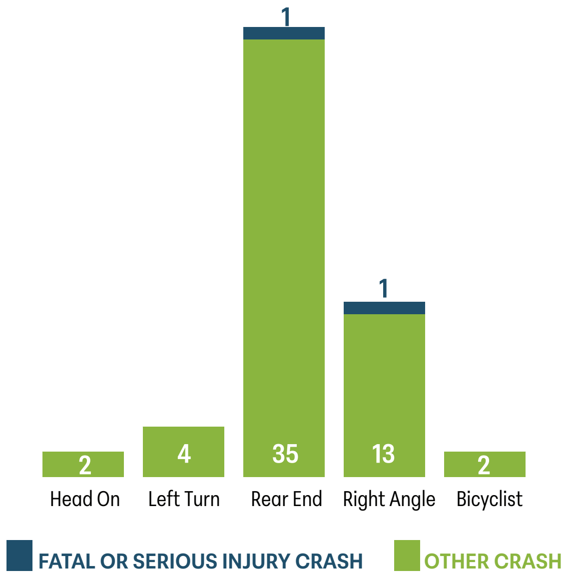
Contributing Factors

- Lack of high visibility crosswalks at intersections
- Lack of bicyclist accommodations
- Faded striping throughout corridor

Crash Severity

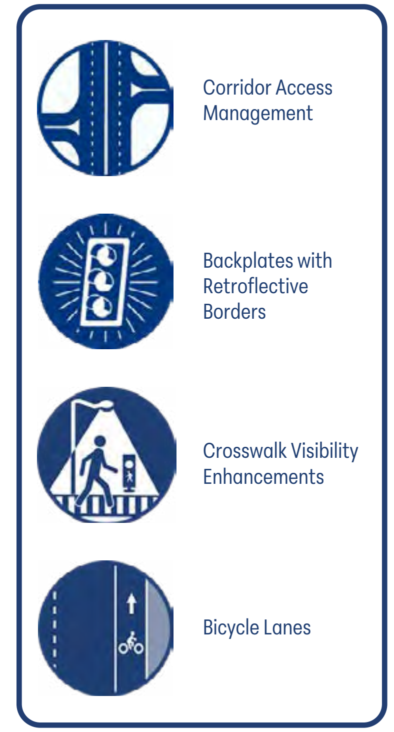


Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures



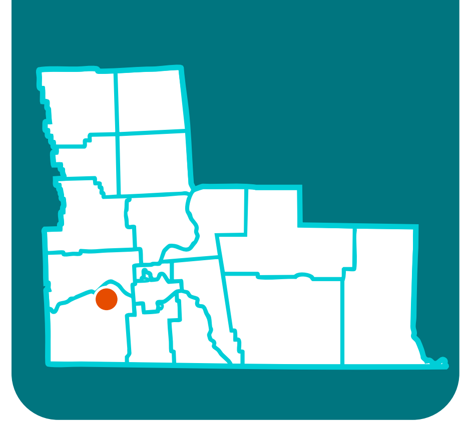
Contributing factors at Hooper Road from the intersection with Hoover Avenue to the intersection with Pheasant Lane included a relatively high density of commercial and residential driveways, lack of high visibility crosswalks at intersections, a lack of bicyclist accommodations, and faded striping throughout corridor. Potentially relevant safety countermeasures at this location include, reducing the density of driveways (enhancing access management), implementation of bicycle lanes and shared use lanes where applicable, installation of high visibility crosswalks, and the addition of traffic signal backplates with retroreflective borders. Techniques for better access management include decreasing the number of driveways through closure, consolidation, or relocation, and limiting allowed movements at driveways (e.g., right-in / right-out). In sections of the corridor where the existing travel lane is wide enough, there is an opportunity to split the travel lane in each direction into a travel lane and a bicycle lane. This will give bicyclists a designated space to travel along the corridor with appropriate separation from motor vehicle traffic. In the other sections of the corridor, where the existing lane width does not allow for a bike lane, shared use markings will be added to emphasize the need for drivers to share the road with bicyclists. The implementation of this bicycle infrastructure will create a more accessible corridor for bikes to safely navigate between the neighborhoods and businesses along Hooper Rd. This is especially important given the corridors close proximity to the Maine Endwell schools and the high volume of students who use this section of Hooper Rd to travel to and from school both on foot and via bicycle. At all the intersections along this corridor, high visibility crosswalks will be installed to enhance driver awareness of pedestrian crossings and thus increase pedestrian safety throughout the corridor. Lastly, new traffic signal backplates will be installed with retroreflective borders to provide increased visibility of the signal heads at the intersections within the corridor.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	620.00	LF	$24.00	$14,880.00
White Striping	7,425.00	LF	$2.00	$14,850.00
Striping Symbols	40.00	EA	$300.00	$12,000.00
Traffic Signal Backplates	20.00	EA	$600.00	$12,000.00
			Construction Total	$53,730.00
			Contingency and Inflation (20%)	$10,800.00
			Subtotal	$64,600.00
			Work Zone Traffic Control (10%)	$6,500.00
			Mobilization (4%)	$2,600.00
			Survey (2%)	$1,300.00
			Engineering Design (10%)	$6,500.00
			Construction Inspection & Administration(15%)	$9,700.00
			Grand Total	**$91,200.00**

Corridor Broome County

PRIORITY 6



Vestal Parkway East

Town of Vestal

Existing Conditions

The Vestal Parkway East (NY-434) corridor from African Rd to Clubhouse Rd consists of 3.5 miles of two lane divided highway. The corridor runs through a densely populated area just went of the City of Binghamton and provides access to SUNY Binghamton as well as several commercial plazas.

A total of 758 crashes occurred during the study period with 119 of these crashes resulting in some form of injury. There were 10 total crashes resulting in either fatalities or serious injuries and 9 crashes involving vulnerable road users which consisted of 4 pedestrians and 5 bicyclists. Over half the crashes were rear ends, however there were a significant number of right-angle collisions and collisions with fixed objects. The speed limit for the majority of Vestal Pkwy E is 45 mph when some reduced speed limit zones around Binghamton University. The road width varies throughout the corridor and primarily consists of two 11-ft travel lanes in each direction which are accompanied by dedicated turn lanes at several intersections.

The east and westbound travel lanes are separated by a centerline median that varies between concrete barrier and curbed, vegetated area. These median barriers are in poor condition at many locations along this highway. Concrete sidewalks are present at limited locations, resulting in a lack of connectivity. There are a few slight horizontal curves and no significant vertical curves on this corridor leading to major no sight distance issues. Bike lanes are present in some locations along the corridor; however, they are inconsistent and present some difficulties for vulnerable road users navigating the corridor. Pedestrian crossings exist at most of the intersections along the corridor. Three other projects were identified in the action plan at high-injury intersections along the Vestal Pkwy E corridor.

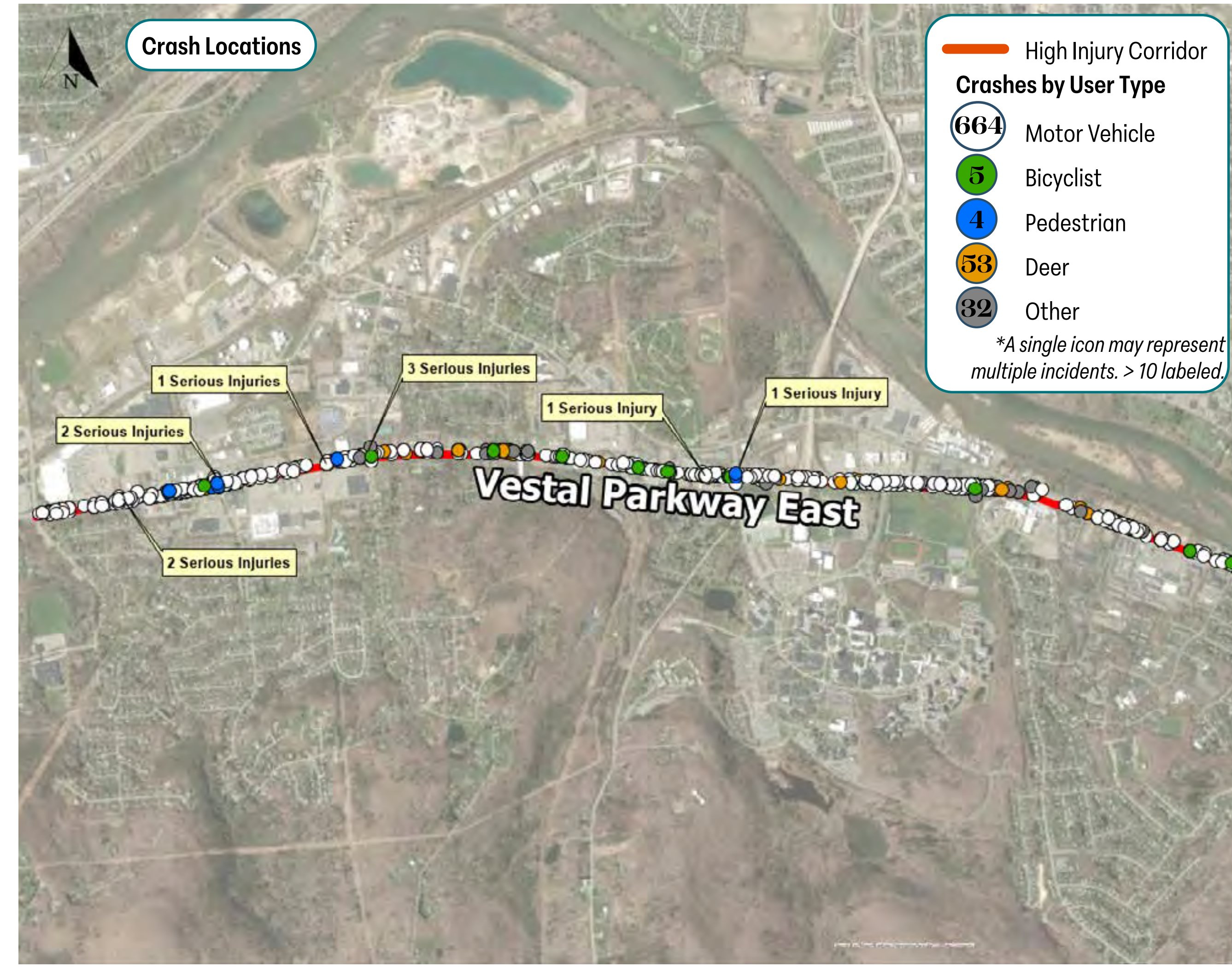
Highway Characteristics

Owner	NYSDOT
Route No.	NY-434
Description	Two-lane divided urban highway
Segment Length	4.83 miles
Speed Limit	45 mph
AADT	25,619 VPD
Functional Class	(14) Principal Arterial Other
LOSS	None
HRN Score	5
Equity Rank	Top 20

Photo 1: Vestal Pkwy E at Rano Blvd looking west

Photo 2: Vestal Pkwy E looking west

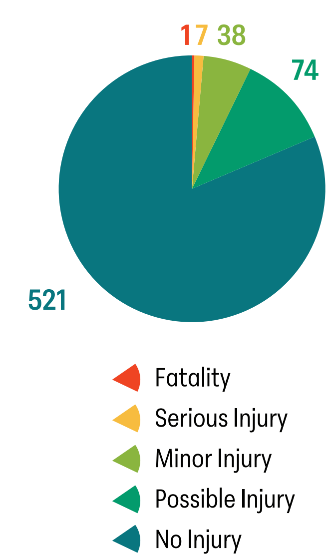
Crash Data



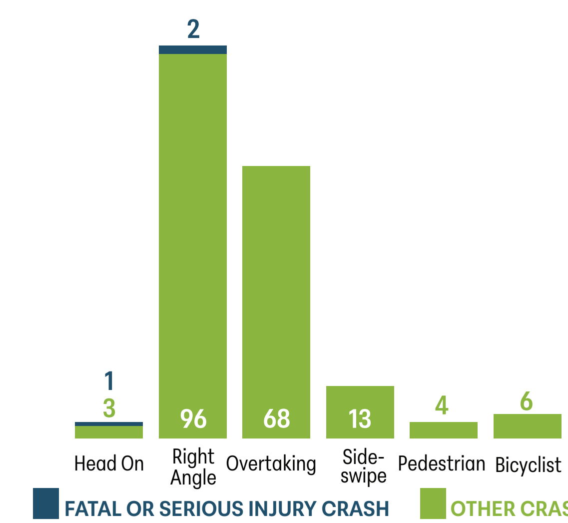
Contributing Factors

- Deteriorated median barrier
- Excessive driver speed
- Difficult turning movements
- High traffic volume

Crash Severity

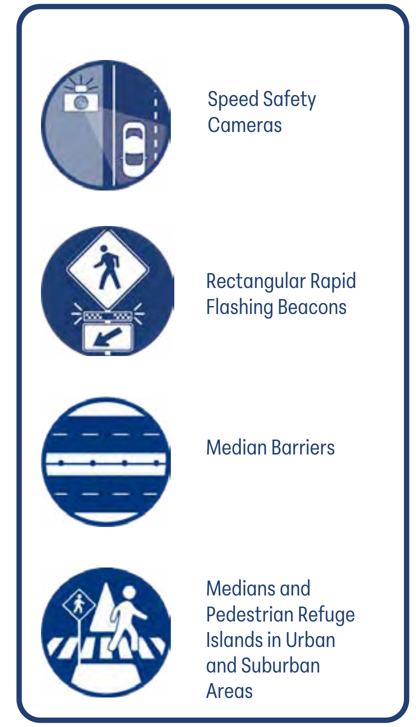


Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures



Contributing factors at Vestal Parkway East from African Road to Clubhouse Road included deteriorated median barrier, excessive driver speed, difficult turning movements, and high traffic volume. Potentially relevant safety countermeasures at this location include, speed safety cameras, median barriers, rectangular rapid flashing beacons, and pedestrian refuge islands. Drivers traveling at unsafe speeds has been a recurring contributing factor for crashes on Vestal Parkway East. To address this speed safety cameras (SSCs) will be installed at locations staggered throughout the corridor. Both fixed and point-to-point SSCs are suitable options for this corridor due to its length and wide distribution of crashes. The existing median barriers along this corridor are old and have deteriorated away over time offering little protection for drivers that stray from their travel lane. To improve these conditions, the existing median barriers will be reconstructed using curbed concrete and raised concrete in some locations. The new median barriers will offer protection against head on collisions and collisions with fixed objects which are together responsible for 5 serious injuries within this corridor. Along with these concrete medians, select sections of sidewalks will be reconstructed throughout the corridor to provide safe, accessible access for pedestrians. Rectangular rapid flashing beacons (RRFBs) will be installed on either side of the crossing at the unsignalized intersection of Vestal Pkwy E and the State Route 26 on/off ramp. These RRFBs will activate via a push button and provide increased driver awareness of pedestrians. Lastly, pedestrian refuge islands will be installed at the intersections of Vestal Pkwy E and Rano Blvd, African Rd and South Washington St. These high-injury locations are a part of separate projects included in the intersections portion of this document. The costs for these refuge islands are accounted for only in the intersection specific estimates. The impact of these refuge islands will improve the overall safety for pedestrians and bicyclists along this entire corridor.

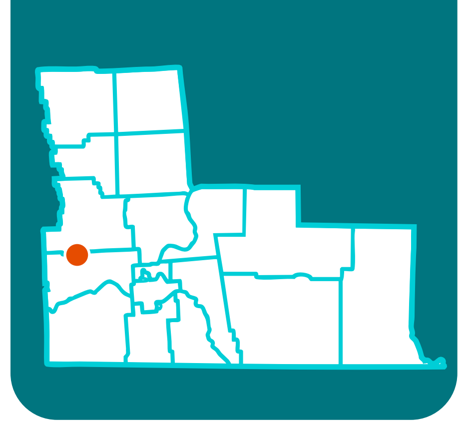
Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
New Concrete Sidewalk	1,400.00	CY	$1,500.00	$2,100,000.00
Concrete Median Barrier	850.00	CY	$1,500.00	$1,275,000.00
Speed Safety Cameras	8.00	EA	$25,000.00	$200,000.00
Curb Ramp and Warning Units	12.00	EA	$10,000.00	$120,000.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EA	$15,000.00	$30,000.00
Pedestrian Warning Signage	2.00	EA	$1,250.00	$2,500.00
			Construction Total	$3,727,500.00
			Contingency and Inflation (20%)	$745,500.00
			Subtotal	$4,473,000.00
			Work Zone Traffic Control (10%)	$447,300.00
			Mobilization (4%)	$179,000.00
			Survey (2%)	$89,500.00
			Engineering Design (10%)	$447,300.00
			Construction Inspection & Administration(15%)	$671,000.00
			Grand Total	**$6,307,100.00**

Corridor Broome County

PRIORITY 7

Union Center-Maine Highway (NY 26)



Town of Union / Town of Maine

Existing Conditions

The segment of Union Center-Maine Highway (NY 26) is 4.95 miles long and is located within the Towns of Union and Maine. The corridor spans from the intersection with Daugherty Road to Nanticoke Creek, just north of Day Hollow Road. The surrounding area is both residential and commercial with numerous businesses and residential homes located along the corridor.

A total of 174 crashes occurred during the study period between 2019 and 2023, with 26 of these crashes resulting in injury. One of the crashes during the study period for this corridor involved a pedestrian which resulted in a fatality. Union Center-Maine Highway maintains one travel lane with a striped shoulder in each direction and a two-way left turn lane from Nanticoke Creek, just north of Day Hollow Road to just north of Ann G. McGuinness Elementary School. From just north of Ann G. McGuinness Elementary School to Daugherty Road, Union Center-Maine Highway maintains one travel lane with a striped shoulder in each direction. Just north and south of the intersection with NY 38B, Union Center-Maine Highway widens to accommodate a northbound dedicated left turn lane.

This corridor is uncontrolled along Union Center-Maine Highway and features ten streets that meet Union Center-Maine Highway at a three-leg intersection where stop control is only on the minor approach. Sidewalks are only present for a short distance on both sides of the road at the southern terminus of the corridor around Linnaeus W West Elementary School. The only curb ramps in the corridor are located in front of the previously mentioned school for a driveway crossing and an uncontrolled midblock crossing which has a rectangular rapid flashing beacon (RRFB). These two crossings at the school feature type LS crosswalks. The corridor features street lighting throughout with the lighting alternating sides of the road at different sections of the corridor.

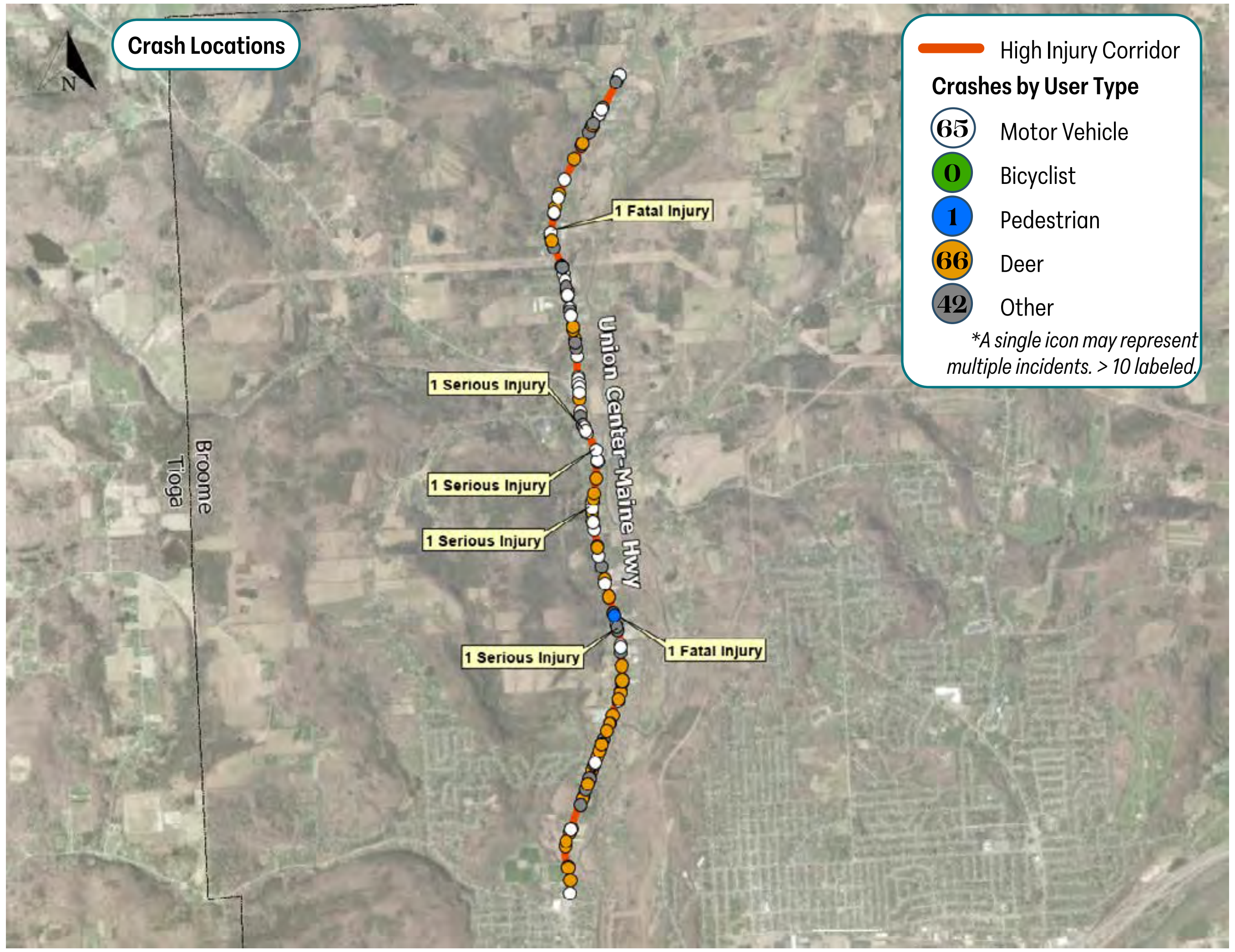
Highway Characteristics

Owner	NYSDOT
Description	Two lane undivided urban road sections of a two-way left turn lane
Segment Length	4.95 miles
Speed Limit	35-55 mph
AADT	12,639 VPD
Functional Class	(16) Minor Arterial
LOSS	N/A
HRN Score	3
Equity Rank	Top 20
Adjacent Lane Use	Urban

Photo 1: South end of high-injury corridor looking south

Photo 2: Union Center-Maine Highway looking north

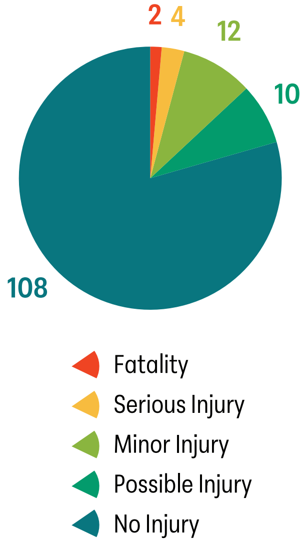
Crash Data



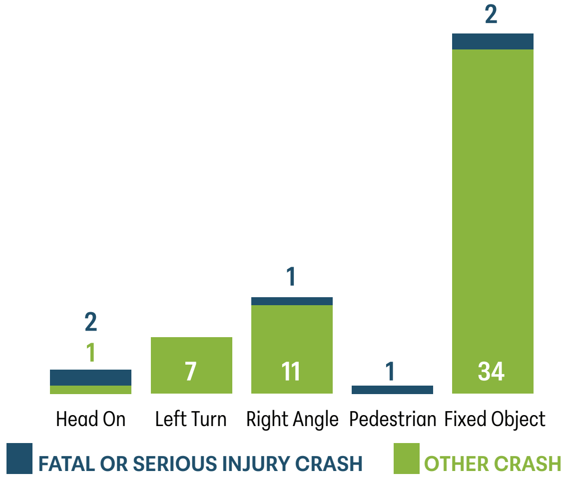
Contributing Factors

- Lack of guide railing at horizontal curves with higher crash rates
- Lack of pedestrian and bicyclist accommodations
- Faded centerline striping throughout corridor

Crash Severity



Most Frequent Collision Type



Proposed Countermeasures

Roadside Design Improvements at Curves

Rectangular Rapid Flashing Beacons

Bicycle Lanes

Safety Edge

Contributing factors at Union Center-Maine Highway from the intersection with Daugherty Road to Nanticoke Creek, included a lack of guide railing at horizontal curves with higher crash rates, a lack of pedestrian and bicyclist accommodations, and faded centerline striping throughout corridor. Potentially relevant safety countermeasures at this location include, roadside design improvements with shoulder widening and installation of guide railing, installation of rectangular rapid flashing beacons (RRFB) at midblock crossing, restriping the yellow centerline, and installation of solar speed feedback signs. The existing paved shoulder widths vary throughout the corridor and where they are less than 5 feet, they will be expanded to meet the width suitable for bicycle use. 5 feet is the minimum width for a bicycle path and by expanding the shoulder, adequate space will be provided for bicycles to travel with proper distance between them and motor vehicle traffic. Guide railing will be installed at multiple horizontal curves throughout the corridor to guide vehicles that have veered off the curve back onto the road. Guide railing in these locations is essential to prevent serious injuries in the event off run-off-the-road crashes. RRFBs will be installed at the uncontrolled midblock crossing to the south of the project limits just north of Carden Street to provide enhanced visibility of the crossing. There are existing pedestrian signs here but, replacing these with RRFB's will improve driver awareness of the crossing and give them proper warning when a pedestrian is present in the crosswalk. The double yellow centerline striping has faded in certain areas throughout the corridor and will be restriped to enhance visibility of the lanes in the corridor. These will decrease the potential for head on collisions and improve drivers' awareness of their respective travel lane. Solar speed feedback signs would be installed near the elementary school at the south end of the corridor in an effort to reduce vehicle speed around the school. These areas near the school have a reduced speed limit that drivers may neglect, creating a dangerous hazard for pedestrians. Adding the speed feedback sign will make drivers aware of their speed limit and encourage them to decrease their speed as they enter the school zone.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Subbase Course	488.89	CY	$100.00	$49,000.00
Asphalt Pavement	577.50	TON	$150.00	$87,000.00
Yellow Epoxy Striping	5,000.00	LF	$2.00	$10,000.00
Removal of Existing Guide Rail	1,200.00	LF	$5.00	$6,000.00
Box Beam Guide Railing	2,500.00	LF	$50.00	$125,000.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EA	$15,000.00	$30,000.00
Solar Speed Feedback Sign	2.00	EA	$20,000.00	$40,000.00
			Construction Total	$347,000.00
			Contingency and Inflation (20%)	$69,400.00
			Subtotal	$416,400.00
			Work Zone Traffic Control (10%)	$42,000.00
			Mobilization (4%)	$17,000.00
			Survey (2%)	$9,000.00
			Engineering Design (10%)	$42,000.00
			Construction Inspection & Administration(15%)	$63,000.00
			Grand Total	**$589,400.00**

BMTS safety *ACTION* plan

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Corridor Broome County

PRIORITY 8

George F Highway West (NY-17C)

Town of Union

Existing Conditions

George F Highway West (NY-17C) is 1.52 miles in length and is located between Johnson City and Endicott, NY. The project limits span from the intersection with River Road to Main Street. There was a total of 35 crashes during the study period between 2019 and 2023 with 7 of them resulting in injuries. Among these injury crashes was a pedestrian fatality and one other serious injury crash.

This stretch of George F Hwy W is a two-lane, one-way road (westbound) that follows the state speed limit of 55 mph. The width of the road ranges from 30 to 40 feet and is composed of two 11-foot travel lanes in the westbound direction. The two travel lanes are separated by a broken white line allowing lane changes and passing throughout the stretch. The corridor features an exterior right white edge line, and the left lane has a yellow edge line. There are two stretches where a temporary third lane emerges to accommodate traffic getting on or off the southern tier expressway. There are wide shoulders throughout the corridor varying from 4 feet to 11 feet.

Based on field visits, and discussions with local municipalities, it was observed that pedestrians opt to use this route to travel between Johnson City and municipalities to the west as it is a fairly flat route with wide shoulders. The high-injury corridor begins to the east where NY-17C becomes Main St. To the west, the high-injury corridor ends just as it converges with George F Hwy eastbound. The Norfolk Southern Railway runs alongside the corridor to the north. The high-injury stretch of George F Highway W does not directly connect to any residential or commercial driveways.

There is guide railing along either side of the road for the majority of the corridor. There are no existing bicyclist or pedestrian accommodations along the corridor. The pavement is in poor condition with significant cracking and some deformation which has also led to faded striping. Light poles are present along the south side of the corridor; however, this lighting was observed to be outdated and inadequate.

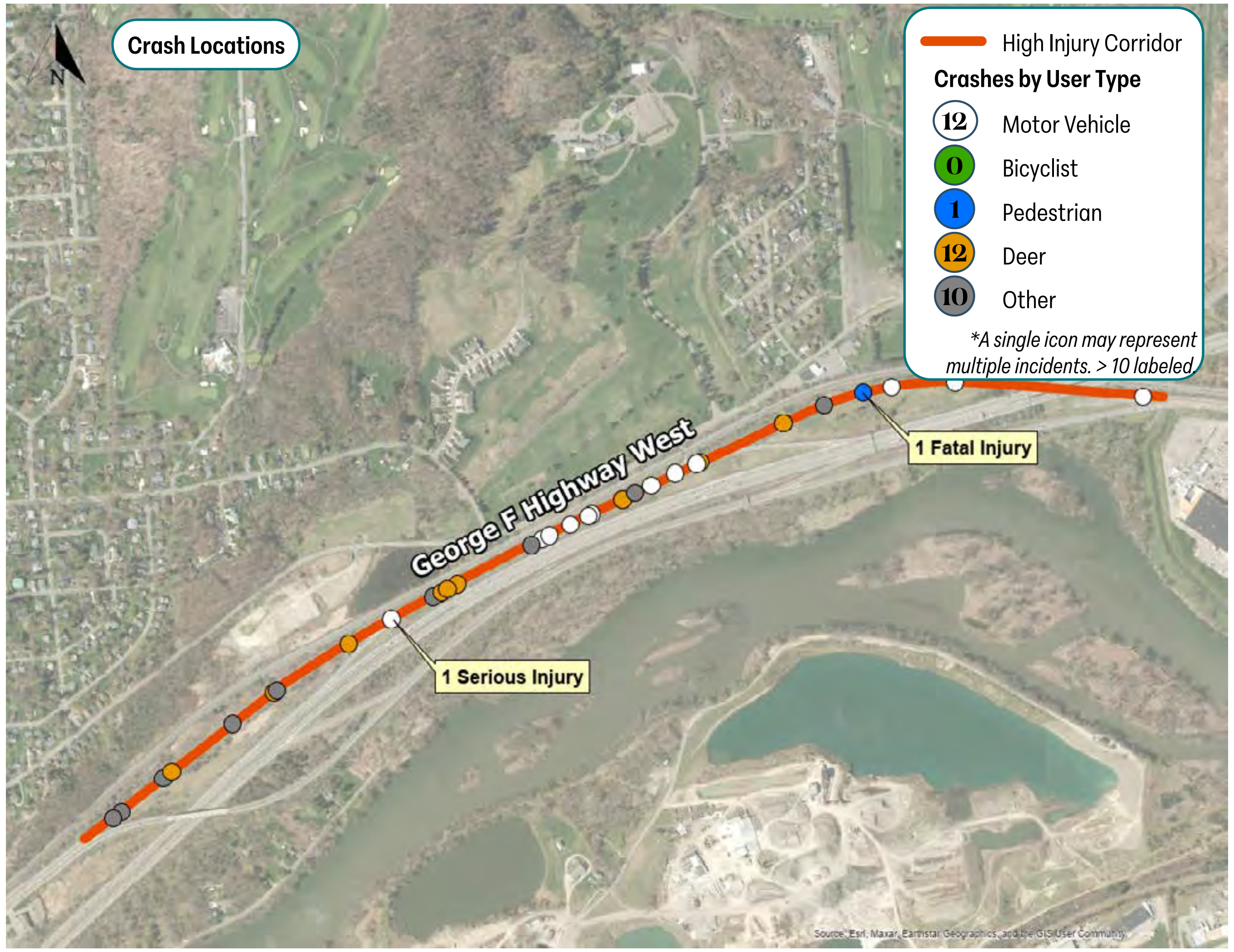
Highway Characteristics

Owner	NYSDOT
Route No.	NY-17C
Description	Two-lane one-way highway
Segment Length	1.52 miles
AADT	9,182 VPD
Functional Class	(12) Principal Arterial Expressway
LOSS	Not Available
HRN Score	4
Equity Rank	Normal Equity

Photo 1: George F Highway westbound looking east

Photo 2: George F Highway westbound looking west

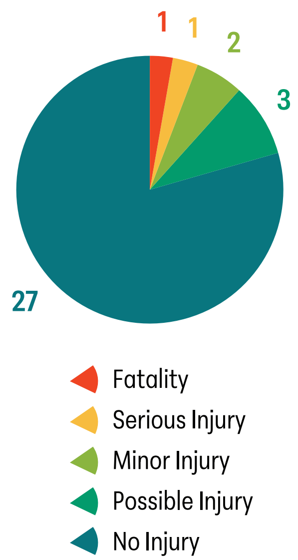
Crash Data



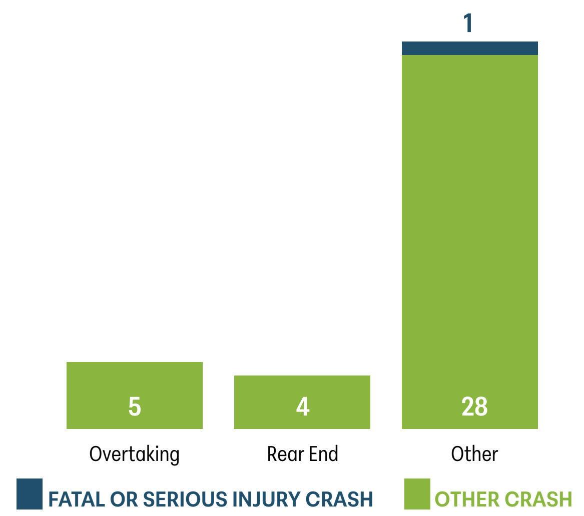
Contributing Factors

- Lack of pedestrian/bicycle accommodations
- Poor roadway lighting
- Deteriorated pavement and striping

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at George F Highway West from the intersection with River Road to Main Street included a lack of pedestrian/bicycle accommodation, poor roadway lighting, deteriorated pavement and striping. Potentially relevant safety countermeasures at this location include, roadside design improvements, crosswalk visibility enhancements, bike lanes, walkways, lighting improvements, and a pedestrian hybrid beacon. These countermeasures are all centered around the reconfiguration of the roadway to construct a shared use path on the north side of the highway. These improvements will require shoulder widening and guide rail relocation. This will include removing and replacing the old guide rail with improved box beam guide railing. The existing pavement edge will be extended approximately 4 feet, and the guide railing will be relocated approximately 6 feet towards the existing outside travel lane. This will create space for a 10-foot-wide shared use path accessible to both bicyclists and pedestrians. This pathway will begin to the east where the existing sidewalk will be extended approximately 600 feet to meet the asphalt path which consists of two 5-foot shared use lanes. The path will have pavement markings and signage to identify the direction of travel and occupancy of both pedestrians and bicycles. The path will be separated from the roadway by the new box beam guide railing. To the west the path will cross George F Hwy W with a type LS crosswalk. This crossing will have push buttons on either side that activate a pedestrian hybrid beacon, stopping traffic temporarily to permit safe crossing. This path will allow residents to safely travel between the cities of Endicott, Endwell and Johnson City. It will offer increased protection for vulnerable road users who are already using this corridor without any existing accommodations. Lighting improvements will also be added to the corridor to replace the existing outdated light poles with new LED streetlights. This will enhance the visibility of drivers traveling in the morning and evening to better see and avoid pedestrians, bicyclists and deer.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete Sidewalk	38.27	CY	$1,500.00	$58,000.00
Subbase Course	391.11	CY	$100.00	$40,000.00
Asphalt Pavement	693.00	TON	$150.00	$104,000.00
Overhead Street Lighting	30.00	EA	$5,000.00	$150,000.00
Removal of Existing Guide Rail	9,000.00	LF	$5.00	$45,000.00
Box Beam Guide Rail	8,900.00	LF	$50.00	$445,000.00
Shared Use Path Signs	16.00	EA	$1,250.00	$20,000.00
HAWK Beacon	1.00	EA	$150,000.00	$150,000.00
			Construction Total	$1,012,000.00
			Contingency and Inflation (20%)	$203,000.00
			Subtotal	$1,215,000.00
			Work Zone Traffic Control (10%)	$122,000.00
			Mobilization (4%)	$49,000.00
			Survey (2%)	$25,000.00
			Engineering Design (10%)	$122,000.00
			Construction Inspection & Administration(15%)	$183,000.00
			Grand Total	**$1,716,000.00**

Corridor Broome County

PRIORITY 9

Route 11

Town of Kirkwood

Existing Conditions

Kirkwood Ave (US Route 11) from Meadow Lane to Main St is 2.53 miles in length and is located in the Town of Kirkwood, NY, southeast of the City of Binghamton. There was a total of 42 crashes on this corridor during the study period from 2019 to 2023 and 8 of those crashes resulted in some form of injury. There were 5 serious injury crashes with 4 of them involving vehicles running off the road. One of the crashes resulted in a fatality due to a collision with a deadly fixed object.

The high-injury corridor begins just south of Fivemile Point and ends north of the Conklin Kirkwood Bridge. The Susquehanna River and Norfolk Southern Railway run parallel to Kirkwood Ave to the west. There are several culverts which pass underneath this stretch of Route 11. This corridor maintains one travel lane each way with a speed limit of 55 mph. The width of the road ranges from 22 to 30 feet with 11-foot travel lanes in the northbound and southbound directions. The two travel lanes are separated by full barrier double yellow lines for a majority of the corridor. Passing is permitted through the use of broken yellow lines through certain stretches where sight distance is adequate. Both travel lanes have a 4" white line to indicate the edge of the travel lane. There are shoulders present on either side of the corridor which vary between 2 and 4 feet in width.

There are numerous driveways and side streets present along the east side of Kirkwood Ave. Advanced signage is present in some locations to give warning of upcoming intersections. Other than two standalone pedestrian signs located south of Trim St, there are no existing pedestrian or bicyclist accommodations on this corridor. There is existing guide railing present along some of the horizontal curves and along the culvert crossings. The bridge railing appears to be in good condition, but the corrugated guide rail along the curves is in need of replacement. Based on field observations and discussion with the local highway department, there are sight distance issues present at Ostrum Rd and Grange Hall Rd due to overgrowth of vegetation. The pavement on Kirkwood Ave is in poor condition and has significant cracking which has led to faded striping. There are few streetlights present along the study corridor.

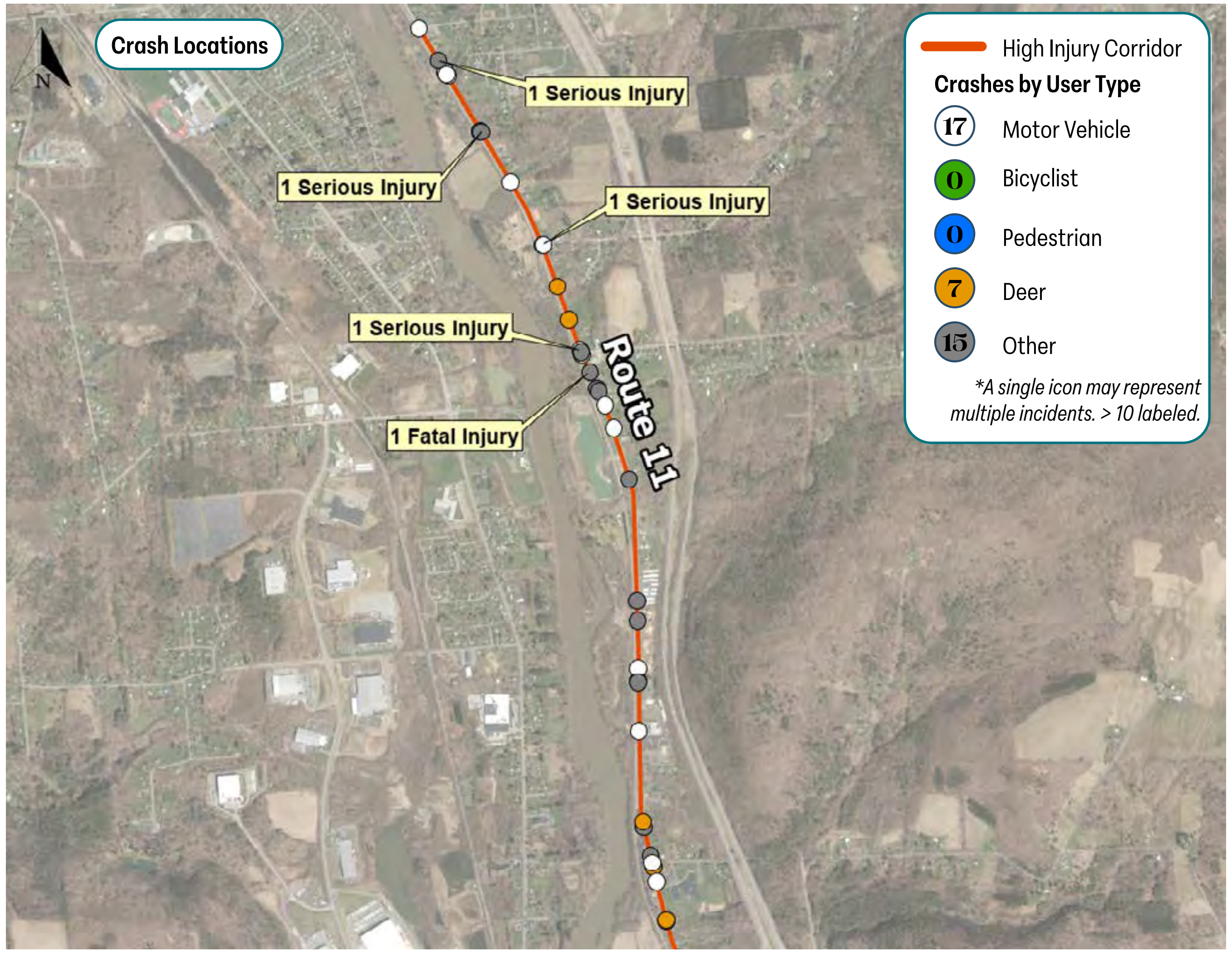
Highway Characteristics

Owner	NYSDOT
Route No.	Route 11
Description	Two-lane local highway
Segment Length	2.53 miles
Speed Limit	55 mph
AADT	2,703 VPD
Functional Class	(17) Major Collector
LOSS	4
HRN Score	3
Equity Rank	Normal Equity

Photo 1: Kirkwood Ave at First Christian Church looking north

Photo 2: Kirkwood Ave south of Johnson Rd looking south

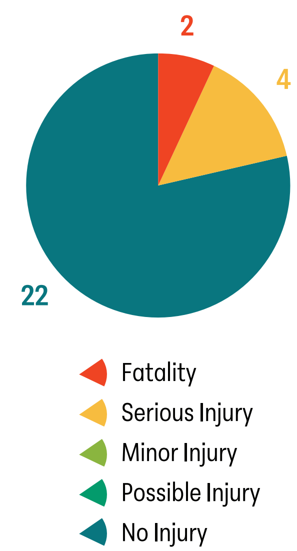
Crash Data



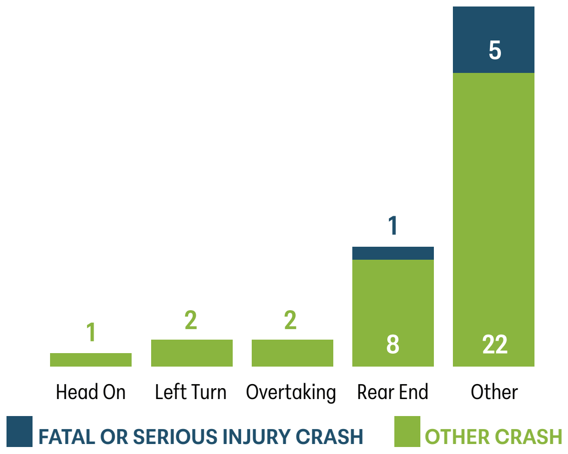
Contributing Factors

- Narrow shoulder width
- Minimal protection from fixed objects
- Poor roadway lighting

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

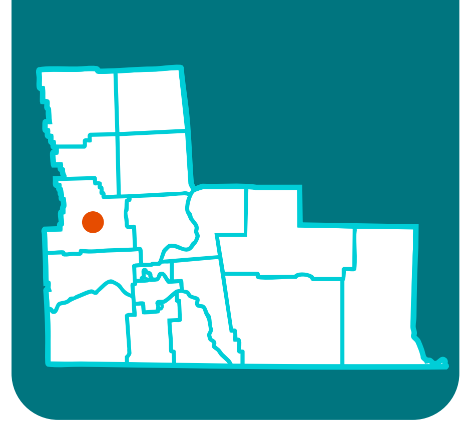
Contributing factors at Kirkwood Avenue (US Route 11) from Meadow Lane to Main Street included narrow shoulder width, minimal protection from fixed objects, and poor roadway lighting. Potentially relevant safety countermeasures at this location include, longitudinal rumble strips, safety edge, roadside design improvements at curves, and lighting. Rumble strips will be grooved longitudinally along the centerline of the corridor. These will alert drivers who may be drowsy or are straying out of their lane. The existing shoulder on either side of the roadway will be widened and additional 4 feet using subbase material. With this new material, a safety edge will also be formed to provide an easier transition back onto the travel way in the event that a vehicle runs off the road. Where there is existing guiderail and along horizontal curves, new box beam guide railing will be installed. This will provide a safe barrier for cars that exit the travel way during a crash to prevent them from undergoing serious injuries. The striping along the centerline has faded and will be impacted by the installation of the new rumble strip, so it should be restriped. The locations where passing is permitted from one direction or both should also be reevaluated to prevent future head on crashes. New streetlights will also be added to the corridor primarily along the southern half of the corridor where there is no existing streetlights present. This will allow for increased visibility during the morning and evening. The increased lighting will decrease the risk of crashes involving vulnerable road users as well as deer and animals. Lastly, vegetation will be cut back and removed around existing signage and approaches near side streets. This will allow for increased visibility of motor vehicles looking to pull out onto Route 11.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Vegetation Removal	1.00	LS	$25,000.00	$25,000.00
Shoulder Backup Subbase	485.33	CY	$100.00	$49,000.00
Yellow Epoxy Striping	2,500.00	LF	$2.00	$5,000.00
Box Beam Guide Railing	2,000.00	LF	$50.00	$100,000.00
Longitudinal Rumble Strip	7,500.00	LF	$2.00	$15,000.00
Lighting Improvements	1.00	LS	$100,000.00	$100,000.00
			Construction Total	$294,000.00
			Contingency and Inflation (20%)	$58,800.00
			Subtotal	$352,800.00
			Work Zone Traffic Control (10%)	$35,300.00
			Mobilization (4%)	$14,200.00
			Survey (2%)	$7,100.00
			Engineering Design (10%)	$35,300.00
			Construction Inspection & Administration(15%)	$53,000.00
			Grand Total	**$497,700.00**

Corridor Broome County

PRIORITY 10



Lewis Rd. (CR 72)

Town of Maine/Town of Chenango

Existing Conditions

This stretch of Lewis Road (CR 72) from Middle Stella Ireland Rd to Upper Front Street is 2.59 miles long and is located north of the City of Binghamton.

There was a total of 33 crashes during the study period with 10 of them resulting in injury. There were five serious injury crashes, including four run-off-the-road crashes. The speed limit on Lewis Road varies from 30 to 45 mph with 25 mph advisory speeds at horizontal curves. The width of the road ranges between 30 and 50 feet. The corridor primarily maintains one 11-foot travel lane each way but expands to two lanes each way for a short distance at the west end of the corridor. The shoulder width varies throughout the corridor from 0 to 4 feet. The corridor has many residential homes present on both sides of the road.

There are several significant horizontal and vertical curves which present sight distance issues throughout the corridor. Limited sight distance, reduced curve speed, and curve warning chevrons are present at select locations on Lewis Road. There are no existing bicyclist or pedestrian accommodations present on this corridor. Guide railing is present at the severe geometric curves, but is in poor condition, and has fallen into disrepair at several locations, likely as the result of previous crashes.

Passing is restricted within the entire stretch with the use of a full barrier double yellow centerline. White edge lines are missing from the majority of the corridor. The striping is overall in good condition, but there are several stretches where it has faded and needs updating.

