TRIANGLE WEST
Transportation Planning Organization

April 2025

# 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

**PSCi:** 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)

# Acknowledgments

## Triangle West TPO

Doug Plachcinski, Executive Director

Colleen McGue, Planning Manager

Madeline Galliano, Transportation Planner

## Technical Advisory Team

Matt Albee, FHWA, Safety Engineer

Cha'ssem Anderson, The University of North Carolina

Wright Archer, NCDOT Division 7

Ellen Beckmann, Durham County

Ben Berolzheimer, Town of Chapel Hill

Paul Black, GoTriangle

Reuben Blakey, NCDOT Division 8

Julie Bogle, NCDOT Transportation Planning Division, Transportation Engineer III

Anne Calef, Research Triangle Foundation

Delia Chi, The Raleigh Durham Airport Authority

Travis Crayton, RTP

Matt Day, CPRC

Carl DePinto, Duke University

Caroline Dwyer, Chapel Hill Transit

Matt Efird, Town of Hillsborough

Becca Eversole, Town of Carrboro

Karyl Fuller, Central Pines Planning Organization

Madelline Galliano, Transportation Planner

John Grant, NCDOT Traffic Operations

Lauren Grove, Vision Zero Coordinator, Chapel Hill

Will Guzman, NCCU, Community Engagement

Catherine Knudson, North Carolina Railroad

Bryan Lopez, NCDOT IMD (interim)

Colleen McGue, Planning Manager

David Miller, Transportation Planner

Tina Moon, Town of Carrboro

Brian Murphy, NCDOT Safety Office

Doug Plachcinski, Executive Director

Jordan Powell, VHB

Samad Rangoonwala, DCHC MPO

John Sandor, NCDOT Division 5

Curtis Scarpignato, Durham County

Thanh Schado, Chatham County

Kurt Stolka, Vision Zero Coordinator, Chapel Hill

Nishith Trivedi, Orange County

Stephanie Trueblood, Hillsborough

Bergen Watterson, Town of Chapel Hill

Kenneth Withrow, CAMPO

## Consultant Team

Toole Design Group

VHB

Catalyst Design

**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.**

**The Triangle West TPO Vision Zero Action Plan was adopted on April 22, 2025.**

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# 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.

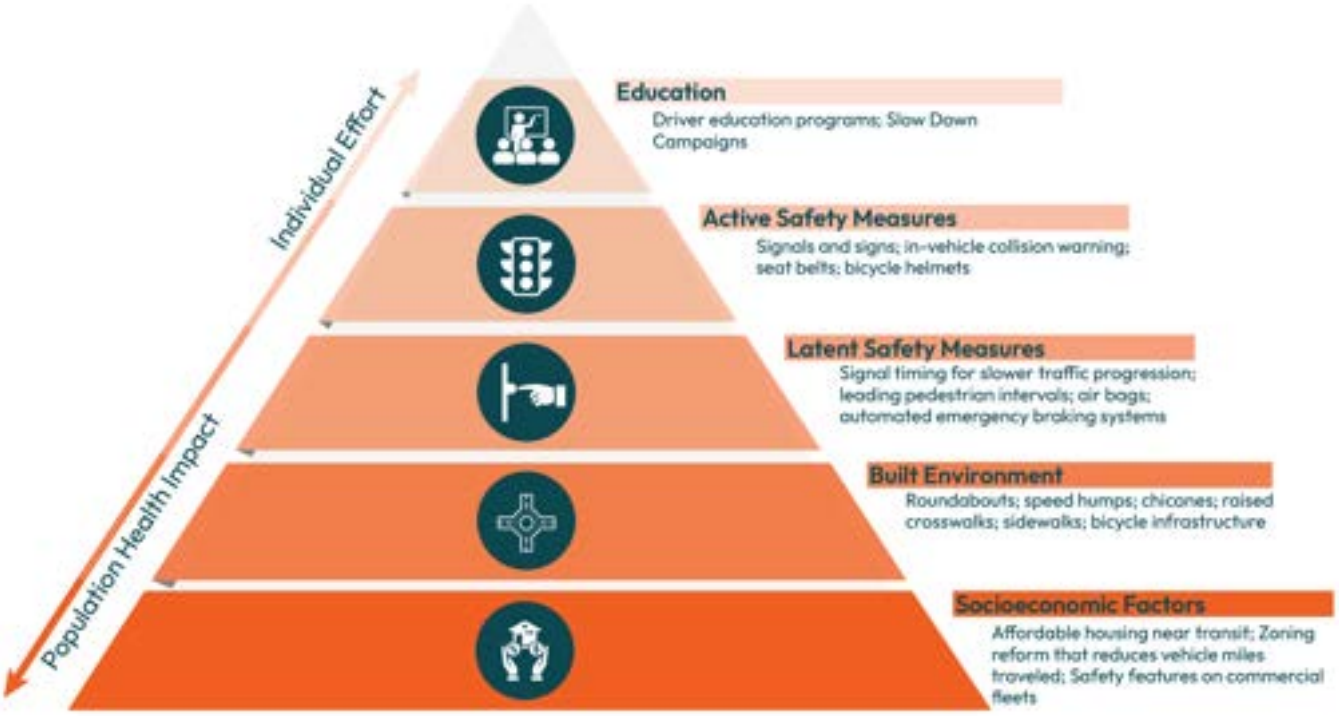



**FIGURE 1** Safe System Pyramid

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]

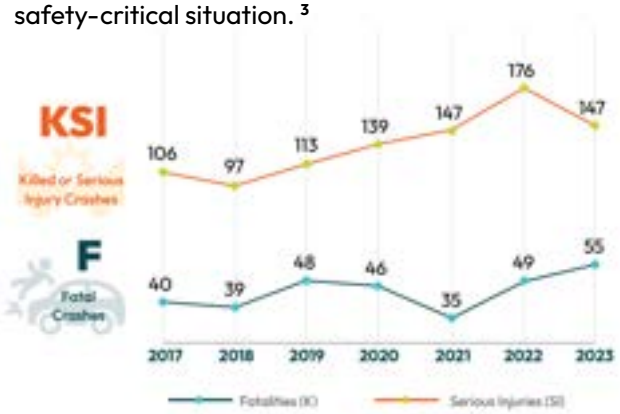



**FIGURE 4** KSI Crashes by Year

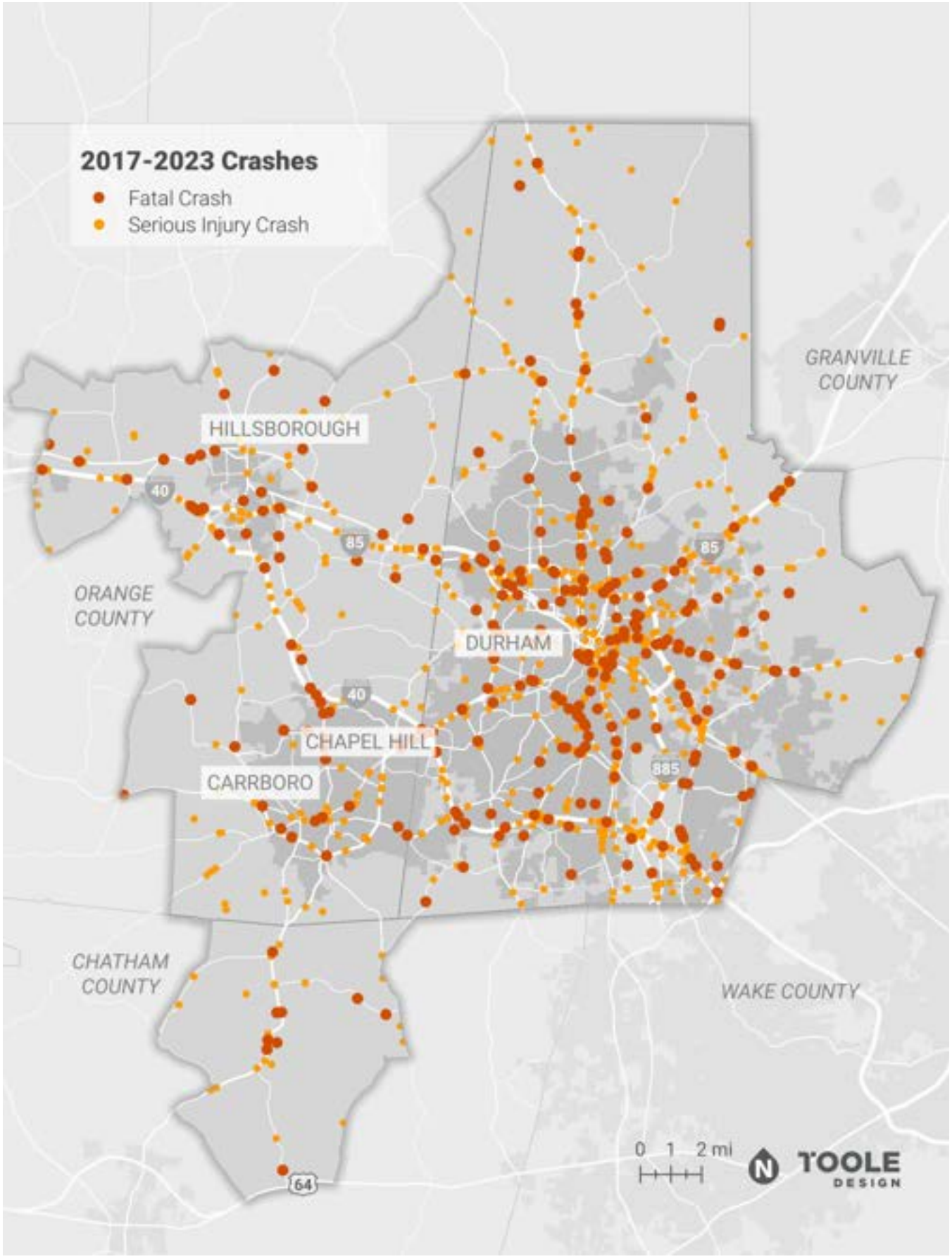
## What is a Serious Injury?

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)

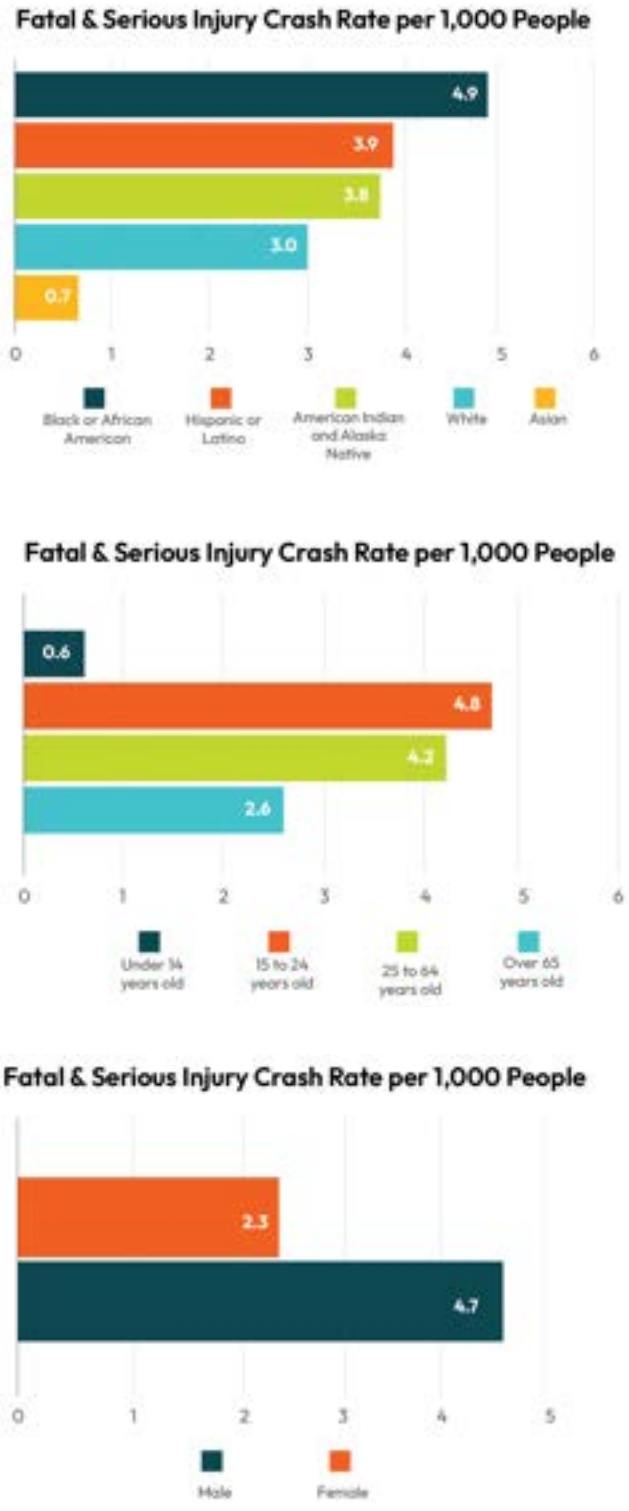
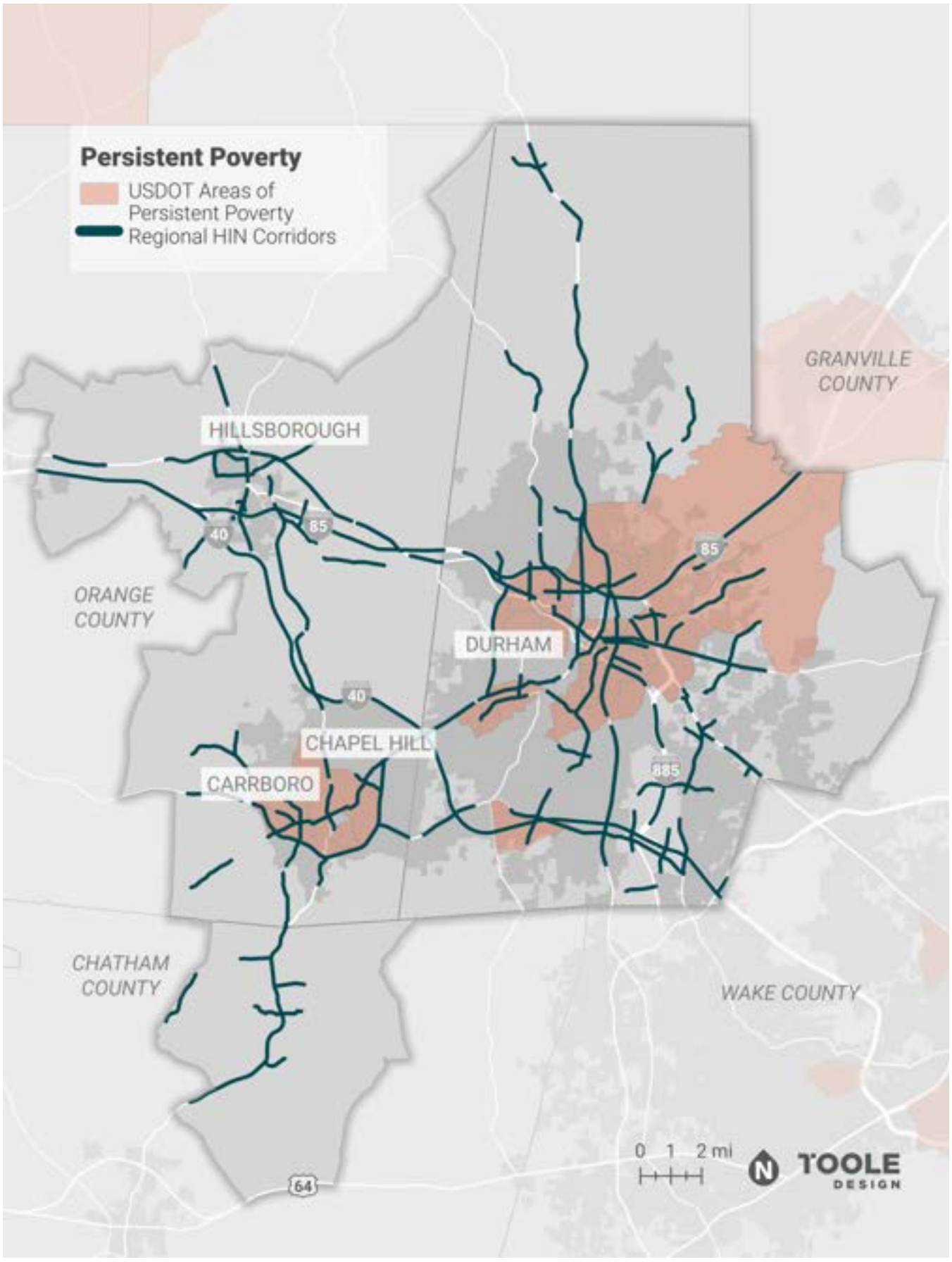



**FIGURE 6** KSI Crashes by Year

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



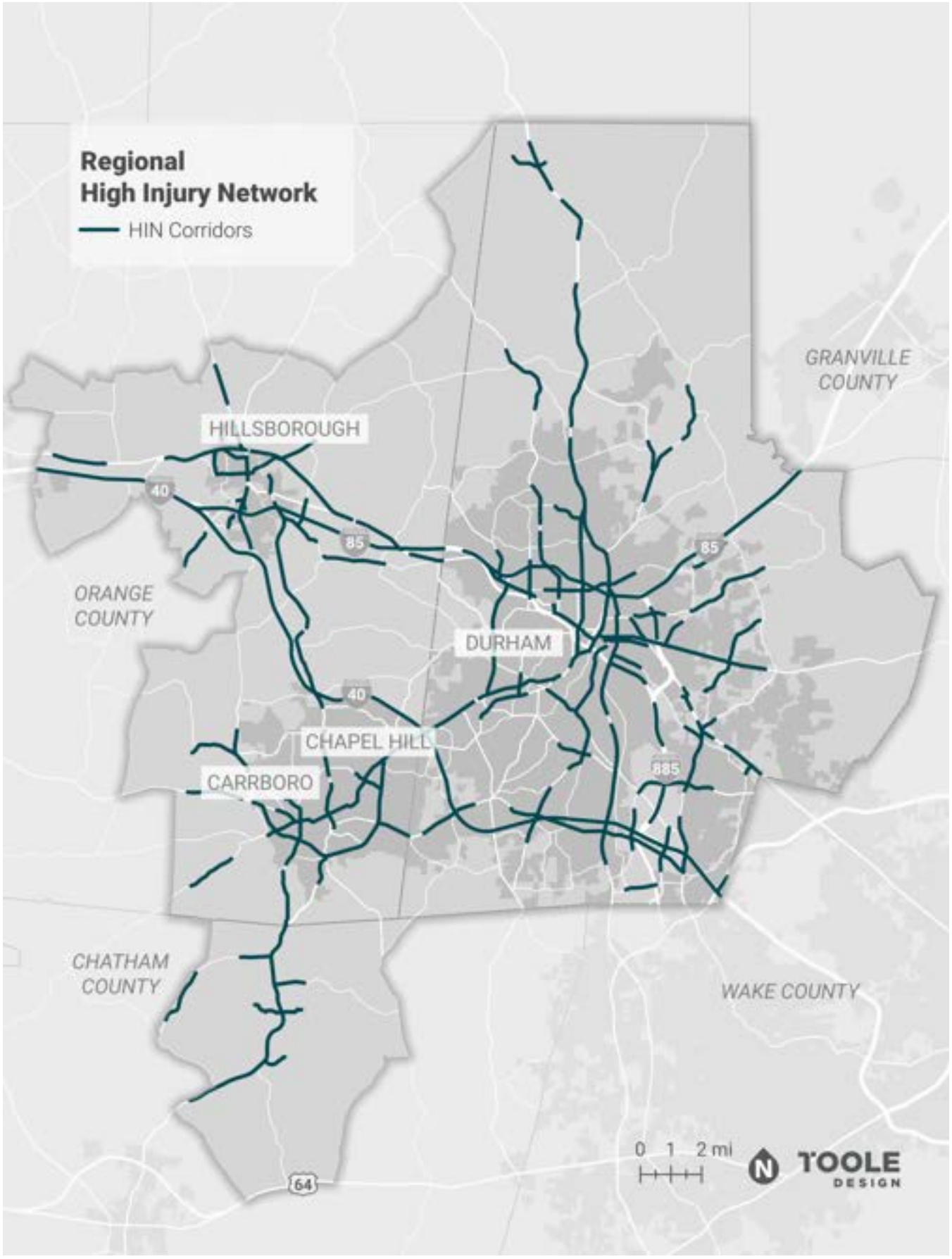
# High Injury Network

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.

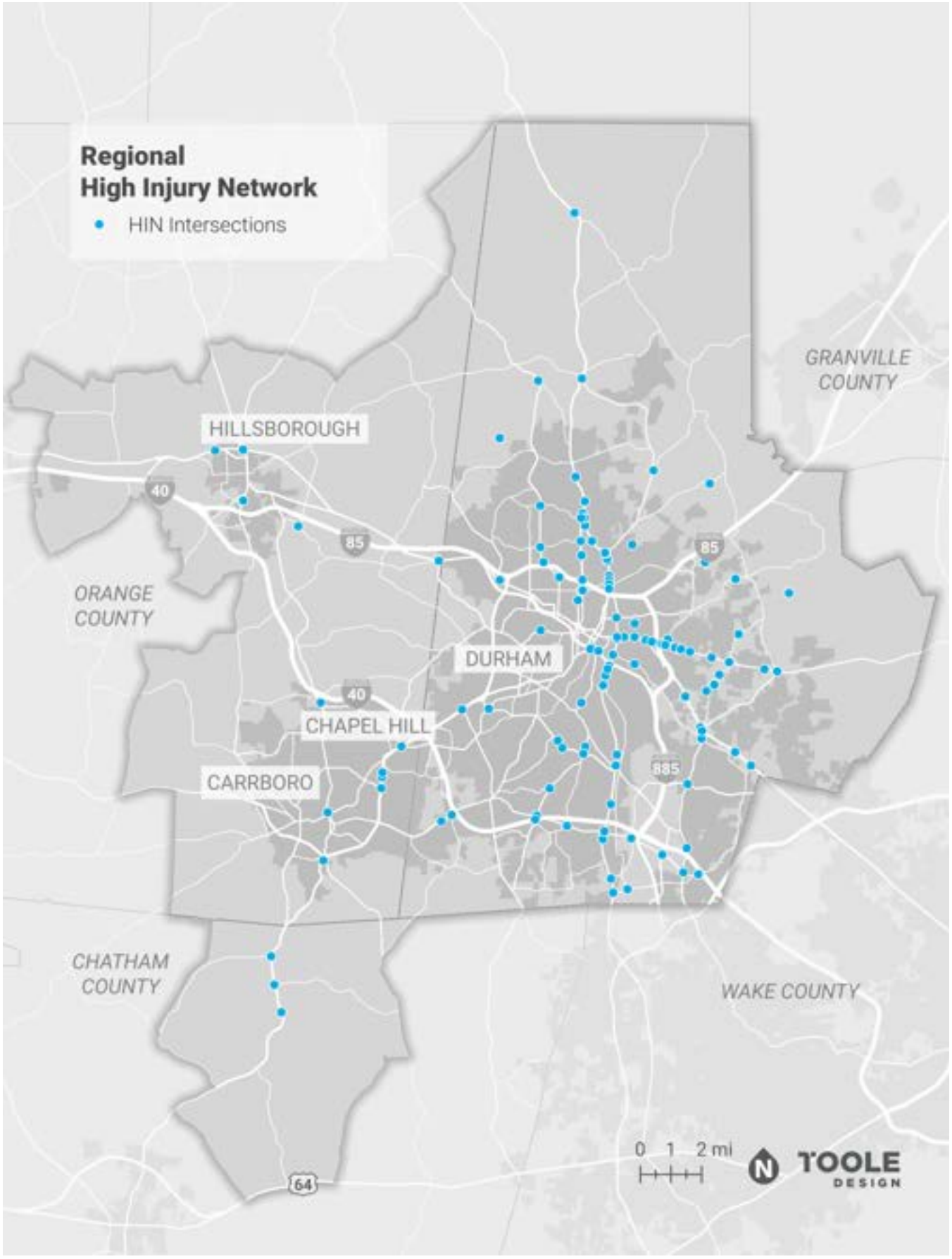
The HIN represents 7.82% of total roadway miles across the Triangle West region, while also accounting for 63.5% of the total killed or serious injury crashes. For each of the seven municipalities within the Triangle West TPO region, **Figure 7** highlights the percent of local roadway miles that fall 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

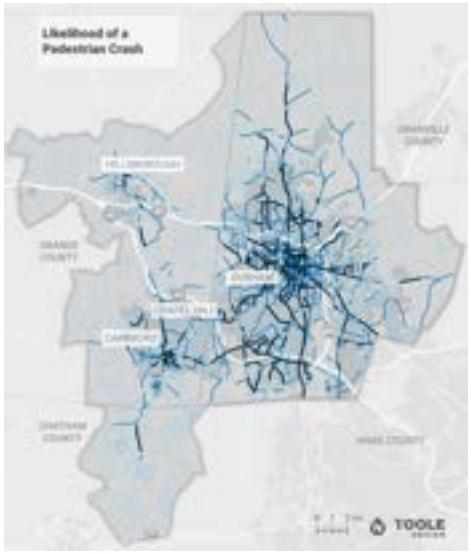
**Exposure** - Reduce the interactions where potential collisions may occur

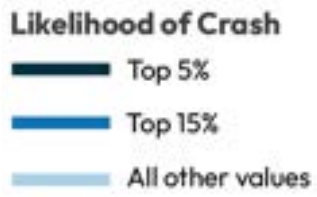
**Risk/Likelihood –** Reduce the likelihood of a collision occurring

**Severity –** Reduce the kinetic energy associated with collisions

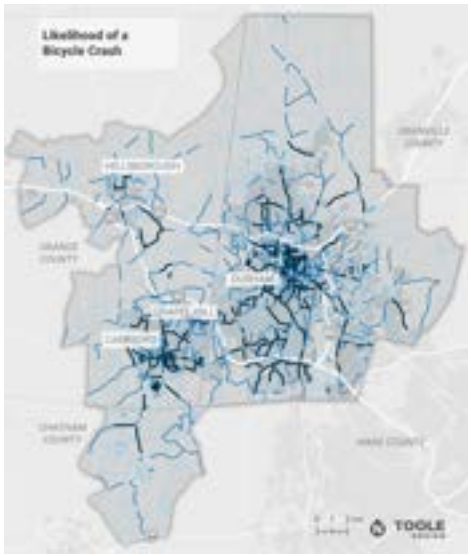
**MAP 5** High Risk Corridors Map by Crash Type

Likelihood of a Pedestrian Crash




Likelihood of a Bicycle Crash

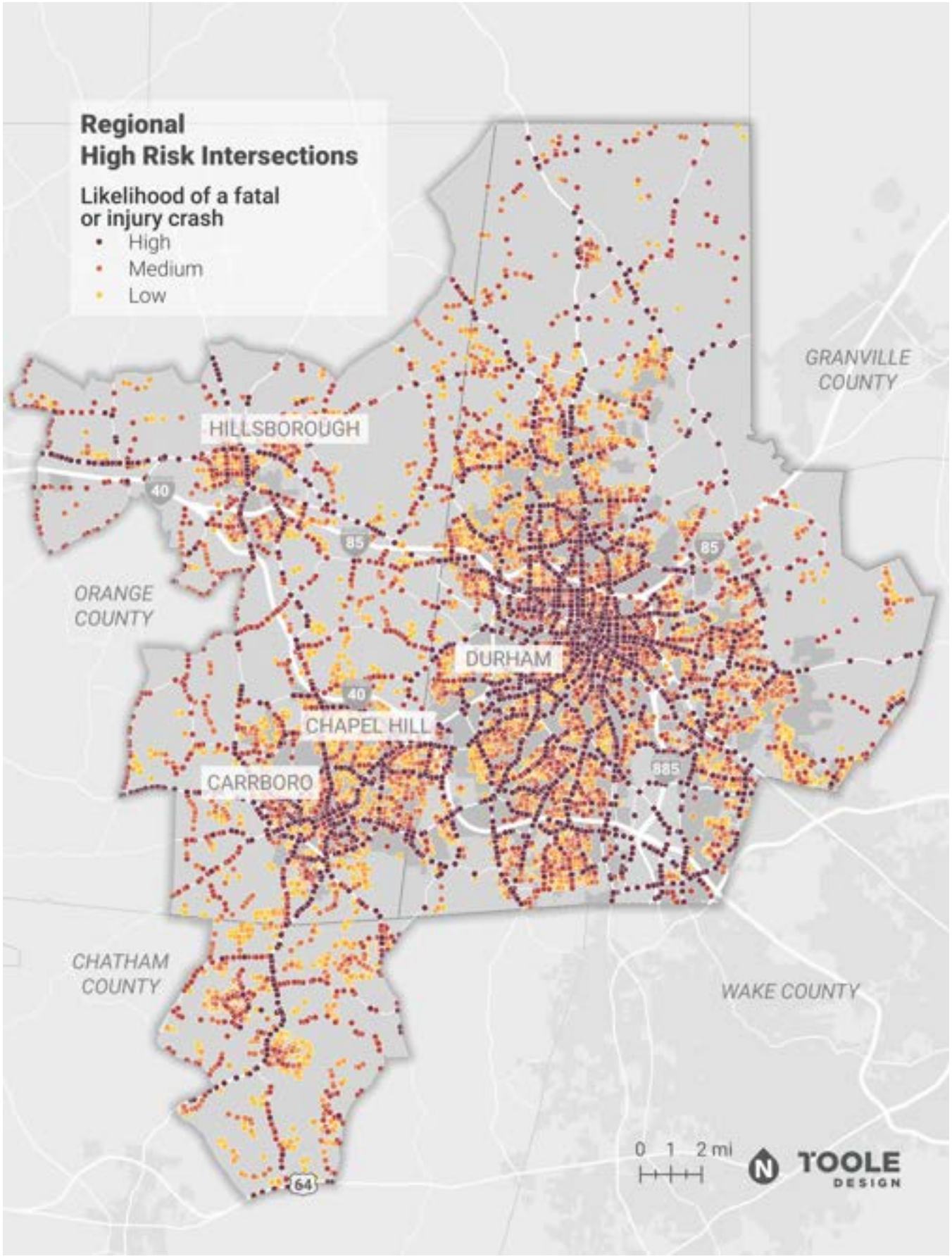



Likelihood of a Speed-Related Crash


Likelihood of a Motorcycle Crash


Likelihood of a Lane Departure Crash

**MAP 6** Regional High Risk Network Intersections Map



# Vulnerable Road Users

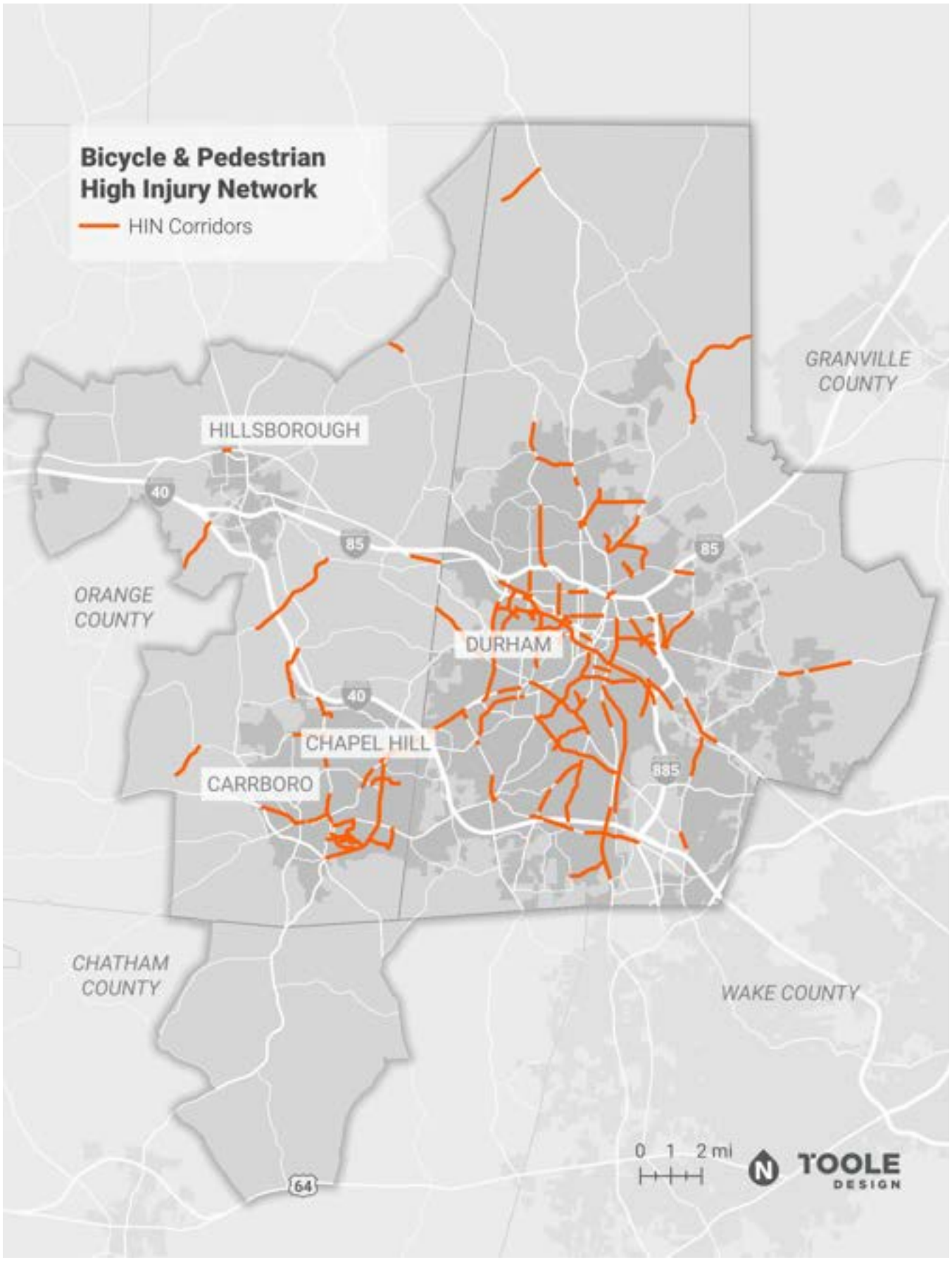
When a person walking or bicycling is struck by a vehicle, there is no bumper or airbag to protect them. When a crash occurs, these Vulnerable Road Users are more likely to be killed or seriously injured. Vehicle safety technology has seen significant advancements in recent decades, with airbags, anti-lock 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.

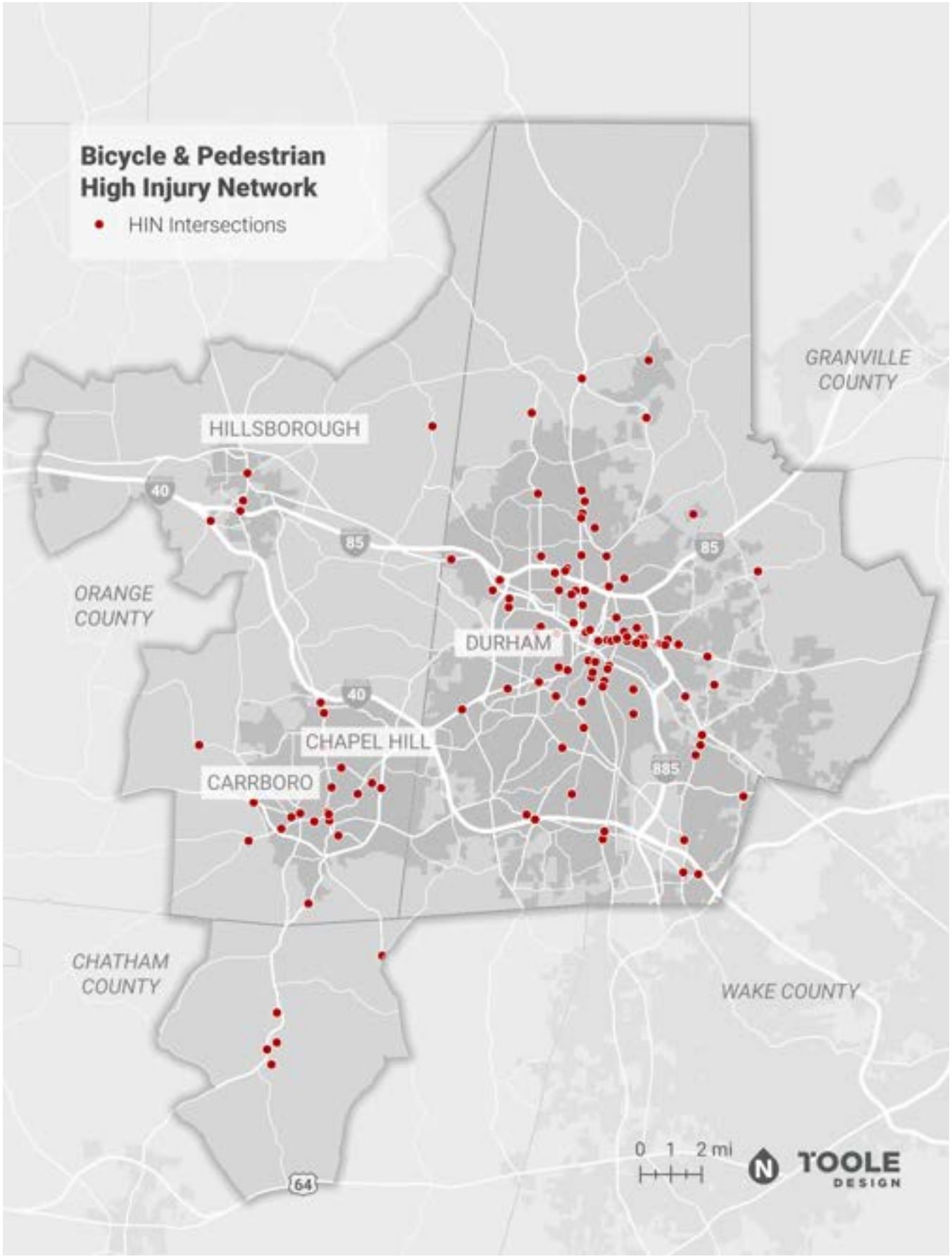

**FIGURE 8** Fatal and Serious Injuries Among Vulnerable Road Users (VRUs)

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.




# 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.

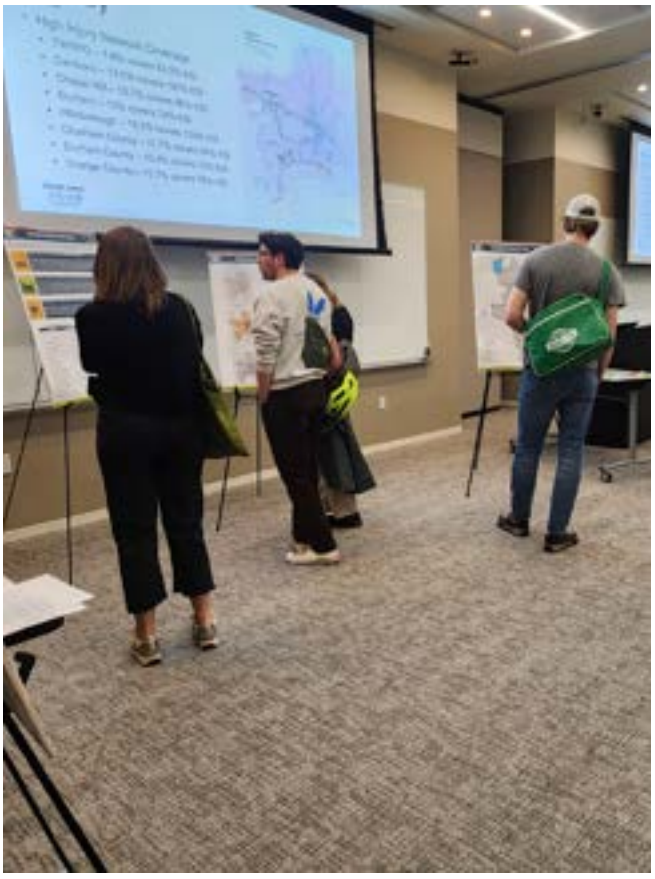



**FIGURE 11** Interactive Boards at the Open House Events

# 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

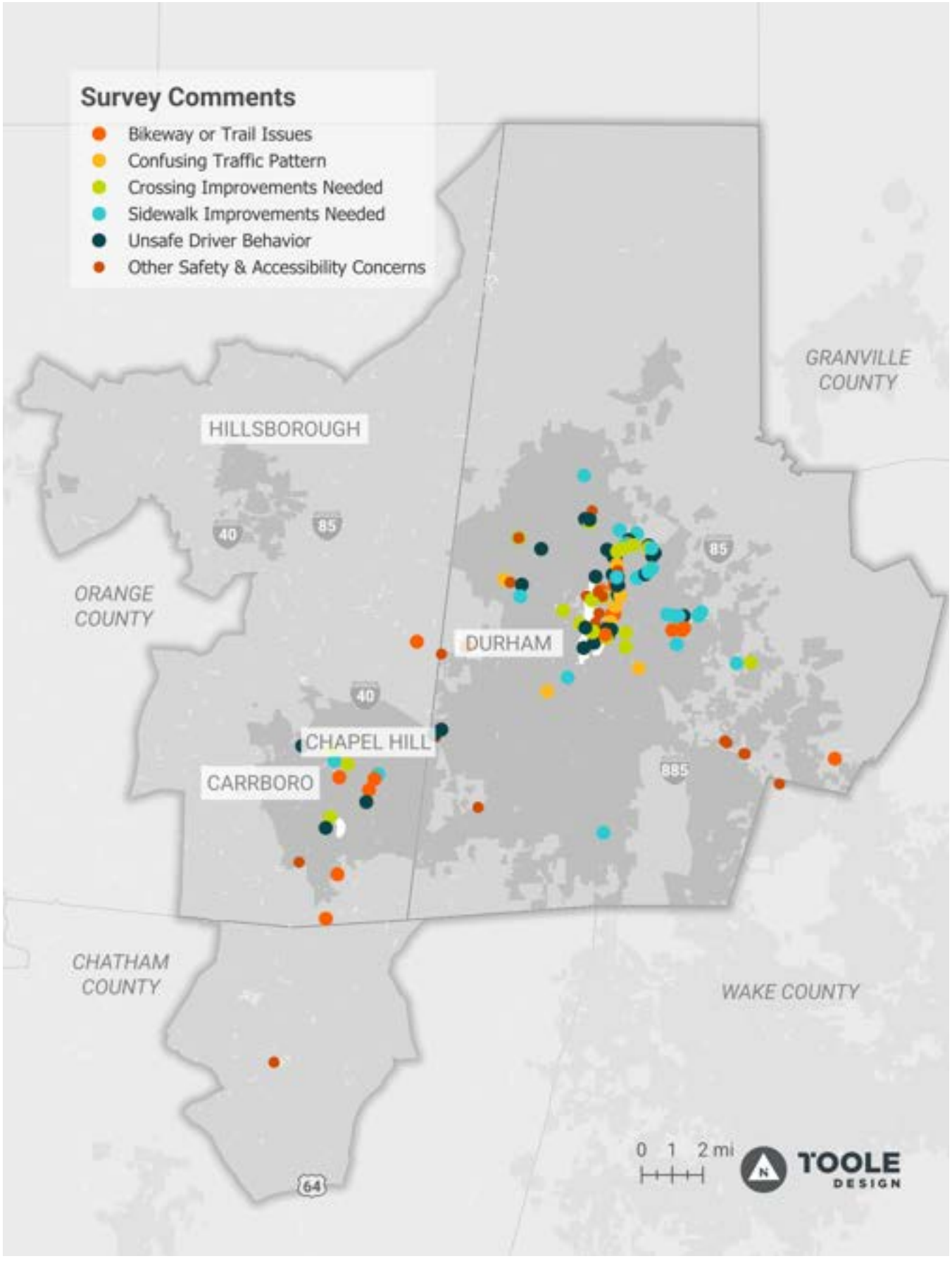
### Top three reasons people feel unsafe:

- **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

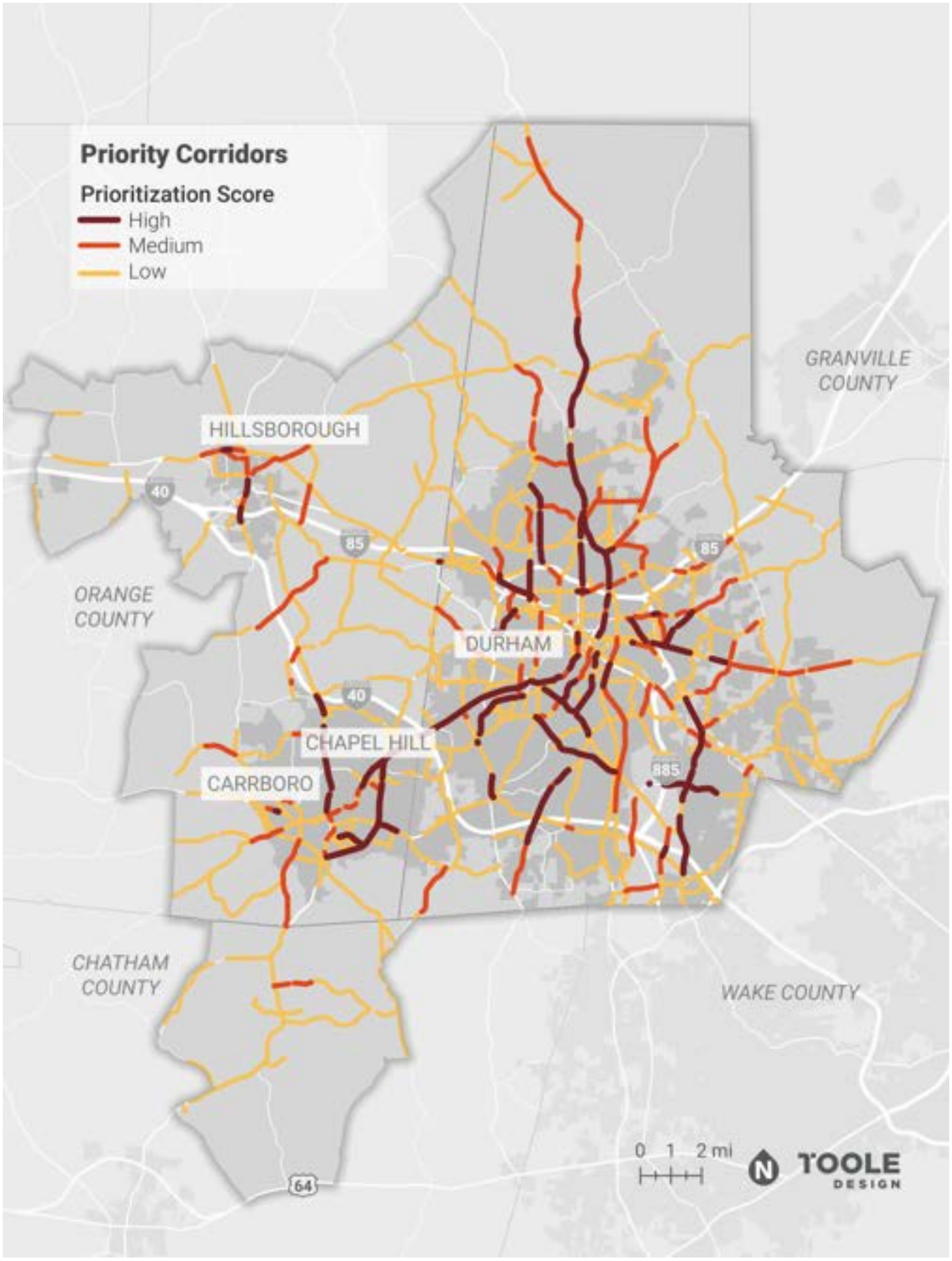
A few of the highest scoring regional priority corridors are identified in **Table 1**. Additionally, **Map 10** reflects priority corridors across the region based on the prioritization criteria described in the previous section – Severity, Exposure, and Risk/Likelihood. Additionally, key intersections 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

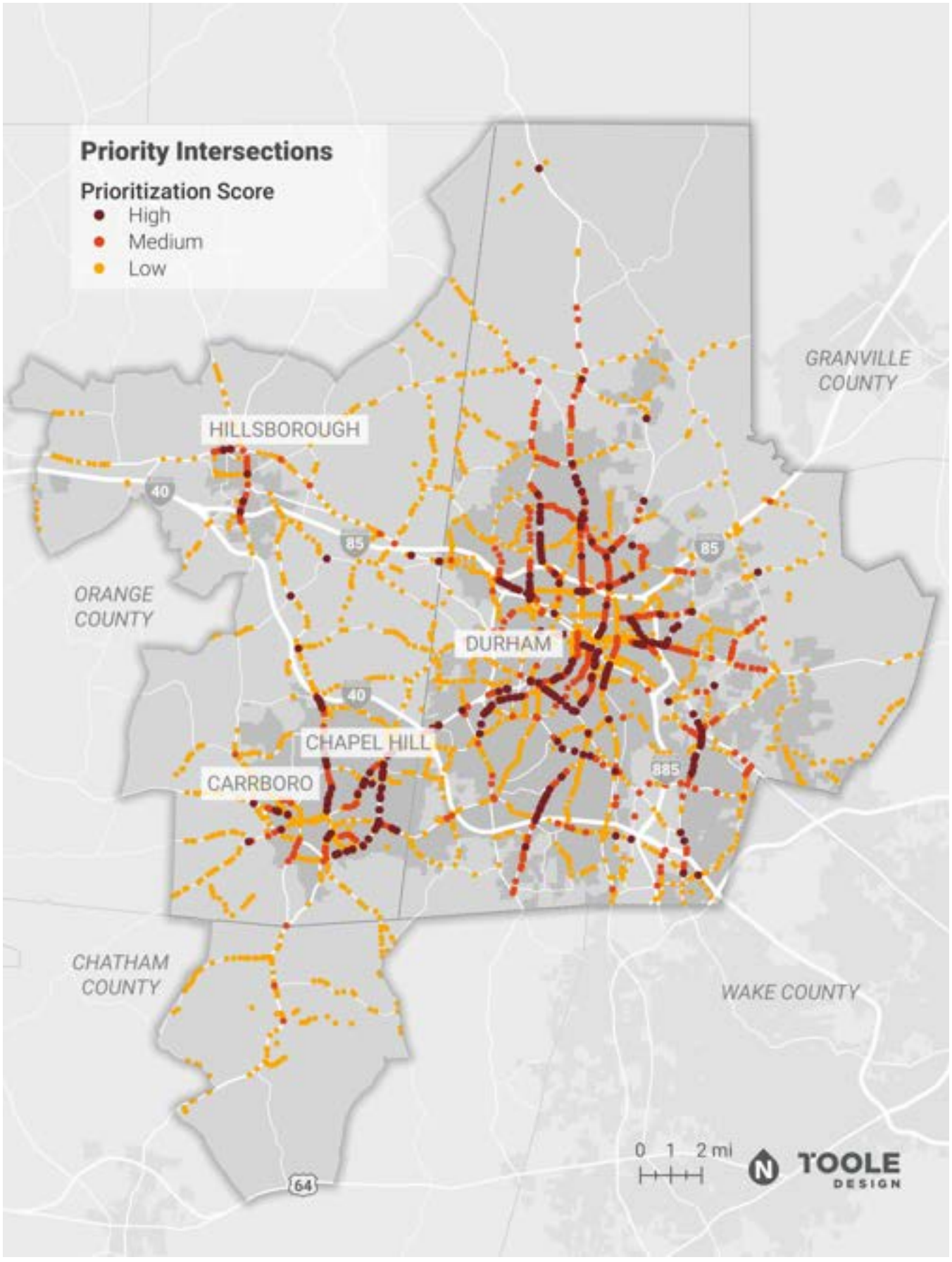


## Regional Priority Intersections

**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

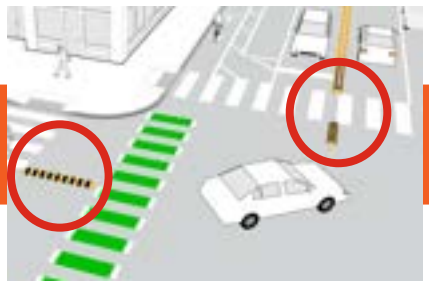
Post-Crash Care Resources and Programs

# 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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# 06

# 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/**

TRIANGLE WEST
Transportation Planning Organization

April 2025

# Triangle West Transportation Planning Organization

# VISION ZERO ACTION PLAN

# Appendix A

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# A

# Appendix A: Safety Analysis Methodology

# High Injury Network Methodology

The purpose of this memorandum is to document the process for the Triangle West Transportation Planning Organization (Triangle West TPO) High Injury Network (HIN), as well as 7 local HINs for the following jurisdictions:

1. Town of Carrboro
2. Town of Chapel Hill
3. Chatham County
4. City of Durham
5. Durham County
6. Town of Hillsborough
7. Orange County

## Data

The project team obtained two sets of crash data from the North Carolina Department of Transportation (NCDOT):

- All crash data from the NCDOT enterprise crash database (2016-2023)
- Bicycle and pedestrian-specific crash data available via NCDOT's Open Data Portal (2013-2022)[1]

These data sources included characteristics such as location, roadway characteristics, and crash severity. There are several considerations for the inclusion of both data sources:

- Crash data from NCDOT's enterprise database has limited crash location data. Generally, crashes are much more likely to be locatable on NCDOT-maintained roads, and therefore able to be used to generate a network of high crash locations.
- By contrast, the crashes in NCDOT's curated Bicycle and Pedestrian dataset are manually located and therefore can be located on all parts of the network with greater confidence.
- Furthermore, NCDOT reviews all potential bicycle and pedestrian crashes for accurate reporting. NCDOT:
  - removes crashes that may be labeled as bicycle or pedestrian that did not actually involve a bicyclist or a pedestrian, as well as
  - removes any crash that did not occur in the public right of way (i.e., excluding parking lots or private driveways).
- Differences in crash frequency and timeliness account for the differences in the year ranges associated with each dataset (i.e., 7 years of total crashes and 10 years of bicycle and pedestrian crashes). Although all bicycle and pedestrian crashes are locatable, they are less frequent than total crashes, and more observations are required for meaningful insights.

The project team also obtained NCDOT's route characteristics file and intersection inventory in a geographic information systems (GIS) format. The project team used a spatial join to link crashes with roadway segments based on a common route classification (for the all-crash HIN); this helped reduce the likelihood of erroneous joins between crashes and roadway segments. Crashes were designated intersection-related for the HII if they occurred within the 150-foot buffer standard in the NCDOT inventory.

1 NCDOT Non-Motorist Crash Map. **https://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=b4fcdc266d054a1ca075b60715f88aef**

## Methodology

A Python-based tool was developed for this analysis that uses a sliding window approach to generate an equivalent property damage only (EPDO) score for each roadway segment. The tool is customizable to different settings that dictate how it scans the network. The tool iterates along a centerline one-tenth of a mile at a time and creates a one-mile segment with an associated EPDO value; note that this creates overlaps, as each one-tenth-mile segment is incorporated in several one-mile segments.

For this HIN version, access-controlled roads (I-40, I-885, I-85, NC 147, and the US 15-501 Bypass in Durham County), ramps, and crashes were excluded from local HINs; this left only non-access-controlled roads (except for US 15-501 in Orange County) in the analysis. US 15-501 remained in the Chapel Hill and Carrboro HINs due to the high proportion of local fatal and serious injury crashes. At the end of the analysis, the access-controlled roads identified in the July 2024 HIN were reincorporated into the Triangle West TPO regional HIN to create the complete final version of the regional network.

The following steps summarize the process by which data were processed and HIN segments were synthesized:

- After excluding crashes with a route number flagged as access-controlled, crash points are clipped to the boundaries of each subregion.
- EPDO values/cost are assigned to crashes based on crash severity, and this value is summed during the aggregation process. **Table 1** provides the EPDO weights for each severity type. The EPDO weight is based upon the crash cost using a Property Damage Only cost as the base unit (e.g., Fatal and Suspected Serious Injury weight equals $3,865,000/$14,400=268)
- A one-tenth-mile sliding window captures crashes on segments (this is used for corridors and not intersections).
- A spatial join is performed to calculate the total EPDO score for each segment.
- To generate final HIN corridors, the top 5 percent of segments region-wide, and the top 10 percent of segments for each locality were extracted for final processing.
- Since this produces overlaps, segments are aggregated so that each individual segment is a single feature; more than one HIN segment may be on a single route, but unique segment features are generated if these are not spatially contiguous.
- As noted previously, access-controlled segments identified in July 2024 were reintegrated into Triangle West TPO regional HIN.

**TABLE 17** Equivalent Property Damage Only (EPDO) Weights for High Injury Locations

| Crash Severity | Crash Cost (2022) | EPDO Weight |
|---|---|---|
| Fatal (K) or Suspected Serious Injury (A) | $3,865,000 | 268 |
| Suspected Minor Injury (B) | $230,000 | 16 |
| Possible Injury (C) | $136,000 | 9 |
| Property Damage Only (PDO) | $14,400 | 1 |

## High Injury Intersection Network (HII)

To ensure consistency between which crashes are associated with which networks, the HII is created first. Then, any crashes associated with the HII are excluded from the creation of the HIN and the bike-ped HIN. The following steps provide a summary of the development of the HII.

- **Step 1:** Clip intersection polygons and spatially locatable crashes to the Triangle West TPO planning area using the Pairwise Clip geoprocessing tool.
- **Step 2:** Spatial join intersection polygons to crash points with the parameters Join One to Many, Closest, Keep ALL, and a search radius of 25 feet (used for intersections and not corridor segments).
- **Step 3:** Run Summary Statistics on the spatial join layer. Sum the EPDO field by KeyIntersectionID.
- **Step 4:** Use the join field geoprocessing tool to tie the Sum EPDO column to the original intersection layer using the KeyIntersectionID fields.
- **Step 5:** For any location with a null value in the summed EPDO field, calculate a "0."
- **Step 6:** Calculate the percentile rank of all locations.

This step normalizes the location scores between 0 and 100, where the highest intersection based on EPDO is closest to 100 and the lowest is 0. The script for this analysis is shown in **Figure 1**. To determine the top 1 percent of scores/locations, for instance, one would select all rows with a value of 99 and above.

- **Step 7:** Create a non-intersection crash layer based on crashes that were not located within the 150-feet influence area of an intersection polygon.

It is important to consider the HII in relationship to the HIN. Assessing the HII and the HIN separately is a safety planning practice that allows a more nuanced view of the safety problems on the road network. Intersection crashes and non-intersection crashes can tell different stories about safety issues on the road network and create an opportunity for more context-specific countermeasure development. By examining intersection crashes and non-intersection crashes in their own layers, we are able to see a network of roadways, as well as a network of intersections that contribute to the High Crash Network in the Triangle West TPO region.

```
In [1]: import arcpy
        from scipy import stats

In [2]: # Define geodatabase path(s)
        gdb = r'\\vhb.com\gis\proj\Raleigh\39600.01 NCDOT_NC SHSP 2024\Project\NC Safety Plans\DCHC_HIN\DCHC_Geodatabase\temp_outputs.gdb'

        # Define geodatabase content(s)
        fc = gdb + r'\\' + r'DCHC_Intersections'

In [3]: # Field containing values to rank
        value_field = 'Pct_Total'

        # Field to which to write the rankings
        rank_field = 'PercentileRank_total'

        # SQL query to limit rankings to certain rows in the table
        # If no query is needed (if performing ranking on all rows of the table) set the clause variable like: clause = None
        clause = None

In [4]: ScoreArray = []
        with arcpy.da.SearchCursor(fc, [value_field]) as sCur:
            for row in sCur:
                if row[0] is not None:
                    ScoreArray.append(row[0])

        print(len(ScoreArray))
        with arcpy.da.UpdateCursor(fc, [value_field, rank_field]) as uCur:
            for row in uCur:
                row[1] = stats.percentileofscore(ScoreArray, row[0], kind='weak')
                uCur.updateRow(row)

        print("Finished.")
```

**FIGURE 14** ArcPy Script for Calculating Percentile Rank

## Regional High Injury Network (HIN)- All Crashes

The following steps provide a summary of the development of the HIN for all crashes in the Triangle West TPO planning area. Steps 1 through 6 generate individual high injury segments, and Step 7 generates the HIN from these segments. Based on conversations with the Triangle West TPO, the project team can adjust the thresholds for identifying HIN segments and corridors for the final HIN. The proposed and recommended threshold for the regional HIN is the top 1 percent.

- **Step 1:** Clip road centerlines and remaining non-intersection crashes to the Triangle West TPO planning area using the Pairwise Clip Geoprocessing Tool.
- **Step 2:** Segment roadway centerlines to generate segments between intersections using the intersection inventory and generate a unique ID for each road segment in the study area.
- **Step 3:** Using route class as a common attribute, join roadway segments to crashes with the parameters Join One to Many, Closest, Keep ALL, and a search radius of 150 ft.
- **Step 4:** Run the Merge and Summarize Script with appropriate inputs and outputs to get the final route segments with sum EPDO for each segment.
- **Step 5:** For any locations with a null value in the summed EPDO field, calculate a "0"
- **Step 6:** Calculate the percentile rank of all locations.
- **Step 7:** Using the 99th percentile segments (top 1 percent of EPDO scores), connect any HIN segments that share the same RouteID (i.e. are objectively the same roadway) and are within 0.5 miles of each other, and delete any HIN segments that are not within 0.5 miles of another HIN segment. The minimum length for HIN segments included in the final map is one-mile.

This step is sometimes referred to as "smoothing." This smoothing process takes a disconnected network of short segments and smooths it into a legible road network. This process has a number of benefits:

1) Improves data interpretability by removing segments between HIN segments that may not show up on the analysis because several severe crashes may not have occurred on that block specifically, but it is representative of the same safety concern

2) enhances countermeasure application by removing isolated one-block segments and considering the relationship between high injury segments and corridors

## Localized High Injury Network (HIN)- All Crashes

The following steps provide a summary of the development of a localized HIN for all crashes in the Triangle West TPO planning area. Based on conversations with Triangle West TPO, the project team has identified the need to develop a localized HIN for all crashes in the following communities within the Triangle West TPO planning area: City and County of Durham, Town of Chapel Hill, Town of Carrboro, Town of Hillsborough, Orange County, Chatham County. The development of these localized HINs starts with clipping the crashes and road centerlines to the identified community boundaries and then follows the same Steps 2 through 7 outlined in the Region HIN. An objective of the localized HINs would be to create more detailed networks for local agencies; however, any locations identified on the regional network should also be present in the local network. Based on conversations with the individual communities, the project team can adjust the thresholds for identifying HIN segments and corridors for the final localized HINs. The proposed thresholds for the localized HINs will vary between 1 percent and 5 percent based on local context.

Through this curated approach, each community identified in this step will have a regional HIN and a localized HIN, which provides a greater opportunity to identify nuances of safety issues, foster local support for safety countermeasures, and identify funding opportunities (local, state, federal) for safety countermeasure implementation.

## High Injury Network (HIN)- Bicycle and Pedestrian Crashes

The following steps provide a summary of the development of the HIN for bicycle and pedestrian crashes only in the Triangle West TPO planning area. The primary difference between the "All Crashes" version and the "Bicycle and Pedestrian Crash" version is the segmentation of the roadway. Since bicycle and pedestrian crashes are much less frequent than other crash types, road segments are developed using dynamic segmentation;[2] this creates longer contiguous segments than the intersection-to-intersection approach. This process creates homogenous segments based on selected attributes. For the Triangle West TPO analysis, the project team used RouteID, functional class, and number of lanes to create homogenous segments of similar characteristics.

