TRIANGLE WEST
Transportation Planning Organization

April 2025 DRAFT

Triangle West Transportation Planning Organization

VISION ZERO ACTION PLAN

List of Abbreviations & Acronyms

AADT: Annual Average Daily Traffic

ACS: American Community Survey

CDC: Centers for Disease Control and Prevention

CPRC: Central Pines Regional Council

CIP: Capital Improvement Program

DUI: Driving Under the Influence

EMS: Emergency Medical Services

EPDO: Equivalent Property Damage Only

FARS: Fatality Analysis Reporting System

FHWA: Federal Highway Administration

GIS: Geographic Information Systems

HII: High Injury Intersections

HIN: High Injury Network

HRN: High Risk Network

IPD: Indicators of Potential Disadvantage

KABCO: Injury Severity Scale:

- **K:** Fatal injury
- **A:** Suspected serious injury
- **B:** Suspected minor injury
- **C:** Possible injury
- **O:** No apparent injury

KSI: Killed or Serious Injury (K and A on KABCO scale)

LPI: Leading Pedestrian Interval

NC: North Carolina

NCDOT: North Carolina Department of Transportation

NCHS: National Center for Health Statistics

NCRR: North Carolina Railroad Company

NHTSA: National Highway Traffic Safety Administration

OSM: OpenStreetMap

PCSi: Proven Safety Countermeasure initiative

PHB: Pedestrian Hybrid Beacon

PDO: Property Damage Only

RRFB: Rectangular Rapid Flashing Beacon

SSA: Safe System Approach

SOV: Single-Occupant Vehicle

SRTS: Safe Routes to School

TDI: Transportation Disadvantage Index

TDM: Transportation Demand Management

TAC: Technical Advisory Committee

Triangle West TPO: Triangle West Transportation Planning Organization

USDOT: United States Department of Transportation

VMT: Vehicle Miles Traveled

VRU: Vulnerable Road User (includes Pedestrians, bicyclists, and users of micromobility)

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Thanks to all those that participated in the Regional Safety Summit and contributed to this planning effort through survey responses, feedback at local events, and sharing your stories related to roadway safety in the region.

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Table of Contents

List of Figures

List of Tables

List of Maps

Executive Summary

Daily trips across the Triangle West Transportation Planning Organization (Triangle West TPO) region should be safe for everyone—children, parents, coworkers, grandparents, friends, neighbors- every person. Far too often, these daily trips on the region's transportation network end in tragedy. From 2017 to 2023, 312 people lost their lives and 926 were seriously injured while walking, bicycling, or driving in the Triangle West region. On average, over 44 people a year, more than 3 people a month, and almost one person a week did not make it home.

Roadway Safety Vision

This loss of life and the impact of sustaining life-altering injuries is unacceptable. The Triangle West TPO developed this Plan to honor the victims of fatal and serious injury crashes by identifying actions that can increase safety through proactive policies, important safety programs, and strategic project opportunities. With a goal that aligns with NCDOT's 2024 Strategic Highway Safety Plan Update target of zero fatal and serious injury crashes by 2050, include a fifty percent reduction by 2035, this Plan uses the Safe System Approach and framework (**Figure 2**) to prioritize safety for all users. Foundational to this Plan is creating change that has system-level impacts. The Safe System Pyramid (**Figure 1**) illustrates how policies can substantially impact safety in people's daily lives.[1] While we all share responsibility for safety, emphasizing the safety interventions that reduce risk and benefit a broader population is critical to eliminating fatal and serious injury crashes.

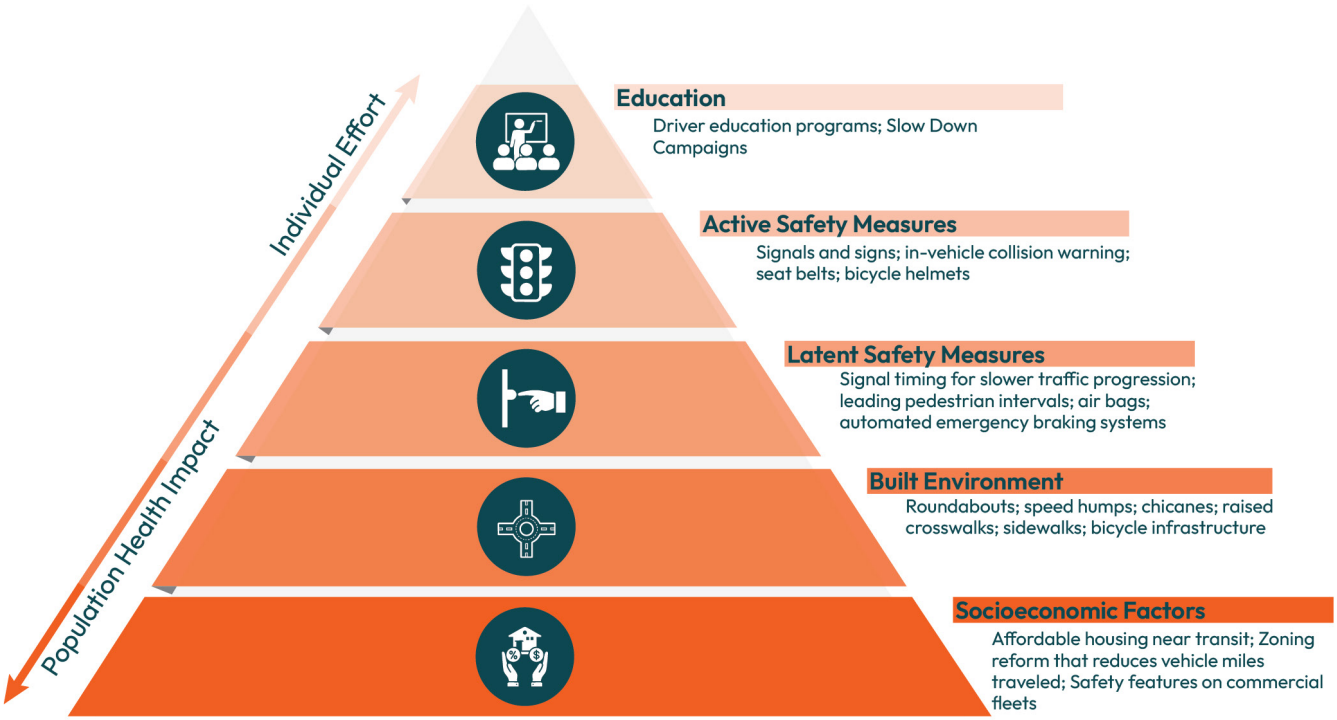


FIGURE 1 Safe System Pyramid

1 Ederer, David J. et al. "The Safe Systems Pyramid: A new framework for traffic safety." Transportation Research Interdisciplinary Perspectives, vol. 21, Sept. 2023, 100905, **https://doi.org/10.1016/j.trip.2023.100905**

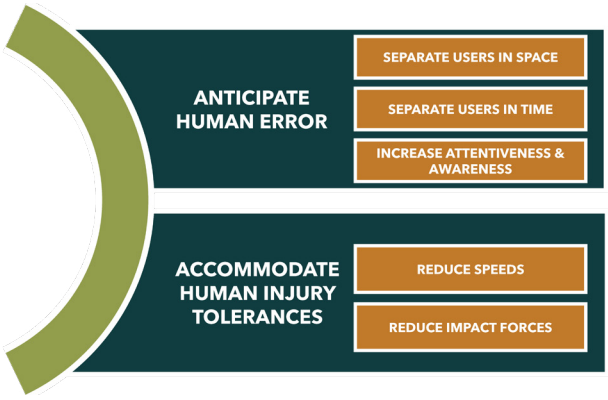


FIGURE 2 Safe System Approach Framework

Regional Crash Summary

Crashes over a seven-year period (2017-2023) highlight the need for change. This section presents where these crashes occurred and the people in communities across the region that are being impacted. Results of safety analyses are included that established a High Injury Network (both roadways and intersections), a High Risk Network (both roadways and intersections), and a High Injury Network for vulnerable road users (people walking and bicycling). Additionally, this section illustrates how the High Injury Network impacts underserved communities in the Triangle West TPO region.

Engagement and Input

Community engagement for the Plan occurred throughout the region and in a variety of ways to connect with people and hear about their roadway safety concerns and input. Through a regional safety summit, Technical Advisory Committee meetings, regional and local open houses, online surveys and interactive maps, and tabling at local events, community members were able to get involved in the development of the Vision Zero Action Plan. Comments from the community highlighted the importance of safe infrastructure for all users, specifically at intersections, along with the need to create a culture of safety for all roadway users. This conversation about roadway safety and culture is just the beginning and one that can continue as actions are implemented.

Focus Areas and Priority Projects

Based on findings from safety analyses, specific crash types and focus areas were identified. This section emphasizes using proven safety countermeasures in both proactive and reactive ways to increase safety. Additionally, this section describes criteria—severity, exposure, and risk/likelihood—that were used to prioritize corridors and intersections across the region for safety interventions. Criteria were used at the municipal and county levels as well and results can be found in **Appendix D.**

Strategies and Actions

Eliminating fatal and serious injury crashes by 2050 will only happen by taking actions that impact the system and increase safety for all users. Roadway safety must be integrated into the work of various agencies, departments, and daily choices by individuals in the community to see results. This section establishes important strategy categories that were developed based on analysis results and direct input from the Technical Advisory Committee and community feedback. For each strategy category, there are a variety of actions—related to policies, programs, and projects—that can be taken to increase safety across the region, in individual communities, and for a variety of contexts.

Metrics and Accountability

The final section of the Plan outlines opportunities to measure and report on roadway safety across the region as the target year for zero (2050) is approached. A framework for annual target setting is included to ensure a review of crash data is contextual and encourages more focused actions to address severe crashes. As a living document, this Plan must be dynamic to address safety in the Triangle West TPO region. The recommended strategies, actions, and tracking included are meant to be a starting point, not all-encompassing. The Triangle West TPO can build upon the work in this plan to develop resources, prioritize funding, and report on progress for the region and member agencies as everyone shares the responsibility to increase roadway safety.

01

Roadway Safety Vision

What is a Vision Zero Action Plan?

The Triangle West Transportation Planning Organization (Triangle West TPO) Vision Zero Action Plan marks a critical and fundamental shift in the approach to roadway safety. For decades, our streets have prioritized convenience and speed over safety—moving cars as quickly as possible even as the number of roadway fatalities increased across the country and in our hometowns. Consistently, streets have been designed with the assumption that crashes are accidents—events that no one can predict or prevent—or these numbers are just the cost for the system to function. While communities have grieved the loss of individual friends and family members, this traditional approach to transportation has accepted roadway fatalities as an unfortunate inevitability.

This Vision Zero Action Plan proclaims that nothing on our roadways is more important than human life and that everyone deserves to make it to their destination safely. It begins by believing that roadway deaths and serious injuries are preventable, and that the responsibility is on each of us to create safer streets for everyone who lives, works, and enjoys the region.

The Triangle West TPO Vision Zero Action Plan takes a data-driven approach to focus infrastructure, design, policy, and programs around the goal of zero traffic fatalities or severe injuries, while increasing safe and healthy mobility for all community members.

The Triangle West TPO Vision Zero Action Plan sets a goal of eliminating fatal and serious injury crashes in the region by 2050 and reducing the number of fatal and serious injury crashes in half by 2035. Achieving this goal will require partnerships across the region and with NCDOT. Additionally, it requires a focus on addressing roadway safety at the system level, with daily choices, policy changes, and projects that make a real impact.

The Safe System Approach

This Plan is rooted in the Safe System Approach, which aims to eliminate fatal and serious injuries by anticipating human mistakes and minimizing impacts on the human body when crashes do occur.

The following six principles form the foundation for the Safe System Approach

1. Death and Serious Injuries are Unacceptable

While no one likes to get in a fender-bender, this plan focuses on crashes that lead to deaths and serious injuries.

2. Humans Make Mistakes

Even the best drivers will inevitably make mistakes that can lead to a crash. How we design and operate our transportation system can ensure these mistakes don't have life-ending or life-altering impacts.

3. Humans Are Vulnerable

Human bodies can only withstand so much impact from a crash; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.

4. Responsibility is Shared

All stakeholders—from officials to everyday users—have a role to play in preventing fatal and serious injury crashes on our roadways.

5. Safety is Proactive

Rather than waiting for crashes to occur, transportation agencies should seek to proactively identify and address dangerous situations.

6. Redundancy is Crucial

Redundancy means making sure every part of the transportation system is safe. This way, if one part fails, people are still protected.

The Safe System Approach is implemented through five elements

1. Safe Road Users

Working towards a culture of safety starts with developing a network of partners, educating road users, and creating personal connection to eliminate fatal and serious injury crashes.

2. Safe Vehicles

Making vehicles safer can be done through advanced driver assistance systems and by ensuring future technology prioritizes vulnerable roadway users.

3. Safe Speeds

Promoting safer speeds in all roadway environments and contexts is critical. Slower vehicle speeds through speed limit reduction, traffic calming, and roadway design can increase visibility and reaction times for drivers and reduce impact forces when a crash occurs.

4. Safe Roads

Safer roads result from mitigating human mistakes and accounting for injury tolerances through separation of users in space/time to reduce conflicts.

5. Post-Crash Care

A system-wide approach means working towards safety even after a crash has occurred. This comes from improving emergency response, traffic incident reporting, and traffic management.

FIGURE 3 Safe System Approach

02

Regional Crash Summary

Crash Map

Crashes occur for a variety of reasons and often a combination of contributing factors. These factors may include excessive speed, roadway conditions, equipment failure, inexperience, environmental conditions (e.g., weather, lighting, glare), and human behaviors such as distraction, impairment, and not complying with traffic laws. **Map 1** reflects the locations fatal and serious injury crashes occurred over the seven-year period between 2017 and 2023.

People Impacted by Crashes

From 2017 to 2023, there have been over numerous crashes that resulted in 312 lives lost and 926 people with serious injuries in the Triangle West region. Each of these crashes impacted people in local communities – people who were getting around in different ways, were of different ages, were of different races and ethnicities, and were traveling on different types of streets.

In the Triangle West region and across the United States, the design of our transportation system has led to traffic crashes and other negative outcomes that unfairly affect people who have the fewest transportation options resulting in more vulnerability to the dangers of our transportation system.