Highway Characteristics

Owner	Broome County
Route No.	CR-72
Description	Two-lane undivided rural road
Segment Length	2.59 miles
Speed Limit	30-45 mph
AATD	VPD
Functional Class	(17) Major Collector
LOSS	3
HRN Score	2
Equity Rank	Top 40

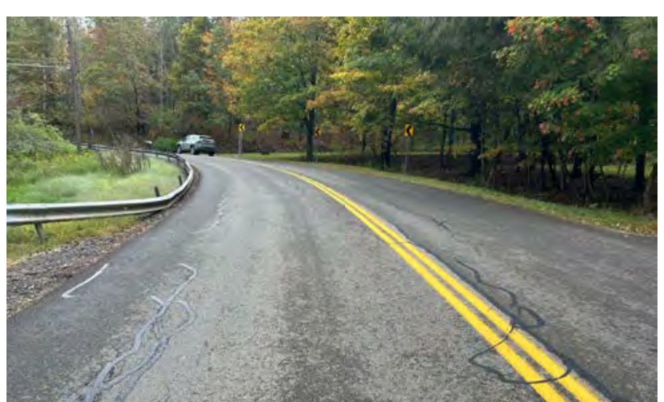
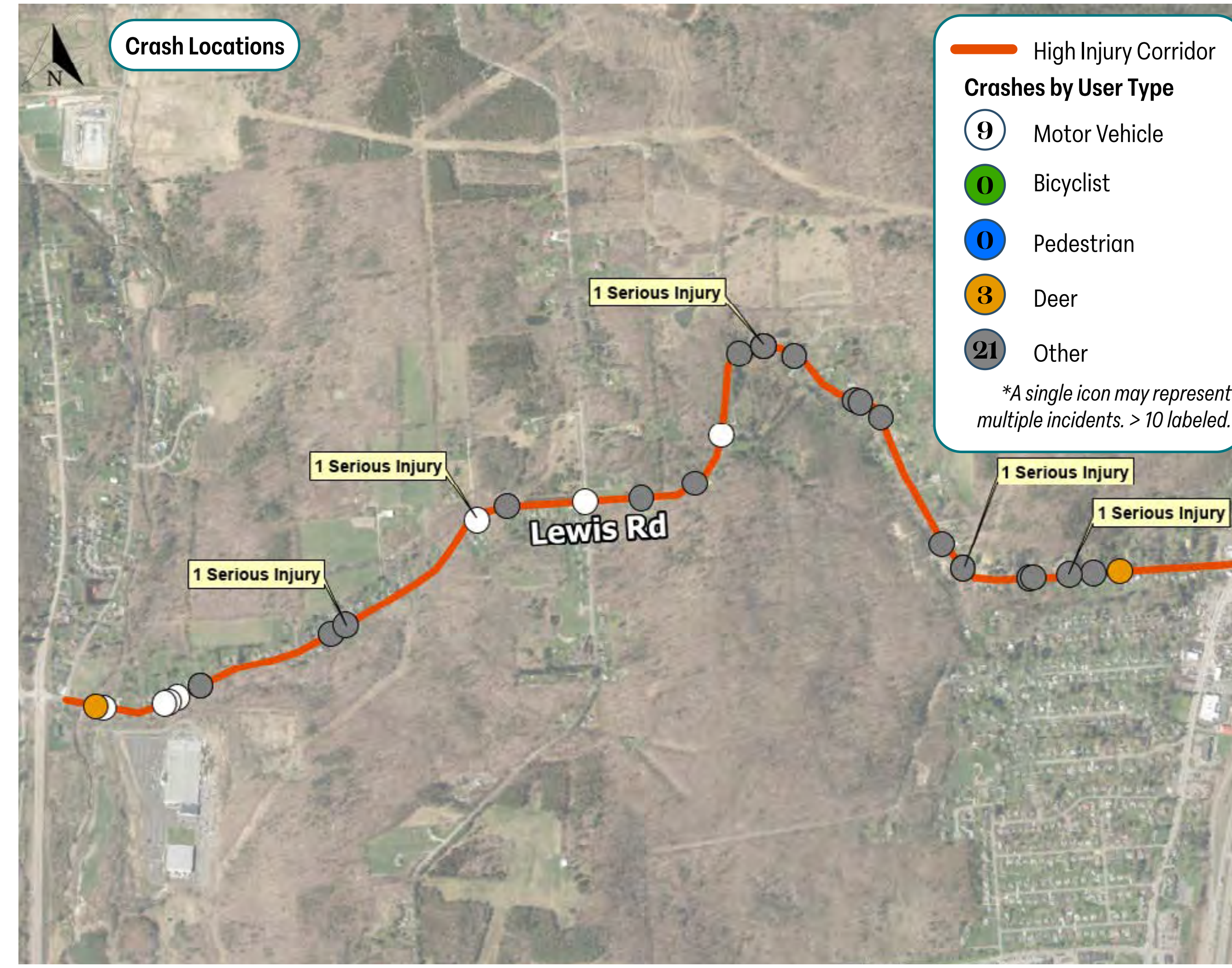


Photo 1: Lewis Rd looking north

Photo 2: Lewis Rd looking west

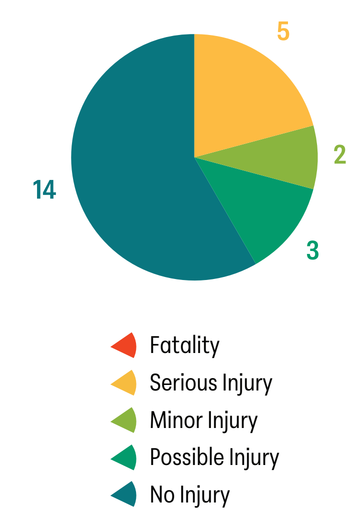
Crash Data



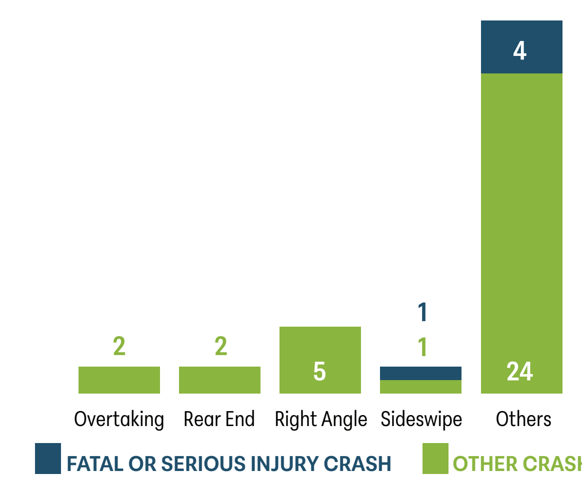
Contributing Factors

- Steep vertical and sharp horizontal curves
- High run-off-road risk
- Limited sight distance

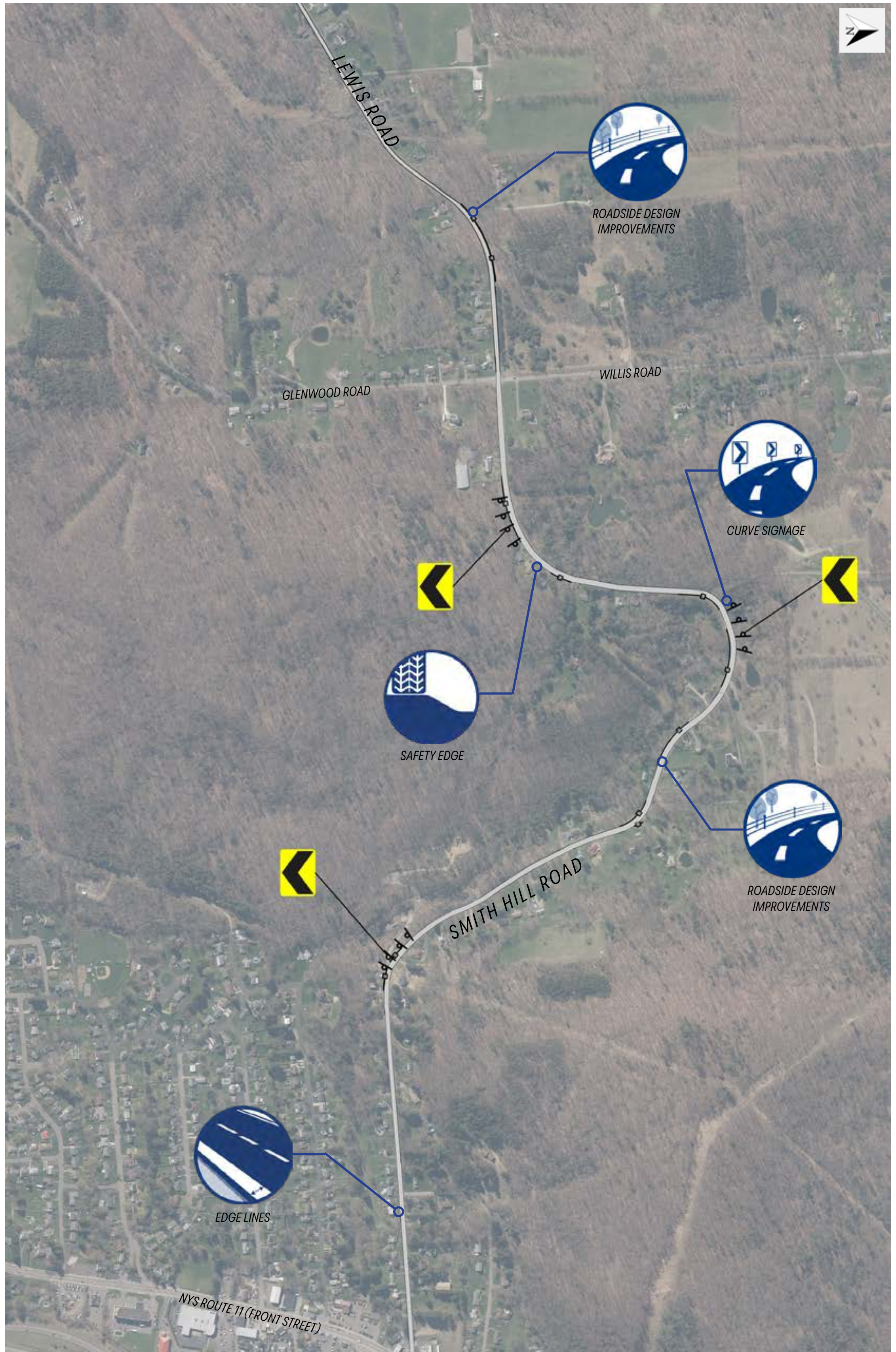
Crash Severity



Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures

Contributing factors at Lewis Road from Middle Stella Ireland Road to Upper Front Street included steep vertical and sharp horizontal curves, high run-off-road risk, and limited sight distance. Potentially relevant safety countermeasures at this high-injury corridor include wider edge lines, enhanced delineation at horizontal curves, safety edge installation, and roadside design improvements at curves. New 6" white epoxy edge lines will be striped onto Lewis Rd where they are currently missing. This will give drivers a better sense of where they are on the road and prevent them from straying too close to the edge of the travel lane. This will reduce the risk of run-off-road and head on crashes by keeping drivers appropriately positioned within their lane. Curve warning chevrons will be added to areas of sharp horizontal curvature and existing curve warning signs will be replaced. This will improve driver awareness of upcoming curves and reduce the risk of them crashing with other vehicles or fixed objects as they go around curves. Along the corridor, shoulder backup subbase will be added to provide drivers with additional recovery zones. To improve roadside safety at curves, existing guide railing that is in disrepair will be replaced and additional guide railing will be added at areas of extreme curvature. Lastly, there are some existing signage including a speed limit and curve warning sign that are covered up by vegetation. This vegetation shall be cut back and cleared to allow drivers to easily view the signage and have appropriate sight distance around curves.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Shoulder Backup Subbase	888.89	CY	$100.00	$89,000.00
Box Beam Guide Rail	2,705.00	LF	$50.00	$136,000.00
Vegetation Removal	1.00	LS	$10,000.00	$10,000.00
Curve Warning Chevrons	12.00	EA	$1,000.00	$12,000.00
White Edge Lines	25,500.00	LF	$2.00	$51,000.00
			Construction Total	$298,000.00
			Contingency and Inflation (20%)	$59,600.00
			Subtotal	$357,600.00
			Work Zone Traffic Control (10%)	$36,000.00
			Mobilization (4%)	$15,000.00
			Survey (2%)	$8,000.00
			Engineering Design (10%)	$36,000.00
			Construction Inspection & Administration(15%)	$54,000.00
			Grand Total	**$506,600.00**

Corridor Tioga County

PRIORITY 2

State Route 17C

Village of Owego

Existing Conditions

This segment of State Route 17C (NY-17C) is 0.97 miles long and is located just to the east of the Village of Owego. There was a total of 65 crashes during the study period from 2019 to 2023, with 6 of those crashes resulting in injury. There were 2 crashes involving pedestrians and 1 crash with a bicyclist. 1 of the pedestrians suffered serious injuries from the crash. The speed limit of this road is 40 mph throughout the entire length included in the high-injury network. The width of the road ranges between 40-ft and 50-ft and maintains one travel lane each way with a centerline two-way left turn lane. Each travel lane is approximately 11 feet wide, the left turn median has a width of 12 feet. There are shoulders on either side ranging from 2-ft to 11-ft throughout the corridor.

The corridor begins to the east with the NY-434 Connection off-ramp consisting of a sharp turn radius. To the west, the corridor narrows down and the left turn median ends. This stretch includes several driveways on either side of the roadway leading to commercial businesses. There is one four-way signalized intersection with a shopping plaza and hotel on either side. There are sharrows present on both roadway approaches on the east side of the corridor.

Signage indicates that there is a bike lane which begins at the entrance to Wendy's and continues along both approaches into the village of Owego. There are, however, no existing pavement markings to indicate the presence of bike lanes. There are several "no driving on shoulder" signs along the road. Light posts are scattered throughout the corridor, primarily at and around the driveways and parking lots. Type LS crosswalks are located crossing Route 17C at the NY-434 off-ramp, and Hampton Inn intersections. They are accompanied by audible pedestrian signals but do not have any curb ramps or detectable warning units. There are no sidewalks present within this corridor. The asphalt pavement is in poor condition, the striping and pavement markings are still fairly visible.

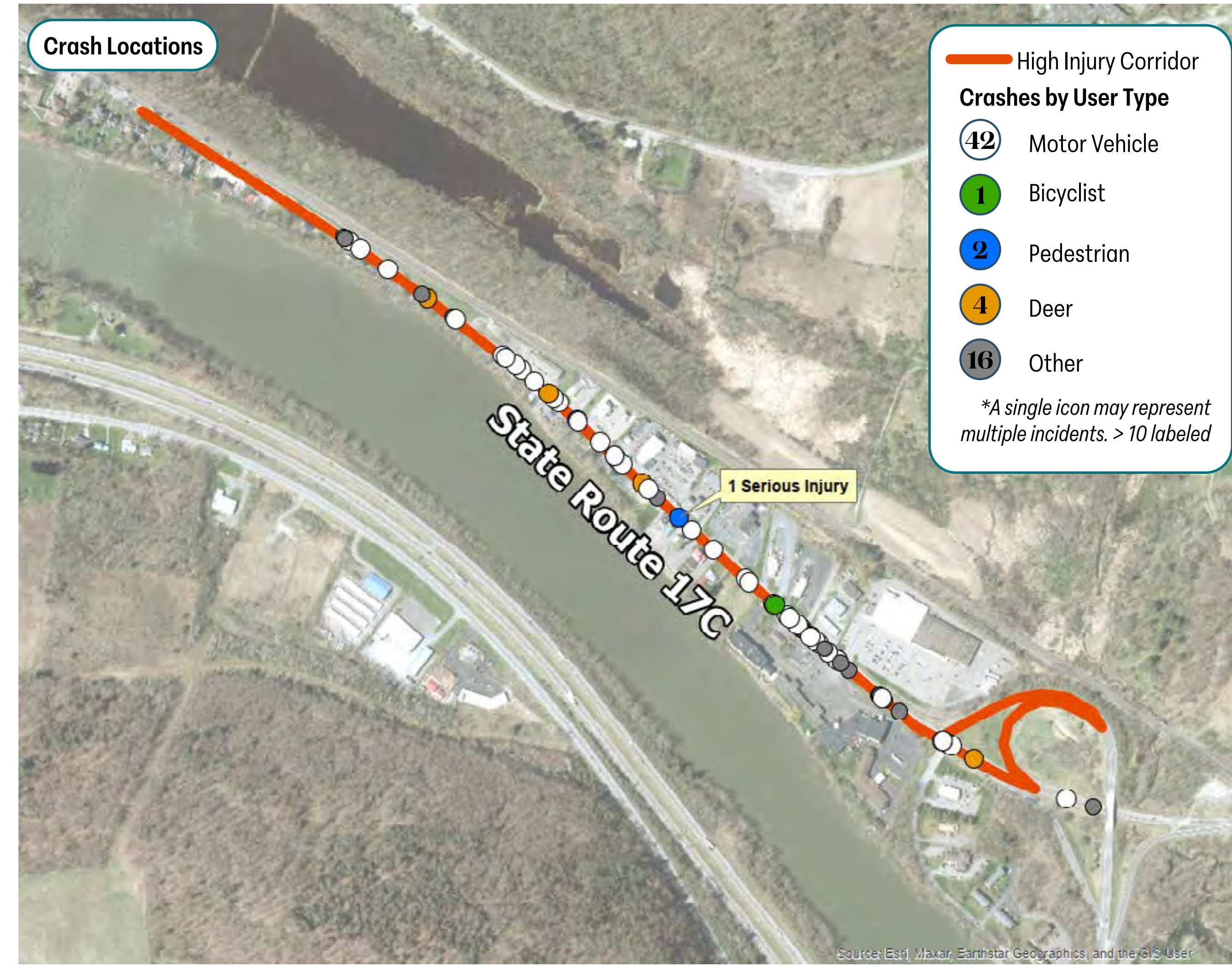
Highway Characteristics

Owner	NYSDOT
Description	Two-lane undivided urban road with left turn median
Segment Length	0.97 miles
Speed Limit	30-40 mph
AADT	9,586 VPD
Functional Class	(16) Minor Arterial
LOSS	3
HRN Score	3
Equity Rank	Normal Equity

Photo 1: Intersection of State Route 17C and Grand Union Plaza

Photo 2: State Route 17C westbound looking east

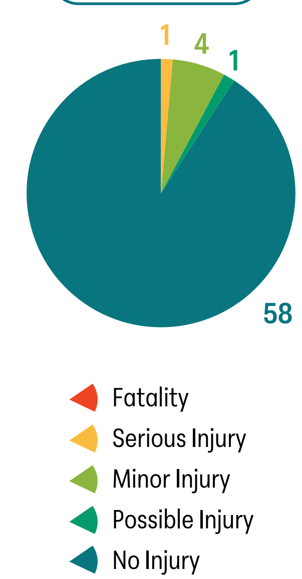
Crash Data



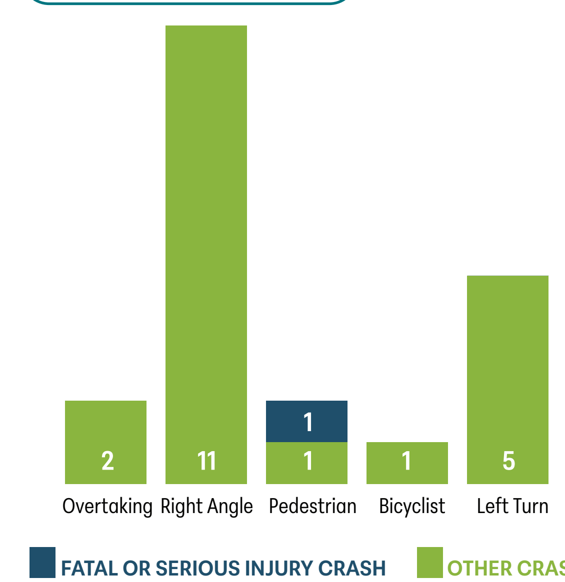
Contributing Factors

- No sidewalks or curb ramps present
- Poorly indicated bike lanes
- Outdated traffic signals

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at State Route 17C (NY-17C) included no sidewalks or curb ramps present, poorly indicated bike lanes, and outdated traffic signals. Potentially relevant safety countermeasures at this location include, new concrete sidewalks, traffic signal improvements, and bike lane accommodations. 7-foot sidewalks would be installed beginning directly to the west of the off-ramp and continue along both approaches until 5th Avenue where the left-turn median ends. These sidewalks will provide an elevated paved surface that separates pedestrians from motor vehicle traffic by a curb. The sidewalks will be accompanied by ADA compliant curb ramps and detectable warning surfaces. Having sidewalks along the corridor will offer a safe path for pedestrians to access the stores and restaurants on this stretch of Route 17C. It will also provide a connection for the village of Owego residents. With approximately 60 feet of right-of-way available, the project will allow for 5-ft bike lanes and 7-ft sidewalks in both directions in addition to the existing vehicular travel lanes. Additional pavement markings and signage will be added to the bike lanes per the guidelines for bicyclist facilities. Type LS crosswalks will be restriped and added at the crossings of the Grand Union Plaza entrance. The 3-color traffic signals on span wires at the two intersections will be replaced with updated signals that will be reprogrammed to ensure safe and efficient timing. In addition, backplates with retroreflective borders will be added to the new traffic signals for enhanced visibility.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete Sidewalk	450.00	CY	$1,500.00	$675,000.00
Curb Ramp & Warning Units	12.00	EA	$10,000.00	$120,000.00
Granite Curb	5,100.00	LF	$80.00	$408,000.00
Type LS Crosswalks	400.00	LF	$24.00	$10,000.00
Traffic Signal Replacement	16.00	EA	$10,000.00	$160,000.00
Traffic Signal Backplates	16.00	EA	$600.00	$9,600.00
Bike Lane Signs and Posts	10.00	EA	$1,250.00	$12,500.00
Bike Lane Pavement Markings	20.00	EA	$300.00	$6,000.00
			Construction Total	$1,401,100.00

Contingency and Inflation (20%)	$280,300.00
Subtotal	$1,681,400.00
Work Zone Traffic Control (10%)	$169,000.00
Mobilization (4%)	$68,000.00
Survey (2%)	$34,000.00
Engineering Design (10%)	$169,000.00
Construction Inspection (15%)	$253,000.00
Grand Total	**$2,375,000.00**

Corridor Tioga County

PRIORITY 8

NY-434

Town of Owego

Existing Conditions

The high-injury segment of NY-434 is 1.27 miles long and is located within the Town of Owego. The corridor spans from the intersection with Degroat Road to northwest of the NY 17C Access Road.

The surrounding area is both residential and commercial with The Owego Town Court, several businesses, and residential homes located in close proximity to the corridor. A total of 37 crashes occurred during the study period between 2019 and 2023, with 8 of these crashes resulting in injury. Many of the crashes during the study period for this corridor were located along the horizontal curves or involved a deer-related crash. One of the crashes during the study period for this corridor involved a pedestrian which resulted in serious injury. NY-434 maintains one travel lane and a striped shoulder in each direction for the entire corridor. The speed limit for this stretch is posted as 55 mph.

The three-leg intersection with NY-17 Access Road is controlled by span wire traffic signal which also includes pedestrian signal infrastructure for crossing NY-434 with a type LS crosswalk. The intersection with the I-86 on/off ramps features yield control for the I-86 off ramp and is uncontrolled along NY-434. The three-leg intersection with Degroat Road features stop control on Degroat Road and is uncontrolled along NY-434. The corridor lacks pedestrian infrastructure such as sidewalks and curb ramps. The entirety of the corridor is void of street lighting.

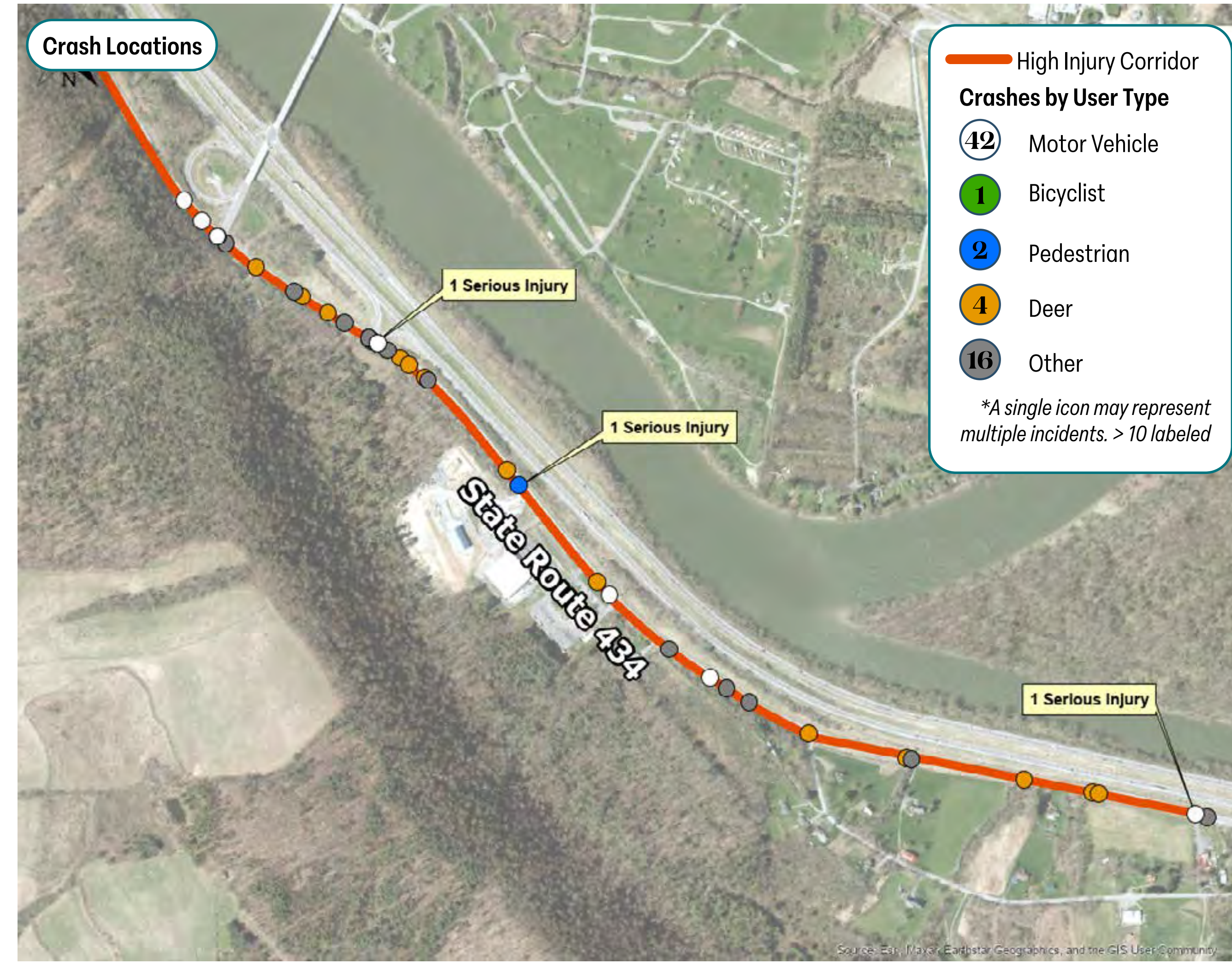
Highway Characteristics

Owner	NYSDOT
Description	Two lane undivided urban road
Segment Length	1.27 miles
Speed Limit	55 mph
AADT	4,088 VPD
Functional Class	(16) Minor Arterial
LOSS	3
HRN Score	3
Equity Rank	None

Photo 1: Outside of Owego Town Hall looking east on NY-434

Photo 2: Northbound approach at NY 17C Access Road intersection looking northwest

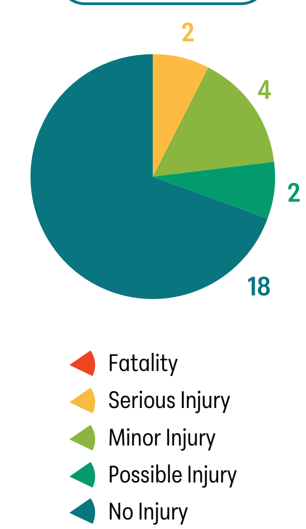
Crash Data



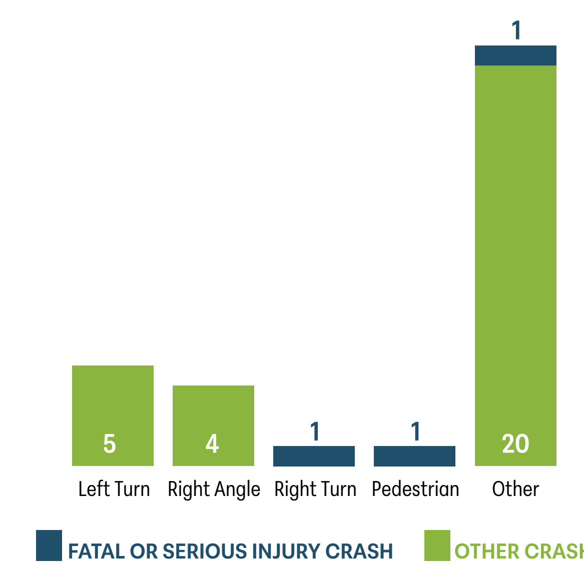
Contributing Factors

- Sharp horizontal curves
- Insufficient warning signage
- No lighting present in corridor

Crash Severity



Most Frequent Collision Type



Proposed Countermeasures

Enhanced Delineation for Horizontal Curves

Backplates with Retroflective Borders

Lighting

Contributing factors at NY-434 from the intersection with Degroat Road to northwest of the NY 17C Access Road included sharp horizontal curves, insufficient warning signage, and no lighting present in corridor. Potentially relevant safety countermeasures at this location include, enhanced delineation for horizontal curves through the installation of curve warning signage including chevrons, installation of deer warning signage, the addition of traffic signal backplates with retroreflective borders, and lighting improvements. Curve warning signage and chevrons will be installed at each of the horizontal curves throughout the corridor. This enhanced signage will increase driver awareness of the upcoming curves and prevent vehicles from straying outside of their travel lane or off the around these curves, preventing crashes of all types. The curve warning signage will include supplemental signage to recommend a lower speed around the curves with a high concentration of crashes. This lower speed will increase drivers' reaction time and ability to maintain their travel path around curves. Due to the high number of crashes involving animals, deer warning signage will also be installed to increase roadway users' awareness of the potential presence of deer throughout the corridor. To provide increased visibility of the signal heads at the intersection, traffic signal backplates with retroreflective borders will be installed at the intersection with NY 17 Access Road. Lighting improvements would be installed at the intersections with NY 17 Access Road and the I-86 ramps to provide increased visibility and enhance safety at the intersections. These lighting improvements will also improve drivers' capability to see during dawn and dusk hours when deer are the most active, decreasing the potential for fatal or serious injury crashes involving deer.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Curve Warning Signage	8.00	EA	$1,250.00	$10,000.00
Chevron Signage	20.00	EA	$1,000.00	$20,000.00
Deer Warning Signage	2.00	EA	$1,250.00	$2,500.00
Traffic Signal Backplates	6.00	EA	$600.00	$3,600.00
Lighting Improvements	1.00	LS	$50,000.00	$50,000.00
			Construction Total	$86,100.00

Contingency and Inflation (20%)	$17,300.00
Subtotal	$103,400.00
Work Zone Traffic Control (10%)	$10,400.00
Mobilization (4%)	$4,200.00
Survey (2%)	$2,100.00
Engineering Design (10%)	$10,400.00
Construction Inspection (15%)	$15,600.00
Grand Total	**$146,100.00**

BMTS safety ACTION plan

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Sulphur Springs Rd.

Town of Owego

Existing Conditions

The high-injury segment of Sulphur Springs Road (CR-25) is 0.75 miles long and is located within the Town of Owego. The corridor spans from the intersection with Stanton Hill Road to the Village of Owego line. The surrounding area is both residential and commercial with numerous businesses and homes located along the corridor.

A total of 14 crashes occurred during the study period between 2019 and 2023, with 4 of these crashes resulting in some form of injury. The majority of crashes related to roadway departure (i.e., vehicle travels off road or into oncoming traffic). All 3 serious injury crashes were located along the same horizontal curve situated south of I-86.

The high incidence of roadway departure crashes along the corridor is influenced by curves and limited or outdated guide railing. Sight distance obstructions are caused by the several significant horizontal and vertical curves throughout the corridor. Despite these curves and the presence of ditches and fixed objects along the side of the road, there is very little guide railing to protect vehicles that stray from their travel lane off the road. The existing guide railing on the south end of the high-injury corridor is outdated corrugated guide railing that is in need of replacement. The speed limit on this section of Sulphur Springs Rd is posted at 45 mph. Sulphur Springs Road maintains one travel lane in each direction for the entire corridor.

This corridor features three streets that meet Sulphur Springs Road where stop control is only on the minor approach and Sulphur Springs Road is uncontrolled which are Stanton Hill Road, Waits Road, and East River Road.

The corridor is lacking pedestrian infrastructure such as sidewalks, curb ramps, and crosswalks. The east end of the corridor in the eastbound direction is the end of the greenway bicycle path. The entirety of the corridor is void of street lighting. There are steep ditches on either side of the road throughout the corridor which present a dangerous condition in the event of a run-off-road crash, also known as a roadway departure crash.

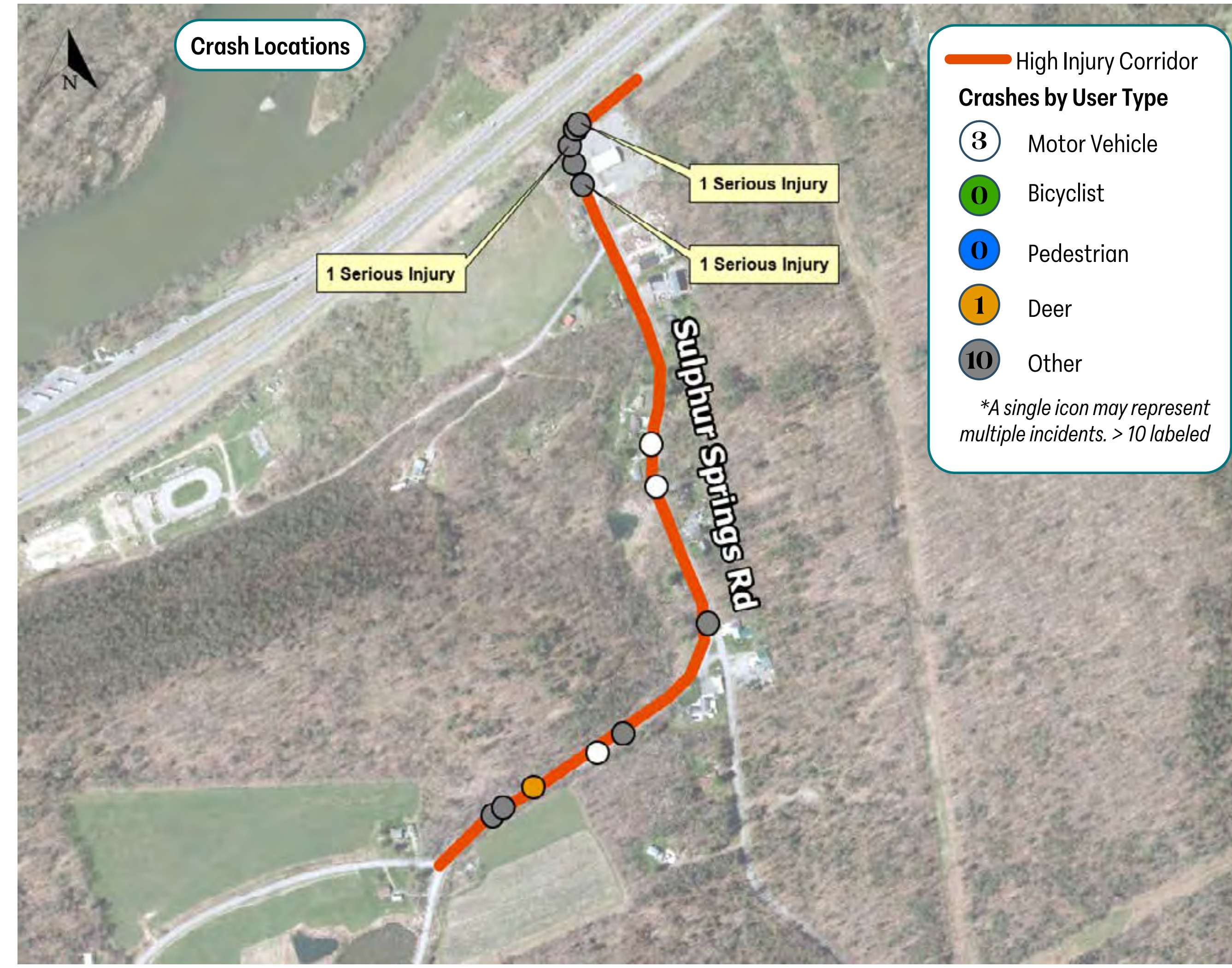
Highway Characteristics

Owner	Tioga County
Description	Two lane undivided urban road
Segment Length	0.75 miles
Speed Limit	55 mph
AADT	1,780 VPD
Functional Class	(17) Major Collector
LOSS	3
HRN Score	3
Equity Rank	Top 20
Adjacent Lane Use	Urban

Photo 1: Looking north past upper bend in Sulphur Springs Rd. to I-86

Photo 2: Sulphur Springs Rd. looking north near middle of segment

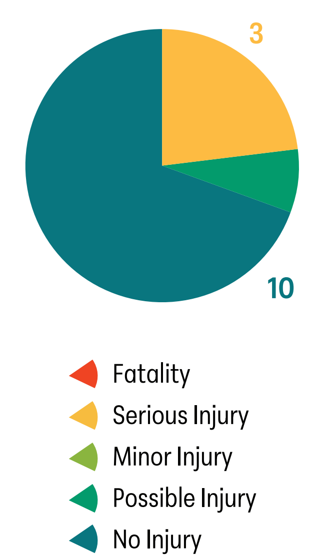
Crash Data



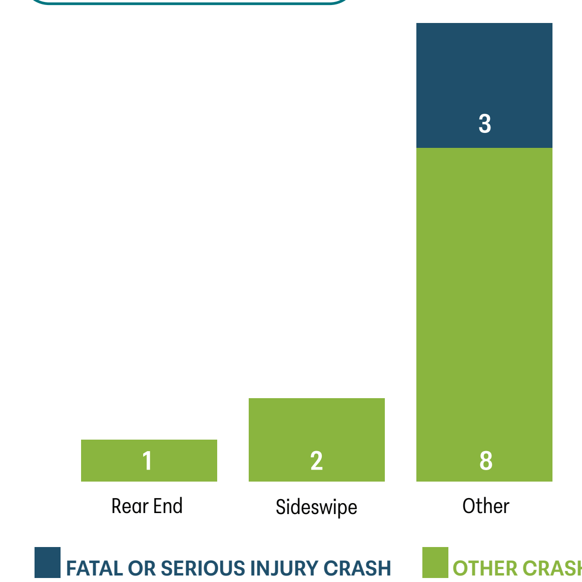
Contributing Factors

- Sharp horizontal and vertical curves
- Insufficient curve warning signage and chevrons
- Faded striping and limited sight distance
- Lack of striped shoulders

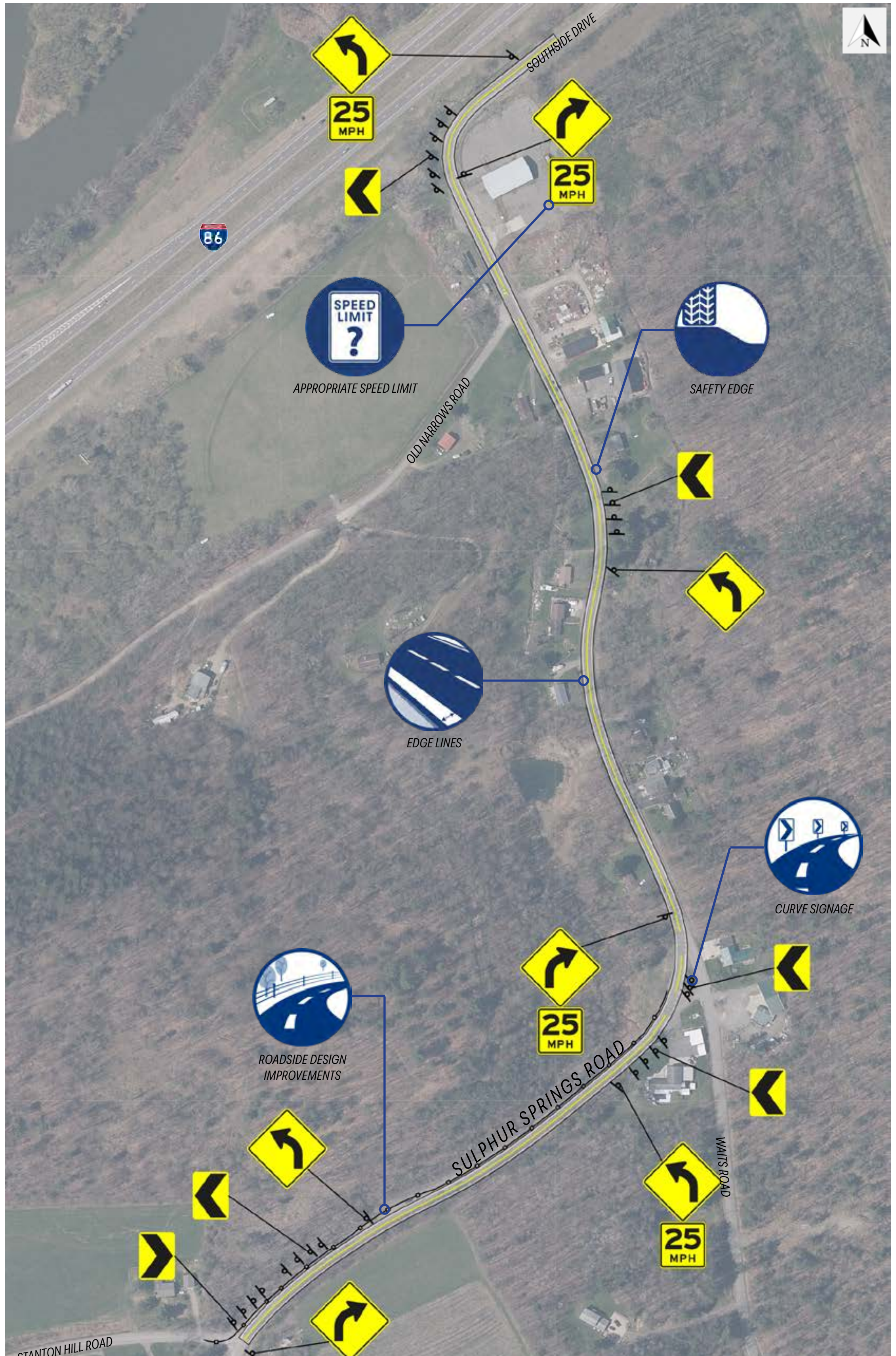
Crash Severity



Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures

- Enhanced Delineation for Horizontal Curves
- Appropriate Speed Limits for All Road Users
- Wider Edge Lines
- Roadside Design Improvements at Curves
- Safety Edge

Contributing factors at Sulphur Springs Road from the intersection with Stanton Hill Road to the Village of Owego line included sharp horizontal and vertical curves, insufficient curve warning signage and chevrons, faded striping and limited sight distance, and a lack of striped shoulders. Potentially relevant safety countermeasures at this location include, enhanced delineation for horizontal curves through the installation of curve warning signage and chevrons, new wider edge lines striped onto the road shoulder, and the addition of a 4-foot-wide asphalt shoulder with a safety edge. To improve driver awareness of the horizontal curves present, warning signage and chevrons will be installed at each of the curves throughout the corridor. The curve warning signage will include supplemental signage to recommend a lower speed around the curves. Through the crash data analysis, it was observed that a majority of crashes taking place on this corridor were located at curves due to high speeds, slippery roads, and driver inattention. Several of these roadway departure crashes also resulted in collisions with fixed objects, ditches or rocks directly adjacent to the travel way. Where there is currently no existing shoulder striping, 6" wide edge lines will be installed to increase driver visibility of the road around curves to increase roadway safety. This will give drivers a better sense of where they should be in their travel lane and encourage them to maintain a proper path around curves. To further improve roadside safety for drivers the existing shoulder will be widened an additional 4 feet with asphalt accompanied by a safety edge. This wider will allow drivers extra space to correct the course of their vehicle and prevent them from leaving the roadway around a curve. The safety edge will also allow them to easily re-enter the travel way in a safe manner in the event that they do fall on the edge of the road and prevent them from having a potential collision with a ditch or fixed object that could result in a fatal or serious injury.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Asphalt Pavement	1,600.00	TON	$150.00	$240,000.00
Subbase	1,200.00	CY	$100.00	$120,000.00
White Striping	7,700.00	LF	$2.00	$15,400.00
Curve Warning Signage	7.00	EA	$1,250.00	$8,750.00
Chevron Signage	25.00	EA	$1,000.00	$25,000.00
Box Beam Guide Railing	1,500.00	LF	$50.00	$75,000.00
			Construction Total	$484,150.00

Contingency and Inflation (20%)	$96,900.00
Subtotal	$581,100.00
Work Zone Traffic Control (10%)	$58,200.00
Mobilization (4%)	$23,300.00
Survey (2%)	$11,700.00
Engineering Design (10%)	$58,200.00
Construction Inspection (15%)	$87,200.00
Grand Total	**$819,700.00**

Project Profiles:

Intersections

Intersection Broome County

PRIORITY 1

Vestal Parkway East & S Washington St.

City of Binghamton

Existing Conditions

The intersection of Vestal Parkway East (NY 434) and South Washington Street is located within the City of Binghamton. The surrounding area is mostly commercial with numerous businesses in close proximity to the intersection along with residential developments further south and east of the intersection.

A total of 66 crashes occurred during the study period between 2019 and 2023, with 14 of these crashes resulting in injury. The majority of crashes within the study period at this intersection were rear end crashes. Nine crashes during the study period for this corridor involved a pedestrian or bicyclist and four of those crashes resulted in serious injury. The northbound and southbound approaches to the intersection on South Washington Street maintains two travel lanes with one being a dedicated right turn lane. The eastbound approach on Vestal Parkway East maintains four travel lanes with one being a dedicated left turn lane. The westbound approach to the intersection on Vestal Parkway East maintains three travel lanes with one being a dedicated left turn lane.

The intersection features traffic control by span wire traffic signal including compliant pedestrian signals. Compliant curb ramps and type LS crosswalks allow for pedestrian movements between all corners of the intersection. The two pedestrian crossings across Vestal Parkway East have minimal median refuge islands. Sidewalk is present along both sides of South Washington Street and only along the southern side of the westbound approach on Vestal Parkway East. The intersection has street lighting at all approaches to the intersection.of all four approaches except for the south side of the westbound approach. The intersection follows the city speed limit of 30 mph for all approaches and traffic is controlled at the intersection with Brandywine Ave by a signal supported via span wire. Field observations showed that the pavement and striping are in fair condition.

Highway Characteristics

Owner	NYSDOT
Intersection Type	Urban 4-Leg Signalized
Traffic Control	Span Wire Signal
Speed Limit	30 mph
AATD (Vestal Pkwy E)	19,858 VPD
AATD (S Washington St)	2,202 VPD
Functional Class (Vestal Pkwy E)	(12) Principal Arterial – Other Freeway/Expressway
Functional Class (S Washington St)	(17) Major Collector
LOSS	4
HRN Score	4
Equity Rank	Top 20

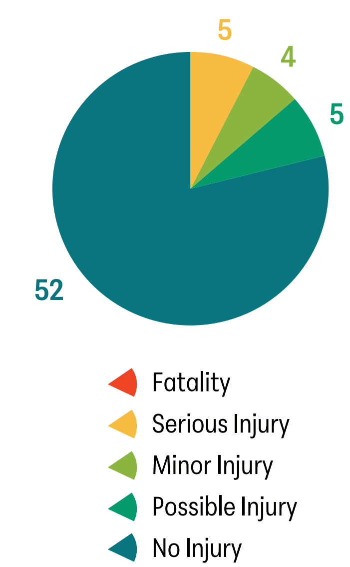
Photo 1: Northeast corner looking west

Crash Data

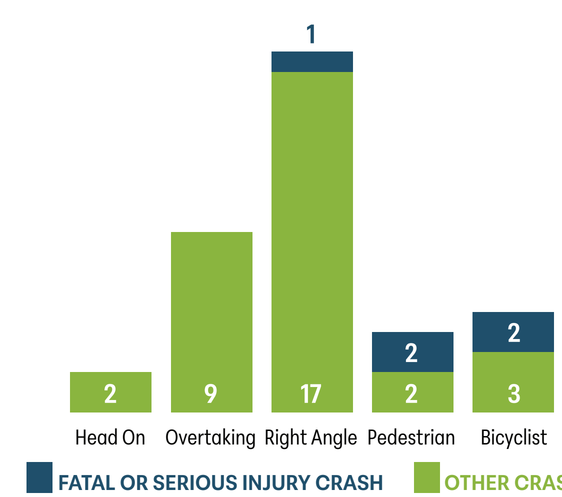
Contributing Factors

- Long crossing length (pedestrian exposure)
- Very high volume of traffic
- Faded crosswalk striping

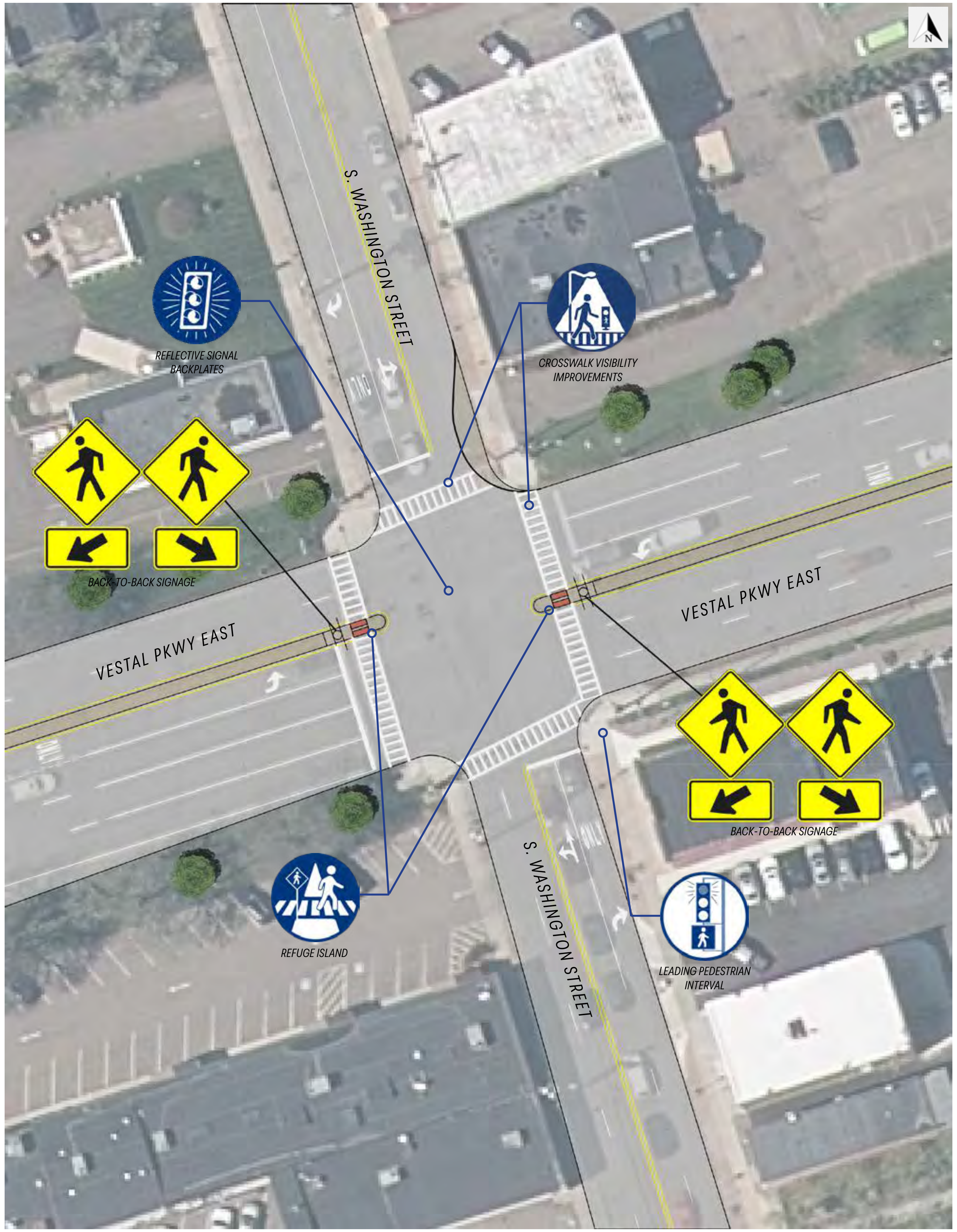
Crash Severity



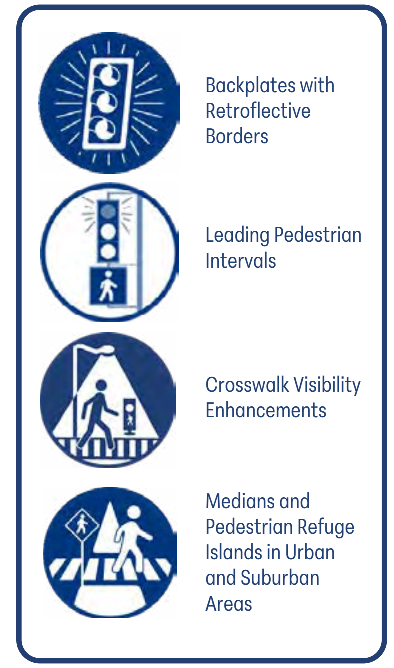
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at Vestal Parkway East and South Washington Street included long crossing length, a very high volume of traffic, and faded crosswalk striping. Potentially relevant safety countermeasures at this intersection include, reconstruction of median refuge islands, a curb bump out in the northeast corner of the intersection, high visibility crosswalks, adding a leading pedestrian interval (LPI), and adding traffic signal backplates. The reconstruction of the existing concrete median refuge islands for the Vestal Parkway East crossings would provide additional protection for pedestrians in the long crossings. A curb bump out will be installed in the northeast corner of the intersection to shorten the crossing distance for pedestrians. High visibility crosswalks would be installed for all crossings at the intersection to replace the existing faded striping. A leading pedestrian interval would be added to give pedestrians the opportunity to enter the crosswalk prior to vehicles being given a green indication to better establish their presence in the crosswalk. The installation of retroreflective backplates will provide increased visibility of the signal heads at the intersection and give drivers advanced warning.

