

Safety Planning Overview

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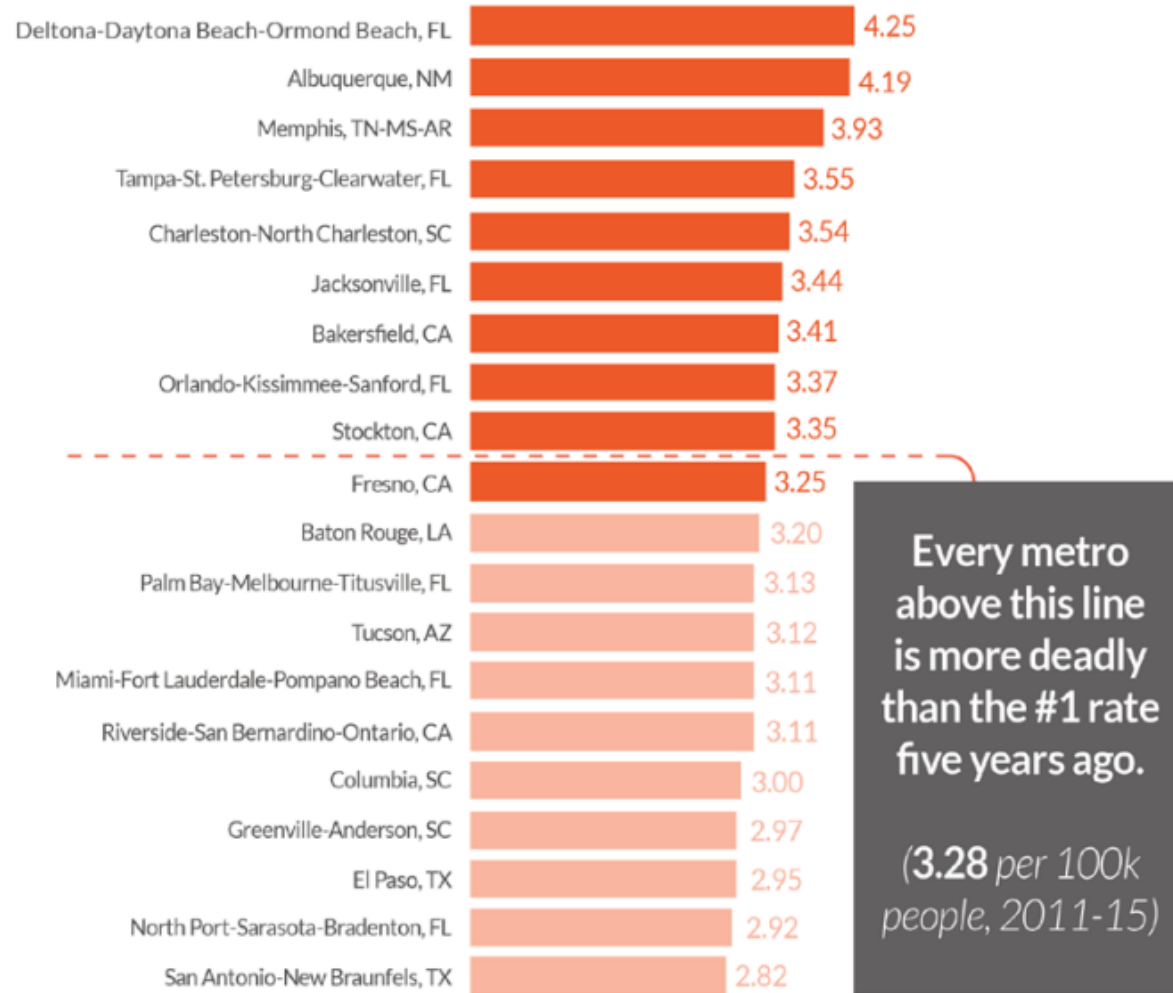
46,000 people were killed in preventable traffic crashes in the U.S. in 2022.

National Safety Council estimate

LUCIEN MERRYWEATHER, 9
ALLISON LIAO, 3
KIKO SHAO, 5
RENEE THOMPSON, 16
SAMUEL COHEN ECKSTEIN, 12
LUIS BRAVO, 18
TENZIN DRUDAK, 16
OLVIN YHAR FIGUERO, 3
PURAN THAPA, 7
SARA KISHIK, 15

PEOPLE
LIVE
HERE

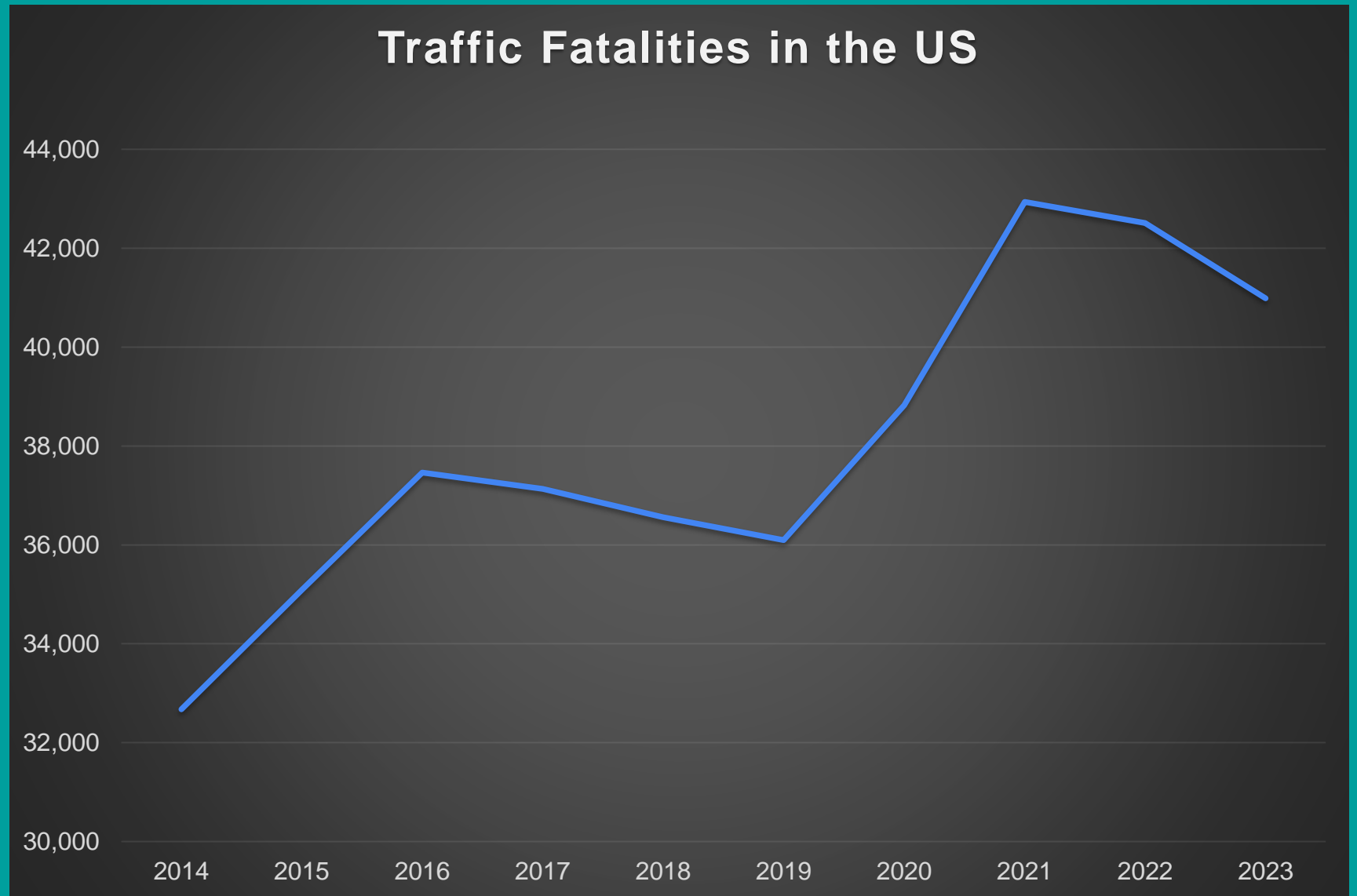
The ninth most deadly metro in 2022 would have topped this list five years ago



