2025 SAFETY POLICY STUDY

BISMARCK-MANDAN MPO

December 16, 2025

Bismarck-Mandan
Metropolitan Planning Organization

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Acknowledgements

The Bismarck-Mandan Metropolitan Planning Organization (BMMPO) Safety Policy Study is a product of a collaborative effort and commitment from BMMPO staff, the Steering Committee (SC), Technical Advisory Committee (TAC), and Policy Board. The Project team would also like to acknowledge stakeholders and community members within the region who participated and provided instrumental feedback to guide the Safety Policy Study.

Bismarck-Mandan Metropolitan Planning Organization Staff

- Kim Riepl, Executive Director
- Stephen Larson, Transportation Planner
- Tracy Walters, Transportation Specialist
- Paulette Jacobsen, Transit Planner

Steering Committee

- Gabe Schell, City of Bismarck
- Chris Holzer, City of Bismarck
- Daniel Nairn, City of Bismarck
- Dan Schriock, Burleigh County
- Deidre Hughes, Bis-Man Transit
- Loretta Marshik, City of Lincoln
- Jarek Wigness, City of Mandan
- John Saiki, Morton County
- Kim Riepl, Bismarck-Mandan MPO
- Kristen Sperry, FHWA ND Division
- Will Hutchings, NDDOT
- Logan Biese, NDDOT Bismarck District
- Mitch Flanagan, Burleigh County
- Natalie Pierce, Morton County
- Ranae Tunison, FTA Region 8

Consultant Team

- Luke Champa, SRF Consulting
- Jolene Rieck, Emergent Strategies Group
- Scott Harmstead, SRF Consulting
- Sarah Couture, SRF Consulting
- Erik Thorkelson, SRF Consulting
- Peter Dirks, SRF Consulting
- Will Fenner, SRF Consulting
- Julian Padilla, SRF Consulting
- Josie Myers, SRF Consulting

Letter from the Bismarck-Mandan Metropolitan Planning Organization

Dear Residents and Visitors of the Bismarck-Mandan Region,

Safety on our roads is more than a transportation issue — it's a public health and community priority. Every trip in the Bismarck-Mandan region should begin and end safely, regardless of travel mode, age, or ability. Yet too many lives have been permanently changed by traffic crashes.

Between 2020 and 2024, 281 people in the Bismarck-Mandan planning area died or experienced life-changing injuries due to traffic crashes. Many involved vulnerable road users: pedestrians, bicyclists, and motorcyclists.

The Bismarck-Mandan Metropolitan Planning Organization's (BMMPO's) Safety Policy Study is the region's first safety-focused plan — a proactive, data-informed approach to reducing fatal and life-changing injury crashes. It provides a unified set of strategies to achieve a regional safety vision and goal.

The Study identifies key corridors with historically severe crashes — the High-Injury Network — and prioritizes improvements where they will have the greatest impact. It also emphasizes equity, ensuring all people — regardless of income, age, ability, or travel mode — benefit from safer infrastructure and policies.

Central to the plan is the Safe System Approach, which recognizes that while human error is inevitable, death or serious injury should not be. This approach builds safety into every part of the transportation system — from policy and road design to speed management and user behavior.

This work cannot be done in isolation. Achieving regional safety goals requires collaboration across public health, planning, law enforcement, education, advocacy, and policymaking — and input from those who use our roads every day: you.

At BMMPO, we believe loss of life and life-changing injuries are unacceptable. The Safety Policy Study is more than a report — it's a call to action. Together, we can shape a future where our transportation system works safely for everyone.

Sincerely,
Kim Riepl
Executive Director
Bismarck-Mandan Metropolitan Planning Organization