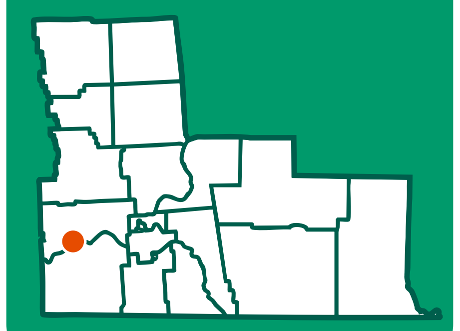
Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	240.00	LF	$24.00	$5,760.00
Curb Ramp	3.00	EA	$10,000.00	$30,000.00
Granite Curb	180.00	LF	$80.00	$14,400.00
Concrete Sidewalk	20.00	CY	$1,500.00	$30,000.00
Traffic Signal Backplates	10.00	EA	$600.00	$6,000.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
Pedestrian Warning Signage	2.00	EA	$1,250.00	$2,500.00
			Construction Total	$91,660.00

Contingency and Inflation (20%)	$18,400.00
Subtotal	$110,100.00
Work Zone Traffic Control (10%)	$11,100.00
Mobilization (4%)	$4,500.00
Survey (2%)	$2,300.00
Engineering Design (10%)	$11,100.00
Construction Inspection (15%)	$16,600.00
Grand Total (Rounded)	**$155,700.00**

Intersection Broome County

PRIORITY 2



Vestal Parkway East & Rano Blvd

Town of Vestal

Existing Conditions

The intersection of Vestal Parkway East (NY-434) and Rano Boulevard is located in the Town of Vestal, NY in the greater Binghamton area. The intersection is surrounded by several large commercial plazas, and the intersection is categorized as a 4-leg signalized intersection.

During the study period between 2019 and 2023 there were a total of 89 crashes that occurred with 18 of them resulting in injury. 3 of the crashes involved pedestrians and 1 of those crashes resulted in serious injury to a pedestrian. The eastbound approach on Vestal Pkwy East maintains two thru lanes and both right and left dedicated turn lanes. The westbound approach maintains the same configuration with two thru lanes and a left and right dedicated turn lane. The northbound approach on Rano Blvd consists of one travel lane and a dedicated left turn lane. The southbound approach on Sycamore St maintains a dedicated left turn lane and a travel lane with a 3-way arrow.

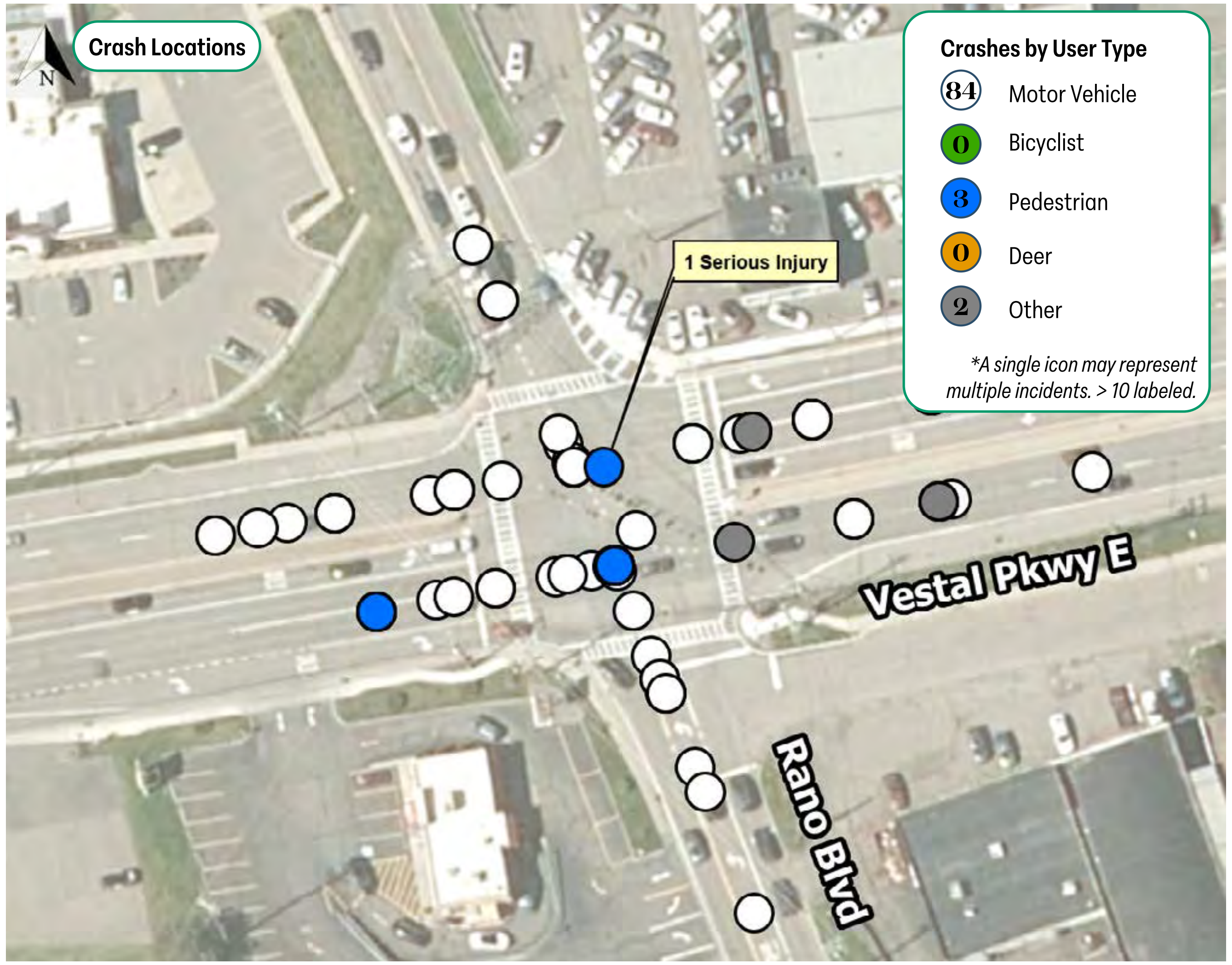
There are type LS crosswalks along each of the approaches which are accompanied by ADA compliant pedestrian signals. The crossing distances along Vestal Pkwy E measure approximately 100 feet in length. There is currently a leading pedestrian interval present for these crossings. There is existing concrete sidewalk present along each of the approaches. The curb ramps are in good condition and some of the detectable warning units are ADA compliant cast-iron while others are plastic warning units. Field observations showed the pavement at this intersection is in fair condition with some minor cracking. The striping is also in fair condition, with the crosswalks having faded in some locations.

Photo 1: Southeast corner of intersection looking northwest

Highway Characteristics

Owner (Vestal Pkwy E)	NYSDOT
Owner (Rano Blvd)	Town of Vestal
Intersection Type	Urban 4-leg signalized
Traffic Control	Span Wire Signal
Pedestrian Signals	All Approaches
Speed Limit	45 mph
AADT (Vestal Pkwy E)	23,940 VPD
AADT (Rano Blvd)	9,330 VPD
Functional Class (Vestal Pkwy E)	(14) Principal Arterial Other
Functional Class (Rano Blvd)	(17) Major Collector
LOSS	3
HRN Score	5
Equity Rank	Top 20

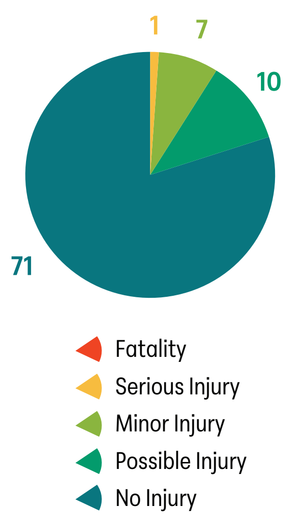
Crash Data



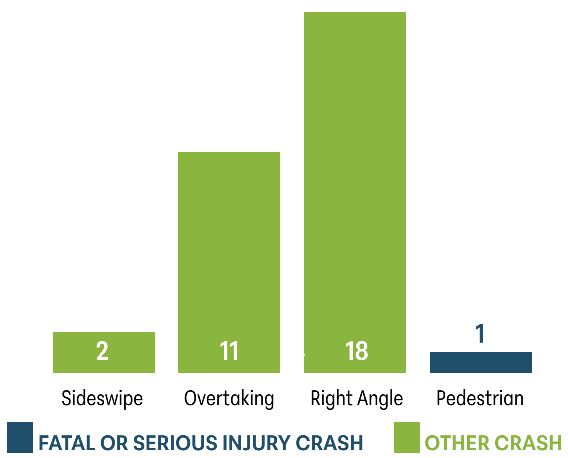
Contributing Factors

- Long pedestrian crossing length
- High traffic volume
- Faded crosswalk striping

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at Vestal Parkway East and Rano Boulevard included long pedestrian crossing length, high traffic volume, and faded crosswalk striping. Potentially relevant safety countermeasures at this intersection include, the construction of pedestrian refuge islands and crosswalk visibility enhancements. One of the contributing factors at this intersection is long crossing lengths leading to extended pedestrian exposure. To address this issue, the existing concrete center median can be extended out to create a pedestrian refuge island. The refuge island will provide vulnerable road users with extra protection and allow them to cross one direction of traffic at a time. To further protect individuals crossing the road the existing crosswalks will be reconstructed with a high visibility treatment. This new high visibility crosswalk will increase driver awareness of the crossing and allow them to recognize pedestrians crossing the street with adequate time to stop. These proposed countermeasures in combination with the existing leading pedestrian interval and retroreflective traffic signal backplates will increase the overall safety for all road user and reduce the likelihood of future serious injury crashes.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	320.00	LF	$24.00	$7,680.00
Concrete Refuge Island	20.00	CY	$1,500.00	$30,000.00
Granite Curb	200.00	LF	$80.00	$16,000.00
Curb Ramp and Warning Units	4.00	EA	$10,000.00	$40,000.00
Pedestrian Warning Signage	2.00	EA	$1,250.00	$2,500.00
			Construction Total	$96,180.00

Contingency and Inflation (20%)	$19,300.00
Subtotal	$115,500.00
Work Zone Traffic Control (10%)	$11,600.00
Mobilization (4%)	$4,700.00
Survey (2%)	$2,400.00
Engineering Design (10%)	$11,600.00
Construction Inspection & Administration(15%)	$17,400.00
Grand Total	**$163,200.00**

Intersection Broome County

PRIORITY 8

Court St. & Brandywine Ave.

City of Binghamton

Existing Conditions

The location of Court Street (Route 11) from Chapman St to Brandywine Avenue (NY-7) is located within the City of Binghamton, east of the central business district. A total of 144 crashes occurred during the study period between 2019 and 2023, with 31 of these crashes resulting in injuries.

There were in total 11 crashes involving bicyclists or pedestrians, resulting in 5 serious injury crashes with vulnerable road users. The crashes are largely concentrated at the intersection with Brandywine Ave. Looking specifically at that intersection, the southbound approach maintains two travel lanes with a dedicated left turn lane. The northbound approach is the Tompkins St bridge which crosses the Susquehanna River and consists of two travel lanes including a dedicated left turn lane. On Court St, the eastbound approach maintains four travel lanes and a bike lane with dedicated right and left turn lanes at the intersection. The westbound approach maintains two travel lanes with a dedicated left turn lane and a bike lane that continues through the intersection.

The intersection has type LS crosswalks present on the eastbound, southbound, and westbound approaches. These crosswalks are accompanied by ADA compliant curb ramps and pedestrian signals. There is currently no crosswalk on Tompkins St. There are concrete sidewalks on both sides of all four approaches except for the south side of the westbound approach. The intersection follows the city speed limit of 30 mph for all approaches and traffic is controlled at the intersection with Brandywine Ave by a signal supported via span wire. Field observations showed that the pavement and striping are in fair condition.

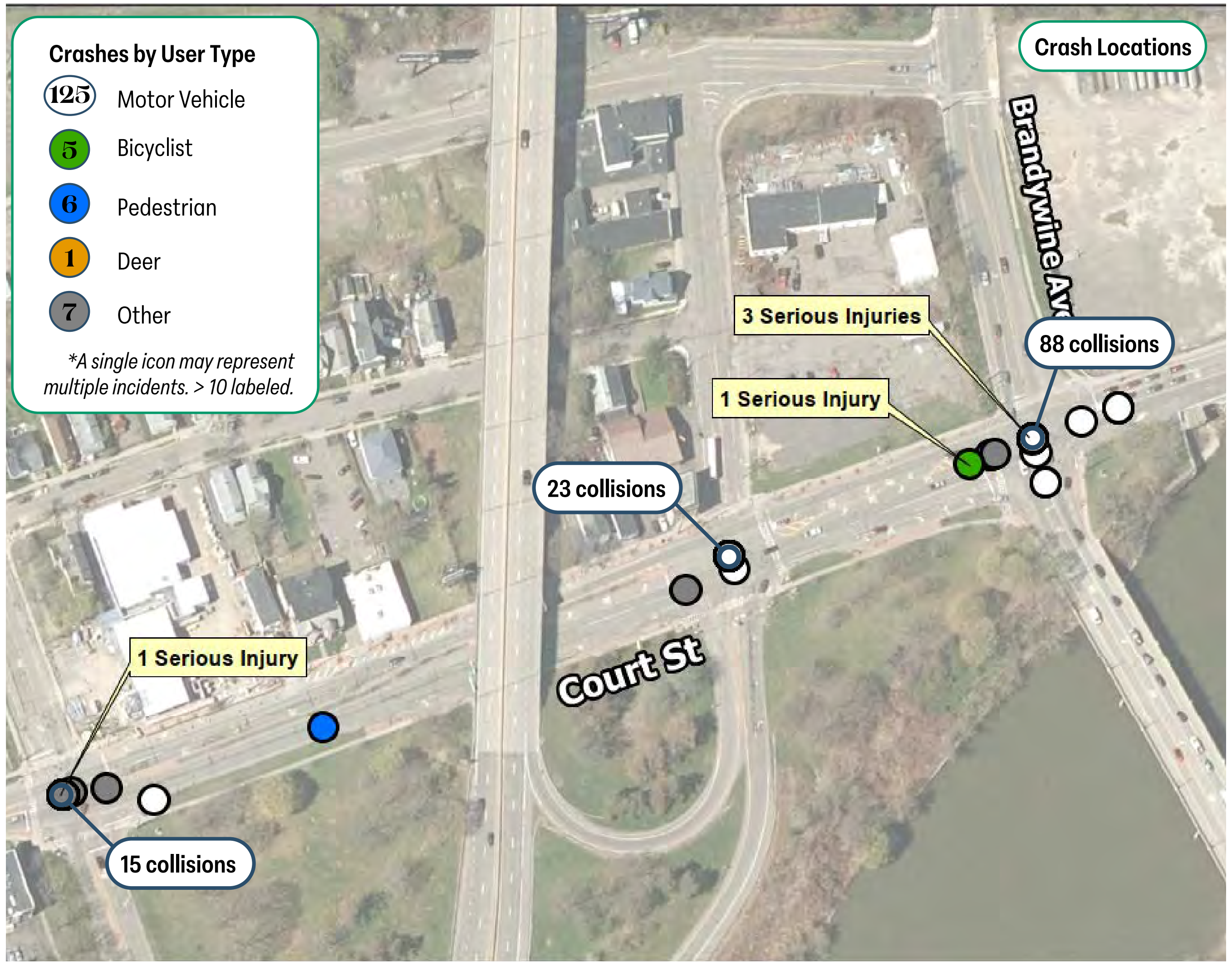
Highway Characteristics

Owner	NYSDOT
Intersection Type	Urban 4-Leg Signalized
Traffic Control	Signalized Span Wire
Pedestrian Signals	All Crossings
Speed Limit	30 mph
AATD (Major)	18,227 VPD
AATD (Minor)	9,276 VPD
Functional Class (Major)	(16) Minor Arterial
Functional Class (Minor)	(16) Minor Arterial
LOSS	3
HRN Score	5
Equity Rank	Top 20 Lowest

Photo 1: Northeast corner looking west

Photo 2: Northwest corner looking south

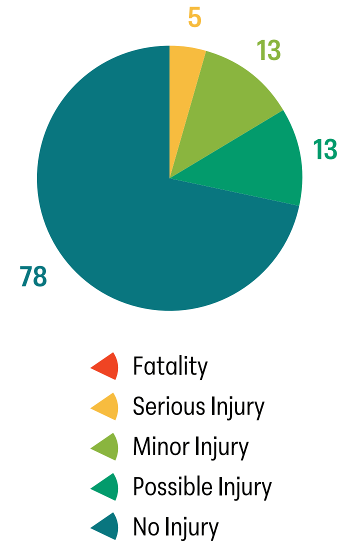
Crash Data



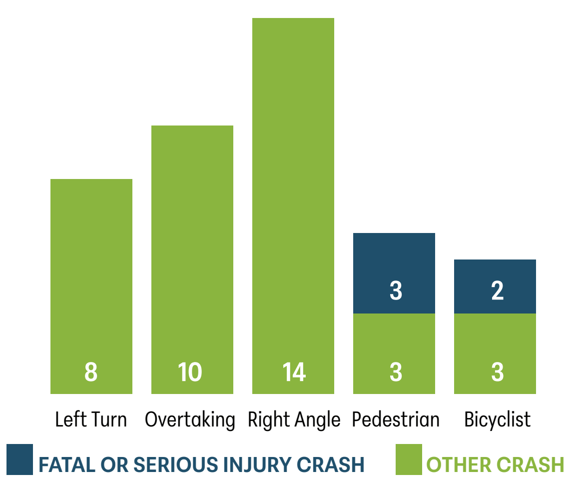
Contributing Factors

- Long crossing length (pedestrian exposure)
- Inconsistent bike lane infrastructure
- Immediate travel lane drop (eastbound)

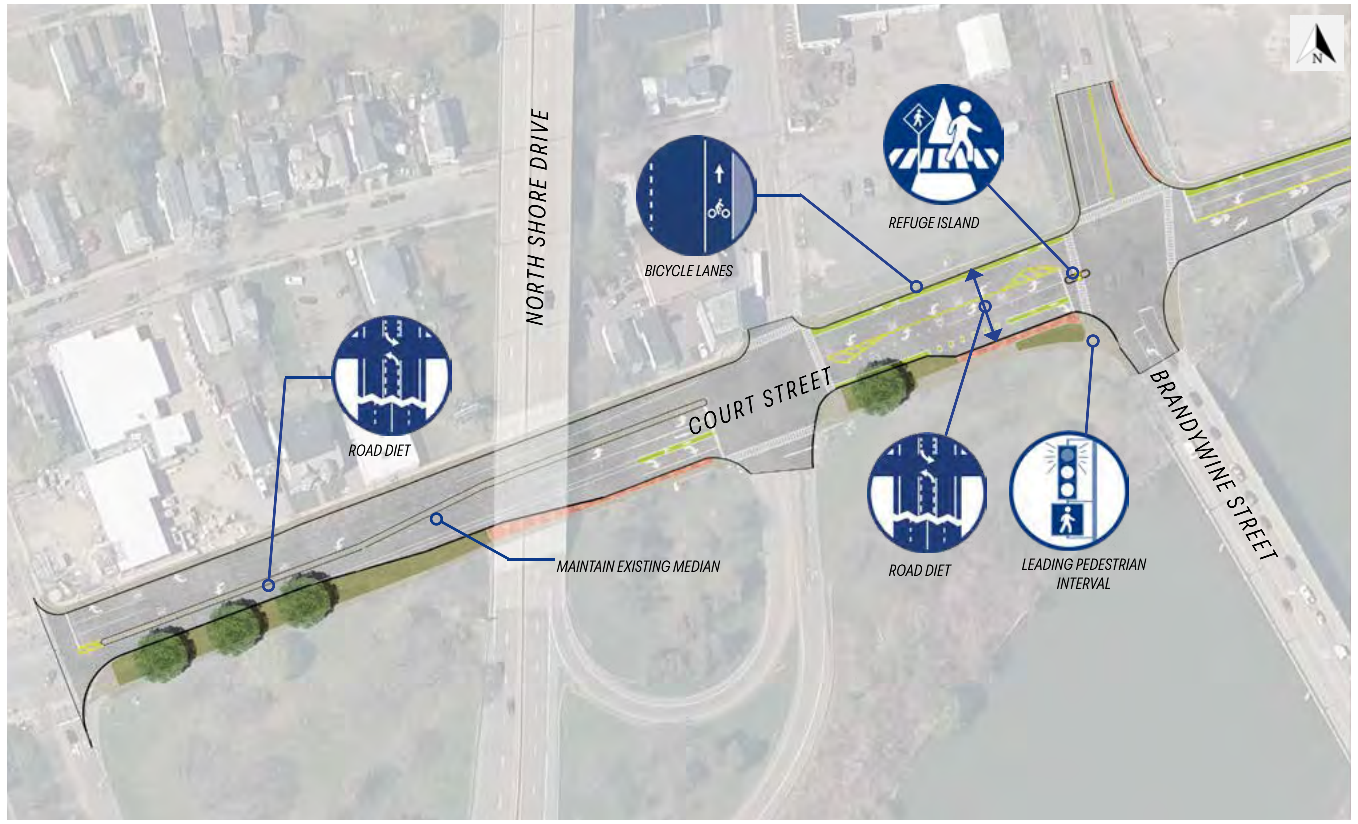
Crash Severity

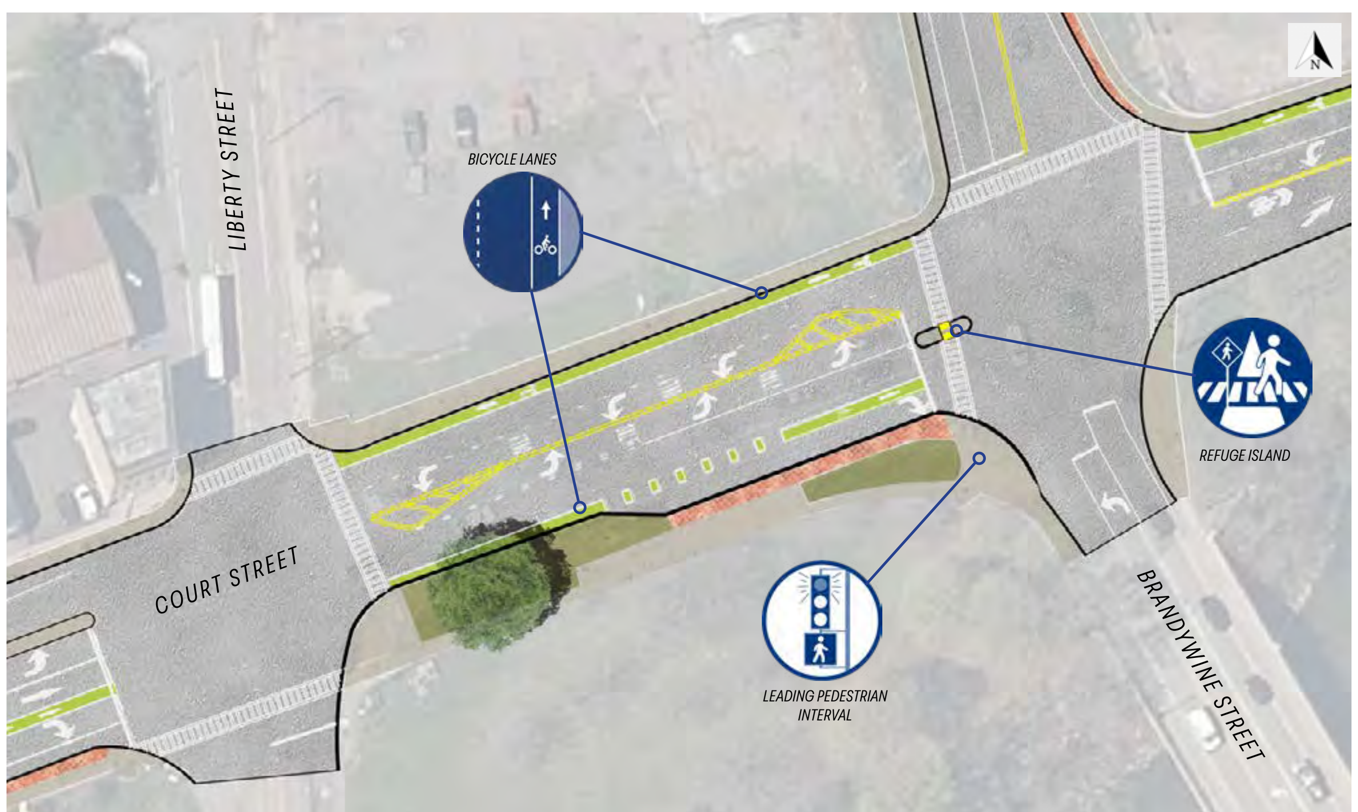


Most Frequent Collision Type

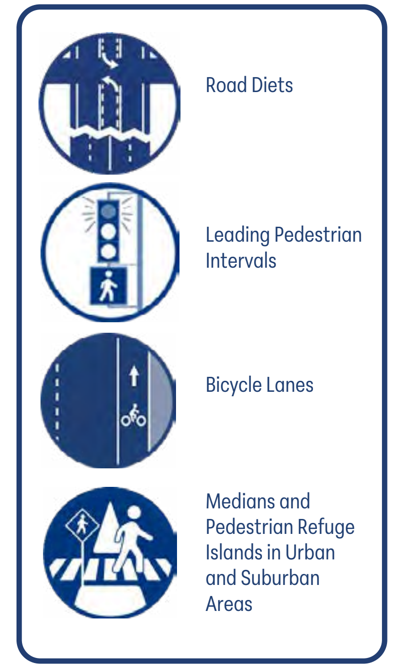


Proposed Improvements





Proposed Countermeasures



Contributing factors at Court Street and Brandywine Avenue included long crossing length, inconsistent bike lane infrastructure, and an immediate travel lane drop (eastbound). Potentially relevant safety countermeasures at this intersection include, a road diet, consistent bike lane treatments, a median refuge island, and a leading pedestrian interval. A road diet is feasible beginning to the west at the intersection of Chapman St and continuing until Brandywine Ave. The new road configuration on Court St would consist of one through lane each way and dedicated right and left turn lanes on Court St heading eastbound. The road diet would maintain bike lanes on both sides of Court St which can become sharrows to the east of the intersection. The road diet would also include curb bump outs along the eastbound side of the corridor. These bump outs will shorten crossing distance and improve the flow of traffic in a safe manner. A concrete pedestrian refuge island would be installed on Court St along the entire length of the road diet. These refuge islands will be accompanied by ADA compliant curb ramps and additional pedestrian signals at Court St and Brandywine. The road diet and pedestrian refuge island will shorten the crossing distances, making conditions safer for pedestrians. A leading pedestrian interval will be installed at the intersection of Court St and Brandywine Ave giving pedestrians a designated window to enter the crossing and give them the opportunity to establish their presence in the intersection before any vehicular traffic receives a green indication. These countermeasures together enhance the overall safety for all road users at this intersection.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Asphalt Sidewalk/Vegetation Strip	375.00	TON	$400.00	$150,000.00
Concrete Pedestrian Refuge Island	5.00	CY	$1,500.00	$7,500.00
Cast Iron Detectable Warning Signs	2.00	EA	$10,000.00	$20,000.00
Granite Curb	1,200.00	LF	$80.00	$96,000.00
Striping White Line	1,250.00	LF	$2.00	$2,500.00
Striping Yellow Line	250.00	LF	$2.00	$500.00
Striping White Symbols	12.00	EA	$300.00	$3,600.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
			Construction Total	$283,100.00

Contingency and Inflation (20%)	$57,000.00
Subtotal	$340,100.00
Work Zone Traffic Control (10%)	$35,000.00
Mobilization (4%)	$14,000.00
Survey (2%)	$7,000.00
Engineering Design (10%)	$35,000.00
Construction Inspection (15%)	$52,000.00
Grand Total (Rounded)	**$483,100.00**

Intersection Broome County

PRIORITY 4

Harry L Dr. & Reynolds Rd.

Village of Johnson City

Existing Conditions

The intersection of Harry L Dr and Reynolds Rd is located in the Village of Johnson City adjacent to significant commercial developments (e.g. Wegman's and the Dick's House of Sport). This is a 4-legged signalized intersection that facilitates traffic flows between the cities of Endwell, Endicott and Johnson City, resulting in high traffic volumes.

Between 2019 and 2023 there were 104 total crashes with 14 of them resulting in injury. There were two crashes involving bicyclists and 2 crashes with a pedestrian. None of the crashes during the study period resulted in fatalities or serious injuries. The eastbound approach maintains 5 travel lanes with 2 through lanes, 1 dedicated left turn lane and two dedicated right turn lanes. The right turn lanes lead to the exits of 86 east and west to Binghamton and Corning respectively. The westbound approach maintains 4 travel lanes with two through lanes and two dedicated right turn lanes. The northbound approach also maintains the same configurations with 4 travel lanes and 2 dedicated left turn lanes. The southbound approach consists of 3 travel lanes with 1 left turn lane, and two through lanes.

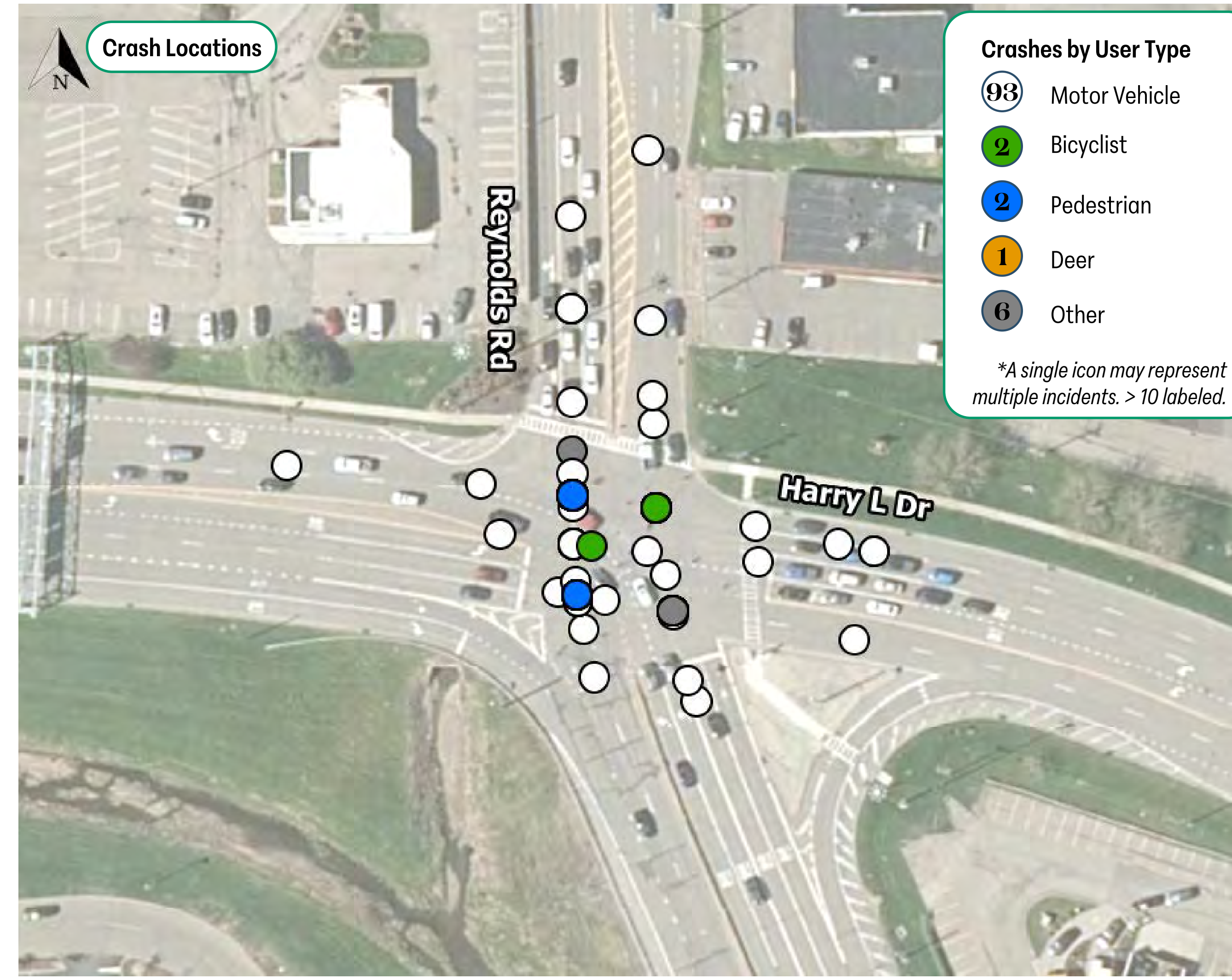
The NYSDOT has planned a project which will add a dedicated left turn lane along the southbound approach. There is centerline guide rail on the southbound approach. There is concrete sidewalk along both the eastbound and westbound approaches. The sidewalk is in fair condition, and the curb ramps are in poor condition, not in ADA compliance. There is a crosswalk across Reynolds Rd at the north end of the intersection connecting the sidewalks, and across Harry L Dr on the east end of the intersection connected to the pedestrian refuge island. There are push buttons at the crossings of Harry L Dr and Reynolds Rd. There are audible pedestrian signals at east of the crossing locations with the exception of the slip ramp in the southeast corner.

Highway Characteristics

Owner (Harry L Dr)	Village of Johnson City
Owner (Reynolds Rd)	NYSDOT (Route 991C)
Intersection Type	4-leg signalized
Traffic Control	Span Wire
Pedestrian Signals	NE and SE
Speed Limit	30 mph
AADT (Harry L Dr)	14,015 VPD
AADT (Reynolds Rd)	17,331 VPD
Functional Class (Harry L Dr)	(16) Minor Arterial
Functional Class (Reynolds Rd)	(16) Minor Arterial
LOSS	4
HRN Score	2
Equity Rank	Top 20

Photo 1: Concrete island in southeast corner looking northwest

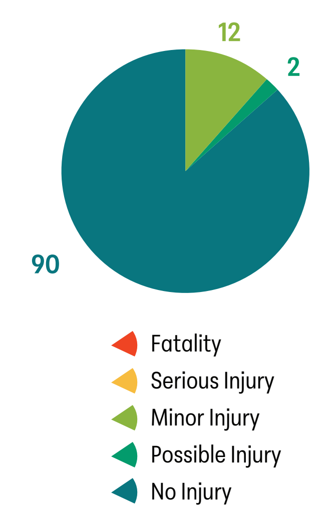
Crash Data



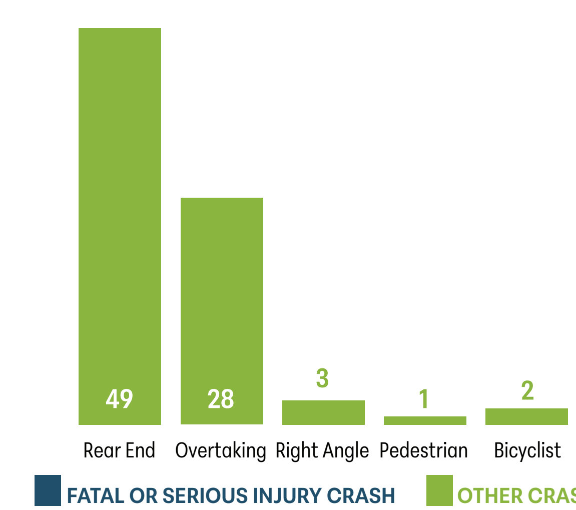
Contributing Factors

- Long pedestrian crossing lengths
- Deteriorated roadway infrastructure
- Poorly signed lane configurations

Crash Severity



Most Frequent Collision Type



Proposed Countermeasures

Contributing factors at Harry L Drive and Reynolds Road included long pedestrian crossing lengths, deteriorated roadway infrastructure, and poorly signed lane configurations. Potentially relevant safety countermeasures at this intersection include, sidewalk improvements, crosswalk enhancements, rectangular rapid flashing beacons (RRFB), concrete refuge islands, a median barrier, and signage improvements. The sidewalks at this intersection are in fair condition, but the curb ramps and associated warning units have deteriorated significantly and are in need of replacement to meet ADA standards. These new curb ramps and warning units will ensure safe crossing for visually impaired users. New crosswalks will be painted at the existing locations over the existing faded LS crosswalks. This will allow crosswalks to be properly visible to all the vehicles moving through this busy intersection. New edge lines, lane lines, and dotted turn lines will be striped on where the existing striping has faded with the deteriorated pavement. The concrete refuge island in the southeast corner is nearing the end of its service life, has cracking, deformation and vegetation growth. This island needs repairs to function as a safe refuge for pedestrians crossing Harry L Dr. A solar powered RRFB will be installed on the existing pedestrian sign present at the slip ramp crossing in the southeast corner.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete Median Refuge Island	54.63	CY	$1,500.00	$82,000.00
Granite Curb	455.00	LF	$80.00	$37,000.00
Cast Iron Dedectable Warning Units	6.00	EA	$10,000.00	$60,000.00
R10-11 No Turn on Red Sign	5.00	SF	$45.00	$300.00
New Exit Signs	16.50	SF	$45.00	$800.00
White Epoxy Striping	5,640.00	LF	$2.00	$12,000.00
Yellow Epoxy Striping	440.00	LF	$2.00	$900.00
Rectangular Rapid Flashing Beacon (RRFB)	1.00	EA	$15,000.00	$15,000.00
			Construction Total	$208,000.00
	Contingency and Inflation (20%)			$41,600.00
	Subtotal			$250,000.00
	Work Zone Traffic Control (10%)			$25,000.00
	Mobilization (4%)			$10,000.00
	Survey (2%)			$5,000.00
	Engineering Design (10%)			$25,000.00
	Construction Inspection & Administration(15%)			$37,500.00
	Grand Total			**$353,000.00**

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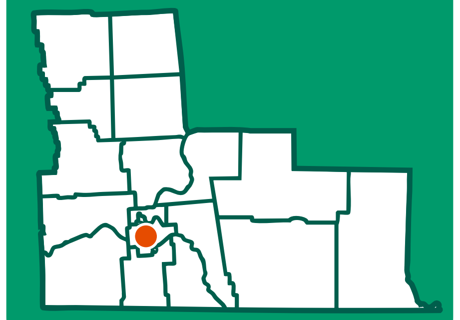
Intersection Broome County

PRIORITY 5



Court St. & State St.

City of Binghamton

Existing Conditions

The intersection of Court Street (US 11) and State Street (NY 434) is located within the City of Binghamton. The surrounding area is densely populated and commercial with numerous businesses in close proximity to the intersection along with the Broome County Courthouse. A total of 51 crashes occurred during the study period between 2019 and 2023, with 13 of these crashes resulting in injury. Bicyclists or pedestrians were involved in 10 of the crashes within the study period.

The eastbound approach to the intersection on Court Street maintains two travel lanes with one being a dedicated left turn lane. Prior to the intersection, the eastbound bicycle lane transitions to a shared use lane while the westbound bicycle lane begins. The westbound approach to the intersection maintains three travel lanes with one being a dedicated left turn lane and one being a dedicated right turn lane. The northbound approach to the intersection on State Street maintains two travel lanes with one being a dedicated right turn lane. The southbound approach to the intersection maintains one travel lane.

The intersection features traffic control by mast arm traffic signal including compliant pedestrian signals at all approaches. No turn on red signage is present at all legs of the intersection. Curb ramps, sidewalks, and type LS crosswalks are present at all approaches to the intersection, but all of the curb ramps are not ADA compliant due to the presence of plastic detectable warning units in lieu of cast iron detectable warning units. The intersection is well lit due the presence of street lighting on both side of the road at all approaches.

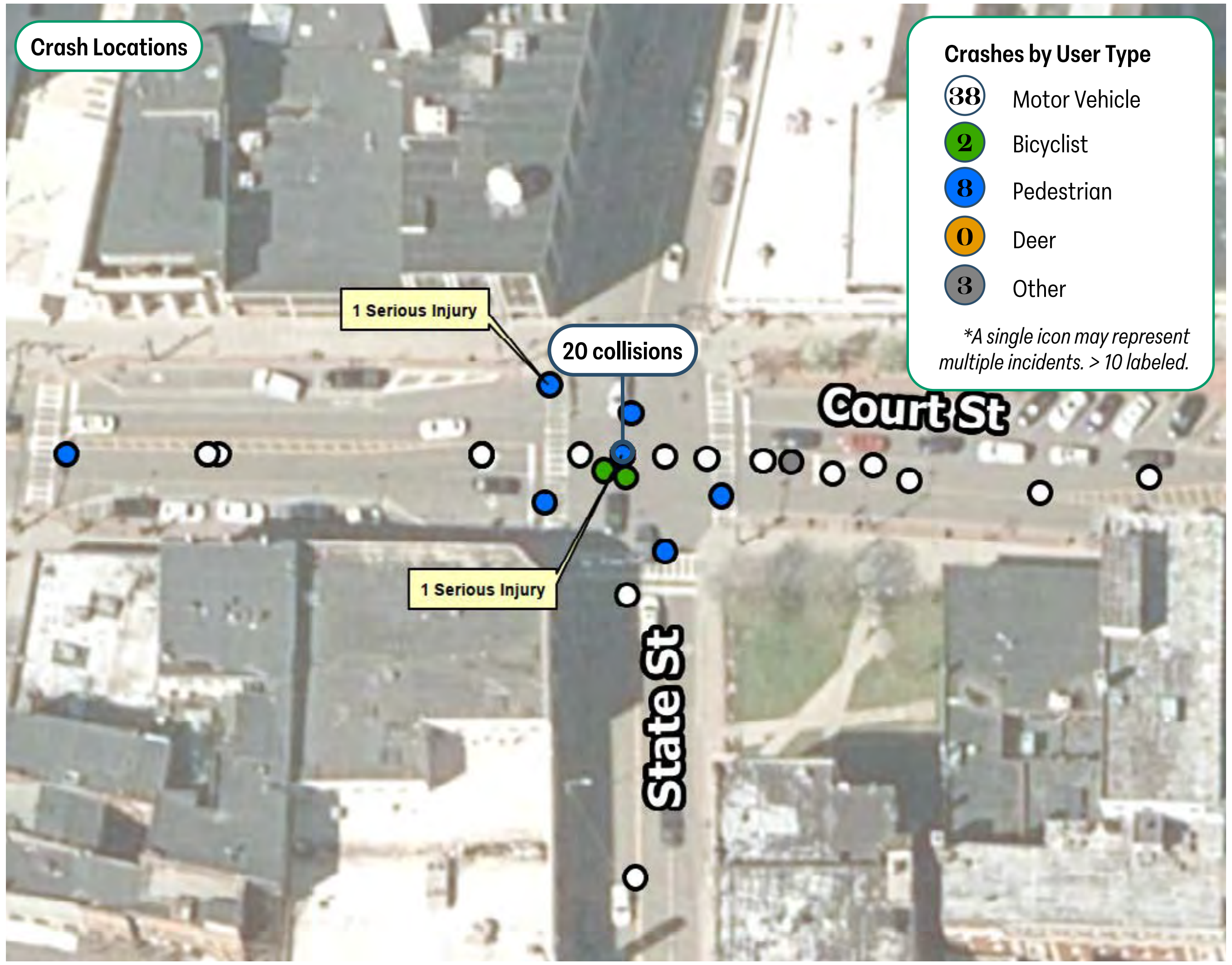
Highway Characteristics

Owner	NYSDOT
Intersection Type	Urban 4-Leg signalized
Traffic Control	Mast Arm Signal
Speed Limit	30 mph
AADT (Court St)	14,179 VPD
AADT (State St)	9,148 VPD
Functional Class (Court St)	(16) Minor Arterial
Functional Class (State St)	(16) Minor Arterial
LOSS	3
HRN Score	6
Equity Rank	Top 20

Photo 1: Court Street crosswalk looking west

Photo 2: Northeast corner looking southeast

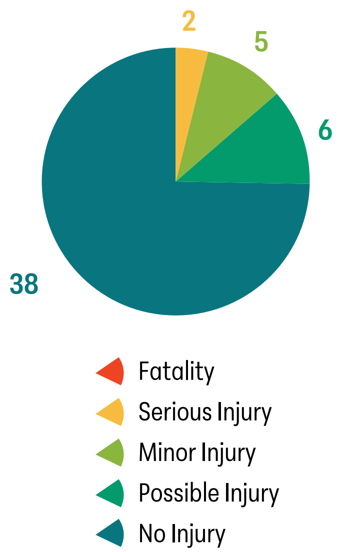
Crash Data



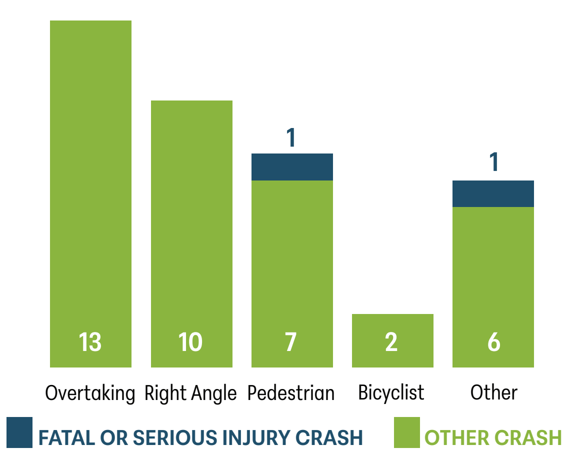
Contributing Factors

- Faded striping and poor sight distance from stopping locations
- Lack of bicyclist accommodations
- Tight turning radii with on street parking
- Very high volume of traffic

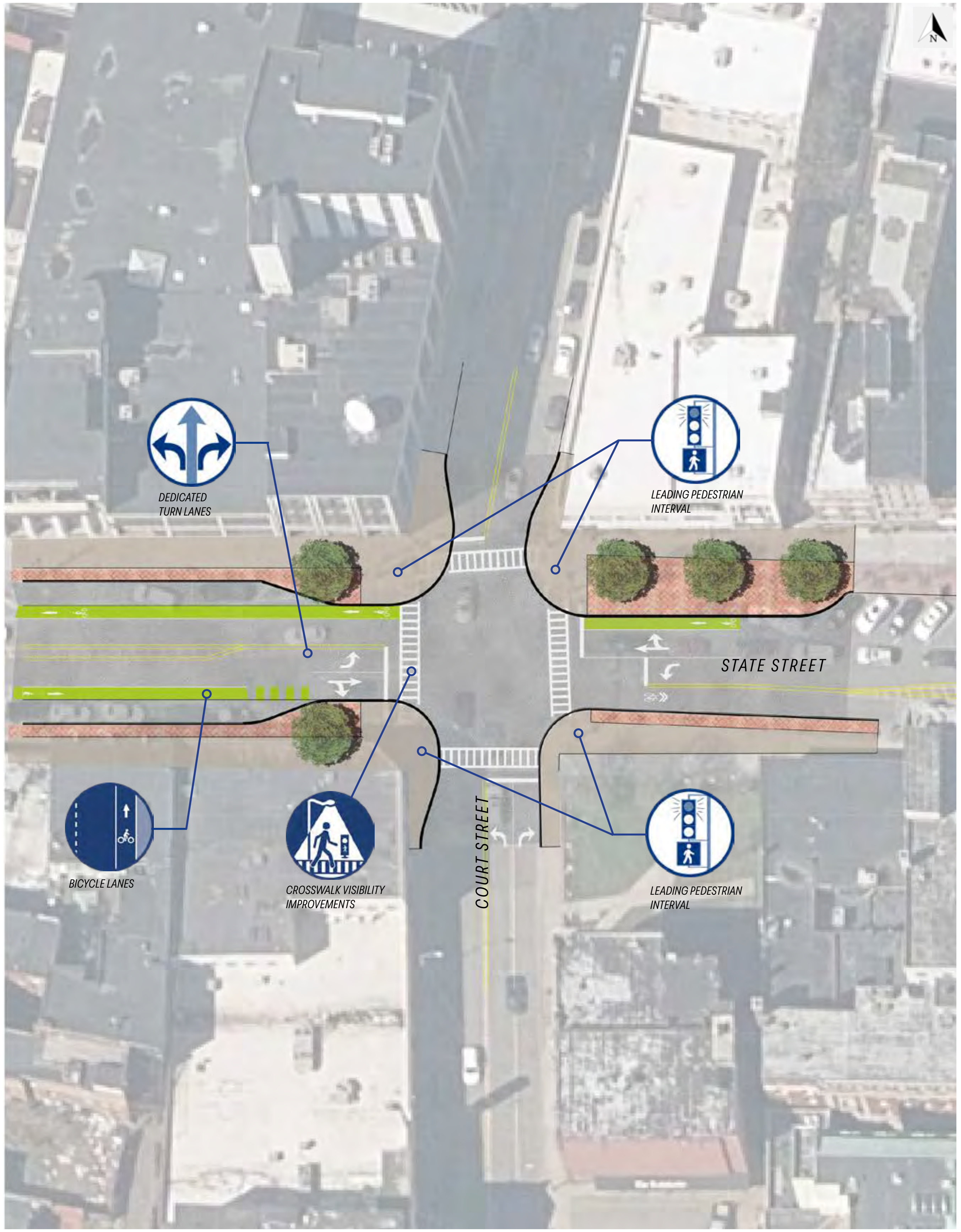
Crash Severity



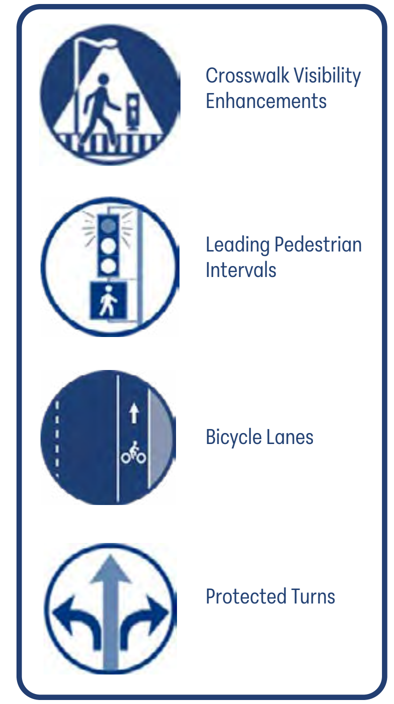
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at Court and State Streets included faded striping and poor sight distance from stopping locations, lack of bicyclist accommodations, tight turning radii with on street parking, and a very high volume of traffic. Potentially relevant safety countermeasures at this intersection include, high visibility crosswalks, sharrow striping, curb bump outs at multiple corners of the intersection, adding a leading pedestrian interval (LPI), and green arrow protected left turns for both approaches on Court Street. High visibility type LS crosswalks will be installed at all approaches to the intersection with supporting signage. These new crosswalks will enhance the visibility of crossing locations and allow drivers to see pedestrians crossing the street with adequate time to stop. Sharrow striping will be installed at the eastbound approach after the bicycle lane ends and on the westbound approach in both directions. This will notify road users of the need to share the road with bikes and give bicyclists the ability to navigate through this intersection and access the adjacent bike lanes. Curb bump outs will be installed in the northeast, northwest, and southwest corners of the intersection. Bumping out the curb will also involve construction need sidewalk and updating curb ramps at these corners. The newly bumped out curb locations will provide shorter crossing distances for pedestrians and reduce their exposure to motor vehicle traffic. There have been a total of 7 crashes involving pedestrians at this intersection despite the presence of crosswalks and pedestrian signals. Because of this, a leading pedestrian interval is necessary to give pedestrians the opportunity to enter the crosswalk prior to vehicles being given a green indication to better establish their presence in the crosswalk. Court St and State St in downtown Binghamton is a high traffic location frequented by locals and students, many of whom travel on foot or via bicycle, making this an extremely high priority location. These countermeasures implemented together will increase the safety for all road users and reduce the risk of serious injury crashes in the future.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	160.00	LF	$24.00	$3,900.00
White Striping	880.00	LF	$2.00	$1,800.00
Yellow Striping	300.00	LF	$2.00	$600.00
Striping Symbols	9.00	EA	$300.00	$2,700.00
Curb Ramp	8.00	EA	$10,000.00	$80,000.00
Granite Curb	440.00	LF	$80.00	$36,000.00
Concrete Sidewalk	65.00	CY	$1,500.00	$98,000.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
Green Arrow Protected Left Turns	2.00	EA	$3,000.00	$6,000.00
			Construction Total	$232,000.00

Contingency & Inflation (20%)	$46,400.00
Subtotal	$278,400.00
Work Zone Traffic Control (10%)	$27,900.00
Mobilization (4%)	$11,200.00
Survey (2%)	$5,600.00
Construction & Inspection (15%)	$41,800.00
Engineering Design (10%)	$27,900.00
Grand Total	**$392,800.00**

Intersection Broome County

PRIORITY 6

S 363 & Frederick St.

