Local Road Safety Plan

Kingsport Metropolitan Transportation Planning Organization
Tennessee/Virginia

2022

KINGSPORT
TENNESSEE

Acknowledgements

Kingsport Metropolitan Transportation Planning Organization

Tennessee Department of Transportation

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City of Kingsport

Kingsport Police Department

Kingsport City Schools

NET Trans

Hawkins County Health Department

Hawkins County Schools

Sullivan County

Sullivan County Regional Health Department

Sullivan County Sheriff's Office

Scott County Public Schools

LENOWISCO Planning District Commission

Tennessee Local Technical Assistance Program

Federal Highway Administration (FHWA) Tennessee Division

Federal Highway Administration Office of Safety

RESOLUTION BY THE EXECUTIVE BOARD OF THE
KINGSPORT METROPOLITAN TRANSPORTATION PLANNING ORGANIZATION (MTPO)
TO ADOPT THE KINGSPORT MTPO LOCAL ROAD SAFETY PLAN (LRSP)

WHEREAS, the Kingsport Metropolitan Transportation Planning Organization (MTPO) is the designated Metropolitan Planning Organization (MPO) for the Kingsport urbanized area in Tennessee and Virginia and is responsible for carrying out a comprehensive, cooperative, and continuous transportation planning process; and

WHEREAS, a Local Road Safety Plan (LRSP) is a locally-focused data-driven plan that considers the unique and diverse safety issues of local roadways and provides a framework to improve safety and save lives; and

WHEREAS, the LRSP is a Proven Safety Countermeasure of the FHWA which results in a prioritized list of issues, risks, actions, and improvements that can be used to reduce fatalities and serious injuries on the area roadways; and

WHEREAS, the Kingsport MTPO staff has worked with the FHWA Office of Safety, a consultant team from VHB, and a diverse group of stakeholders to develop a LRSP for the Kingsport MTPO area; and

WHEREAS, the Kingsport MTPO staff and board recognize the importance of prioritizing roadway safety for everyone; and, therefore, support a goal of zero roadway fatalities and serious injuries by the year 2050.

NOW THEREFORE BE IT RESOLVED BY THE EXECUTIVE BOARD OF THE KINGSPORT METROPOLITAN TRANSPORTATION PLANNING ORGANIZATION AS FOLLOWS:

The Local Road Safety Plan has been developed in accordance with all applicable requirements and this resolution is adopted as an endorsement of the plan and goal toward zero roadway fatalities and serious injuries.

RESOLUTION APPROVED: Date: 11/3/22

Paul Montgomery, Chairman
Kingsport MTPO Executive Board

Lesley Phillips
Kingsport MTPO Staff

Executive Summary

The Kingsport Metropolitan Transportation Planning Organization (KMTPO) promotes a safe, efficient, and reliable multi-modal transportation system that serves the needs of the citizens and those that travel the Kingsport metropolitan region. The KMTPO planning area limits encompass Kingsport, Mt Carmel, Church Hill, Weber City, Gate City, and portions of Sullivan, Hawkins, Greene, and Washington Counties in Tennessee, and Scott County in Virginia. KMTPO is committed to improving transportation safety for all users and eliminating traffic fatalities and serious injuries. To achieve this, KMTPO initiated and, through a series of workshops, engaged a multi-disciplinary stakeholder group comprised of federal, state, and local representatives from the 4E's (engineering, enforcement, education, and emergency response) to develop a Local Road Safety Plan (LRSP).

A LRSP is a Federal Highway Administration (FHWA) Proven Safety Countermeasure[1] that provides a framework for identifying, analyzing, and prioritizing roadway safety improvements on local roads. The LRSP development process and content are tailored to local issues and needs. The process results in a prioritized list of issues, risks, actions, and improvements that can be used to reduce fatalities and serious injuries on all roads in the region. The KMTPO LRSP uses a strategic approach to achieve the vision of creating a transportation system that is safe for all users. It expands on past safety efforts by providing a data-driven framework to collaboratively and equitably focus multi-disciplinary safety strategies and allocate resources. This LRSP focuses on the safety issues of all public roads within the planning area limits and aligns with the goals, objectives, emphasis areas and strategies of the Tennessee Strategic Highway Safety Plan (SHSP)[2] and the Virginia SHSP[3]. It adopts a Safe System Approach[4] which is based on the principles that the human body is vulnerable, humans make mistakes, responsibility is shared, safety is proactive, redundancy is crucial, and it is unacceptable that these mistakes result in death and injury. This supports Tennessee Department of Transportation's (DOT) implementation of the national Toward Zero Deaths concept. The KMTPO LRSP helps the region fulfill its commitment toward eliminating traffic fatalities and serious injuries.

Developed using the collaborative six-step process documented by FHWA, the KMTPO LRSP's intent is to:

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[1] FHWA, Office of Safety, Proven Safety Countermeasures, https://safety.fhwa.dot.gov/provencountermeasures/local_roads.cfm

[2] Tennessee Department of Transportation, Tennessee Strategic Highway Safety Plan, https://www.tn.gov/content/dam/tn/tdot/strategic/SHSP-2020.pdf

[3] Virginia Department of Transportation, Virginia 2022-2026 Strategic Highway Safety Plan, https://www.virginiadot.org/info/resources/SHSP/VA_2017_SHSP_Final_complete.pdf

[4] FHWA, Office of Safety, Safe System Approach flyer, SA-20-015, https://safety.fhwa.dot.gov/zerodeaths/docs/FHWA_SafeSystem_Brochure_V9_508_200717.pdf

- Achieve a significant reduction of traffic fatalities and serious injuries on public roadways in the KMTPO planning area limits.
- Leverage partnerships and resources to maximize implementation of this plan.
- Complement efforts to develop and implement master transportation plans and other plans and studies.
- Identify strategies and action items based on data analysis and crash trends.
- Prioritize needed roadway safety improvements.
- Increase awareness of road safety and risks through education and enforcement.
- Develop support for funding applications.
- Support implementation of the Tennessee and Virginia SHSPs and help achieve their safety performance targets.

The region has a robust multi-modal transportation system that includes state and locally owned roadways, sidewalks, bicycle paths, multi-use paths, and transit facilities. The roadways in the region are a combination of local streets and multi-lane highways that seek to accommodate the various users of the system but also create conditions that may put vulnerable users at greater risk. The area is experiencing a growing aging population with reduced mobility options that contributes to the unique and diverse safety issues specific to the Kingsport metropolitan region.

This LRSP includes an analysis of safety data (crash, roadway, and traffic volume) for the over 1,000 miles of local roads and over 400 miles of higher classification such as Interstates and arterials that are owned by the State within the limits of the KMTPO planning area between 2016 to 2020. This analysis identified crash trends, over-represented crash types, and the High Injury Network (HIN). During this five-year analysis period, a total of 581 fatal and serious injury crashes occurred on the region's roadways. The data analysis results indicate that infrastructure related predominant crash types occurring on the road system include those involving roadway departure, intersections, and young drivers while predominant behavior-related crash types include distracted driving, impaired driving, speeding, and not using a restraint resulted in these fatalities and serious injuries.

The HIN are those roadways with a concentration of fatal and serious injury crashes. Data analysis facilitated the identification of 185 miles of HIN which represents nearly 14 percent of the region's road system on which nearly 71 percent of the total fatal and serious injury crashes occurred. These roadways also overlap with transportation equity areas. The largest portion of fatal and serious injury crashes occur on US-11W/TN-1, I-81, Fort Henry Drive/TN-36, US-23, TN-93, and I-26. Data analysis and field reviews of these locations and other portions of the HIN indicate a need for a variety of safety countermeasures such as enhanced visibility of the existing traffic control devices, crosswalks at intersections across the network, and consistent and enhanced delineation of curves. Safety improvements on the HIN will have the greatest impact on reducing fatal and serious injury crashes.

The stakeholder group used the data analysis results and collaborated through a series of workshops to establish vision, mission, and goal statements, select seven LRSP emphasis areas,

and identify safety strategies. The LRSP uses the five elements (Safe Roads, Safe Road Users, Safe Speeds, Safe Vehicles, and Post-Crash Care) of the Safe System Approach as the framework for integrating the emphasis areas, strategies, and action items. It uses a proactive approach and considers redundancy in the implementation of strategies and action items. Redundancy means that reducing risks requires that all parts of the transportation system play a role in safe roads, so that if one part fails, the other parts still protect people.

To facilitate implementation of the LRSP, each strategy and action item includes lead and partner agencies, an implementation time frame (low, medium, and long-term), and level of funding (low, medium, and high). The KMTPO and its stakeholders recognize the limitation of resources including funding, staffing, and existing protocols; therefore, have prioritized actionable strategies. These include items such as establishing a KMTPO Safety Committee, improving data collection especially related to non-motorized users and intersections, conducting road safety audits (RSAs) on HIN corridors, and implementing RSA recommendations, providing enhanced crosswalk and intersection visibility, and implementing road infrastructure that accommodates all users of the transportation system.

The LRSP identifies and prioritizes potential projects to help advance implementation. The LRSP is viewed as a living document that will be updated every three to five years as the Tennessee SHSP, Virginia SHSP, and the KMTPO Long Range Transportation Plan (LRTP) are updated to reflect changing needs and priorities of the Kingsport metropolitan region. It is the combined, collaborative efforts of the stakeholders that will advance the implementation of the LRSP and achieves the vision of creating a transportation system that is safe for all users.

Acronym List

4Es	Engineering, Education, Enforcement, and Emergency Medical Services
A	Suspected Serious Injury/A-Injury (From the KABCO Injury Scale)
B	Non-Incapacitating Injury (From the KABCO Injury Scale)
C	Possible Injury (From the KABCO Injury Scale)
DMV	Department of Motor Vehicles
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
HIN	High Injury Network
HSM	Highway Safety Manual
HSP	Highway Safety Plan
HSIP	Highway Safety Improvement Program
K	Fatality (from the KABCO injury scale)
KA	Fatal and Serious Injury
KMTPO	Kingsport Metropolitan Transportation Planning Organization
LEL	Law Enforcement Liaison
LRSP	Local Road Safety Plan
LRTP	Long Range Transportation Plan
NHTSA	National Highway Traffic Safety Administration
O	Property Damage Only (From the KABCO Injury Scale)
PSC	Proven Safety Countermeasure (As identified by FHWA)
RSA	Road Safety Audit
SS4A	Safe Streets and Roads for All
SHSP	Strategic Highway Safety Plan
TDOSHS	Tennessee Department of Safety and Homeland Security
TDOT	Tennessee Department of Transportation
THP	Tennessee Highway Patrol
THSO	Tennessee Highway Safety Office
VDH	Virginia Department of Health
VDMV	Virginia Department of Motor Vehicles
VDOT	Virginia Department of Transportation
VSP	Virginia State Police

Contents

Background

The Kingsport Metropolitan Transportation Planning Organization (KMTPO) consists of the City of Kingsport, City of Church Hill, and Town of Mount Carmel, Tennessee; Town of Weber City and Town of Gate City, Virginia; and portions of Hawkins County, Sullivan County, Greene County, and Washington County, Tennessee as well as portions of Scott County, Virginia. Figure 1 illustrates the geographic coverage of the KMTPO area.

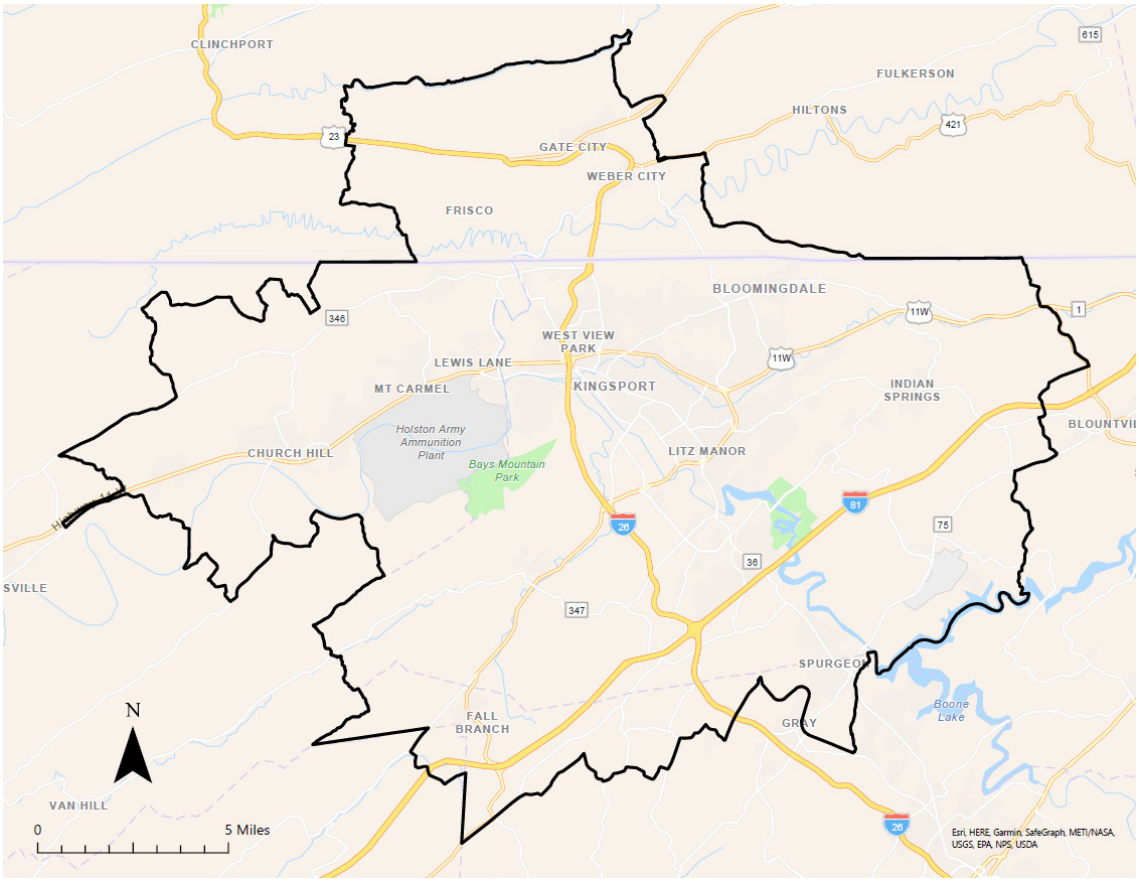

Figure 1. Graphic. Kingsport Metropolitan Planning Area (Source: FHWA, 2022).

According to data from the 2019 US Census American Community Survey (ACS), the KMTPO area has a population of 141,745 residents, roughly stable from 2010 (141,797). However, the City of Kingsport saw a substantial increase of 11 percent, or over five thousand people. Overall, population in the metropolitan planning area (i.e., Kingsport, Church Hill, Mount Carmel, Gate City, Weber City) increased by eight percent since 2010, due in large part to the growth in Kingsport. The four-county area population (including Sullivan, Hawkins, and Washington County in Tennessee and Scott County in Virginia) grew by one percent, primarily due to growth in Washington County. For comparison, the statewide average growth since 2010 is six percent for both Tennessee and Virginia.

The KMTPO provides a forum for decision-making in the metropolitan planning area to create a multi-modal transportation system that is safe and addresses the needs of the various system users. The region has a robust multi-modal transportation system that includes state and locally owned roadways, sidewalks, bicycle lanes, multi-use paths, and transit facilities. There are over 1,000 miles of local roadways within the metropolitan planning area. These roadways are a combination of older, historic routes in areas such as downtown Kingsport and multi-lane highways outside of the downtown core. The 2045 LRTP indicates there are 46 miles of roadway in the region with sidewalk and 30 miles of official bicycle accommodations (on-street bike lanes, paved shoulders, shared lanes) in the region. Three public transit operators exist in the region. Consideration of the diverse users of the system within the Kingsport region requires retrofitting infrastructure that has historically prioritized the motor vehicle.

The KMTPO is committed to improving transportation safety for all users and eliminating traffic fatalities and serious injuries. The established safety goal from the Kingsport Long Range Transportation Plan[5] (LRTP) is "*increase the safety of the transportation system for motorized and non-motorized users*". To achieve this, the KMTPO initiated and engaged a multi-disciplinary stakeholder group comprised of federal, state, and local representatives from the 4E's (engineering, enforcement, education, and emergency response) to develop a Local Road Safety Plan (LRSP).

A LRSP is a Federal Highway Administration (FHWA) Proven Safety Countermeasure[6] that provides a framework for identifying, analyzing, and prioritizing roadway safety improvements on local roads. The LRSP development process and content are tailored to local issues and needs. The process results in a prioritized list of issues, risks, actions, and improvements that can be used to reduce fatalities and serious injuries on local roads

The data-driven KMTPO LRSP aligns with the Tennessee Strategic Highway Safety Plan (SHSP) [7] and the Virginia Strategic Highway Safety Plan[8]. With the focus on improving safety for all users on the road system in the region, the LRSP adopts and uses the Safe System Approach as the framework for integrating the emphasis areas, strategies, and action items.

[5] KMTPO 2045 Long Range Transportation Plan, https://www.kingsporttn.gov/city-services/kmtpo/plans-and-documents/long-range-plan/

[6] FHWA, Office of Safety, Proven Safety Countermeasures, https://safety.fhwa.dot.gov/provencountermeasures/local_roads.cfm

[7] Tennessee Department of Transportation, Tennessee Strategic Highway Safety Plan, https://www.tn.gov/content/dam/tn/tdot/strategic/SHSP-2020.pdf

[8] Virginia Department of Transportation, Virginia 2022-2026 Strategic Highway Safety Plan https://www.virginiadot.org/info/resources/SHSP/VA_2017_SHSP_Final_complete.pdf

Developed using the collaborative six-step LRSP process documented by the Federal Highway Administration (FHWA), the KMTPO LRSP's intent is to:

- Achieve a significant reduction of traffic fatalities and serious injuries on all roads in the KMTPO planning area limits.
- Leverage partnerships and resources to maximize implementation of this plan.
- Complement efforts to develop and implement master transportation plans and other plans and studies.
- Identify strategies and action items based on data analysis and crash trends.
- Prioritize needed roadway safety improvements.
- Increase awareness of road safety and risks through education and enforcement.
- Pursue funding opportunities for identified safety priorities.
- Support implementation of the Tennessee and Virginia SHSPs and help achieve their safety performance targets.

