CITY OF TAHLEQUAH

TRANSPORTATION SAFETY ACTION PLAN DRAFT

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

Report Draft | March 2025

PREPARED FOR:

TAHLEQUAH
CAPITAL OF THE CHEROKEE NATION

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Expect More. Experience Better.

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EXECUTIVE SUMMARY

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TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

EXECUTIVE SUMMARY

The City of Tahlequah has secured federal funding to develop a Transportation Safety Action Plan (TSAP) through the U.S. Department of Transportation's (USDOT) Safe Streets and Roads for All (SS4A) grant program. This initiative aims to enhance traffic safety by reducing transportation-related fatalities and serious injuries. The TSAP will assess the current traffic safety landscape and propose both city-wide countermeasures and targeted recommendations for the most high-risk areas.

Launched in December 2024, the Tahlequah TSAP is set for adoption in April 2025. The plan is structured into five chapters, each focusing on a key phase of its development.

Chapter 1: Creating a Vision

Chapter 2: Public Engagement

Chapter 3: Safety Analysis

Chapter 4: Countermeasures

Chapter 5: Implementation Plan

The Safe Streets and Roads for All (SS4A) program serves as a key driving force behind the TSAP, aligning with the Federal Highway Administration's (FHWA) Safe Systems Approach. This approach prioritizes safety by aiming to eliminate all traffic fatalities and severe injuries through principles focused on safer road design, enforcement, education, and community engagement. The guiding principles of the Safe Systems Approach and this document are outlined in **Chapter 1**, providing a framework for integrating safety into every aspect of the plan:

With these safety principles in mind, the Safety Steering Committee (SSC) collaborated to establish a mission statement that clearly communicates how this plan will serve the community and stakeholders in the future. This mission statement for the TSAP reflects a commitment to improving roadway safety and ensuring that all transportation decisions are made through a lens of safety and equity:

> ***The Tahlequah Transportation Safety Action Plan is dedicated to eliminating serious crashes by implementing an equitable approach that enhances connections, educates the community, and collaborates with stakeholders to foster a safer, more connected city for all.***

Chapter 1 defines the purpose of the TSAP and provides an overview of the 6-month planning process. It also outlines the safety guiding principles that shaped the plan's development. Additionally, it includes a summary of the existing conditions analysis that was conducted to understand the state of the City of Tahlequah. This existing conditions analysis sets the stage for the crash analysis portion included in **Chapter 3**.

Chapter 2 describes the public engagement process, including a description of the online and in-person events that were realized throughout the process and the various activities that the public participated in. Results from the online surveys are also found in this chapter.

Chapter 3 details the results of the in-depth crash analysis conducted at the beginning of the process. This analysis informed the Planning Team when refining the High-Injury Network (HIN) and selecting study corridors. Additionally, the results of HIN study are included within. A high-injury network is a network of roads, intersections, or other transportation infrastructure that experiences an above average rate of KABs. The identification and prioritization of these networks is foundational in the success of a TSAP. The HIN will be essential in allowing Tahlequah to:

- **Prioritize safety improvements**
- **Allocate and distribute resources**
- **Implement and monitor improvements**
- **Continuously review and update with the most recent crash data**

Chapter 4 is divided into two subsections – Systemic Countermeasures and Targeted Countermeasures. The Safety Countermeasure Toolbox was developed to include Systemic Countermeasures that can be used throughout the entire Tahlequah road network to improve the level of roadway safety. The toolbox in **Chapter 4** presents a comprehensive set of strategies and interventions aimed at addressing specific traffic safety challenges. **Table 1** provides a summary of these countermeasures, each of which is associated with a Crash Modification Factor (CMF)—a measure indicating the expected change in crash occurrences after implementation. Countermeasures with lower CMFs generally yield the greatest reduction in crashes. These CMF values are sourced from the CMF Clearinghouse, ensuring data-driven decision-making in safety improvements.

TABLE 1. COUNTERMEASURES SUMMARY

Countermeasures	CMF	Context (Urban/Rural)
Raised Medians	0.29	Both
Change Driveway Width	0.25	Both
Rectangular Rapid Flashing Beacons (RRFB)	0.31	Both
Pedestrian Refuge Islands	0.44	Urban
Midblock Crossings	0.45	Urban
Roadway Reconfiguration	0.53	Urban
Sidewalks	0.598	Both
Corridor Lighting	0.68	Both
Crosswalk Visibility Enhancements	0.732	Both
Rumble Strips	0.745	Rural
High-Contrast Lane Markings	0.75	Both
Flashing Yellow Arrow	0.97	Both
Retroreflective Backplates	0.85	Both
Appropriate Speed Limits	0.856	Both
Corridor Access Management	0.93	Both
Speed Feedback Signs	0.95	Both
Wider Edge Lines	0.97	Both
Curb Extensions	–	Urban

The Targeted Countermeasures subsection within **Chapter 4** details the Recommendation Sheets that were developed to display the potential placements of safety improvements that can be made along the 5 study corridors.

Chapter 5 concludes with an implementation matrix outlining actionable strategies designed to enhance roadway safety across Tahlequah through policy and procedural improvements. It also provides recommendations for implementing the Countermeasure Toolbox. Additionally, the Plan includes guidance on administration, annual reporting, and future updates to ensure its ongoing effectiveness.

1-5

CHAPTERS 1–5

1

The Tahlequah Transportation Safety Action Plan (TSAP) was developed using three guiding principles to help Tahlequah achieve its goal of zero traffic-related fatalities in the City: Vision Zero, the Safe System Approach, and the Six Es of Safety.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

CHAPTER 1: CREATING A VISION

VISION AND PURPOSE

INTRODUCTION

The Tahlequah Transportation Safety Action Plan (TSAP) was developed over a 6-month period to help Tahlequah achieve its goal of a 50% reduction in fatalities and serious injuries by 2035. The TSAP will assist City Staff and local partners in making informed decisions when identifying projects that will improve traffic safety in the City. **Chapter 1** includes detailing the Safety Guiding Principles and **Chapter 2** outlines the Community Engagement involved in the development of the plan.

SAFETY GUIDING PRINCIPLES

The Tahlequah Transportation Safety Action Plan (TSAP) was developed using three guiding principles to help Tahlequah achieve its goal of zero traffic-related fatalities in the City: Vision Zero, the Safe System Approach, and the Six Es of Safety. This chapter highlights the importance of each guiding principle and how they can be utilized to enhance traffic safety in the City.

VISION ZERO

Vision Zero is a traffic safety initiative pioneered in Europe that utilizes a holistic approach in efforts to eliminate all traffic safety fatalities and severe injuries. Vision Zero enacts change through prioritizing the principles of safe road design, enforcement, education, and community engagement. Through the emphasis of a comprehensive approach to crash-related injury, cities can experience improvements in quality of life, safety, and community mobility. Although the Vision Zero goal is ambitious, every step closer to the goal, every reduction in traffic-related injuries or fatalities has a tremendous positive impact on a community.

The Vision Zero initiative is different from other approaches because it recognizes that human error is inevitable; road systems should be designed to mitigate the consequences of mistakes. By acknowledging this aspect of traffic safety, Vision Zero works to create a shift in the community. This shift from the idea that traffic injuries and fatalities are simply a byproduct of modern transportation networks to the idea that creating a safe and accessible transportation system for all is possible opens the opportunity to influence impactful change in a community.

SAFE SYSTEM APPROACH

The Safe System Approach was pioneered in the 1990s by Swedish road safety expert Claes Tingvall. The Safe System Approach is the framework and mechanism by which this Vision Zero Action Plan can be implemented. The six key principles that can be utilized to implement the elements of the Safe System Approach are as follows:

Death or serious injury is unacceptable

Focusing attention on preventing fatal and severe crashes over minor crashes so residents are better protected on the public roads.

Humans make mistakes

Human error is inevitable, inevitably leading to crashes, but a roadway system that accounts for and accommodates this fact can mitigate the effects (avoiding serious injury or death).

Humans are vulnerable

Human tolerance to crashes is a recognized and measurable benchmark (kinetic energy transfer can be measured) and should be incorporated into design considerations.

Responsibility is shared

No single party is responsible for crash prevention alone, but collectively all parties are responsible. This includes transportation designers and engineers, users, law enforcement, vehicle manufacturers, and publicly appointed decision-makers.

Safety is proactive

Rather than responding to tragedy, measures should be taken beforehand to identify and mitigate potential risks.

Redundancy is crucial

Affecting change requires strengthening all Safe Systems elements. If one element fails, redundancy prevents system-wide failure, ensuring people are protected.

The Safe System Approach is a principle-based approach intended to eliminate serious and fatal injuries by acknowledging that humans make mistakes. Traffic safety planning can accommodate human error through roadway design features, such as reducing speeds and physically separating automobiles from other road users, as well as vehicle advancements, such as lane departure assist and autonomous emergency braking.

There are five complementary objectives outlined by the U.S. Department of Transportation (USDOT) that correspond to and support the implementation of the Safe System Approach detailed below:

Safe Roads

Safe Roads are not defined by their design alone. Instead, the road design, construction, maintenance, operation, and countermeasures work collaboratively to improve safety.

Safe Speeds

Safe Speeds are directly correlated with an increased rate of survival in crashes. Reducing speeds reduces impact, improves visibility, and affords drivers additional breaking time.

Safe Vehicles

Safe Vehicles are responsible for preventing crashes or mitigating their consequences. Active safety measures can help prevent crashes, while passive measures can lessen the implications of a crash.

Safe Road Users

Safe Road Users bear the burden of responsibility for complying with the rules and regulations of the roadway.

Post-Crash Care

Post-Crash Care accounts for the actions of those responding to a crash, whether emergency services, law enforcement, or cleanup.

SIX Es OF SAFETY

Similar to the Safe System Approach, the Six Es of Safety are components of an integrated and comprehensive framework. While every community's composition and understanding of safety varies, the Six Es can be deployed at all levels to enhance the user experience and improve safety.

ENGINEERING

Engineering projects and interventions in support of Vision Zero may be implemented through the built environment to improve safety. The primary goal is to calm traffic and improve safety for all road users. Examples of proven engineering project enhancements include the implementation of safety countermeasures or traffic calming measures that reduce speeding.

EDUCATION

Education can improve safety by raising awareness of transportation choices, furthering or establishing the benefits of multimodal transportation, and demonstrating the proper use of the system.

EVALUATION

Evaluation can support both proactive and responsive measures. Understanding the when, where, and why of crashes allows us to respond to historical trends and adjust to improve future safety. Similarly, careful evaluation can help head off potential issues before they reach greater severity.

EQUITY

Equity efforts must be made to acknowledge and rectify the imbalance and additional burden that disadvantaged populations carry. Vulnerable and disadvantaged populations are historically under-served and deserve access to the same information and infrastructure as everyone else.

ENFORCEMENT

Enforcement can ensure that system users follow traffic laws and regulations while also preventing profiling. Enforcement can also target and prioritize problem behaviors like speeding and other dangerous behaviors over minor infractions.

ENCOURAGING

Encouraging the community to further their knowledge and understanding of safety principles can be fun and interactive. Events and activities can support and promote better behavior.

EXISTING CONDITIONS

An inventory of Tahlequah's existing conditions was taken to examine the current state of their roadway network and highlight potentially vulnerable communities in the City. A clear understanding of the existing conditions plays a vital role in the plan's development, ensuring that project recommendations are tailored to the community and that project locations are determined based on a holistic view. This process equips the project team to make the most effective recommendations to improve safety and create the greatest positive impact on the community. To gather a better understanding of the City of Tahlequah's transportation network, five (5) different data analysis maps were created:

1. Road Network
2. Local/ODOT Projects
3. Traffic Volumes
4. ETC Explorer
5. Demographics

A thorough understanding of the existing conditions in Tahlequah enabled the project team to make informed decisions and recommendations that aligned with the community's values and goals, bringing the City of Tahlequah closer to its goal of eliminating traffic fatalities and serious injuries.

TAHLEQUAH

ROADWAY NETWORK

Tahlequah's existing Roadway Network, seen in **Exhibit 1**, is designed with a grid pattern of local and collector roads concentrated in the downtown region. Downtown Tahlequah is designed with primary and minor arterials that cross through the region, allowing traffic to flow through and out of downtown. These primary and minor arterials connect Tahlequah to adjoining cities and create a loop around the City for an efficient traffic flow.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

Existing Roadway Network

Source: My Tahlequah 2040 Comprehensive Plan (2021)

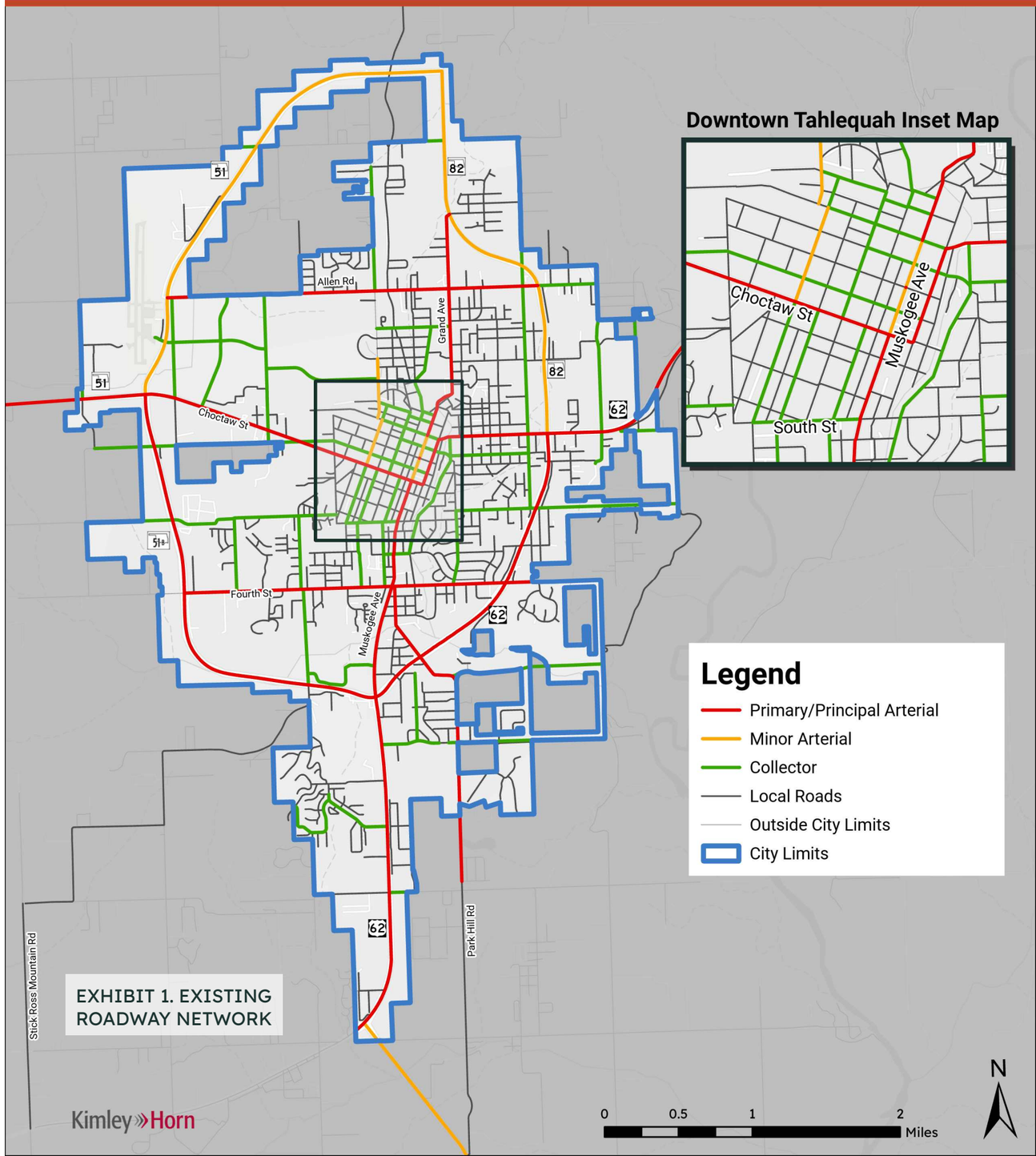
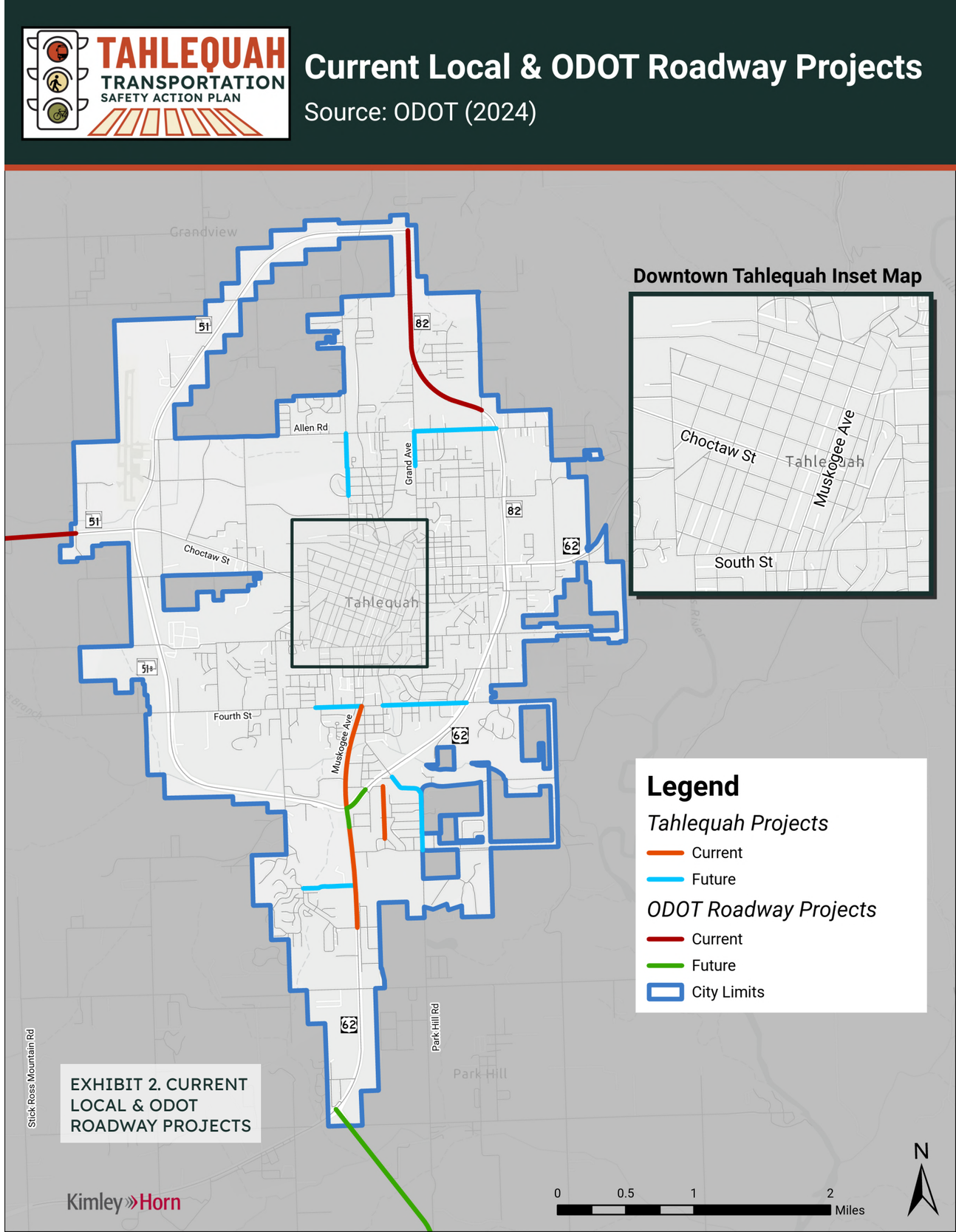


EXHIBIT 1. EXISTING ROADWAY NETWORK

TAHLEQUAH

LOCAL/ODOT PROJECTS

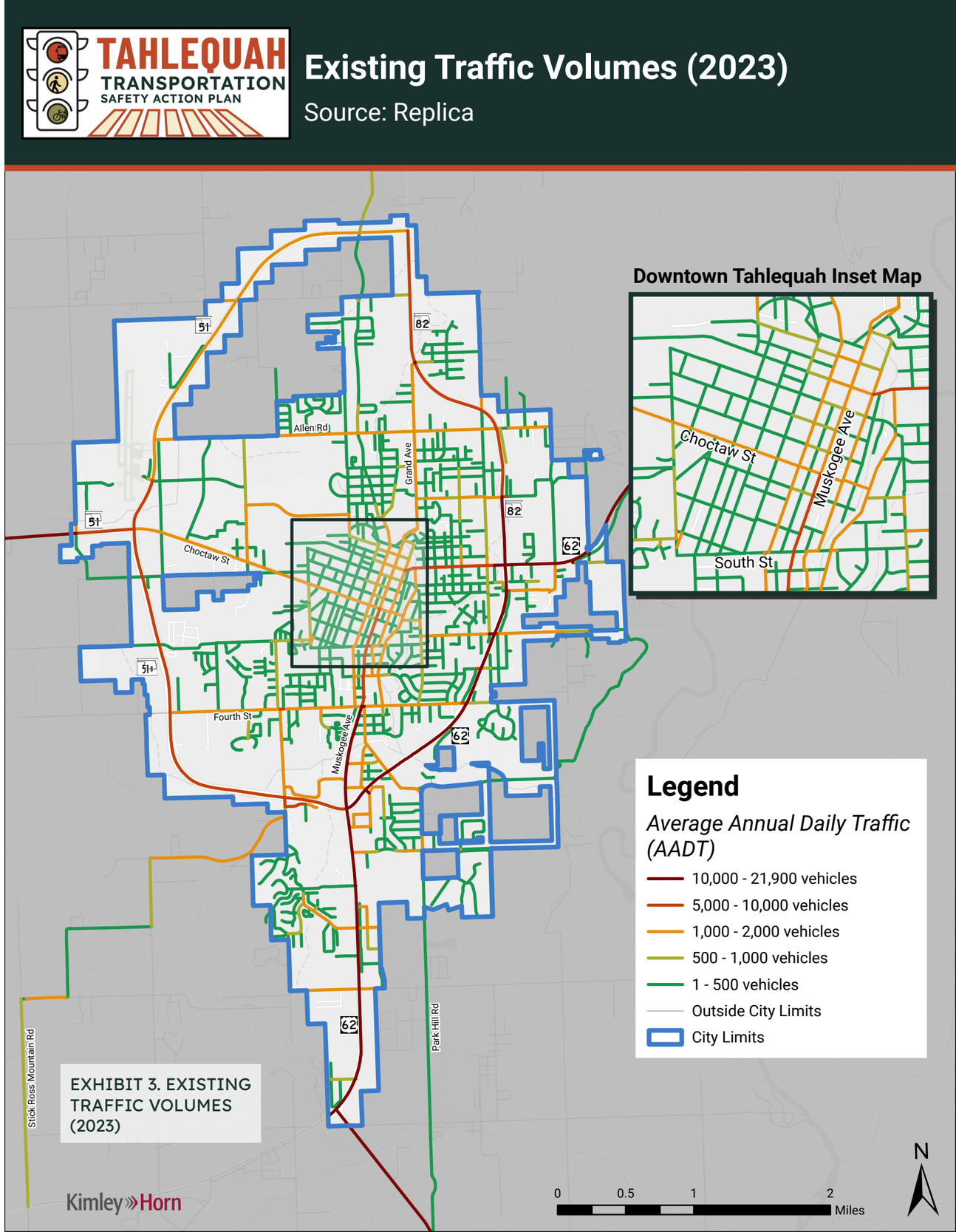
The City of Tahlequah currently has three (3) current roadway projects, all located in south Tahlequah along Muskogee Ave and White Ave. The City also has six (6) future roadway projects in north and south Tahlequah. Oklahoma Department of Transportation (ODOT) has one current roadway project in north Tahlequah along Highway 82 and one project along Highway 51 as it enters Tahlequah from the West. ODOT has two (2) future projects planned for Tahlequah, one along Muskogee Ave connecting two current Tahlequah projects, and one project planned for Highway 82 as it enters Tahlequah from the South. The locations of these local and ODOT projects are seen in **Exhibit 2**.