City of Binghamton

Existing Conditions

The intersection of NY 363 and Frederick Street is located within the City of Binghamton, south of the I-86/I-81 interchange. The surrounding area is both residential and commercial with multiple businesses in close proximity to the intersection along with residential developments.

A total of 45 crashes occurred during the study period between 2019 and 2023, with 11 of these crashes resulting in injury. The majority of crashes within the study period at this intersection were rear end crashes. In 2024 there were two fatal crashes at this intersection, one being a rear end crash and the other involved a bicyclist at night. There was an additional fatal crash at this intersection that preceded the study period involving a pedestrian. The northbound approach to the intersection on NY 363 maintains four travel lanes with one being a right turn slip ramp which is uncontrolled and separated by a concrete curb island.

There is an uncontrolled pedestrian crossing between the concrete curb island and the southeast corner of the intersection which has pedestrian warning signage. The southbound approach maintains four travel lanes with one being a dedicated right turn lane and the right-most thru lane transitions into an exit only lane for NY 7 West after the intersection.

The eastbound approach to the intersection on Frederick Street maintains two travel lanes with one being a dedicated left turn lane and the other being a left/right turn lane. The westbound approach maintains one travel lane which is a right turn only slip ramp onto NY 363 which is separated by a concrete curb island. The intersection features traffic control by span wire traffic signals including compliant pedestrian signals for the crossing of NY 363. Compliant curb ramps, sidewalks, and type LS crosswalks allow for pedestrian movements between the southwest and southeast corners of the intersection.

The south side of Frederick Street on both approaches maintains sidewalk. The westbound approach to Frederick Street has a midblock crossing between the intersection with Walter Avenue and the NY 363 intersection which features non-compliant curb ramps, no crosswalk, and no warning signage. The intersection has street lighting on the eastbound and westbound approaches on Frederick Street, but no lighting is present on NY 363.

Highway Characteristics

Owner	NYSDOT
Intersection Type	Urban 4-Leg signalized
Traffic Control	Span Wire Signal, Stop Control
Speed Limit	30 mph
AADT (S 363)	34,339 VPD
AADT (Frederick)	2,719 VPD
Functional Class (S 363)	(12) Principal Arterial – Other Freeway/Expressway
Functional Class (Frederick)	(17) Major Collector
LOSS	N/A
HRN Score	3
Equity Rank	Top 20

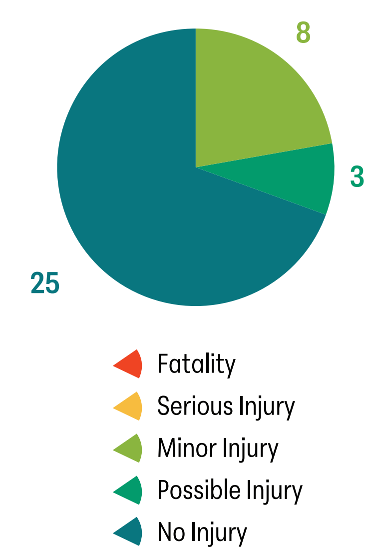
Photo 1: South 363 northbound Looking northeast

Crash Data

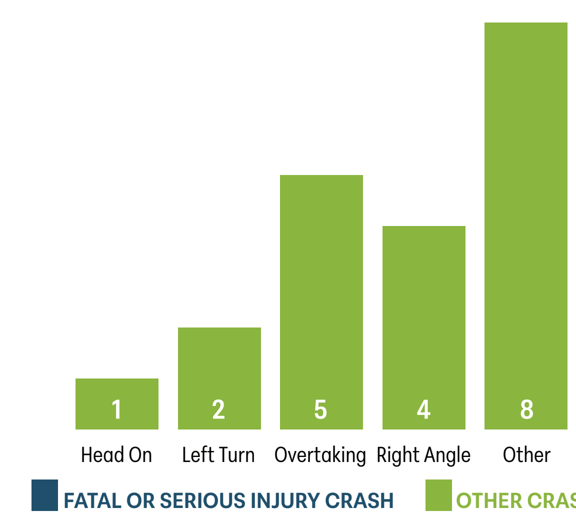
Contributing Factors

- Long crossing length (pedestrian exposure)
- Uncontrolled pedestrian crossing
- Lack of bicyclist accommodations
- Very high volume of traffic

Crash Severity

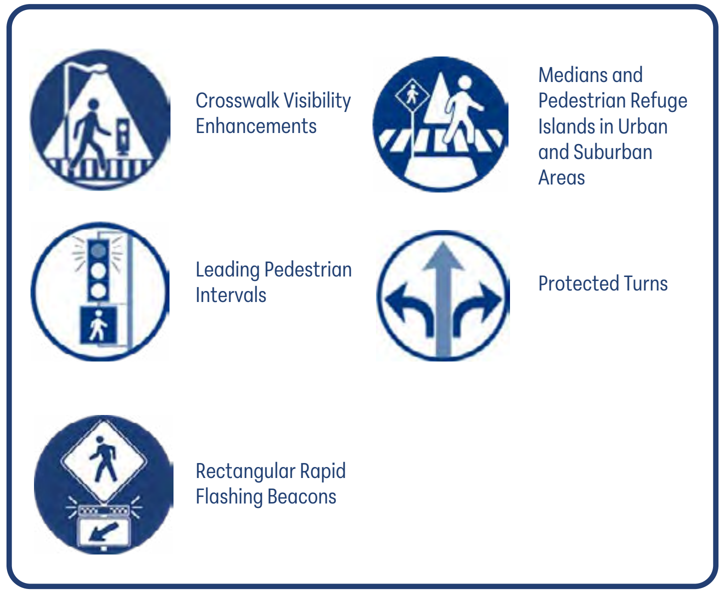


Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures



Contributing factors at NY 363 and Frederick Street included long crossing length, uncontrolled pedestrian crossing, lack of bicyclist accommodations, and a very high volume of traffic. Potentially relevant safety countermeasures at this intersection include, installation of a median refuge island, high visibility crosswalks, improved lighting, adding a leading pedestrian interval (LPI), installing a rectangular rapid flashing beacon RRFB for the uncontrolled crossing, and warning signage for mid-block crossing on Frederick St. The installation of a concrete median refuge island for the NY 363 crossing would provide additional protection for pedestrians. High visibility crosswalks would be installed for the northbound NY 363 crossing and the northbound slip ramp uncontrolled crossing. Lighting improvements will be installed at the intersection to provide additional visibility. A leading pedestrian interval would be added to give pedestrians the opportunity to enter the crosswalk prior to vehicles being given a green indication to better establish their presence in the crosswalk. A RRFB will be installed at the northbound slip ramp uncontrolled crossing to provide increased visibility and safety for crosswalk users. Pedestrian crossing warning signage will be added to provide additional visibility to the mid-block crossing on Frederick Street.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	170.00	LF	$24.00	$4,080.00
Curb Ramp	2.00	EA	$10,000.00	$20,000.00
Granite Curb	85.00	LF	$80.00	$6,800.00
Concrete Sidewalk	15.00	CY	$1,500.00	$22,500.00
Lighting Improvements	1.00	CY	$25,000.00	$25,000.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EA	$15,000.00	$30,000.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
Pedestrian Warning Signage	8.00	EA	$1,250.00	$10,000.00
			Construction Total	$121,380.00

Contingency and Inflation (20%)	$24,300.00
Subtotal	$145,700.00
Work Zone Traffic Control (10%)	$14,600.00
Mobilization (4%)	$5,900.00
Survey (2%)	$3,000.00
Engineering Design (10%)	$14,600.00
Construction Inspection & Administration(15%)	$21,900.00
Grand Total	**$205,700.00**

Intersection Broome County

PRIORITY 7

Country Club Rd. & Hooper Rd. (CR 33)

Town of Union

Existing Conditions

The intersection of Country Club Road and Hooper Road (CR 33) is located within the Town of Union. The surrounding area is both residential and commercial with multiple businesses in close proximity to the intersection. A total of 18 crashes occurred during the study period between 2019 and 2023, with 3 of these crashes resulting in injury. One of the crashes during the study period resulted in a pedestrian fatality and was attributable to limited driver visibility. Half of the crashes at this intersection during the study period were rear end crashes.

The eastbound and westbound approaches to the intersection on Country Club Road maintains three travel lanes with one being a dedicated left turn lane and one being a dedicated right turn lane. The southbound approach to the intersection on Hooper Road also maintains three travel lanes with one being a dedicated left turn lane and one being a dedicated right turn lane. The northbound approach to the intersection maintains two travel lanes with one being a dedicated left turn lane.

The intersection features traffic control by span wire traffic signal including compliant pedestrian signals at all approaches. Curb ramps and type S crosswalks are present at all approaches to the intersection. All of the curb ramps have plastic detectable warning units in lieu of NYSDOT standard cast iron detectable warning units. All approaches to the intersection feature sidewalks with the exception of the north side of Country Club Road on the westbound approach. The intersection features street lighting in the northeast corner of the intersection and on the northbound approach.

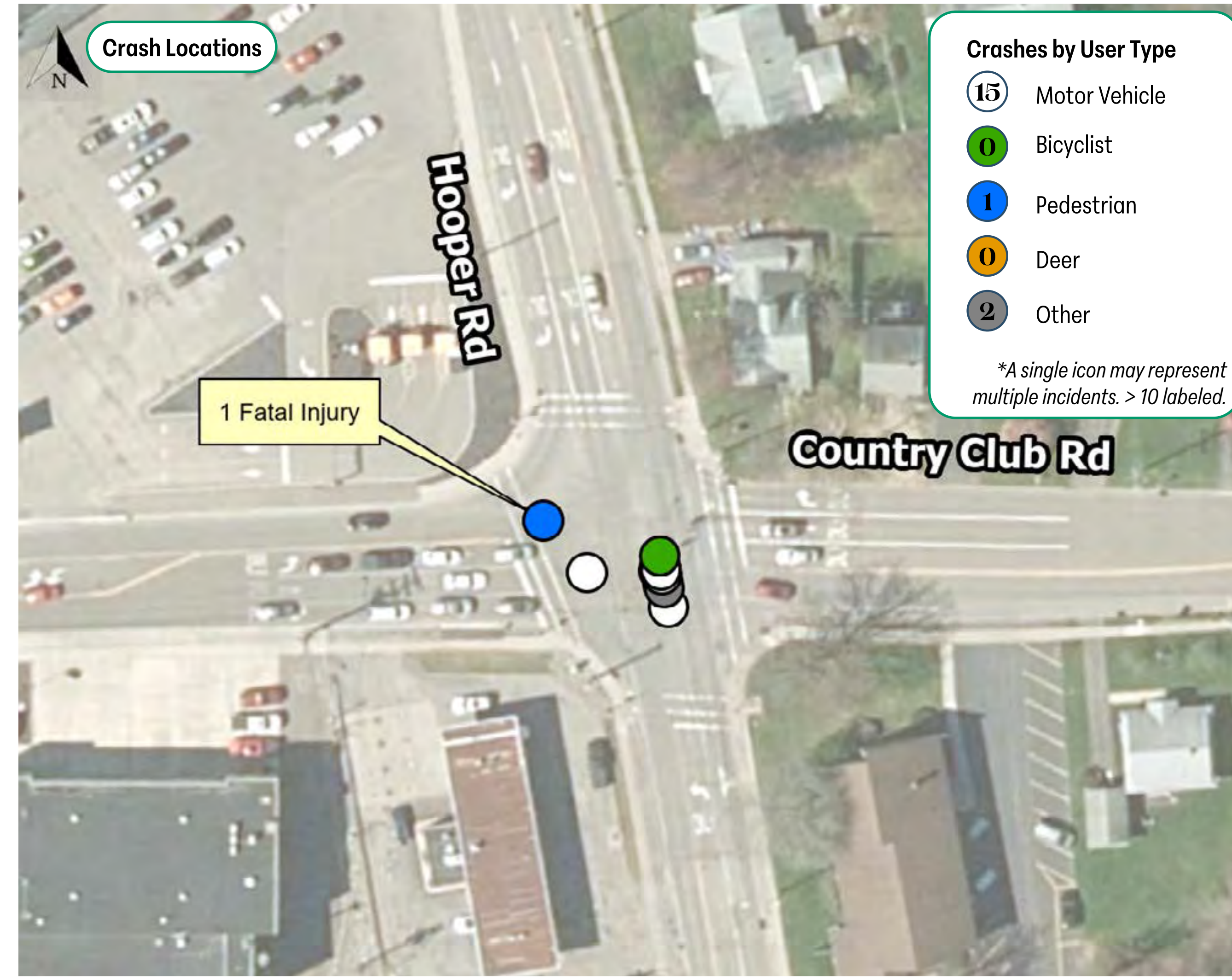
Highway Characteristics

Owner	Town of Union / Broome County
Intersection Type	Urban 4-leg signalized
Traffic Control	Span Wire Signal
Speed Limit	30 mph
AADT (Hooper Road)	15,443 VPD
AADT (Country Club Road)	4,136 VPD
Functional Class (Hooper Road)	(16) Minor Arterial
Functional Class (Country Club Road)	(17) Major Collector
LOSS	3
HRN Score	4
Equity Rank	N/A
Adjacent Lane Use	Urban

Photo 1: Southwest corner of Hooper Rd and Country Club Rd

Photo 2: Northeast corner looking west on Hooper Rd

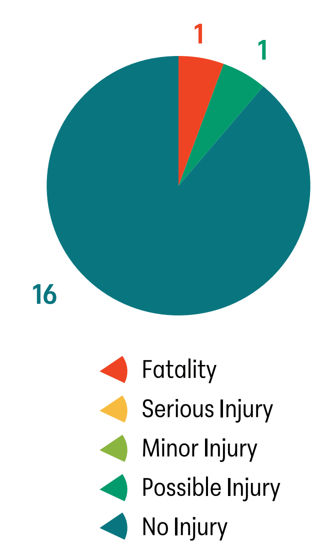
Crash Data



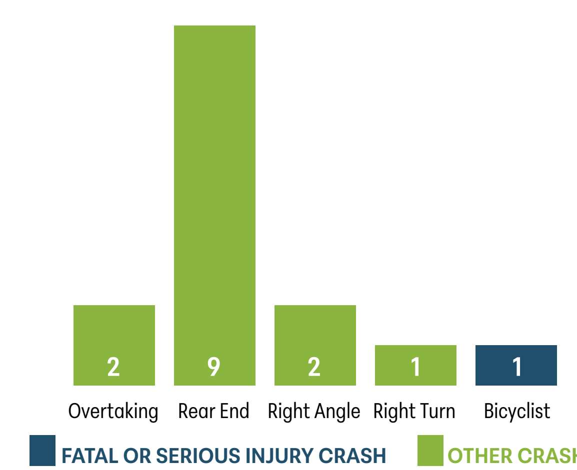
Contributing Factors

- Faded striping and poor intersection sight distance
- Lack of high visibility crosswalks
- Lack of bicyclist accommodations
- Long crossing length (pedestrian exposure)

Crash Severity



Most Frequent Collision Type



Proposed Countermeasures

- Crosswalk Visibility Enhancements
- Backplates with Retroflective Borders
- Leading Pedestrian Interval
- Dedicated Left- and Right-Turn Lanes at Intersections

Contributing factors at Country Club Road and Hooper Road included faded striping and poor intersection sight distance, lack of high visibility crosswalks and bicyclist accommodations, and long crossing length. Potentially relevant safety countermeasures at this intersection include, installation of high visibility crosswalks, addition of traffic signal backplates, adding a leading pedestrian interval (LPI), and sight distance improvements. High visibility crosswalks would be installed at all approaches to the intersection to increase pedestrian safety and driver awareness, especially during darker times of day. The existing traffic signals boxes at this intersection are outdated and in need of traffic signal backplates. The installation of retroreflective backplates will provide increased visibility of the signal heads at the intersection and give drivers increased time to stop from all approaches. This intersection has existing crosswalks at all approaches, accompanied by audible pedestrian signals. However, there was still a pedestrian fatality during the study period. This warrants the need for implementation of a leading pedestrian interval. The LPI will give pedestrians the opportunity to enter the crosswalk prior to vehicles being given a green indication to better establish their presence in the crosswalk. The crash report for the pedestrian fatality at this intersection cited obstruction of view as one of the contributing factors to the crash. To prevent future instances of drivers having an obstructed view, tree trimming will be conducted in the northeast and southeast corners of the intersection, which will increase the sight distance for multiple approaches.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	240.00	LF	$24.00	$5,760.00
Traffic Signal Backplates	8.00	EA	$600.00	$4,800.00
Tree Trimming	1.00	LS	$5,000.00	$5,000.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
			Construction Total	$18,560.00

Contingency and Inflation (20%)	$3,800.00
Subtotal	$22,400.00
Work Zone Traffic Control (10%)	$2,300.00
Mobilization (4%)	$900.00
Survey (2%)	$500.00
Engineering Design (10%)	$2,300.00
Construction Inspection & Administration(15%)	$3,400.00
Grand Total	**$31,800.00**

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Intersection Broome County

PRIORITY 8

N. Nanticoke Ave. & Jennings St.

Village of Endicott

Existing Conditions

The intersection of N Nanticoke Ave (NY-26) and Jennings St is located in the Village of Endicott, New York. It is categorized as a 3-leg urban two-way stop-controlled intersection. Between 2019 and 2023 there were a total of 9 crashes at this intersection, with 5 of them resulting in injury. There were 3 total serious injury crashes, 1 to a bicyclist and 1 to a pedestrian.

The eastbound approach maintains one travel lane with left turns restricted from 4:00pm to 6:00pm on weekdays. The northbound approach maintains one travel lane and a dedicated left turn lane.

The south bound approach maintains one travel lane. Solid yellow hashed striping is present on the southbound approach dividing the travel lanes. To the east there is a parking lot that serves multiple businesses. There is one LS crosswalk present to the north crossing N Nanticoke Ave. The crosswalk is accompanied by a pedestrian sign on either side but does not feature any pedestrian signals. There is concrete sidewalk along all approaches which show signs of disrepair.

Field observations showed the remnants of curb ramps at sidewalk endpoints, but they have fallen out of ADA compliance. The striping at this intersection is in good condition, however the pavement has severe cracking.

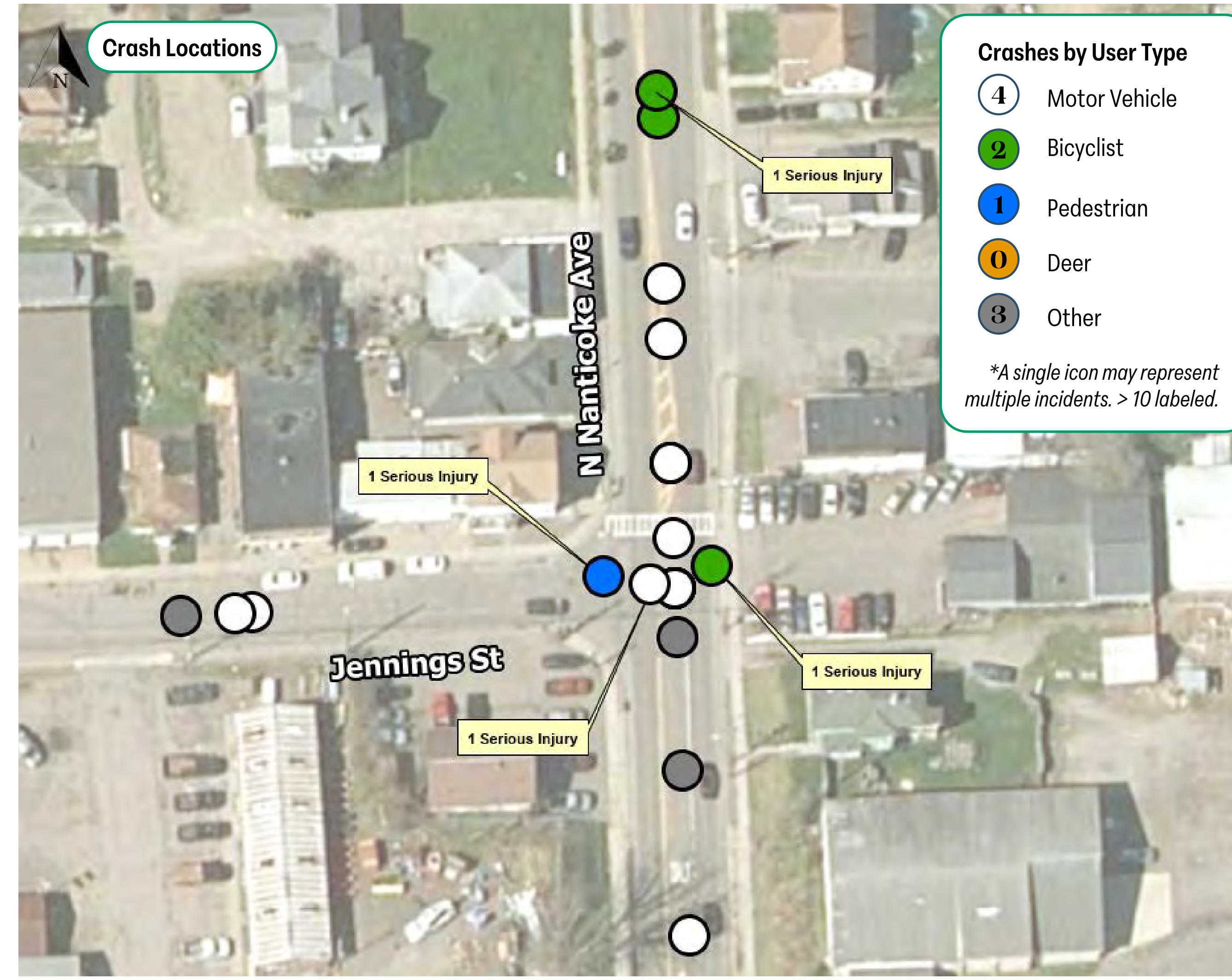
Highway Characteristics

Owner (N Nanticoke)	NYSDOT
Owner (Jennings)	Village of Endicott
Intersection Type	Urban 3-Leg Stop Controlled
Traffic Control	Two-way Stop
Speed Limit	30 mph
AADT (N Nanticoke)	11,470 VPD
AADT (Jennings)	Not Available
Functional Class (N Nanticoke)	(16) Minor Arterial
Functional Class (Jennings)	(N/A) Local Street
LOSS	4
HRN Score	3
Equity Rank	None

Photo 1: Southwest corner of intersection looking north

Photo 2: Northwest corner of intersection looking south

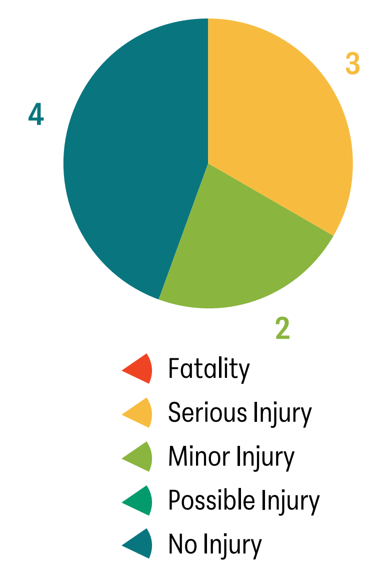
Crash Data



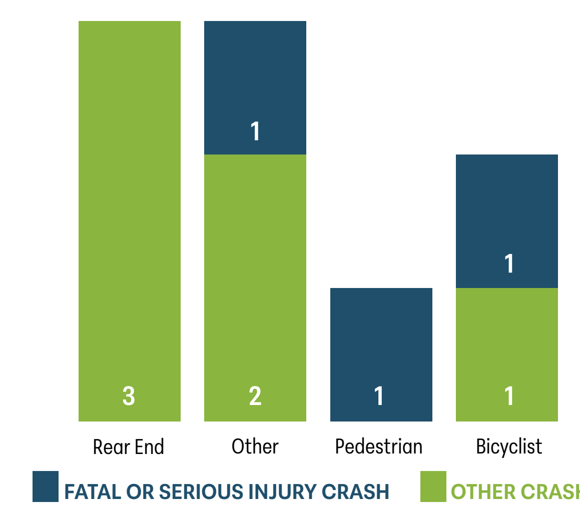
Contributing Factors

- Absence of traffic signal causing dangerous turns
- Long pedestrian crossing with the signals
- Sharp radii and poor sight distance

Crash Severity

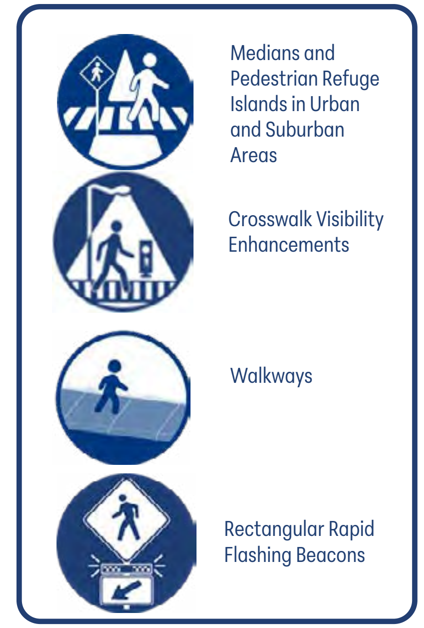


Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures



Contributing factors at N Nanticoke Avenue and Jennings Street included absence of traffic signal causing dangerous turns, long pedestrian crossing with the signals, and sharp radii and poor sight distance. Potentially relevant safety countermeasures at this intersection include, the installation of a 3-color traffic signal with reflective backplates, a pedestrian refuge island, new pedestrian signals and LS type crosswalks, rectangular rapid flashing beacons at the crossing, and reconstruction of curb radii for safer turns. The intersection is currently stop controlled, however traffic could benefit from a traffic signal to prevent accidents from cars turning off the side streets or pedestrians crossing the street. The three-color signals will be linked to pedestrian signals that are placed on either side of the crosswalk. A flashing beacon will be installed on the existing pedestrian signs that will be activated when the pedestrian button is pressed. A concrete pedestrian refuge island will be installed on Nanticoke Ave where the current yellow epoxy hashing is located. This will shorten the crossing length and further improve pedestrian safety at the intersection. The crosswalk on N Nanticoke Ave will be restriped, and an LS type crosswalk will be added on Jennings St. Lastly, the current curb lines will be adjusted slightly to improve the safety of turning movements, this will also allow proper sight distance between cars from Jennings St and oncoming traffic. With this adjusted curb line, the detectable warning units will be replaced at the three existing locations

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Pedestrian Refuge Island	1.38	CY	$1,500.00	$2,100.00
Subbase Course	50.00	CY	$100.00	$5,000.00
Asphalt Pavement	15.00	TON	$150.00	$3,000.00
Concrete Sidewalk	3.33	CY	$1,500.00	$5,000.00
Curb Ramp & Warning Units	6.00	EA	$10,000.00	$60,000.00
Granite Curb	42.00	LF	$80.00	$3,400.00
LS Type Crosswalk	66.00	LF	$24.00	$1,600.00
Striping Yellow Line	134.00	LF	$2.00	$300.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EA	$15,000.00	$30,000.00
			Construction Total	$110,400.00

Contingency and Inflation (20%)	$22,100.00
Subtotal	$132,500.00
Work Zone Traffic Control (10%)	$14,000.00
Mobilization (4%)	$6,000.00
Survey (2%)	$3,000.00
Engineering Design (10%)	$14,000.00
Construction Inspection & Administration(15%)	$20,000.00
Grand Total	**$190,000.00**

Intersection Broome County

PRIORITY 9

Leroy St., Chestnut St., & Chapin St.

City of Binghamton

Existing Conditions

The intersection of Leroy Street and Chestnut Street is located within the City of Binghamton. The surrounding area is residential with multiple businesses in close proximity to the intersection. At the intersection of Leroy Street and Chestnut Street, a total of 14 crashes occurred during the study period between 2019 and 2023, with 6 of these crashes resulting in injury. The majority of all crashes within the study period at this intersection were rear end crashes with 2 pedestrian involved crashes. All approaches to the intersection maintains one travel lane in each direction with parking on both sides of the road with the exception of no parking on the west side of Chestnut Street. The intersection features traffic control by span wire traffic signal, but lacks pedestrian signals. Curb ramps, sidewalks, and type LS crosswalks are present at all approaches to the intersection, but all of the curb ramps have plastic detectable warning units in lieu of NYSDOT standard cast iron detectable warning units. The intersection is well lit due the presence of street lighting in the northeast and southeast corners of the intersection.

The intersection of Leroy Street and Chapin Street is located three blocks to the east of the previously discussed intersection. A total of 16 crashes occurred during the study period between 2019 and 2023, with 2 of these crashes resulting in injury. The majority of all crashes within the study period at this intersection were right angle crashes. The intersection features stop control at the northbound and southbound approaches on Chapin Street while the eastbound and westbound approaches on Leroy Street are uncontrolled. All approaches to the intersection maintains one travel lane in each direction with parking on both sides of the road with the exception of the southbound approach which is one-way only. Curb ramps and sidewalks are present at all approaches to the intersection, but all of the curb ramps are not ADA compliant due to the lack of detectable warning units. There are no existing crosswalks present at the intersection while there is an existing stop bar at the southbound approach for the one-way approach. The intersection is well lit due the presence of street lighting in the southwest corner of the intersection.

Highway Characteristics

	Leroy & Chestnut St.	Leroy & Chapin St.
Owner	City of Binghamton	City of Binghamton
Intersection Type	Urban 4-leg signalized	Urban 4-leg stop control
Traffic Control	Span Wire Signal	Stop Control
Speed Limit	30 mph	30 mph
AADT	4,029 VPD	4,029 VPD
Functional Class (Leroy)	(17) Major Collector	(17) Major Collector
Functional Class (Chestnut/Chapin)	(19) Local	(19) Local
LOSS	3	4
HRN Score	1	1
Equity Rank	Top 40	Top 40

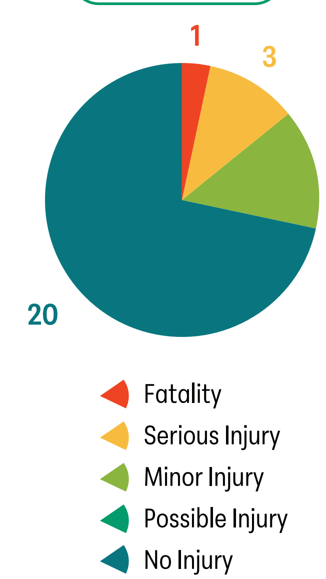
Photo 1: Northwest corner of Leroy St and Chestnut St

Crash Data

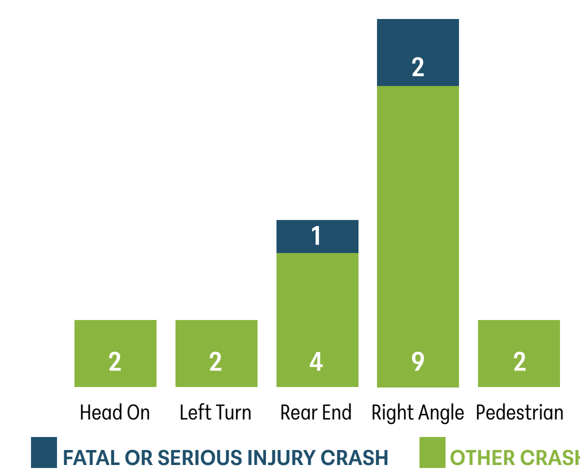
Contributing Factors

- Lack of pedestrian signals – Leroy/Chestnut
- Lack of crosswalks – Leroy/Chapin
- Poor sight distance from stopping locations at two uncontrolled approaches – Leroy/Chapin
- Tight turning radii with on street parking

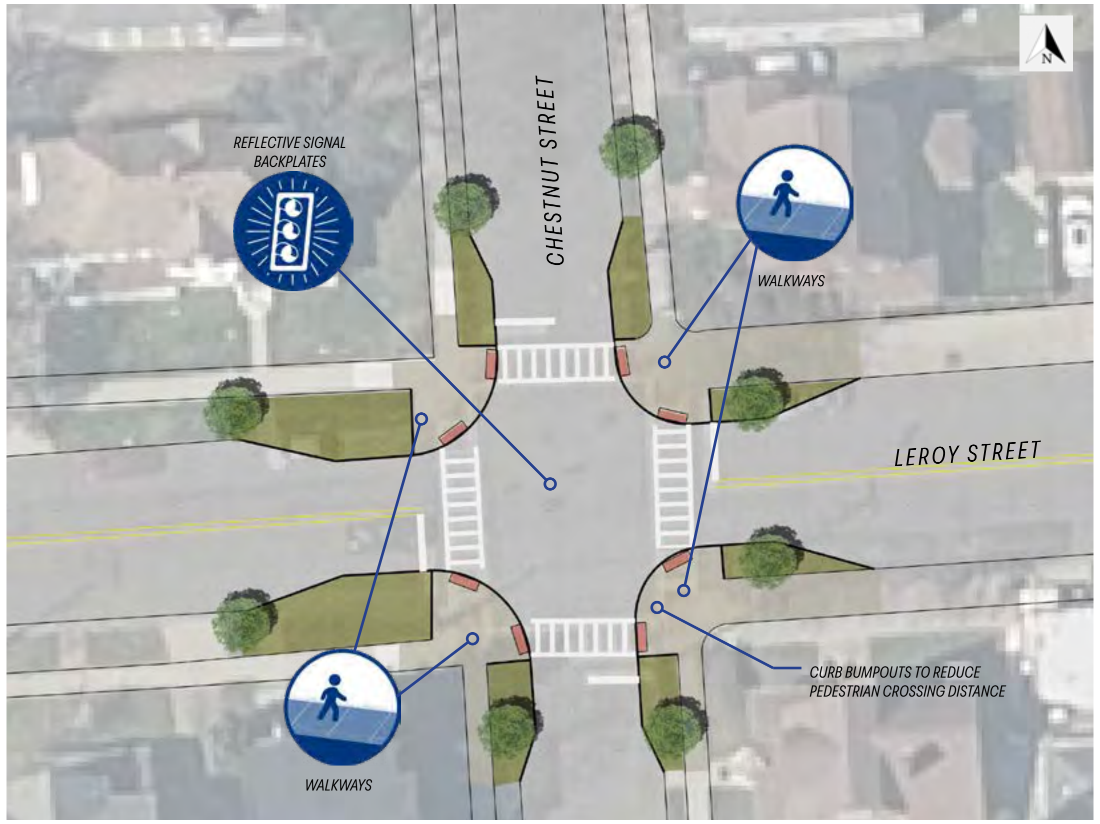
Crash Severity

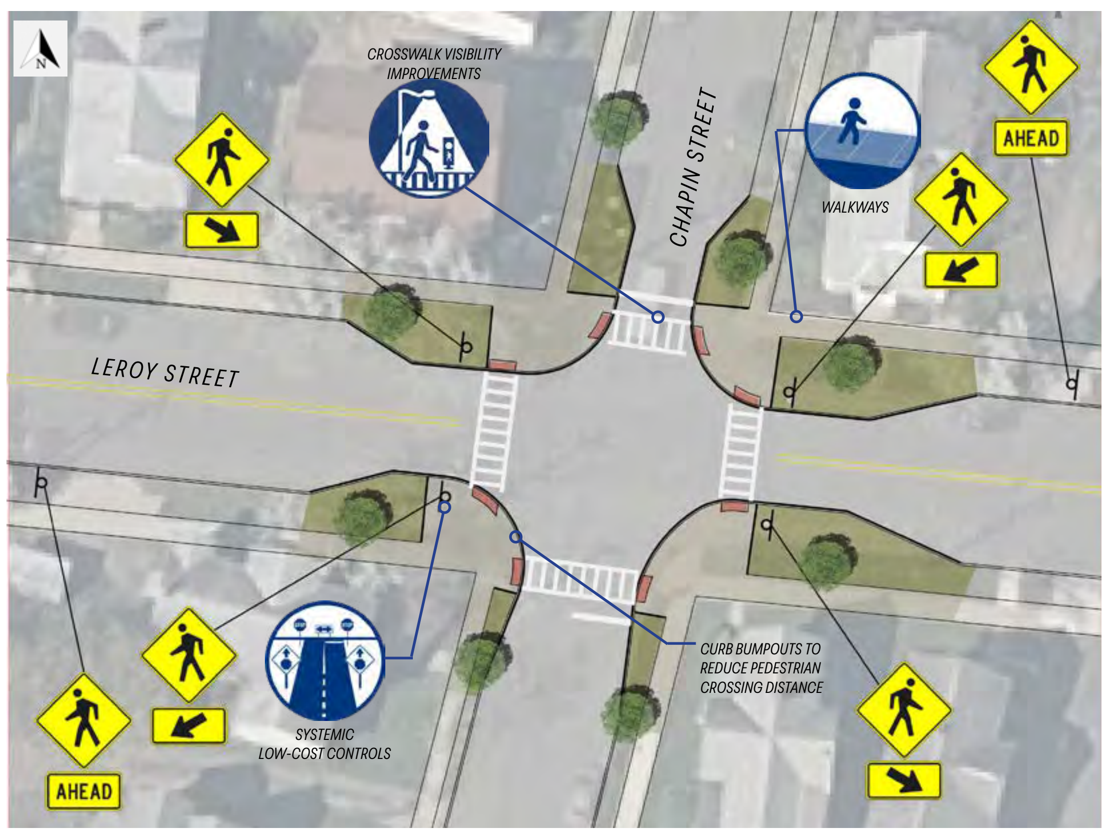


Most Frequent Collision Type



Proposed Improvements





Proposed Countermeasures

Contributing factors at Leroy, Chestnut, & Chapin Streets included lack of crosswalks, pedestrian signals, poor sight distance from stopping locations at the Leroy and Chapin approaches, and tight turning radii. Potentially relevant safety countermeasures at these intersections include, traffic signal enhancements, pedestrian infrastructure improvements, installation of high visibility crosswalks, curb bump outs at all corners of the intersection, and enhanced warning signage. The existing traffic signals at Chestnut St are outdated and are in need of traffic signal backplates with retroreflective borders. These backplates will provide increased visibility of the signal heads at the intersection of Leroy Street and Chestnut Street. At Leroy and Chestnut St there are currently no pedestrian signals at any of the crossing locations. It is necessary to install pedestrian signals to provide increased protection for pedestrians crossing at this intersection where there were two crashes involving pedestrians during the study period. Currently at Chapin St, there are no crosswalks present and the type LS crosswalks at Chestnut St have faded. To address this, high visibility crosswalks will be installed at all approaches to both intersections. These will increase driver awareness of pedestrian crossings and reduce the risk of crashes involving vulnerable road users. To further accommodate pedestrians, curb bump outs will be installed in all corners of both intersections to shorten the crossing distance for crosswalk users. Pedestrian crossing warning signage will be installed at the intersection of Leroy Street and Chapin Street to provide increased visibility at the uncontrolled crossings.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	210.00	LF	$24.00	$5,040.00
White Striping	450.00	LF	$2.00	$900.00
Yellow Striping	400.00	LF	$2.00	$800.00
Traffic Signal Backplates	8.00	EA	$600.00	$4,800.00
Curb Ramp	16.00	EA	$10,000.00	$160,000.00
Granite Curb	840.00	LF	$80.00	$67,200.00
Concrete Sidewalk	55.00	CY	$1,500.00	$82,500.00
Pedestrian Signals and Poles	8.00	EA	$6,000.00	$48,000.00
Pedestrian Warning Signage	6.00	EA	$1,250.00	$7,500.00
			Construction Total	$376,740.00

Contingency and Inflation (20%)	$75,400.00
Subtotal	$452,200.00
Work Zone Traffic Control (10%)	$45,300.00
Mobilization (4%)	$18,100.00
Survey (2%)	$9,100.00
Engineering Design (10%)	$45,300.00
Construction Inspection & Administration(15%)	$67,900.00
Grand Total	**$637,900.00**

Intersection Broome County

PRIORITY 10

Harry L Dr. & Lester Ave. & Zoa Ave.

Village of Johnson City

Existing Conditions

The intersection of Harry L Dr, Lester Ave, and Zoa Ave is located in the Village of Johnson City east of the Wegmans and Dick's locations. It operates as a 4-legged signalized intersection and features a significant geometric skew. Between 2019 and 2023 there were a total of 13 crashes with 7 of them resulting in some level of injury. There were 3 crashes which led to serious injuries and one crash that involved a pedestrian.

The eastbound approach maintains one travel lane and a bike lane that does not continue through the intersection. The westbound approach maintains one travel lane that expands to add a dedicated left turn lane at the intersection. The northbound approach is Lester Ave which is composed of one travel lane.

The southbound approach is Zoa Avenue which also supports one travel lane. There are sight-distance issues present from all approaches due to existing structures beyond the highway right-of-way that cannot be relocated. All approaches have concrete sidewalks on each side which are in very poor condition showing signs of settlement and cracking. Each approach has a Type S standard crosswalk without ladder bars. The intersection features audible pedestrian signals at each of the crossings. Curb ramps are present at all four quadrants but only the southeast and southwest corners have detectable warning units. These units have fallen out of ADA compliance due to deterioration. East of the intersection on Harry L Dr facilitates traffic from I-86 and NY-69. The speed limit reduces to 30 mph prior to the westbound intersection approach, but vehicles have limited space to transition lanes or observe pedestrians potentially crossing the road before reaching the intersection.

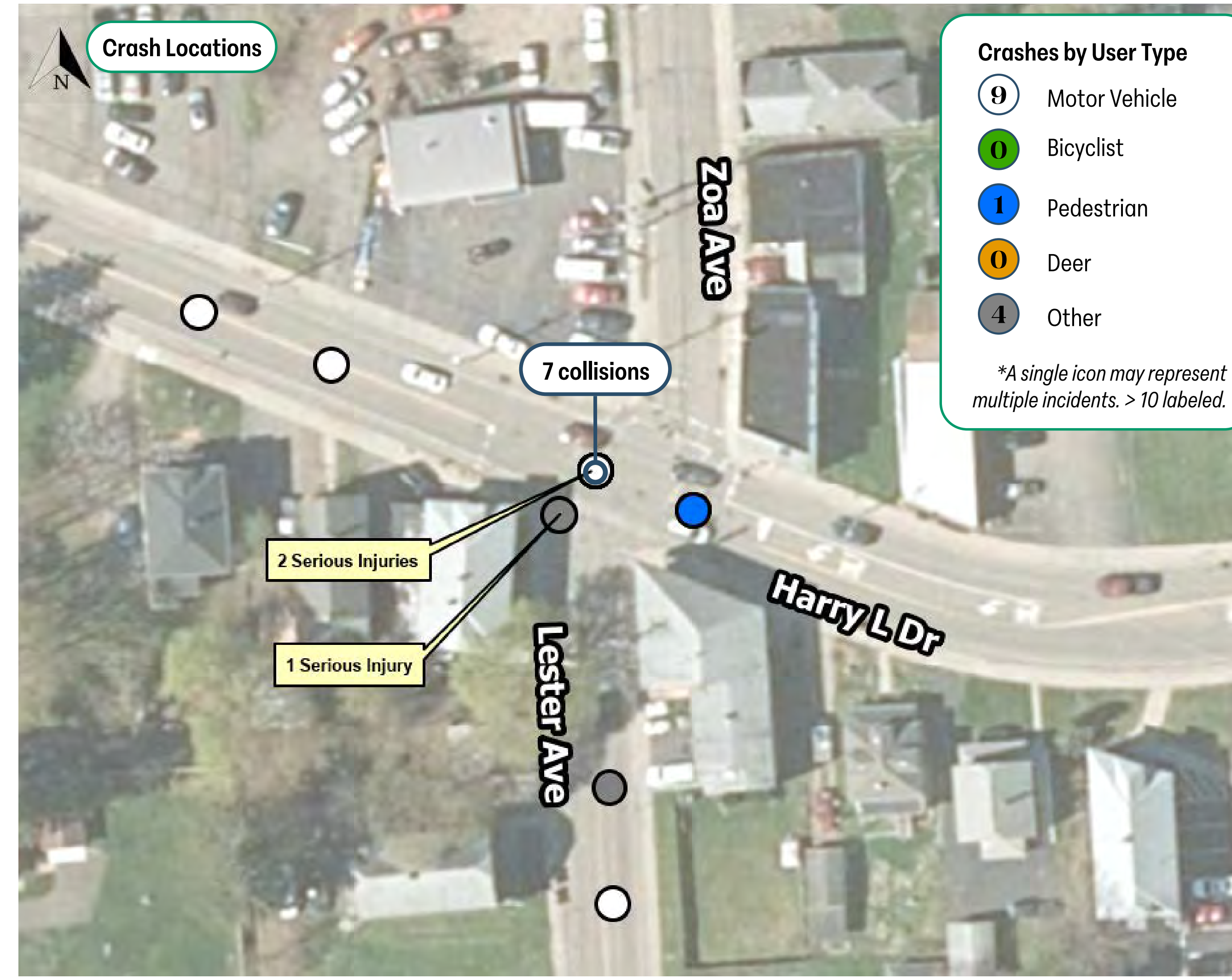
Highway Characteristics

Owner	Village of Johnson City
Intersection Type	Urban 4-Leg signalized
Traffic Control	Span Wire
Speed Limit	30 mph
AADT (Harry L Dr.)	8,000 VPD
AADT (Lester Ave.)	3,593 VPD
Functional Class (Harry L)	(16) Minor Arterial
Functional Class (Lester)	(17) Minor Arterial
LOSS	3
HRN Score	2
Equity Rank	Top 40

Photo 1: Northwest corner looking southeast

Photo 2: Harry L Dr eastbound looking West

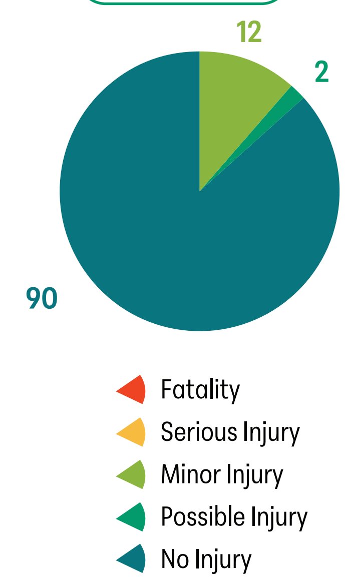
Crash Data



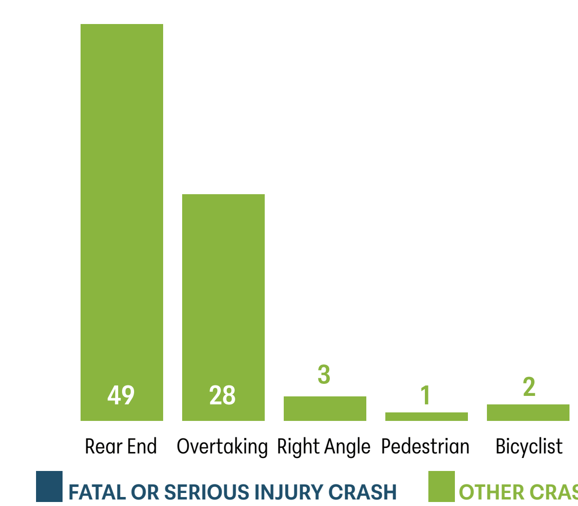
Contributing Factors

- Deteriorated or cracked sidewalks and curb ramps
- Poor intersection sight distance
- Cracked pavement and faded striping

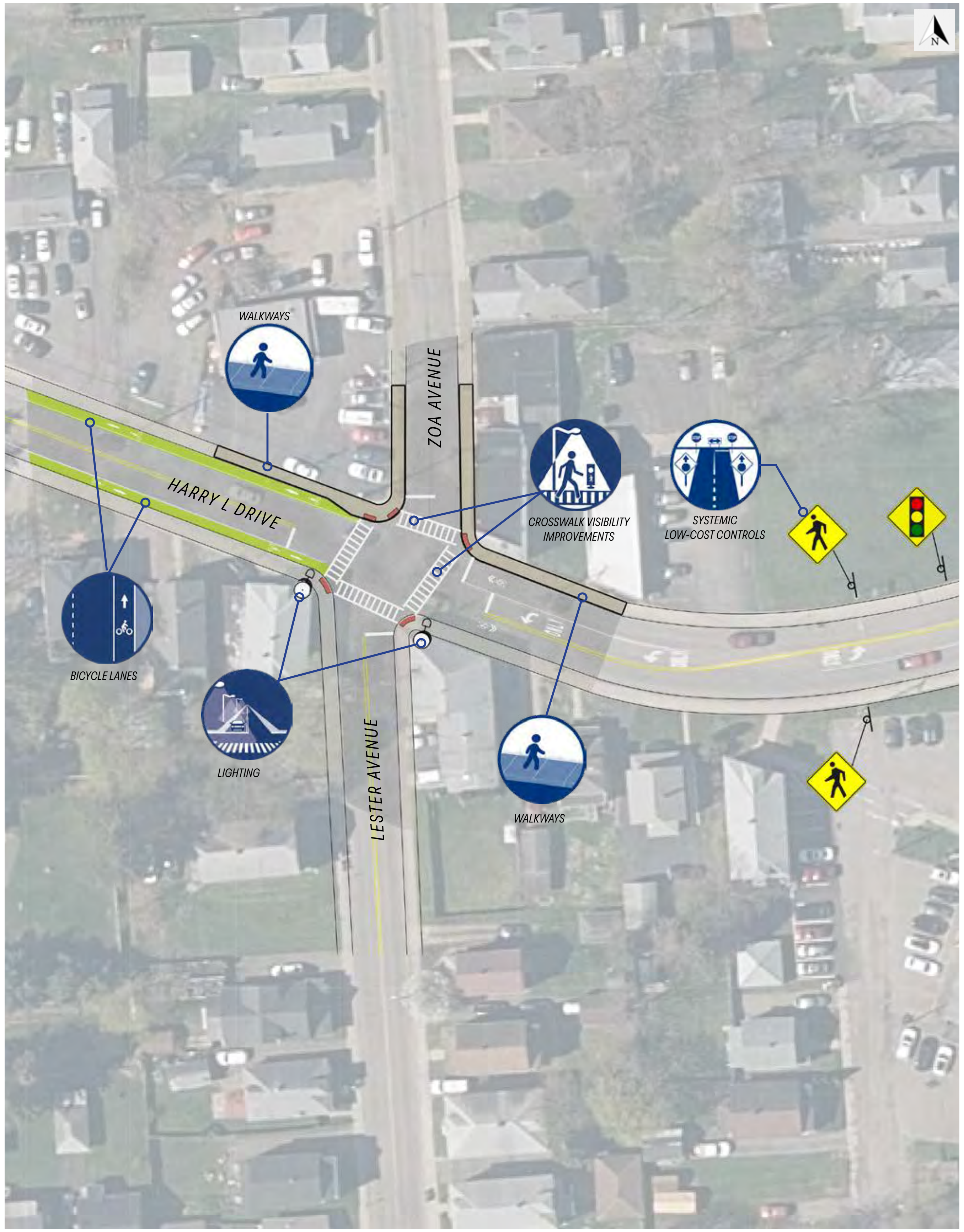
Crash Severity



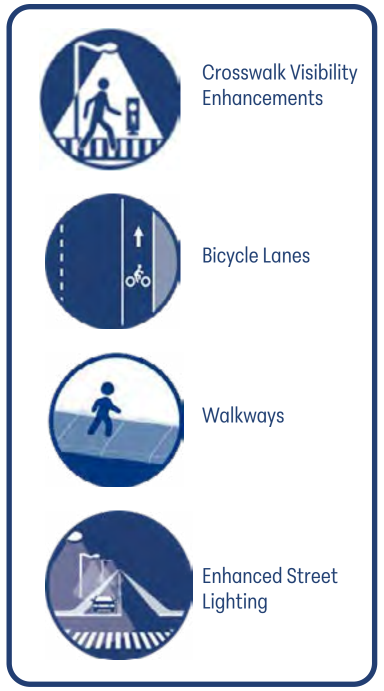
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at Harry L Drive, Lester Avenue, and Zoa Avenue included deteriorated or cracked sidewalks and curb ramps, poor intersection sight distance, cracked pavement and faded striping. Potentially relevant safety countermeasures at this intersection include, reconstructing walkways with curb bump outs and ADA compliant curb ramps, new type LS crosswalks, lighting improvements, rectangular rapid flashing beacons, signage improvements and traffic signal upgrades. Curb bump outs will allow for safer pedestrian crossing by shortening crossing distances and slowing down traffic. ADA-compliant curb ramps will be installed at all approaches so the visually impaired can safely navigate the intersection. By restriping the crosswalks to combine the standard layout with ladder lines, the crosswalks will be more visible to drivers and further improve the safety of pedestrian crossings. Additional overhead lighting will be installed on the signal pole in the southeast corner to increase visibility of the entire intersection. Neon green advanced pedestrian warning signs are recommended to be installed east of the intersection which will flash when a user activates the pedestrian signal. Vegetation removal is required to unveil the speed limit sign east of the intersection. Lastly, the traffic signals at the intersection are in need of replacement with upgraded signal heads including yellow retroreflective backplates. Also recommended is the replacement of the existing pedestrian signals with updated signals that include countdown timers and audible push buttons.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete Sidewalk	30.24	CY	$1,500.00	$46,000.00
Curb Ramp and Warning Units	4.00	EA	$10,000.00	$40,000.00
Granite Curb	50.00	LF	$80.00	$4,000.00
LS Type Crosswalk	150.00	LF	$24.00	$3,600.00
Striping White Line	250.00	LF	$2.00	$500.00
Striping White Symbols	10.00	EA	$300.00	$3,000.00
Traffic Signal Replacement	8.00	EA	$5,000.00	$40,000.00
Pedestrian Warning Signage	2.00	EA	$1,250.00	$3,000.00
Overhead LED Street Lighting	2.00	EA	$10,000.00	$20,000.00
			Construction Total	$160,100.00

Contingency and Inflation (20%)	$33,000.00
Subtotal	$193,100.00
Work Zone Traffic Control (10%)	$20,000.00
Engineering Design (10%)	$20,000.00
Mobilization (4%)	$8,000.00
Survey (2%)	$4,000
Construction Inspection & Administration(15%)	$29,000.00
Grand Total	**$274,100.00**

Intersection Broome County

PRIORITY 11

Vestal Parkway East & African Rd.

