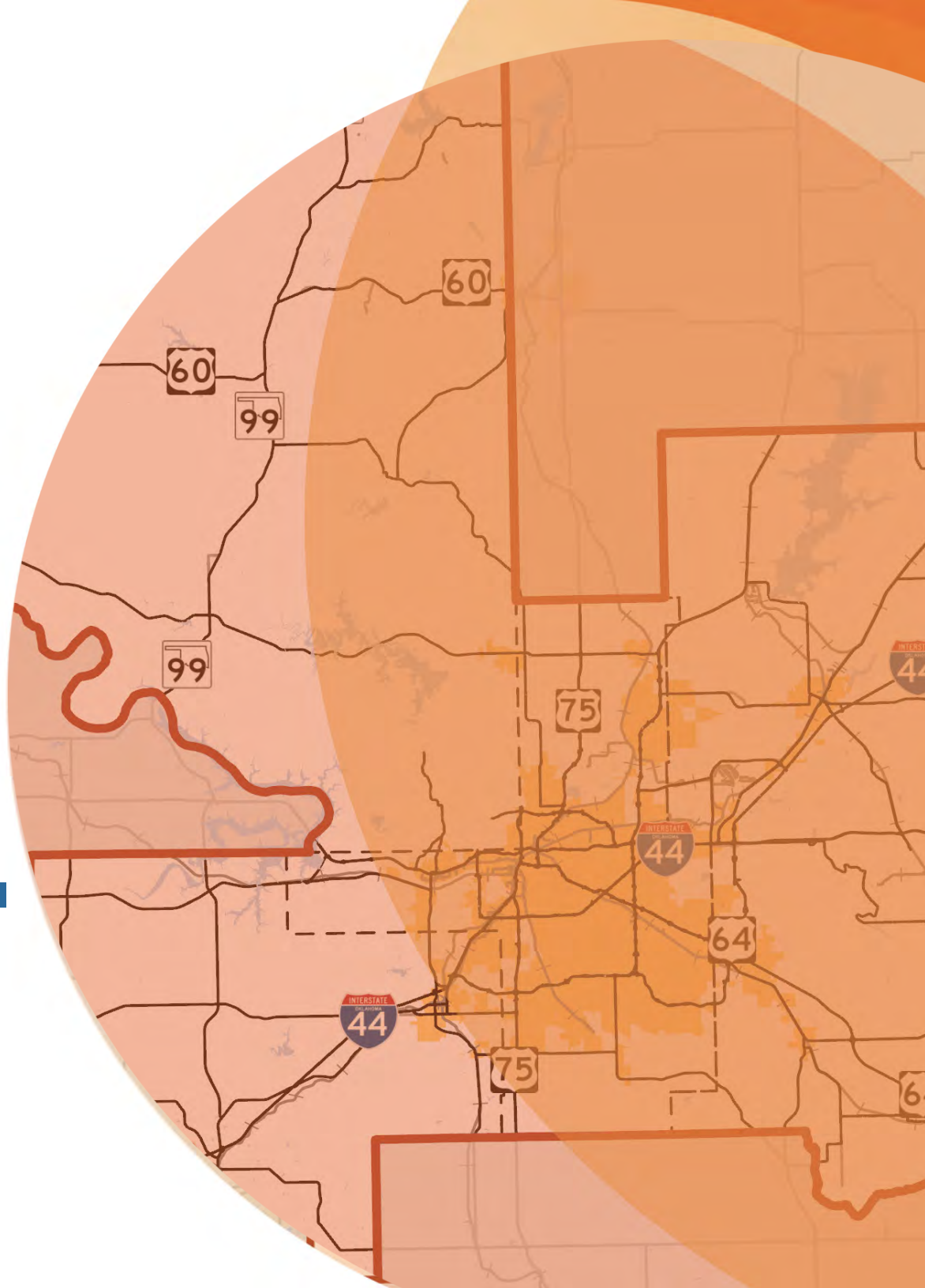
LOCAL ROADS SAFETY ACTION PLAN

2025 UPDATE

INDIAN NATIONS
COUNCIL OF GOVERNMENTS



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TOOLE DESIGN

VENICE COMMUNICATIONS, INC.

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GLOSSARY

AASHTO (American Association of State Highway Transportation Officials): A standards setting body for highway and transportation departments across the nation that developed the CCR.

Action Matrix: A list of best practices in roadway safety and changes recommended in accordance with the five (5) pillars.

ArcGIS: Geographic information systems software program used to develop the heat maps and high-injury network (HIN) maps for the local roads safety action plan report.

CMF Clearinghouse: An online repository of CMFs that serves as a search engine to allow users to search for CMFs for a specific countermeasure.

Crash Analysis: A series of comprehensive and robust data-driven methods used to analyze crash data and identify streets and intersections where concentrations of serious and fatal crashes occur.

Crash Density: The number of crashes in a particular area, not considering factors such as roadway classification, traffic volumes, or severity of the crash.

Crash Modification Factor (CMF): A measure indicating the expected change in crash occurrences after implementation.

Critical Crash Rate Analysis (CCR): This analysis assesses the safety performance of road segments or intersections, aiming to identify locations with a higher likelihood of severe crashes.

Emphasis Areas: The top safety concerns based on crash severity and frequency

Highway Safety Manual (HSM): Published by the American Association of State Highway Transportation Officials (AASHTO), it is the recognized source of information and methods for quantitatively evaluating traffic safety performance on existing or proposed roadways.

HIN (High-Injury Network): A network of roads, intersections, or other transportation infrastructure that experiences an above average rate of fatalities or roadway injuries.

HMVMT (per Hundred Million vehicle miles traveled): The unit of measure used to measure the total distance traveled by all vehicles in the region.

INCOG (Indian Nations Council of Governments): The Indian Nations Council of Governments (INCOG) is a voluntary association of local and tribal governments in the Tulsa metropolitan area in northeast Oklahoma. Established in 1967, INCOG is one of 11 Councils of Governments in the State of Oklahoma, and one of several hundred regional planning organizations across the country. INCOG is the designated Metropolitan Planning Organization (MPO) for the Tulsa Transportation Management Area, which includes all of Tulsa County as well as portions of the adjoining counties in the region. Because of this, INCOG is responsible for coordinating federal, state, and local agencies to create a cohesive, safe, and effective transportation network for the region's most urbanized area.

KABs (Fatalities – K, Serious Injuries – A, Minor Injuries – B): The functional measure of the injury severity for any person involved in a crash.

LRSAP (Local Roads Safety Action Plan): A plan to analyze the current state of traffic safety in the region and provide region-wide countermeasures

Oklahoma Strategic Highway Safety Plan (SHSP): A yearly plan working in conjunction with the national highway safety improvement program (HSIP) as a comprehensive framework for reducing highway fatalities and serious injuries on public roads.

Property Damage Only (PDO): A type of crash where no injuries were reported to any persons, and is limited instead to the damages to vehicles and properties.

Roadway functional classification: The assigned classification of all current roadways based on each roadway's mobility and access to destinations, usually divided into the three categories of arterials, collectors, and local roads.

Safety best practices: Incorporating elements of safety action plans from peer MPOs to provide insight into strategies that work best for projec development, foster collaboration, and in effective strategies of implementation.

Safe System Approach: A principles-based approach to eliminate serious and fatal injuries. This approach acknowledges that humans make mistakes that can be offset through traffic safety planning.

Six "E's" of Safety: the components of an integrated and comprehensive framework, which includes: Engineering, Education, Evaluation, Equity, Enforcement, and Encouraging. This can be deployed at all levels to enhance the user experience and improve safety.

SS4A (Safe Streets and Roads for All grant): The SS4A grant works to provide funding to improve traffic safety by reducing transportation-related fatalities and serious injuries

Systemic Countermeasures Toolbox: A countermeasure toolbox is a comprehensive list of countermeasures and improvements designed to address specific traffic safety issues, as well as targeted recommendations for the region's most high-risk road networks.

SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats Analysis): A framework intended to identify strengths, weaknesses, opportunities, and threats presented under the existing conditions of our roadways in the INCOG region.

Transportation Demand Management (TDM): A set of strategies aimed at maximizing traveler choices to improve travel reliability.

Vision Zero: A traffic safety initiative that enacts change by prioritizing the principles of safe road design, enforcement, education, and community engagement with the goal of eliminating traffic fatalities and severe injuries.

Vulnerable Road User (VRU): A term used to describe those unprotected by an outside shield, as they sustain a greater risk of injury in any collision with a vehicle and are therefore highly in need of protection against such collisions. This includes pedestrians, roadway workers, a person operating a wheelchair or other personal mobility device, whether motorized or not, a person operating an electric scooter or similar, a person operating a bicycle or other nonmotorized means of transportation, and motorcycle operators.

EXECUTIVE SUMMARY

Photo Location: Osage County, Oklahoma

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EXECUTIVE SUMMARY

Between 2017 and 2021, 588 people lost their lives and 2,231 were injured on city streets, county roads, and state highways in the Indian Nations Council of Governments (INCOG) region. These people deserved the opportunity to live full lives, to belong to their families and friends, and to contribute to their communities. Sadly, their lives ended prematurely, their families and friends are left without a loved one, and their communities are incomplete. What's worse, these fatalities are the result of extraordinarily violent events; human bodies are highly vulnerable to the blunt force trauma, shattered glass, and crushed metal that are the result of high-speed collisions.

Roadway crashes and the resultant fatalities and injuries have been commonplace for so long, that at this point it, would be normal to think that this is just something that has to be put up with in order to have an auto-centric transportation system. However, in recent years transportation professionals across the United States have begun to re-evaluate the approach and prioritize safety alongside the more traditional priority of traffic throughput. These new approaches are also gaining support from elected officials, adding much needed leadership to solving the tragic reality of crashes on their streets.

In Washington, the US Department of Transportation has facilitated opportunities for states, counties, and cities to redesign and improve road facilities to make them safer. In particular, in 2022, the Safe Streets and Roads for All (SS4A) grant program was established specifically to address unsafe conditions on roadways across the US. INCOG successfully applied for funding through this program to address transportation safety concerns in the region and received $21.2M in implementation funding in 2022. This money will fund low-cost high-impact safety improvements in six jurisdictions: Broken Arrow, Jenks, Owasso, Tulsa, Tulsa County, and Wagoner County.

> *"...the goal of the Indian Nations council of Governments (INCOG) Board of Directors to reduce traffic fatalities and serious injuries by 25% by 2030 and to work toward achieving Zero Fatalities due to traffic crashes..."*
>
> INCOG Board of Directors Resolution July 12, 2022

INCOG is the only MPO in the country to receive a SS4A Implementation Grant because we adopted a Local Road Safety Plan in 2022. In order to qualify for the SS4A program in future years, an update to the 2022 plan was needed. This plan, the Local Roads Safety Action Plan (LRSAP) is the product of this update process, and takes the commitment to transportation safety to the next level for the region. This plan places an emphasis on two frameworks:

1. Vision Zero
2. Safe System Approach

The INCOG Board of Directors made a Vision Zero commitment in 2022, whereby the regional governments will collaborate with the goal of reducing traffic fatalities to zero. Each life is valuable, and though accidents do occur, the coalition of local governments can work to ensure that their roadways are designed in ways that reduce risk of fatality and injury. This dovetails with a commitment to the Safe System Approach, which acknowledges that people make mistakes and are vulnerable, but that proper planning and design can offset these mistakes. This is achieved by focusing on safer people, safer vehicles, safer speeds, safer road design, and post-crash care.

This plan is the product of countless contributions by the INCOG member governments, the LRSAP Advisory Committee, and the public, and it sets the framework for reducing collisions in the region. INCOG is committed to protecting the lives of people in the region by supporting local governments with planning and funding for projects that incorporate the principles laid out in this plan.

THE VISION

VISION ZERO

Traffic deaths and serious injuries are **PREVENTABLE**

Integrate **HUMAN FAILING** into the approach

Prevent **FATAL AND SEVERE CRASHES**

Use a **SAFE SYSTEMS** approach

Saving lives is **NOT EXPENSIVE**

THE APPROACH

THE SAFE SYSTEM APPROACH

Zero is our goal. A Safe System is how we get there.

SAFER PEOPLE

SAFER VEHICLES

SAFER SPEEDS

SAFER ROADS

POST-CRASH CARE

THE COMMITMENT

With these safety principles in mind, the **LRSAP Advisory Committee** collaborated to establish a mission that clearly communicates how this plan will serve the community and stakeholders in the future.

We are committed to eliminating all traffic fatalities and serious injuries by embracing Vision Zero and following the Safe System Approach.

INCOG commits to reducing traffic fatalities and serious injuries by 50% by 2035.

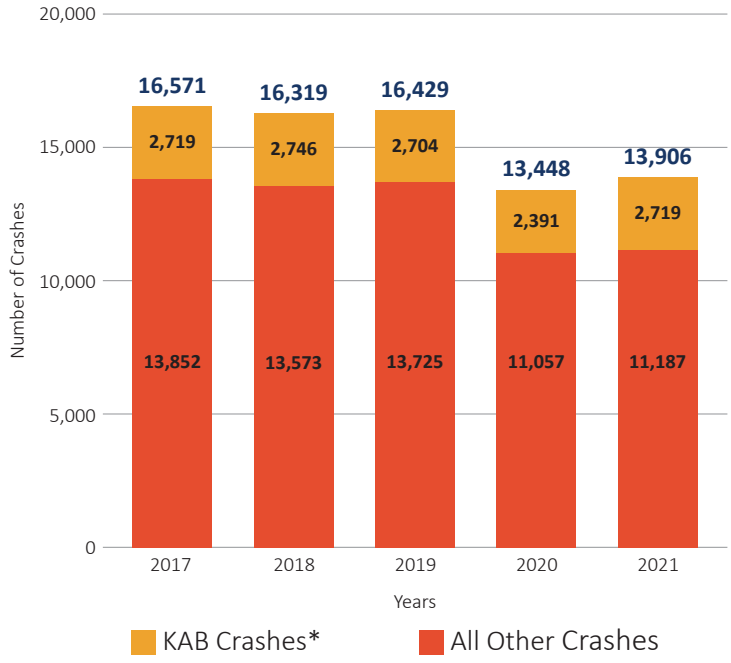
COLLISIONS

Like most metropolitan areas across the country, the INCOG five-county region saw significant reductions in the total number of collisions per year in 2020, heavily influenced by the national health response to the COVID pandemic. However, despite this noticeable decline, the number of KAB crashes reduced much less and represented a larger percentage of total collisions than in the years prior to 2020. In 2017, KABs represented 16.4% of the total collisions in the area, and in 2023 KABs accounted for 19.5% of total collisions. Both years had the same number of KABs, 2,719, illustrating the importance of interventions at key locations to begin to reduce the number of KABs per year in the region.

Among the five counties there are differences in the percentage of collisions that are KABs. Tulsa County has the lowest percentage in the past five years, with KABs representing 16.5% of collisions in the county, compared with 17.8% for Creek, 22.2% for Wagoner, 22.4% for Rogers, and 23.7% for Osage. While Tulsa County accounts for the vast majority of the total collisions in the region, these percentages illustrate that more rural areas have higher rates of collisions that result in a fatality or injury than urban areas. Despite this apparent difference between Tulsa County and the other counties, KABs as a percentage of total collisions have begun to increase in recent years for Tulsa County, narrowing this difference.

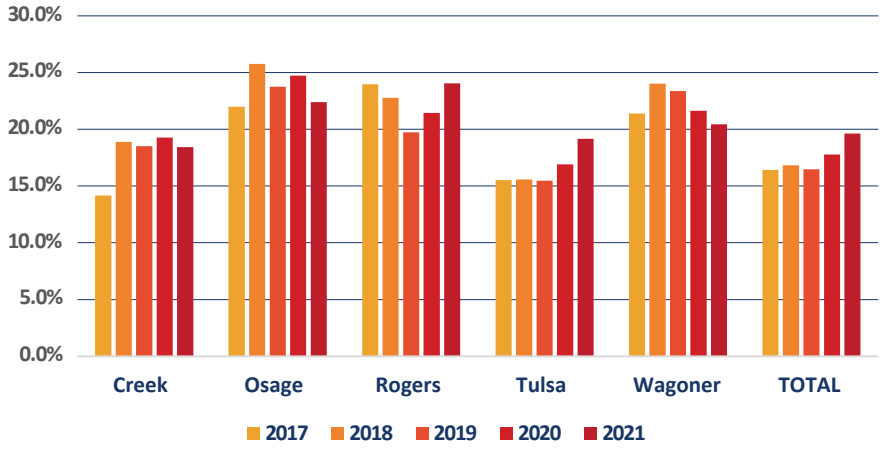
By mode, the difference in the percentage of collisions that are KABs is more stark. Between 2017 and 2021 in the five-county area, 18.95% of automobile-involved collisions resulted in a KAB outcome. In contrast, collisions involving pedestrians, cyclists, and motorcyclists resulted in KAB outcomes 68.49%, 54.95%, 71.09% of the time, respectively. The term Vulnerable Road User (VRU) describes these modes that are at greater risk for injury or fatality in a collision, and this notable difference in risk must be considered during the deployment of safety countermeasures.

FIGURE 1. CRASHES PER YEAR



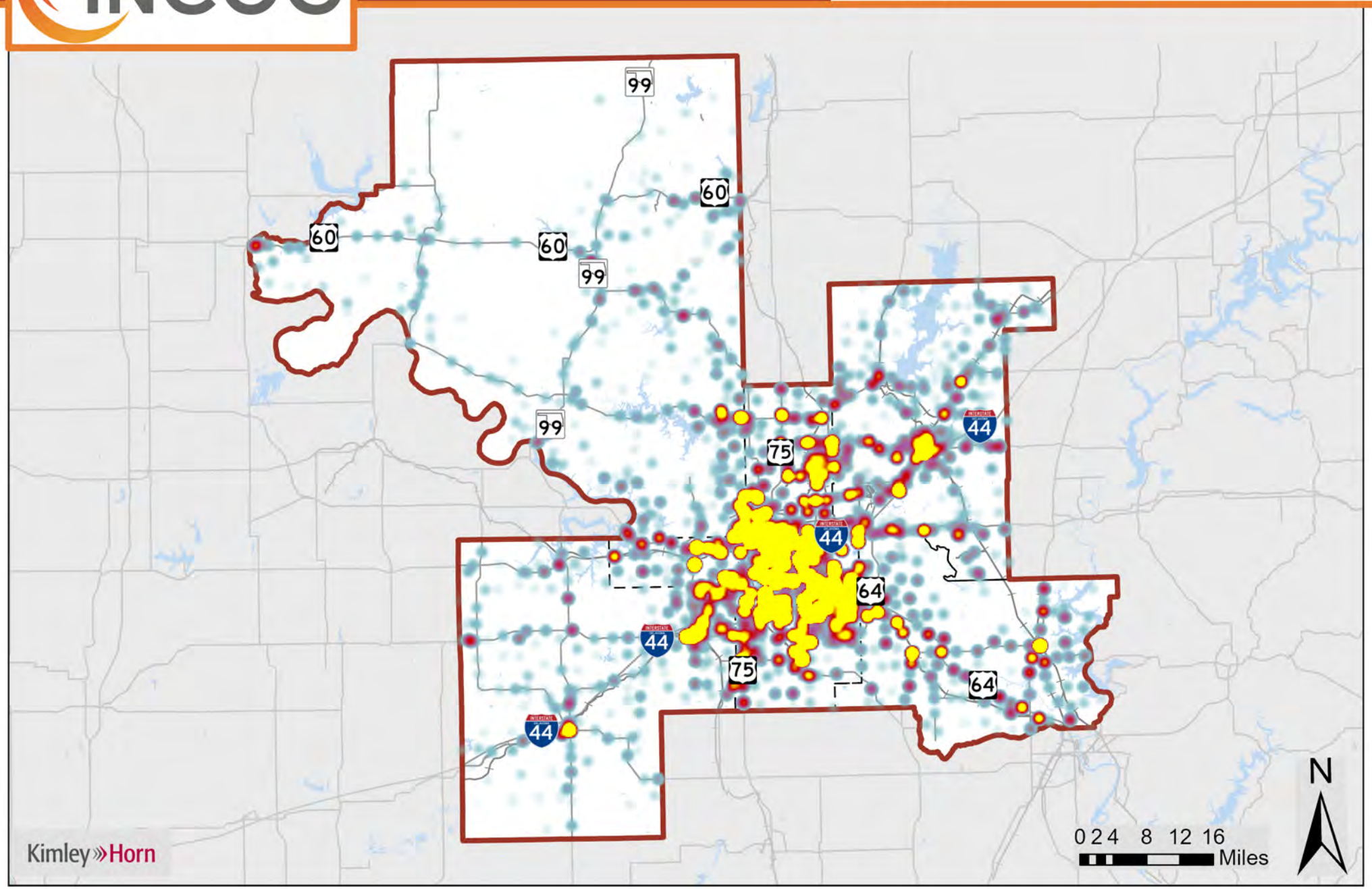
**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

FIGURE 2. KAB CRASHES BY YEAR BY COUNTY



INCOG Local Roads Safety Action Plan

Crash Heat Map



HIGH-INJURY NETWORK (HIN)

This planning process defined a High-Injury Network (HIN) for the five-county INCOG region. A high-injury network is a network of roads, intersections, or other transportation infrastructure that experiences an above-average rate of KABs (Fatalities – K, Serious Injuries – A, Minor Injuries – B). Identifying and prioritizing these networks are foundational to the success of an LRSAP. The HIN will be essential in enabling INCOG to prioritize safety improvements, implement and monitor improvements, allocate and distribute resources, and continuously review and update the HIN with the most recent crash data.

The development of the HIN also provides a comparison of crash densities between roadway segments. **Table 1** below outlines the corridors with the highest densities within each county. These densities are quantified by the Critical Crash Rate Ratio, which compares the rate of crashes on these segments to the average rate across the entire local roads network in the five-county region. The Total KABs and Critical Crash Rate Ratio are based on a five-year study period of collision data in the region from 2017 to 2021.