TAHLEQUAH

TRAFFIC VOLUMES

Tahlequah's existing average daily traffic for many of Tahlequah's roadways falls in the 1-500 vehicles per day range. These roadways with a lower average annual daily traffic (AADT) are primarily collector and local roadways, making up most of Tahlequah's Road Network. The loop around Tahlequah consists of US-62, SH-82, SH-51, and SH-51B; this network of highways has the highest traffic volumes in the City, reaching up to 21,900 vehicles daily. **Exhibit 3** depicts the average annual daily traffic (AADT) of roadways in Tahlequah.



TAHLEQUAH

ETC EXPLORER

Exhibit 4 displays the overall disadvantaged Census Tracts in Tahlequah according to the U.S. Department of Transportation Equitable Transportation Community Explorer. The central portion of Tahlequah, which contains Downtown Tahlequah and reaches the City's west edge, is considered disadvantaged overall. Of the seven (7) fatal crashes in the City, two (2) of these fatalities happened in disadvantaged census tracts.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

Overall Disadvantaged Census Tracts

Source: USDOT Equitable Transportation Community (ETC) Explorer

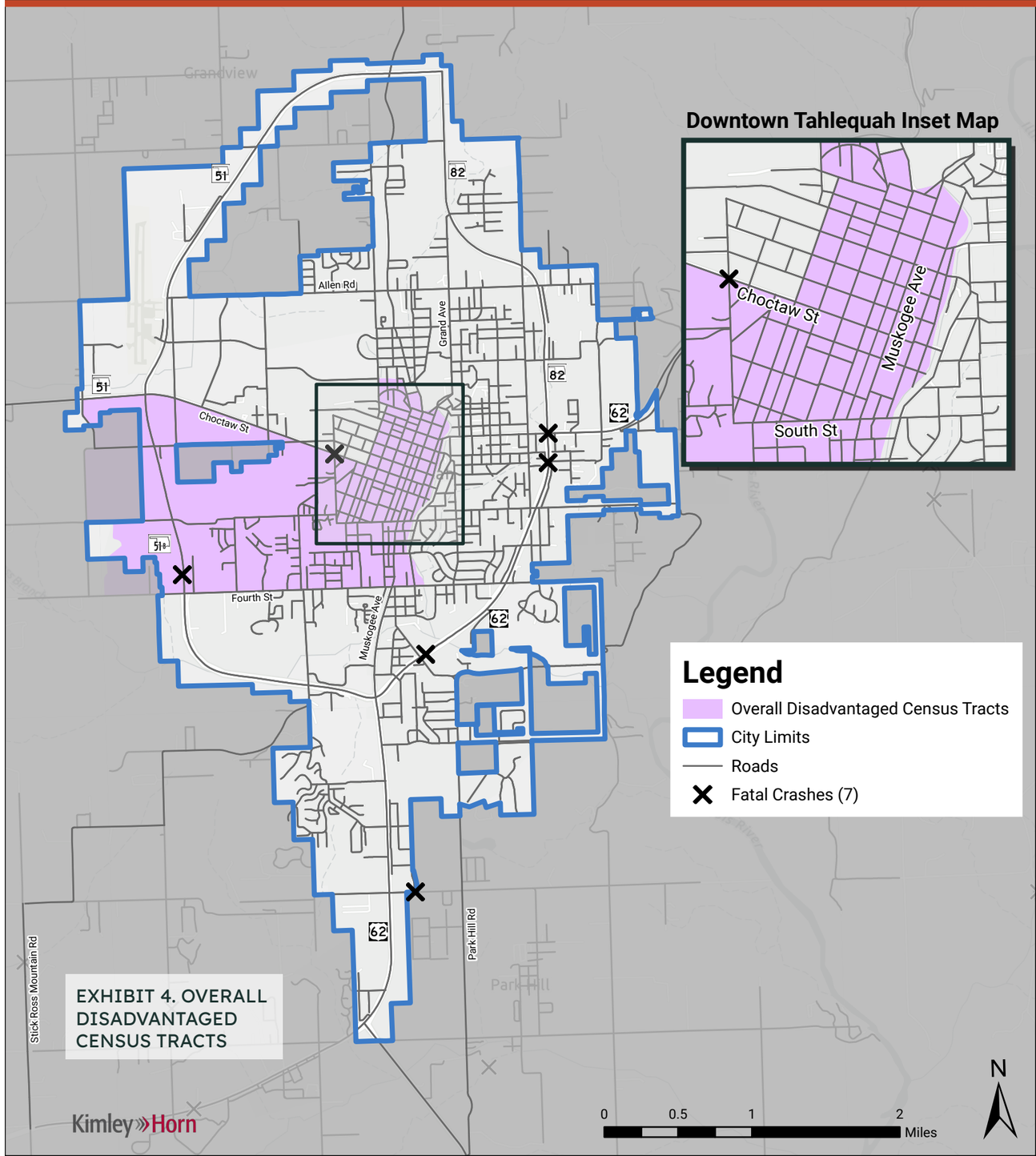


EXHIBIT 4. OVERALL DISADVANTAGED CENSUS TRACTS

TAHLEQUAH

DEMOGRAPHICS

The majority of Tahlequah comprises populations consisting of 50% minority or greater. These 50% minority and greater census tracts contain 100% of the fatal crashes occurring in Tahlequah. In comparison, three (3) of the seven (7) fatalities occur in or are bordering on census tracts containing populations of 60% minority or greater. **Exhibit 5** displays the percent minority population by census tracts in Tahlequah.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

Race & Ethnicity

Source: American Community Survey (2022)

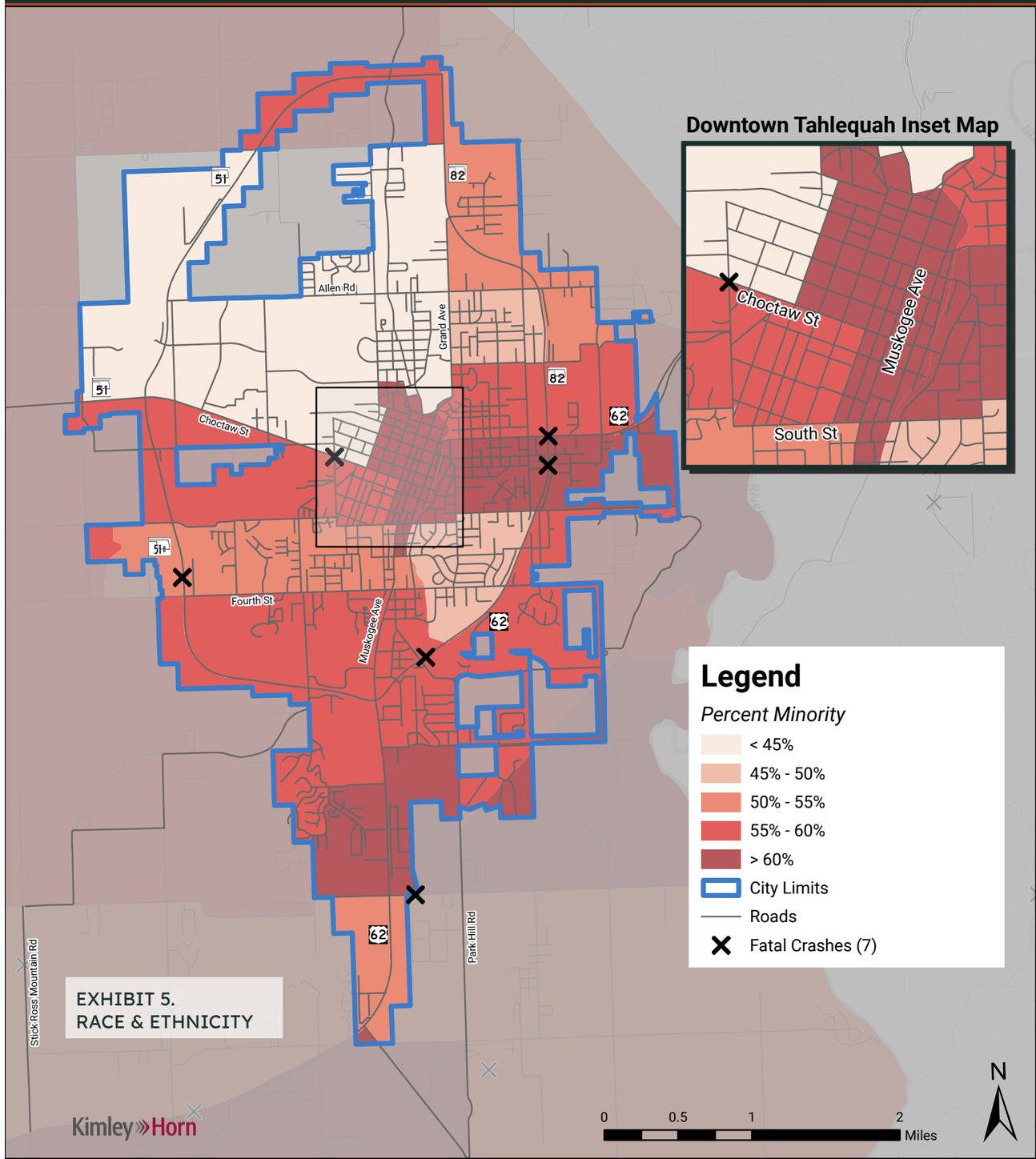


EXHIBIT 5.
RACE & ETHNICITY

2

Community feedback is a vital component of any planning process. It enables the Transportation Safety Action Planning Team to understand the concerns of those affected and ensures the plan aligns with their needs.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

CHAPTER 2: PUBLIC ENGAGEMENT

INTRODUCTION

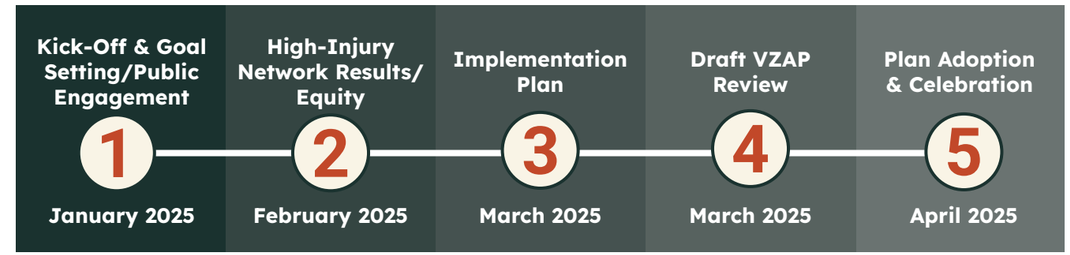
Community feedback is a vital component of any planning process. It enables the Transportation Safety Action Planning Team to understand the concerns of those affected and ensures the plan aligns with their needs. Additionally, fostering a space for the community to share their input strengthens project support, making it easier to implement safety recommendations effectively. The insights gathered are the foundation for the plan's goals and recommendations. Public engagement for the Tahlequah Transportation Safety Action Plan included the following participation opportunities:

- Safety Steering Committee (SSC)
- Tahlequah Safety Day
- Public Workshops
- Public Hearing to City Council
- Online Engagement

PROJECT TIMELINE

The Tahlequah TSAP kicked off in December 2024, and the planning process lasted until May 2025. **Figure 1** below presents a timeline for the SSC meetings.

FIGURE 1. PROJECT TIMELINE



SAFETY STEERING COMMITTEE

The Safety Steering Committee (SSC) served as the guiding body throughout the planning process, building consensus and taking ownership of the Plan while providing critical feedback at key project milestones. The SSC was comprised of City Staff from various departments, as well as representatives from local organizations. The SSC Meetings were held on the following days:

- **Meeting 1:** Kick-off & Goal Setting – January 13, 2025
- **Meeting 2:** High-Injury Network Results/Equity Analysis – February 10, 2025
- **Meeting 3:** Implementation Plan – March 3, 2025
- **Meeting 4:** Draft TSAP Review – March 24, 2025
- **Meeting 5:** Plan Adoption & Celebration – April 14, 2025

Members of the SSC serve as advocates of the plan process and champions for the plan throughout the implementation phase. During the first SSC Meeting, a mission statement was developed to outline the plan's mission and establish a commitment to serving stakeholders and the community at large:

> ***The Tahlequah Transportation Safety Action Plan is dedicated to eliminating serious crashes by implementing an equitable approach that enhances connections, educates the community, and collaborates with stakeholders to foster a safer, more connected city for all.***

The SSC engaged in various activities, including a SWOT analysis, selection of study corridors, HIN refinement, development of the action matrix, and prioritization of actions. Additionally, the SSC established a clear target for reducing roadway fatalities and severe injuries, as outlined in the City's Vision Zero Ordinance, stating:

"The City of Tahlequah commits to reducing traffic fatalities by 50% by 2035, and 100% by 2050."

In April, the SSC marked the completion of the planning process and transitioned into the implementation phase, continuing efforts to eliminate fatalities and serious injuries on Tahlequah's roadways.

IN-PERSON EVENTS

TAHLEQUAH ROAD SAFETY DAY

In February 2025, the City of Tahlequah hosted the "Tahlequah Road Safety Day" for residents and road users to learn more about the TSAP and provide input on the future of safety for drivers, pedestrians, and cyclists in the City. Attendees had the opportunity to talk with the project team about transportation safety improvements that would mitigate crashes. Additionally, the City invited various community organizations that sponsored the event with door prizes, refreshments, and informational materials to enhance community support for the event. The event was very successful and resulted in over 70 community members of all ages attending.

DRAFT RECOMMENDATIONS WORKSHOP

On April 5th, 2025, the Planning Team hosted a pop-up event during the Crawfish Festival event in Downtown Tahlequah.

This subsection will be completed closer to the event.

PUBLIC HEARING TO CITY COUNCIL

The Consultant Team held one public hearing opportunity with the City Council on April 7, 2025. This public hearing served as the final opportunity for council members and the public to provide comments on the final report before it was adopted by the City Council

FIGURE 2. PHOTOS FROM TAHLEQUAH ROAD SAFETY DAY

ONLINE ENGAGEMENT

Community engagement involved collaboration, input, and involvement from a broad cross-section of community members and project stakeholders. The plan utilized a combination of in-person and online outreach opportunities to maximize public and stakeholder input and solidify the vision for the future. The online portion of community engagement began with the launch and introduction of the project website, which provided foundational information about the purpose and process and an opportunity for comments through an interactive project area map and written survey. The website was available and updated from January through March to keep the public informed and up to date.

IN TOTAL, THE PROJECT WEBSITE GARNERED:

651 VIEWS **556 VISITORS**

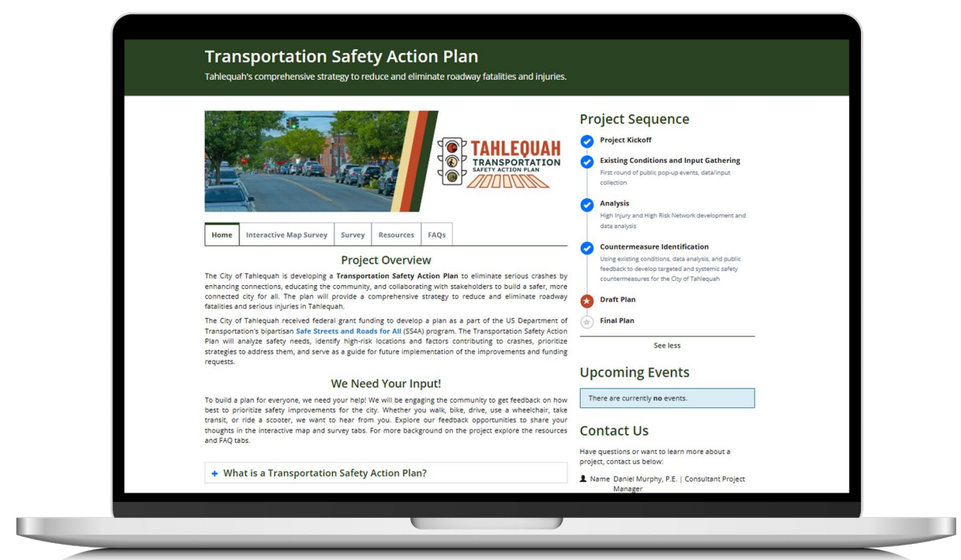
250 TOTAL CONTRIBUTIONS

56 map survey pins

194 written survey contributions

Overall, the responses throughout the process highlight the community's desire for a safer, more efficient, and more pedestrian-friendly city with efficient transit options. Addressing these issues through targeted infrastructure upgrades, better traffic management, and enhanced enforcement could significantly enhance safety and improve accessibility for all road users.

FIGURE 3. PROJECT WEBSITE LANDING PAGE

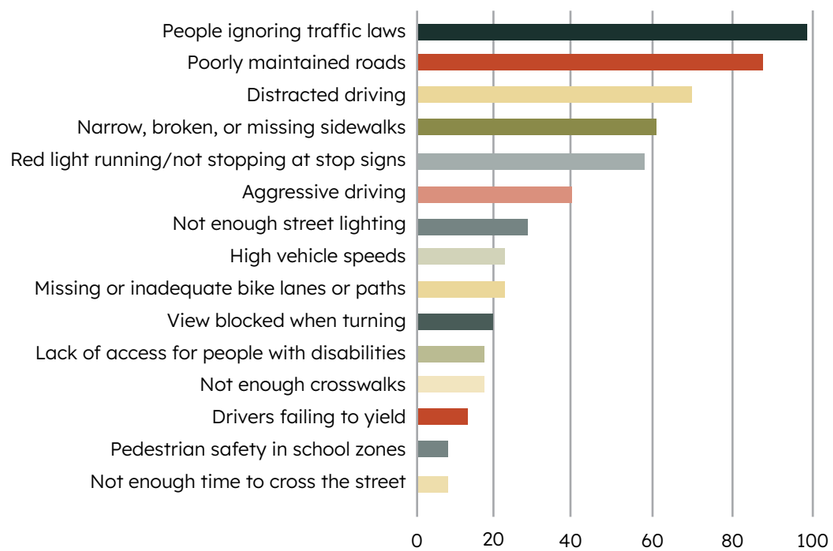


WRITTEN SURVEY

The Written Survey was distributed on the project website and at in-person engagement events to collect information on demographics, mode choice, and roadway safety concerns. The survey comprised 24 questions and was divided into four sections. Of the 194 received survey responses, most households reported having no work commute or commuting 0-20 minutes to their place of work. The top reporting age group for the written survey was those aged 30-44, while most respondents indicated their household as having 1-3 cars. Additionally, the top safety concerns for participants included ignoring traffic laws, poorly maintained roads, and distracted driving. Key insights from the written survey included:

- **Pedestrian Safety – 89% of respondents** support investing in making walking safer by creating more sidewalks, mid-block crossings, high-visibility crosswalks, and other safety countermeasures.
- **Public Transportation – 6.7% of respondents** reported using transit in the last two years in Tahlequah.
- **Bicycling Safety – 69% of respondents** support investing in making bicycling safer by creating more bike lanes and separation from vehicle traffic.
- **Enforcement & Education – 73% of respondents** support funding for educational programs for driver safety and enhanced enforcement.
- **Infrastructure & Car Dependency – Over 50% of respondents** indicated issues with people ignoring traffic laws while driving, inciting great support for educational programs and greater enforcement.

FIGURE 4. TOP SAFETY CONCERNS IN TAHLEQUAH

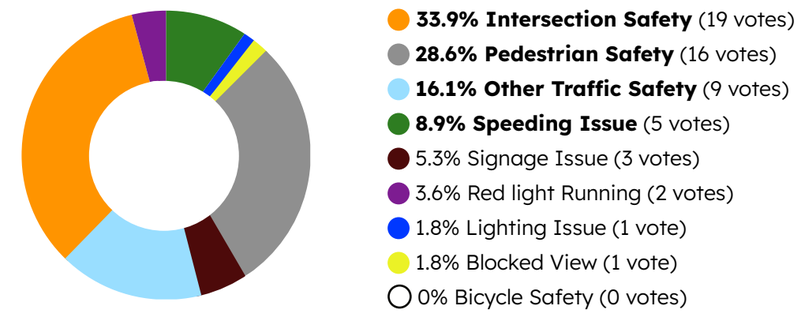


MAP SURVEY

Residents and stakeholders were encouraged to provide feedback on the safety conditions of existing roadways with an interactive map survey. This engagement tool enabled website visitors to identify specific locations throughout the City that related to nine comment topics like speeding issues, visibility concerns, intersection safety, and several others. Once the location and topic were identified, respondents could leave detailed comments regarding their concerns, potential resolutions, or ideas. The results of the map survey identified several key insights, including:

- **Intersection Safety (34%):** Dangerous intersections were identified as needing traffic lights, stop signs, or roundabouts.
- **Pedestrian Safety (29%):** Respondents identified a need for better infrastructure like sidewalks, crosswalks, and pedestrian signals.
- **Speeding (9%):** Major concerns related to vehicular speeds were identified near schools, residential areas, and busy intersections.