For example:

- Children and youth are often not independently mobile and rely on guardians to accompany them as they travel.
- Households in poverty may spend an outsized portion of their income on travel expenses.
- People in households without a vehicle – or even people who have limited access to the vehicle within their household – may be dependent on the availability of safe multimodal facilities to access their daily needs.
- People with disabilities are less likely to drive and more likely to rely on public transportation than nondisabled residents, meaning safe, accessible, and intuitive infrastructure are critical for ensuring people with vision, hearing, cognitive, or mobility-related disabilities can go about their daily lives.[2]
- Lack of safe and convenient transportation is a major barrier for households facing food insecurity. For people in food deserts, affordable transportation options are essential for accessing healthy foods and/or other needed services.
- People with lower levels of English proficiency may face challenges understanding or communicating in a safety-critical situation. [3]

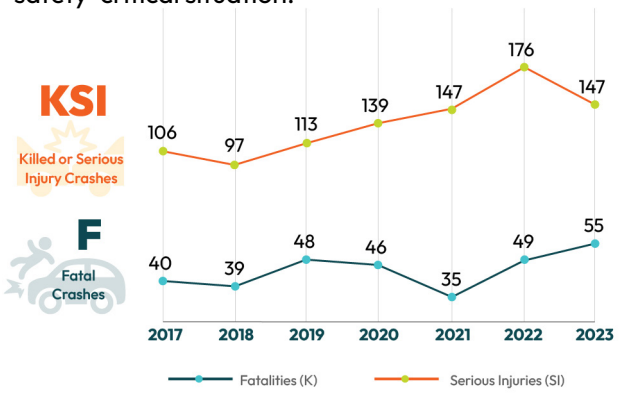


FIGURE 4 KSI Crashes by Year

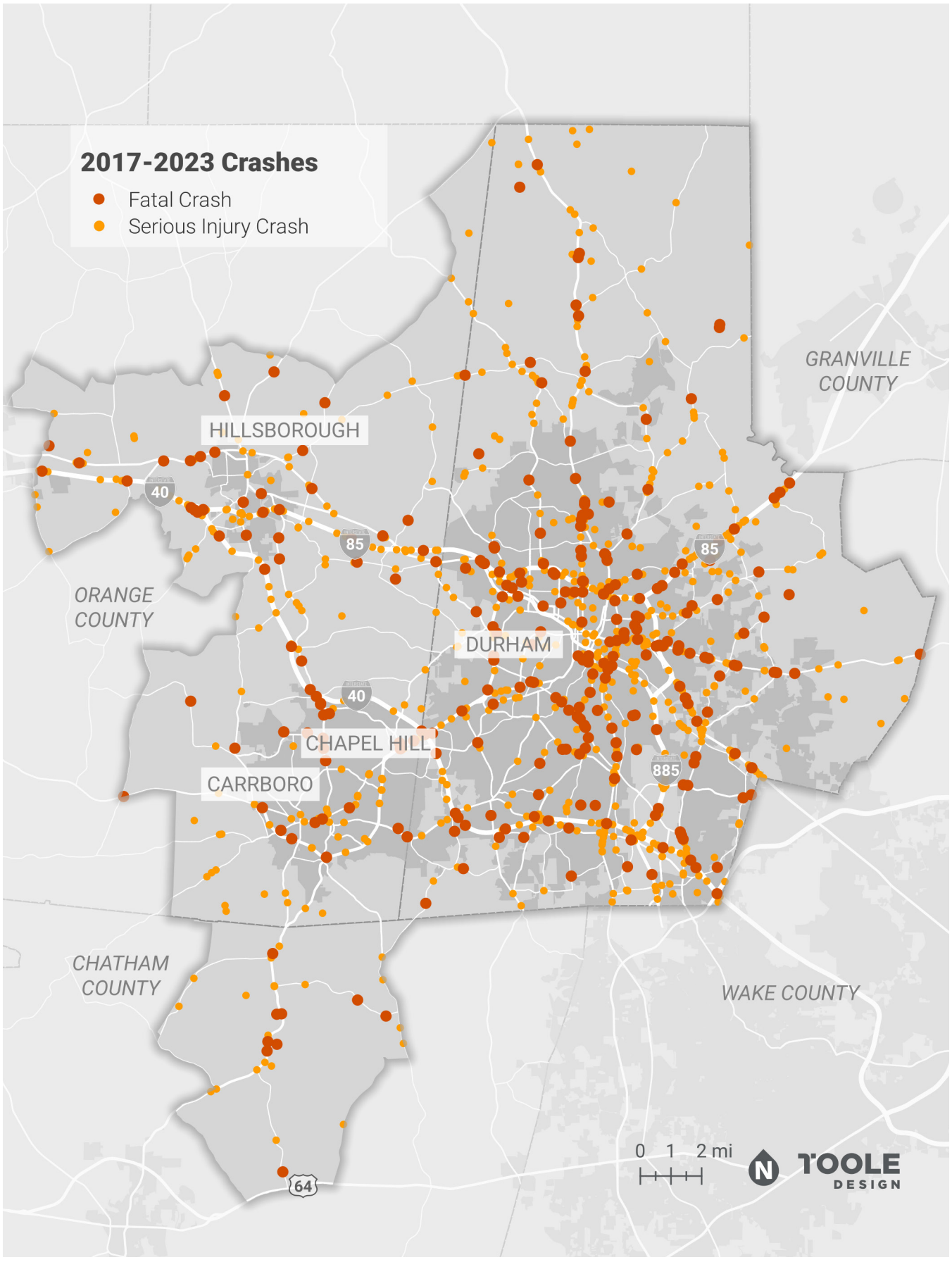
What is a Serious Injury?

A serious injury includes severe lacerations exposing muscle, tissue, or organs, or causing significant blood loss; broken or distorted limbs; crush injuries; suspected skull, chest, or abdominal trauma; second or third-degree burns covering at least 10% of the body; unconsciousness; or paralysis.

2 Data Analysis. Data Analysis | Bureau of Transportation Statistics. (2011, November 30). **https://www.bts.gov/archive/publications/freedom_to_travel/data_analysis%20%20**

3 Marudut Bernadtua Simanjuntak. (2024). The Impact Of English Communication On Transportation Safety Practices. International Journal of Educational Development, 1(2), 79–87. **https://international.aspirasi.or.id/index.php/IJED/article/view/38**

MAP 1 Regional Crash Map



While everyone is affected by crashes, they do not affect everyone equally. To improve safety outcomes for people facing outsized transportation challenges, analyses were conducted to assess how safety outcomes vary across different populations.

In the Triangle West region, people of different races, ages, and genders experience different fatality crash rates. From 2017 - 2023, people who were Black, male, or aged 15 to 24 had higher fatal and serious injury crash rates compared to their nonblack, younger, older, and female counterparts.

Additionally, the Triangle West TPO Vision Zero Action Plan evaluated census tracts in areas of persistent poverty, as identified by the U.S. Department of Transportation (USDOT). Areas of persistent poverty are defined as communities that have maintained a poverty rate of 20 percent or higher for the past 30 years.[4]

The results in **Map 2** indicate that the highest concentrations of residents living in areas of persistent poverty are:

- East Durham near downtown and along the Durham Freeway
- Northeast Durham along the US 15/501/I-85 corridor
- Census tracts directly around North Carolina Central University and Duke University in Durham
- Nearly all of Chapel Hill and Carrboro, including census tracts surrounding the University of North Carolina Chapel Hill.

Achieving a fair and balanced transportation system requires an understanding of how both positive and negative impacts are distributed throughout a region and across different demographic groups. Detailed information about the additional factors analyzed as part of this planning process can be found in **Appendix B.**

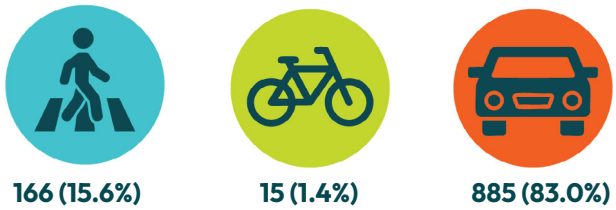
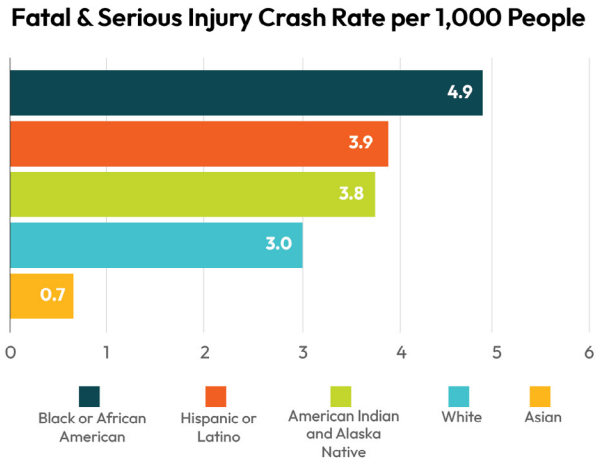
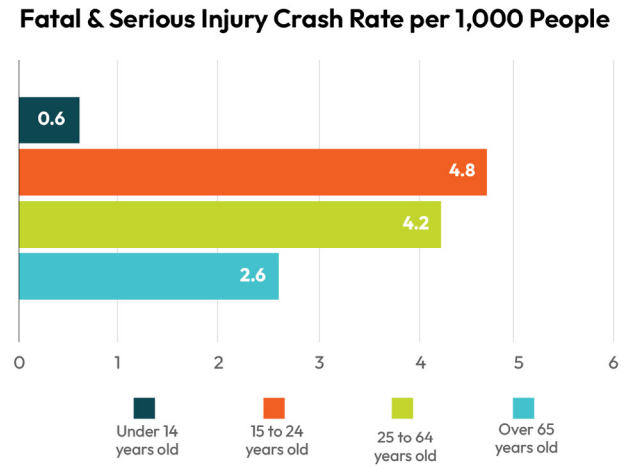


FIGURE 5 Fatal and Serious Injury Crash by Mode (2017-2023)





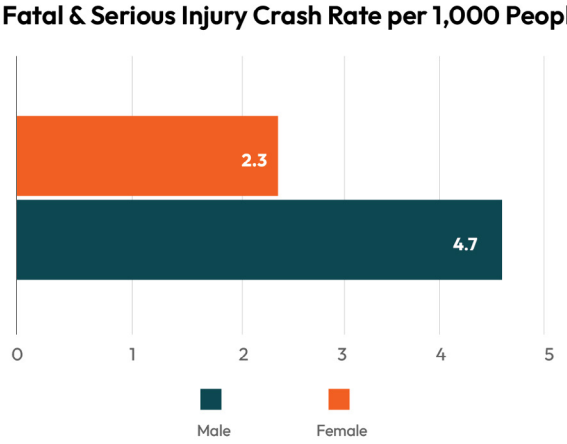
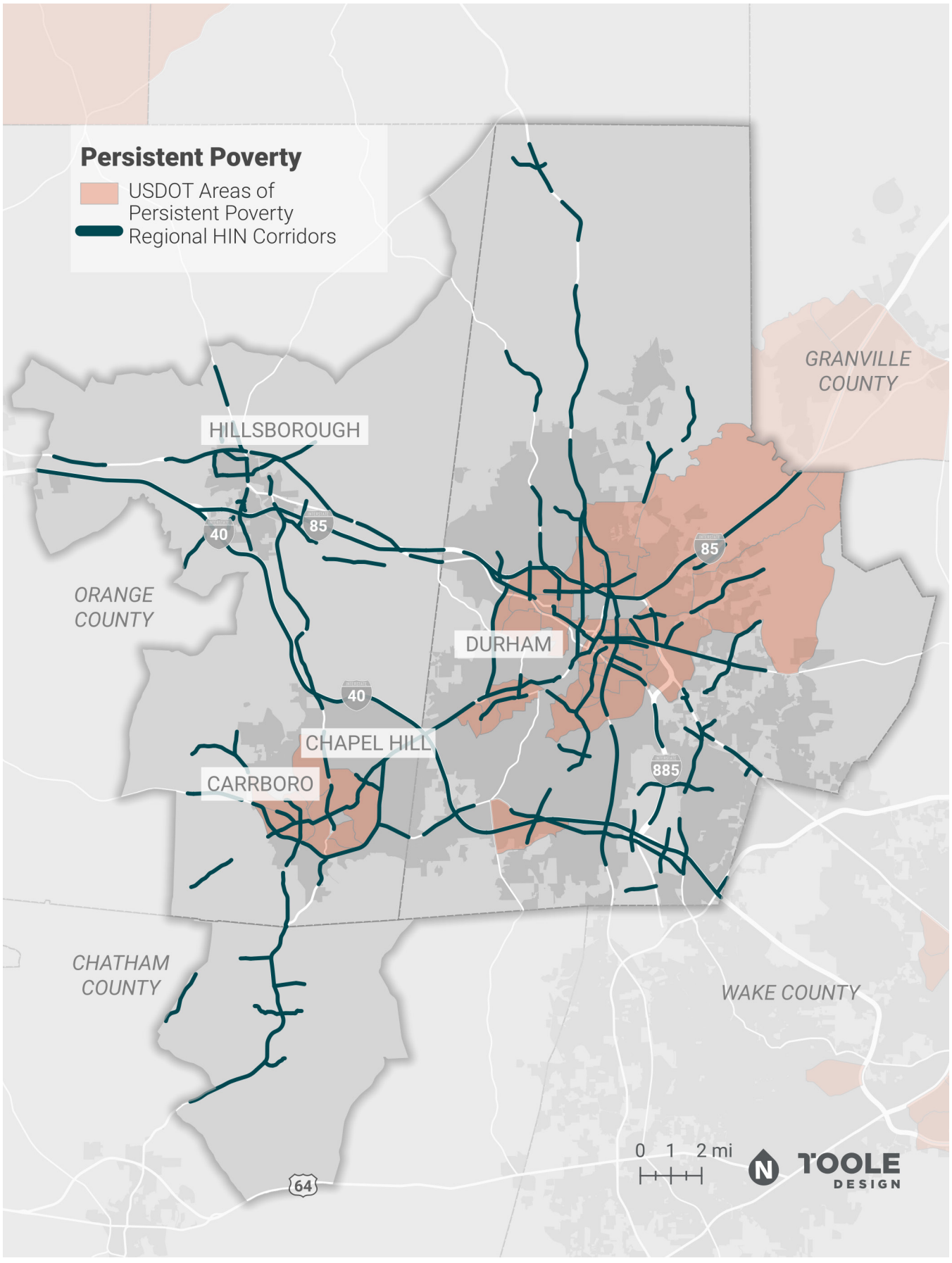


FIGURE 6 KSI Crashes by Year

4 United States Census Bureau, Persistent Poverty in Counties and Census Tracts. **https://www.census.gov/library/publications/2023/acs/acs-51.html**

MAP 2 Areas of Persistent Poverty and High Injury Network



High Injury Network

One way to go beyond the traditional hot-spot crash analysis is to identify a High Injury Network (HIN) map that focuses on segments of the roadway network where the highest number of vehicle, bicycle, and pedestrian fatal and serious injury crashes occur. This provides a bigger-picture perspective on the roadways and intersections with the highest concentration of the worst crashes in the region. This can be used to identify locations where it is appropriate to make changes to the roadway to prevent similar crashes from happening in the future.

The HIN represents 7.82% of total roadway miles across the Triangle West region, while also accounting for 63.5% of the total killed or serious injury crashes. For each of the seven municipalities within the Triangle West TPO region, **Figure 7** highlights the percent of local roadway miles that fall within the HIN, as well as the percent of Fatal or Serious Injury crashes (2017-2023) that occurred on the HIN. For example, 13.74% of the roadway miles in Chapel Hill are within the HIN and these roadway miles included 88% of all fatal and serious injury crashes in Chapel Hill between 2017 and 2023