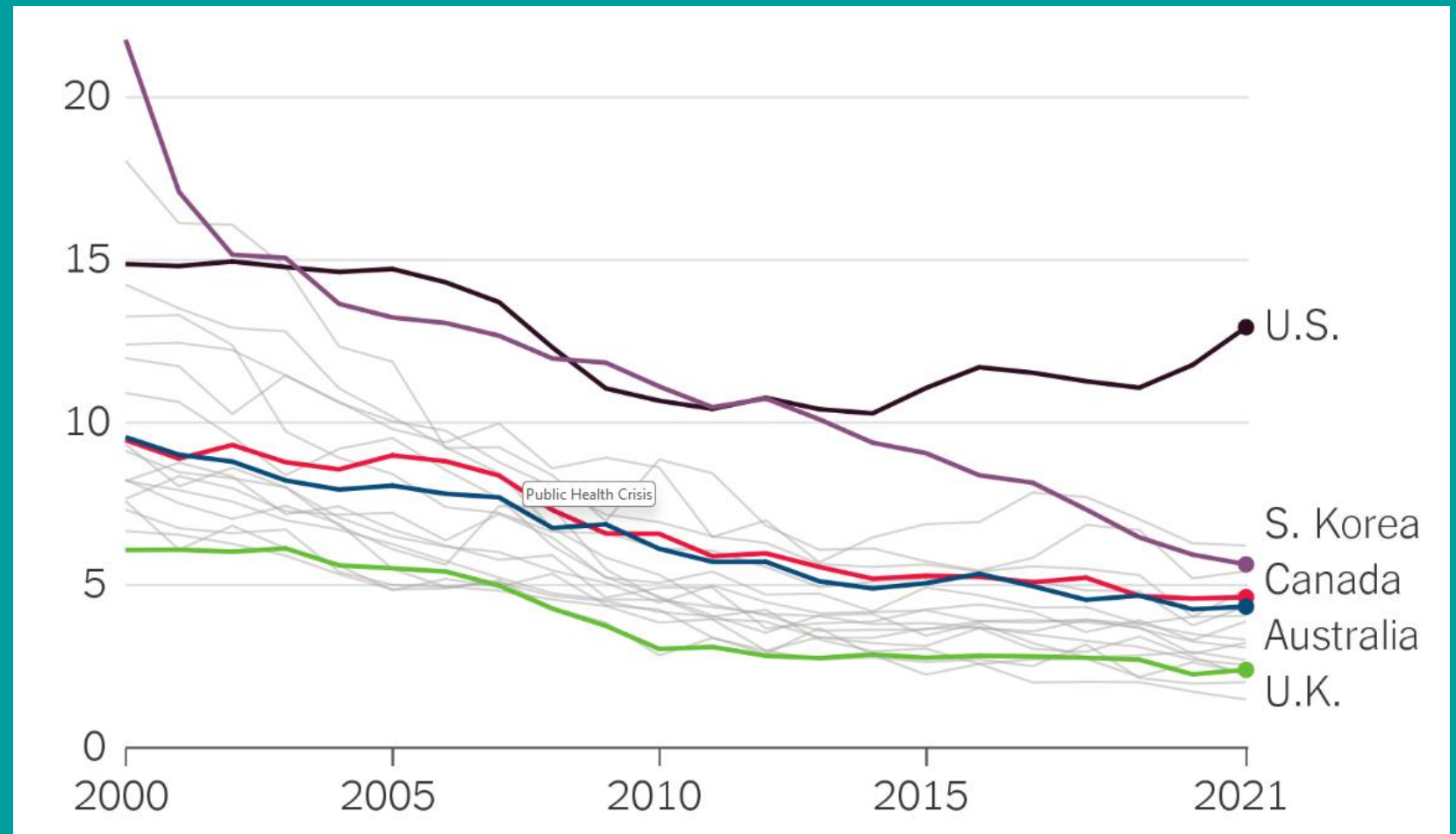
2016-2020 average yearly deaths per 100k people



Public Health Crisis



Public Health Crisis



Why is it happening?

- Speed
- Roads designed for vehicles
- Vehicle size
- Land use



Photo credit: [KMPH](#)

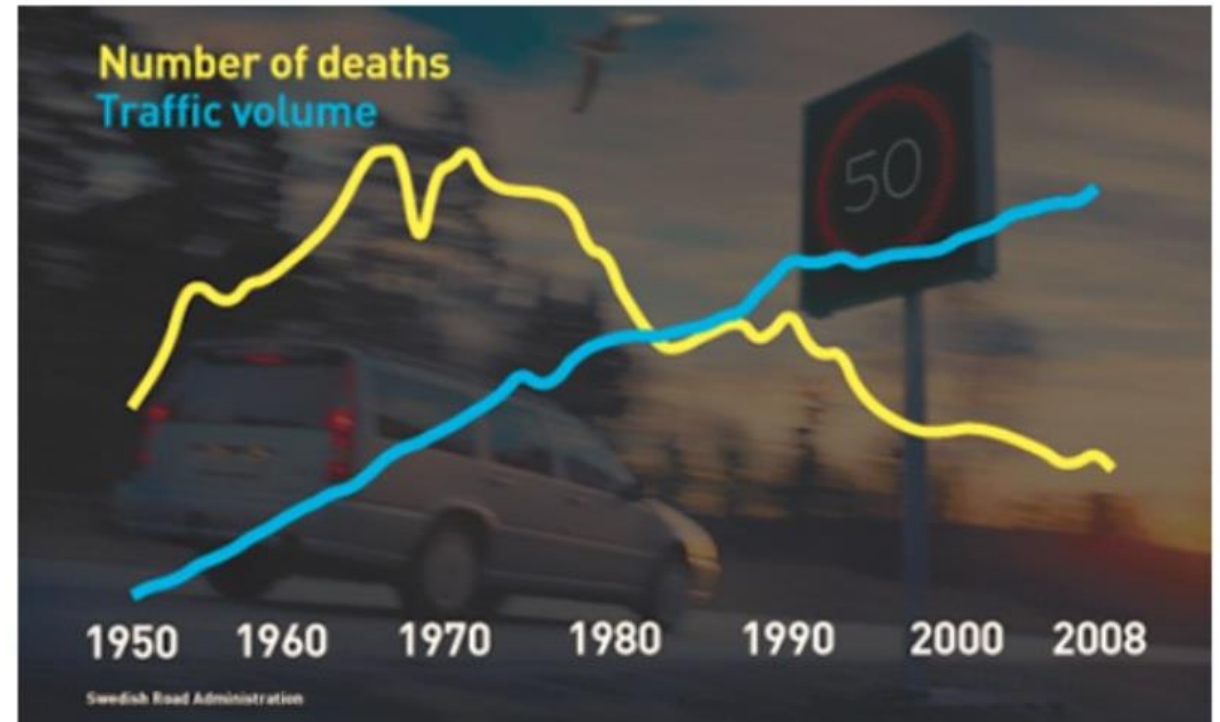
What is Being Done About it?

Success Stories

Sweden

Traffic Deaths are down 30% since adopting the first-in-the-world policy.