Safe System Approach

The KMTPO LRSP adopts the Safe System Approach[9] (figure 2) which is based on the principles that the human body is vulnerable, humans make mistakes, and it is unacceptable that these mistakes result in death and injury. It is critical to design and operate the roadway system to keep impact energy on the human body at tolerable levels. Shared responsibility by all stakeholders is key, making it important that the stakeholders are collaborative and engaged when developing and implementing the KMTPO LRSP.

Figure 2. Graphic. Safe System approach (Source: FHWA).

The FHWA has recognized the Safe System Approach as a method for eliminating traffic fatalities and serious injuries for all roadway users. The Safe System Approach moves beyond the traditional approach of reacting strictly based on crash history to proactively identifying risk factors associated with severe crash types and implementing safety countermeasures systemically based on those factors. This LRSP includes the systemic implementation of strategies. All parts of the transportation system need to be strengthened to build in redundancy to accommodate failures of the system that may arise. Examples of redundancy include the installation of curve warning signs to alert motorists of conditions in which a slower speed is necessary combined with speed feedback signs and education and enforcement campaigns that help avoid behaviors that may result in crashes.

The KMTPO LRSP uses the five elements of the Safe System Approach as the framework for integrating emphasis areas and strategies. These elements encompass the 4Es of safety and accommodate human error:

Safe Roads: The roadway is the platform in which users move across the system. Safe roads incorporate engineering-related strategies during planning, design, construction, maintenance, and operations to prevent crashes and manage impacts to keep kinetic energy at tolerable levels should a crash occur.

[9] FHWA, Office of Safety, Safe System Approach flyer, SA-20-015, https://safety.fhwa.dot.gov/zerodeaths/docs/FHWA_SafeSystem_Brochure_V9_508_200717.pdf

Safe Road Users: This represents all users of all modes of travel. Their capabilities are influenced by factors such as age, level of impairment, and other behaviors. System owners and other stakeholders can use strategies such as signing, enforcement, and education campaigns to address these limitations and encourage behavior change.

Safe Speeds: As speeds increase, the risk of death and serious injury dramatically increase. This is especially true for pedestrians (figure 3) where the risk of death doubles for a pedestrian when speeds increase from 32 mph to 42 mph, and triples at 50 mph. Safe speeds increase the likelihood of an individual surviving a crash. Appropriate speed limits and signing, as well as radar speed feedback signs, help reduce the speed of users. These can be reinforced with enforcement and education campaigns.

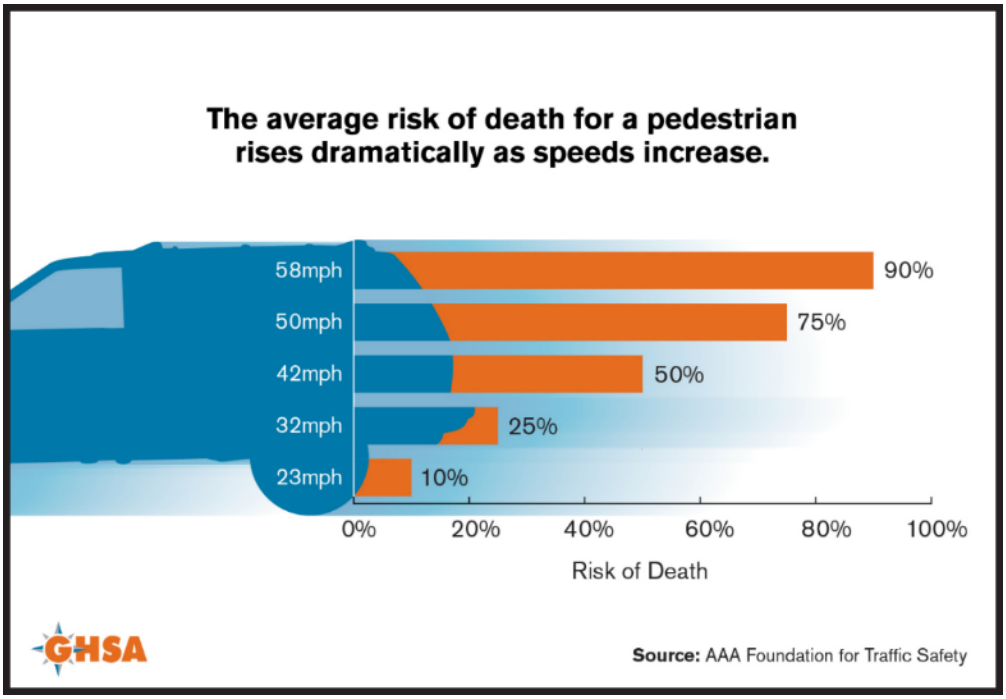

Figure 3. Graphic. Relationship between pedestrian crash risk and speed (Source: GHSA).

Safe Vehicles: Safe vehicles incorporate new technology and other features to prevent crashes from occurring, and if they do, reduce the severity of a crash.

Post-Crash Care: Post-crash care is critical when a crash occurs, and a person is injured. This includes first responders being able to quickly locate and respond to the crash and stabilize and transport the individual. This also includes accurate and complete data collection and sharing of the data to facilitate improved decision-making and investments specific to safety.

Ultimately, the Safe System Approach puts safety at the forefront and shifts how agencies prioritize transportation investments. The KMTPO and its stakeholders, through their combined efforts and application of the Safe System Approach in the KMTPO LRSP, can have success in reducing traffic fatalities and serious injuries on its roadways.

Equity

The transportation system is a vital component of the quality of life of the people in a community. As a minimum, it effects where people live, where and how they travel to work and school, and what services and recreational activities are available. Transportation equity seeks fairness in mobility and accessibility to meet the needs of all community members, especially those individuals traditionally underserved. These include populations with limited English proficiency, elderly, persons of disability, minorities, and low-income areas. The Federal Highway Administration (FHWA) provides information on its webpage Transportation Equity - Transportation Planning Capacity Building Program[10].

As noted in the Kingsport LRTP, the population of the Kingsport MPA is 94 percent non-Hispanic (White alone) and six percent minority. This is a much lower range of racial and ethnic diversity than the statewide averages of 26 percent for Tennessee and 38 percent for Virginia. The municipal areas are somewhat more diverse, with a nine percent rate overall, and ten percent within the City of Kingsport. Also noted in the LRTP is there are fewer millennials, more imminent retirees, and a much smaller minority population than would normally be expected for an area of this size compared to other regions in the country.

The Kingsport LRTP also indicates that the region has about 26 percent of households earning less than $25,000 (for reference, the federal poverty level for a four-person household in 2022 is $27,750, according to the Department of Health and Human Services, versus about $18,310 for two persons or $13,590 for one person)[11]. This 26 percent is above the Tennessee average of 23 percent. Generally, there are more low-income households in the municipalities (30%) than unincorporated areas, likely due to the importance of proximity to employment opportunities and public services when one is unable to afford the higher transportation costs associated with traveling longer distances. It is essential to consider these various populations and communities in the Kingsport metropolitan region early during the planning process to address potential impacts and transportation equity.

The KMTPO understands that the demographic composition (age, gender, race/ethnicity, ability/disability, income) of the region is critical to making informed transportation investment decisions and achieving the region's social equity goal of providing equitable investments in transportation to enable quality of life for all residents. The consideration of demographics and equity also influence safety of all road users. For example, houses with zero-vehicles likely means that there will be more people walking, bicycling, or using transit as a means of transportation. This increased exposure would lead to a higher percentage of pedestrian crashes in these communities. Implementation of safety countermeasures such as installing and properly maintaining sidewalks, adding high visibility crosswalks, evaluating intersections for safe

[10] FHWA/Federal Transit Administration, Transportation Capacity Building, Transportation Equity
[11] US Department of Health and Human Services. https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines

pedestrian accommodations, and placing transit stops to provide for safe travels of users in these zero-vehicle household blocks would improve traffic safety and address equity at the same time.

The KMTPO and its stakeholders considered transportation equity during each step of the LRSP development process. This included using indices to evaluate and compare locations of minority populations, low-income areas, and households with zero-vehicle with those roadways with higher concentration of fatal and serious injury crashes. The LRSP identifies strategies that address the safety needs of all road users. Projects identified support the recognition that the needs of all road users should align with future transportation investments.

Vision, Mission, Goal

The stakeholders established the KMTPO LRSP Vision, Mission, and Goal statements. These statements reflect the Safe System Approach principles that death and serious injuries are unacceptable and shared responsibility by all stakeholders is necessary. The Vision for the LRSP demonstrates the intent that all users of the roadway system within the Kingsport metropolitan region reach their destination safely. The Mission statement recognizes that a collaborative effort by all the safety partners is necessary to achieve the reductions in traffic-related fatalities and serious injuries set forth by the Goal. Strategies and action items identified in later sections of this LRSP reflect elements of the Safe System Approach and support achieving the Vision, Mission, and Goal statements.

Vision:

Eliminate ALL deaths and life-changing injuries on Kingsport metropolitan area roadways.

Mission:

Implement a collaborative data-driven 4E approach (Engineering, Enforcement, Education and Emergency Response) to reduce and prevent fatalities and serious injuries on all roads.

Goal:

Reduce all crashes annually on our roadways.

LRSP Process Methodology

LRSPs are an FHWA Proven Safety Countermeasures and are developed using a collaborative six-step process (figure 4). The following sections describe each step. More detail can be found in later sections of the plan. The KMTPO LRSP builds upon past and ongoing safety activities and considers the unique needs and issues specific to the road system within the planning area limits and the users of these roadways. The LRSP aligns with the Tennessee and Virginia SHSPs and its goals and strategies to eliminate traffic fatalities and serious injuries. This is supported by adopting the principles and elements of the Safe System Approach. Implementation is key and has been kept in the forefront during the LRSP development process.

Figure 4. Graphic. LRSP development process (Source: FHWA).

Establish Leadership

The KMTPO LRSP leadership team, comprised of representatives from regional and local agencies in the region, has a key role in the development and implementation of safety projects, programs, and policies. The leadership team is ultimately responsible for developing, adopting, and implementing the LRSP. The KMTPO engaged multi-disciplinary safety stakeholders representing 4Es: engineering, enforcement, education, and emergency response through a series of workshops to provide input into the development of the LRSP. These partnerships and collaborative efforts recognize a shared responsibility to eliminate fatal and serious injury crashes and provide the opportunity to share knowledge, leverage resources, and maximize implementation of the LRSP. An initial kickoff meeting was held to identify additional stakeholders and sources of data.

Analyze Safety Data

Analyzing safety data (e.g., crash, traffic, roadway data) identifies crash trends, high-risk factors, and those locations and infrastructure characteristics with a higher concentration of fatal and serious injury crashes. Tennessee Department of Transportation (TDOT), Virginia Department of Transportation (VDOT), and KMTPO provided safety data for the local roadways within the limits of the metropolitan planning area for the five-year period of 2016 to 2020. The safety analysis for the LRSP considered the over-representation of major crash types and their relationship between each other. This guided the selection of LRSP emphasis areas. Crash tree analysis helped to identify key combinations of factors that contribute to predominant crash types. This is especially

beneficial to systemically address locations where crashes have not yet occurred. An assessment of crashes and key corridors identified a High Injury Network (HIN) where most fatal and serious injury crashes occur. An overlay of the HIN with equity area maps for equity demographic indices showed a strong correlation between the HIN and equity areas of concentration. Performing safety field reviews helped to identify additional features that may contribute to crashes and safety countermeasures that are typically present to mitigate crashes. Ultimately, the analysis results and safety field review guided the selection of the emphasis areas and strategies and identification of potential projects.

Determine Emphasis Areas

Emphasis areas in a LRSP enable the safety stakeholders to better focus available resources. The Tennessee SHSP contains six emphasis areas and the Virginia SHSP 13 emphasis areas selected based on analysis results for the period of 2013-2017 and 2016-2020, respectively. The safety stakeholders considered these SHSP emphasis areas and the corresponding data analysis results for the roads within the limits of the Kingsport metropolitan planning area for 2016 to 2020. They selected the following seven emphasis areas for the KMTPO LRSP.

- Lane Departure.
- Distracted Driving.
- Impaired Drivers.
- Speed.
- Intersections.
- Young Drivers.
- Unrestrained Occupants.

Although crashes involving non-motorized users and older drivers are not included as emphasis areas in the LRSP, strategies related to these users are integrated into the other emphasis areas. The five Safe System elements serve as "pillars," and each emphasis area aligns with the appropriate Safe System element.

Identify Strategies

The LRSP identifies strategies and action items that support the appropriate Safe System element and align with each of the seven emphasis areas. This allows for the strategies to take all road users and modes of transportation into account, while also ensuring that multiple emphasis areas can be addressed simultaneously. It also makes it easier for the various stakeholders to strategize and implement the KMTPO LRSP. Based on local knowledge and potential policy changes, the stakeholders considered the data analysis results, potential to address identified safety issues, different types of road users, equity, and how to ensure the strategies are actionable when identifying multi-disciplinary countermeasures for inclusion in the LRSP. Many of the action items are identified in the Tennessee and Virginia SHSPs as well as the behavioral-related Highway

Safety Plans for each State and are considered as effective countermeasures by FHWA and National Highway Transportation Safety Administration (NHTSA).

Prioritize and Incorporate Strategies

The stakeholders considered each strategy and action item as well as the feasibility of implementation during the process to prioritize them. The cost and availability of resources as well as the ease of implementation or how a strategy could influence implementation of other strategies were factors that influenced the prioritization. Each action item is listed in priority order and includes the lead agency and partners, application method (e.g., regionwide), priority ranking, effectiveness, level of resources required (e.g., low, medium, or high), and an implementation time frame. Short-term actions are anticipated to be implemented within 3 years; medium-term actions can be implemented within 3 to 10 years; and long-term actions can be implemented within 15 years. Some actions are considered ongoing.

Evaluate and Update

System managers (engineers, planners, designers, builders, operators, and maintenance workers), law enforcement, post-crash personnel, system users and other stakeholders all have a shared responsibility to reduce traffic fatalities and serious injuries on the roadway system within the Kingsport metropolitan planning area. It is essential that this LRSP moves beyond a planning document. Implementation of the identified strategies and action items by the various stakeholders is key to achieving the goal set forth in this LRSP. The benefit of the alignment of the LRSP with the SHSPs in both States is that it leverages existing funding sources to support LRSP implementation. These include State funds from TDOT and VDOT as well as federal funding from sources such as the Highway Safety Improvement Program (HSIP) and Highway Safety Plan (HSP) administered by FHWA and NHTSA, respectively. In addition, the Bipartisan Infrastructure Law (BIL) establishes the new Safe Streets and Roads for All (SS4A) Grant Program which may support implementation of the LRSP. This new discretionary program provides $5-6 billion over the next five years of funding to support regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries.

The LRSP is a living document that should be evaluated and updated periodically. Tracking the allocation of resources, positive changes in user behavior, and the reduction in crashes as the various strategies and action items are implemented can be the mechanism with which the KMTPO and its safety stakeholders evaluate the effectiveness of the LRSP implementation. This also will assist the KMTPO and its stakeholders to identify new action items or those that should be expanded, determine necessary resources for implementation, and pursue grant opportunities.

Based on the five-year update cycle required for state SHSPs, it is anticipated that the Tennessee SHSP would be updated for 2025 and the Virginia SHSP for 2027. It is important that the KMTPO LRSP continue to align with the SHSPs to leverage safety resources. The KMTPO will update the LRSP in conjunction with priorities identified with each update of the State SHSPs. KMTPO will

also align the timing of the update of the LRSP with that of the KMTPO Long-Range Transportation Plan (LRTP). Aligning the timing provides an opportunity to integrate LRSP strategies and action items into LRTP projects, ultimately advancing the implementation of the LRSP. The Local Technical Assistance Programs (LTAP) programs in each State is a potential resource for assisting with the implementation, evaluation, and update of the LRSP.

Existing Efforts

The project team reviewed several resources developed by regional and State agencies as background research for this LRSP. These resources included the 2020-2024 Tennessee SHSP, the 2022-2026 Virginia SHSP, the 2020 Tennessee and Virginia HSIP annual reports, the State of Tennessee, and Virginia Highway Safety Plans for fiscal year 2021, the KMTPO Transportation Improvement Plan for 2020-2023, and the draft 2045 KMTPO LRTP.

The five-year Tennessee SHSP was released in 2020 and was developed based on input from numerous agencies and multi-disciplinary stakeholders. This document is an important resource for the development and implementation of the LRSP as it can inform potential strategies and actions for local adoption.

The Tennessee SHSP outlines six emphasis areas (EAs):

- Data Collection and Analysis
- Driver Behavior
- Infrastructure Improvements
- Vulnerable Road users
- Operational Improvements
- Motor Carrier Safety

The Virginia SHSP was released in 2022 and identified the following emphasis areas for implementation between 2022 and 2026 and grouped by Safe System elements

- Safe Road Users – Pedestrians & Bicyclists, Young Drivers, Aging Road Users, Occupant Protection, Impaired Driving, Motorcyclists
- Safe Vehicles – Heavy Vehicles, Connected & Automated Vehicles
- Safe Speeds – Speeding
- Safe Roads – Roadway Departure, Intersections
- Post-Crash Care – Emergency Response & Medical Services
- Supporting – Data & Analytics

The Tennessee HSIP Annual Report in 2020 identified the types of projects the State would like to allocate funds toward, including:

- Roadway Safety Audits (RSA)
- Local Road Safety Initiative
- Wrong Way Safety Initiative
- Ramp Queue Program
- Pedestrian Road Safety Initiative
- Spot Safety Program
- Cable Median Barrier
- Curb Ramps

- Roadway Resurfacing

Understanding that these programs are a State priority helps KMTPO stakeholders prioritize their projects toward these types of programs.