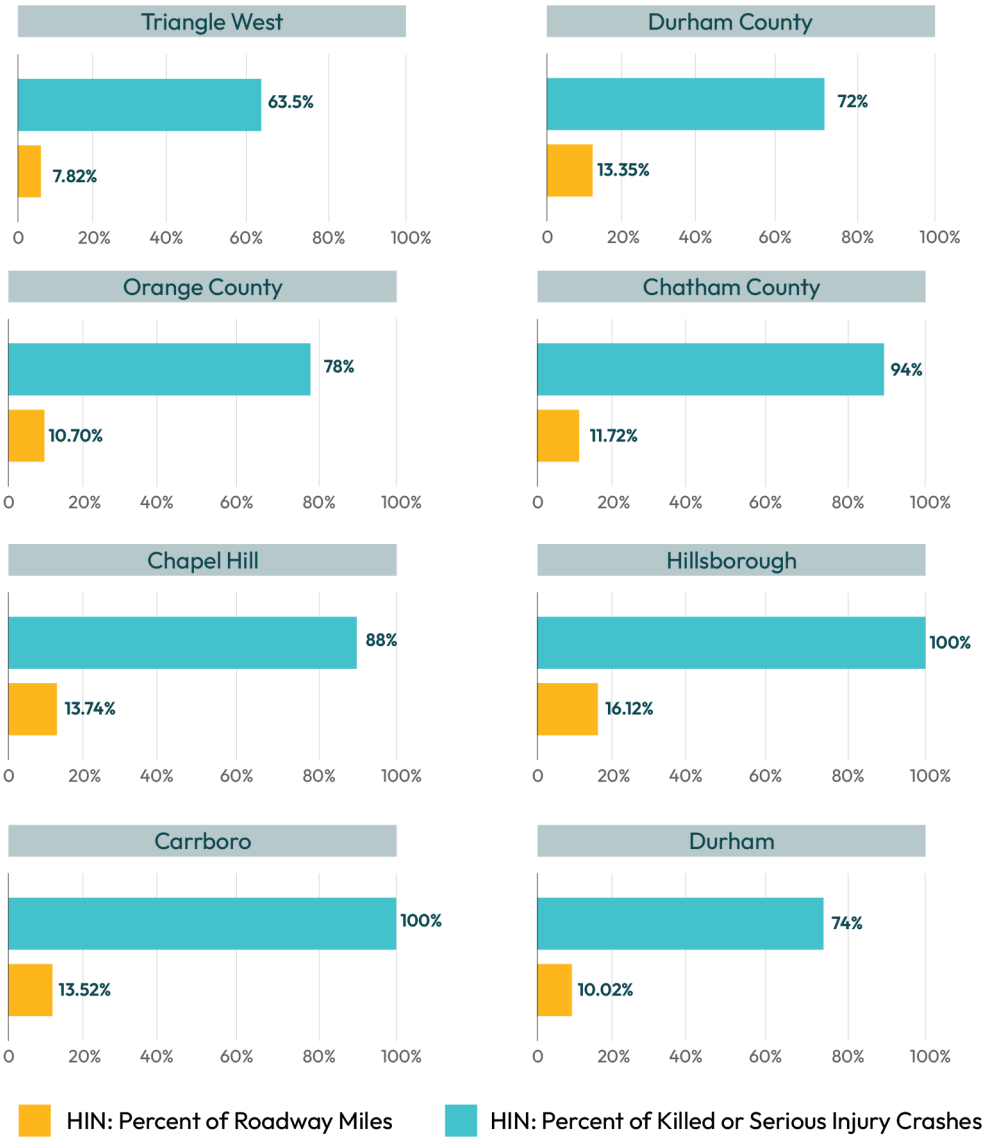
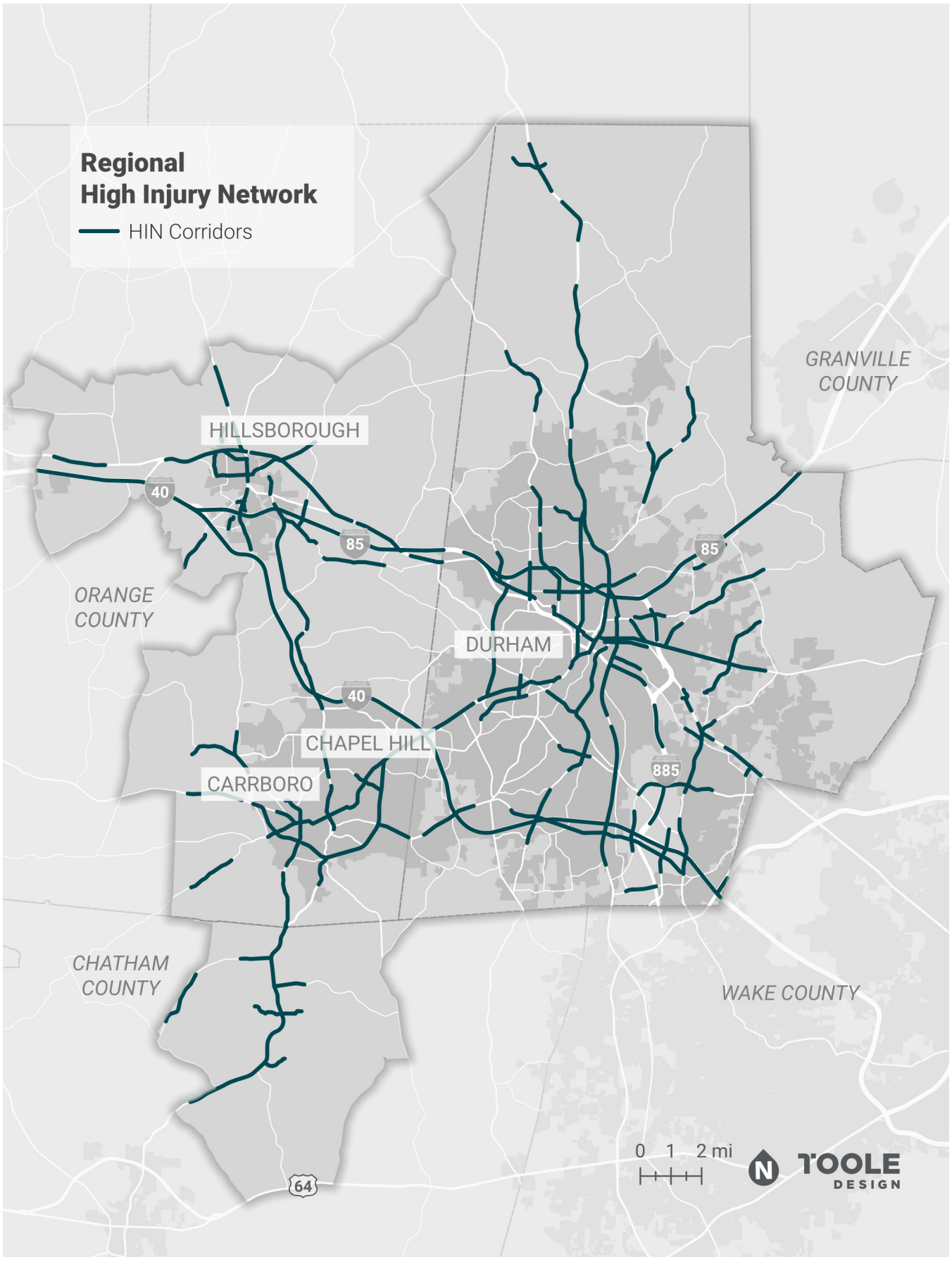
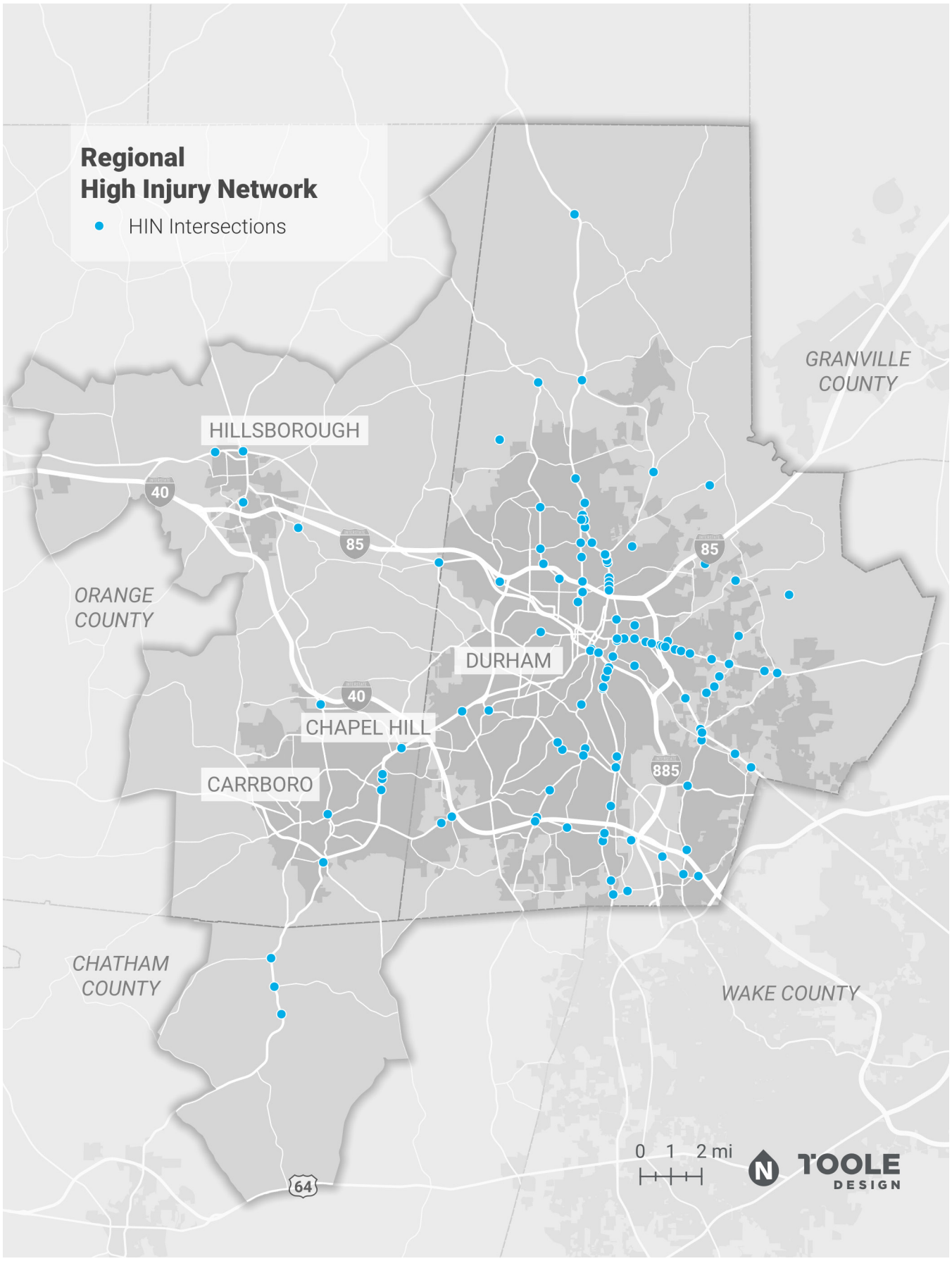


FIGURE 7 Local High Injury Network Roadway Miles and Killed or Serious Injury Coverage

MAP 3 Regional High Injury Network Corridors Map (All Modes)



MAP 4 Regional High Injury Network Intersections Map (All Modes)



High Risk Network

The HIN effectively captures what has happened in the immediate past. The HIN was also analyzed to identify any common conditions that exist on roadway segments on the HIN – for example, the land use context, number of lanes, posted speed limit, and other factors. The Regional High Risk Network analysis reflected in a **Map 5** series on the following page, identifies corridors throughout the region where street characteristics exist that increase the risk and likelihood for specific crash types in the future. The crash types are based upon those identified along the HIN and include pedestrian, bicycle, motorcycle, speed, and lane departure. Similarly, **Map 6** identifies the Regional High Risk intersections where it is reasonable to anticipate serious crashes in the future.

The risk analysis accounts for three main pillars: Exposure, Likelihood, and Severity. The Triangle West TPO risk analysis identifies:

Exposure

- Areas where there is an expectation of higher exposure risk for all road users based on the potential for conflict between road users.
- Roadways where there is an expectation of higher exposure risk for all road users based on number of vehicles.

Risk/Likelihood

- Roadways where there is an expectation of increased likelihood of specific crash emphasis areas, independent of crash history, based on shared location characteristics.

Severity

- Roadways where there is an expectation of higher severity risk based on speed.

This risk analysis can be used to identify systemic changes to the roadway network that need to be made whenever the opportunity presents itself, as well as elements of roadway design that should be avoided in the future.

Three Pillars of Risk Analysis

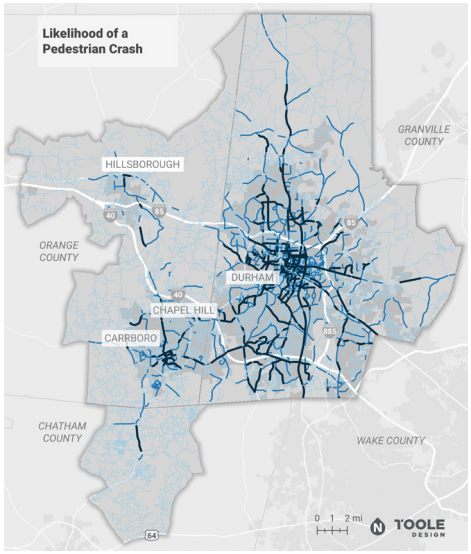
Exposure - Reduce the interactions where potential collisions may occur