TABLE 1. TOP HIN CORRIDOR PER COUNTY

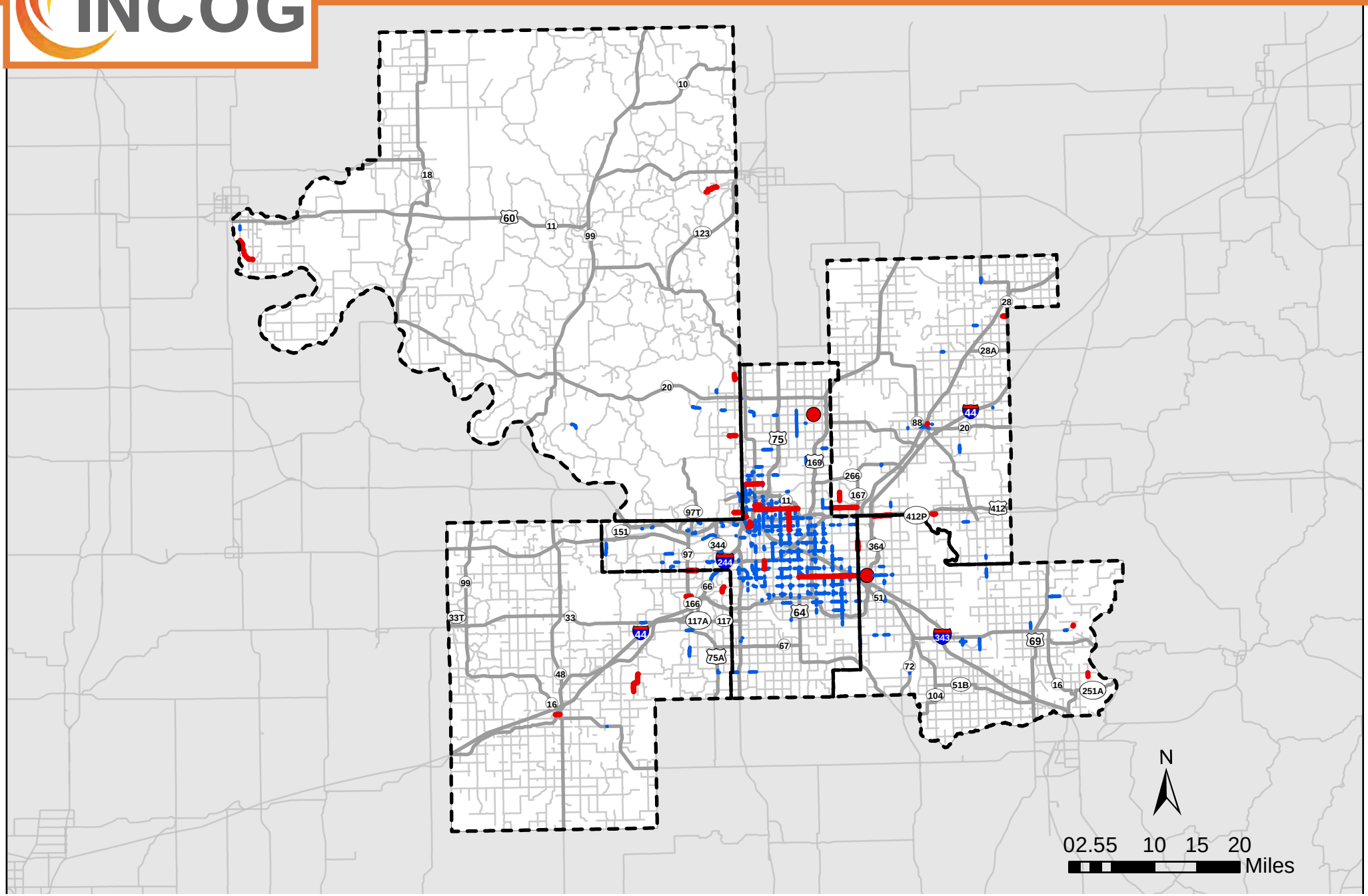
COUNTY	CORRIDOR	TOTAL KABs	CRITICAL CRASH RATE RATIO
Creek	W 91st St S	11	9.9
Creek	W 61st St S	4	7.5
Creek	S 49th West Ave	4	5.3
Creek	Slick Rd	2	4.5
Creek	W 8th Ave	4	3.0
Osage	N Lombard Ln	5	9.1
Osage	Co Rd 2706	7	6.9
Osage	W Newton St	8	4.9
Osage	W 103rd St N	4	3.3
Osage	Old River Rd	5	2.9
Rogers	N Muskogee Ave	3	14.7
Rogers	E 590 Rd	4	12.6
Rogers	E Pine St	16	11.2
Rogers	E 360 Rd	2	10.9
Rogers	S 4050 Rd (N 161st E Ave)	2	7.0
Tulsa	E Virgin St	15	12.1
Tulsa	S Elgin Ave	17	6.6
Tulsa	W Haskell Pl	5	6.2
Tulsa	Sheridan Rd	99	5.5
Tulsa	N Garnett Rd at E 126th St N	8	5.4
Tulsa	E 71st St	337	4.9
Tulsa	E 46th St N	27	4.9
Tulsa	E Pine St	111	4.7
Tulsa	S Lewis Ave	85	4.6
Tulsa	E 8th St	15	4.4
Wagoner	N 55th St E	2	18.6
Wagoner	Toppers Rd	1	11.7
Wagoner	E Admiral Pl	2	6.8
Wagoner	N 37th St at E Kenosha St	1	5.7
Wagoner	County Line Rd	1	4.6

INCOG Local Roads Safety Action Plan
High-Injury Network

INCOG

Legend

- Priority High-Injury Intersection
- Priority High-Injury Corridor
- High-Injury Network
- Highway
- Arterial
- County Limits



COUNTERMEASURES

Chapter 3 includes the Safety Countermeasure Toolbox, which was developed to include systemic countermeasures that can be used throughout the entire INCOG road network to improve the level of roadway safety. The toolbox in **Chapter 3** presents a comprehensive set of strategies and interventions aimed at addressing specific traffic safety challenges. While not every systemic countermeasure listed by the FHWA was factored into the safety toolbox, this list provides deployable countermeasures for the crash types and design contexts within the INCOG region, and other treatments may be utilized for specific projects or specific locations. **Table 2** 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 2. COUNTERMEASURES SUMMARY

COUNTERMEASURES	CMF	CONTEXT (URBAN/RURAL)
Raised Medians	0.29	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
Roundabouts	0.59	Both
SafetyEdge^{SM}	0.59	Rural
Sidewalks	0.60	Both
Corridor Lighting	0.68	Both
Crosswalk Visibility Enhancements	0.73	Both
Rumble Strips	0.74	Rural
High-Contrast Lane Markings	0.75	Both
Retroreflective Backplates	0.85	Both
Appropriate Speed Limits	0.86	Both
Corridor Access Management	0.93	Both
Speed Feedback Signs	0.95	Both
Wider Edge Lines	0.97	Both
Bike Facilities	–	Urban
Curb Extensions	–	Urban
Add New Paved Shoulder	0.67	Rural

FIGURE 3. EXAMPLE OF RAISED MEDIANS

Source: Adobe Stock

FIGURE 4. EXAMPLE OF A ROUNDABOUT

Source: Adobe Stock

CHAPTER 1

PROCESS & PURPOSE

Photo Location: Osage County, Oklahoma

Credit: Roberto - stock.adobe.com

CHAPTER 1: PROCESS & PURPOSE

BACKGROUND

The Indian Nations Council of Governments (INCOG) developed a Local Road Safety Plan (LRSP) in 2022, aiming to improve safety for all roadway users on city streets and county roads in the region. Since this plan was completed, INCOG has decided to update the plan, taking a deeper dive into the most dangerous corridors and intersections in the region and creating tailored countermeasures and recommendations for those areas. The current LRSP provides a region-wide analysis, systemic countermeasures, and detailed listings of potential project locations. The LRSAP will update the region and corridor-wide systemic countermeasures and provide policy and process changes based on the crash analysis and the public outreach process.

Indian Nations Council of Governments Background

Located in northeast Oklahoma, INCOG is one of the 11 regional councils of government in the state of Oklahoma. This council of governments provides services for 3 Tribal Nations, 5 counties, and 50 towns and cities. INCOG is the designated Metropolitan Planning Organization (MPO) for the Tulsa Transportation Management Area, which includes all of Tulsa County as well as portions of the adjoining counties in the region. Because of this, INCOG is responsible for coordinating federal, state, and local agencies to create a cohesive, safe, and effective transportation network.

> This update to INCOG's current LRSP aims to bring INCOG closer to its current goal of eliminating fatal and severe injuries on Local Roads in the region by further improving traffic safety.

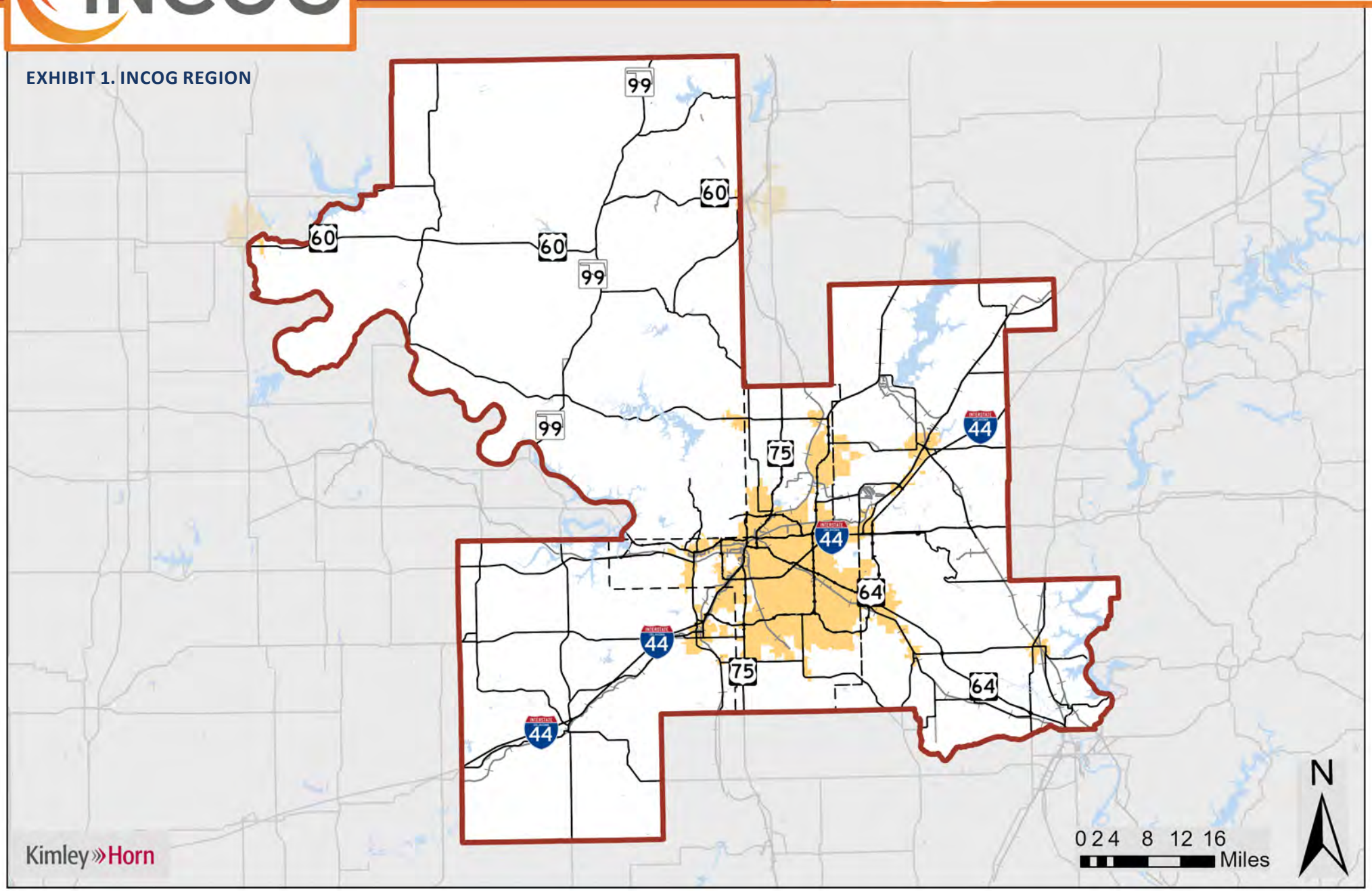
SAFETY GUIDING PRINCIPLES

This plan update enhances INCOG's current Local Road Safety Plan into a **Local Road Safety Action Plan** by applying three traffic safety principles. This update to INCOG's current LRSP aims to bring INCOG closer to its current goal of eliminating fatal and severe injuries on local roads in the region by further improving traffic safety. The three principles used to guide this traffic safety plan are Vision Zero, Safe System Approach, and the Six "E's" of safety – these principles will be referred to as guiding principles. This update will further assist the region's leaders in informed decision-making when identifying projects that will significantly improve traffic safety in the region.

INCOG Local Roads Safety Action Plan
Project Base Map

INCOG

EXHIBIT 1. INCOG REGION



Vision Zero

Vision Zero is a traffic safety initiative that prioritizes the principles of safe road design, enforcement, education, and community engagement. Through this comprehensive approach, Vision Zero aims to eliminate traffic fatalities and severe injuries. The initiative recognizes that human error is inevitable; therefore, road systems should be designed to mitigate the consequences of mistakes. By emphasizing a comprehensive approach to crash-related injury reduction, regions can experience improvements in quality of life, safety, and community mobility. Vision Zero was not incorporated into the 2022 Local Road Safety Plan; however, INCOG has recently adopted a resolution embracing Vision Zero, communicating the importance of ensuring the safety of all road users in the region.

Vision Zero differs from other approaches because it challenges the idea that traffic injuries and fatalities are inevitable byproducts of modern transportation networks. Instead, it promotes the idea that there is a possibility of creating safe and accessible transportation for all.

Safe System Approach

The Safe System Approach is the framework and mechanism by which this Vision Zero resolution can be implemented. Six key principles can be utilized to implement the elements of the Safe System Approach, and 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 designers and engineers, users, law enforcement, vehicle manufacturers, and 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 System elements. If one element fails, redundancy prevents systemwide failure, ensuring people are protected.

The Safe System Approach is a principles-based approach to eliminate serious and fatal injuries. This approach acknowledges that humans make mistakes that can be offset through traffic safety planning. Efforts to mitigate or lessen the physical impacts on the human body include enhancing existing roadway design, reducing speeds, physically separating automobiles from alternative road users, and technological advancements in vehicles (lane departure assist, autonomous emergency braking, etc.).

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:

1. **Safer Road Users** bear the burden of responsibility for complying with the rules and regulations of the roadway.
2. **Safer Vehicles** are responsible for mitigating or preventing the potential impacts of crashes. Active safety measures can help prevent crashes, while passive measures can lessen the implications of a crash. This includes not only vehicle manufactures, but vehicle owners too. Ensuring proper vehicle maintenance—headlights, turn signals, brake lights, brakes, etc.—creates a safer driving environment for everyone and reduces the chances of crashes.
3. **Safer Speeds** have a direct correlation with an increased rate of survival in crashes. Reducing speed reduces impact, improves visibility, and affords drivers additional braking time. Roads should also be designed to elicit the target speeds.
4. **Safer Roads** are not defined by their design alone. Instead, the road design, construction, maintenance, operation, and countermeasures work in tandem to improve safety.
5. **Post-Crash Care** accounts for the actions of those responding to a crash, whether emergency services, law enforcement, or clean-up.

FIGURE 5. SAFE SYSTEM APPROACH

Source: FHWA

Six "E's" of Safety

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

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 users. Examples of engineering projects that have been proven include the implementation of safety countermeasures or traffic calming measures that reduce speeding.

EDUCATION

Can improve safety by raising awareness of transportation choices, furthering or establishing the benefits of multimodal transportation, and demonstrating the proper way to utilize the system.

EVALUATION

Can support both proactive and responsive measures. Understanding the when, where, and why of crashes allows for response to historical trends and adjustments to improve future safety. Similarly, careful evaluation can help avoid potential issues before they reach greater severity.

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

Can ensure that traffic laws and regulations are being followed by system users. Enforcement can also be targeted to prioritize problem behaviors like speeding and other dangerous behaviors over minor infractions.

ENCOURAGING

Can lead the community to further their knowledge and understanding of safety principles. Events and activities can support and promote better behavior.

Local Road Safety Plan (2022)

The 2022 Local Road Safety Plan (LRSP) was created to address the concern of traffic safety on local roads in the INCOG region. The 2022 LRSP was developed using 2010-2019 crash data analysis and utilized the framework provided by the Safe System Approach. This previous plan was developed during the COVID pandemic and therefore had limited opportunities for stakeholder engagement. The 2022 LRSP was developed in accordance with the Oklahoma Strategic Highway Safety Plan (SHSP) and provides strategies and action items to improve traffic safety on INCOG's local roads. The 2022 LRSP's vision, mission, and goal are:

VISION

Incorporate the 5 E's* approach (Engineering, Enforcement, Education, Emergency Services, and Everyone) to reach zero deaths.

MISSION

Establish a Culture of Safety where EVERYONE helps to ensure their own safety and the safety of others through their actions, attitudes, and behaviors.

GOAL

Reduce annual traffic fatalities and serious injuries by 25 percent by 2030.

The 2022 LRSP defined emphasis areas for lane departures, Native American fatalities, intersections, non-motorized users, younger/older drivers, and unsafe driver behavior. INCOG stakeholders identified nearly 100 countermeasure strategies and actions for each emphasis area. These components will be evaluated for their relevancy with updated crash statistics, an in-depth equity assessment, and a robust public engagement process. The 2025 LRSAP update will take the 2022 LRSP and, through building on prior work, find ways to improve the plan.

Safety Best Practices

At the beginning of the project, the consultant team reviewed best practices and innovative strategies from peer Metropolitan Planning Organizations (MPOs) to inform the development of the INCOG Local Roads Safety Action Plan. The Safety Action Plans (SAPs) selected for review were based on geographic proximity, population size, and similar characteristics, emphasizing regions with completed or nearly completed plans. Plans reviewed included those from:

- **WAMPO** (Wichita Area Metropolitan Planning Organization): Comprehensive Safety Action Plan (2023)
- **ACOG** (Association of Central Oklahoma Governments, Oklahoma City): Regional Safety Action Plan (2024)
- **MAPA** (Metropolitan Area Planning Agency, Omaha): Vision Zero Omaha Action Plan (2023)
- **NWARPC** (NW Arkansas Regional Planning Commission): NW Arkansas Safety Action Plan (2023)
- **MRMPO** (Mid-Region Metropolitan Planning Organization, Albuquerque): Vision Zero Action Plan (2021)

Additional plans were analyzed for specific elements relevant to INCOG's needs. The findings provide insights to guide the Safety Action Plan, support project prioritization processes, and promote collaboration among regional entities. The review looked at safety data collection methods, data analysis strategies, methods for equity analysis, how SAPs incorporated interagency collaboration, best practices in project development, and methods for transparency and reporting. A detailed summary of these plans is provided in **Appendix D**.

*The 5 E's is an earlier version of the 6 E's used in this plan.

PUBLIC ENGAGEMENT OVERVIEW

Community engagement is an essential component of the planning process. Input from community members allows the Safety Action Plan Team to understand the issues of road users in the INCOG region to ensure the plan meets their needs. Additionally, providing ample opportunities to receive community concerns and opinions creates more advocates of the plan and grows support for more impactful implementation of the plan's recommendations. The Public Engagement for the INCOG Local Roads Safety Action Plan included the following opportunities for participation:

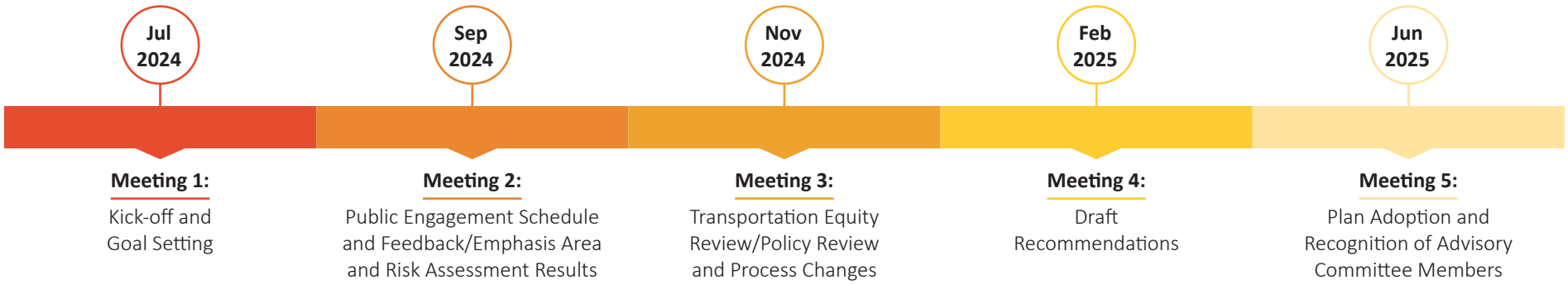
- Public Workshops
- Public Pop-up Events
- Tribal Nations Meetings
- Online Engagement
- INCOG Transportation Technical Committee
- INCOG Transportation Policy Committee
- INCOG Board of Directors
- LRSAP Advisory Committee (AC)

Appendix A dives deeper into the details of the engagement events, including dates, activities, and goals of the events hosted. A summary of the online engagement is also provided.

PROJECT TIMELINE

The INCOG LRSAP kicked off in June 2024, and the planning process spanned until February 2025. A timeline for the LRSAP AC meetings is displayed in **Figure 7**.

FIGURE 6. PROJECT TIMELINE



Members of the LRSAP AC acted as advocates for the planning process and intend to be champions of the plan during its implementation. In the first LRSAP AC meeting, a Mission Statement was crafted to define the plan's purpose and reinforce a commitment to serving stakeholders and the broader community:

> "We are committed to eliminating all traffic fatalities and serious injuries by embracing Vision Zero and following the Safe System Approach."

The LRSAP AC participated in various exercises, including a SWOT Analysis, HIN refinement, countermeasure prioritization, future INCOG Project Prioritization, and Implementation Plan refinement. The LRSAP AC also defined a target to reduce roadway fatalities and severe injuries. INCOG adopted this target and states, **"INCOG commits to reducing traffic fatalities and serious injuries by 50% by 2035."** Once the date is reached and the goal is accomplished, INCOG will reevaluate the target for refinement or establish a new target for future dates.