**Step 1:** Clip road centerlines and remaining, non-intersection crashes to the Triangle West TPO planning area using the pairwise clip geoprocessing tool.

**Step 2:** Segment roadway using RouteID, functional class, and number of lanes fields with no multi-part features and generate a unique ID for each road segment in the study area.

**Step 3:** Exclude road segments and crashes with the "Interstate" route class (road segments layer) or road class (crashes layer).

**Step 4:** Use Spatial Join (join setting Closest, search radius 150 feet) on study area crashes and study area segments.

**Step 5:** Use the Summary Statistics geoprocessing tool on the crash layer to get EPDO and Frequency (i.e., the total number of crashes) by SegmentID.

**Step 6:** Use Join Field to join crash frequency and sum of EPDO back to original segments using join fields SegmentID.

**Step 7:** Calculate the percentile rank of all locations based on the EPDO score.

## Key Distinctions from the Previous Methodology & Conclusions

There are important distinctions between the November 2024 version of the analysis and the July 2024 version. Previous HIN versions separated midblock and intersection-related crashes to avoid redundancy between these two networks. However, this creates a more segmented, block-by-block visualization of the HIN. There is no appreciable difference in "coverage" of historic fatal and serious injury crashes or mileage between either approach; however, the more continuous corridors may be more intuitive for presentation or discussion with stakeholders. Furthermore, as a result of combining midblock and intersection-related crashes, most HIIs are also on corridors identified in the regional and/or local HINs. Only 2 intersections are uniquely (i.e., not on a HIN) regional or local HIIs after this update.

2 Dynamic Segmentation Scenario. **https://pro.arcgis.com/en/pro-app/latest/help/production/roads-highways/apply-dynamic-segmentation.htm**

# Risk Analysis

This memorandum summarizes the data analysis conducted to support the Triangle West TPO Vision Zero Safety Action Plan. This includes a review of historic crashes to identify high crash locations (reactive analysis), as well as a systemic, risk-based analysis to identify locations that share factors that contribute to certain crash types even if a crash has not occurred in recent history at all locations that share these characteristics (proactive analysis).

## High Injury Network (HIN) and Intersections (HII)

### Analysis

The project team submitted a draft summary of the High Injury Network and High Injury Intersections to the Triangle West TPO in the summer of 2024. The Results section in this memorandum provides the coverage statistics for the following networks:

- Regionwide HIN and HII for all modes (Total Crash)
- Regionwide HIN and HII for bicyclist- and pedestrian-involved crashes (Bike/Ped Crash)
- Local HINs and HIIs for:
  - Chatham County (unincorporated, within Triangle West TPO)
  - Durham City and County
  - Orange County (unincorporated, within Triangle West TPO)
  - Town of Carrboro
  - Town of Chapel Hill
  - Town of Hillsborough

### Regional HIN and HII

**Figure 2** displays the coverage statistics for Regional HIN and HII. These statics cover the total percentage of public road miles and intersections included in their respective high injury analysis, contrasted with the total percentage of fatal (also referred to as "K" injuries) and serious injury (also referred to as "A" injuries) crashes during the study period that are included on the network.

The Triangle West TPO Total Crash HIN covers 63.5% of fatal and serious injury crashes between 2016 and 2023 and 9.1% of road mileage. The Bike/Ped Crash HIN covers 48.6% of fatal and serious injury bike/ped crashes between 2013 and 2022 while only consisting of 3.8% of road mileage. The Bike/Ped Crash HIN and HII combined cover 100% of fatal, non-interstate highway, bicycle and pedestrian crashes between 2013 and 2022.

The Triangle West TPO Total Crash HII (the top 1 percent of intersections) covers 29% of intersection-related fatal and serious injury crashes, as well as 100% of all bicycle and pedestrian intersection-related fatal and serious injury crashes.

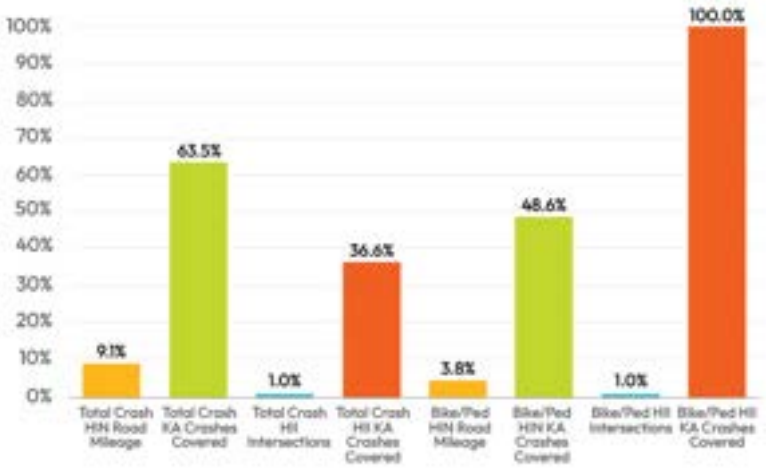


**FIGURE 15** Regional HIN Coverage Statistics

**Figure 3** displays the coverage statistics for the HIN when routes signed as interstates (e.g., I-40, I-885, and I-85) are excluded. The Triangle West TPO non-interstate HIN covers 58% of fatal and serious injury (KA) crashes and 7.5% of road mileage.

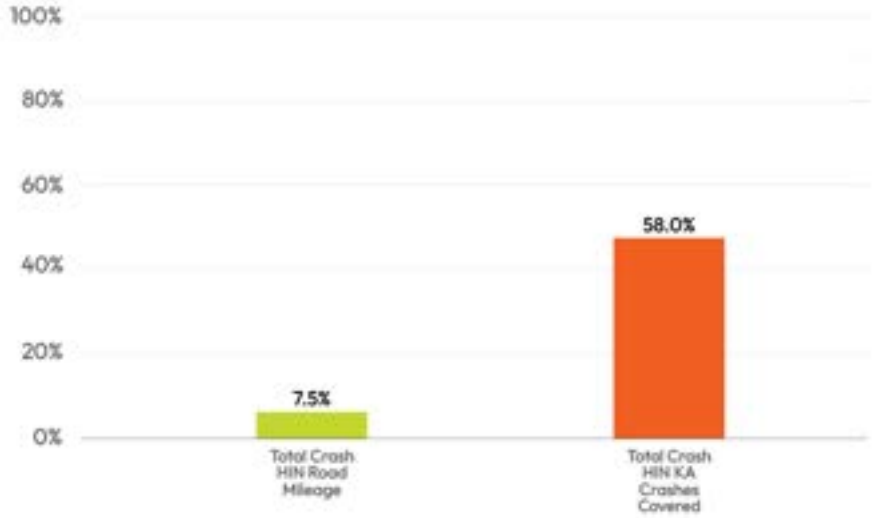


**FIGURE 16** Regional HIN Coverage Statistics Excluding Interstate Highways.

## Local HIN and HII

**Figure 4** provides coverage statistics for local HINs in the Triangle West TPO region. Mileages for each HIN vary between 7.1% and 13.2% of the locality's roads, while fatal and serious injury crash coverage varies between 71.4% and 88.9%. These thresholds were used to capture the greatest share of historic fatal and serious injury crashes while keeping the amount of road mileage around 10% for any single jurisdiction.

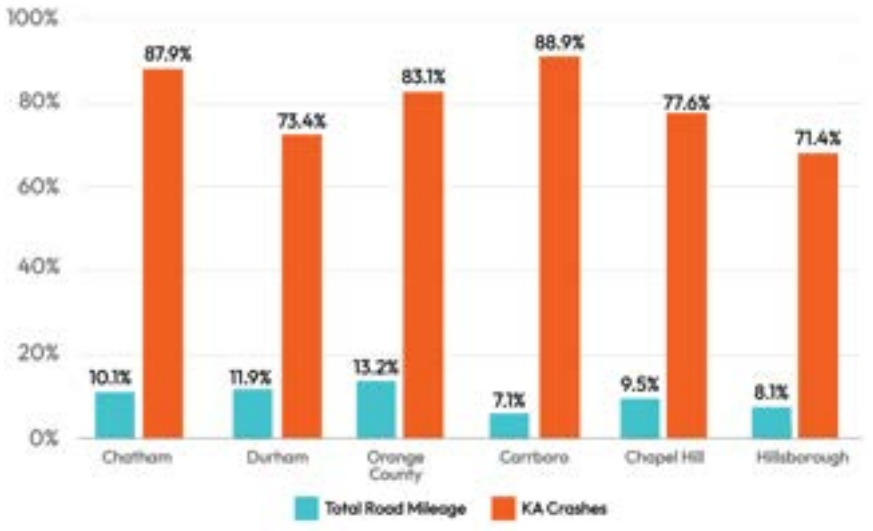


**FIGURE 17** Local HIN Coverage Statistics

**Figure 5** provides a summary of the fatal and serious crash coverage for the top 1% of intersections in each locality. There are roughly 11,600 intersections in the Triangle West TPO boundary and this threshold was set at 1% across the region to focus attention on the highest severe crash locations.

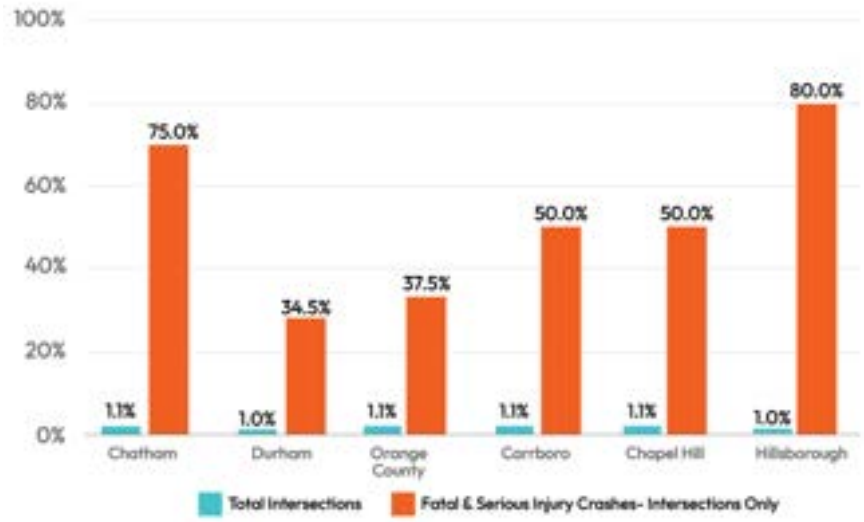


**FIGURE 18** Local HII Coverage Statistics

# Risk-Based Networks

## Analysis

The objective of the risk-based analysis is to enhance road safety through the identification of specific roadway characteristics where fatal (K), suspected serious injury (A), and suspected minor injury (B) crashes are most likely to occur. This analysis identifies common roadway characteristics at high severity crash locations and identifies a network of road segments and intersections with those same characteristics. This approach identifies segment- and intersection-level risk factors and is a tool used to inform transportation policies and infrastructure improvements that can proactively target these specific high injury crash types.

The following crash types represent a greater share of KA injury crashes than total crashes. Focusing on these crash types as the highest priority for treatment – due to their comparatively higher severity than other crashes – supports the Vision Zero goals of this action plan.

- **Lane Departure:** Crash/Collision type recorded as running off the road, rollover/overturn, striking a fixed object, sideswiping in opposite directions, or head-on.
- **Speed-Related:** Contributing circumstances related to the driver are recorded as exceeding the posted speed limit or driving too fast for conditions.
- **Bike:** Crash/Collision type, "vehicle" type, or person type recorded as a bicycle.
- **Pedestrian:** Crash/Collision type, "vehicle" type, or person type recorded as a pedestrian.
- **Motorcycle:** The vehicle type involved in a crash is recorded as a motorcycle.
- **Intersection-Related:** The roadway feature at the crash location is an at-grade intersection.
    - All crash modes
    - Bicycle/Pedestrian crashes

## Methodology

Risk network identification starts by identifying the roadways and intersections where more severe KAB focus crashes (i.e., the seven identified above) have occurred during the study period. This framework then assesses common characteristics among these roadways using a binary logistic model for each of the seven crash types. This model produces a probability that a crash will occur at a segment or intersection based on the associated characteristics of each site. This produces a set of risk factors – characteristics that are correlated with KAB crashes. The characteristics are then used to generate a "probability" or score for each segment and intersection in the inventory that indicates the likelihood that a KAB crash will occur based on the characteristics of that location.

This "probability" is not associated with a site's specific crash history, but rather an indication of crash likelihood based on the known characteristics. Furthermore, there may be site-specific characteristics that are not captured as part of the model that can influence safety. For instance, although the presence of a traffic signal, approach AADT, and intersection skew angle are all risk factors for intersections, sites that have these similar characteristics might be differentiated by sight distance limitations associated with vegetation or other obstructions or driveway curb cuts near the intersection that may impact safety at the individual site-level. This reflects the importance of site-level diagnosis and review before implementing countermeasures.

## Results

**Figure 6** provides the coverage statistics for the seven high risk networks developed for the Triangle West TPO area. This includes five segment-based networks and two intersection networks. The following notes provide more context for the high-risk network:

- Whether or not a crash has occurred at a segment or intersection does not factor into whether the location is "high risk" or not; only the probability produced by the model indicates high risk.
- The risk networks in **Figure 6** reflect the highest probability locations for each crash type; each risk network is distinct and may include overlapping or unique segments to the other risk networks. These networks are distinct from the HINs and may include overlapping or unique segments.
- The coverage statistics in **Figure 6** reflect crashes that the NCDOT data indicated are associated with that crash type; there are a different number of crashes in each crash type across the Triangle West TPO region; some individual crashes may be identified in multiple crash types.

- All road segments and intersections in the region have a risk probability, or score, associated with them. The road mileage or number of intersections included in **Figure 5** are not necessarily meant to be used as clear cutoff points for a standalone high-risk network(s). Rather, this is a comparable amount of road mileage to the HIN statistics in **Figure 4.**

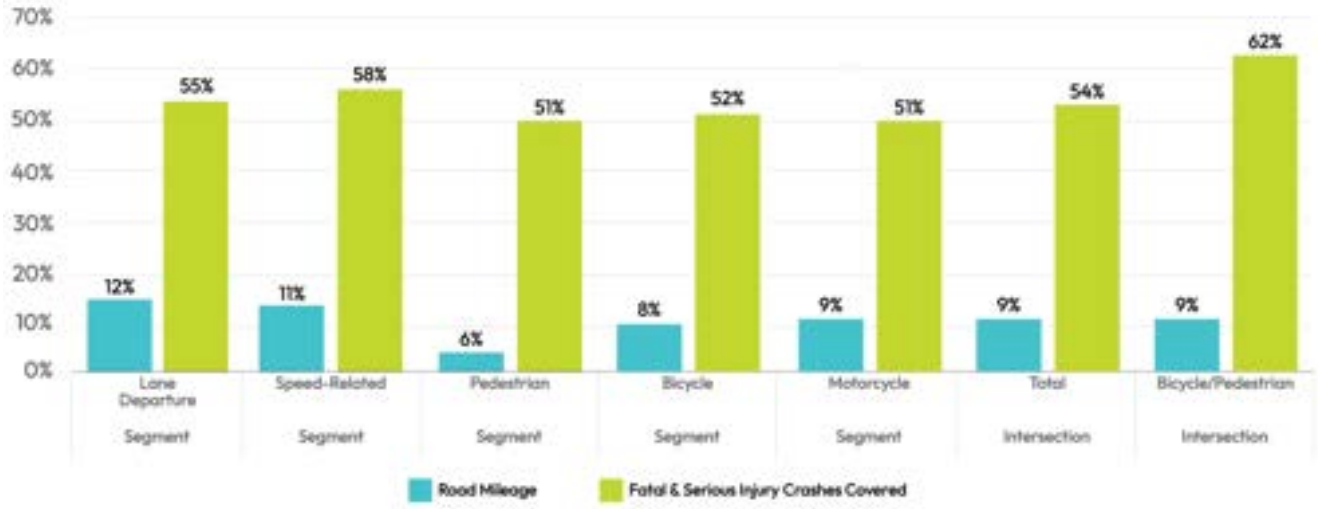


**FIGURE 19** Risk Network Coverage Statistics

## Risk Factors

The logistic model considered many potential factors that could contribute to a higher likelihood of a certain crash type. **Table 2** provides an overview of risk factors by crash type. This does not reflect any specific statistical significance threshold – the results are meant to only be used as a general guide for illustrating contributing factors correlated with increased risk. A blue cell indicates a risk factor correlated with a higher risk for that crash type. An orange cell indicates a potential risk factor that was not considered; this can be because the factor is not necessarily applicable to a crash type (i.e., transit stops and lane departure). A blank square indicates a potential risk factor that was not significantly correlated with the risk of that crash type.

**TABLE 18** Risk Factors by Crash Type

| Risk Factors | Lane Departure | Speed-Related | Pedestrian | Bicycle | Motorcycle | Total Intersection | Bike/Ped Intersection |
|---|---|---|---|---|---|---|---|
| School or University Nearby | | | | | | | |
| Transit Stop Present | | | | | | | |
| Fewer Travel Lanes | | | | | | | |
| More Travel Lanes | | | | | | | |
| Higher AADT | | | | | | | |
| US Route | | | | | | | |
| NC Route | | | | | | | |
| SR Route | | | | | | | |
| Rural Context Classification | | | | | | | |
| Suburban Context Classification | | | | | | | |
| Urban Context Classification | | | | | | | |
| Higher CDC Social Vulnerability Index | | | | | | | |
| Higher Proportion of Zero Vehicle Households | | | | | | | |
| Higher Population and Employment Density | | | | | | | |
| Four Legs | | | | | | | |
| Signalized | | | | | | | |
| Greater Intersection Skew | | | | | | | |

## Comparison of 2023 Bicycle/Pedestrian Crashes

NCDOT produces a curated dataset of bicycle and pedestrian crashes separate from the primary NC crash database.[3] Due to the timing of the analysis for this plan, crashes for the 2023 calendar year were not available for the HIN/HII or high-risk analysis. This provided an opportunity to test the HIN and high-risk networks to see how networks developed using 2013-2022 data compared to the crash locations in 2023.

**Table 3** shows that both networks do a relatively good job of capturing 2023 crashes. However, the high-risk network appears to slightly outperform the crash frequency-based HIN analysis. This underscores the importance of considering risk in the Triangle West region along with locations that have experienced severe crashes recently.

**TABLE 19** Comparison of the Triangle West TPO Bicycle/Pedestrian HIN and Pedestrian High-Risk Network

| | Triangle West Regional Bike/Ped High Injury Network | | Triangle West High Risk Network (Top 500 Segments) | |
|---|---|---|---|---|
| | Total | Percent | Total | Percent |
| Total Mileage | 119.18 | 3.8% | 127.23 | 4.1% |
| Total KA Crashes | 11 | 44.0% | 13 | 52.0% |
| Total KAB Crashes | 35 | 30.2% | 47 | 40.5% |
| Total Crashes (All Severities) | 62 | 29.8% | 86 | 41.3% |

3 NCDOT Non-Motorist Crash Map. **https://www.arcgis.com/home/item.html?id=b4fcdc266d054a1ca075b60715f88aef**

# Prioritization Framework

## Understanding and Assumptions

- The purpose of this analysis is to identify locations that could be suitable for project development by the Triangle West TPO and its member jurisdictions.
- This is not meant to scope or review project feasibility; however, the data analysis can help suggest to Triangle West the type of safety issues they might want to address.
- Proven safety countermeasures and corresponding Crash Modification Factors (CMFs) along with Crash Reduction Factors (CRFs) will be included in the supplemental Countermeasure Toolkit and through other NCDOT and FHWA resources.
- This framework will not consider access-controlled roads/highways in the screening.
- The output of this work will be lists of priority areas (corridors and intersections) for each part of the network:
  - A regional list that includes DOT-maintained roads
  - Agency-specific lists that will focus on areas where local agencies can affect change
- The next step may be to screen priority lists for locations that have already received a project or treatment in recent years.

## Framework

Prioritize locations that have the potential to affect one or more of the following dimensions of safety:

- **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, such as roundabouts and all-way stops, are effective because they 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.
- **Likelihood – Reduce the likelihood of a collision occurring:** Proactive projects that prevent a collision from occurring will be prioritized. The Action Plan may include projects that remove or reduce potential conflicts that tend to result in more severe outcomes. Example strategies include intersection designs that reduce conflict points between left-turning vehicles and on-coming traffic and median barriers that reduce or prevent cross-centerline collisions.
- **Exposure – Reduce the exposure to potential collisions:** Reducing exposure to collisions is another method of reducing severe crashes. This can take many forms, but a simple example may be the presence of bicycle and pedestrian traffic generators near major traffic thoroughfares. For example, this can be applied to reviewing existing transit stops that may be incurring unsafe and unexpected crossings or reviewing planned development for proximity to high-speed, high-volume crossings. Projects that provide refuge and visible crossings in the former example and reconsideration of traffic patterns in the latter example are examples of projects that should be prioritized.

## Practical Application

**Separate paths for corridors and intersections**

- Corridor path
  - Severity: Flag segments that are above the average 50th percentile speed. If no reliable speed data are available, the severity will be assumed to be low, and likelihood and exposure will be used to rank
  - Likelihood: Flag segments that are in the top 20% of bicycle or pedestrian risk or on the Bicycle/Pedestrian HIN, as well as a separate flag for being in the top 20% of lane departure or speed risk or on the “all mode” HIN
  - Exposure: Flag segments above 9,000 and 15,000 AADT,[4] as well as segments in suburban, urban, urban core, and rural contexts. Below is the order of priority in terms of highest to lowest priority

4 FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. **https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/STEP-guide-improving-ped-safety.pdf**

| AADT | Context |
|---|---|
| 1. >15,000<br>2. 9,000 – 15,000<br>3. <9,000 | 1. URBAN CORE<br>2. URBAN<br>3. RURAL TOWN<br>4. SUBURBAN |

- According to this framework, priority will be given to corridors that:
  - Are an above-average speed for the functional class
  - Have a high likelihood of either a Vulnerable Road User (VRU) or motor vehicle collision
  - Are in neighborhoods where multiple modes are more likely to be present
- Separate lists will be developed for vehicular and VRU priority
- Example:
  - Road One is identified as a high priority location because it exhibits High Speeds (85th percentile +), High Bicycle Risk, Moderate High Lane Departure Risk, Moderate Volumes, is in an Urban area, and is on the Bike/Ped HIN,
  - Road Two is not identified as a high priority location because it has the same indicators, except speeds are more moderate, and it is Moderate Bicycle Risk and is not on the Bike/Ped HIN.

- **Intersection path**
  - Severity: Flag Intersections that are on corridors that have above-average 50th percentile speeds on an approach (corridor analysis). If no reliable speed data are available for any approach, the severity will be assumed to be low, and likelihood and exposure will be used to rank
    - Roundabouts and all-way stops receive the lowest "Severity" priority by default
  - Likelihood: Flag intersections that are in the top 20% of bicycle or pedestrian risk or on the Bicycle/Pedestrian HII, as well as a separate flag for being in the top 20% of total crash risk or on the "all mode" HII.
  - Exposure: Flag intersections with approaches above 9,000 and 15,000 AADT, as well as intersections in suburban, urban, urban core, and rural town contexts. For AADT, all approaches will be considered so intersections with multiple approaches >15k will be the highest priority. Below is the order of priority in terms of highest to lowest priority:

| AADT | Context |
|---|---|
| 1. >15,000<br>2. 9,000 – 15,000<br>3. <9,000 | 1. URBAN CORE<br>2. URBAN<br>3. RURAL TOWN<br>4. SUBURBAN |

  - According to this framework, priority will be given to intersections that:
    - Have an approach that has an above-average speed for the functional class
    - Have a high likelihood of either a VRU or motor vehicle collision
    - Are in neighborhoods where multiple modes are more likely to be present
  - Separate lists will be developed for vehicular and VRU priority

## Tiers for Prioritization

- High priority locations will be those that meet the highest criteria in each category- Severity, Likelihood, and Exposure
- Based on the top tier of locations, those that meet all the criteria, top locations for the region and each agency (Orange County, Durham County, Chatham County, Chapel Hill, Hillsborough, City of Durham, and Carrboro) will be included in the final action plan

TRIANGLE WEST
Transportation Planning Organization

April 2025

# Triangle West Transportation Planning Organization

# VISION ZERO ACTION PLAN

# Appendix B

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B

# Appendix B: Equity Mapping and Analysis

This memo presents the framework for the Triangle West Transportation Planning Organization (Triangle West TPO) Vision Zero Action Plan equity analysis. The framework defines equity, describes methods used for the equity analysis, and lays out the historical housing and infrastructure context that influences current outcomes related to transportation safety. This memo also includes the results of the equity analysis and an assessment of comparative transportation safety outcomes. Finally, it shares conclusions and recommendations to help guide and create an implementable Triangle West TPO Vision Zero Action Plan that is grounded in the region's history and centers on transportation equity.

# Equity Definition

Equity can be defined in many ways depending on the context. The transportation planning field defines "equitable transportation" as planning that:

- Accounts for current and past inequality;
- Provides for current needs;
- Produces an overall improvement in the system; and
- Ensures that everyone has transportation access and options that allow them to participate fully in society

Achieving an equitable transportation system requires an understanding of how both positive and negative impacts are distributed throughout a region and across different demographic groups. Communities that have experienced historic marginalization – such as Black, Indigenous, and People of Color (BIPOC), people with disabilities, low-income individuals, or English language learners – are more likely to shoulder the burdens of the transportation system or have benefits of the system withheld due to the ongoing effects of past policies and investment patterns. This results in disparate transportation experiences and an inequitable transportation system.

## Environmental Justice

In accordance with federal statutes, the Triangle West TPO incorporates environmental justice principles into all relevant areas of the transportation process that they oversee. These principles are:

- Avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic efforts, on minority populations and low-income populations.
- Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.[1]

1 Triangle West Transportation Planning Organization. (n.d). Environmental Justice (EJ). **https://www.dchcmpo.org/work-with-us/environmental-justice-ej**

# Equity Analysis Approach

A Vision Zero equity analysis can be used to identify people that experience both sociodemographic vulnerability (due to systemic discrimination and marginalization) and transportation disadvantage. It can help improve understanding of the disproportionate outcomes related to transportation safety and access.

It can then examine how these communities are impacted and provide insights into how future transportation investments can remove sociodemographic disparities and redress past harms.

The knowledge gained through the equity analysis will be used in the Triangle West TPO Vision Zero Action Plan as a component of project prioritization and the plan implementation to monitor, reduce, and, ideally, eliminate disparities.

The equity analysis for the Triangle West TPO Vision Zero Action Plan follows the approach in **Figure 1.** The following sections of this memo will walk through each component of the approach and present findings.


**FIGURE 20** Equity Analysis Approach

# Information Gathering

Transportation is a key element of all people's daily lives. Nearly everyone must use the transportation network to access jobs, healthcare, grocery shopping, entertainment, and recreation opportunities. In the Triangle West region, historic and current policies and practices surrounding housing, infrastructure, and law enforcement contribute to inequitable transportation safety outcomes for BIPOC, people in low-income households, people without vehicles, people who walk and bike, and other marginalized groups.

The following section provides an overview of the historical context and current policies and practices impacting transportation safety outcomes for marginalized people within the Triangle West region.

## Historical Context – Overview of Policies and Outcomes

This equity framework recognizes that current conditions are a product of historical investments and policy decisions. Understanding historical context is critical to understanding who is currently underserved by the transportation network. By looking into where disadvantages began for communities, we can trace the impacts back to the present day as historical actions leave a legacy of effects.

Transportation policies and practices across the United States have long failed to serve BIPOC communities. The Triangle West region is no different as policies with racist origins enabled the perpetration of disinvestment in certain communities. This disinvestment negatively impacted these communities in numerous aspects through direct and indirect effects, but directly in infrastructure and capital investments, including the lack of paved roads and sidewalks.[2] In the words of former Congressman John Lewis:

> "The legacy of Jim Crow transportation is still with us. Even today, some of our transportation policies and practices destroy stable neighborhoods, isolate and segregate our citizens in deteriorating neighborhoods, and fail to provide access to jobs and economic growth centers." [3]

Investments in safe, accessible, and reliable transportation infrastructure are disproportionately allocated in white neighborhoods, often to the detriment of BIPOC communities that have experienced disinvestment and underinvestment. Since the mid-twentieth century, the United States has prioritized highways and suburban commuter transit, chronically underfunding public transportation systems that serve many BIPOC communities and creating unsafe roadways in these communities, with higher speeds and an absence of safe, connected facilities for walking and bicycling.[4] The impact of this disinvestment is visible along racial lines across areas such as access to employment,[5] traffic death and injury rates,[6] and exposure to other public health risks.[7]

Households with low incomes and people with disabilities have also been marginalized and excluded from transportation system benefits and overly burdened by negative outcomes of the system. Both these demographic groups experience inequitable transportation outcomes, including longer work commutes and the increased likelihood of being killed while biking or walking. Households in poverty may spend an outsized portion of their income on travel expenses. People with disabilities are less likely to drive

2 Ernst, S. (2024, May 7). Hooligan Heights: Redlining. Retrieved from Hooligan Heights: Mishawaka's Wild West: **https://hooliganheights.com/redlining.**

3 Lewis, John. (2004). Foreword to Highway Robbery: Transportation Racism & New Routes to Equity by Robert Bullard, G. Johnson, & A. Torres. South End Press.

4 Archer, Deborah. (2021). Transportation Policy and the Underdevelopment of Black Communities. 106 Iowa Law Review 2125, NYU School of Law, Public Law Research Paper No. 21-12. **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3797364**

5 Golub, A., Martens, K. (2014). Using principles of justice to assess the modal equity of regional transportation plans. Journal of Transport Geography, 41, 10-20.

6 Governors Highway Safety Association. (2021). An Analysis of Traffic Fatalities by Race and Ethnicity. **https://www.ghsa.org/sites/default/files/2025-01/race_2021.pdf.**

7 Rosenbaum, A., Hartley, S., Holder, C. (2011). Analysis of diesel particulate matter health risk disparities in selected US harbor areas. American Journal of Public Health, Suppl, 101, S217-223.

and more likely to rely on public transportation than nondisabled residents. Without safe, accessible, and intuitive infrastructure, people with vision, hearing, cognitive, or mobility-related disabilities may struggle to go about their daily lives.[8]

The existing conditions for the groups mentioned above are a result of historical policies and practices, some that are clearly related to transportation and others that, while on the surface are not transportation-related, often impact transportation access. To establish this context, the following sections discuss policies and practices in infrastructure, housing, and law enforcement that have led to and continue to exacerbate the transportation conditions for vulnerable groups in the Triangle West TPO region. Acknowledging and understanding these policies equips present-day transportation planners and plans – like the Triangle West TPO Vision Zero Action Plan – with the knowledge to abate further harm, rebuild trust with the community, increase positive outcomes of the system, and redress past harms.

The postwar history of infrastructure planning across the country and in the Triangle West region has led to inequitable transportation outcomes in terms of access, connectivity, and traffic safety. The Vision Zero Action Plan acknowledges these disparities and will create policy, program, and infrastructure strategies that aim to address pressing harm, eliminate disparities, and achieve zero deaths and serious injuries on the region's roadways.

Reflecting on the history of modern transportation planning allows us to examine how past policies and practices have perpetual impacts that not only influence our current circumstances but often form the foundation for existing and future policies and practices. It is important that the Vision Zero Action Plan acknowledges this history so that the strategies included serve people who have disproportionately shouldered the burdens of transportation "progress" in the past.

## Highway Construction and Urban Renewal

In 1956, the first Federal-Aid Highway Act was passed to create the Dwight D. Eisenhower National System of Interstate and Defense Highways, commonly known as the Interstate Highway System. This law, in concert with the 1949 Housing Act, led to widescale construction of highways through urban, Black communities which facilitated and supported white flight from cities to the suburbs over the next two decades.

In the wake of desegregation and Supreme Court rulings that upended Jim Crow laws, many cities used highway development to bulldoze "blighted" communities designated by inherently racist methodologies, including many vibrant and successful Black communities.[9] The Triangle West TPO region had many thriving African American communities that suffered large-scale demolition and intentional marginalization through transportation and housing policy.

This included neighborhoods such as:

**Hayti in Durham** – Hayti was founded after the Civil War by formerly enslaved African Americans, many of whom came to work in tobacco factories. The establishment of African American-owned North Carolina Mutual Life Insurance Company in 1898 led to significant growth and investment into the community. By the early 1900s, Hayti was one of the most successful Black communities in the country.[10] Throughout the 1920s and 1930s, businesses and civic assets thrived while simultaneously, Black families in the neighborhood still dealt with the realities of redlining, segregation, and racial discrimination. Vibrant and impressive buildings were constructed along Fayetteville Street as the community established schools, churches, restaurants, renowned theaters, hotels, a library, and a hospital. Neighborhood decline began in the early 1960s as highway development and urban renewal planning began by both conservative and progressive decision-makers in Durham. The construction of the Durham Freeway in 1970 was supported by White business owners who wanted to relieve vehicle congestion downtown

8 Bureau of Transportation Statistics. (2011). Data Analysis. U.S. Department of Transportation. **https://www.bts.gov/archive/publications/freedom_to_travel/data_analysis.**

9 Dickerson, A. Mechele. (2020). Systemic Racism and Housing, 70 Emory Law Journal 1535. **https://scholarlycommons.law.emory.edu/cgi/viewcontent.cgi?article=1435&context=elj**

10 Rhodes, Brianna (2020). 9 Historic Black Neighborhoods That Celebrate Black Excellence. National Trust for Historic Preservation. **https://savingplaces.org/stories/9-historic-black-neighborhoods-that-celebrate-black-excellence.**


**FIGURE 21** Hayti in 1950 and 1972, before and after the re-routing of Fayetteville St and construction of Durham Freeway[11]

and connect to the Research Triangle Park – including rerouting Fayetteville Street and demolishing dozens of homes and businesses.[12] Nearly all structures on the corridor were demolished aside from St. Joseph AME Church. By the end of urban renewal practices in Durham, over 4,000 families and 500 businesses were displaced from Hayti.[13]

**Pottersfield and Sunset in Chapel Hill and Carrboro** – The area that is now commonly referred to as Northside is a historically Black community originally established over 100 years ago for Black workers at the University of North Carolina, including stone masons that built the university's walls and workers who carried water to student dorms. [14] Despite the importance of the Black residents and workers to the university, the community was segregated and did not have access to Town services – such as roadway paving – until 1950.[15] These close-knit neighborhoods included thriving businesses and were mostly comprised of homeowners and families.[16] Urban renewal planning began in the 1960s and, Chapel Hill received its first Community Development Block Grant from the federal government in 1975. Despite residents organizing to fight urban renewal planners' efforts, the demand for student rental housing continued to grow. As many Black residents took relocation offers or passed away, the community faced destabilization and housing prices increased, furthering displacement for low-income residents who could no longer afford rising rents. By 1980 the population and homeownership rates of Black residents began to rapidly decline.[17]

**A removed community in Hillsborough near what is now Margaret Lane** – After the Civil War, African American families began settling near the Eno River and established a robust community of self-sustaining

11 Bull City 150. (n.d.). Dismantling Hayti. **https://www.bullcity150.org/uneven_ground/dismantling_hayti/.**

12 Bull City 150. Dismantling Hayti: Who Caused All This? **https://www.bullcity150.org/uneven_ground/dismantling_hayti/who_caused_this/.**

13 Bull City 150. (n.d.). Dismantling Hayti. **https://www.bullcity150.org/uneven_ground/dismantling_hayti/.**

14 Moss, Gary. (2016). Building on history. UNC-Chapel Hill. **https://www.unc.edu/discover/building-on-history/.**

15 Fanning, Sophia. (2023). We really had a great community: A 100-year look at housing in Chapel Hill's Northside. The Daily Tar Heel. **https://www.dailytarheel.com/article/2023/09/city-history-of-development-chapel-hill-housing-northside-marian-cheek-jackson-center-racial-history.**

16 Pottersfield (or Potter's Field). (n.d). From the Rock Wall. **https://fromtherockwall.org/places/potters-field.**

17 Fanning, Sophia. (2023). We really had a great community: A 100-year look at housing in Chapel Hill's Northside. The Daily Tar Heel. **https://www.dailytarheel.com/article/2023/09/city-history-of-development-chapel-hill-housing-northside-marian-cheek-jackson-center-racial-history.**

businesses including a funeral home, boarding house, cobbler, historic church, and parsonage.[18] In 1964, the homes, businesses, and buildings were forcibly destroyed, and citizens were displaced to build the Churton Street Bridge to connect outlying areas to the Hillsborough town center area. The bridge was planned and built using both local and federal funding.[19] Today, where this vibrant community once stood there is now a park with commemorative plaques.

These communities were not the only ones impacted by highway development and urban renewal practices in the region. Other predominately Black neighborhoods like Tin Top and Rogers Road in Carrboro, Pine Knolls in Chapel Hill, and West End/Lyon Park, Brookstown, Hickstown, Walltown, and the East End in Durham were similarly impacted and marginalized.

In Durham, over 90% of Black residents voted in support of a 1963 Urban Renewal-related bond referendum. This is because residents and community leaders were misled about how the major infrastructure investment would impact their homes, businesses, neighborhood and lives. They were promised new housing, new commercial development, and other physical infrastructure improvements.

**"Urban renewal failed on every level to make good on its promises for a renewed Hayti and adequate replacement for lost housing and businesses. Black leaders and the Hayti community were left stung by a sense of betrayal. 'The so-called Urban Renewal program in Durham is not only the biggest farce ever concocted in the mind of mortal man... but just another scheme to relieve Negroes of property.' – Louis Alson, Carolina Times Editor, 1965."** [20]

This exemplifies how equitably addressing transportation safety in historically marginalized neighborhoods goes beyond physical infrastructure. Incorporating transportation equity in both process and outcome will require transportation agencies to intentionally and thoughtfully rebuild trust with communities that have experienced targeted harm and deception from the government. This takes time.


**FIGURE 22** Map depicting the historical locations of historically Black neighborhoods in Chapel Hill and Carrboro including Tin Top, Sunset, and Pottersfield.[21]

Highways and other transportation infrastructure like railroads have created lasting physical barriers between white and predominantly Black neighborhoods, continuing to influence demographic trends long after the end of urban renewal practices in the region. The impact of this is not only felt by Black residents – these infrastructures planned and built in the past present current barriers that disproportionately impact people who are low-income, female, elderly, children, immigrants, disabled, do not drive or do not have regular access to a vehicle.[22]

18 Hillsborough's Black History; A Self-Guided Walking Tour. (2023). Visit Hillsborough North Carolina. **https://visithillsboroughnc.com/press/hillsboroughs-back-history-a-self-guided-walking-tour/.**

19 Eno River Bridge (1964). (n.d.). Open Orange. **https://openorangenc.org/content/eno-river-bridge-1964**.

20 Bull City 150. (n.d.). Dismantling Hayti: Empty Promises. **https://www.bullcity150.org/uneven_ground/dismantling_hayti/empty_promises/.**

21 Pottersfield (or Potter's Field). (n.d). From the Rock Wall. **https://fromtherockwall.org/places/potters-field.**

22 Wang, W., Espeland, S., Barajas, J.M. et al. **Rural–nonrural divide in car access and unmet travel need in the United States**. Transportation 52, 507–536 (2025). **https://doi.org/10.1007/s11116-023-10429-6**.

Highway development and urban renewal supported the rapid suburbanization of American metropolitan areas, with much of the growth happening through auto-oriented development patterns. To this day, the Triangle West region is highly car-dependent, meaning residents of the area are experiencing increased household transportation costs related to car ownership and maintenance. It also results in barriers to transportation for people who cannot drive or do not have regular access to a vehicle, as well as disproportionate impacts on people who are female, low-income, elderly, and/or disabled.

Highway and arterial construction also inflicted (and continues to inflict) harm on historically marginalized communities because of the air, water, and noise pollution that comes with high traffic volumes. People of Color and people with lower incomes are more likely to live within a mile of major roads and highways and, as a result, have a higher risk of asthma, lung disease, heart disease, and reproductive health issues.[23] [24]

**23** Boehmer, Tegan, et al. (2010). **Residential Proximity to Major Highways – United States.** MMWR Morbidity and Mortality Weekly Report, 62(3).

**24** Melton, Courtnee. (2017). How Transportation Impacts Public Health. The Sycamore Institute. **https://sycamoretn.org/transportation-impacts-public-health/**

Transportation and housing policies have been historically linked, both intentionally and unintentionally. Traffic issues and parking provisions strongly influence the types of development that can occur, which in turn affects the provision of affordable housing and surrounding transportation networks. Across the United States, and North Carolina, this linkage has created inequitable outcomes and often places affordable housing near the most dangerous roadways, especially for people walking, biking, or taking transit.

After the Civil War, federal, state, and regional policymakers enacted Jim Crow laws and other racist policies to marginalize African Americans in terms of access to public space, transportation, housing, and economic opportunity (amongst other realms of public life). Restrictive covenants were used in the 1920s through the 1960s to keep Black and other People of Color confined in certain neighborhoods, where schools received less funding and transportation infrastructure was less developed or non-existent. Redlining, which began in the 1930s, codified racial segregation by favoring white-only neighborhoods and making it impossible for residents of majority Black or racially mixed neighborhoods to secure loans from banks based on "risk." These legacy policies continue to affect people today. A study from the National Community Reinvestment Coalition found that economic inequality and segregation persist in areas that were historically redlined.[25]

During the highway construction boom between the 1950s and 1970s, displaced populations were often relocated to massive public housing projects, notorious for their inhumane living conditions and poor construction. Public housing and highway construction were the twin cornerstones of the racially motivated urban renewal that swept the country in the mid-twentieth century, resulting in an extensive loss of urban housing stock and the creation of segregated communities.

**"Created in 1958, the Durham Redevelopment Commission oversaw seven projects of urban renewal aimed at combating "urban blight," one in Durham's downtown and the other six in historically black neighborhoods including Hayti and Northeast Central Durham. These six neighborhood projects affected a primarily residential area of some 9,100 people, or 11.7% of Durham's population at the time. Beginning in 1961 and initially scheduled for completion within ten years, the full slate of projects was never finished."** [26]

Community and tenant-led organizations like the United Organizations for Community Improvement, Operation Breakthrough, and ACT were an important part of ending harmful public housing development strategies in Durham. Low-income residents from Black and White communities began organizing around housing issues in the 1960s and advocating for fair and improved conditions.[27]

Although the scope of the Triangle West TPO Vision Zero Action Plan does not include housing-specific strategies, the inextricable relationship between transportation, housing, and land use development is an important factor that contributes to transportation planning, transportation equity, and traffic safety outcomes. The demographic geography of race and income did not happen by chance – it is the result of government policy and investment and important to understand for developing strategies to eliminate roadway deaths in the region. This process should engage grassroots advocates, members of the public, relevant government departments, and relevant agencies to pursue a collaborative approach to equitable and coordinated strategies for growth and development.

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**25** National Community Reinvestment Coalition. (n.d.). The Injustice of Redlining. **https://www.ncrc.org/redlining/**

**26** Mitchell, Bruce and J. Franco. (2018). HOLC "Redlining" Maps: The persistent structure of segregation and economic inequality. National Community Reinvestment Coalition. **https://ncrc.org/wp-content/uploads/dlm_uploads/2018/02/NCRC-Research-HOLC-10.pdf.**

**27** Bull City 150. (n.d.). Tenants Mobilize: The Power of Grassroots Organizing. **https://www.bullcity150.org/uneven_ground/tenants_mobilize/grassroots_organizing/.**

# Existing Conditions

## Transit

Public transportation that is fast, convenient, and easy to use is associated with increased access to healthcare services and healthy food.[28] Conversely, when people depend on public transportation that is inadequate or irregular, inconvenient or requires multiple transfers, they are more likely to forego accessing necessary destinations, including health services.[29] Historically, the shift in focus toward developing automobile infrastructure, most notably the interstate highway system, came at the expense of funding for public transportation, creating wider access disparities between those who had access to private vehicles and those who did not.[30]

Multiple agencies work in coordination to provide public transportation services to residents in the Triangle West region, as shown in **Table 1**. This includes a traditional fixed-route bus service and demand-response paratransit service for eligible riders such as people with disabilities, seniors, and people in low-income households.[31] Notably, Chapel Hill Transit is one of the largest bus systems in the country that is fare free.[32]

Amtrak provides daily passenger rail service through the Durham station with direct service to 24 cities. In 2022, 83,173 passengers arrived or departed at the station.[33]

**TABLE 20** Public transit operators in the Triangle West region

| Agency | Types of Service | Service Areas | Annual Ridership (2023) |
|---|---|---|---|
| Chapel Hill Transit | Fixed route bus service | Town of Chapel Hill, Town of Carrboro, University of North Carolina | 3,798,800 |
| E-Z Rider | Demand-response paratransit service for eligible riders | Town of Chapel Hill, Town of Carrboro | 56,600 |
| GoDurham | Fixed route bus service | Durham County | 5,267,800 |
| GoDurham ACCESS | Demand-response ADA paratransit service for eligible riders | City of Durham, Durham County | 149,200 |
| GoTriangle | Fixed route bus service | Wake County, Durham County, Orange County | 1,663,700 |
| GoTriangle ACCESS | Demand-response ADA paratransit service for eligible riders | Wake County, Durham County, Orange County | 39,000 |
| Orange County Transportation Services | Fixed route service and demand response service for eligible riders | Town of Hillsborough, Orange County | 21,000*<br>*Approximate 2022 ridership |

28 Litman, Todd. (2022). Evaluating Public Transit Benefits and Costs. Victoria Transport Policy Institute. **https://www.vtpi.org/tranben.pdf**

29 Farhang, Lili and R. Bhatia. (2005). Transportation for Health. Race Poverty, & the Environment. **https://reimaginerpe.org/files/13.Lili.Farhang.pdf.**

30 Sheller, Mimi. (2018). Mobility Justice: The Politics of Movement in an Age of Extremes. Verso.

31 Orange County Transportation Services. (2024). Draft Orange County Short Range Transit Plan. **https://orangecountysrtp.com/wp-content/uploads/2024/08/OC_SRTP_Draft-Report-Revised.pdf.**

32 Morris, DL Gregory. (2023). Ridership rebounds for Chapel Hill Transit. The Local Reporter. **https://thelocalreporter.press/ridership-rebounds-for-chapel-hill-transit/**.

33 Rail Passengers Association. (2023). Amtrak service in Durham, NC. **https://www.railpassengers.org/site/assets/files/1889/dnc.pdf.**

## Multimodal Investment Strategies

Historic transportation planning has led to an overwhelming focus on automobile-oriented transportation investments, which is a significant contributor to inequitable transportation outcomes. In addition to the focus on vehicle-related projects over other modes, contemporary planning frameworks that evaluate system performance are often based on vehicle travel speeds – the faster the better. Vehicular level-of-service standards reinforce the focus on automobile-oriented transportation investments. These frameworks justify road expansions that aim to reduce vehicular congestion delays but often fail to consider how less congestion and higher speeds impact other roadway users as well as safety for all roadway users.

Municipalities throughout the region are working to implement more multimodal planning frameworks to meet the needs of nondrivers through recent and ongoing efforts such as the Durham Bike + Walk Plan, Orange County Transportation Multimodal Plan, Chapel Hill Transit High-Capacity Transit Corridor Feasibility Study, Downtown Hillsborough Parking Study, Carrboro Comprehensive Bicycle Transportation Plan Update, Orange County Bicycle Pedestrian Plan, and Durham-to-Roxboro Rail Trail Planning Study. There are many opportunities for the Triangle West TPO to continue supporting local communities and promoting regional multimodal investment through planning and funding strategies such as the Metropolitan Transportation Plan and Federal Funding Policy.

> Approximately $700 is spent on roads and $1,000-$3,000 on parking subsidies annually per capita [in the United States], compared with $100-200 for transit subsidies and $20-50 for pedestrian and cycling facilities. This is unfair to non-drivers and since driving tends to increase with income, and it is regressive, resulting in lower-income households subsidizing the costs of their wealthier neighbors.[34]

**34** Litman, Todd. (2021). Evaluating Transportation Diversity. Victoria Transport Policy Institute; Victoria Transport Policy Institute. **https://www.researchgate.net/profile/Todd-Litman-2/publication/245559730_Evaluating_Transportation_Choice/links/6166fda125be2600ace1addd/Evaluating-Transportation-Choice.pdf.**

## Active Transportation

Active transportation investments enable safer and more comfortable experiences for people walking, biking, or taking transit. However, active transportation planning has also contributed to racial disparities through a traditional focus on recreational users over those who rely on these modes for mobility. Research shows that the result is a disproportionate lack of infrastructure for walking and bicycling in Black and Latino neighborhoods.[35] [36] In the United States today, neighborhoods that have a majority of Black and Latinx residents have lower quality sidewalks with more obstructions and accessibility issues, even though residents of these neighborhoods are less likely to own or rely on vehicles for transportation.[37] [38]

That said, proposed bikeways and sidewalks are sometimes seen as harbingers of gentrification in these same neighborhoods and are met with opposition because, often, there are other needs that residents have continually asked for and feel should be addressed first (e.g., violence, education, health outcomes, etc.).[39] Decades of disinvestment in BIPOC neighborhoods have bred distrust in communities where cities have failed to respond to the concerns and needs of residents. Contention can occur when historic requests by the community appear to be overlooked instead of an investment in active transportation that was not requested.

Where bicycle facilities have been built, many are standard bicycle lanes that end at intersections or shared lane markings that place bicycle riders in the same lane as motor vehicles. These facilities are designed for riders who are confident riding in traffic, failing to serve the majority of potential riders who are "interested but concerned."[40] Furthermore, the disproportionate effects of traffic crashes on Indigenous, Black, and Latinx individuals emphasizes a need for safer active transportation facilities for vulnerable road users.

Neighborhoods with a higher proportion of Black residents are also less likely to have access to shared micromobility services, including both bikes and scooters.[41] This is partially due to shared micromobility vendors prioritizing areas that already have active transportation infrastructure like bike lanes and paths, rather than those with the greatest need. This lack of geographic coverage contributes to racial disparities in the access and use of micromobility services.

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**35** Barajas, Jesus. (2021). Biking where Black: Connecting transportation planning and infrastructure to disproportionate policing. Transportation Research Part D: Transport and Environment, 99, DOI: **10.1016/j.trd.2021.103027.**

**36** Lee, Richard. I. N. Sener & S. N. Jones. (2017). Understanding the role of equity in active transportation planning in the United States, Transport Reviews, 37:2, 211-226, DOI: **10.1080/01441647.2016.1239660.**

**37** Kelly, C. M., Schootman, M., Baker, E. A., Barnidge, E. K., & Lemes, A. (2007). The association of sidewalk walkability and physical disorder with area-level race and poverty. Journal of Epidemiology and Community Health, 61(11), 978–983. DOI: **10.1136/jech.2006.054775.**

**38** Rajaee, M, et al. (2021). Socioeconomic and racial disparities of sidewalk quality in a traditional rust belt city. SSM Popul Health, 16:100975. DOI: **10.1016/j.ssmph.2021.100975.**

**39** Flanagan, Elizabeth, U. Lachapelle, & A. El-Geneidy. (2016). Riding tandem: Does cycling infrastructure investment mirror gentrification and privilege in Portland, OR and Chicago, IL? **https://www.sciencedirect.com/science/article/abs/pii/S0739885915300287.**

**40** Dill, Jennifer & N. McNeil. (2012). Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. OTREC Working Paper. **https://web.pdx.edu/%7Ejdill/Types_of_Cyclists_PSUWorkingPaper.pdf.**

**41** Aman, J.J.C., Zakhem, M., Smith-Colin, J. (2021). Towards Equity in Micromobility: Spatial Analysis of Access to Bikes and Scooters amongst Disadvantaged Populations. Sustainability, 13, 11856. DOI: **10.3390/su132111856.**

## Traffic Crashes and Fatalities

Nationwide, crash analyses have found that American Indian and Alaska Native, Black, and Latinx Americans face higher rates of traffic injuries and fatalities. These disparities are particularly pronounced for pedestrians (see **Figure 4**). Across the US, the number of people killed while walking reached a new high in 2022, with an estimated 7,500 pedestrians struck and killed, up 19 percent since 2019. Between 2015 and 2019, the annual average bicycle and pedestrian fatality rate in the Triangle West TPO region was 1.9 per 100,000 people overall. Within the Triangle West TPO region, in geographic areas with a relatively higher population of nonwhite residents, the rate was 3.7 per 100,000. People of Color, particularly Native Americans and Black Americans, are substantially more likely to die while walking than any other race or ethnic group.

In addition, people walking in lower-income areas are killed at higher rates than people walking in higher-income areas (see **Figure 5**). The bicycle and pedestrian fatality rate in low-income areas of the Triangle West TPO region was 3.0 per 100,000 from 2015 to 2019; in areas with more zero-car households, the rate was 2.8 per 100,000.

Disparities in transportation safety are closely tied to the road infrastructure in low-income and BIPOC neighborhoods. Three-quarters of the United States' sixty most dangerous roads for pedestrians are in low-income neighborhoods, and more than half are in predominantly Black or Latinx neighborhoods. .

The majority of these roads match a particular profile of arterials constructed through BIPOC neighborhoods, with five or more travel lanes, speed limits of 30 miles per hour or higher, and a lack of facilities for people walking or riding bikes.

Nationwide trends also show that rural pedestrians are killed at a similar rate to pedestrians in urban areas. From 2010 to 2019 when controlling for population, there were 1.7 deaths for every 100,000 people in rural areas compared to 1.6 pedestrian deaths for every 100,000 people in urban areas. In many rural areas – such as northern parts of Durham County and northern and southern areas of Orange County – pedestrians must navigate high-speed state roads with minimal shoulders. Overlap between low-income and rural areas can exasperate transportation safety disparities, especially as it relates to pedestrians.

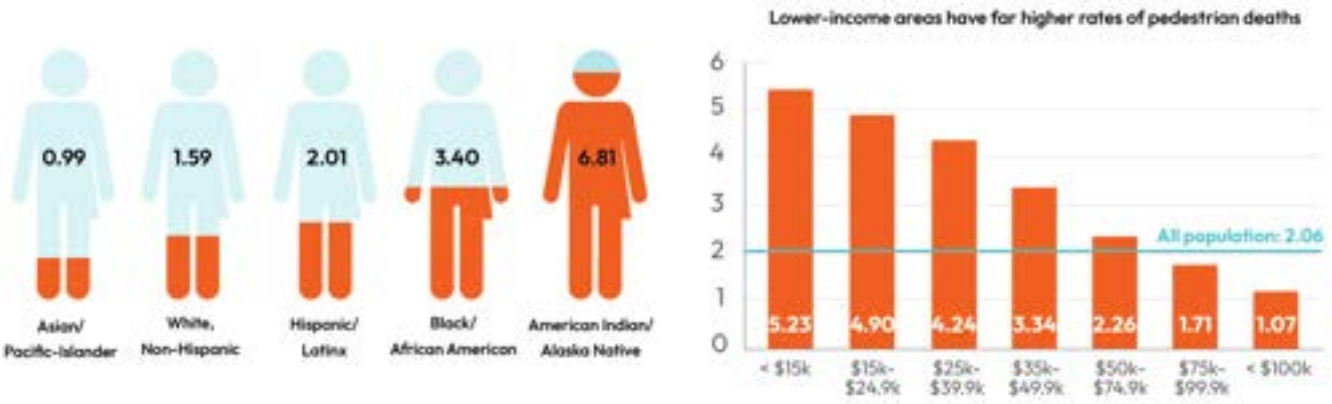



**FIGURE 23** Pedestrian deaths per 100,000 in the United States by race and ethnicity (left), and census tract income (right)[42]

**42** U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA) Bureau of Transportation Statistics (BTS). (2024). Fatality Analysis Reporting System (FARS). Retrieved from **https://catsip.berkeley.edu/news/smart-growth-america-releases-2024-dangerous-design-report#:~:text=Metropolitan%20and%20urban%20areas%20in,a%202.8%25%20increase%20in%20population.**

## Law Enforcement

Enforcement has historically been viewed as a key component of achieving transportation safety and compliance. However, enforcement-based approaches to traffic safety have resulted in racially disparate impacts on mobility and safety. Police officers stop Black drivers at higher rates than White drivers, and both Black and Latinx drivers are searched more often than their White counterparts.[43] As a result of this discrimination, transportation safety strategies that prioritize increasing traffic enforcement by officers are likely to result in racially disparate outcomes.

Racial disparities are even higher for investigatory stops and non-moving violations, such as equipment and registration violations, although research indicates that enforcement of non-moving violations does not have a discernable effect on crime rates.[44] Research has shown that traffic stops are not related to a reduction in deaths from vehicular crashes,[45] although these stops can become a safety risk for Black drivers and Latinx drivers who are more likely to be met with the use of force during these stops.[46]

In 2023, 59 percent of drivers stopped by Durham Police Department were Black and 15 percent were Hispanic – this contrasts with 36 percent of the population that is Black and 13 percent that is Hispanic or Latino. When looking just at the stops conducted by the City's Traffic Services officers, the data shows that 51 percent of that subset of stops were of Black people. Although a clear disparity, it is notable to review the data from this unit because they conduct the most traffic stops in the department and the stops are distributed geographically across Durham.[47]

The report notes that based on a statistical test examining if racial disproportionality in traffic stops existed within the 2023 data, "there was no evidence of unexplainable disparities regarding traffic stops among the officers. Rather, officers are stopping vehicles consistent with the demographics and crime statistics of their assigned areas." The report does not include consideration for variation in roadway characteristics that contribute to traffic behavior, however, it does note that officers with the highest rates of traffic stops involving minorities, "worked in geographical areas with higher minority populations, including District 1 and District 4, which also have the highest per capita violent crime figures."

Despite the report's framing, this does not necessarily dispel concerns about biases- research shows that traffic stops are not an effective strategy for reducing crime.[48] Additionally, these stops have lasting impacts on law-abiding residents using the transportation system for daily needs and activities. As shared by Anthony McLendon, member of the McDougald Terrace public housing resident council (located in Police District 4):

> …he has been stopped by police multiple times in recent weeks. One time an officer said the tint on his license plate was too dark. Another time, it was the tint on his windows. The third time, an officer pulled up to him after he had run back and forth to the store a few times. The officer warned McLendon, he said, that if he came and left again, he was going to pull him over. McLendon asked why. Suspicion, the cop told him, McLendon said. "Suspicion of what….We live over here." Another time McLendon was pulled over, and the cop jumped out of his car with his hand on his gun. "He made me real nervous," McLendon said. The officer said McLendon's car looked similar to a suspect that he was looking for, before soon taking off in response to some chatter on the officer's radio, the resident said. McLendon hasn't been arrested or cited, but the interactions have left him feeling targeted and even more skeptical of police. [49]

**43** Stanford Open Policing Project. (2021).Findings **https://openpolicing.stanford.edu/findings/**

**44** Policing Project. (2018). Reevaluating Traffic Stops in Nashville. NYU School of Law. **https://www.policingproject.org/nashville.**

**45** Sarode, Anuja L. MPH et al. (2021). **Traffic stops do not prevent traffic deaths.** Journal of Trauma and Acute Care Surgery, 91(1), DOI: 10.1097/TA.0000000000003163.

**46** Weisburst, Emily and F. Goncalves. (2020). Economics Research on Racial Disparities in Policing. Econofact. **https://econofact.org/economic-research-on-racial-disparities-in-policing.**

**47** City of Durham. (2023). Executive Summary- Traffic Stop Data. **https://www.durhamnc.gov/DocumentCenter/View/55948/2023-Traffic-Stop-Review-Final.**

**48** Policing Project. (2018). Reevaluating Traffic Stops in Nashville. NYU School of Law. **https://www.durhamnc.gov/DocumentCenter/View/55948/2023-Traffic-Stop-Review-Final.**

**49** Bridges, Virginia. (2023). Durham residents chafe at more aggressive policing after community unit disappears. The News and Observer. **https://www.newsobserver.com/news/local/article273445245.html.**

In line with statewide and regional trends, Carrboro Police Department, Chapel Hill Police Department, and Hillsborough Police Department data also shows that Black and Hispanic drivers are disproportionately impacted by traffic stops and non-moving violations. In 2021, the rate of citations to warnings for Black drivers in Chapel Hill was 23 percent higher than White drivers; for Hispanic drivers, the rate was 20 percent higher. In Carrboro, Black people comprise about 16 percent of the population but account for 29 percent of traffic stops; Hispanic drivers, account for 12 percent of stops even though only 7 percent of the population is Hispanic or Latino.[50] In Hillsborough, Black drivers accounted for 30 percent of traffic stops despite being 9 percent of the population in 2023, and Hispanic drivers comprised 14 percent of stops and 10 percent of the Hillsborough population.[51]

Police departments across the Triangle West region have made public statements condemning racial discrimination in policing, committed to data transparency that is disaggregated by race, participated in internal reviews and reforms related to racial disparities, and developed and elevated community-oriented task forces and committees.[52] [53]

**50** Adams, Jospeh. (2022). Chapel Hill and Carrboro policing data shows racial disparities in traffic stops. Daily Tar Heel. **https://www.dailytarheel.com/article/2022/11/city-crime-disparities.**

**51** Hillsborough Police Update 2/14/24. (2024). Town of Hillsborough. **https://assets.hillsboroughnc.gov/media/documents/temporary/police-presentation-WwLTVun0Ir3oi430jDSy.pdf.**

**52** Adams, Jospeh. (2022). **Chapel Hill and Carrboro policing data shows racial disparities in traffic stops.** Daily Tar Heel.

**53** McConnell, Brighton. (2020). Chapel Hill, Carrboro and Hillsborough Police Share Statements on Racial Injustice. Chapelboro.com. **https://chapelboro.com/news/local-government/chapel-hill-carrboro-police-share-statements-on-injustice-and-affirm-commitments-to-community.**

# Equity Analysis

This section discusses mapping to distinguish demographic populations that reflect communities that have been systemically oppressed and marginalized through historical policies and practices. We can identify and map these populations using available Census and American Community Survey (ACS) data. We will use the equity analysis results in the planning process to compare transportation safety outcomes in areas experiencing the greatest socioeconomic vulnerability, guide an inclusive community outreach approach, and develop strategies for the Triangle West TPO Vision Zero Action Plan that do not further contribute to disparate transportation outcomes.

Through this equity analysis, we identify key populations vulnerable to transportation disadvantages based on socioeconomic factors. 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 depend on the availability of safe multimodal facilities to access their daily needs. Once key populations are defined, we delineate areas throughout the region where we see the highest proportions of these populations and assume that these areas have greater socioeconomic vulnerability.