Risk/Likelihood – Reduce the likelihood of a collision occurring

Severity – Reduce the kinetic energy associated with collisions

MAP 5 High Risk Corridors Map by Crash Type

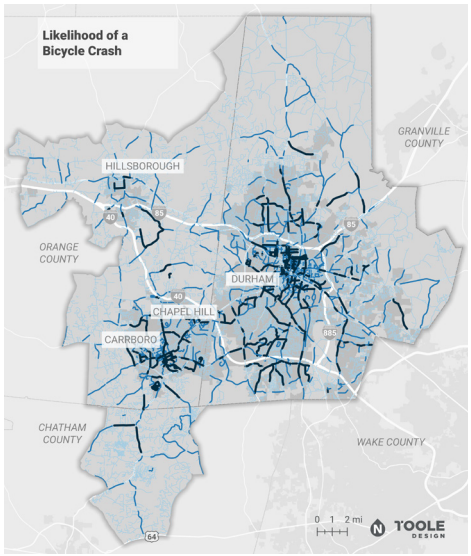
Likelihood of a Pedestrian Crash



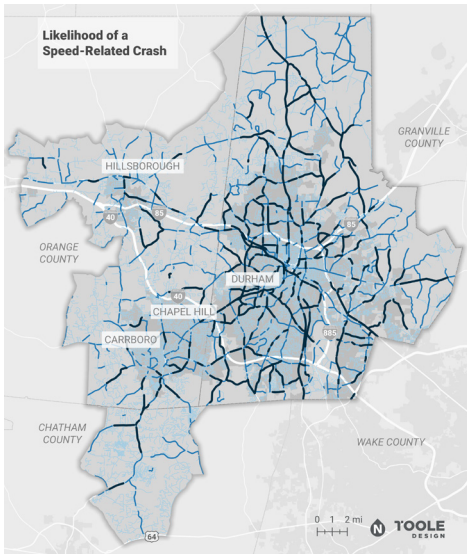
Likelihood of Crash

- Top 5%
- Top 15%
- All other values

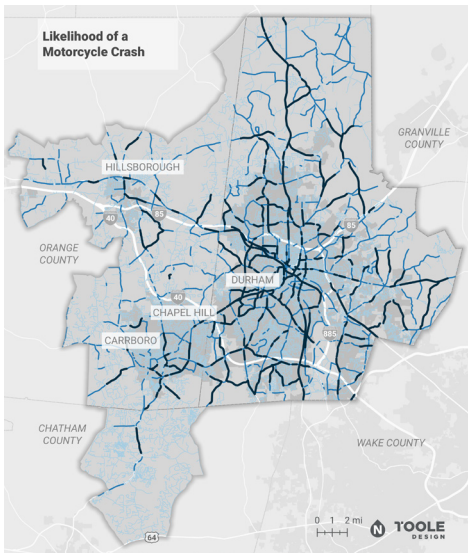
Likelihood of a Bicycle Crash



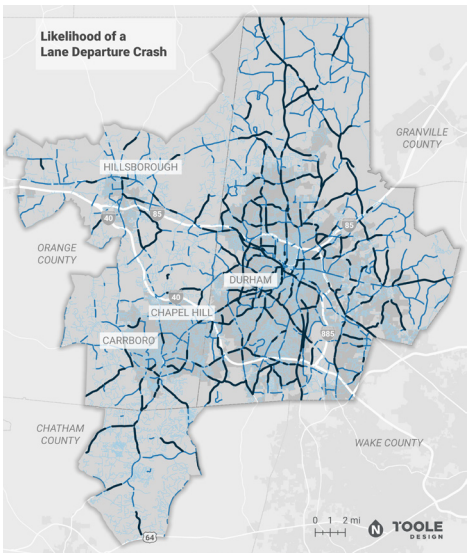
Likelihood of a Speed-Related Crash



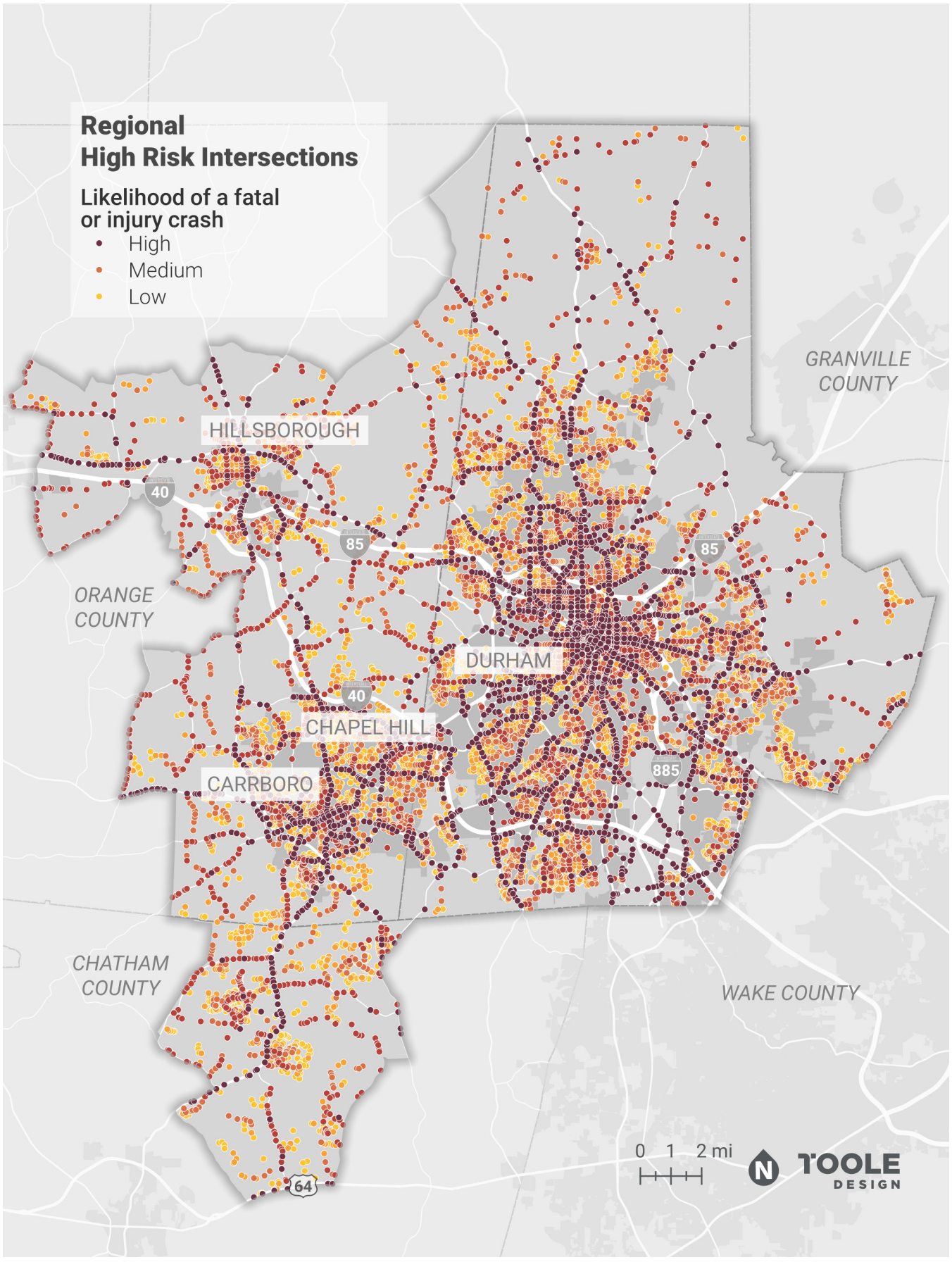
Likelihood of a Motorcycle Crash



Likelihood of a Lane Departure Crash



MAP 6 Regional High Risk Network Intersections Map



Vulnerable Road Users

When a person walking or bicycling is struck by a vehicle, there is no bumper or airbag to protect them. When a crash occurs, these Vulnerable Road Users are more likely to be killed or seriously injured. Vehicle safety technology has seen significant advancements in recent decades, with airbags, anti-lock brakes, and lane-awareness sensors all working to protect a driver in a crash. Pedestrians and bicyclists, however, are unprotected and are especially vulnerable to the impact of a crash. A growing share of roadway fatalities across the United States are people traveling on foot or by bicycle.[5] This disparity underscores the importance of prioritizing safety for vulnerable road users who are most impacted when a crash occurs.

Between the years 2017 and 2023, 80 people in the Triangle West region were killed while walking or bicycling. In that same seven-year period, 127 people were involved in crashes that resulted in serious injuries while walking or bicycling in the region. Based on the locations of these crashes, **Map 7** identifies the corridors, or segments of the roadway network where the highest number of bicycle and pedestrian fatal and serious injury crashes occurred. **Map 8** reflects the individual intersections within the region's High Injury Network (HIN) where the highest number of bicycle and pedestrian fatal and serious injury crashes occurred.

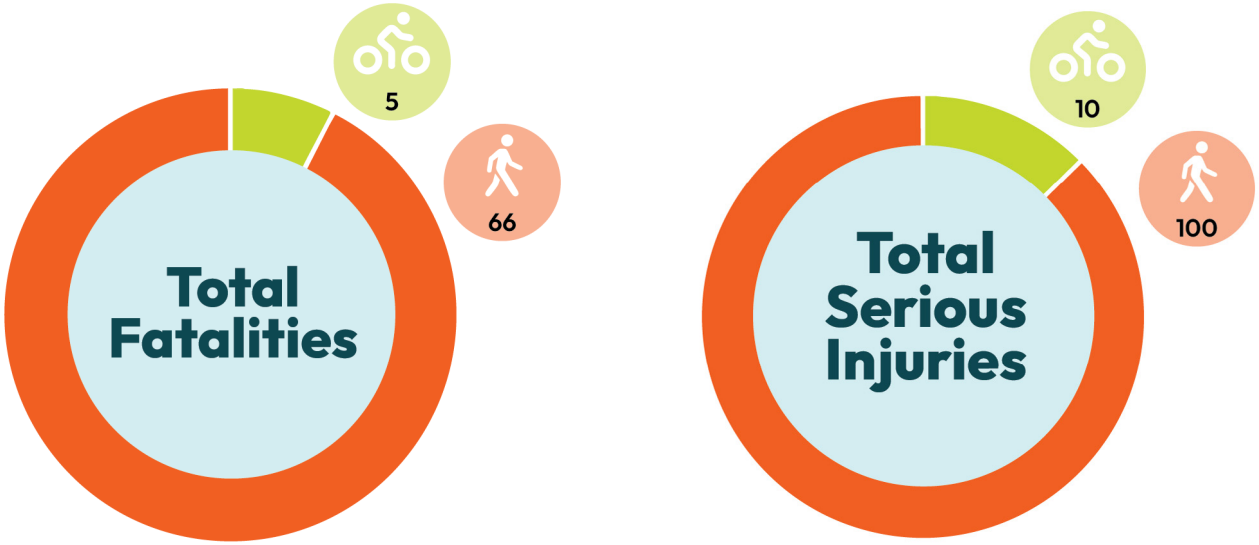
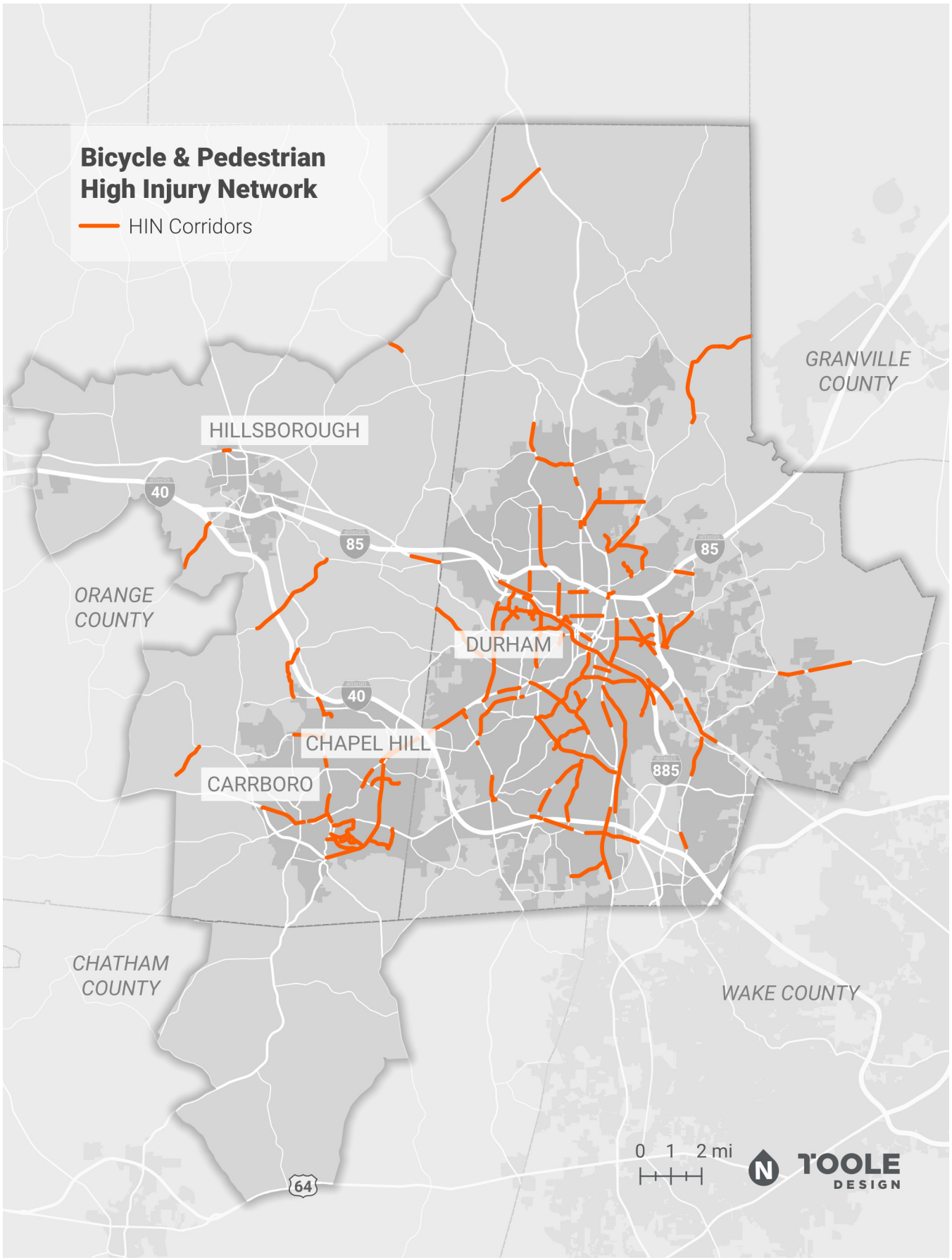


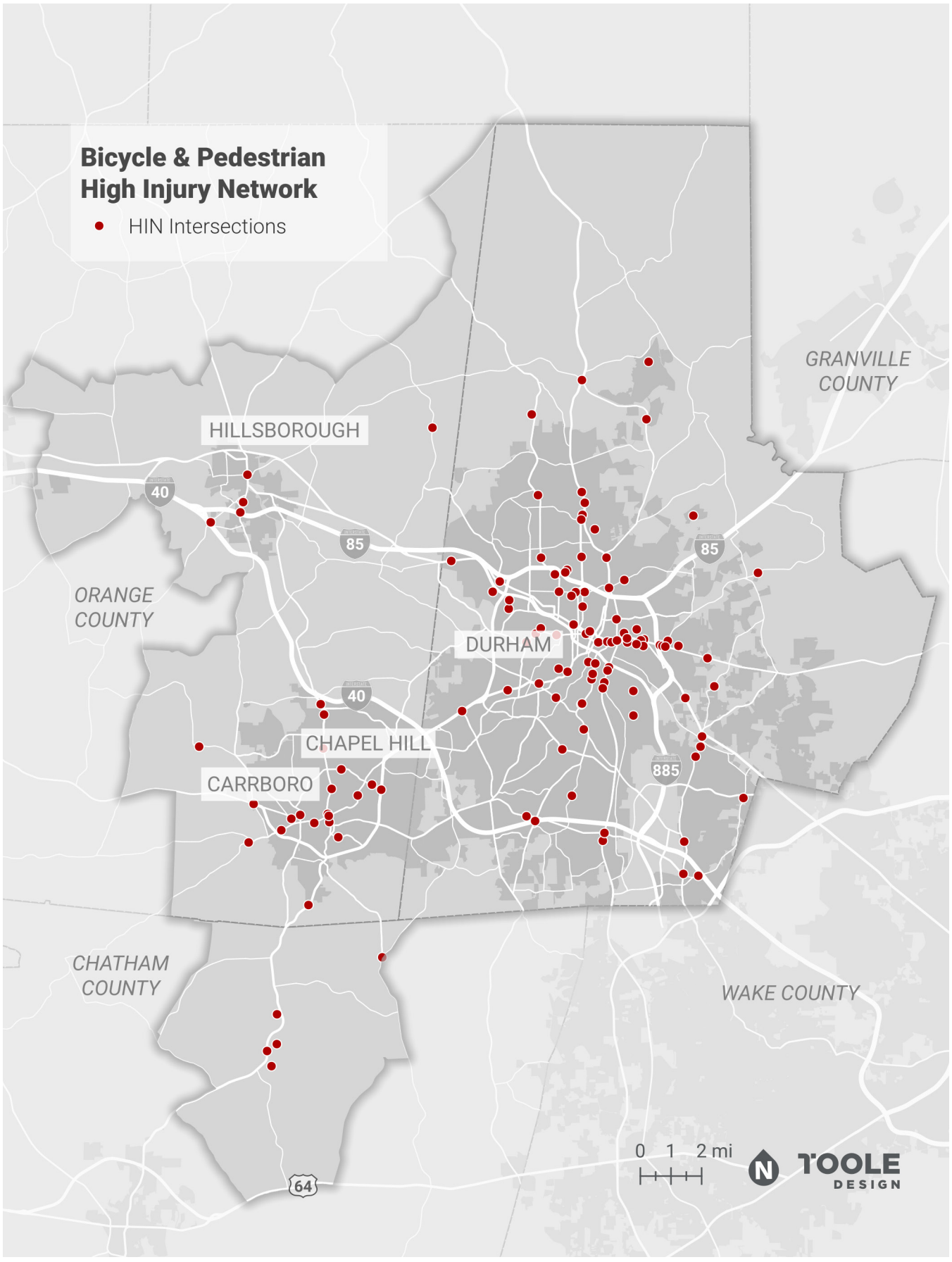
FIGURE 8 Fatal and Serious Injuries Among Vulnerable Road Users (VRUs)

5 Fatality Analysis Reporting System (FARS) – NHTSA. **https://www-fars.nhtsa.dot.gov/Main/index.aspx**

MAP 7 Bicycle & Pedestrian High Injury Network Corridors Map



MAP 8 Bicycle & Pedestrian High Injury Network Intersections Map



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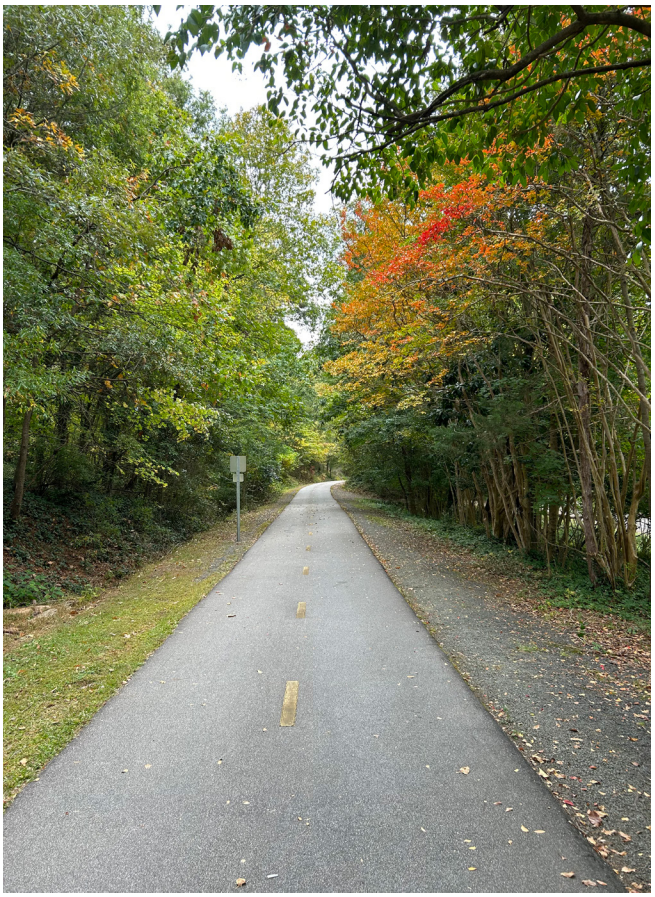
03

Engagement and Input

Listening to the Community

Public and stakeholder engagement played a critical role in shaping the Triangle West TPO Vision Zero Action Plan, ensuring that the process reflected community needs, local priorities, and technical expertise. A variety of engagement activities were conducted to solicit feedback on roadway safety and ultimately inform the Plan, ranging from in-person events to online surveys.