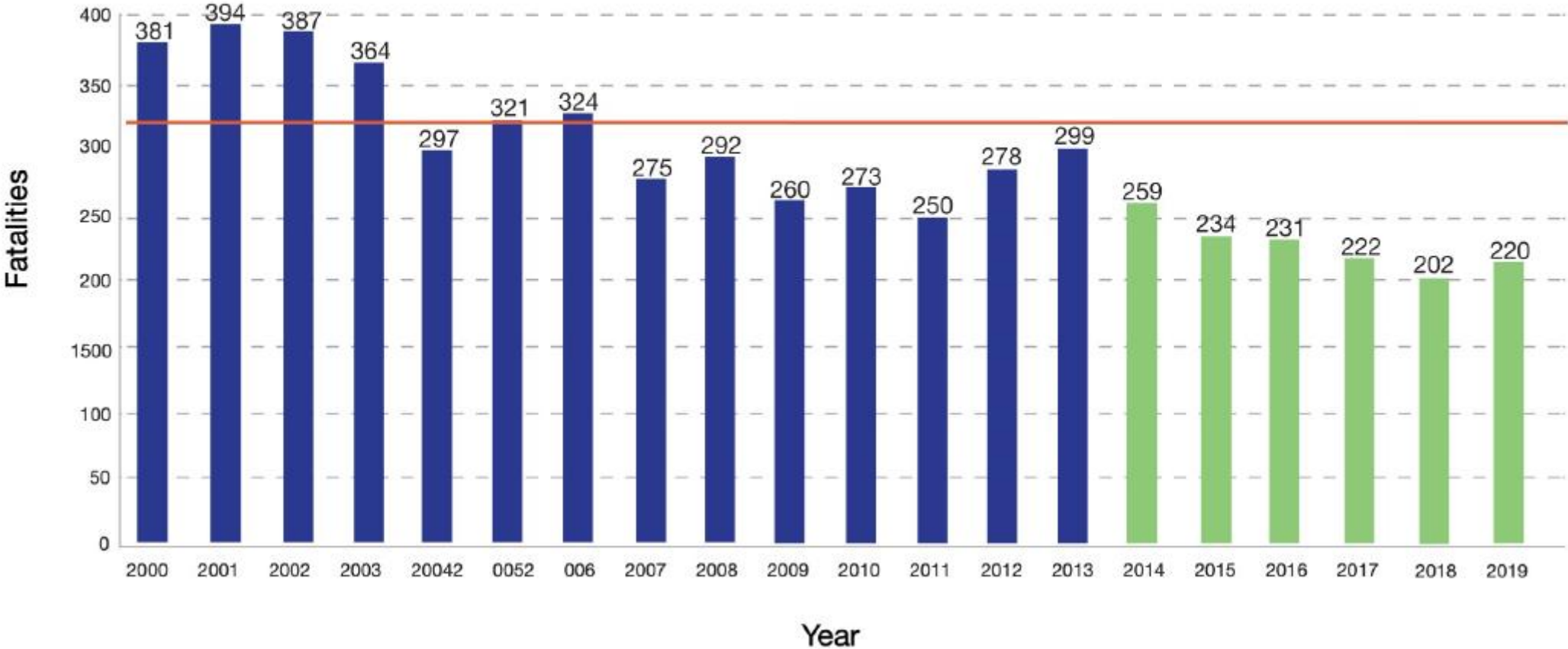
TRAFFIC SAFETY BY SWEDEN



Traffic Safety in Sweden by Vision Zero Initiative

New York City

■ Before Vision Zero ■ Vision Zero — 2000-2013 average prior to Vision Zero





VISION 4 ZERO NETWORK

“

Today we commit that our goal is this: Zero. ***Our goal is zero deaths***; a country where, one day, nobody has to say goodbye to a loved one because of a traffic crash.

*Pete Buttigieg, U.S. Secretary of Transportation,
on National Roadway Safety Strategy release,
January 27, 2022*

Safe System Approach

Principles of the Safe System Approach



WHAT ARE THE SAFETY SYSTEM ELEMENTS?



Unprecedented Federal Funding

IIJA Funding Benefiting Safety & Active Transportation



The infographic is a dark blue vertical rectangle containing four white icons and text blocks. From top to bottom: 1. A diamond-shaped sign with a worker digging, representing infrastructure. 2. A circular icon with a bicycle and a pedestrian, representing active transportation. 3. A location pin icon with a path leading to it, representing community reconnection. 4. An icon of a person standing next to a car, representing transportation alternatives. A yellow arrow points from the 'SAFE STREETS AND ROADS FOR ALL' section towards the right.

Program	Funding
RAISE GRANTS (Rebuilding American Infrastructure with Sustainability and Equity)	\$7.5B OVER 5 YEARS
SAFE STREETS AND ROADS FOR ALL	\$5B OVER 5 YEARS
RECONNECTING COMMUNITIES PILOT PROGRAM	\$1B OVER 5 YEARS
TRANSPORTATION ALTERNATIVES PROGRAM	\$5.8B OVER 5 YEARS

- Action Plan Development
 - Supplemental Activities
 - Implementation
-
- FY 2022: At least \$400M for planning!!!

Plangineering in the Safe System Approach



Safer People

- ✓ Humanize traffic deaths
- ✓ Foster accountability



Safer Vehicles

- ✓ Technology is your friend
- ✓ Consider ALL modes



Safer Roads

- ✓ Focus on safety for ALL road users
- ✓ Leverage current resources to build safer roads for ALL



Post-Crash Care

- ✓ Full circle
- ✓ Evaluate & shift from reactive to proactive



Safer Speeds

- ✓ Speed kills
- ✓ Context matters

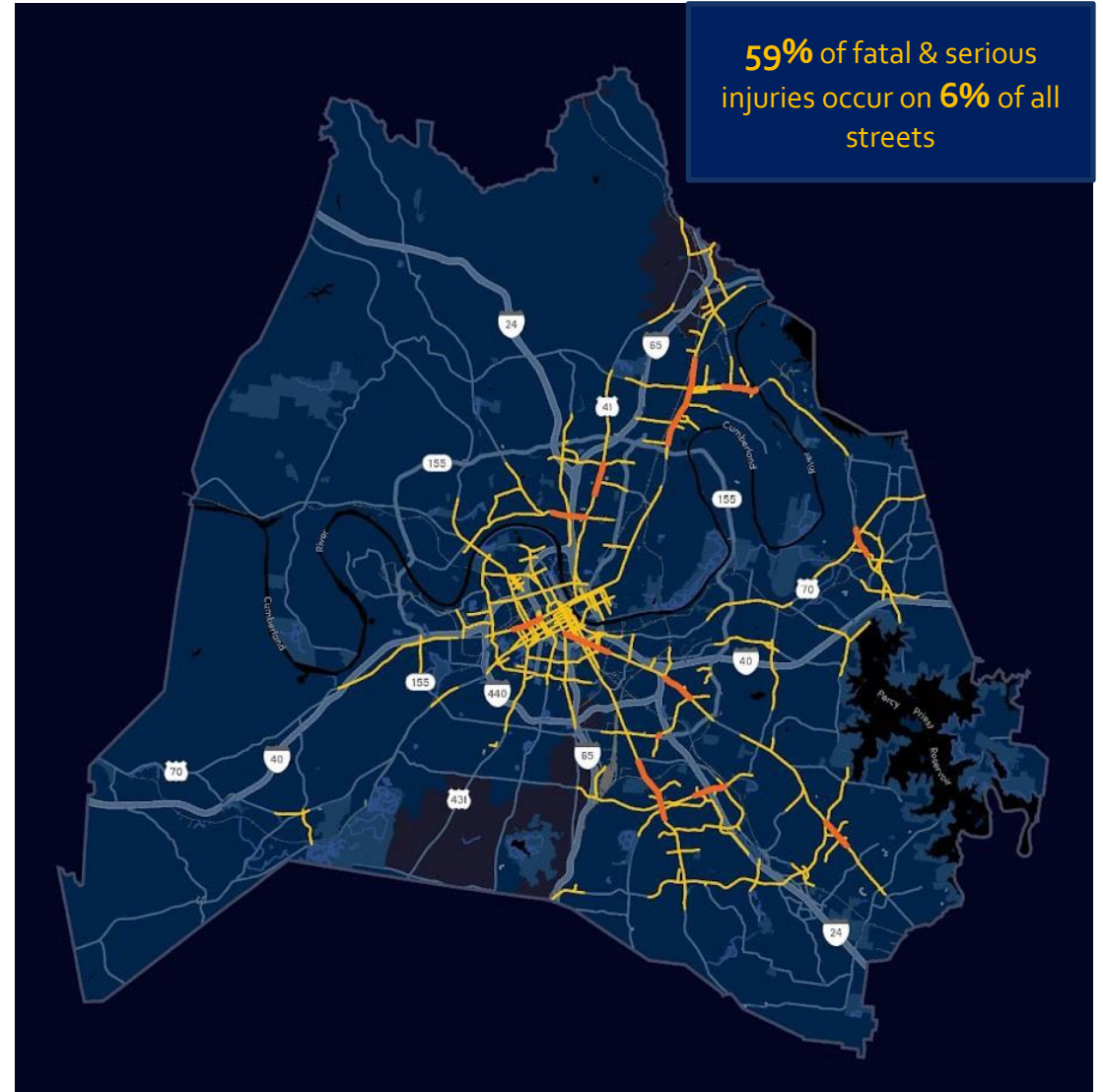


Planning in the Safe System Approach



Keep Your Eye on the Target

- Why are fatalities occurring in my community?
- What are the planning and engineering strategies needed to achieve zero traffic deaths?

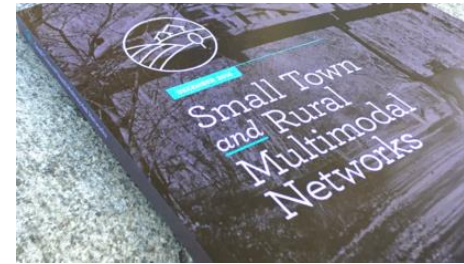


Plengineering in the Safe System Approach



Think Big While Staying Laser-focused on Implementation

- Does the safety solution require a policy change? **Spell it out.**
- Are there current projects or programs to leverage? **Act now.**
- Are there funding sources to pursue? **Package & pursue.**



FUNDING ANNOUNCEMENT
FROM CONGRESSWOMAN TERRI A. SEWELL

\$21+ Million
to support the **Birmingham Urban Trail**

Rep. Sewell helped secure a **\$21,681,306** grant from the Department of Transportation to support the **Birmingham Urban Trail and Multimodal Corridor** and create a more walkable, bikeable, safe, connected, and livable community.