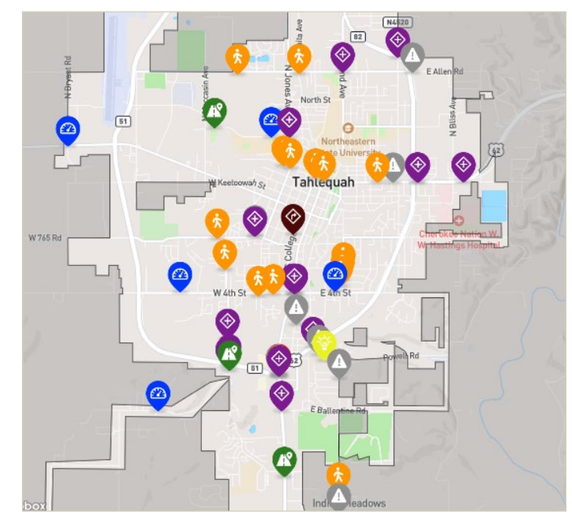
FIGURE 5. MAP SURVEY TOP SAFETY CONCERNS IN TAHLEQUAH



In addition to some key insights that emerged, various geographic locations were identified as hotspots or areas with significant comment volume. Several of the key areas of concern identified include:

- **Muskogee Avenue:** Intersection safety and issues with turn lanes.
- **Downing Street:** High traffic and access management issues.
- **Fourth Street:** Reports of speeding along with pedestrian safety concerns in portions with no sidewalks.
- **Highway 51/Bypass:** Multiple requests for dedicated turn lanes at intersections with Stick Ross Road, Parkhill Road and Muskogee Avenue.
- **Areas Near Schools:** Concerns over speeding and pedestrian safety on multiple streets in the vicinity of Tahlequah High School and Greenwood Elementary.

FIGURE 6. MAP SURVEY COMMENTS



3

An understanding of the City's overall safety is gathered through a data-driven review of the crash history and other contributing elements.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

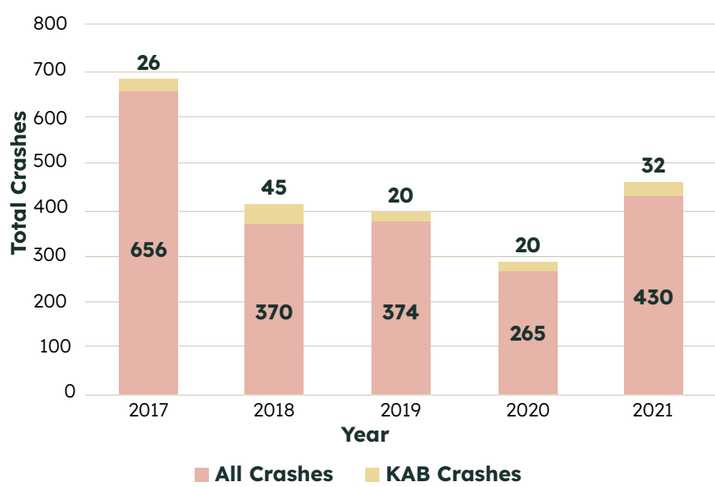
CHAPTER 3: SAFETY ANALYSIS

Chapter 3 elaborates on the state of safety in Tahlequah. An understanding of the City's overall safety is gathered through a data-driven review of the crash history and other contributing elements. To complete the crash history analysis and the High-Injury Network (HIN), historical crash data for the last available five years (2017-2021) from the Oklahoma Highway Safety Office (OHSO) was used.

CITYWIDE CRASH TRENDS

Crash data from 2017 to 2021 was utilized to identify crash trends in Tahlequah, as summarized in **Figure 7**. Prior to 2018, Tahlequah had a total number of crashes per year at around 370. In 2020, there was a decrease in the number of crashes occurring in the City (265 crashes) which is attributed to the COVID-19 pandemic. The following year, 2021, had a spike in total number of crashes (430 crashes); this year had the second highest number of both total number of crashes and KAB crashes in the five-year time frame.

FIGURE 7. TOTAL CRASH SUMMARY (2017-2021)



The total number of fatal (K), serious injury (A), and minor injury (B) crashes have increased since 2020 and exceeded three of the four previous years' totals as shown in **Table 2**. KAB crashes reached a total of 32 in 2021, which is over 50% higher compared to the previous two years.

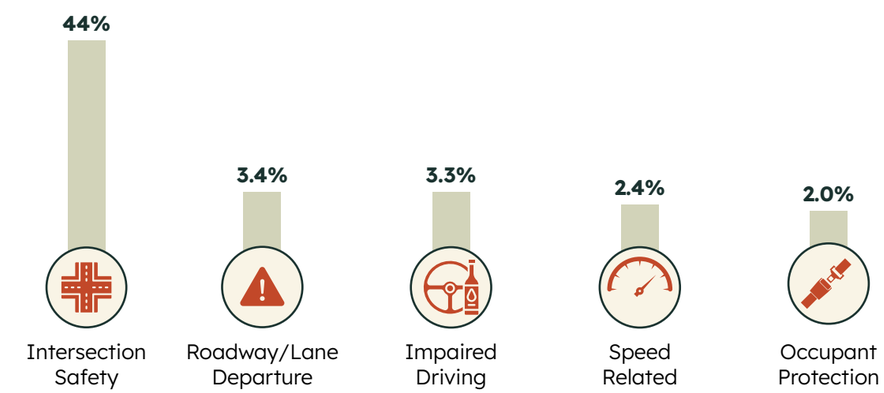
TABLE 2. TOTAL CRASHES BY SEVERITY (2017-2021)

Year	K- Fatal Injury		A - Suspected Serious Injury		B - Suspected Minor Injury		C - Possible Injury		O - Not Injured		99 - Unknown	
2017	0	0.0%	7	0.3%	19	0.9%	70	3.3%	539	25.7%	10	0.5%
2018	4	0.2%	3	0.1%	38	1.8%	40	1.9%	272	13.0%	5	0.1%
2019	2	0.1%	2	0.1%	16	0.8%	60	2.9%	281	13.4%	7	0.3%
2020	1	0.1%	3	0.1%	16	0.8%	40	1.9%	193	9.2%	5	0.2%
2021	0	0.0%	7	0.3%	25	1.2%	48	2.3%	335	16.0%	11	0.5%

Indicates the two highest years by percentage

The top manners of collision and how the crash occurred between vehicles in Tahlequah are shown in **Figure 7**. In the City, the top manners of collision were 'Intersection Safety' (44%), 'Roadway/Lane Departure' (3.4%), and 'Impaired Driving' (3.3%).

FIGURE 8. TOP CONTRIBUTING CRASH FACTORS (2017-2021)



TAHLEQUAH

CRASH HEAT MAP

A crash heat map was created to highlight the density of crashes within the City of Tahlequah form 2017-2021, as seen in **Exhibit 6**. This map is a visual representation of the density of crash counts at various locations in Tahlequah. However, the crash heat map does not account for traffic volumes, number of lanes, or speed limits, these factors to affect the frequency of crashes.

The highest concentration of crashes occurs along Muskogee Avenue and the Bypass (US-62/SH-82), with the highest densities at high volume intersections along the Bypass. Two of the largest densities on the crash heat map are near the intersections of US-62 & the US-62/SH-82 Bypass and the US-62/SH-82 Bypass & S Muskogee Avenue.

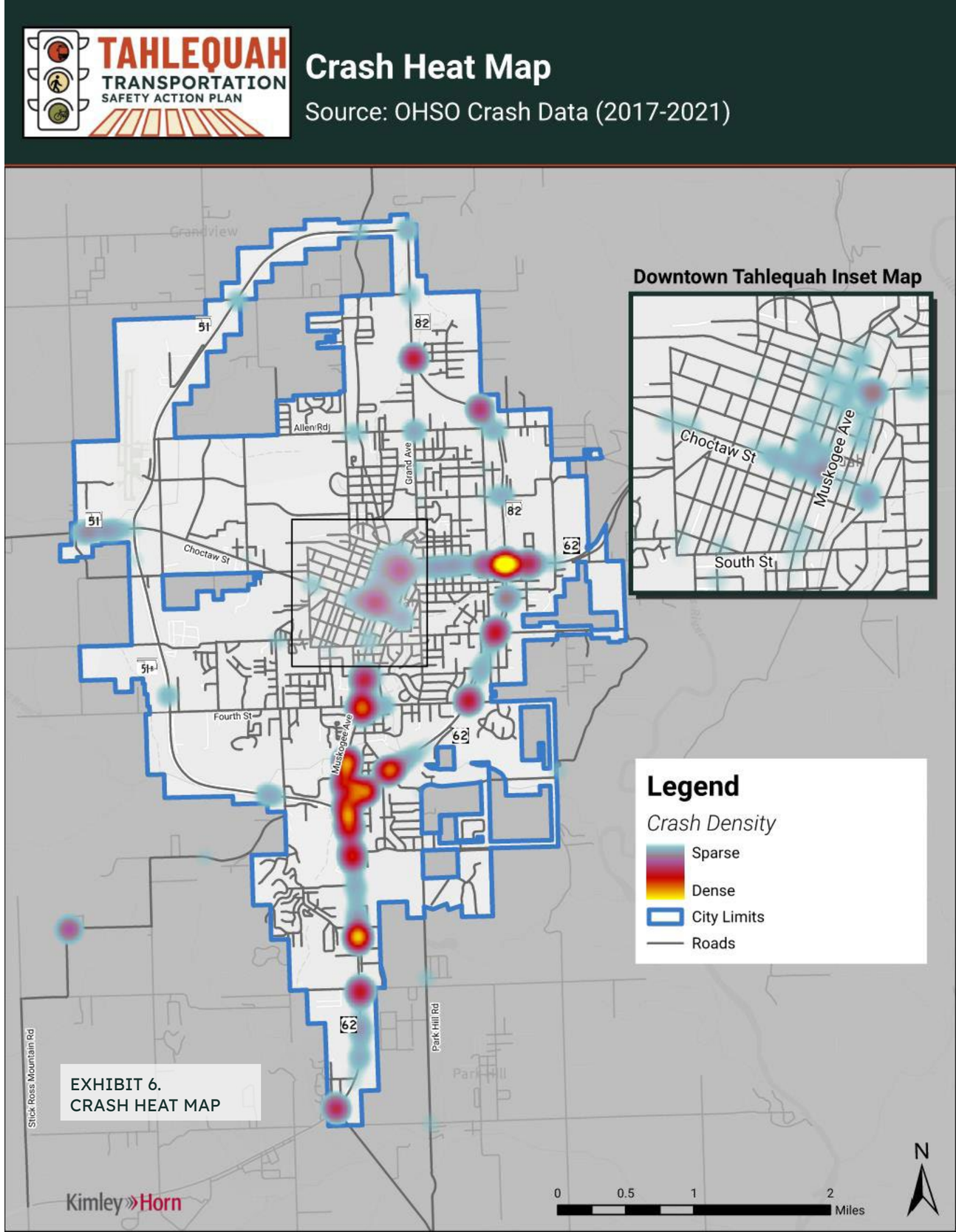


EXHIBIT 6.
CRASH HEAT MAP

TAHLEQUAH

KAB CRASHES

KAB crashes, which are comprised of fatal, severe injury, and possible injury crashes, serve as a critical component in the safety analysis of Tahlequah roadways. With the number of KAB crashes increasing since 2020, it is pertinent to discern the root causes behind these crashes and investigate what countermeasures can be identified to prevent these crashes. The KAB crashes in Tahlequah, seen in **Exhibit 7**, show that these crashes are dispersed throughout the City, often on the busiest roadways such as Muskogee Avenue, the US-62/SH-82 Bypass, SH-82, and US-62. The locations and information about these severe crashes are an important data point when developing the City's High Injury Network. Since these types of crashes are the most impactful to the community, the factors of how these crashes occur, where they are occurring, and how they can be prevented is a core tenant of this plan.

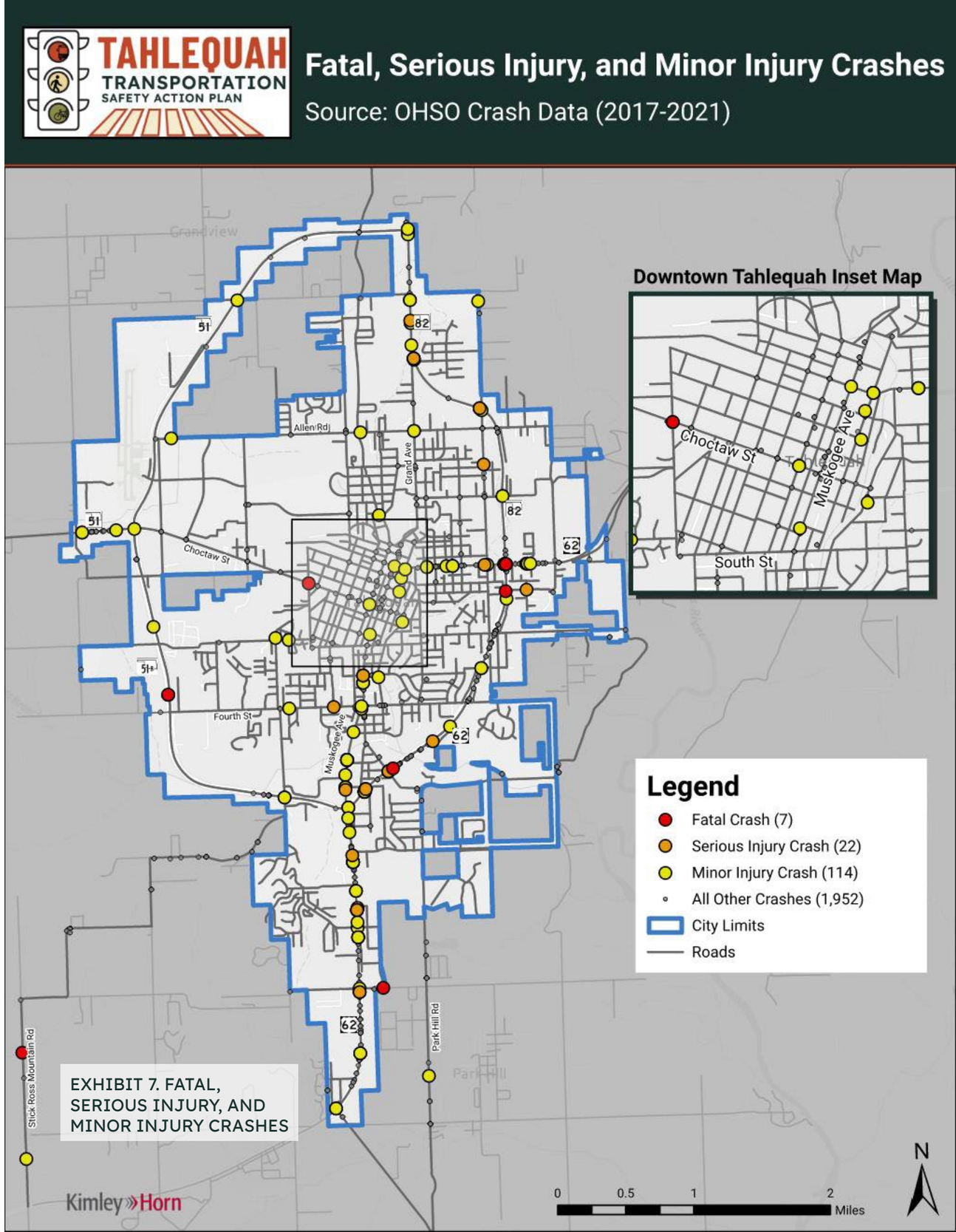


EXHIBIT 7. FATAL, SERIOUS INJURY, AND MINOR INJURY CRASHES

TAHLEQUAH

HIGH CRASH INTERSECTIONS

Approximately 44% of all crashes in Tahlequah occur at intersections. Intersections can become safety hazards for all roadway users since these are areas where the most conflicts for vehicles, pedestrians, and bicyclists occur. In the City of Tahlequah, the intersection of the US-62/SH-82 Bypass & US-62 had the most crashes over the five-year study period; the US-62/SH-82 Bypass is a 4-lane divided roadway and US-62 is a 4-lane undivided roadway. Of the 10 intersections listed in **Table 3**, eight (8) of them involve Muskogee Ave, SH-82, or US-62. **Exhibit 8** on Page 30 contains a map that highlights the locations of the high crash intersections in the City.

TABLE 3. HIGH CRASH INTERSECTIONS

Rank	Intersection	Crash Count
1	SH-82 & US-62	63
2	US-62 & Mimosa Ln	53
3	SH-82 & Cedar Ave	38
4	Muskogee Ave & SH-51	24
5	Downing St & Cedar Ave	24
6	Downing St & Water Ave	23
7	Muskogee Ave & Rayne St	18
8	US-62 & Park Hill Rd	17
9	Muskogee Ave & 4th St	16
10	Muskogee Ave & Meadow Creek Dr	14

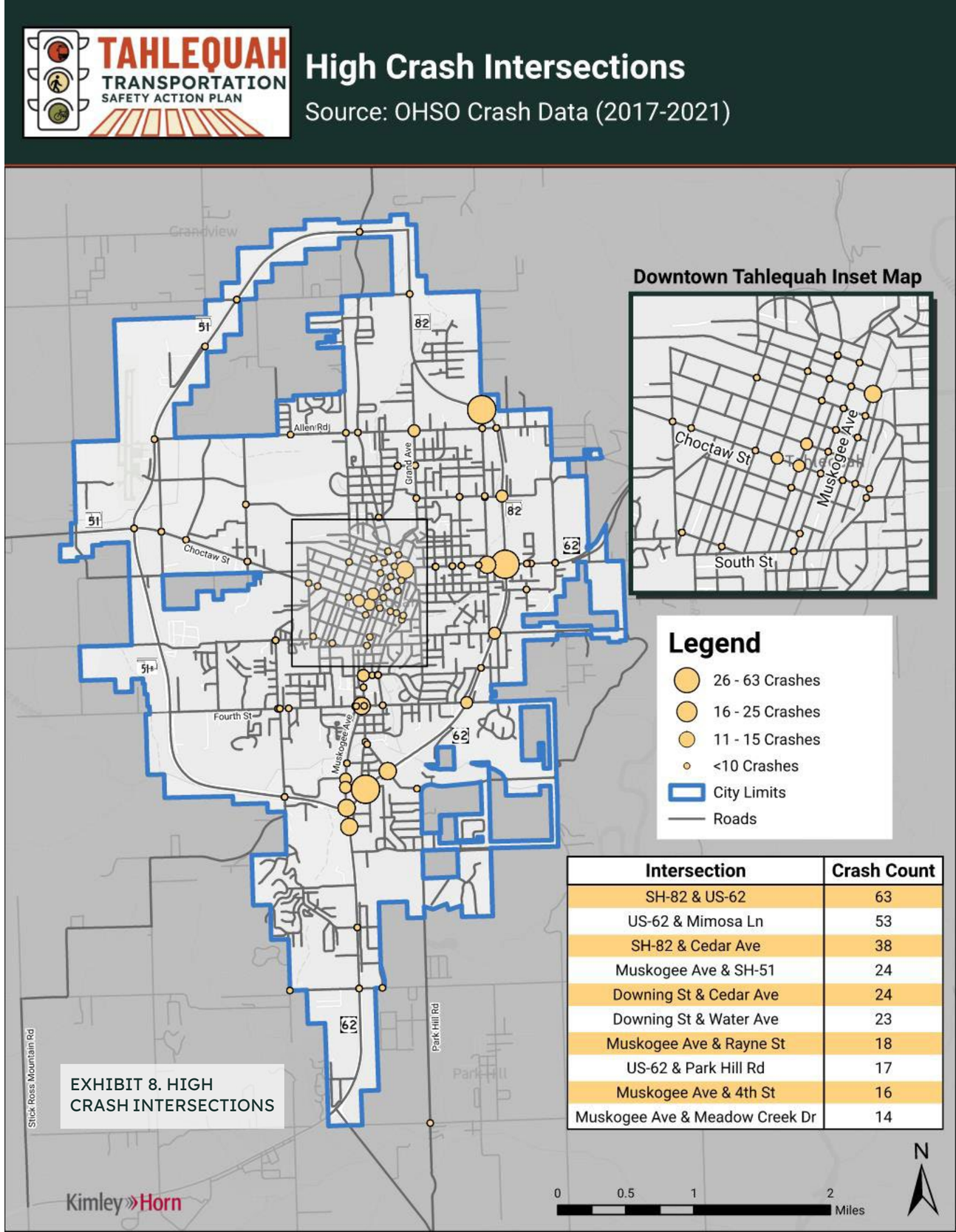


EXHIBIT 8. HIGH CRASH INTERSECTIONS

TAHLEQUAH

BICYCLE & PEDESTRIAN CRASHES

Vulnerable road users, which refers to bicyclists and pedestrians, are the most susceptible to a fatality or serious injury during a crash. This fact is supported by the crash history in Tahlequah. From 2017-2021, the City has experienced 16 pedestrian crashes and 4 bicyclist crashes, as shown in **Exhibit 9** on Page 32. Of the 16 crashes that involved pedestrians or bicyclists, 13 of them resulted in a fatality, serious injury, or minor injury.

On average, pedestrian and bicycle crashes are more severe than vehicle-only crashes in the City. While only 0.2%% of vehicle-only crashes resulted in a fatality, 15% of pedestrian and bicyclist crashes are a KAB crash; this comparison show that, if involved in a crash, a pedestrian or bicyclist is at a 75-time higher risk of experiencing a fatality or serious injury compared to drivers of a vehicle in Tahlequah. While this comparison may be skewed due to the small data set, this alarming discrepancy is a key factor to investigate further in relation to vulnerable road user safety.

A concentration of pedestrian and bicycle crashes occurs south of downtown Tahlequah along S Muskogee Avenue, near a variety of commercial businesses. The pedestrian infrastructure in this area of Tahlequah has long been either absent or insufficient; currently this corridor is under construction that will add sidewalks to address these issues. Otherwise, pedestrian crashes are dispersed throughout the City, often occurring at intersections or during low-light conditions.