Together, these engagement efforts helped shape a data-driven, community-informed plan that prioritizes safety, accessibility, and mobility for all users. The following sections provide a detailed summary of each engagement event or activity and the key themes that emerged.



96
online survey responses

157
comments on the interactive map

4
pop-ups at local agency events

3
technical advisory meetings

Technical Advisory Committee (TAC)

The Technical Advisory Committee (TAC) met three times during the development of the Safety Action Plan. The TAC brought together agency representatives, planners, and transportation professionals to discuss safety priorities, review data, and guide the plan development, ensuring alignment across regional and local stakeholders.

Insights gathered from these meetings helped refine the Triangle West Vision Zero Action Plan's strategies, funding priorities, and implementation roadmap, ensuring a coordinated approach to reducing serious injuries and fatalities in the region.

Meeting 1

Aug 20, 2024

Introduce Safe System Approach (SSA), review safety data

Meeting 2

Dec 10, 2024

Review crash types, roadway contexts, regional risk factors

Meeting 3

Feb 25, 2025

Review draft recommendations & implementation strategies

FIGURE 9 Collaborative Technical Advisory Committee Meeting

Transportation Safety Summit

Public Engagement was kicked off in October 2024 with a half-day Safety Summit, which brought together transportation professionals, policymakers, and community organizations to discuss regional roadway safety. The event included breakout sessions focusing on community perceptions, equity considerations, technical solutions, and policy coordination to address safety challenges in the region.

Breakout Session Discussion Topics

- COMMUNITY PERCEPTIONS OF ROADWAY SAFETY
- INFRASTRUCTURE & TECHNICAL SOLUTIONS
- POLICY COORDINATION
- EQUITABLE ENGAGEMENT
- INFRASTRUCTURE FUNDING

FIGURE 10 Discussion during Breakout Session & Pledge Wall at the Safety Summit

Open Houses

A November 2024 Open House, held at the Chapel Hill Public Library, was designed to gather real-life experiences and insights, with many attendees sharing personal stories about safety challenges, past crashes, and the loss of loved ones due to roadway incidents. These first-hand experiences provided valuable context to the data-driven findings, reinforcing the need for targeted safety interventions. The event featured interactive boards and hands-on activity stations for children and adults, as well as an opportunity for participants to provide additional feedback through an online survey. The Carrboro Vision Zero Open House, held in March 2025, focused on gathering input on the draft plan. Participants provided feedback on strategies and actions, as well as priority corridors and intersections.

Safety Concerns & Themes from Open House Events

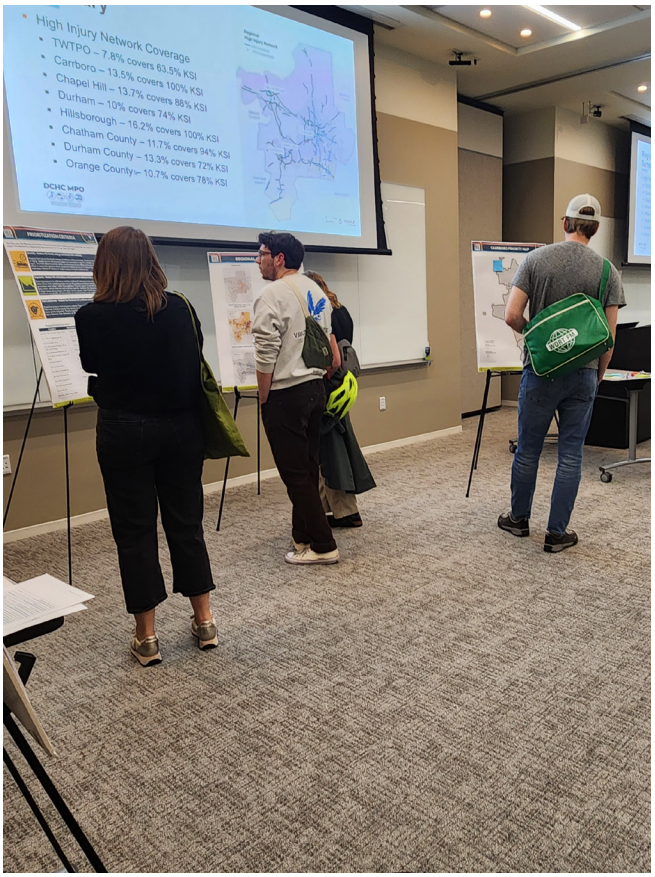


FIGURE 11 Interactive Boards at the Open House Events

Local Events

Agency staff members participated in several local events where they presented plan updates, shared information at tabling events, and gathered input from municipal and county representatives, advocacy groups, and other regional partners. These events allowed for direct discussions between local leaders and stakeholders about transportation needs and priorities.

FIGURE 12 Local Events: Move-A-Bull City (top) & Safetoberfest (below)

September 30, 2024

Durham Vision Zero/Safe Streets Strategies Workshop

Durham Armory, Durham

October 13, 2024

Move-A-Bull City

Central Park, Durham

October 30, 2024

Safetoberfest

UNC Campus, Chapel Hill

November 5, 2024

Merrick Moore & Bragtown Site Visits

Durham

November 17, 2024

Durham World Day of Remembrance

POOF Teen Center, Durham

March 15, 2025

Youth Engagement Pop-up

ReCity, Durham

March 25, 2025

Chapel Hill Safety Workshop

Chapel Hill

April 8, 2025

Middle School Career Day

Immaculata Catholic School, Durham

Online Survey & Interactive Webmap

To ensure broad public participation beyond in-person events, an online survey was created and made available from October 2024 to March 2025. The survey provided an opportunity for the public to share insights into safety challenges, helping to identify high-risk corridors and key concerns for pedestrians and bicyclists.

A total of 96 surveys were submitted, with participants contributing 157 location-specific comments, identifying areas where they felt unsafe or had experienced roadway safety issues. These location-specific comments are reflected in **Map 9** on the following page.

The interactive mapping responses revealed specific corridors and intersections in Durham, Chapel Hill, and Carrboro where pedestrian and bicyclist safety is a community concern. Factors such as lane widths, traffic volume, and proximity of transit stops to schools and employment centers were commonly cited as contributing to high-risk conditions. In addition to this survey, several surveys for related planning efforts were open at the same time: Durham Bike/Walk Plan, City of Durham Vision Zero Action Plan, and Town of Chapel Hill Vision Zero Plan. Survey data collected from each of these efforts was shared and reviewed for consistency with the survey results from this effort

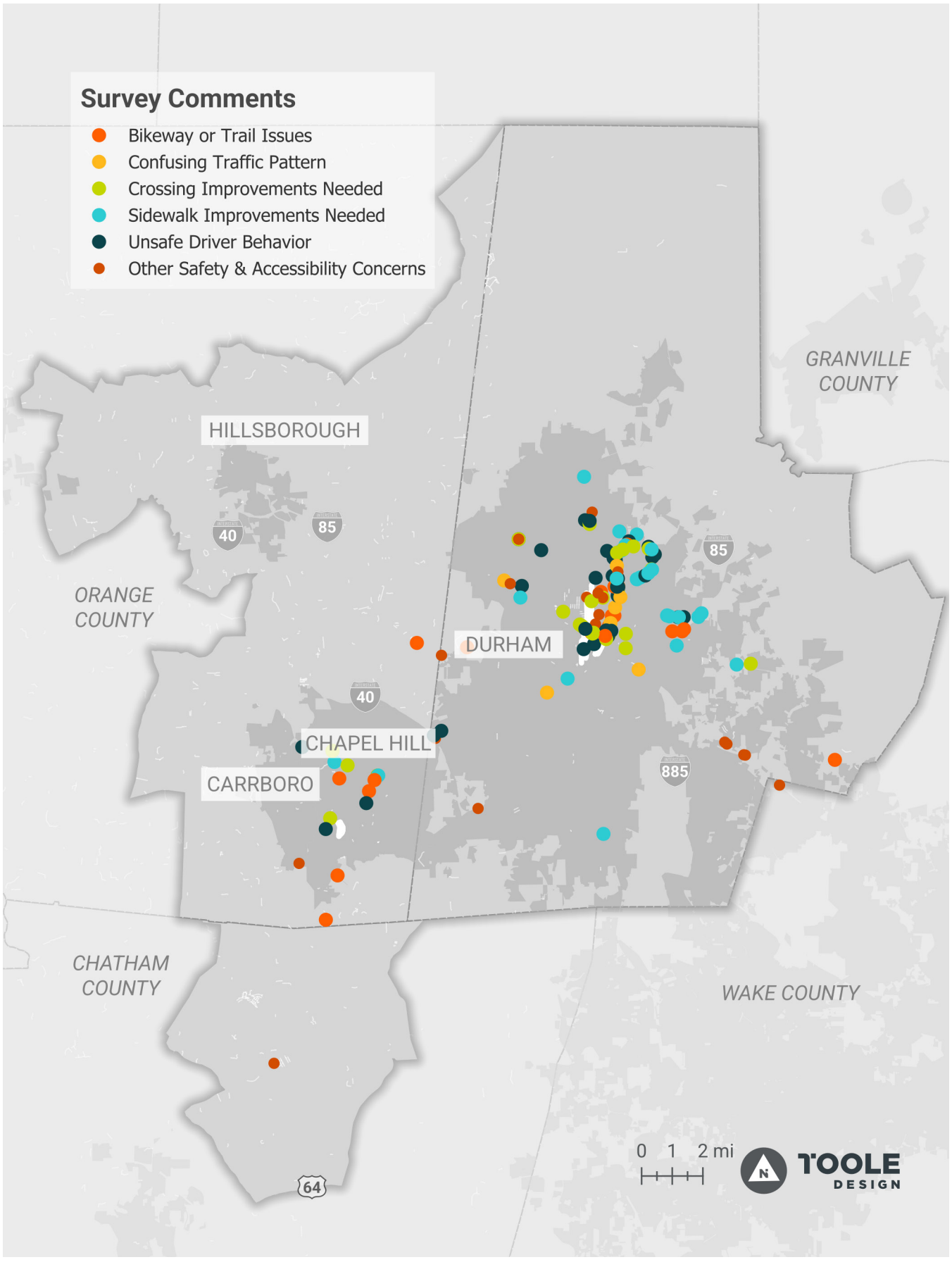
Top three reasons people feel unsafe:

- **Unsafe driver behavior** is a major concern, with reports of **speeding, aggressive driving, and failure to yield**, creating unsafe environments for all users.
- **Inadequate pedestrian and bicycle crossings**, including missing crosswalks, long crossing distances, and lack of signals, creating hazardous conditions.
- **Lack of sidewalks and poor road conditions**, including faded markings, potholes, and visibility issues, making walking and biking more dangerous.

Top three safety improvement ideas:

- **Enhance traffic control measures,** such as adding more traffic lights, stop signs, and protected crossings to improve safety.
- **Stronger enforcement of speed limits and reckless driving laws** to reduce aggressive driving and improve compliance.
- **Expand pedestrian and bike infrastructure,** including adding sidewalks, protected bike lanes, and better lighting for improved safety and visibility.

MAP 9 Online Survey Comments Map




"An avid biker in our neighborhood was struck and killed while riding on Route 98."
"Young man killed at an intersection while crossing with traffic light in his favor. Driver sped through."
"I was struck by a car while I was biking. Thankfully not seriously."
"A cycling friend was hit by a turning car at NC 147/Fayetteville interchange."
"Heavy trucks go over the speed limit on Club Road."
"People do not adhere to the pedestrian hybrid beacon thing on E Franklin."
"I'm aware of several traffic-related fatalities over the last year in my neighborhood."
"There is not enough consideration for pedestrians and sidewalks. Bike lanes seem to be a priority, but more people walk than bike."
"Many people walk alongside the road where there is a dirt path."

04

Focus Areas and Priority Projects

Increasing safety on the transportation system in the region must prioritize addressing locations with a high prevalence or likelihood of fatal and serious injury crashes. Deploying countermeasures systemically along with addressing concerns on high injury corridors and intersections will focus on the region as projects are planned, designed, and deployed.

Proven Safety Countermeasures

There are many tools and resources that can improve transportation safety for all users. As an industry's best practice, the FHWA Proven Safety Countermeasures initiative (PSCi) is a collection of countermeasures that have been proven to decrease serious injuries and fatalities on roadways throughout the country. FHWA has created an online tool that recommends potential countermeasures based on roadway characteristics such as land use context, expected volumes, crash history, and more to help communities across the country improve roadway safety.

Addressing safety in the Triangle West region will require using a variety of these proven safety countermeasures across the transportation network, starting with the High Injury Network. The right countermeasure (or a mix of countermeasures) will vary based on the existing roadway conditions, safety issues, and the community's vision for how it should be serving its transportation and access needs into the future, which may be different than how it functions today.

Selection and design of safety countermeasures on every street project in the region should be decided through the lens of the Safe System Approach so that if a crash occurs it will not result in a fatal or serious injury. Safety countermeasures should not be compromised or simplified during the design or construction phases.

The safety countermeasures listed below include hyperlinks to provide a more detailed description and an overview of each countermeasure's effectiveness in improving safety:

Speed Management

Appropriate Speed Limits for All Road Users

Variable Speed Limits

Safety Speed Cameras

Pedestrian/Bicyclist

Bicycle Lanes

Crosswalk Visibility Enhancements

Leading Pedestrian Interval

Medians & Pedestrian Refuge Islands

Pedestrian Hybrid Beacons

Rectangular Rapid Flashing Beacons

Road Diets (Roadway Reconfiguration)

Walkways

Roadway Departure

Enhanced Delineation for Horizontal Curves

Median Barriers

Longitudinal Rumble Strips and Stripes on Two-Lane Roads

Roadside Design Improvements at Curves

Safety Edge

Wider Edge Lines

Intersections

Backplates with Retroreflective Borders

Corridor Access Management

Dedicated Left & Right-Turn Lanes at Intersections

Yellow Change Intervals

Reduced Left-Turn Conflict Intersections

Systemic Application of Multiple Low-Cost Countermeasures at Controlled Intersections

Roundabouts

Crosscutting

Local Road Safety Plans

Pavement Friction Management

Road Safety Audit

Proactive Systemic Safety Countermeasures

Safety countermeasures can be installed proactively and integrated into existing or planned roadway projects through quick builds, resurfacing or maintenance work, or full reconstruction, especially on the High Injury Network. The following list highlights several safety countermeasures (many are included in the previously noted list of FHWA Proven Safety Countermeasures) that are recommended to increase safety in the Triangle West region: Many of these interventions can be implemented with low-cost treatments such as paint and flexible delineators. Bolt-in roundabouts may also be used to retrofit existing intersections, bringing critical safety interventions to the High Injury Network rapidly and affordably.

Eliminate excess roadway widths that contribute to higher speeds, repurposing the space where lanes exceed widths of 11-12 feet with medians, dedicated transit lanes, bicycle lanes, landscaping, etc.

Install roundabouts instead of new signals or four-way stops and convert two-way stops and appropriate signalized intersections to roundabouts.

Reduce the crossing distance and spacing between crossings based on land use context and transit stop locations.