CONGRESSWOMAN
Terri Sewell
ALABAMA'S 7TH DISTRICT

More at sewell.house.gov



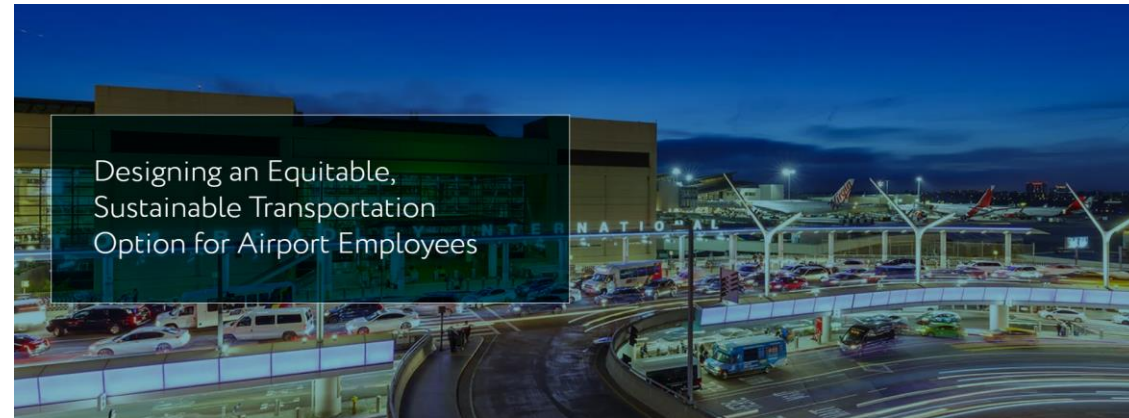
Plengineering in the Safe System Approach



All Roads Lead to Rome

- What is the universe of safety solutions?
- How can you implement the solutions?

→ Leverage a diverse base of implementation and funding options.





Foster AND Maintain Relationships

- Build lasting relationships with the community.
- Sustain interdepartmental & agency partnerships.

→ **Build Communities not Roads!**



VISION ZERO/SS4A TERMINOLOGY

High Injury Network

Streets where crashes are more likely to result in severe injury or death.

Crash/Collision

“Crash” or “Collision” are used rather than “accident,” because accident implies no one was at fault.

KSI

Crashes resulting in a fatality or serious injury are referred to as “KSI” crashes.

Role of Data



Data Analysis



What is happening? Who is impacted?
Systemic Safety Analysis



Where are the most dangerous areas?
High Injury Network



How can we Prevent?
Collision Profiles + Countermeasures



CITY OF KNOXVILLE
VISION ZERO
ACTION PLAN

JUNE 2023



Our Call to Action

Every year, people who live, work, and travel in Knoxville are needlessly injured or killed in traffic crashes. The City rejects the status quo that these life-altering crashes are inevitable. In reality, tragedies can be prevented through bold and aggressive action. We embrace a Vision Zero approach, which means shifting our priorities from moving vehicles quickly to moving people safely, and taking a proactive approach to prevent crashes before they happen.

In 2021, City Council unanimously resolved to endorse a Vision Zero goal to eliminate traffic deaths and serious injuries on Knoxville's streets. Vision Zero aligns with the City's focus on public safety, connectivity, and equitable mobility. By using a comprehensive approach that brings together road design, public education, and law enforcement, we can prevent life-altering crashes. Steps to achieve Vision Zero in Knoxville include:

- **Designating** a high injury network, those roadway segments that see the most life-altering crashes in our city.
- **Identifying** projects and strategies that will reduce the number of fatal and severe injury crashes on our roadways.
- **Creating** a transparent platform for tracking our progress on improving roadway safety.
- **Coordinating** between the City of Knoxville, the Tennessee Department of Transportation (TDOT), and Knoxville TPO in implementing this plan.

IN 2021, 48 PEOPLE
WERE KILLED IN TRAFFIC
CRASHES IN KNOXVILLE.
**ONE LIFE LOST IS ONE
TOO MANY.**

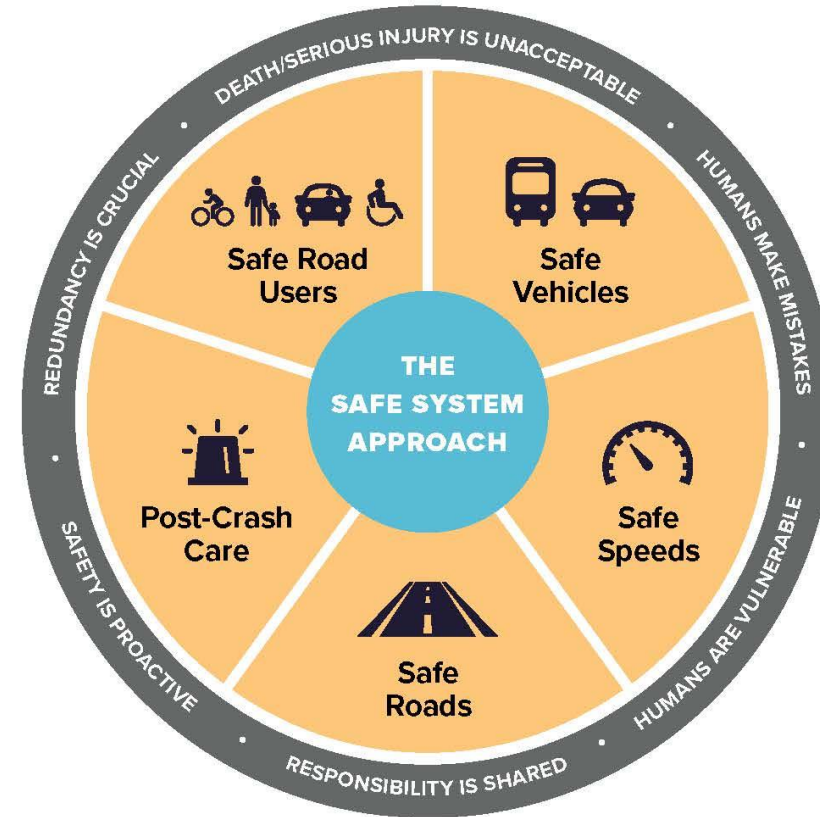


THE CITY OF KNOXVILLE
COMMITTS TO ELIMINATE
TRAFFIC FATALITIES
ON CITY-CONTROLLED
ROADS BY

2040.

Basics of the Safe System Approach

The Safe System approach is the framework that guides Vision Zero efforts. The Safe System approach anticipates human mistakes by building redundancy into transportation systems, so if one aspect of the system breaks down, there are others in place to prevent life-altering crashes and injuries. This approach involves identifying multiple aspects of safety: road users, vehicles, speed, road design, and post-crash care. The Safe System approach requires adopting a culture of safety by those who plan, govern, maintain, and use our roadways in Knoxville.



Source: [USDOT Safe System Approach](#)

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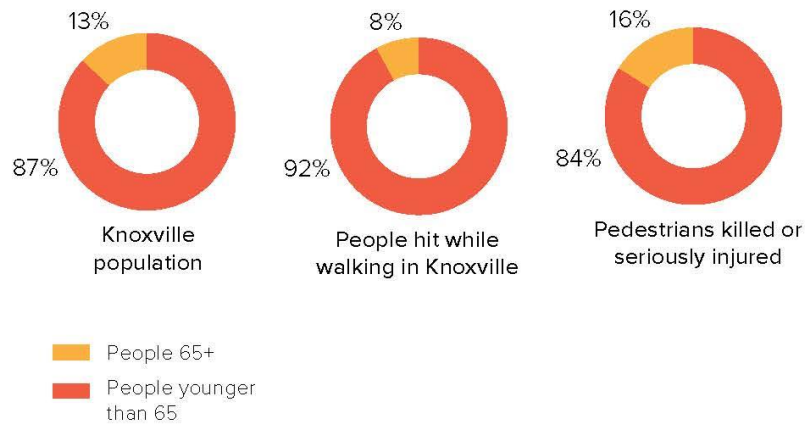
I only ride the greenways since the streets are unsafe for bicyclists.

Community Survey Response

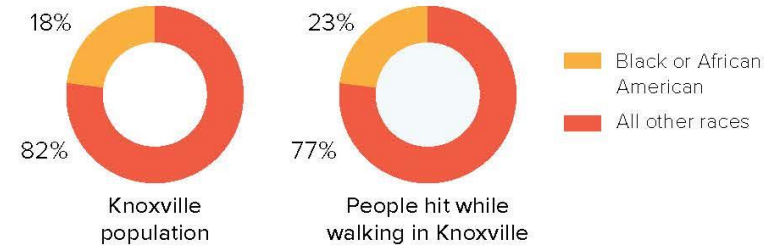
DISPARITIES IN PEDESTRIAN CRASHES

National studies have found that certain demographics are most at risk when it comes to pedestrian traffic crashes. People of color (including Black people, Latino/a people, and Indigenous people) are more likely to be killed in crashes, as are older Americans. Some of these disparities occur in the City of Knoxville and the surrounding area.