Town of Vestal

Existing Conditions

The intersection of Vestal Parkway East (NY-434) and African Rd is located in the Town of Vestal, NY in the greater Binghamton area. This location is adjacent to the Binghamton Walmart and Shoppes at Vestal Plazas.

Vestal Pkwy E and African Rd is categorized as a 4-leg signalized intersection. During the study period between 2019 and 2023 there were a total of 49 crashes with 9 of them resulting in some form of injury. There was one serious injury crash and one collision involving a bicycle. The eastbound approach on Vestal Pkwy E maintains two thru lanes and a dedicated left turn lane. The westbound approach mirrors the same lane configuration with two thru lanes and a dedicated left turn lane. The northbound approach on African Road consists of a thru lanes and dedicated left turn lane. Both of these lanes have sharrow pavement markings present. The southbound approach on N African Rd has a thru lane with a left turn lane set back.

Field observations showed the pavement is in poor condition with significant cracking. There are existing type LS crosswalks that have faded with the deteriorated pavement. The longest crossing along Vestal Pkwy E is over 110-ft in length. Audible pedestrian signals with push buttons are present at each of the crossings. There are curb ramps in good condition with ADA compliant cast iron detectable warning units at three of the four corners except to the southwest where there is a concrete island with no curb ramp.

Highway Characteristics

Owner (Vestal Pkwy E)	NYSDOT
Owner (African Rd)	Town of Vestal
Intersection Type	Urban 4-leg signalized
Traffic Control	Span Wire Signal
Pedestrian Signals	All Approaches
Speed Limit	45 mph
AADT (Vestal Pkwy E)	25,619 VPD
AADT (African Rd)	2,405 VPD
Functional Class (Vestal Pkwy E)	(14) Principal Arterial Other
Functional Class (African Rd)	(17) Major Collector
LOSS	5
HRN Score	3
Equity Rank	Normal Equity

Photo 1: Northwest corner of intersection looking southeast

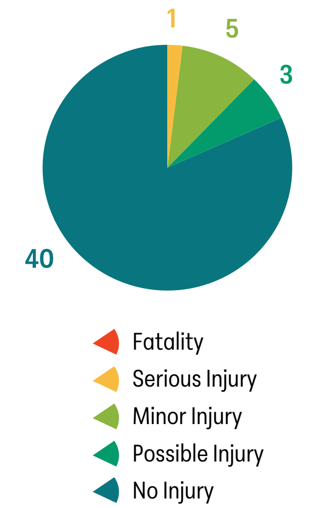
Photo 2: Southeast corner of intersection looking northwest

Crash Data

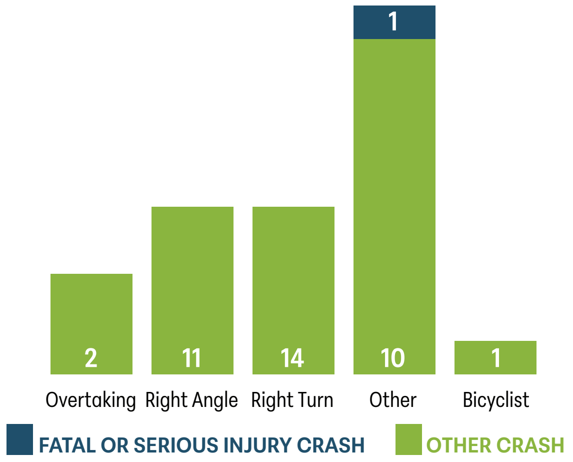
Contributing Factors

- Long pedestrian crossing length
- High traffic volume
- Faded crosswalk striping

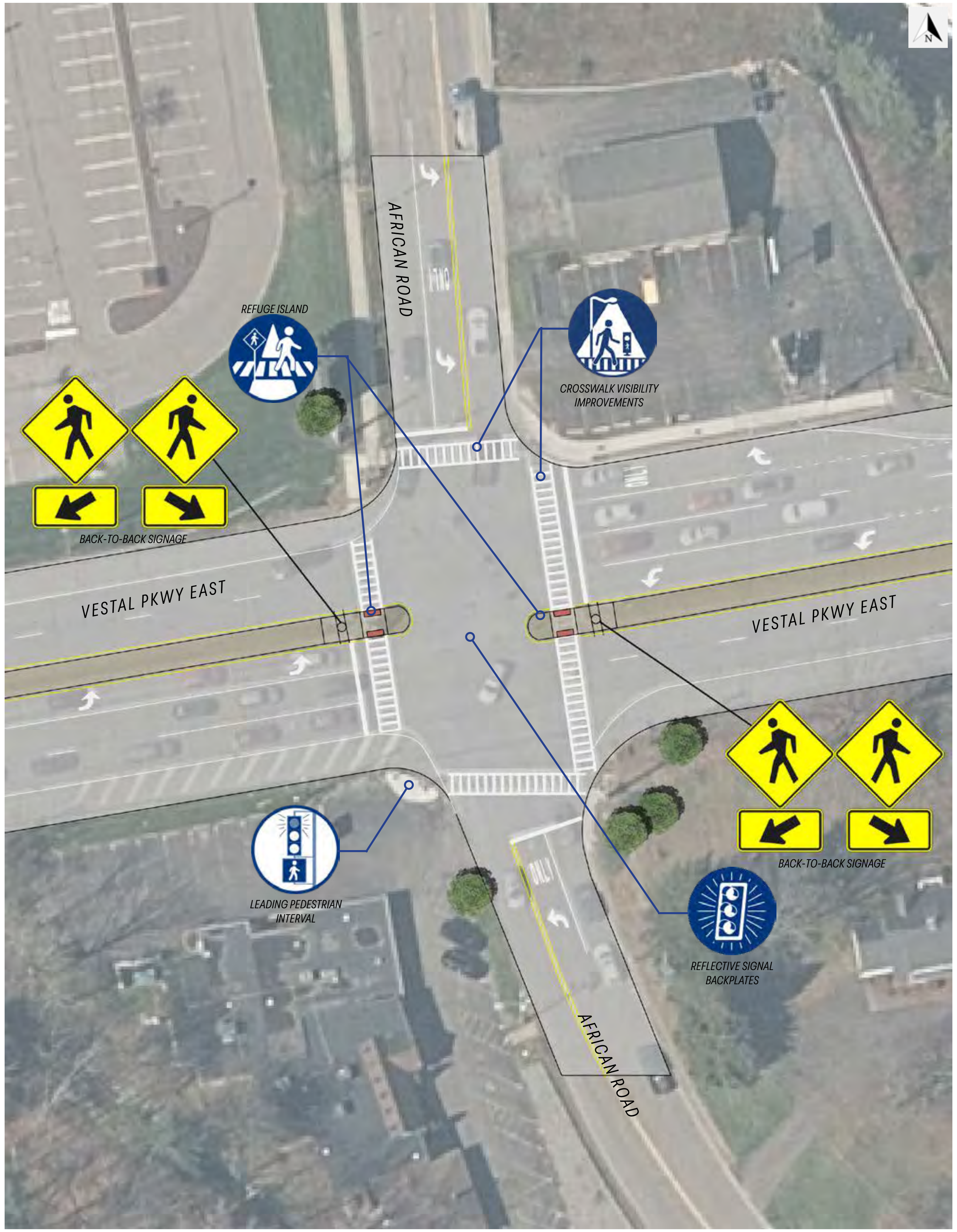
Crash Severity



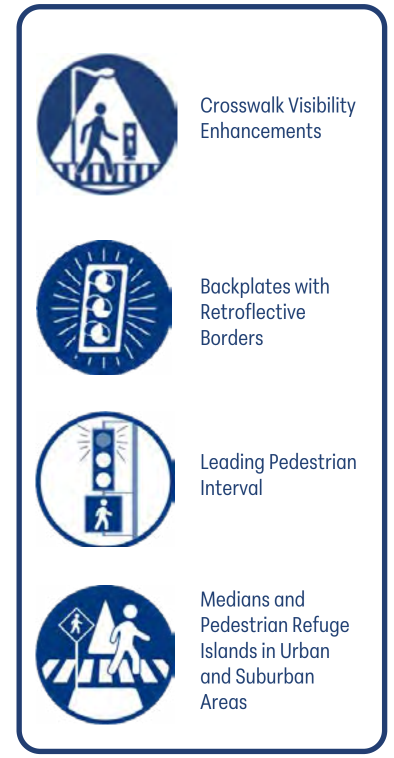
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at Vestal Parkway East and African Road included long pedestrian crossing length, high traffic volume, and faded crosswalk striping. Potentially relevant safety countermeasures at this intersection include, the construction of pedestrian refuge islands, crosswalk visibility enhancements, retroreflective signal backplates, and the installation of a leading pedestrian interval (LPI). The factors contributing to crashes at this intersection were, long crossing distances, faded pavement markings and a high volume of traffic. To address these issues, a treatment consistent with similar intersections is recommended. Pedestrian refuge islands will be installed as an extension of the existing concrete center median. These islands will be present on each of the Vestal Pkwy E crossings and will provide pedestrians with the opportunity to stop safely without the need to cross several lanes of traffic in one movement. High visibility crosswalks will also be installed along each of the approaches, improving the existing striping and increasing driver awareness of individuals in the crossings. To further accommodate vulnerable road users, an LPI will be installed to give pedestrians additional time to complete their crossing without the interference of traffic. Lastly, backplates with retroreflective borders will be installed on the existing traffic signals. The backplates will provide a visual cue for drivers to and offer an additional measure of safety in the event of a power outage or signal malfunction. These countermeasures in combination with one another will effectively reduce the potential for fatal and serious injury crashes for all road users.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	300.00	LF	$24.00	$7,200.00
Concrete Refuge Island	20.00	CY	$1,500.00	$30,000.00
Granite Curb	200.00	LF	$80.00	$16,000.00
Curb Ramp and Warning Units	4.00	EA	$10,000.00	$40,000.00
Traffic Signal Backplates	10.00	EA	$600.00	$6,000.00
Leading Pedestrian Interval (LPI)	1.00	LS	$3,000.00	$3,000.00
Pedestrian Warning Signage	2.00	EA	$1,250.00	$2,500.00
			Construction Total	$104,700.00

Contingency and Inflation (20%)	$21,000.00
Subtotal	$125,700.00
Work Zone Traffic Control (10%)	$12,600.00
Mobilization (4%)	$5,100.00
Survey (2%)	$2,600.00
Engineering Design (10%)	$12,600.00
Construction Inspection & Administration(15%)	$18,900.00
Grand Total	**$177,500.00**

Intersection Tioga County

PRIORITY 1

Cayuta Ave. & Ithaca St.

Town of Barton

Existing Conditions

The intersection of Cayuta Avenue (NY-34) and Ithaca Street is located within the Village of Waverly. The surrounding area is both commercial and residential with numerous businesses and residential houses in close proximity to the intersection.

A total of 4 crashes occurred during the study period between 2019 and 2023, with 3 of these crashes resulting in injury. The crash types observed within the study period at this intersection were left turn, rear end, and right angle crashes. The intersection features stop control at the eastbound and westbound approaches while the northbound and southbound approaches are uncontrolled. The northbound and southbound approaches to the intersection maintain one travel lane in each direction, with parking on the east side of the road. The eastbound approach maintains one travel lane in each direction with parking on the south side of the street. The westbound approach is a narrow bridge which maintains one travel lane in each direction and has no shoulder. The bridge surface is asphalt pavement which has deteriorated and has missing sections along the edges.

There is also a wooden pedestrian path along the north side of the bridge connecting to the existing sidewalks. Curb ramps and sidewalks are present at all approaches to the intersection with the exception of sidewalks at the westbound approach. All of the curb ramps presently have plastic detectable warning units in lieu of NYSDOT standard cast iron detectable warning units. A Type LS crosswalk is present crossing the southbound approach on Cayuta Avenue while faded Type L crosswalks are present at the two Ithaca Street approaches. The intersection features street lighting on the northeast corner and along the east side of Cayuta Avenue and the north side of Ithaca Street.

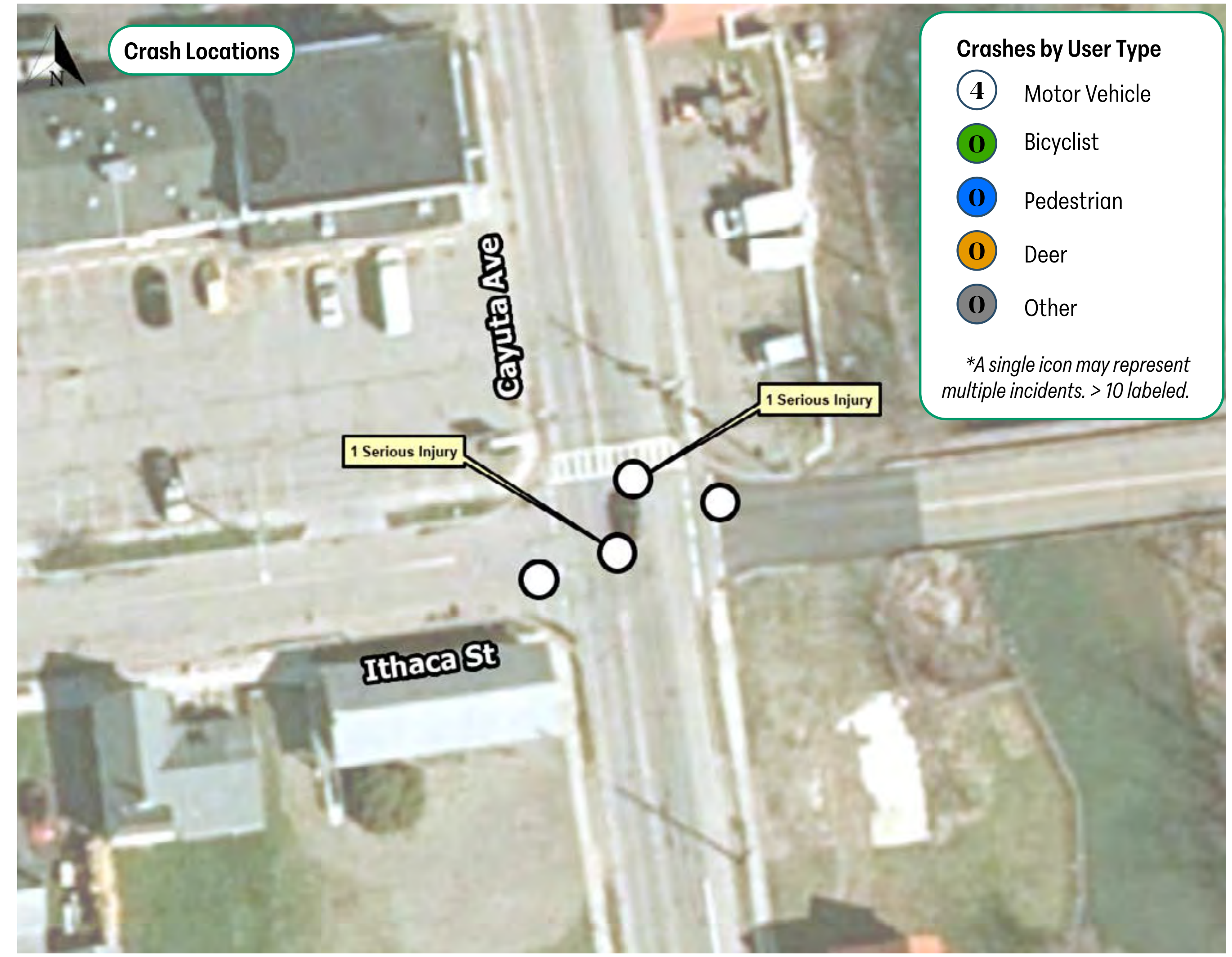
Highway Characteristics

Owner	NYSDOT / Village of Waverly
Intersection Type	Urban 4-leg with stop control on the minor approaches
Traffic Control	Stop Control
Speed Limit	30 mph
AADT (Cayuta Ave)	11,666 VPD
AADT (Ithaca St.)	444 VPD
Functional Class (Cayuta Ave)	(16) Minor Arterial
Functional Class (Ithaca St.)	(19) Local
LOSS	4
HRN Score	2
Equity Rank	Top 20
Adjacent Lane Use	Urban

Photo 1: Eastbound approach looking east

Photo 2: Southwest corner looking north

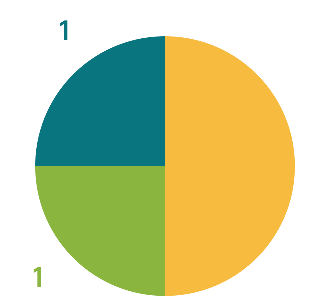
Crash Data



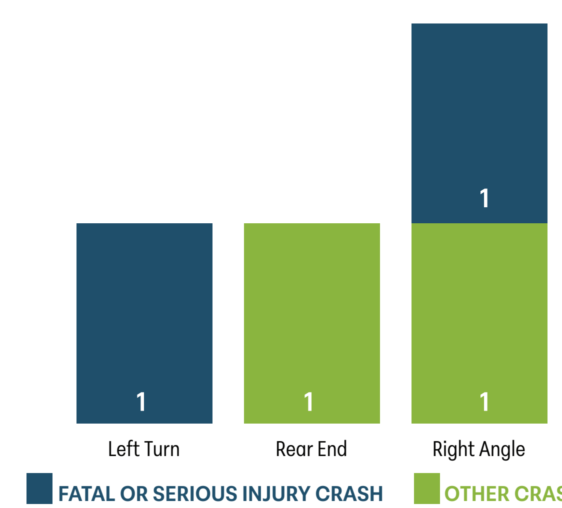
Contributing Factors

- Faded crosswalk striping on minor approaches
- Uncontrolled pedestrian crossing
- Tight turning radii with on street parking

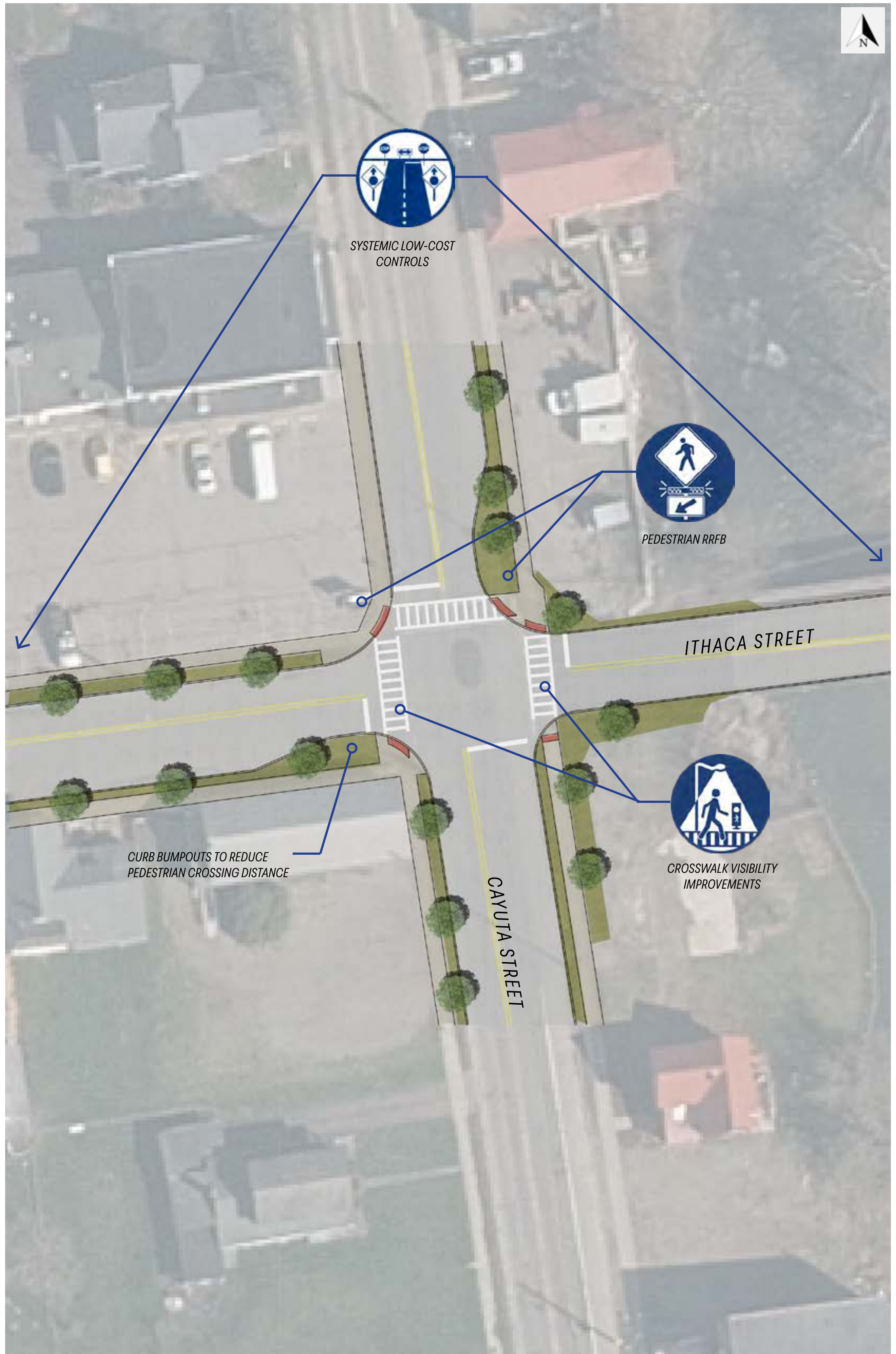
Crash Severity



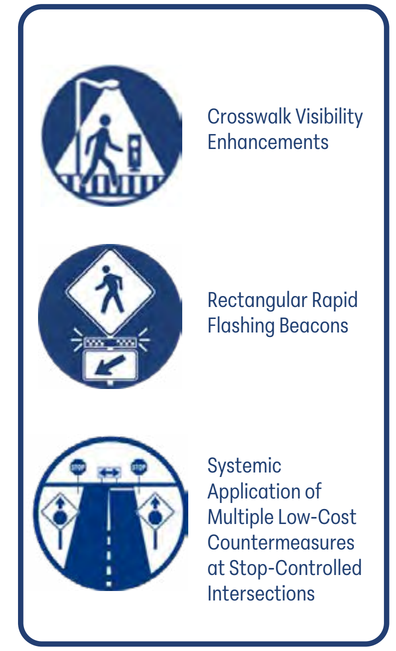
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at Cayuta Avenue and Ithaca Street included faded crosswalk striping on minor approaches, uncontrolled pedestrian crossing, and tight turning radii with on street parking. Potentially relevant safety countermeasures at this intersection include, installation of high visibility crosswalks and stop bars, installation of a rectangular rapid flashing beacon (RRFB) for the uncontrolled crossing, installation of stop ahead warning signage, and curb bump outs at multiple corners of the intersection. High visibility crosswalks and stop bars would be installed at all approaches to the intersection with supporting signage. An RRFB would be installed at the southbound approach on Cayuta Avenue to provide increased visibility for the uncontrolled crossing. Stop ahead warning signage would be installed at both approaches on Ithaca Street to provide increased awareness of the upcoming stop control intersection. Given this intersection's location, drivers may not anticipate the upcoming stop sign creating a potentially dangerous situation where a driver needs to stop abruptly. This additional warning signage provides extra protection for potential pedestrians crossing the intersection, as well as vehicles currently stopped at the intersection. Curb bump outs would be installed in the northeast and southwest corners of the intersection to shorten the crossing distances for crosswalk users. Along with these curb bump outs would be some minor sidewalk reconstruction creating an improved walking and riding surface for vulnerable road users. The systemic application of multiple safety countermeasures at this stop controlled intersection provides cost effective solutions to the current safety issues present and reducing the risk of any future fatal or serious injury crashes.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	90.00	LF	$24.00	$2,160.00
Stop Bar Striping	25.00	LF	$12.00	$300.00
Curb Ramp	3.00	EACH	$10,000.00	$30,000.00
Granite Curb	165.00	LF	$80.00	$13,200.00
Concrete Sidewalk	10.00	CY	$1,500.00	$15,000.00
Rectangular Rapid Flashing Beacon (RRFB)	2.00	EACH	$15,000.00	$30,000.00
Stop Warning Signage	2.00	EACH	$1,250.00	$2,500.00
			Construction Total	$93,160.00
		Contingency / Inflation (20%)		$18,700.00
		Subtotal		$111,900.00
		Work Zone Traffic Control (10%)		$11,200.00
		Mobilization (4%)		$4,500.00
		Survey (2%)		$2,300.00
		Engineering Design (10%)		$11,200.00
		Construction Inspection (15%)		$16,800.00
		Grand Total		**$157,900.00**

Intersection Tioga County

PRIORITY 2

Broad St. & Fulton St.

Town of Barton

Existing Conditions

The intersection of Broad Street and Fulton Street is located within the Village of Waverly, just north of the Pennsylvania/ New York State line. The surrounding area is both commercial and residential with numerous businesses in close proximity to the intersection while many of the surrounding side streets have mostly residential housing.

A total of 21 crashes occurred during the study period between 2019 and 2023, with 5 of these crashes resulting in injury. The majority of all crashes within the study period at this intersection were right angle crashes. One of crashes that occurred at the intersection during the study period involved a pedestrian. The intersection features stop control at the eastbound, westbound, and southbound approaches while the northbound approach is uncontrolled. The eastbound, westbound, and southbound approaches to the intersection maintains one travel lane in each direction with parking on both sides of the road. The northbound approach maintains one travel lane in each direction.

Curb ramps and sidewalks are present at all approaches to the intersection, but all of the curb ramps are not ADA compliant due to the presence of plastic detectable warning units in lieu of cast iron detectable warning units.

Type LS crosswalks are present at the two approaches on Broad Street while Type S crosswalks are present at the two Fulton Street approaches. The intersection is well lit due the presence of street lighting on both side of the road at all approaches.

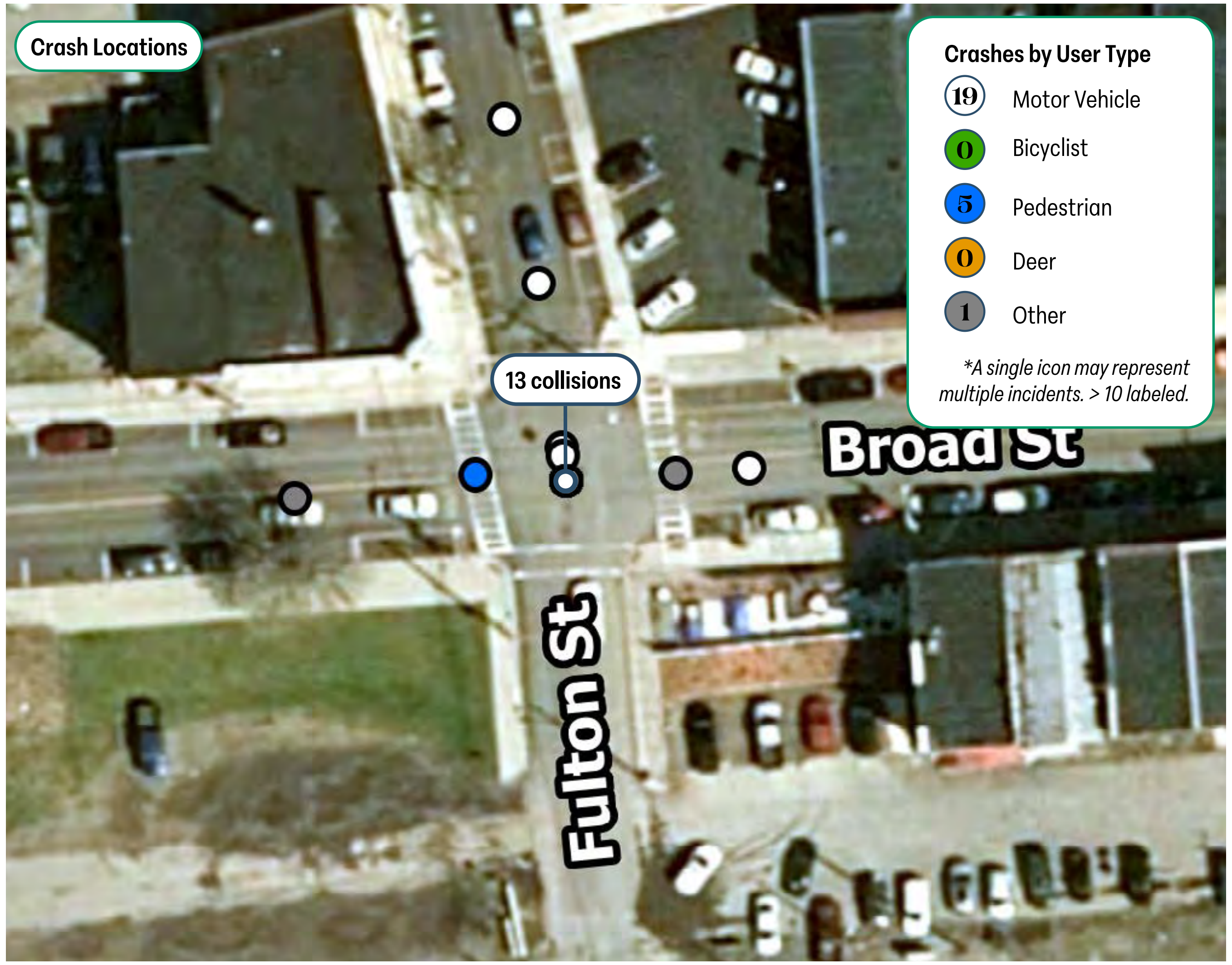
Highway Characteristics

Owner	Village of Waverly
Intersection Type	Urban 4-leg stop control, northbound approach uncontrolled
Traffic Control	Stop Control
Speed Limit	30 mph
AADT (Fulton St.)	4,683 VPD
AADT (Broad St.)	3,653 VPD
Functional Class (Fulton St.)	(17) Major Collector
Functional Class (Broad St.)	(17) Major Collector
LOSS	3
HRN Score	2
Equity Rank	Top 20

Photo 1: Northwest corner looking southeast

Photo 2: Southeast corner looking northwest

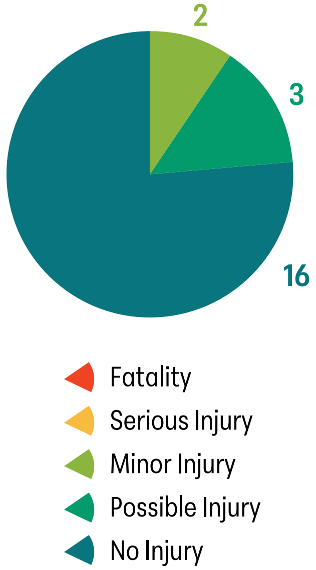
Crash Data



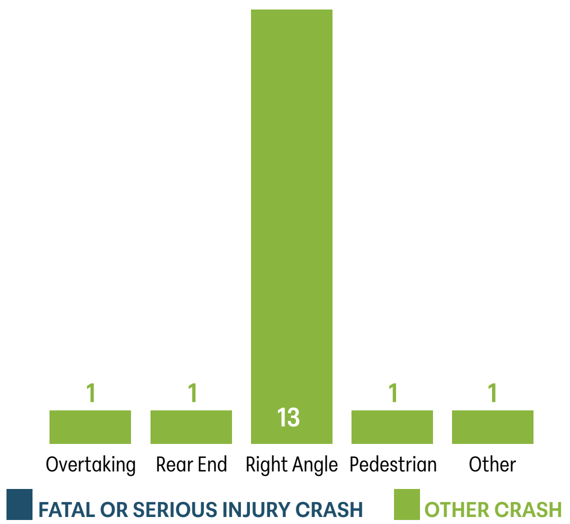
Contributing Factors

- Faded striping and poor sight distance from stopping locations
- One approach is uncontrolled while the other three are stop controlled
- Tight turning radii with on street parking

Crash Severity



Most Frequent Collision Type



Proposed Improvements

Proposed Countermeasures

Contributing factors at Broad and Fulton Streets included faded striping and poor sight distance from stopping locations, one approach is uncontrolled while the other three are stop controlled, and tight turning radii with on street parking. Potentially relevant safety countermeasures at this intersection include, making the intersection an all-way stop, installation of high visibility crosswalks, stop bars, curb bump outs at all corners of the intersection, and replacing the existing intersection control beacon with an all-red intersection control beacon. Transitioning the intersection from a three-way stop with the northbound approach being uncontrolled to an all-way stop will help to limit the right angle crashes which were the main accident type at this intersection. High visibility crosswalks and stop bars would be installed at all approaches to the intersection with supporting signage. Curb bump outs would be installed in all corners of the intersection to shorten the crossing distance for crosswalk users. Replacing the existing intersection control beacon will update the intersection to all-way stop control and allow roadway users approaching the intersection to recognize the stop control from each direction.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	110.00	LF	$24.00	$2,640.00
White Striping	300.00	LF	$2.00	$600.00
Yellow Striping	200.00	LF	$2.00	$400.00
Curb Ramp	8.00	EA	$10,000.00	$80,000.00
Granite Curb	280.00	LF	$80.00	$22,400.00
Concrete Sidewalk	120.00	CY	$1,500.00	$180,000.00
Remove Existing Intersection Control Beacon	1.00	LS	$2,000.00	$2,000.00
Install All-Red Intersection Control Beacon	1.00	EA	$3,000.00	$3,000.00
			Construction Total	$291,040.00
			Contingency / Inflation (20%)	$58,300.00
			Subtotal	$349,400.00
			Work Zone Traffic Control (10%)	$35,000.00
			Mobilization (4%)	$14,000.00
			Survey (2%)	$7,000.00
			Engineering Design (10%)	$35,000.00
			Construction Inspection (15%)	$52,500.00
			Grand Total	**$492,900.00**

Intersection Tioga County

PRIORITY 8

NY 17C & Talmadge Hill Rd.

Town of Barton

Existing Conditions

The intersection of NY 17C and Talmadge Hill Road is located within the Village of Waverly. The surrounding area is largely commercial with the State Line Auto Auction located to the north of, contributing to the majority of trips to this intersection. The close proximity to the auto auction results in a higher than usual traffic volume and a larger percentage of trucks compared to other intersections nearby.

A total of 4 crashes occurred during the study period between 2019 and 2023, with 3 of these crashes resulting in injury. The collision types documented during the study period were left turn and right-angle crashes with two serious injuries resulting from separate right-angle collisions. This signifies vehicles are having trouble with turning movements at the intersection. The intersection is two-way stop controlled, featuring stop signs at the northbound (Ellistown Rd) and southbound (Talmadge Hill Rd) approaches while the eastbound and westbound approaches of Route 17C are uncontrolled. The speed limit on Route 17C is 45 mph for both approaches. The northbound approach on Ellistown Rd has a posted speed limit of 45 mph and the southbound approach on Talmadge Hill Rd has a speed limit of 40 mph. The northbound and southbound approaches to the intersection on Talmadge Hill Road maintain one travel lane in each direction.

The travel lanes are separated by a full barrier, double yellow line which is extremely faded on the existing pavement. The eastbound and westbound approaches to the intersection on NY 17C maintain one travel lane in each direction with a striped shoulder. Neither intersecting corridor featuring supporting pedestrian infrastructure. The intersection lacks any street lighting in close proximity to the intersection, creating dangerous situations during darker times of day.

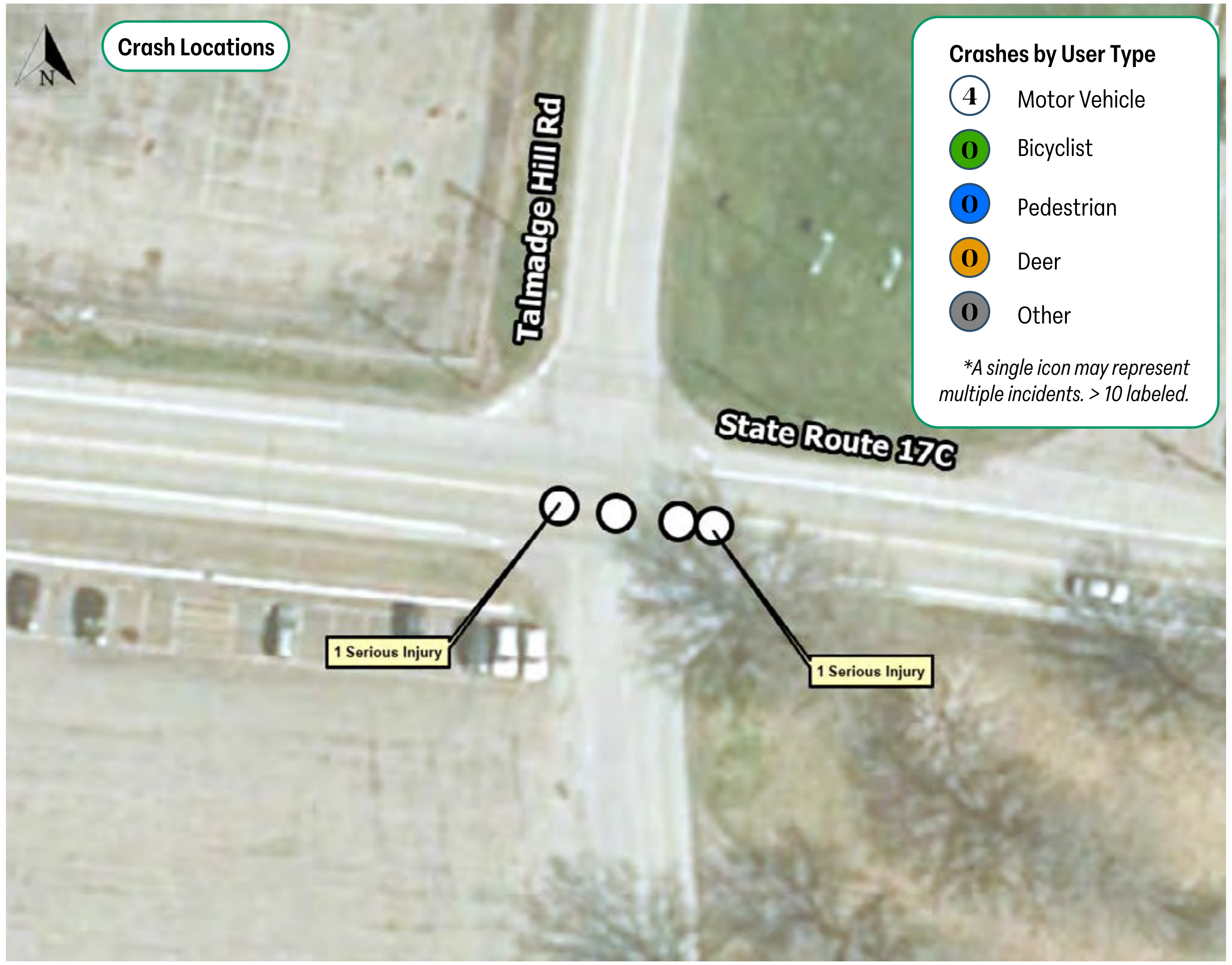
Highway Characteristics

Owner	NYSDOT / Town of Barton
Intersection Type	Urban 4-leg with stop control on Talmadge Hill Rd
Traffic Control	Stop Control
Speed Limit	30 mph
AADT (NY-17C)	4,157 VPD
AADT (Talmadge Hill Rd)	3,653 VPD
Functional Class (NY-17C)	(16) Minor Arterial
Functional Class (Talmadge Hill Rd)	(17) Major Collector
LOSS	3
HRN Score	3
Equity Rank	None
Adjacent Lane Use	Urban

Photo 1: Southbound approach looking north

Photo 2: Middle of intersection looking east

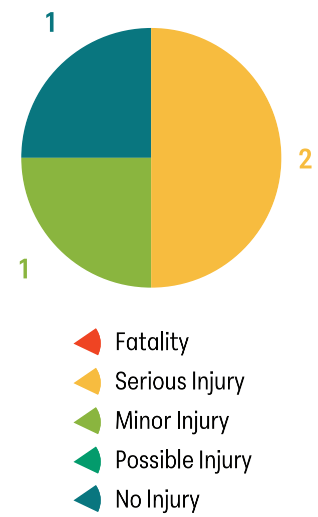
Crash Data



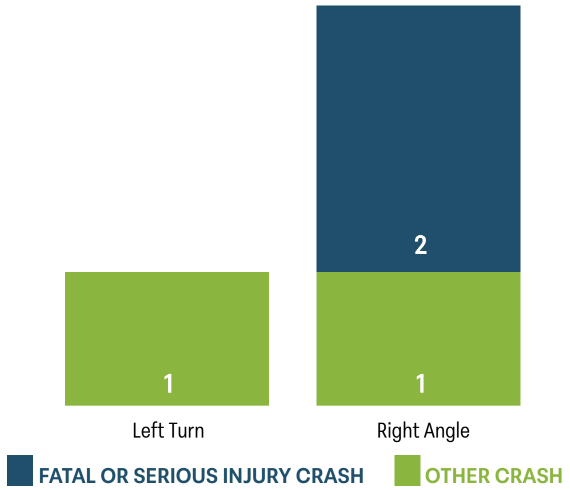
Contributing Factors

- Two-way stop with two uncontrolled approaches
- Faded striping
- Limited sight distance

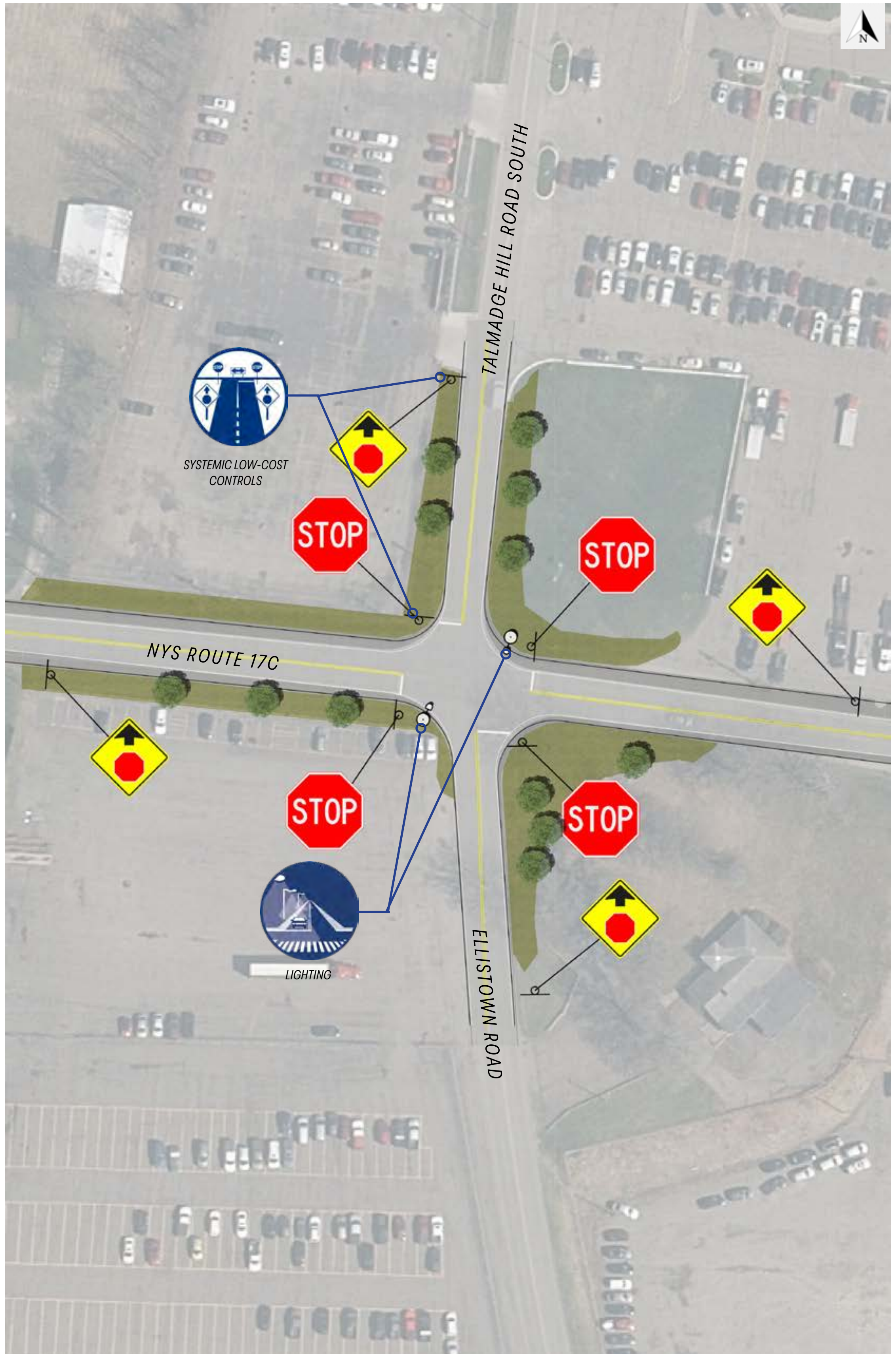
Crash Severity



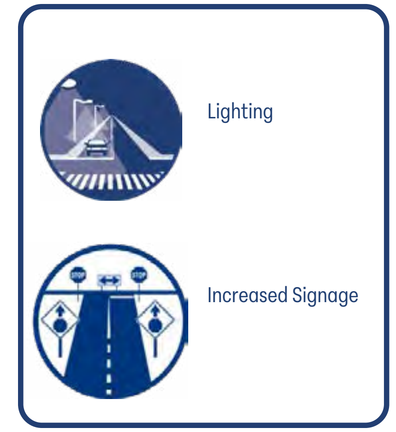
Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures



Contributing factors at NY 17C and Talmadge Hill Road included a two-way stop with two uncontrolled approaches, faded striping, and limited sight distance. Potentially relevant safety countermeasures at this intersection include, converting the intersection from two-way stop control to all-way stop control, installation of stop bars and new epoxy striping, installation of new stop signage as well as stop ahead warning signage, and adding lighting improvements. The intersection would be converted from two-way stop control to all-way stop control in an effort to reduce right angle and left turn crashes. With the existing two-way stop condition, vehicles turning onto Route 17C are exposed to oncoming traffic from both directions traveling at higher speeds that does not have to stop. To provide increased awareness of the newly established all-way stop controlled intersection, and ensure drivers from the east and westbound approaches are prepared to stop, stop ahead warning signs will be added on Route 17C. New 12" thick white epoxy stop bars will be added to all approaches of the intersection so drivers are familiar with where to stop and position themselves appropriately so that turning vehicles have adequate space. New street lighting improvements will be installed to provide increased visibility and enhance safety at the intersection.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Stop Bar Striping	65.00	LF	$12.00	$780.00
White Striping	430.00	LF	$2.00	$860.00
Yellow Striping	400.00	LF	$2.00	$800.00
Stop & Warning Signage	8.00	EA	$1,250.00	$10,000.00
Lighting Improvements	1.00	LS	$25,000.00	$25,000.00
			Construction Total	$37,440.00

Contingency / Inflation (20%)	$7,500.00
Subtotal	$45,000.00
Work Zone Traffic Control (10%)	$4,500.00
Mobilization (4%)	$1,800.00
Survey (2%)	$900.00
Engineering Design (10%)	$4,500.00
Construction Inspection (15%)	$6,800.00
Grand Total	**$63,500.00**

Intersection Tioga County

PRIORITY 4

Chemung St. & Cayuta Ave.

Town of Barton

Existing Conditions

The intersection of Chemung Street (NY 17C) and Cayuta Avenue (NY 34) is located within the Village of Waverly. The surrounding area is both commercial and residential with multiple businesses and residential houses in close proximity to the intersection.

A total of 6 crashes occurred during the study period between 2019 and 2023, with 2 of these crashes resulting in injury. The crash types within the study period at this intersection were rear end and right-angle crashes. The intersection exists on a significant skew between the approaches which creates sight distance issues and challenging turning movements. The intersection features stop control at the northbound and southbound approaches while the eastbound and westbound approaches are uncontrolled. To support the two-way stop control, a one-color signal exists that is flashing yellow for each of the Chemung St approaches and it is flashing red for the Cayuta Ave approaches. The northbound approach to the intersection maintains one travel lane in each direction with parking on the east side of the road. When stopped at the intersection on the northbound approach it is difficult to see traffic traveling east on Chemung St. There is a steep hill on the eastbound approach which results in both vertical and horizontal sight distance obstruction. The southbound, eastbound, and westbound approach maintains one travel lane in each direction with a minimal shoulder.

Curb ramps and sidewalks are present at all approaches to the intersection with the exception of sidewalks going up the southbound approach. All curb ramps at the intersection have NYSDOT standard cast iron detectable warning units. Type LS crosswalks are present at the northbound and southbound approaches on Cayuta Avenue. The intersection features street lighting on the northwest corner and along the east side of Cayuta Avenue and the south side of Chemung Street. Signage on Chemung St indicates the State Route 17 bike path proceeds to the east and west.