## Methodology

### Defining Key Populations

This equity analysis uses eight key demographic populations that face transportation and socioeconomic disparities. The identification of these populations was informed by the Triangle West TPO 2020 Environmental Justice Report, NCDOT Transportation Disadvantage Index, and the Indicators of Potential Disadvantage methodology, are discussed in the following section. The key populations in the Triangle West TPO Vision Zero Action Plan equity analysis are:

- Black, Indigenous, and other People of Color, specifically the ACS race and ethnicity categories:
  - Black or African American
  - American Indian and Alaska Native
  - Asian
  - Two or More Races
  - Hispanic or Latino
- Households in poverty
- Carless households
- Youth under 18 years old
- Older adults over 64 years old
- People with disabilities
- People with limited English proficiency
- People with limited educational attainment
  - Note, that this indicator was added due to empirical research that shows people with lower education attainment are more likely to be vulnerable roadway users who walk or bike for transportation. Research has also found that as education levels increase, so does access to reliable transportation.[54]

**54** Ng AE, Adjaye-Gbewonyo D, Dahlhamer J. Lack of reliable transportation for daily living among adults: United States, 2022. NCHS Data Brief, no 490. Hyattsville, MD: National Center for Health Statistics. 2024. DOI: https://dx.doi.org/10.15620/ cdc:135611. **https://www.cdc.gov/nchs/data/databriefs/db490.pdf.**

## Regional - Indicators of Potential Disadvantage Methodology

The regional equity analysis uses the Indicators of Potential Disadvantage (IPD) methodology, originally developed by the Delaware Valley Regional Planning Commission (DVRPC). The IPD methodology uses ACS, 5-year estimates (2018-2022) to delineate areas where key populations are more prevalent. Although identified at the block group level, the data is gathered at the regional level so that regional averages for each population group can be determined.

Each block group's population percentage is calculated from the standard deviations relative to each indicator's regional average. The calculations range from "well below average" to "well above average." An example of this is shown in **Figure 6**.

For each indicator, block groups receive a score of 0 to 4 as follows:

- Well below average – score of 0
- Below average – score of 1
- Average – score of 2
- Above average – score of 3
- Well above average – score of 4

The Overall IPD summarizes the indicator scores, ranging from 0 – 32. For the purposes of the Triangle West TPO Vision Zero Action Plan, the regional Overall IPD is used as the basis for identifying Vision Zero Focus Areas to guide plan engagement, strategies, and implementation.

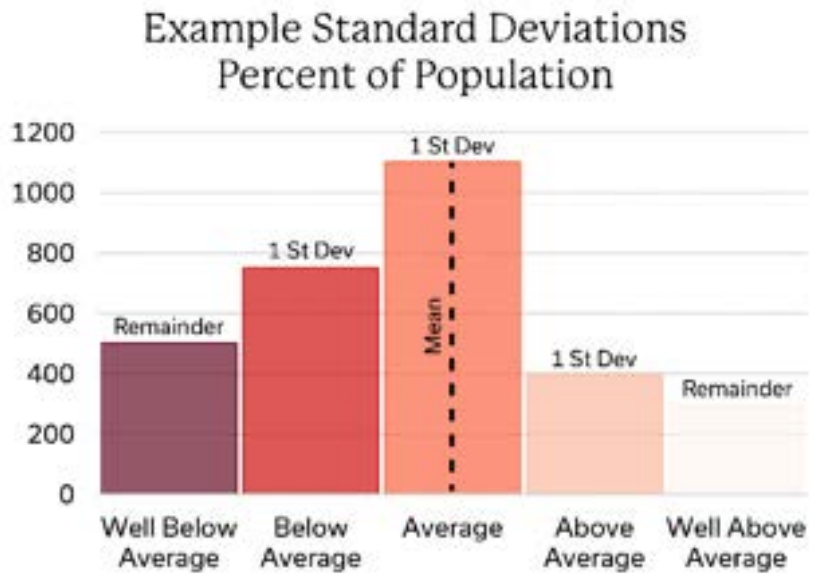



**FIGURE 24** Example Standard Deviations and Corresponding Scores[55]

55 Michiana Area Council of Governments. (2023). Michiana Area Environmental Justice Analysis. **https://storymaps.arcgis.com/stories/2e3bccbd775b4e9ba8d6b34832abf9ed.**

## Localized Equity Analyses

In addition to the regional equity analysis, this equity framework presents localized equity analyses for the following communities in the Triangle West TPO planning area:

- City of Durham
- Town of Chapel Hill
- Town of Carrboro
- Town of Hillsborough
- Durham County
- Orange County
- Chatham County

The localized analyses use the same indicators for the analyses and a similar methodology. Still, at the block group scale, ACS, 5-year estimates (2018-2022) data is collected at the community level and the community average is determined for each population group. Each block group's population percentage is calculated from the standard deviations relative to each indicator's community-level average. A community-level Overall IPD is available for each of the communities above to allow for a contextualized approach to safety action planning, engagement, and strategy implementation.

## Map Interpretation

### Race

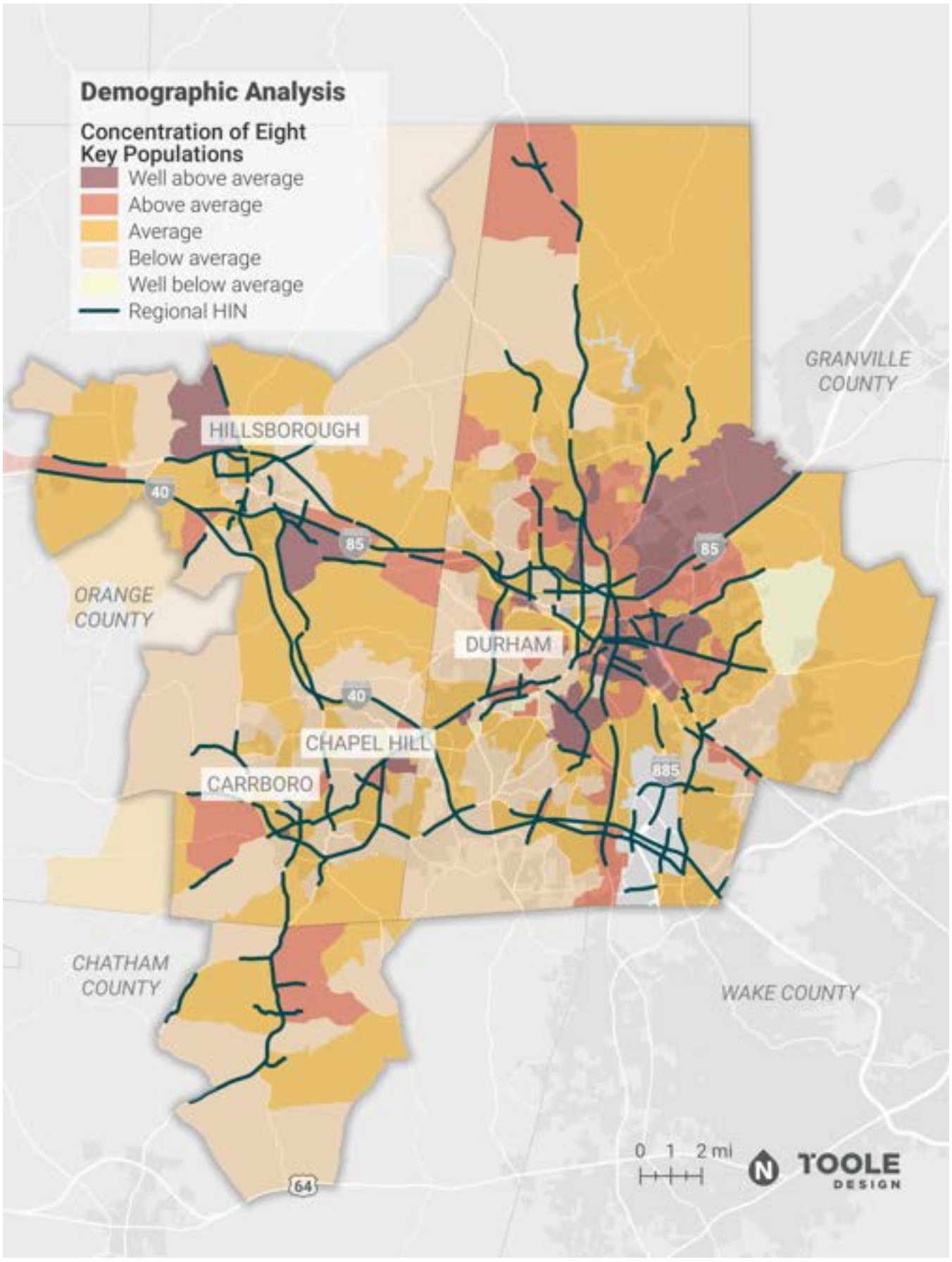
The IPD analysis for racial minorities assesses where there are prevalent populations of Black, Native American, Alaska Native, Asian, Native Hawaiian, Pacific Islander, Hispanic or Latino, and multiracial residents. The results of the regional analysis are shown in **Map 1**.

In Orange County, there are above average concentrations of nonwhite residents in the northwest areas of Hillsborough and the surrounding areas that are part of Orange County. Most of Chapel Hill has an average concentration of nonwhite residents, however, there are a few census blocks with above average concentrations of People of Color in the Northside area and the southwest corner of the Town, north of NC-54.

Durham County has the highest concentrations of People of Color, most notably on the south and east sides of the City of Durham which range from above to well above average. There are additional areas with above average or well above average concentrations of nonwhite residents, including the Duke University campus area, and communities along Durham-Chapel Hill Boulevard between the two municipalities.

Most of the unincorporated areas of Orange, Durham, and Chatham County range from average to well below average concentrations of this demographic group.

**MAP 12** Triangle West TPO IPD: Racial Minority Population



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.[56]

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

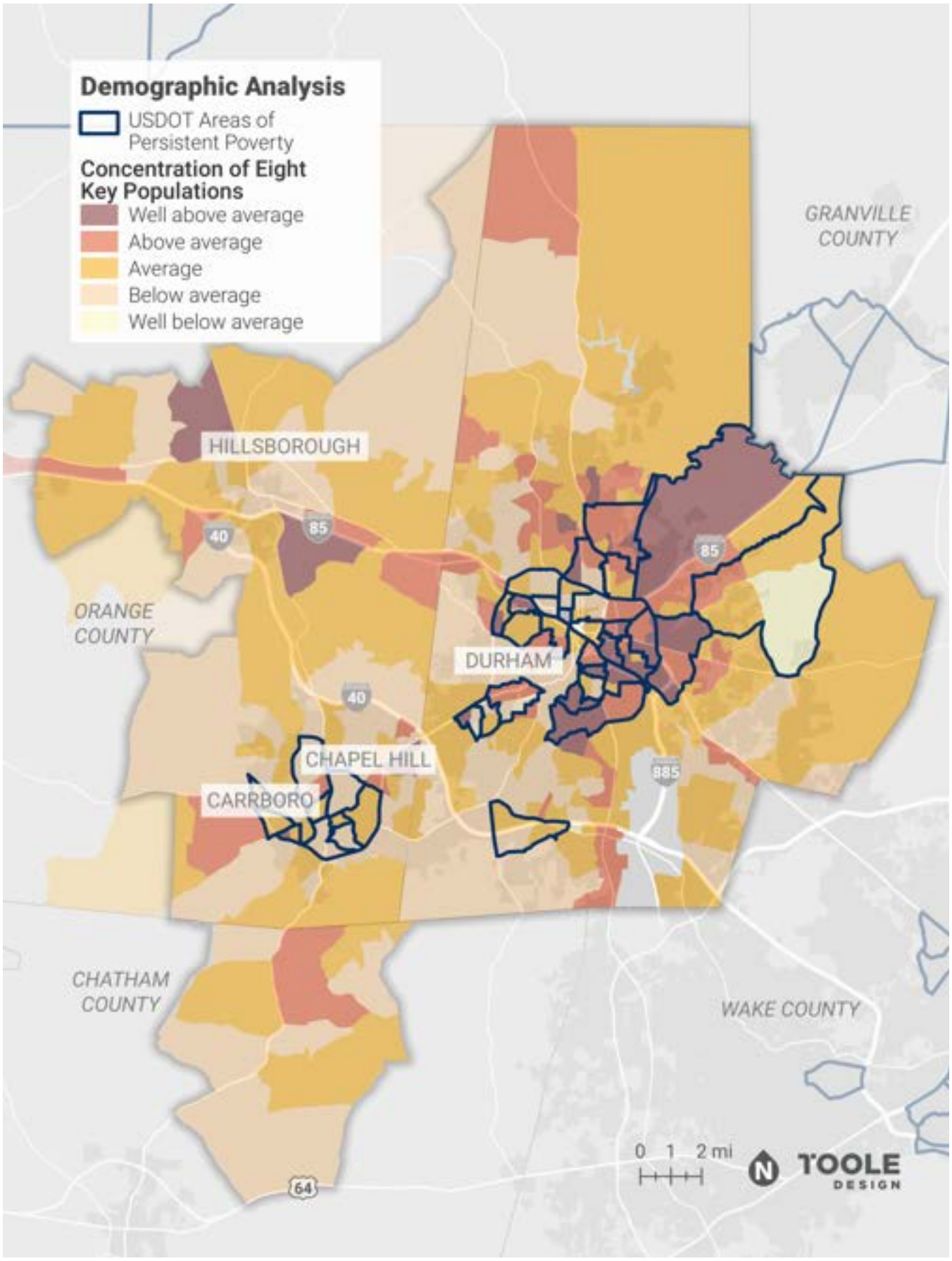
- East Durham near downtown and along the Durham Freeway
- Northeast Durham along the US-15/I-85 corridor
- Census tracts directly around North Carolina Central University and Duke University in Durham
- Nearly all of Chapel Hill and Carrboro, including census tracts surrounding the University of North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

The concentration of census tracts in Chapel Hill and Carrboro is likely influenced by the high population of UNC-Chapel Hill students living in these communities. U.S. Census Bureau research found that the presence of off-campus university students has a significant impact on local poverty rates.[57]

**56** Benson, Craig and A. Bishaw. (2018). Small and Large College Towns See Higher Poverty Rates. United States Census Bureau. **https://www.census.gov/library/stories/2018/10/off-campus-college-students-poverty.html.**

**57** Benson, Craig and A. Bishaw. (2018). Small and Large College Towns See Higher Poverty Rates. United States Census Bureau. **https://www.census.gov/library/stories/2018/10/off-campus-college-students-poverty.html.**

**MAP 13** Triangle West TPO IPD: Areas of Persistent Poverty Map



TRIANGLE WEST
Transportation Planning Organization

April 2025

# Triangle West Transportation Planning Organization

# VISION ZERO ACTION PLAN

# Appendix C

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# List of Figures

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# Appendix C: Engagement and Input

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

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

In addition to the Safety Summit, a series of **Technical Advisory Committee** meetings took place throughout the planning process. These meetings provided a forum for key stakeholders to review data, discuss priorities, and align regional transportation strategies. Designed as workshops, they included updates, a review of materials, and interactive activities to encourage meaningful engagement and collaboration.

Two **Open Houses**, held in November 2024 in Chapel Hill and March 2025 in Carrboro, provided community members with the opportunity to review recommendations, ask questions, and share feedback on proposed improvements. The events featured interactive boards exploring roadway behaviors and personal behaviors that affect safety, as well as informational displays highlighting historical crash locations. Many attendees at the Chapel Hill Open House also participated in an online survey, providing additional insights to help shape the final elements of the plan. At the Carrboro Open House, participants provided input on the draft plan, including strategies and actions and priority corridors and intersections.

Engagement efforts continued at **local agency and community events** where staff presented plan updates and gathered input from municipal and county representatives, advocacy groups, community members, youth, and other regional stakeholders. These events allowed for direct discussions with the local leaders and community members about transportation needs and priorities.

To ensure broad participation beyond in-person events, an **Online Survey** was available from October 2024 to March 2025. The survey gathered input from 89 participants and received 145 location-based comments, gathering input on roadway safety concerns, behaviors, and personal experiences in the Triangle West region. This feedback informed key recommendations in the plan.

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 and key themes that emerged from public input.

# Safety Summit- October 8, 2024

The Safety Summit, held October 8, 2024, was the first major engagement event in the planning process and provided an opportunity for stakeholders to discuss roadway safety concerns across the region. The event brought together transportation professionals, policymakers, and community organizations to explore safety challenges, equity considerations, and data-driven solutions.


**FIGURE 25** Transportation Safety Summit Event Agenda & Promotional Materials

The Summit, structured around three breakout sessions, focused on different aspects of roadway safety. Discussions covered community perceptions of safety, infrastructure and technical solutions, and policy coordination. Participants shared insights on barriers to safety improvements, the need for equitable engagement, and strategies for reducing crashes and improving roadway design.

Throughout the event, attendees identified key challenges, such as gaps in safety funding, limitations in data collection, and difficulties in implementing safety measures. The discussions also highlighted local success stories, including efforts to improve pedestrian and bicycle safety through infrastructure enhancements and public engagement initiatives.


**FIGURE 26** Collaborative Breakout Session Discussions on Safer Streets

Attendees also had the opportunity to personally sign a commitment to supporting safer streets at a pledge wall station. This interactive element encouraged personal accountability and reinforced the collective goal of improving roadway safety in the region.

The feedback gathered from the Safety Summit played a key role in shaping the Triangle West Vision Zero Plan, ensuring that recommendations reflected both community concerns and best practices for improving safety.


**FIGURE 27** Words that Rose to the Top: Themes from the Transportation Safety Summit


**FIGURE 28** Participants at Safety Summit Pledge Wall


**FIGURE 29** "Pledge for Safer Streets" Wall

# Technical Advisory Committee (TAC) Meetings

The Technical Advisory Committee (TAC) meetings served as key engagement opportunities throughout the planning process, bringing together agency representatives, planners, and transportation professionals to discuss safety priorities, review data, and shape plan development. These meetings, designed as workshops, incorporated project updates, materials review, and interactive discussions to ensure alignment across regional and local stakeholders.

Four TAC meetings were held to guide the plan's development and ensure that regional safety priorities were informed by data and stakeholder input.

- **Meeting 1 (August 20, 2024):** Focused on introducing the Safe System Approach (SSA) and reviewing safety data, including the High-Injury Network (HIN), High-Risk Network (HRN), and equity analysis. Attendees discussed crash trends, safety strategies, and how engagement efforts would be structured to gather meaningful public input.
- **Meeting 2 (October 22, 2024):** Reviewed the High Injury Network (HIN) and High Risk Network (HRN) analyses, including risk analyses methodologies and crash probabilities for different roadway types and environments. Participants discussed how risk-based prioritization could inform safety planning. Participants also reviewed crash data trends for all modes and covered key factors influencing high-risk pedestrian crashes, such as traffic volumes, lane widths, transit stops, schools, and employment centers.
- **Meeting 3 (December 10, 2024):** Addressed the plan format, content structure, and prioritization strategies. Breakout discussions explored key crash types, roadway contexts, and risk factors, with participants identifying safety challenges such as pedestrian crashes at night on arterials, school zone safety, and transit access gaps. Discussions also included grant deadlines, regional coordination, and strategies for tracking safety improvements over time.
- **Meeting 4 (February 25, 2025):** Focused on finalizing plan recommendations, implementation strategies, and strengthening partnerships. TAC members also discussed ideas for tracking progress and measuring the effectiveness of safety interventions.

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

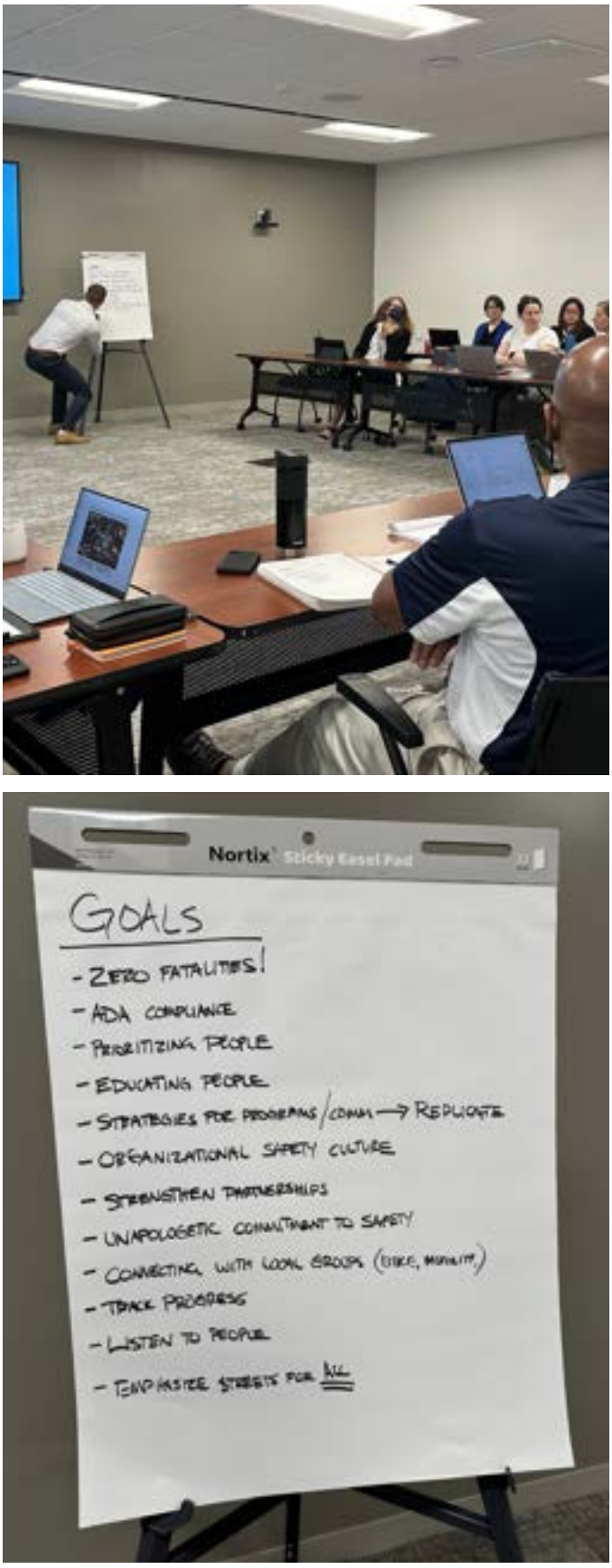



**FIGURE 30** Collaborative Discussions during the TAC Meetings

# Open Houses

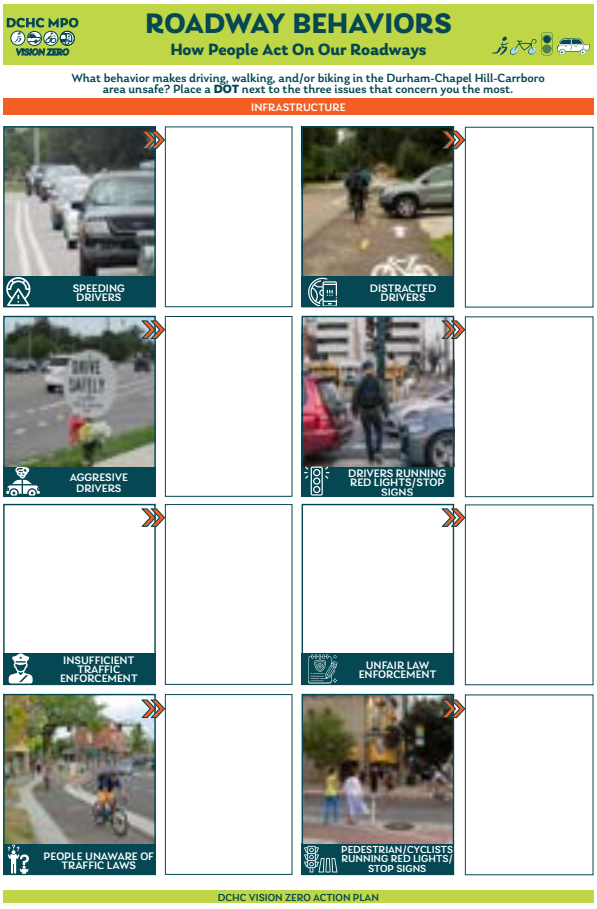
The first Open House was held on November 20, 2024, at the Chapel Hill Public Library. The Open House provided members with an opportunity to review preliminary recommendations, ask questions, and share feedback on proposed safety improvements. The event focused on engaging those living and working in Chapel Hill, ensuring that local perspectives were reflected in the planning process.

Attendees interacted with a series of display boards, including:

- Interactive boards exploring roadway behaviors and personal behaviors affecting safety.
- Informational displays highlighting crash trends in Durham, Chapel Hill, and Carrboro.
- Survey stations with iPads, allowing participants to provide direct input on safety concerns and priorities through the Online Survey.

The event 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 firsthand experiences provide valuable context to the data-driven findings, reinforcing the need for targeted safety interventions.

The input gathered during the Open House, including in-person feedback, written comments, and online survey responses, helped refine key elements of the final plan. The event served as a touchpoint for community engagement, ensuring that the recommendations reflect the experiences and concerns of the most impacted by transportation safety issues.



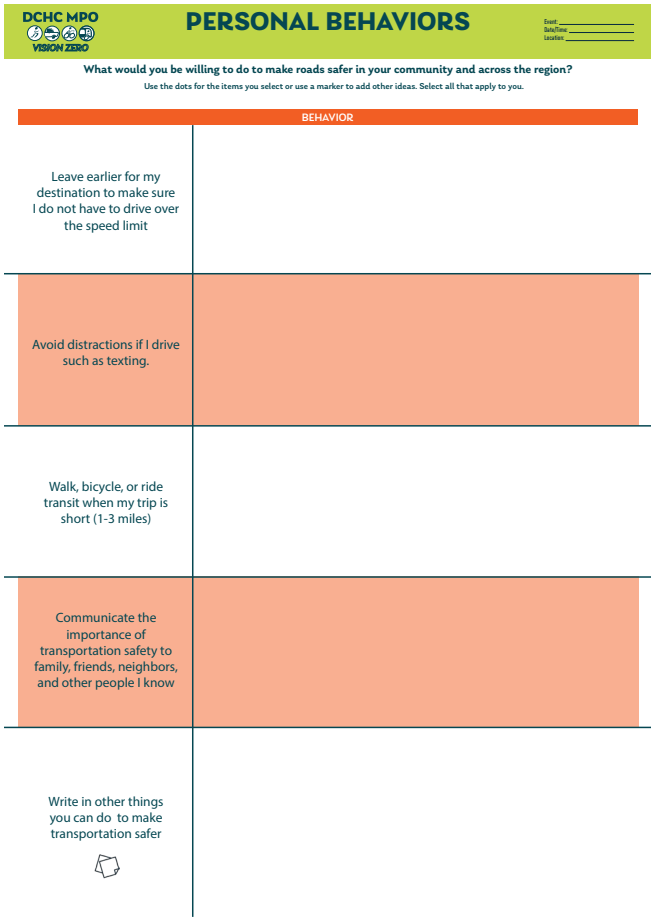




**FIGURE 31** Interactive Boards from Chapel Hill Open House Event


**FIGURE 32** Attendees engaging with boards at Chapel Hill Open House Event

A second Open House was held on March 25, 2025, at the Drakeford Library Complex in Carrboro. This Open House focused on gathering input from the community on the draft Vision Zero Action Plan. Participants were given the opportunity to review draft strategies and actions, as well as draft priority corridors and intersections for safety improvement projects.

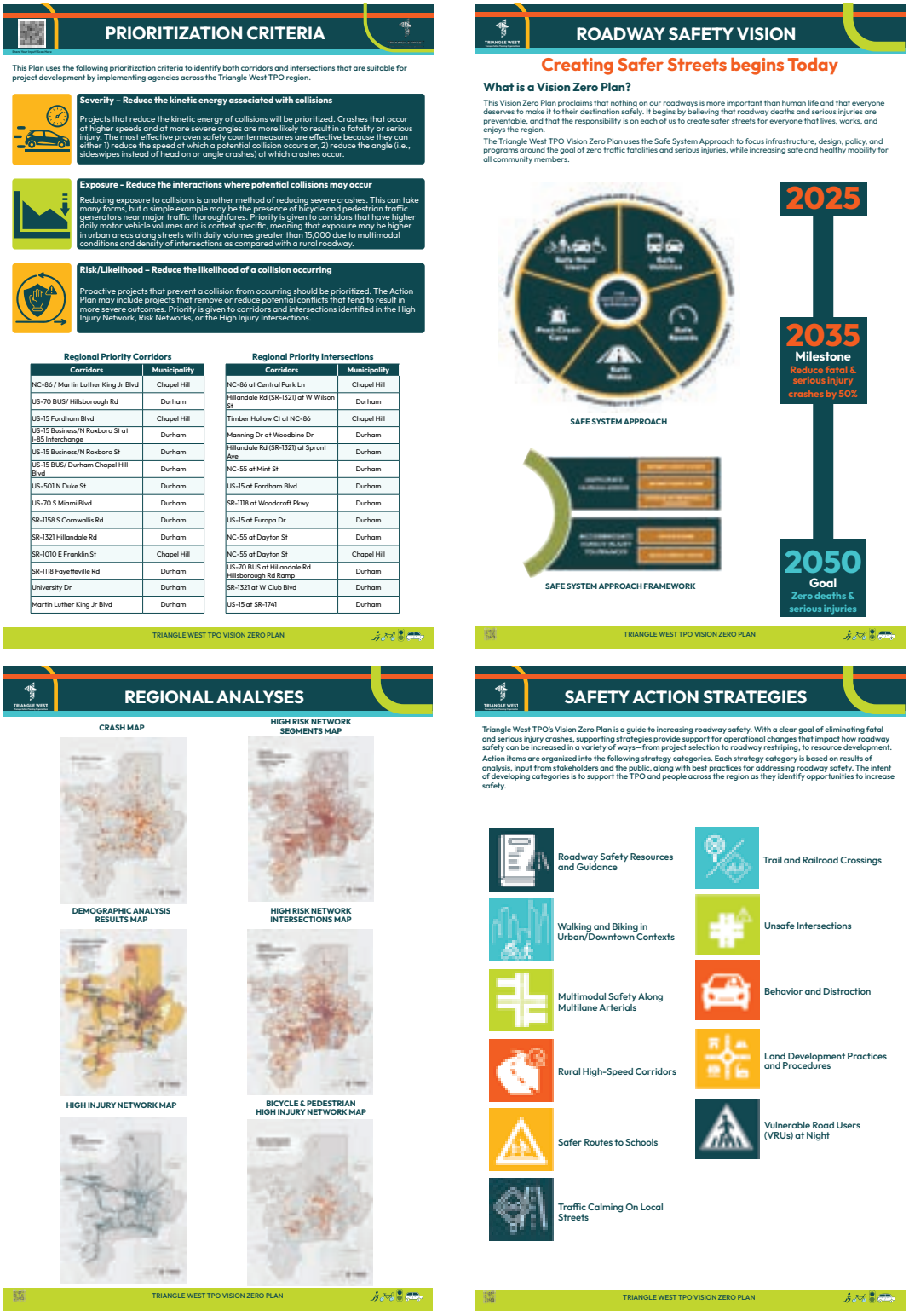



**FIGURE 33** Informative Boards from Carrboro Open House Event


**FIGURE 35** Carrboro Open House Event Promotional Flyer

**FIGURE 34** Attendees engaging with boards at Carrboro Open House Event

# Local Events

Throughout the planning process, community members were able to participate in the development of the Vision Zero Action Plan at multiple community events where staff presented plan updates and gathered input. These events allowed for direct discussions with the community members and local leaders about transportation needs and priorities.

| DATE | EVENT | LOCATION |
|---|---|---|
| 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 with the BOOST Program | ReCity, Durham |
| March 25, 2025 | Chapel Hill Safety Workshop | Chapel Hill Library, Chapel Hill |
| April 8, 2025 | Middle School Career Day | Immaculata Catholic School, Durham |

**FIGURE 36** Local Event Details


**FIGURE 37** Pictures from Move-A-Bull City Event


**FIGURE 38** Pictures from World Day of Remembrance Event

**FIGURE 39** Pictures from Safetoberfest Event

# Site Visits

On December 3, 2024, staff from the Triangle West TPO and the City of Durham met with representatives from the Merrick-Moore and Bragtown neighborhoods. During the site visits, neighborhood representatives conducted tours for staff highlighting specific, community-identified locations of traffic safety concern. Thes locations identified were near activity centers, such as schools, parks, and community gardens. The community concerns regarding traffic safety and the identified locations of concern were also documented in the Online Survey.

**FIGURE 40** Pictures from Bragtown Site Visit

**FIGURE 41** Pictures from Merrick-Moore Site Visit

# Online Survey

To ensure broad participation beyond in-person events, an Online Survey was conducted from October 2024 to March 2025, gathering insights on roadway safety concerns, behaviors, and personal experiences. A total of 89 surveys were submitted, with participants contributing 145 location-specific comments, identifying areas where they felt unsafe or had experienced safety issues. The survey provided an opportunity for the public to help identify high-risk corridors and areas of concern for pedestrians and bicyclists.

Survey responses highlighted key safety concerns, including insufficient sidewalks and bikeways, unsafe driver behavior, and high-risk intersections. Many participants identified speeding, distracted driving, and aggressive behavior as major contributors to unsafe 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.

The input gathered through the Vision Zero Action Plan survey, related local surveys, and the location based mapping tool helped highlight priority areas for safety improvements, ensuring that community concerns and experiences were considered in the planning process.

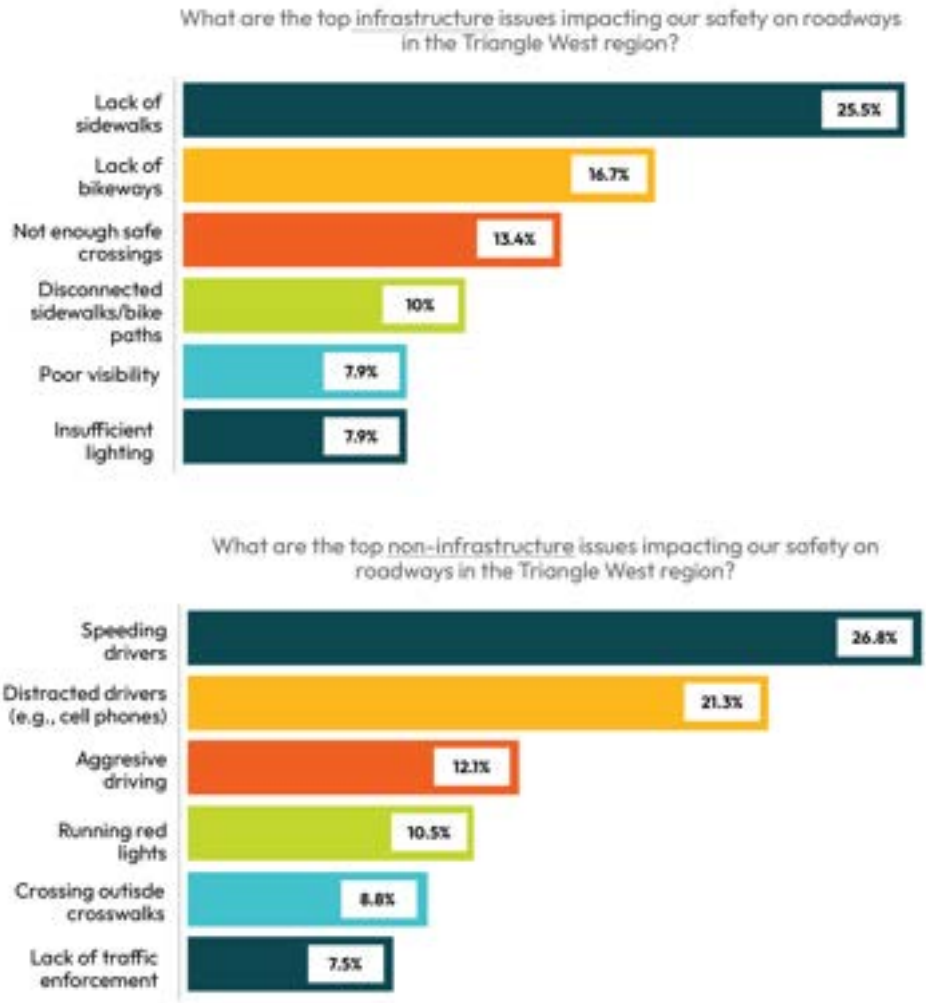



**FIGURE 42** Online Survey Responses

TRIANGLE WEST
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# VISION ZERO ACTION PLAN

# Appendix D

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# Table of Contents



# List of Maps

D

# Appendix D: Member Agency Maps & Actions

This appendix includes information that is detailed for specific Triangle West TPO member agencies. The following agencies are included:

**Town of Carrboro**
**Town of Chapel Hill**
**City of Durham**
**Town of Hillsborough**
**Durham County**
**Orange County**
**Chatham County**

For each of these agencies, results from data analysis have been mapped to the respective jurisdiction. Additionally, some action items have been updated based on comments from the Technical Advisory Committee (TAC) to include details that are specific to the member agency. This may include a change in wording or an update to the recommended timeframe for the action. Only the modified actions are included in this appendix. The proposed actions in the Vision Zero Plan should be used by the jurisdiction.

A series of maps are included for each member agency followed by the updated action table (if applicable). The maps included in this appendix for each member agency are the following:

- Crash Map: illustrating fatal and serious injury crashes
- High Injury Network (HIN)
- High Injury Intersections
- Vulnerable Roadway User (VRU) High Injury corridors and intersections
- High Risk Corridors
  - » Pedestrian Risk
  - » Bicycle Risk
  - » Motorcycle Risk
  - » Speed Risk
  - » Lane Departure Risk
- High Risk Intersections
- Indicators of Potential Disadvantage and HIN
- Priority Corridors
- Priority Intersections

# Town of Carrboro

Source: Town of Carrboro

## Community Data

The following information is provided as a resource for the Town of Carrboro and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Carrboro.

### Population

20,240 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 4 fatalities
  - » Fatality rate per 100K: 2.82
  - » 5 serious injuries
- 2018-2022
  - » 3 fatalities
  - » Fatality rate per 100K: 2.96
  - » 3 serious injuries

### High Injury Network Coverage

13.52% of roadway miles cover 100% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provide information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.13
- Top 15% = “prob_ped” > 0.05 and < 0.13

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.13
- Top 15% = “prob_bike” > 0.04 and < 0.13

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.08
- Top 15% = “prob_MC” > 0.02 and < 0.08

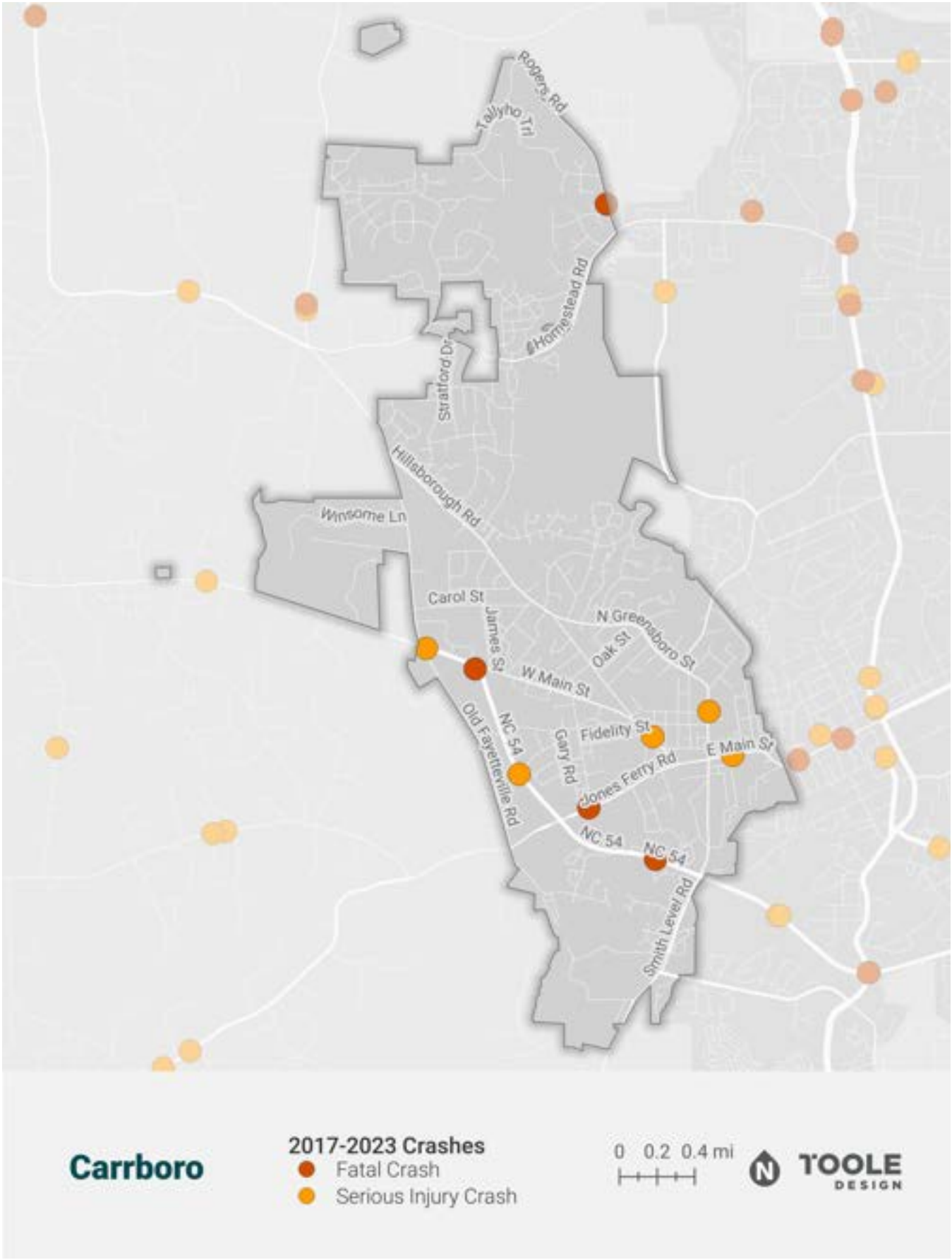
**Speed Risk**

- Top 5% = “prob_speed” > 0.15
- Top 15% = “prob_speed” > 0.04 and < 0.15

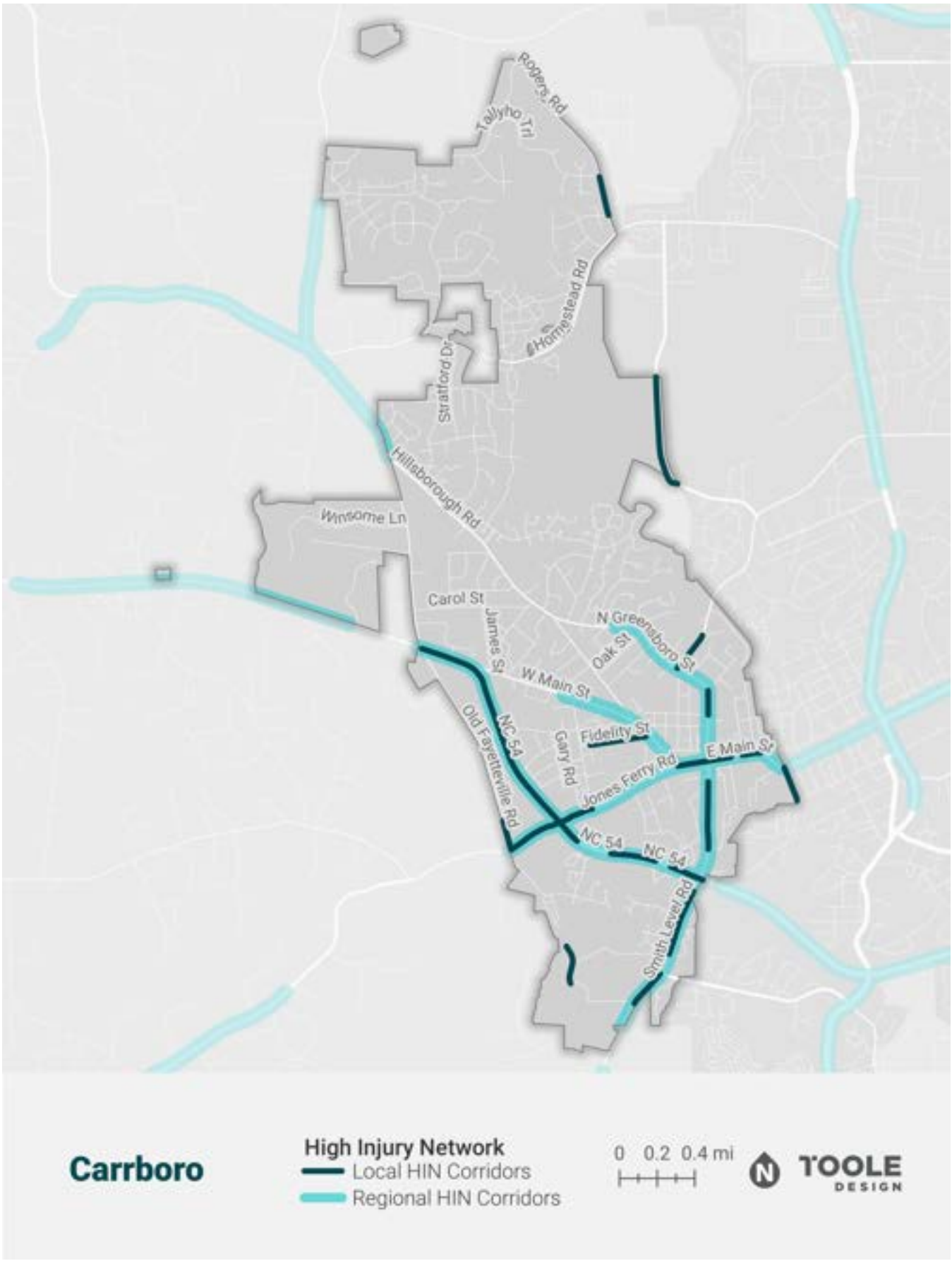
**Lane Departure Risk**

- Top 5% = “prob_LD” > 0.36
- Top 15% = “prob_LD” > 0.13 and < 0.36

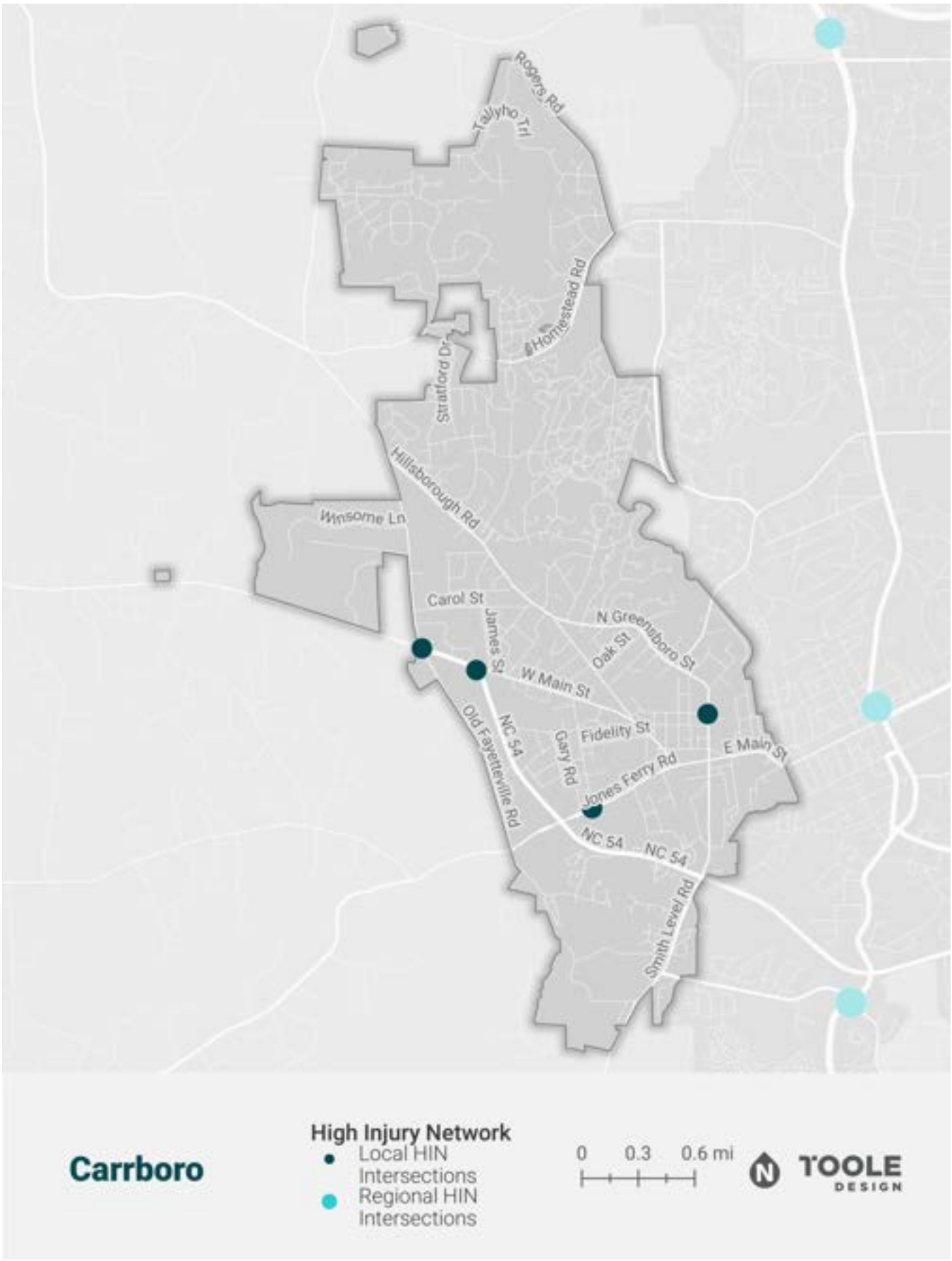
**MAP 14** Carrboro Crash Map



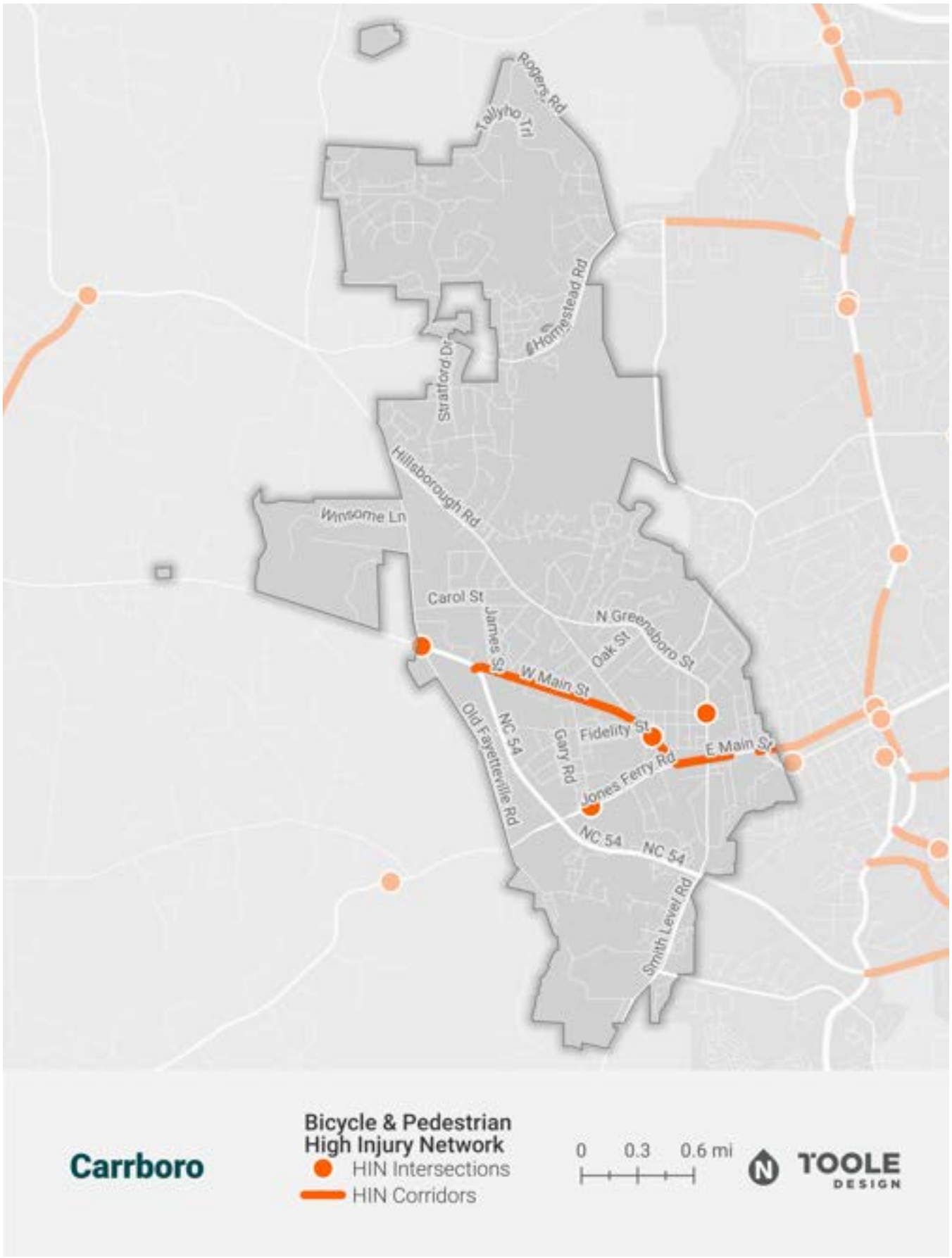
**MAP 15** Carrboro High Injury Network Map



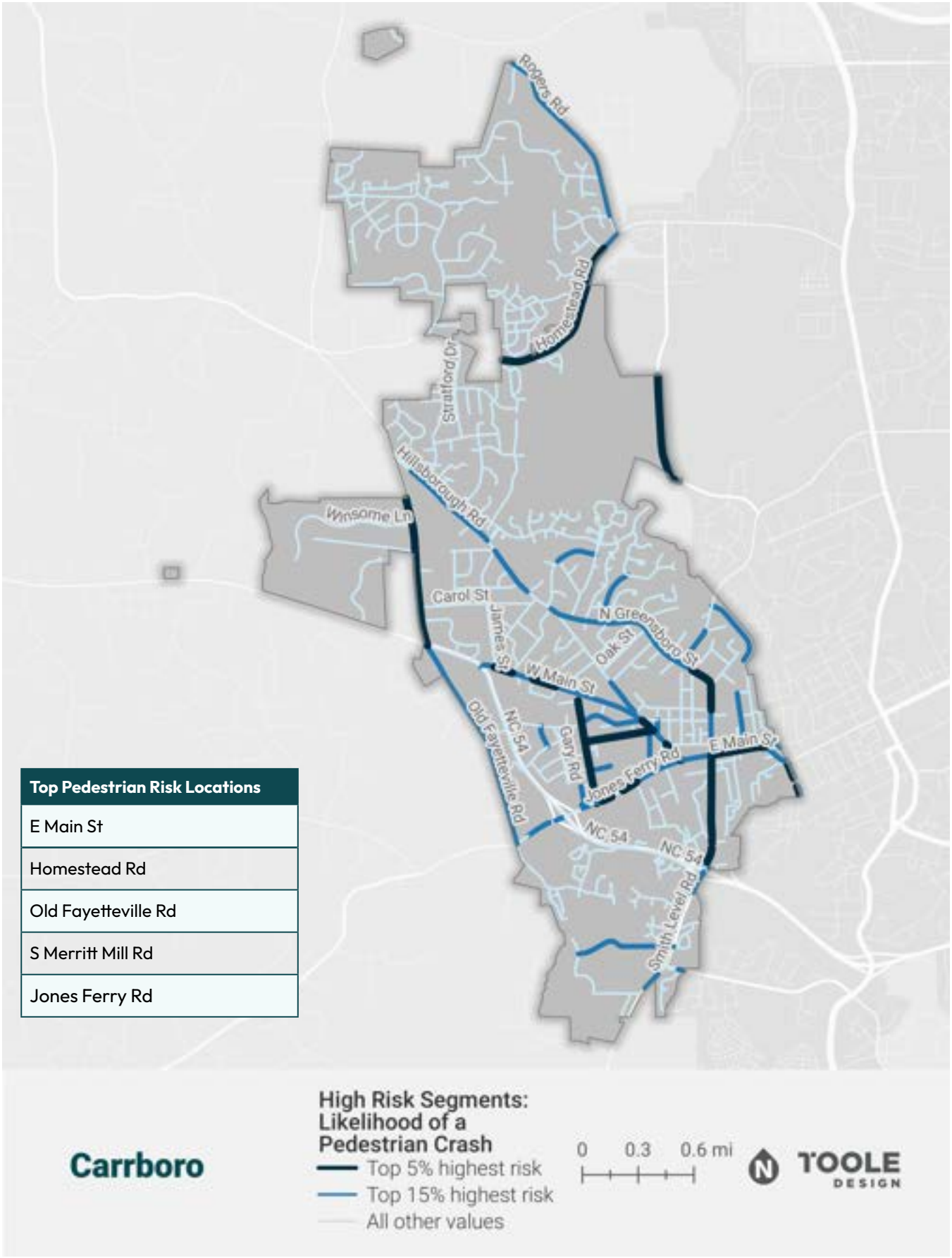
**MAP 16** Carrboro High Injury Intersections Map



**MAP 17** Carrboro VRU High Injury Corridors and Intersections Map

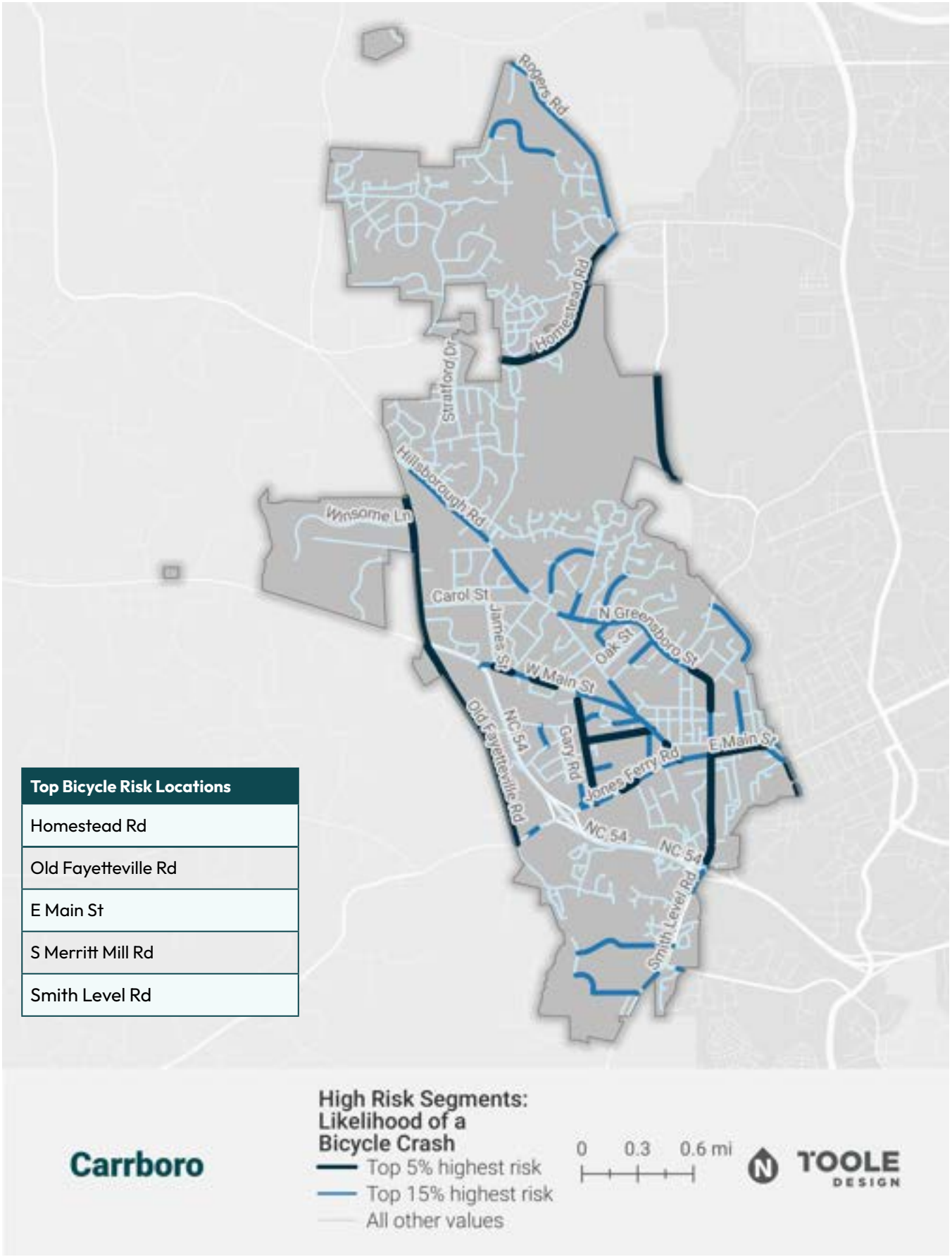


**MAP 18** Carrboro High Risk Corridors : Pedestrian Risk



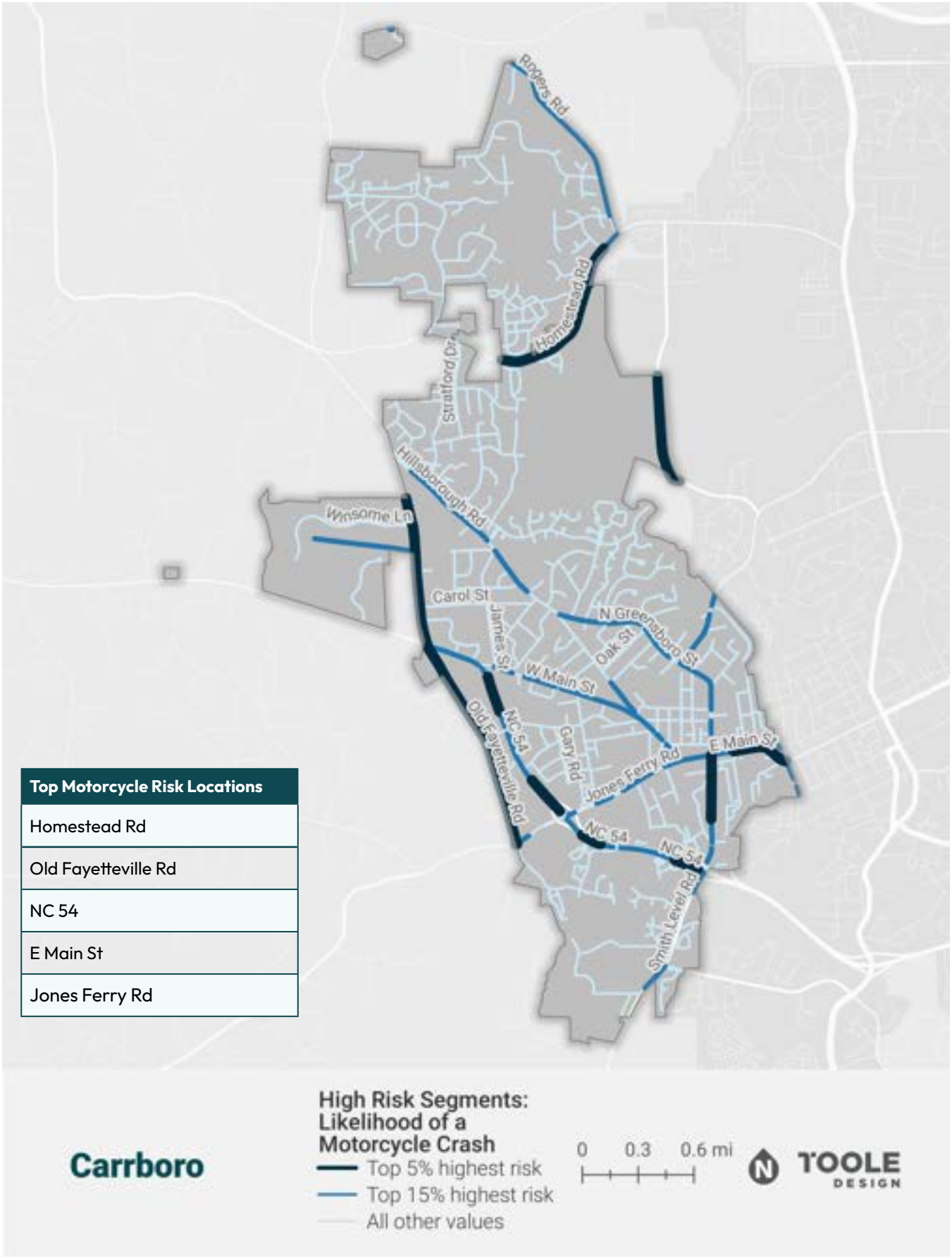

| Top Pedestrian Risk Locations |
|---|
| E Main St |
| Homestead Rd |
| Old Fayetteville Rd |
| S Merritt Mill Rd |
| Jones Ferry Rd |