Older Adults: People age 65 and older are less likely to be hit as pedestrians, compared with their share of the population, but are more likely to be killed or seriously injured.

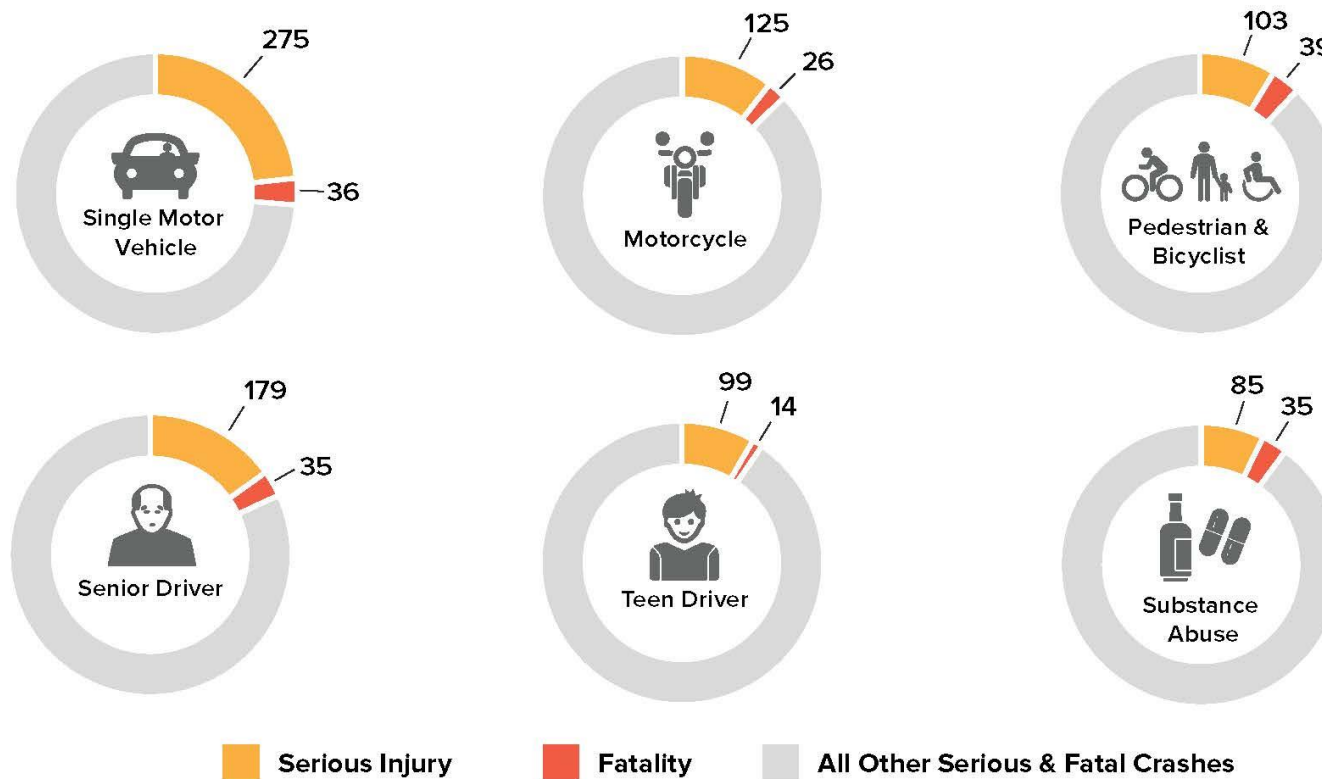


People of Color: Black people represent a larger share of people hit by cars while walking, compared with their share of the Knoxville population.



WHO'S GETTING HURT?

The charts below show the total number of road user attributes that were factors in crashes resulting in death or serious injury between October 2016 and September 2021 in the City of Knoxville. However, when all crashes are considered, pedestrians, bicyclists, and motorcyclists are overrepresented in serious and fatal crashes.

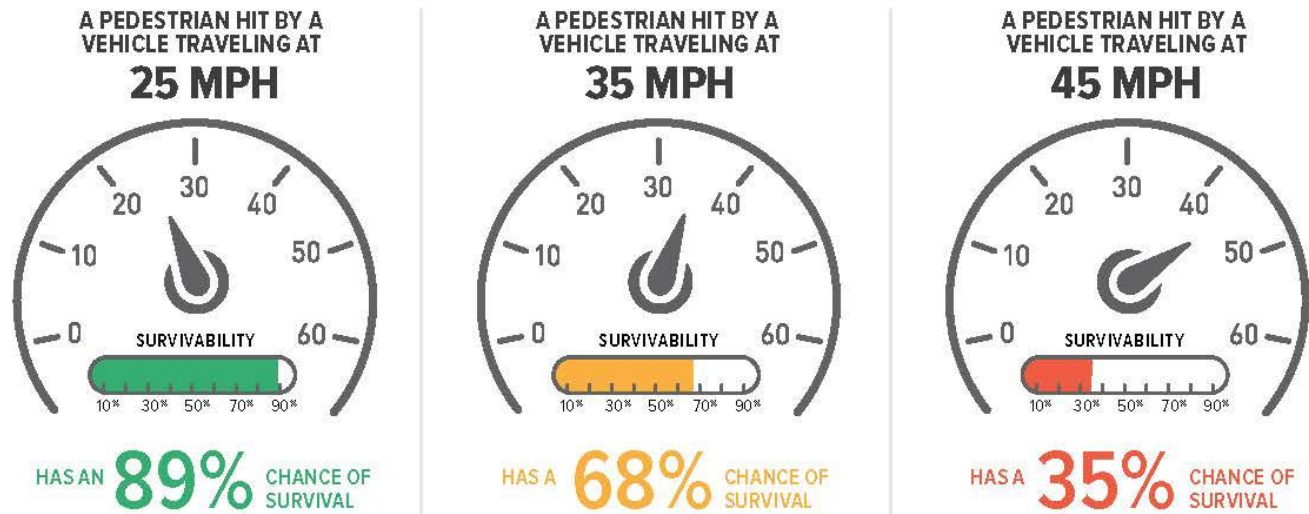




CONTEXT AND CRASH FACTORS

Speed

Speed is one of the most important predictors of whether a crash is survivable. Lower speeds make crashes more avoidable as well. Due to the high speeds common on major arterials and suburban roads, crashes tend to be more severe on these roadways. This is a significant crash factor throughout Knoxville and for people using all modes of transportation. However, higher speeds are particularly dangerous for people walking, with a pedestrian's chance of surviving a crash declining to 35% when hit by a vehicle traveling at 45 mph. The graphic below illustrates the likelihood of a pedestrian being killed in a crash based on the speed of the motor vehicle.

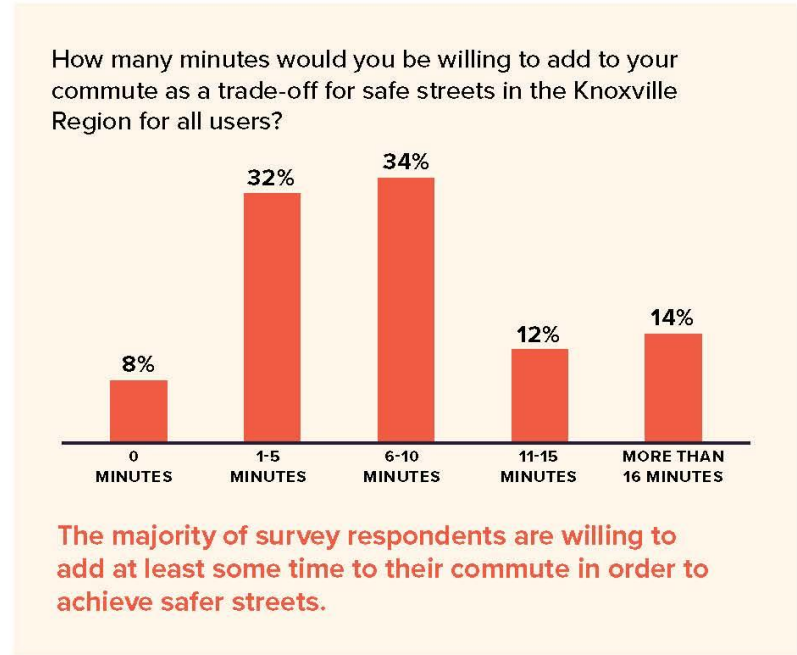


Tefft, B. C. *Impact speed and a pedestrian's risk of severe injury or death.* Accident Analysis & Prevention 50 (2013) 871-878.