The Highway Safety Plans (HSP)[12][13] developed by each State to identify behavioral safety grants suggests a strong opportunity for the KMTPO LRSP that can effectively contribute to the reduction of fatalities within the region. The HSP indicates safety initiatives that target impaired driving, occupant protection, and speed.

KMTPO adopted the 2045 Long Range Transportation Plan in May 2022. In its development process, KMTPO continued the goals described in the 2040 edition of the plan which revolve around Livability, Sustainability, and Prosperity. In the 2045 update, there are new statements to advance viable and affordable public transportation and mobility options, support equitable transportation investments and policies, and support multimodal investments, especially bicycle and pedestrian enhancements.

[12] Tennessee HSP: https://tntrafficsafety.org/sites/default/files/tn_hsp_ffy_2021_-_amended.pdf
[13] Virginia HSP: https://www.dmv.virginia.gov/safety/highway_safety_plan.pdf

Data Analysis

The data analysis used statewide crash data from the Tennessee Department of Transportation (TDOT), as well as crash data in Scott County, Virginia from the Virginia Department of Transportation (VDOT). The severity of crashes is based on the KABCO scale which corresponds to the severity of the injuries as assessed by law enforcement officer responding to the crash scene. A crash with a fatality is coded as "K"; suspected serious injury as "A"; suspected minor injury as "B"; possible injury as "C", and property damage only as "O". Analysis results for the five-year period of 2016 to 2020 indicate that a total of 19,048 reported crashes occurred on roads within the limits of the Kingsport metropolitan region planning area. Of these crashes, 581 involved a fatality or serious injury.

Safety data analysis identifies trends and proportions in the types of crashes, risk factors, and locations with higher proportion of fatal and serious injury crashes. The objective of the analysis is to identify road safety priorities, emphasis areas, strategies, and action items that can be implemented by the various stakeholders. The analyses used crash trees to identify factors for the systemic application of safety countermeasures. Crash maps assisted with identifying corridors with higher concentration of fatal and serious injury crashes. Mapping of the equity areas allowed for a comparison with these corridors. A safety field review supplemented the results of the analysis and supported systemic application of specific strategies and action items.

Emphasis Area Analysis

The data analysis considered the over-representation of major crash types and their relationship between each other to guide the selection of the LRSP emphasis areas. The emphasis areas identified in the Tennessee and Virginia SHSPs serve as a starting point for the analysis. This ensures that the LRSP aligns with the SHSPs while also addressing the safety needs on the local roads within the Kingsport metropolitan region. The analysis period for the KMTPO LRSP is 2016 to 2020. This emphasis area share of all fatalities and serious injuries in the Kingsport region are compared against the share at the State level as published in the State SHSPs. While the Virginia 2022-2026 SHSP uses the same analysis period of 2016-2020, the Tennessee 2020-2024 SHSP uses the period of 2013 to 2017. The offset of the data analysis period does not significantly hinder the comparison of the statewide fatality and serious injury numbers with the values for the Kingsport metropolitan region as the comparison is with the percentages of overall KA fatalities and serious injuries.

Table 1 shows distribution of crashes and injuries that have occurred on the roads within the limits of the Kingsport metropolitan region planning area considering the emphasis areas in the SHSPs of both States. This table shows that roadway departure and intersection are significant factors for fatalities and serious injuries in the Kingsport region, both involved in at least 40 percent of those killed or seriously injured.

Table 1. KMTPO emphasis area share of fatalities and serious injuries compared to State share (Source: TDOT and VDOT, 2022).

Emphasis Area / Crash Attribute	Percent of KMTPO KA Persons (581)	Percent of Tennessee Statewide KA Persons (2013-2017)	Percent of Virginia Statewide KA Persons (2016-2020)
Roadway Departure	41.3	48.7	40.0
Intersection	40.0	30.9	35.1
Speeding	8.4	10.3	32.7
Occupant Protection	19.8	17.9	19.8
Impaired Driving	10.9	13.5	36.6 (includes distraction)
Distracted Driving	7.0	12.5	See above
Young (<20) Drivers	13.4	14.9	15.9
Older Drivers	27.3	17.6	18.5
Pedestrians	3.8	4.7	6.6
Bicyclists	0.5	0.9	0.2
Motorcycles	13.3	10.0	8.3

Intersection fatalities and serious injuries are notably higher than the average for both States, likewise, occupant protection, older drivers, and motorcycles are also above State averages. Pedestrians and bicyclists make up a small share of fatalities and serious injuries in the region and is generally below the State average.

The emphasis area matrix shown in table 2 illustrates the relationship between the stakeholder selected LRSP emphasis areas. This relationship allows stakeholders to leverage resources and address multiple emphasis areas simultaneously. The matrix is read by selecting the primary emphasis area on the left column and then reading across the row to determine that portion of fatal and serious injuries associated with the other emphasis areas.

Table 2. KMTPO LRSP emphasis area matrix, number of KA crashes 2016 to 2020 (Source: TDOT and VDOT, 2022).

	Roadway Departure	Intersection	Speeding	Unbelted	Impaired Driving	Distracted Driving	Young (<20) Drivers
Roadway Departure		18%	10%*	29%	15%	5%*	13%
Intersection	18%		4%	15%	8%	7%	15%
Speeding	53%	22%		24%	9%	16%	27%
Unbelted	62%	32%	10%		17%	5%	14%
Impaired Driving	57%	31%	7%	30%		15%	7%
Distracted Driving	30%	38%	18%	13%	23%		10%
Young (<20) Drivers	40%	45%	16%	20%	5%	5%	

**underreported due to both crash factors being reported within the same field*

The LRSP emphasis areas for distracted driving, roadway departure, impaired driving, and speeding are closely related. Strategies and action items consider this relationship. When looking at each of the emphasis areas individually, the distracted driving emphasis has a close

relationship with impaired drivers which represents 23 percent of the fatalities and serious injuries, while only 10 percent involve younger drivers. For the roadway departure emphasis area, crashes involving unbelted occupants represent 29 percent of the fatalities and serious injuries. Similarly, the impaired driving emphasis area more correlates to unbelted occupants (30 percent) and roadway departure (57 percent).

High Injury Network (HIN)

The High Injury Network (HIN) are those roadways that have a higher concentration of fatal and serious injury crashes. The HIN for the Kingsport metropolitan region represents 185 miles of roads as shown in figure 5, or almost 14 percent of the mileage of roads in the region. This represents 71 percent (334) of the fatal and serious injury (KA). Table 3 lists a subset of the HIN corridors (those with at least 3 percent of the region's KA crashes) and the percentage of KA crashes on the corridor segment.

Table 3. Priority High Injury Network (HIN) corridors (Source: TDOT and VDOT, 2022).

HIN Corridor	Length in Miles	K Crashes	A Crashes	Percent of Region's KA Crashes
Interstate 81	18.4	11	20	9.3
TN-1/East Stone Drive	8.8	6	34	12.0
TN-36/Fort Henry Drive	8.9	4	23	8.1
Interstate 26 / James H. Quillen Parkway	8.3	6	16	6.6
TN-93/John B. Dennis Highway	7.6	1	13	4.2
TN-126/Memorial Boulevard	7.0	2	9	3.3
US-11W/TN-1	14.2	10	13	6.9
US-23 (Virginia)	10.9	2	24	7.8

The top HIN are primarily Interstate and Principal Arterials. East Stone Drive/US-11W/TN-1 has the highest concentration of fatal and serious injury (KA) crashes (12 percent), and Interstate 81 has the second highest at 9.3 percent of KA crashes.

Whereas the State and Interstate routes show high numbers of fatal and serious injuries, the LRSP will also focus on addressing crashes on the local roads. The LRSP study team originally focused the plan on the non-State maintained roadway network and developed a HIN that excluded the State-maintained roads. However, the larger share of crashes on the State-maintained road network in the region and how these had the greatest influence on the region's road safety targets, led stakeholders to focus this LRSP on all roads in the region. In the local road analysis for the same study period between 2016-2020, Mill Creek Road, Carters Valley Road, East Carters Valley Road, North Eastman Road, and Bloomingdale Pike had the highest share of fatal and serious injury crashes. However, the number of crashes on these routes is smaller than the State routes shown in table 3.

A safety field review of the top HIN provided insight into risk factors and potential safety strategies that can be implemented systemically to address safety of all users and the various facilities. Consistently, the operating speed was higher than the posted speed limit. This higher operating speed combined with factors such as distracted driving or impaired driving results in a higher potential for fatal and serious injury crashes. Use of radar speed indicator signs will increase motorist awareness and possible compliance of posted speed limits, especially when combined with enforcement. East Stone Drive/US-11W/TN-1, with its high density of driveways presents an access management challenge.

Intersections across the system do not consistently have high retro-reflectivity backplates on signals, enhanced high visibility crosswalks, stop bars, and intersection and pedestrian ahead signage. These are essential to increasing the visibility of the intersection as well as the driver expectation for pedestrians, and ultimately will result in reduced fatalities and serious injuries involving intersections and pedestrians. In addition, safe accommodations for disabled users are necessary.

Improved delineation of bicycle lanes, new and old, as well as separation of bicycle lanes from the vehicle travel lane, especially on higher speed principal arterials would enhance the safety of these system users. In addition, improved connectivity of bicycle accommodations across the network provides a proactive approach to improving safety, especially as growth occurs in the region.

Consistent application of chevrons and advance warning signs on the Interstate and rural two-lane roads can proactively address roadway departure, especially with the winding roads and undulating topography of the region.

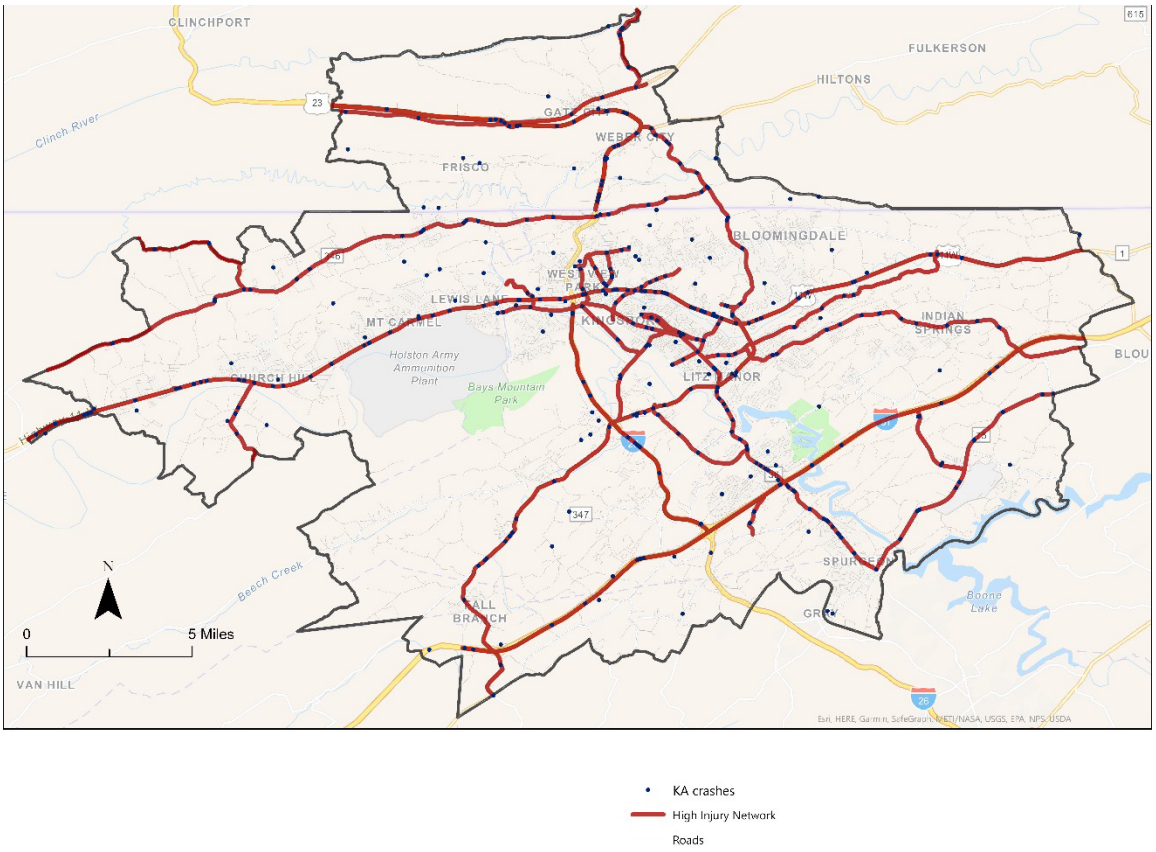

Figure 5. Graphic. Kingsport metropolitan region High Injury Network (Source: TDOT and VDOT, 2022).

Equity Analysis

As part of KMTPO's efforts to provide equitable investments in transportation, the LRSP included analyses of the overlap between transportation safety and equity. This includes the use of EJScreen, developed by the Environmental Protection Agency, which is an environmental justice mapping and screening tool that provides a nationally consistent dataset and approach for combining environmental and demographic indicators. EJScreen uses census block group data for its screen and reports indicator data by percentile, or the percent of population that exhibit a specified indicator. Of note, a Demographic Index that is based on the average of two demographic indicators; low-income and people of color, is used for this LRSP. Figure 6 shows that superimposing the HIN on the Demographic Index allows for comparison of block groups that have a high index value, particularly a high percentage of low-income residents and/or people of color, with the HIN. Several of the roadways identified as HIN are located within the higher concentrated areas of these key census block groups, particularly in the center portions of the City of Kingsport. Addressing safety on these corridors can simultaneously address these typical underserved populations and communities.

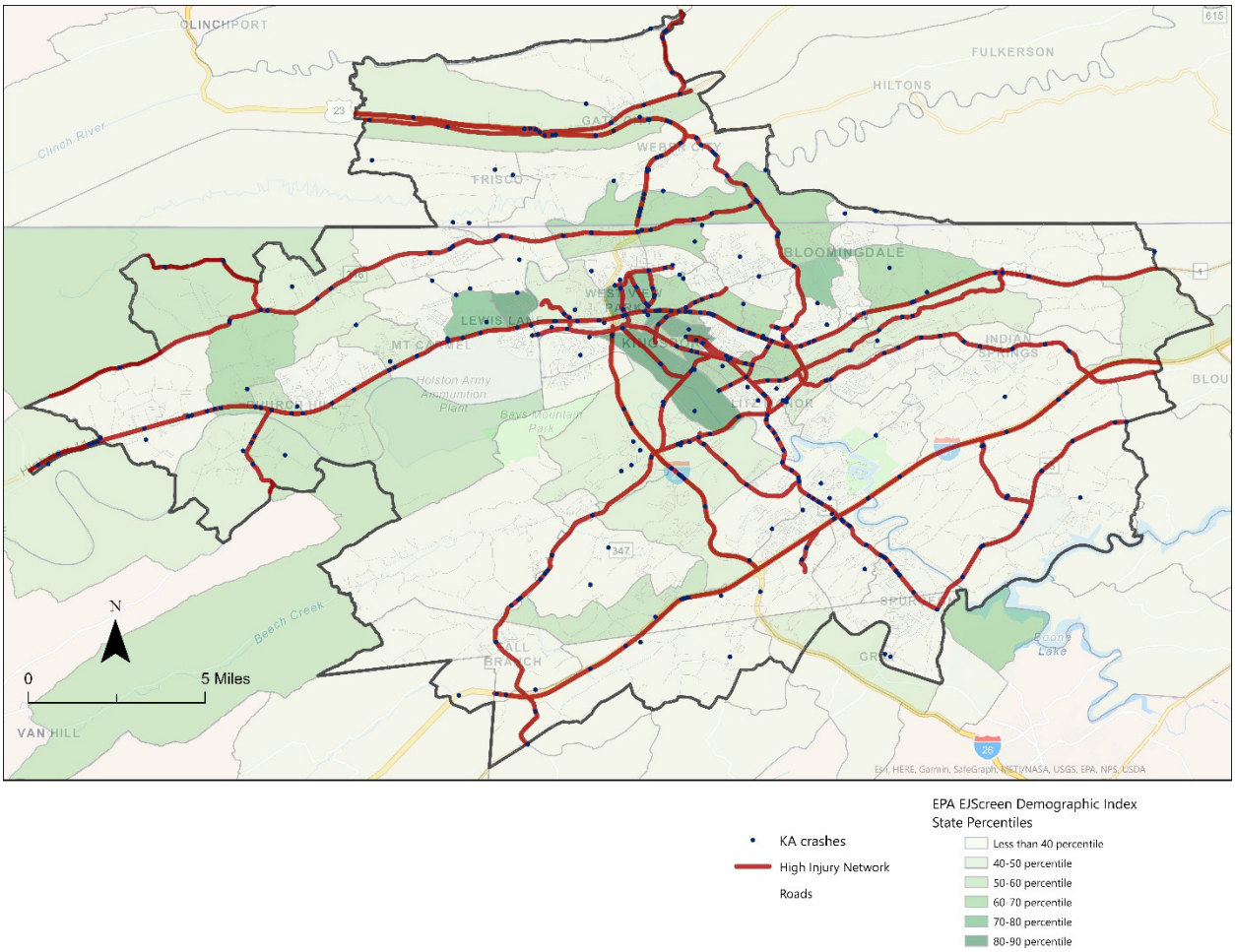

Figure 6. Graphic. Demographic index analysis and KMTPO High Injury Network (Source: TDOT, VDOT, EPA, 2022).

Systemic Analysis

Crashes are random in nature. A system-based approach looks beyond crashes at a specific location and evaluates risk across an entire roadway system, and proactively treats locations where crashes have not yet occurred. Systemic safety analysis evaluates crash data to identify key combinations of factors that contribute to predominant crash types and guides the selection and systemic implementation of low-cost proven safety countermeasures. This proactive technique complements traditional site-specific analysis and supports the Safe System principle that safety is proactive.