**MAP 19** Carrboro High Risk Corridors Map: Bicycle Risk



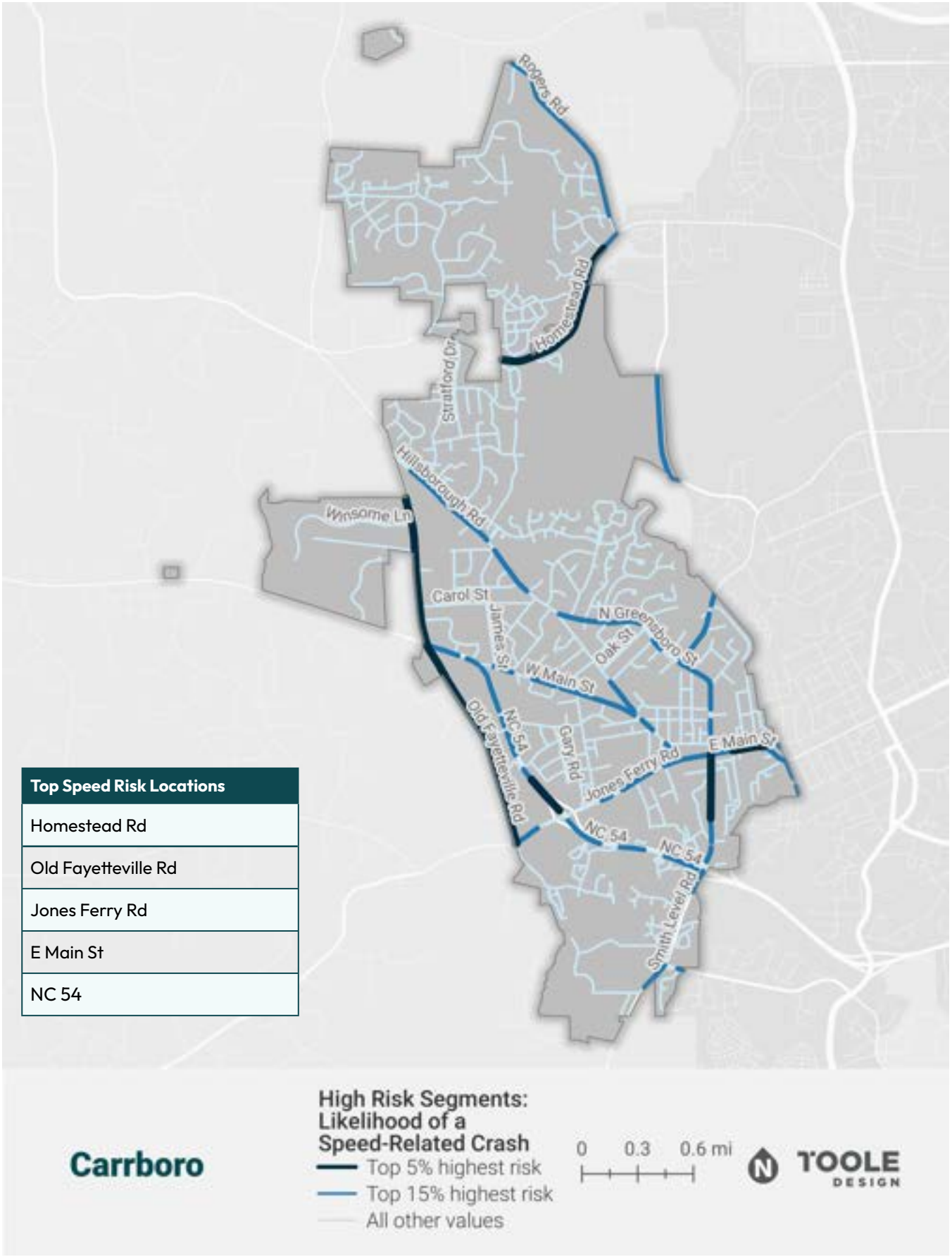

| Top Bicycle Risk Locations |
|---|
| Homestead Rd |
| Old Fayetteville Rd |
| E Main St |
| S Merritt Mill Rd |
| Smith Level Rd |

**MAP 20** Carrboro High Risk Corridors Map: Motorcycle Risk



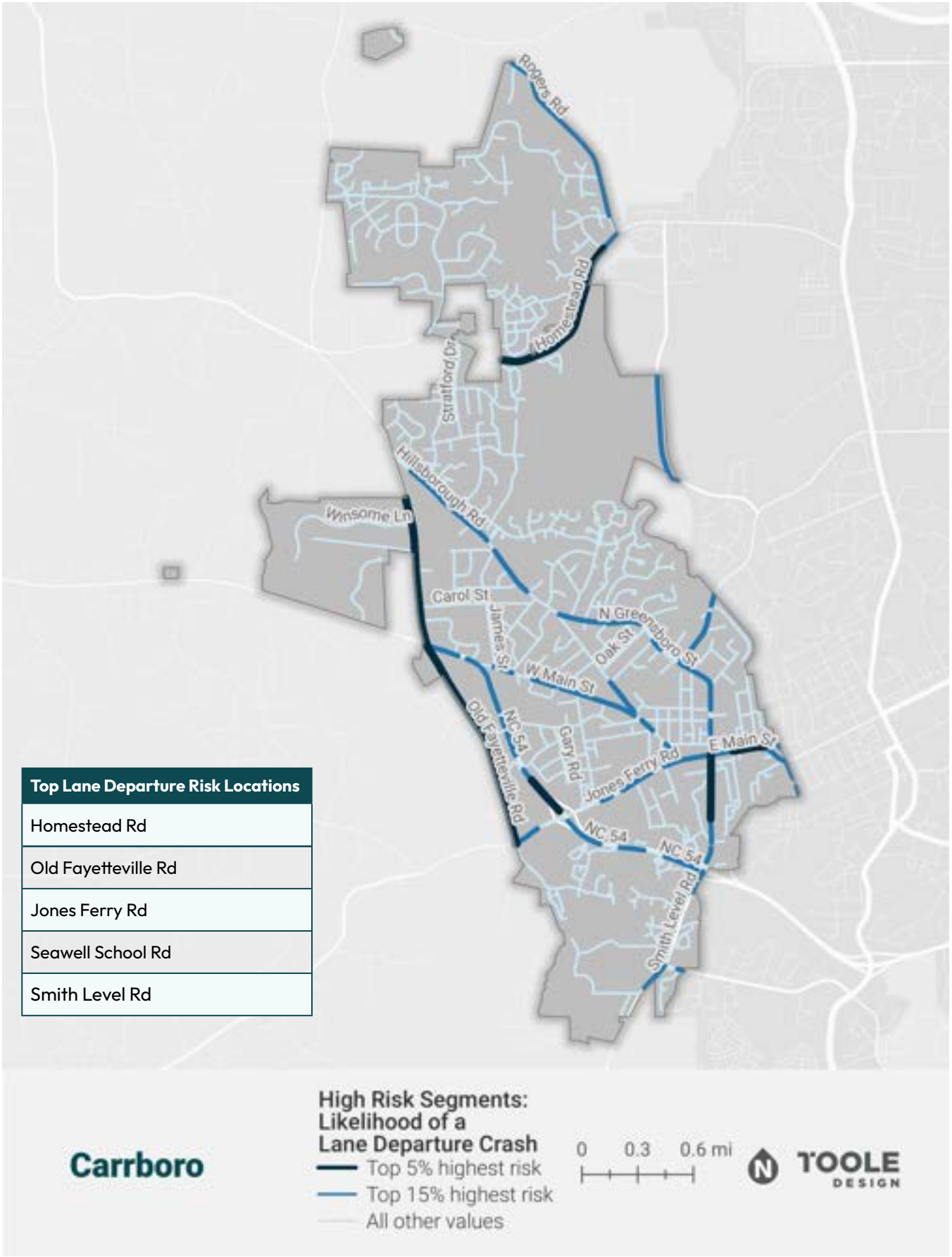

| Top Motorcycle Risk Locations |
|---|
| Homestead Rd |
| Old Fayetteville Rd |
| NC 54 |
| E Main St |
| Jones Ferry Rd |

**MAP 21** Carrboro High Risk Corridors Map: Speed Risk



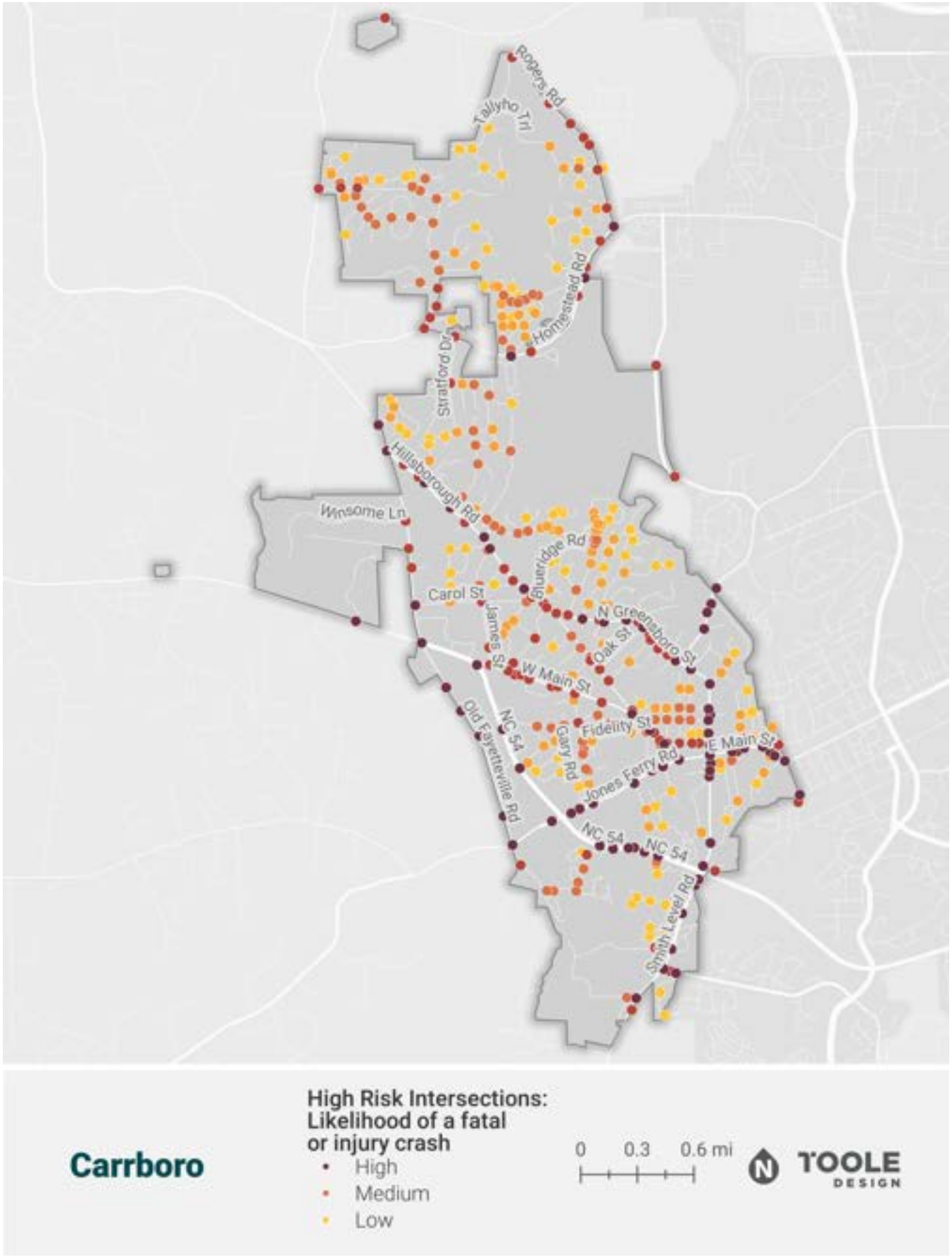

| Top Speed Risk Locations |
|---|
| Homestead Rd |
| Old Fayetteville Rd |
| Jones Ferry Rd |
| E Main St |
| NC 54 |

**MAP 22** Carrboro High Risk Corridors Map: Lane Departure Risk

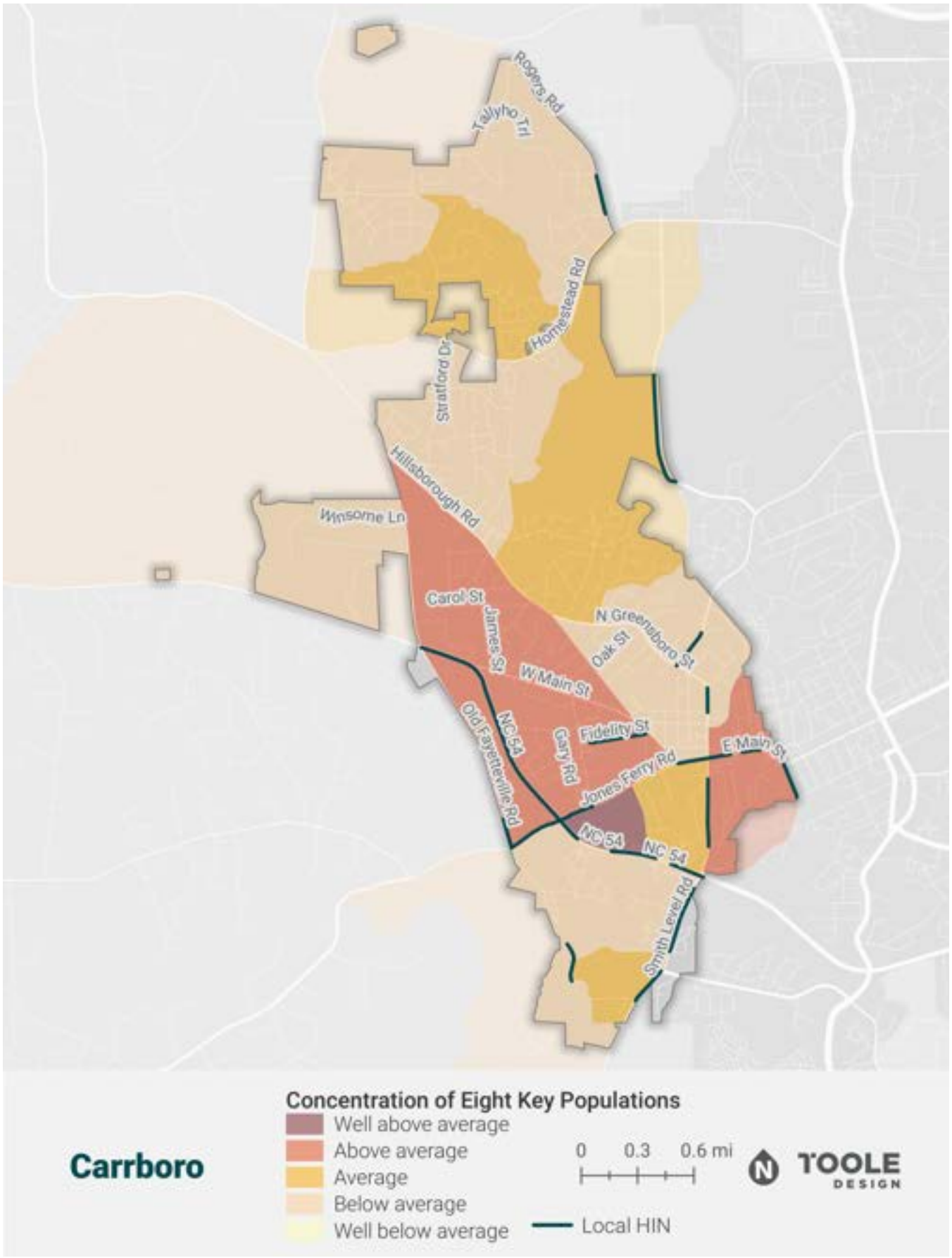



| Top Lane Departure Risk Locations |
|---|
| Homestead Rd |
| Old Fayetteville Rd |
| Jones Ferry Rd |
| Seawell School Rd |
| Smith Level Rd |

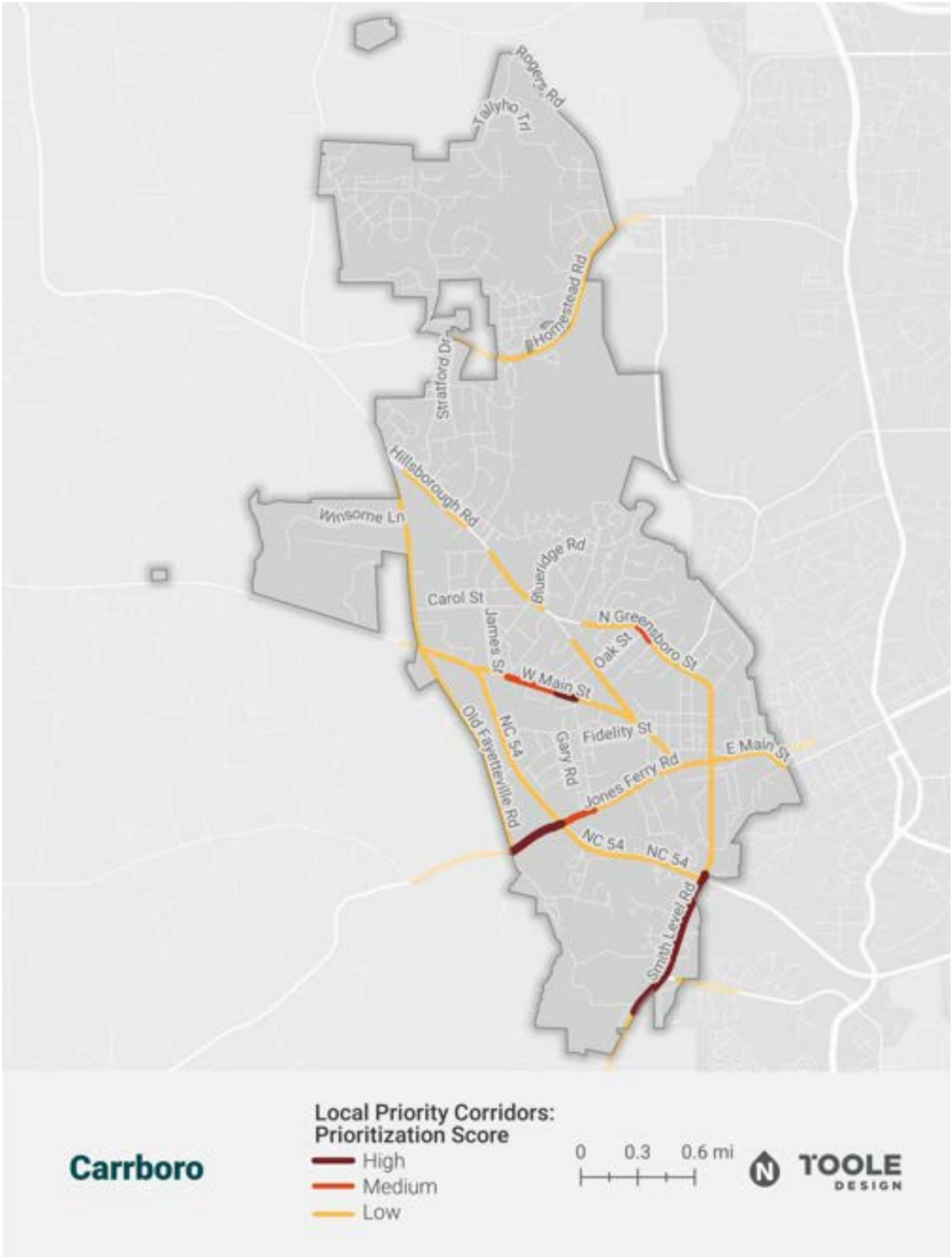
**MAP 23** Carrboro High Risk Intersections Map



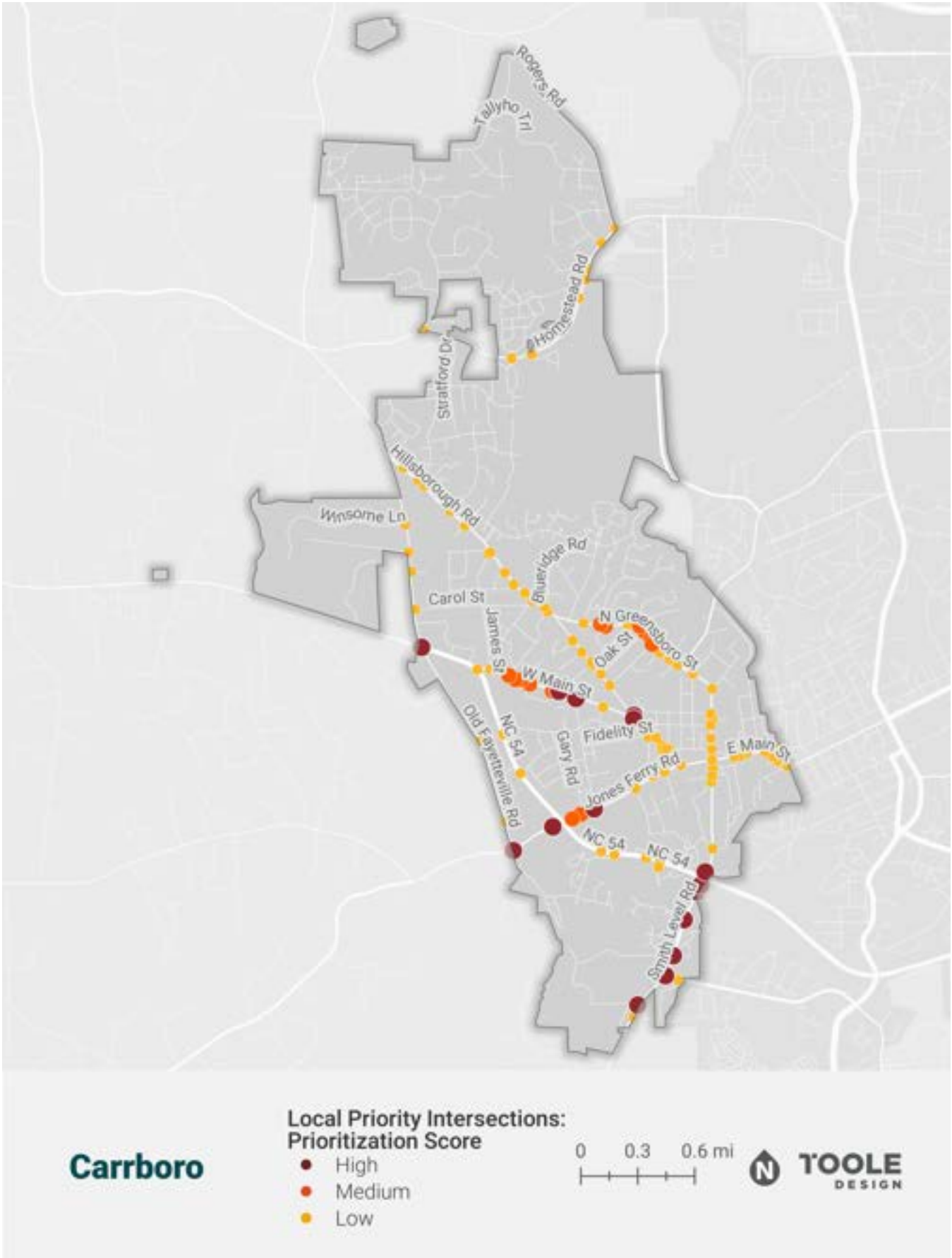
**MAP 24** Carrboro Indicators of Potential Disadvantage and HIN Map



**MAP 25** Carrboro Priority Corridors Map



**MAP 26** Carrboro Priority Intersections Map



# Town of Chapel Hill


Estes Drive, Chapel Hill

Credit: Ryanbee Photoworks

## Community Data

The following information is provided as a resource for the Town of Chapel Hill and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Chapel Hill.

### Population

62,000 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 17 fatalities
  - » Fatality rate per 100K: 3.92
  - » 34 serious injuries
- 2018-2022
  - » 12 fatalities
  - » Fatality rate per 100K: 3.87
  - » 24 serious injuries

### High Injury Network Coverage

13.74% of roadway miles cover 88% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.15
- Top 15% = “prob_ped” > 0.05 and < 0.15

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.12
- Top 15% = “prob_bike” > 0.04 and < 0.12

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.08
- Top 15% = “prob_MC” > 0.02 and < 0.08

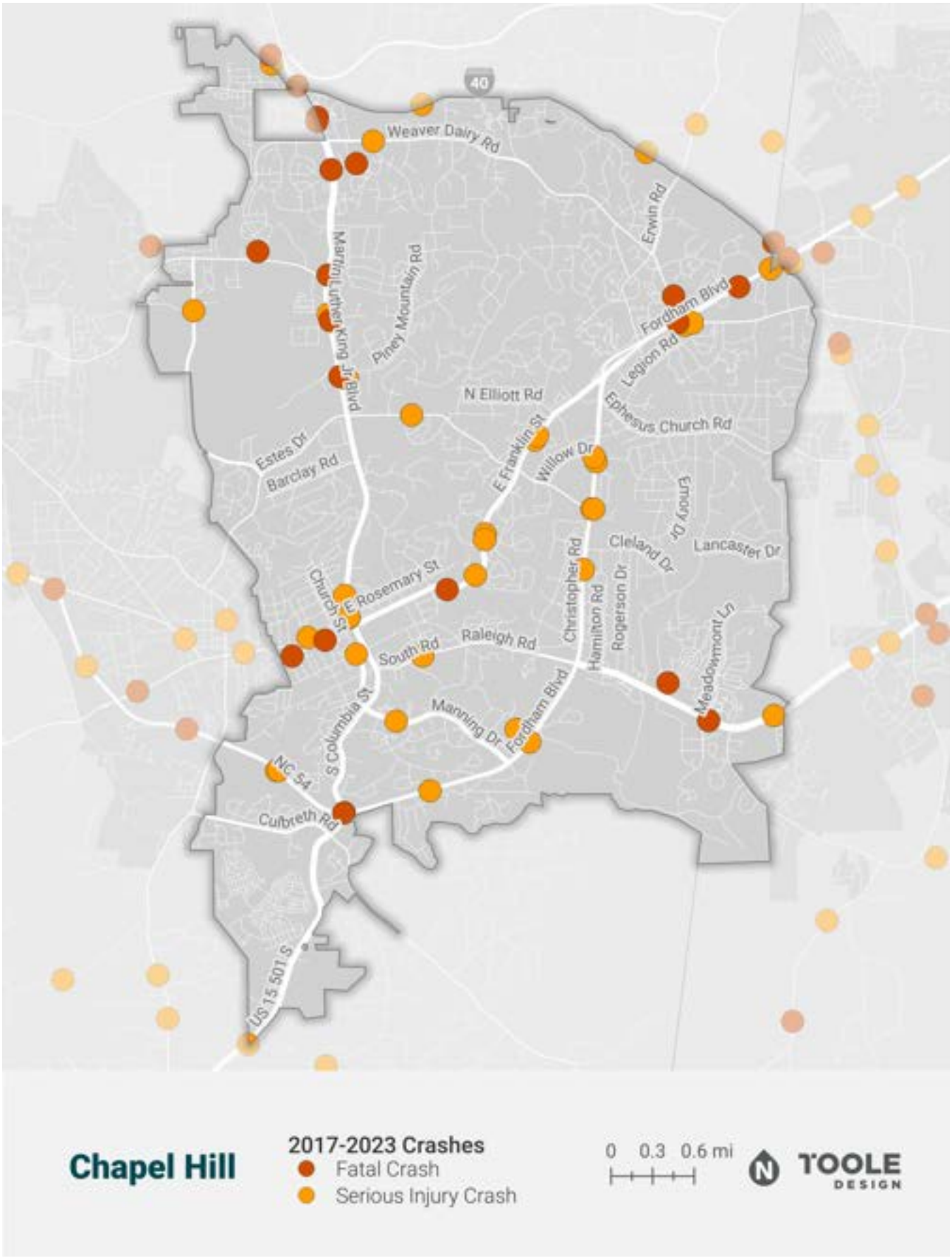
**Speed Risk**

- Top 5% = “prob_speed” > 0.13
- Top 15% = “prob_speed” > 0.04 and < 0.13

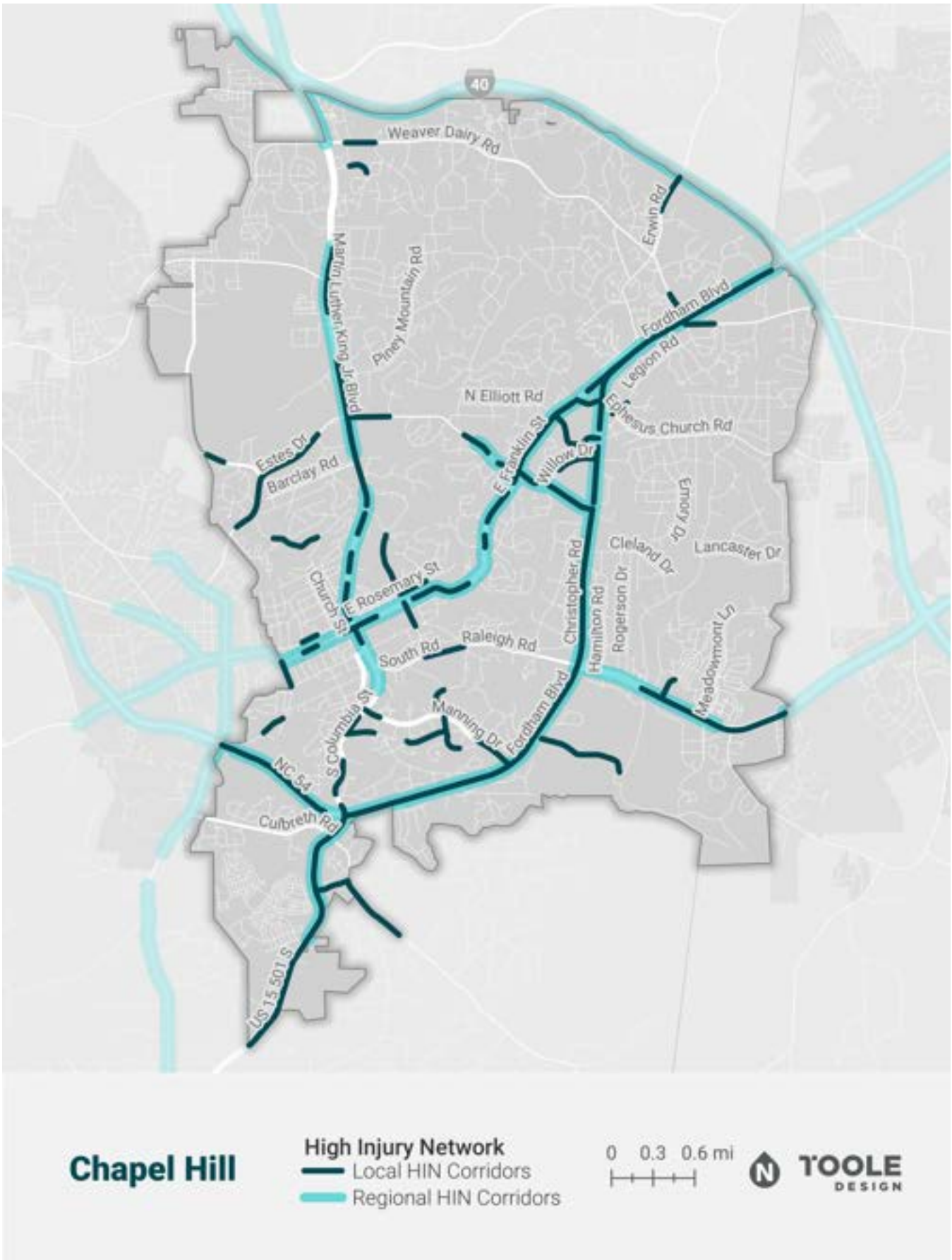
**Lane Departure Risk**

- Top 5% = “prob_LD” > 0.33
- Top 15% = “prob_LD” > 0.10 and < 0.30

**MAP 27** Chapel Hill Crash Map

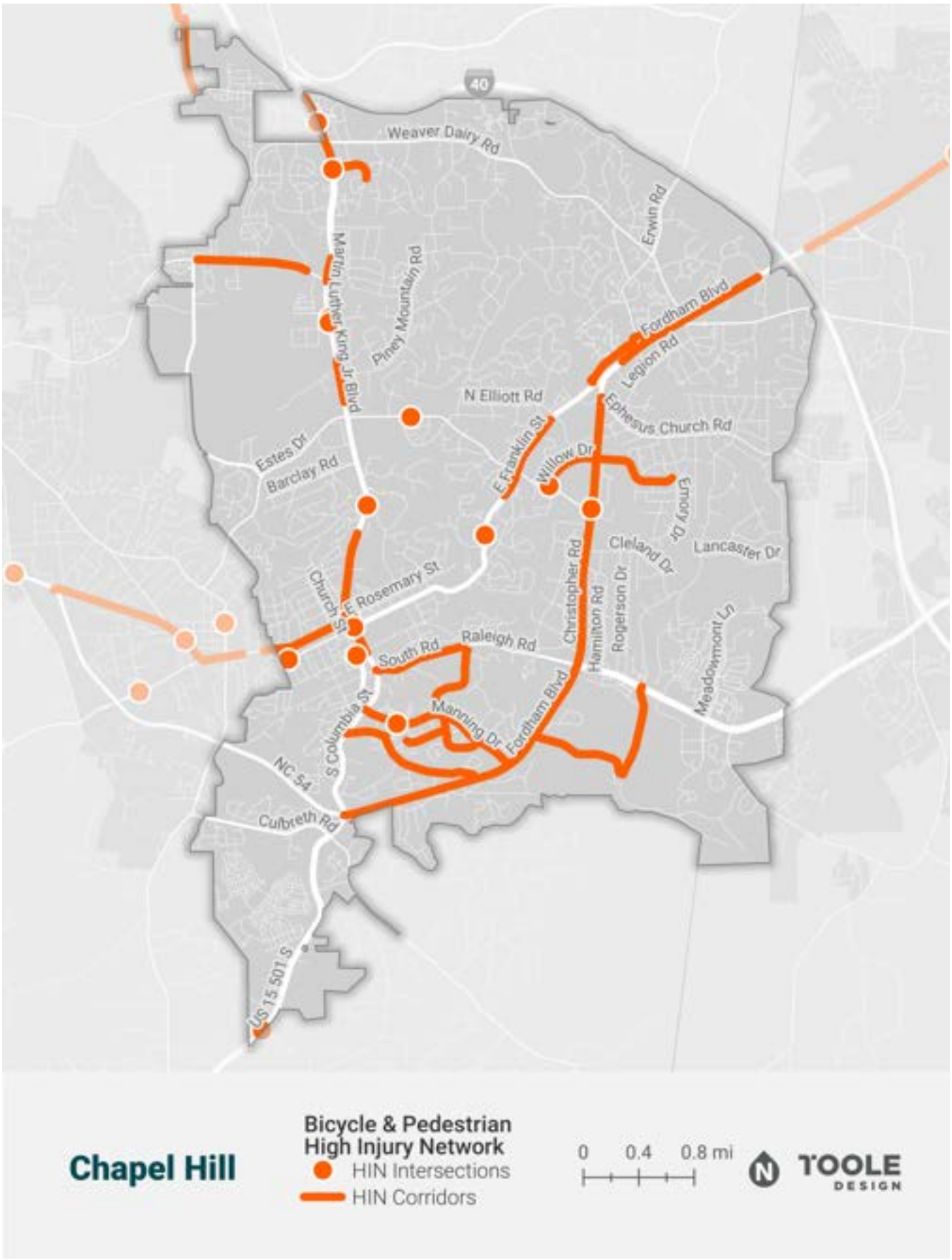


**MAP 28** Chapel Hill High Injury Network Map

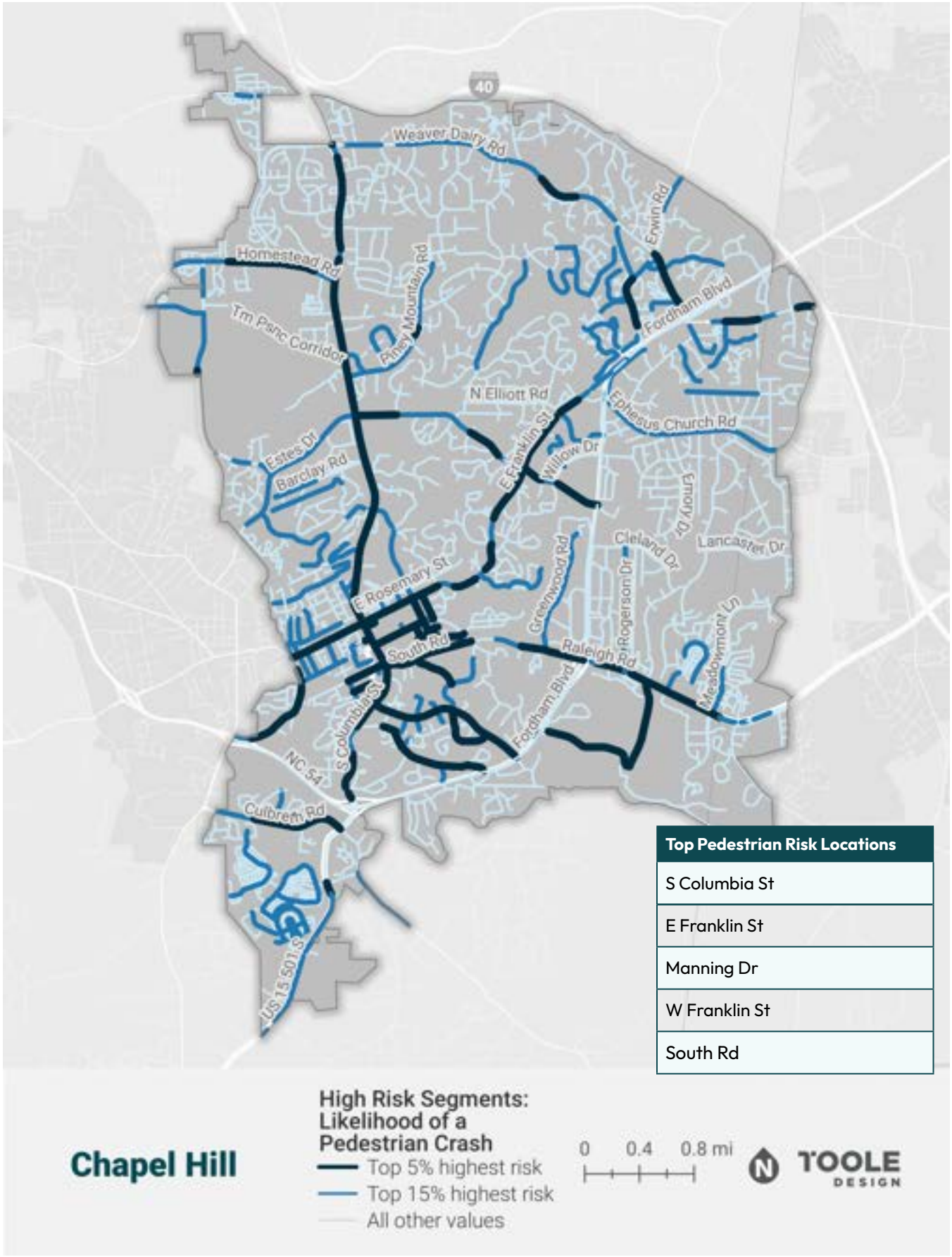


**MAP 29** Chapel Hill High Injury Intersections Map

**MAP 30** Chapel Hill VRU High Injury Corridors and Intersections Map

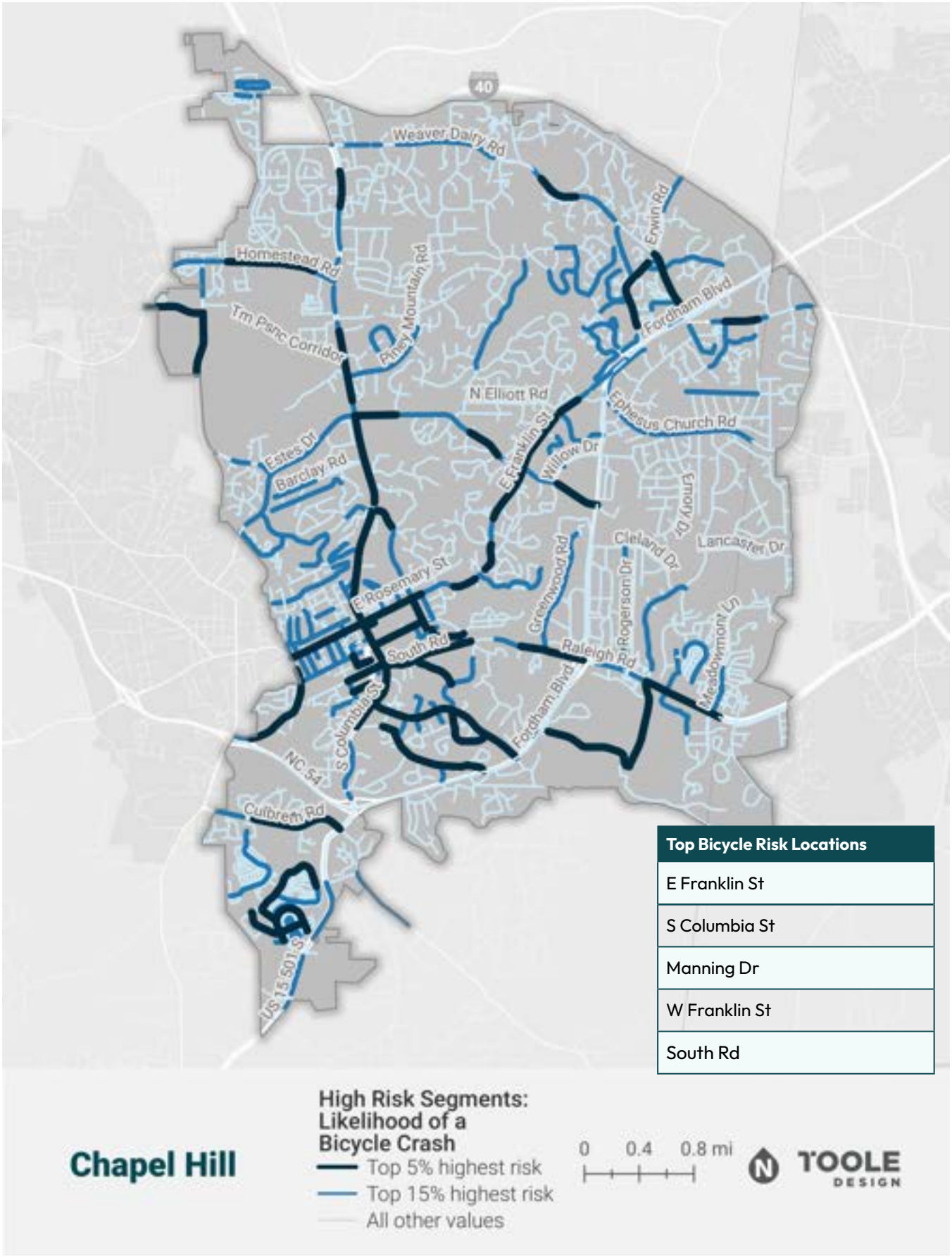


**MAP 31** Chapel Hill High Risk Corridors Map: Pedestrian Risk



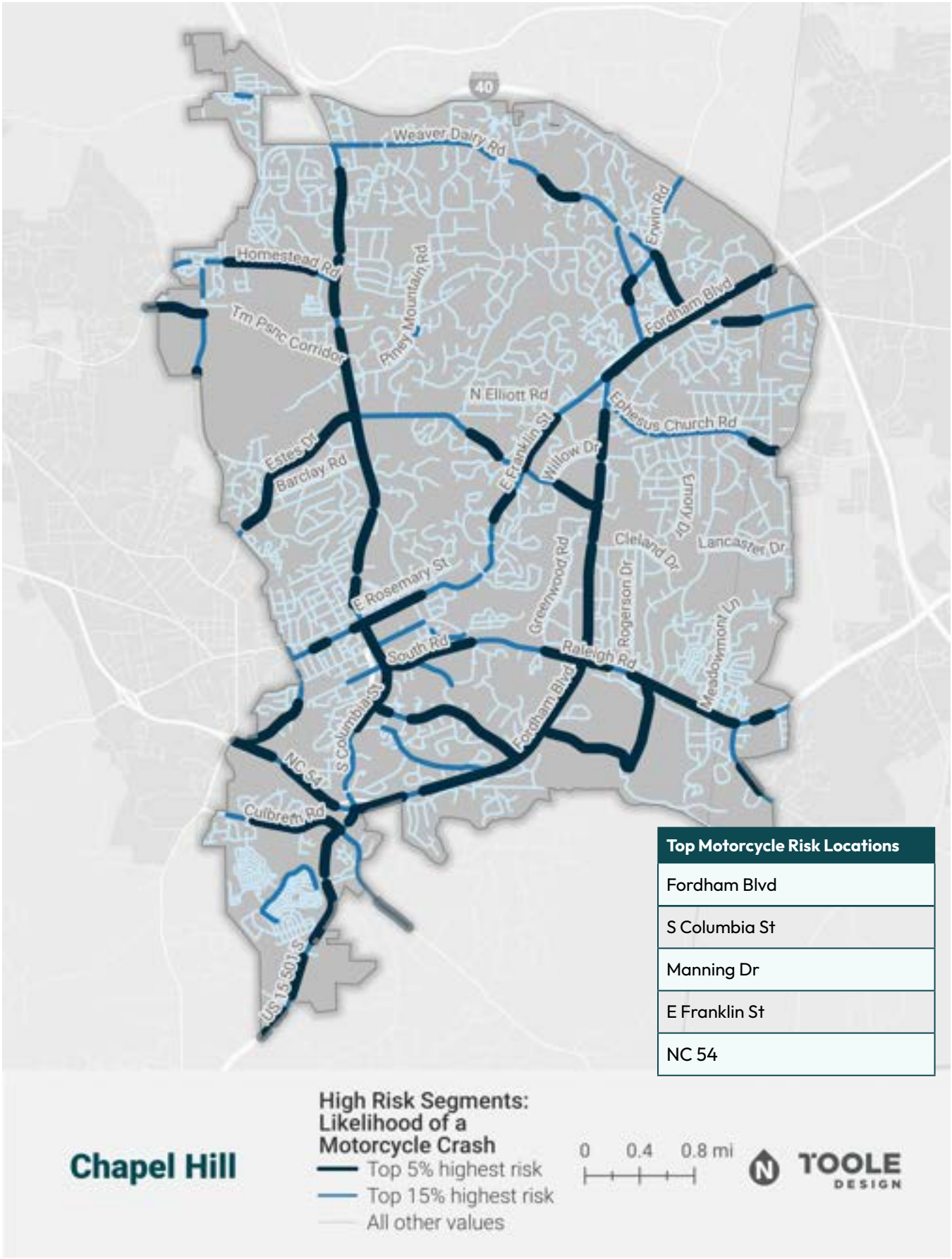

| Top Pedestrian Risk Locations |
|---|
| S Columbia St |
| E Franklin St |
| Manning Dr |
| W Franklin St |
| South Rd |

**MAP 32** Chapel Hill High Risk Corridors Map: Bicycle Risk

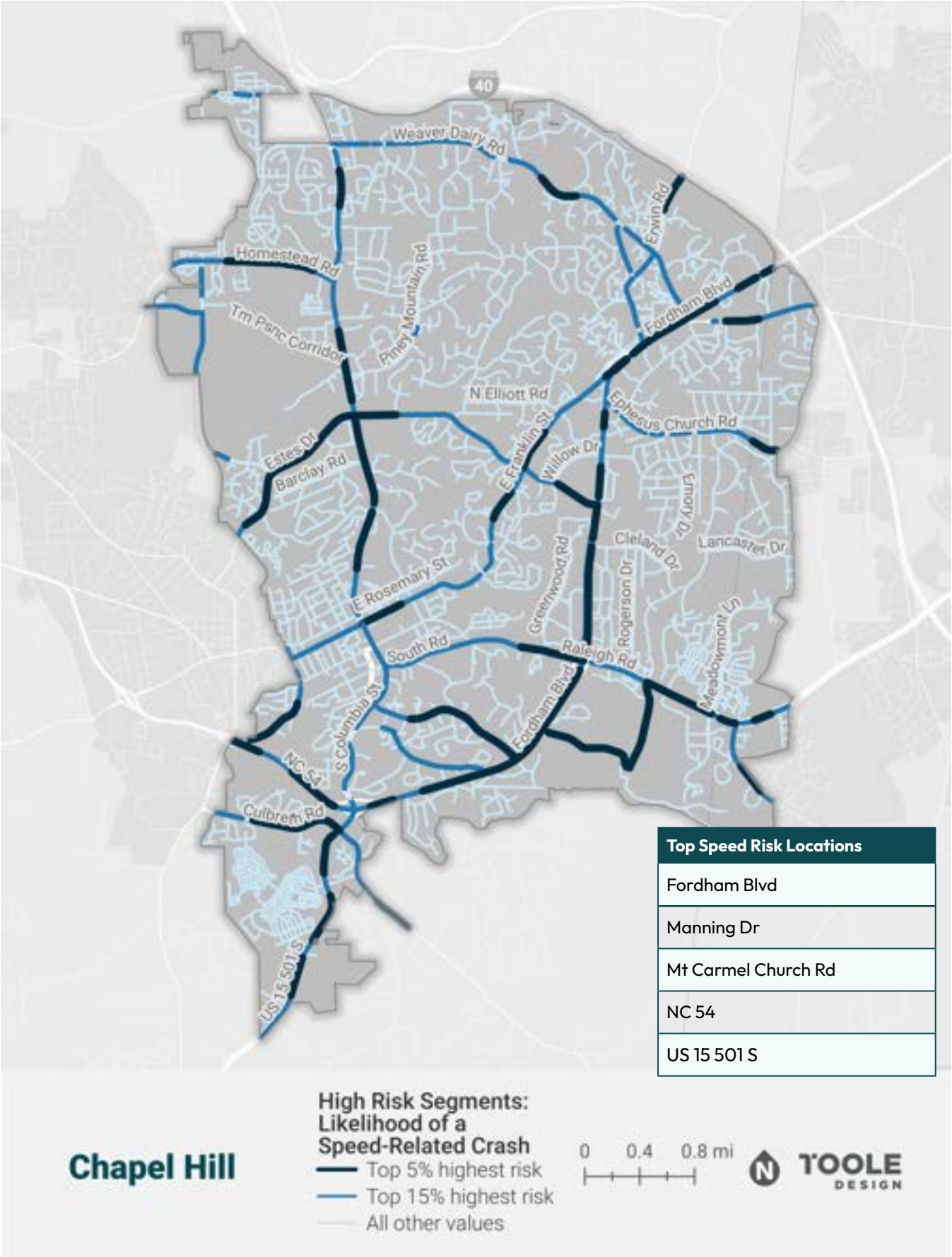



| Top Bicycle Risk Locations |
|---|
| E Franklin St |
| S Columbia St |
| Manning Dr |
| W Franklin St |
| South Rd |

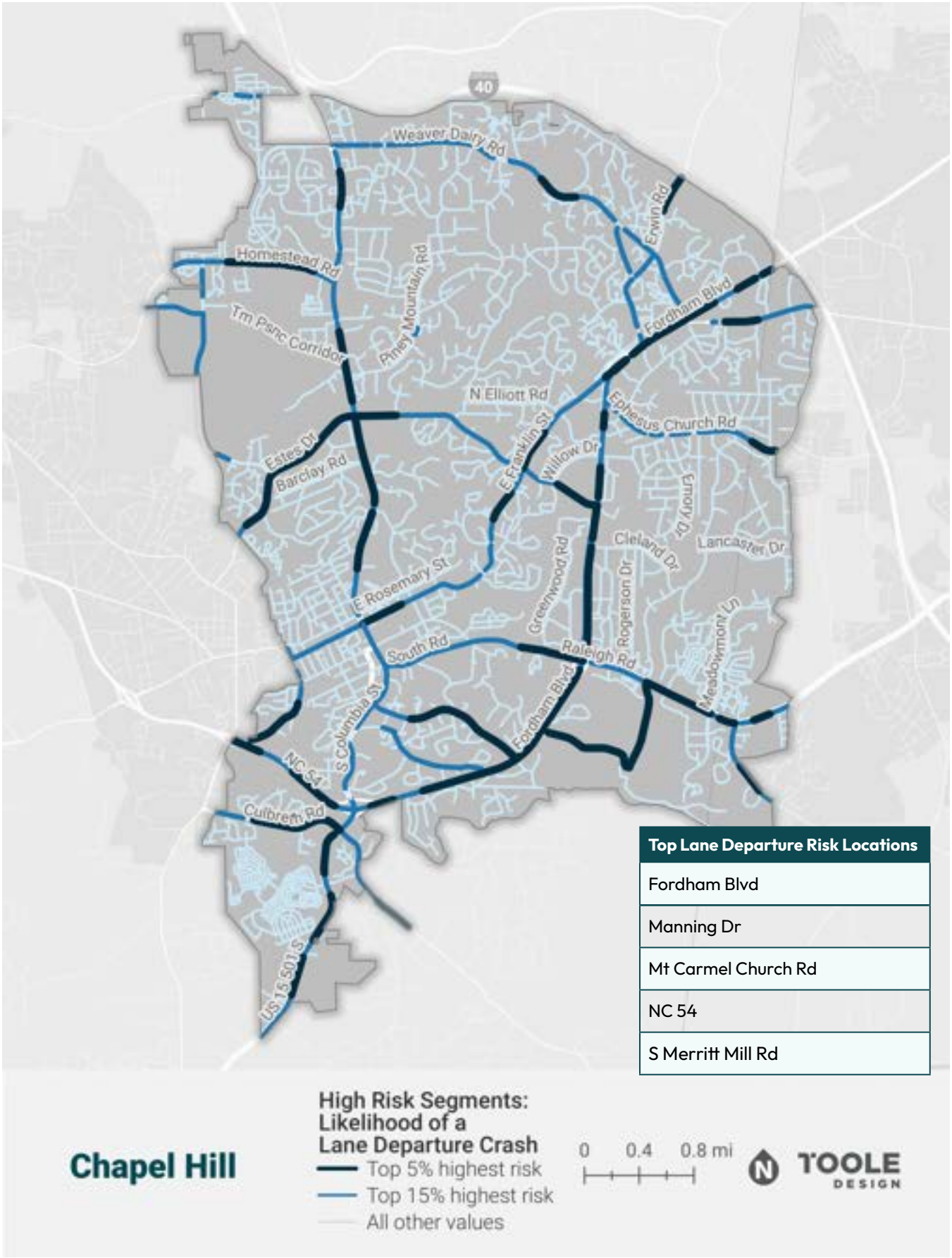
**MAP 33** Chapel Hill High Risk Corridors Map: Motorcycle Risk



**MAP 34** Chapel Hill High Risk Corridors Map: Speed Risk

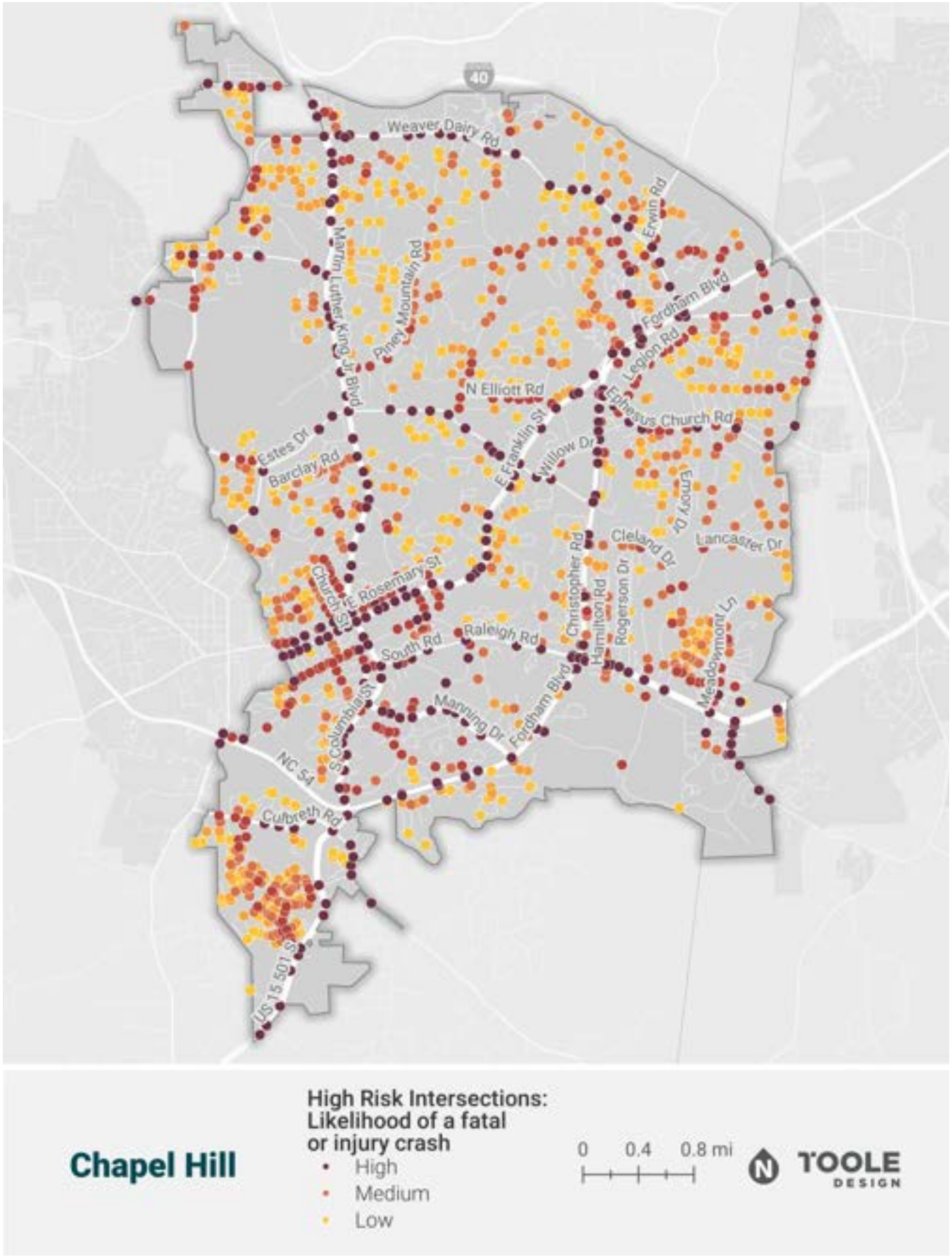


**MAP 35** Chapel Hill High Risk Corridors Map: Lane Departure Risk

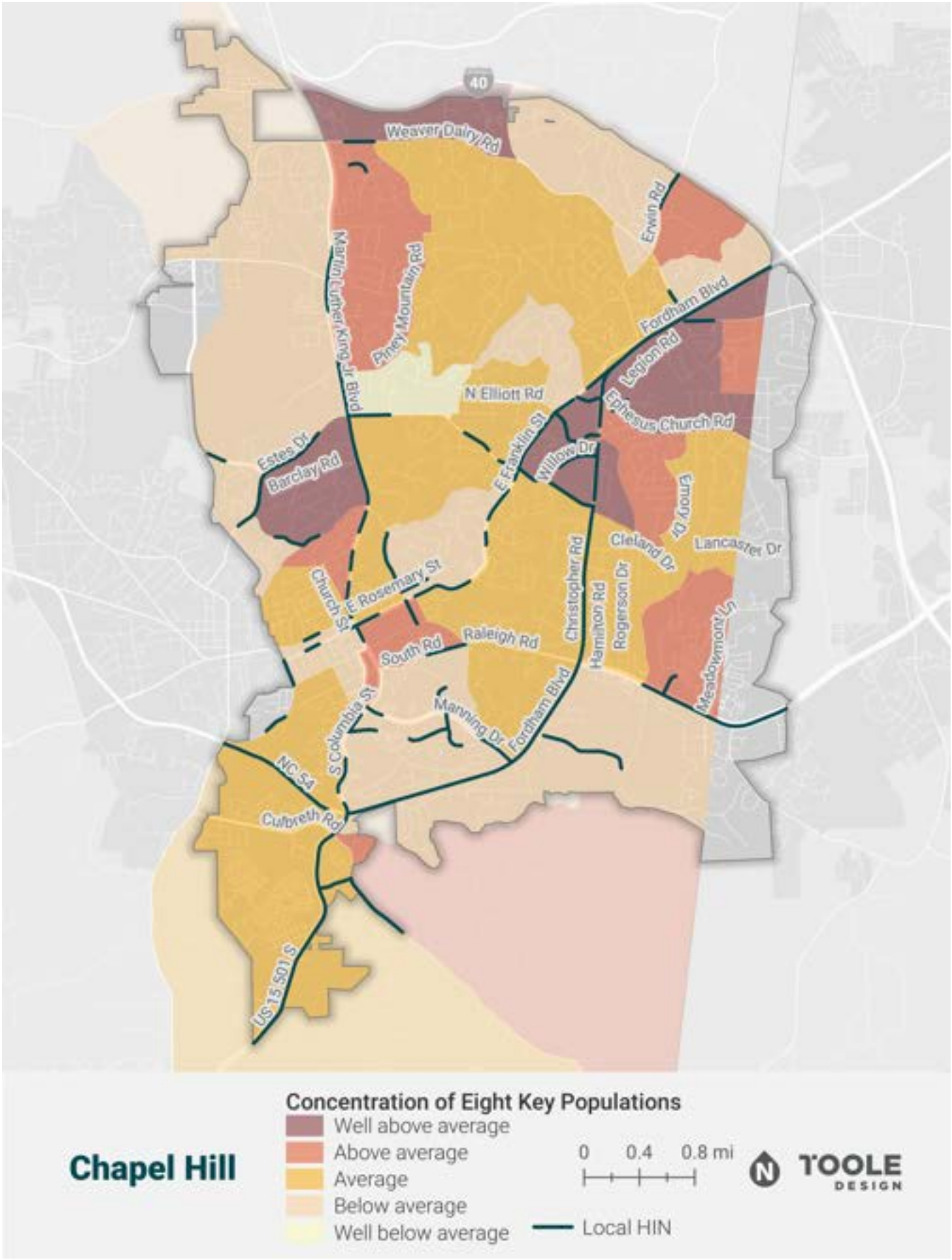



| Top Lane Departure Risk Locations |
|---|
| Fordham Blvd |
| Manning Dr |
| Mt Carmel Church Rd |
| NC 54 |
| S Merritt Mill Rd |

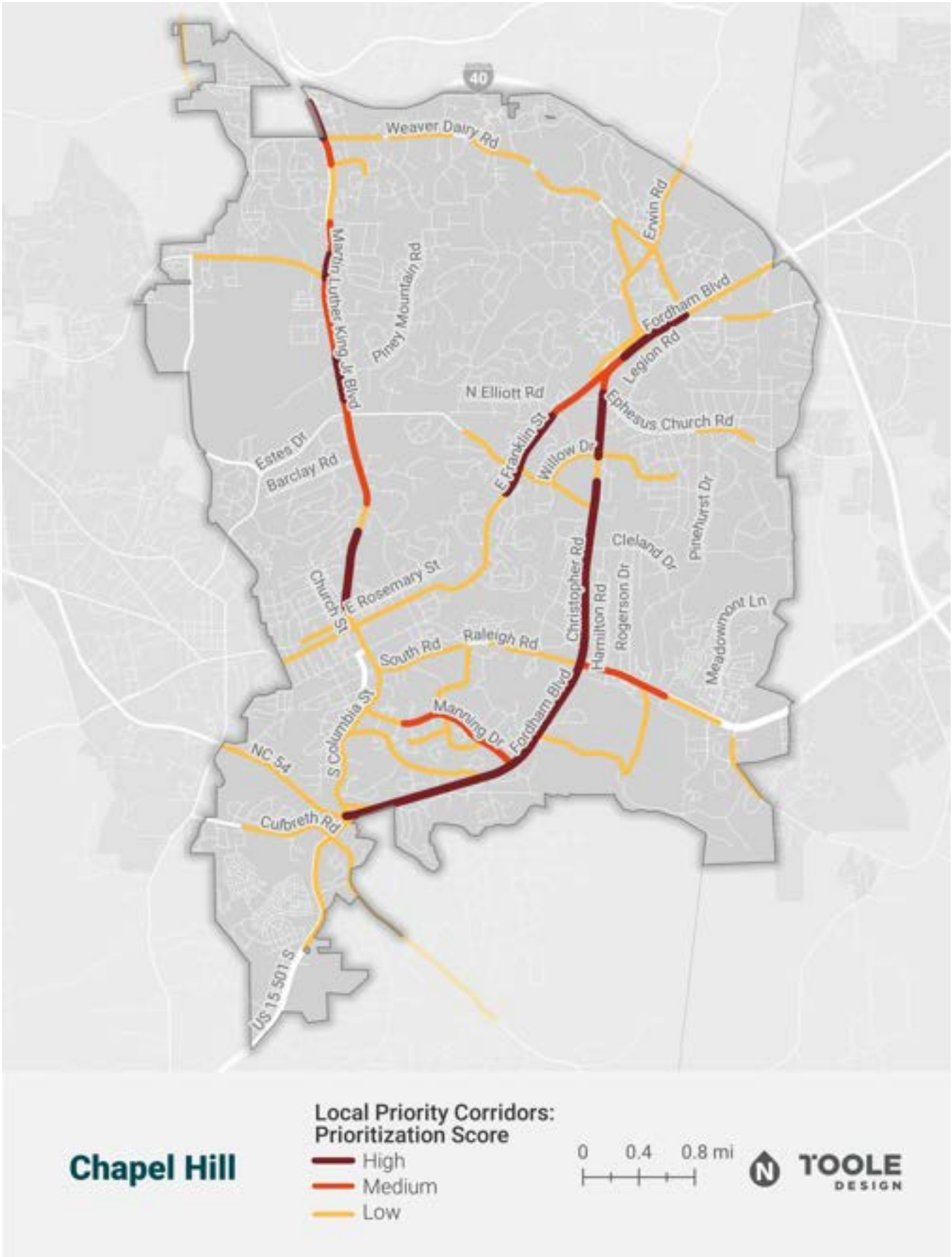
**MAP 36** Chapel Hill High Risk Intersections Map



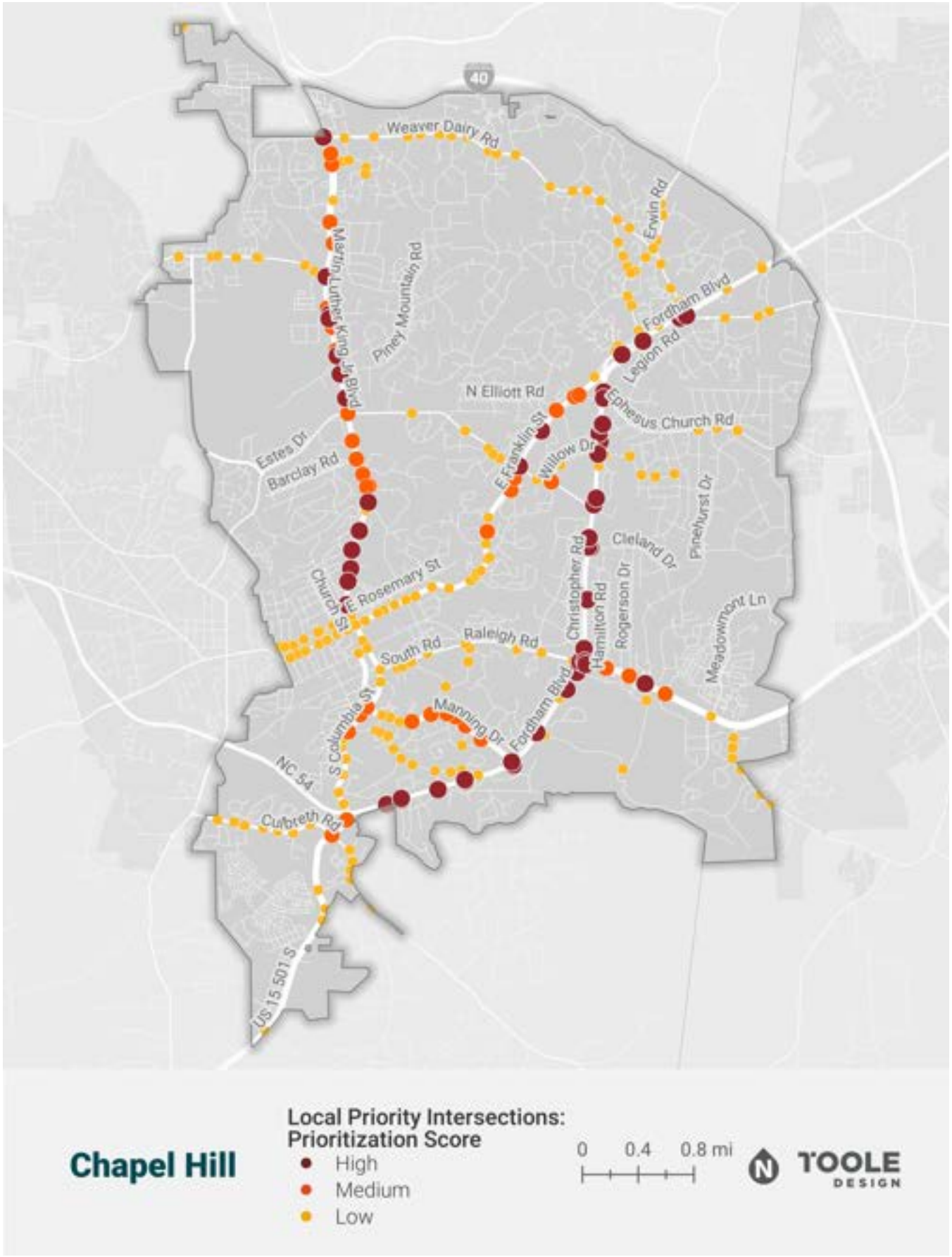
**MAP 37** Chapel Hill Indicators of Potential Disadvantage and HIN Map



**MAP 38** Chapel Hill Priority Corridors Map



**MAP 39** Chapel Hill Priority Intersections Map



# City of Durham

Source: City of Durham

## Community Data

The following information is provided as a resource for the City of Durham and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Durham.