Building on Engagement

The City of Knoxville took a multi-pronged approach with gathering community input. In February 2022, Mayor Indya Kincannon convened the Vision Zero Steering Committee. Members of that committee learned about the history of the City’s safety plans and processes, and identified an extended network of essential stakeholders. City staff conducted interviews with members of these organizations to learn about past and future initiatives and blind spots. The committee also reviewed the Vision Zero planning process as it developed over a year and a half.

The City of Knoxville went into communities to talk about the Vision Zero approach, gather additional information about traffic safety priorities, and conduct surveys in the spring of 2023. Staff spoke with community groups about perceptions of safety and potential problem areas in their communities. A team with Bike Walk Knoxville worked with the City team to provide on-the-street “intercept” surveys in and around the high-injury network. The team from Bike Walk Knoxville visited community centers, bus stops, and public events to engage with residents.



142
ONLINE SURVEY
RESPONSES

117
FOCUS GROUP
PARTICIPANTS

341
INTERCEPT SURVEYS
COLLECTED

14
TASK FORCE
PARTICIPANTS

CONTEXT AND CRASH FACTORS

Crashes within the City of Knoxville are more common than in the outlying areas, but are generally less severe. This is likely due to lower travel speed of motor vehicles in the City when compared to surrounding rural areas. For example, Cumberland Avenue in Knoxville has the most crashes per mile involving pedestrians and bicyclists of any corridor, yet it hasn't seen any pedestrian/bicycle fatalities since 2007.



Cumberland Avenue before streetscape improvements

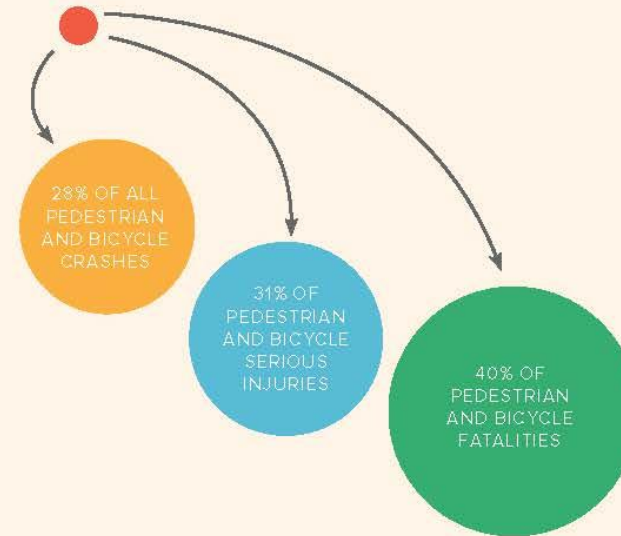


Cumberland Avenue after streetscape improvements

Major Arterials

Major arterials make up six percent of the surface streets (non-freeway) mileage in Knoxville. Yet a disproportionate share of pedestrian/bicycle crashes, especially serious crashes, occur on major arterials (streets such as Broadway and Kingston Pike).

MAJOR ARTERIALS
MAKE UP 6% OF TOTAL
SURFACE STREETS



Where Is the Risk?

In addition to understanding overall trends, it's important to know the places people have been killed or seriously injured in traffic crashes. The results of this crash analysis is the High Injury Network (HIN), which identifies specific roads that bear a disproportionate amount of serious crashes. These corridors are a small subset of the larger overall roadway network, highlighting opportunities for targeted investments where it is needed the most. Roads on the HIN that ranked particularly high for severe crashes are shown as a Tier 1 priority on the map on the following page.

KNOXVILLE'S HIGH INJURY NETWORK

The HIN identifies Knoxville's most dangerous roads, those with the greatest number of serious crashes. This analysis helps guide the City of Knoxville's investments in infrastructure and programs and ensures that Vision Zero projects support those most in need.

KNOXVILLE'S HIGHEST INJURY ROADS

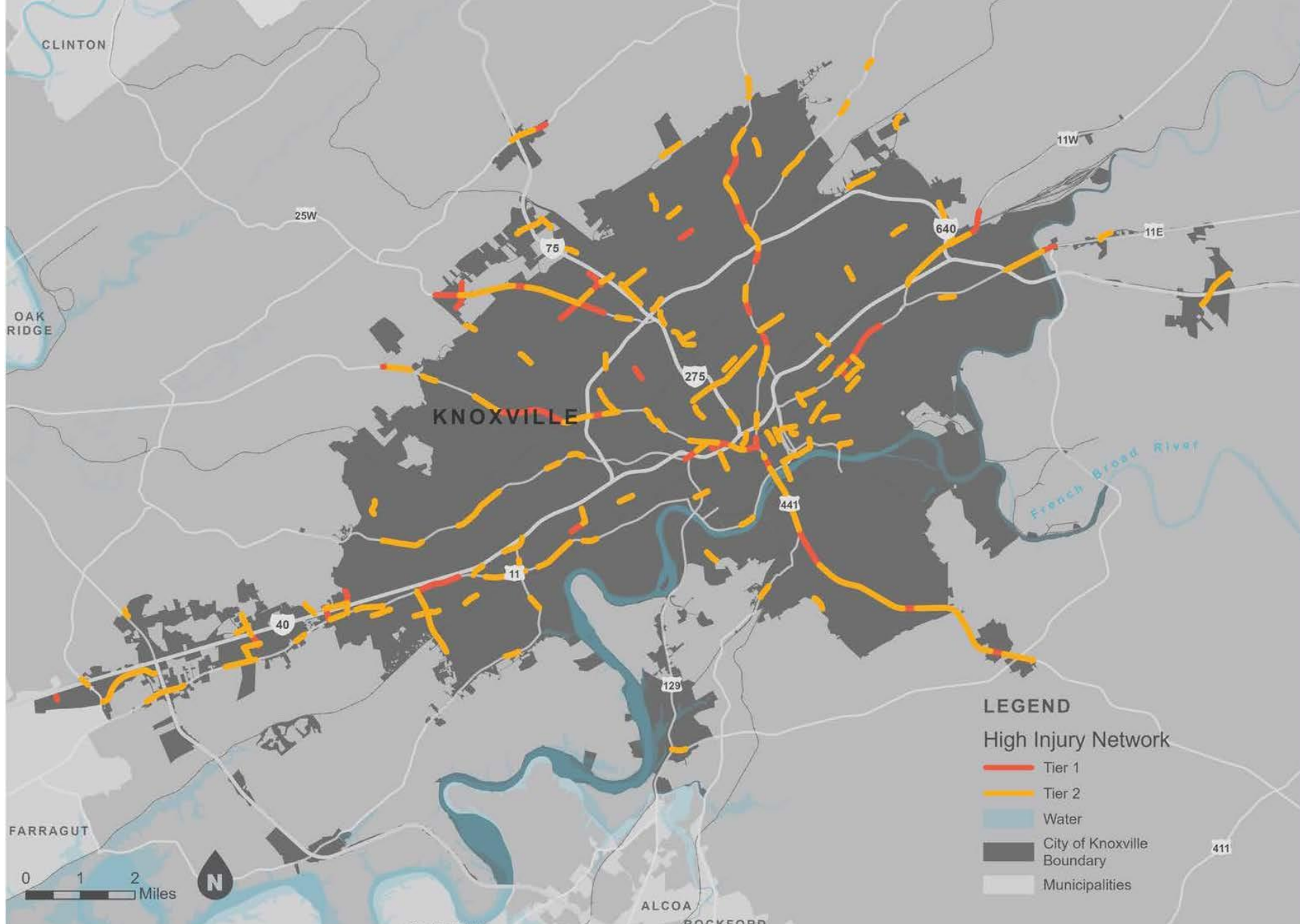
The HIN analysis is a process of ranking roadways with the highest overall score, based on the number and severity of crashes on that road. See the Appendix for a full list of the City HIN corridors. Roads in Knoxville with the highest overall score include:

- Clinton Highway (US-25W) from Old Callahan Drive to Schaad Road
- North Broadway from Old Broadway to Highland Drive
- Chapman Highway (SR-71) from Nixon Road to Norton Road
- Western Avenue from 17th Street to Interstate 40
- East Magnolia Avenue from North Harrison Street to North Beaman Street



East Magnolia at Kirkwood Street is part of a roadway corridor on the City of Knoxville's HIN.





5% OF NON-FREEWAY ROADWAYS IN THE CITY OF KNOXVILLE
ACCOUNT FOR **63%** OF SEVERE INJURY CRASHES

PREDICTING WHERE A CRASH MAY OCCUR BEFORE IT HAPPENS

This predictive crash analysis highlights roadways where severe crashes are likely to occur in the future. This is done by identifying characteristics associated with high-crash locations and identifying other roadways with those characteristics, even if they have not experienced a high number of actual crashes.