The systemic safety analysis developed crash trees (See Appendix) for each of the LRSP emphasis areas to evaluate the roadways within the limits of the Kingsport metropolitan region. Crash tree diagrams can be used as part of the systemic safety analysis process to help identify and select the facility types or combination of crash factors that are present in most crashes. A safety field review supplemented the systemic and HIN analysis to identify risk factors that may contribute to the potential for fatal and serious injury crashes. The discussion below presents the key findings from the crash tree diagrams.

Roadway departure crashes occur after a vehicle crosses an edge line or a center line, or otherwise leaves the traveled way. The roadway departure crash tree indicates that the largest number of roadway departure injury crashes are on two lane roads in the region, with trees and embankments a common factor in these crashes. Chevrons, advanced signing, and higher visibility pavement markings are countermeasures that help keep motorists in their lane of travel, especially at night.

Distracted driving is any activity that diverts attention from driving, including talking or texting on your phone, eating and drinking, talking to people in your vehicle, fiddling with the stereo, entertainment, or navigation system — anything that takes the driver's attention away from the task of safe driving. The distracted driving crash tree indicates most of these crashes involve more than one vehicle. The safety field review, which includes routes such as East Stone Drive, observed some motorists driving faster than the posted speed limit. Speeding reduces the ability for motorists to react quickly to avoid a crash, especially when distracted.

Most fatal and injury crashes involving young drivers occur during daylight conditions and many result in rear-end impact. Three primary factors for these crashes are following too closely, failure to yield the right of way, and driver inattention. Mapping of the younger driver fatal and serious injury crashes indicate a balance of both intersection-related and non-intersection related crashes. Improperly judging gaps in traffic for turning movements is a common contributing factor.

During the five-year analysis period, the highest number of fatal and serious injury crashes occurred between June and September. Most of the crashes occurred during the typical working hours of 7 am to 7 pm with most of these crashes occurring between 3 pm and 7 pm. This can guide targeted enforcement efforts.

Emphasis Areas

The KMTPO LRSP stakeholders identified seven emphasis areas to achieve significant reductions in traffic-related fatal and serious injury crashes and meet the safety goal of the LRSP. However, other emphasis areas will also be addressed based on the interrelationship of crash factors, contributing factors and recommended solutions that may benefit multiple emphasis areas.

The Emphasis Areas identified through the data analysis and confirmed by the stakeholders included:

Roadway Departure

Intersections

Distracted Driving

Unrestrained Occupants

Impaired Drivers

Speed

Young Drivers

Table 4 shows how each emphasis area can be grouped with the five Safe System elements. These groupings show which Safe System element has the greatest association with an emphasis area. However, this does not mean an emphasis area has no association with the other elements. The Action Tables section of this LRSP provides additional discussion about the relationship between emphasis areas and the Safe System elements.

Table 4. KMTPO LRSP emphasis areas by Safe System element.

Safe Roads	Safe Road Users	Safe Speeds	Post Crash Care	Safe Vehicles
Roadway Departure	Distracted Driving	Speed	All	All
Intersections	Unrestrained Occupants			
	Impaired Drivers			
	Young Drivers			

The following pages describe each emphasis area in greater detail.

Roadway Departure Crashes

Roadway departure crashes account for 41 percent of roadway fatalities and serious injuries in the region, which is the largest share of any emphasis area in this LRSP. Figure 7 shows there is a greater density of these crashes on the Interstate and on four-lane routes such as Fort Henry Drive/TN-36, US-11-W/TN-1, and US-23. However, it is notable that despite the clustering of these crashes on the four-lane routes, crashes on two-lane routes make up over half of the fatal and serious injury roadway departure crashes – these do not show up on the map as they are distributed throughout the region. This distribution suggests that roadway departure crashes would benefit from systemic improvements.

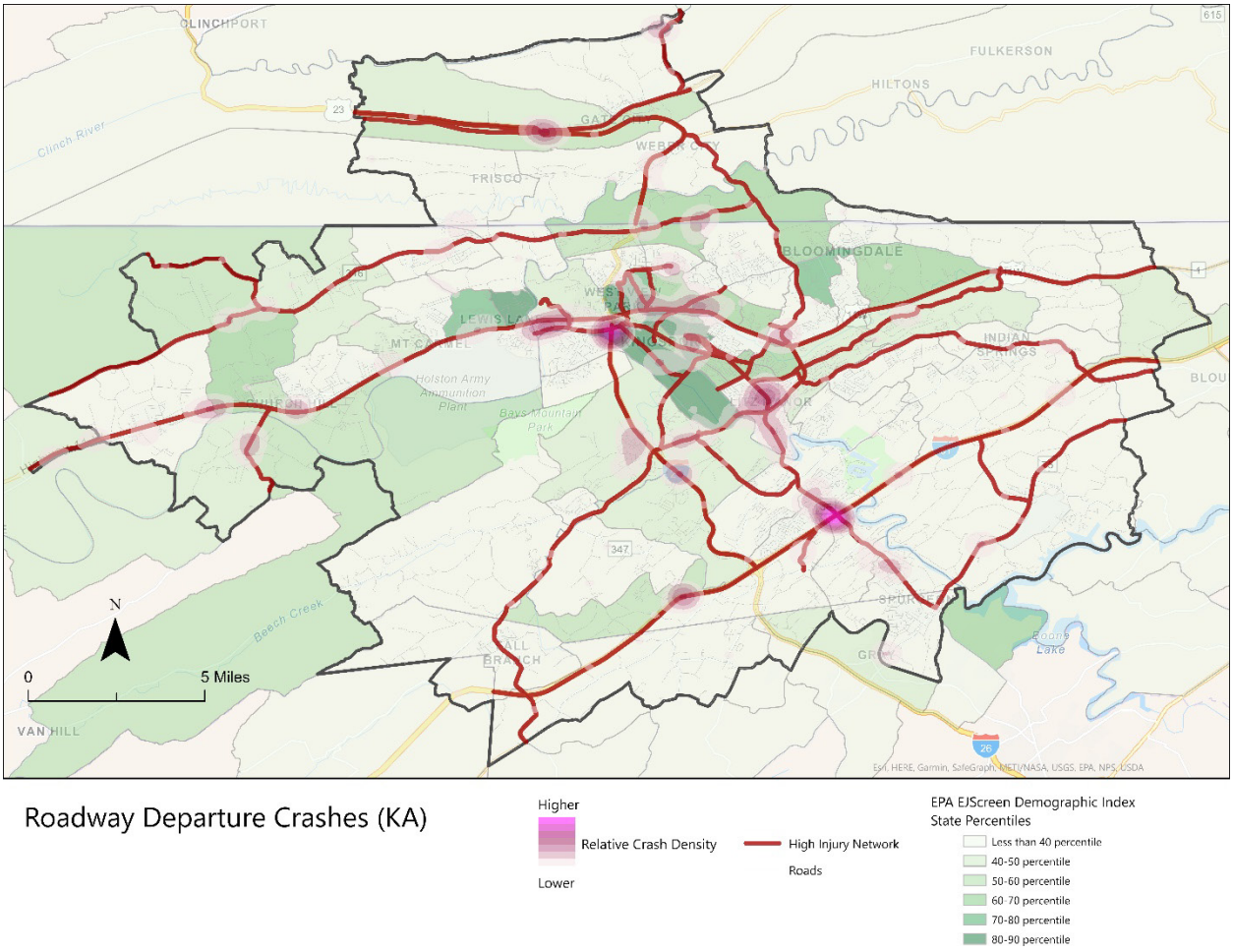

Figure 7. Graphic. High Injury Network with density of fatal and serious injury roadway departure crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Intersection Crashes

Intersection crashes make up 40 percent of roadway fatalities and serious injuries in the region. As figure 8 shows, the greatest density of these crashes is located within or adjacent to the central urban core of the City of Kingsport, with notable clustering on East Stone Drive/US-11W/TN-1. The density of intersections is greater in the densely populated and built-up areas, leading to greater conflict between users of the road system. Over half of these intersection crashes are of the angle-type and occur mainly during daylight hours.

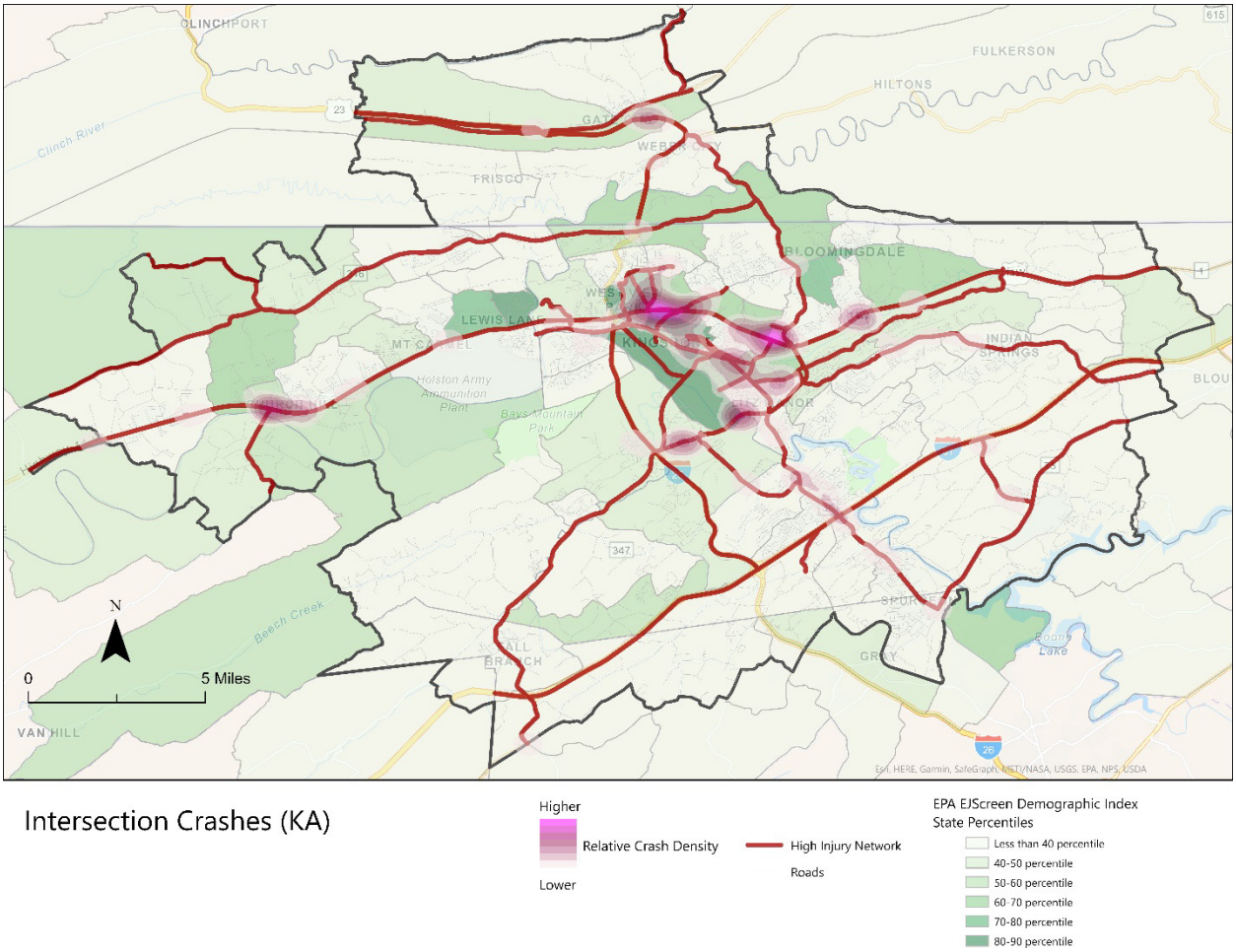

Figure 8. Graphic. High Injury Network with density of fatal and serious injury intersection crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Distracted Driving Crashes

Distracted driving crashes account for 7 percent of all roadway fatalities and serious injuries in the region, however, this percentage may be undercounted due to the difficulty in determining distraction in a crash. Figure 9 shows that distracted crashes are distributed throughout the region.

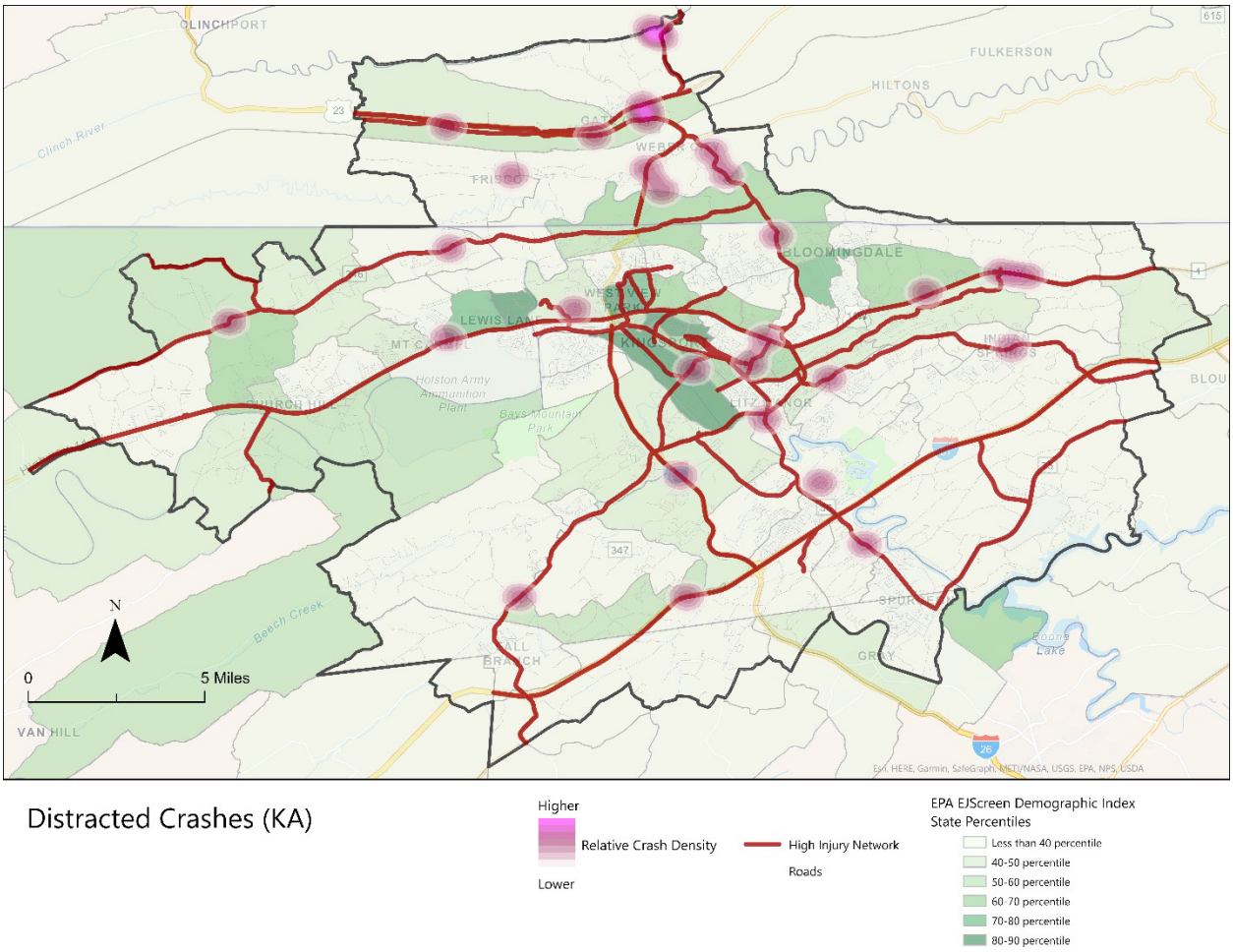

Figure 9. Graphic. High Injury Network with density of fatal and serious injury distracted driving crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Unrestrained Occupant Crashes

Crashes involving unrestrained occupants account for almost 20 percent of all roadway fatalities and serious injuries in the region. Figure 10 shows that the largest share of these crashes occurs on principal arterials in the region, which includes routes such as East Stone Drive/US-11W/TN-1, US-11-W/TN-1, and John B. Dennis Highway/TN-93. These crashes are often associated with lane departure crashes, with almost two-thirds of unbelted occupant crashes also involving the vehicle leaving the travel lane.