### Population

270,522 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 174 fatalities
  - » Fatality rate per 100K: 9.19
  - » 390 serious injuries
- 2018-2022
  - » 119 fatalities
  - » Fatality rate per 100K: 8.80
  - » 314 serious injuries

### High Injury Network Coverage

10.02% of roadway miles cover 74% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.25
- Top 15% = “prob_ped” > 0.09 and < 0.25

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.08
- Top 15% = “prob_bike” > 0.03 and < 0.08

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.17
- Top 15% = “prob_MC” > 0.05 and < 0.17

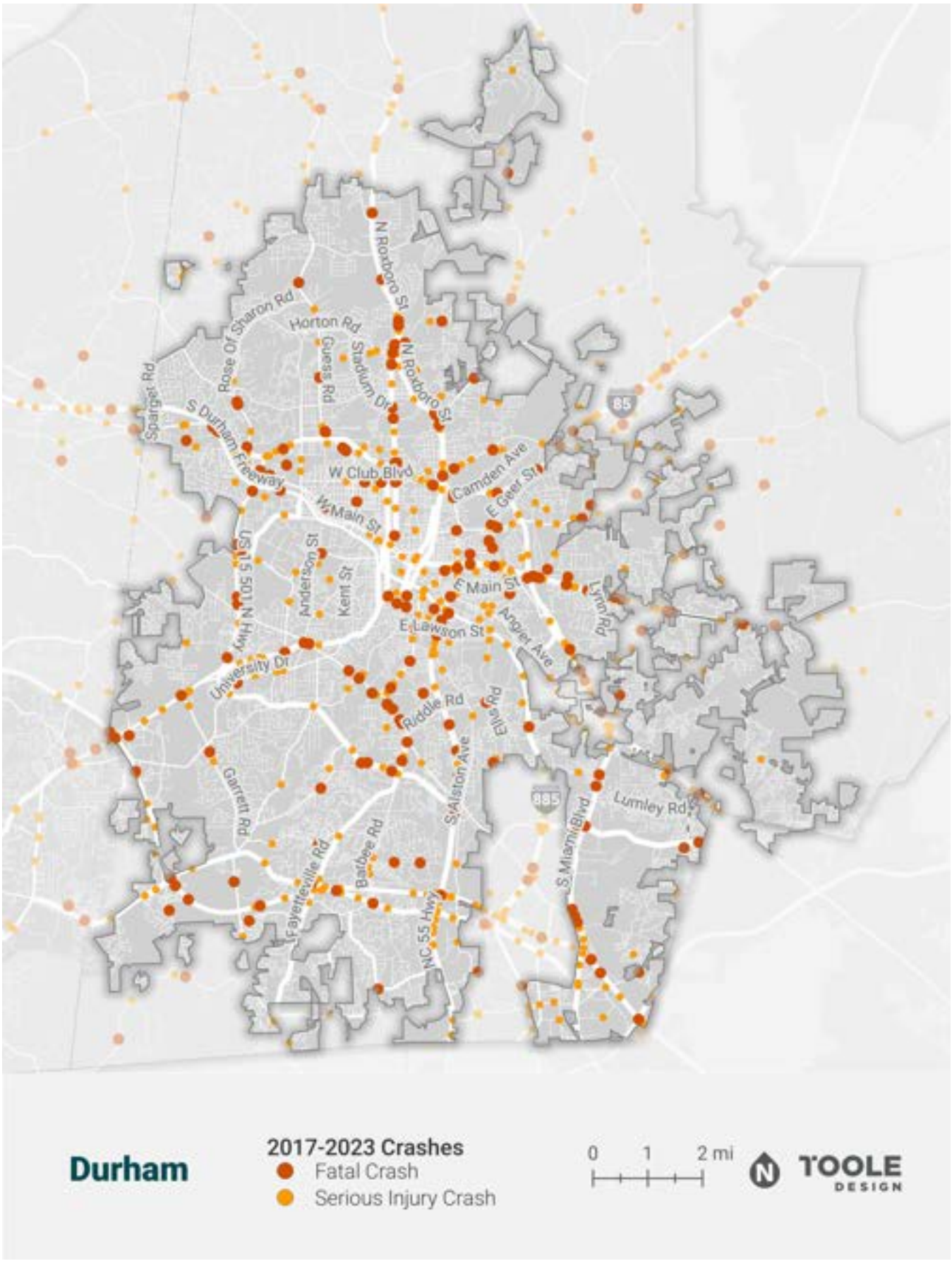
**Speed Risk**

- Top 5% = “prob_speed” > 0.30
- Top 15% = “prob_speed” > 0.09 and < 0.30

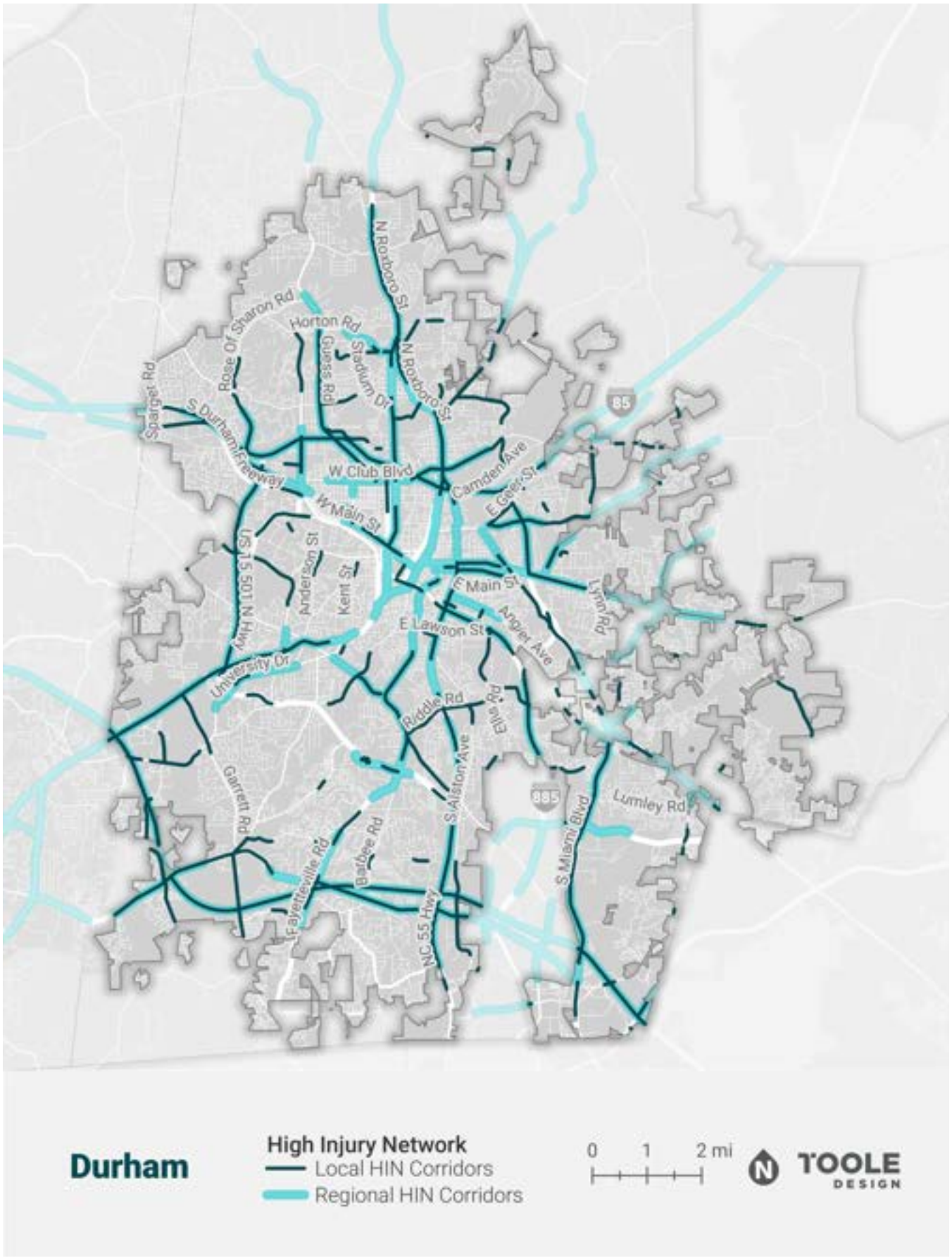
**Lane Departure Risk**

- Top 5% = “prob_LD” > 0.54
- Top 15% = “prob_LD” > 0.21 and < 0.54

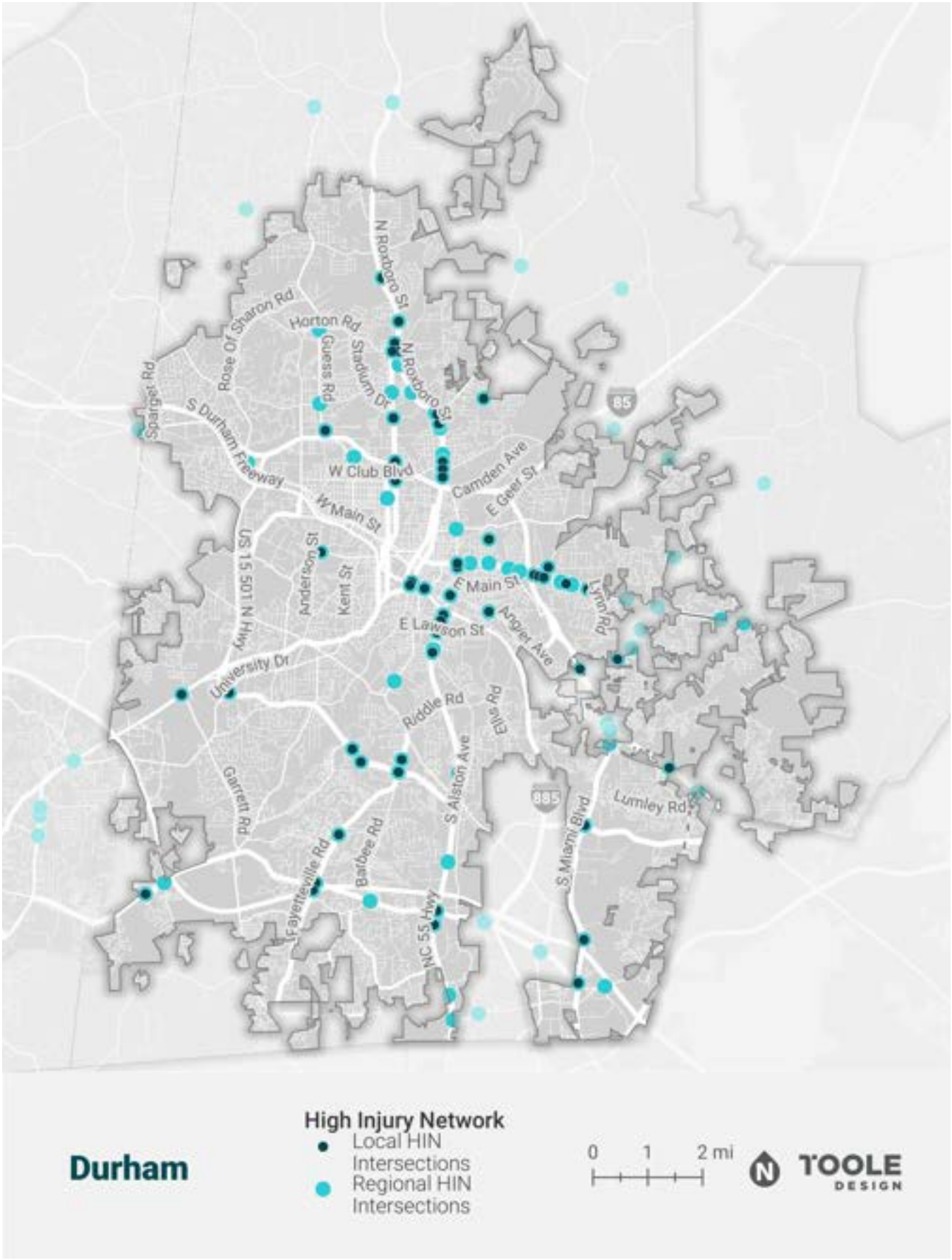
**MAP 40** City of Durham Crash Map



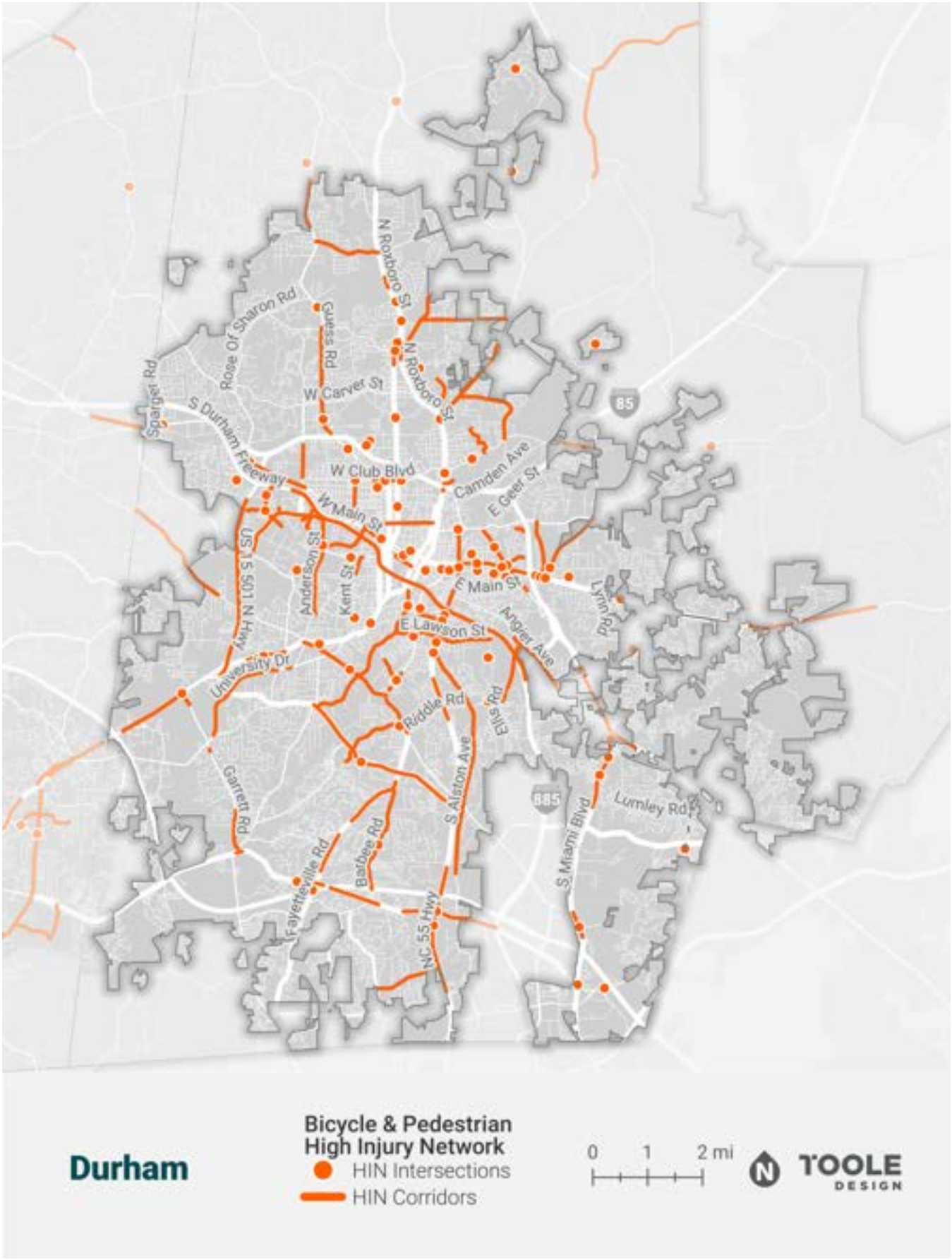
**MAP 41** City of Durham High Injury Network Map



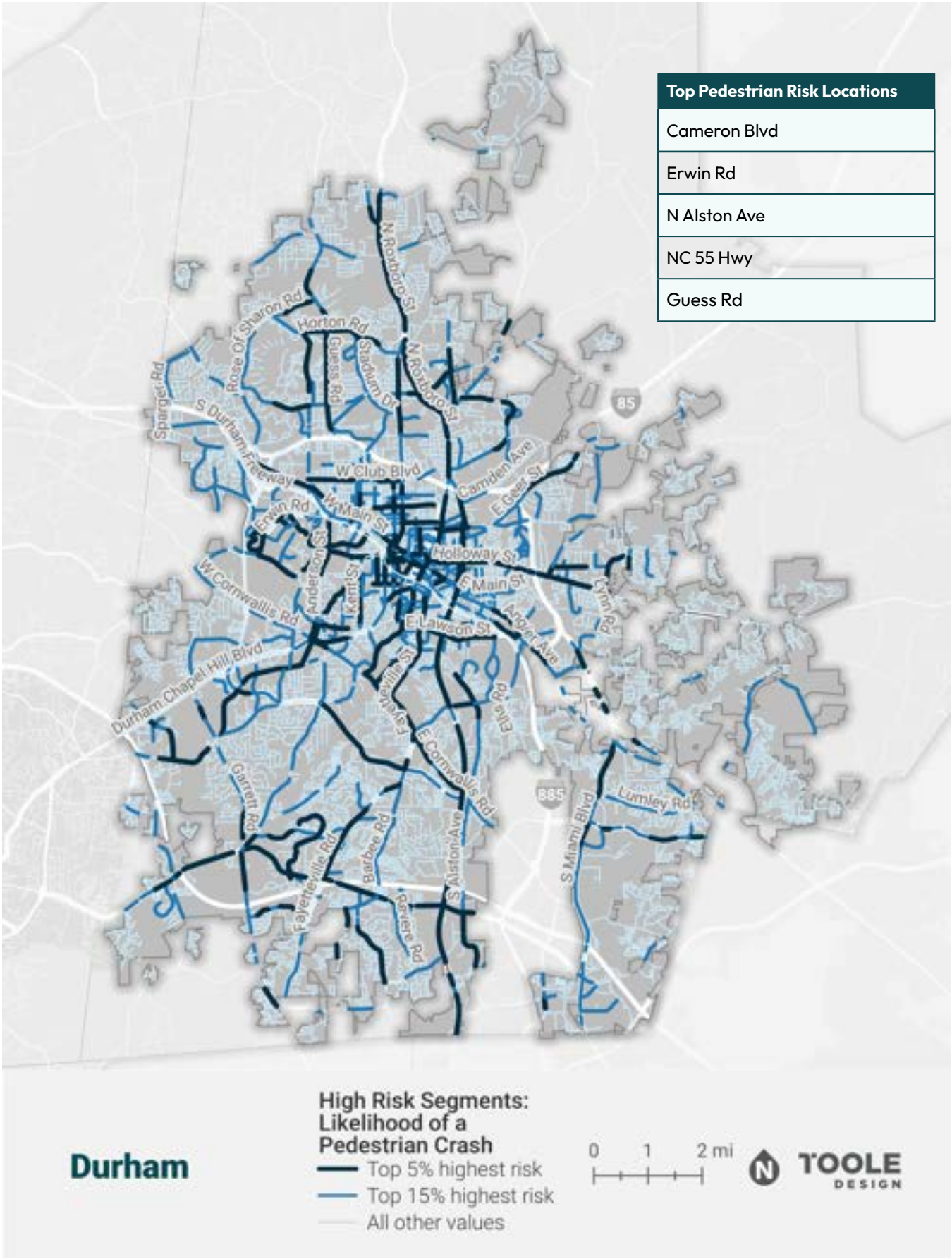
**MAP 42** City of Durham High Injury Intersections Map



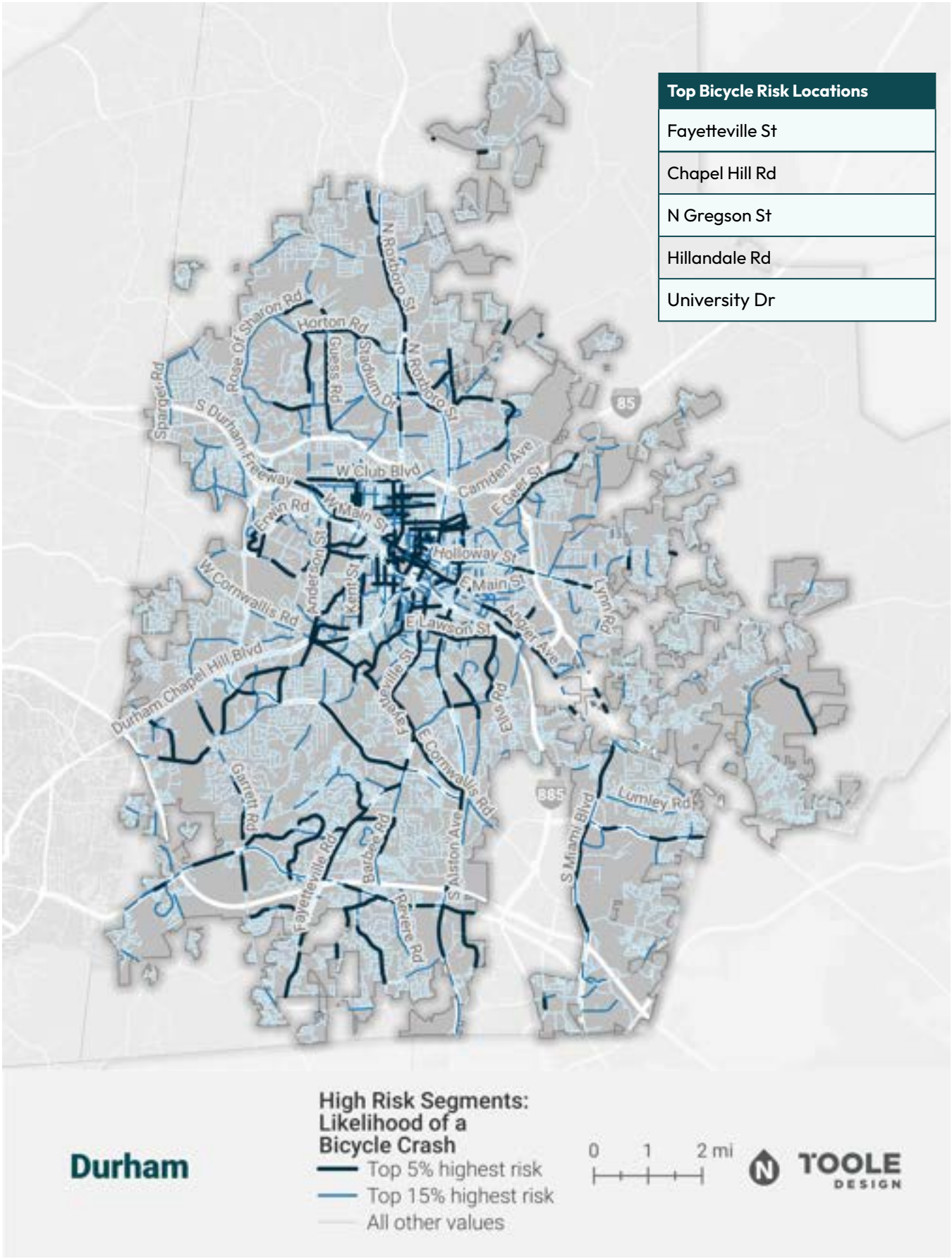
**MAP 43** City of Durham VRU High Injury Corridors and Intersections Map



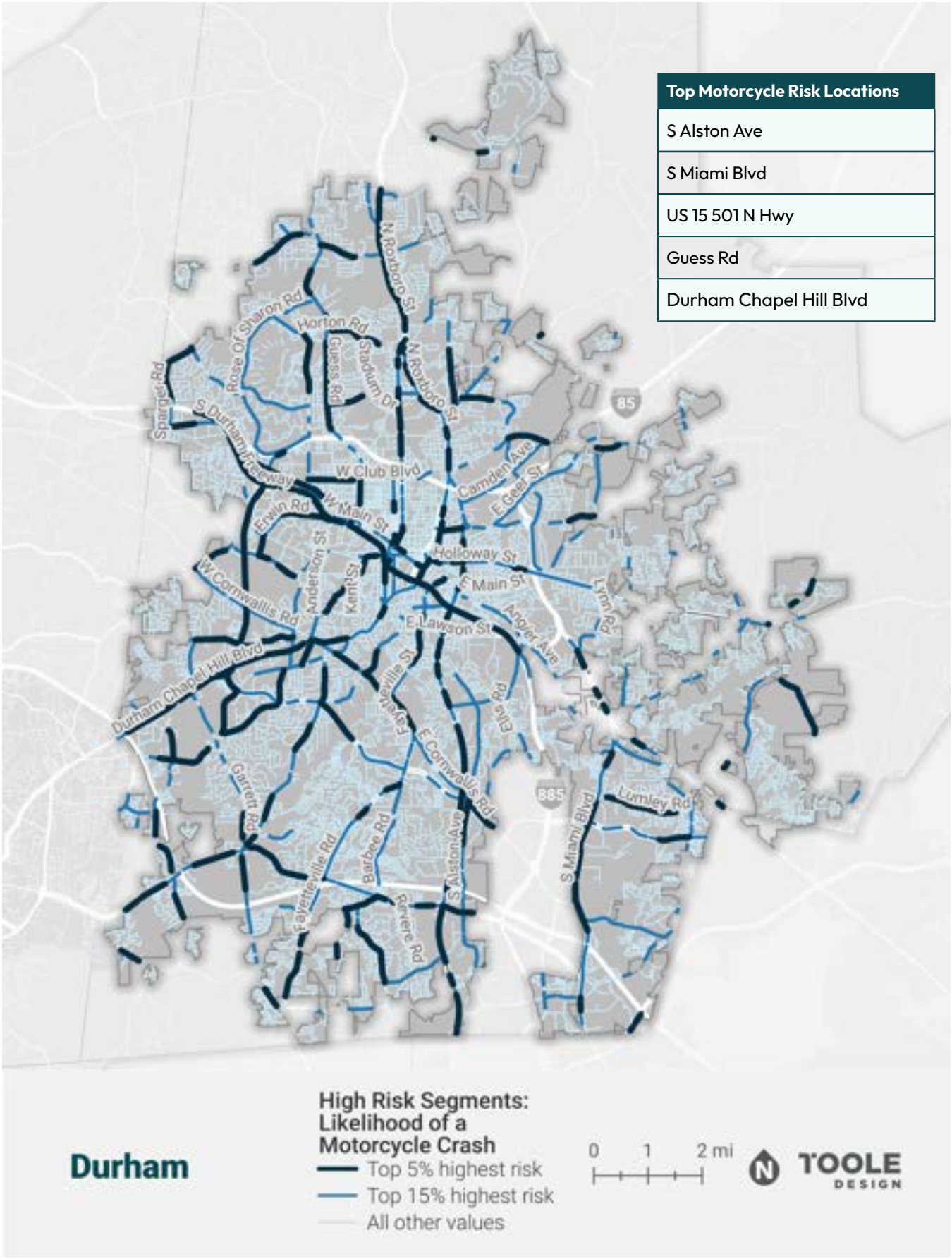
**MAP 44** City of Durham High Risk Corridors Map: Pedestrian Risk



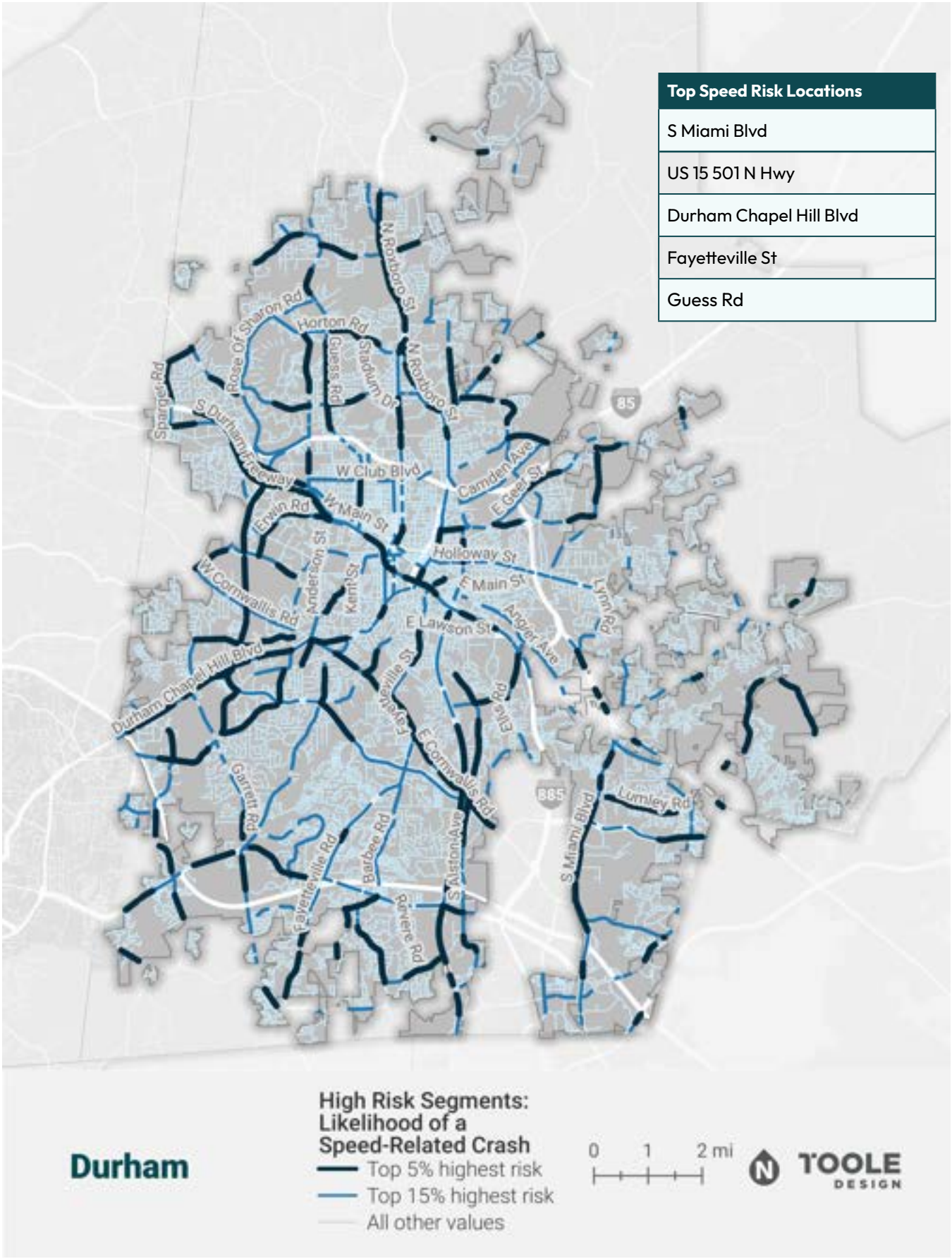
**MAP 45** City of Durham High Risk Corridors Map: Bicycle Risk



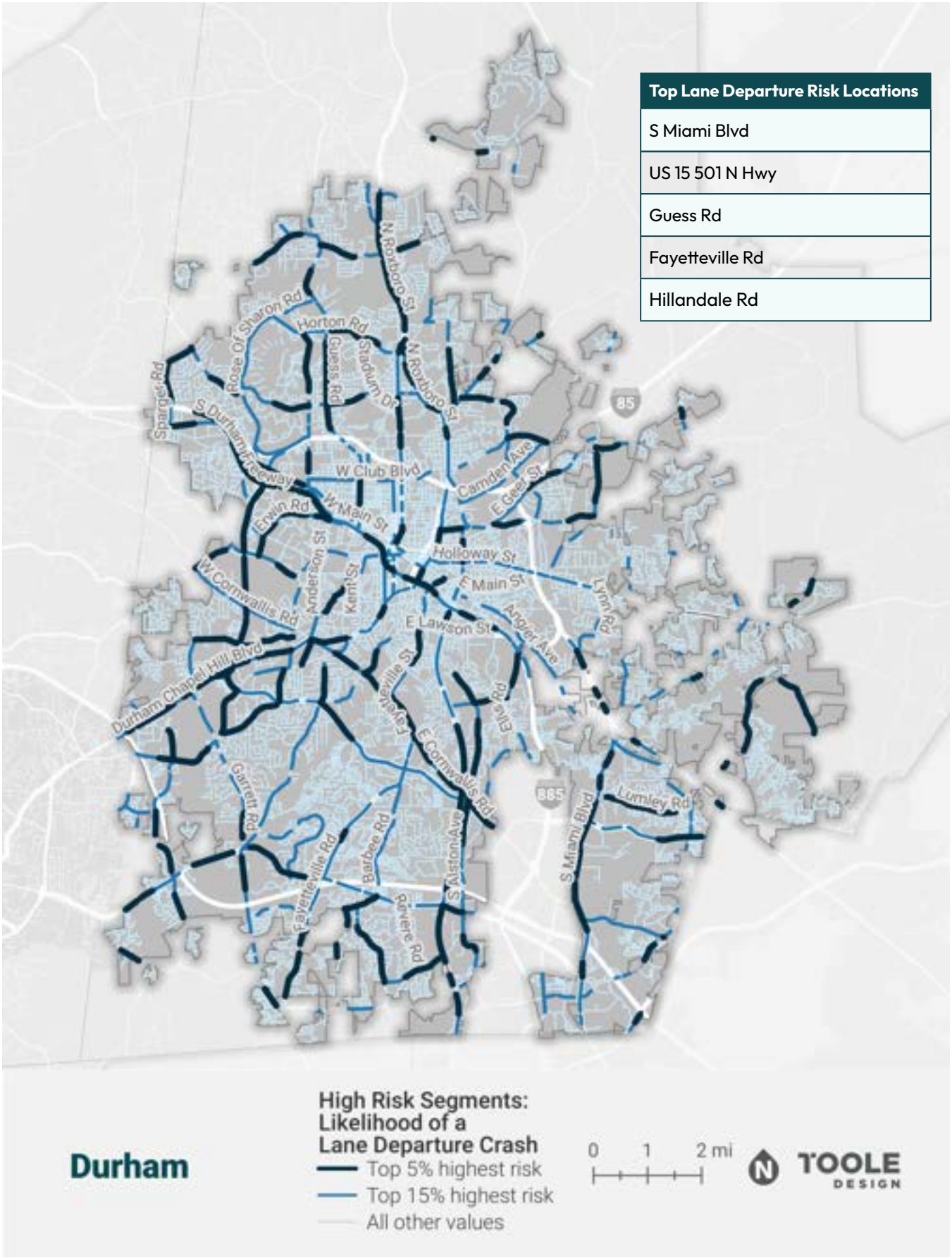
**MAP 46** City of Durham High Risk Corridors Map: Motorcycle Risk



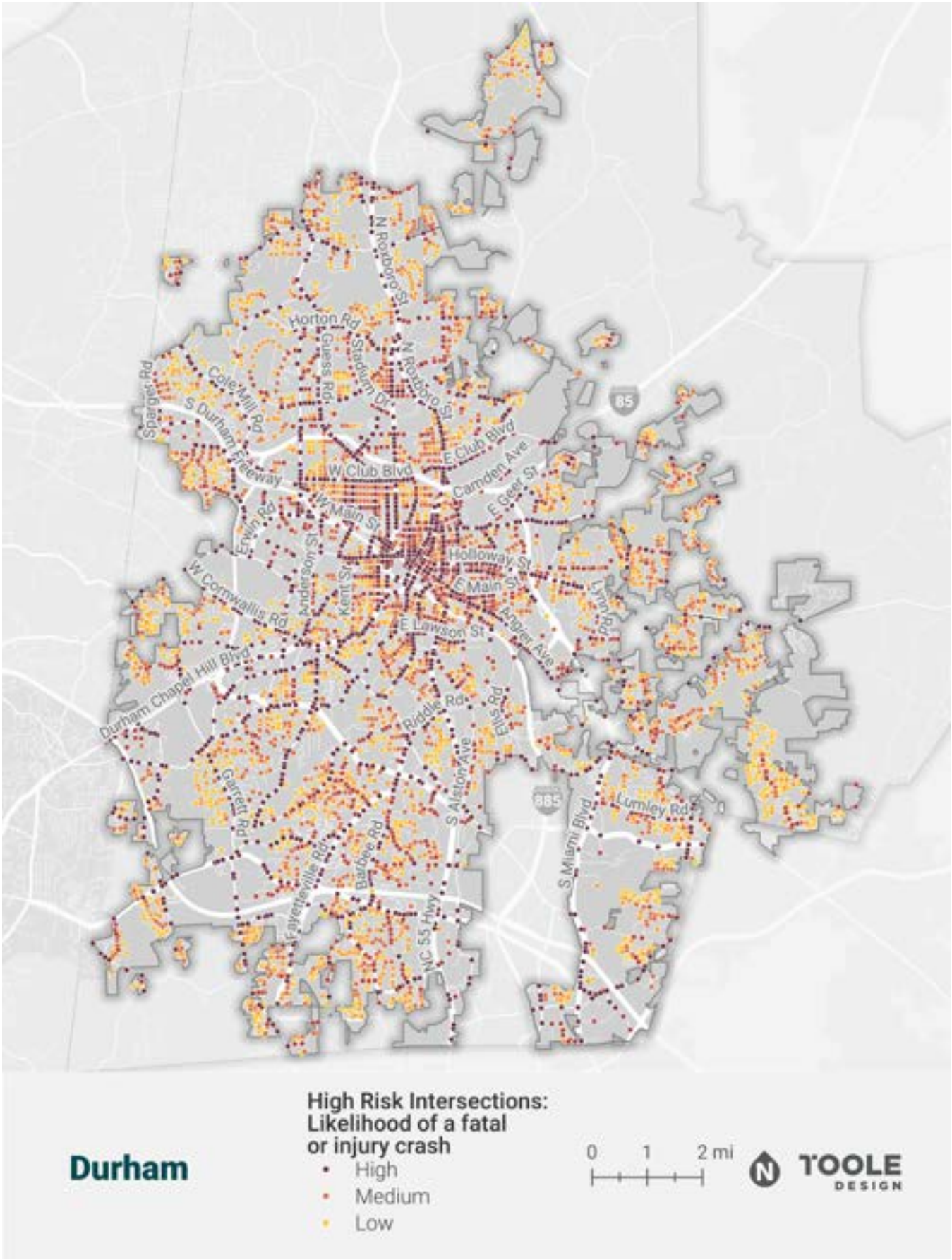
**MAP 47** City of Durham High Risk Corridors Map: Speed Risk



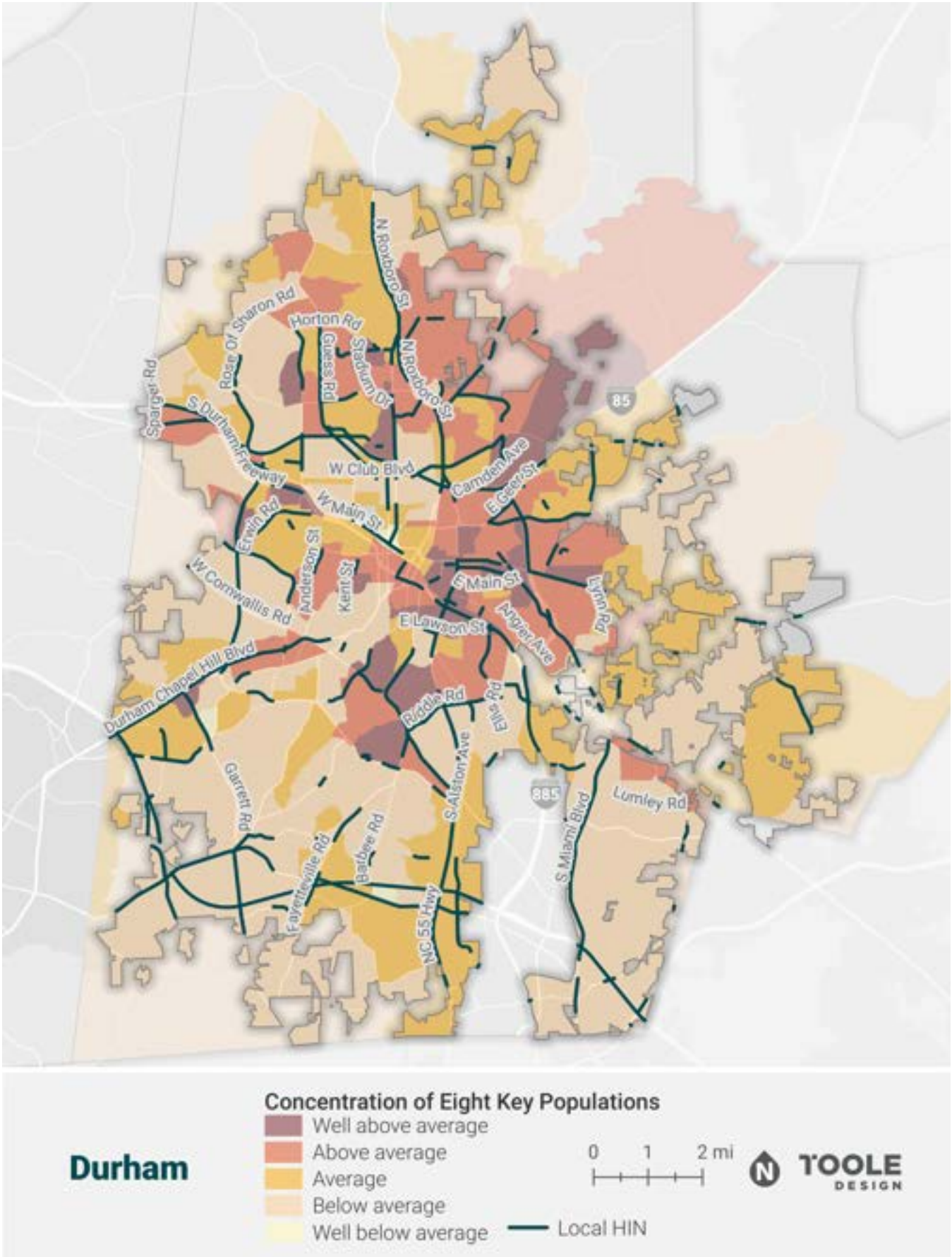
**MAP 48** City of Durham High Risk Corridors Map: Lane Departure Risk



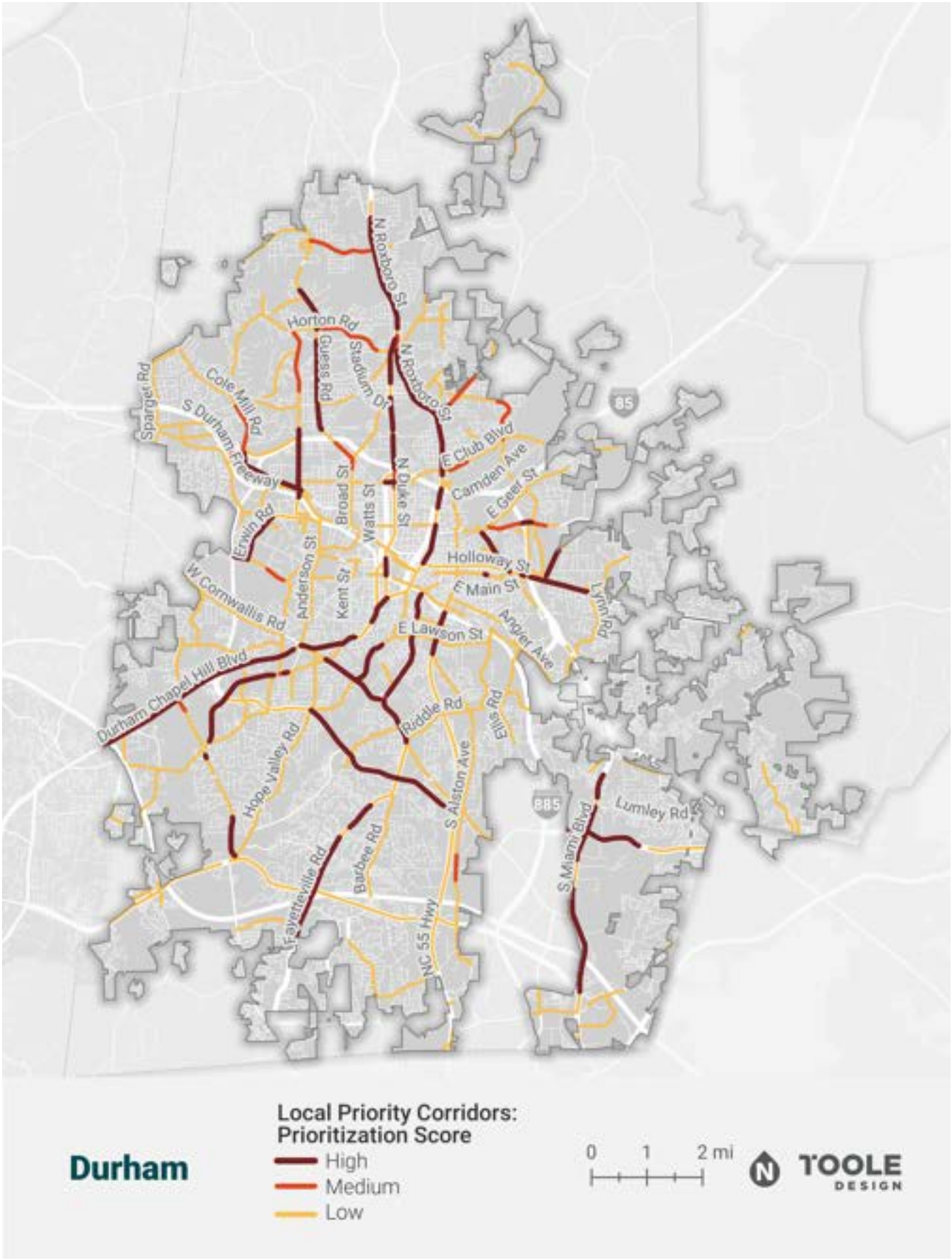
**MAP 49** City of Durham High Risk Intersections Map



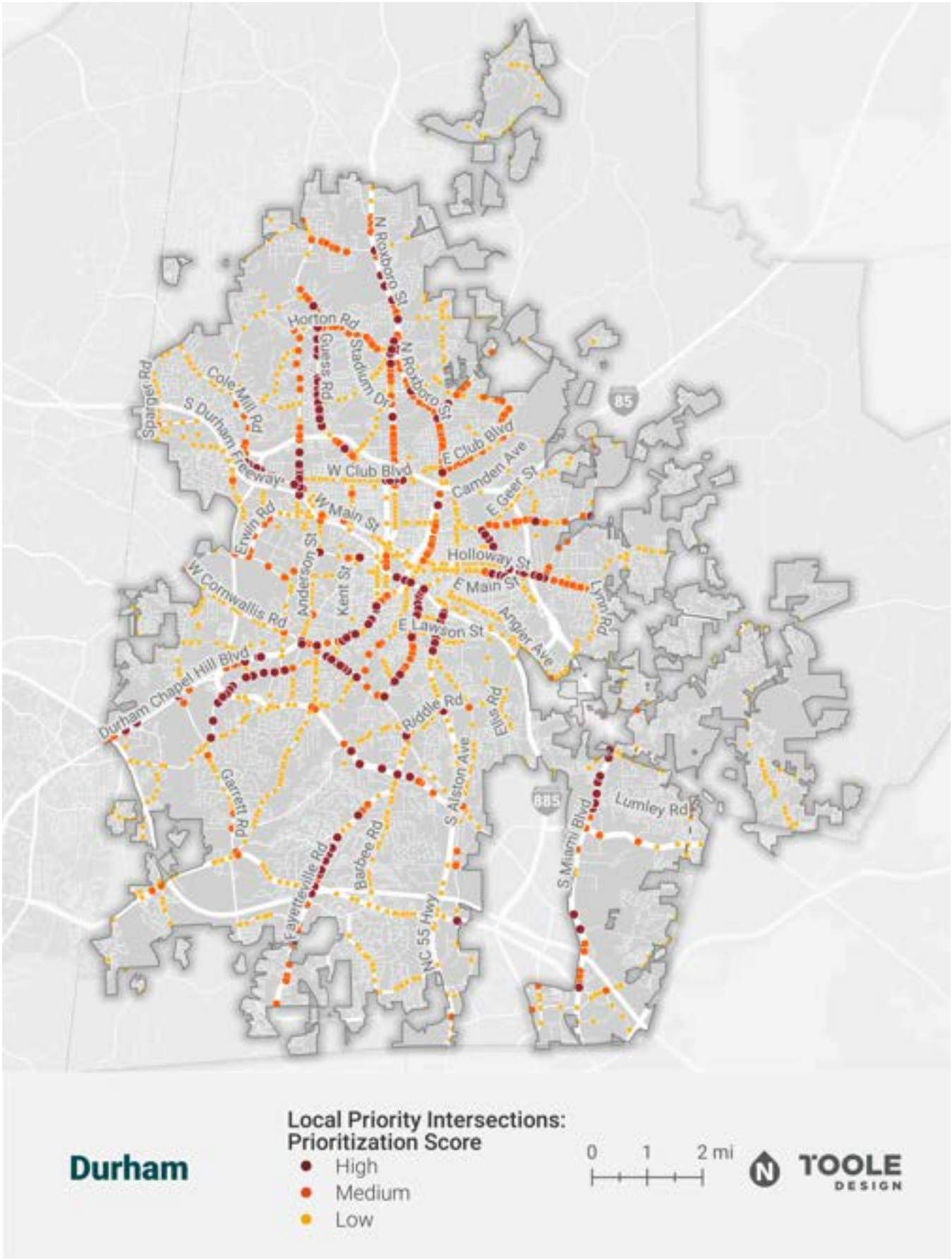
**MAP 50** City of Durham Indicators of Potential Disadvantage and HIN Map



**MAP 51** City of Durham Priority Corridors Map



**MAP 52** City of Durham Priority Intersections Map



# Town of Hillsborough

Source: Hooper Schultz

## Community Data

The following information is provided as a resource for the Town of Hillsborough and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Hillsborough.