Acronyms and Glossary

Acronym	Definition
AADT	Average Annualized Daily Traffic
ADA	Americans with Disabilities Act
APP	Areas of Persistent Poverty
BIL	Bipartisan Infrastructure Law
BN	Burlington Northern
BNSF	Burlington Northern Sante Fe
BMMPO	Bismarck-Mandan Metropolitan Planning Organization
CA	Cultural Actions
CPTED	Crime Prevention Through Environmental Design
CR	County Road
CRF	Crash Reduction Factor
CRSP	County Road Safety Plan
EPDO	Equivalent Property Damage Only
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Authority
HIN	High-Injury Network
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
KABCO Injury Severity Scale	National Standard, Crash Severity Reporting ▪ K: Fatal Injury ▪ A: Incapacitating Injury ▪ B: Non-Incapacitating Injury ▪ C: Possible Injury ▪ O: Property Damage Only
LRSP	Local Road Safety Plan
MPA	Metropolitan Planning Area
MPO	Metropolitan Planning Organization
NDDOT	North Dakota Department of Transportation
NDSC	North Dakota Safety Council
NRSS	National Roadway Safety Strategy
OHV	Off-Highway Vehicle
PHB	Pedestrian Hybrid Beacon
PPP	Public Participation Plan
RCUT	Restricted Crossing U-Turn
RRFB	Rectangular Rapid Flashing Beacon
SC	Steering Committee
SHSP	Strategic Highway Safety Plan
SS4A	Safe Streets and Roads for All
SSA	Safe System Approach
SSRDH	Safe System Roadway Design Hierarchy
STIP	Statewide Transportation Improvement Program
TAC	Technical Advisory Committee
TIP	Transportation Improvement Program
USDOT	United States Department of Transportation
VPD	Vehicles Per Day
VRU	Vulnerable Road User

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Chapter 1 - Introduction & Background