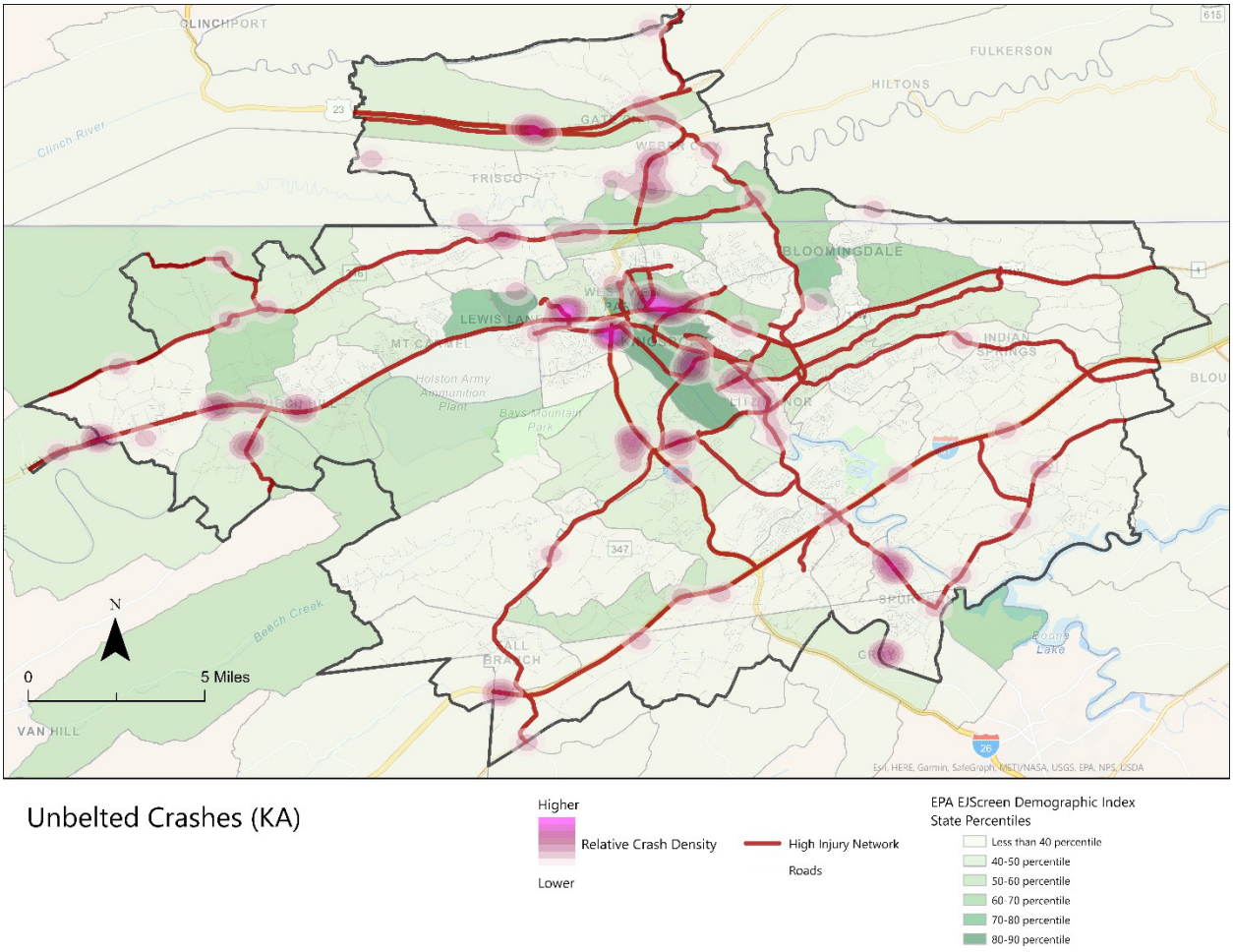

Figure 10. Graphic. High Injury Network with density of fatal and serious injury unrestrained occupant crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Impaired Driver Crashes

Impaired driving is reported in just over 10 percent of roadway fatalities and serious injuries in the region. Figure 11 shows that these crashes are distributed across the region but there is some notable density on or near Fort Henry Drive/TN-36. Over half of these crashes involve roadway departure. Also, over half of reported impaired driving crashes, regardless of severity, occur on Friday, Saturday, or Sunday. These crashes also occur generally in the evening hours.

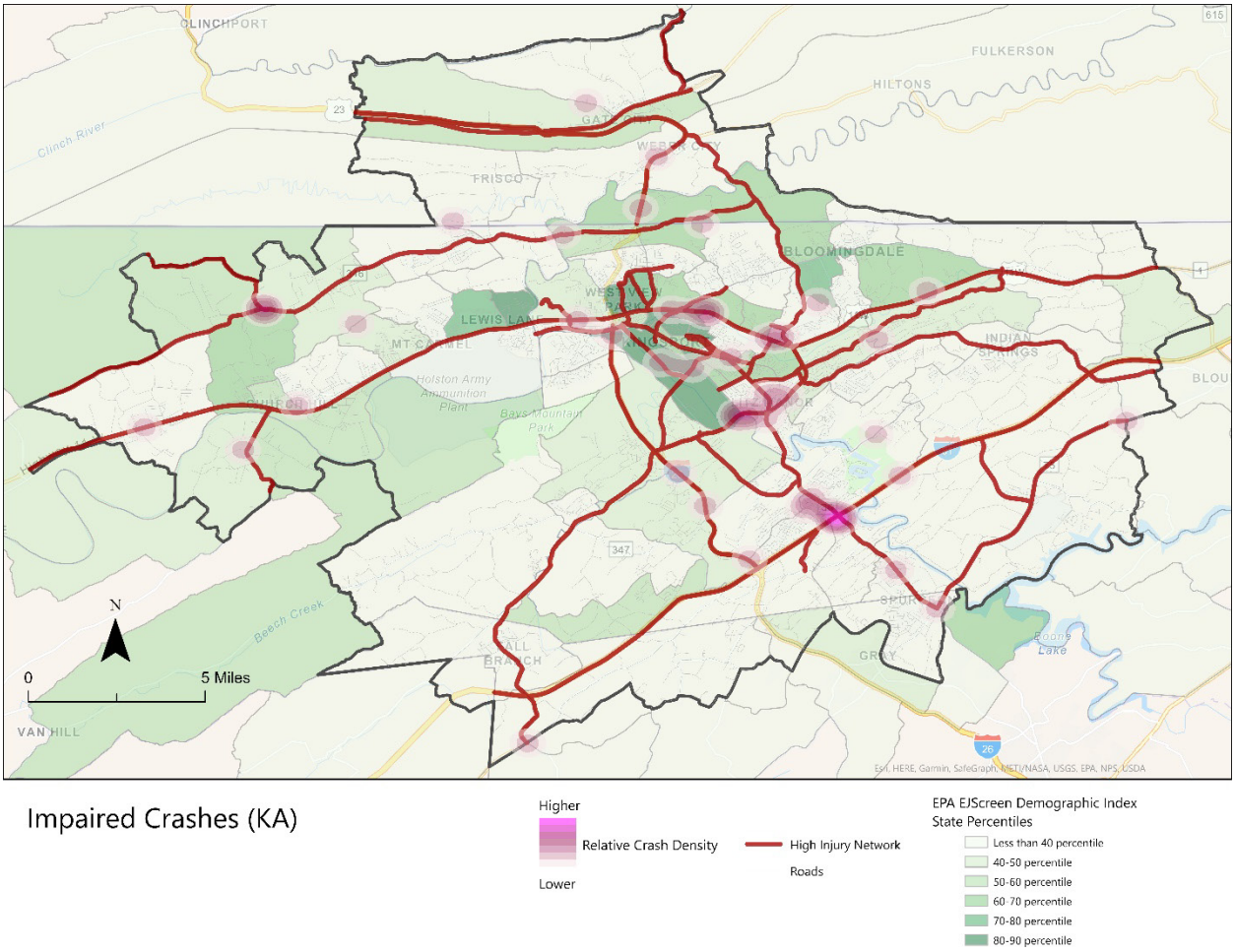

Figure 11. Graphic. High Injury Network with density of fatal and serious injury impaired driving crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Speed-Related Crashes

Figure 12 shows the density of speed-related crashes overlaid on the high injury network. Speed-related crashes account for 8 percent of fatalities and serious injuries in the region, with over half of these involving roadway departure. In addition, over one-quarter of these crashes involve young drivers, aged less than 20 years old. When looking at speed-related crashes for all crash severities across the region, most of them occur on two-lane roads and on roads with a posted speed limit of 35, 40, or 45 miles per hour.

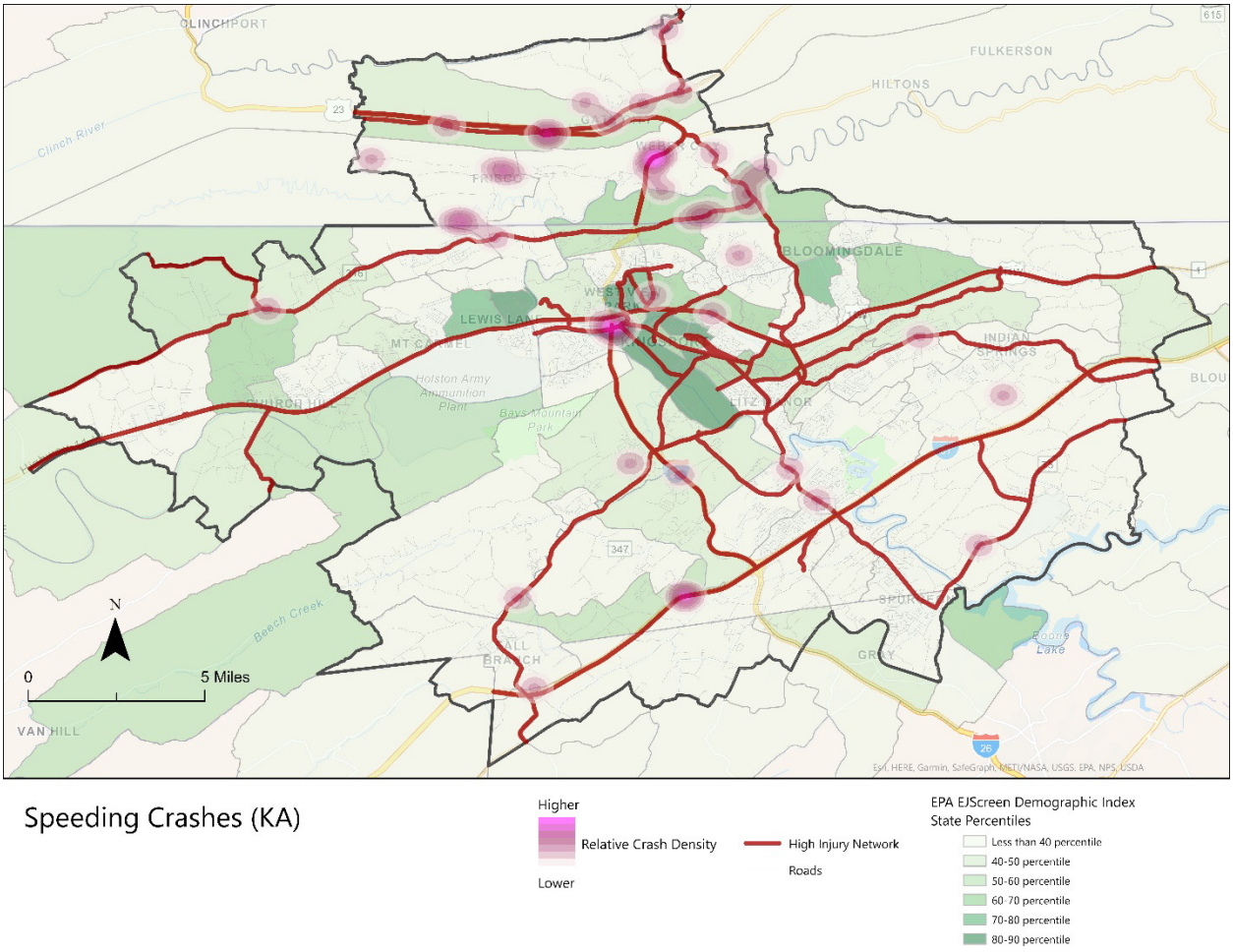

Figure 12. Graphic. High Injury Network with density of fatal and serious injury speed-related crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

Young Driver Crashes

Young Driver-involved crashes in the region account for 13 percent of all roadway fatalities and serious injuries. Figure 13 shows there is notable density of such crashes closer to the urban core of Kingsport, particularly on East Stone Drive/US-11W/TN-1. The data also shows that 40 percent of these crashes involve roadway departure and 45 percent are at intersections. When looking at young driver crashes for all crash severities, the intersection crashes are mostly angle and during daylight hours.

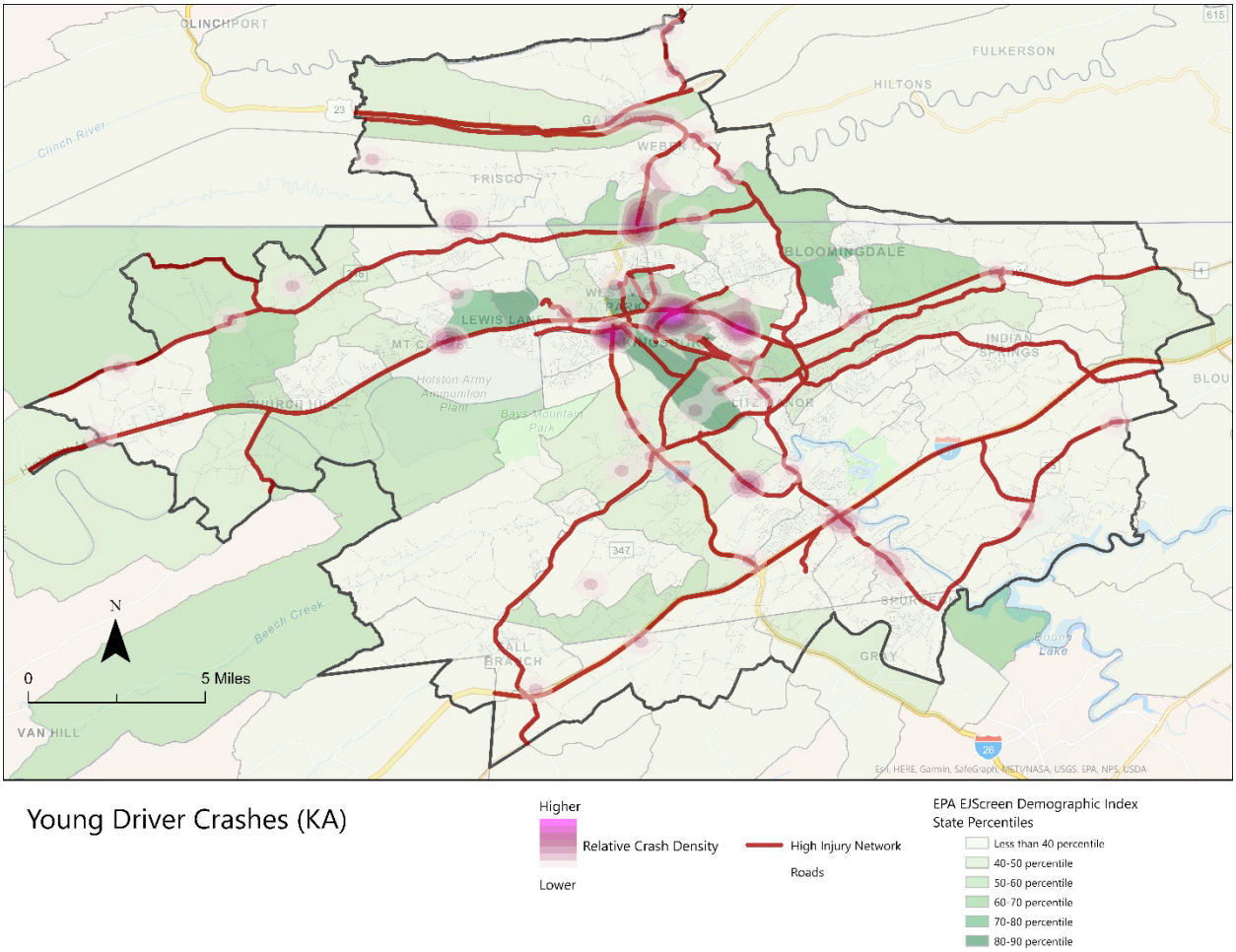

Figure 13. Graphic. High Injury Network with density of fatal and serious injury young driver crashes and demographic index screening (Source: TDOT, VDOT, and EPA, 2021).

The five elements of the Safe System Approach provide the framework into which each of these emphasis areas are integrated. The LRSP identifies strategies and action items for each Safe System element and emphasis area. Each action item includes the effectiveness (if available). The effectiveness of an engineering-related action item is measured by a crash modification factor (CMF) from the FHWA Crash Modification Factors Clearinghouse.[14] Each CMF in the Clearinghouse is given a star rating to indicate the quality or confidence in the results of the study producing the CMF. NHTSA's publication Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices[15] contains star ratings to measure the effectiveness of behavior-related (education and enforcement) countermeasures that are used most regularly by State Highway Safety Offices.

What is a crash modification factor (CMF)?

A CMF is an estimate of the change in crashes expected after implementation of a countermeasure. For example, an intersection is experiencing 100 angle crashes and 500 rear-end crashes per year. If you apply a countermeasure that has a CMF of 0.80 for angle crashes, then you can expect 80 angle crashes per year following the implementation of the countermeasure (100 x 0.80 = 80). If the same countermeasure also has a CMF of 1.10 for rear-end crashes, you will also expect 550 rear-end crashes per year following implementation (500 x 1.10 = 550).

(Source: FHWA CMF Clearinghouse)[14]

Behavior Countermeasure Star Ratings

★★★★ or ★★★★★ Effective
★★★ Promising, and Likely To Be Effective
☆☆ Effectiveness Still Undetermined
☆ Limited or No High-Quality Evaluation Evidence

(Source: NHTSA Countermeasures That Work)[15]

[14] FHWA, Crash Modification Factor Clearinghouse, http://www.cmfclearinghouse.org/
[15] NHTSA, https://www.ghsa.org/sites/default/files/2021-09/Countermeasures%20That%20Work%2C%2010th%20Edition.pdf

Action Tables

The KMTPO and its stakeholders evaluated the results of the data analysis and the safety concerns and priorities of the region, and using the Safe System Approach as the framework, established the strategies and action items represented in the LRSP. The strategies are organized by each Safe System element: Safe Roads, Safe Speeds, Safe Road Users, Safe Vehicles, and Post-crash Care. Each of these elements identifies LRSP emphasis areas, strategies, and action items which when implemented with leadership and partnership support and input will achieve the KMTPO LRSP safety goals. However, in a cost-constrained environment, not all actions are proposed to take place simultaneously. Therefore, these tables identify actions by short-term, medium-term, and long-term implementation time frames.

Safe Speeds

The KMTPO LRSP data analysis and stakeholder input led to including speed as an emphasis area and this directly aligns with the Safe System element, Safe Speeds. Such crashes include those where the vehicle operator is driving too fast for conditions or exceeding the posted speed limit. As speeds increase, the risk of death and serious injury dramatically increase, especially when pedestrians and bicyclists are involved. Higher speeds require longer stopping distances and influence the ability of drivers to control their vehicle, quickly react and avoid a crash. Safe speeds increase the likelihood of an individual surviving a crash and can be accomplished through implementation of strategies such as speed management, enforcement, and outreach efforts. Designing roadways with all users in mind and establishing appropriate speed limits help reduce the speed of users. This is further enhanced using proper signing including radar speed feedback signs. These can be reinforced with enforcement and education campaigns.