### Population

9,143 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 1 fatality
  - » Fatality rate per 100K: 1.56
  - » 4 serious injuries
- 2018-2022
  - » 1 fatality
  - » Fatality rate per 100K: 2.19
  - » 4 serious injuries

### High Injury Network Coverage

16.12% of roadway miles cover 100% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.07
- Top 15% = “prob_ped” > 0.02 and < 0.07

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.06
- Top 15% = “prob_bike” > 0.02 and < 0.06

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.06
- Top 15% = “prob_MC” > 0.02 and < 0.06

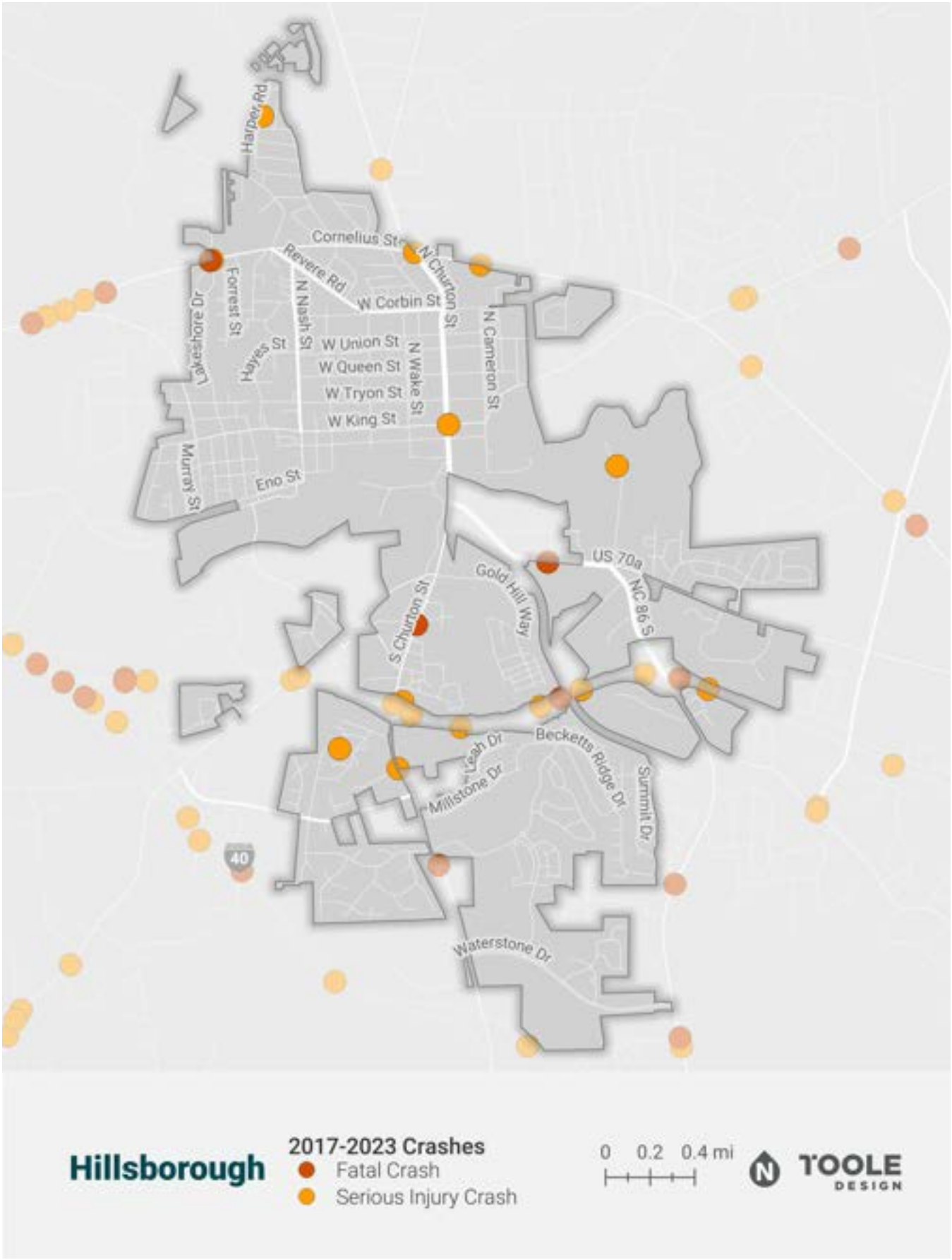
**Speed Risk**

- Top 5% = “prob_speed” > 0.15
- Top 15% = “prob_speed” > 0.03 and < 0.15

**Lane Departure Risk**

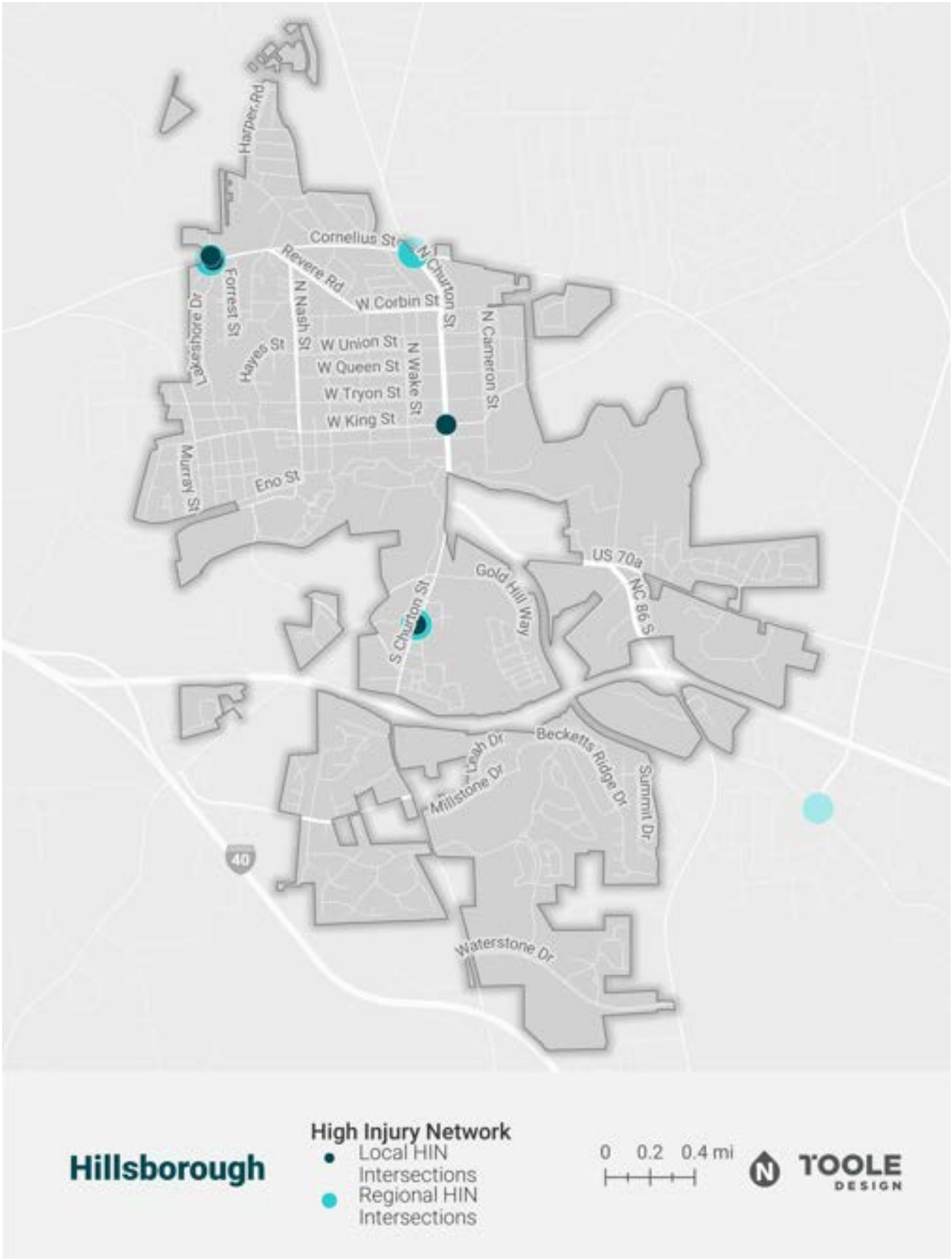
- Top 5% = “prob_LD” > 0.37
- Top 15% = “prob_LD” > 0.09 and < 0.37

**MAP 53** Town of Hillsborough Crash Map

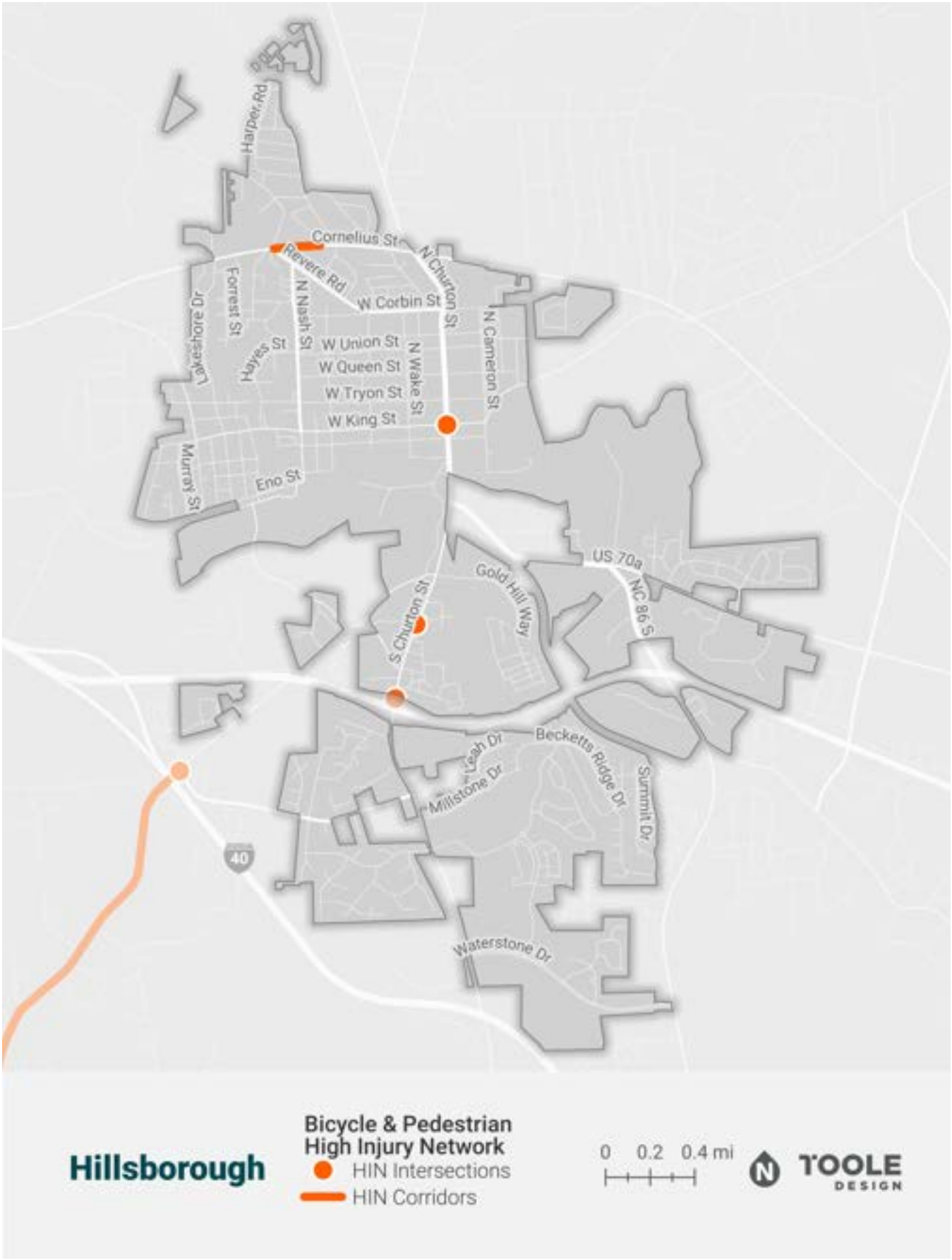


**MAP 54** Town of Hillsborough High Injury Network Map

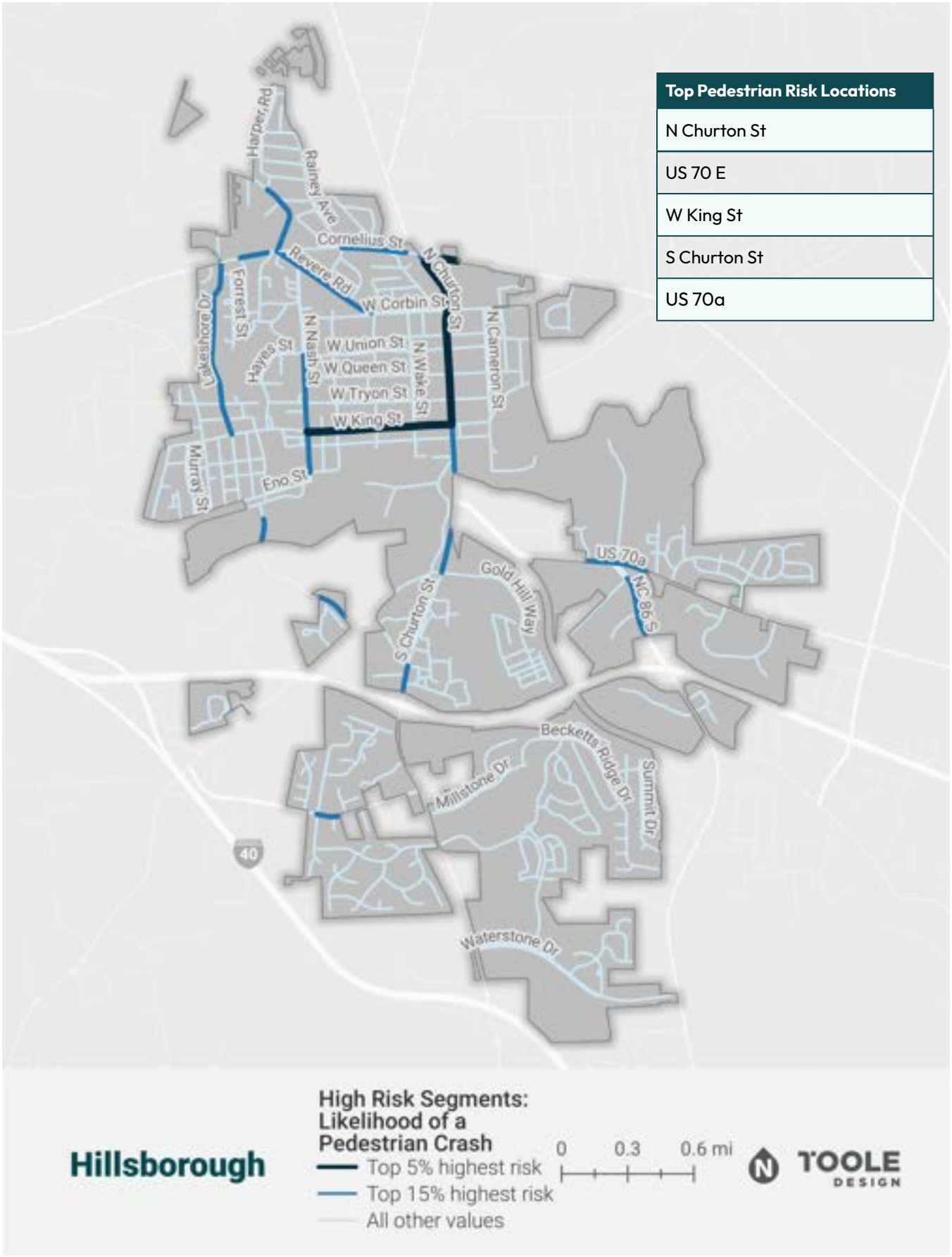
**MAP 55** Town of Hillsborough High Injury Intersections Map



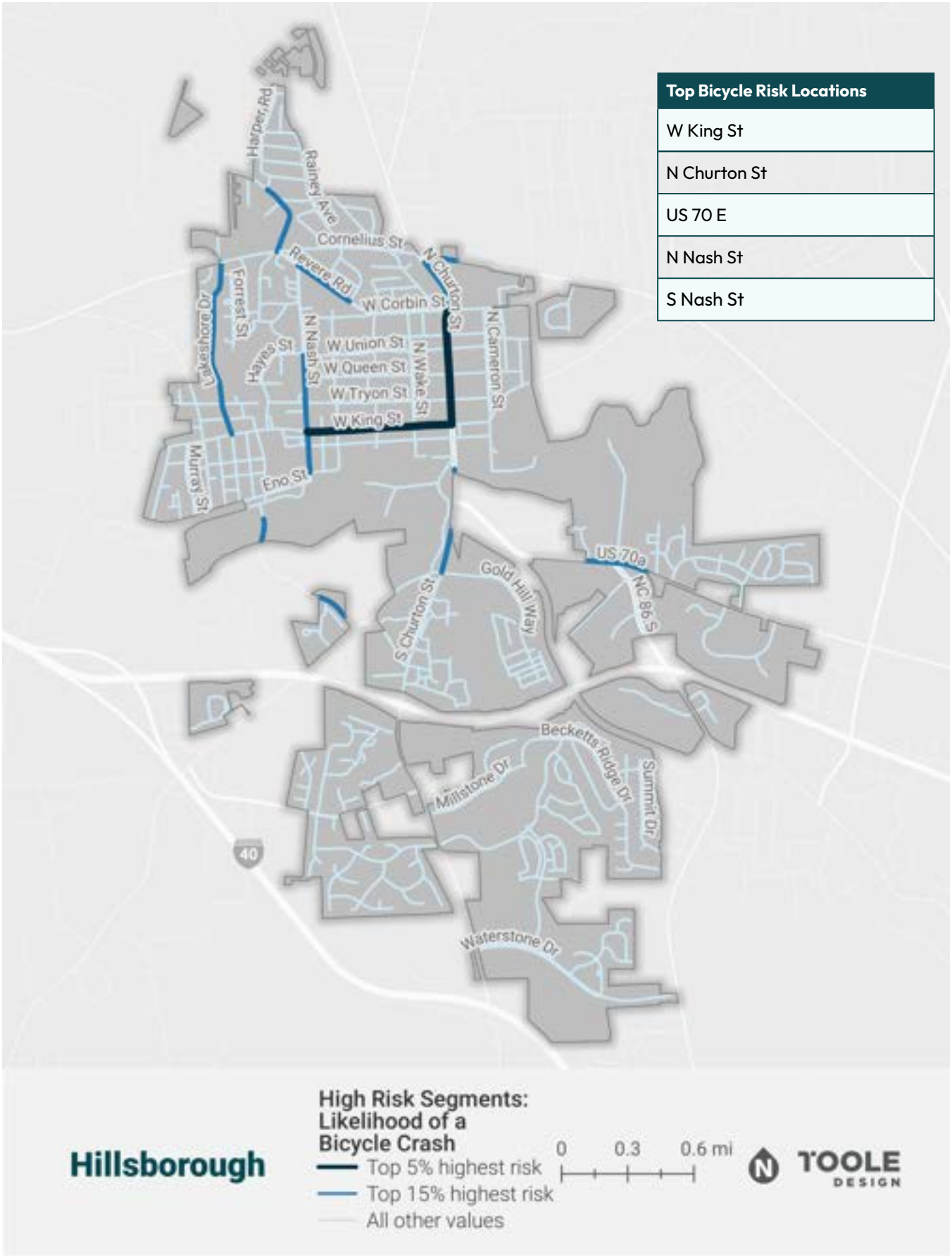
**MAP 56** Town of Hillsborough VRU High Injury Corridors and Intersections Map



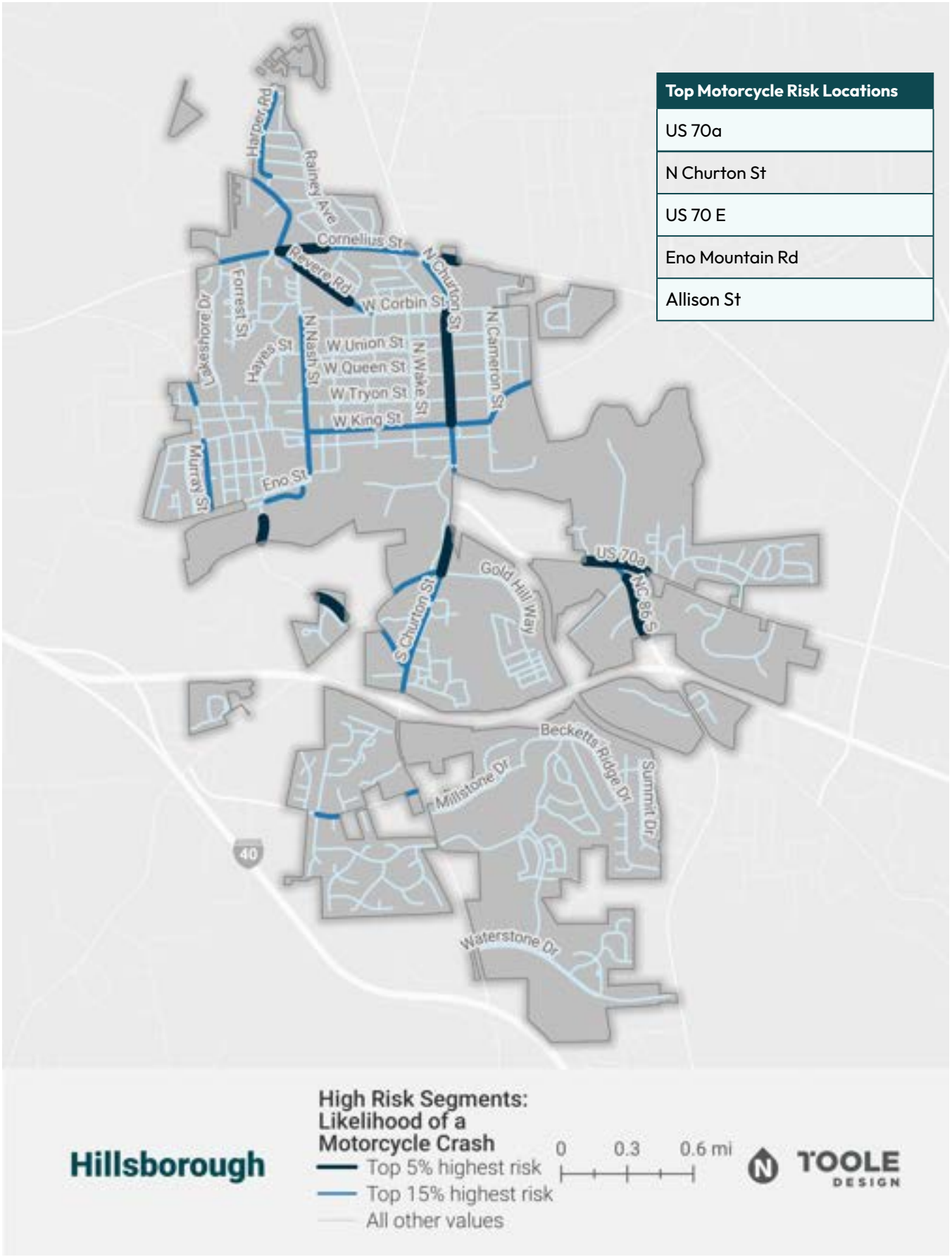
**MAP 57** Town of Hillsborough High Risk Corridors Map: Pedestrian Risk



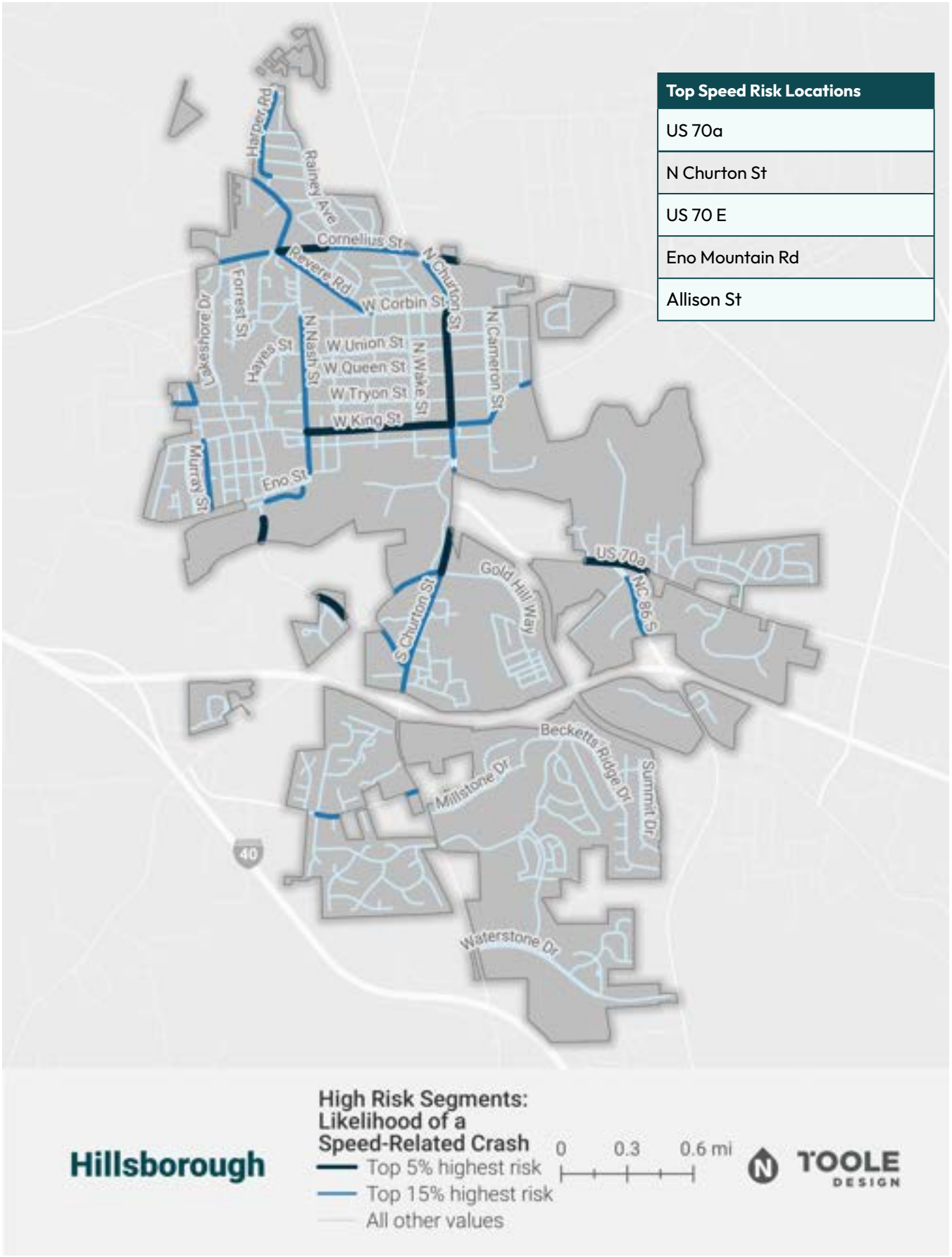
**MAP 58** Town of Hillsborough High Risk Corridors Map: Bicycle Risk



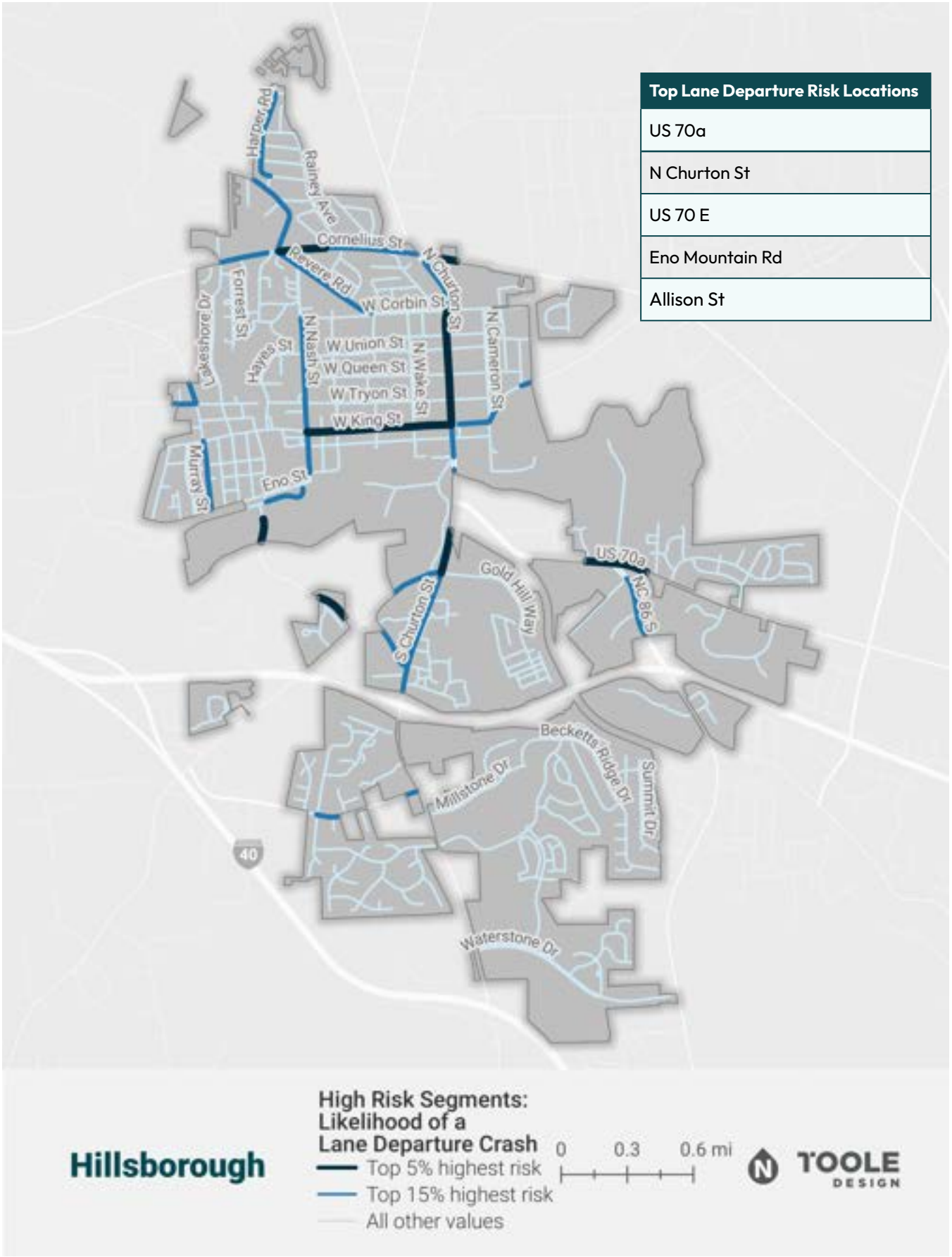
**MAP 59** Town of Hillsborough High Risk Corridors Map: Motorcycle Risk



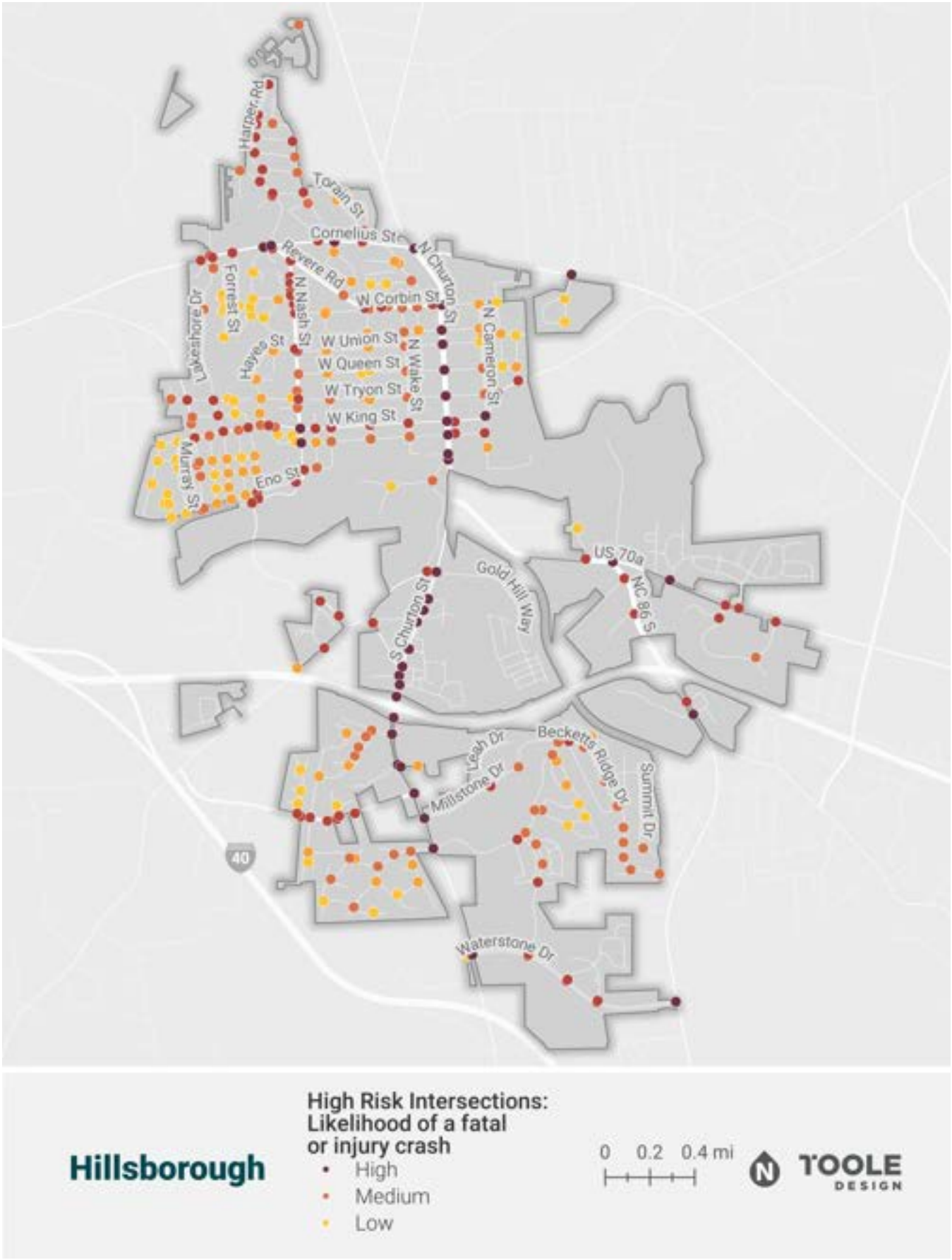
**MAP 60** Town of Hillsborough High Risk Corridors Map: Speed Risk



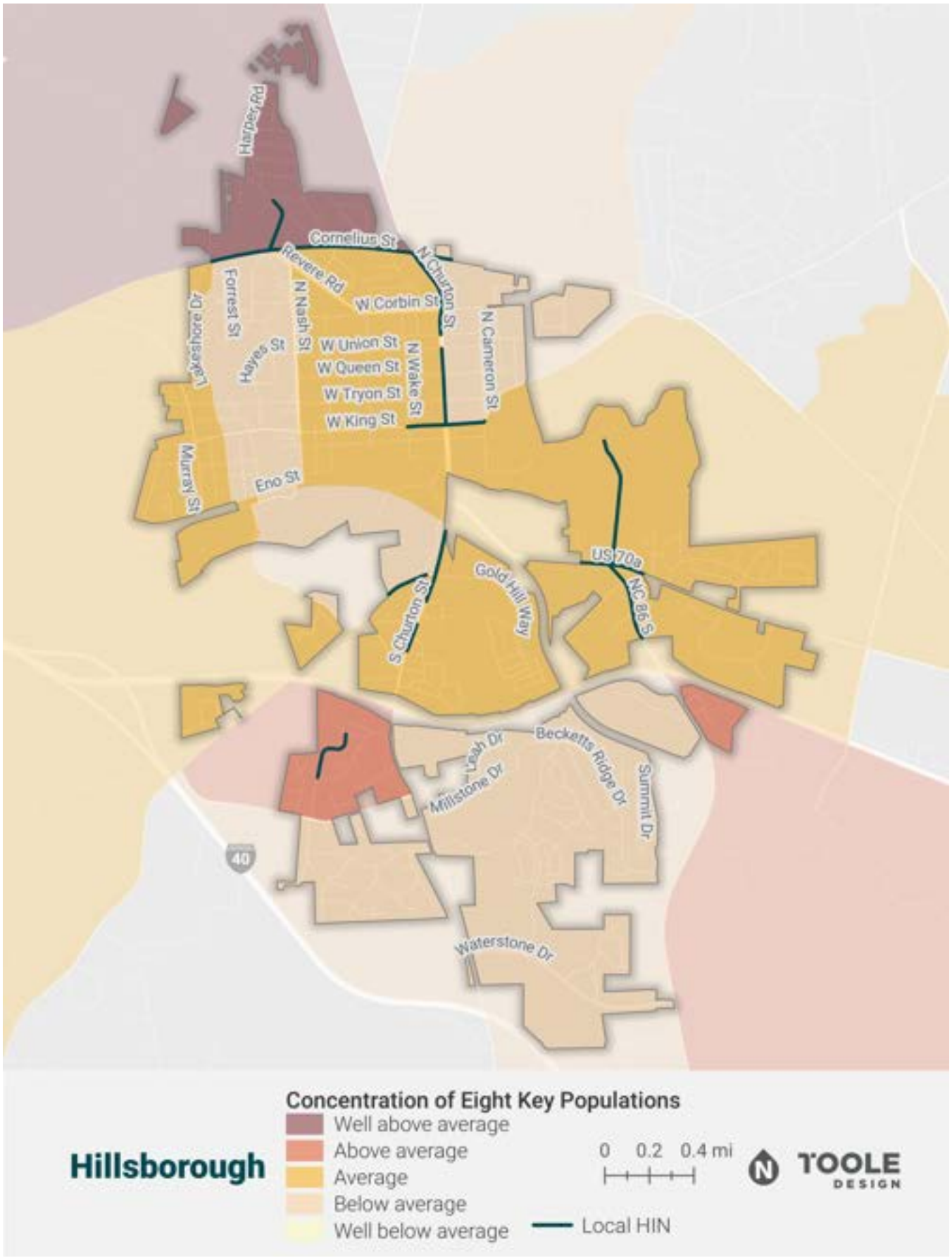
**MAP 61** Town of Hillsborough High Risk Corridors Map: Lane Departure Risk



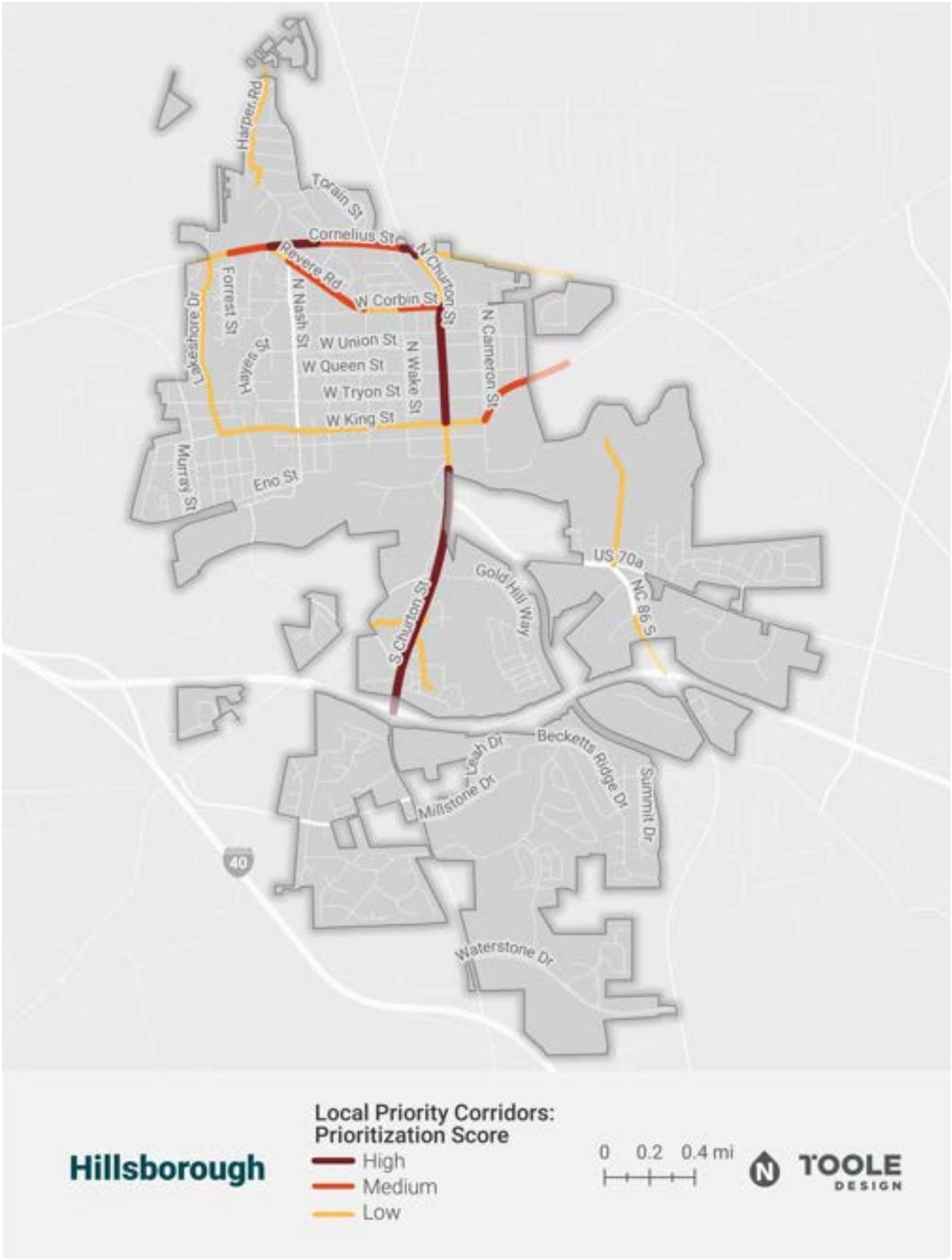
**MAP 62** Town of Hillsborough High Risk Intersections Map



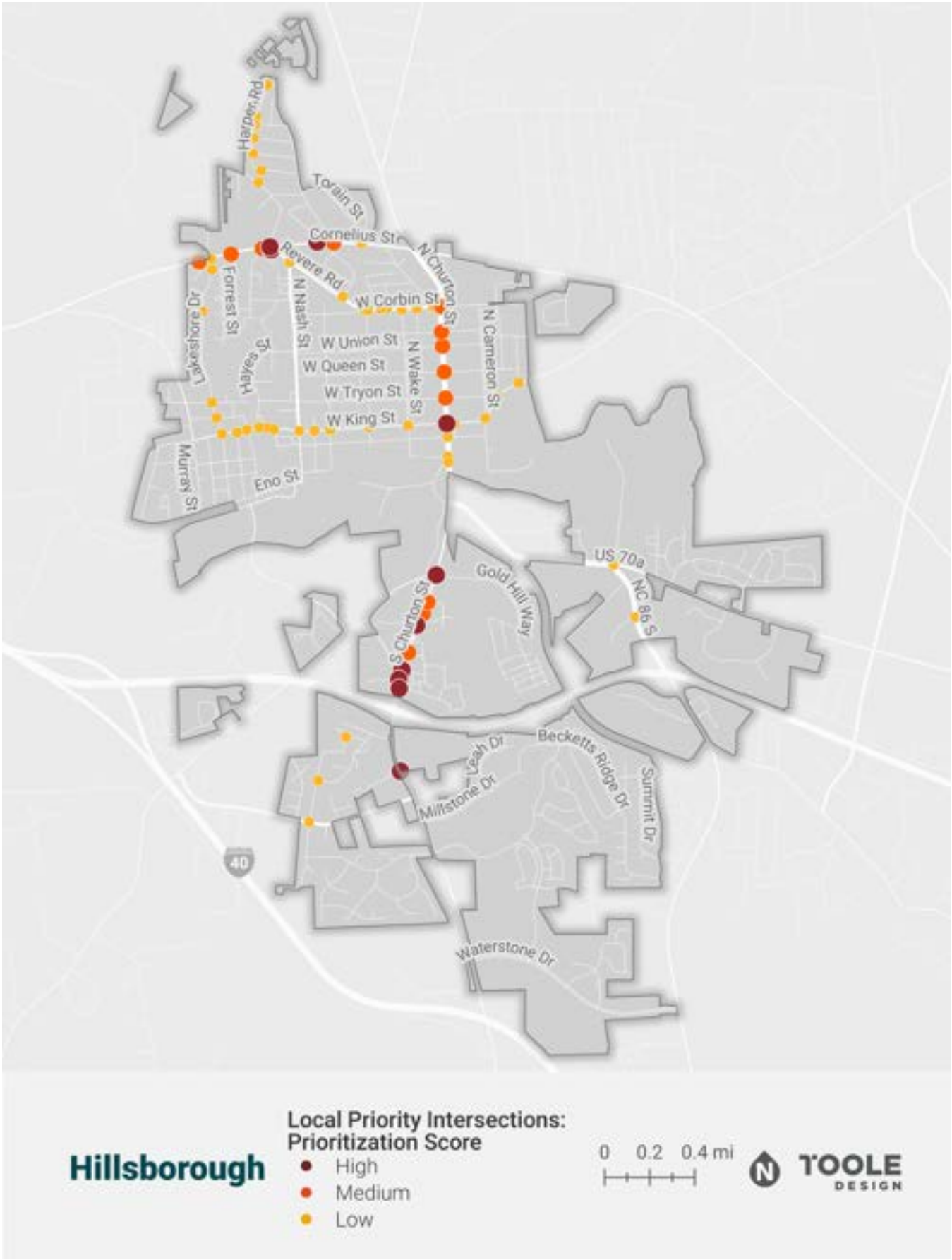
**MAP 63** Town of Hillsborough Indicators of Potential Disadvantage and HIN Map



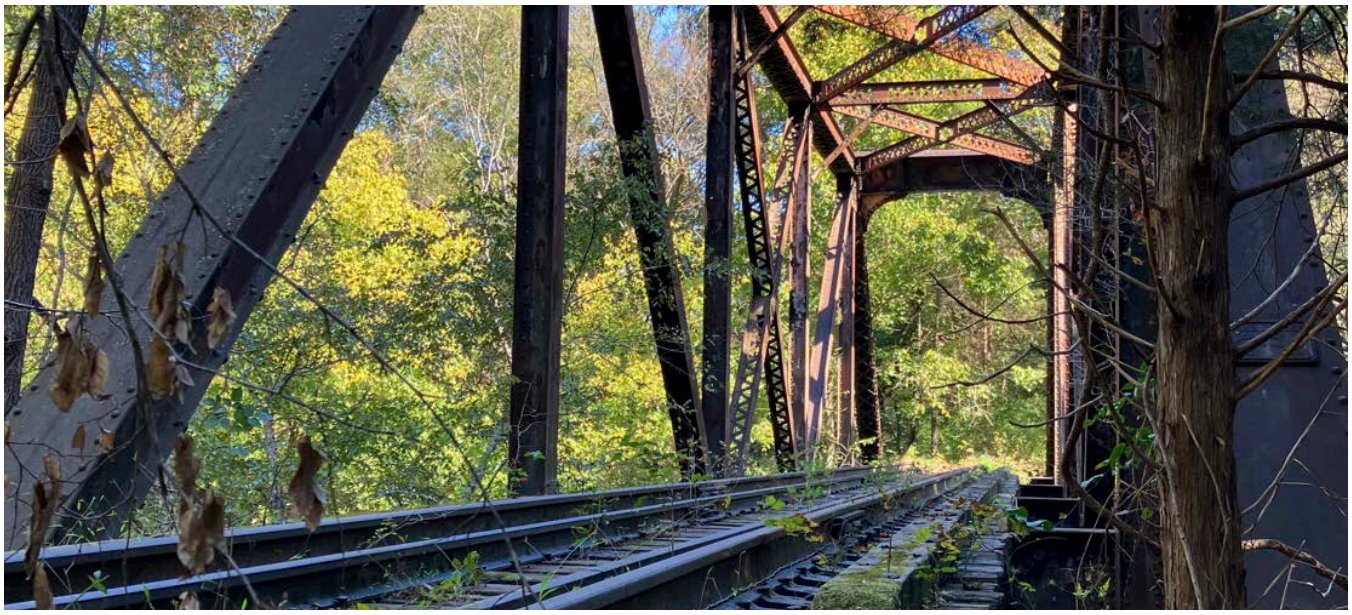
**MAP 64** Town of Hillsborough Priority Corridors Map



**MAP 65** Town of Hillsborough Priority Intersections Map



# Durham County



Source: Eric Woolridge, Destination by Design

## Community Data

The following information is provided as a resource for Durham County and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Durham County.

### Population

324,841 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 233 fatalities
  - » Fatality rate per 100K: 10.25
  - » 695 serious injuries
- 2018-2022
  - » 160 fatalities
  - » Fatality rate per 100K: 9.85
  - » 517 serious injuries

### High Injury Network Coverage

13.35% of roadway miles cover 72% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.21
- Top 15% = “prob_ped” > 0.08 and < 0.21

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.07
- Top 15% = “prob_bike” > 0.03 and < 0.07

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.17
- Top 15% = “prob_MC” > 0.06 and < 0.17

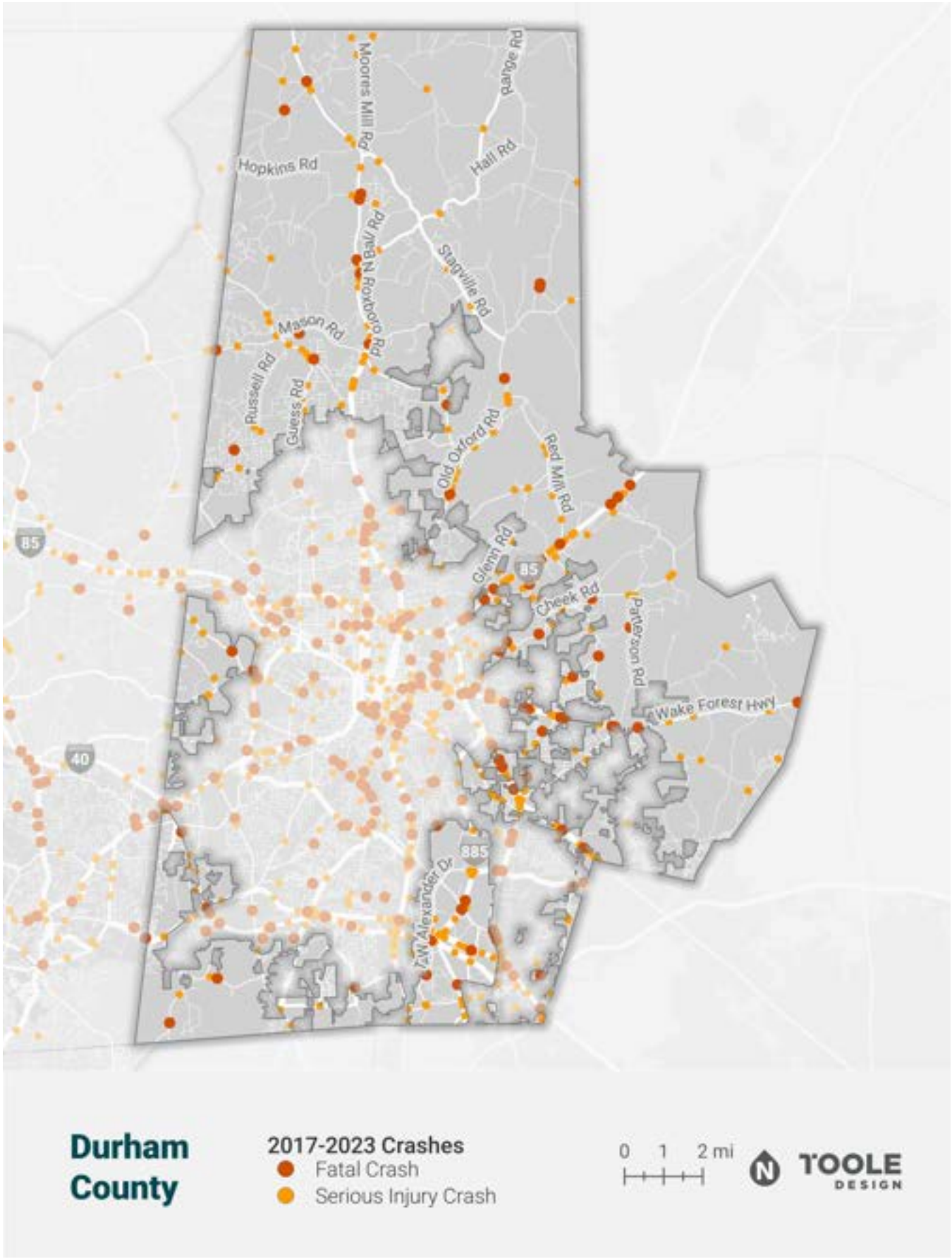
**Speed Risk**

- Top 5% = “prob_speed” > 0.31
- Top 15% = “prob_speed” > 0.10 and < 0.31

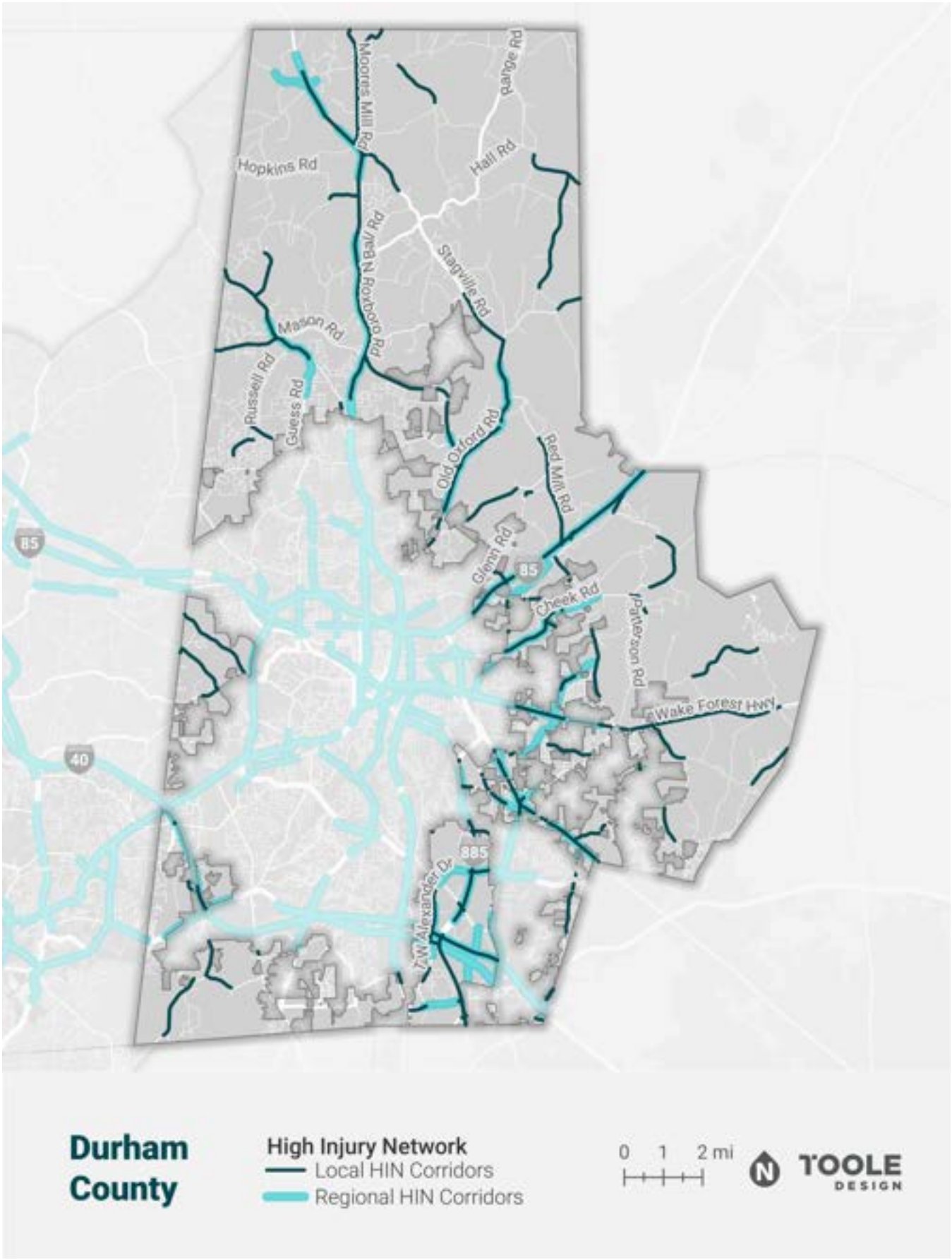
**Lane Departure Risk**

- Top 5% = “prob_LD” > 0.57
- Top 15% = “prob_LD” > 0.25 and < 0.57

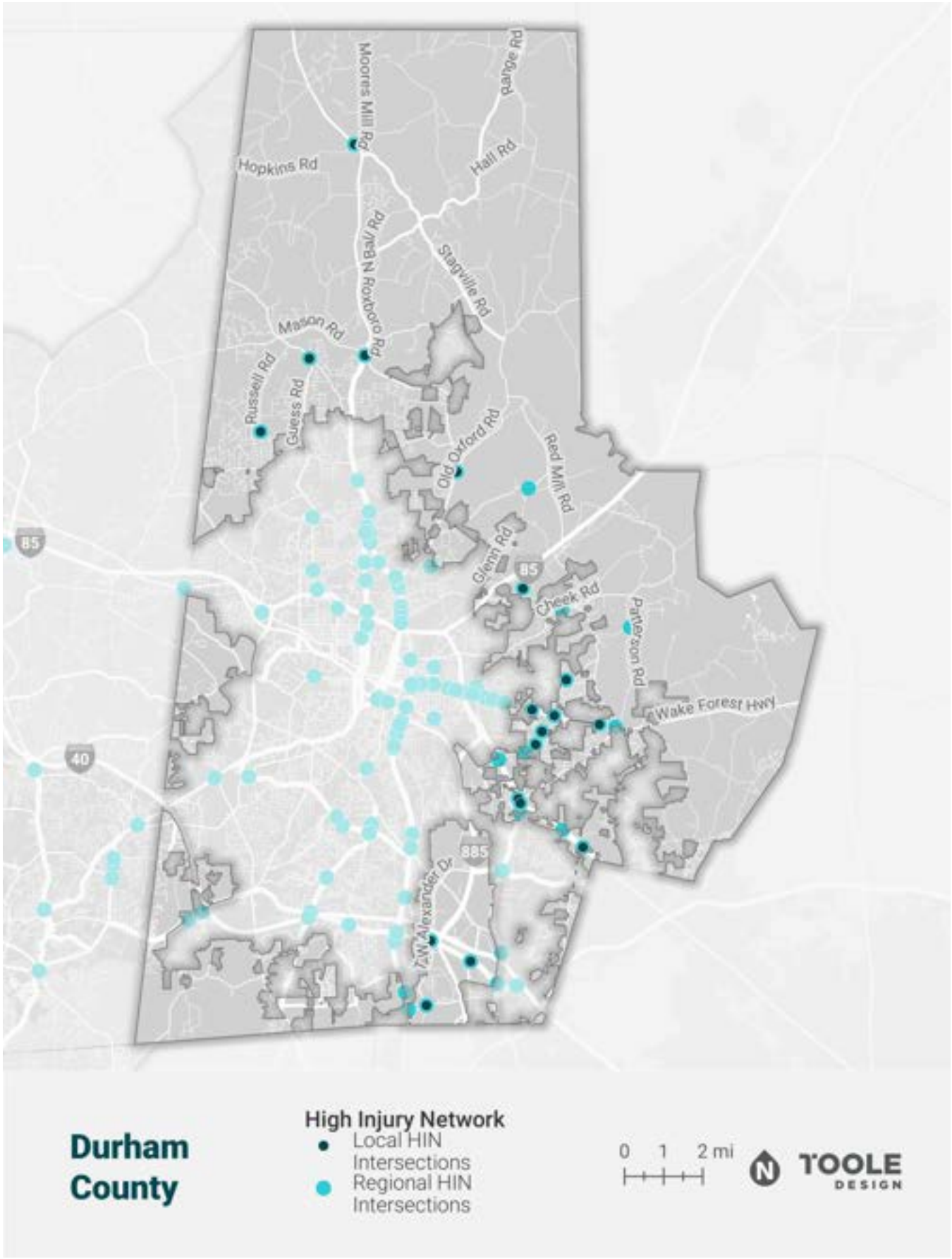
**MAP 66** Durham County Crash Map



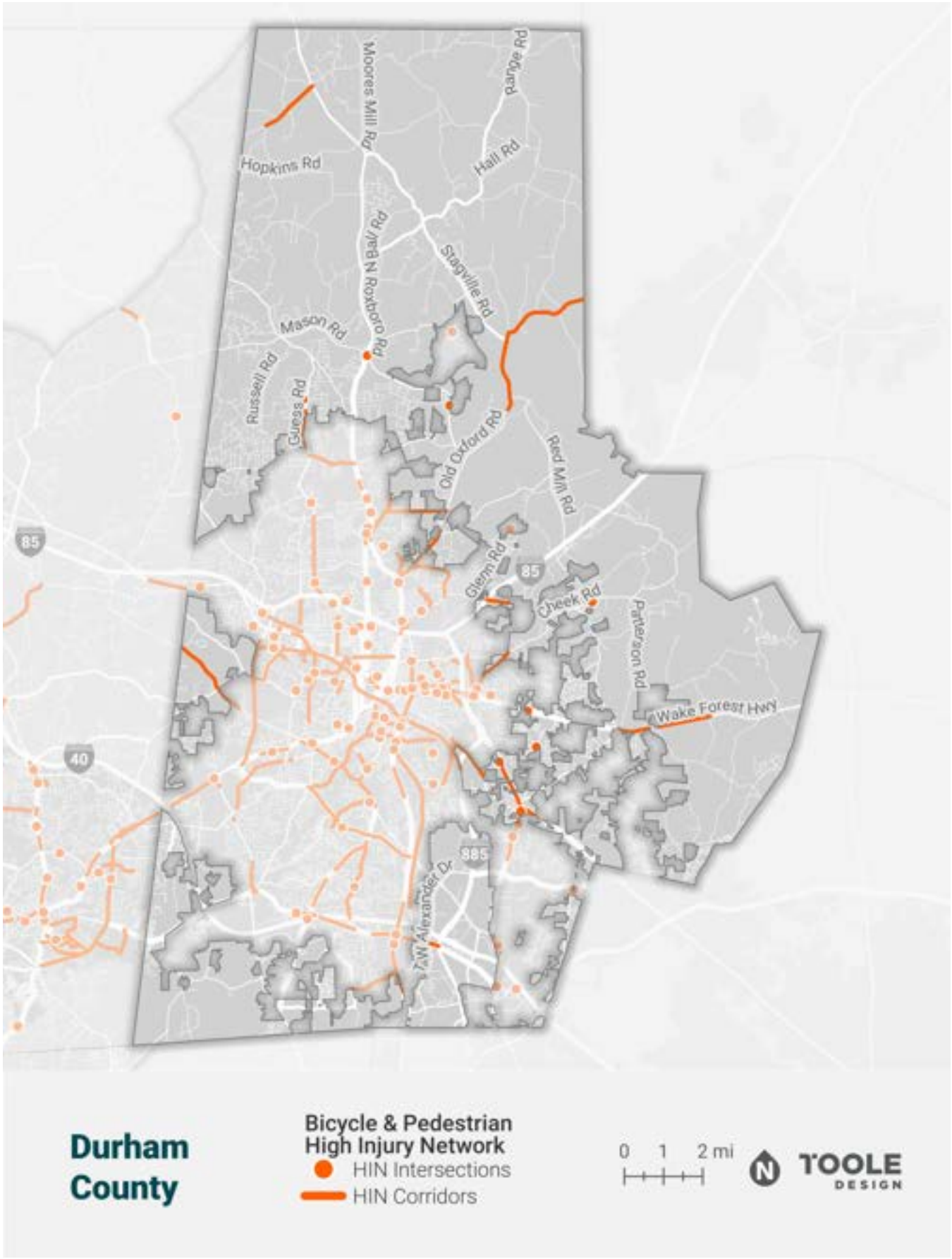
**MAP 67** Durham County High Injury Network Map



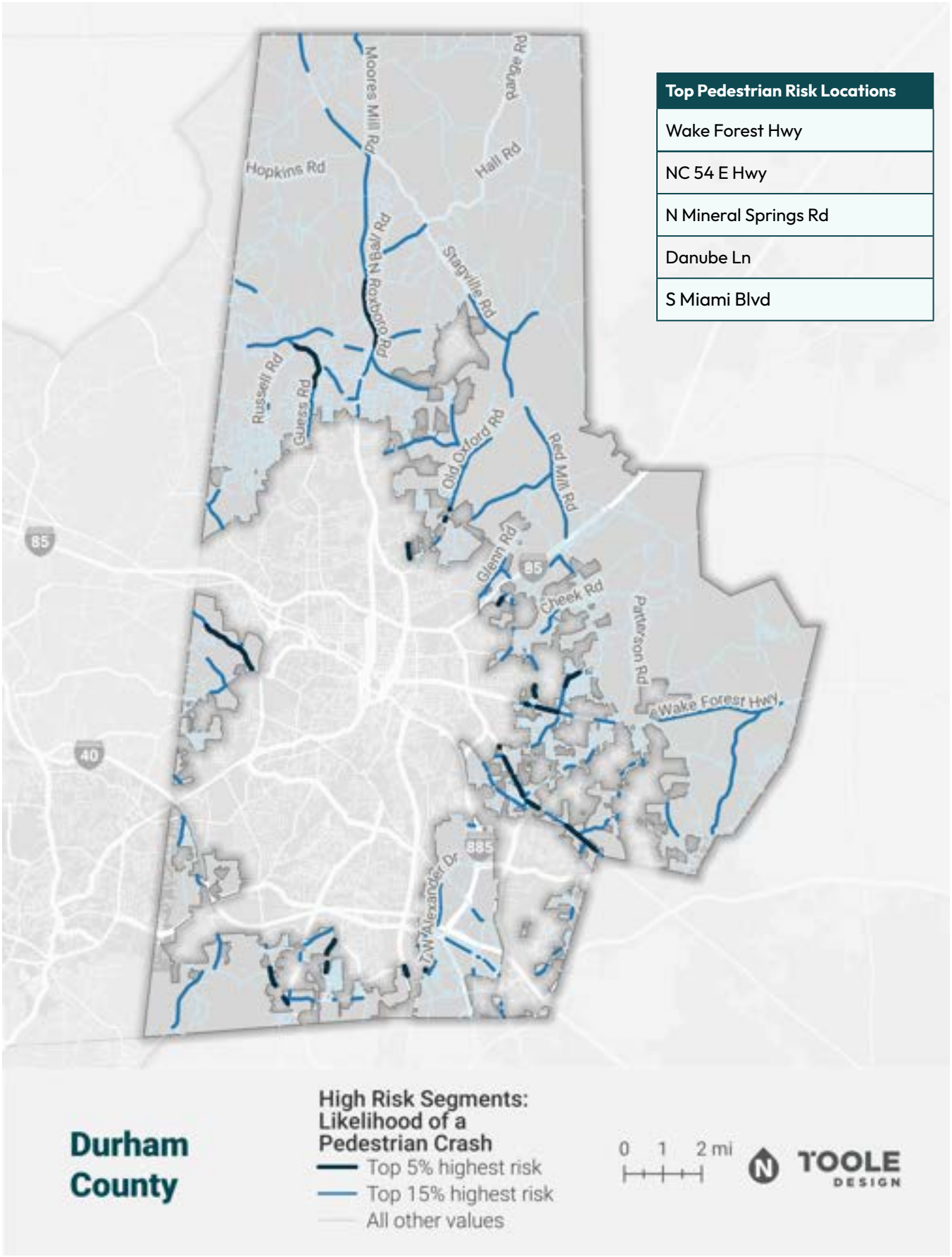
**MAP 68** Durham County High Injury Intersections Map