CHAPTER 2

CRASH ANALYSIS

Photo Location: Osage County, Oklahoma

Credit: Roberto - stock.adobe.com

CHAPTER 2: CRASH ANALYSIS

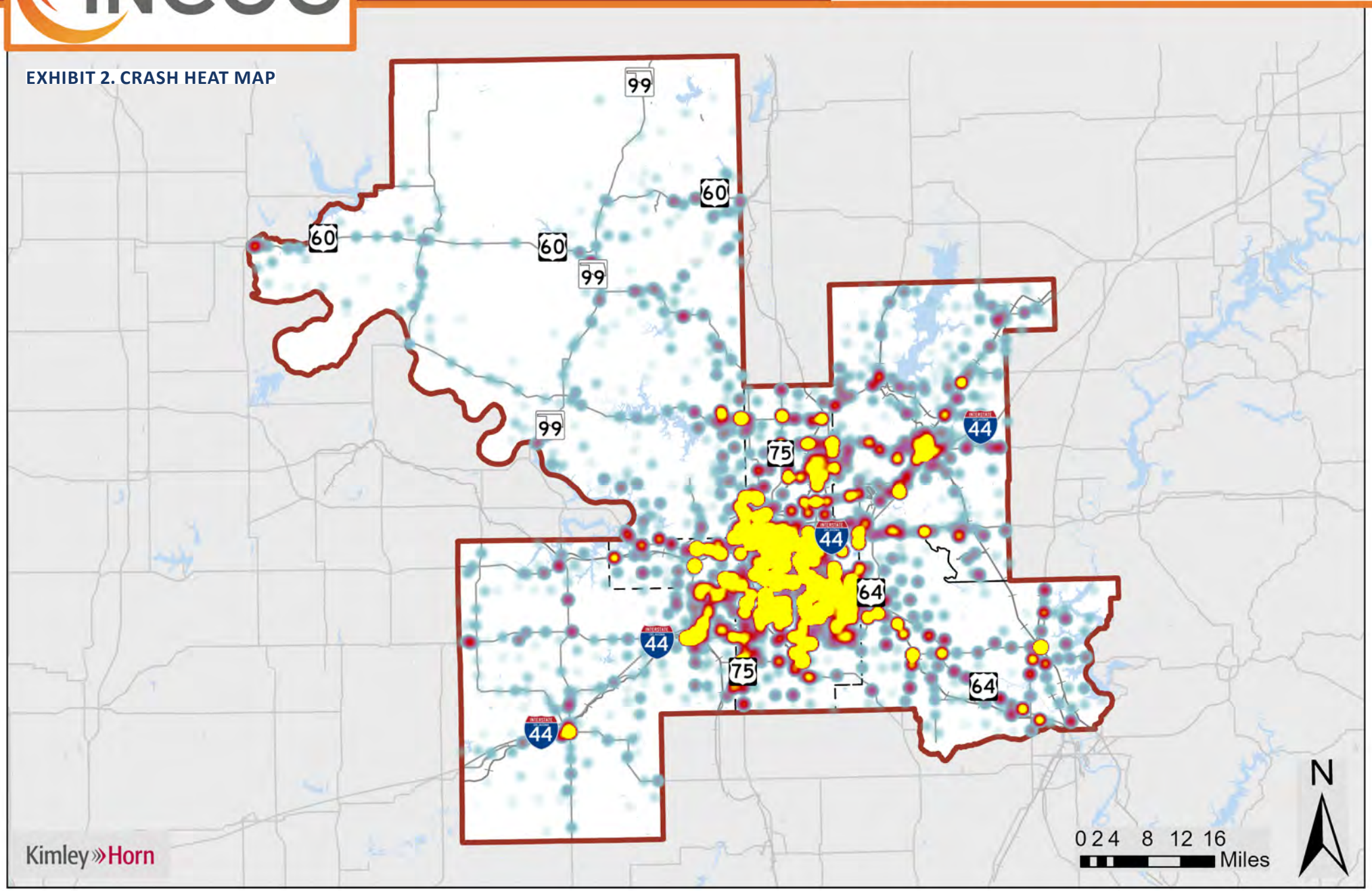
CRASH DENSITY

Exhibit 3 shows the crash heat map of total crashes in the INCOG Region from 2017-2021. This heat map displays unweighted crash density, which does not consider crash characteristics such as roadway classification, traffic volumes, or severity. The greatest densities of crashes in the region occurred in and around the Tulsa region along major arterials. A few areas in Rogers and Wagoner Counties also exhibited high rates of crashes during the study period. **Appendix C** also provides the annual rates of fatality per 100,000 population for every incorporated community and every county within the INCOG region.

> By identifying road segments with a higher likelihood of severe crashes, this tool can promote the prioritization of high-risk segments/points in a region's transportation network.

INCOG Local Roads Safety Action Plan
Crash Heat Map

EXHIBIT 2. CRASH HEAT MAP



Emphasis Areas

The top safety emphasis areas in the region guided the INCOG LRSAP. Emphasis areas are the top safety concerns based on crash severity and frequency. Targeting these emphasis areas provides the biggest impact on improving traffic safety in the region. These safety emphasis areas are:

LANE DEPARTURES

A lane departure crash occurs when a vehicle leaves the traveled way. It is the top emphasis area (most common) in the state of Oklahoma. there are several types of lane departures and crashes classified under a lane departure crash including: 1) off-center head-on crashes, and 2) side swipe crashes. Although the INCOG region's rate of lane departure crashes is below the state's, it is still a top emphasis area, accounting for 21.7% of crashes.

IMPAIRED DRIVING

Impaired driving is a crash involving occupants whose senses and reaction times are impaired by substances, such as alcohol, drugs, and some medications, as well as physical impairments such as drowsiness and poor vision. Impaired driving accounts for 23.1% of crashes in Oklahoma and 16.1% of crashes in the INCOG region.

OCCUPANT PROTECTION

Occupant protection crashes refer to crashes involving unrestrained occupants. Proper use of seatbelts and child safety seats directly increases crash survival rates, making this emphasis area a top three emphasis area for Oklahoma (24.7%) and the INCOG region (20.2%).

UNSAFE SPEEDING

Operating a vehicle at a speed unsafe for the roadway or the current conditions increases the chances and severity of a crash. Unsafe speed crashes often go underreported, and therefore, the true effects and rates of unsafe speed crashes are likely more severe than noted. Unsafe speed crashes account for 21.4% of crashes in Oklahoma and 17.6% of crashes in the INCOG region.

INTERSECTIONS

Intersection-related crashes are crashes that happen in or near an intersection. Intersections pose a safety risk due to the increased number of potential points of conflict for vehicles and vulnerable road users. Traditional intersection projects have focused on adding turning lanes, which has increased the distances pedestrians have to cross. Intersection-related crashes are the top leading factor in the INCOG region, accounting for 32.3% of crashes, compared to the state of Oklahoma, where intersection-related crashes only make up 24.7%.

WORK ZONES

Work zone crashes are crashes that occur in a marked designated work zone. Work zones pose a unique safety concern due to the presence of workers, heavy machinery, reduced lane width, unclear lane markings, lane/road closures, and speed limit changes. Work zone-related crashes occur for only 2.4% of crashes in Oklahoma, while rates in the INCOG region rises to 6.1%.

VULNERABLE ROAD USERS

Vulnerable road users, as described by The National Safety Council, are “those unprotected by an outside shield, as they sustain a greater risk of injury in any collision with a vehicle and are therefore highly in need of protection against such collisions”. Projects to address Vulnerable Road User (VRU) safety includes 1) traffic signaling changes that prohibits a right turn at a red light, 2) Improving pedestrian signals, 3) eliminating sidewalk gaps, 4) and adding ADA accessible ramps and audio at signals. Vulnerable Road User crashes account for 15.9% of crashes in Oklahoma and 12.2 % in the INCOG region.

MOTORCYCLES

Motorcyclists, being VRUs, are also at increased risk in a collision due to the lack of an outside shield and increased speeds compared to a pedestrian or bicyclist crash. Motorcyclist crashes make up 14.4% of crashes in Oklahoma and 10.8% in the INCOG region.

High-Injury Network (HIN) Development & Results

The HIN was created by selecting segments based on a data-driven approach coupled with qualitative refinement. A further description of the HIN development is provided in **Appendix B**. The goal of the HIN is to contain the maximum number of fatal, severe injury, and possible injury (KAB) crashes on the fewest number of roadways.

The results from the GIS model developed for the analysis component of this plan were refined by removing roadway segments with only one crash during the 5-year study period, to ensure these segments did not skew the data regionally. This was done to identify corridors experiencing high-severity crashes. The cleaned model contained segments with a crash rate higher than expected that had experienced at least one high-injury crash between 2017-2021. Any resulting gaps between segments were examined to be linked or filled with the intention of creating a consistent and contiguous HIN.

The resulting HIN for the INCOG LRSAP consists of 1.5% of the total road network in the region while capturing 53.7% of fatal, severe injury, and possible injury crashes and 59.6% of fatal crashes.

The following steps can be taken to implement and monitor future improvements once the HIN is established:

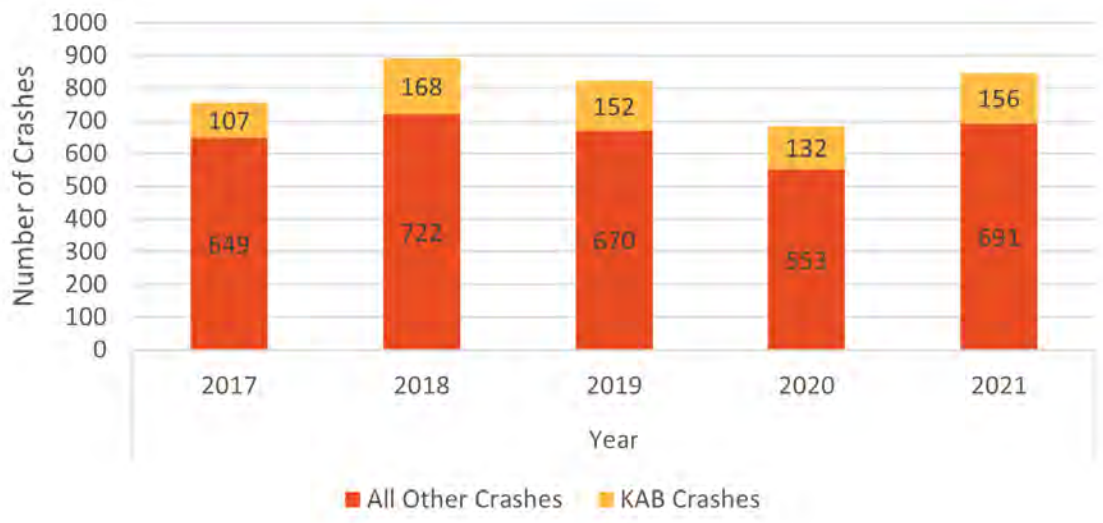
1. ***Prioritize safety improvements:*** Safety improvements (countermeasures) for the identified high-risk locations can be prioritized based on the analysis results and crash patterns. This could involve implementing engineering measures such as roadway redesign, installing traffic control devices, improving lighting, or enhancing pedestrian and cyclist safety.
2. ***Resource allocation:*** Allocation and distribution of the resources needed to implement the safety improvements. This may include funding, personnel, and coordination with other agencies or stakeholders.
3. ***Implement and monitor improvements:*** Implement the planned safety improvements and closely monitor their effectiveness. It is important to track crash data after the improvements have been implemented to assess their impact on critical crash rates and overall safety performance.
4. ***Continuously review and update:*** Review the critical crash rate analysis results regularly and update the prioritization of safety improvements as new crash data becomes available. This ensures that resources are allocated to the locations with the greatest potential for reducing severe crashes.

Top Corridors per County

Creek County

Critical Crash Rate Analysis of Creek County's local road network identified five road segments totaling 7.34 miles and containing 25 KAB crashes. These segments include 8 fatal crashes, 14 serious injury crashes, and 3 minor injury crashes. The total combined length of these five segments is 7.34 miles. **Table 3** summarizes these corridors, and **Exhibit 4** displays their locations.

FIGURE 7. CREEK COUNTY CRASHES PER YEAR



**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

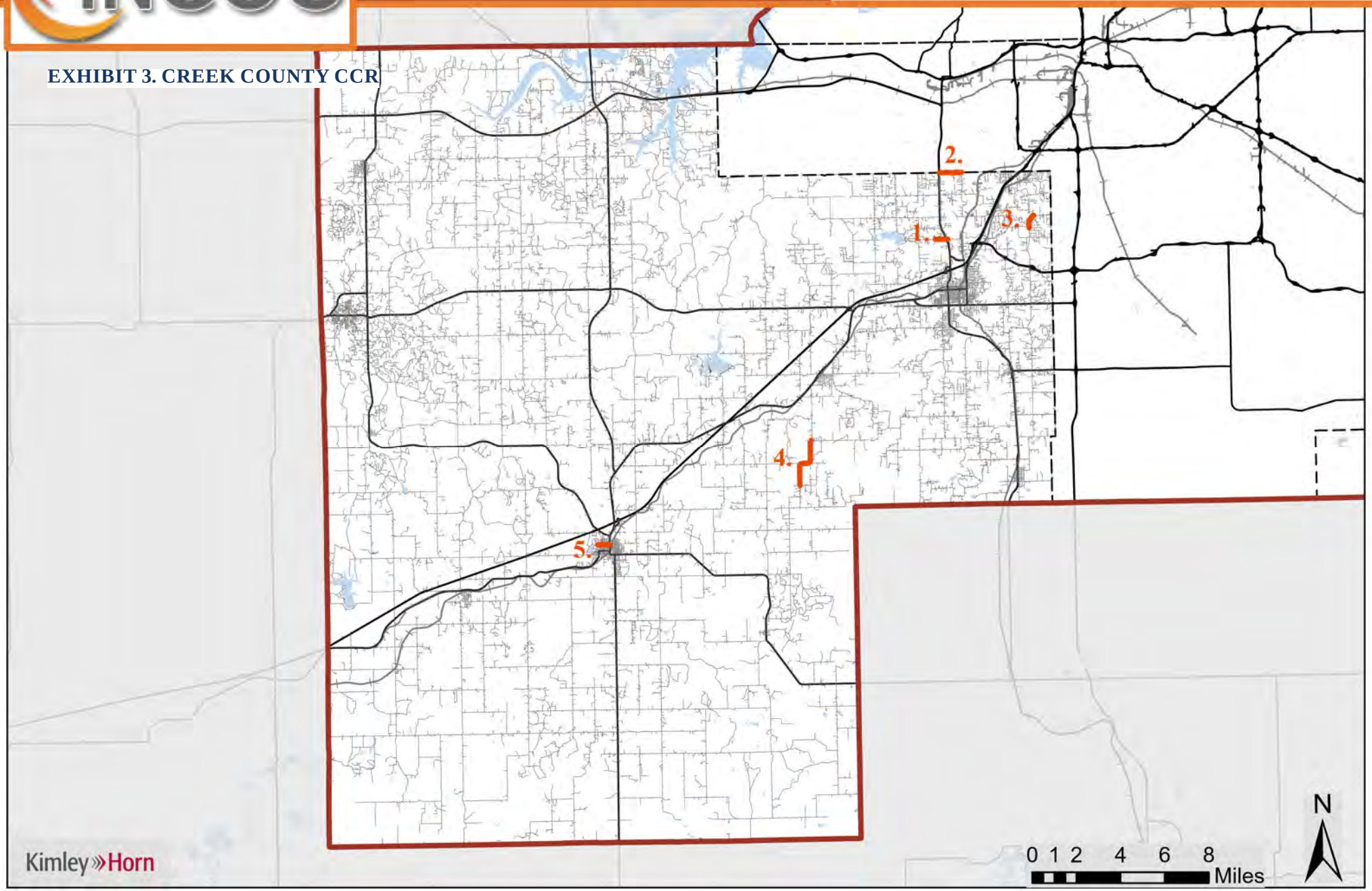
TABLE 3. CREEK COUNTY TOP 5 HIN CORRIDORS

	JURISDICTION	CORRIDOR NAME	ORIGIN	ENDING	LENGTH (MI.)	TOTAL KABS	CRITICAL CRASH RATE RATIO
1	Sapulpa	W 91st St S	W 116th St	N Park St	0.58	11	9.9
2	Borderline-Sapulpa/ Sand Springs	W 61st St S	S 97th W Ave	State Hwy 97	1.05	4	7.5
3	Unincorporated	S 49th West Ave	W 87th St S	S 44th West Ave	0.68	4	5.3
4	Unincorporated	Slick Rd	W 201st St S	W 181st St S	2.44	2	4.5
5	Bristow	W 8th Ave	Spruce St	N Main St	0.56	4	3.0
				TOTAL MILES	***5.31***	**25**	

INCOG Local Roads Safety Action Plan

Creek County Top 5 Corridors

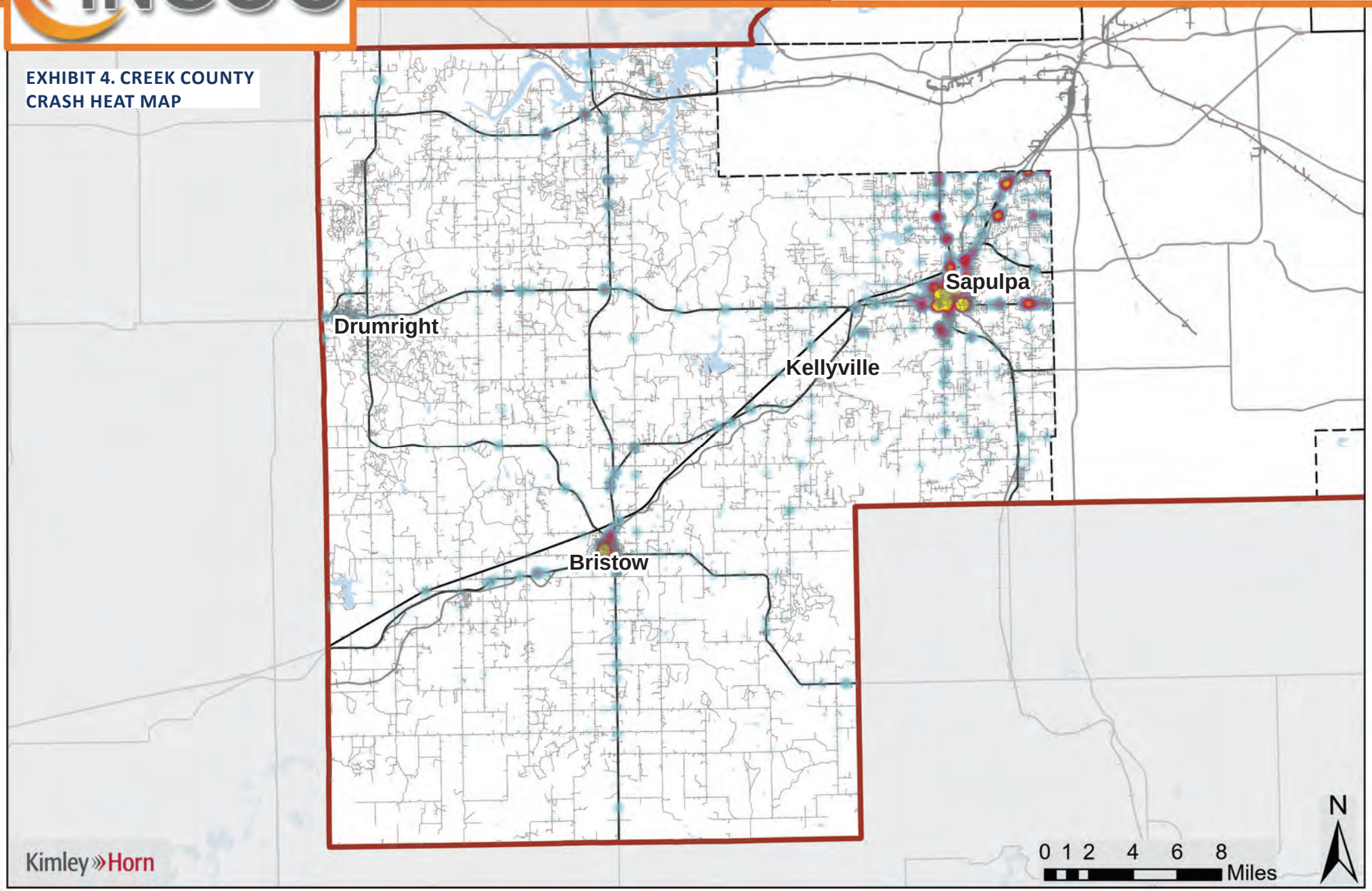
EXHIBIT 3. CREEK COUNTY CCR



INCOG Local Roads Safety Action Plan

Creek County Crash Heat Map

EXHIBIT 4. CREEK COUNTY CRASH HEAT MAP



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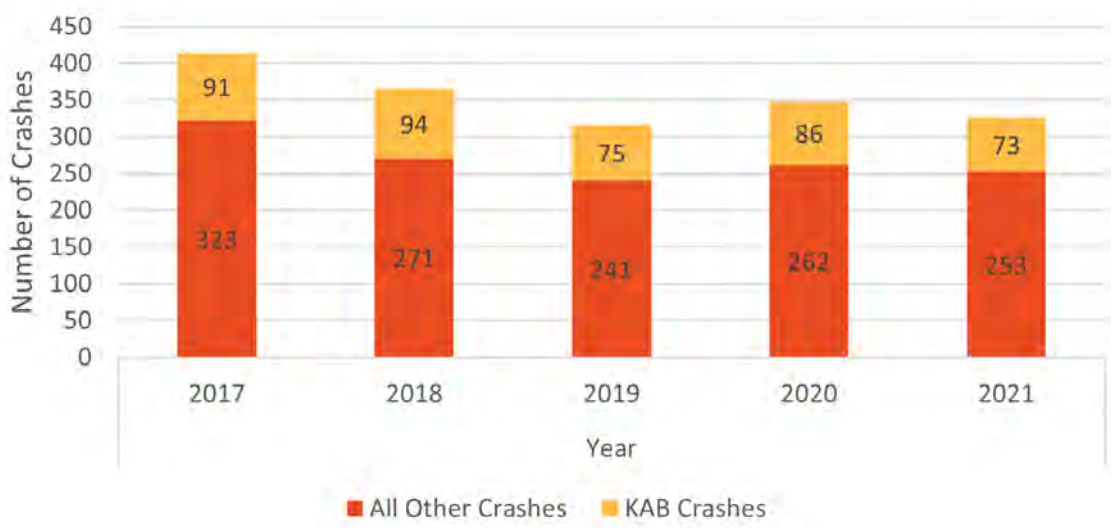
Osage County

Critical Crash Rate Analysis of Osage County's local road network identified five road segments totaling 8.56 miles and containing 29 KAB crashes. These segments include 3 fatal crashes, 8 serious injury crashes, and 18 minor injury crashes. The segments identified as potential High-Injury Network corridors are located in central Osage County as well as near the county boundaries. **Table 4** summarizes these corridors, and **Exhibit 6** displays their locations.