1. Safe System Element: Safe Speeds

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1. Conduct Speed Management							
1.1 Set speed limits on new roadways based on roadway context and target speed.	Multi-Jurisdictional	KMTPO, TDOT, VDOT Bristol District	N/A	Short, Ongoing	N/A	Speed	*TN SHSP Operational Improvements 4.6, Driver Behavior 2.4; First Workshop (Variable Speed Limits)*
1.2 Re-evaluate speed limits on existing roadways and implement projects (e.g., gateway treatments, chicanes) to calm traffic.	Multi-Jurisdictional	KMTPO, TDOT, VDOT Bristol District	High Injury Network	Medium	N/A	Speed	*Second Workshop*
1.3 Implement Complete Streets and Road Diets to provide context-sensitive street design.	Multi-Jurisdictional	KMTPO, TDOT, VDOT Bristol District	High Injury Network; Equity Areas	Medium	0.53-0.81	Speed	*Kingsport LRTP; FHWA PSC (Road Diets); First Workshop (Kingsport has Complete Streets policy)*
1.4 Use radar speed feedback signs to notify drivers they are speeding based on the posted speed limits.	County Sheriffs, City Police	TDOT, VDOT Bristol District	High Injury Network	Short-Term	0.95	Speed	*First Workshop (Kingsport has speed feedback signs)*

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1.5 Implement traffic calming measures[16]	Multi-Jurisdictional	TDOT, VDOT Bristol District		Short-Term	Varies	Speed	*Second Workshop; FHWA PSC (Road Diets)*
1.6 Improve quality and availability of speed data collection	KMTPO	TDOT, VDOT Bristol District, TN LTAP		Medium	N/A	Speed	*Second Workshop (discussion)*
2. Conduct Speed Enforcement							
2.1 Conduct high visibility speed enforcement.	County Sheriffs, City Police	THP, VSP, LEL, THSO, VDMV	High Injury Network	Short-Term, Ongoing	★★	Speed	*TN SHSP Driver Behavior 2.1, Vulnerable Users 4.3, 6.1; NHTSA Countermeasures That Work*
3. Conduct Outreach Efforts							
3.1 Conduct educational campaigns in conjunction with enforcement efforts to reinforce safe speeds.	KMTPO	THSO, VDMV; School district competitions	Regionwide	Short	★★★	Speed	*NHTSA Countermeasures That Work*
3.2 Coordinate with high schools to deploy national speed awareness education campaigns	KMTPO	THSO, VDMV, School Boards	Regionwide	Short	★★★	Speed	*Second Workshop (discussion)*

[16] https://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless11.pdf and https://www.ite.org/technical-resources/traffic-calming/traffic-calming-measures/

Safe Roads

The roadway is the platform in which users move across the system. The Safe System element, Safe Roads, considers the interaction of all users and incorporates engineering-related strategies during planning, design, construction, maintenance, and operations of the system to prevent crashes and manage impacts to keep kinetic energy at tolerable levels should a crash occur. The Kingsport metropolitan region has a limited infrastructure network to accommodate pedestrians and bicyclists. A field review of the HIN noted the need for pedestrian and bicycle facilities, improved connectivity of these facilities, and enhanced visibility of the existing traffic control devices and crosswalks at intersections across the network. Implementing strategies associated with these three key findings addresses crashes related to intersections, pedestrians, bicyclists, older drivers, and younger drivers. Enhanced delineation of curves on the road network can reduce roadway departure crashes.

2. Safe System Element: Safe Roads

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1. Conduct Road Safety Audits							
1.1. Conduct RSA on priority corridors.	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO, County Sheriffs, City Police LEL,	High Injury Network, Equity Areas	Medium	0.40-0.90	All	*TN SHSP Infrastructure 1.1, 2.1, 6.1; FHWA PSC (Road Safety Audits); First Workshop Discussion (TDOT has conducted them in the past)*
2. Reduce Lane Departure Crashes							
2.1. Install, enhance, or maintain center line and edge line markings on paved roadways.	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	Edge lines: 0.63-0.78	Lane Departure	*FHWA PSC (Wider Edge Lines, Enhanced Delineation for Horizontal Curves, Longitudinal Rumble Strips and Stripes); First Workshop (not much shoulder or clear zone)*
2.2. Curve delineation using advance curve warning signs, chevrons, reflective strips on signposts, and pavement markings	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	0.75-0.85	Lane Departure	*FHWA PSC (Enhanced Delineation for Horizontal Curves)*

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
2.3. Install SafetyEdge[SM] to give drivers the opportunity to return to their travel lane while maintaining control of their vehicle.	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	0.79-0.89	Lane Departure	*FHWA PSC (SafetyEdge[SM]); First Workshop (SafetyEdge[SM] discussion)*
2.4. Widen shoulders	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Medium	Varies	Lane Departure	*First Workshop (recommended for some roads)*
2.5. Install centerline and shoulder rumble strips	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	Centerline: 0.46-0.56 Shoulder: 0.49-0.87	Lane Departure	*FHWA PSC (Rumble Strips); First Workshop (recommended for some roads)*
2.6. Improve clear zones	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Medium	0.56-0.78	Lane Departure	*First Workshop (recommended for some roads)*
2.7. Implement high friction surface treatment	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Medium	0.52	Lane Departure	*Second Workshop (discussion); FHWA PSC (Pavement Friction Management)*

3. Improve Intersection Safety							
3.1. Systemic application of low-cost countermeasures (signing, delineation, and pavement markings) at stop-controlled intersections.	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	0.73-0.95	Intersections	*FHWA PSC (Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections); First Workshop (restriping of turn lanes)*
3.2. Verify Sight Triangles and eliminate obstructions	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Short	N/A	Intersections	*TN SHSP Infrastructure 2.2; First Workshop (sight distance concerns)*
3.3. Implement Innovative Intersections (e.g., roundabouts, RCUT, Restricted Crossing U-Turn)	Multi-Jurisdictional	TDOT, VDOT Bristol District, KMTPO	Divided Highways (East Stone Drive, West Stone Drive)	Medium	Roundabout: 0.18-0.22 RCUT: 0.36-0.78	Intersections	*FHWA PSC (Reduce Left-Turn Conflict Intersections, Roundabouts)*
3.4. Manage Corridor Access	Local planners	TDOT, VDOT Bristol District, KMTPO	High Injury Network	Medium	0.69-0.75	Intersections	*FHWA PSC (Corridor Access Management); First Workshop (TDOT Access Management program)*

Safe Road Users

This element addresses all users of all modes of travel. Their capabilities are influenced by factors such as age, level of impairment, and other behaviors. System owners and other stakeholders can use strategies such as signing, enforcement, and education campaigns to address these limitations and encourage behavior change.

3. Safe System Element: Safe Road Users

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1, Coordinate efforts to address impairment, restraint use, distraction, and young drivers							
1.1 Establish a safety working group which will focus on strategies to improve driving behavior.	KMTPO	TDOT, VDOT Bristol District, County Sheriffs, City Police	Regionwide	Short	N/A	All	*TN SHSP Implementation and Evaluation*
2. Conduct community outreach to address impairment, restraint use, distraction, and young drivers							
2.1 Host informational meetings and press events and provide editorials to local news to inform the public of the region's safety activities.	KMTPO	THSO, VDMV, School Districts	Regionwide	Short	★★★	All	*NHTSA Countermeasures That Work*
2.2 Highlight *Drive Safe Tennessee* and other similar campaigns on regional, county, city, and other stakeholders' websites.	KMTPO	County stakeholders, THSO, Law Enforcement Agencies	Regionwide	Short	★★★	Impaired Driving, Young Drivers, Occupant Protection, Distracted Driving, Speed	*NHTSA Countermeasures That Work*

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
2.3 Use the distracted driving simulator, rollover convincer, and other exhibits at community events and high schools to demonstrate the impact of risky driver behavior.	TDOSHS	School districts, THSO, VDMV	Regionwide	Short	★★★	Young Drivers, Occupant Protection, Distracted Driving, Lane Departure	*TN SHSP Driver Behavior 1.6, 3.4, 4.1, 5.2; Infrastructure 4.2; First Workshop (public health and school districts have conducted campaigns, impairment goggles)*
2.4 Implement driver education programs to reduce aggressive and risky behavior by drivers.	TDOSHS, VDH	County Health Departments	Regionwide	Short	★	Impaired Driving, Speed, Occupant Protection, Distracted Driving	*TN SHSP Driver Behavior 1.6; First Workshop (Alive at 25 campaigns)*
2.5 Address youth alcohol and drug use and driving and restrict minor access to alcohol.	TDOSHS, VDH	County health departments	Regionwide	Short	★★★	Impaired Driving, Young Drivers	*TN SHSP Driver Behavior 1.7, 5.1*
2.6 Implement outreach campaigns that address non-motorized users of the transportation system about their conspicuity	KMTPO	THSO, VDMV	Regionwide	Short	★★★	All	*Second Workshop (discussion)*
3 Enforce the Rules of the Road							
3.1 Conduct High Visibility saturation patrols for impaired driving.	County Sheriffs, City Police	THP, VSP, LEL, THSO, VDMV	High Injury Network	Short	★★★★	Impaired Driving	*TN SHSP Driver Behavior 1.2; First Workshop (active with Click it or Ticket)*

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
3.2 Perform integrated enforcement of impaired driving, speed, occupant protection, and distracted driving.	County Sheriffs, City Police	THP, VSP, LEL, THSO, VDMV	High Injury Network	Short	★★★	Impaired Driving, Speed, Occupant Protection, Distracted Driving	*TN SHSP Driver Behavior 1.2, 2.1, 3.3, 4.2; NHTSA Countermeasures That Work*
3.3 Engage LEL for training, grant assistance, and coordination of enforcement activities and initiatives.	County Sheriffs, City Police	THP, VSP, LEL, THSO, VDMV	Regionwide	Short	N/A	Impaired Driving, Young Drivers, Occupant Protection, Distracted Driving, Speed	*TN SHSP Driver Behavior 1.1, 3.6*
3.4 Participate in Comprehensive Alcohol Risk reDuction (CARD) enforcement projects. These are a combination of the Cops in Shops and the Party Patrol programs that allows for a greater number of patrols in a community and will increase the perception of risk.[17]	TDOSHS	Local law enforcement	Tennessee counties	Short	★★★	Impaired Driving	*TN SHSP Driver Behavior 5.3*

[17] https://tntrafficsafety.org/applying-for-grants

Post-Crash Care

Post-crash care is one of the five Safe System elements and is critical to the survivability of a crash victim. The ability of emergency responders to quickly locate and respond to a crash and stabilize and transport an individual injured in a crash influences the chances of survivability. The crash location is a major factor related to the response time. The distance away from the necessary emergency care plays a significant role in whether an injured person survives a crash. For these reasons, accurate and complete data collection and sharing of the data is important to facilitate improved decision-making and investments specific to safety. Communication and collaboration between all stakeholders are necessary to improve post-crash care and reduce the potential of crashes resulting in fatalities and serious injuries.

4. Safe System Element: Post-Crash Care

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1. Coordinate Post Crash Efforts							
1.1. Establish an Incident Management Taskforce to coordinate with emergency response officials to determine and address roadway issues related to getting crash victims medical care as well as desired training	County EMS Departments	TDOT, VDOT Bristol District	Regionwide	Short	N/A	All	*TDOT SHSP Operational Improvements 3.1, 3.2, 3.3; First Workshop (example Sullivan County FIRST team); Second Workshop (Incident management discussion)*
1.2. Partner on providing quick clearance of incidents	County Sheriffs, City Police	TDOT, VDOT Bristol District	Regionwide	Short	N/A	All	*TDOT SHSP Operational Improvements 2.1; First Workshop (example Sullivan County FIRST team)*
1.3. Reinforce the Move Over Law through outreach campaigns	KMTPO	THP, VSP	Regionwide	Short	N/A	All	*Second Workshop discussion*

Safe Vehicles

Safe vehicles incorporate new technology and other features to prevent crashes from occurring, and if they do, reduce the severity of a crash.

5. Safe System Element: Safe Vehicles

Strategy/Action	Lead Agency	Partners	Priority Location	Timeline	Crash Modification Factor/Star Rating	Emphasis Area	*Source of Strategy or Comment from Workshops*
1. Coordinate efforts to address Safe Vehicles							
1.1. Maintain and increase alternative transportation options in the region, especially in underserved communities	KMTPO	TDOT, VDOT Bristol District	Regionwide	Medium	★★★	All	*KMTPO LRTP; First Workshop (Equity discussion); NHTSA Countermeasures That Work*
1.2. Provide training on the safe operation of work vehicles to city and county employees.	Cities, Counties	All local jurisdictions	Regionwide	Medium	N/A	All	*First Workshop (Public Works can set an example by not using phones or laptops while driving)*
1.3. Implement Intelligent Transportation System infrastructure-related technologies to enhance vehicular safety and communication.	TDOT	KMTPO	Regionwide	Long	N/A	All	*TDOT Kingsport Regional ITS Architecture and Deployment Plan 2017*

Implementation and Evaluation

The KMTPO LRSP builds on past and ongoing efforts, strengthens partnerships, and enhances the ability to leverage limited funds and resources. Moving the LRSP from planning to implementation is essential to reduce fatalities and serious injuries occurring in the region. This section provides a road map to guide implementation of the LRSP and evaluate success. It identifies potential funding sources and a detailed list of strategies and action items using the Safe System Approach as the framework.

A key benefit of the KMTPO LRSP is its alignment with the SHSPs for both Tennessee and Virginia. As TDOT and VDOT use the SHSP and its emphasis areas to guide its safety funding, the alignment of the KMTPO LRSP strategies and actions with State priorities enhances their eligibility for Federal and state safety funds. Federal funding from the HSIP to support infrastructure projects is predicated on this linkage to emphasis areas in the SHSP; therefore, the region's alignment with the State's safety efforts is critical. Accessing these Federal funds helps to supplement local funding for projects stemming from this LRSP. Additionally, Federal behavioral safety grant funding from NHTSA and managed in the highway safety office in each State is available on an annual basis.

Establishment of a Kingsport Regional Safety Committee provides a leadership group to facilitate LRSP implementation. Membership from the multi-disciplinary LRSP stakeholder group ensures a seamless transition to this new Safety Committee. Essential activities can include coordinating with the various existing committees, collaborating with key stakeholders, prioritizing safety projects, and pursuing potential funding opportunities that support implementation of LRSP strategies and actions across the region. This Safety Committee would also coordinate with TDOT and VDOT to ensure the safety activities of the region align with the State safety priorities.

Evaluation of the LRSP will be in the form of process and outcomes. Process evaluation involves reviewing each numbered action under the strategies in the LRSP and determining if progress has been made. Outcome evaluation looks at the impact of activities. For some projects, such as site-specific projects, it is relatively straightforward to determine safety impact based on pre-construction and post-construction crash statistics. For other projects, it may be a combination of several activities that lead to a change in crash frequency. For example, a change in the frequency of impaired driving crashes may be a result of a combination of educational and enforcement initiatives. Therefore, because of the interrelationship between different safety activities in the region, KMTPO will use fatalities and injuries as the metric for annual progress in each of the emphasis areas.

KMTPO will consider other metrics, if data allow. Changes in traffic volumes, crash severity, and characteristics of crashes also provide meaningful insight into the effect of safety

countermeasures. Part B of the Highway Safety Manual (HSM)[18] is a useful resource that provides further information on different performance measures and evaluation methods.

The KMTPO and its stakeholders recognize that some strategies may take several years to fully implement. Additionally, it may take several years to realize the benefit of the strategies through a reduction of fatal and serious injury crashes. The LRSP is a living document and will be reviewed on an on-going basis. Like the SHSP, a full update of the LRSP is anticipated to be completed every five years, in conjunction with the LRTP update, or as deemed necessary by KMTPO. However, more frequent updates to the individual strategies and actions may take place to reflect the Plan's progress and any new policies that affect implementation. The KMTPO will be the primary agency responsible for updating the LRSP with support from the stakeholders.

KMTPO will also consult additional resources to guide the implementation of the LRSP, such as Chapter 3 of FHWA's reference, Implementing a Local Road Safety Plan[19].

Funding Sources

Funding is critical to implement the strategies and action items in this LRSP and may come from a variety of sources: federal, state, local, and the private sector. These include standard funding program mechanisms and grants as well as new initiative grants. Some potential sources of funding may include the following:

- **Local Agency Funding**. Local agencies have various funding sources that can be used to improve and maintain roadways and perform other safety activities. Consideration of the LRSP strategies during the allocation of funding, especially for maintenance activities or other roadway improvement projects can support implementation of the LRSP.
- **Highway Safety Improvement Program (HSIP.)**[20] The TDOT and VDOT each manage HSIP programs. This core Federal-aid highway program funds projects and strategies that are data-driven, align with the State SHSP, and through implementation, help reduce traffic-related fatalities and serious injuries on all public roads, including locally owned public roads and roads on Tribal lands. The HSIP supports advancing implementation of the Safe System Approach and LRSPs. KMTPO tabulates HSIP funds within its Transportation Improvement Program (TIP).
- **Safe Streets and Roads for All**. The Bipartisan Infrastructure Law (BIL) established the new Safe Streets and Roads for All (SS4A) discretionary program that will provide $5-6

[18] AASHTO, Highway Safety Manual, https://www.highwaysafetymanual.org/Pages/default.aspx
[19] FHWA, Office of Safety, Implementing a Local Road Safety Plan, https://safety.fhwa.dot.gov/local_rural/training/fhwasa20025/chap3.cfm
[20] FHWA, Office of Safety, HSIP Eligibility Guidance, https://safety.fhwa.dot.gov/hsip/rulemaking/docs/BIL_HSIP_Eligibility_Guidance.pdf

billion in grants over the next 5 years. Funding supports regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries.