Provide appropriate dedicated bicycle facilities on roadways with posted speeds greater than 25 miles per hour or with vehicle volumes greater than approximately 3,000 vehicles per day.

Implement leading pedestrian intervals at signalized intersections, specifically on the High Injury Network and High-Risk locations.

Install pedestrian-scale lighting along the High Injury Network, especially at arterial crossings.

Implement no turn on red in dense urban contexts and along the High Injury Network and high-volume pedestrian routes.

Adjust signal timing and signage for speed limits on arterials.

Set target speeds based on the Safe System Approach, including context sensitive design.

Implement raised medians or comparable devices to prohibit across-roadway movements such as turns for mid-block driveways, particularly for multi-lane roadways and where there are high pedestrian and bicyclist volumes.

Road diets can also be implemented as a part of regular resurfacing projects or through targeted restriping projects. FHWA notes that road diets are feasible on roadways with four or more lanes and daily volumes of 25,000 or less.[6] Excess roadway width is correlated with speeding and safety risks; reducing excess width creates safer streets. Removing space purely allocated for high-speed vehicle travel will increase space for other modes and create opportunities for roadway enhancements such as medians, improving the experience for all users.

Proactive and systemic safety countermeasures should be considered for installation on the HIN first and then as part of other street projects with similar conditions where crashes could occur, and eventually in a more widespread fashion, as budget and staff resources allow.

6 FHWA. Road Diet Informational Guide (2014). **https://highways.dot.gov/safety/other/road-diets/road-diet-informational-guide**

Priority Criteria

The development of prioritization criteria was based on the results of safety analyses and an understanding of the Safe System Approach. The list of possible projects that result from the prioritization process should highlight corridors that have experienced high numbers and density of fatal and serious injury crashes, as well as opportunities to address risk characteristics to increase safety. This Plan uses the following prioritization criteria, that is consistent with the previously described risk analysis, to identify both corridors and intersections that are suitable for project development by implementing agencies across the Triangle West TPO region.

Severity – Reduce the kinetic energy associated with collisions

Projects that reduce the kinetic energy of collisions will be prioritized. Crashes that occur at higher speeds and at more severe angles are more likely to result in a fatality or serious injury. The most effective proven safety countermeasures can either 1) reduce the speed at which a potential collision occurs or, 2) reduce the angle (i.e., sideswipes instead of head on or angle crashes) at which crashes occur.

Exposure - Reduce the space and frequency where potential collisions may occur

Reducing exposure to collisions is another method of reducing severe crashes. Priority is given to corridors that have higher daily motor vehicle volumes and is context specific, meaning that exposure may be higher in urban areas along streets with daily volumes greater than 15,000 due to multimodal conditions and density of intersections as compared with a rural roadway. Elevating corridors where the space and frequency of potential collisions may occur due to additional volume of motor vehicle trips can highlight the opportunity to separate users in these locations.

Risk/Likelihood – Reduce the likelihood of a collision occurring

Proactive projects that prevent a collision from occurring should be prioritized. The Plan may include projects that remove or reduce potential conflicts that tend to result in more severe outcomes. Priority is given to corridors and intersections identified in the High Injury Network, High Risk Network, or the High Injury Intersections.

Priority Corridors

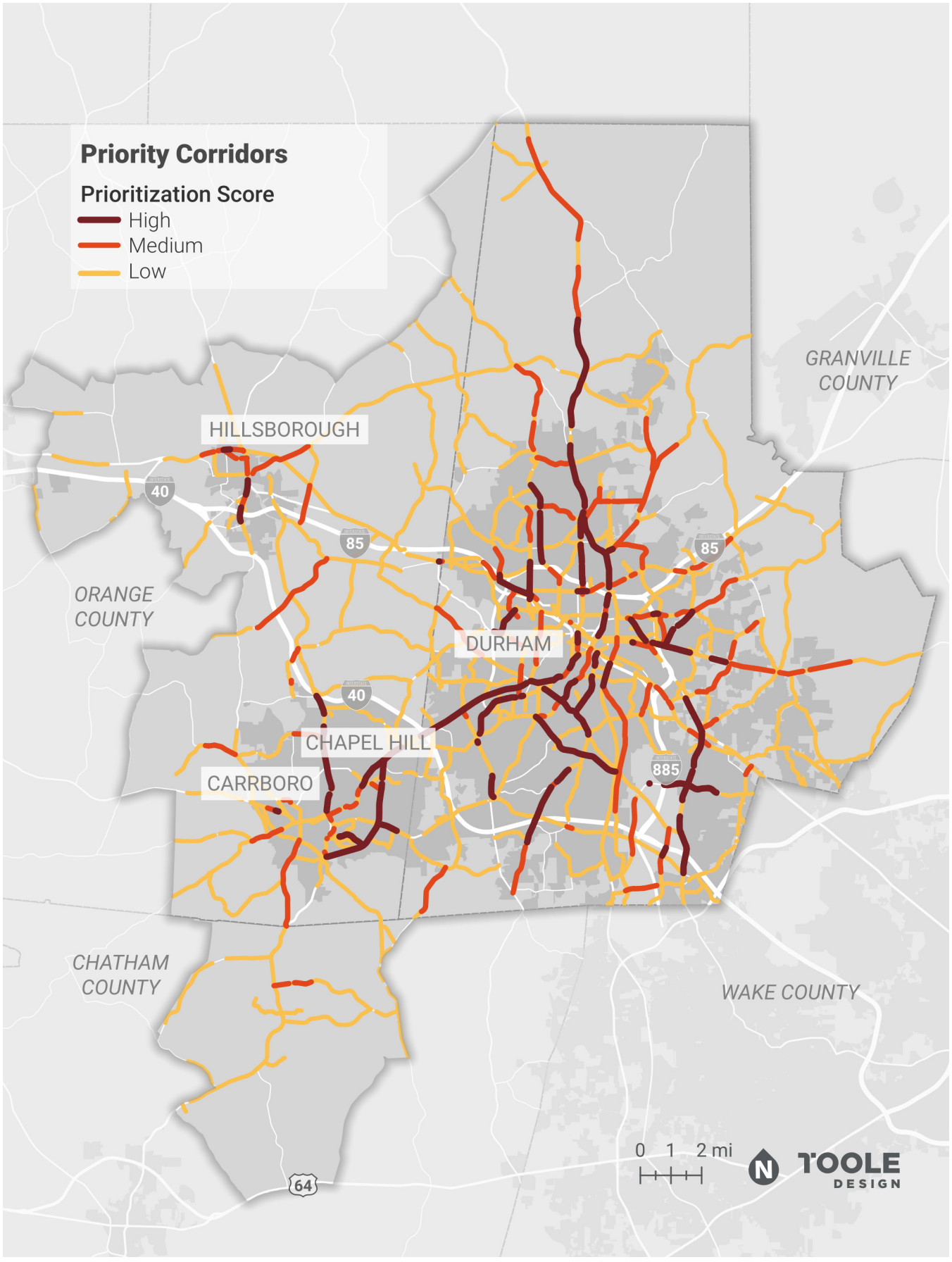
A few of the highest scoring regional priority corridors are identified in **Table 1**. Additionally, **Map 10** reflects priority corridors across the region based on the prioritization criteria described in the previous section – Severity, Exposure, and Risk/Likelihood. Additionally, key intersections were prioritized and scored as high, medium, or low for project development. The highest scoring intersections are listed in **Table 2** and priority intersections across the region are reflected in **Map 11**. Priority corridors and intersections for local agencies are displayed in map packages in **Appendix D**.

Regional Priority Corridors

TABLE 1 Regional Priority Corridors Overview

Corridors	Municipality	County
Martin Luther King Jr Blvd (NC-86)	Chapel Hill	ORANGE
Hillsborough Rd (US-70 BUS)	Durham	DURHAM
Fordham Blvd (US-15)	Chapel Hill	ORANGE
N Roxboro St at I-85 Interchange (US-15 Business)	Durham	DURHAM
N Roxboro St (US-15 Business)	Durham	DURHAM
Durham Chapel Hill Blvd (US-15 Business)	Durham	DURHAM
N Duke St (US-501)	Durham	DURHAM
S Miami Blvd (US-70)	Durham	DURHAM
S Cornwallis Rd (SR-1158)	Durham	DURHAM
Hillandale Rd (SR-1321)	Durham	DURHAM
E Franklin St (SR-1010)	Chapel Hill	ORANGE
Fayetteville Rd (SR-1118)	Durham	DURHAM
University Dr	Durham	DURHAM
Martin Luther King Jr Blvd	Durham	DURHAM

MAP 10 Regional Priority Corridors

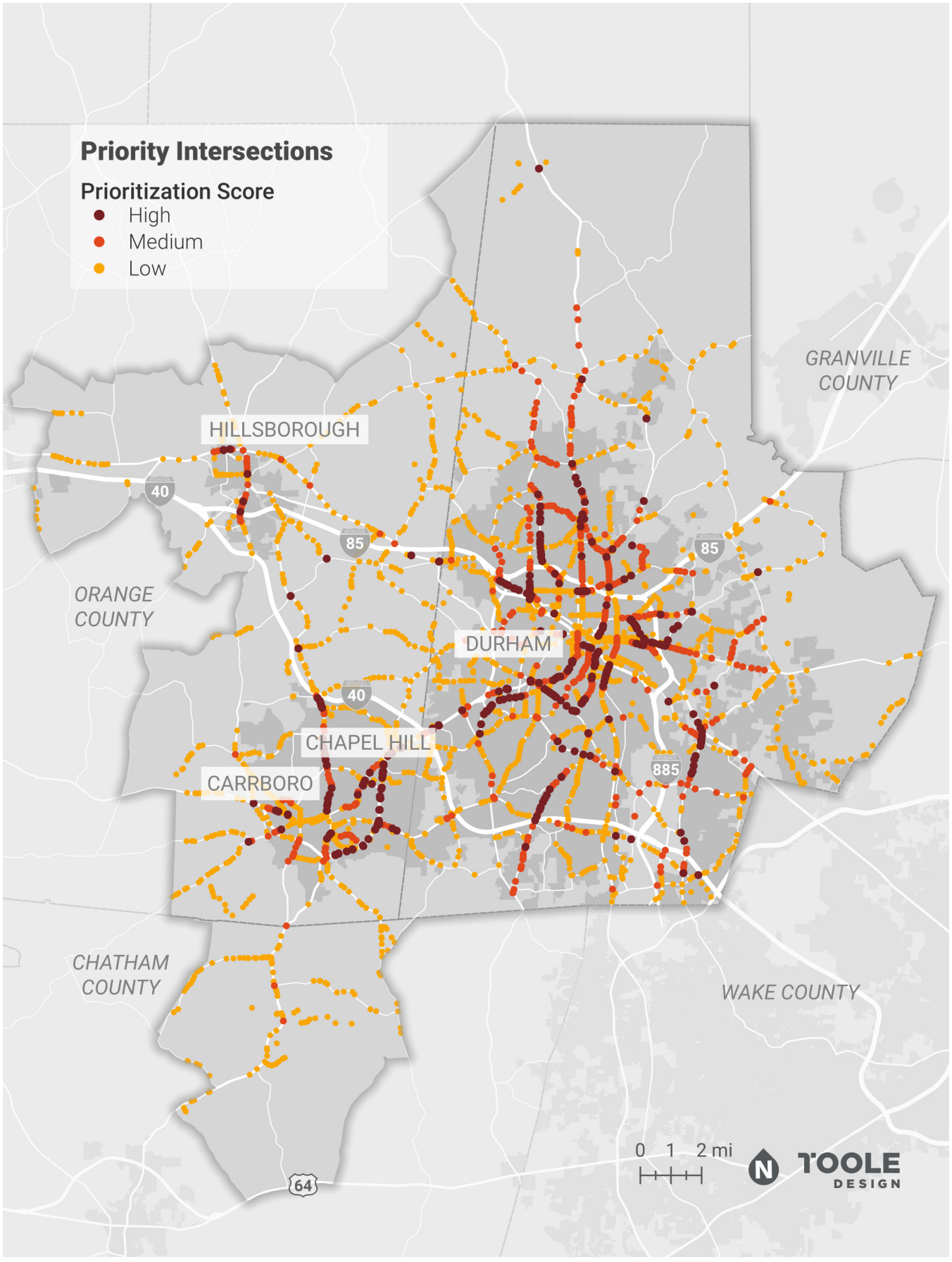


Regional Priority Intersections

TABLE 2 Regional Priority Intersections Overview

Intersection	Municipality	County
Martin Luther King Jr Blvd (NC-86) at Central Park Ln	Chapel Hill	ORANGE
Hillandale Rd (SR-1321) at W Wilson St	Durham	DURHAM
Martin Luther King Jr Blvd (NC-86) at Timber Hollow Ct	Chapel Hill	ORANGE
Manning Dr at Woodbine Dr	Chapel Hill	ORANGE
Martin Luther King Jr Blvd (NC-86) at North St	Chapel Hill	ORANGE
Martin Luther King Jr Blvd (NC-86) at Piney Mountain Rd	Chapel Hill	ORANGE
Hillandale Rd (SR-1321) at Sprunt Ave	Durham	DURHAM
NC-55 at Mint St	Durham	DURHAM
US-15 at Fordham Blvd	Chapel Hill	ORANGE
Fayetteville Rd (SR-1118) at Woodcroft Pkwy	Durham	DURHAM
US-15 at Europa Dr	Chapel Hill	ORANGE
NC-55 at Dayton St	Durham	DURHAM
US-70 Business at Hillandale Rd Hillsborough Rd Ramp	Durham	DURHAM
Hillandale Rd (SR-1321/) at W Club Blvd	Durham	DURHAM
James Madison Hwy (US-15) at Marsh Rd (SR-1741)	Chapel Hill	ORANGE

MAP 11 Regional Priority Intersections



05

Strategies and Actions

The ultimate goal of the Triangle West TPO Vision Zero Action Plan—to **save the lives of people across the region**—requires changing not only what we do but also how we plan, design, and operate the system that people use for daily trips. The Safe System Approach is the foundation for this change that elevates human life above everything else. Analyses in this Plan highlight important safety projects that can respond to locations where higher numbers and densities of fatal and serious injury crashes have occurred—displayed in the HIN and HII. Additionally, roadway characteristics were reviewed to understand where to address safety risks leading to projects, policies, and programs that can be proactive in addressing the safety of the transportation network.

To develop comprehensive solutions—both reactive and proactive—for the transportation safety challenges that exist across the Triangle West TPO region, the strategies and actions should focus on the principles and elements of the Safe System Approach:

Principles

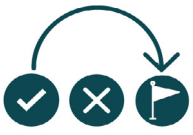
- Death and Serious Injuries are Unacceptable

- Humans Make Mistakes

- Humans Are Vulnerable

- Responsibility is Shared

- Safety is Proactive



- Redundancy is Crucial

Elements

- Safe Road Users

- Safe Vehicles

- Safe Speeds

- Safe Roads

- Post-Crash Care

Safety Action Strategies

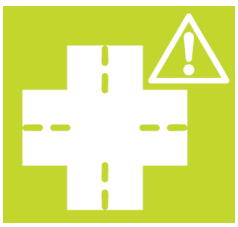
The Triangle West TPO's Vision Zero Action Plan is a guide to increasing roadway safety. With a clear goal of eliminating fatal and serious injury crashes, supporting strategies provide support for operational changes that impact how roadway safety can be increased in a variety of ways—from project selection to roadway restriping and resource development.

Action items are organized into the following strategy categories. Each strategy category is based on the results of analysis, input from stakeholders and the public, along with best practices for addressing roadway safety. The intent of developing categories is to support the Triangle West TPO and people across the region as they identify opportunities to increase safety.