Highway Characteristics

Owner	NYSDOT
Intersection Type	Urban 4-leg with stop control on Cayuta Ave
Traffic Control	Stop Control
Speed Limit	30 mph
AADT (Chemung St)	5,606 VPD
AADT (Cayuta Ave)	11,666 VPD
Functional Class (Chemung St)	(16) Minor Arterial
Functional Class (Cayuta Ave)	(16) Minor Arterial
LOSS	3
HRN Score	3
Equity Rank	Top 20
Adjacent Lane Use	Urban

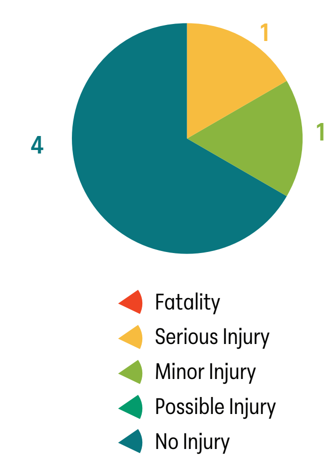
Photo 1: Chemung St and Cayuta Ave southwest corner looking east

Crash Data

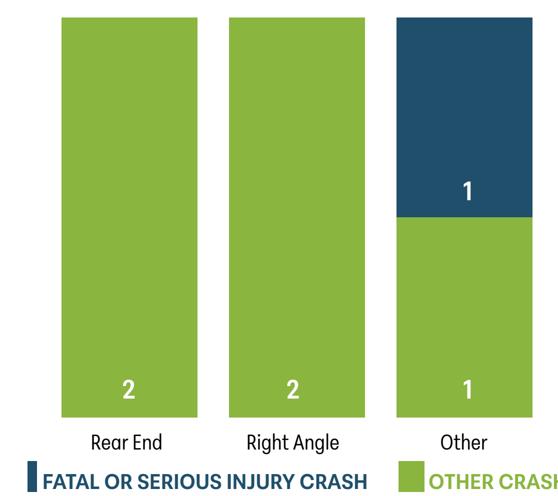
Contributing Factors

- Skewed approaches to intersection
- Tight turning radii with on street parking
- Obstructed sight distance

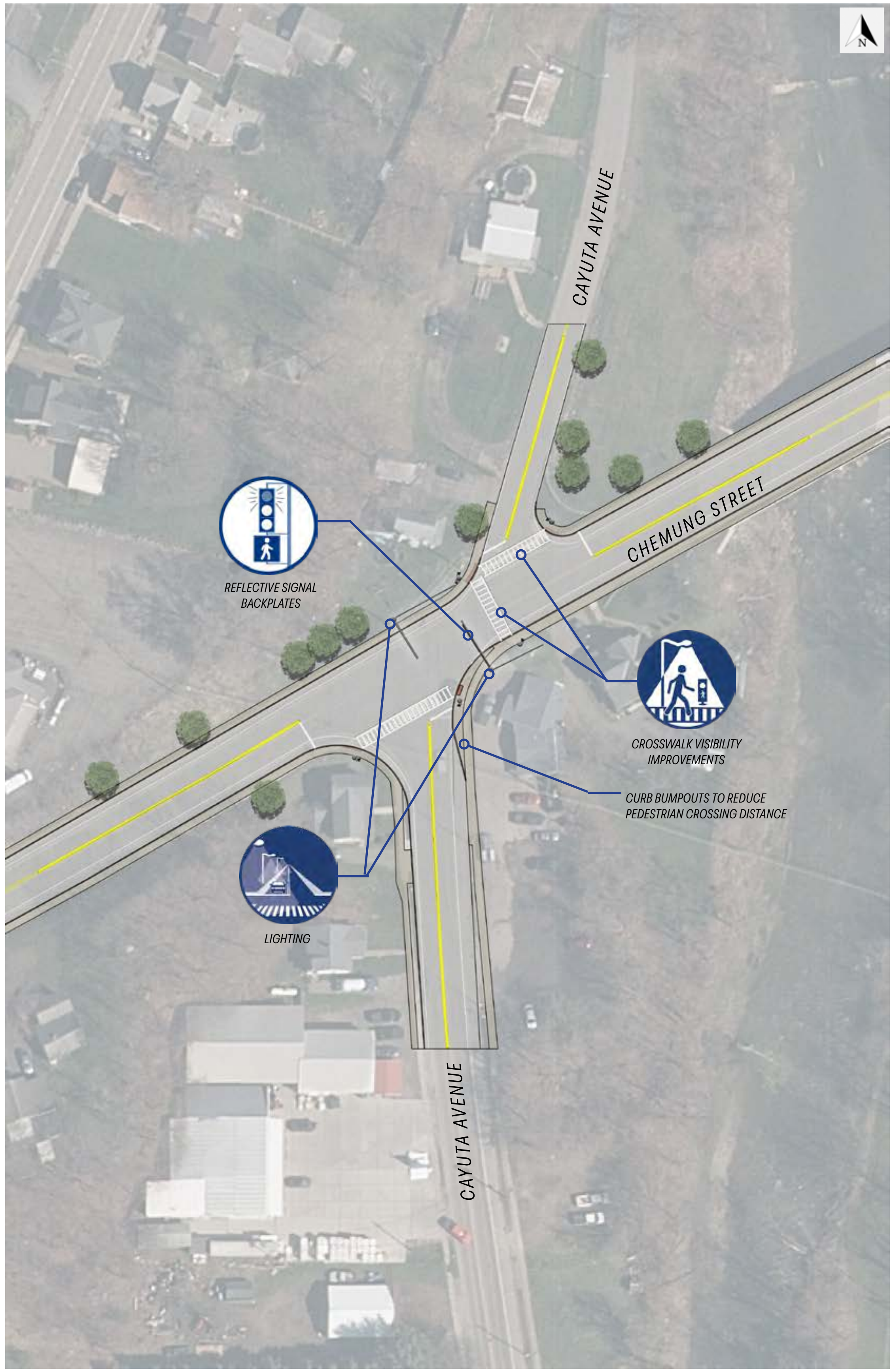
Crash Severity



Most Frequent Collision Type



Proposed Improvements



Proposed Countermeasures

Contributing factors at Chemung Street and Cayuta Avenue included skewed approaches to intersection, tight turning radii with on street parking, and obstructed sight distance. Potentially relevant safety countermeasures at this intersection include, the installation of high visibility crosswalks and stop bars, converting the intersection from stop control to traffic signal control, installing backplates with retroreflective borders, lighting improvements, and a curb bump out in the southeast corner of the intersection. The existing type LS crosswalks would be replaced with high visibility crosswalks to enhance drivers' ability to see the crosswalks and pedestrians crossing the intersection. 12" thick white epoxy stop bars would be installed at all approaches to the intersection along with the necessary supporting signage. The existing two-way stop would be converted to signal controlled, with the installation of 3-color traffic signals along each of the approaches. With these new traffic signals, pedestrian signal infrastructure will be installed at each of the crossings to give pedestrians guidance on when it is safe for them to cross. Implementing pedestrian signals enhances safety for both road users and pedestrians. Lighting improvements will be installed at the intersection to provide increased visibility of the intersection. The curb in the southeast corner of the intersection will be bumped out in order to shorten the crossing distance for crosswalk users. The new curb alignment will require some reconstruction of the side and installation of a new curb ramp with a cast iron detectable warning surface.

Cost Estimate

Item	Quantity	Unit	Unit Cost	Total Cost
Type LS Crosswalk	150.00	LF	$24.00	$780.00
Curb Ramp	1.00	EA	$10,000.00	$10,000.00
Granite Curb	105.00	LF	$80.00	$8,400.00
Concrete Sidewalk	10.00	CY	$1,500.00	$15,000.00
Lighting Improvements	1.00	LS	$25,000.00	$25,000.00
Pedestrian Signals	6.00	EA	$6,000.00	$36,000.00
Traffic Signal Infrastructure	1.00	LS	$250,000.00	$250,000.00
			Construction Total	$348,000.00

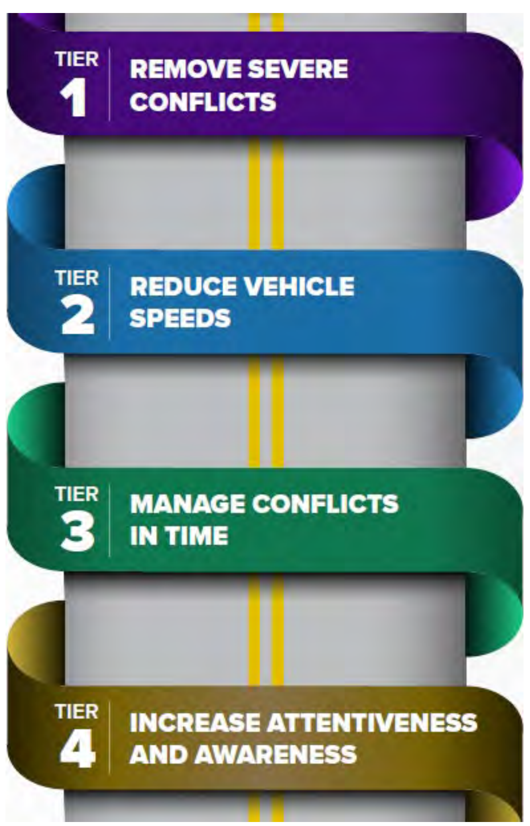
Contingency / Inflation (20%)	$69,600.00
Subtotal	$417,600.00
Work Zone Traffic Control (10%)	$41,800.00
Mobilization (4%)	$16,800.00
Survey (2%)	$8,400.00
Engineering Design (10%)	$41,800.00
Construction Inspection (15%)	$62,700.00
Grand Total	**$589,100.00**

7. Systemic Countermeasures for Emphasis Areas

This chapter offers an outline of how BMTS can reduce some of the most prevalent causes of fatal and serious injury crashes, which are referred to as "Emphasis Areas." Following an introduction to systemic safety planning, each section features a description of an Emphasis Area, its contribution to KSI crashes in each county, typical locations where it clusters, a list of frequent underlying causes, and a list of safety design strategies and operational countermeasures that can be used to systematically program different interventions across a broader, area-wide scale. For additional background and data concerning these Emphasis Areas, please refer to sections 3.3.1, 3.3.2, and 3.4.3.

It should be noted that some countermeasures are listed under more than one Emphasis Area because they mitigate crash risk in different ways (i.e., they address multiple dimensions of crash risk or "tiers" of the USDOT's Safe System Roadway Design Hierarchy shown in **Figure 62**). For instance, many strategies that reconfigure intersections, as well as those that cater to pedestrians and bicyclists, often serve to create separation across space and/or time while also influencing vehicle speeds and user attentiveness in the process (e.g., roundabout, pedestrian median refuge island with flashing beacon).

Figure 62. Safe System Roadway Design Hierarchy (Source: FHWA-SA-22-069, pg. 1)



In addition to this chapter's Engineering measures, the New York State Strategic Highway Safety Plan (2023) offers a complementary set of Education and Enforcement strategies related to the first three Emphasis Areas. For additional information on behavior-based strategies, please refer to APPENDIX – New York SHSP 2023-2027: Appendix 1 and Chapter 8 (Policies, Programs & Strategies).

7.1 The Systemic Safety Lens

Analysis of crash data shows that severe crash outcomes are often driven by both the specific nature of the crash (i.e., what a vehicle collides with (Figure 24) and how it collides (Figure 25 and Figure 26)) and recurring contributing actions like unsafe speed and failure to yield (Table 19). Many fatal and serious injury collisions occur at sites that do not yet exhibit high crash frequency but share common risk characteristics. To address this gap, a systemic safety approach that proactively mitigates known risk factors across multiple roadway segments and intersections should be considered.

A systemic safety program shifts from a reactive, location-specific approach to a predictive, network-wide strategy that:

- Identifies roadway segments and intersections with similar risk characteristics;
- Targets known contributing factors to fatal and serious injury crashes;
- Deploys proven, scalable countermeasures at multiple locations; and
- Prioritizes reductions in crash severity in addition to crash frequency.

Effective crash reduction is generally not achieved by focusing solely on driver behavior. The most successful strategies treat crashes as a system-level failure and attempt to correct this deficiency by applying layered interventions across engineering, policy, enforcement, vehicle design, and data analytics to reduce both the likelihood and severity of crashes. Systemic approaches to improve safety recognize that human error is inevitable and informs the design of transportation systems so that crashes do not result in serious injury or death. Under a systemic safety approach, the responsibility for safety is shared amongst designers / engineers, system managers, policy makers, and roadway users.

7.2 Defining Emphasis Areas: Notable Crash Types & Contributing Actions

A substantive review of the crash data presented previously for Broome and Tioga Counties identified three factors based on crash type and three contributing actions that had an above average frequency of fatal and serious injury collisions. These six "Emphasis Areas" are as follows:

Crash Type:

- Intersections
- Roadway Departure
- Vulnerable Road User Crashes

Contributing Action:

- Unsafe Speed
- Failure to Yield
- Passing / Unsafe Lane Usage

7.3 Emphasis Area #1 – Intersections

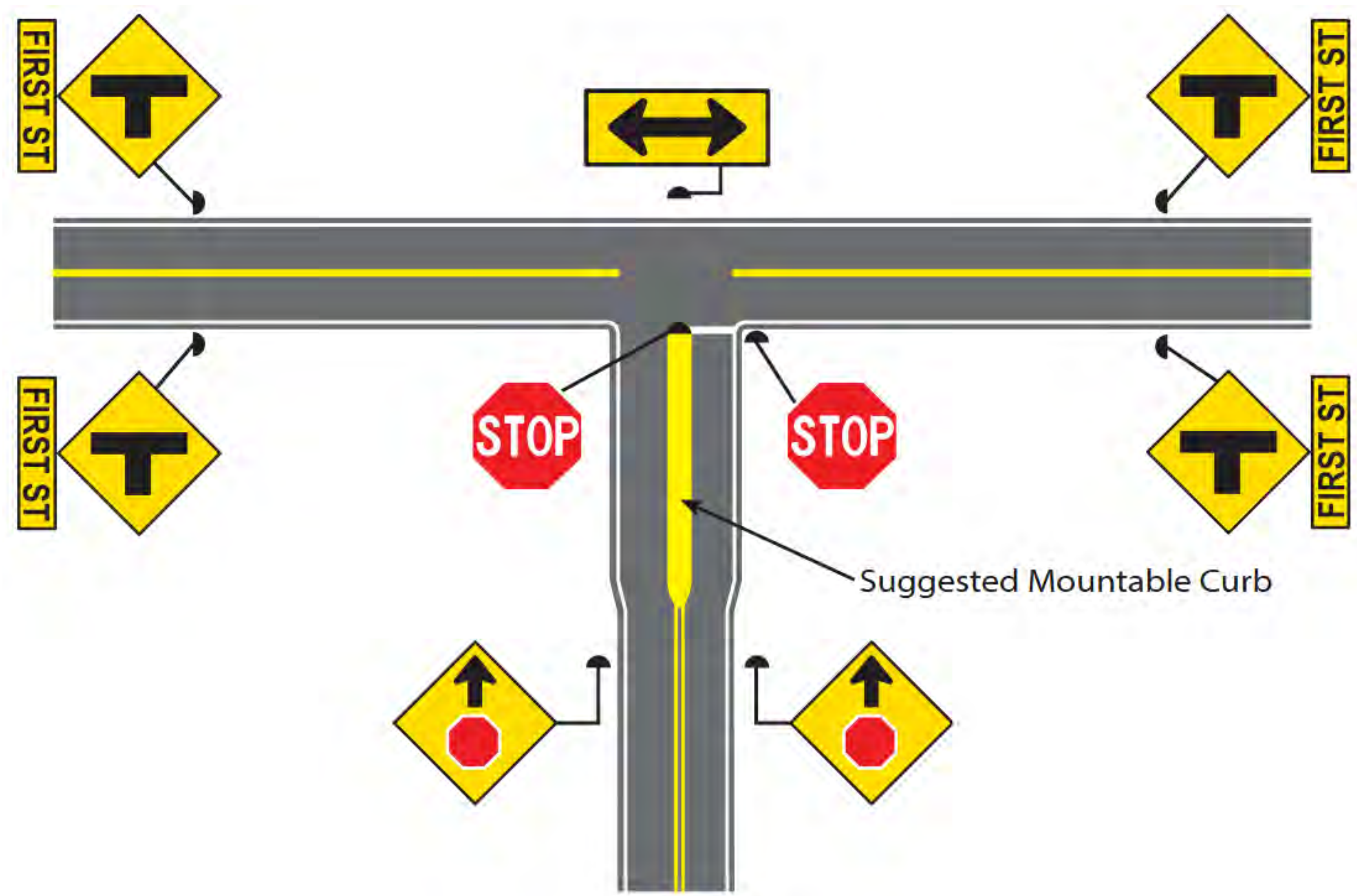
Due to the perpendicular nature of the conflicts and the limited lateral crash protection of vehicles, right angle crashes represented a disproportionate share of fatal and serious injury crashes throughout the study area network between 2019 and 2023. In fact, this was the most frequent crash type for KSI collisions involving multiple vehicles in both counties. Of the fatal and serious injury crashes assessed, right angle collisions accounted for approximately 10% in Broome (22% of Multi-Vehicle's 47% overall) and 9% in Tioga (27% of Multi-Vehicle's 35% overall).

These crashes typically occur at at-grade intersections and are frequently associated with failure to yield, disregarding traffic control devices, excessive approach speeds, and limited sight distance. Crash data and systemic safety analysis indicate that intersections with complicated geometric characteristics, permissive traffic control, and higher operating speeds consistently experience elevated rates of right-angle crashes. These patterns demonstrate that the issue is systemic rather than isolated, warranting a programmatic, infrastructure-focused response.

Systemic approaches to reducing right angle crashes should prioritize eliminating / reducing potential conflict points, speed management, and survivable crash conditions. Systemic strategies to eliminate or substantially reduce right angle crashes are outlined below. It should be noted that the countermeasures listed under "Basic Countermeasures" and "Supplemental Countermeasures" are explored further within FHWA's *Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections* (FHWA-SA-09-020).

- Signalized Intersection
  - Basic Countermeasures
    - High-visibility signal heads, retroreflective backplates, and signage
    - One traffic signal head per approach lane
    - Eliminating any late night flashing operations
    - Increasing all-red clearance times at signalized intersection to accommodate late entries or driver error (i.e., dilemma zones, yellow change intervals)
  - Supplemental Countermeasures
    - Protected left-turn phasing or split phasing at high-risk intersections (i.e., eliminating permissive turning movements)
    - Advance detection control systems at isolated high-speed signalized intersections where reg-light running angle crashes are an issue
    - Signal timing strategies that support speed consistency and compliance (e.g., "green wave")
  - Other Countermeasures for Signalized Intersections
    - Adding, upgrading, or removing signals as warranted
    - Conversion of traditional at-grade intersections to roundabouts
    - Access consolidation and intersection spacing improvements (Access Management)
    - Channelization of movements to reduce or eliminate conflict points
    - Geometric design modifications to reinforce appropriate operating speeds
- Stop-Controlled Intersections (Four Legs)
  - Basic Countermeasures
    - Through Approach – Doubled up (left and right), oversize advance intersection warning signs, including street names on plaques
    - Stop Approach – Doubled up, oversize signs, including "Stop Ahead" intersection warning signs and STOP signs, and a 6 ft. wide raised splitter island
  - Supplemental Countermeasures (Used Alongside Basic Countermeasures)
    - Flashing solar-powered LED beacons on advance warning and STOP signs OR flashing overhead intersection beacons
    - Dynamic warning sign to inform through traffic that a stopped vehicle is present and could potentially enter the intersection
    - Transverse rumble strips across the stop approach lanes (or "Stop Ahead" pavement markings if noise is a concern)
    - Reflective strips on signposts and retroreflective STOP signs
  - For Multi-Lane Divided Highways
    - Reduced Left Turn Conflict Intersection (e.g., J-Turn Modifications, "Michigan Left," Restricted Crossing U-Turn (RCUT), Median U-Turn (MUT))
- Stop-Controlled T Intersections (Three Legs)
  - *Same set of Basic and Supplemental Countermeasures as Four Leg*
    - Double arrow warning sign on stop-controlled approach (as shown in **Figure 63**)
- Crosscutting
  - New or upgraded intersection lighting
  - Improved intersection sight triangles through the removal of obstructions

Figure 63. Basic Low-Cost Countermeasures for Stop-Controlled T Intersections (Source: FHWA-SA-09-020, Figure 1 (pg. 6))



7.4 Emphasis Area #2 – Roadway Departure

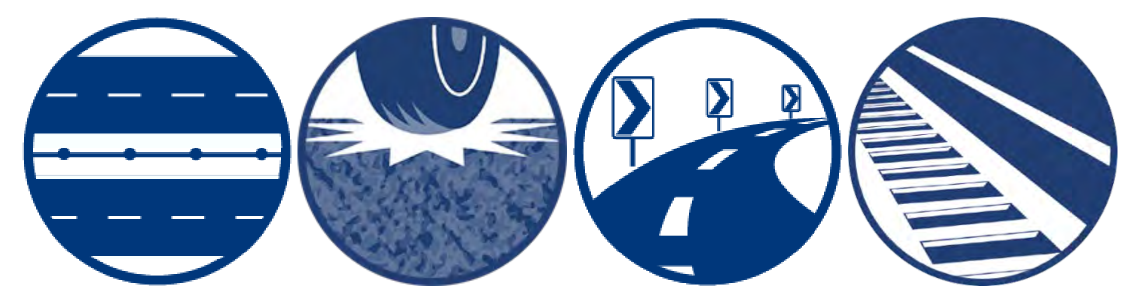
7.4.1 Head-On Collisions

Head-on collisions are among the most severe crash types on highway facilities, frequently resulting in fatal or serious injuries due to the combined speed of opposing vehicles. This was the third most frequent KSI crash type for collisions involving multiple vehicles in both counties. Of the fatal and serious injury crashes assessed, head-on collisions accounted for approximately 8% in Broome (17% of Multi-Vehicle's 47% overall) and 6% in Tioga (18% of Multi-Vehicle's 35% overall).

These crashes typically occur on two-lane rural highways and undivided multi-lane highways. Such collisions are often associated with lane departure, improper passing maneuvers, driver error / impairment, or loss of vehicle control. Crash data and systemic safety screening indicate that roadway segments with similar geometric characteristics, such as narrow lanes / shoulders, limited clear zones, horizontal curves, or an absence of median separation, experience an elevated risk for head-on crashes.

Systemic strategies to eliminate or substantially reduce head-on collisions include:

- Installation of median barriers on undivided multi-lane facilities
- Use of cable median barrier where available right-of-way is limited
- Conversion of two-lane roadways to three-lane sections with a center two-way left-turn lane (TWLTL)
- Installation of centerline delineators (e.g., raised pavement markers)
- Centerline rumble strips to provide tactile and audible warnings
- Shoulder rumble strips to prevent roadway departures resulting in driver overcorrection
- Widened or paved shoulders to provide additional recovery space
- Improved pavement friction (e.g., High Friction Surface Treatment), particularly on horizontal / vertical curves
- Enhanced curve warning signage and chevrons
- Improved roadway lighting
- Review and restriction of passing zones based on sight distance



7.4.2 Natural Element Crashes

Crashes involving natural roadside elements (e.g., trees, rock outcrops, steep embankments, drainage features, bodies of water) are especially severe, as they involve rigid, unforgiving objects. As shown previously in Figure 24, of the fatal and serious injury crashes assessed, natural element collisions were the second most frequent KSI collision type in Tioga (28% overall) and the fourth most frequent in Broome (12% overall).

Natural element crashes most often occur along rural roads and high-speed facilities. Such crashes typically occur when vehicles depart the travelled way due to driver error, adverse weather, fatigue / impairment, or loss of vehicle control. Crash data and systemic safety analysis indicate that roadway segments with narrow clear zones, steep side slopes, horizontal curvature, and limited roadside recovery space tend to experience a higher number of natural element crashes.

Systemic strategies to eliminate or substantially reduce natural element crashes include:

- Removal or relocation of trees, vegetation, and fixed objects within the clear zone
- Flattening of side slopes and embankments
- Regrading and reshaping of drainage ditches to traversable designs
- Installation of guiderail or barrier systems to shield rigid natural features
- Shoulder and centerline rumble strips
- Widening or paved shoulders to provide recovery space
- Enhanced roadway delineation, including wider edge lines and reflective markers
- Curve realignment or superelevation improvements
- Advance warning signage and chevrons on curves
- Improved roadway lighting in critical highway segments
- High-visibility pavement markings and signage

7.5 Emphasis Area #3 – Vulnerable Road User-Involved Collisions

Due to their lack of physical protection, vulnerable road users (VRUs), which include pedestrians, bicyclists, micro-mobility users, and people using wheelchairs, are highly susceptible to serious or fatal injury at relatively low impact speeds. Of the KSI collisions assessed from 2019 to 2023, crashes involving people walking or biking accounted for 23% in Broome (16% walk, 7% bike) and 8% in Tioga (6% walk, 2% bike).

VRU crashes frequently occur along high-speed arterials, at intersections, in areas with limited pedestrian or bicycle infrastructure, and where roadway design prioritizes motor vehicle throughput over multimodal safety. Crash data and systemic safety analysis indicate that corridors with high operating speeds, wide cross-sections, long crossing distances, insufficient access control, and inconsistent pedestrian / bicycle accommodations experience elevated VRU crash risk.

Safety countermeasures for pedestrians emphasize the separation of multimodal conflicts across both space (e.g., dedicated facilities like sidewalks and mid-block refuges) and time (e.g., leading pedestrian intervals, eliminating concurrent phasing that pits drivers turning against those walking, biking, or rolling). Relevant countermeasures seek to heighten driver awareness of locations where pedestrians are expected to cross through the use of high-visibility treatments (e.g., colored or textured pavement, dynamic lighting, retroreflective elements, button-activated signage, etc.).

Similar to pedestrians, safety countermeasures for bicyclists emphasize the separation of multimodal conflicts across both space (e.g., dedicated facilities like protected bike lanes or multi-use paths, sufficiently wide crossing islands, bike boxes and two-stage left turn lanes for queuing) and time (e.g., dedicated bicycle signals, exclusive intervals for those walking, biking, or rolling). In addition to the pedestrian strategies noted above, one particularly useful enhancement for bicyclists is the provision of detection equipment (e.g., camera or sensor integrated with adjacent traffic controls) that helps to limit stopping and otherwise support the use of exclusive phasing intervals for cyclists.

Systemic strategies to eliminate or substantially reduce crashes involving VRUs include:

- Lane reductions or road diets where appropriate
- Gateway treatments to emphasize the need for drivers to transition to lower speeds when entering thickly settled, human-oriented environments (e.g., villages)
- Narrowed lanes, Traffic Calming elements (e.g., speed humps, speed tables, chicanes, raised intersections, chokers, etc.), or curb extensions to reinforce lower operating speeds
- Sidewalk installation or upgrades to meet current standards
- Separated bicycle facilities and shared-use paths where appropriate
- Raised medians and refuge islands to provide protected crossing opportunities
- High-visibility crosswalks and advance stop bars
- Leading Pedestrian Intervals (LPIs) and bicycle-specific signalization
- Pedestrian countdown signals and Accessible Pedestrian Signal (APS) equipment
- Protected (dedicated and exclusive) signal phases for pedestrians and bicyclists
- Removal of permissive turning movements where motorized conflicts with VRUs are prevalent
- At midblock crossings and uncontrolled intersections, a Rectangular Rapid Flashing Beacon (RRFB) or, along higher-speed roads, a Pedestrian Hybrid Beacon (PHB or a "HAWK" signal)
- Improved driveway design and spacing considerations (Access Management)
- Improved pedestrian-scale lighting

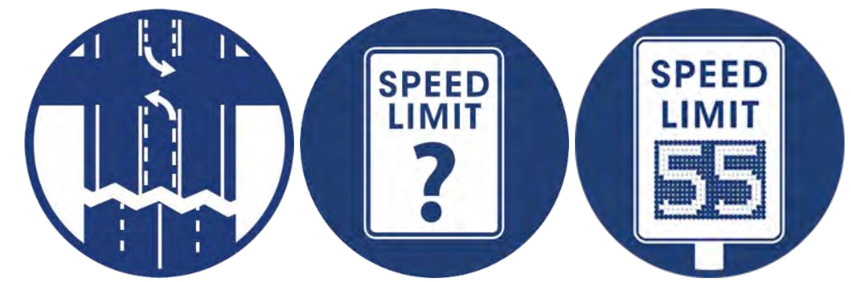
7.6 Emphasis Area #4 – Unsafe Speed

The most frequent contributing action among KSI crashes in Tioga was unsafe speed (28%), which ranked a close third among KSI contributing actions in Broome (15%). By decreasing the time available to respond to changing conditions, excessive speed increases the likelihood of a crash. By increasing the kinetic energy at play, excessive speed comparatively increases the severity of a collision.

Unsafe speed crashes often take place along highways and arterial facilities; however, the potential for excessive speed exists along the majority of roadways throughout America. Crash data and systemic safety analysis consistently show that roadway segments with high operating speed, wide cross-sections, long uninterrupted (intersection-free) segments, and limited speed management features experience elevated rates of speed-related crashes.

Systemic strategies to eliminate or substantially reduce unsafe speeds include:

- Lane width reductions and road diets where appropriate
  - Lane narrowing using rumble strips parallel to the edge lines (or raised pavement markers where noise issues or bicycle safety concerns may be present)
- Gateway treatments near thickly settled areas, as well as predictable transitions between highway facility types
- Horizontal alignment modifications to reinforce appropriate speeds (e.g., chicanes, lateral shift)
- Vertical treatments to reduce speeds (e.g., raised intersections, speed tables)
- Conducting corridor-wide speed studies to set appropriate speed limits so that the posted speed limit aligns with surrounding land uses
- Targeted speed enforcement programs
- Dynamic speed feedback signs



7.7 Emphasis Area #5 – Failure to Yield

Ranked second among contributing actions in KSI crashes for both counties (17% in Broome, 15% in Tioga), failure to yield right-of-way collisions occur when one driver, who is supposed to wait for oncoming traffic to clear, either does not observe, fails to respond with sufficient time to, or simply disregards, the existing traffic control present along the roadway (e.g., stop sign, signal, yield sign).

Failure to yield crashes are commonly found at intersections, driveways, and crossing locations. These crashes frequently result in right angle, turning, and VRU-involved crashes and often occur where drivers are required to make complex, time-critical decisions regarding gap selection and right-of-way assignment. Crash data and systemic safety analysis demonstrate that facilities with characteristics like high operating speeds, complex intersection treatments involving multiple conflict points, and inconsistent traffic control exhibit an elevated rate failure to yield KSI crashes.

Systemic strategies to eliminate or substantially reduce failure to yield include:

- Conversion of high-risk intersections to roundabouts, particularly at locations with a high frequency of right angle collisions
- Conversion of high-risk intersections along multi-lane divided highways to Reduced Left-Turn Conflict Intersections (e.g., Restricted Crossing U-Turn or "J Turn" or a Median U-Turn depending on adjacent land uses and desired movements) at locations where obstructions, roadway geometry, or other issues lead to complex decision-making for those crossing, or turning on / off, the primary roadway
- Consolidation of minor side streets and driveways (Access Management)
- Channelization of turning movements

- Grade separation where volumes and speed warrant
- Protected-only left turn phasing or split phasing at signalized intersections
- Removal of permissive turning movements
- Increased all-red clearance time intervals
- Conversion of two-way stop control to all-way stop control or signal control where warranted
- Advance warning signage (e.g., Intersection Conflict Warning Systems) to improve driver expectancy

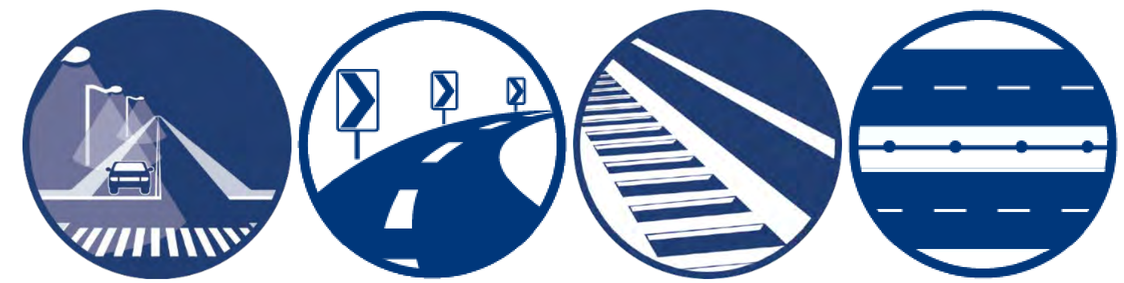
7.8 Emphasis Area #6 – Passing / Unsafe Lane Usage

Crashes stemming from passing maneuvers or unsafe lane usage (e.g., failing to signal when changing lanes, weaving) occur when drivers misjudge available gaps, violate no-passing zones, or drift from their designated lane, often due to distraction, fatigue, or impairment. From 2019 to 2023, this contributing action was reported in 12% of KSI crashes in Tioga and 7% of KSI collisions in Broome.

Issues with passing maneuvers and unsafe lane usage are most common along two-lane rural highways and undivided multi-lane facilities. This contributing action is typically found in crashes coded as head-on, sideswipe, or collisions with a natural element. Crash data and systemic safety analysis indicate that highway segments with limited passing opportunities, narrow lanes and shoulders, horizontal curves, and inconsistent delineation experience elevated rates of passing-related and unsafe lane usage crashes.

Systemic strategies to eliminate or substantially reduce passing / unsafe lane usage include:

- Installation of two-way left-turn lanes (TWLTL)
- Provisions for periodic passing lanes ("Super 2 design") in constrained two-way corridors
- Review and refinement of passing zones based on sight distance
- Centerline rumble strips
- Median treatments / barriers on undivided multi-lane facilities
- High-visibility pavement markings, including wider centerlines
- Enhanced curve signage and chevrons
- Consistent lane configurations and transitions along corridors
- Improved nighttime visibility through delineation and lighting
- Geometric design refinements to encourage appropriate operating speeds



8. Policies, Programs & Strategies

Policies, programs and strategies play a crucial role in shaping the non-design elements of the Safe System Approach by embedding safety into the broader transportation ecosystem beyond infrastructure. Policies establish the legal and regulatory framework that enables proactive safety measures, such as speed management, automated enforcement and vehicle safety standards, while programs operationalize these policies through education, outreach and equity-focused initiatives. Strategies align goals across agencies, prioritize systemic risk reduction and ensure that safety interventions are data-driven and equitably distributed amongst BMTS communities.

Together, these elements reinforce the Safe System's core principles – acknowledging human error, protecting vulnerable users and sharing responsibility – by creating layers of protection that reduce the likelihood and severity of crashes. They also support post-crash care systems and institutionalize safety culture, making the approach sustainable and adaptable across jurisdictions.

This action plan follows the principles of the Safe System Approach and provides strategies to achieve zero fatalities and serious injuries in the region under the five categories of the Safe Systems Approach:

- **Safe Roads:** Create predictable, self-enforcing, self-explaining roads and intersections that allow for unavoidable errors by reducing the severity of the consequences
- **Post-Crash Care:** Provide resources and support to establish a timely and effective emergency response system for crashes, injuries and victims
- **Safe Users:** Promote safe travel behavior among all road users, whether they are using a vehicle, walking, biking, or rolling
- **Safe Vehicles:** Design and regulate safe vehicles and incorporate updated technologies and fleet modifications to promote safety
- **Safe Speeds:** Prevent fatal and serious injury crashes by managing vehicle speeds

These strategies have been identified based on a review of other successful Vision Zero action plans and FHWA's Vision Zero Toolkit, as well as an evaluation of their potential applicability to BMTS.

8.1 Safe Roads

To create and finance predictable, intuitive and safer streets for all users, a broad set of design, operations, and programmatic strategies needs to be collaboratively developed. One strategy is to prioritize safety within BMTS's Transportation Improvement Program (TIP) project evaluation process. Supporting quick-build and demonstration projects, especially within the High Injury Network, is a strategy to improve safety outcomes. Updating Complete Streets policies and design criteria, as well as advocating for municipal- and county-level changes in these regards, to align with Vision Zero principles is a strategy that will ensure consistency across public and private development. Additional measures include conducting Road Safety Audits to identify and mitigate crash risks, designating Pedestrian Safety Zones in high-risk areas, and implementing systemic signal upgrades (e.g., ITS sensors, countdown timers and high-visibility markings).

Strategy & Policy	**Responsible Agency/-ies** Supporting Party/-ies	Timeline	Components and Considerations
1.1. Identify deficiencies in the pedestrian and bicycle network and prioritize projects to address those gaps.	**BMTS**, Municipalities	Ongoing	BMTS will continue to advocate for filling in gaps in the walking and cycling network, as well as broader build-out of the Two Rivers Greenway. Municipalities will continue to install pedestrian and bicycle facilities where there are gaps and inadequacies in the network.
1.2. Quick-build and demonstration projects to improve safety	**Municipalities**, Counties, BMTS, NYSDOT, Non-profits, Safety Advocacy Groups	Short-term	Deployment of quick-build and demonstration projects that improve safety for all road users, especially within the High-Injury Network.
1.3. Update BMTS Complete Streets Policy to Incorporate Recent Federal Guidance and Vision Zero Principles	**BMTS**	Short-term	BMTS adopted a Complete Streets Policy in 2016. Technical literature related to walking and biking in the United States has progressed substantially over the last decade. BMTS will work to incorporate key insights from USDOT-issued design and operational guidance related to walking, biking, rolling, and connecting via transit.
1.4. Prioritize Safety in Transportation Improvement Programming (TIP) Project Selection Processes	**BMTS Planning and Policy Committees**	Ongoing	Prioritize safety in TIP by formally incorporating a safety-based project rating within the evaluation / scoring process.
1.5. Road Safety Audits	**BMTS**	Annual	BMTS currently has an annual goal of conducting two RSAs. Road Safety Audits follow a formal process utilizing a multidisciplinary group that reviews street safety aspects and makes recommendations. To the extent such measures are relevant, BMTS will consider implementing traffic calming measures as part of future RSA recommendations.
1.6. Systemic Signal Improvement	**BMTS**, NYSDOT, Municipalities	Long-term	All new and upgraded existing signals should consider retroreflective backplates, intelligent transportation systems (ITS) sensors, pedestrian countdown timers and future capability of red-light running detection where appropriate. Additionally, all signalized intersections should include high-visibility crosswalk striping and stop bars.
1.7. Encourage the Adoption or Update of Local Complete Streets Policies as Best Practices Change	**Municipalities**, BMTS	Mid-term	The City of Binghamton led the way in 2011 by adopting the region's first Complete Streets Policy. Since then, some of the smaller municipalities have established similar policies (e.g., Village of Johnson City, Town of Dickinson, Village of Deposit). BMTS will encourage the adoption of Complete Streets policies by municipalities via collaboration, education, and outreach.
1.8. Access Management and Driveway Guidelines for Private Development	**Municipalities**, BMTS	Short-term	Update municipal zoning regulations to include best practices for access management and driveway design

Strategy & Policy	**Responsible Agency/-ies** Supporting Party/-ies	Timeline	Components and Considerations
1.9. Support Systemic Safety Training for Local Planning & Zoning Decision-Makers	**BMTS**, Municipalities	Short-term	Provide training to local Planning and Zoning boards on systemic safety treatments, particularly in regard to pedestrian facilities that may be implemented through the land use review process.
1.10. Update Development Review Checklists	**Municipalities**, Local Planning Departments	Short-term	Update development review checklists to include Complete Streets elements and, where a traffic study is needed, a crash analysis should be included. Traffic studies should incorporate safety as part of their core evaluation criteria. The crash analysis should be performed in alignment with Vision Zero and Safe System principles and all improvements constructed in the public right-of-way by private entities should demonstrate a safety benefit through the use of the Highway Safety Manual methodology.
1.11. Safe Routes to School (SRTS) Program Development and Funding Pursuit	**BMTS**, Municipalities, School Districts	Ongoing	Establish SRTS programs in communities to enhance safety for children. Implementation of SRTS programs has shown 10-20% reduction in severe pedestrian and cyclist crashes around schools. SRTS efforts also have the added benefit of increasing walking and biking to school.

8.2 Post-Crash Care

Post-crash care strategies focus on enhancing emergency response systems and ensuring coordinated, timely action following collisions. One post-crash care strategy is to review the fatal and serious injury crashes through multidisciplinary investigations and identify contributing factors and recommend preventive measures. These recommendations are used to inform future safety improvements and guide policy updates. Support for crash victims is strengthened through improved access to medical care, legal resources and follow-up services is another strategy. By integrating post-crash data into planning and decision-making, these actions contribute to a safer transportation system and help reduce the risk of future fatal crashes.

Strategy & Policy	Responsible Agency/-ies Supporting Party/-ies	Timeline	Components and Considerations
2.1. Convene the Traffic Incident Management (TIM) Committee	**BMTS**, EMS, Counties, Municipalities	Short-term	Secure a formal commitment from local or regional leadership to prioritize roadway safety and adopt the Safe System Approach. The Traffic Incident Management Committee brings agencies together to coordinate quick, safe responses to roadway incidents. Its goal is to improve communication and reduce congestion while protecting responders and motorists.
2.2. Monitor High-Risk Locations	**BMTS**, Counties, Municipalities	Mid-term	Track and evaluate roadway segments and intersections identified as high-risk to reduce fatalities and serious injury over a specific recurring period. Crash trends, speed compliance, and implemented improvements at these locations can be part of monitoring at these locations.
2.3. Annual Assessment	**BMTS**	Ongoing	Prepare a brief annual assessment that summarizes yearly crash statistics and outlines progress towards Vision Zero goals.
2.4. Update Core Inputs (HIN, HRN, and Equity) on a Routine Basis	**BMTS**	Every two to three years	Update the High Injury Network, High Risk Network and Transportation Equity map layers with most current data.

Strategy & Policy	Responsible Agency/-ies Supporting Party/-ies	Timeline	Components and Considerations
2.5. Augment Data on Fatal and Serious Injuries by Incorporating Hospitals, Emergency Responders and Demographic Information	**BMTS**, Counties, Municipalities, Hospitals, EMS	Mid-term	Explore ways to collect demographic information at crash sites to help better assess equity. Supplementing police-collected crash data with additional sources of information, such as hospitals and emergency responders, is an emerging best practice. It has been shown that police data can undercount incidents among some populations.[2]
2.6. Host an Interactive Safety Dashboard	**BMTS**	Short-term	Develop an interactive safety dashboard where members of the public can easily access the networks and trends developed within this Safety Action Plan.
2.7. Advocate for Proper Maintenance of Emergency Vehicle Pre-Emption Equipment at Intersections along Key Corridors	**BMTS**, EMS, First Responders	Ongoing	Emergency vehicle pre-emption technology allows for traffic signal phases to be modified in real-time so as to cater to emergency response movements and maneuvers. This approach not only provides for more reliable response times to emergency events but also improves safety for first responders while en route to the scene. BMTS will advocate for and encourage proper maintenance of these regional assets, as this intersection-based signal pre-emption equipment ultimately supports Public Safety in general (in addition to addressing the Post-Crash Care element of the Safe System approach).
2.8. Map Cell Phone Dead Zones and Coordinate to Improve Response Times	**BMTS**, EMS, First Responders, Telecommunications	Mid-term	The ability to dispatch emergency services can be influenced both by population density, as well as topographic challenges. In a rural river valley like Broome/Tioga, there are likely many corridors where establishing contact with EMS may be unreliable or simply not possible given current infrastructure. To combat this gap, BMTS will study where coverage drops out and develop strategies designed to mitigate that issue.

8.3 Safe Users

Safe Users strategies include targeted education. A communications and outreach campaign will be launched to support enforcement efforts and raise public awareness around key safety behaviors such as speeding, seatbelt use and distracted driving. These campaigns will be developed in collaboration with municipalities and the New York Governor's Traffic Safety Committee (GTSC).

With representation from a broad array of state-level agencies, including , the GTSC serves as the primary coordinating entity for targeted safety activities across New York State and includes representatives from various executive departments (e.g., Transportation, Motor Vehicles, State Police, Health, Education, Criminal Justice, Thruway, Finance). One of the primary functions of the GTSC is to disseminate safety-related outreach materials, such as brochures, manuals, videos, and guides, oriented towards specific road safety concerns (e.g., distracted driving, younger drivers, sharing the road with cyclists).

Strategy & Policy	Responsible Agency/-ies Supporting Party/-ies	Timeline	Components and Considerations
3.1. Communications and Outreach Supporting Enforcement	**BMTS**, Municipalities, Traffic Safety Boards	Ongoing & Short-term	Public education campaigns on speeding, seatbelt use, impaired driving, distracted driving, etc.

[2] Prioritizing Health Equity in Vision Zero Planning, Vision Zero Network, 2023

8.4 Safe Vehicles

The safe vehicles strategies contribute to a safer transportation environment by addressing vehicle-related risks through both equipment and education. Improving vehicle safety is supported by upgrading fleet vehicles with modern crash-reduction technologies, such as backup cameras and blind spot detection. Another strategy under this category is right-sizing fleet vehicles, which helps reduce crash severity and improve fuel efficiency. Additionally, vehicle safety education and awareness efforts, such as distributing best practice materials and hosting safety forums, promoting safer driving behaviors and encouraging adoption of safety technologies across public and private fleets.

Strategy & Policy	Responsible Agency/-ies Supporting Party/-ies	Start Year	Components and Considerations
4.1. Government Fleet Vehicle Improvements	**Municipalities**, Counties, State agencies	Long-term	Require that all new fleet procurements feature the latest crash-reduction technology and safety equipment (e.g., back-up cameras, blind spot detection, intelligent speed assist). Given that smaller vehicles are less lethal in crashes and more fuel-efficient, future government purchases should seek to reduce the size and mass of the vehicles while also including safety-first design treatments (e.g., teardrop windows, modified mirrors).
4.2. Vehicle Safety Education and Awareness	**Municipalities**, Counties, State Agencies, Non-profits	Mid-term	Provide education content on vehicle safety best practices. NYCDOT has led the Vision Zero Fleet Safety Forum, an initiative that brings together stakeholders from government, private fleets, non-profits and academia to improve vehicle safety and share best practices. It features information on past and upcoming events, downloadable resources, like flyers, videos and presentations, as well as safety campaigns and videos.

8.5 Safe Speeds

Safe Speeds strategies include lowering statutory speed limits in residential districts to 25 mph or less, conducting a regional Speed Management Plan to identify priority areas for traffic calming and adopting updated speed-setting criteria that reflect federal guidance and local context. Dynamic speed feedback signs will be deployed at high-risk locations to encourage compliance. Although current state law does not allow municipalities in Broome/Tioga to use automated speed enforcement, regulatory changes at the state level regarding the use of speed and red-light cameras should be monitored to eventually leverage the safety benefit of these devices.

Strategy & Policy	Responsible Agency/-ies Supporting Party/-ies	Timeline	Components and Considerations
5.1. Reduce Statutory Speed Limit to 25 mph as permitted by NYS Assembly Bill A1007A	**Municipalities**, BMTS, Counties	Short-term	Lower the statutory speed limit to 25mph on streets within residential districts, considering the process required by NYS for lowering speed limit to under 30 mph.
5.2. Establish Safe Speed Limits	**Municipalities**, BMTS	Mid-term	The policy will follow updated federal guidance (e.g., USLIMITS2) to incorporate a range of factors, including crash history, intersection spacing, driveway density, roadway geometry, roadside conditions, roadway functional classification, traffic volume, pedestrian and bicycle activity, land use context and observed speeds.
5.3. Dynamic Speed Feedback Signs at High-Risk Locations	**Local Law Enforcement**	Short-term	Speed feedback signs dynamically show the driver's speed and the posted speed limits and have been shown to slow overall speeds where deployed. They can also be used in part to educate drivers about the importance of safe speeds.

9. Monitoring Plan Outcomes

9.1 Performance Measures

The Plan goal to reduce fatal and serious injury crashes by 50% by 2040 and 80% by 2050 will require a collaborative effort among the project team and stakeholders. To measure progress towards this goal and the implementation of this Plan, both process and outcome measures will be reported publicly.

9.1.1 Adopted Crash Reduction Targets

To help monitor long-term progress towards Vision Zero, this plan establishes several crash reduction targets based on the injury severity of the crash and/or the types of road users involved. This Safety Action Plan's quantitative crash reduction targets are summarized in bullets below. For each performance measure, the targets assume a consistent, proportional reduction.

- 2025 serves as the baseline (informed by 5-year annual average from 2019 to 2023)
- 50% reduction by 2040 as the midpoint goal for this Safety Action Plan
- 80% reduction by 2050
- 100% reduction in fatalities and serious injuries remains the ultimate target

Table 46 through Table 48 present detailed listings of the plan's recommended performance measures for monitoring, beginning with Broome County, moving to Tioga County, and concluding with Broome-Tioga. Within each table, the performance measures are shown in rows, with the first set of data indicating the annual crash count, followed by the annual crash rate per 100,000 residents.

The monitoring metrics presented in this section should be thoroughly reviewed every five years to determine how to best adjust course towards Vision Zero. Performance measures may be adjusted in future plan updates based on trends identified in the Vision Zero Performance Report, along with the breadth and depth of transportation-related data available to assess safety trends.

9.1.2 Potential Metrics for Consideration during Future Updates

In addition to the crash-based metrics established within this plan, BMTS may consider assessing other transportation-related metrics, such as those listed below, to gauge progress as part of future five-year updates.

- **Safety Infrastructure:** Assessing the implementation and safety impact of infrastructure improvements that stem from this plan (e.g., prioritized projects, Road Safety Audits)

- **Equity:** Evaluating whether safety improvements are addressing disparities in safety outcomes across different demographic groups

- **Speed Management:** Reviewing the number of municipalities that have adopted municipality-wide speed limit reductions

9.2 Approach to Monitoring Progress

9.2.1 Vision Zero Committee

To implement the BMTS Safety Action Plan, BMTS will establish a Vision Zero Committee. Such groups are usually comprised of representatives from local municipalities, county departments, and other relevant stakeholders (e.g., transit, emergency response, commerce). The Vision Zero Committee will meet periodically to discuss recent KSI collisions and trends, coordinate safety-related efforts, initiatives, and projects, and guide the annual Vision Zero Performance Report. The Committee can also serve as a forum for community engagement ahead of the report's annual release, offering a space where stakeholders and the public can openly discuss recent outcomes, lessons learned, and opportunities for improvement.

9.2.2 Reporting Progress

The annual Vision Zero Performance Report will analyze roadway safety data from the previous year, note current progress towards plan goals, and describe key victories, projects delivered, and other sources of momentum that will help sustain the drive to zero. This report will be made publicly available and presented to the BMTS Policy Committee.

9.2.3 Online Dashboard

A public-facing online dashboard has been established as part of the BMTS Safety Action Plan. It is a powerful tool to ensure accountability and transparency en route to Vision Zero. The dashboard will help the public understand and remain engaged with this technical topic, offering key lessons learned from the data compiled and analyzed each year. The BMTS Safety Action Plan, project dashboard, and Annual Report will be sent to the Vision Zero Committee members and made publicly accessible on the project website.

The online dashboard can be accessed at the URL printed below.