FIGURE 8. OSAGE COUNTY CRASHES PER YEAR



**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

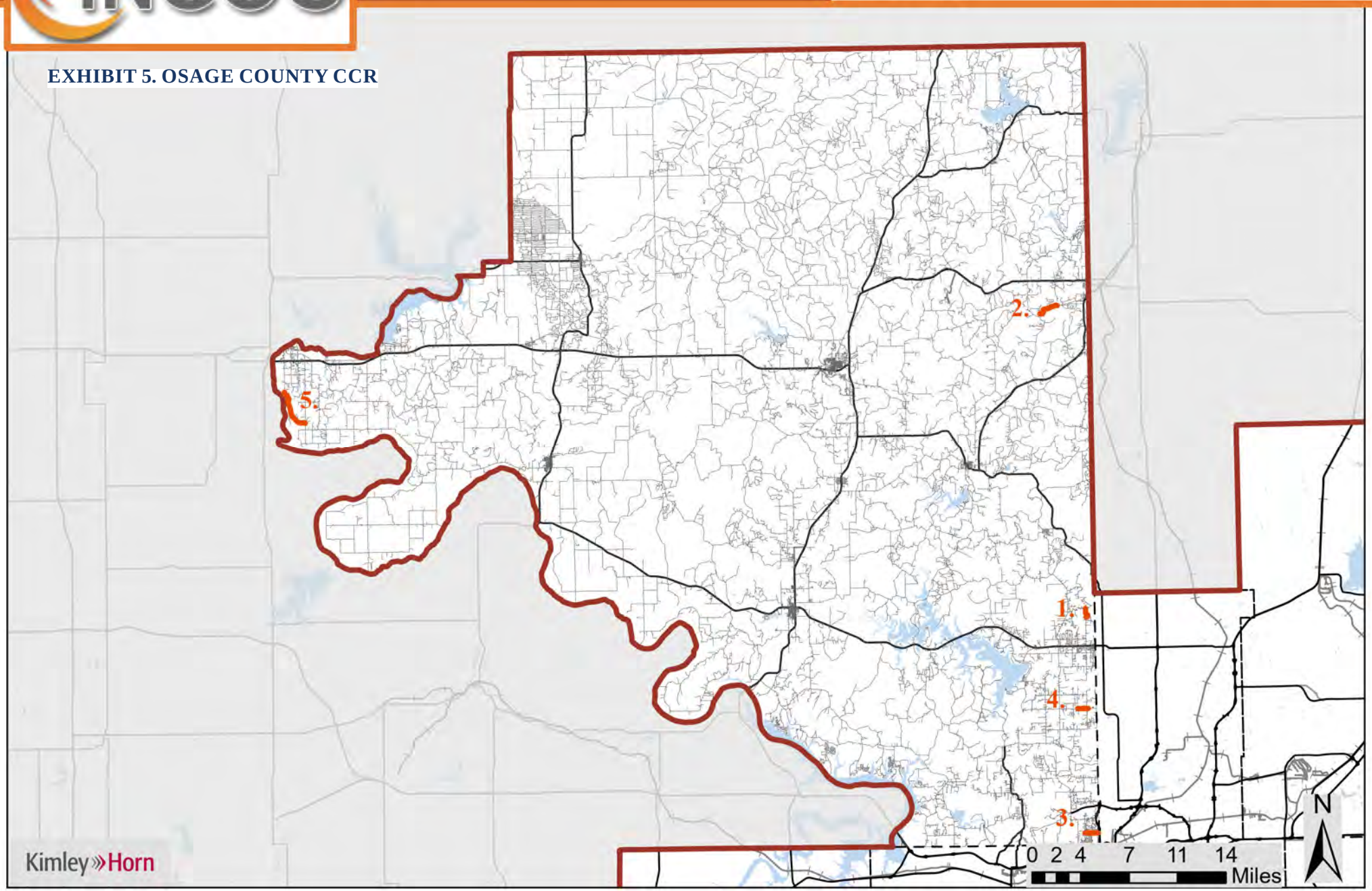
TABLE 4. OSAGE COUNTY TOP 5 HIN CORRIDORS

	JURISDICTION	CORRIDOR NAME	ORIGIN	ENDING	LENGTH (MI.)	TOTAL KABS	CRITICAL CRASH RATE RATIO
1	Unincorporated	N Lombard Ln	176th St N	Star Mountain Rd	0.77	5	9.1
2	Unincorporated	Co Rd 2706	Private Road 2705	Private Drive	1.58	7	6.9
3	Tulsa	W Newton St	Gilcrease Museum Rd	W Osage Dr	1	8	4.9
4	Unincorporated	W 103rd St N	Private Drive	Private Drive	0.78	4	3.3
5	Unincorporated	Old River Rd	Private Drive	Private Drive	3.08	5	2.9
				TOTAL MILES	***7.21***	***29***	

INCOG Local Roads Safety Action Plan

Osage County Top 5 Corridors

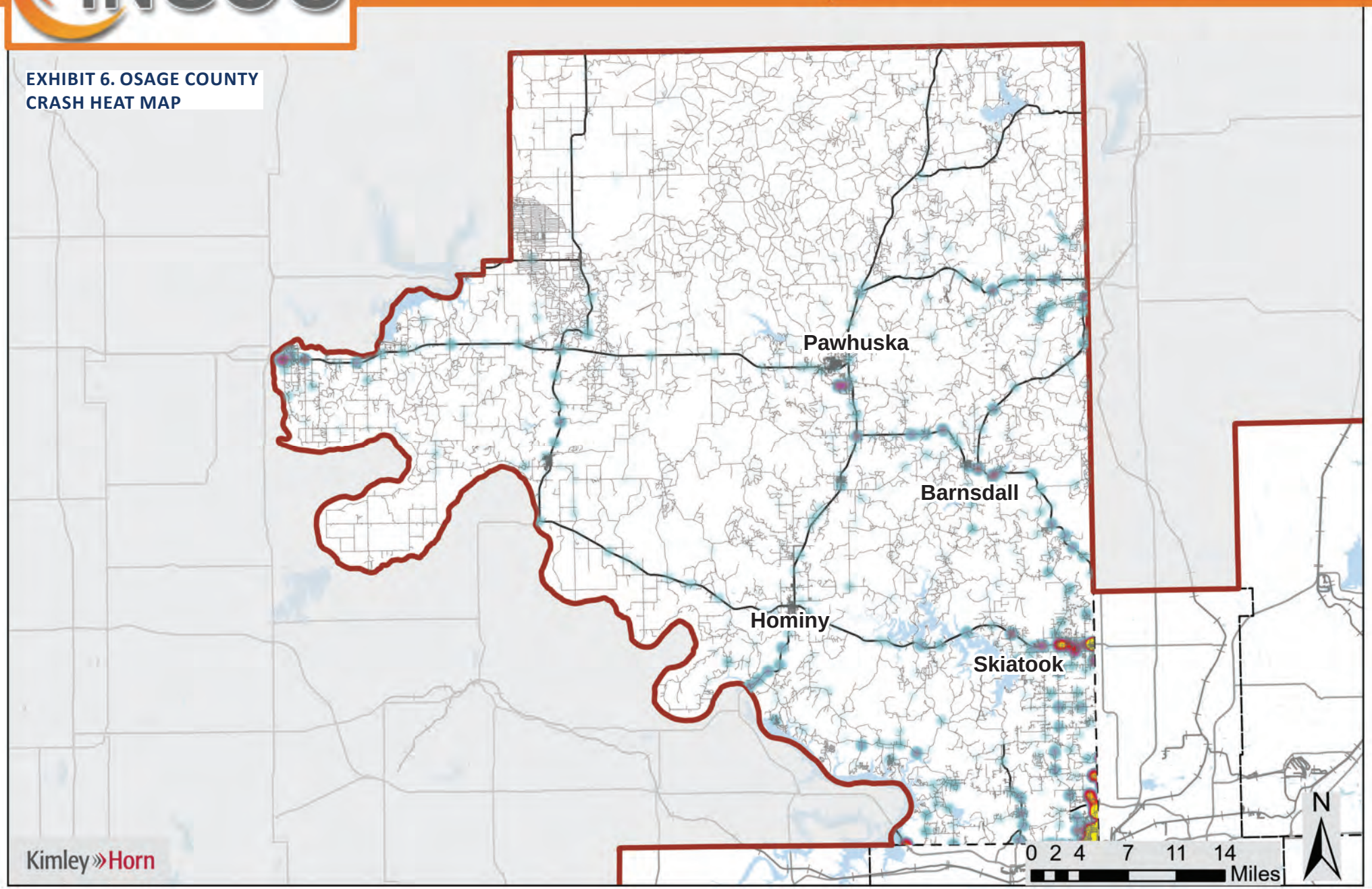
EXHIBIT 5. OSAGE COUNTY CCR



INCOG Local Roads Safety Action Plan

Osage County Crash Heat Map

EXHIBIT 6. OSAGE COUNTY CRASH HEAT MAP



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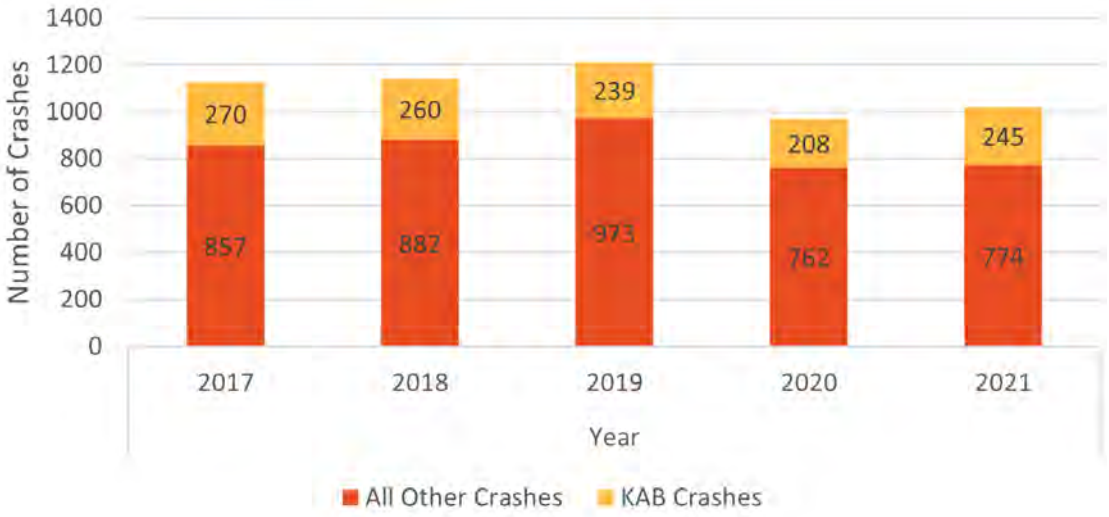
Rogers County

Critical Crash Rate Analysis of Rogers County's local road network identified five road segments totaling 5 miles and containing 27 KAB crashes. These segments include 5 fatal crashes, 8 serious injury crashes, and 14 minor injury crashes. The segments identified as potential High-Injury Network corridors are spread throughout the county. **Table 5** summarizes these corridors, and **Exhibit 8** displays their locations.

FIGURE 9. ROGERS COUNTY CRASHES PER YEAR



**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

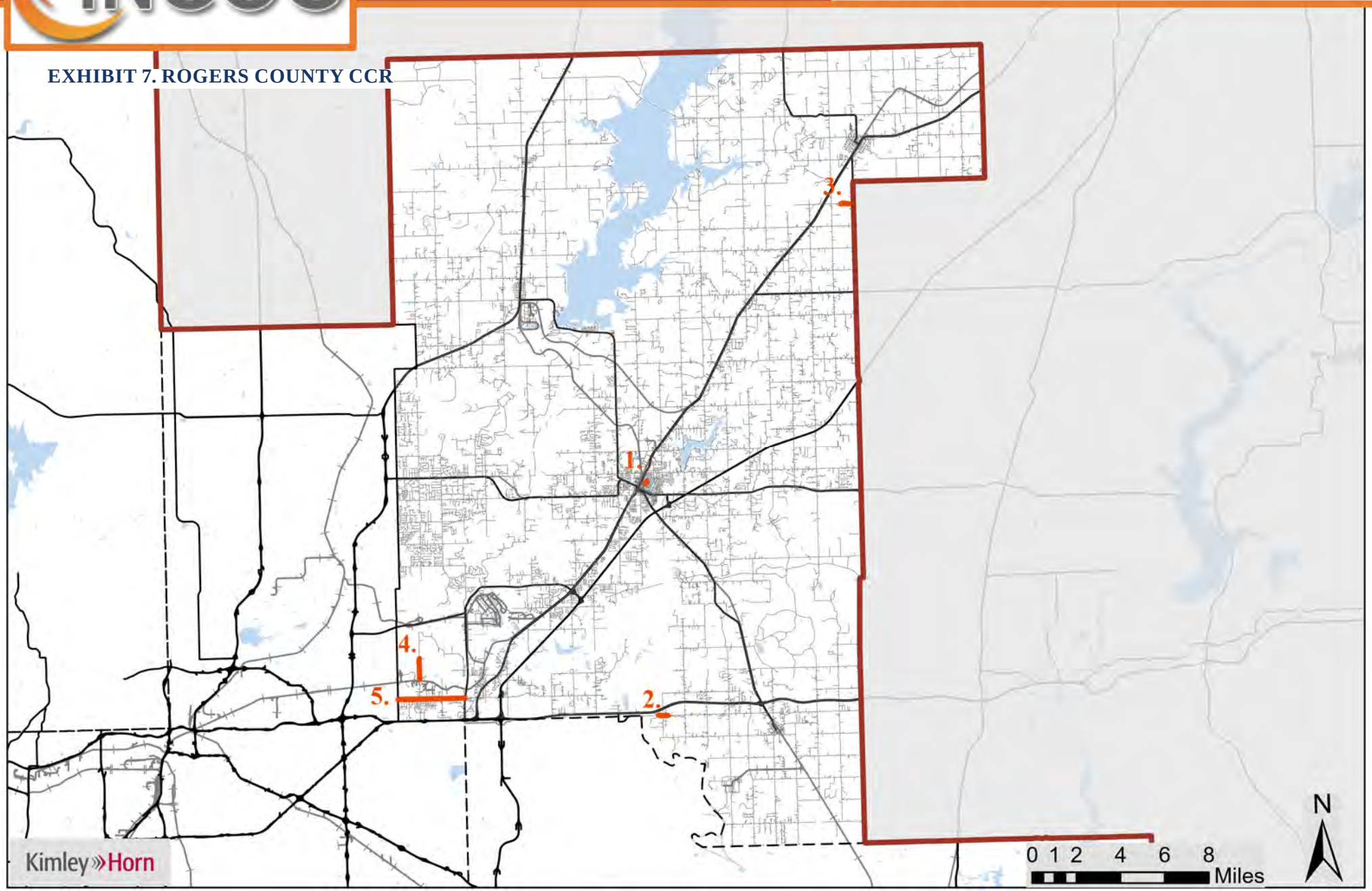
TABLE 5. ROGERS COUNTY TOP 5 HIN CORRIDORS

	JURISDICTION	CORRIDOR NAME	ORIGIN	ENDING	LENGTH (MI.)	TOTAL KABS	CRITICAL CRASH RATE RATIO
1	Claremore	N Muskogee Ave	W 7th St	W 9th St	0.15	3	14.7
2	Unincorporated	E 590 Rd	–	–	0.43	4	12.6
3	Unincorporated	S 4050 Rd (N 161st E Ave)	–	–	1	2	7.0
4	Catoosa	E Pine St	N 145th E Ave	N 193rd E Ave	3	16	11.2
5	Unincorporated	E 360 Rd	–	–	0.40	2	10.9
				TOTAL MILES	***4.98***	**27**	

INCOG Local Roads Safety Action Plan

Rogers County Top 5 Corridors

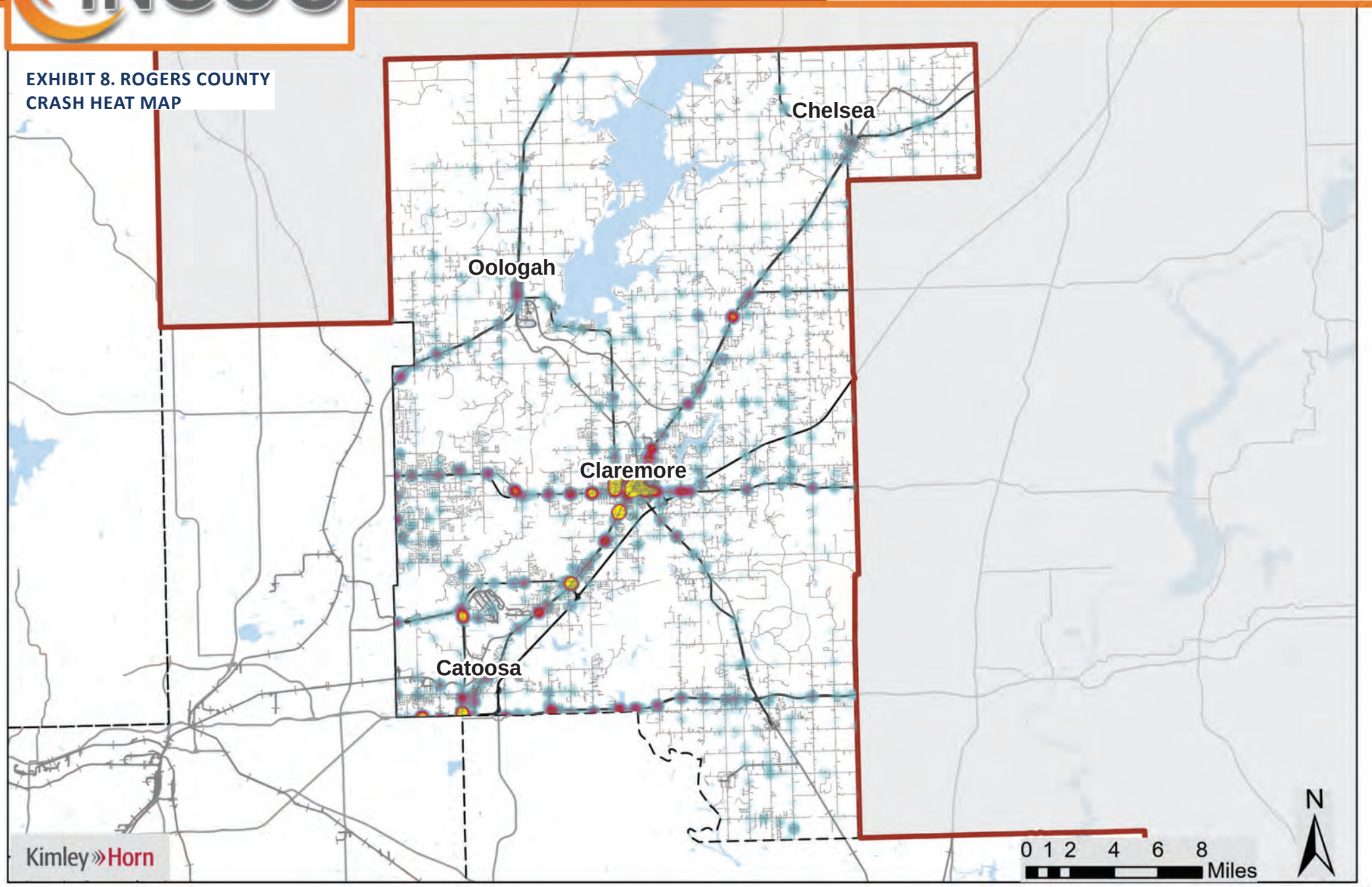
EXHIBIT 7. ROGERS COUNTY CCR



INCOG Local Roads Safety Action Plan

Rogers County Crash Heat Map

EXHIBIT 8. ROGERS COUNTY CRASH HEAT MAP



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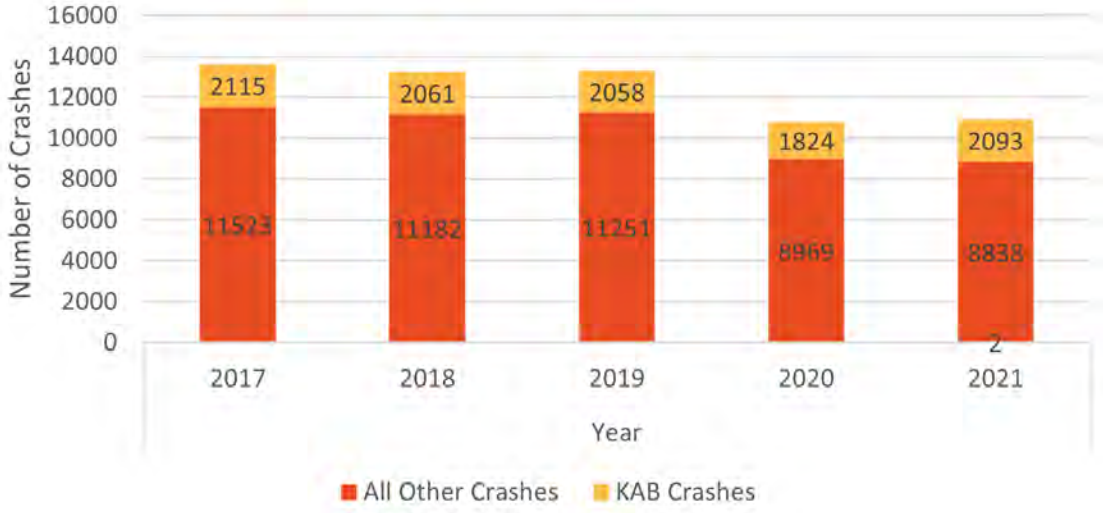
Tulsa County

Critical Crash Rate Analysis of Tulsa County's local road network identified segments with a higher-than-expected crash history, selecting the top 10 segments. These segments have a combined total length of 15 miles and contain 619 total KAB crashes. These potential High-Injury Network segments include 13 fatal crashes, 76 serious injury crashes, and 530 minor injury crashes. Most of these segments are concentrated within Tulsa city limits. **Table 6** summarizes these corridors, and **Exhibit 10** displays their locations.