Roadway Safety Resources and Guidance

Trail and Railroad Crossings

Walking and Biking in Urban/Downtown Contexts



Unsafe Intersections

Multimodal Safety Along Multilane Arterials

Behavior and Distraction

Rural High-Speed Corridors

Land Development Practices and Procedures

Safer Routes to Schools

Vulnerable Road Users (VRUs) at Night

Traffic Calming On Local Streets

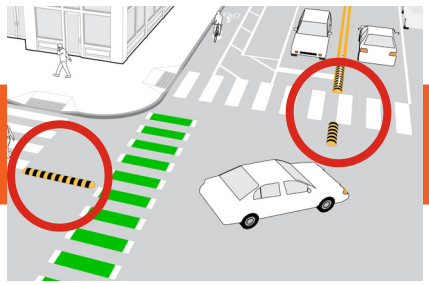
Post-Crash Care Resources and Programs

Street Safety Features: A Visual Guide

Chicane

Curb Extension

Daylighting



Hardened Centerline

High Visibility Crosswalk

Leading Pedestrian Intervals (LPIs)

Median Refuge Island

Mid-Block Trail Crossing

Mini Traffic Circle

No Turn On Red

Pedestrian Hybrid Beacon (PHB)

Protected Left Turn

Raised Crossing

Rectangular Rapid Flashing Beacon (RRFB)

Road Diet

Roundabout

Separated Bike Lane (SBL)

Sidepath

Slip Lane

Speed Cushions

Speed Feedback Sign

Truck Apron

Turning Radii

Turn Wedge

How to Use the Action Item Tables

A. Strategy Category

Strategies are overarching changes that may be operational, contextual, or mode-specific to systematically address the factors that lead to fatal and serious injury crashes and promote a culture of safety.

B. Action Items

Each action item is a discrete, specific effort that can be advanced by the Triangle West TPO, member agencies, supporting agencies, or NCDOT.

C. Systemic Actions

Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region where similar conditions exist for crashes to potentially occur.

D. Timeframe

Action items are assigned general timeframes to help action leaders prioritize their efforts. Although the timeframes note several years, these timeframes align with the level of effort for completing these actions.

Timeframes include:

- Immediate: Within 1 year;
- Short-term: 1-5 years; or
- Mid-term: 5-10 years.

E. General Cost

Although costs vary overtime and by jurisdiction, the following cost ranges were used to assign a high-level estimate for each action:

- $ - low (less than $250k)
- $$ - medium (between $250k-$1M)
- $$$ - high ($1M and above)

F. Action Leaders and Partners

Each action item may have several agencies that can take the lead, and those along with agencies/ organizations that can provide support are noted. This is not an exhaustive list, and each action may create opportunities for partnerships in each community and across the region.

Trail and Railroad Crossings

Similar to unsafe intersections, trail and railroad crossings impact the experience of roadway users and can present barriers to accessing key destinations. These actions identify opportunities to change crossing locations that prioritize trail users and coordinate with the railroad companies to create strategic plans for future changes.

TABLE 11 Trail and Railroad Crossings: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Daylight intersections (removing obstacles that impair sight lines) for all trail and railroad crossings*	Short	$$	NCDOT, Municipalities
Construct grade-separated crossings for trails at streets with posted speeds of greater than 45 mph*	Mid	$$$	NCDOT, Municipalities
Install crossings arms and enhanced warning devices at all uncontrolled railroad crossings*	Mid	$$$	NCDOT, NCRR, Other rail partners
Install lighting at all mid-block trail crossings*	Short	$$	NCDOT, Municipalities

Roadway Safety Resources and Guidance

Although the Triangle West TPO is not an implementing agency, there are numerous resources that can support roadway safety across the region. Additionally, member agencies are consistently developing new policies and programs that can be useful to other communities. These actions identify opportunities to create resources that can be hosted by the TPO and shared among its members.

TABLE 3 Roadway Safety Resources and Guidance: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Create and adopt a regional Complete Streets Design Guide as a resource for the region	Short	$	TPO, Municipalities, NCDOT
Convene a standing Transportation Safety Committee or Vision Zero Task Force to review crash and safety audit reports, coordinate efforts between jurisdictions, and track progress toward Vision Zero goals	Immediate	$	TPO, Municipalities, NCDOT
Develop a region-wide safety campaign to share information with the community about traffic safety for all modes	Short	$	Municipalities, TPO
Develop an annual program budget to support the Triangle West TPO region's Vision Zero Program	Short	$$	TPO
Ensure that asset management and maintenance programs reflect Vision Zero priorities	Immediate	$	Municipalities, NCDOT
Publish annual reports for measuring progress with Vision Zero implementation, including crash data and other safety metrics for transparency and accountability	Immediate	$	TPO, Municipalities
Adopt a Vision Zero Quick Build/Interim Design Policy that identifies interim design solutions with proven safety countermeasures that can be installed for safety projects while the more permanent solution is in the design and pre-construction processes	Short	$	TPO, Municipalities
Develop and adopt a regional framework for developing annual safety targets that are focused on aggressively reducing fatal and serious injury crashes in the Triangle West TPO region	Immediate	$	TPO, NCDOT
Develop a region-specific traffic calming guide that identifies best practices and applications for specific design elements	Short	$	TPO, Municipalities NCDOT

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Walking and Biking in Urban/Downtown Contexts

Increasing safety for people walking and biking—the most vulnerable road users—is paramount for municipalities across the region. As the downtowns in the City of Durham, and the Towns of Chapel Hill, Carrboro, and Hillsborough continue to increase in density and attract more people, roadway safety is critical. The following actions identify opportunities to prioritize pedestrian and bicyclist mobility in the core of the communities that experience high volumes of daily trips.

TABLE 4 Walking and Biking in Urban/Downtown Contexts: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Install No Turn on Red signs at all signalized intersections*	Immediate	$	NCDOT
Install Leading Pedestrian Intervals (LPIs) on auto recall at all signalized intersections*	Short	$	NCDOT, Municipalities
Construct curb extensions (interim solutions or concrete curbing) to daylight mid-block and intersection crossings along with formalizing parking/loading locations*	Short	$$$	NCDOT, Municipalities
Deploy protected left turn signal phases (removing permissive left turns during active pedestrian crossing phases) in downtown areas and along high-volume pedestrian and bicycle corridors*	Short	$$	NCDOT, Municipalities
Create a sidewalk gap program to fill short segments outside of the private development or Capital Improvement Program (CIP) processes*	Short	$$$	Municipalities
Host Complete Streets design trainings/workshops for local government staff, elected officials, NCDOT project managers, consultants, etc.	Immediate	$	TPO, Municipalities, NCDOT
Consider rest in red phase for downtown signals in off-peak, late night, or early morning periods*	Short	$	NCDOT, Municipalities
Deploy hardened centerlines and turn wedges for motor vehicle turning movements at intersections*	Short	$	Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Multimodal Safety Along Multilane Arterials

Roadway safety is a key concern along corridors where people are walking, bicycling, using transit, and driving in conditions with high motor vehicle volumes and numerous travel lanes. Safety action items for these corridors must elevate the Safe System principles and framework to ensure that users are separated wherever possible, and design emphasizes slower speeds where conflicts occur.[7] The following actions can impact project development and policy decisions, as well as encourage additional evaluation and study to understand key characteristics that impact local safety on multimodal multilane arterials.

TABLE 5 Multimodal Safety Along Multilane Arterials: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Construct separated pedestrian and bicycle facilities- detached sidewalks, sidepaths, separated bike lanes	Short	$$$	NCDOT, Municipalities
Install speed feedback signage	Short	$	NCDOT, Municipalities
Set/reduce speed limits for multilane arterials based on context	Short	$$$	NCDOT, Municipalities
Conduct regular Road Safety Audits on high-risk arterials	Immediate	$	NCDOT, Municipalities
Remove permissive left turns during active pedestrian phases at intersections starting with intersections that include trail crossings and are adjacent to transit stops	Short	$$	NCDOT, Municipalities
Develop corridor studies for HIN corridors, including crash types, speeds, multimodal facilities, crossings, and lighting/ visibility	Mid	$$	TPO, NCDOT, Municipalities
Narrow travel lane widths on multilane arterials to support traffic calming and identify opportunities for repurposing existing roadway for multimodal facilities/amenities*	Short	$$	NCDOT, Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

7 USDOT FHWA Appropriate Speed Limit for All Road Users. **https://highways.dot.gov/safety/proven-safety-countermeasures/appropriate-speed-limits-all-road-users**

Rural High-Speed Corridors

The Triangle West TPO Vision Zero Action Plan recognizes that roadway safety and context must be considered together to eliminate fatal and serious injury crashes. In the rural context, roadway design should consider how lane departures on high-speed corridors can be mitigated along high injury corridors as well as deploy proactive countermeasures to increase roadway safety. The list below includes specific actions related to curvature and speeds while also noting the need for thoughtful intersection control/design and trail crossing enhancements.

TABLE 6 Rural High-Speed Corridors: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Install enhanced delineation for horizontal curves for corridors along the HIN or HRN*	Immediate	$	NCDOT, Municipalities
Install wider edge lines on high-speed rural roadways*	Mid	$$	NCDOT, Municipalities
Create a policy, procedure, and multi-agency team to conduct a Road Safety Audit for rural corridors along the HIN and in response to future KSI crashes	Immediate	$	TPO, Municipalities, Counties
Review speed limits on the rural HIN, evaluate the speed limit change process, and explore rural corridors for design and signal improvements and speed limit reduction	Short	$	NCDOT, Municipalities, Counties
Consider a roundabout-first policy to address speeds and dangerous intersections along rural high-speed corridors	Immediate	$	TPO, NCDOT, Municipalities, Counties
Install high visibility and enhanced trail crossings (i.e., high visibility crossings, RRFBs, PHBs, raised crossings, neck-downs) along rural corridors*	Short	$$	NCDOT, Municipalities
Create and adopt an intersection control/design selection policy	Immediate	$	TPO, Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Safe Routes to School

Increasing safety for students is an opportunity to protect one of the most vulnerable populations in each community and provide opportunities to educate children about mobility in the built environment. These actions are focused on changing infrastructure at and approaching schools to create safer and more intuitive infrastructure for all roadway users.

TABLE 7 Safe Routes to School: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Install high-visibility crosswalks within a one-mile travelshed of all schools*	Immediate	$	School Districts, Municipalities
Construct curb extensions and median refuge islands for street crossings within a half mile of all schools*	Short	$$	NCDOT, Municipalities, School Districts
Install separated bikeway facilities—separated bike lanes or shared use paths—along corridors that are within a half-mile of schools*	Short	$$	NCDOT, Municipalities, School Districts
Install speed feedback signage along with RRFBs/PHBs for mid-block crossings within a half mile of all schools*	Short	$$	NCDOT, Municipalities, School Districts
Provide raised crosswalks at mid-block crossings and at intersections used for walking and bicycling to/from schools	Mid	$$$	NCDOT, Municipalities, School Districts
Conduct targeted/automated enforcement of handheld device bans, distracted driving, yielding, and speeding within school zones	Short	$	Law enforcement
Implement a comprehensive crossing guard program	Short	$$	NCDOT, Municipalities, School Districts
Develop a resident/ambassador program to support local SRTS programs (i.e., counts, safety audits, infrastructure project review)	Immediate	$	TPO, School Districts, Municipalities, SRTS
Create a walking and bicycling school bus leader guide and program development information	Immediate	$	School Districts, Municipalities, SRTS
Create a traffic playground pop-up toolkit that can be used at local events to teach walking and bicycling in a playful manner	Immediate	$	County health departments, School Districts, Municipalities, SRTS, TPO
Identify locations for permanent traffic playgrounds and asphalt art locations that can support education and speed management	Short	$$	County health departments, School Districts, Municipalities, SRTS, TPO
Adopt a Safe Routes to School Action Plan	Short	$	Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Traffic Calming on Local Streets

Reducing speed on local streets creates safer and more livable places for residents in communities across the region. Traffic calming actions emphasize changing streets to allow for shared spaces for a variety of users that are comfortable because of slower moving vehicles along streets and at intersections.

TABLE 8 Traffic Calming on Local Streets: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Implement road diets/lane removals to provide space for walking, bicycling, transit, green space, and/or on-street parking*	Short	$$$	NCDOT, Municipalities
Develop a neighborhood slow streets program to support community requests for low vehicular traffic residential streets that emphasize slow and safe speeds and support a variety of uses and activities beyond driving	Immediate	$	Municipalities
Create a neighborhood traffic calming program to manage community traffic safety requests in a transparent, consistent, and equitable manner	Short	$	Municipalities
Deploy mini traffic circles, speed cushions, chicanes, neck downs, hardened centerlines, and curb extensions on residential streets to reduce vehicle speeds and cut through traffic	Short	$$	Municipalities
Install a network of bicycle boulevards/neighborhood slow streets to expand existing bicycle networks and reduce motor vehicle speeds	Mid	$$	Municipalities
Narrow travel lane widths along local streets at the corridor level or at strategic locations*	Short	$$	Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Trail and Railroad Crossings

Similar to unsafe intersections, trail and railroad crossings impact the experience of roadway users and can present barriers to accessing key destinations. These actions identify opportunities to change crossing locations that prioritize trail users and coordinate with the railroad companies to create strategic plans for future changes.

TABLE 9 Trail and Railroad Crossings: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Daylight intersections (removing obstacles that impair sight lines) for all trail and railroad crossings*	Short	$$	NCDOT, Municipalities
Construct grade-separated crossings for trails at streets with posted speeds of greater than 45 mph*	Mid	$$$	NCDOT, Municipalities
Install crossing arms and enhanced warning devices at all uncontrolled railroad crossings*	Mid	$$$	NCDOT, NCRR, Other rail partners
Install lighting at all mid-block trail crossings*	Short	$$	NCDOT, Municipalities
Install RRFBs or PHBs for trail crossings on high-speed corridors until grade-separated crossing is constructed*	Short	$$	NCDOT, Municipalities
Coordinate with railroad companies to create a strategic plan to address crossing locations	Mid	$	Municipalities, Railroad Companies

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Unsafe Intersections

Intersections are inherently locations where multimodal conflicts exist due to the confluence of people walking, bicycling, using transit, and driving. As all of these street users make decisions at an intersection, these actions provide guidance on how to reduce conflicts and exposure while creating a more intuitive design that prioritizes more vulnerable users.

TABLE 10 Unsafe Intersections: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Implement systemic safety improvements at highest risk rural intersections annually*	Short	$$	NCDOT
Implement daylighting at urban high risk and mid-block intersections with on street parking and near transit stops*	Short	$$	NCDOT, Municipalities
Add pedestrian countdown signals and LPIs at high risk signalized intersections and adjacent to transit stops*	Immediate	$$	NCDOT, Municipalities
Study the implementation of automated enforcement for red light running in school zones	Short	$	TPO, NCDOT, Municipalities, School District
Remove permissive left turns during active pedestrian phases*	Short	$	NCDOT, Municipalities
Tighten turning radii to reduce turning speeds and include truck aprons on freight routes*	Mid	$$$	NCDOT, Municipalities
Consider a roundabout-first policy to address speeds and dangerous intersections along the HIN and high-risk corridors	Immediate	$	NCDOT, Municipalities Counties, TPO
Close slip lanes where applicable, starting with the HIN	Mid	$$$	NCDOT, Municipalities
Deploy protected intersections for pedestrians and bicyclists along multilane arterials, transit corridors, and where bikeways exist or are planned	Mid	$$$	NCDOT, Municipalities
Use intersection control/design selection process to determine appropriate intersection treatments	Short	$	Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Behavior and Distraction

Addressing behavior of roadway users is one part of increasing safety and aligns with the Safe Road User element of the Safe System Approach. These actions should be used alongside other actions that make physical changes to the streets.

TABLE 11 Behavior and Distraction: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Establish county metrics for seatbelt and car seat public education campaigns	Short	$	TPO, Law enforcement, NCDOT, Municipalities, Health Departments
Conduct High Visibility Enforcement for seatbelts and impaired driving	Short	$	Law enforcement
Promote and implement safe driving and anti-distraction messaging and policies	Short	$	TPO, Law enforcement, NCDOT, Municipalities
Host community conversations about roadway safety	Short	$	TPO, Municipalities, Trauma-Centers, Local advocacy groups
Develop a program for emergency responders to tell their stories about roadway safety that can be shared with communities to emphasize the impact of fatal and serious injury crashes have on people	Short	$	TPO, Trauma Centers, Law enforcement, Local advocacy groups

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Land Development Practices and Procedures

The Safe System Approach is grounded in the reality that increasing safety will require making changes to the system, not only individual parts. Land use impacts on the transportation network are important and the policies and plans that guide development are an opportunity to make transportation safety changes.