- **Federal NHTSA Grant Funding**. The highway safety office in each State manages the various federal NHTSA grant funding that the State receives to support enforcement, education, and emergency response activities to improve driver behavior and reduce deaths and injuries from motor vehicle-related crashes. The highway safety office in each State receives grant applications annually in early spring and approval by NHTSA, typically in July.
- **Congestion Mitigation and Air Quality Improvement (CMAQ) Program**. These federal funds are made available to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act.
- **Technology Transfer (T2)**. These federal funds are managed by the FHWA Division office and are used for research development, technology and innovation transfer, outreach, and communication activities (e.g., peer exchanges, scan tours). They are completely reimbursable for travel.
- **FHWA Grants and Technical Assistance**. FHWA may make other funding available through grants to advance various safety activities. Other initiatives through FHWA that can provide resources to assist locals with LRSP activities include technical assistance.

Implementation of Strategies and Action Items

Each of the strategies and action items in the tables for each Safe System element addresses the seven emphasis areas identified within the KMTPO LRSP using the Safe System Approach. Agency leads, priority locations, potential funding sources and timeframe for implementation have been provided for each emphasis area strategy and action item. The implementation time frame identified as "Short" is for a period of now to three years; "Medium" covers three to eight years; "Long" covers a period over eight years.

The strategies and actions in the LRSP can also link to the current and future updates of KMTPO-led programs including the Long Range Transportation Plan and the Transportation Improvement Program. Bringing together the LRSP with these other plans and programs has the potential to reduce administrative burden, encourages the use of consistent data and analysis methods, and allocates resources to identified locations and programs that address the greatest safety needs in the region.

Regional Safety Priorities

Based on analysis of the High Injury Network, field reviews, and input from stakeholders, Table 4 presents projects that should be considered for implementation.

Legend: = Equity Area = Short Time Frame = Medium Time Frame = Long Time Frame

Table 4: Regional Safety Priority Projects

Project Name and Description	Lead Agency	Cost (Low, Medium, High)	Safe System Element	Emphasis Area	Equity	Time Frame
Interstate 81; Interstate 26/James H. Quillen Parkway; US 23 enforcement campaigns	THP; VSP	High	Safe Users	Distracted, Impaired, Occupant Protection		
East Stone Drive/US-11W/TN-1 corridor access management and Complete Streets	City of Kingsport	High	Safe Roads	Intersections, Young Drivers, Impaired, Roadway Departure		
US-11 W/TN-1 (non-City portions) enforcement campaigns	Sullivan County, Hawkins County	High	Safe Users	Distracted, Impaired, Occupant Protection		
US-11 W/TN-1, 2000 ft each direction from Hord Creek (Church Hill), guardrail enhancement or new installation, edge delineation with reflectors/chevrons	TDOT	Medium	Safe Roads	Lane Departure		
Fort Henry Drive/TN-36 (Airport Drive to John B Dennis Highway/TN-93), new guardrail installation, edge delineation with reflectors/chevrons	TDOT	Medium	Safe Roads	Lane Departure		
East Carters Valley Road edge delineation by striping and/or reflectors/chevrons	TDOT, VDOT	Medium	Safe Roads	Lane Departure		

Project Name and Description	Lead Agency	Cost (Low, Medium, High)	Safe System Element	Emphasis Area	Equity	Time Frame
Carters Valley Road/TN-346/TN-2462 edge delineation by striping and/or reflectors/chevrons	TDOT	Medium	Safe Roads	Lane Departure		
Fort Henry Drive/TN-36 (north of Interstate 81) speed management (road diet, speed feedback signs, traffic calming strategies)	TDOT	Medium	Safe Roads Safe Speeds	Roadway Departure, Speed		
Fort Henry Drive/TN-36 (Airport Drive to John B Dennis Highway/TN-93) corridor access management and Complete Streets	TDOT	Medium	Safe Roads	Intersections		
John B. Dennis Highway/TN-93 (S Wilcox and Lincoln intersection approach signage and warnings)	TDOT	Medium	Safe Roads Safe Speeds	Intersections		
Memorial Boulevard/TN-126 (systemic intersection improvements, turn lanes)	City of Kingsport; Sullivan County	Medium	Safe Roads	Intersections		
US 23 Weber City speed management (feedback signs)	VDOT	Low	Safe Speeds	Speed		
US 23/58 Gate City @ US 58 Business speed management (feedback signs)	VDOT	Low	Safe Speeds	Speed		
E Stone Drive/US-11W/TN-1 (US 23 to TN 93) systemic pedestrian improvements (sidewalks, marked crossings of minor streets)	TDOT	Low	Safe Roads	Intersections, Pedestrians		
Center Street/TN-36 systemic pedestrian improvements (high visibility crosswalks, curb extensions)	City of Kingsport, TDOT	Low	Safe Roads	Intersections, Pedestrians		

Appendix: Crash Trees

Regional Crash Trees

Fatal Injuries and Suspected Serious Injuries

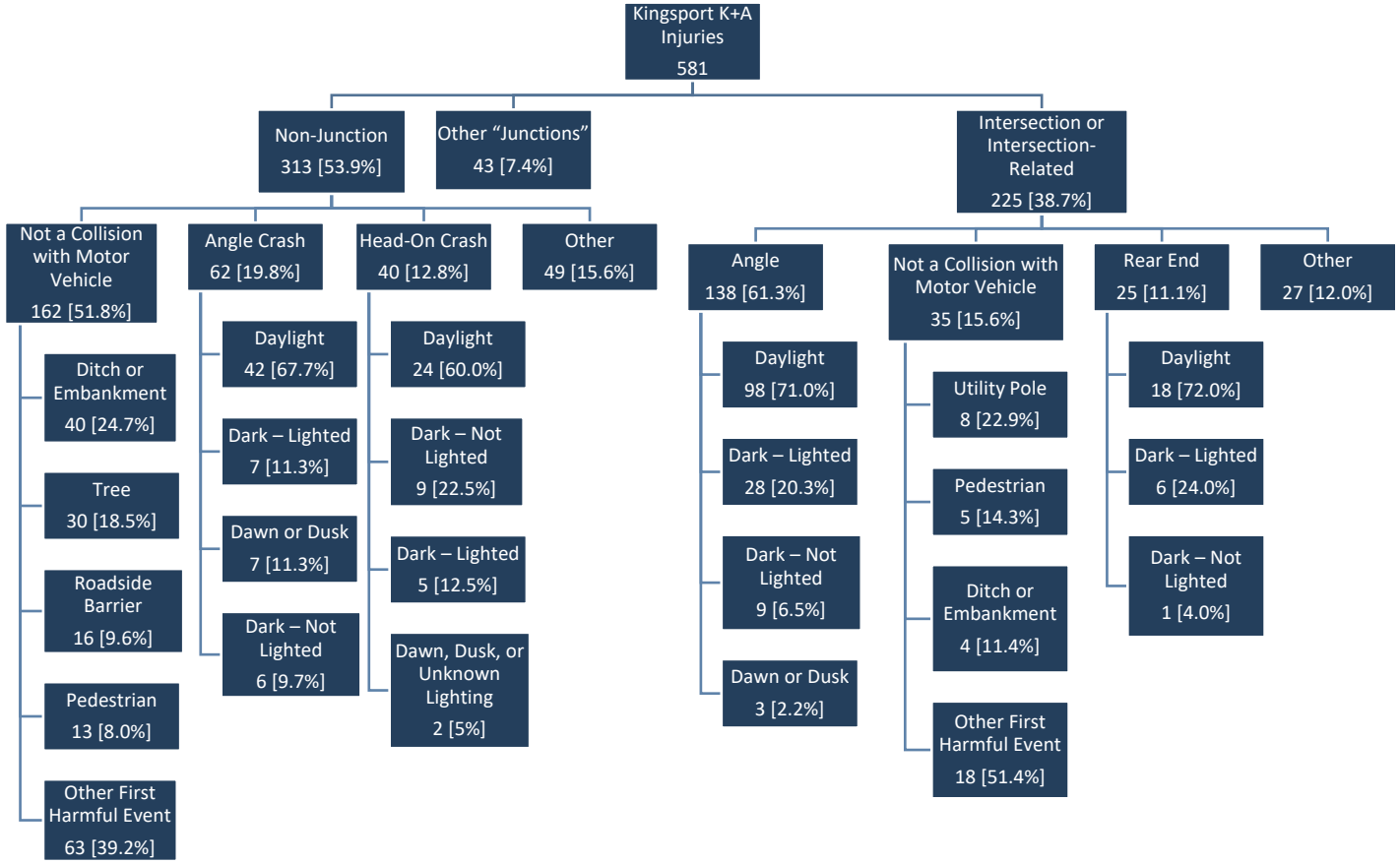

Figure 14. Graphic. Total fatal and suspected serious injuries in Kingsport (Source: TDOT, VDOT, 2022).

Lane Departure Crashes

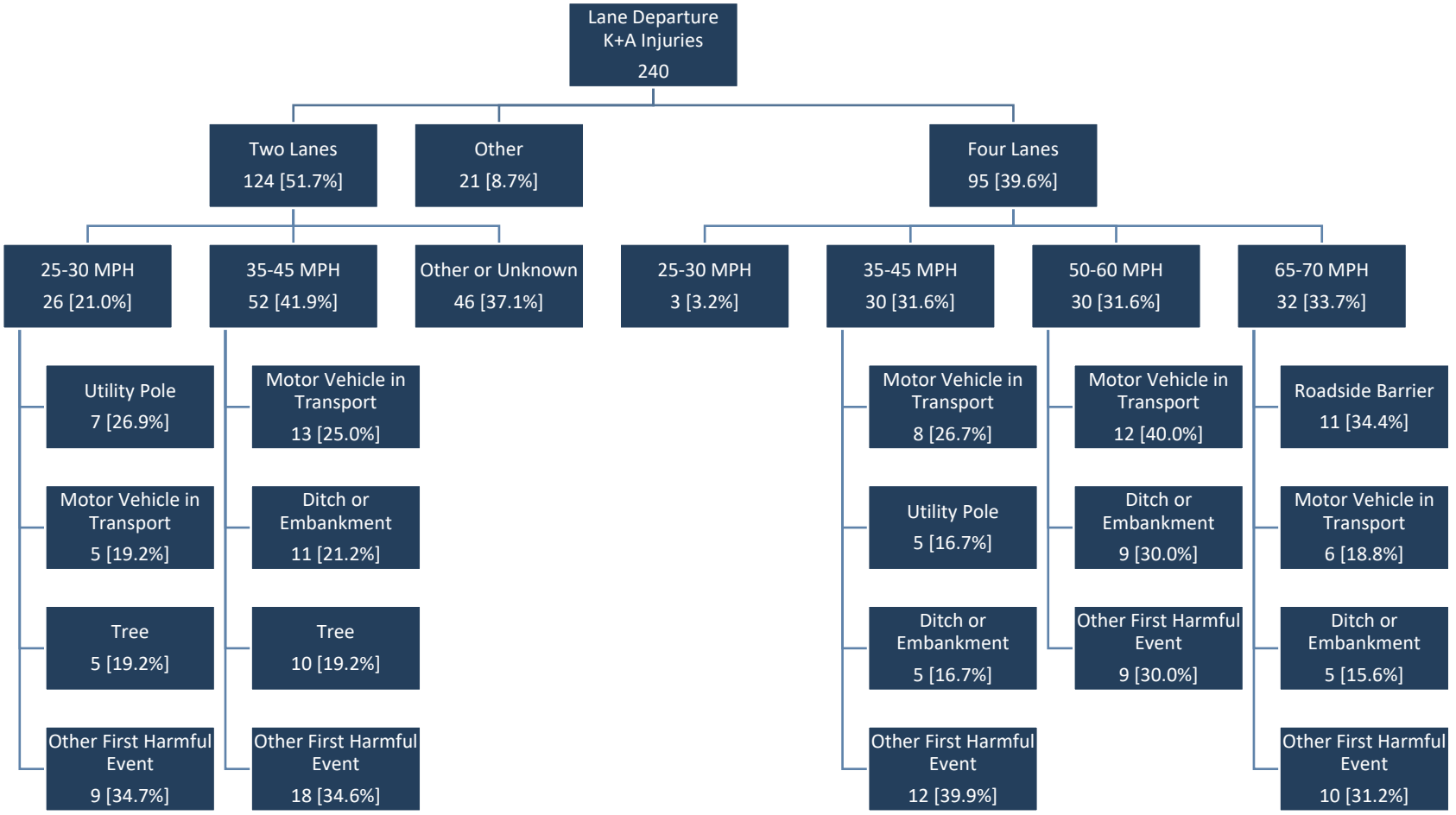

Figure 15. Graphic. Lane departure fatal and serious injury crashes (Source: TDOT, VDOT, 2022).

Intersection Crashes

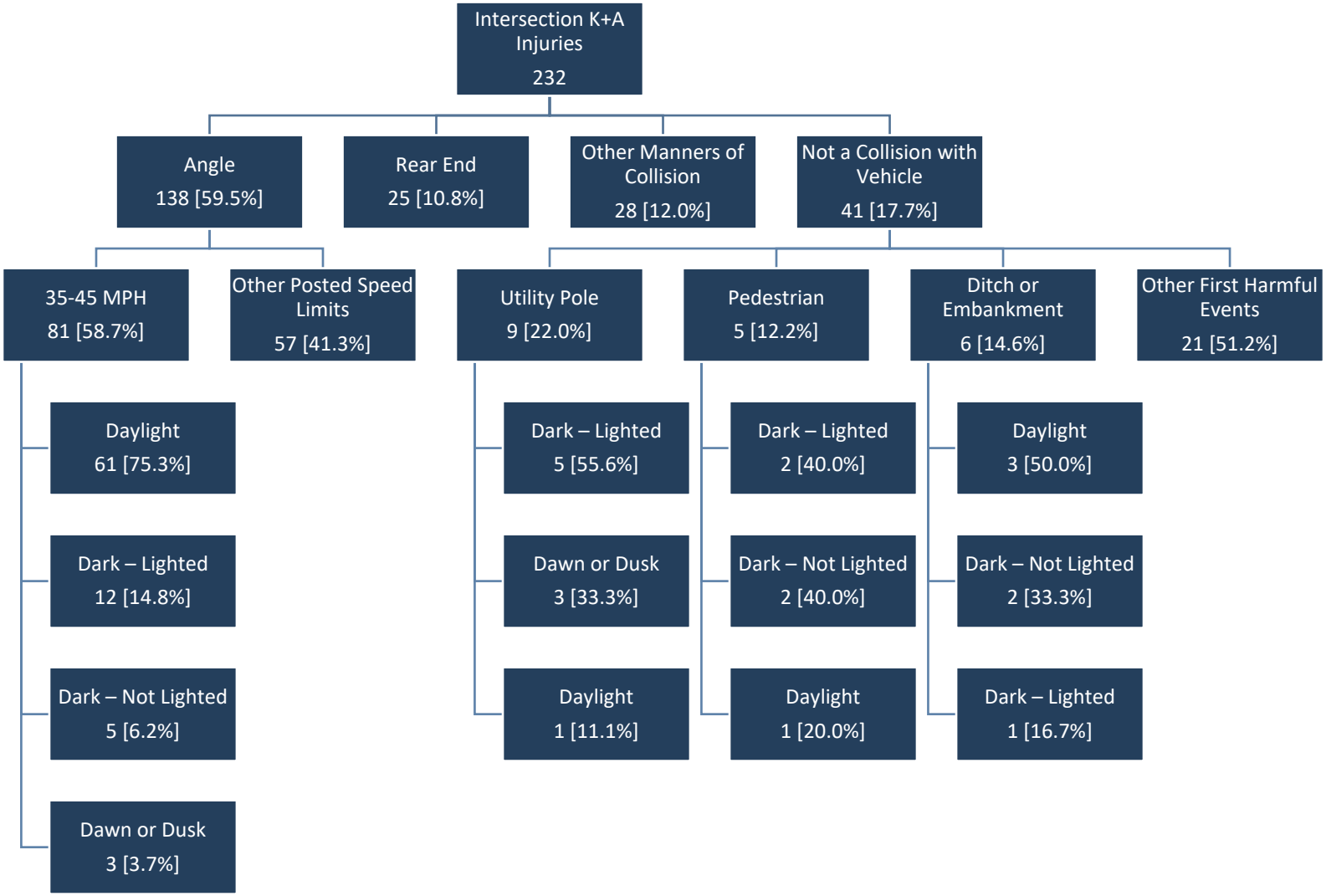

Figure 16. Graphic. Intersection-related fatalities and serious injuries (Source: TDOT, VDOT, 2022).