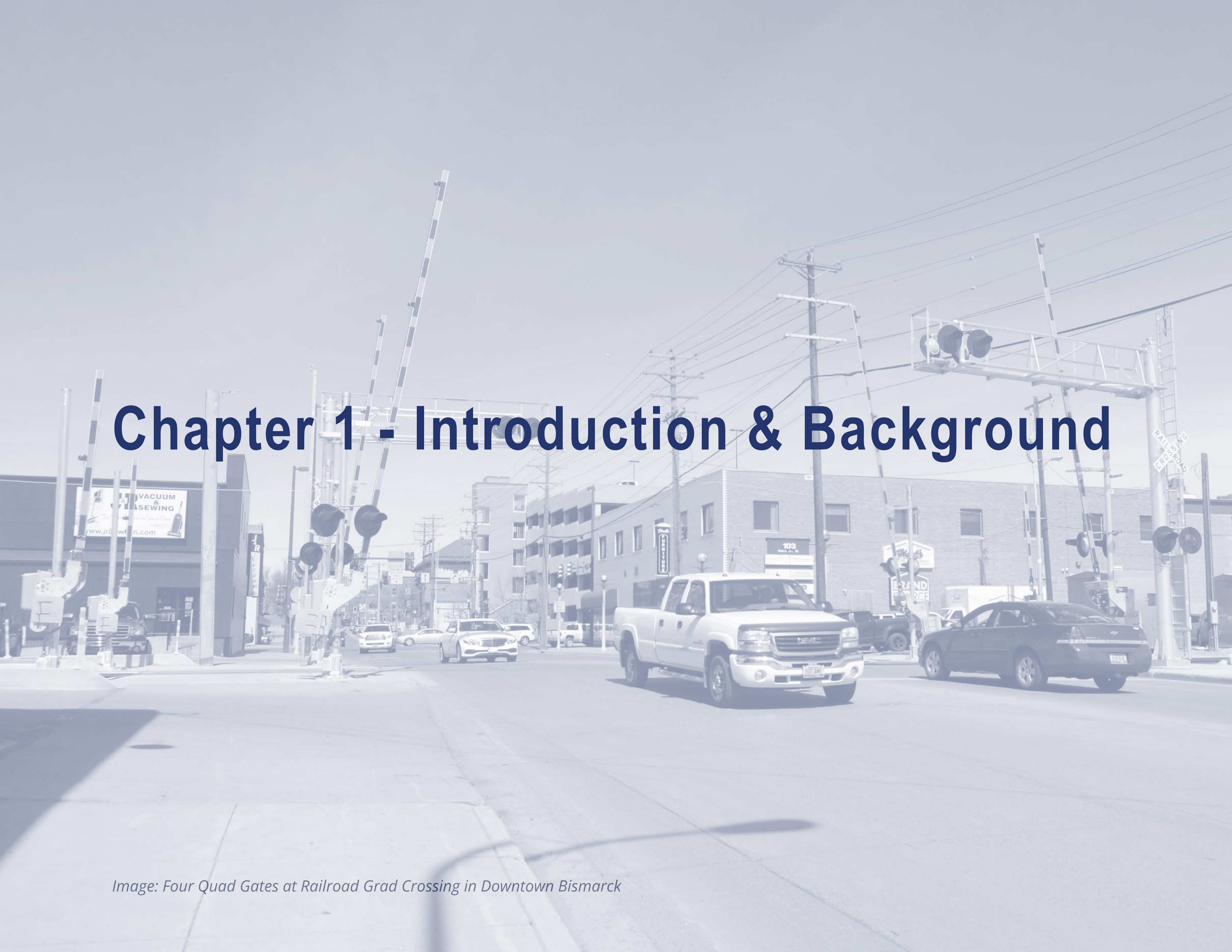


Image: Four Quad Gates at Railroad Grad Crossing in Downtown Bismarck

Safety Policy Study Introduction

The Safety Policy Study (Study) is the first MPO-led regional safety study for the Bismarck-Mandan Metropolitan Planning Organization's (BMMPO's) Metropolitan Planning Area (MPA). The Study will identify countermeasures and safety strategies that are appropriate for typical roadway types or typical intersections in the Bismarck-Mandan region. The plan will help local jurisdictions assign effective strategies based on context which can be navigated through a toolkit. This will help position communities to implement right-sized infrastructure solutions and pursue additional safety funding resources, such as through the Highway Safety Improvement Program (HSIP) and Safe Streets and Roads for All (SS4A) Program.

About the BMMPO

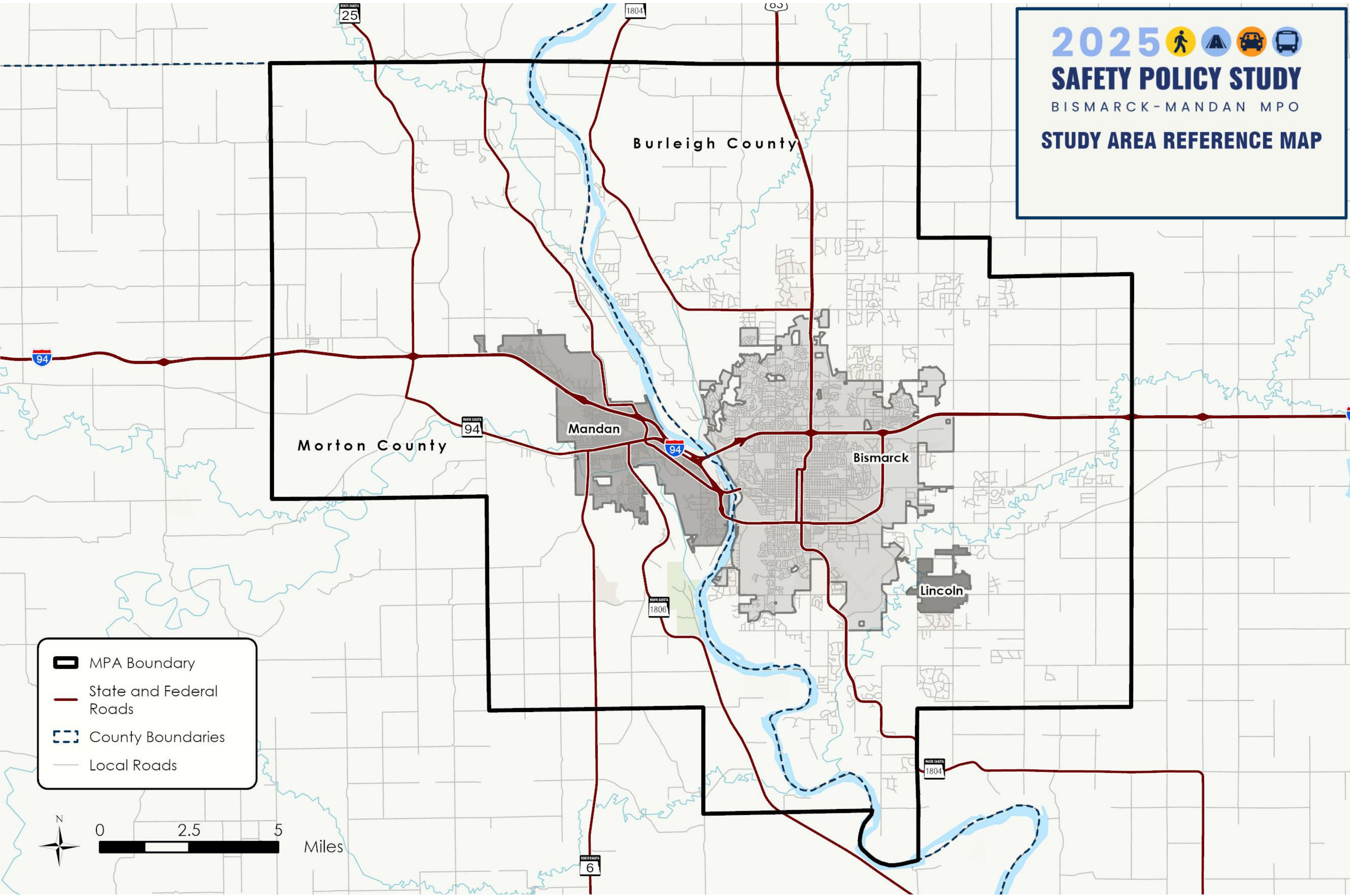
The Bismarck-Mandan Metropolitan Planning Organization (BMMPO) is the federally designated Metropolitan Planning Organization (MPO) for the Bismarck-Mandan Metropolitan Planning Area (MPA). The BMMPO facilitates implementing agencies (including municipal planning and engineering departments, county highway departments, and state departments of transportation) to prioritize local transportation investments in a coordinated way consistent with regional needs, as outlined in *Arrive 2050 Metropolitan Transportation Plan*. The mission of BMMPO is to harmonize the activities of federal, state, and local agencies, render technical assistance, and encourage public participation in the development of the area. BMMPO brings communities together to prioritize, coordinate, and fund transportation projects in the MPA, while supporting regional land use, and environmental and economic objectives.