FIGURE 10. TULSA COUNTY CRASHES PER YEAR



**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

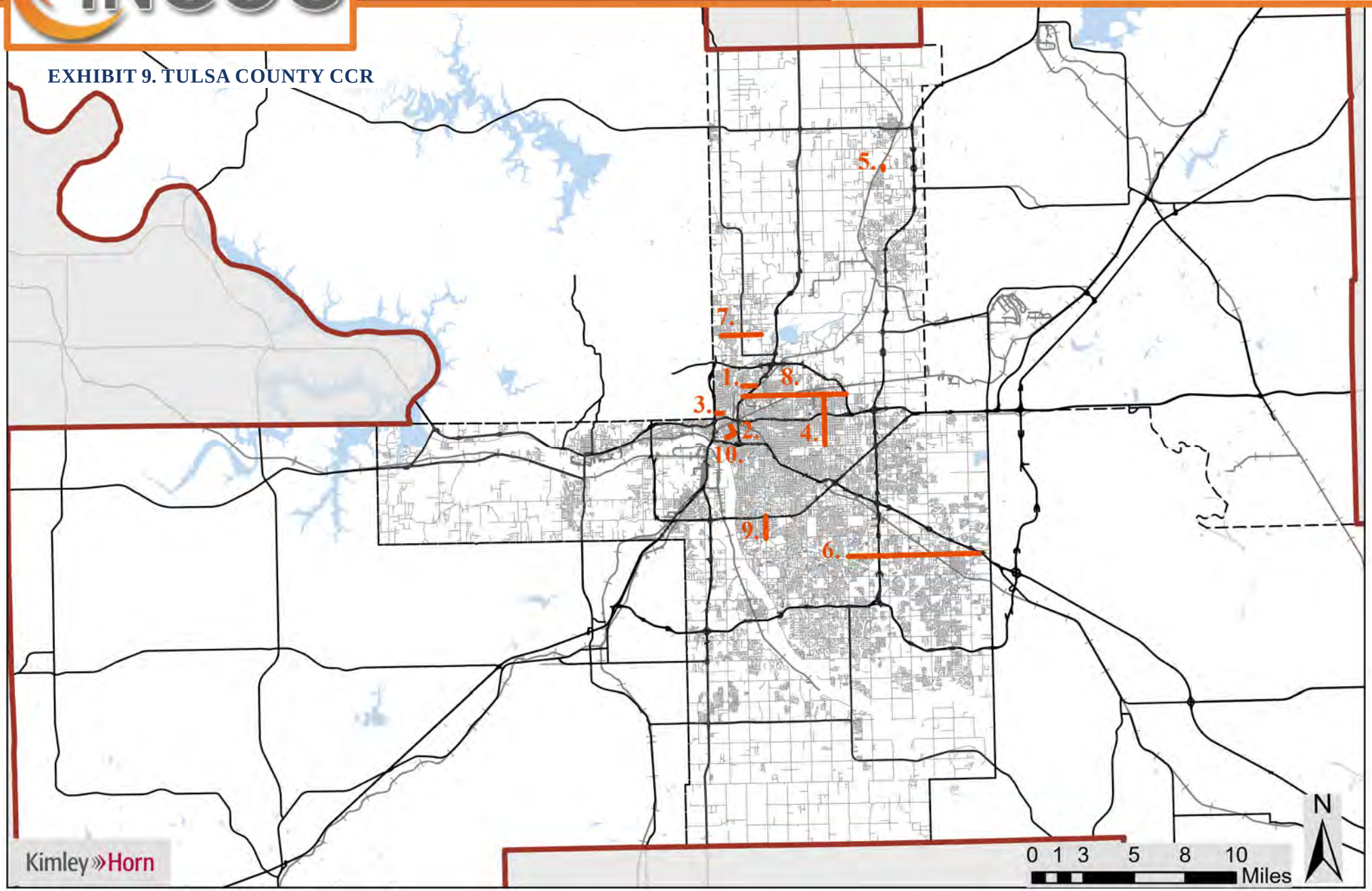
TABLE 6. TULSA COUNTY TOP 10 HINCORRIDORS

	JURISDICTION	CORRIDOR NAME	ORIGIN	ENDING	LENGTH (MI.)	TOTAL KABS	CRITICAL CRASH RATE RATIO
1	Tulsa	E Virgin St	S Peoria Ave	North Xanthus Ave	0.65	15	12.1
2	Tulsa	S Elgin Ave	East 8th St	East 2nd St	0.44	17	6.6
3	Tulsa	W Haskell Pl	N Denver Ave	N MLK Jr Blvd	0.33	5	6.2
4	Tulsa	Sheridan Rd	E Pine St	E 15th St	2.5	99	5.5
5	Owasso/Collinsville/ Unincorporated	N Garnett Rd at E 126th St N	–	–	–	8	5.4
6	Tulsa/Broken Arrow	E 71st St	S Memorial Dr	S 193rd E Ave/S 23rd St	7	337	4.9
7	Tulsa	E 46th St N	N MLK Jr Blvd	N Lewis Ave	2	27	4.9
8	Tulsa	E Pine St	S Peoria Ave	State Hwy 11	5.06	111	4.7
9	Tulsa	S Lewis Ave	E Skelly Dr	E 61st St	1	85	4.6
10	Tulsa	E 8th St	S Elgin Ave	S Cheyenne Ave	0.44	15	4.4
				TOTAL MILES	***19.42***	**719**	

INCOG Local Roads Safety Action Plan

Tulsa County Top 10 Corridors

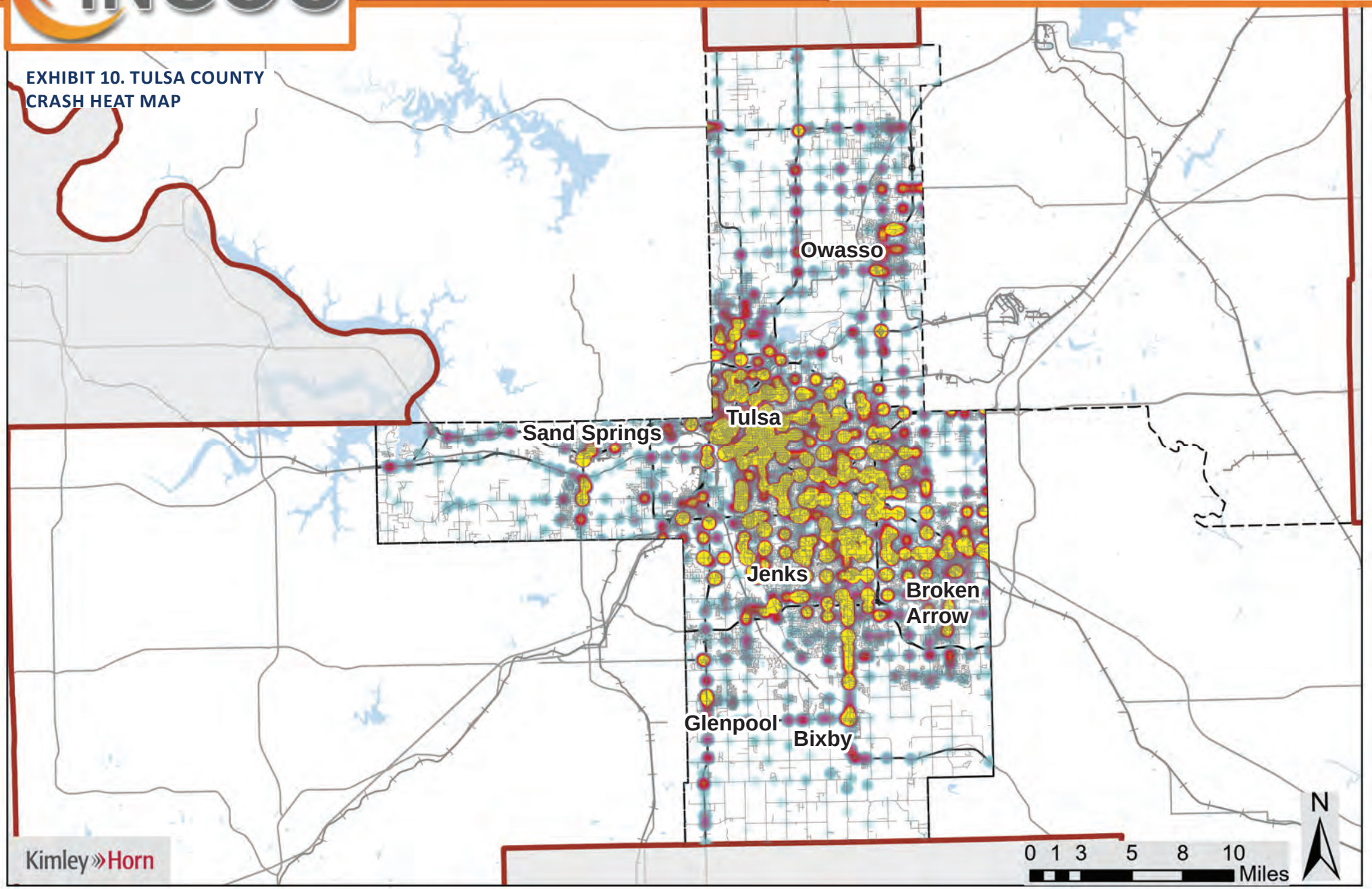
EXHIBIT 9. TULSA COUNTY CCR



INCOG Local Roads Safety Action Plan

Tulsa County Crash Heat Map

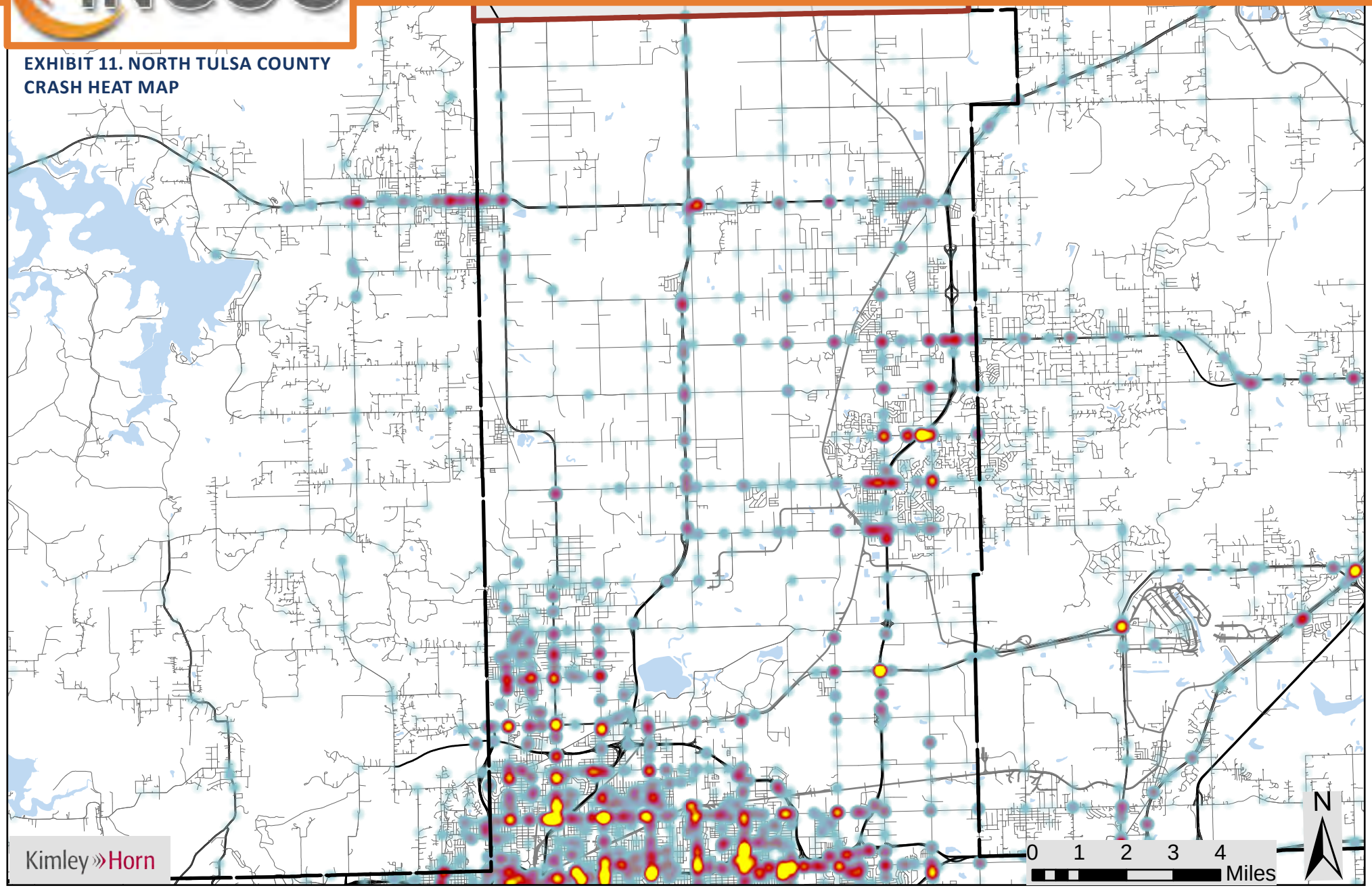
EXHIBIT 10. TULSA COUNTY CRASH HEAT MAP



INCOG Local Roads Safety Action Plan

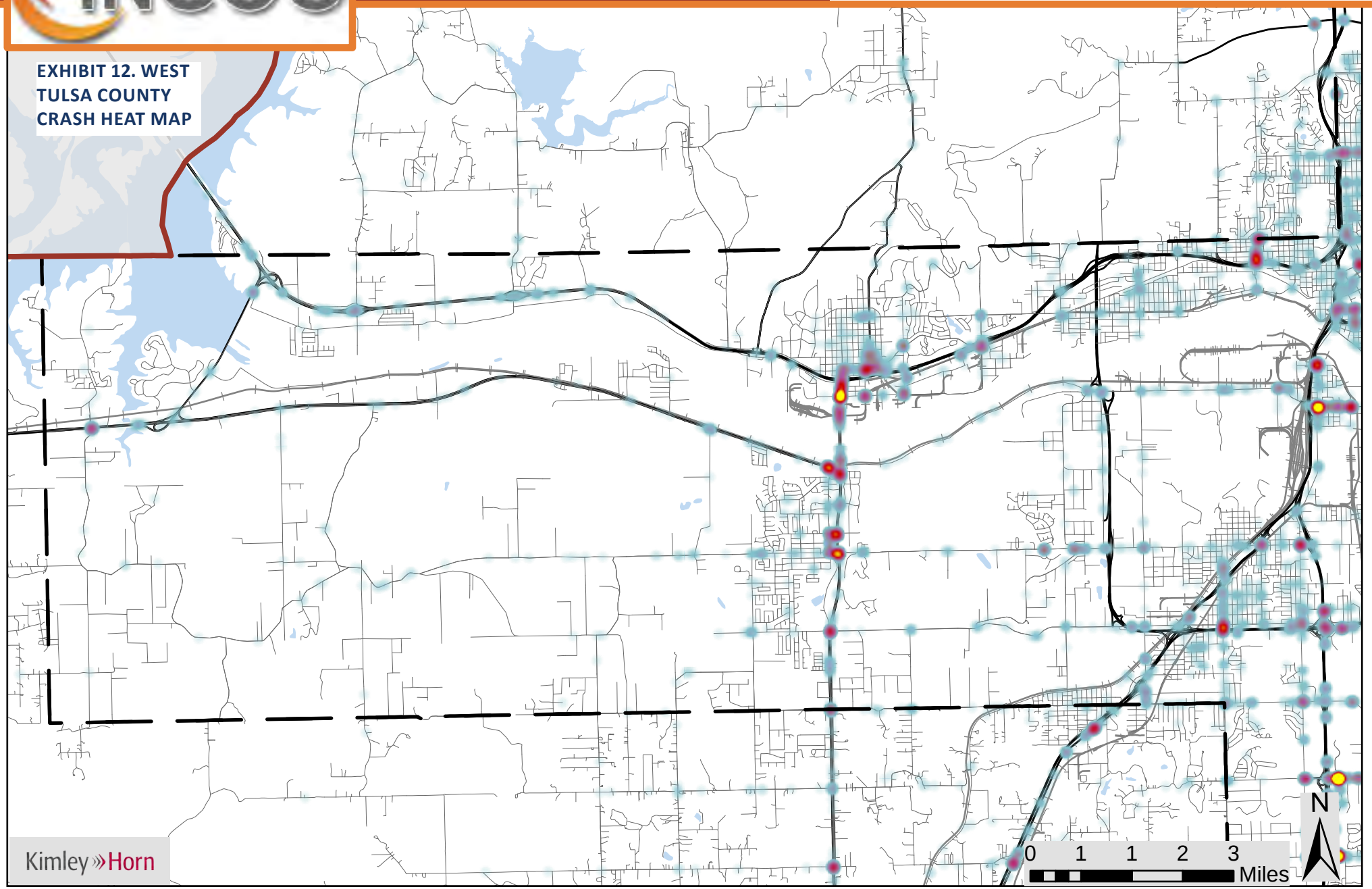
Tulsa County North Heat Map

EXHIBIT 11. NORTH TULSA COUNTY CRASH HEAT MAP



INCOG Local Roads Safety Action Plan

Tulsa County West Heat Map



INCOG Local Roads Safety Action Plan

Tulsa County Central Heat Map

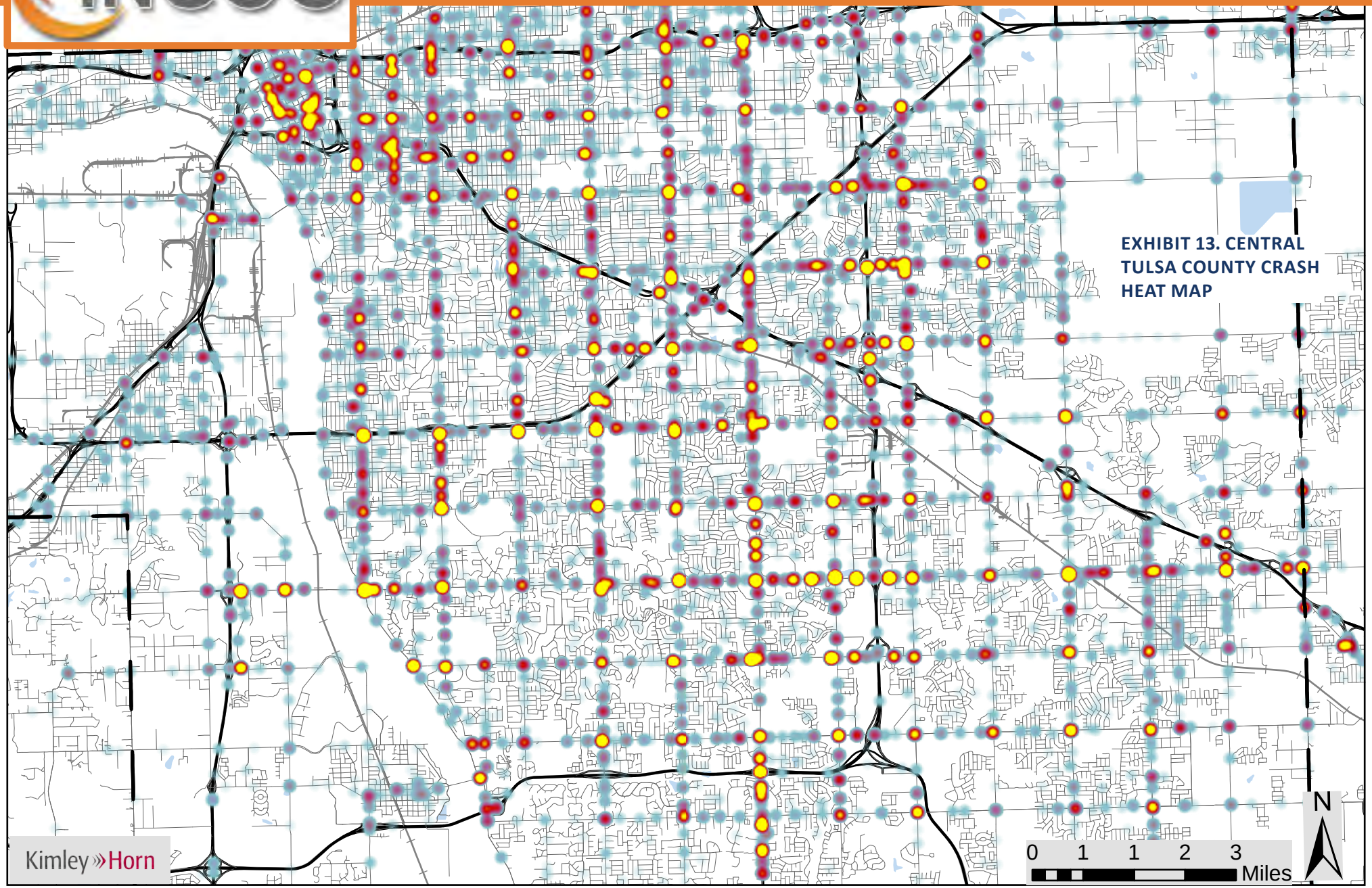
Legend

- INCOG Boundary
- Counties
- Waterways
- Roads

Crash Density

Sparse

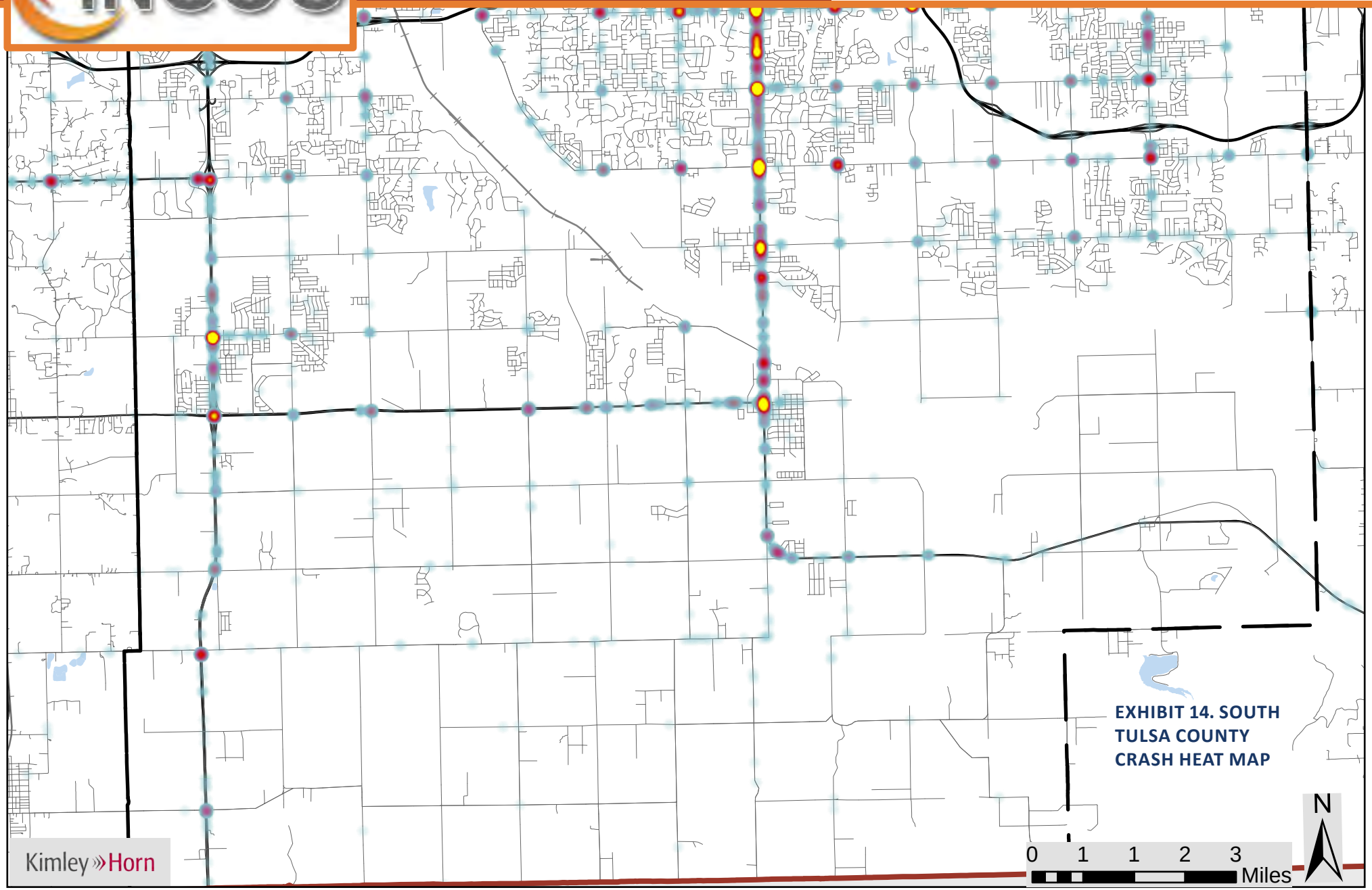
Dense



Kimley»Horn

INCOG Local Roads Safety Action Plan

Tulsa County South Heat Map



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Wagoner County

Wagoner County's Critical Crash Rate Analysis identified five segments for consideration as part of the High-Injury Network. These segments contain 45 KAB crashes and have a combined length of 4.6 miles. They include 2 fatal crashes, 3 severe injury crashes, and 2 minor injury crashes. **Table 7** summarizes these corridors, and **Exhibit 12** displays their locations.