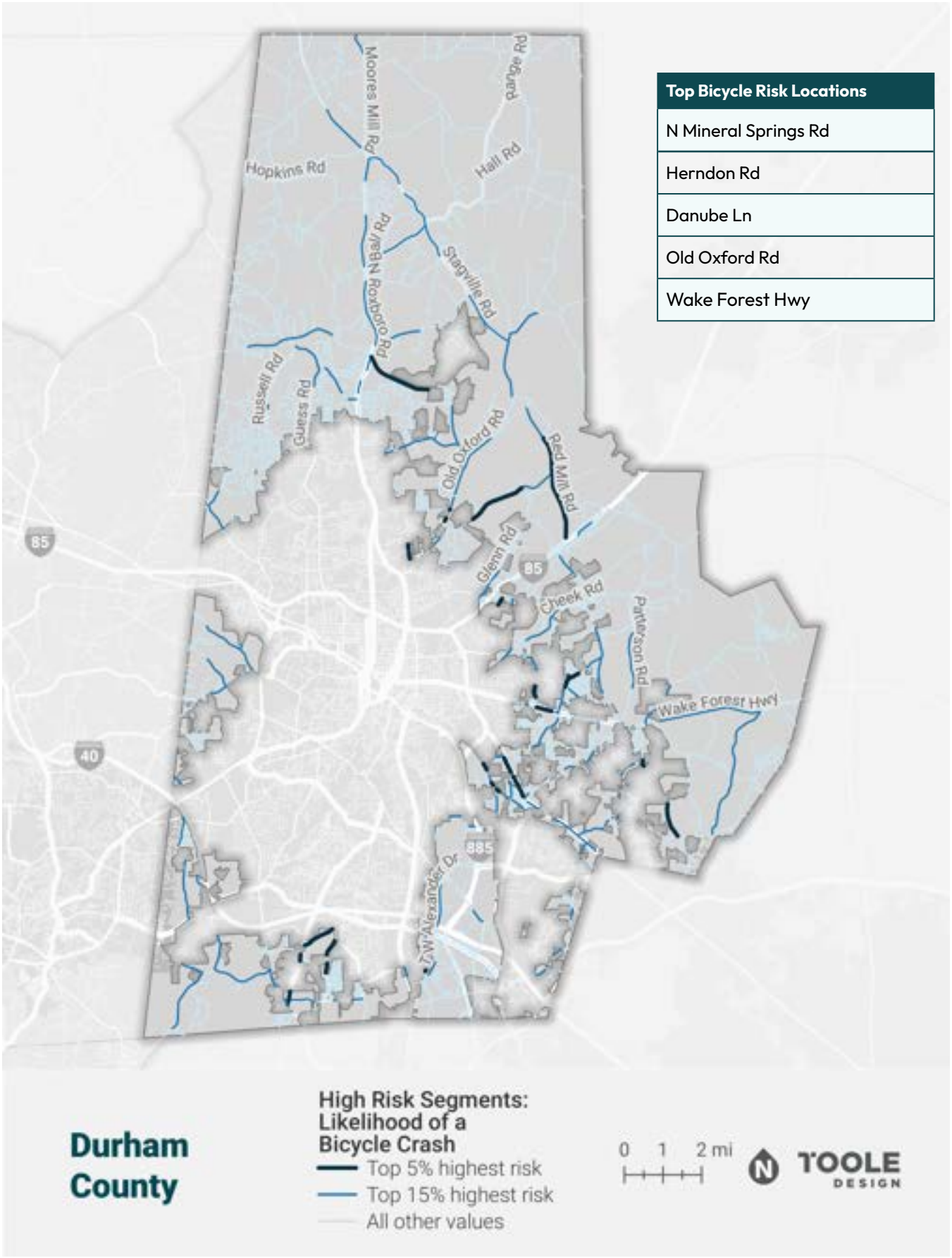
**MAP 69** Durham County VRU High Injury Corridors and Intersections Map



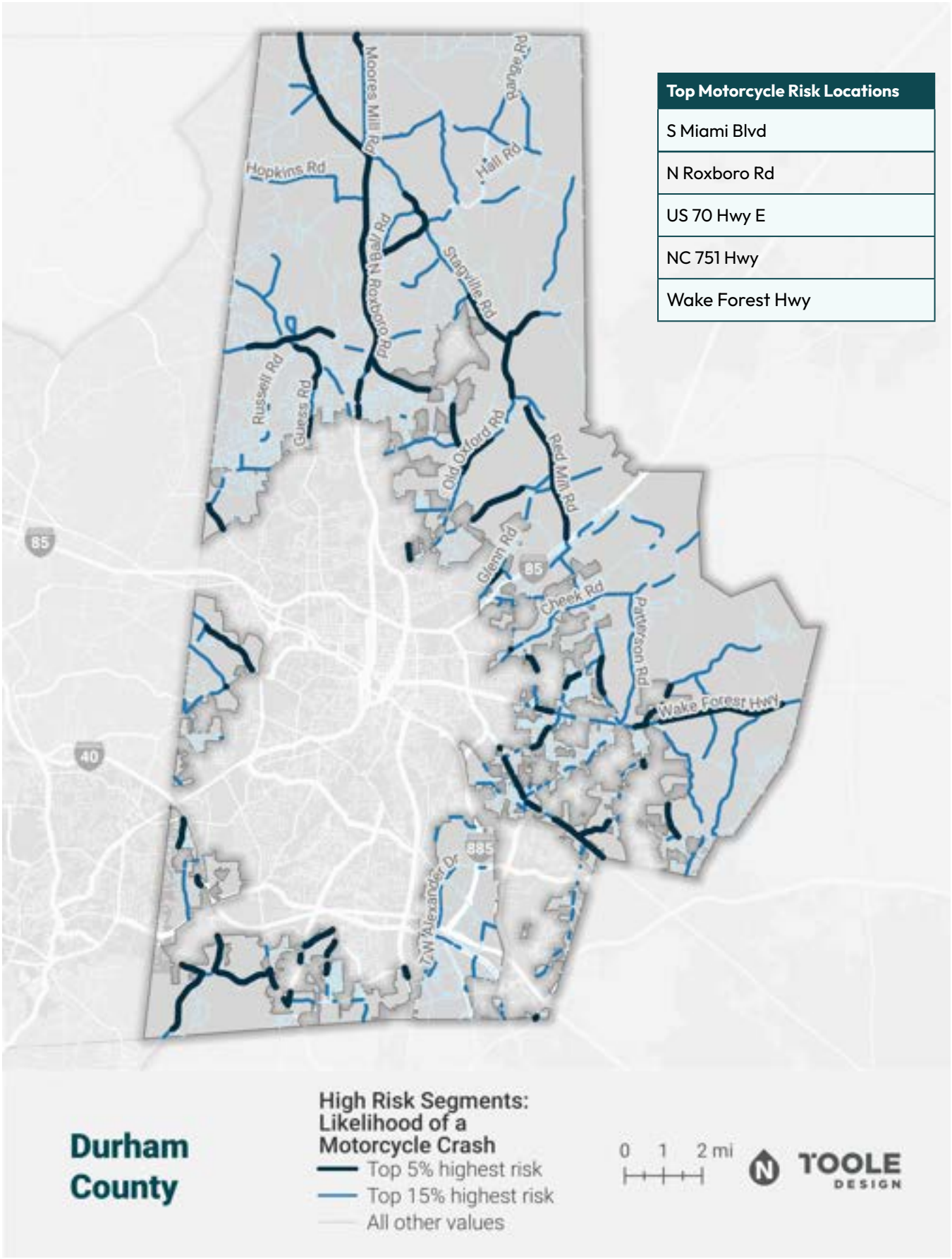
**MAP 70** Durham County High Risk Corridors Map: Pedestrian Risk



**MAP 71** Durham County High Risk Corridors Map: Bicycle Risk

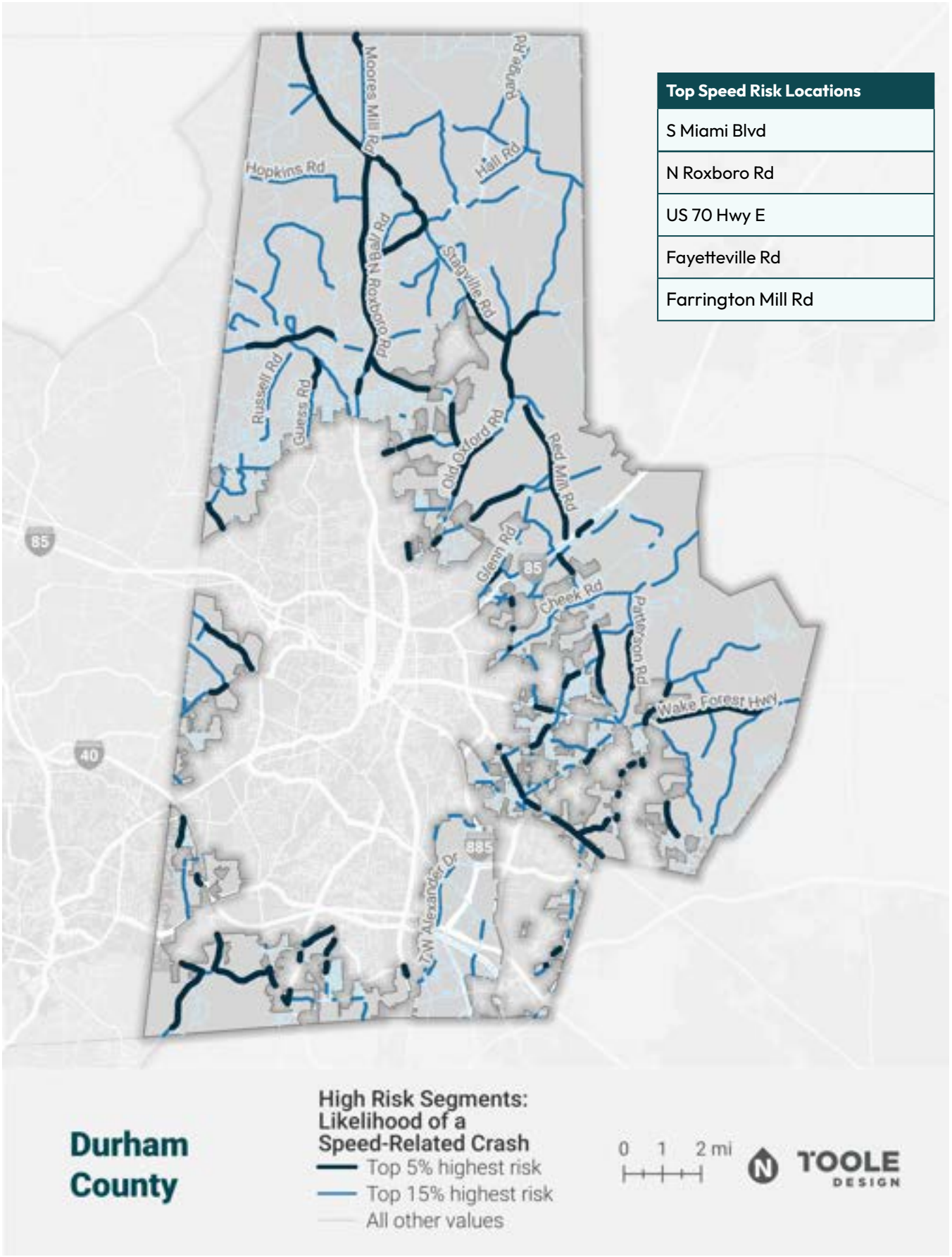


**MAP 72** Durham County High Risk Corridors Map: Motorcycle Risk



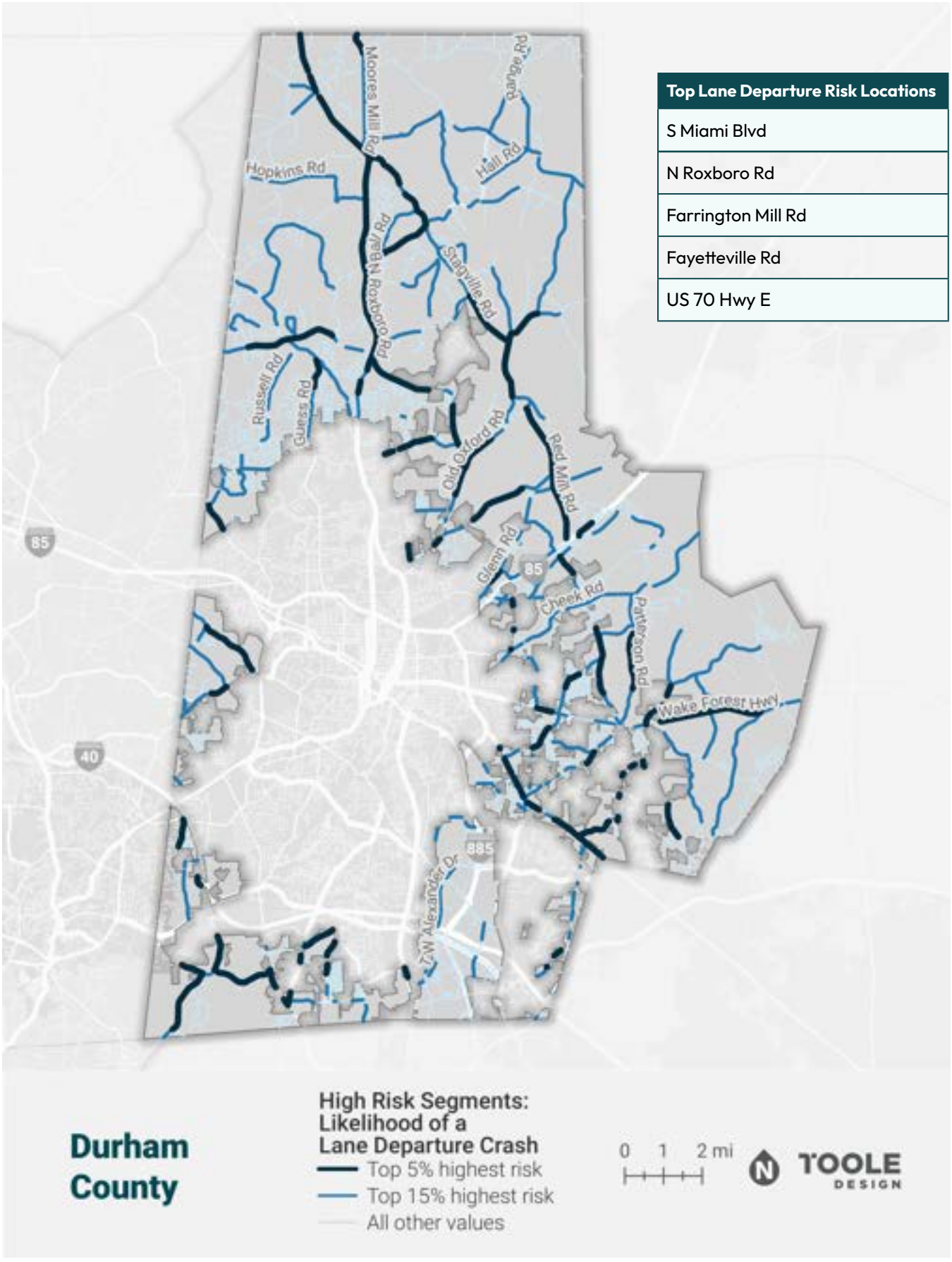

| Top Motorcycle Risk Locations |
|---|
| S Miami Blvd |
| N Roxboro Rd |
| US 70 Hwy E |
| NC 751 Hwy |
| Wake Forest Hwy |

**MAP 73** Durham County High Risk Corridors Map: Speed Risk



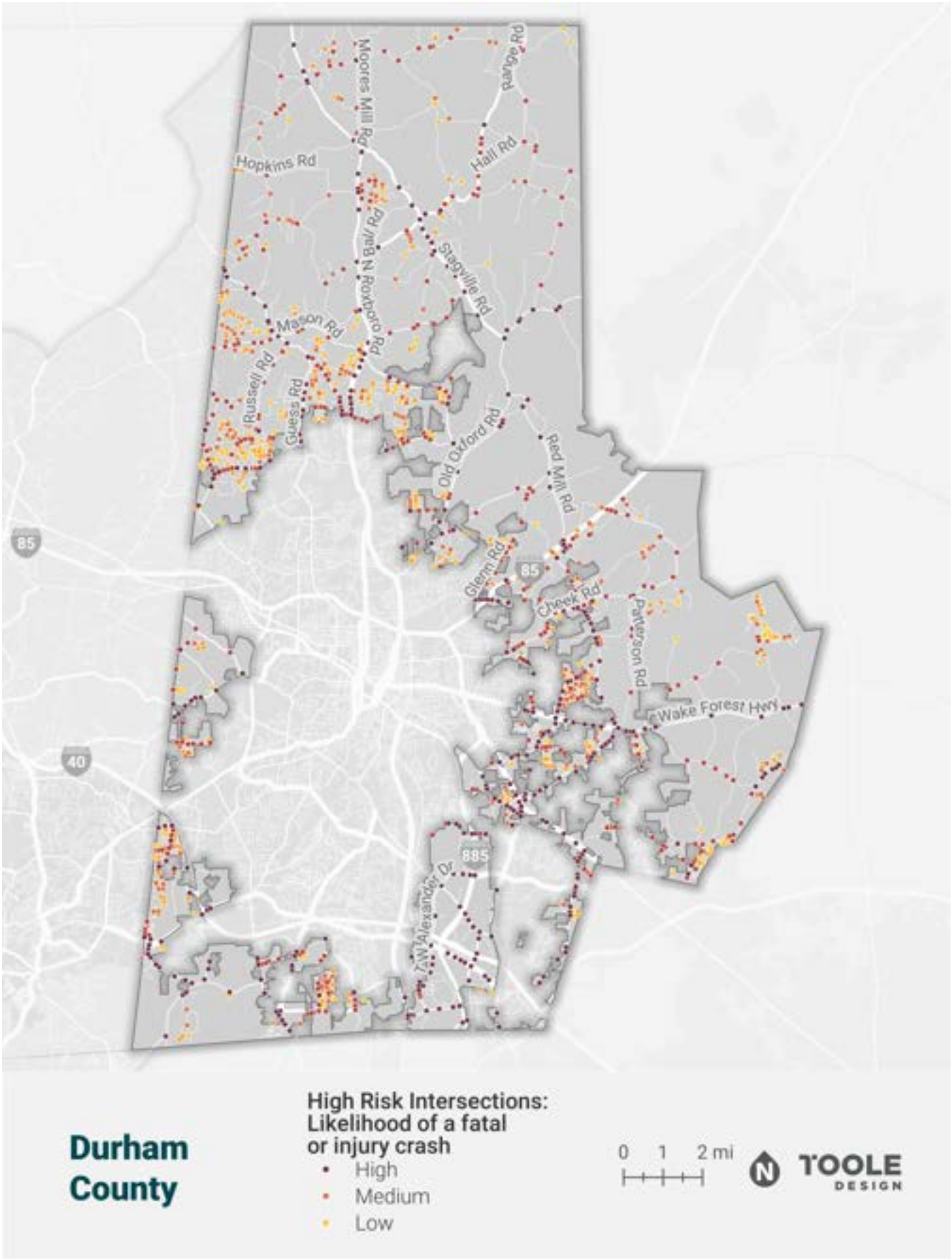

| Top Speed Risk Locations |
|---|
| S Miami Blvd |
| N Roxboro Rd |
| US 70 Hwy E |
| Fayetteville Rd |
| Farrington Mill Rd |

**MAP 74** Durham County High Risk Corridors Map: Lane Departure Risk

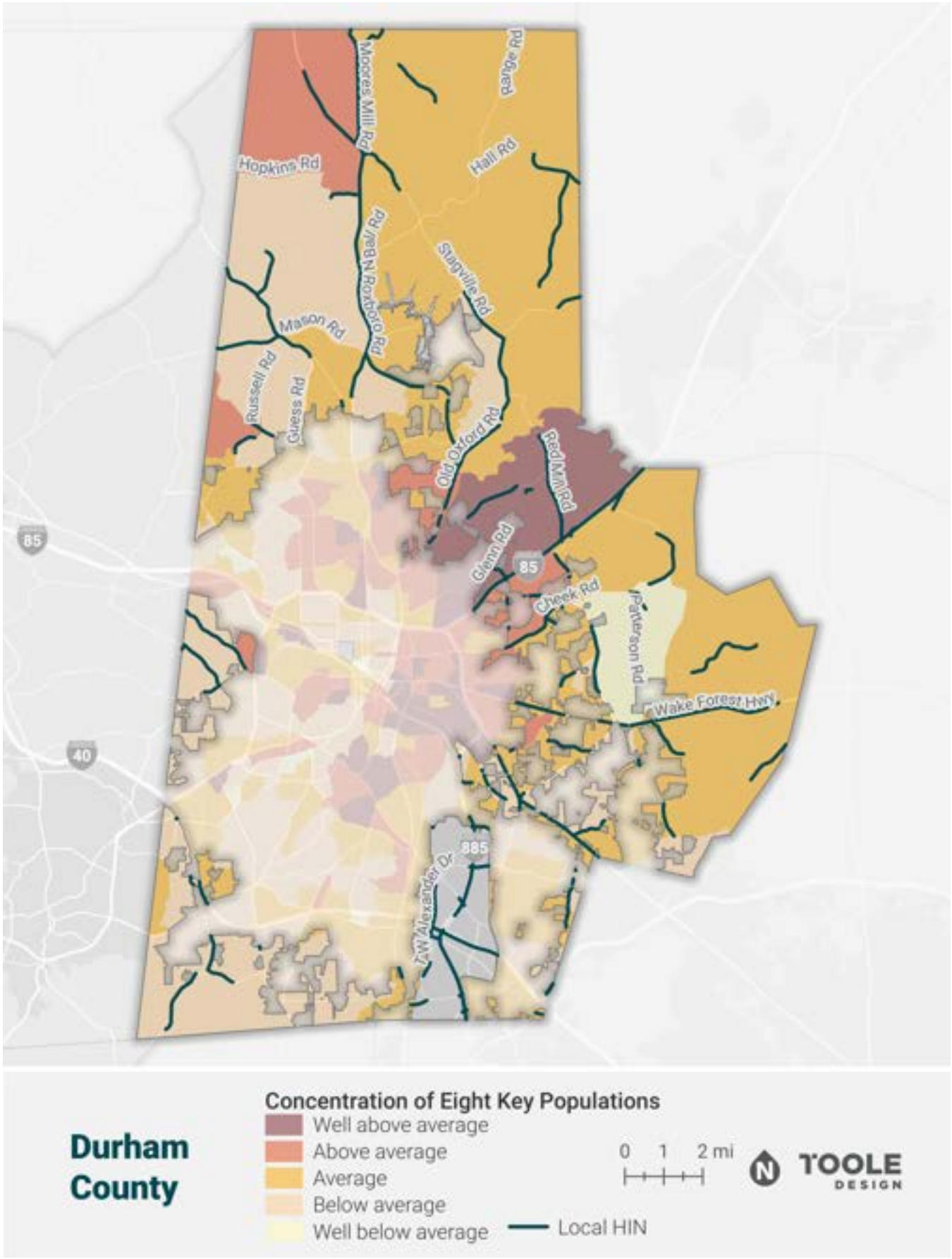



| Top Lane Departure Risk Locations |
|---|
| S Miami Blvd |
| N Roxboro Rd |
| Farrington Mill Rd |
| Fayetteville Rd |
| US 70 Hwy E |

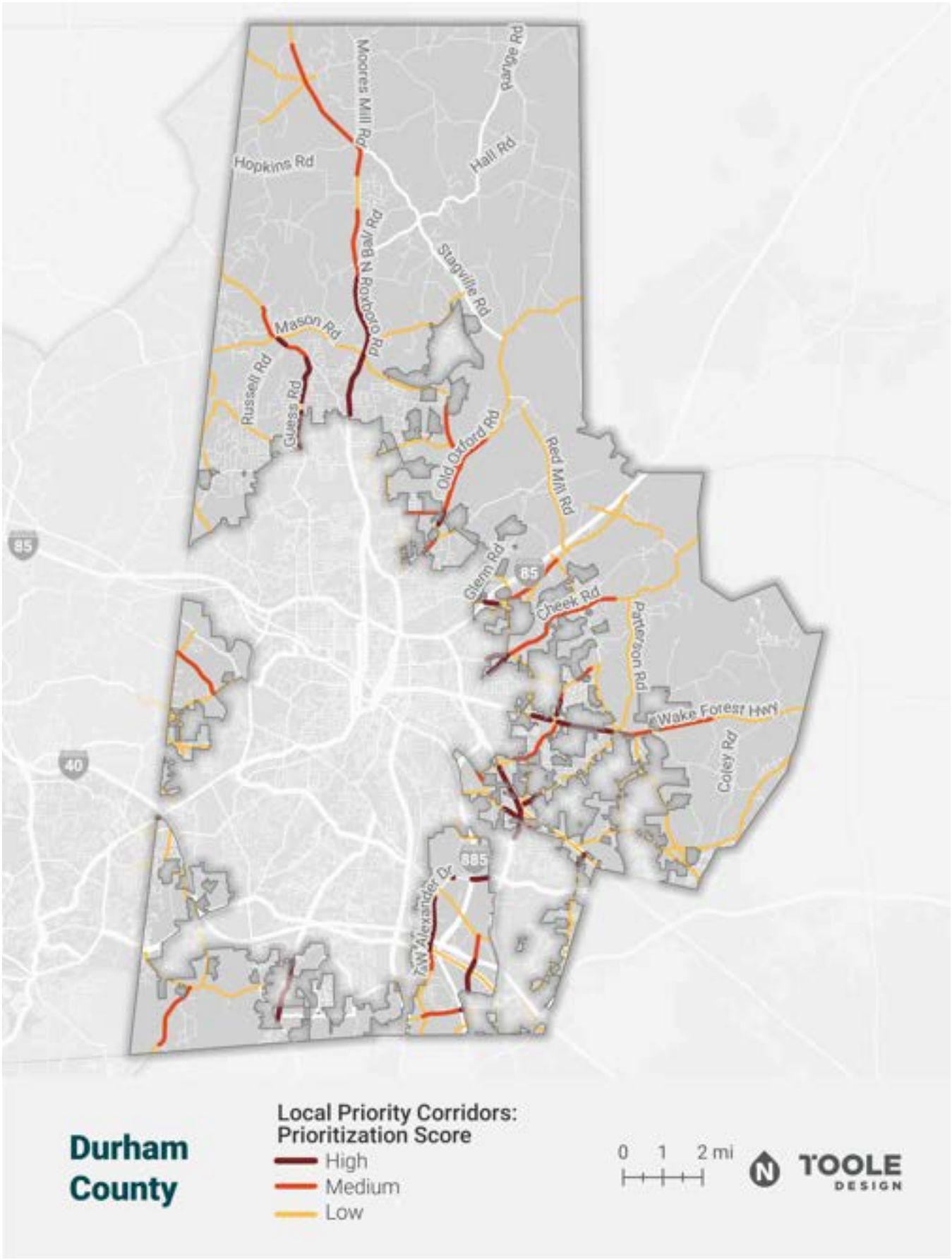
**MAP 75** Durham County High Risk Intersections Map



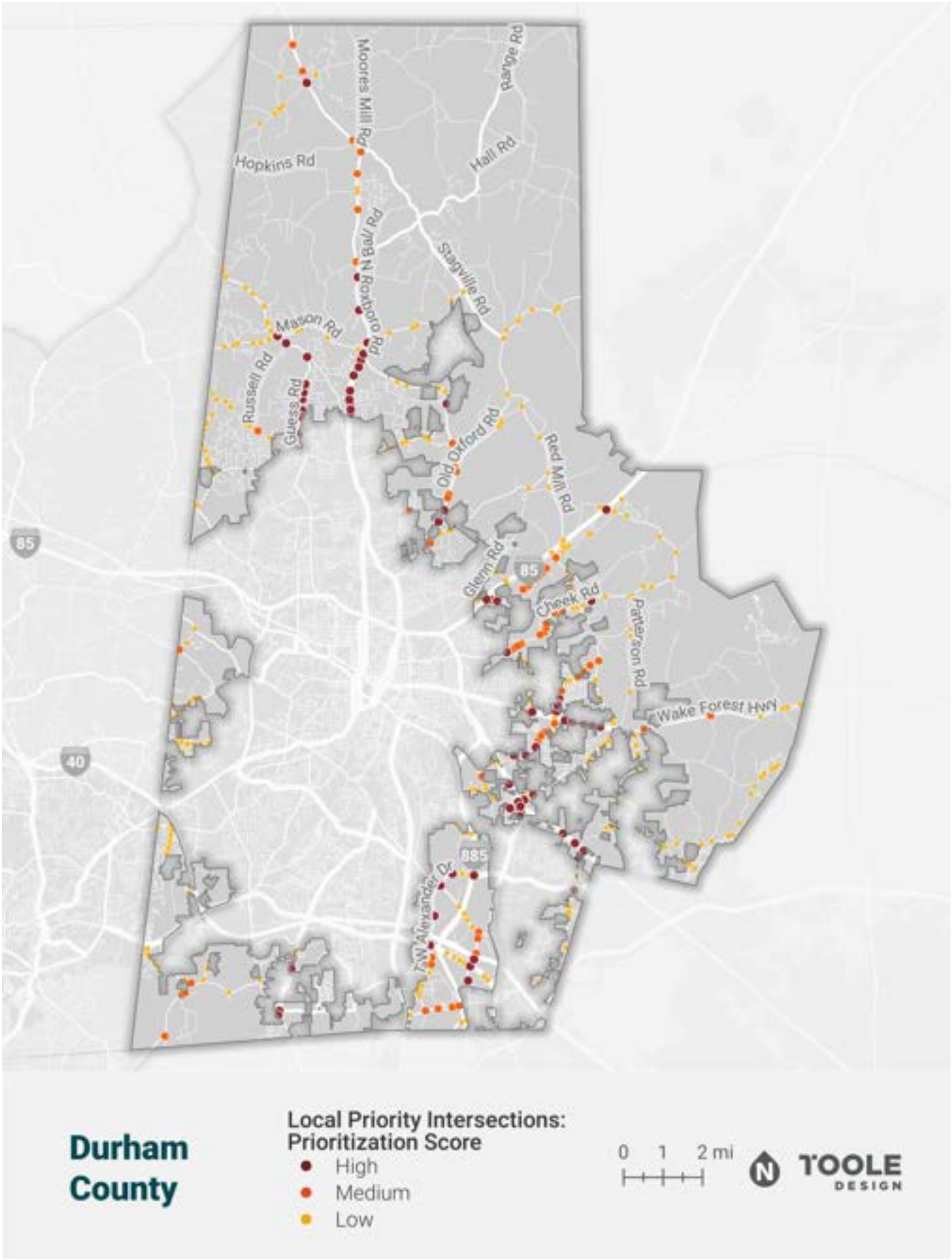
**MAP 76** Durham County Indicators of Potential Disadvantage and HIN Map



**MAP 77** Durham County Priority Corridors Map



**MAP 78** Durham County Priority Intersections Map



# Orange County

Source: Orange County

## Community Data

The following information is provided as a resource for Orange County and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Orange County.

### Population

148,696 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 69 fatalities
  - » Fatality rate per 100K: 6.63
  - » 236 serious injuries
- 2018-2022
  - » 48 fatalities
  - » Fatality rate per 100K: 6.46
  - » 134 serious injuries

### High Injury Network Coverage

10.07% of roadway miles cover 78% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.09
- Top 15% = “prob_ped” > 0.04 and < 0.09

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.07
- Top 15% = “prob_bike” > 0.03 and < 0.07

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.09
- Top 15% = “prob_MC” > 0.03 and < 0.09

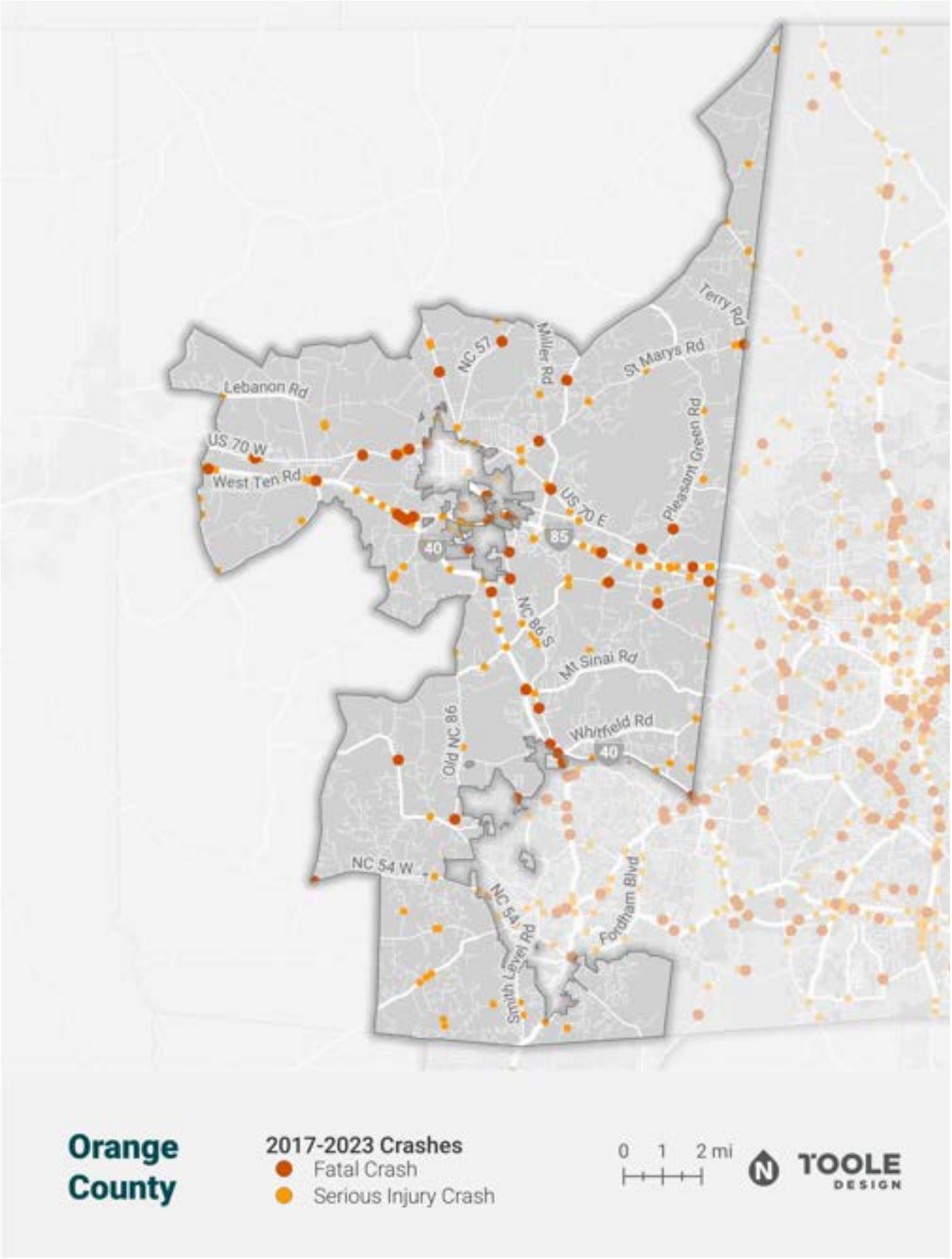
**Speed Risk**

- Top 5% = “prob_speed” > 0.18
- Top 15% = “prob_speed” > 0.06 and < 0.18

**Lane Departure Risk**

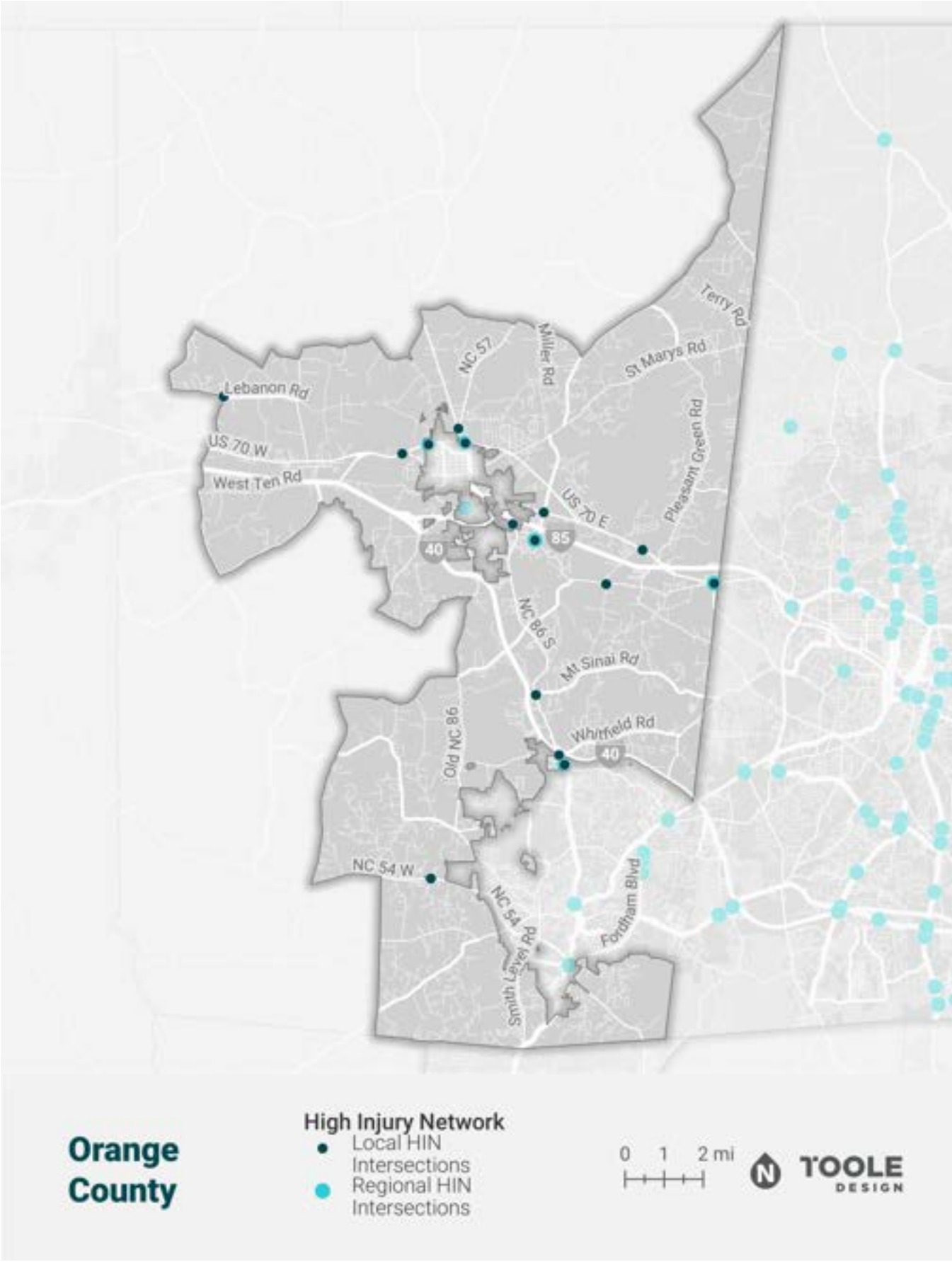
- Top 5% = “prob_LD” > 0.42
- Top 15% = “prob_LD” > 0.16 and < 0.42

**MAP 79** Orange County Crash Map

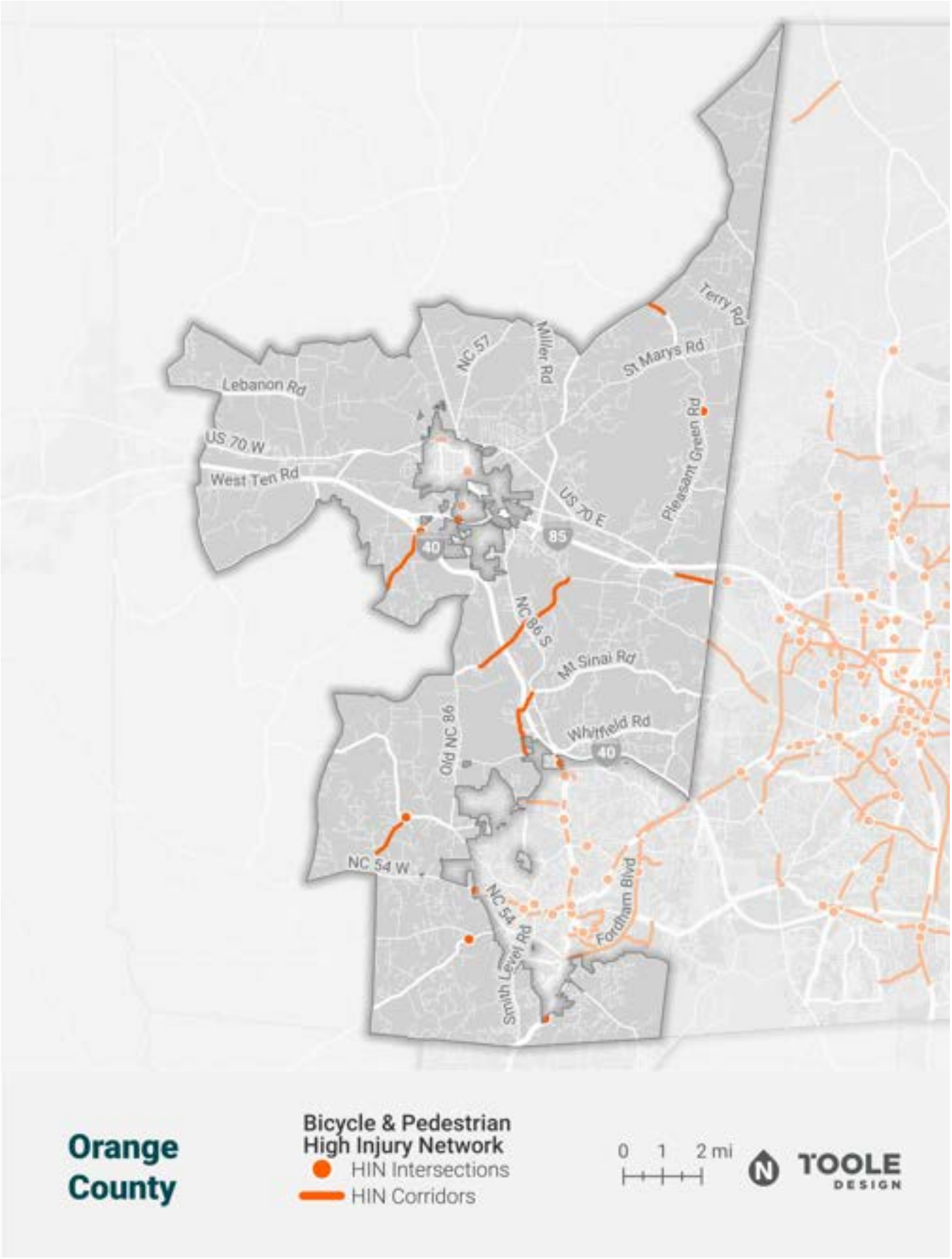


**MAP 80** Orange County High Injury Network Map

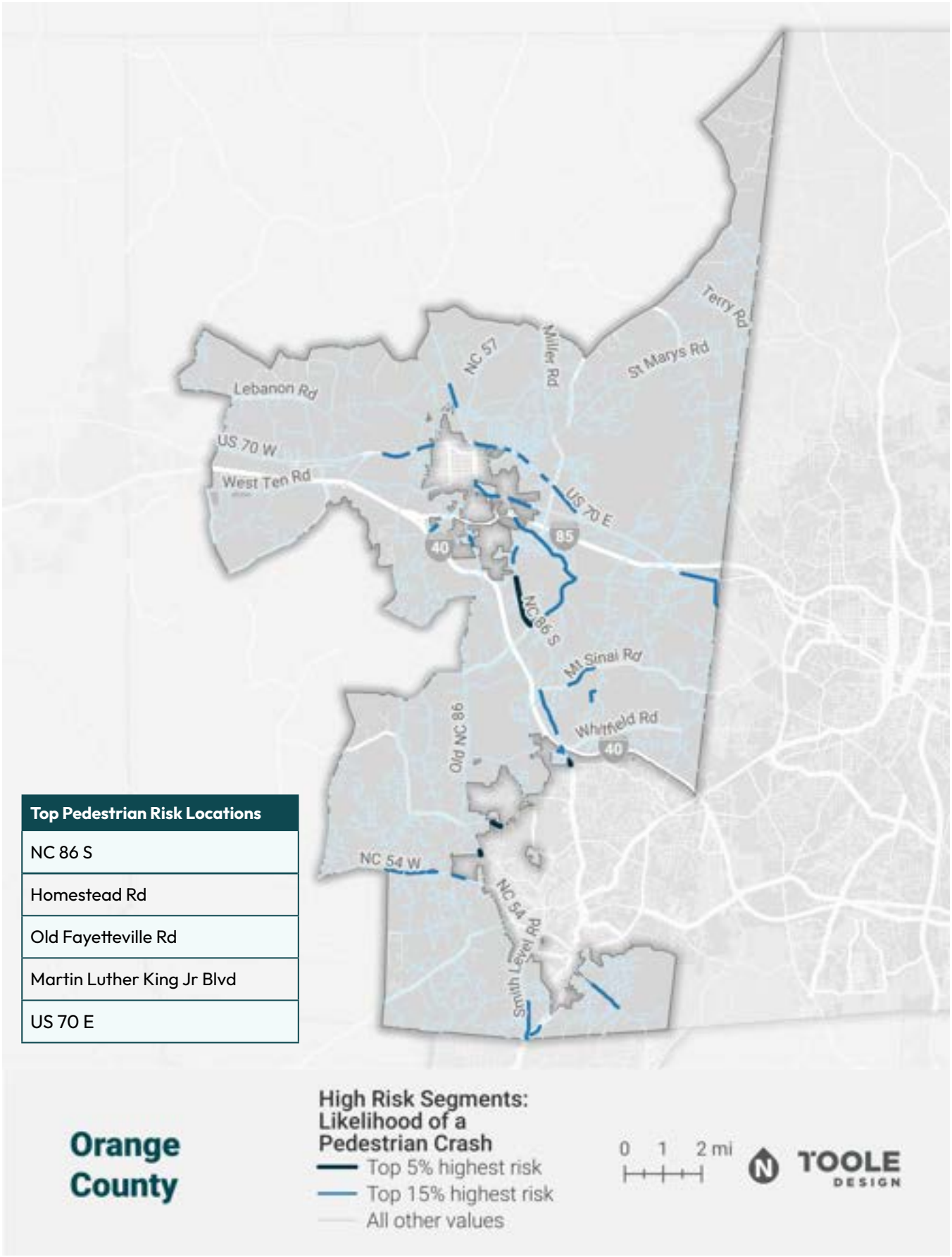
**MAP 81** Orange County High Injury Intersections Map



**MAP 82** Orange County VRU High Injury Corridors and Intersections Map

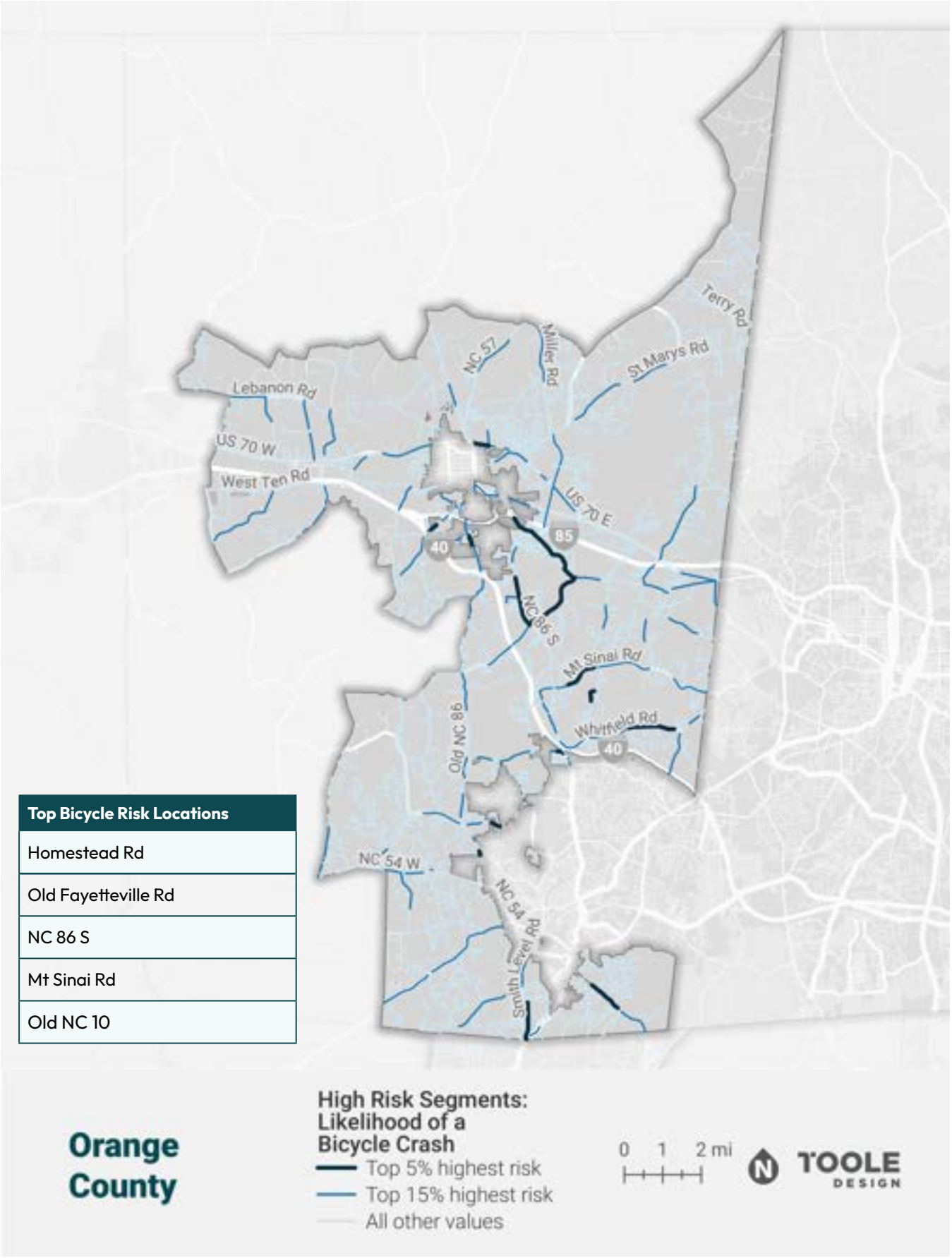


**MAP 83** Orange County High Risk Corridors Map: Pedestrian Risk



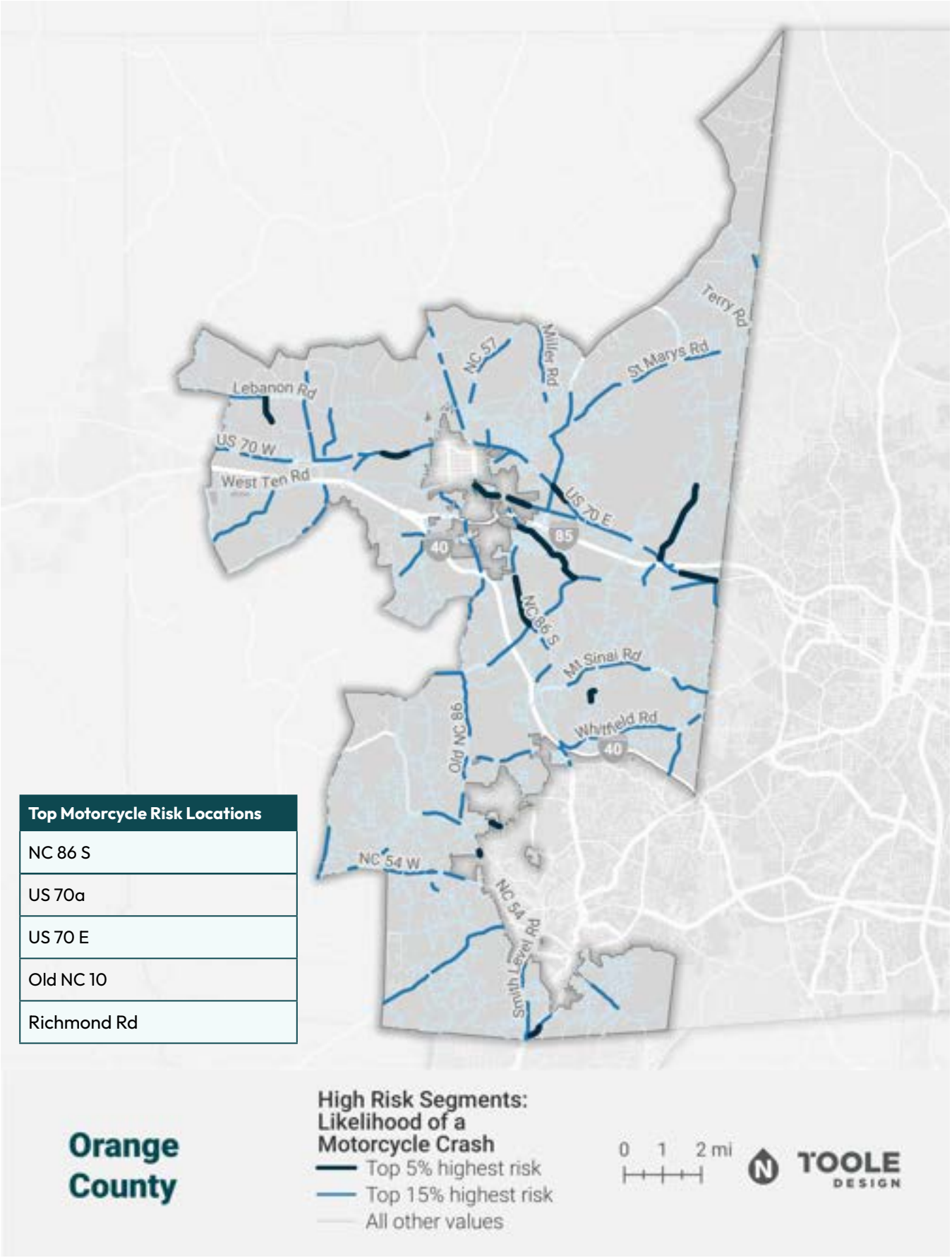

| Top Pedestrian Risk Locations |
|---|
| NC 86 S |
| Homestead Rd |
| Old Fayetteville Rd |
| Martin Luther King Jr Blvd |
| US 70 E |

**MAP 84** Orange County High Risk Corridors Map: Bicycle Risk



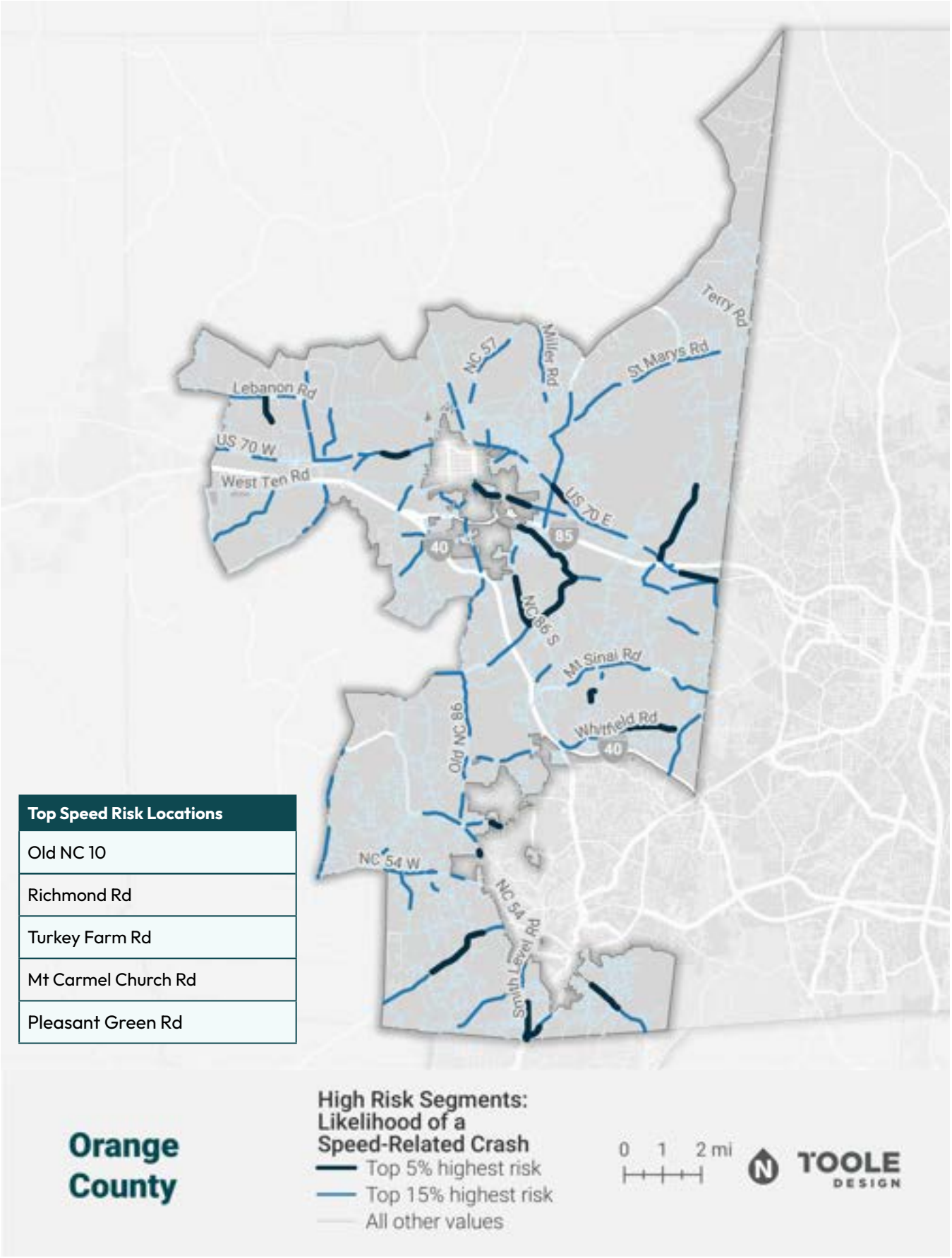

| Top Bicycle Risk Locations |
|---|
| Homestead Rd |
| Old Fayetteville Rd |
| NC 86 S |
| Mt Sinai Rd |
| Old NC 10 |

**MAP 85** Orange County High Risk Corridors Map: Motorcycle Risk



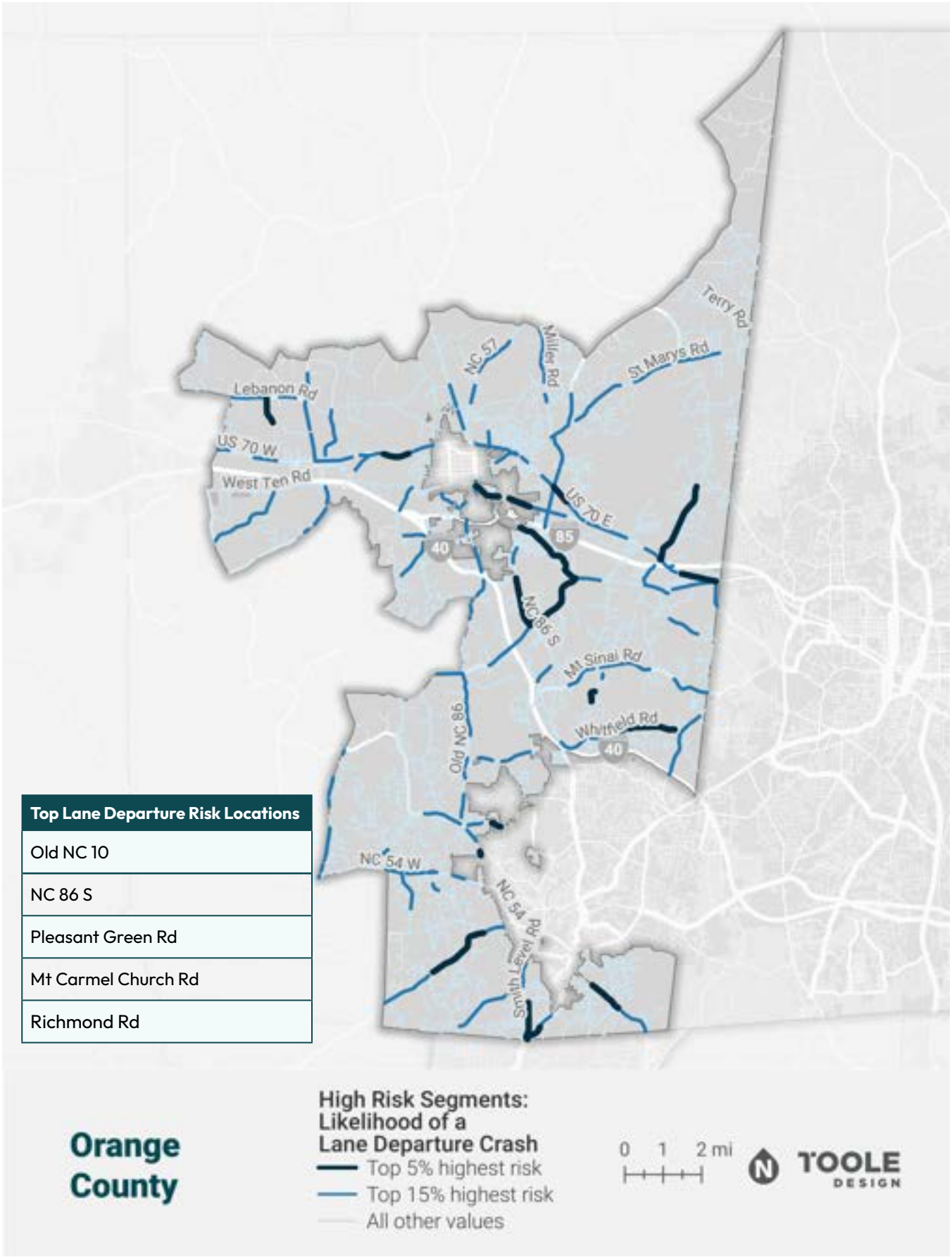

| Top Motorcycle Risk Locations |
|---|
| NC 86 S |
| US 70a |
| US 70 E |
| Old NC 10 |
| Richmond Rd |

**MAP 86** Orange County High Risk Corridors Map: Speed Risk



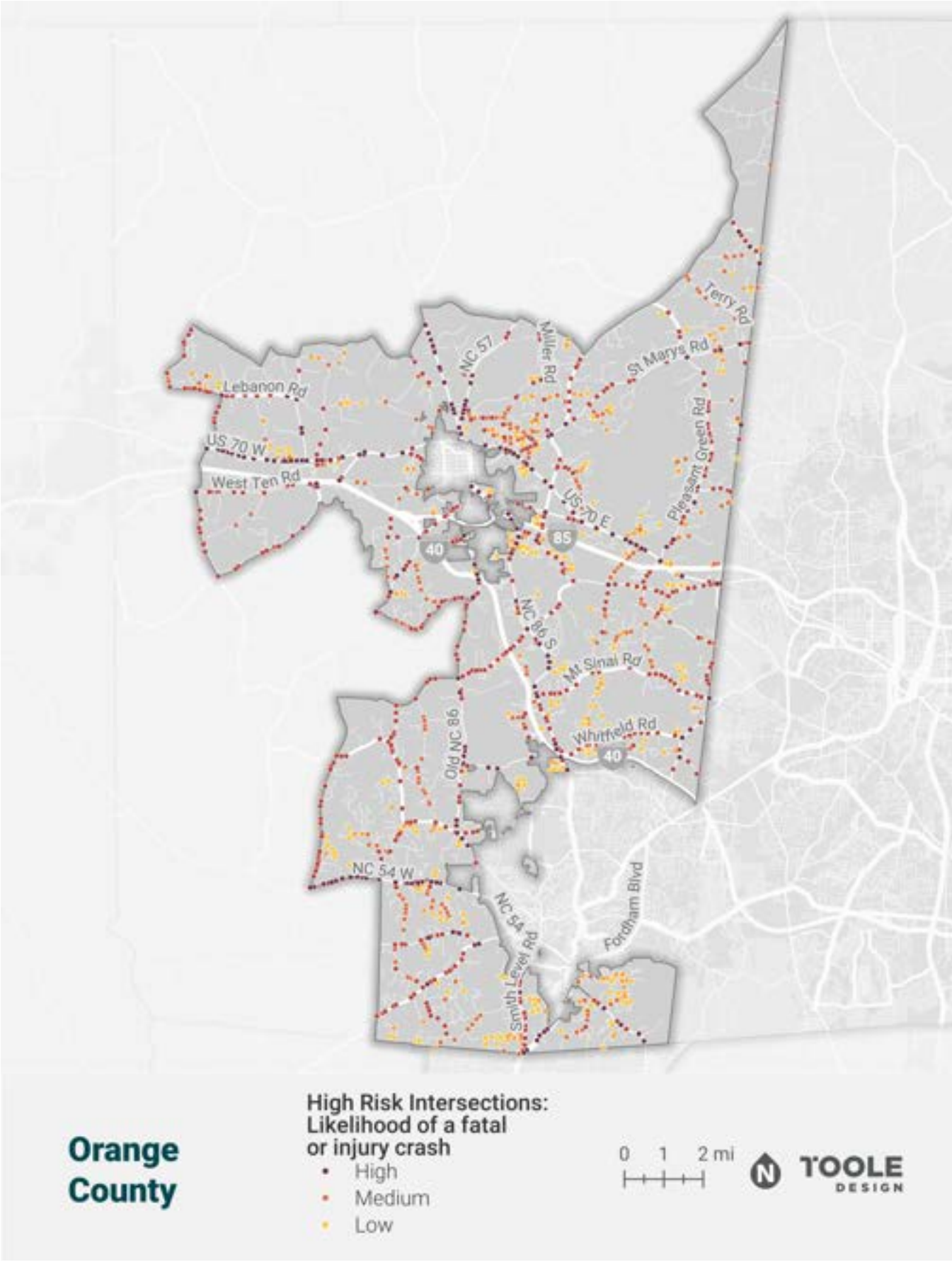

| Top Speed Risk Locations |
|---|
| Old NC 10 |
| Richmond Rd |
| Turkey Farm Rd |
| Mt Carmel Church Rd |
| Pleasant Green Rd |