[LINK TO BE INSERTED INTO POLICY COMMITTEE DRAFT]

Table 46. Crash Reduction Targets – Broome County (Source: NYSDOT CLEAR 5-Year Crash Counts)

					Absolute Targets (Annual Count)				Population-Adjusted Targets (Annual Rate per 100,000 Residents)			
Jurisdiction	Type of Change to Monitor	User Type(s) / Focus Area	Injury Severity Level	Unit of Analysis	5-Year Total Count	2025 Baseline	2040 (- 50%)	2050 (- 80%)	Base Population	2025 Baseline	2040 (- 50%)	2050 (- 80%)
Broome County	Crash Outcomes	All Users	Fatal	Crashes	46	9	5	2	197,738	4.7	2.3	0.9
Broome County	Crash Outcomes	All Users	Serious Injury	Crashes	513	103	51	21	197,738	51.9	25.9	10.4
Broome County	Crash Outcomes	Pedestrian-Involved or Bicyclist-Involved	Fatal or Serious Injury	Crashes	125	25	13	5	197,738	12.6	6.3	2.5

Table 47. Crash Reduction Targets – Tioga County (Source: NYSDOT CLEAR 5-Year Crash Counts)

					Absolute Targets (Annual Count)				Population-Adjusted Targets (Annual Rate per 100,000 Residents)			
Jurisdiction	Type of Change to Monitor	User Type(s) / Focus Area	Injury Severity Level	Unit of Analysis	5-Year Total Count	2025 Baseline	2040 (- 50%)	2050 (- 80%)	Base Population	2025 Baseline	2040 (- 50%)	2050 (- 80%)
Tioga County	Crash Outcomes	All Users	Fatal	Crashes	25	5	3	1	48,106	10.4	5.2	2.1
Tioga County	Crash Outcomes	All Users	Serious Injury	Crashes	140	28	14	6	48,106	58.2	29.1	11.6
Tioga County	Crash Outcomes	Pedestrian-Involved or Bicyclist-Involved	Fatal or Serious Injury	Crashes	14	3	1	1	48,106	5.8	2.9	1.2

Table 48. Crash Reduction Targets – All Metrics – Broome-Tioga (Source: NYSDOT CLEAR 5-Year Crash Counts)

					Absolute Targets (Annual Count)				Population-Adjusted Targets (Annual Rate per 100,000 Residents)			
Jurisdiction	Type of Change to Monitor	User Type(s) / Focus Area	Injury Severity Level	Unit of Analysis	5-Year Total Count	2025 Baseline	2040 (- 50%)	2050 (- 80%)	Base Population	2025 Baseline	2040 (- 50%)	2050 (- 80%)
Broome-Tioga	Crash Outcomes	All Users	Fatal	Crashes	71	14	7	3	245,844	5.8	2.9	1.2
Broome-Tioga	Crash Outcomes	All Users	Serious Injury	Crashes	653	131	65	26	245,844	53.1	26.6	10.6
Broome-Tioga	Crash Outcomes	Pedestrian-Involved or Bicyclist-Involved	Fatal or Serious Injury	Crashes	139	28	14	6	245,844	11.3	5.7	2.3

Appendices

10. High Injury Network Methodology

Based on the highest injury severity level reported in the crash record, each collision with at least one injury (i.e. non-PDO) was assigned a maximum injury value (i.e., K, A, B or C). Like the crash analysis in Chapter 3, crashes occurring along interstate facilities and limited-access highways were filtered out from the underlying dataset that was used as the core input for the networks that follow.

10.1 Weighting by Injury Severity

Each crash was assigned a weighting score based on the maximum injury severity for all parties involved, as shown in **Table 49**.

Table 49. High Injury Network – Injury Severity Weighting Scheme (Corridors & Intersections)

Crash Injury Severity Code	Severity Description	Other Terms Often Used	HIN Weight Applied
K	Fatal Injury	Killed	15
A / SI	Serious Injury	Incapacitating Injury	5
B	Minor Injury	Non-Incapacitating injury	2
C	Possible Injury	Complaint of Injury	1
O	No Injury	Property Damage Only	0

This methodology leverages the general approach found in Federal Highway Administration's *Crash Costs for Highway Safety Analysis* (FHWA-SA-17-071, 2018) –comparatively evaluating the relative cost of an injury crash based on its comprehensive crash costs (i.e., tangible or "economic" costs, plus intangible costs or "quality-adjusted life years") – with a few notable changes.

- In divergence from an equivalent property damage only (EPDO) based scheme, where property damage serves as the base weight value (1), all values were re-indexed to equivalent injury level (i.e., baseline of 1 was defined as the lowest injury level, C). Assigning a zero weight to non-injury crashes reflects the goals of Vision Zero and active pursuit of a Safe System Approach.
- Weighting for fatal crashes can vary depending upon the weighting scheme utilized. For this Safety Action Plan, fatal crashes were assigned a weight value of 15. When fatal crashes are assigned a weight that is substantially higher than the baseline (possible injury), the resulting High Injury Network converges towards a simple hotspot map consisting of isolated, limited samples of fatal crashes. Weighting fatal crashes to a value of 15 continues to reflect their severity compared to all other crashes, while providing a network that can be better leveraged en route to developing capital projects.

10.2 Separating Intersection and Corridor Crashes (Location Type)

Recognizing the unique characteristics of collisions that occur at intersections versus along segments (corridors), each crash was designated as either an intersection or a corridor collision based on information recorded in the crash report. As discussed in Section 3.3.3 (Crash Location), the NYSDOT dataset included a designation for the physical location of each crash in relation to a designated intersection – "At-Intersection", "Intersection-Related", or "Not at an Intersection". After analysis of crash data and the typical geography of the locations for each designation, it was determined that the overall High Injury Network (HIN) would be separated into two discreet components: segment-based High Injury Corridors (HIC), which would incorporate "Not at an Intersection" and "Intersection-Related" crashes, and High Injury Intersections (HII), which would account for the "At-Intersection" crash group component of this reactive network.

10.3 Corridor Crashes

According to the NYSDOT CLEAR crash records, 63% of injury crashes had characteristics that led them to be assigned to the Corridor subset of crashes, as opposed to the Intersection subset. Each of these crashes was assigned to a segment of roadway in GIS using NYSDOT's Road Inventory shapefile. To verify each location, in addition to roadway proximity, crashes were also assigned to a roadway segment by matching roadway name data native to the crash report with roadway name data from the official roadway inventory. This enhanced the crash assignment process, allowing for a more accurate accounting of crashes along each respective roadway segment.

While corridor crashes are geocoded at one specific point, the factors that contribute to those crashes often cascade from one roadway segment to the next. For that reason, the High Injury Corridor portion of the HIN employed a "sliding window" analysis, which synthesizes crash data from neighboring segments in addition to the primary crash segment, allowing for a more holistic view of crash trends along a given corridor (compared to a point-based sample along a single block or segment).

As such, specific key variables were aggregated to the segment level, including counts of crash-related injuries by severity, the types of modes involved in each collision (i.e., motorist, pedestrian, or bicyclist), information on operating conditions and maneuvers at the time of collision, and the assigned crash weight based on the rubric shown previously (Table 49).

An injury score was calculated for each segment, based on the aggregated crash weights normalized by overall segment length across the "sliding window" of analysis. From this injury score, three models spanning a wide range of scales were developed – an absolute rank across the two-county study area, a county-level rank, and a municipal-level individual ranks. Recognizing the fundamental differences between the counties outlined in Chapter 3 – Crash Analysis, the subsequent sections showcase High Injury Corridors based on the county-level ranks for injury score.

10.4 Intersection Crashes

At a regional level, 38% of injury crashes were explicitly designated "At-Intersection" crashes within the crash reports summarized by the NYSDOT database. These Intersection subset crashes were spread across just 713 of the 6,395 total roadway junctions in the two-county public roadway network. Unlike segment-based crashes, which require more refined analysis (e.g., smoothing via "sliding window"), intersections were treated as individual points in the road network.

Intersection points were created based on NYSDOT's Roadway Inventory shapefile. These intersection points were then cleaned to remove false positives, such as overpasses, underpasses and cul-de-sacs. Each intersection was then buffered and crashes within the buffer were assigned to the given location. Similar to the approach for each corridor, key variables were then aggregated at each intersection based on the crash history, including counts of crash-related injuries by severity, the types of modes involved in each collision, information on operating conditions and angle of collision, and the assigned crash weight based on the rubric shown previously (Table 49).

Intersections with overlapping buffers were dissolved to form a single intersection. For the limited set of crashes outside of any buffer, the individual crash record was examined to determine the most relevant intersection to which the crash was then assigned.

11. Systemic Analysis

11.1 Systemic Factors – All Injury Crashes

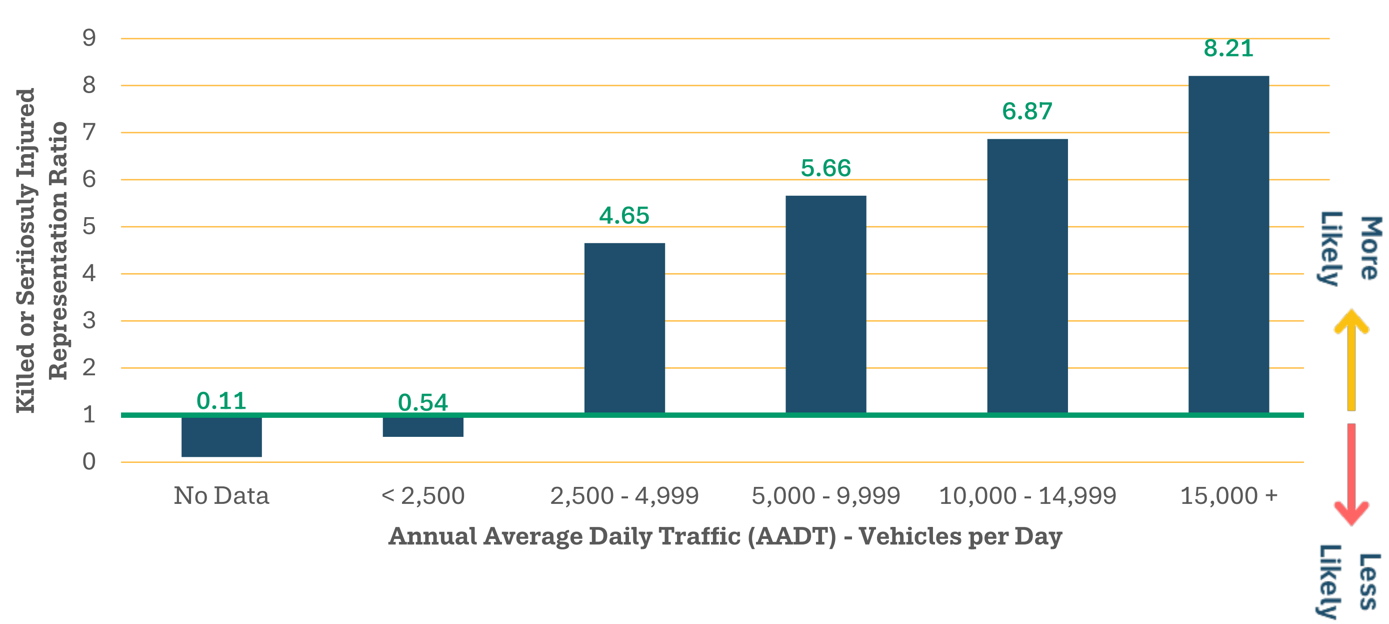
11.1.1 Daily Vehicle Volumes (AADT)

Broome County

Table 50. Systemic Analysis (Broome County) – Daily Auto Volumes (Source: Replica, Typical Weekday, Fall 2024)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Daily Auto Volumes / AADT	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
No Data	5%	2	1%	0.11	14	1%	0.15
< 2,500	85%	152	46%	0.54	653	36%	0.43
2,500 - 4,999	4%	64	19%	4.65	232	13%	3.10
5,000 - 9,999	3%	65	20%	5.66	355	20%	5.68
10,000 - 14,999	2%	39	12%	6.87	396	22%	12.83
15,000 +	< 1%	9	3%	8.21	150	8%	25.16
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 64. KSI Crash Representative Ratios (Broome County) – Daily Auto Volumes (Source: Replica, Typical Weekday, Fall 2024)

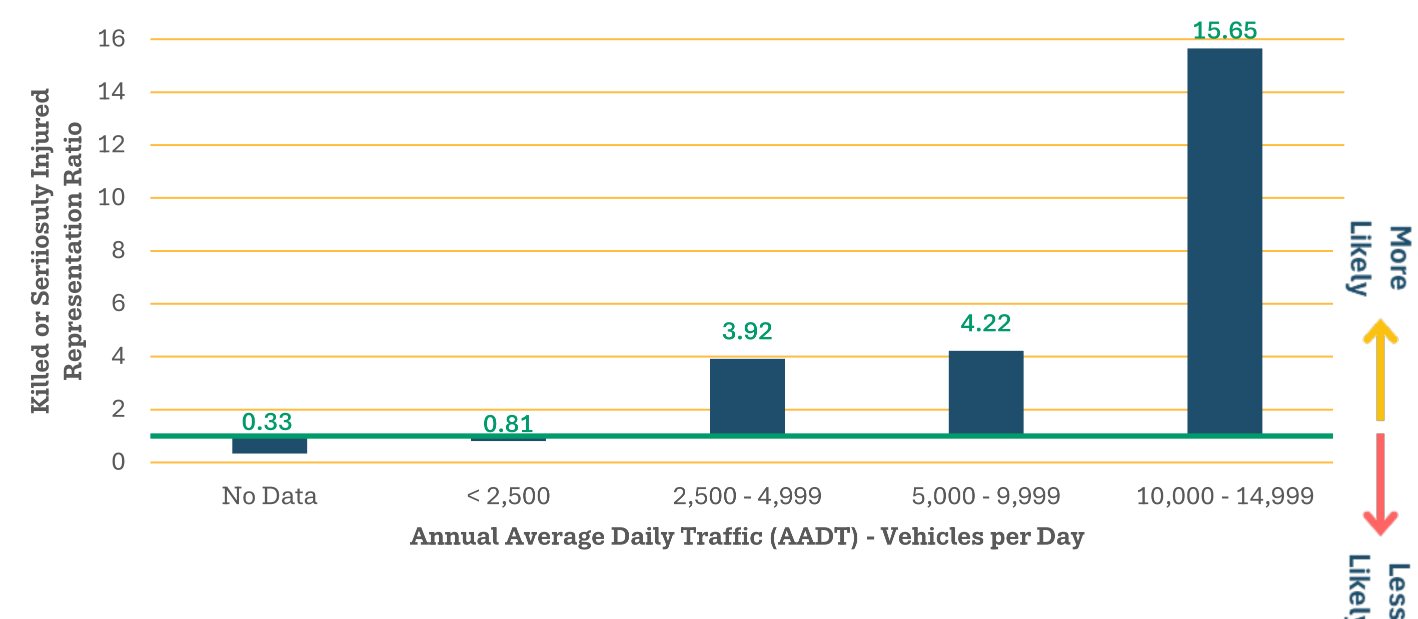


Tioga County

Table 51. Systemic Analysis (Tioga County) – Daily Auto Volumes (Source: Replica, Typical Weekday, Fall 2024)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Daily Auto Volumes / AADT	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
No Data	19%	9	6%	0.33	26	4%	0.23
< 2,500	73%	85	59%	0.81	298	48%	0.66
2,500 - 4,999	6%	36	25%	3.92	195	32%	4.96
5,000 - 9,999	1%	9	6%	4.22	67	11%	7.34
10,000 - 14,999	< 1%	5	3%	15.65	30	5%	21.95
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 40. KSI Crash Representative Ratios (Tioga County) – Daily Auto Volumes (Source: Source: Replica, Typical Weekday, Fall 2024)



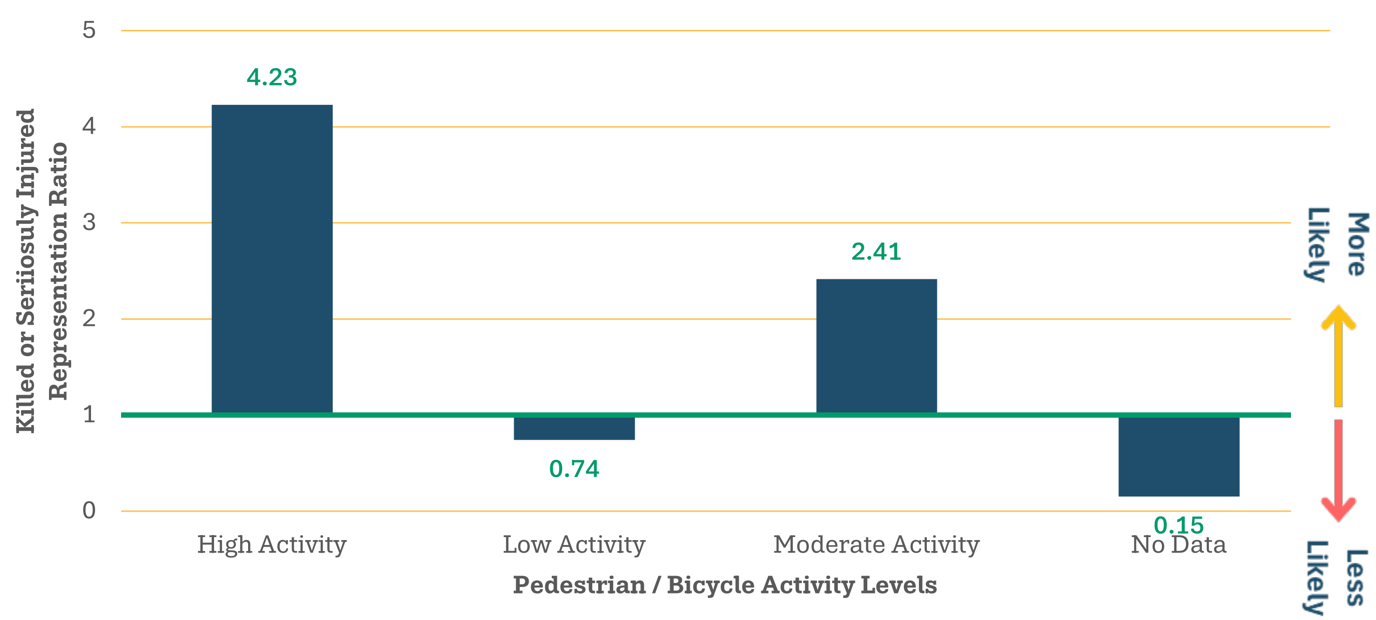
11.1.2 Pedestrian / Bicycle Activity Levels

Broome County

Table 52. Systemic Analysis (Broome County) – Ped / Bike Volume (Source: Replica, Typical Weekday, Fall 2024)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Pedestrian / Bicycle Activity Level	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
High Activity	4%	59	18%	4.23	383	21%	5.05
Low Activity	76%	185	56%	0.74	819	46%	0.60
Moderate Activity	10%	82	25%	2.41	585	33%	3.17
No Data	10%	5	2%	0.15	13	1%	0.07
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 65. KSI Crash Representative Ratios (Broome County) – Ped / Bike Volume (Source: Replica, Typical Weekday, Fall 2024)

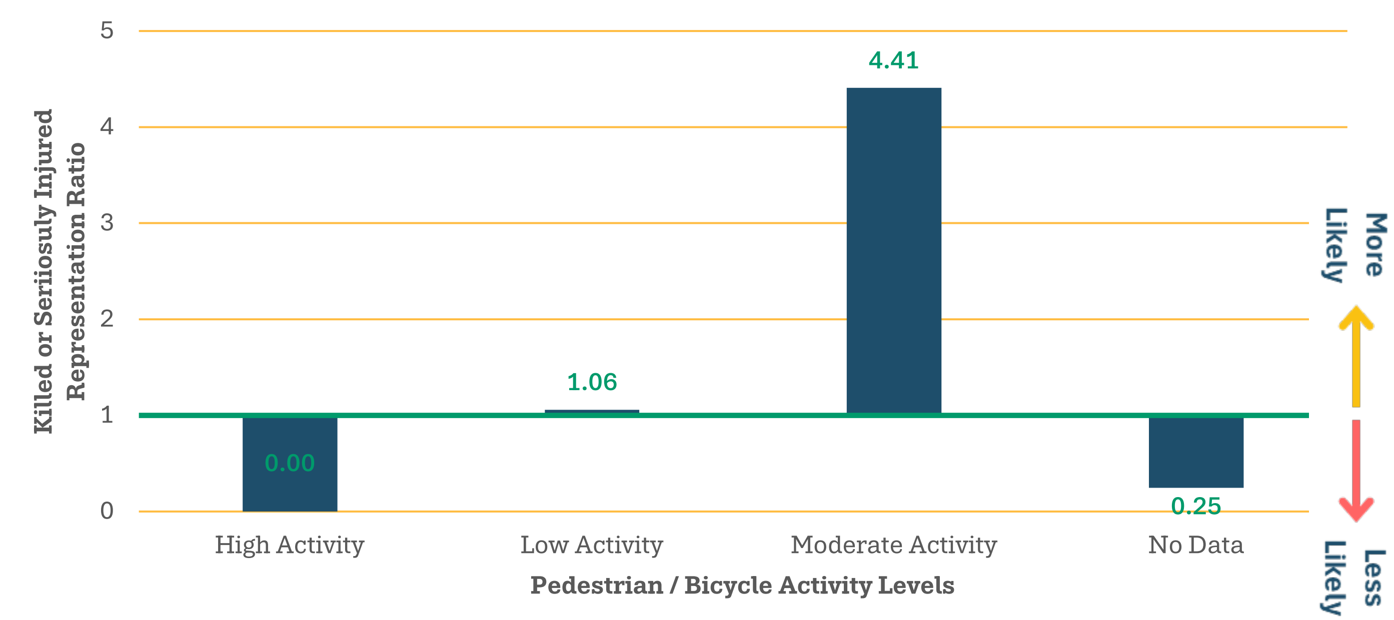


Tioga County

Table 53. Systemic Analysis (Tioga County) – Ped / Bike Volume (Source: Replica, Typical Weekday, Fall 2024)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Pedestrian / Bicycle Activity Level	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
High Activity	-	-	-	-	-	-	-
Low Activity	81%	123	85%	1.06	521	85%	1.05
Moderate Activity	2%	15	10%	4.41	79	13%	5.43
No Data	17%	6	4%	0.25	16	3%	0.15
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 66. KSI Crash Representative Ratios (Tioga County) – Ped / Bike Volume (Source: Replica, Typical Weekday, Fall 2024)



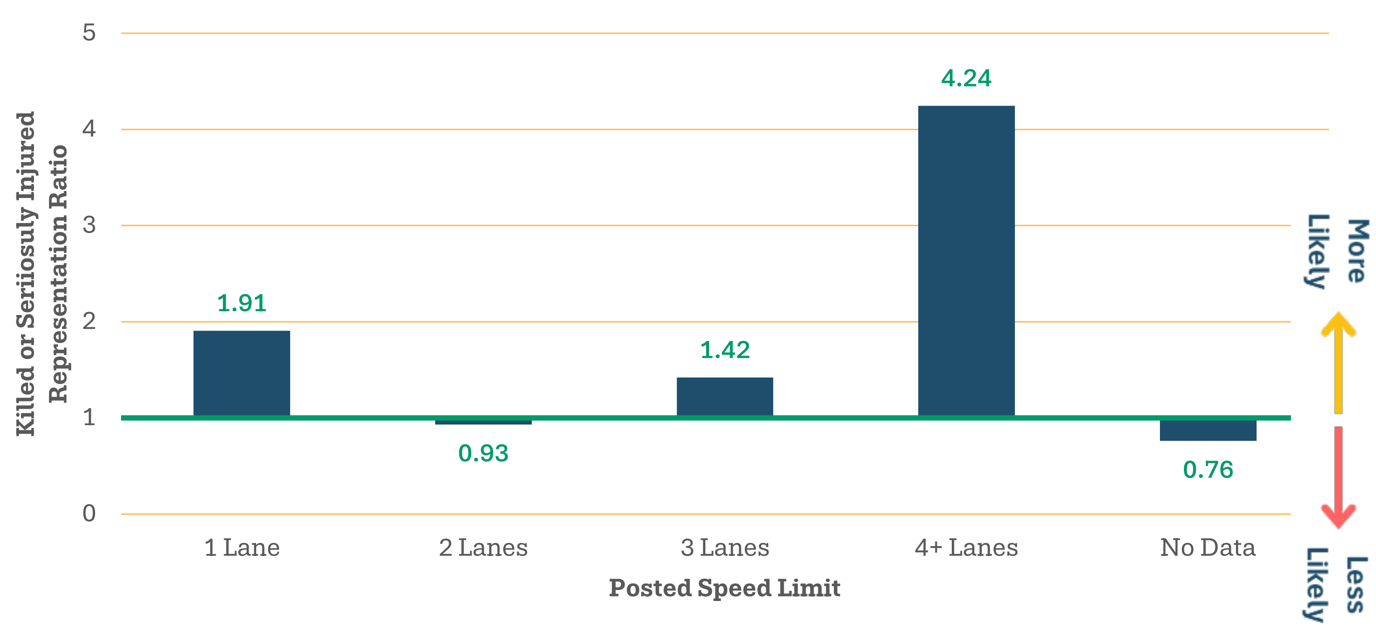
11.1.3 Posted Speed Limit

Broome County

Table 54. Systemic Analysis (Broome County) – Speed Limit (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Posted Speed Limit	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
< 30 mph	39%	128	39%	0.99	788	44%	1.12
30 - 39 mph	8%	28	8%	1.01	201	11%	1.33
40 - 49 mph	6%	52	16%	2.51	309	17%	2.74
50+ mph	43%	114	34%	0.80	429	24%	0.56
No Data	3%	9	3%	0.80	73	4%	1.20
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 67. KSI Crash Representative Ratios (Broome County) – Speed Limit

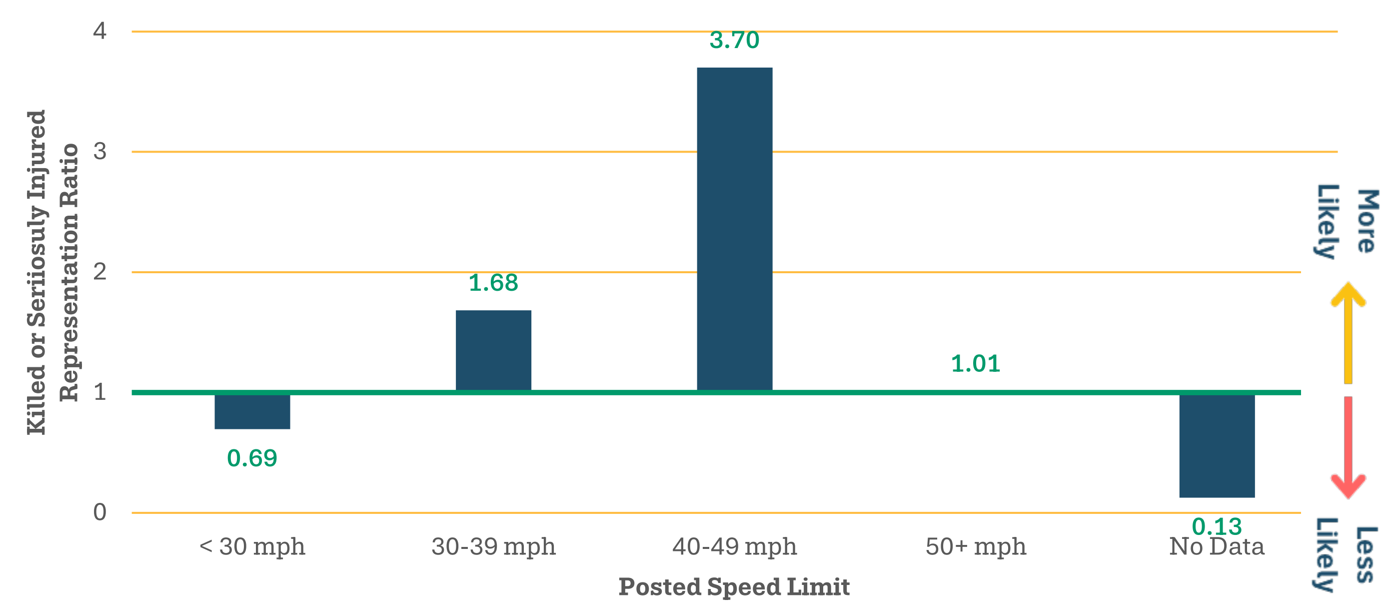


Tioga County

Table 55. Systemic Analysis (Tioga County) – Speed Limit (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Posted Speed Limit	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
< 30 mph	12%	12	8%	0.69	66	11%	0.89
30 - 39 mph	4%	9	6%	1.68	66	11%	2.89
40 - 49 mph	2%	10	7%	3.70	47	8%	4.07
50+ mph	77%	112	78%	1.01	421	68%	0.89
No Data	6%	1	1%	0.13	16	3%	0.47
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 68. KSI Crash Representative Ratios (Tioga County) – Speed Limit



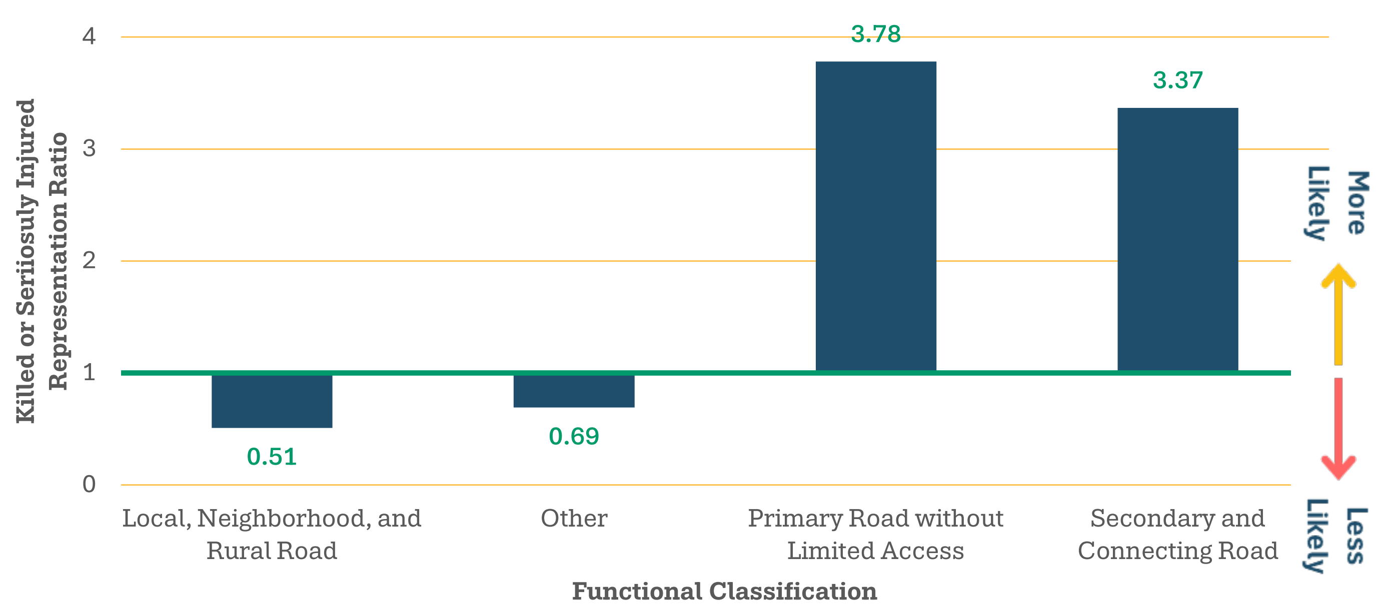
11.1.4 Functional Classification

Broome County

Table 56. Systemic Analysis (Broome County) – Functional Class (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Functional Classification	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Local, Neighborhood, and Rural Road	81%	137	41%	0.51	612	34%	0.42
Other	2%	5	2%	0.69	20	1%	0.51
Primary Road without Limited Access	2%	31	9%	3.78	179	10%	4.01
Secondary and Connecting Road	14%	158	48%	3.37	989	55%	3.88
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 69. KSI Crash Representative Ratios (Broome County) – Functional Class Representation Ratios

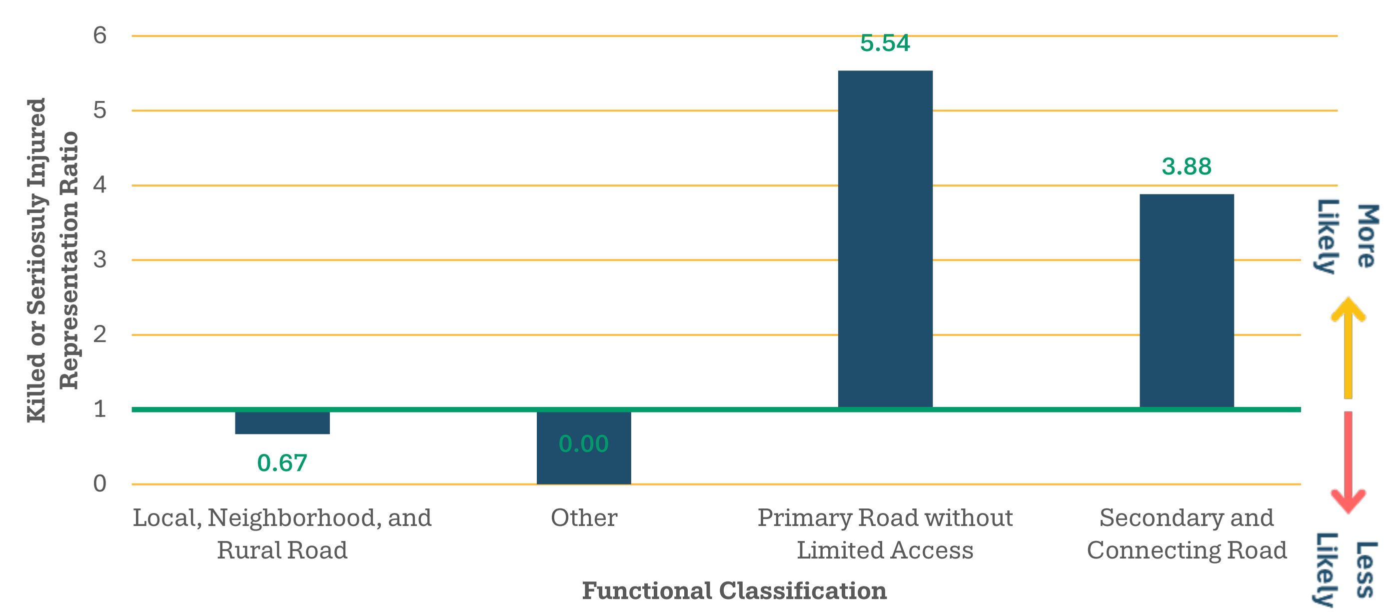


Tioga County

Table 57. Systemic Analysis (Tioga County) – Functional Class (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Functional Classification	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Local, Neighborhood, and Rural Road	83%	80	56%	0.67	285	46%	0.56
Other	6%	0	0%	0.00	0	0%	0.00
Primary Road without Limited Access	2%	12	8%	5.54	63	10%	6.79
Secondary and Connecting Road	9%	52	36%	3.88	268	44%	4.68
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 70. KSI Crash Representative Ratios (Tioga County) – Functional Class Representation Ratios.



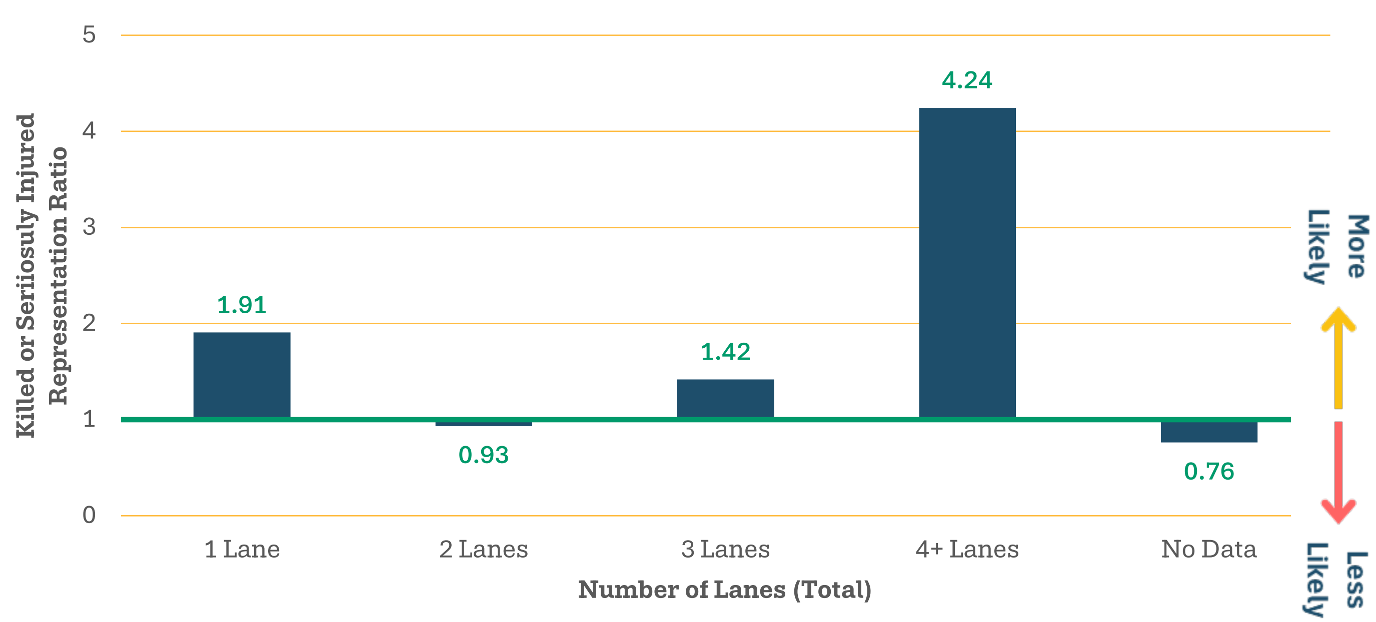
11.1.5 Total Number of Vehicle Lanes

Broome County

Table 58. Systemic Analysis (Broome County) – Total Number of Lanes (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Total Vehicle Travel Lanes	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
1 Lane	1%	9	3%	1.91	71	4%	2.77
2 Lanes	93%	288	87%	0.93	1,391	77%	0.83
3 Lanes	1%	4	1%	1.42	51	3%	3.33
4+ Lanes	2%	23	7%	4.24	243	14%	8.25
No Data	3%	7	2%	0.76	44	2%	0.88
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 71. KSI Crash Representative Ratios (Broome County) – Total Number of Lanes

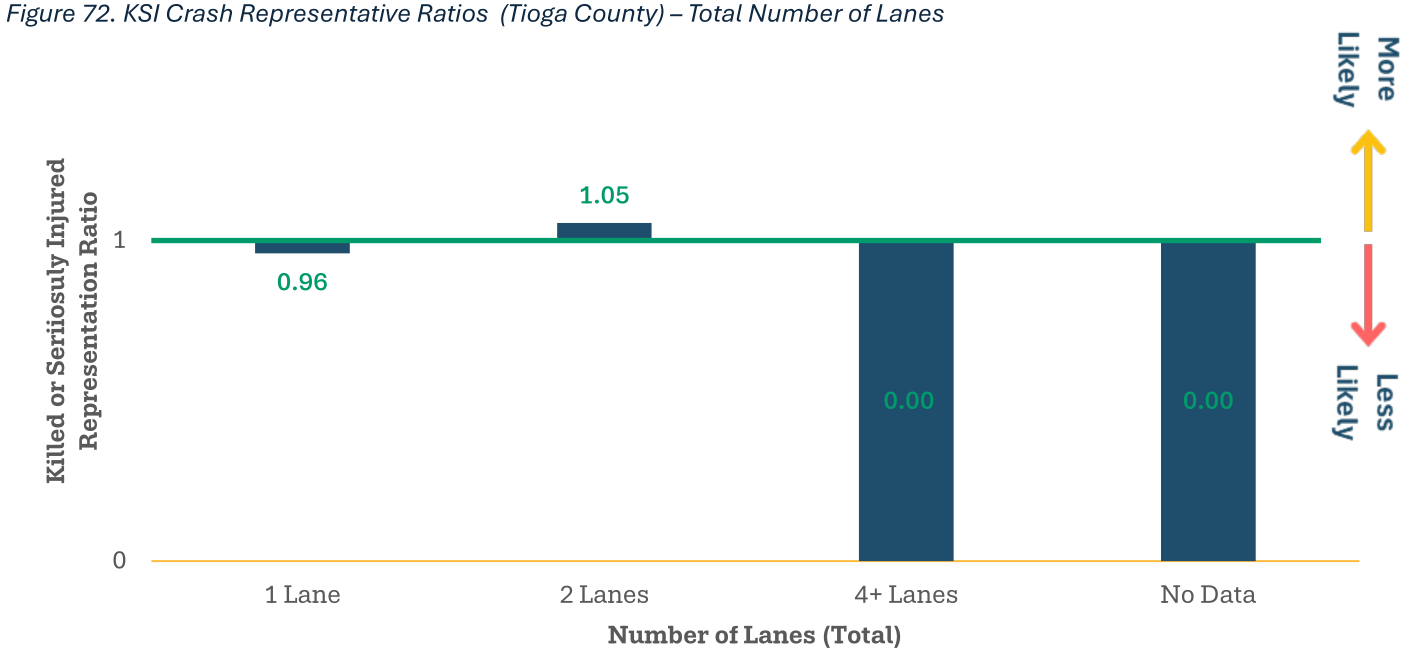


Tioga County

Table 59. Systemic Analysis (Tioga County) – Total Number of Lanes (Source: NYSDOT CLEAR Crash Data Viewer)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Total Vehicle Travel Lanes	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
1 Lane	3%	4	3%	0.96	14	2%	0.79
2 Lanes	92%	140	97%	1.05	588	95%	1.04
3 Lanes	-	-	-	-	-	-	-
4+ Lanes	< 1%	0	0%	0.00	8	1%	13.09
No Data	5%	0	0%	0.00	6	1%	0.20
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 72. KSI Crash Representative Ratios (Tioga County) – Total Number of Lanes



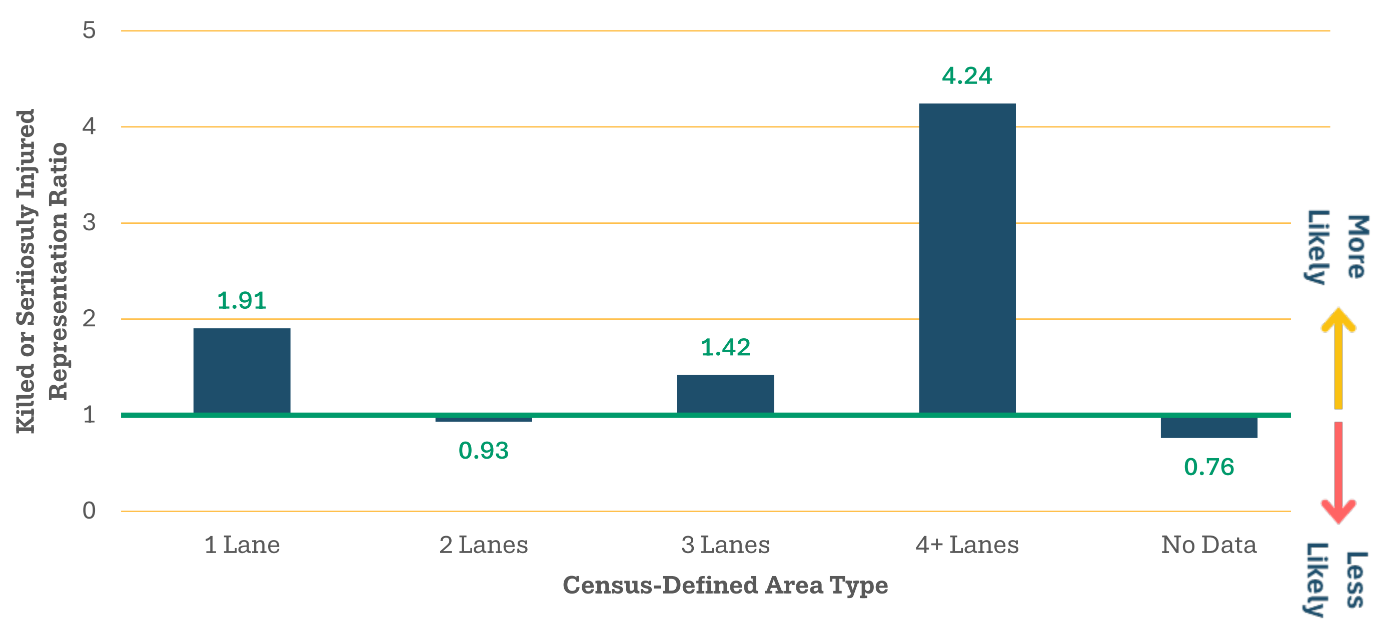
11.1.6 Area Type

Broome County

Table 60. Systemic Analysis (Broome County) – Area Type (Source: Census)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Census-Defined Area Type	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Rural	59%	116	35%	0.60	438	24%	0.42
Urban	41%	215	65%	1.57	1,362	76%	1.83
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 73. KSI Crash Representative Ratios (Broome County) – Area Type (Source: Census)

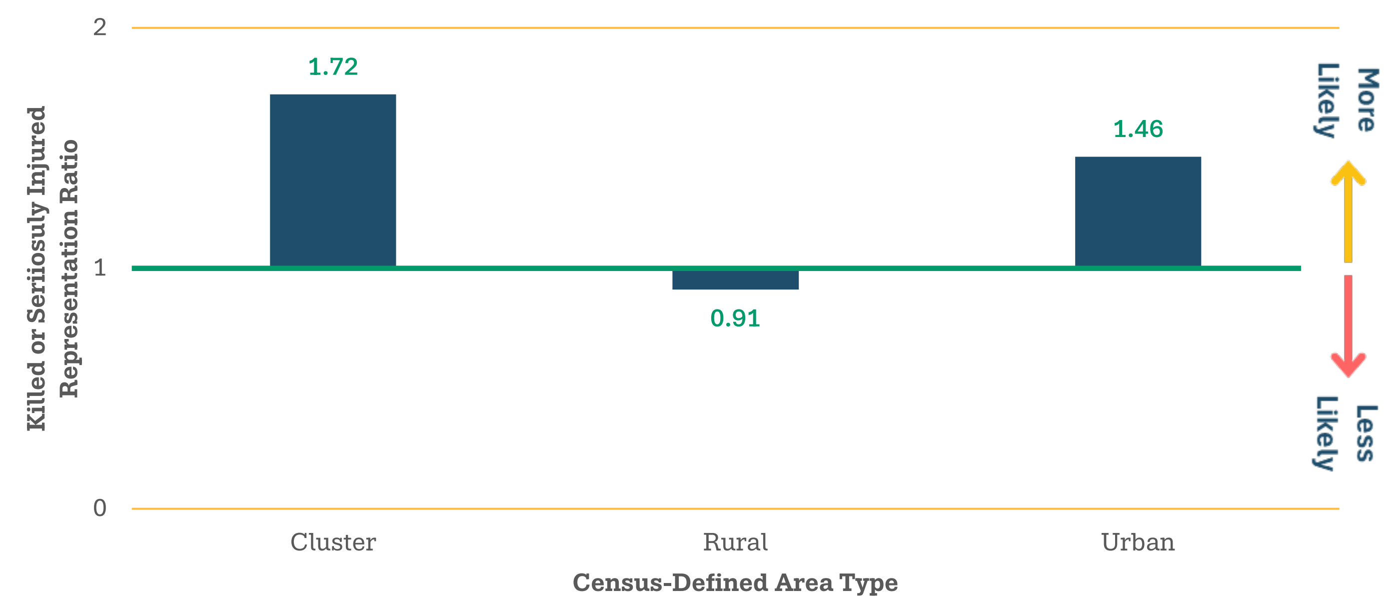


Tioga County

Table 61. Systemic Analysis (Tioga County) – Area Type (Source: Census)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Census-Defined Area Type	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Cluster	7%	18	13%	1.72	103	17%	2.31
Rural	88%	115	80%	0.91	443	72%	0.82
Urban	5%	11	8%	1.46	70	11%	2.18
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 74. KSI Crash Representative Ratios (Tioga County) – Area Type (Source: Census)



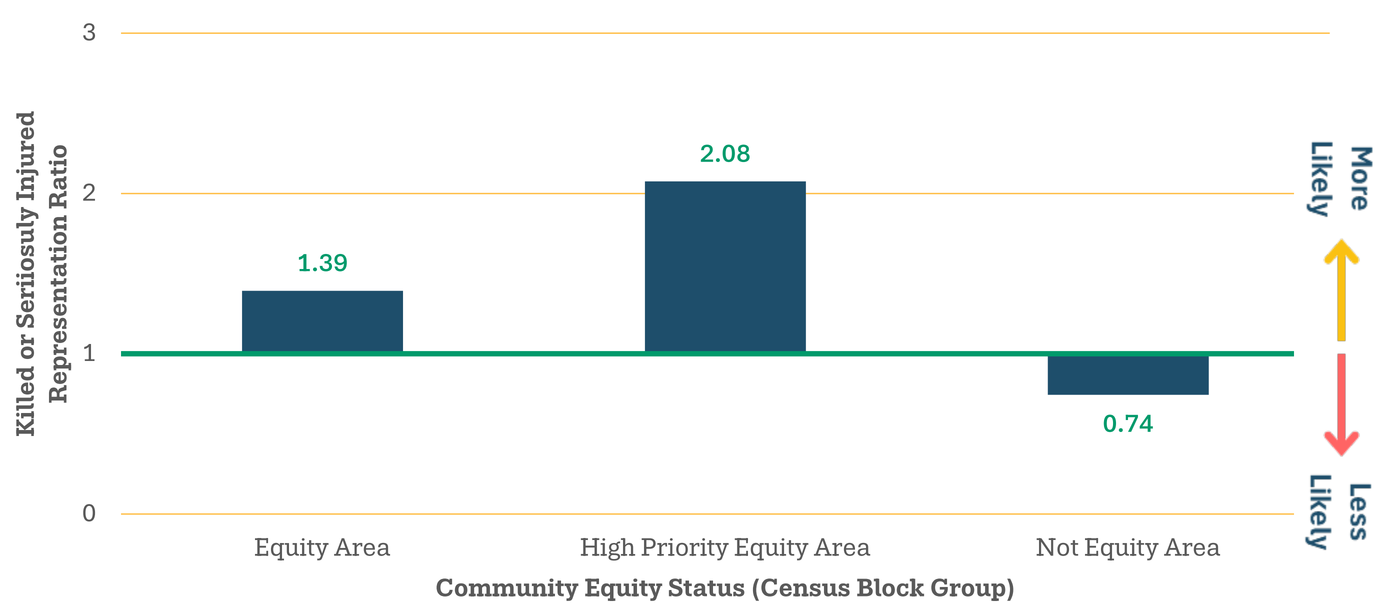
11.1.7 Community Equity Status

Broome County

Table 62. Systemic Analysis (Broome County) – Community Equity Status (Source: WSP, Census)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Community Equity Status	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity Area (Top 21-40%)	18%	83	25%	1.39	482	27%	1.49
High Priority Equity Area (Top 20%)	10%	72	22%	2.08	510	28%	2.70
Not Equity Area	72%	176	53%	0.74	808	45%	0.63
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 75. KSI Crash Representative Ratios (Broome County) – Community Equity Status (Source: WSP, Census)

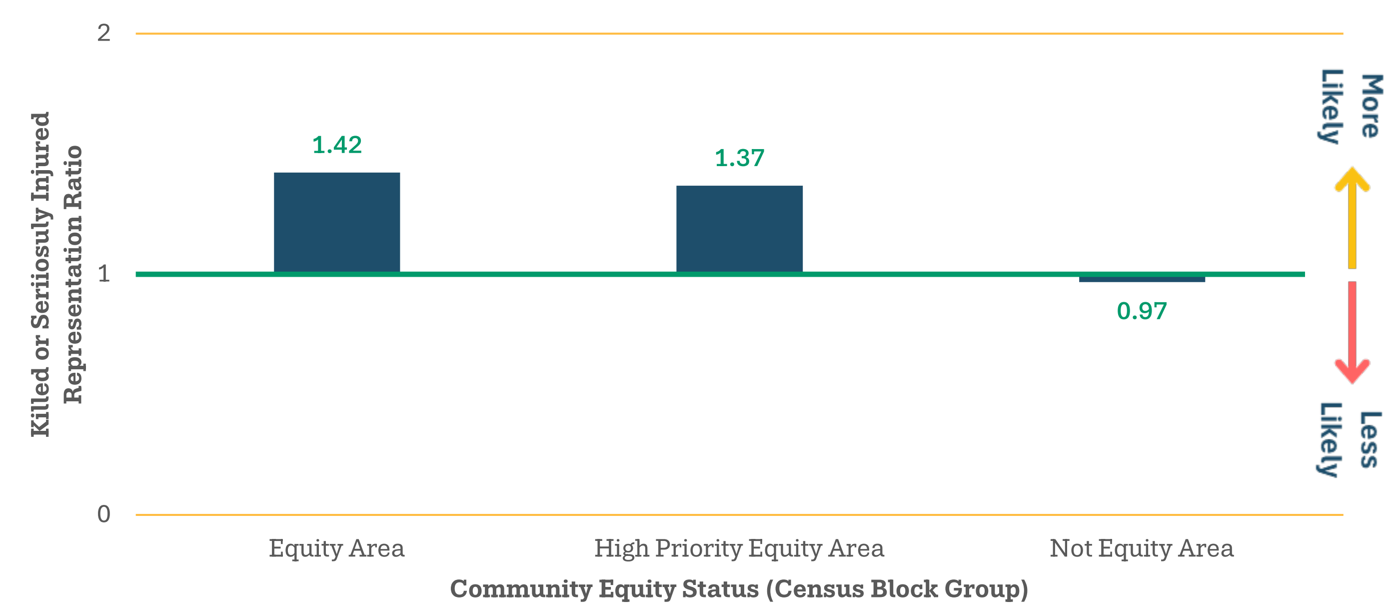


Tioga County

Table 63. Systemic Analysis (Tioga County) – Community Equity Status (Source: WSP, Census)

	LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Community Equity Status	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity Area (Top 21-40%)	6%	12	8%	1.42	43	7%	1.19
High Priority Equity Area (Top 20%)	2%	3	2%	1.37	21	3%	2.24
Not Equity Area	93%	129	90%	0.97	552	90%	0.97
TOTAL	**100%**	**331**	**100%**	**1.00**	**1,800**	**100%**	**1.00**

Figure 76. KSI Crash Representative Ratios (Tioga County) – Community Equity Status (Source: WSP, Census)



11.2 Systemic Factors – Pedestrian-Involved Crashes

Broome County

Table 64. Systemic Analysis (Broome County) – Pedestrian-Involved Crashes – Primary Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	**Risk Factor**	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity	*Not Equity Area*	77%	29	34%	0.44	90	25%	0.33
	Equity Area (Top 21-40%)	9%	45	52%	5.70	209	59%	6.42
	High Priority (Top 20%)	13%	12	14%	1.04	56	16%	1.17
Posted Speed Limit	*< 30 mph*	39%	63	73%	1.87	284	80%	2.05
	30 - 39 mph (*)	8%	6	7%	0.83	26	7%	0.87
	40 - 49 mph (*)	6%	7	8%	1.30	17	5%	0.76
	50+ mph (*)	43%	7	8%	0.19	20	6%	0.13
	No Data (*)	3%	3	3%	1.03	8	2%	0.66
Func-tional Classif-ication	*Primary Road without Limited Access (*)*	2%	5	6%	2.35	28	8%	3.18
	Secondary and Connecting Road	14%	44	51%	3.61	139	39%	2.76
	Local, Neighborhood, and Rural Road	81%	35	41%	0.50	181	51%	0.63
	Other (*)	2%	2	2%	1.06	7	2%	0.90
Ped / Bike Activity Levels	*No Data (*)*	10%	3	3%	0.35	5	1%	0.14
	Low Activity	76%	19	22%	0.29	67	19%	0.25
	Moderate Activity	10%	33	38%	3.74	134	38%	3.68
	High Activity	4%	31	36%	8.55	149	42%	9.96
Area Type	*Rural*	59%	12	14%	0.24	20	6%	0.10
	Urban	41%	74	86%	2.08	335	94%	2.28
Number of Lanes	*1 Lane (*)*	1%	6	7%	4.89	14	4%	2.76
	2 Lanes	93%	66	77%	0.82	296	83%	0.89
	3 Lanes (*)	1%	4	5%	5.46	9	3%	2.98
	4+ Lanes (*)	2%	9	10%	6.39	31	9%	5.33
Daily Auto Volumes (AADT)	*No Data (*)*	5%	1	1%	0.22	4	1%	0.21
	Less than 2,500	85%	28	33%	0.38	146	41%	0.48
	2,500 - 4,999	4%	13	15%	3.64	51	14%	3.46
	5,000 - 9,999	3%	31	36%	10.39	108	30%	8.77
	10,000 - 14,999 (*)	2%	11	13%	7.46	38	11%	6.24
	15,000 or More (*)	<1 %	2	2%	7.02	8	2%	6.80
TOTAL	***ALL***	**100%**	**86**	**100%**	**1.00**	**355**	**100%**	**1.00**

(*) – Limited crash data available to confidently generalize this particular representation ratio.