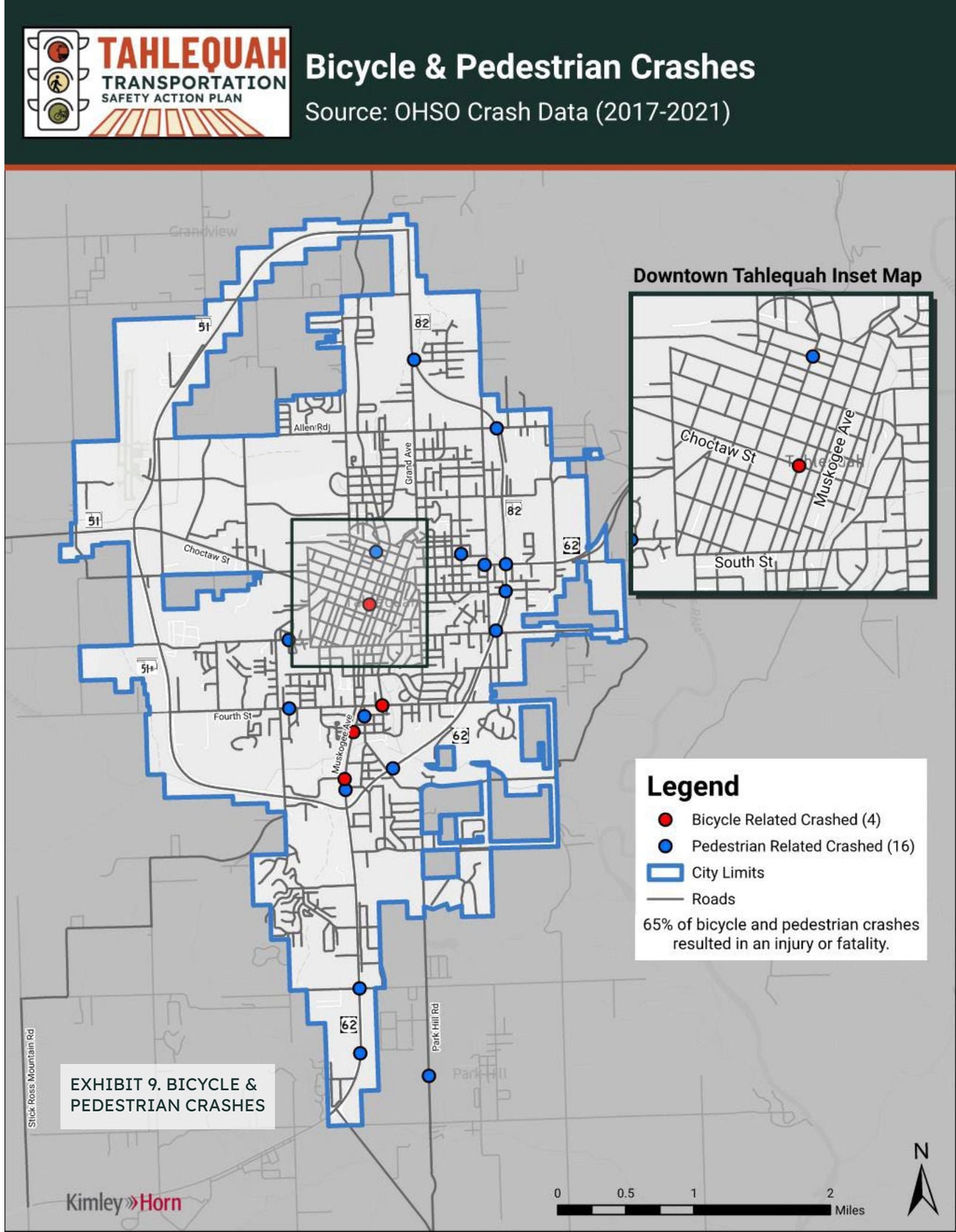


EXHIBIT 9. BICYCLE & PEDESTRIAN CRASHES

TAHLEQUAH

COMMERCIAL MOTOR VEHICLE & WORK ZONE CRASHES

Commercial motor vehicle and work zone related crashes are an important focus area due to their significant impact on road safety. These crashes often result in severe consequences, due to the heavy weight of commercial vehicles and the vulnerability of construction workers to traveling vehicles. In the available crash data, there were 37 commercial motor vehicle crashes and 17 work zone crashes; of these crashes, 6% resulted in an injury or fatality. **Exhibit 10** shows the location of these crashes in Tahlequah.

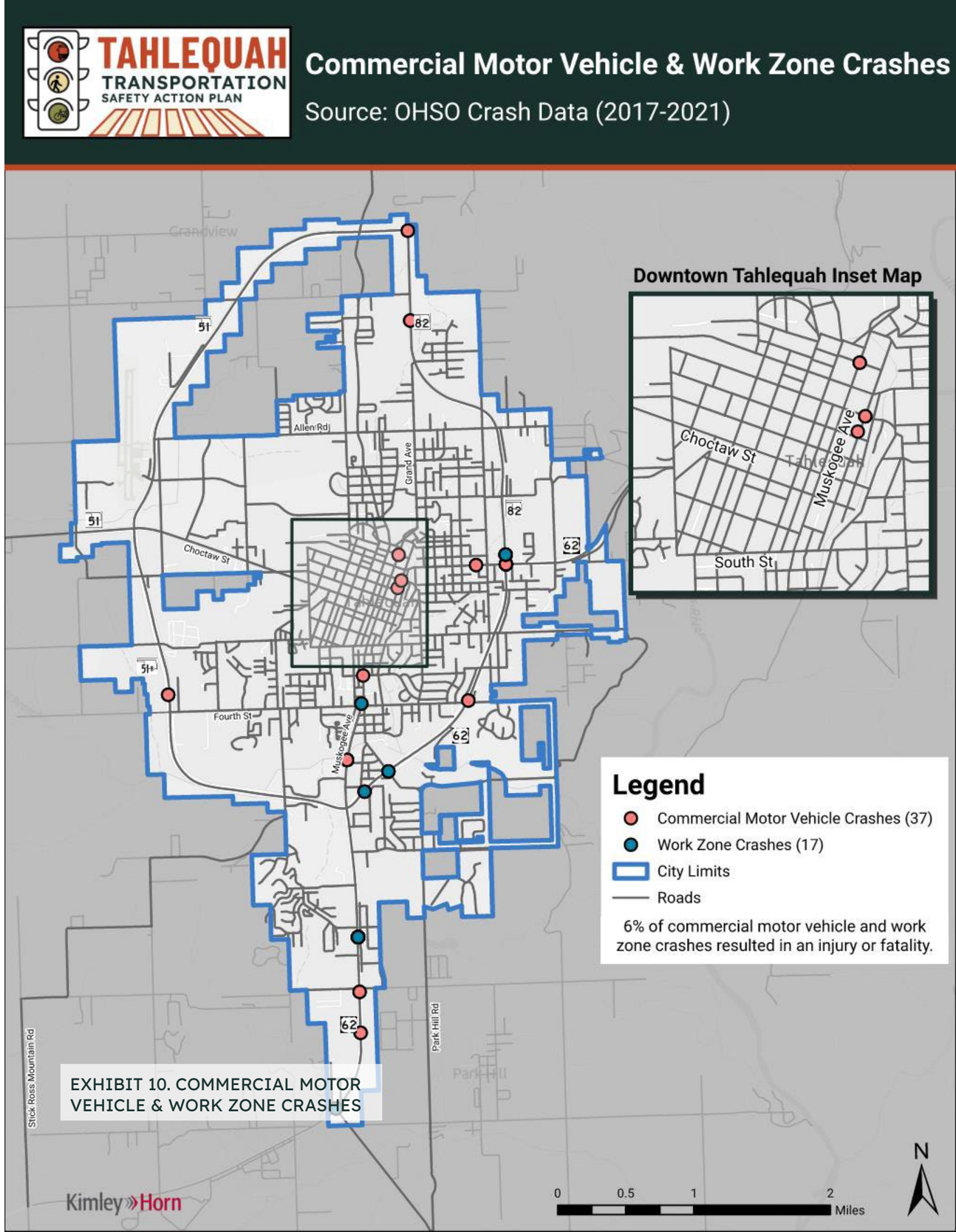


EXHIBIT 10. COMMERCIAL MOTOR VEHICLE & WORK ZONE CRASHES

TAHLEQUAH

LANE DEPARTURE CRASHES

Lane departure crashes, which occurs when a vehicle unintentionally leaves the travel lane, often lead to head-on collisions, rollovers, or run-off-road incidents. These types of crashes are a major concern in Tahlequah due to the high likelihood of resulting in a severe injury or fatality. The City has experienced 64 lane departure crashes and 7 crossover median crashes, as seen in **Exhibit 11** From these crashes, 12.4% resulted in an injury or fatality. These types of crashes have primarily occurred along US-62, SH-51, Stick Ross Mountain Road, and Allen Road.

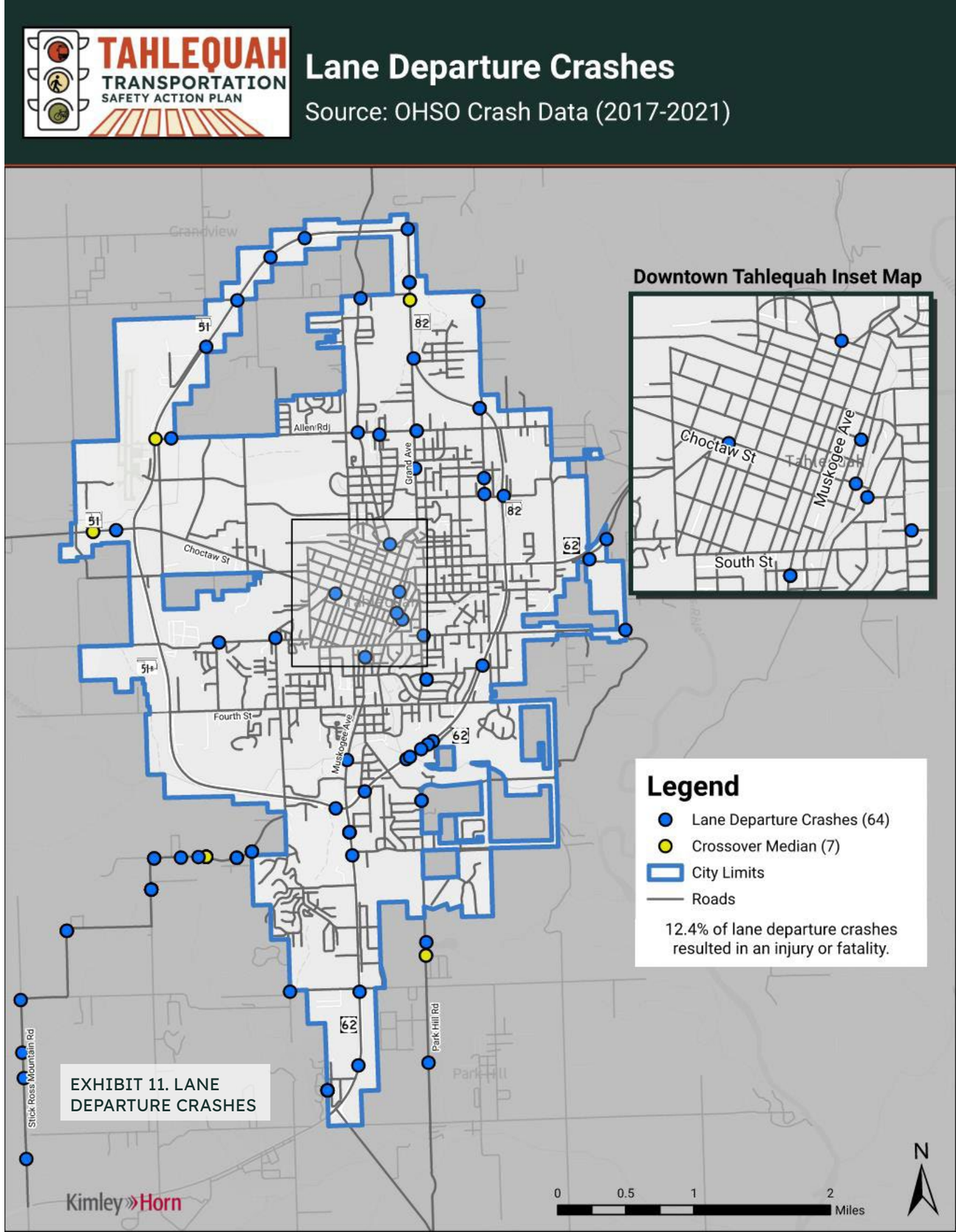


EXHIBIT 11. LANE DEPARTURE CRASHES

TAHLEQUAH

IMPAIRED DRIVING CRASHES

Impaired driving crashes represent a significant threat to road safety in Tahlequah. These crashes, which include impairment from both alcohol and drugs, lead to a disproportionate number of severe injuries and fatalities. In Tahlequah, there were 52 alcohol related and 16 drug related crashes, in which 11.4% resulted in an injury or fatality. As seen in **Exhibit 12**, a higher density of impaired driving crashes occurs in Downtown Tahlequah but are still seen dispersed throughout the city limits.

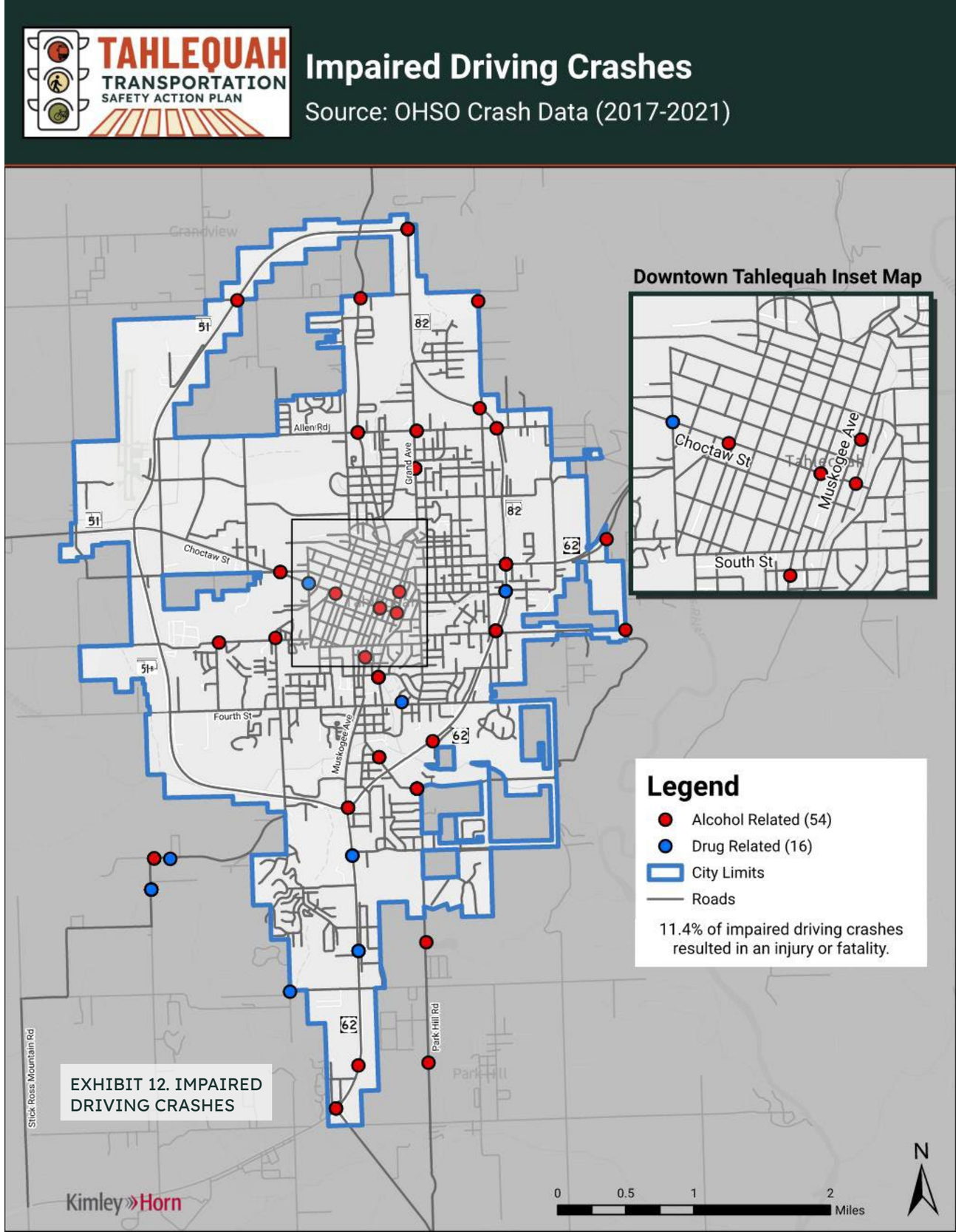


EXHIBIT 12. IMPAIRED DRIVING CRASHES

TAHLEQUAH

UNSAFE SPEED CHRASHES

Speed related crashes are another important area of concern in Tahlequah, as excessive speed greatly increases the occurrence and severity of crashes. Tahlequah saw 37 unsafe speed crashes, which resulted 8.1% of the crashes resulted in an injury or fatality. **Exhibit 13** show the locations of these crashes; the Bypass and Stick Ross Mountain Road had the highest incidences for unsafe speed crashes.

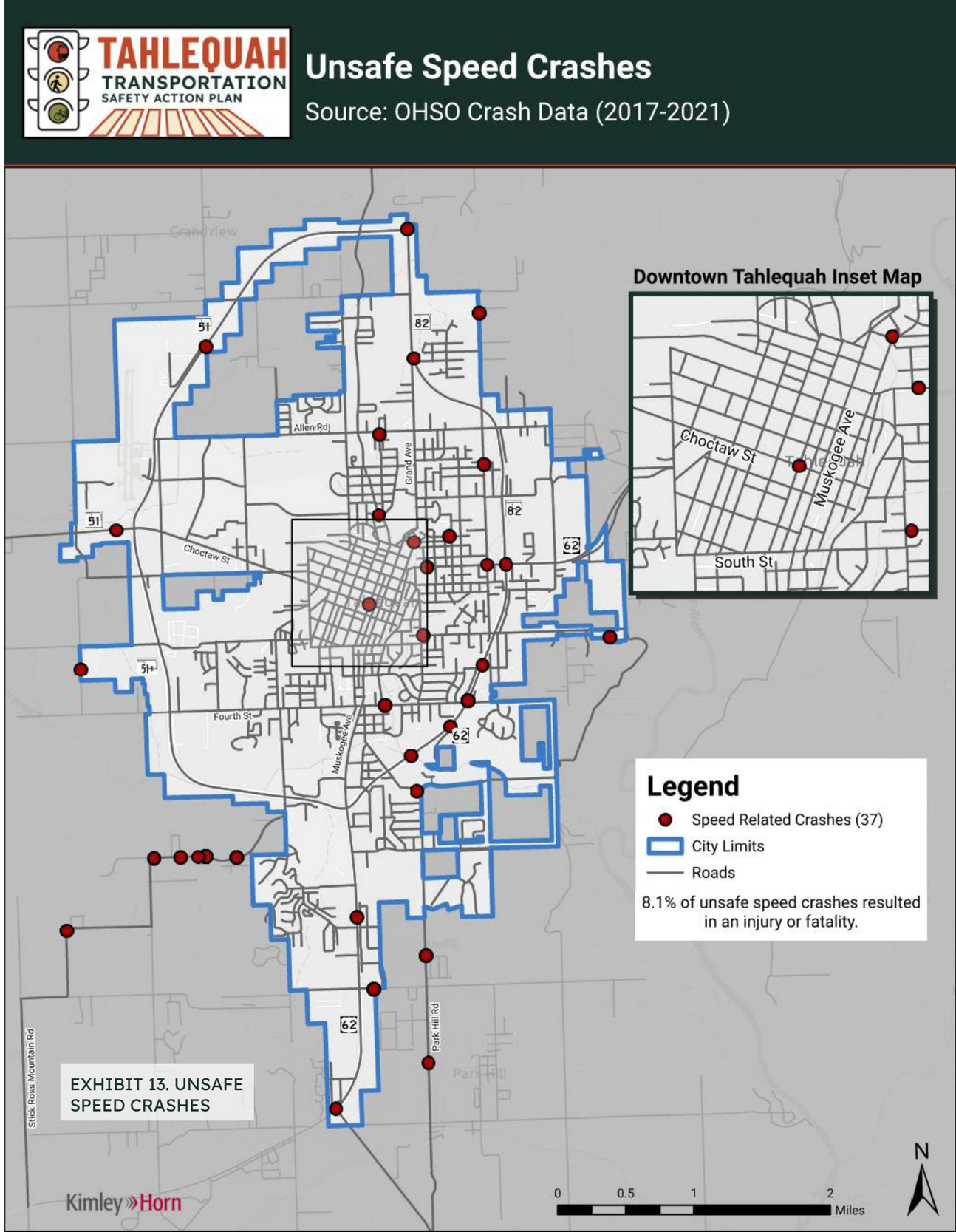


EXHIBIT 13. UNSAFE SPEED CRASHES

TAHLEQUAH

CRITICAL CRASH RATE (CCR) METHOD

The Federal Highway Administration (FHWA) outlines methods to calculate crash rates to prioritize locations where safety improvements are most needed. Outlined in the Highway Safety Manual, Section 4.4.4.5 on Page 4-41, the critical crash rate method identifies crash hotspots by comparing the observed crash rate at a roadway segment to the expected crash rate based on similar functional classification and traffic volumes. If the observed crash rate exceeds the expected crash rate, the roadway segment is considered to have a critical crash rate and is considered for the high injury network (HIN).

An ArcGIS Pro model was created to calculate the critical crash rate and supporting calculations for each roadway segment in the City. The model assigns crashes to an adjacent segment and performs the calculations in the order outlived by the FHWA. The following section outlines the process used in the calculation of the critical crash rate using fata, severe, and minor injury crashes from 2017-2021 in Tahlequah.