FIGURE 11. WAGONER COUNTY CRASHES PER YEAR

**K – Fatal Crash; A – Serious Injury Crash; B – Minor Injury Crash*

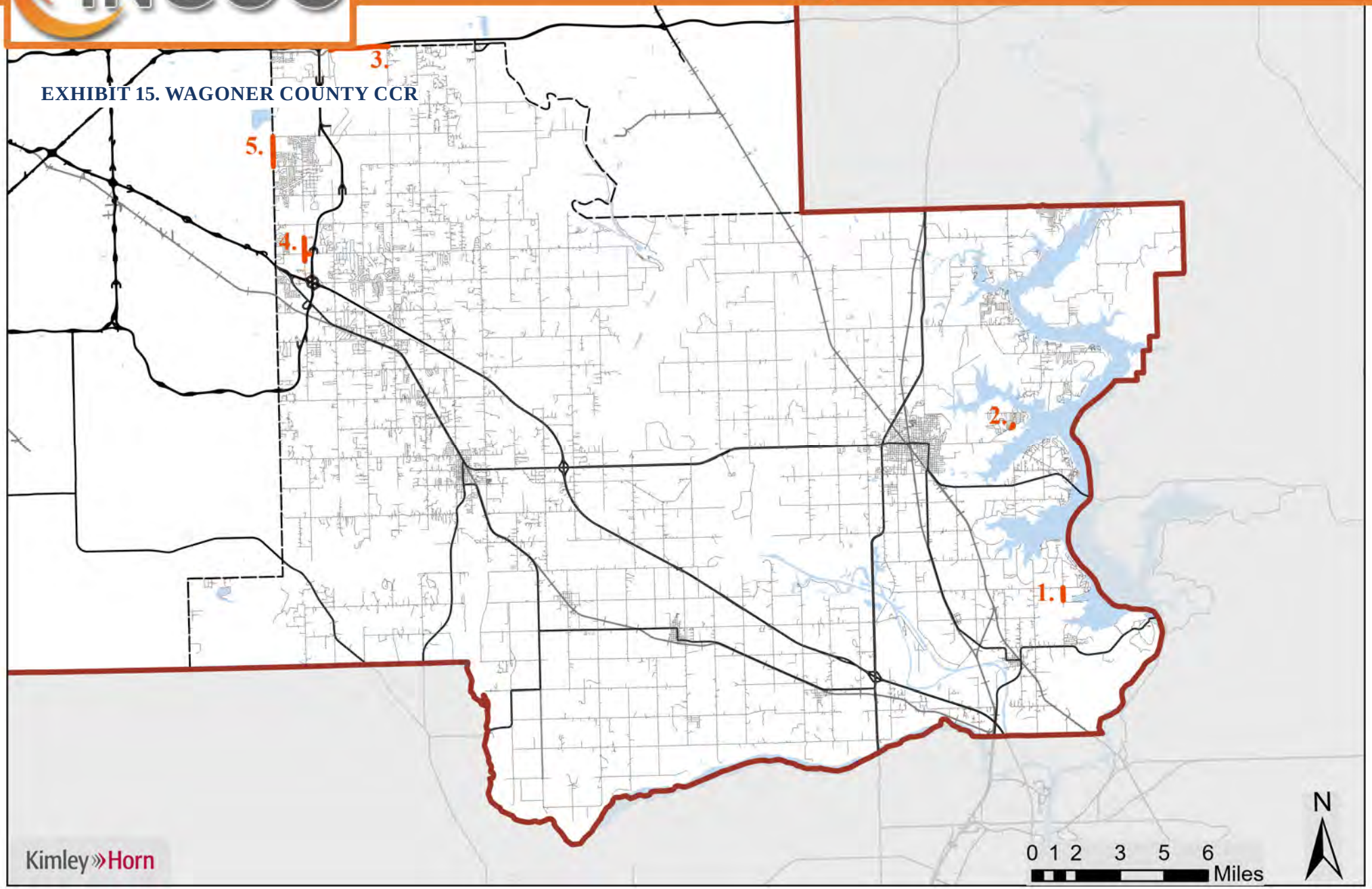
TABLE 7. WAGONER COUNTY TOP 5 HIN CORRIDORS

	JURISDICTION	CORRIDOR NAME	ORIGIN	ENDING	LENGTH (MI.)	TOTAL KABS	CRITICAL CRASH RATE RATIO
1	Unincorporated	N 55th St E	E 100th St N	E 95th St N	0.45	2	18.6
2	Toppers	Toppers Rd	S 319 Ct	E 724 Rd	0.14	1	11.7
3	Borderline- Fair Oaks/Tulsa	E Admiral Pl	S 4090 Rd	S 257 E Ave	2	2	6.8
4	Broken Arrow	N 37th St at E Kenosha St	–	–		1	5.7
5	Borderline- Tulsa/ Broken Arrow	County Line Rd	E 31st St	E 41st St S	1	1	4.6
				TOTAL MILES	***3.59***	**7**	

INCOG Local Roads Safety Action Plan

Wagoner County Top 5 Corridors

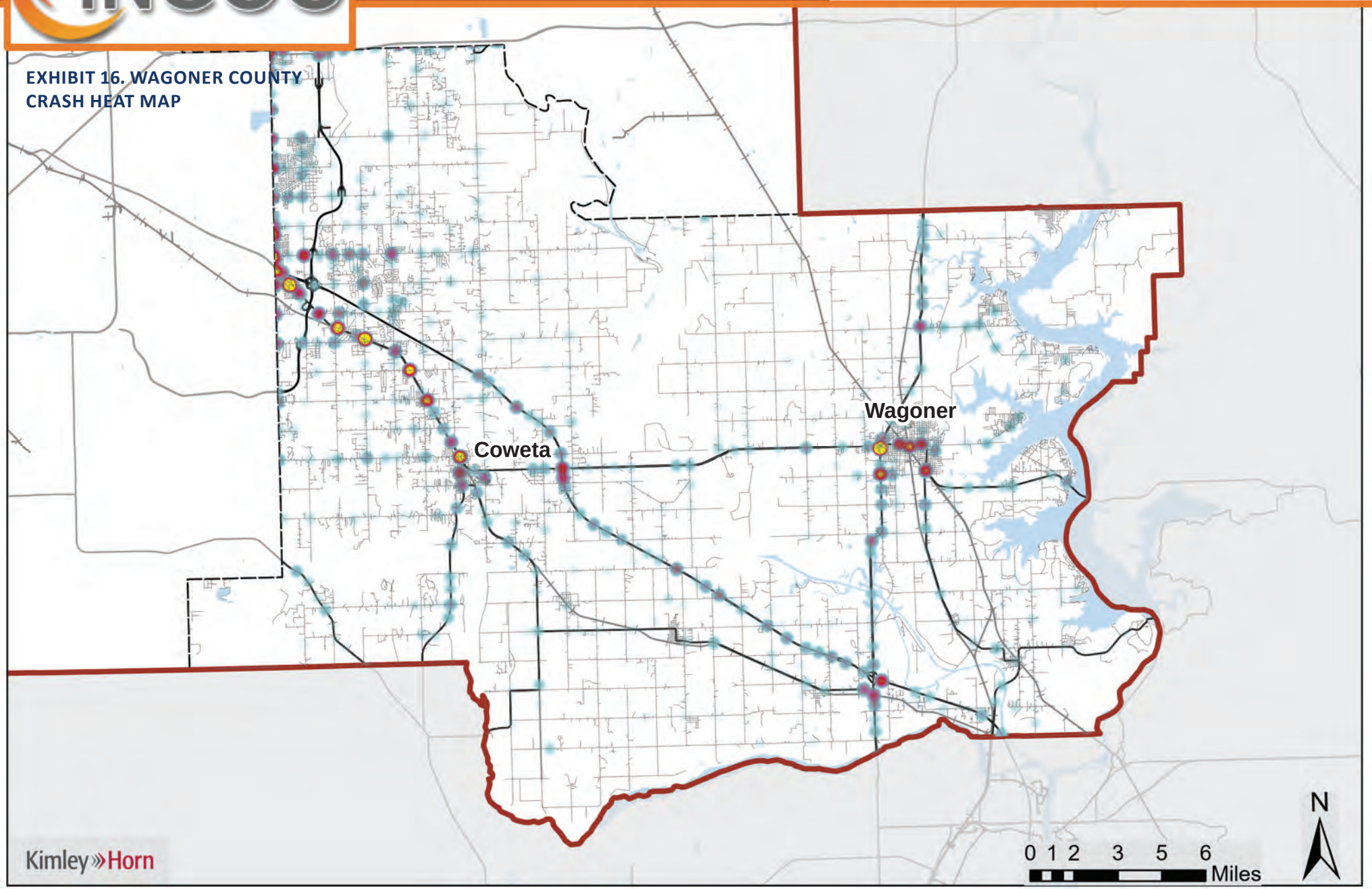
EXHIBIT 15. WAGONER COUNTY CCR



INCOG Local Roads Safety Action Plan

Wagoner County Crash Heat Map

EXHIBIT 16. WAGONER COUNTY CRASH HEAT MAP



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CHAPTER 3

COUNTERMEASURES

Photo Location: Osage County, Oklahoma

Credit: Roberto - stock.adobe.com

CHAPTER 3: COUNTERMEASURES

This chapter introduces a Systemic Countermeasure Toolbox, featuring a range of roadway safety measures that can be applied beyond the selected corridors into every project opportunity that presents itself as a means to enhance overall safety. Each subsection details individual countermeasures with a brief description of their applicability and provides some guidance for appropriate deployment.

SYSTEMIC COUNTERMEASURES

This section of the LRSAP describes systemic countermeasures that can be implemented across the INCOG region to enhance safety. Preference will be given to roadways and intersections along the HIN and areas of greatest need identified within the equity analysis.

A countermeasure toolbox is an extensive list of countermeasures and improvements designed to address specific traffic safety issues. INCOG will be equipped with a range of options and resources to improve safety and effectively enhance roadway performance. The systemic countermeasure toolbox is outlined in the table below, with each countermeasure assigned a corresponding Crash Modification Factor (CMF). The CMF represents the expected ratio of crashes after implementing the countermeasure. These values are sourced from the CMF Clearinghouse, a national resource that compiles reliable studies, educates users, and supports research to enhance the accuracy of CMF assignments. This list provides deployable countermeasures for the crash types and design contexts within the INCOG region, but other treatments may be utilized for specific projects or specific locations.

INCOG will be equipped with a range of options and resources to improve safety and effectively enhance roadway performance.

TABLE 8. COUNTERMEASURES SUMMARY

COUNTERMEASURES	CMF	CONTEXT (URBAN/RURAL)
Raised Medians	0.29	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
Roundabouts	0.59	Both
SafetyEdge[SM]	0.59	Rural
Sidewalks	0.60	Both
Corridor Lighting	0.68	Both
Crosswalk Visibility Enhancements	0.73	Both
Rumble Strips	0.74	Rural
High-Contrast Lane Markings	0.75	Both
Retroreflective Backplates	0.85	Both
Appropriate Speed Limits	0.86	Both
Corridor Access Management	0.93	Both
Speed Feedback Signs	0.95	Both
Wider Edge Lines	0.97	Both
Bike Facilities	–	Urban
Curb Extensions	–	Urban
Add New Paved Shoulder	0.67	Rural

Raised Medians

A raised median is a physical barrier or divider in the center portion of the roadway that separates opposing lanes of traffic on a roadway. Raised medians have a functional and aesthetic value. They are 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. They are most useful on roadways with high volumes, high speeds, and high driveway density. Installing a raised median has a CMF of 0.29.

FIGURE 12. RAISED MEDIANS

Source: INCOG –Riverside Drive, Tulsa, OK

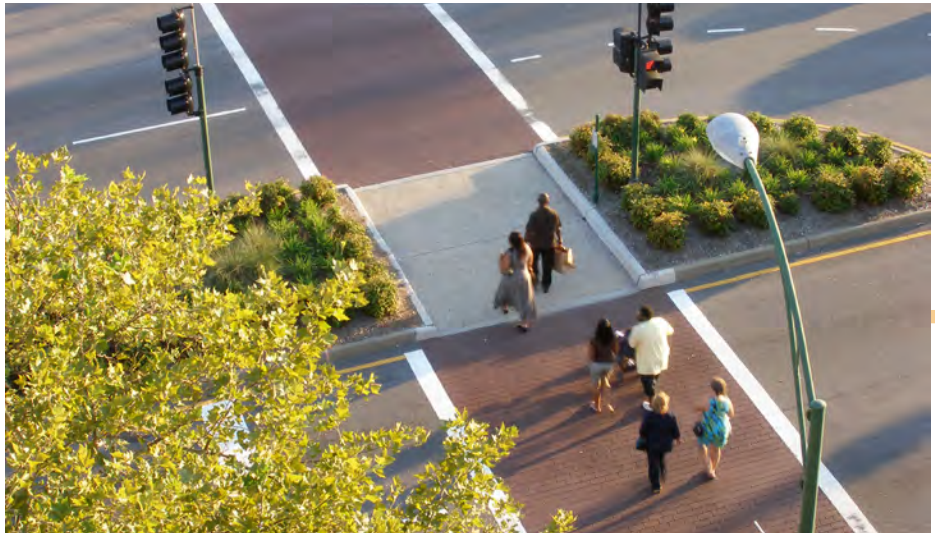
Rectangular Rapid Flashing Beacon (RRFB)

An RRFB is a pedestrian-activated safety device installed at crosswalks to enhance visibility and alert drivers to the presence of pedestrians. RRFBs consist of two rectangular-shaped yellow indicators, each with a light emitting diode (LED)-array-based light source. When activated 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. They are most effective at multi-lane crossings with posted speeds below 40 miph. Additionally, RRFBs should be installed at the median of the roadway if there is a pedestrian refuge or other type of median already present. 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.

FIGURE 13. RECTANGULAR RAPID FLASHING BEACON (RRFB)

Source: Adobe Stock

FIGURE 14. PEDESTRIAN REFUGE ISLANDS



Source: Adobe Stock

Pedestrian Refuge Islands

Pedestrian Refuge Islands are dedicated pedestrian "islands" in the middle of intersections that provide a safe place for vulnerable road users to stop when crossing a large and busy intersection. They 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.

FIGURE 15. MIDBLOCK CROSSINGS

Source: FHWA

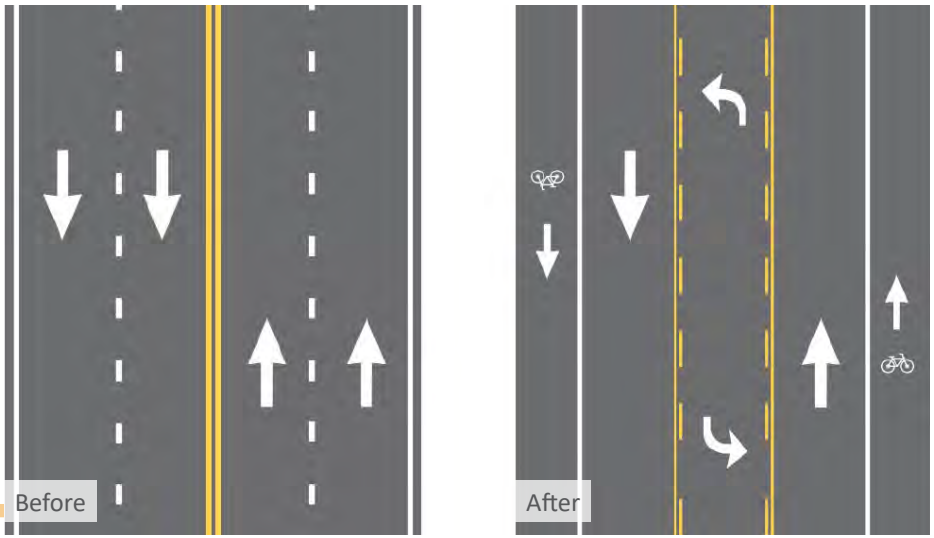
Midblock Crossings

These are designated pedestrian crossings away from an intersection and are an inexpensive method to increase pedestrian safety through clear visual cues to pedestrians and drivers of a crossing. These are particularly beneficial in the case of significant distance between pedestrian crossing points. Midblock crossings increase vulnerable road user safety by alerting drivers to pedestrian crossings and encouraging pedestrians to use dedicated crossing points. This countermeasure can be paired with other countermeasures in this toolbox to increase impact. Installing Midblock Crossings has a CMF of 0.45.

Roadway Reconfiguration

A Roadway Reconfiguration typically involves converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left turn lane. Implementing a roadway reconfiguration can improve safety, calm traffic, and provide better mobility and access for all users. A reconfiguration presents the opportunity to repurpose the existing ROW to improve mobility by making space for the addition of bike lanes or shared-use paths. Additionally, with the inclusion of a center turn lane, rear-end crashes can be greatly reduced due to the removal of conflict points during turning movements and through traffic. In the context of a 4-lane to 3-lane reconfiguration, a road segment can experience up to a 47% reduction in total crashes.

FIGURE 16. ROADWAY RECONFIGURATION

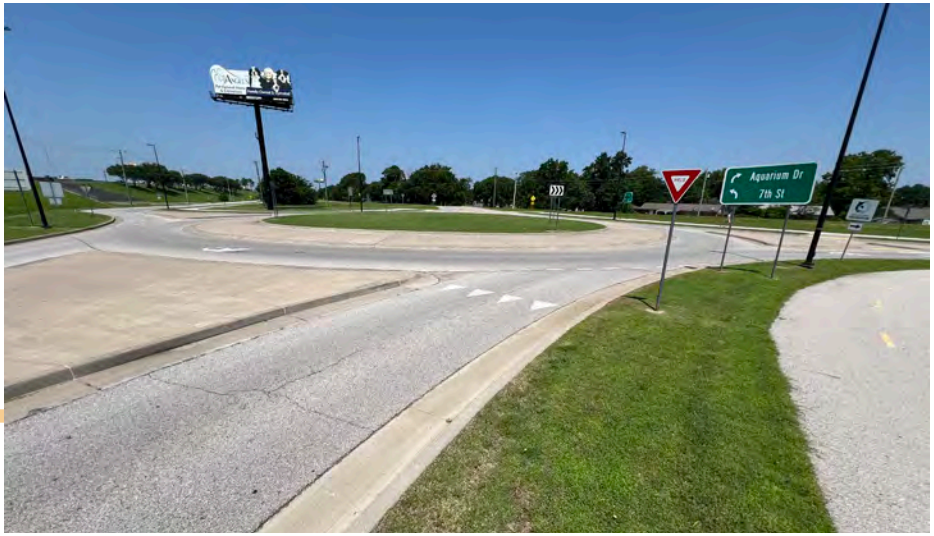


Source: FHWA

Roundabouts

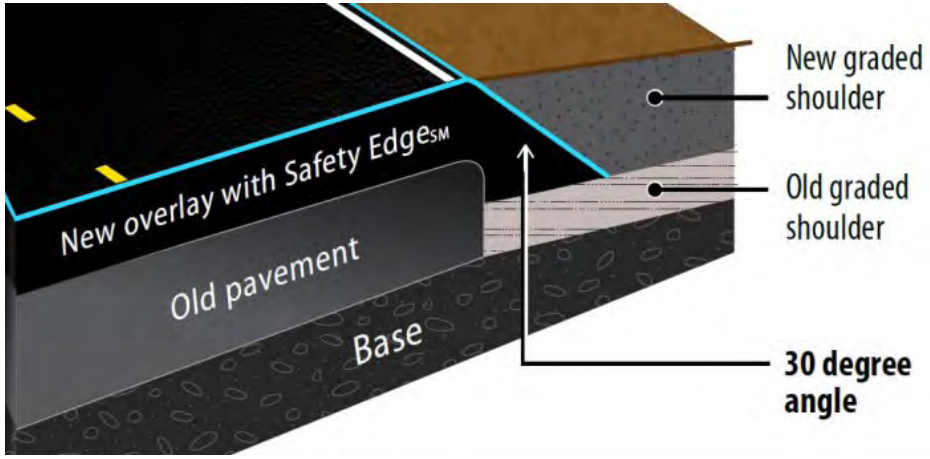
Roundabouts are intersections with a circular configuration that safely and efficiently moves traffic around a central island. Vehicles entering a roundabout must yield to traffic already circulating within, promoting a smooth and efficient flow of traffic. Roundabouts are designed to reduce vehicle speeds, establish clear right-of-way, and minimize conflict points while contributing to a better flow of traffic and reduced congestion. Crash severities are typically decreased due to a natural decrease in speeds. Roundabouts lead to a 78-82% reduction in fatal and injury crashes.

FIGURE 17. ROUNDABOUTS



Source: INCOG – Roundabout at Aquarium Drive, E 101st Street, and E 7th Street, Jenks, OK

FIGURE 18. SAFETYEDGE[SM]



Source: FHWA

SafetyEdge[SM]

A SafetyEdge[SM] is a low-cost treatment implemented in conjunction with pavement resurfacing to minimize drop-off-related crashes. This countermeasure is typically implemented on rural highways and can be categorized as a shoulder treatment. SafetyEdge[SM] can provide drivers with the opportunity to return to their travel lane while maintaining control of their vehicle. Safety benefits of this treatment include an 11% reduction in fatal and injury crashes, a 21% reduction in run-off-road crashes, and a 19% reduction in head-on crashes.

FIGURE 19. SIDEWALKS

Source: INCOG – Reconciliation Way and MLK Boulevard, Tulsa, OK

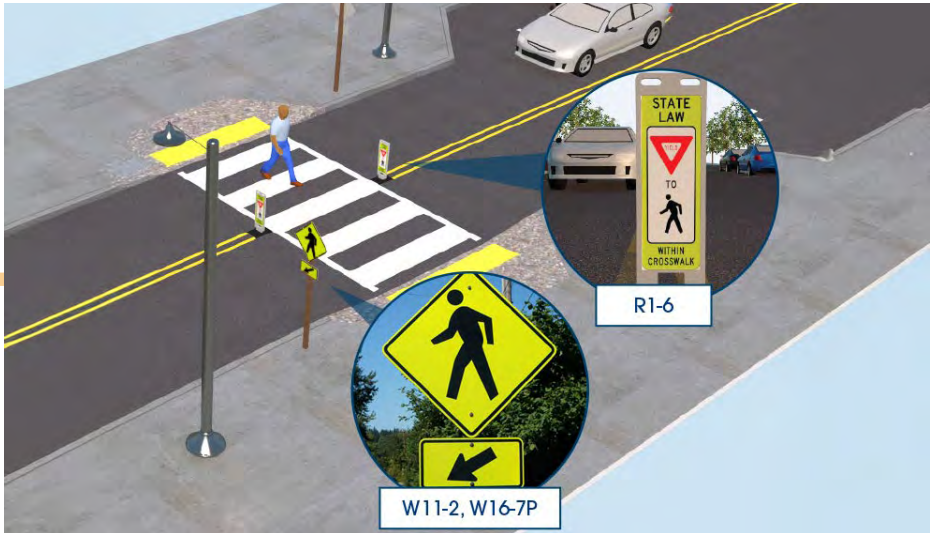
Sidewalks

A sidewalk is a defined space or pathway for use by a person traveling by foot or using a wheelchair. Sidewalks provide a safe and separate space for pedestrians of all ages and abilities. They improve the safety and mobility of pedestrians by increasing separation, reducing the risk of collision with vehicles, and promoting walking as a mode of transportation by increasing comfortability. Sidewalks can reduce pedestrian crashes by as much as 50%. In the INCOG region there are approximately 500 miles of sidewalk gaps along artieral streets.

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.