Table 65. Systemic Analysis (Broome County) – Pedestrian-Involved Crashes – Other Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	**Risk Factor**	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Transit Proximity	*Not Near Transit*	86%	24	28%	0.33	77	22%	0.25
	Near Transit Stop	14%	62	72%	5.00	278	78%	5.43
Juris-diction	*State Road*	11%	36	42%	3.75	124	35%	3.13
	County Road (*)	17%	7	8%	0.47	12	3%	0.20
	Other	72%	43	50%	0.70	219	62%	0.86
School Proximity	*Not Near School*	96%	70	81%	0.85	264	74%	0.78
	Near School	4%	16	19%	4.24	91	26%	5.84
	No Data (*)	3%	1	1%	0.42	5	1%	0.51
Direction	*One Way*	3%	11	13%	3.84	43	12%	3.63
	Two Way	97%	75	87%	0.90	312	88%	0.91
TOTAL	***ALL***	**100%**	**86**	**100%**	**1.00**	**355**	**100%**	**1.00**

(*) – Limited crash data available to confidently generalize this particular representation ratio.

Tioga County

Table 66. Systemic Analysis (Tioga County) – Pedestrian-Involved Crashes – Primary Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	Risk Factor	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity	Not Equity Area (+)	55%	7	78%	1.42	17	44%	0.79
	Equity Area (Top 21-40%) (+)	10%	0	0%	0.00	13	33%	3.23
	High Priority (Top 20%) (+)	35%	2	22%	0.64	9	23%	0.66
Posted Speed Limit	< 30 mph (+)	12%	0	0%	0.00	15	38%	3.21
	30 - 39 mph (+)	4%	2	22%	5.99	3	8%	2.07
	40 - 49 mph (+)	2%	2	22%	11.84	4	10%	5.47
	50+ mph (+)	77%	5	56%	0.72	15	38%	0.50
	No Data (+)	6%	0	0%	0.00	2	5%	0.93
Func-tional Classif-ication	Primary Road without Limited Access (+)	2%	0	0%	0.00	3	8%	5.11
	Secondary and Connecting Road (+)	9%	7	78%	8.36	20	51%	5.51
	Local, Neighborhood, and Rural Road (+)	83%	2	22%	0.27	16	41%	0.50
	Other (+)	6%	0	0%	0.00	0	0%	0.00
Ped / Bike Activity Levels	No Data (+)	17%	0	0%	0.00	0	0%	0.00
	Low Activity (+)	81%	8	89%	1.10	26	67%	0.83
	Moderate Activity (+)	2%	1	11%	4.70	13	33%	14.10
	High Activity (+)	-	-	-	-	-	-	-
Area Type	Rural (+)	88%	5	56%	0.63	16	41%	0.47
	Cluster (+)	7%	2	22%	3.06	18	46%	6.36
	Urban (+)	5%	2	22%	4.26	5	13%	2.46
Number of Lanes	No Data (+)	5%	0	0%	0.00	2	5%	1.06
	1 Lane (+)	3%	0	0%	0.00	1	3%	0.89
	2 Lanes (+)	92%	9	100%	1.09	34	87%	0.95
	4+ Lanes (+)	< 1%	0	0%	0.00	2	5%	51.67
Daily Auto Volumes (AADT)	No Data (+)	19%	0	0%	0.00	0	0%	0.00
	Less than 2,500 (+)	73%	3	33%	0.46	18	46%	0.63
	2,500 - 4,999 (+)	6%	4	44%	6.96	13	33%	5.22
	5,000 - 9,999 (+)	1%	2	22%	15.00	8	21%	13.85
	10,000 - 14,999 (+)	< 1%	0	0%	0.00	0	0%	0.00
TOTAL	**ALL**	**100%**	**9**	**100%**	**1.00**	**39**	**100%**	**1.00**

(+) – Limited crash data available to confidently generalize for all pedestrian-involved representation ratios in Tioga County.

Table 67. Systemic Analysis (Tioga County) – Pedestrian-Involved Crashes – Other Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	Risk Factor	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Transit Proximity	Not Near Transit (+)	99%	9	100%	1.01	36	92%	0.93
	Near Transit Stop (+)	1%	0	0%	0.00	3	8%	13.77
Juris-diction	State Road (+)	10%	6	67%	6.61	19	49%	4.83
	County Road (+)	11%	1	11%	1.00	4	10%	0.92
	Other (+)	79%	2	22%	0.28	16	41%	0.52
School Proximity	Not Near School (+)	98%	9	100%	1.02	39	100%	1.02
	Near School (+)	2%	0	0%	0.00	0	0%	0.00
Direction	One Way (+)	< 1%	0	0%	0.00	3	8%	19.45
	Two Way (+)	100%	9	100%	1.00	36	92%	0.93
TOTAL	**ALL**	**100%**	**9**	**100%**	**1.00**	**39**	**100%**	**1.00**

(+) – Limited crash data available to confidently generalize for all pedestrian-involved representation ratios in Tioga County.

11.3 Systemic Factors – Bicyclist-Involved Crashes

Broome County

Table 68. Systemic Analysis (Broome County) – Bicyclist-Involved Crashes – Primary Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	Risk Factor	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity	Not Equity Area (*)	77%	8	22%	0.28	53	23%	0.30
	Equity Area (Top 21-40%)	9%	20	54%	5.89	135	59%	6.40
	High Priority (Top 20%) (*)	13%	9	24%	1.80	42	18%	1.35
Posted Speed Limit	< 30 mph	39%	33	89%	2.28	188	82%	2.09
	30 - 39 mph (*)	8%	1	3%	0.32	7	3%	0.36
	40 - 49 mph (*)	6%	1	3%	0.43	16	7%	1.11
	50+ mph (*)	43%	2	5%	0.13	14	6%	0.14
	No Data (*)	3%	0	0%	0.00	5	2%	0.64
Func-tional Classif-ication	Primary Road without Limited Access (*)	2%	2	5%	2.18	21	9%	3.68
	Secondary and Connecting Road	14%	21	57%	4.00	110	48%	3.37
	Local, Neighborhood, and Rural Road	81%	14	38%	0.47	97	42%	0.52
	Other (*)	2%	0	0%	0.00	2	1%	0.40
Ped / Bike Activity Levels	No Data (*)	10%	0	0%	0.00	0	0%	0.00
	Low Activity (*)	76%	6	16%	0.21	35	15%	0.20
	Moderate Activity	10%	14	38%	3.69	88	38%	3.73
	High Activity	4%	17	46%	10.90	107	47%	11.04
Area Type	Rural (*)	59%	2	5%	0.09	3	1%	0.02
	Urban	41%	35	95%	2.28	227	99%	2.38
Number of Lanes	No Data (*)	3%	0	0%	0.00	3	1%	0.47
	1 Lane (*)	1%	1	3%	1.89	6	3%	1.83
	2 Lanes	93%	29	78%	0.84	178	77%	0.83
	3 Lanes (*)	1%	3	8%	9.52	8	3%	4.08
	4+ Lanes (*)	2%	4	11%	6.60	35	15%	9.30
Daily Auto Volumes (AADT)	No Data (*)	5%	0	0%	0.00	3	1%	0.25
	Less than 2,500	85%	12	32%	0.38	77	33%	0.39
	2,500 - 4,999 (*)	4%	7	19%	4.55	31	13%	3.24
	5,000 - 9,999	3%	14	38%	10.91	71	31%	8.90
	10,000 - 14,999 (*)	2%	4	11%	6.30	37	16%	9.38
	15,000 or More (*)	< 1%	0	0%	0.00	11	5%	14.44
TOTAL	**ALL**	**100%**	**37**	**100%**	**1.00**	**230**	**100%**	**1.00**

(*) – Limited crash data available to confidently generalize this particular representation ratio.

Table 69. Systemic Analysis (Broome County) – Bicyclist-Involved Crashes – Other Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	Risk Factor	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Transit Proximity	Not Near Transit (*)	86%	9	24%	0.28	39	17%	0.20
	Near Transit Stop	14%	28	76%	5.25	191	83%	5.76
Juris-diction	State Road	11%	14	38%	3.39	94	41%	3.66
	County Road (*)	17%	1	3%	0.16	8	3%	0.20
	Other	72%	22	59%	0.83	128	56%	0.78
School Proximity	Not Near School	96%	29	78%	0.82	185	80%	0.84
	Near School (*)	4%	8	22%	4.93	45	20%	4.46
Direction	One Way (*)	3%	4	11%	3.24	26	11%	3.39
	Two Way	97%	33	89%	0.92	204	89%	0.92
TOTAL	**ALL**	**100%**	**37**	**100%**	**1.00**	**230**	**100%**	**1.00**

(*) – Limited crash data available to confidently generalize this particular representation ratio.

Tioga County

Table 70. Systemic Analysis (Tioga County) – Bicyclist-Involved Crashes – Primary Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	**Risk Factor**	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Equity	*Not Equity Area (+)*	55%	0	0%	0.00	4	25%	0.45
	Equity Area (Top 21-40%) (+)	10%	3	75%	7.27	10	63%	6.06
	High Priority (Top 20%) (+)	35%	1	25%	0.72	2	13%	0.36
Posted Speed Limit	*< 30 mph (+)*	12%	3	75%	6.25	11	69%	5.73
	30 - 39 mph (+)	4%	0	0%	0.00	2	13%	3.37
	40 - 49 mph (+)	2%	0	0%	0.00	1	6%	3.33
	50+ mph (+)	77%	1	25%	0.33	2	13%	0.16
	No Data (+)	6%	0	0%	0.00	0	0%	0.00
Func-tional Classif-ication	*Primary Road without Limited Access (+)*	2%	0	0%	0.00	1	6%	4.15
	Secondary and Connecting Road (+)	9%	1	25%	2.69	5	31%	3.36
	Local, Neighborhood, and Rural Road (+)	83%	3	75%	0.91	10	63%	0.75
	Other (+)	6%	0	0%	0.00	0	0%	0.00
Ped / Bike Activity Levels	*No Data (+)*	17%	0	0%	0.00	0	0%	0.00
	Low Activity (+)	81%	2	50%	0.62	7	44%	0.54
	Moderate Activity (+)	2%	2	50%	21.16	9	56%	23.80
	High Activity (+)	-	-	-	-	-	-	-
Area Type	*Rural (+)*	88%	2	50%	0.57	5	31%	0.36
	Cluster (+)	7%	2	50%	6.89	11	69%	9.48
	Urban (+)	5%	0	0%	0.00	0	0%	0.00
Number of Lanes	*No Data (+)*	5%	0	0%	0.00	0	0%	0.00
	1 Lane (+)	3%	0	0%	0.00	0	0%	0.00
	2 Lanes (+)	92%	4	100%	1.09	15	94%	1.02
	4+ Lanes (+)	< 1%	0	0%	0.00	1	6%	62.98
Daily Auto Volumes (AADT)	*No Data (+)*	19%	0	0%	0.00	0	0%	0.00
	Less than 2,500 (+)	73%	3	75%	1.02	10	63%	0.85
	2,500 - 4,999 (+)	6%	1	25%	3.92	1	6%	0.98
	5,000 - 9,999 (+)	1%	0	0%	0.00	5	31%	21.10
	10,000 - 14,999 (+)	< 1%	0	0%	0.00	0	0%	0.00
TOTAL	***ALL***	**100%**	**4**	**100%**	**1.00**	**16**	**100%**	**1.00**

(+) – Limited crash data available to confidently generalize for all bicyclist-involved representation ratios in Tioga County.

Table 71. Systemic Analysis (Tioga County) – Bicyclist-Involved Crashes – Other Risk Factors

		LENGTH	FATAL OR SERIOUS INJURY (KSI) CRASHES			ALL INJURY (KABC) CRASHES		
Variable Assessed	**Risk Factor**	Share of Roads	Crash Count	Share of Crashes	Represent. Ratio	Crash Count	Share of Crashes	Represent. Ratio
Transit Proximity	*Not Near Transit (+)*	99%	4	100%	1.01	15	94%	0.94
	Near Transit Stop (+)	1%	0	0%	0.00	1	6%	11.19
Juris-diction	*State Road (+)*	10%	1	25%	2.48	5	31%	3.10
	County Road (+)	11%	0	0%	0.00	0	0%	0.00
	Other (+)	79%	3	75%	0.95	11	69%	0.87
School Proximity	*Not Near School (+)*	98%	4	100%	1.02	16	100%	1.02
	Near School (+)	2%	0	0%	0.00	0	0%	0.00
Direction	*One Way (+)*	0%	0	0%	0.00	0	0%	0.00
	Two Way (+)	100%	4	100%	1.00	16	100%	1.00
TOTAL	***ALL***	**100%**	**4**	**100%**	**1.00**	**16**	**100%**	**1.00**

(+) – Limited crash data available to confidently generalize for all bicyclist-involved representation ratios in Tioga County.

12. Project Development & Prioritization

12.1 Project Development

12.1.1 Identifying Potential Project Locations

The results of the prior analyses presented in this Action Plan provided several tangible data sets (e.g., High Injury Corridors and Intersections, High Risk Network, NYSDOT CLEAR data, etc.) to inform the development of potential implementation project locations. The objectives contributing to project identification include:

- Promoting safety to prevent fatal and serious injuries on public roadways;
- Employing low-cost, high-impact strategies that improve safety over wide geographic areas;
- Ensuring equitable investment in the safety needs of underserved communities which include both urban and rural communities;
- Incorporating evidence-based projects and strategies and adopt innovative technologies; and
- Demonstrating engagement with a variety of public and private stakeholders.

Potential projects were initially identified by performing an analysis of available crash data. The High Injury Network (HIN) was initially utilized because it represents empirical data of where the most frequent and severe crashes occurred during the analysis period.

This analysis was compartmentalized into both key intersections and corridors within Broome and Tioga Counties. The result being a paired down list of priority intersections and corridors with the highest number of KSI crashes warranting further evaluation. In total, 26 corridors and 15 intersections were identified in Broome County and similarly 16 corridors and 20 intersections within Tioga County.

To understand the nature of the safety issues present at each of the 42 corridors and 35 intersections initially considered, a comprehensive review of crash characteristics (via NYSDOT CLEAR) was conducted for each potential priority location. This CLEAR-based exploratory analysis provided further context for each location regarding typical crash types, common collision types, and frequent contributing actions. This records-based screening served to narrow the list of potential locations to focus on sites where infrastructure changes had the greatest potential to affect safety outcomes.

Further GIS evaluation was performed for each potential implementation location. This included analyzing each location with respect to:

1. High Injury Network
2. High Risk Network
3. Regional Equity Data
4. NYSDOT CLEAR Level of Service of Safety (LOSS) Metrics
5. Public Outreach Survey Results

Following these initial screenings, coordination meetings were held with the Project Steering Committee (PSC) to solicit feedback and review pre-existing planned improvements projects within both counties. Feedback from the PSC, NYSDOT in particular, informed the development of specific project limits, as well as potential countermeasures.

Site visits were performed at each approved project location to "ground truth" the feasibility of potentially relevant safety countermeasures. Existing site conditions, such as highway geometry (e.g., horizontal / vertical curves, lane configurations, shoulder conditions), right-of-way, intersection sight distance, traffic signal inventory, pedestrian and bicycle infrastructure, and presence of utilities, were recorded for future project development.

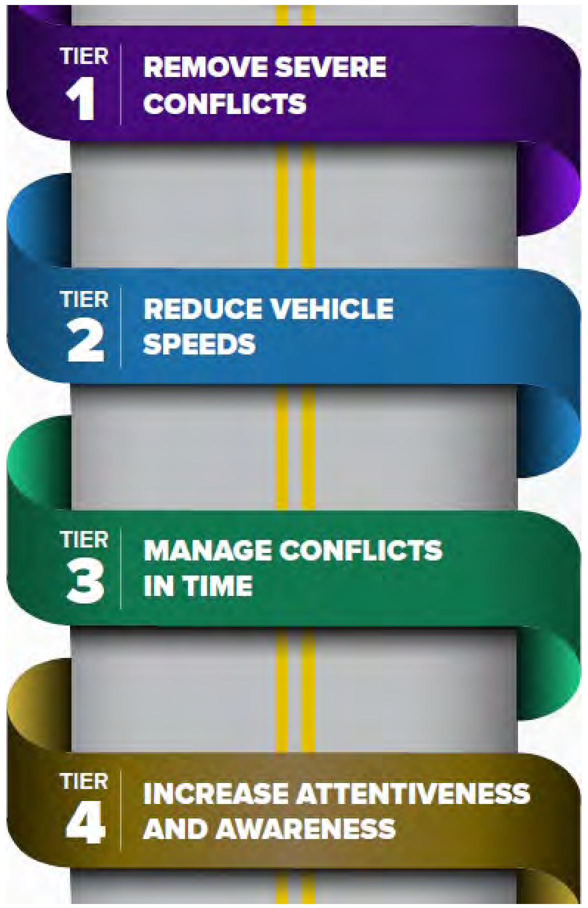
12.1.2 Developing Relevant Countermeasures for Selected Locations

The U.S. Department of Transportation's Federal Highway Administration (FHWA) has issued its Proven Safety Countermeasures initiative (PSCi), a collection of 28 countermeasures and strategies effective in reducing roadway fatalities and serious injuries, was consulted to guide the development of relevant countermeasures, and ultimately the basis of potential implementation projects. Each PSCi countermeasure addresses at least one safety focus area (e.g., speed management, intersection safety, roadway departures, or pedestrian/bicyclist safety). A comprehensive review of crash data, contributing actions, GIS analysis, public and stakeholder feedback, and existing site conditions were leveraged to evaluate the feasibility of each PSCi countermeasure for a given location.

An AutoCAD layout for each project was developed to establish baseline existing conditions and identify appropriate locations for safety countermeasures. The strategies and countermeasures proposed seek to address site-specific safety concerns. For example, roadway departure countermeasures were predominantly proposed for rural corridors whereas medians and pedestrian refuge islands were proposed at intersections with a history of crashes involving vulnerable road users.

The countermeasures proposed align with the USDOT's Safe System Roadway Design Hierarchy, which is summarized in **Figure 77**. The hierarchy assigns a tier rating to each potential safety countermeasure based on the extent to which it reduces the likelihood of a severe injury crash through physical separation (e.g., sidewalks, dedicated turn lanes), lower vehicle speeds (e.g., infrastructure and operations), temporal separation (e.g., exclusive or leading phase for vulnerable road users), and boosting user attentiveness and awareness (e.g., signage).

Figure 77. Safe System Roadway Design Hierarchy (Source: USDOT FHWA)



Project costs inclusive of implementation costs (i.e. construction), as well as soft costs (e.g., engineering design, planimetric surveys, and construction inspection), were estimated to inform a benefit-cost analysis, as well as anticipated project timeframes (i.e., short-, mid-, and long-term).

12.1.3 Caveats and Exclusions for Costs and Implementation Timelines

Anticipated total project costs (TPC) are presented within the tables of Section 6.2 (Project List), as well as the individual project profiles that conclude this chapter. The following assumptions and limitations apply to the capital cost estimates developed for this study:

- Unit costs for individual implementation/construction items were based on trends over the past five years (as of 2025).
- It is assumed that federal / state funding will be secured for implementation. As such, unit costs consistent with federal / state specifications were assumed, alongside prevailing wages.
- Materials and construction costs will fluctuate in the future and may increase or decrease based on the availability of materials, global market conditions (e.g., tariffs), and influence of competing projects.
- Costs for work zone traffic control, survey, engineering design, and construction inspection efforts, are based on industry standards set forth by NYSDOT.
- Project costs associated with right-of-way, environmental screenings / permits, and utility alterations are NOT included. These costs are typically established during preliminary design once a survey has been performed to quantify project impacts.
- To account for potential cost increases, a 20% contingency / inflation factor was incorporated.

12.2 Prioritization Framework

Table 72 outlines the evaluation rubric used within this prioritization scheme. The prioritized list of capital projects presented in the next section accounts for each location's crash history (HIN), relative risk (HRN and LOSS), potential to impact vulnerable road users, and proximity to equity communities, as well as the relative competitiveness of each project based on estimates of capital cost and the expected crash reduction benefits triggered by the safety countermeasures proposed at that particular location. This prioritization scheme awarded a total of 100 points across four categories and eight evaluation criteria, as summarized below.

1) Safety Impacts (50%)
2) Project Competitiveness (20%)
3) Vulnerable Road User & Community Facilities (15%)
4) Equity (15%)

Table 72. Prioritization Score Evaluation Rubric

Category / Theme	Category Weight	Prioritization Criteria	Criteria Weight	Rankings / Classifications	Points Awarded
Safety Impact	50%	High Injury Network Ranking (Corridors / Intersection)	30%	Top 1% / Top 3	30 / 30
				Top 3% / Top 5	25 / 24
				Top 5% / Top 10	20 / 18
				Top 10% / Top 15	15 / 12
				Top 15% / Top 20	10 / 6
				Top 25% / Not Top 20	5 / 0
		High Risk Network Score	15%	Highest (Top 3%)	15
				Higher (Top 5%)	12
				High (Top 10%)	9
				Moderate (Top 25%)	6
				Low (Top 50%)	3
		CLEAR Level of Safety Service (LOSS)	5%	Highest (4)	5
				2nd Highest (3)	3
Project Competitiveness	20%	Benefit-Cost Ratio	20%	45	20.0
				15	13.3
				3	6.7
VRU & Community Facilities	15%	Vulnerable Road User Injury Crashes (KABC)	10%	2	10
				1	5
		Proximity to Schools & Parks	5%	Within 1/8 Mile	5
Equity	15%	Vulnerable Community Analysis	10%	High Priority (Top 20%)	10
				Priority (Top 21-40%)	5
		Federal Designation (Underserved)	5%	Meets Federal Criteria	5
4 Categories	100%	8 Evaluation Criteria	100%	MAX SCORE	100

Reflecting half the weight of the prioritization scheme (50%), the **Safety Impacts** category utilized the High Injury Network, the High Risk Network, and NYSDOT CLEAR's Level of Safety Service (LOSS) rating, which compares the expected crash frequency to the predicted crash frequency based on vehicle volumes, to assess the extent of the safety issue at each location. Within this category, most of the weight (60% in this category, 30% overall) was based on the reactive High Injury Network, with points assigned for any facility within the Top 25% of the High Injury Corridors or the Top 20 among the High Injury Intersections. To incorporate an assessment of future crash risk, up to 15 points were assigned for facilities that ranked within the Top 50% of the study's High Risk Network. In addition, up to 5 points were allocated whenever a facility was rated as a 4 (10th percentile) or 3 (10th to 50th percentile) within NYSDOT CLEAR's LOSS ratings system.[3]

The **Project Competitiveness** category, which was evaluated via project-specific estimates of crash reduction benefits stemming from the safety countermeasures depicted in this chapter, constituted 20% of the total prioritization score. For more information on the benefit-cost analysis, please refer to APPENDIX – Benefit-Cost Analysis.

Accounting for 15% of the total score, the **Vulnerable Road Users & Community Facilities** category seeks to guide investment towards locations where injury crashes involving pedestrians and cyclists have already occurred and/or project areas that are proximate to schools and/or public parks. VRU crash history was awarded up to 10 points if the location had a documented history of injury crashes involving pedestrians or cyclists over the five-year study period. Five points were assigned whenever a school or public park was found to lie within one-eighth of a mile.

The **Equity** category blends the vulnerable community analysis (Chapter 2) with federally-issued assessments of whether a community is traditionally underserved to award up to 15% of the prioritization score. Using the study-specific designations of High Priority Equity Area (Top 20%) and Priority Equity Area (Top 21-40%), a project was awarded 10 or 5 points, respectively, based on its overlap with the highest-rated (i.e., most vulnerable) block group traversed. A project earned an additional five points if it traversed a tract that was defined as an "Underserved Community" within the USDOT's FY 2025 SS4A Underserved Communities online tool.

12.2.1 Determining Tiebreaks for Rankings

En route to developing a prioritized list of safety priorities, the total prioritization score was used as the primary ranking metric. In cases where two or more projects earned the same total prioritization score, first order ties were decided by comparing the prioritization score component for High Injury Network Ranking, with the project location that received the higher HIN-based score ranked first. When necessary, second order ties were broken based on the benefit-cost ratio, with the project that had the higher BCR ranked first.

[3] *Highway Safety Improvement Program Procedures and Techniques (aka "Red Book").* New York State Department of Transportation. 2023. Page 37.

12.2.2 Project Timeframe

Recognizing the trade-offs between filling a critical funding gap and accepting a substantial administrative burden with regard to administering federal / state grant awards, this study sought to define project implementation timeframes based on the overall magnitude of the anticipated cost. **Table 73** shows the capital cost breakpoints that were used to define the implementation timeframe for each project proposed.

Table 73. Project Timeframes & Capital Cost Thresholds

PROJECT TIMEFRAME / TYPE	INTERSECTION	CORRIDOR
Short-Term	< $175,000	< $500,000
Mid-Term	< $400,000	< $1,000,000
Long-Term	≥ $400,000	≥ $1,000,000

This approach effectively creates different time-based bins of investment priorities. With this information, BMTS can quickly understand its most promising safety projects based on the extent to which the construction effort could be funded through primarily local means (short-term) or may require a mix of outside funding from state/federal partners (mid- or long-term).

13. Benefit-Cost Analysis

In developing conceptual engineering approaches to addressing roadway safety issues for the Priority Projects, the suite of countermeasures reviewed in Chapter 6 (Capital Projects to Address the High Injury Network) was utilized. A team of planners and engineers used aerial imagery, professional judgment, and federal guidance related to anticipated crash reduction factors[4] to assign relevant countermeasures, estimate their potential safety, and compute a high-level, 20-year benefit-cost ratio (BCR). The BCR was used within the prioritization process as a proxy for project competitiveness, serving to supplement the other heavily location-based prioritization metrics.

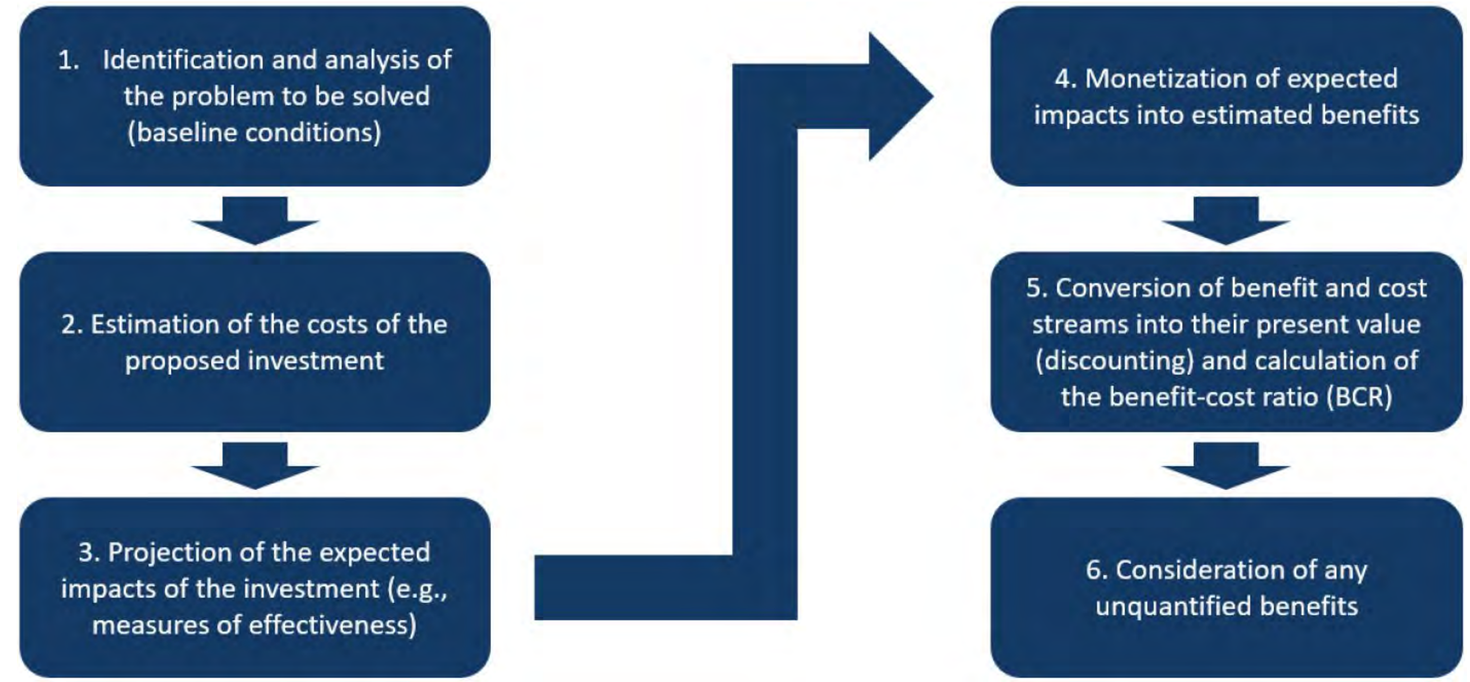
13.1 Benefit-Cost Analysis Overview

As summarized below, the process used to estimate safety-related benefits is aligned closely with the core components of FHWA's Benefit-Cost Analysis (BCA) methodology. [5]

1. Service life of the improvement of 20 years
2. Use of Crash Modification Factors (CMFs) from the CMF Clearinghouse that are applied to relevant crashes (e.g., all injury severity crashes, correct context – corridor versus intersection, high confidence or star rating on the CMF, etc.)
3. Use of historical crash records to estimate safety-related benefits from expected crash reductions
4. Applying a discount rate of approximately 7%

The general process used to conduct a BCA, as depicted by the USDOT in the May 2025 guidance, is shown in **Figure 78**. In line with previous SS4A Notice of Funding Opportunity (NOFO) announcements, this plan, which is published ahead of the FY 2026 NOFO, reports project both project costs and benefits in 2025 dollars.

Figure 78. Benefit-Cost Analysis – Process Overview (Source: USDOT, May 2025, pg. 7)



13.2 Estimating Benefits from Relevant Countermeasures

For each capital project shown in Chapter 6, crash data spanning from 2019-2023 was analyzed via NYSDOT's CLEAR portal. This was used to identify any crash clusters, such as a particular curve, intersection, or driveway, and the associated manners of collision in which roadway crashes were reported to occur. Based on this review, relevant safety countermeasures were suggested to address existing crash histories at these particular locations.

With an understanding of the crash histories within a given project area and a conceptual approach to addressing safety issues via the proposed countermeasures, safety-related benefits for each capital project were estimated using the following process:

1. Separated the segment- and intersection-related crashes into two distinct groups, then performed the routines below within each grouping
   a. Counted the number of crash events (i.e., crashes or persons injured) by severity

[4] Crash Modification Factors (CMFs) were retrieved from the USDOT-funded Crash Modification Factors Clearinghouse, with a preference for those that were readily generalizable (i.e., they pertained to All crash types and related to either All or All Injury severity types).

[5] USDOT. "Benefit-Cost Analysis Guidance for Discretionary Grant Programs." May 2025. Available at https://www.transportation.gov/sites/dot.gov/files/2025-05/Benefit%20Cost%20Analysis%20Guidance%202025%20Update%20II%20%28Final%29.pdf

b. Calculated the total value of all collisions by multiplying the (corridor- or intersection-level) severity-based crash counts by the USDOT-informed values for each severity type (**Table 74**)
c. Estimated the combined crash reduction factor associated with the suite of countermeasures using the dominant common residuals method, which can be used to control for the influence of potential overlapping effects among similar countermeasures
d. Generated the economic value of the crash reductions by multiplying the total value of all collisions (b) and the combined crash reduction factor (c)

2. Estimated the safety-related benefit for the project as a whole by adding the corridor- and intersection-level values above (d)

Table 74. Monetized Value of Reduced Fatalities, Injuries, and Crashes (Source: Table A-1, USDOT BCA Guidance, May 2025)

Crash Type / BASIS OF BENEFITS	PER CRASH	PER PERSON INVOLVED
Killed (K)	$14,806,000	$13,200,000
Serious Injury (A)	$329,500	$1,254,700
Minor Injury (B)	$329,500	$246,900
Possible Injury (C)	$329,500	$118,000
Property Damage Only (O)	$9,500	$5,300

13.3 Capital Costs

The development of capital costs is described in APPENDIX – Project Development & Prioritization.

13.4 Benefit-Cost Ratio (BCR)

The Benefit-Cost Ratio (BCR), which was calculated by dividing the countermeasures' anticipated safety-related benefits over a 20-year service life by their estimated capital cost, accounted for 20% of a project's total prioritization score. Projects with a BCR of 1.0 are estimated to produce one dollar of safety-related benefit for every dollar necessary to install the countermeasures. In terms of gauging competitiveness for future grant applications, projects with a BCR greater than 1.0 are expected to generate more safety-related benefits than costs (i.e., public spending could be justified solely based on number of roadway-related injuries and fatalities avoided).

13.5 BCA Approach Caveats

The methodology used to estimate costs and benefits for this plan is a simplification of the process a community would need to undertake in order to submit a benefit-cost analysis for an SS4A Implementation grant. It is only meant to capture an order-of-magnitude sense of the potential costs and safety-related benefits. Recognizing the planning nature of this effort, a more in-depth and technical economic analysis was not completed; however, such an analysis would include the following:

1. Expanded calculation of non-safety related benefits: economic, travel time, state of good repair, operations cost, environmental/emissions, health, etc.
2. Expanded calculation of safety related benefits to capture any crash reduction created as a result of mode shift brought about by the project
3. Detailed argument for the appropriateness of each CMF applied, as it relates to the literature from which it was derived and the methodology of combining CMFs (dominant common residuals)
4. Escalation of crash rates in the no-build, modeled with traffic volumes, declining roadway conditions, etc.
5. Expansion of project costs to capture the true capital cost of construction based on detailed design drawings, and the inclusion of operation and maintenance costs for the useful life of the project
6. Capturing "disbenefits", which were screened out from this analysis
   a. Only sidewalks, which were reset to a CMF of 1
   b. FHWA has guidance on the benefit per mile for certain bicycle and pedestrian facilities, but these need to be modeled subject to their assumptions and diminishing returns
7. Shift to a non-linear estimation of benefits
   a. Crash reduction is uniform over the 20-year period and always matches the CMF value

14. New York SHSP 2023-2027: Appendix 1

NEW YORK STATE

Governor Kathy Hochul
Commissioner Marie Therese Dominguez

Appendix 1: Strategic Highway Safety Plan

2023-2027

STRATEGIES

Reducing the number of intersection-related fatal and serious injury crashes will be achieved through a Safe Systems Approach using strategies that encourage safe road users, safe vehicles, safe speeds, safe roads, and post-crash care to address contributing factors.

This Strategic Highway Safety Plan (SHSP) includes the following strategies to address the Intersections emphasis area:

1. Develop a Statewide Intersection Safety Action Plan.
2. Implement systemic safety improvement projects at intersections.
3. Implement safety countermeasures at intersections based on location-specific crash data.
4. Support policy initiatives to increase intersection safety.
5. Develop educational materials to promote safer travel at intersections.
6. Improve enforcement of traffic laws at intersections

1 Develop a Statewide Intersection Safety Action Plan.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Determine which intersection countermeasures are effective (targeted and systemic) in New York and should be expanded.	NYS DOT/*All partners*	Enforcement	Safer Speeds
Engage education and enforcement partners in the intersection plan's develeopment, implementation, and outreach.	NYS DOT, *MPOs/All partners*	Enforcement	Safer Vehicles, Safer People

2 Implement systemic safety improvements projects at intersections.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Identify intersections with high risk roadway features that are correlated with crash types.	NYS DOT, *MPOs/All partners*	Engineering	Safe Roads
Provide training and documentation on the systemic analysis process.	NYS DOT, *MPOs/All partners*	Engineering	Safe Roads
Identify and implement appropriate countermeasures at intersections with risk factors.	No lead agency/*All partners*	Engineering	Safe Roads
Refine the intersection inventory to improve the identification of locations with risk factors on all public roads.	NYS DOT/*All partners*	Engineering	Safe Roads

3 Implement safety countermeasures at intersections based on location-specific crash data.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Identify intersections safety by implementing Complete Streets roadway designs.	NYS DOT/*All partners*	Engineering	Safe Roads
Improve intersection geometry by supporting innovative intersection designs. (e.g., improve signal detection and signal timing)	NYS DOT/*All partners*	Engineering	Safe Roads
Improve signal operation by encouraging signal timing assessments.	No lead agency/*All partners*	Engineering	Safe Roads
Continue to evaluate the effectiveness of intersection safety projects.	No lead agency/*All partners*	Engineering	Safe Roads

3 Implement safety countermeasures at intersections based on location-specific crash data. (cont'd)

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Improve safety at signalized intersections by adding, upgrading, or removing signals as warranted.	No lead agency/*All partners*	Engineering	Safe Roads
Improve or eliminate highway-railroad grade crossings to reduce the frequency and severity of crashes at grade crossings.	NYS DOT/*All partners*	Engineering	Safe Roads

4 Support policy initiatives that increase intersection safety.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Support complete streets policy and implementation and livable communities' initiatives in accordance with State law.	*MPOs / All partners*	Engineering	Safe Roads
Facilitate grant application process for municipalities and rural areas not served by MPOs.	NYS DOT, *MPO / All partners*	Education	Safe Roads

5 Develop educational materials to promote safer travel at intersections.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Encourage the use of the Driver Education Research and Innovation Center model.	NYS DOH, *GTSC/All partners*	Education	Safe Road Users
Develop materials, outreach, and training to educate the public on new traffic control devices.	NYS DOT/*All partners*	Education	Safe Road Users
Promote public awareness of intersection safety issues and provide educational resources for all users on ways to prevent crashes.	NYS DOH/*All partners*	Education	Safe Road Users

6 Improve enforcement of traffic laws at intersections.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Support the use of intelligent transportation systems to improve safety.	NYS DOT/*All partners*	Enforcement	Safer Vehicles
Support the use of emerging technologies such as connected vehicle technology.	NYS DOT/*All partners*	Enforcement	Safer Vehicles

This Strategic Highway Safety Plan (SHSP) includes the following strategies to support the Vulnerable Road Users emphasis area:

STRATEGIES

Reducing fatal and serious injury crashes involving vulnerable road users will be achieved through multidisciplinary approaches incorporating strategies developed using the Safe System Approach that encourages safe road users, safe vehicles, safe speeds, safe roads, and post-crash care to address contributing factors.

1. Continue implementing infrastructure programs to enhance vulnerable road user safety, especially in High Risk areas.
2. Enhance data processes to easily obtain current vulnerable road user data, especially in High Risk areas.
3. Support policy initiatives to increase vulnerable road user safety, especially in High Risk areas.
4. Continue educational programs for vulnerable road user safety, especially in High Risk areas.
5. Continue to work with vulnerable road user advocates and working groups, especially regarding strategies to address safety in High Risk areas.
6. Enforce safety laws that pertain to vulnerable road users and motorists, especially in High Risk areas.

1 Continue implementing infrastructure programs to enhance vulnerable road user safety especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Promote work zone safety for highway workers, cyclists, and pedestrians.	GTSC/*All agencies*	Engineering	Safe Roads, Safe Road Users, Safe Speeds
Promote pedestrian and bicycle safety and encourage mobility, especially in disadvantaged communities, by consdiering new or additional pedestrian and bicycle infrastructure.	NYS DOT, MPOs *All partners*	Engineering, Education	Safe Roads, Safe Road Users
Increase pedestrian safety measures, such as extended Leading Pedestrian Intervals (LPIs), curb extensions (on streets with parking), and left turn calming infrastucture where appropriate.	No lead agency/*All partners*	Engineering, Education	Safe Roads, Safe Road Users, Safe Speeds, Safe Vehicles
Construct safe, well-lit crosswalks along bus routes.	No lead agency/*All partners*	Engineering	Safe Roads, Safe Road Users
Encourage passive detection (instead of a button) and universal symbology to trigger the pedestrian signal when someone is waiting.	No lead agency/*All partners*	Engineering	Safe Roads, Safe Road Users
Conduct planning studies to determine the costs and benefits of highway removal projects for vulnerable road users in Special Equity Areas.	NYS DOT, MPOs/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Consider using the Complete Streets checklist on all projects.	No lead agency/*All partners*	Engineering	Safe Roads, Safe Road Users, Safe Speeds

2 Enhance data processes to easily obtain current vulnerable road user data, especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Incorporate demographic data, as available and Special Equity Area locations to enhnace the analysis in the Vulnerable Road User Safety Assessment.	NYS DOT/MPOs, *All agencies*	Engineering, Education	Safe Roads, Safe Road Users
Expand data collection, such as AADT, on all public roads.	No lead agency/*All partners*	Engineering	Safe Roads, Safe Road Users
Consolidate pedestrian count data and establish best practices.	NYS DOT, MPO/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Investigate the use of travel demand models to determine pedestrian and cyclist activity.	NYS DOT, MPO/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Support collaboration to discuss vulnerable road user data collection strategies and best practices.	NYS DOT, ITSMR, MPOs/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Continue Crash Location, Engineering Analysis and Reporting (CLEAR) training for NYS DOT staff, local municipalities, MPOs, and Tribal Nations.	NYS DOT/MPOs, *All partners*	Engineering, Education	Safe Roads, Safe Road Users
Consider collecting demographic data on police reports.	NYS DOT, ITSMR/*All partners*	Engineering, Education	Safe Roads, Safe Road Users

3 Support policy initiatives to increase vulnerable road user safety, especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Continue to support the NY Complete Streets Act.	NYS DOT/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Develop and implement the recommendations of the Active Transportation Strategic Plan.	NYS DOT/*All partners*	Engineering, Education, Enforcement	Safe Roads, Safe Road Users, Safe Vehicles, Safe Speeds
Analyze the results of smart work zone technologies to prevent crashes involving vulnerable road users in NYS, such as the Automated Work Zone Speed Enforcement program.	NYS DOT/*All partners*	Engineering	Safe Roads, Safe Road Users

4 Continue educational programs for vulnerable road user safety, especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Continue to promote public awareness of vulnerable user and work zone safety issues through interactive education, training, and outreach programs.	GTSC/*All partners*	Education	Safe Roads, Safe Road Users, Safe Speeds, Safe Vehicles
Ensure educational programs are multilingual and interact with groups like delivery cyclists and children and parents to share information.	GTSC/*All partners*	Education	Safe Roads, Safe Road Users, Safe Speeds, Safe Vehicles
Support educational outreach campaigns, such as Operation Safe Stop and Operation See! Be Seen, Share the Road, Slow Down, etc.	GTSC/*All partners*	Education	Safe Roads, Safe Road Users, Safe Speeds, Safe Vehicles
Provide vulnerable road user safety and enforcement training to police officers. Improve training for enforcement of failure to yield.	GTSC/*All partners*	Education, Enforcement	Safe Roads, Safe Road Users
In Amish communities, educate drivers on sharing the road with buggies or other horse-drawn equipment.	No lead agency/*All partners*	Education	Safe Roads, Safe Road Users
Provide training on best practices for crash analysis using CLEAR.	NYS DOT/*All partners*	Engineering, Education	Safe Roads, Safe Road Users

5 Continue to work with vulnerable road user advocates and working groups, especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Conduct community engagement training to improve outreach strategies with vulnerable road users, particularly those in High Risk areas.	NYS DOH/*All partners*	Education	Safe Road Users
Improve coordination, communication, and engagement strategies between the State, municipalities, and Tribal Nations.	NYS DOT, MPOs/*All partners*	Education	Safe Roads, Safe Road Users
Support walk or bike audits with stakeholder groups to gather input about pedestrian and bicycle safety issues.	NYS DOH, MPOs/*All partners*	Engineering, Education	Safe Roads, Safe Road Users
Coordinate follow-up stakeholder meetings following the publication of the Strategic Highway Safety Plan.	NYS DOT, MPOs/*All partners*	Engineering, Education	Safe Roads, Safe Road Users

6 Enforce safety laws that pertain to vulnerable road users and motorists, especially in High Risk areas.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Enforce lower motor vehicle speeds, especially in dense communities where pedestrian facilities traverse public roadways.	Law Enforcement/*All partners*	Enforcement	Safe Roads, Safe Road Users, Safe Speeds
Support community traffic safety programs.	GTSC/*All partners*	Enforcement, Education	Safe Roads, Safe Road Users
Implement Automated Work Zone Speed Enforcement (AWZSE) to reduce speeds and work zone crahses.	NYS DOT, Thruway Authority/ *All partners*	Enforcement	Safe Road Users

STRATEGIES

Decreased fatal and serious injury crashes involving roadway departures will be achieved through strategies developed using the Safe Systems Approach that encourages safe road users, safe vehicles, safe speeds, safe roads, and post-crash care to address contributing factors

This Strategic Highway Safety Plan (SHSP) includes the following strategies to address the Roadway Departures emphasis area:

1. Complete a statewide Roadway Departure Safety Action Plan.
2. Continue enforcement of traffic laws that reduce roadway departure crashes.
3. Develop educational materials related to roadway departure crashes.
4. Implement systemic safety improvements that decrease the severity of roadway departure crashes.
5. Implement safety countermeasures at specific locations based on roadway departure crash data

1 Complete a statewide Roadway Departure Safety Action Plan.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Determine which roadway departure countermeasures are effective in New York State and should be expanded.	NYS DOT / *All partners*	Engineering	Safe Roads
Engage education and enforcement partners in the development, implementation, and outreach of the Roadway Departure Safety Action Plan.	NYS DOT, MPOs / *All partners*	Engineering	Safe Roads

2 Continue enforcement of traffic laws that reduce roadway departure crashes.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Increase enforcement, education, and public awareness of the causes of Roadway Departure crashes.	GTSC / *All partners*	Enforcement/ Education	Safe Road Users

3 Develop educational materials related to roadway departure crashes.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Develop outreach materials and training to educate the public on the major causes of roadway departure crashes.	NYS DOT / *All partners*	Education	Safe Road Users
Conduct outreach to the public.	NYS DOH / *All partners*	Education	Safe Road Users

4 Implement systemic safety improvements that decrease the severity of roadway departure crashes.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Identify locations with high risk roadway features correlated with roadway departure crashes.	NYS DOT / *All partners*	Engineering	Safe Roads
Install Centerline Audible Roadway Delineators (CARDs) and Shoulder Audible Roadway Delineators (SHARDs) on eligible roadways.	NYS DOT / *All partners*	Engineering	Safe Roads
Support innovative processes and technology such as Intelligent Transportation Systems (ITS) and Traffic Incident Management (TIM).	NYS DOT / *All partners*	Engineering	Safe Road Users

5 Implement safety countermeasures at locations based on roadway departure crash data.

Strategy/Proposed Action	Lead Agency/Partners	Focus	Safe Systems Element
Implement proven countermeasures such as shoulder improvements, roadway delineation, geometric improvements, and reflective line painting.	NYS DOT / *All partners*	Engineering	Safe Roads
Continue to implement the Skid Accident Reduction Program (SKARP).	NYS DOT / *All partners*	Engineering	Safe Roads