CRITICAL CRASH RATE (CCR) CALCULATION

The following three steps were followed to calculate the crucial crash rate for each road in Tahlequah:

1. Assigning Data to Road Segments
2. Calculate Variables of Critical Crash Rate
3. Calculate Critical Crash Rate Ratio

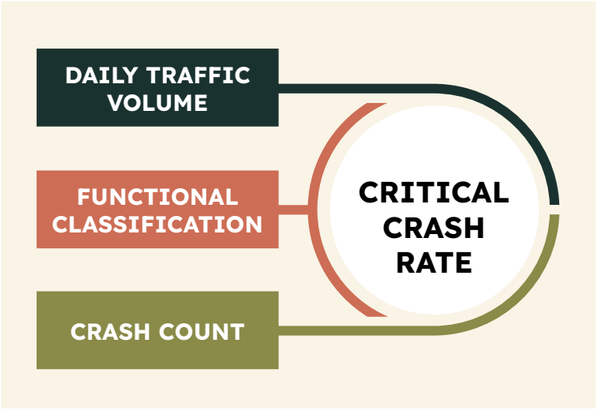
ASSIGNING DATA TO ROAD SEGMENTS

Calculating the critical crash rate requires three data inputs: roadway functional classification, daily traffic volumes, and crash counts. Since different factors, such as higher traffic volumes, more travel lanes, and higher speed limits, can impact crash rates, the normalization and comparison of these rates are crucial. The critical crash rate compares road segments that have similar roadway functional classification and normalizes daily traffic volumes to calculate crashes at a more even level based on their commonalities.

CALCULATE VARIABLES OF CRITICAL CRASH RATE

The critical crash rates were calculated using the equations outlined in the FHWA's Highway Safety manual. The observed crash rate represents the existing KAB crashes on each road segment per 100 million vehicle-miles traveled. For the expected average crash rate per 100 million vehicles-miles traveled calculations, the daily volumes for each functional class were normalized. Furthermore, roadways were only compared to other roadways that were similar; for example, local roads were only compared to local roads. **Figure 9** outlines the data inputs needed to calculate the critical crash rate.

FIGURE 9. HIN DATA INPUTS



CALCULATE CRITICAL CRASH RATE RATIO

A ratio is used to identify the magnitude of difference between the observed and expected crash rates. If the ratio is greater than 1.0 or the observed crash rate is higher than the expected crash rate, then that road segment's crash history was greater than the other road segments that share the same functional classification. Any segments with a ratio of 1 or greater were flagged as potential HIN segments. **Exhibit 14** provides a visual summary of all the ratio results.

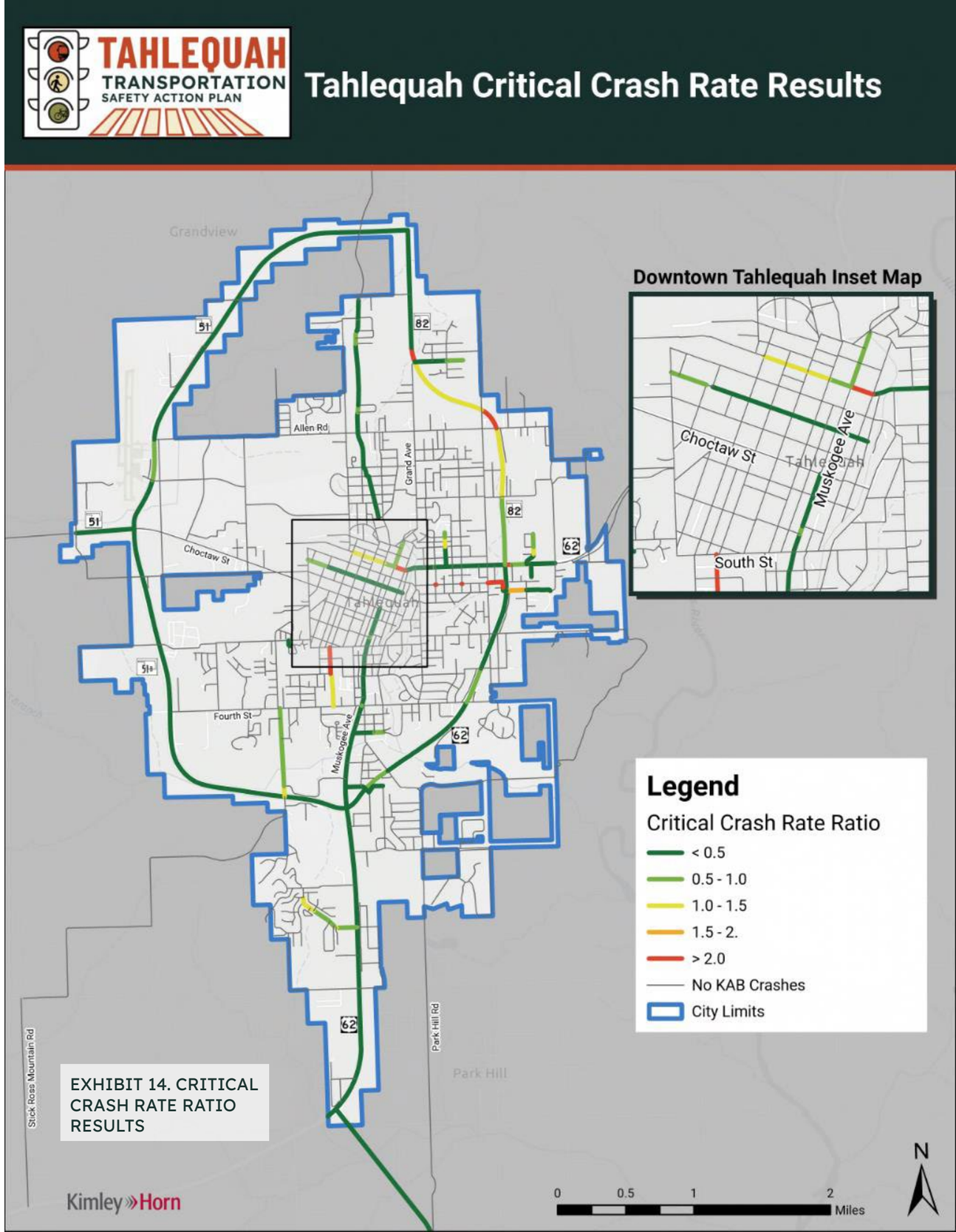


EXHIBIT 14. CRITICAL CRASH RATE RATIO RESULTS

TAHLEQUAH

HIGH INJURY NETWORK (HIN) DEVELOPMENT & RESULTS

The High Injury Network (HIN) was created through the selection of segments based on data-driven criteria combined with qualitative refinement of the model results. The goal of the HIN is to maximize the total vehicle-only KAB crashes and bicycle/pedestrian KAB crashes on the smallest percentage of City roads.

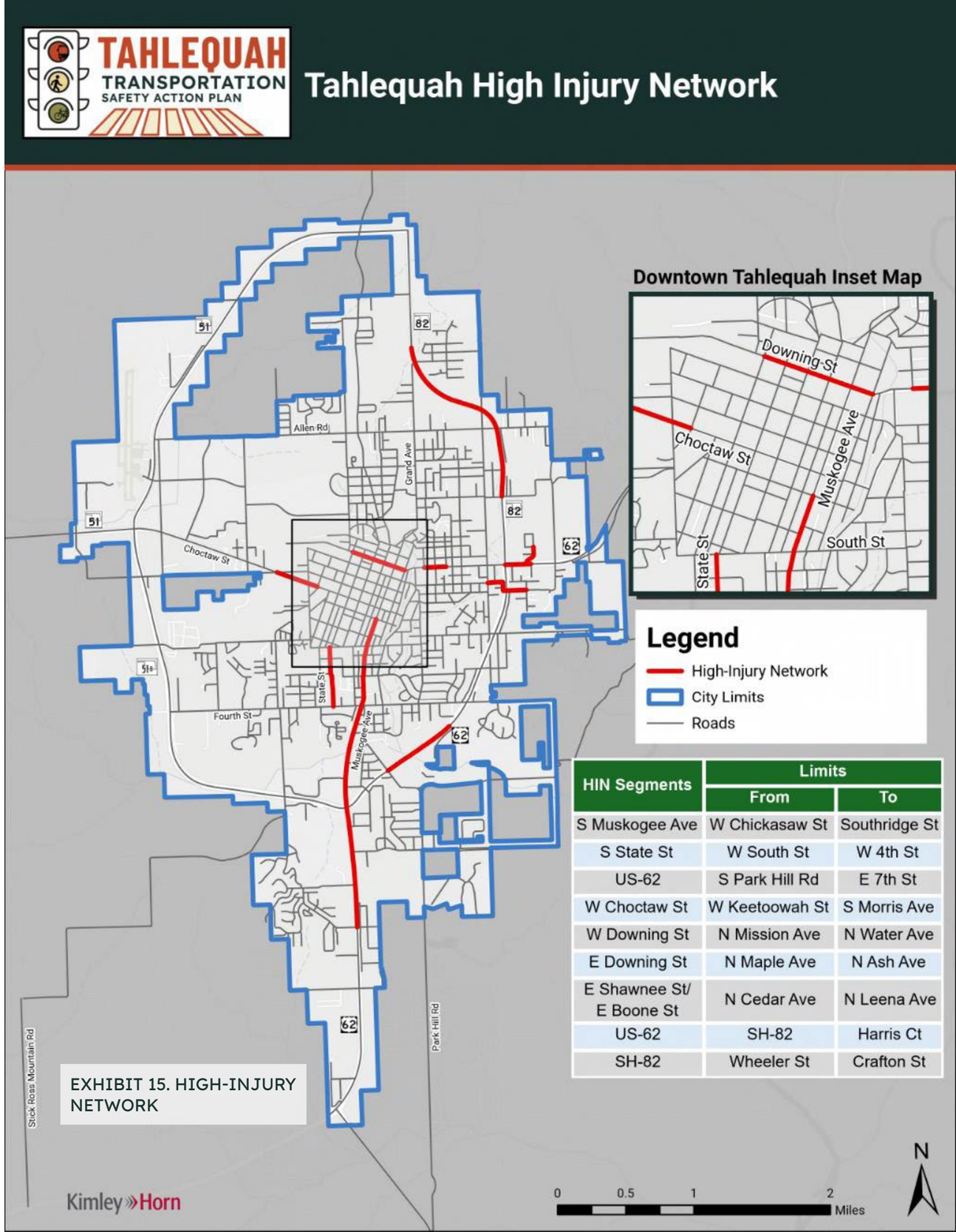
To refine and clean the model results, crash segments that only saw one crash but had a ratio of greater than 1.0 were removed from the model to prioritize segments with more severe crash histories. After this initial cleaning, the remaining segments were those with more than one KAB crash that occurred in the five-year crash history and had a higher-than-expected crash rate. While not all segments experienced a KAB crash, the influence area of the crash typically bleeds over to adjacent segments. To create a coherent and continuous HIN, the gaps between high crash segments were filled.

Following the refinement of the calculated critical crash rates, the HIN for the City of Tahlequah is determined. Tahlequah's HIN consists of approximately 6.3 miles or 3.9% of the City's roadways while capturing 53.1% of all KAB crashes and 57.1% of all fatal crashes.

A summary of all segments included in the HIN is shown in **Table 4**, and a map of the City's High Injury Network is shown in **Exhibit 15** on the following page.

TABLE 4. HIGH-INJURY NETWORK SEGMENTS

HIN Segments	Limits		Length (miles)	Crashes			Total KABS	AADT
	From	To		K	A	B		
S Muskogee Ave	W Chickasaw St	Southridge St	2.30	0	5	35	40	9,500
S State St	W South St	W 4th St	0.44	0	1	0	1	200
US-62	S Park Hill Rd	E 7th St	0.56	1	2	4	7	3,500
W Choctaw St	W Keetoowah St	S Morris Ave	0.32	1	0	0	1	4,000
W Downing St	N Mission Ave	N Water Ave	0.41	0	0	4	4	3,000
E Downing St	N Maple Ave	N Ash Ave	0.16	0	0	4	4	7,600
E Shawnee St/E Boone St	N Cedar Ave	N Leena Ave	0.35	1	1	0	2	400
US-62	SH-82	Harris Ct	0.19	1	4	6	11	14,000
SH-82	Wheeler St	Crafton St	1.41	0	4	7	11	8,200



HIN Segments	Limits	
	From	To
S Muskogee Ave	W Chickasaw St	Southridge St
S State St	W South St	W 4th St
US-62	S Park Hill Rd	E 7th St
W Choctaw St	W Keetoowah St	S Morris Ave
W Downing St	N Mission Ave	N Water Ave
E Downing St	N Maple Ave	N Ash Ave
E Shawnee St/ E Boone St	N Cedar Ave	N Leena Ave
US-62	SH-82	Harris Ct
SH-82	Wheeler St	Crafton St

EXHIBIT 15. HIGH-INJURY NETWORK

4

This chapter outlines systemic recommendations are organized by safety emphasis areas and provide a countermeasure toolbox to make Citywide improvements.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

CHAPTER 4: COUNTERMEASURES

This chapter outlines systemic recommendations are organized by safety emphasis areas and provide a countermeasure toolbox to make Citywide improvements. Furthermore, this chapter details the five (5) study corridors identified by the HIN, City staff and SSC, along with their respective targeted recommendations and countermeasures. Informed by the countermeasure toolbox, targeted recommendations at study corridors provide detailed and crafter recommendations for specific areas of the City of Tahlequah that have varying crash history, road geometry, intersection control, and land use context.

SYSTEMIC COUNTERMEASURE TOOLBOX

A countermeasure toolbox is a comprehensive collection of strategies and interventions designed to address specific traffic safety issues and challenges. It provides transportation professional with a range of options and resources to effectively mitigate risks, improve safety, and enhance the overall performance of roadways and transportation systems.

The following details systemic countermeasures that can be implemented in all areas of the City to improve safety, not limited to the recommendations and study corridors. The summary of all Tahlequah countermeasures is found in **Table 5**. Tahlequah's systemic countermeasure toolbox is provided with each categorized by safety emphasis area in **Table 6**. Priority should be given to roads along the HIN and in areas of disadvantages populations to lessen severity among crashes.

TABLE 5. COUNTERMEASURE SUMMARY

Countermeasures	CMF	Context (Urban/Rural)
Raised Medians	0.29	Both
Change Driveway Width	0.25	Both
Rectangular Rapid Flashing Beacons (RRFB)	0.31	Both
Pedestrian Refuge Islands	0.44	Urban
Midblock Crossings	0.45	Urban
Roadway Reconfiguration	0.53	Urban
Sidewalks	0.598	Both
Corridor Lighting	0.68	Both
Crosswalk Visibility Enhancements	0.732	Both
Rumble Strips	0.745	Rural
High-Contrast Lane Markings	0.75	Both
Flashing Yellow Arrow	0.97	Both
Retroreflective Backplates	0.85	Both
Appropriate Speed Limits	0.856	Both
Corridor Access Management	0.93	Both
Speed Feedback Signs	0.95	Both
Wider Edge Lines	0.97	Both
Curb Extensions	–	Urban

TABLE 6. SAFETY EMPHASIS AREAS COUNTERMEASURES TOOLBOX

Safety Emphasis Areas	CMF	Lane Departures	Impaired Driving	Occupant Protection	Unsafe Speeds	Intersections	CMV Crashes and Work Zones	Motorcycle Crazes and ATVs	Vulnerable Road Users
Raised Median	0.29	●	●	●	●				●
Corridor Access Management	0.93			●		●		●	●
Change Driveway Width	0.25			●		●			●
Retroreflective Backplates	0.85					●			
Flashing Yellow Arrow	0.97					●			
Lane Designation Markings and Signs	0.75		●			●	●		
Wide Edge Lines	0.63	●	●						
High Contrast Lane Markings	0.75	●	●						
Rumble Strips	0.36	●	●	●			●		
Curb Extensions	N/A				●			●	●
Speed Feedback Signs	0.95			●	●		●	●	●
Appropriate Speed Limits				●	●		●	●	●
Rectangular Rapid Flashing Beacon	0.31								●
Pedestrian Refuge Islands	0.44								●
Midblock Crossings	0.45								●
Corridor Lighting	0.73	●	●	●				●	
Crosswalk Visibility Enhancements	0.73								●

RAISED MEDIAN

A raised median is a physical barrier or divider that separates opposing lanes of traffic on a roadway. It is most used in urban and suburban areas to enhance safety and traffic flow by preventing vehicles from crossing over into opposing lanes or making certain left-turn movements. Installing a raised median has a CMF of 0.29 for all crash types and severities. **Figure 10** provides an example of a raised median.

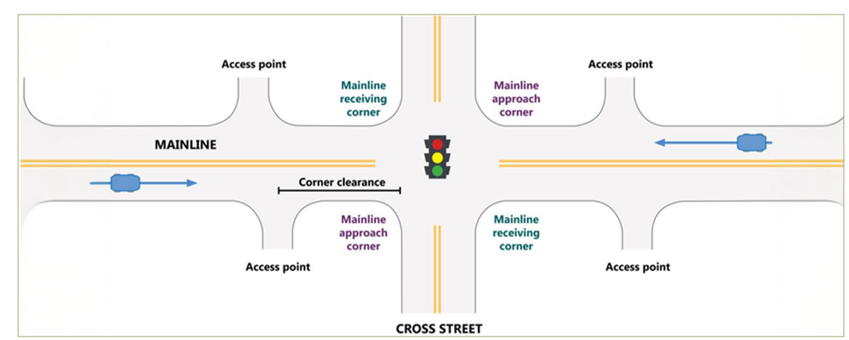
FIGURE 10. RAISED MEDIAN

Source: Adobe Stock

CORRIDOR ACCESS MANAGEMENT

Access management pertains to the planning, implementation, and regulation of entry and exit locations along a road, encompassing intersections with other roads and driveways serving nearby properties. Thoughtful management of access along a corridor can improve safety for all transportation modes, promote walking and cycling, and alleviate traffic congestion and delays. Closure or relocation of driveways from functional area of intersection has a CMF of 0.93 for all crash types and severities. **Figure 11** provides an example of corridor access management elements and example.

FIGURE 11. CORRIDOR ACCESS MANAGEMENT

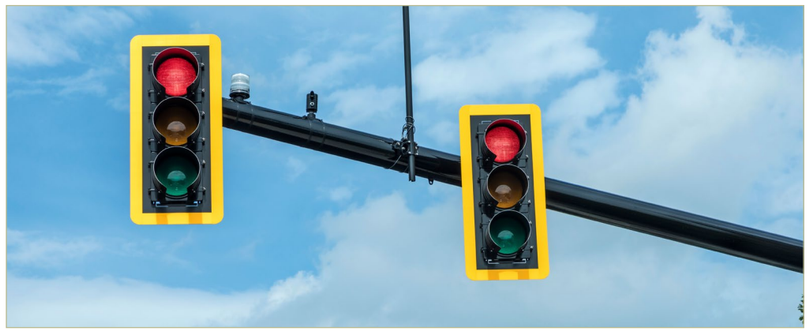


Source: FHWA

RETROREFLECTIVE BACKPLATES

A retroreflective backplate is a backplate made by framing a signal head with a 1-to-3-inch yellow retroreflective border. They improve the visibility of the illuminated face of the signal by introducing a controlled-contrast background. They are also more visible and conspicuous in both daytime and nighttime conditions. Installing retroreflective backplates has a CMF of 0.85 for all crash types and severities. **Figure 12** provides an example of a retroreflective backplate installed on a signal head.

FIGURE 12. RETROREFLECTIVE BACKPLATE



Source: FHWA

FLASHING YELLOW ARROW

A flashing yellow arrow (FYA) indicates that drivers are permitted to turn left but should yield to pedestrians and oncoming traffic during a permissive circular green. This countermeasure is a national standard adopted by the FHWA meant to increase intersection safety. The addition of an FYA is meant to decrease the number of left-turn crashes, especially those that involve a crash between vehicles turning left and those going straight. Installing an FYA has a CMF of 0.975. **Figure 13** shows an example of an FYA installed at an intersection.

FIGURE 13. FLASHING YELLOW ARROW

Source: mntransportationresearch.org

WIDE EDGE LINES

Edge lines are the pavement markings at the edge of travel lanes and are designed to help drivers clearly identify the road alignment ahead. Edge lines are considered “wider” when the marking width is increased from the minimum normal line width of 4 inches to the maximum normal width of 6 inches. Wider edge lines enhance the visibility of travel lane boundaries compared to traditional edge lines. This has a CMF of 0.635 for all crash types and for K, A, B, or C crash severities. **Figure 14** provides an example of a wide edge line.

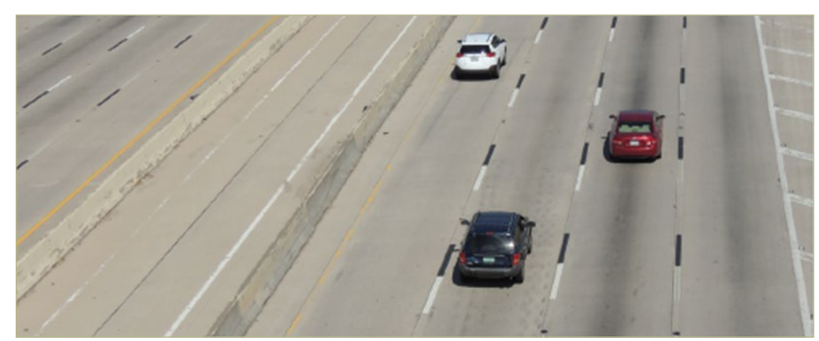
FIGURE 14. WIDE EDGE LINE

Source: FHWA, Texas Transportation Institute

HIGH-CONTRAST LANE MARKINGS

High contrast lane markings are road markings designed to be easily distinguishable from the surrounding pavement, typically by contrasting colors or materials. These markings are intended to improve visibility and clarity for drivers, especially in challenging conditions such as low light, inclement weather, or areas with poor visibility. High contrast lane markings can reduce lane departure, intersection, distracted driving, and impaired driving related crashes. Installing high contrast lane markings has a CMF of 0.75. **Figure 15** provides an example of high contrast lane markings.

FIGURE 15. HIGH CONTRAST LANE MARKINGS



Source: FHWA

RUMBLE STRIPS

Rumble Strips are a method of improving traffic safety by alerting drivers in the case that they leave the traveled way. In the instance that a driver strays from the travel lane rumble strips will produce a noise and vibration that will alert drivers prompting them to correct the error. Longitudinal, center line, edge line, and shoulder rumble strips are effective low-cost safety countermeasures. Longitudinal rumble strips can result in a 44-64% reduction in head-on fatal and injury crashes on two-lane rural roads. Installing rumble strips have a CMF of 0.36. **Figure 16** shows an example of longitudinal rumble strips.