The following variables collected for each road segment were used in the analysis to compare roadways with observed crashes to other roadways throughout the area. These variables are focused on land uses near the roadway, road characteristics, and relation to intersections.

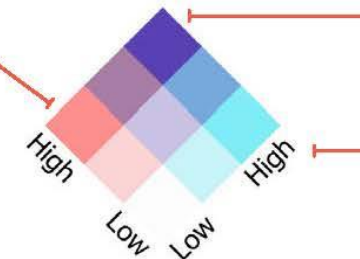
VARIABLE

- Near commercial land use
- Near multifamily land use
- Average annual daily traffic (AADT)
- At signalized intersection
- Speed limit
- Functional class
- At intersection (regardless of signal)
- Segment length
- Road curvature

HOW THE PREDICTIVE ANALYSIS IS USED

High Predicted but Low Observed: These segments have characteristics of high-crash roadways but have not seen as many actual crashes. They could experience near misses that are not captured in crash data, or there may be other variables not included in the model that reduce their risk of severe crashes. **Improvements on these segments should be a priority for preventing crashes before they happen.**

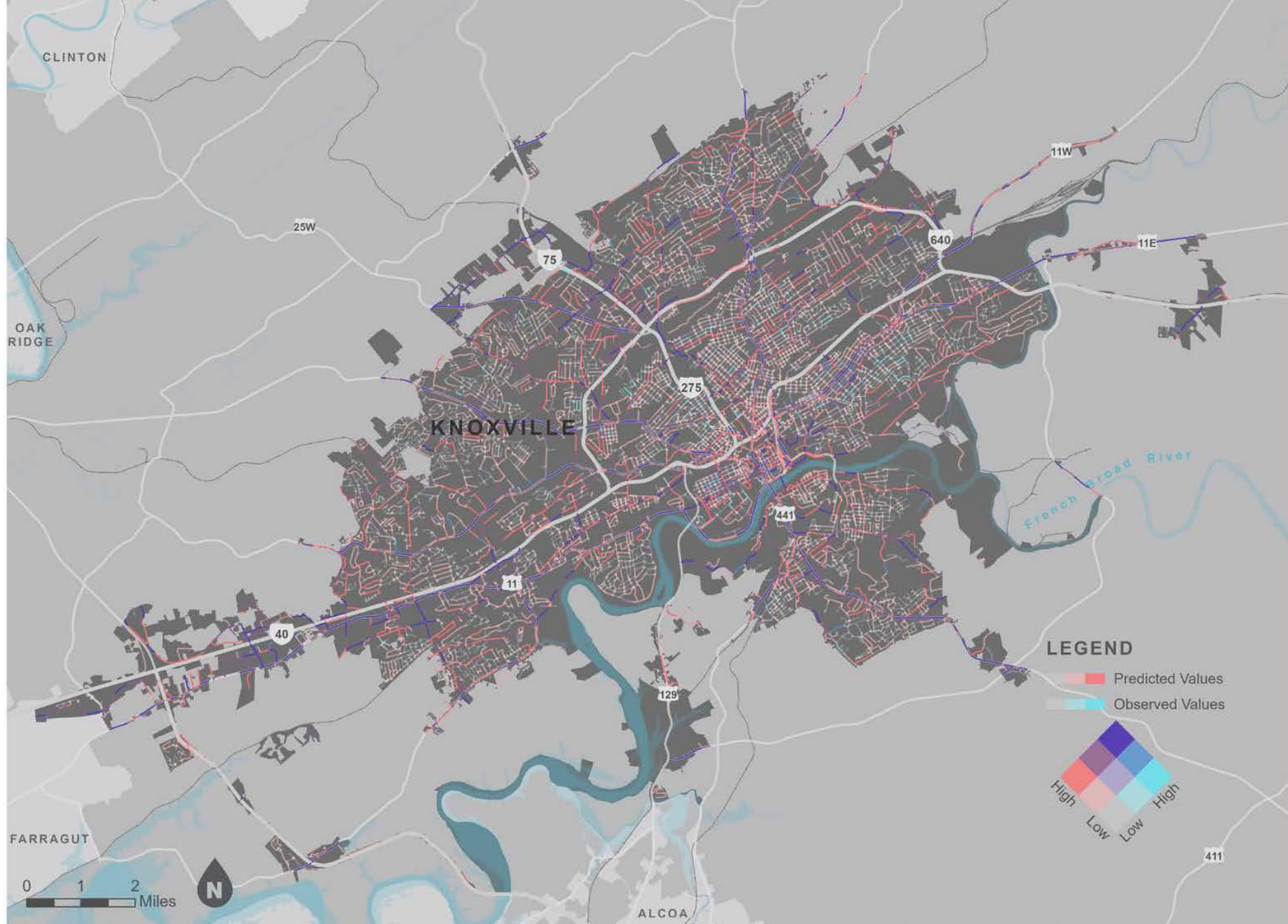
Low Predicted and Low Observed: These are low-crash roadways that have characteristics consistent with low-crash roadways. **These characteristics should be documented as potential countermeasures.**



Predicted Values
 Observed Values

High Predicted and High Observed: These are high-crash roadways that have the characteristics that the model has shown are consistent with high-crash roadways. **These roads should be considered as high priorities.**

Low Predicted but High Observed: These are high-crash roadways that we would not expect to have a high number of crashes based on the characteristics identified in the model. There may be other variables not included in the model that cause these roadways to see high numbers of severe crashes, such as a blind curve or poor street lighting. **These factors should be further investigated.**



Crash Profiles

Through an examination of crash characteristics and contextual factors, the most pertinent crash trends were identified for further analysis. “Crash profiles” highlight specific conditions that account for a large share of fatal and serious injury crashes in Knoxville. These crash profiles are paired with potential countermeasures to identify system-wide safety interventions, in addition to the corridor interventions identified in the HIN.

The following crash profiles were identified for both the City of Knoxville and the region. More detail is provided on the following pages.

Crash profiles most relevant to the City of Knoxville:

- **Crash Profile 1:** Motor Vehicle Crashes in Commercial Areas
- **Crash Profile 2:** Left Turn/U-Turn-Related Motor Vehicle Crashes at Signalized Intersections
- **Crash Profile 3:** Pedestrian/Bicyclist-related Crashes in Commercial Areas along Arterials

Other crash profiles that are more applicable to rural parts of the TPO region, but may have some relevance within the City of Knoxville:

- **Crash Profile 4:** Motor Vehicle Crashes at Nighttime on Arterials
- **Crash Profile 5:** Motor Vehicle Roadway Departure Crashes on Slopes and Hill Crests
- **Crash Profile 6:** Crashes Involving Motorcycles



Safety Countermeasures are actions to counteract an identified danger to one or more modes of travel. A rectangular rapid flashing beacon (RRFB) is an example of a countermeasure.



CRASH PROFILE 6: CRASHES INVOLVING MOTORCYCLES

This factor analyzes crashes that resulted in death or serious injury that involved a motorcycle on roads with posted speed limits of 35 MPH or greater in the Knoxville Region.

OWNERSHIP



37% on local roads
63% on TDOT maintained roads

MODE: MOTORCYCLES



SERIOUS AND FATAL CRASHES

183

POTENTIAL COUNTERMEASURES

- Longitudinal rumble strips and stripes
- Lane narrowing
- Safety edge
- High-friction surface treatment
- Sight distance improvements
- Systemic application of multiple low-cost countermeasures at stop-controlled intersections

*Crash statistics cover entire Knoxville TPO region outside of City of Knoxville



US 321



CRASH PROFILE 4: MOTOR VEHICLE CRASHES AT NIGHTTIME ON ARTERIALS

This factor analyzes crashes that resulted in death or serious injury of a motorcyclist on roads with posted speed limits of 35 MPH or greater in the Knoxville Region.

OWNERSHIP



28% on local roads
72% on TDOT maintained roads

MODE: MOTOR VEHICLES



SERIOUS AND FATAL CRASHES

257

POTENTIAL COUNTERMEASURES

- Lighting
- Retroreflective traffic signal backplates
- Increase pavement marking reflectivity

*Crash statistics cover entire Knoxville TPO region outside of City of Knoxville



Antvale Road



CRASH PROFILE 3: PEDESTRIAN/BICYCLIST-RELATED CRASHES IN COMMERCIAL AREAS ALONG ARTERIALS

This factor analyzes crashes that resulted in death or serious injury to a person walking within 200 feet of a commercial land use area along an arterial roadway in the City of Knoxville. The countermeasures address both pedestrians and bicyclists, even though bicyclist serious injuries or deaths did not occur in this crash profile, because people bicycling are vulnerable in this context as well.