**MAP 87** Orange County High Risk Corridors Map: Lane Departure Risk

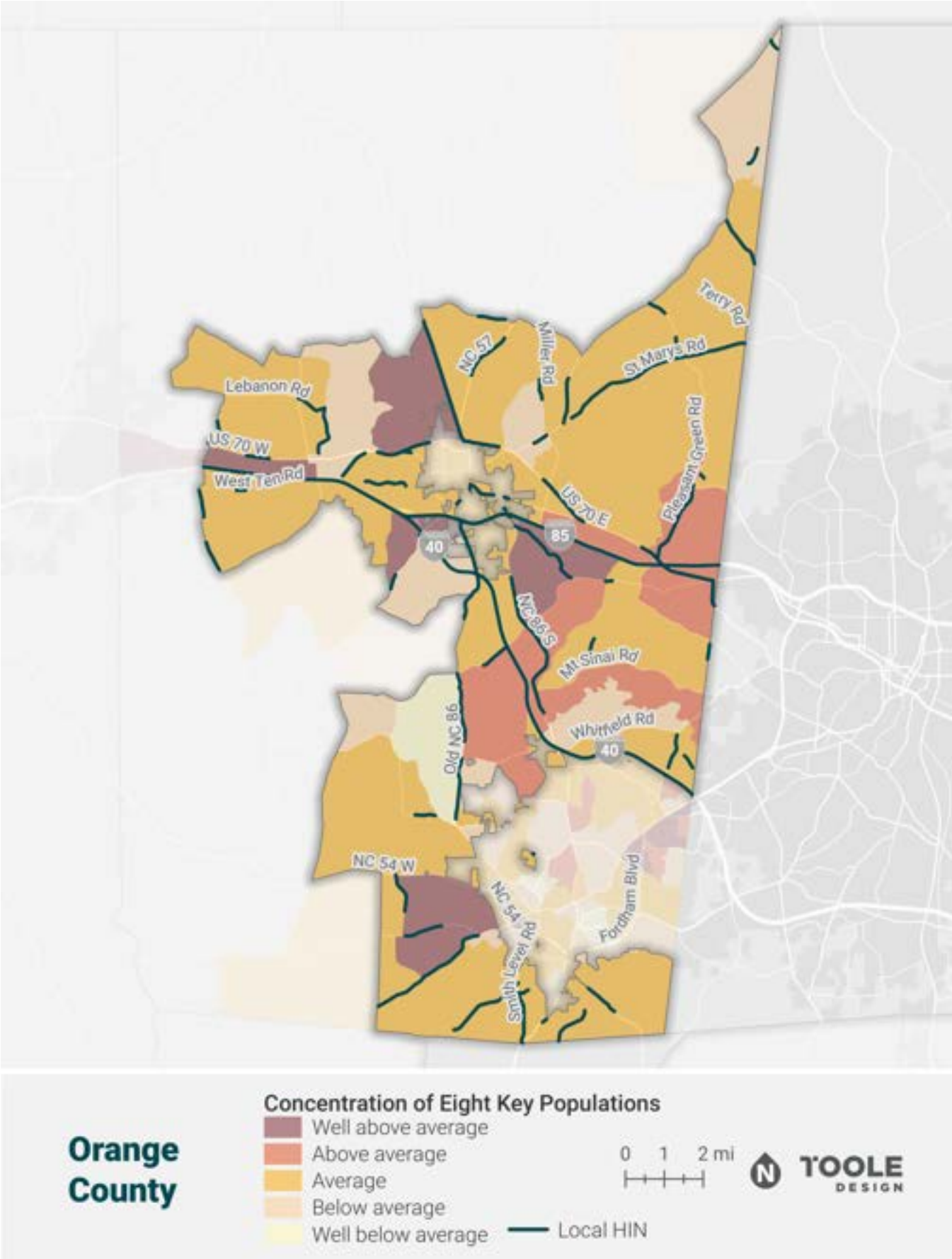



| Top Lane Departure Risk Locations |
|---|
| Old NC 10 |
| NC 86 S |
| Pleasant Green Rd |
| Mt Carmel Church Rd |
| Richmond Rd |

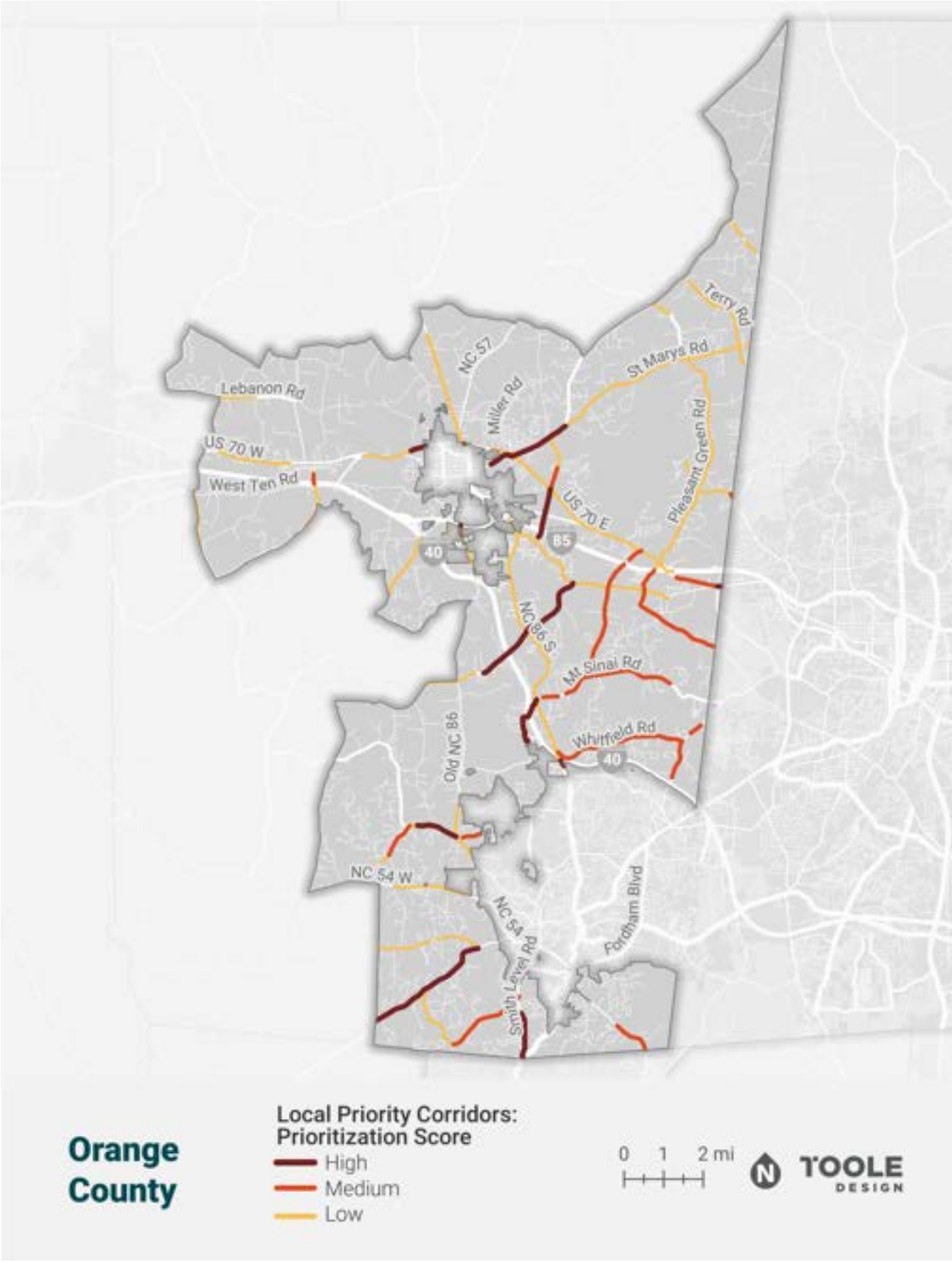
**MAP 88** Orange County High Risk Intersections Map



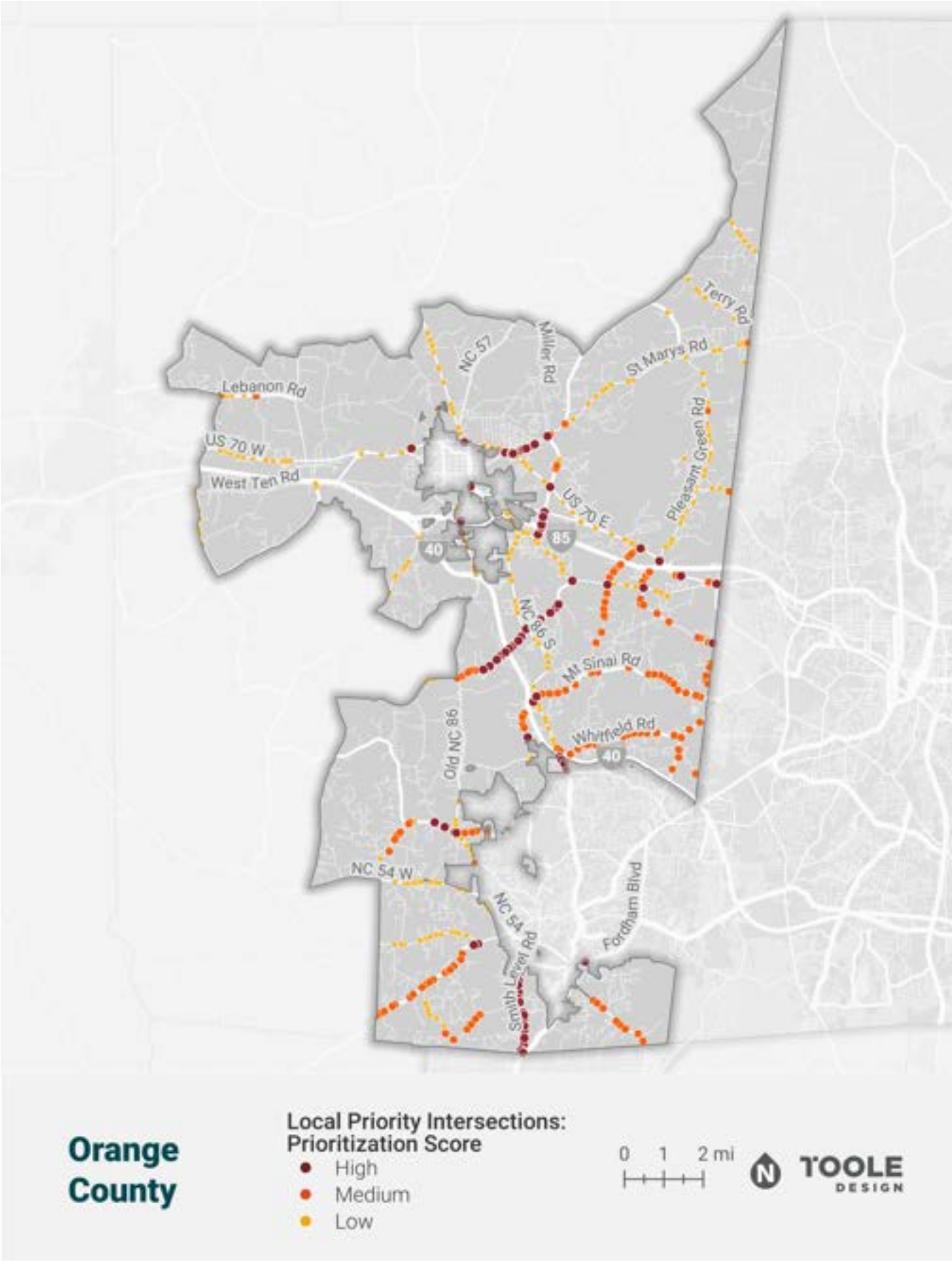
**MAP 89** Orange County Indicators of Potential Disadvantage and HIN Map



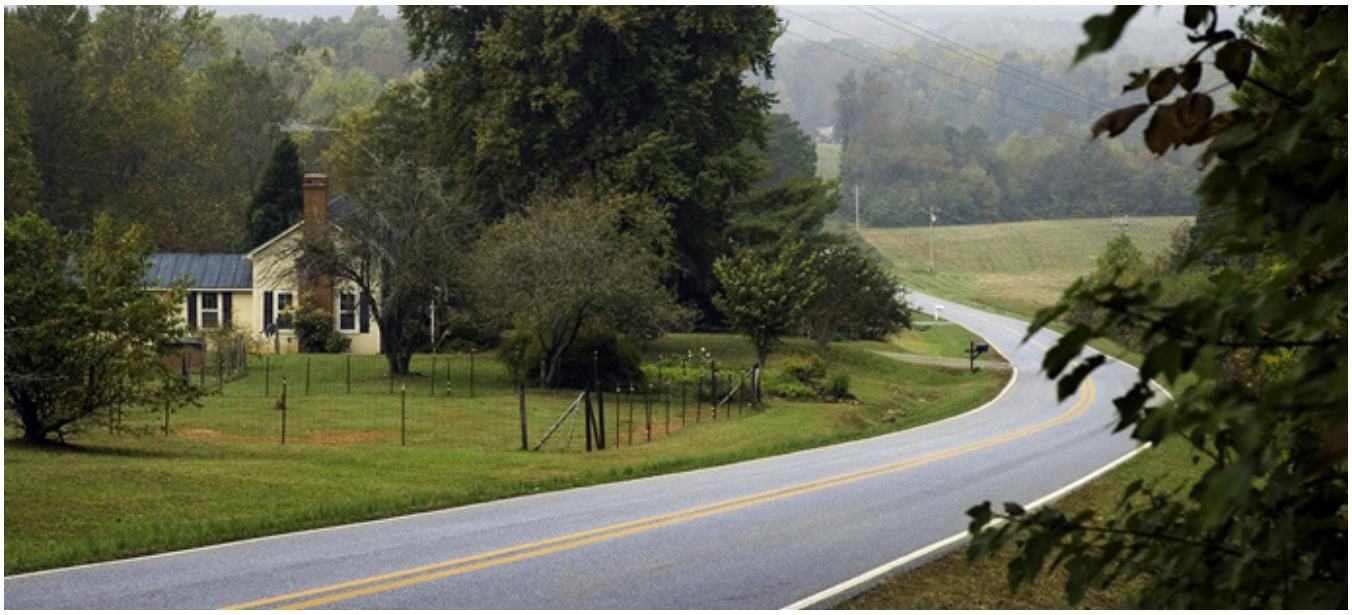
**MAP 90** Orange County Priority Corridors Map



**MAP 91** Orange County Priority Intersections Map



# Chatham County



Source: Chatham County

## Community Data

The following information is provided as a resource for Chatham County and can be used to support grant applications. Content specific to risk analysis should be used in conjunction with data from the Triangle West TPO Vision Zero Action Plan and is unique to Chatham County.

### Population

76,194 (2020)

### Roadway Fatalities and Serious Injuries

- 2017-2023
  - » 10 fatalities
  - » Fatality rate per 100K: 1.87
  - » 25 serious injuries
- 2018-2022
  - » 9 fatalities
  - » Fatality rate per 100K: 2.36
  - » 21 serious injuries

### High Injury Network Coverage

11.72% of roadway miles cover 94% of fatal and serious injury crashes (2017-2023)

### Risk Analysis Thresholds

The following provides information related to the data for each community and applicable attributes.

**Pedestrian Risk**

- Top 5% = “prob_ped” > 0.02
- Top 15% = “prob_ped” > 0.01 and < 0.02

**Bicycle Risk**

- Top 5% = “prob_bike” > 0.03
- Top 15% = “prob_bike” > 0.01 and < 0.03

**Motorcycle Risk**

- Top 5% = “prob_MC” > 0.03
- Top 15% = “prob_MC” > 0.00 and < 0.03

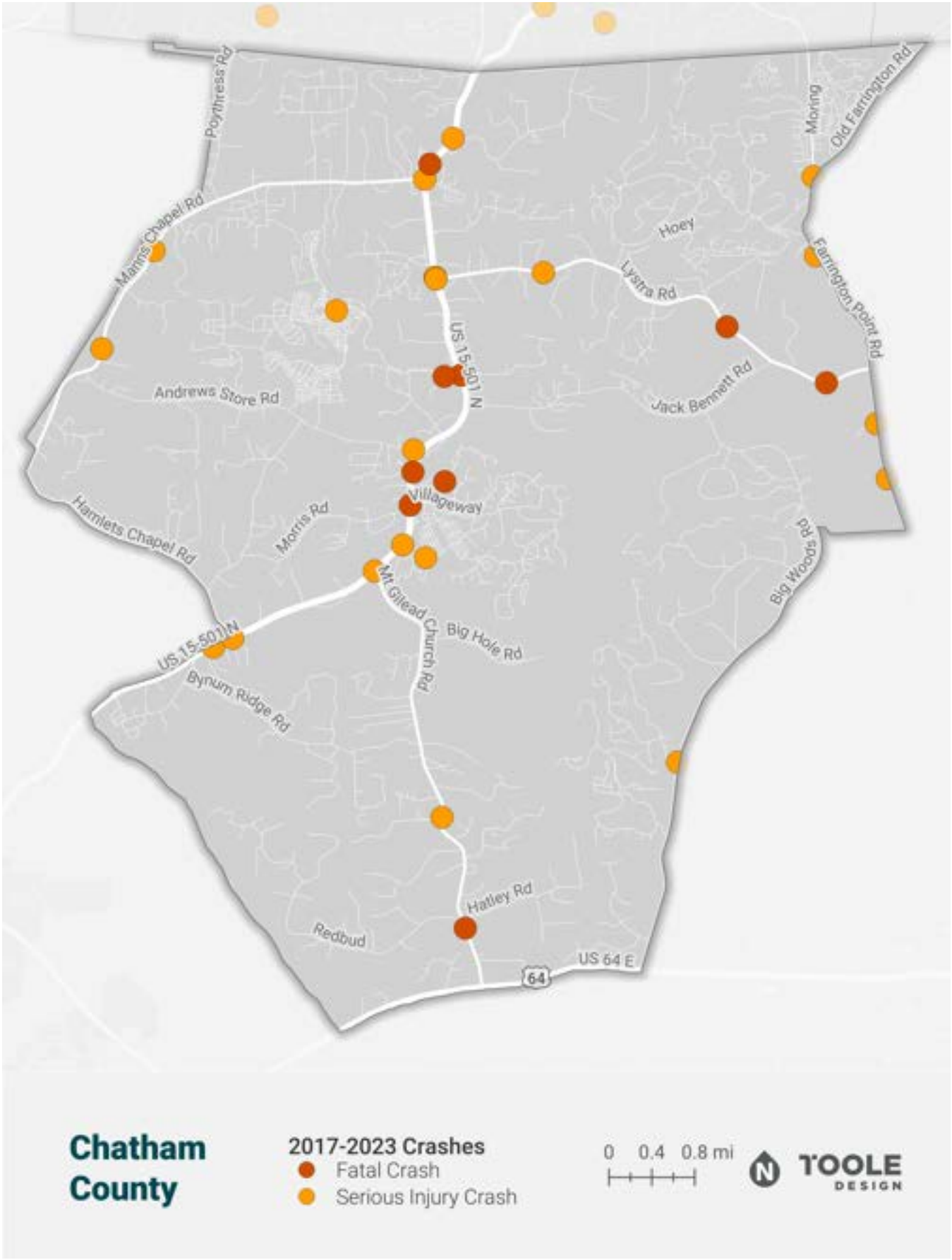
**Speed Risk**

- Top 5% = “prob_speed” > 0.12
- Top 15% = “prob_speed” > 0.02 and < 0.12

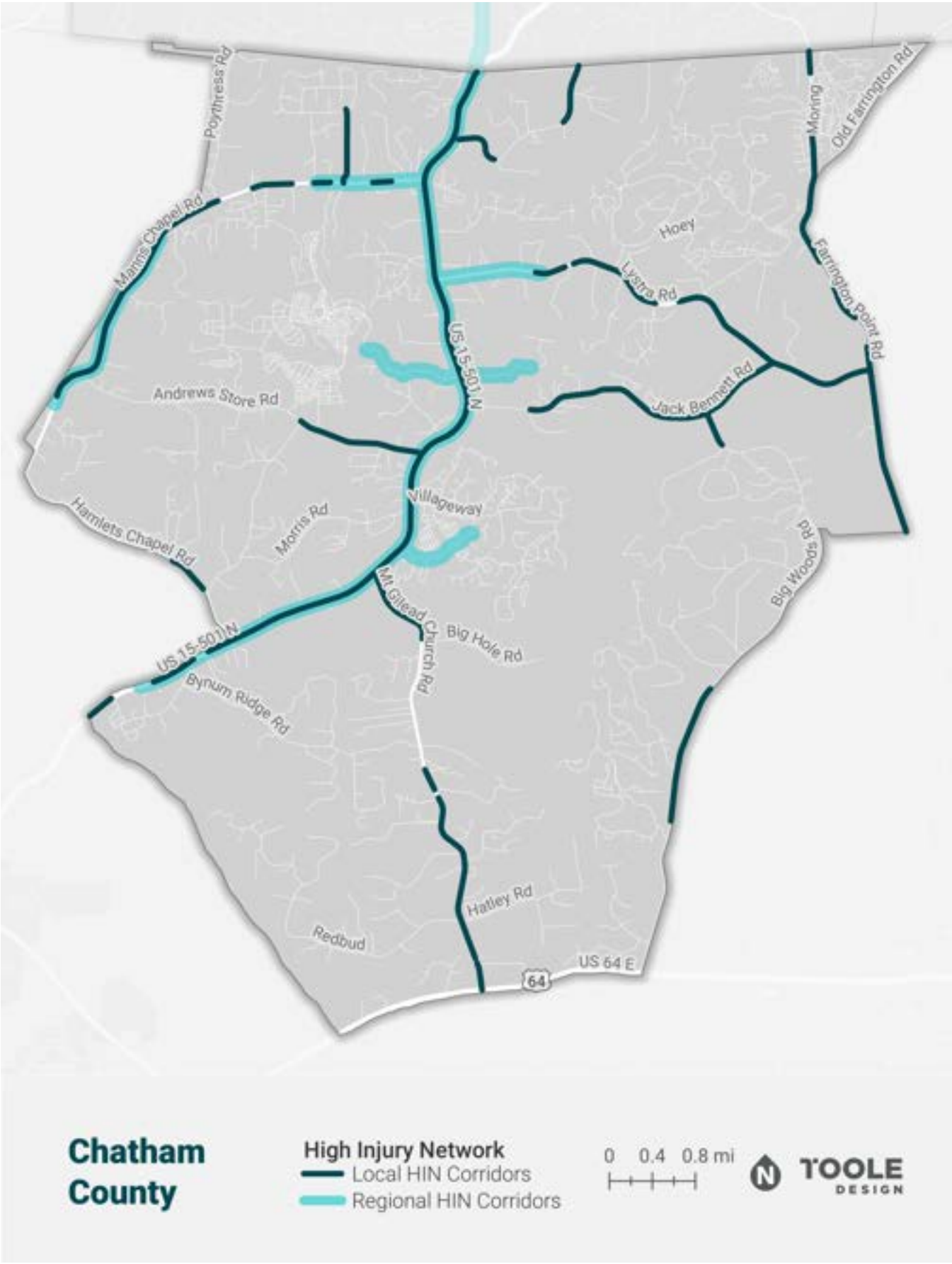
**Lane Departure Risk**

- Top 5% = “prob_LD” > 0.36
- Top 15% = “prob_LD” > 0.08 and < 0.36

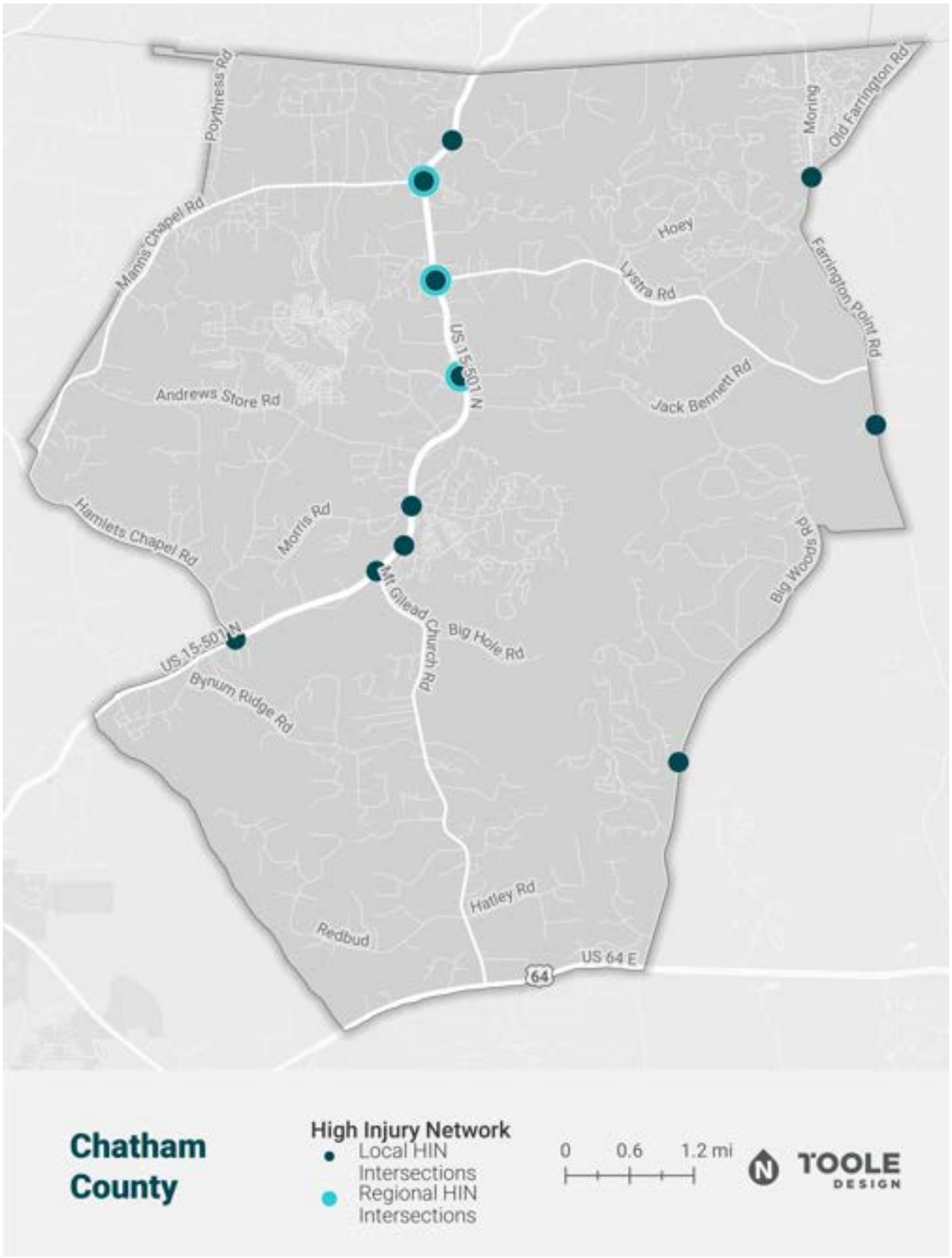
**MAP 92** Chatham County Crash Map



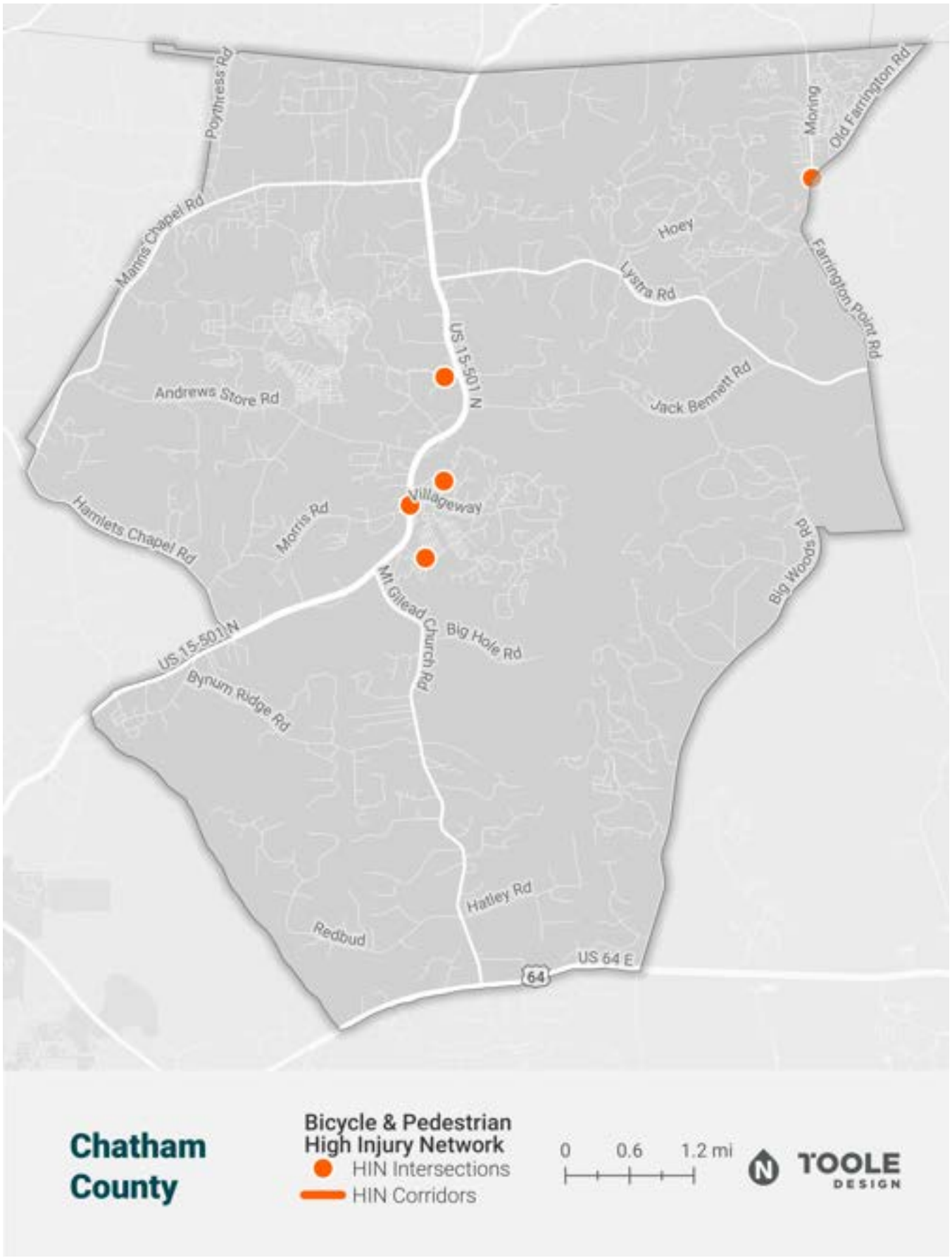
**MAP 93** Chatham County High Injury Network Map



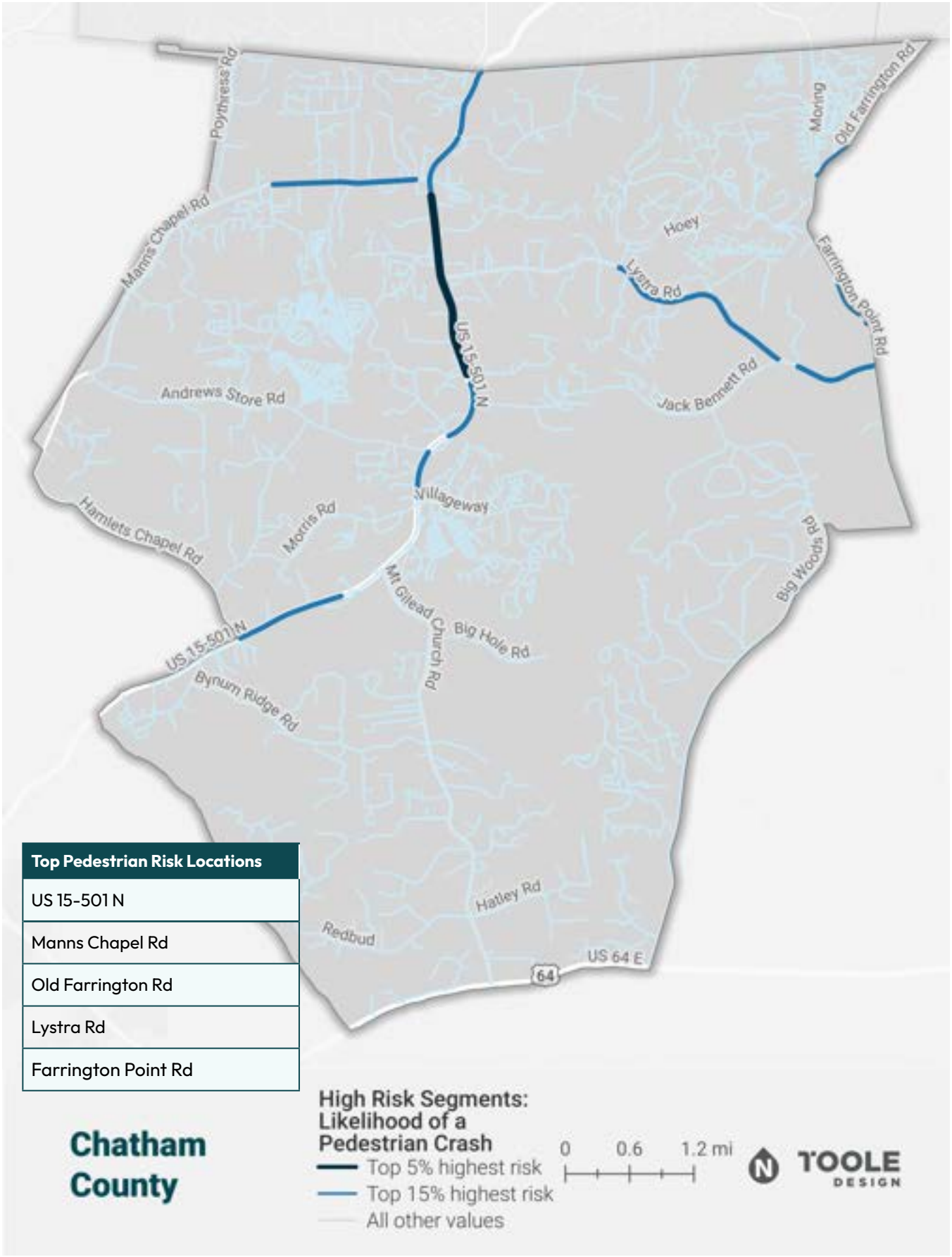
**MAP 94** Chatham County High Injury Intersections Map



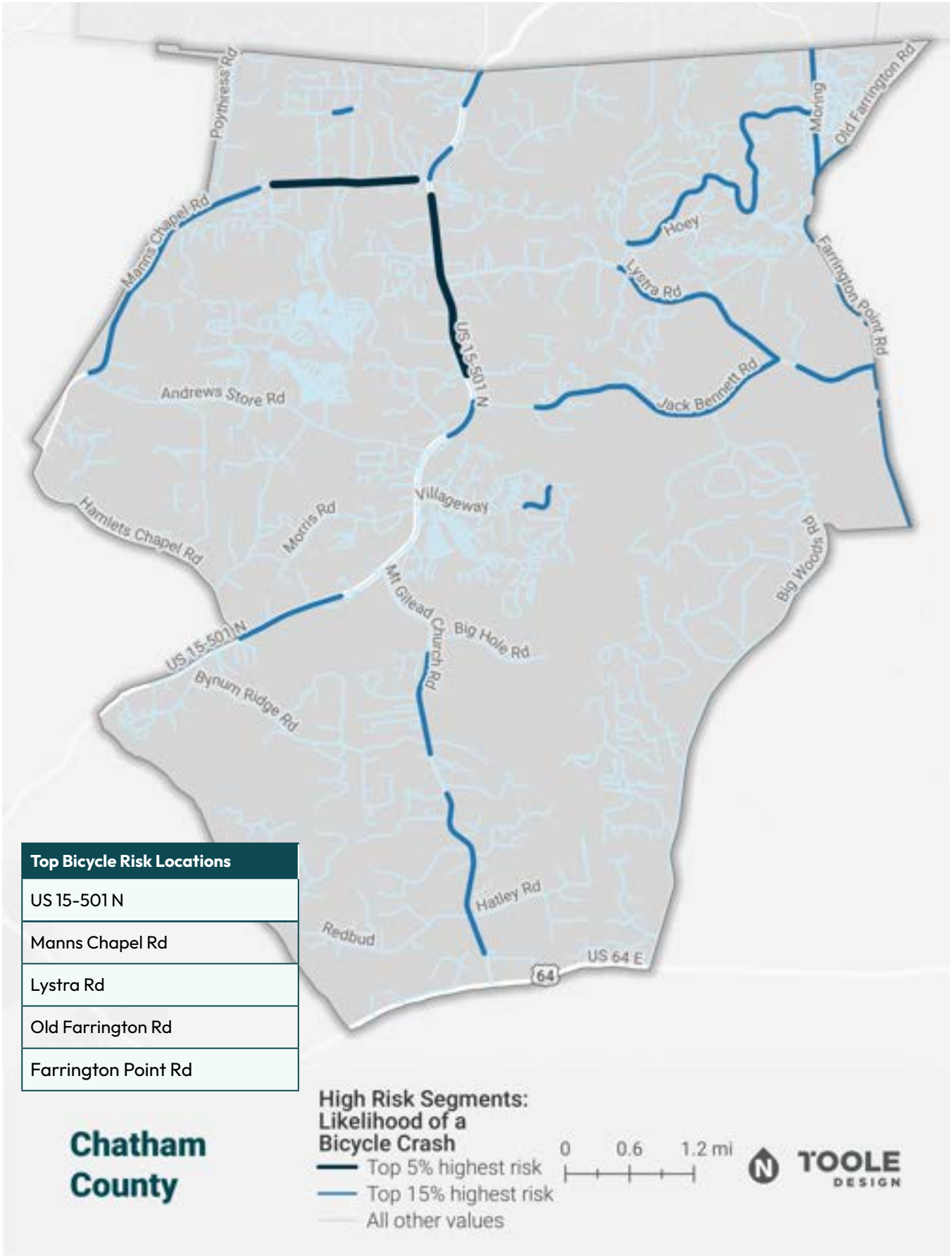
**MAP 95** Chatham County VRU High Injury Corridors and Intersections Map



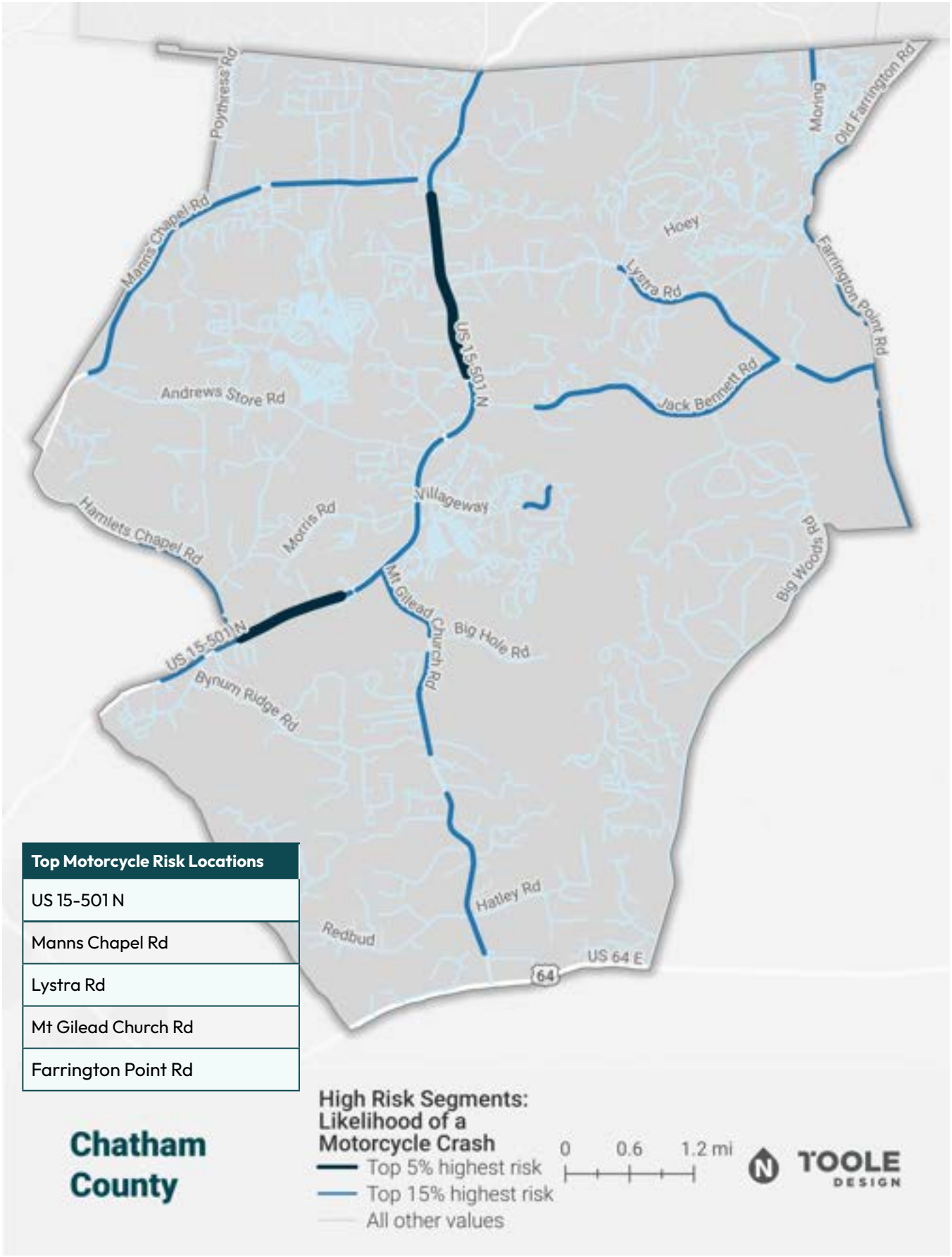
**MAP 96** Chatham County High Risk Corridors Map: Pedestrian Risk



**MAP 97** Chatham County High Risk Corridors Map: Bicycle Risk

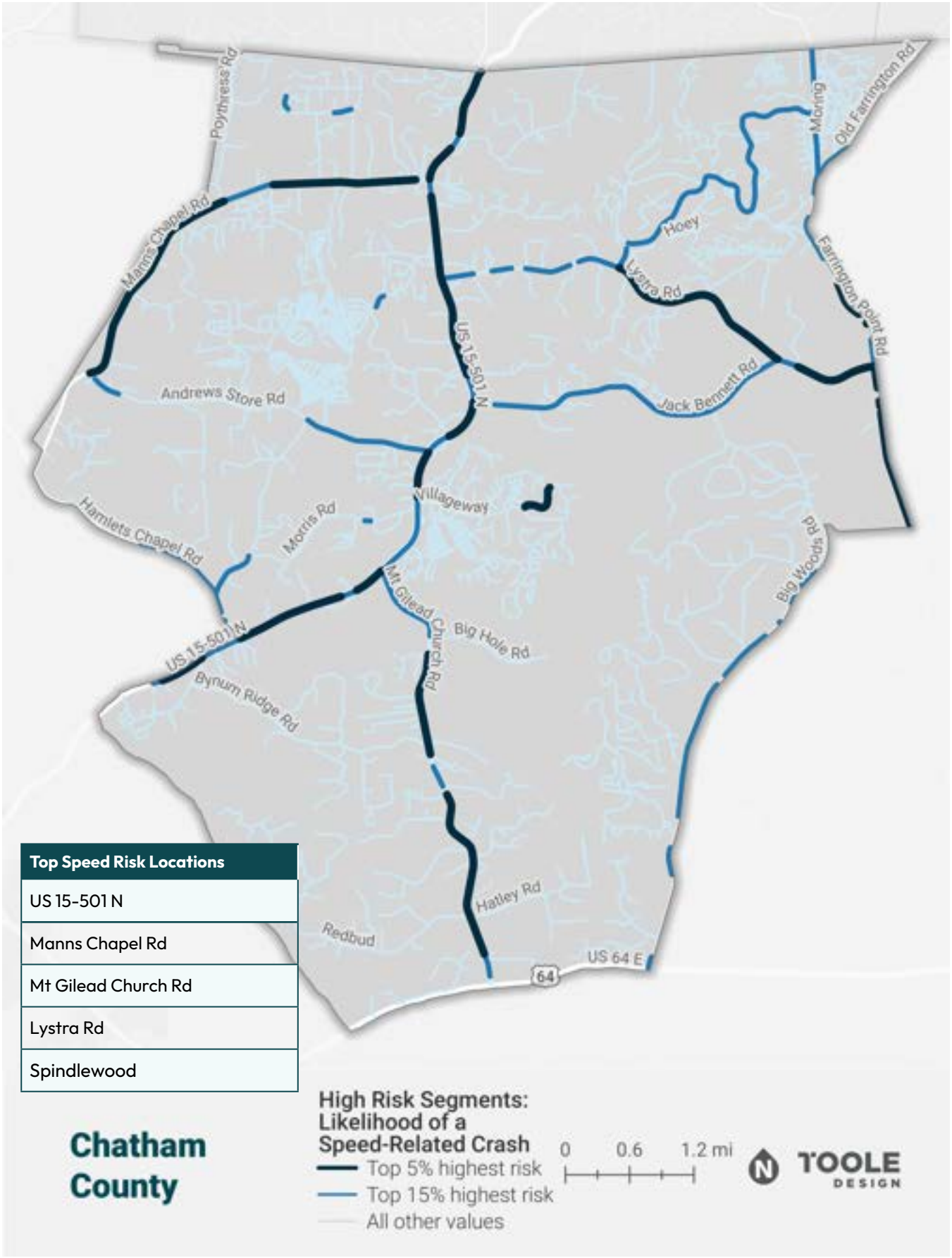


**MAP 98** Chatham County High Risk Corridors Map: Motorcycle Risk

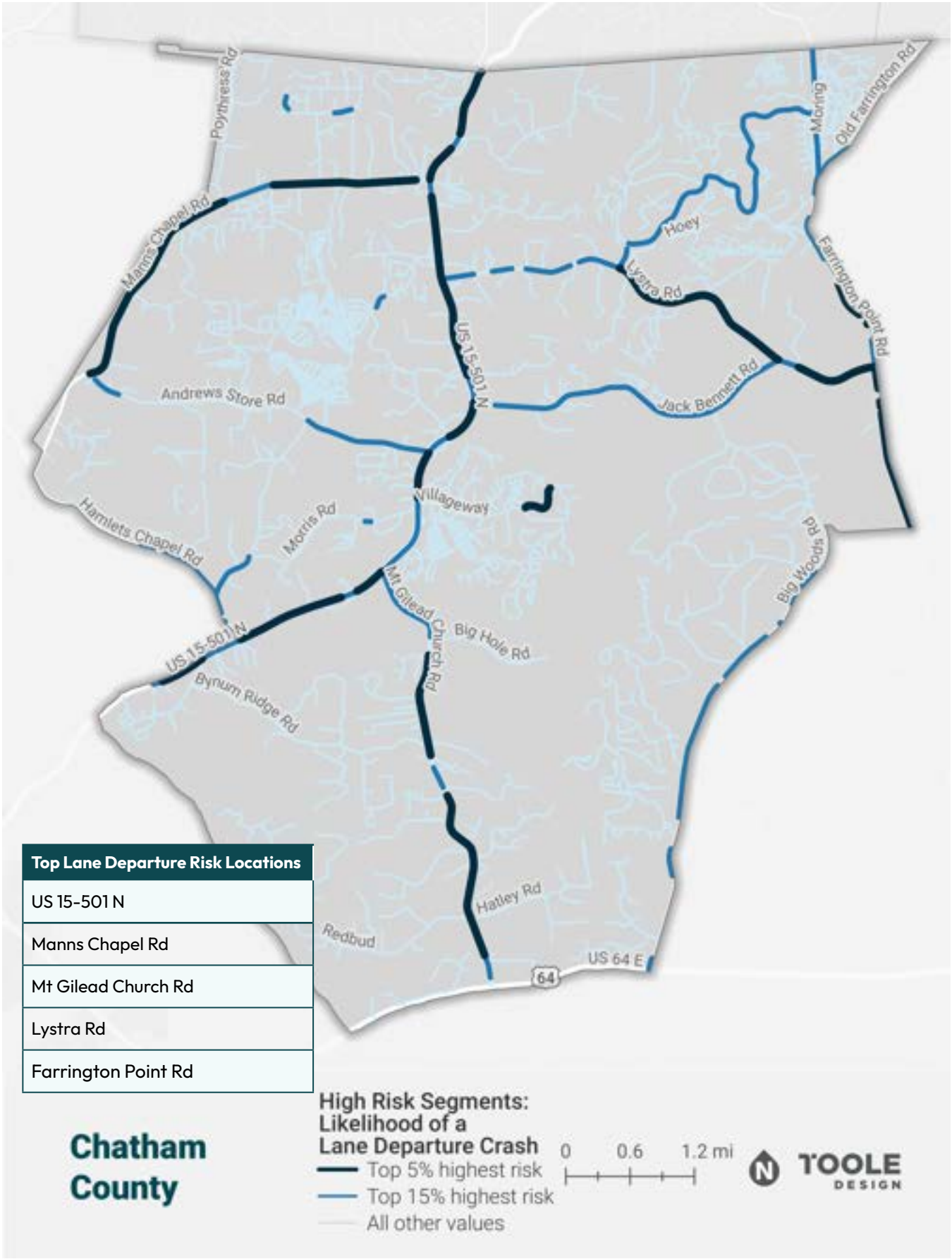



| Top Motorcycle Risk Locations |
|---|
| US 15-501 N |
| Manns Chapel Rd |
| Lystra Rd |
| Mt Gilead Church Rd |
| Farrington Point Rd |

**MAP 99** Chatham County High Risk Corridors Map: Speed Risk

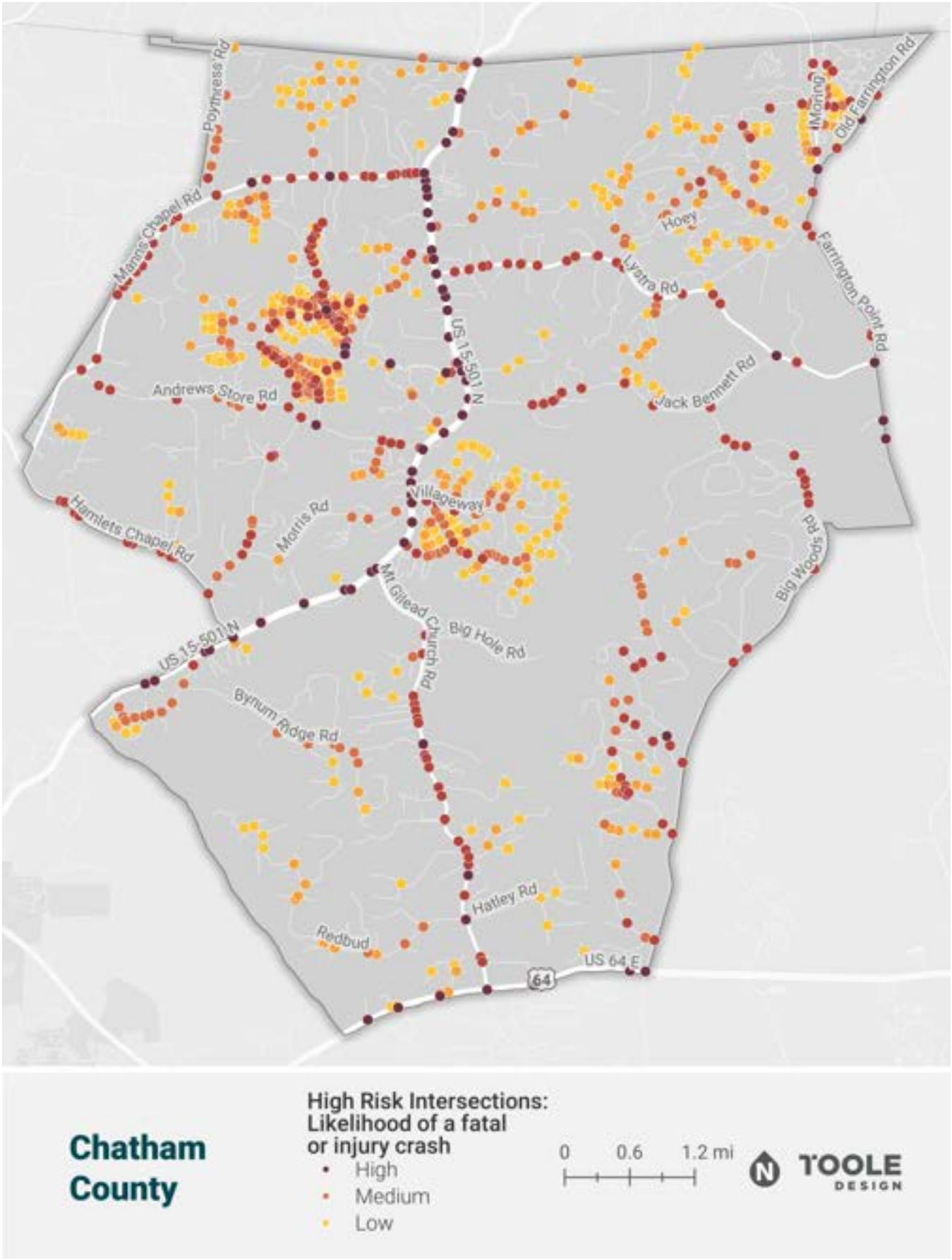


**MAP 100** Chatham County High Risk Corridors Map: Lane Departure Risk

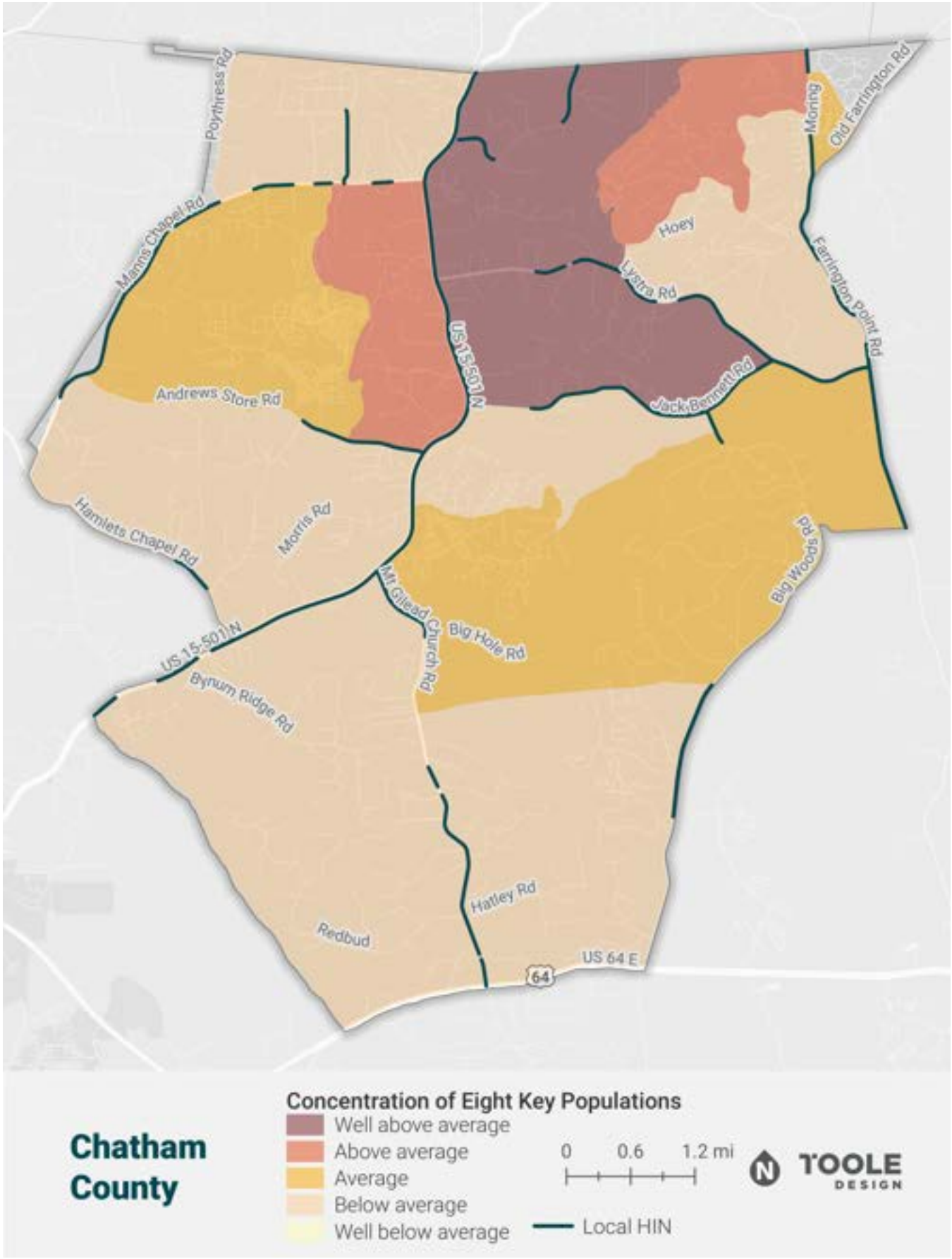



| Top Lane Departure Risk Locations |
|---|
| US 15-501 N |
| Manns Chapel Rd |
| Mt Gilead Church Rd |
| Lystra Rd |
| Farrington Point Rd |

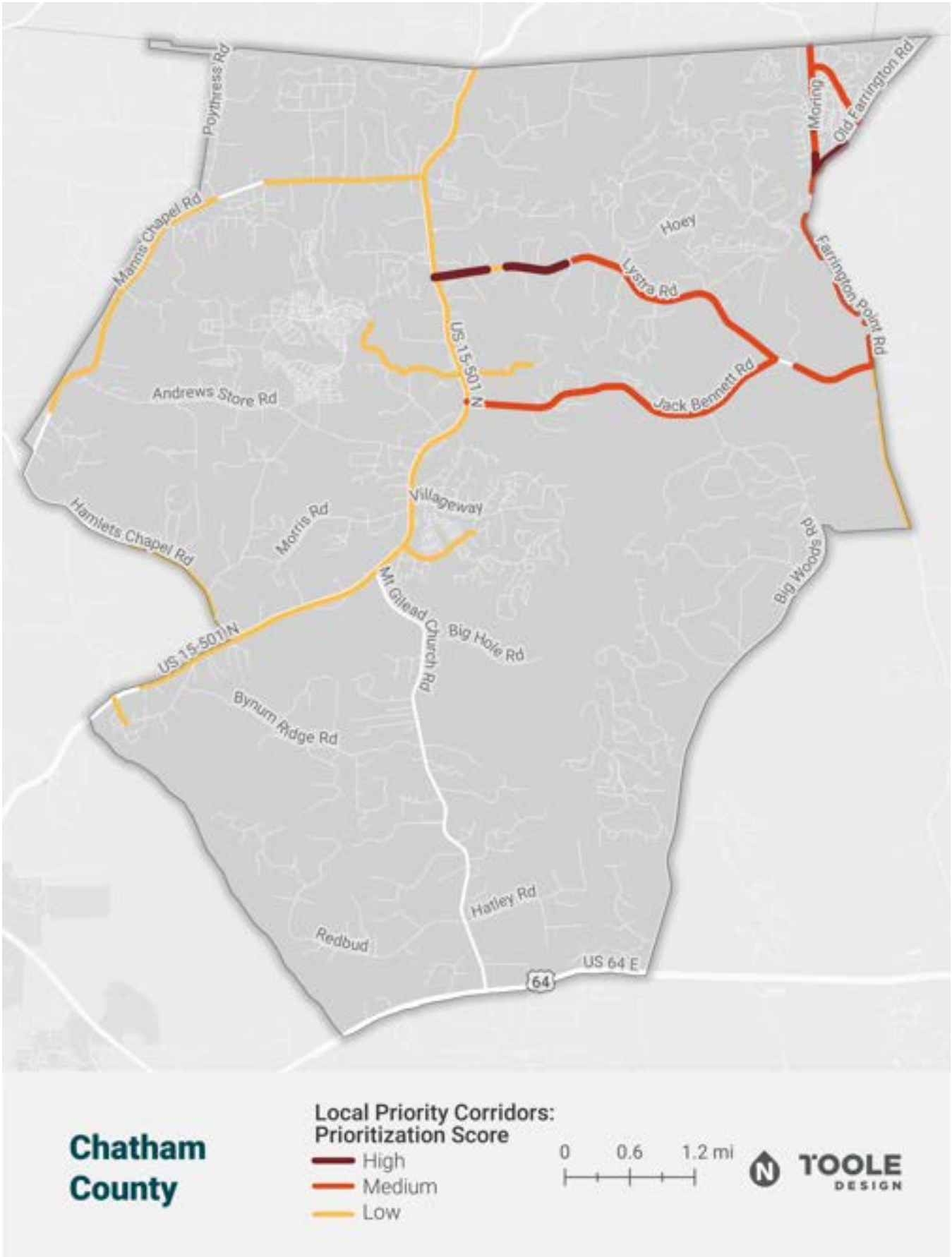
**MAP 101** Chatham County High Risk Intersections Map



**MAP 102** Chatham County Indicators of Potential Disadvantage and HIN Map



**MAP 103** Chatham County Priority Corridors Map



**MAP 104** Chatham County Priority Intersections Map