FIGURE 16. RUMBLE STRIPS

Source: Adobe Stock

CURB EXTENSIONS

Curb Extensions visually and physically narrow the roadway, creating a safer and shorter crossing for pedestrians while increasing the available space for pedestrians or other amenities. Curb Extensions help with speed reductions and increased safety. There is currently not CMF for Curb Extensions. **Figure 17** provides an example of curb extensions.

FIGURE 17. CURB EXTENSIONS

Source: FHWA

IMPLEMENT SYSTEMIC SIGNING AND MARKING IMPROVEMENTS AT STOP-CONTROLLED INTERSECTIONS

Deploying a variety of low-cost countermeasures at a number of stop-controlled intersection within a jurisdiction can increase overall intersection safety in that location. Countermeasure that could applied to stop-controlled intersections are properly placed stop bars, doubled-up oversized stop signs, doubled up oversized advance “stop ahead” signs, and removal of vegetation. These countermeasures increase driver awareness to the upcoming intersection and any potential conflicts. Implementing signing and marking improvements at stop-controlled intersections through a systemic approach has a CMF of 0.734. **Figure 18** provides an example of some low-cost countermeasures that could be utilized.

FIGURE 18. EXAMPLE OF COUNTERMEASURES AT A STOP CONTROLLED INTERSECTION

Source: FHWA

RECTANGULAR RAPID FLASHING BEACON (RRFB)

A RRFB is a pedestrian activated safety device installed at crosswalks to enhance visibility and alert drivers to the presence of pedestrians. A RRFB consists of two, rectangular-shaped yellow indicators, each with a light emitting diode (LED)-array-based light source. When activated these the RRFB emits a rapid, alternating pattern of flashing lights to alert drivers to pedestrians crossing the street. RRFBs are a low maintenance improvement that should be deployed at targeted locations. According to FHWA, RRFBs can result in motorist yielding rates as high as 98 percent at marked crosswalks with varied speed limits, crossing distances, and number of travel lanes. Installation of an RRFB has a CMF of 0.31 for all crash types and severities. **Figure 19** provides an example of an RRFB.

FIGURE 19. RRFB

Source: Adobe Stock

PEDESTRIAN REFUGE ISLANDS

Pedestrian Refuge Islands is a dedicated pedestrian "island" in the middle of an intersection that provides a safe place for vulnerable road users to stop when crossing a large and busy intersection. Pedestrian Refuge Islands increase pedestrian safety by shortening pedestrian exposure when crossing an intersection. This safety countermeasure is most useful at intersections with high traffic volumes. Pedestrian Refuge Islands contribute to a 56% reduction in pedestrian crashes and have a CMF value of 0.44. **Figure 20** shows an example of a pedestrian refuge island.

FIGURE 20. PEDESTRIAN REFUGE ISLAND

Source: Adobe Stock

MIDBLOCK CROSSINGS

Designated pedestrian crossings away from an intersection. Inexpensive method to increase pedestrian safety through clear visual cues to pedestrians and drivers of a crossing, particularly in the case of increased distance between pedestrian crossing points. Increases vulnerable road user safety through alerting drivers to pedestrian crossings and encourage pedestrians to use dedicated crossing points. These treatments should be implemented at key locations where there are large expanses between pedestrian crossings at intersections. Installing Midblock Crossings has a CMF of 0.45. **Figure 21** provides an example of a midblock crossing.

FIGURE 21. MIDBLOCK CROSSINGS

Source: Adobe Stock

APPROPRIATE SPEED LIMITS

Utilization of appropriate speed limits increases roadway safety through implementing speed limits that take into account factors such as school/work zones, visibility, elevation changes, curves, congestion, and vulnerable road users. Through implementing appropriate speed limits into street design, it increases roadway safety for all users. Speeding increases fatality of all collisions, this low-cost method of speed control reduces danger of speed related collisions. A driver traveling at 30 miles per hour who hits a pedestrian has a 45 percent chance of killing or seriously injuring them. At 20 miles per hour, that percentage drops to 5 percent.

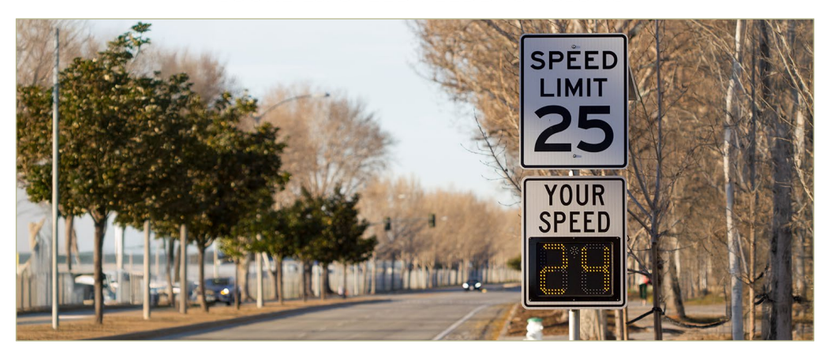
FIGURE 22. APPROPRIATE SPEED LIMITS

Source: Adobe Stock

SPEED FEEDBACK SIGNS

Traffic control device using a system of speed measurement and feedback sign to alert and warn drivers if exceeding the speed limit. Feedback signs typically consist of a display panel, often featuring LED or digital readouts, which visually indicate the speed of approaching vehicles or a warning message. Primary purpose of speed feedback signs is to increase roadway safety by alerting drivers of their speed, encouraging driver awareness, and promoting safer driving behaviors. These speed feedback signs are typically implemented in school zones, work zones, residential areas, and other areas in which speeding is an increased safety hazard. Installing Speed Feedback Signs has a CMF of 0.95. **Figure 23** shows an example of a speed feedback sign.

FIGURE 23. SPEED FEEDBACK SIGNS



Source: Adobe Stock

CORRIDOR LIGHTING

The number of fatal crashes occurring during daylight is roughly equal to those occurring in darkness. However, the nighttime fatality rate is three times higher than the daytime rate, despite only 25% of vehicle miles traveled (VMT) occurring at night. At higher speeds, vehicles may be unable to stop in time when a hazard or roadway change becomes visible within headlight range.

Enhancing roadway lighting significantly improves visibility and safety. Research-based recommendations for horizontal and vertical illuminance levels ensure lighting meets or exceeds minimum acceptable standards, benefiting all roadway users. Additionally, adequate lighting enhances personal security for non-vehicle users traveling along or across roadways. Depending on community needs, lighting improvements can take the form of intersection or corridor lighting. Increased lighting has been shown to reduce pedestrian nighttime crashes by up to 42%. Corridor lighting improvements have a CMF value of 0.73; an example of a well-lit roadway corridor is seen in **Figure 24**.

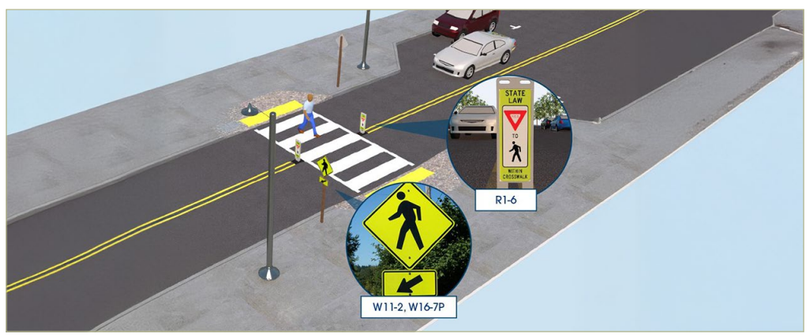
FIGURE 24. CORRIDOR LIGHTING

Source: Adobe Stock

CROSSWALK VISIBILITY ENHANCEMENTS

Crosswalk Visibility Enhancements may include lighting, high-visibility crosswalks, and signing and pavement markings. These enhancements improve pedestrian safety by improving visibility and better alerting drivers of pedestrian presence. These low-cost improvements can be deployed on a large scale and encourage active transportation. Crosswalk Visibility Enhancements have a CMF of 0.732. Examples of visibility enhancements to a crosswalk is found in **Figure 25**.

FIGURE 25. CROSSWALK VISIBILITY ENHANCEMENTS



Source: FHWA

CHANGE DRIVEWAY WIDTH

Changing the width of existing driveways can have a significant impact on decreasing crashes near the driveway location. Through this countermeasure, driveways with large widths will not have to be fully closed but rather shortened to enhance intersection safety. Although this countermeasure reduced the degree of access a driveway has, it should be considered when limited sight distance does not allow adequate time to judge traffic, there is proximity to busy intersections, or there is a need to reduce conflicting turning movements. Reducing driveway widths in Tahlequah could have a CMF of 0.25 for all crash severities.

FIGURE 26. DRIVEWAY IN NEED OF CHANGE

Source: Kimley-Horn

TAHLEQUAH

TARGETED RECOMMENDATIONS

To select projects and recommendations that would improve safety in Tahlequah, in-field observations were made to understand existing conditions and crash locations. The following sections summarizes the crash history and highlights corridor-level recommendations for each of the five selected study corridors.

STUDY CORRIDORS AND INTERSECTIONS

Five road segments on the High-Injury Network were selected as priority corridors to make targeted recommendations that improve safety on the City's most unsafe corridors today. The highest priority study corridors were selected with input from City staff and the SSC. The criteria for study corridor selection were based on the following inputs:

- Equity
  - Disadvantaged Areas (USDOT ETC Explorer)
  - Transportation Disadvantaged Areas (USDOT ETC Explorer)
- Engagement
  - Social Pinpoint Map Survey Comments
  - SSC Study Area Comments (from Meeting 2)
  - SSC Priority Selection (from Meeting 3)
- Feasibility
  - Current City Projects
  - Current ODOT Projects

In coordination with the City of Tahlequah Staff and the SSC, the five study corridors for targeted recommendations are outlined in **Table 7**. The study corridors, seen in **Exhibit 16**, add up to 2.98 miles of roadway, capturing 18% of the total KAB crashes within their limits. Each are spread between various locations of Tahlequah and are located near multiple land use contexts.

TABLE 7. STUDY CORRIDORS

Corridor		Limits		Length	Crashes			Total KABS	AADT
		From	To		K	A	B		
1	S Muskogee Ave	E Ballentine Rd	Bypass	0.33	0	1	4	62	20,800
2	Bypass	S Park Hill Rd	7th Street	0.55	1	2	5	42	17,500
3	S Muskogee Ave	W Chickasaw St	Goingsnake St	0.61	0	0	1	27	7,400
4	Bypass/ US-82	E Boone St	E Downing St	0.78	2	3	4	85	16,000
5	SH-82	Near E Allen Rd		0.71	0	1	2	25	9,500
			Totals	**2.98**	**3**	**7**	**16**	**240**	**–**

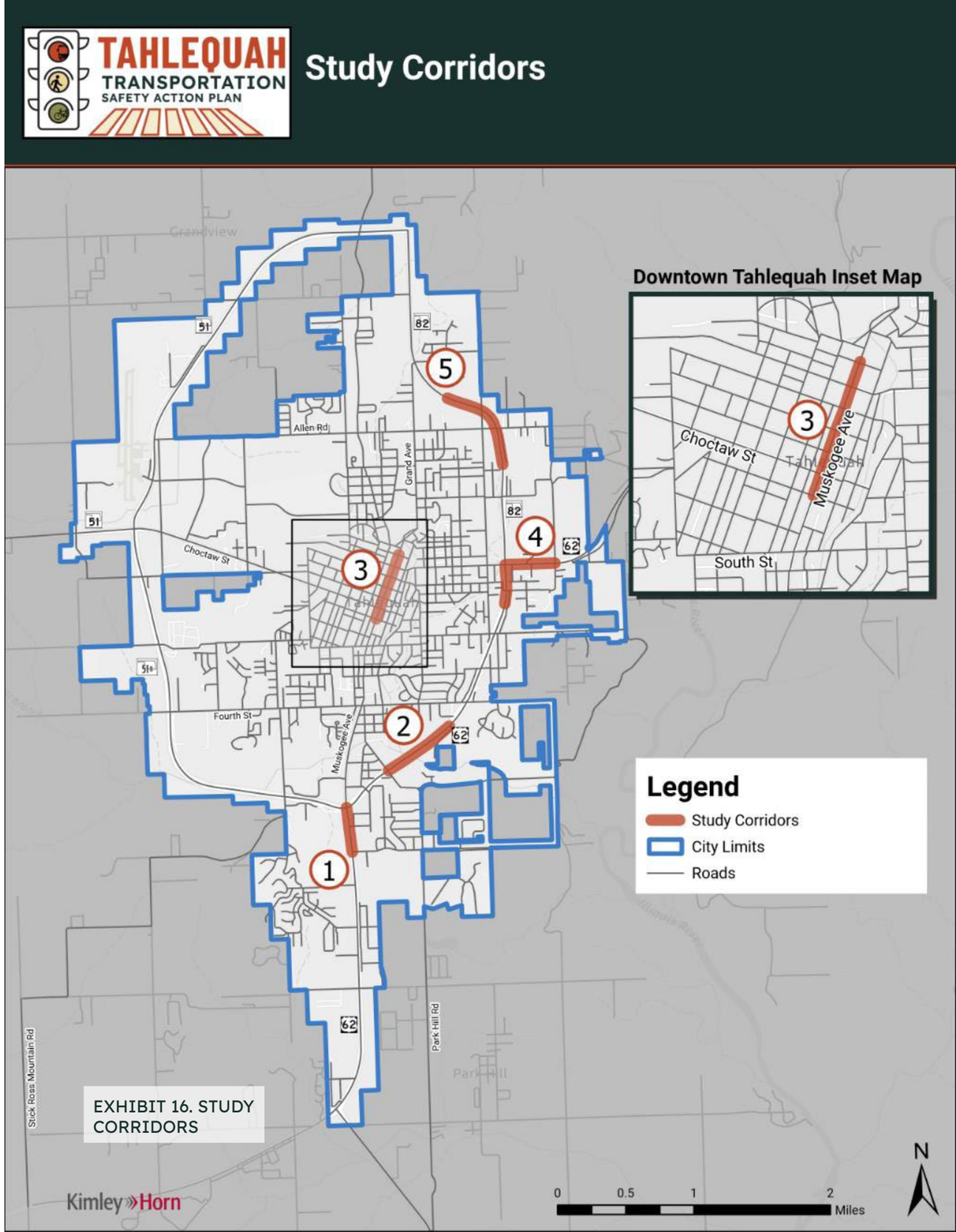


EXHIBIT 16. STUDY CORRIDORS

TAHLEQUAH

1 CORRIDOR 1: *S MUSKOGEE AVENUE, FROM E. BALLENTINE ROAD TO BYPASS*

Context

The S Muskogee Avenue corridor (Corridor 1) is a section of Muskogee Ave, also known as US-62, from E Ballentine Road to the US-62/SH-82 Bypass that is 0.33 miles in length. Corridor 1 is located south of Downtown Tahlequah and is surrounded by primarily commercial land uses. This section of Muskogee Avenue is primarily a 5-lane undivided roadway with a center two-way left-turn lane. The volume of this road is approximately 20,800 vehicles per day. The posted speed limit of this corridor is 45 MPH. This corridor has two signalized intersections, one at the Bypass and one at Rayne Street, which acts as an entrance point to Walmart and Reasor's.

Crash History

There were 64 total crashes on this section of S Muskogee Road between 2017-2021. Of these crashes, 5 were KABs. Key takeaways for crash trends along Corridor 1 were the following:

32%

20 of the 62 crashes were intersection related (32%), which includes 2 of the 5 KAB crashes (40%).

31%

The top contributing factors of crashes were 'Followed Too Closely' (31%) and 'Failure to Yield/Stop' (21%).

Corridor Recommendations

It is recommended to install countermeasures along Corridor 1 that would both increase driver awareness and address both intersection and access management concerns. These countermeasures include installing corridor-wide high-contrast lane markings, a raised center median, improved lighting, transverse rumble strips, and steep hill warning signage. Raised medians will draw drivers' attention to the way, help decrease speeds and improve access management along the corridor. High contrast lane markings enhance the visibility of the travel lanes throughout the corridor. This, paired with improved corridor lighting, will allow drivers to easily see in low-light conditions and see where travel lanes begin and end. Installation of transverse rumble strips and 'Steep Hill Ahead' signage will alert drivers about the steep hill south of Rayne Street; increasing driver awareness of these conditions is important so drivers are cognizant of speed and potential sight issues.

To enhance the safety of vulnerable road users, it is recommended to install sidewalks and ensure these sidewalks are adequately lit. There is an ODOT Transportation Alternative Project proposed to install a multi-use trail on the west side of the corridor that will address some vulnerable road user concern; it is recommended to connect this proposed trail to the east side of the corridor, as well as constructing sidewalks to connect to priority destinations, such as Walmart, Chick fil A, and Reasor's.

Improved access management along this corridor is important, especially due to high traffic volumes and congestion seen here. Reduction of the number of driveway openings and creation of shared driveways between Rayne Street and Ballentine Road is recommended. Also, a designated 'Entrance Only' and 'Exit Only' driveway for Chick fil A is recommended.

Intersection Recommendations

For Corridor 1, the only signalized intersection that have safety recommendation is S Muskogee Avenue and Rayne Street. Currently, the intersection of S Muskogee Avenue and the US-62/SH-82 Bypass is under construction for pedestrian and capacity improvements.

Rayne Street

- Add positive offset left-turn lanes for Northbound and Southbound traffic.
- Realign the east-west movement of intersection along Rayne Street.
- Add pedestrian crossing and pedestrian signals.
- Install new retroreflective backplates.

TABLE 8. COUNTERMEASURE CRASH MODIFICATION FACTORS FOR CORRIDOR 1

ID	Location	Recommendation	CMF ID	Countermeasure	CMF
1.1	Corridor	• Install a Raised Median	7792	• Install a raised median	0.76
1.2	Corridor	• Install High Contrast Pavement Markings	11280	• Install contrast pavement markings	0.84
1.3	Corridor	• Install Sidewalk	11246	• Install sidewalk	0.6
1.4	Corridor	• Driveway Consolidation	442	• Closure and/or consolidation of driveway access	0.93
1.5	Corridor	• Transverse Rumble Strips	138	• Install transverse rumble strips to alert drivers of steep hill	0.66
1.6	Corridor	• Install Signage	N/A	• Install steep hill ahead signage	N/A
1.7	Corridor	• Illumination	581	• Install lighting	0.73
1.A.1	Rayne St	• Reflective Backplates	1410	• Add 3-inch yellow retroreflective sheeting to signal backplates	0.85
1.A.2	Rayne St	• Road Alignment	N/A	• Adjust intersection road alignment	N/A
1.A.3	Rayne St	• Pedestrian Signals	8967	• Implement signing and visibility improvements at signalized intersection	0.732
1.A.4	Rayne St	• Positive Left Turn Offset	277	• Introduce a positive offset left turn lane for the NB/SB lanes	0.8

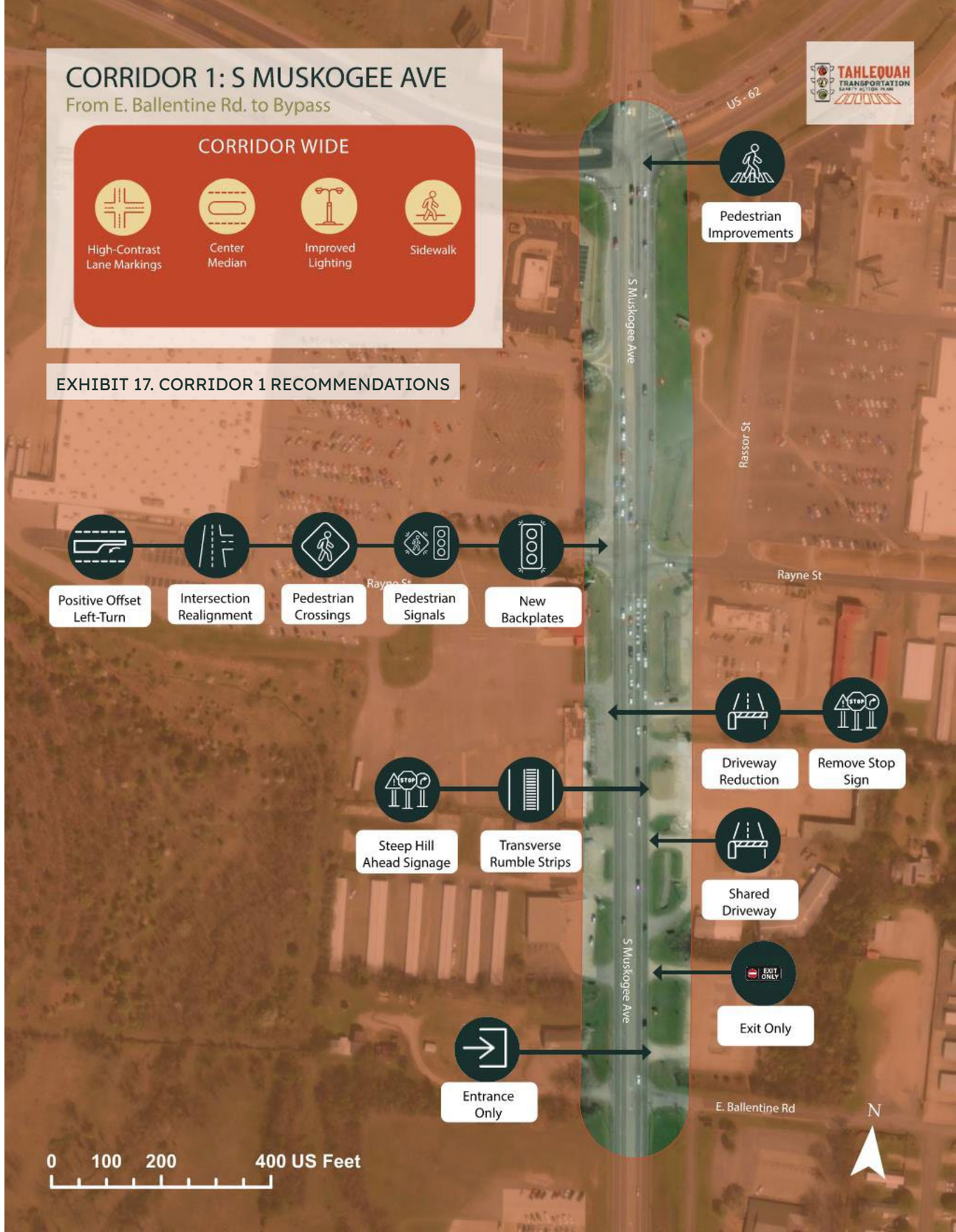


EXHIBIT 17. CORRIDOR 1 RECOMMENDATIONS

2 CORRIDOR 2: *BYPASS FROM S PARK HILL ROAD TO 7TH STREET*

Context

The US-62/SH-82 Bypass corridor (Corridor 2) is a section of the Bypass from S Park Hill Road to 7th Street that is 0.55 miles in length. Corridor 2 is located southeast of Downtown Tahlequah and is surrounded by primarily industrial and agricultural land uses. This section of the Bypass is a 4-lane divided roadway. The volume of this road is approximately 17,500 vehicles per day. The speed limit varies on this corridor, with the southern half posted at 45 MPH and the norther half posted at 55 MPH. This corridor has one signalized intersection at S Park Hill Road.