FIGURE 20. CROSSWALK VISIBILITY ENHANCEMENTS



Source: FHWA

Corridor Lighting

The number of fatal crashes during daylight and darkness are roughly equal, but the rate of nighttime fatality crashes is three times higher because only 25% of vehicle miles traveled (VMT) are at night. Higher speeds may prevent vehicles from stopping in time when hazards or changes appear 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%.

FIGURE 21. CORRIDOR LIGHTING

Source: Adobe Stock

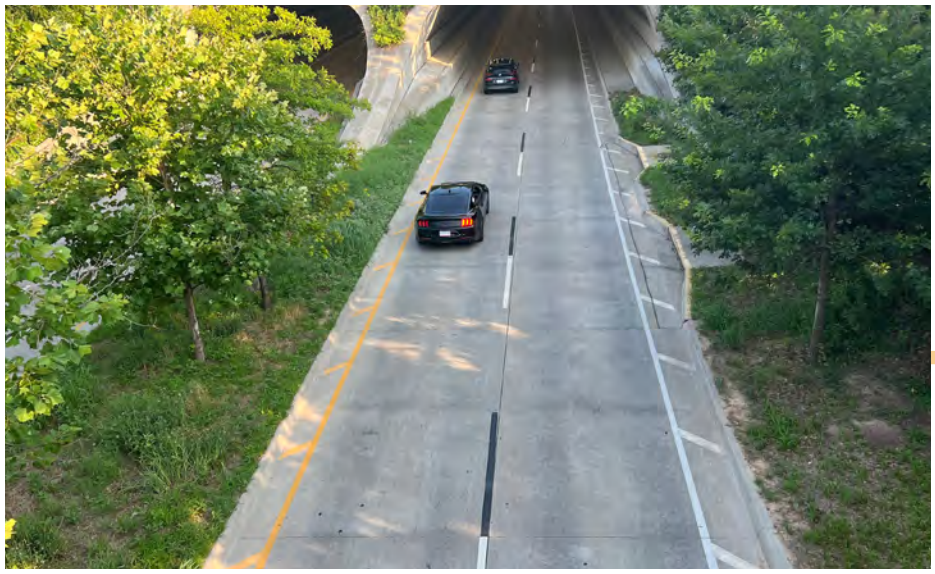
FIGURE 22. RUMBLE STRIPS

Source: Adobe Stock

Rumble Strips

Rumble Strips improve traffic safety by alerting drivers when they leave the traveled way. When a driver strays from the travel lane, rumble strips produce a noise and vibration that alerts 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.

FIGURE 23. HIGH-CONTRAST LANE MARKINGS



Source: INCOG – Riverside Drive, Tulsa, OK

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, distracted driving, and impaired driving-related crashes. Installing high-contrast lane markings has a CMF of 0.75.

Retroreflective Backplates

A backplate frames a signal head with a 1-to-3-inch yellow retroreflective border. It improves the signal head's visibility by introducing a controlled contrast background. Retroreflective backplates are also more visible and conspicuous in both daytime and nighttime conditions, which can reduce near misses and the risk of conflicts at intersections, as well as reduce distracted and impaired driving crashes. Installing retroreflective backplates has a CMF of 0.85. While this is a high CMF, deployment at a system-wide scale can be relatively inexpensive and can provide widespread benefits.

FIGURE 24. RETROREFLECTIVE BACKPLATES

Source: Adobe Stock

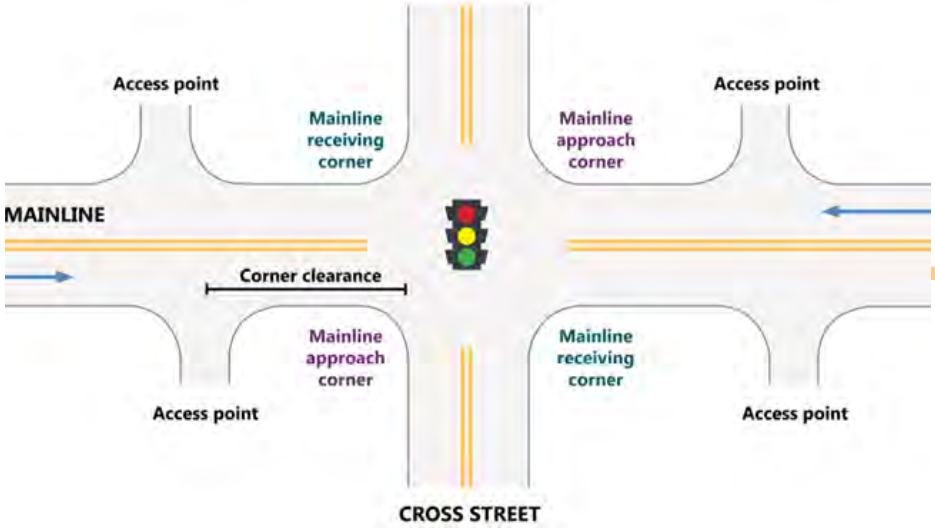
Appropriate Speed Limits

Using appropriate speed limits increases roadway safety by implementing speed limits that consider factors such as school/work zones, visibility, elevation changes, curves, congestion, and vulnerable road users. Implementing appropriate speed limits into street design increases roadway safety for all users. Speeding increases the fatality of all collisions, and this low-cost method of speed control reduces the danger of speed-related collisions. A pedestrian impacted by a vehicle traveling at 30 mph has a 45% chance of survival, with the rate of survival decreasing sharply as the speed of the vehicle increases.

FIGURE 25. APPROPRIATE SPEED LIMITS

Source: Adobe Stock

FIGURE 26. ACCESS MANAGEMENT



Source: FHWA

Access Management

Access Management involves the planning, implementation, and regulation of entry and exit locations along a roadway. Proper access management can improve safety for all travel modes and roadway users by limiting points of collision and reducing traffic congestion. Safety benefits include a 25% to 31% reduction in fatal and injury crashes along urban/suburban arterials.

FIGURE 27. SPEED FEEDBACK SIGNS

Source: Adobe Stock

Speed Feedback Signs

Speed Feedback Signs are traffic control devices that use a system of speed measurement and feedback to alert and warn drivers if exceeding the speed limit. Feedback signs typically consist of a display panel, often featuring LED or digital readouts, visually indicating the speed of approaching vehicles or a warning message. The 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.

Wider Edge Lines

Edge lines are the pavement markings at the edge of travel lanes, 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 width of four inches to the maximum normal width of six inches. Wider edge lines are an effective low-cost method of increasing traffic safety by improving travel lane visibility. They can reduce crashes by up to 22% for fatal and injury crashes on rural freeways.

FIGURE 28. WIDER EDGE LINES

Source: FHWA

BIKE FACILITIES

Bike facility improvements include Bike Lanes, Bicycle Boulevards, Signed Bicycle Routes, and Side Paths. Bike facilities provide cyclists with a designated roadway area to ride, improving safety by reducing conflict points between cyclists and motorists, while encouraging multimodal transportation. The expected reduction in crashes varies widely by facility type and by degree of separation. Generally, a greater speed difference between vehicles and bicycles requires a higher level of separation.

FIGURE 29. BIKE FACILITIES

Source: Adobe Stock

FIGURE 30. CURB EXTENSIONS

Source: INCOG – W 22nd Street and S Nogales Avenue, Tulsa OK

Curb Extensions

Curb Extensions visually and physically narrow the roadway, creating a safer and shorter pedestrian crossing while increasing the available space for pedestrians or other amenities. They also help with speed reductions and increased safety. There is currently no CMF for Curb Extensions.

FIGURE 31. ROADWAY SHOULDER

Source: FHWA

Paved Shoulders on 2-Lane Arterials

Paved shoulders on two-lane rural arterials are critical for improving safety, providing space for disabled vehicles, and reducing run-off-road crashes, which are a leading cause of severe injuries and fatalities. They also enhance mobility for bicyclists and agricultural equipment, which are common in rural areas within INCOG's region. Additionally, shoulders contribute to roadway longevity by protecting pavement edges from deterioration.

CHAPTER 4

IMPLEMENTATION PLAN

Photo Location: Osage County, Oklahoma

Credit: Roberto - stock.adobe.com

CHAPTER 4: IMPLEMENTATION PLAN

INTRODUCTION

> This LRSAP provides an opportunity to amplify elements that support a safer system and suggest new actions, policies, and procedures that are currently missing or could benefit from updates based on the state of the practice.

While infrastructure investments are vital to eliminating future severe and fatal injury crashes, a Safe System Approach also recognizes how engineering, enforcement, and education decisions are an outcome of planning, design, and policy guidelines in place when the decisions are made. This LRSAP provides an opportunity to amplify elements that support a safer system and suggest new actions, policies, and procedures that are currently missing or could benefit from updates based on the state of the practice.

This section outlines recommended actions that build on previous planning efforts to address current challenges, optimize performance for both new and existing roadway projects, and align with best practices. Some recommendations reflect proposed changes to policies and standards related to sidewalk infrastructure and other active transportation investments to ensure connected continuous facilities. Other recommendations explore code or program incentives that support the adoption of active transportation by making it more convenient for residents to bike or walk as part of their daily routines.

These recommendations will require a concerted and ongoing effort that may include new partners, such as the city or county governments, to review and adjust elements of their policies that impact traffic safety and transportation infrastructure. Next steps toward success will require ongoing coordination between INCOG and its partner jurisdictions to develop more detailed steps to achieve the actions below. Together, these policy and regulatory updates will enhance INCOG's efforts to achieve Vision Zero by creating a safer and more supportive environment for all active transportation modes.

To enhance the safety and accessibility of INCOG's roadways in alignment with Vision Zero, it is crucial to evaluate the impact of infrastructure projects on vulnerable populations and health outcomes over time. If evaluation efforts show that positive health and safety outcomes are not spread equitably across diverse community groups such as low-income residents, seniors, people of color, and individuals with disabilities, adjustments to implementation should be made.

The actions in the following tables amplify or recommend changes to actions documented in other INCOG plans and draw from best practices within each pillar. In total, there are 38 actions are recommended across the five pillars. It is imporant to note that the cost that is estimated to be associated with each action can vary widely depending on the action category, which may include procedural, operational, construction, or policy recommendations. Additionally, timeframes include Short (0-2 years), Medium (2-5 years), and Long (> 5 years).

THE FIVE PILLARS

ACTION MATRIX

TABLE 9. SAFER PEOPLE ACTION MATRIX

	ACTION	LEAD AGENCY	PARTNERS
SP1	Through the Travel With Care program, launch public workshops, events, and campaigns: 1. Promoting safe driving and road use. 2. Promoting courtesy towards pedestrians and bicyclists. 3. On dangers of distracted driving. 4. Reducing aggressive driving. 5. Correct usage of new traffic facilities (bike lanes, HAWK signals, etc.) 6. Proper use of seat belts while driving. Use targeted messaging via social/local media; partner with local organizations to share educational materials; engage with schools and workplaces.	INCOG	OHSO, Local Governments, School Districts, ODOT, Law Enforcement, Tribal Governments, Advocacy Organizations
SP2	Coordinate with school districts to create Safe Routes to School (SRTS) programs that improve pedestrian routes with crosswalks, lighting, and sidewalks.	INCOG, Local Governments, School Districts	Law Enforcement, Tribal Governments, ODOT
SP3	Enhance enforcement of speeding, red-light running, reckless driving with targeted patrols, prioritizing high-injury network corridors.	Law Enforcement	Local Governments
SP4	Conduct training for law enforcement on pedestrian and bicycling laws to ensure accurate understanding and enforcement.	Law Enforcement	Local Governments, INCOG, ODOT
SP5	Improve pedestrian and bicyclist safety infrastructure around public transit stops.	MTTA	INCOG, City of Tulsa, City of Sand Springs, City of Jenks, City of Broken Arrow
SP6	Provide opportunities for local and regional staff to attend Safe System, Vision Zero, and other safety-related webinars, trainings, and conferences. Invite elected officials and key decision-makers to participate in these educational opportunities as well.	INCOG	Local Governments, Tribal Governments
SP7	Conduct reviews of traffic crash data, safety metrics, and progress toward completed safety projects. Make this reporting accessible to the public.	INCOG	Local Governments, Tribal Governments

TABLE 11. SAFER SPEEDS ACTION MATRIX

	ACTION	LEAD AGENCY	PARTNERS
SS1	Implement Vulnerable Road User (VRU) safety countermeasures along high-crash corridors and at high-crash intersections.	Local Governments	INCOG, Local Governments, ODOT, Tribal Governments
SS2	Use radar speed feedback signs at high crash locations to discourage speeding and rotate periodically to prevent driver desensitization.	Local Governments	INCOG, School Districts, Local Governments, ODOT, Tribal Governments
SS3	Deploy flashing lights to enhance the visibility of traffic control devices at critical locations.	Local Governments	INCOG, Local Governments, ODOT, Tribal Governments
SS4	Develop guidance for using the Safe System Approach to set speed limits in the region that quantifiably accounts for road types, injury severity risk, modal priority, and land use context.	INCOG, ODOT	Local Governments, Tribal Governments

TABLE 10. SAFER VEHICLES ACTION MATRIX

	ACTION	LEAD AGENCY	PARTNERS
SV1	Through the Travel With Care program: 1. Promote vehicle maintenance awareness to ensure residents keep vehicles in safe operating condition (especially brakes, tires, lights, and mirrors). 2. Educate the public about the dangers of oversized and high-profile vehicles and encourage safer driving habits for operators of these vehicles.	INCOG	Local Governments, County Governments, Tribal Governments
SV2	Leverage the Federal Transit Agency's Section 5310 (Enhanced Mobility of Seniors & Individuals with Disabilities) program to encourage fleet operators to invest in vehicles equipped with modern safety features, such as lane departure warning, automatic emergency braking, blind spot sensors, and pedestrian detection technology.	Local Governments	County Governments, Tribal Governments, Local Businesses

TABLE 12. SAFER ROADS ACTION MATRIX

	ACTION	LEAD AGENCY	PARTNERS
SR1	Evaluate the High-Injury Network for locations to install proven safety countermeasures that prevent fatal and severe injury crashes for all roadway users.	INCOG, Local Governments	ODOT, Tribal Governments
SR2	Prioritize vulnerable road user safety improvements in communities where existing infrastructure does not support safe walking and biking.	Local Governments, INCOG	ODOT, Tribal Governments
SR3	Prioritize low-cost, high-impact countermeasures in local projects and in grant selection criteria.	Local Governments	INCOG, Local Governments, ODOT, Tribal Governments
SR4	Enhance bicycle and pedestrian infrastructure to increase the comfort and safety of vulnerable road users. Conduct community engagement before constructing bicycle infrastructure projects, such as protected bike lanes, standard bike lanes, side paths, and trails. Refer to the GO! Plan for further guidance.	Local Governments	INCOG, Local Governments, ODOT, Tribal Governments
SR5	Leverage road maintenance prioritization processes to implement low-cost treatments, such as restriping lane widths or improving crosswalk visibility, to encourage safer behaviors, reduce speeds, and minimize hazards.	Local Governments	INCOG, ODOT
SR6	Conduct Road Safety Audits on High-Injury Network corridors to identify appropriate crash countermeasures and prioritize improvements.	INCOG	Local Governments, Tribal Governments
SR7	Prioritize safety criteria in local funding decision-making processes. Integrate the High-Injury Network into grant selection criteria in order to prioritize safety countermeasures in roadway construction projects.	Local Governments,INCOG	Tribal Governments, ODOT

TABLE 13. POST-CRASH CARE ACTION MATRIX

	ACTION	LEAD AGENCY	PARTNERS
PC1	Improve emergency response times by optimizing traffic signal preemption for emergency vehicles.	Local Governments	INCOG, County Governments, Tribal Governments
PC2	Provide education to Law Enforcement on crash data recording. Improve crash data collection and data quality on crashes and injuries to better understand trends and refine safety initiatives.	Local Governments	INCOG, County Governments, ODOT, Tribal Governments
PC3	Encourage counseling programs to assist responders, victims, and witnesses in coping with trauma, PTSD, and recovery challenges.	Local Governments	County Governments, Tribal Governments, Local Businesses

PLAN ADMINISTRATION

INCOG and its partners are responsible for administering the plan. INCOG Staff will oversee the day-to-day implementation, monitoring, and amendments of the plan. This section details the administration activities. INCOG should work to integrate the above recommendations into their work plans with more specific next steps and responsible parties.

INCOG Transportation Planning Program

Through the Safe System Approach, the Transportation Planning Program will primarily oversee the administration and annual updates to the INCOG Board of Directors.

INCOG Board of Directors

The INCOG Board of Directors will play a pivotal role by providing continuous guidance and direction to staff and other boards and commissions and making decisions on budget allocations and regulatory modifications as specified in the Implementation Plan.

Other Boards, Committees, and Commissions

Various INCOG boards, committees, and commissions are designated to review and guide specific initiatives. They will play a crucial role in implementing the recommendations in the Implementation Plan that align with their focus areas.

LRSAP Advisory Committee and Other Partners

The LRSAP AC plays a crucial role in implementation by overseeing the plan's actions and initiatives to ensure goals are met efficiently and effectively. The committee provides continuous guidance, supports implementing agencies, monitors progress, and adjusts for emerging challenges. Additionally, the LRSAP AC fosters collaboration among stakeholders—including residents, regional entities, and external departments—facilitates communication and promotes community engagement to maintain momentum and accountability. Within the INCOG region, County and City governments will also assist in advancing the goals of the LRSAP. Their participation in the Implementation Plan will assist INCOG with specific

AMENDING THE PLAN

INCOG's LRSAP reflects a specific point in time, anticipating adjustments as the region evolves. To ensure the long-term viability of the vision, the implementation approach must be flexible and responsive to changing crash patterns. The Transportation Planning Program will identify adjustments to the High-Injury Network as trends shift. Additionally, a comprehensive review and update of the Plan should occur every five years to stay aligned with these trends as new data arises and reassess the relevance of the action plan strategies.

FUTURE PROJECT PRIORITIZATION

The LRSAP also informs the prioritization of future projects that are submitted as applications for INCOG funding. The LRSAP Planning Team reviewed a few scoring criteria to identify ways to incorporate traffic safety and advance the goals of the LRSAP through future projects. Revamping the project selection and funding process is critical to ensuring that transportation investments align with the goals of the LRSAP, prioritizing safety in roadway improvements. By refining the scoring criteria, INCOG can more effectively allocate resources to projects with the greatest potential to reduce fatal and serious injury crashes. A key adjustment involves removing Property Damage Only (PDO) crashes from consideration, as Vision Zero emphasizes the prevention of severe crashes rather than minor incidents. Including PDO crashes may skew data and lead to less effective outcomes, as reporting inconsistencies exist across jurisdictions, particularly in lower-income and rural areas. Additionally, ensuring that projects from smaller and rural areas remain competitive is essential, as these communities often face unique safety challenges despite having fewer miles in the High-Injury Network.

To strengthen the objectivity and effectiveness of the scoring process, INCOG should assign higher points to projects with the most effective CMFs, as these interventions have been proven to yield significant safety improvements. Consideration should also be given to multijurisdictional projects, as they often have a broader regional impact and require collaboration across agencies, making them more complex yet highly valuable. However, even while this document does provide guidance on improving roadway safety for new projects, no higher priority should be given on the merits of whether the roadway design elements are entirely new, or maintaining proven safety countermeasures. INCOG should formally adopt these scoring adjustments through a transparent review and approval process, engaging stakeholders to build consensus. By refining the selection criteria based on data-driven safety priorities, and objective evaluation methods, INCOG can ensure that funding decisions align with Vision Zero goals and effectively improve roadway safety for all users.

LESSONS LEARNED

The completed plan provides a solid foundation and sound framework for addressing key issues; however, through its development, the Planning Team identified a few scope limitations, methodological challenges, and additional topics worth exploring in greater depth. These insights serve as valuable lessons learned that can guide refinements and expanded focus areas in the next five-year update. The following components are recommended inclusions for INCOG's consideration for the next LRSAP update:

- Existing Conditions Maps to set the stage for the crash analysis task.
- Crash History Maps that identify locations for a variety of topics including but not limited to Contributing Factors, Severities, and Crash Types.
- The development of Crash Profiles that provide an analysis of combinations of environmental and design characteristics that yield the highest densities and severities of crashes throughout the INCOG Region. This analysis will equip INCOG with the knowledge of specific roadway characteristics that need to be reevaluated in future safety projects and can create a better focus when deploying safety countermeasures from the toolbox.
- An approach of High-Injury Network development that separates analysis and compares roadways by County. The vast differences in roadway design were greatly illuminated, as each county is experiencing significantly different traffic safety issues. Analyzing each county independently will allow for a more even distribution of roadway segments to focus on at a regional scale.
- The identification of specific roadway segments for further evaluation. INCOG should consider selecting key problematic segments to conduct Roadway Safety Audits which will yield targeted corridor recommendations to improve safety at key locations.
- Schematic Designs of selected Targeted Recommendations.
- Interactive Crash Dashboard. This publicly available dashboard will allow for a transparent display of crash data and HIN information.

APPENDIX

Photo Location: Osage County, Oklahoma

Credit: Roberto - stock.adobe.com

A

Photo Location: Jenks, Oklahoma

Credit: 4kclips - stock.adobe.com

APPENDIX A

LRSAP ADVISORY COMMITTEE

The Local Roads Safety Action Plan Advisory Committee (LRSAP AC) played a central role in guiding the planning process, fostering consensus, and taking ownership of the plan while offering essential feedback at key project milestones. The AC included first responders, ADA officials, city engineers, transit agencies, school districts, and tribal nations officials from across the region. LRSAP AC meetings were held on the following dates:

- **Meeting 1:** Kick-off and Goal Setting – July 11, 2024
- **Meeting 2:** Public Engagement Schedule and High-Injury Network Results – September 5, 2024
- **Meeting 3:** Transportation Equity Review, Policy Review, Process Changes – November 7, 2024
- **Meeting 4:** Draft Recommendations – February 6, 2025
- **Meeting 5:** Plan Adoption and Recognition of Advisory Committee Members – June 2025

Members of the LRSAP AC acted as advocates for the planning process and champions of the plan during its implementation. In the first LRSAP AC meeting, a mission statement was crafted to define the plan's purpose and reinforce a commitment to serving stakeholders and the broader community:

"We are committed to eliminating all traffic fatalities and serious injuries by embracing Vision Zero and following the Safe System Approach."

The LRSAP AC participated in various exercises, including a SWOT Analysis, HIN refinement, countermeasure prioritization, future INCOG Project Prioritization, and Implementation Plan refinement. The LRSAP AC also defined a target to reduce roadway fatalities and severe injuries. INCOG adopted this target and states, **"INCOG commits to reducing traffic fatalities and serious injuries by 50% by 2035."** Once the date is reached and the goal is accomplished, INCOG will reevaluate the target for refinement or establish a new target for future dates.

PUBLIC ENGAGEMENT

Public Engagement for the INCOG LRSAP included public events such as pop-up events, workshops, and online engagement. Support from the community plays an important role in the continued success and implementation of the Plan. Public Engagement involved residents, community leaders, and other key stakeholders to ensure the Plan accurately reflected the public's safety concerns.

Public Events

In-person public pop-up events and workshops were used to engage the public in the planning process. The pop-up events allowed residents to interact with the project team, understand the importance of safety in the Region, and share with residents how they can improve traffic safety in their communities. These events were held publicly to generate awareness about the Local Roads Safety Action Plan and Vision Zero.