Speed Crashes

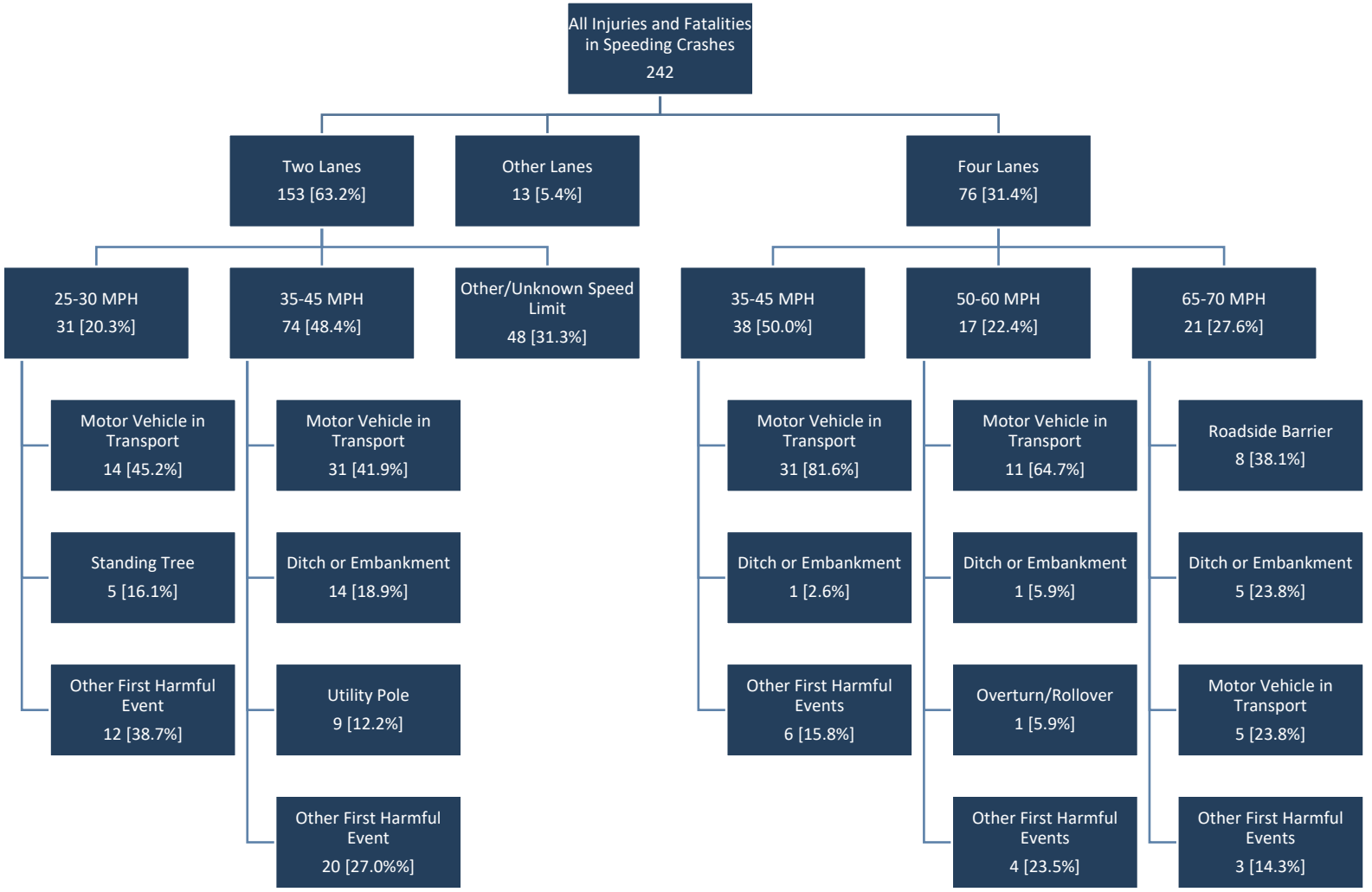

Figure 17. Graphic. All fatalities and injuries for speeding crashes (Source: TDOT, VDOT, 2022).

Unbelted Occupants

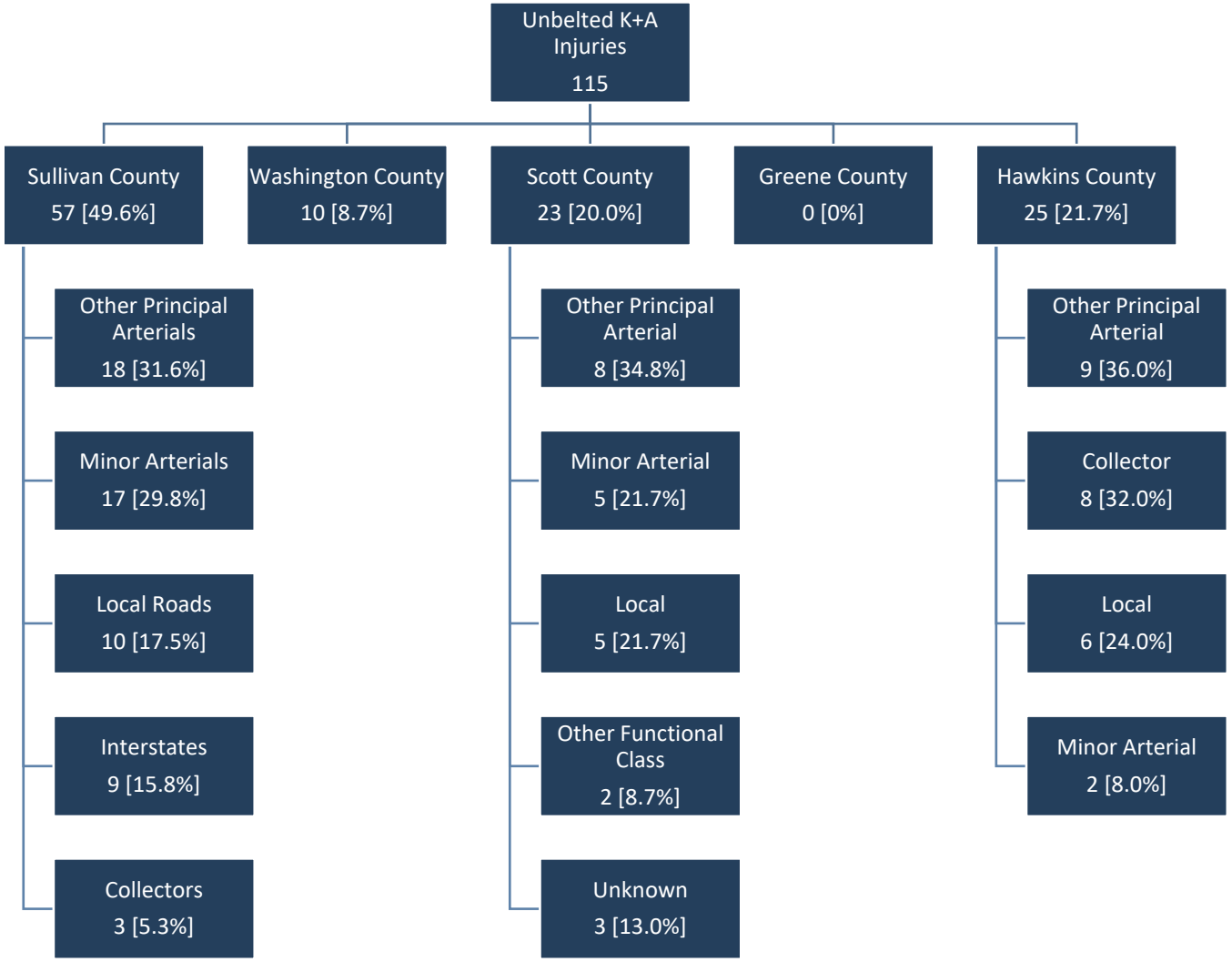

Figure 18. Graphic. Unbelted fatalities and serious injuries (Source: TDOT, VDOT, 2022).

Impaired Driver Crashes

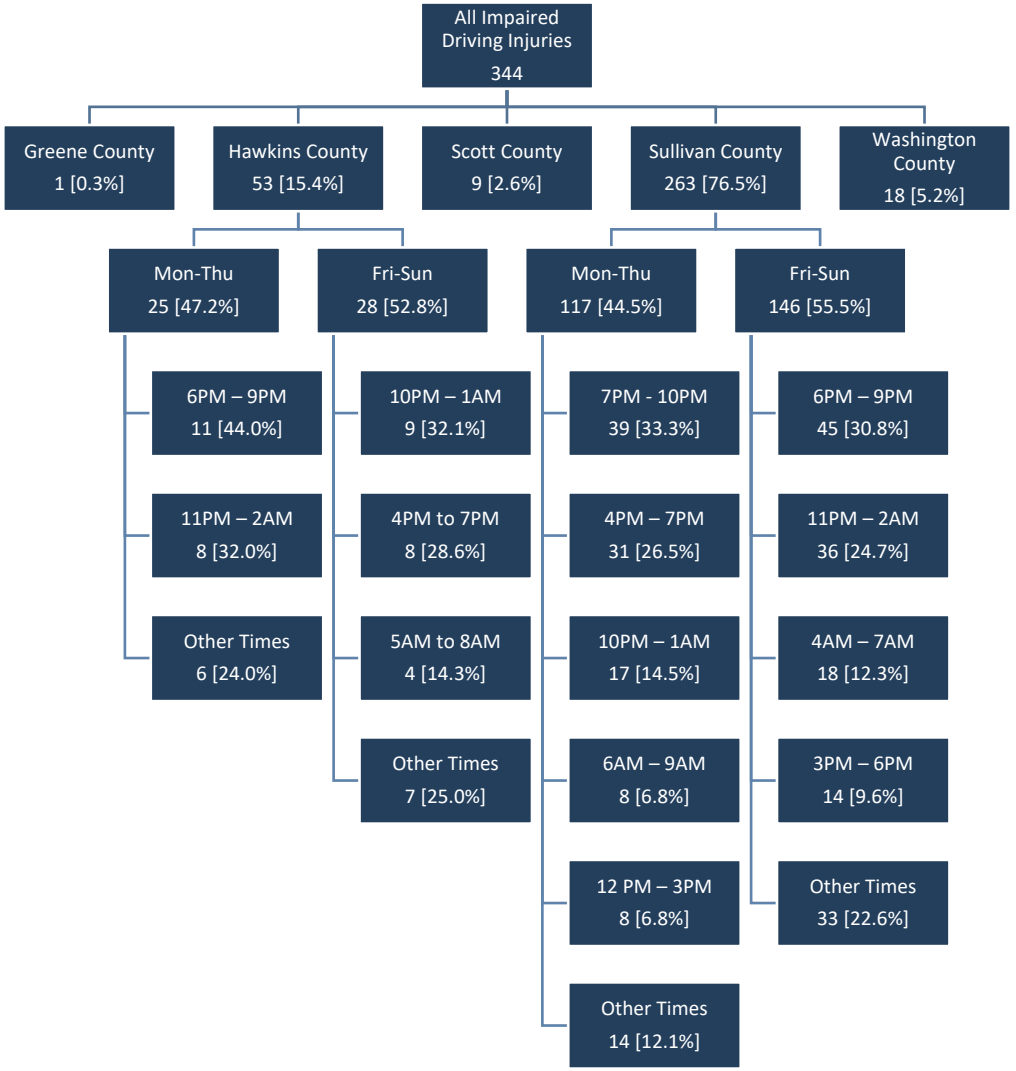

Figure 19. Graphic. All impaired driving injuries (Source: TDOT, VDOT, 2022).

Distracted Driver Crashes

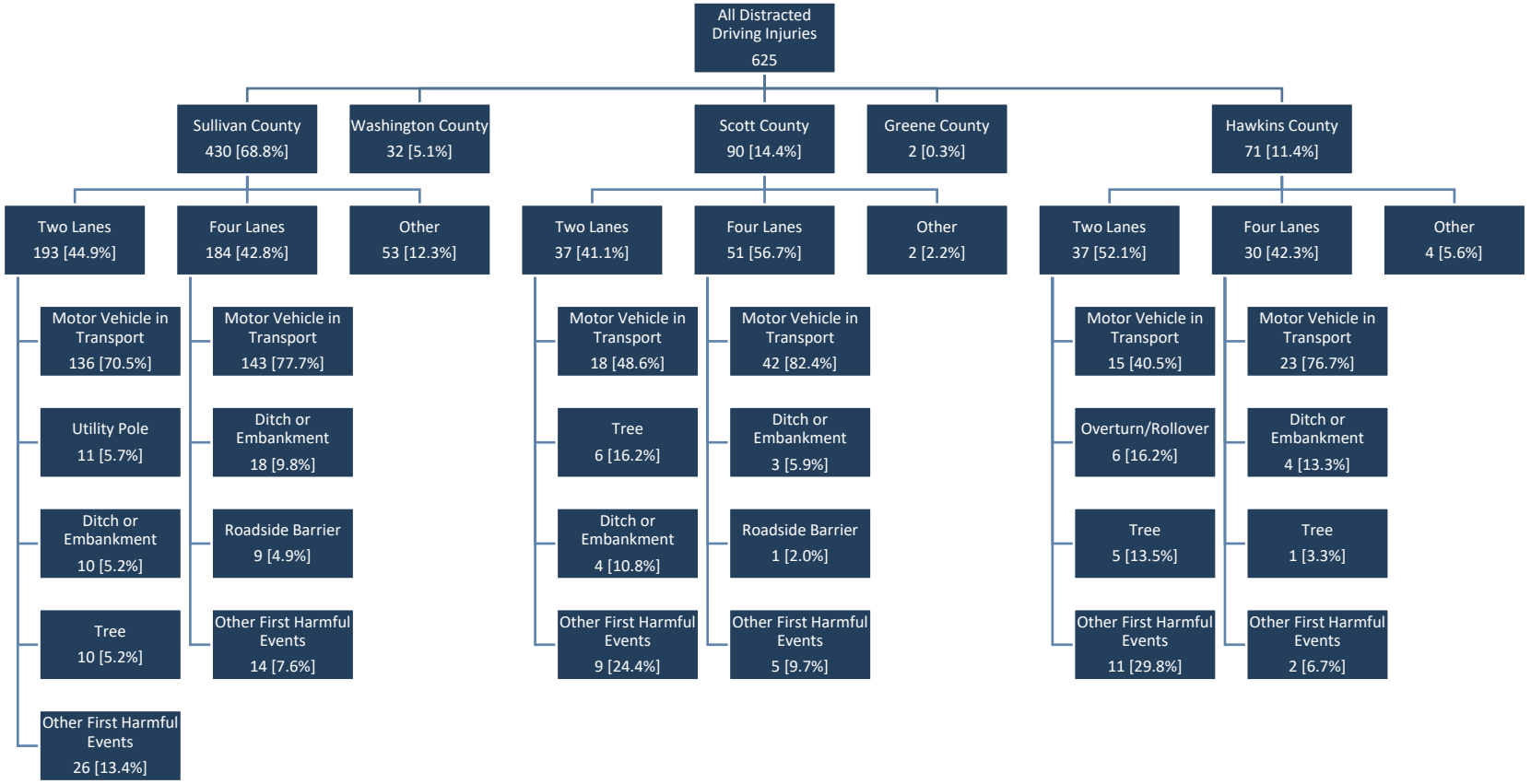

Figure 20. Graphic. All distracted driving injury crashes (Source: TDOT, VDOT, 2022).

Young Driver Crashes

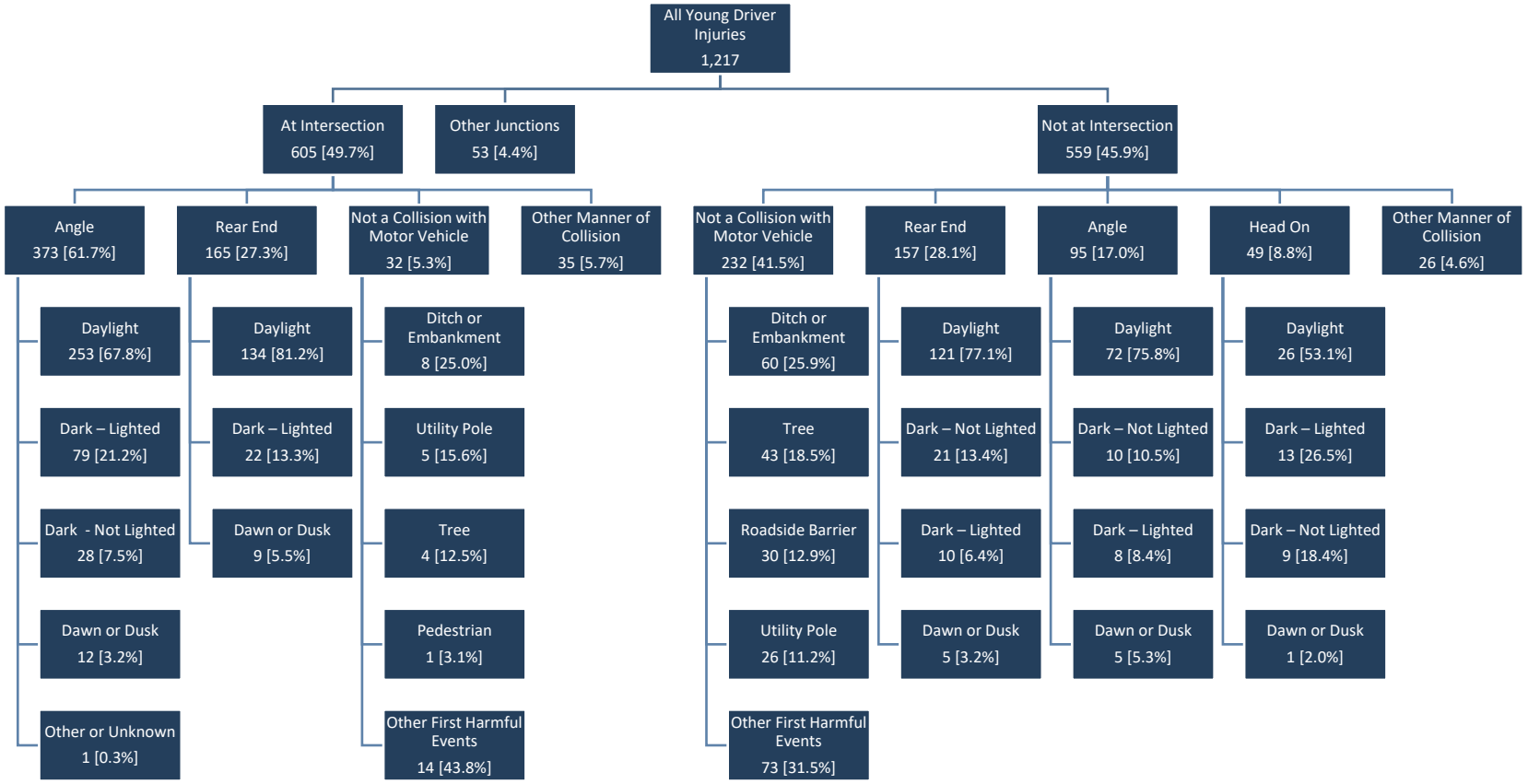

Figure 21. Graphic. All young driver injuries (Source: TDOT, VDOT, 2022).