Crash History

There were 42 total crashes on this section of the Bypass between 2017-2021. Of these crashes, 8 were KABs. Key takeaways for crash trends along Corridor 2 were the following:

21%

9 of the 42 crashes were intersection related (21%), which includes 2 of the 9 KAB crashes (22%).

41%

The top contributing factors of the crash were 'Followed Too Closely' (41%).

16%

7 of the 42 (16%) crashes occurred in non-daylight or non-lighted conditions.

Corridor Recommendations

It is recommended to install countermeasures along Corridor 2 that would increase driver awareness. These countermeasures include installing high contrast lane markings, wider edge lane lines and shoulder rumble strips. Wider edge lines and high contrast lane markings enhance the visibility of the travel lanes throughout the corridor. Installation of shoulder rumble strips along the edge line of the roadway will alert drivers if they begin to depart the roadway.

To further enhance the safety along this corridor, it is recommended to install adequate roadway lighting and manage speeds along this section of the roadway. Adequate roadway lighting will help mitigate crashes that occur in dark conditions. Management of the speed limit along this corridor to safe and adequate speeds is recommended to reduce the severity of crashes; installation of speed feedback signs is a mitigation technique to reduce speeds.

Intersection Recommendations

For Corridor 2, the only signalized intersection is the Bypass and S Park Hill Road. The non-signalize T-intersection of 7th Street also have minor recommendations.

Park Hill Road

- Install new retroreflective signal backplates.
- Install high visibility crosswalks.
- Add pedestrian crossing and pedestrian signals.
- Refresh pavement markings.

TAHLEQUAH

TABLE 9. COUNTERMEASURE CRASH MODIFICATION FACTORS FOR CORRIDOR 2

ID	Location	Recommendation	CMF ID	Countermeasure	CMF
2.1	Corridor	• Install High Contrast Pavement Markings	11280	• Install high contrast pavement markings	0.84
2.2	Corridor	• Install Shoulder Rumble Strips	10449	• Install shoulder rumble strips	0.68
2.3	Corridor	• Illumination	581	• Install lighting	0.73
2.4	Corridor	• Install Wide Edge Lines	4737	• Install wider edge lines (4 in to 6 in)	0.64
2.5	Corridor	• Speed Management	6885	• Install dynamic speed feedback sign	0.95
2.A.1	Park Hill Rd	• Reflective Backplates	1410	• Add 3-inch yellow retroreflective sheeting to signal backplates	0.85
2.A.2	Park Hill Rd	• Pedestrian Signals	8697	• Implement signing and visibility improvement at signalize intersection	0.732
2.A.3	Park Hill Rd	• Crosswalk	4123	• Install high-visibility crosswalk	0.6
2.B.1	7th St	• Refresh Pavement Markings	N/A	• Refresh existing pavement markings	N/A

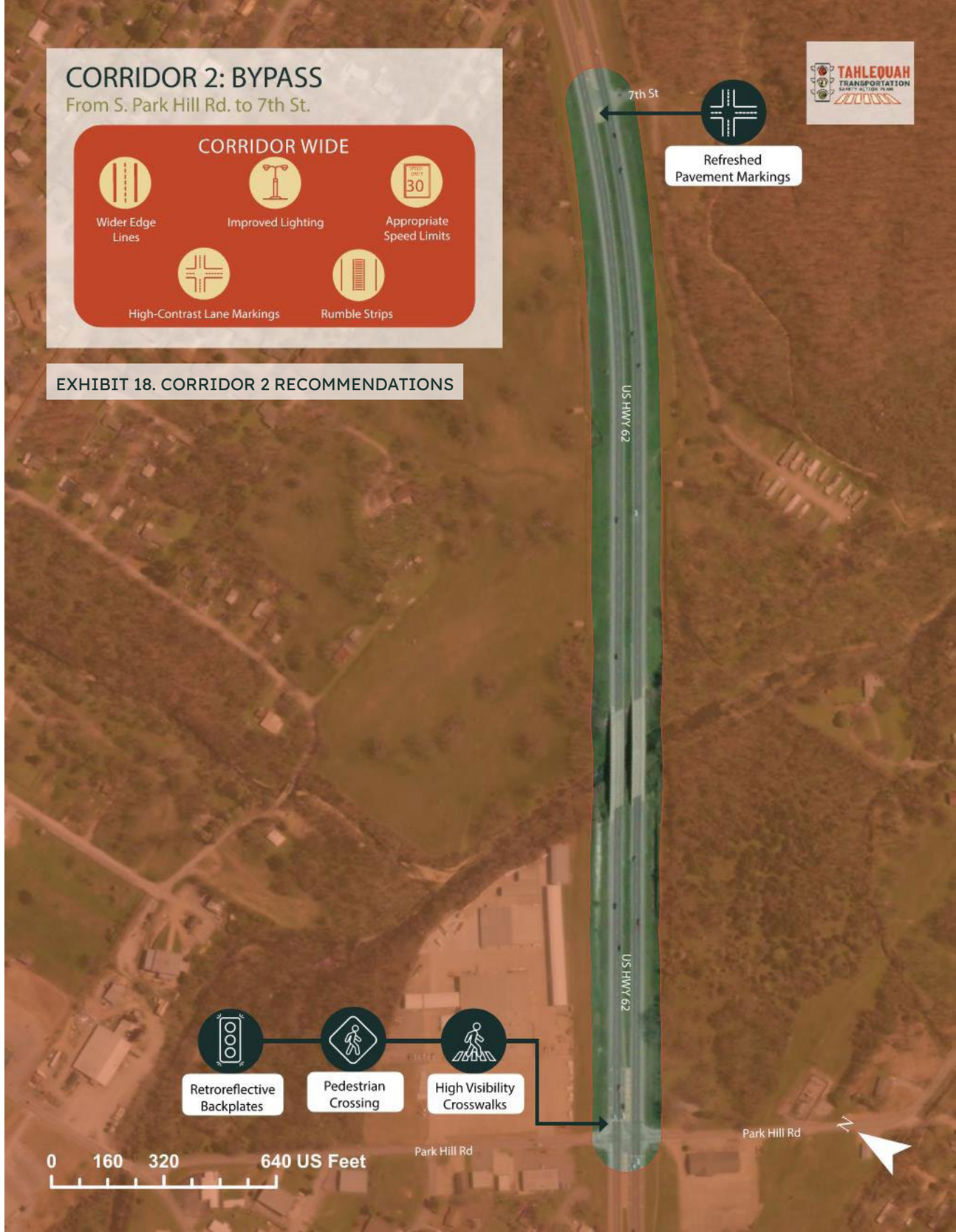


EXHIBIT 18. CORRIDOR 2 RECOMMENDATIONS

3 CORRIDOR 3: *S MUSKOGEE AVE FROM W CHICKASAW STREET TO GOINGSNAKE STREET*

Context

The S Muskogee Avenue corridor (Corridor 3) is a section of Muskogee from W Chickasaw Street to Goingsnake Street that is 0.61 miles in length. Corridor 3 is in Downtown Tahlequah and is surrounded by primarily commercial and residential land uses. This section of Muskogee Avenue is primarily a 2-lane undivided roadway with parallel parking on each side of the road. The volume of this roadway is approximately 7,400 vehicles per day. The posted speed limit of this corridor is 25 MPH. This corridor has seven signalized intersections. This corridor also experiences heavy pedestrian traffic due to its high concentration of businesses and proximity to Northeastern State University.

Crash History

There were 27 crashes along this section of S Muskogee Road between 2017-2021. Of these crashes, 1 was a KAB. Key takeaways for crash trends along Corridor 3 were the following:

48%

13 of the 27 crashes were intersection related (48%).

37%

The top contributing factors of the crash were 'Failure to Stop/Yield' (37%) and 'Followed Too Closely' (19%).

Corridor Recommendations

It is recommended to install countermeasures along Corridor 3 that will increase pedestrian safety. These countermeasures include implementing ADA enhancements to all sidewalks, installing bulb outs at intersections, implementing pedestrian enhancements at all signalized intersections, reducing driveways, and improving lighting. Providing adequate pedestrian facilities will provide pedestrians of all abilities greater and safer access along this corridor. Implementing corridor-wide bulb out installation at intersections will provide pedestrians more visibility to vehicles and a shorter distance to cross the street. Further enhancement of intersection to include pedestrian signals will provide designated movements across the intersections, something that is currently lacking today. Driveway reduction along the corridor will provide better guidance to drivers and allow pedestrians to safely cross these openings. Corridor-wide lighting improvements will impact the visibility of both pedestrians and drivers, especially in low-light conditions.

Other corridor recommendations include the upgrade of all traffic signals and installation of high visibility markings. Current traffic signals along this corridor are positioned in the center of the intersection at a difficult to see height, compounded with the size of many traffic signal heads not in compliance with current guidelines. Installation of compliant and better visible traffic signals will impact intersection related crashes. Additionally, installation of high visibility markings at intersection and along the corridor will enhance the visibility of the travel lanes and provide better guidance for drivers.

Intersection Recommendations

For Corridor 3, all signalized intersections are recommended to be upgraded in the previous corridor recommendations. Other, targeted, improvements are as follows.

Spring Street

- Reconfigure driveway and parking lot.
- Introduce RRFB pedestrian crossing.

E Downing Street

- Update pavement markings to clearly delineate lanes.

Midblock at the Cherokee National History Museum

- Construct a raised midblock crossing with RRFB.

TABLE 10. COUNTERMEASURE CRASH MODIFICATION FACTORS FOR CORRIDOR 3

ID	Location	Recommendation	CMF ID	Countermeasure	CMF
3.1	Corridor	• Retroreflective Backplates	1410	• Add 3-inch yellow retroreflective sheeting to signal backplate	0.85
3.2	Corridor	• Illumination	581	• Install upgraded lighting.	0.73
3.3	Corridor	• Pedestrian Signals	8967	• Implement systemic signing and visibility improvements at signalized intersections	0.68
3.4	Corridor	• Upgrade Signalized Intersection	N/A	• Upgrade signalized intersection to meet current guideline standards	N/A
3.5	Corridor	• ADA Pedestrian Improvements	N/A	• Implement ADA enhancements to all pedestrian facilities	N/A
3.6	Corridor	• Driveway Consolidation	442	• Closure or relocation of driveways from functional area of intersection	0.93
3.7	Corridor	• Pedestrian Bump Outs	9120	• Median treatment for ped/bike safety	0.86
3.8	Corridor	• High-Visibility Crosswalks	4123	• Install high-visibility crosswalk	0.6
3.A.1	Spring St	• RRFB Installation	11168	• Install Rectangular Rapid Flashing Beacon (RRFB)	0.3
3.B.1	E Downing St	• Update Pavement Markings	N/A	• Update existing pavement markings to delineate lanes	N/A
3.C.1	Cherokee National History Museum	• Midblock Crossing	11181	• Presence of a pedestrian crosswalk at midblock locations	0.82

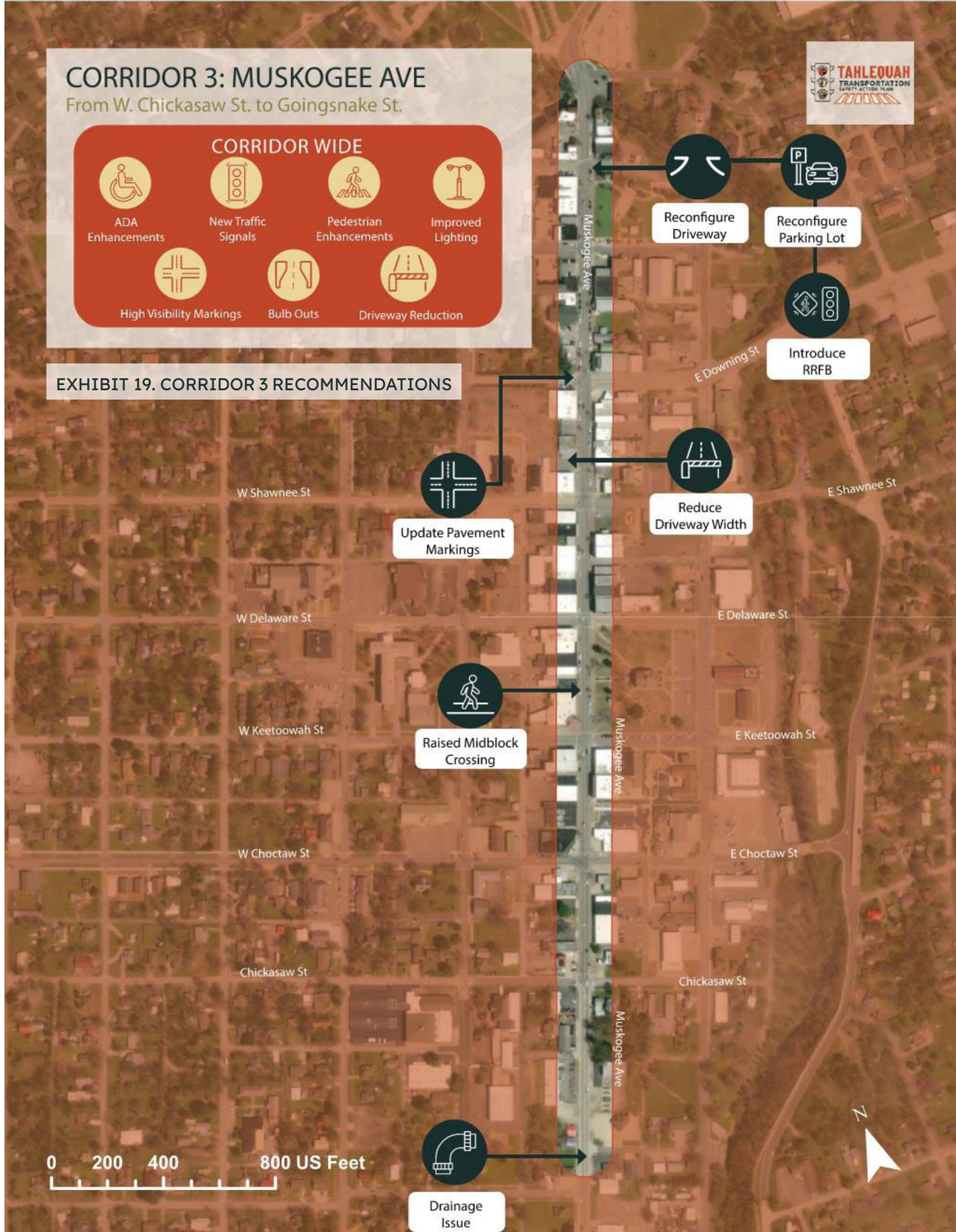


EXHIBIT 19. CORRIDOR 3 RECOMMENDATIONS

4 CORRIDOR 4: *BYPASS/US-62 FROM E BOONE STREET TO E DOWNING STREETBYPASS*

Context

The US-62/SH-82 Bypass and US-62 corridor (Corridor 4) is a section of these roadway from E Boone Street to E Downing Street that is 0.78 miles in length. Corridor 4 is located east of Downtown Tahlequah and is surrounded by primarily commercial and residential land uses. The volume of this road is approximately 16,000 vehicles per day. This section of the Bypass included in this corridor is a four-lane divided roadway, and the section of US-62 is a four-lane undivided roadway. The posted speed limit along the Bypass is 35 MPH and 45 MPH, while the posted speed limit along US-62 is 35 MPH. This corridor is a primary mover of traffic around Tahlequah and has important access to medical facilities, including the Northeastern Health System and Cherokee Nation W.W. Hastings Hospital.

Crash History

There were 85 total crashes on the section of the Bypass/US-62 between 2017-2021. Of these crashes, 9 were KABs. Key takeaways for crash trends along Corridor 4 were the following:

54%

46 of the 85 crashes were intersection related (54%), which includes 3 of the 9 KAB crashes (33%).

32%

The top contributing factors of crashes were 'Followed Too Closely' (32%) and 'Failure to Yield/Stop' (19%).

Corridor Recommendations

It is recommended to install countermeasures along Corridor 4 that would increase driver awareness and slow down speeds along the corridor. These improvements include installing high contrast lane markings, new shoulder rumble strips and wider edge lines. These improvements will increase the visibility of travel lanes throughout the corridor and alert drivers if they begin to depart the roadway.

Other corridor countermeasures to slow down speeds along this corridor include installing elevated medians at targeted location along US-62 and assigning appropriate speed limits along the corridor. Installation of elevated median along US-62, from the Bypass to Harris Circle will draw drivers' attention to roadway to reduce speeds and control access both in and out of driveways. Allowing for strategic left-turn cuts in the center median will allow for adequate access and decrease conflict points between exiting vehicles. Appropriate speed limits along this corridor are necessary to decrease the amount of unsafe speed related crashes.

Intersection Recommendations

For intersections on Corridor 4, it is recommended that dangerous driver maneuvers are eliminated, access management techniques are deployed, pedestrian access is improved, and signalized intersections are upgraded to include safety features.

Bypass & E Boone Street

- Add positive offset left-turn lanes for Northbound and Southbound traffic.
- Prohibit EB/WB left turning movements.
- Install improved lighting.

Bypass & US-62

- Install high visibility crosswalks.
- Extend center median.
- Upgrade pedestrian refuge island.
- Install turning tracks for left-turn movements.

US-62 & Plaza Drive

- Driveway consolidation at the Sonic Drive-In.
- Right-in, right-out at southbound Plaza Drive.

US-62 & Harris Circle

- Reconfigure Harris Circle to one entrance/exit roadway.

US-62 & Bliss Avenue

- Install flashing yellow arrow left-turn signal heads.
- Install new retroreflective signal backplates.
- Install high visibility crosswalks.
- Add pedestrian crossing and pedestrian signals at missing approaches.
- Consolidate driveways at the business on the northwest corner of the intersection.

US-62 & E Downing Street

- Consolidate driveways at the gas station west of the intersection.
- Adjust road alignment of Old River Road and E Downing Street.
- Install a traffic signal or alternative intersection treatment at this intersection.

TABLE 11. COUNTERMEASURE CRASH MODIFICATION FACTORS FOR CORRIDOR 4

ID	Location	Recommendation	CMF ID	Countermeasure	CMF
4.1	Corridor	• Install a Raised Median	2219	• Install a raised median	0.29
4.2	Corridor	• Install High Contrast Pavement Markings	11280	• Install contrast pavement markings	0.84
4.3	Corridor	• Install Shoulder Rumble Strips	10449	• Install shoulder rumble strips	0.68
4.4	Corridor	• Install Wide Edge Lines	4737	• Install wider edge lines (4 in to 6 in)	0.64
4.5	Corridor	• Speed Management	11290	• Lower posted speed limit	0.95
4.A.1	E Boone St	• Positive Left Turn Offset	277	• Introduce a positive offset left turn lane for the NB/SB lanes	0.8
4.A.2	E Boone St	• Turn Prohibitions/ Permissions	390	• Prohibit left-turns with "No Left Turn" sign	0.36
4.A.3	E Boone St	• Illumination	7776	• Install lighting	0.68
4.B.1	Bypass & US-62	• Crosswalk	4123	• Install high-visibility crosswalk	0.6
4.B.2	Bypass & US-62	• Pedestrian Refuge	9120	• Median treatment for ped/bike safety	0.86
4.C.1	Plaza Dr	• Driveway Consolidation	442	• Closure and/or consolidation of driveway access	0.93
4.C.2	Plaza Dr	• Right In Right Out	9821	• Install right-in-right-out (RIRO) operations at stop-controlled intersection	0.55
4.D.1	Harris Cir	• Driveway Consolidation	442	• Reconfigure Harris Cir entrance to one point	N/A
4.E.1	Bliss Ave	• Flashing Yellow Arrow	7730	• Install left turn flashing yellow arrow signals and supplemental traffic signs	0.857
4.E.2	Bliss Ave	• Reflective Backplates	1410	• Add 3-inch yellow retroreflective sheeting to signal backplates	0.85
4.E.3	Bliss Ave	• Crosswalk	4123	• Install high-visibility crosswalk	0.6
4.E.4	Bliss Ave	• Pedestrian Signals	8967	• Implement signing and visibility improvements at signalized intersection	0.732
4.E.5	Bliss Ave	• Driveway Consolidation	442	• Closure or relocation of driveways from functional area of intersection	0.93
4.F.1	E Downing St	• Driveway Consolidation	442	• Closure or relocation of driveways from functional area of intersection	0.93
4.F.2	E Downing St	• Road Alignment	N/A	• Adjust road alignment to accommodate enhance intersection control	N/A
4.F.3	E Downing St	• Traffic Signal Improvements	316	• Install a traffic signal	0.86

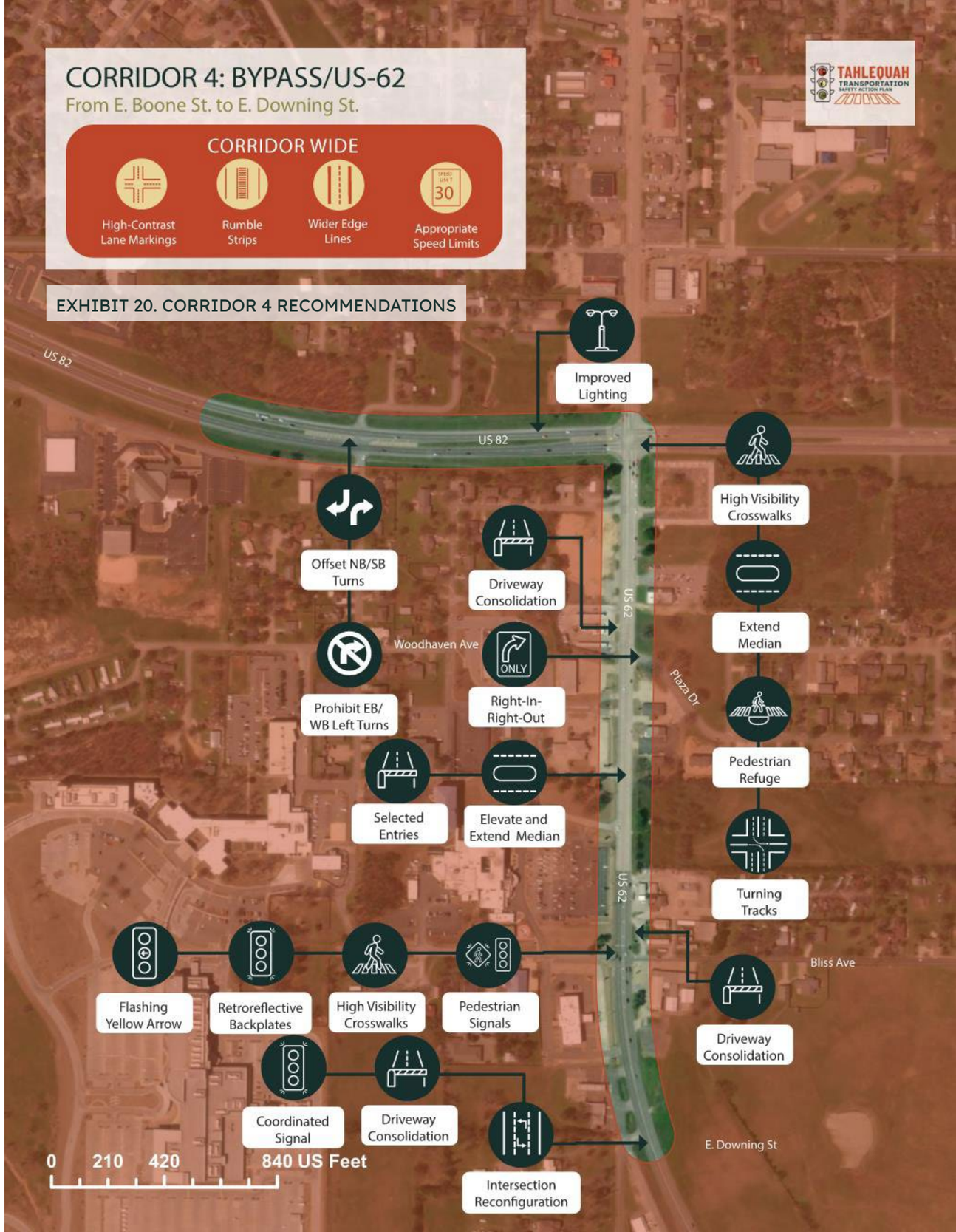


EXHIBIT 20. CORRIDOR 4 RECOMMENDATIONS

5 CORRIDOR 5: *SH-82 NEAR E ALLEN ROAD*

Context

The SH-82 corridor (Corridor 5) is a section of this roadway located near E Allen Road that is 0.71 miles in length. Corridor 4 is located northeast of Downtown Tahlequah and is surrounded by primarily residential and agricultural land uses. The volume of this road is approximately 9,500 vehicles per day. This section of SH-82 is a divided 4-lane roadway. The posted speed limit is 55 MPH. The only signalized intersection along this corridor is at E Allen Road. This corridor serves as main entrance into the core of Tahlequah from the North. It is characterized by a significant curve from the just north of the E Allen Road intersection.