OWNERSHIP



34% on local roads
66% on TDOT maintained roads

MODE: WALKING & BIKING



SERIOUS AND FATAL CRASHES

56

POTENTIAL COUNTERMEASURES

- Access management
- Add sidewalk
- Prohibit right turn on red
- Driveway improvements, including sight distance improvements
- Adding midblock crossings and improvements
- Pedestrian hybrid beacon (PHB) or Rectangular Rapid Flashing Beacon (RRFB)
- Pedestrian refuge islands
- Raised crosswalks and high-visibility crosswalks
- Road diets (cross-section reallocation)
- Bike facilities; including bike paths, protected bike lanes, cycle track, depending on context
- Lighting
- Speed management strategies



North Broadway & West 5th Avenue



Magnolia Avenue & Castle Street



CRASH PROFILE 5: MOTOR VEHICLE ROADWAY DEPARTURE CRASHES ON SLOPES AND HILL CRESTS

This profile analyzes crashes resulting in death or serious injury that occurred when a motor vehicle leaves the roadway and hits a fixed object on a slope or hillcrest along a one- or two-lane roadway in the Knoxville Region.

OWNERSHIP



75% on local roads
25% on TDOT maintained roads

MODE: MOTOR VEHICLES



SERIOUS AND FATAL CRASHES

273

POTENTIAL COUNTERMEASURES

- Remove or relocate fixed objects
- Crash cushions
- Breakaway posts/supports
- Longitudinal edge line rumble strips
- Safety edge
- Speed humps/cushions/tables
- High-friction surface treatment
- Speed feedback signs
- Wider edge lines
- Reconstruct roadway to flatten crest vertical curve
- Spot shoulder widenings

*Crash statistics cover entire Knoxville TPO region outside of City of Knoxville



Maryville Pike



Boyds Creek Highway

Action Plan Framework

To comprehensively identify solutions for transportation safety challenges and organize recommended strategies, this action plan’s recommendations are organized into the following themes: Design, Land Use, Plans, Policies, and Programs.

In addition, the framework integrates the Safe System approach and identifies the corresponding category. Most recommendations fall into multiple categories, as the elements of a Safe System approach are interconnected.

SAFE SYSTEM CATEGORIES



SAFE ROAD USERS



SAFE SPEEDS



SAFE VEHICLES



SAFE ROADS



POST-CRASH CARE

HOW TO READ THE RECOMMENDATIONS

The table below outlines the definitions for the columns in the following pages.

Safe System Categories	Safe Road Users, Safe Vehicles, Safe Speeds, Safe Roads, Post-Crash Care
Recommendation	The key steps needed to achieve the recommendation.
Timeline	When the action should take place. Short (<1 Year) Medium (1-2 Years) Long (>2 years)
Action Lead	Who are the leading and supporting partners?
Implementation Needs	Identifies if the action item will require funding, additional staff capacity, relationship building with external partners, or policy legislation in order to advance.
Example Performance Measure	How will the action be monitored, evaluated or communicated on progress?
Cost	What is the general expected cost to implement this recommendation?

City of Knoxville Priority Actions

We are committed to eliminating deaths and serious injuries on our streets. The strategies outlined in this action plan were developed to help guide the implementation efforts of the City and its partners to improve safety in Knoxville.

ACTION ITEMS

The following immediate action items are intended to be the priority steps the City will take toward implementing the Vision Zero Action Plan. While this is an aggressive approach, we're committed to making Knoxville safer for all users, and we will update these action steps publicly based on performance and progress.

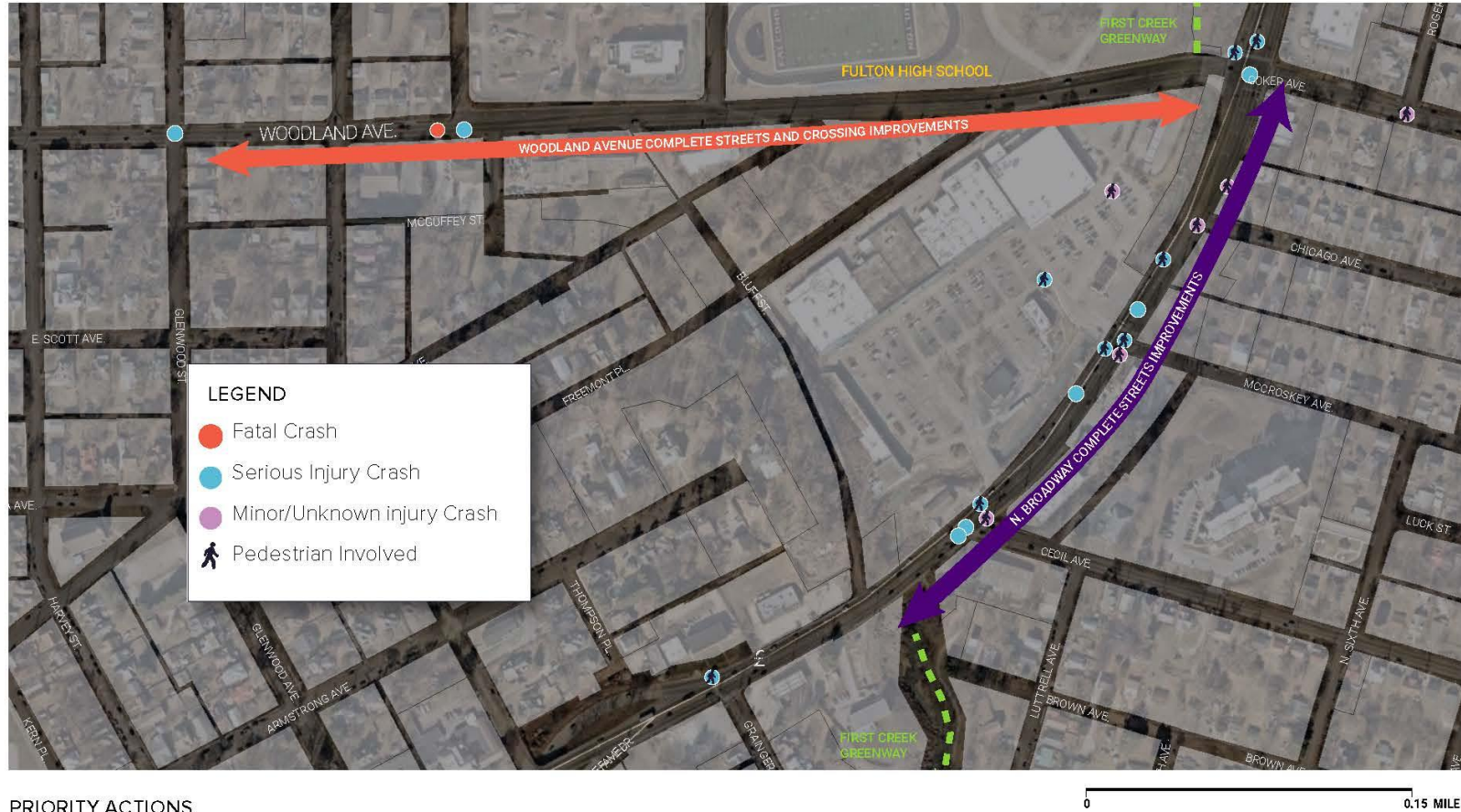
PRIORITY PROJECTS

Priority projects will be identified using the HIN and predictive analysis. These will be detailed with planning-level cost estimates, and implementation will be pursued over time in accordance with the Action Plan Framework and through the various funding sources listed in Table 2.

PRIORITY ACTIONS

- Apply for Safe Streets and Roads for All Implementation Grant for priority projects.
- Support the Knoxville Vision Zero Steering Committee.
- Collaborate with TDOT to prioritize, design, and fund safety projects on the HIN that are state maintained.
- Implement safety improvements along the HIN prioritizing Tier 1 project segments.
- Conduct demonstration projects to test new design ideas, engage the public, and implement safety improvements faster.
- Evaluate success towards the goal of zero traffic deaths and severe injuries.
- Launch a transparent data dashboard.

PRIORITY ACTION: NORTH BROADWAY / WOODLAND AVENUE



PRIORITY ACTIONS

Both Broadway and Woodland Avenue present opportunities for targeted investments in high-crash corridors. Improvements on N Broadway include adding a shared-use path. This would also provide a valuable connection to the First Creek Greenway trail. On E Woodland Avenue, improvements include a shared-use path, reducing travel lanes from four to two, an on-road bike lane, and a refuge island at Fulton High School.

Thank you!

JeanCrowther@AltaGo.com

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