TABLE 12 Land Development Practices and Procedures: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Deploy access management strategies to combine driveways to adjacent properties, provide cross-access between developments, and construct medians to reduce conflicts near driveways and intersections	Mid	$$	Municipalities
Incorporate into the Triangle West TPO Federal Funding Policy a regional Project Evaluation Framework to exclude undivided multi-lane highways from regional funding priorities. Every multilane road must have a median (preferred) and/or turn lane (at a minimum)	Short	$$	TPO, NCDOT, Municipalities
Develop guidance and coordinate with external stakeholders to ensure that access for people walking, bicycling, and using transit is maintained during roadway or site construction and special events	Immediate	$$	Municipalities
Integrate the HIN into project and development reviews	Immediate	$	TPO, NCDOT, Municipalities
Update, adopt, and implement land use, Transportation Demand Management (TDM), and street design policies that increase safety, reduce Vehicle Miles Travelled (VMT), and decrease dependence on single-occupancy vehicles (SOV) trips	Short	$	TPO, CPRC, Municipalities
Review and update land use policies and development standards to prioritize the safety of all road users (e.g., block size, crosswalk spacing, access management)	Immediate	$$$	Municipalities
Update local and regional plans and policies to be inclusive of all modes and ensure safety is a primary priority. Plans include comprehensive plans, land use plans, mode-specific plans, etc.	Immediate	$	Local Government Agencies

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Vulnerable Road Users at Night

Roadway safety should not be dependent on the time of day or the transportation mode of the person taking the trip. Across the Triangle West TPO region, there are opportunities to make changes that will increase visibility and reduce exposure for people walking and bicycling, no matter the trip purpose—i.e, commuting to/from work for a night shift, leaving a local evening event, or exercising early in the morning, etc.

TABLE 13 Vulnerable Road Users at Night: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Install street lighting along high-frequency transit corridors, specifically at transit stops and crossings	Mid	$$$	NCDOT, Municipalities
Deploy high visibility crosswalks*	Immediate	$	NCDOT, Municipalities
Install RRFBs or PHBs to catch the attention of drivers, specifically at night*	Short	$$	NCDOT, Municipalities
Narrow lane widths to support traffic calming and reduce crossing distances for pedestrians and bicyclists	Mid	$$	NCDOT, Municipalities
Conduct night-time Road Safety Audits along key high-risk roadways and for fatal or serious injury crashes that involve a VRU at night	Immediate	$	TPO, NCDOT, Municipalities
Install pedestrian-scale lighting strategically along the HIN and high-risk roadways, especially at trail crossings and transit stops, to improve visibility to drivers*	Mid	$$$	NCDOT, Municipalities

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

Post-Crash Care Resources and Programs

As a key element of the Safe System Approach, post-crash care should be prioritized across the region. The following actions highlight opportunities to increase the resources and support programs that can improve care and response time. Most importantly, these actions should be a catalyst for similar programming and resources that may available in the future.

TABLE 14 Post-Crash Care of Individuals Injured in Motor Vehicle Collisions: Actions & Implementation

Action	Timeframe	Cost	Action Leaders and Partners
Establish a regional whole blood program for critically injured trauma patients	Short	$$	Municipalities, Counties, Hospitals
Increase EMS resources (ambulances, personnel) to improve response times and rapid hospital transport of post-crash patients	Immediate	$$	Municipalities, Counties
Develop a regional training and education program for first responder and EMS care of post-crash patients	Short	$	Municipalities, Counties, Hospitals
Implement regional data measurement system into stakeholder review committees to asses post-crash EMS response and quality of care	Short	$	Municipalities, Counties

* Items followed by an asterisk represent systemic safety countermeasures that can be installed on the HIN or proactively across the region

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Metrics and Accountability

The Triangle West TPO Vision Zero Action Plan is a commitment along with an initial set of goals and actions to achieve zero fatal and serious injury crashes on roadways across the region by 2050. However, Vision Zero must be more than a document; it must be embraced, discussed, emphasized, reinforced, and acted upon every day. This Plan must be a living document that unites people across agencies, departments, organizations, and the region to prioritize roadway safety.

Performance Metrics

There must be accountability at a variety of levels for eliminating fatalities and serious injury crashes. Triangle West TPO will need to monitor and report the progress and impact of Plan actions related to safety strategies. Evaluation and regular reporting are essential in understanding whether actions, tactics, and approaches are working. If certain actions are not successful, not moving fast enough, or not working for another reason, the Triangle West TPO should assess and modify actions as needed. However, it is critical that monitoring does not reduce or minimize the focus on the ultimate performance measure of eliminating fatal and serious injuries on all roadways in the Triangle West region.

Measuring progress and success can be accomplished in a variety of ways—frequent tracking, data dashboards, and local agency reports. Routine updates to performance metrics when new projects are funded, designed, and implemented highlight changes and mark milestone efforts related to increasing roadway safety. While the items that can be measured can change over time, key performance metrics may include but are not limited to:

- Number and rates of fatal and serious injury crashes
- Changes in the number and rates of fatal and serious injury crashes over time
- Crashes along the HIN and changes in crash rates over time
- Crashes involving bicycles and pedestrians
- Crashes resulting from unsafe speeds
- Crashes on NCDOT roadways versus local roadways
- Crashes occurring on roadways in communities where a high number of indicators of potential disadvantage exist

Target Setting Framework

Moving Toward Zero

Target setting for the Triangle West TPO should emphasize the ultimate goal – eliminating fatal and serious injuries across the region. Using the performance metrics, the following is a framework for setting annual targets and five-year milestones. Each element of the framework includes context (local or NCDOT), crashes by mode, along with goals for annual and milestone changes. Aiming to meet or exceed each of these annual goals will ensure the Triangle West TPO and member agencies are successful in achieving the goal of eliminating fatal and serious injuries.

How to Use the Target Setting Framework

A. Purpose of Framework

The Target Setting Framework helps track progress toward Vision Zero by setting annual and five-year targets for fatal and serious injury crashes. This table is designed to provide a structured way to measure changes over time and ensure data-driven decision making.

B. Benchmark & Milestone Years

- 2025 is the Benchmark Year- This serves as the starting point to measure progress
- 2030 is the Milestone Year- This is the target year for achieving significant reductions in crashes
- Each year, agencies compare new data to both the benchmark year (2025) and the previous year to assess progress

C. Tracking Progress Annually

The table should be updated each year to document:

- The number and rate of fatal and serious injury crashes
- The percentage change will highlight the change in number and rate of fatal and serious injury crashes from 2025 (baseline year) and the prior year (based on when targets are being reviewed/set)
- Trends across different roadway types (urban/rural) and user groups (pedestrians, bicyclists, motorists)

D. Using the Table for Decision-Making

- A decrease in crash numbers/rates suggests that safety strategies are working and should be continued or expanded
- An increase in crashes may indicate the need for new interventions, infrastructure improvements, or policy adjustments
- Comparing data across different modes (pedestrians, cyclists, motorists) helps prioritize equitable safety investments

E. Updating Targets & Adjustments

- Targets are not static: they should be reviewed annually to reflect changing roadway conditions, new safety initiatives, and regional trends
- The framework should guide funding decisions, policy changes, and infrastructure improvements based on data-driven insights

Fatal Crashes

TABLE 15 Annual and Five-Year Target Framework for Fatal Crashes

Context	Type	1-Year Target				5-Year Milestone			
		Number		Rate		Number		Rate	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
NCDOT									
	PEDESTRIAN								
	BICYCLIST								
	MOTORIST								
	SUBTOTAL								
LOCAL									
	PEDESTRIAN								
	BICYCLIST								
	MOTORIST								
	SUBTOTAL								
TOTALS									

Serious Injury Crashes

TABLE 16 Annual and Five-Year Target Framework for Serious Injury Crashes

Context	Type	1-Year Target				5-Year Milestone			
		Number		Rate		Number		Rate	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
NCDOT									
	PEDESTRIAN								
	BICYCLIST								
	MOTORIST								
	SUBTOTAL								
LOCAL									
	PEDESTRIAN								
	BICYCLIST								
	MOTORIST								
	SUBTOTAL								
TOTALS									

Annual Report

In addition to tracking performance measures, the Triangle West TPO should produce an annual report to summarize accomplishments and communicate planned next steps toward eliminating fatal and serious injury crashes. A true commitment to the Safe System Approach does not mean that results are immediate; however, annual reporting is a valuable tool to keep roadway safety at the forefront until the goal of zero is accomplished. Some metrics will be reported annually while others will be updated as resources allow depending on the complexity of the data. As annual reporting and tracking inform decisions, the Triangle West TPO should review and update this Plan routinely. This may include annual minor revisions along with a more comprehensive update every five to seven years. Other topics and metrics to consider for annual reporting include:

- Efforts to impact factors that increase the likelihood of fatal and serious injury crashes such as speed, visibility, driving under the influence, or education, among others
- Funding associated with safety projects across the region
- Funding invested in infrastructure improvements in Disadvantaged Communities (**see Appendix B**) as a percentage of all transportation projects
- Changes in land use policies or practices to increase safe connections between residential areas and employment locations
- Projects completed (including corridor or spot treatments)
- Locations and number of street segment and intersection improvements made on the High Injury Network
- Locations and number of off-street segment improvements (sidewalks, multi-use paths, bike trails) made adjacent to the High Injury Network.
- Changes in KSI crashes after projects have been completed
- Proven Safety Countermeasures deployed

Sharing Responsibility for Vision Zero

To carry out everything presented in this Vision Zero Action Plan and to eliminate fatalities and serious injury crashes on all roadways across the Triangle West region, everyone—from elected officials and municipal staff to local employers and residents of all ages and abilities— will need to consider the actions they can take, individually and collectively. The Triangle West TPO, NCDOT, CAMPO, Burlington-Graham MPO, Central Pines RPO, and member agencies all have key roles in building a safer transportation system in the region.

- Triangle West TPO: Develop resources, identify and secure project funding, provide technical support
- NCDOT: Safer project development, funding resources, partnerships, clear guidance for safety projects
- Member Agencies: Adopt safety-focused plans and policies, initiate safety programs, prioritize safety projects, and take action (both responding to crashes and deploying proactive countermeasures)

We all have a personal responsibility to make the right choices and to communicate the importance of why roadway safety matters—making the region's efforts even more effective. The goal of zero is not simple, but it is important because everyone deserves to arrive home safely.

Glossary

Chicane

Chicanes are traffic-calming features that create a curved path for vehicles, encouraging slower speeds and improving safety for all road users while adding visual interest to the streetscape.

Curb Extension

Curb extensions, also called neckdowns or bulbouts, improve pedestrian visibility and enhance street safety by narrowing roadways and tightening intersections. Curb extensions shorten the crossing distance for pedestrians and reduce motor vehicle turning speeds.

Daylighting

Daylighting references areas at street corners with no visual obstructions for drivers or pedestrians, providing unobstructed sightlines for users and improving safety at crossings.

Hardened Center Line

Hardened centerlines promote wider left turns by motor vehicles, thereby enhancing visibility for pedestrians crossing the street. These include vertical elements – mountable curb or flex posts – that force drivers to slow down and restrict their ability to cross the double yellow lines when making turning movements.

High Visibility Crosswalk

High visibility crosswalks are pedestrian crossings marked with patterns (e.g., ladder, zebra, continental) that improve visibility for pedestrians and drivers.

Leading Pedestrian Intervals (LPIs)

Lead pedestrian intervals are a type of pedestrian signal phasing that gives pedestrians 3-7 seconds to begin crossing prior to traffic signals turning green, thus improving the safety and visibility of pedestrians.

Median Refuge Island

Median refuge islands enhance safety for pedestrians by providing space in the center of a two-way street to allow pedestrians to cross the street in two phases. They are particularly beneficial to ease pedestrian crossing stress where crossings are long.

Mid-block Trail Crossing

Mid-block trail crossings allow trail users to cross roadways at areas other than intersections. These crossings should include appropriate infrastructure, such as pedestrian signalization, signage, median refuges, and other elements as appropriate.

No Turn On Red

No Turn on Red signs are used to restrict motor vehicles from turning right at signalized intersections, during the red indication. Restricting this movement eliminates conflicts with bicycles and pedestrians crossing in front of turning vehicles.

Mini Traffic Circle

Traffic circles are effective traffic calming design alternatives for residential, low-volume streets, particularly when used in conjunction with other strategically placed traffic calming devices throughout a corridor.

Pedestrian Hybrid Beacon (PHB)

Pedestrian Hybrid Beacons (PHBs) enhance safety at unsignalized crosswalks by controlling traffic and assisting pedestrian crossings. PHBs remain dark until activated, displaying a sequence of lights to indicate crossing intervals. They are particularly effective at locations with high vehicle speeds or volumes where traffic signals are not warranted, such as school crossings and parks.

Protected Left Turn

Protected Left Turn traffic signal phasing provides a separate phase for left-turning vehicular traffic, indicated by a left arrow signal. The protected left turn signal reduces pedestrian and vehicular conflicts with the left turning vehicles, creating safer intersection operations for all users.

Raised Crossings

Raised crossings are traffic calming measures that employ vertical changes to create sidewalk-level crossings and improve motorist yielding to people walking, rolling, and biking at intersections and mid-block crossings.

Rectangular Rapid Flashing Beacon (RRFB)

Rectangular Rapid Flashing Beacons (RRFBs), activated via pushbuttons or automated sensors, are installed on pedestrian crossing signs to increase driver awareness at crosswalks. RRFBs feature a rapid-pulsing flash rate, bright intensity, and a distinct shape, and are placed on both sides of the roadway below the pedestrian crossing sign.

Road Diet

A road diet reduces the number of lanes on a roadway. A road diet from four to three lanes is most common and results in two travel lanes with a center turn lane.

Roundabout

Roundabouts are specialized intersections that are designed for counterclockwise circulation around a central island. They have several benefits when compared with conventional signalized intersections, including reducing conflict points and crash severity, encouraging slower turning speeds, and eliminating the need for utilities powering traffic signals.

Separated Bike Lane (SBL)

Separated bicycle lanes (SBLs), also called protected bicycle lanes, provide a greater physical distance from motorized travel for people riding bicycles. Separated bicycle lanes incorporate a buffer space with vertical elements, such as curbs or flexible delineator posts, making them more attractive to a wider range of bicyclists than traditional striped bike lanes.

Sidepath

Located adjacent to (or parallel) the roadway, a sidepath is a bidirectional shared use path for pedestrians and people riding bicycles.

Slip Lane

A vehicular lane of traffic that allows drivers to make right-hand turns and enter a new roadway without fully stopping or entering the intersection.

Speed Cushions

Speed cushions, humps, and tables are traffic-calming measures designed to slow vehicles, improving safety for pedestrians, cyclists, and neighborhood residents while maintaining accessibility for all road users. These vertical deflection treatments are highly effective in reducing motor vehicle speeds.

Speed Feedback Sign

These signs are intended to aid in traffic calming by showing vehicular speeds, highlighting when drivers are driving over the speed limit, and potentially encouraging drivers to slow down.

Truck Apron

A slightly raised, drivable area on the outside of a roundabout or a curb extension to allow for turning movements of larger vehicles, often trucks, without requiring wider roadways to accommodate larger vehicles.

Turning Radii

Turning radii directly impact vehicle turning speeds and pedestrian crossing distances. Minimizing the size of a corner radius is critical to creating compact intersections with safe turning speeds.[8]

Turn Wedge

Installed at the corners of intersections, turn wedges reduce vehicular turning speeds by requiring wider turning angles, improving crossing visibility and safety for pedestrians. Turn wedges can be constructed with concrete or paint and vertical elements such as raised speed humps and flexible delineators.

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8 NACTO Urban Street Design Guide. **https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/corner-radii/**