Crash History

There were 25 total crashes on this section of SH-82 between 2017-2021. Of these crashes, 3 were KABs. Key takeaways for crash trends along Corridor 5 were the following:

80%

20 of the 25 crashes were intersection related (80%), which included all 3 of the KAB crashes (100%).

44%

The top contributing factor of the crashes were 'Followed Too Closely' (44%).

72%

18 of the 25 (72%) crashes were located near the unsignalized intersection of SH-82 and N Cedar Ave.

Corridor Recommendations

It is recommended to install countermeasures along Corridor 5 that would increase driver awareness. These countermeasures include installing high contrast lane markings, wider edge lane lanes, shoulder rumble strips, and improved roadway lighting. Wider edge lines and high contrast lane markings enhance the visibility of the travel lanes throughout the corridor. Installation of shoulder rumble strips along the edge line of the roadway will alert drivers if they begin the depart the roadway.

To further enhance the safety along this corridor, it is important to manage speeds. Management of speed limits along this corridor to safe and adequate speeds is recommended to reduce the severity of crashes; installation of speed feedback signs is a mitigation technique to reduce speeds.

Intersection Recommendations

For Corridor 5, the signalized intersection of SH-82 and Allen Road and the unsignalized intersection of SH-82 and Cedar Avenue have recommendations. It is especially pertinent to address the Cedar Avenue intersection do to the current intersection conditions contributing to the vast majority (72%) of the corridor crashes.

Allen Road

- Install new retroreflective signal backplates.
- Add positive offset left-turn lanes for Northbound and Southbound traffic.
- Install transverse rumble strips on the southbound approach to alert incoming drivers.

Cedar Avenue

- Install a J-Turn intersection.
  - Right-in, right out at both approaches of Cedar Avenue.
  - Install U-turn movement along SH-82, north of Cedar Avenue.

TABLE 12. COUNTERMEASURE CRASH MODIFICATION FACTORS FOR CORRIDOR 5

ID	Location	Recommendation	CMF ID	Countermeasure	CMF
5.1	Corridor	• Install High Contrast Pavement Markings	11280	• Install contrast pavement markings	0.84
5.2	Corridor	• Install Wide Edge Lines	4737	• Install wider edge line (4 in to 6 in)	0.64
5.3	Corridor	• Illumination	581	• Install lighting	0.73
5.4	Corridor	• Speed Management	6885	• Install dynamic speed feedback sign	0.95
5.A.1	Allen Rd	• Reflective Backplates	1410	• Add 3-inch yellow retroreflective sheeting to signal backplates	0.85
5.A.2	Allen Rd	• Positive Left Turn Offset	277	• Introduce a positive offset left turn lane for the NB/SB lanes	0.8
5.A.3	Allen Rd	• Transverse Rumble Strips	8967	• Install transverse rumble strips ahead of signalized intersection	0.66
5.B.1	Cedar Ave	• Install J-Turn Intersection	11150	• Install J-Turn Intersection	0.288

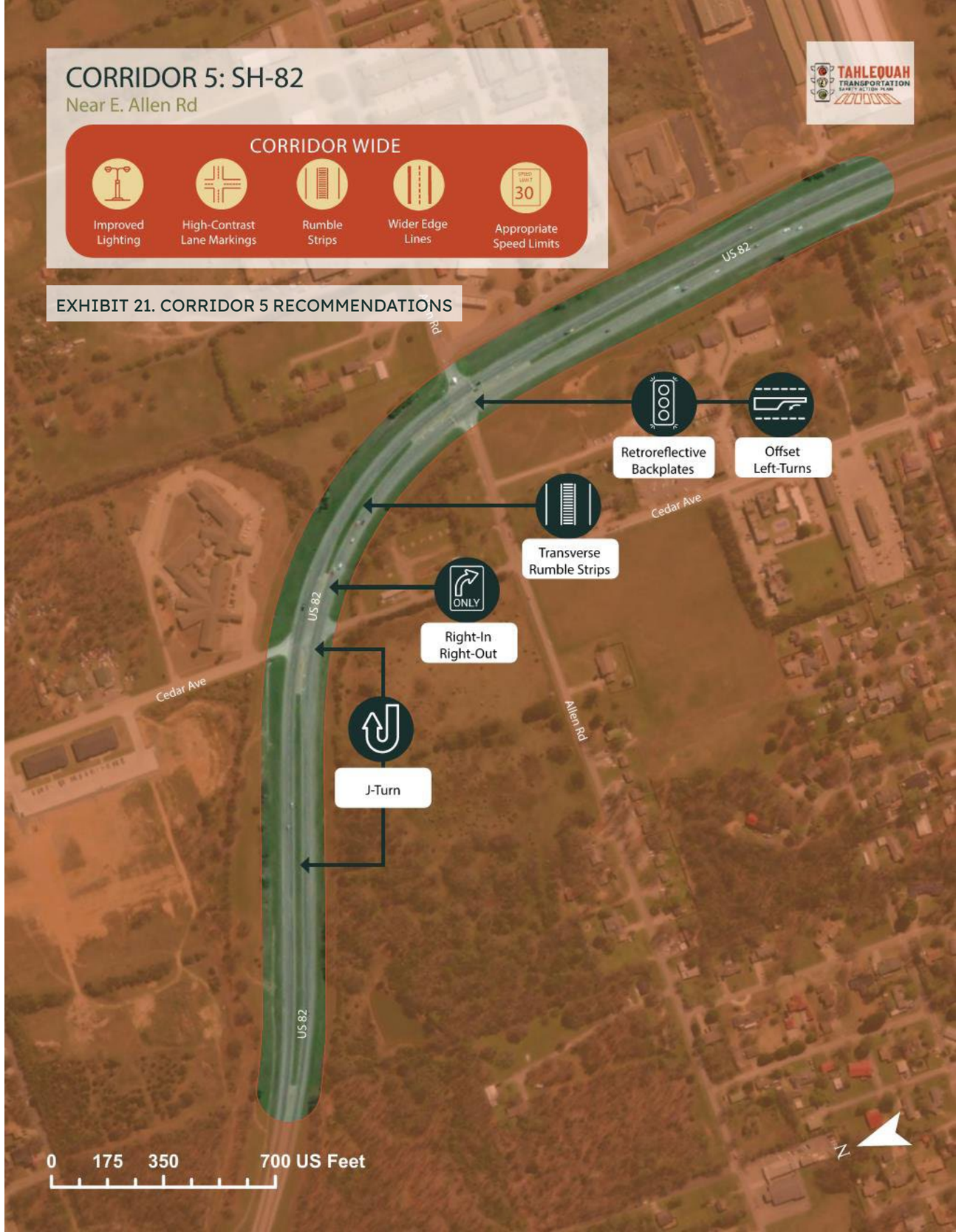


EXHIBIT 21. CORRIDOR 5 RECOMMENDATIONS

5

These actions are focused on eliminating deaths on Tahlequah roads through the building complete streets, engaging the community, and finding innovative solutions to protect all road users.

TAHLEQUAH TRANSPORTATION SAFETY ACTION PLAN

CHAPTER 5: IMPLEMENTATION PLAN

INTRODUCTION

This chapter outlines the recommended policies and programs that could aid in achieve the TSAP goals set by the SSC. These policies and programs are meant to help solve the safety deficiencies found in the City's transportation system. The policies and programs are organized by the five pillars of the Safe System Approach discussed previously. These actions are focused on eliminating deaths on Tahlequah roads through the building complete streets, engaging the community, and finding innovative solutions to protect all road users.

ACTION MATRIX ELEMENTS

THE OKLAHOMA SHSP EMPHASIS AREAS

- Lane Departures
- Impaired Driving
- Occupant Protection
- Unsafe Speed
- Vulnerable road Users
- Intersections
- Commercial Motor Vehicles and Work Zones
- Motorcycles and All-Terrain Vehicles

TIMEFRAME

For every strategy, each action provides an estimated timeframe for implementation. The estimate timeframe for implementation allows for better decision making and allocation of funding to complete the action plan strategies and actions in a timely manner. This is broken out between the following:

Short (<2 years): This action is a top priority and can be a "quick win" for Vision Zero.

Medium (2-5 years): This action may take more time but can be accomplished before the next TSAP update.

Long (>5 years): This action will require many years but will have significant impact when complete.

Ongoing: This action does not have a specified timeframe and should be executed on a continuous basis.

IMPLEMENTATION PARTNERS

In many instances, collaboration with partner organizations, entities, or stakeholders is crucial for the successful implementation of the recommended actions. These partners play a vital role by contributing resources, expertise, and support to achieve the Plan's goals. The following list identifies internal and external partners that could aid in the implementation process, though it is not exhaustive:

- Planning & Development
- Fire
- Police
- Street
- Cherokee Nation
- Tahlequah Main Street Association
- Cherokee County
- Tahlequah Public Schools
- Northeastern State University
- Northeastern Health System
- Tahlequah Best

FUNDING

Funding and its source is an important step in implementing the action plan. The matrix also provides the information if the action can be accomplished through three different funding sources:

- Existing Funds
- Reallocation of Funds
- Grant Acquisition

ACTION MATRIX

SAFER PEOPLE

The Safe System approach treats all road users—whether walking, biking, driving, or using transit—as equals. Rather than prioritizing vehicle flow, it emphasizes the safety of everyone on the road. However, each user is responsible for navigating the system to the best of their ability within the established guidelines. Education and enforcement play a key role in shaping and reinforcing safe behavior.

TABLE 13. SAFER PEOPLE ACTION MATRIX

Action	Emphasis Area(s)	Timeframe	Implementation Partners	Funding
Work with community partners and schools to provide highest quality driver, youth, and older adult training focused on safety and crash prevention.	• Lane Departures • Impaired Driving • Occupant Protection • Unsafe Speed • Vulnerable Road Users • Intersections • Commercial Motor Vehicles and Work Zones • Motorcycle Crashes and All-Terrain Vehicles	Ongoing	• Planning • Tahlequah Public Schools • Northeastern State University	Grant Acquisition
Coordinate with the Police Department to ensure compliance check for Social Hosts.	• Occupant Protection	Short (<2 years)	• Tahlequah Best Police	Other
Explore the development of "Traffic Gardens" at key city locations to educate children on roadway safety.	• Lane Departures • Impaired Driving • Occupant Protection • Unsafe Speed • Vulnerable Road Users • Intersections • Commercial Motor Vehicles and Work Zones • Motorcycle Crashes and All-Terrain Vehicles	Medium (2-5 years)	• Planning • Tahlequah Public Schools • Police	Reallocation of Funds
Provide approved child protection for vulnerable populations.	• Occupant Protection	Medium (2-5 years)	• Planning • Police • Fire • Tahlequah Public Schools	Reallocation of Funds
Enforce improper lane changes and turns.	• Lane Departures	Short (<2 years)	• Police	Existing Funds

SAFER ROADS

Safe roads are engineered and managed to minimize crashes and ensure that, when they do occur, the impact on the human body remains within survivable limits. This is achieved by strategically separating users traveling at different speeds or in opposite directions, either physically or through controlled timing.

TABLE 14. SAFER ROADS ACTION MATRIX

Action	Emphasis Area(s)	Timeframe	Implementation Partners	Funding
Update the Street Design Manual to include the recommendations of this TSAP. Ensure new roads and road reconstruction and restriping projects incorporate elements of the Countermeasure Toolbox.	• Lane Departures • Unsafe Speed • Vulnerable Road Users • Intersections	Medium (2-5 years)	• Planning • Street	Grant Acquisition
Establish a program to refresh pavement markings that delineates refreshment frequency, and quality standards.	• Lane Departures • Intersections	Short (<2 years)	• Planning • Street	Existing Funds
Evaluate intersection safety at a system-wide level to implement the Countermeasure Toolbox.	• Impaired Driving • Vulnerable Road Users • Intersections	Medium (2-5 years)	• Planning • Street	Grant Acquisition, Reallocation of Funds
Develop a wayfinding plan that incorporates bike lanes and trails.	• Lane Departures • Impaired Driving • Unsafe Speed • Vulnerable Road Users • Intersections • Commercial Motor Vehicles and Work Zones • Motorcycle Crashes and All-Terrain Vehicles	Medium (2-5 years)	• Planning • Street	Reallocation of Funds
Develop crosswalk guidelines to aid in selecting locations and treatments for mid-block and uncontrolled crosswalks.	• Vulnerable Road Users	Medium (2-5 years)	• Police • Street	Existing Funds

SAFER VEHICLES

The Safer Vehicles pillar can seem challenging to address since vehicle manufacturing regulations are set at the federal level. However, local actions play a crucial role. Municipalities can adjust fleet procurement policies, promote additional safety features on bicycles and cars, and develop public awareness campaigns on the risks of driving large vehicles.

Built-in vehicle safety measures protect both occupants and those outside the vehicle by preventing crashes and reducing their severity. Active safety features, such as autonomous emergency braking and lane change alerts, help avoid collisions, while passive measures, like seat belts and airbags, minimize harm when crashes occur. While manufacturers are key players in vehicle safety, individuals and organizations can also prioritize vehicles with advanced safety features.

TABLE 15. SAFER VEHICLES ACTION MATRIX

Action	Emphasis Area(s)	Timeframe	Implementation Partners	Funding
Develop standards to prepare Tahlequah Roads for IOT technology.	• Lane Departures • Impaired Driving • Unsafe Speed • Vulnerable Road Users • Intersections	Long (>5 years)	• Planning • Street	Grant Acquisition, Reallocation of Funds
Adopt a City Ordinance to restrict ATVs on City Roads.	• Motorcycle Crashes and All-Terrain Vehicles	Short (<2 years)	• Planning • Police	Existing Funds
Develop procurement strategies that specify minimum safety requirements on municipal fleet vehicles and include multimodal alternatives in the fleet.	• Commercial Motor Vehicles and Work Zones	Short (<2 years)	• Planning • Street	Grant Acquisition
Encourage recumbent bicycles to be fitted with a flag or other visual element to account for the low-profile nature of the vehicle. Enhances the visibility and safety of low-profile bicycles.	• Vulnerable Road Users	Ongoing	• Planning	Existing Funds

SAFER SPEEDS

Safe speeds are directly linked to crash survivability. Lower speeds reduce impact forces, give drivers more time to react, and enhance visibility of their surroundings. To effectively slow our streets, we must take a creative and equitable approach, using strategies such as setting appropriate speed limits, implementing roadway design changes, promoting education, advocating for policy changes at the state level, and aligning enforcement efforts to target behaviors that pose the greatest risk of serious injury or death.

TABLE 16. SAFER SPEEDS ACTION MATRIX

Action	Emphasis Area(s)	Timeframe	Implementation Partners	Funding
Establish a Zero-Tolerance Policy for speeding in Tahlequah.	• Unsafe Speed	Short (<2 years)	• Planning • Police	Existing Funds
Conduct a City-wide speed study to determine appropriate speed limits.	• Unsafe Speed	Medium (2-5 years)	• Planning • Police • Street	Existing Funds
Adopt alternative speed limit setting strategies to reduce reliance on 85th percentile.	• Unsafe Speed • Vulnerable Road Users	Short (<2 Years)	• Planning • Street	Existing Funds
Separate modes, using solid barriers where speed differentials are high.	• Occupant Protection • Unsafe Speed • Vulnerable Road Users	Long (>5 years)	• Planning • Street	Reallocation of Funds, Grant Acquisition
Implement retroreflective materials on speed limit signs.	• Unsafe Speed	Medium (2-5 years)	• Planning • Street	Reallocation of Funds, Grant Acquisition

POST-CRASH CARE

When crashes occur, first responders play a critical role in quickly locating victims, providing medical aid, and transporting them to healthcare facilities. Additionally, securing the scene is essential to protect others and prevent further incidents. A swift response from law enforcement and road managers helps document crash factors, offering valuable insights into the broader safety landscape. This information informs justice, infrastructure design, programs, and policies. Through our actions, we commit to supporting those affected, ensuring high-quality medical care, and learning from crashes to prevent future incidents.

TABLE 17. POST-CRASH CARE ACTION MATRIX

Action	Emphasis Area(s)	Timeframe	Implementation Partners	Funding
Expand and update the use of emergency vehicle preemption technology.	• Lane Departures • Occupant Protection	Long (>5 years)	• Planning • Police • Fire • Cherokee Nation • Cherokee County	Existing Funds
Establish a partnership between the Tahlequah Police Department and OHSO to improve road user behavior and advance educational safety campaigns.	• Lane Departures • Unsafe Speed • Vulnerable Road Users • Intersections	Ongoing	• Planning • Police • Street	Grant Acquisition
Study time from crash to trauma center and implement methods to shorten time from collision to hospital care (examples include issuing lifesaving equipment to all first responders and deploying a mobile EMT force in small vehicles).	• Vulnerable Road Users • Commercial Motor Vehicles and Work Zones	Ongoing	• Planning • Police • Fire • Cherokee Nation • Cherokee County	Reallocation of Funds
Purchase a drone for first responders to provide real-time situational awareness and enhance response times.	• Vulnerable Road Users	Long (>5 years)	• Police • Fire • Cherokee Nation • Cherokee County	Reallocation of Funds, Grant Acquisition

PLAN ADMINISTRATION

The City of Tahlequah and its partners are responsible for administering this Plan. City staff will oversee the day-to-day implementation, monitoring, and amendments of the Plan. This section details administration duties.

CITY DEPARTMENTS

Through the Safe System Approach, all City of Tahlequah departments will be involved to some extent. The Planning & Development Department will primarily oversee the administration and annual updates to City Council.

CITY COUNCIL

The City Council will play a vital role by providing continuous guidance and direction to staff and other boards and commissions, as well as making decision on budget allocations and regulatory modifications as specified in the Implementation Plan.

OTHER BOARDS, COMMITTEES, AND COMMISSIONS

Various boards, committees, and commissions in Tahlequah are tasked with reviewing and overseeing several initiatives. They will also play a pivotal role in implementing the recommendations in the Implementation Plan.

SAFETY STEERING COMMITTEE AND OTHER PARTNERS

The SSC plays a crucial role in implementation by seeing the plan's actions and initiatives to advance the goals effectively and efficiently. He committee provides continued guidance, supports implementing agencies, monitors progress, and adjusts for emerging challenges. Additionally, the SSC fosters collaboration among stakeholders, including residents, regional entities, and external departments to ensure accountability.

AMENDING THE PLAN

Tahlequah's TSAP captures a moment in time, with changes expected as the City grows and matures. To ensure the attainability of the overarching vision, the implementation approach must remain adaptable, capable of accommodating shifts in crash trends. The Planning & Development Department will provide annual updates to the City Council on Implementation Plan progress, including necessary High-Injury Network revisions due to changes in trends. The Plan should undergo a comprehensive review and update every five years to align with these trends and evaluate the relevance of action plan strategies. **Table 18** further details the Plan's update schedule.

TABLE 18. PLAN UPDATE SCHEDULE

Plan Update Level	Recommended Frequency	Approved By
Minor Revision *Text or wording changes, not affecting recommendations*	As Needed	SSC
Major Revision *Any change substantively changing a recommendation*	As Needed	SSC
TSAP Implementation Progress Report	As Needed	City Council
Full Plan Update	Every Five Years	City Council

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