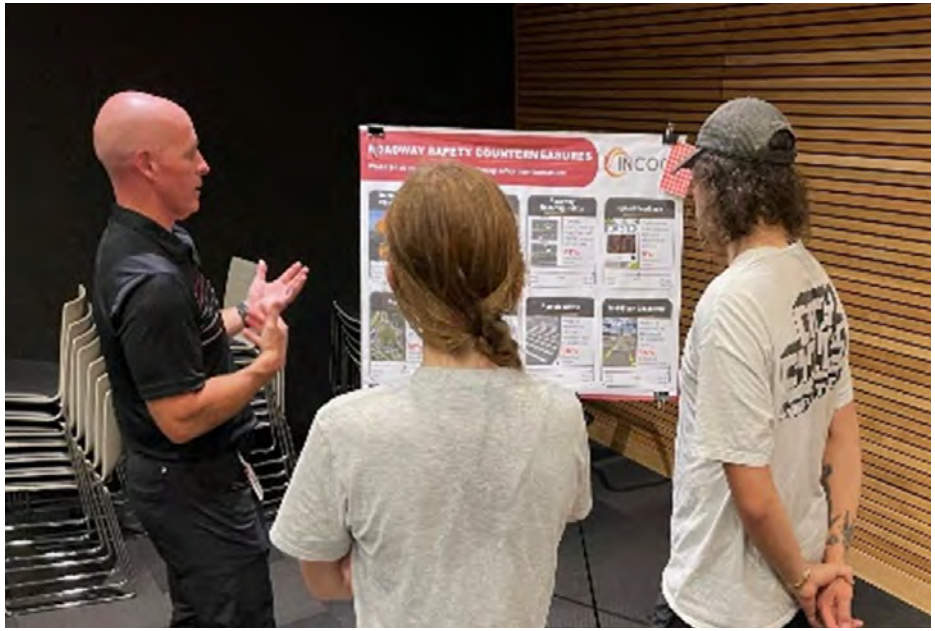
Public Pop-ups

Between October and December 2024, seven (7) public pop-ups were held to educate the community, raise awareness of the plan and its purpose, and receive feedback on the public's safety concerns. These pop-up events were held at local events such as the Tulsa Run, Safety Spooktacular, Shine on Greenwood, Tulsa Farmers Market, Skiatook Tree Lighting, and more. At these events, over six hundred (600) direct individual connections with the public were made, and five hundred (500) business cards with QR codes for the safety survey were handed out. **From these events, 25% of participants committed to Vision Zero.**

Team members interacted with the public at these events, gaining feedback on the public's thoughts on different safety countermeasures. Community members attending these pop-up events showed general interest in raised medians, separated bike lanes, roundabouts, and backplates with retroreflective boards.

FIGURE 32. POP-UP EVENT PARTICIPANTS

FIGURE 33. PHOTOS FROM PUBLIC WORKSHOPS



Public Workshops

Five (5) public workshops were held in late October. These workshops were geared at analyzing the Safety Analysis results, creating the High-Risk Network, and finding potential countermeasures. During these workshops, the project's team worked with attendees to analyze crashes by type to find targeted and systemic potential approaches grouped by emphasis area.

Tribal Nations Meetings

The INCOG LRSAP Study Area is completely encompassed within the Tribal Boundaries of three Nations: Cherokee, Osage, and Muscogee (Creek). Additionally, the Muscogee (Creek) and Cherokee Nations are currently undergoing their own Safety Action Plan processes. The INCOG LRSAP Planning Team conducted a series of meetings with each Tribal Nation to understand their unique safety concerns and share relevant information and data for the ongoing SAP processes. For both the Cherokee and Muscogee Nations' independent Safety Action Plans, the INCOG High-Injury Network will serve as a valuable resource in guiding their HIN development efforts.

INCOG Technical & Policy Committees

Throughout the project, Kimley-Horn and INCOG Staff provided periodical updates to the INCOG Technical & Policy Committees. These updates included public engagement, safety analysis, and the Draft Plan. These committees also participated during the comment period before the Plan was taken to the Board of Directors for approval.

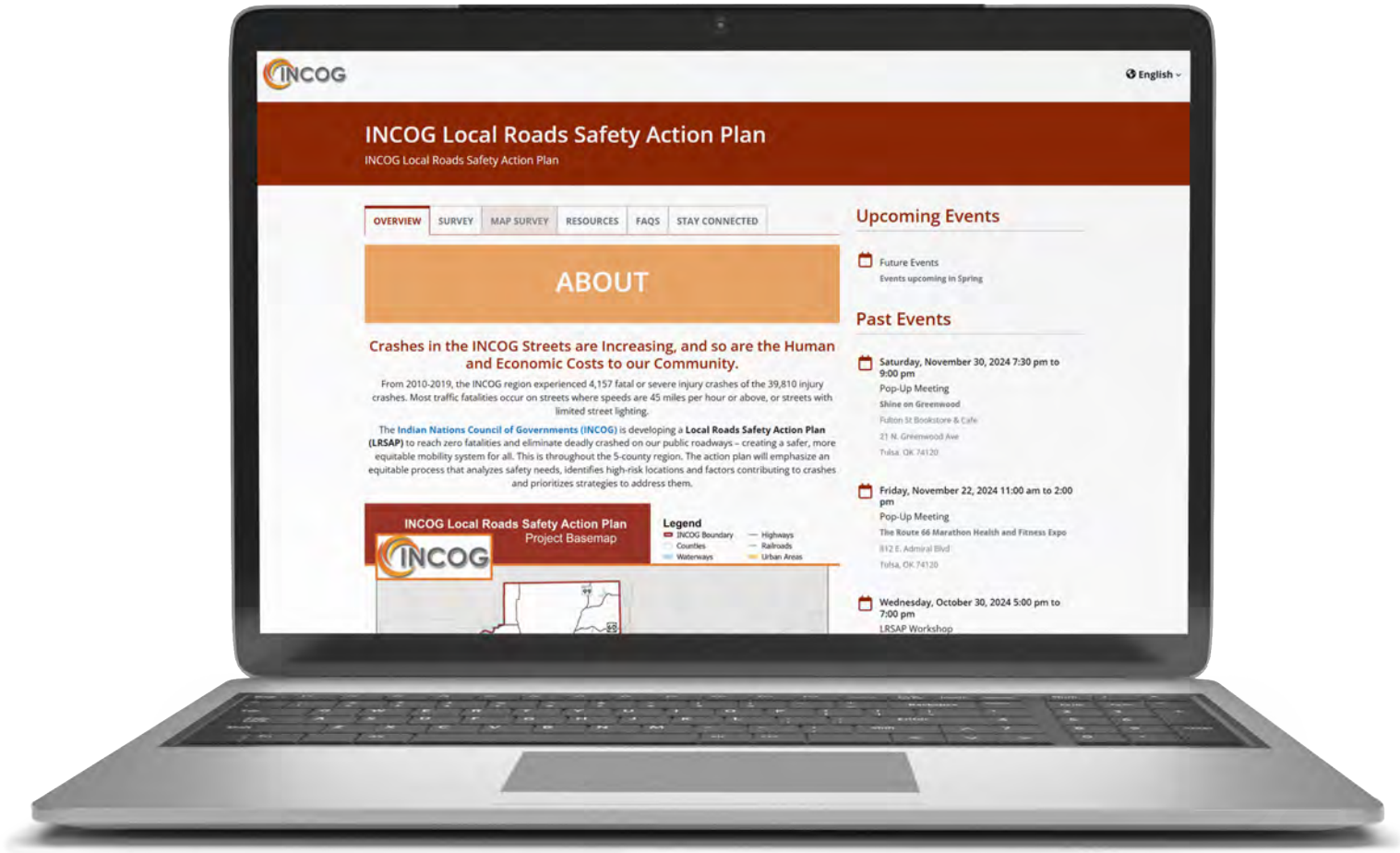
Public Hearing (INCOG Board of Directors)

At the conclusion of the process, the Plan was presented to the INCOG Board of Directors for their approval and adoption. This meeting was held on June 17th.

Online Engagement

Social Pinpoint was used throughout the Plan's development serving as a central online hub for information. The project website contained information on upcoming events, links to surveys and other helpful information, contact information, FAQs, and the Plan itself. These online surveys provided members of the community an opportunity to provide input on safety in the region. This effort received helpful feedback from both residents and stakeholders in the region.

FIGURE 34. PROJECT WEBSITE LANDING PAGE

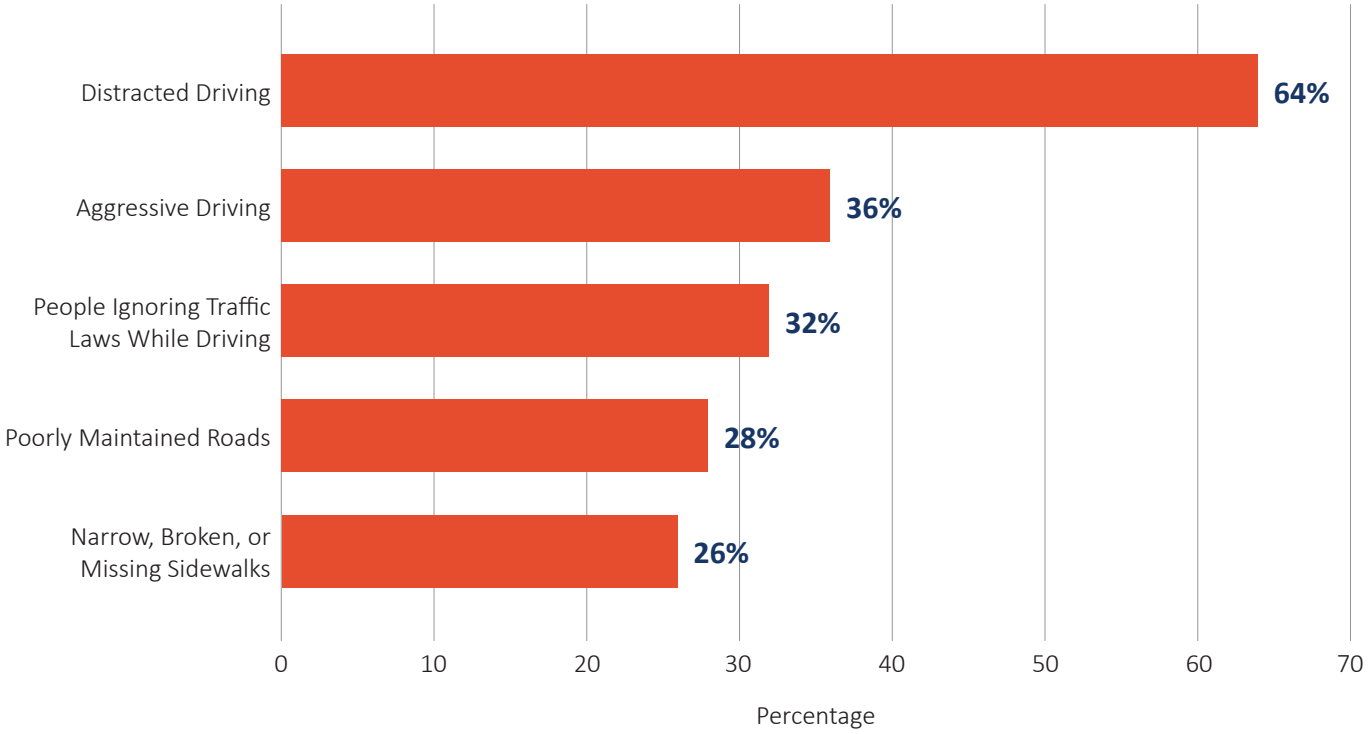


Written Survey

The written safety survey aimed at gathering information on demographics, commute, mode choice, and roadway safety concerns. Survey respondents were evenly divided, with the majority age ranging from 30 to 74. Most respondents live and work in the City of Tulsa; 49% live in the City of Tulsa, 13% in Broken Arrow, 9% in Tulsa County, and 7% in Rogers County. Data regarding where respondents worked showed 48% City of Tulsa, 23% Tulsa County, 13% Other, and 8% City of Owasso. It was found that most households have a 10–30-minute commute and use a car as the primary mode, while 56% of respondents support reducing speed limits to slow down unsafe drivers. The top three traffic safety concerns identified were Distracted Driving (64%), Aggressive Driving (36%), and People Ignoring Traffic Laws while Driving (32%).

Respondents showed support for investing in making active and public transportation safer and more accessible. 82% support investment in Pedestrian Safety, 67% support investment in Bicycling Safety, and 69% support investment in public transportation. Investment in Enforcement and Education is also important to most respondents. 79% show support for funding educational programs for driver safety and enhanced enforcement.

FIGURE 35. TOP 5 SAFETY CONCERNS



Map Survey

The Map Survey aimed to gather location-specific traffic safety concerns from the community. The survey received fifty-nine (59) contributions, with the majority of contributions, all but two (2), located in Tulsa. The top traffic safety concern from contributors was pedestrian safety (28.8%), followed by intersection safety (22%) and bicycle safety (13.6%).

FIGURE 36. MAP SURVEY SAFETY CONCERNS

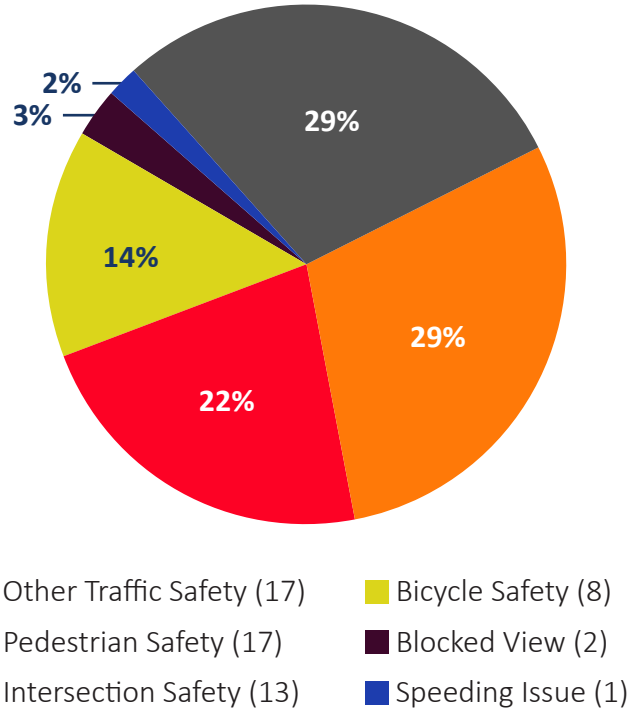
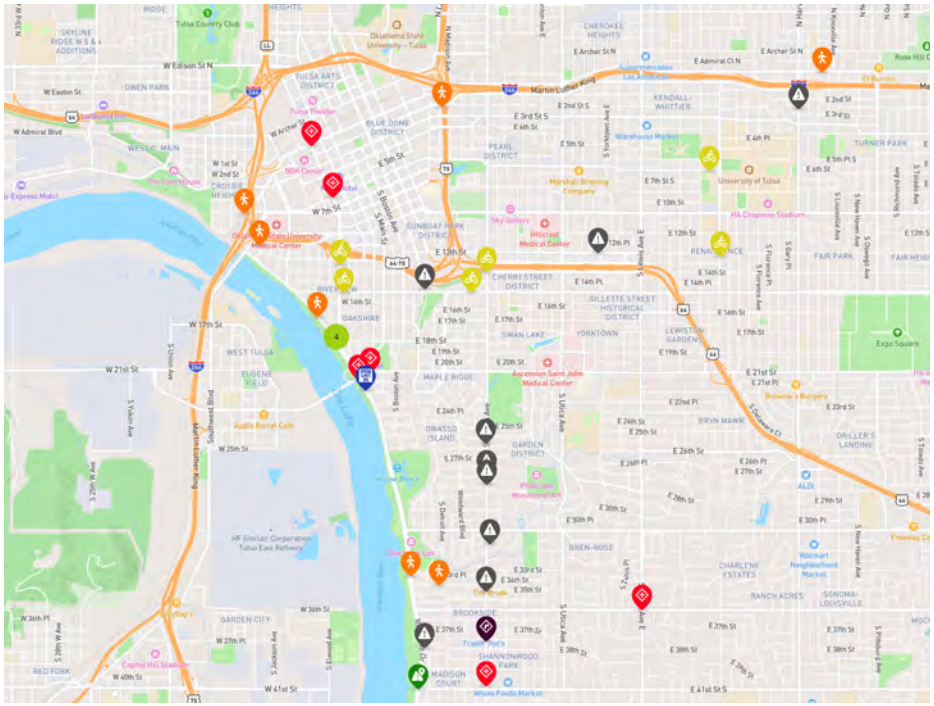


FIGURE 37. MAP SURVEY



Engagement Summary

Key Takeaways/Themes from Engagement

Responses from the Written Safety Survey highlight the **community's desire for a safer, more efficient, and more bicycle and pedestrian-friendly City** with efficient transit options.

ADDRESSING THESE ISSUES THROUGH:

Targeted infrastructure upgrades

Better traffic management

Enhanced enforcement

Enhanced education

COULD SIGNIFICANTLY ENHANCE SAFETY AND IMPROVE ACCESSIBILITY FOR ALL ROAD USERS.

B

Photo Location: Jenks, Oklahoma

Credit: 4kclips - stock.adobe.com

APPENDIX B

CRITICAL CRASH RATE ANALYSIS METHOD

The Critical Crash Rate (CCR) Analysis is a network screening method developed by the American Association of State Highway Transportation Officials (AASHTO) and included in the Highway Safety Manual (HSM). This analysis assesses the safety performance of road segments or intersections, aiming to identify locations with a higher likelihood of severe crashes. By identifying road segments with a higher likelihood of severe crashes, this tool can promote the prioritization of high-risk segments/points in a region's transportation network. The critical crash rate analysis is a valuable tool for identifying and addressing safety issues on our nation's transportation network.

The method for calculating critical crash rates involves comparing road segments with similar roadway functional classifications and contexts. The analysis involves collecting crash data and traffic volume data for a specific roadway segment or intersection over a defined period. By comparing the critical crash rates of different locations, transportation agencies can identify high-crash areas that require attention.

CCR Calculation

An ArcGIS Pro model was created to calculate the critical crash rate and supporting calculations for each roadway segment in the INCOG region. The model assigns crashes, weighted by their severity, to an adjacent segment and performs the calculations in the order outlined by the FHWA. The following section outlines the process used in calculating the critical crash rate using fatal and severe injury crashes from 2017-2021.

Crashes to Segments

Calculating the critical crash rate (CCR) requires four data inputs: roadway functional classification, context, daily traffic volumes, and weighted crash counts. The critical crash rate is calculated by dividing the number of severe crashes (fatalities and serious injuries) by the average daily traffic volume. Comparing road segments of similar functional classifications and normalizing them by their daily traffic volumes allows for the most meaningful results. This rate (CCR) helps identify areas where crashes occur at a higher frequency than traffic volume. The result is a rate of crashes per hundred million vehicle miles traveled (HMVMT).

Weighting

The goal of the LRSAP and Vision Zero is to reduce fatalities and serious injuries, and this crucial step was added to the Critical Crash Rate Calculation.

Calculate Variables

The critical crash rates are calculated using the variables and equations outlined in the FHWA's Highway Safety Manual (HSM). The critical crash rate compares the difference between the observed crash rate and the expected crash rate. The observed crash rate represents the fatal and serious injury crashes on each road segment per hundred million vehicle miles traveled (HMVMT). For the expected average crash rate per HMVMT, the daily volumes for each functional class were normalized. Roadways were only compared to other roadways of a similar functional classification. Once calculated, his equation highlights the segments that display a higher-than-expected crash rate than similar roadways.

Calculate Critical Crash Rate Ratio (CCRR)

A ratio is used to identify the magnitude of the 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 the segment's crash history is greater than roadways of similar functional classification, daily volumes, and context. Segments with a ratio of 1.0 or greater are then flagged as potential HIN segments.

C

Photo Location: Jenks, Oklahoma

Credit: 4kclips - stock.adobe.com

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APPENDIX C

REGIONAL FATALITIES PER 100K POPULATION (ANNUAL RATE)

REGION	POPULATION	FATALITIES (2017-2021)	FATALITIES/100K
INCOG	963,072	588	12.2
TMA	883,436	467	10.6
ADJUSTED URBAN AREAS	773,692	385	10.0
CENSUS URBAN AREAS	722,810	320	9.0

COUNTY FATALITIES PER 100K POPULATION (ANNUAL RATE)

COUNTY	POPULATION	FATALITIES (2017-2021)	FATALITIES/100K
CREEK	71,754	66	18.4
WAGONER	80,981	59	14.6
ROGERS	95,240	69	14.5
OSAGE	45,818	33	14.4
TULSA	669,279	361	10.8

CITY FATALITIES PER 100K POPULATION (CONTINUED)

CITY	POPULATION	FATALITIES (2017-2021)	FATALITIES/100K
Fair Oaks	73	1	274.0
Liberty	153	2	261.4
Kellyville	1,019	3	58.9
Mounds	932	1	21.5
Catoosa	7,440	7	18.8
Sapulpa	21,929	16	14.6
Tulsa	413,066	263	12.7
Coweta	9,654	6	12.4
Mannford	3,262	2	12.3
Skiatook	8,450	5	11.8
Wagoner	7,621	4	10.5
Glenpool	13,691	7	10.2
Chelsea	1,991	1	10.0
Sand Springs	19,874	9	9.1
Drumright	2,560	1	7.8
Pawhuska	2,984	1	6.7
Bixby	28,609	9	6.3
Broken Arrow	113,540	33	5.8
Claremore	19,580	5	5.1
Bristow	4,248	1	4.7
Owasso	38,240	8	4.2
Verdigris	5,256	1	3.8
Collinsville	7,881	1	2.5
Jenks	25,949	1	0.8
Avant	301	0	0.0
Barnsdall	1,034	0	0.0
Burbank	123	0	0.0

CITY	POPULATION	FATALITIES (2017-2021)	FATALITIES/100K
Depew	411	0	0.0
Fairfax	1,136	0	0.0
Foraker	18	0	0.0
Foyil	368	0	0.0
Grainola	31	0	0.0
Hominy	3,329	0	0.0
Inola	1,890	0	0.0
Kiefer	2,187	0	0.0
Lawrence Creek	121	0	0.0
Liberty CDP	214	0	0.0
Lotsee	6	0	0.0
Oilton	885	0	0.0
Okay	505	0	0.0
Oologah	1,305	0	0.0
Osage	177	0	0.0
Porter	561	0	0.0
Prue	374	0	0.0
Redbird	89	0	0.0
Shamrock	65	0	0.0
Shidler	328	0	0.0
Slick	151	0	0.0
Sperry	1,115	0	0.0
Talala	258	0	0.0
Tullahassee	83	0	0.0
Valley Park	19	0	0.0
Webb	58	0	0.0
Wynona	370	0	0.0

D

Photo Location: Jenks, Oklahoma

Credit: 4kclips - stock.adobe.com

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APPENDIX D

SAFETY BEST PRACTICES MEMORANDUM


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