The BMMPO is comprised of the following partner agencies and jurisdictions:

- North Dakota Department of Transportation (NDDOT)
- Burleigh County
- Morton County
- City of Bismarck
- City of Lincoln
- City of Mandan
- Bis-Man Transit
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)

The MPA and local jurisdictions comprising the Safety Policy Study's 'study area' are highlighted in **Figure 1**.

Figure 1. BMMPO Metropolitan Planning Area/Study Area Map



Steering Committee

The Study's development, including the public engagement approach, was guided by the Steering Committee (SC). The SC was comprised of various technical professionals representing BMMPO and partner agencies. The SC was involved throughout the entire duration of the Study's development and provided:

- Thoughts about overall Study development and deliverables.
- Review of key materials and deliverables.
- Ideas to better engage regional residents/stakeholders.
- Local perspectives and insight.
- Technical perspectives and insight.

Six (6) SC meetings were held at critical milestones, covering the following topics:

SC Meeting #1

The SC kickoff meeting established the project process and ensured that all SC members and the project team shared a common understanding of the goals for Study development and desirable outcomes. There was critical discussion regarding current state of safety practice in the MPA and the public engagement and communication strategies that work best in the region.

Steering Committee Members:

- Kim Riepl, BMMPO
- Gabe Schell, City of Bismarck
- Daniel Nairn, City of Bismarck
- Christopher Holzer, City of Bismarck
- Deidre Hughes, Bis-Man Transit
- Jarek Wigness, City of Mandan
- Loretta Marshik, City of Lincoln
- Dan Schriock, Burleigh County
- Mitch Flanagan, Burleigh County
- John Saiki, Morton County
- Natalie Pierce, Morton County
- Logan Biese, NDDOT – Bismarck District
- Will Hutchings, NDDOT
- Kristen Sperry, FHWA – ND Division
- Ranae Tunison, FTA – Region 8

SC Meeting #2

The second SC meeting presented critical information regarding existing policies, plans and studies, and other guidelines related to transportation safety in the MPA. The SC also discussed the safety analysis approach and established the preliminary vision and goals to be included as part of the Study.

SC Meeting #3

Steering Committee (SC) #3 presented results of the community conversations events and preliminary safety analysis results. There was a general discussion about the crash trend summary and HIN results including where additional data may be analyzed to highlight unique or interesting crash trends in the MPA.

SC Meeting #4

The fourth SC meeting presented a final summary of focus group and stakeholder meetings, finalized crash summary results, and the preliminary safety countermeasure toolbox for the MPA. Steering Committee (SC) members discussed preference and feasibility of toolbox options including engineering and non-engineering strategies.

SC Meeting #5

Steering Committee (SC) meeting #5 presented the draft Study report, focusing on the outline and organization of the report. The SC members discussed strategies and implementation outcomes of the Study, including timeline for comments to incorporate into the final draft document.

SC Meeting #6

The final SC meeting highlighted the final draft Study report and how SC comments were incorporated into the final draft document.

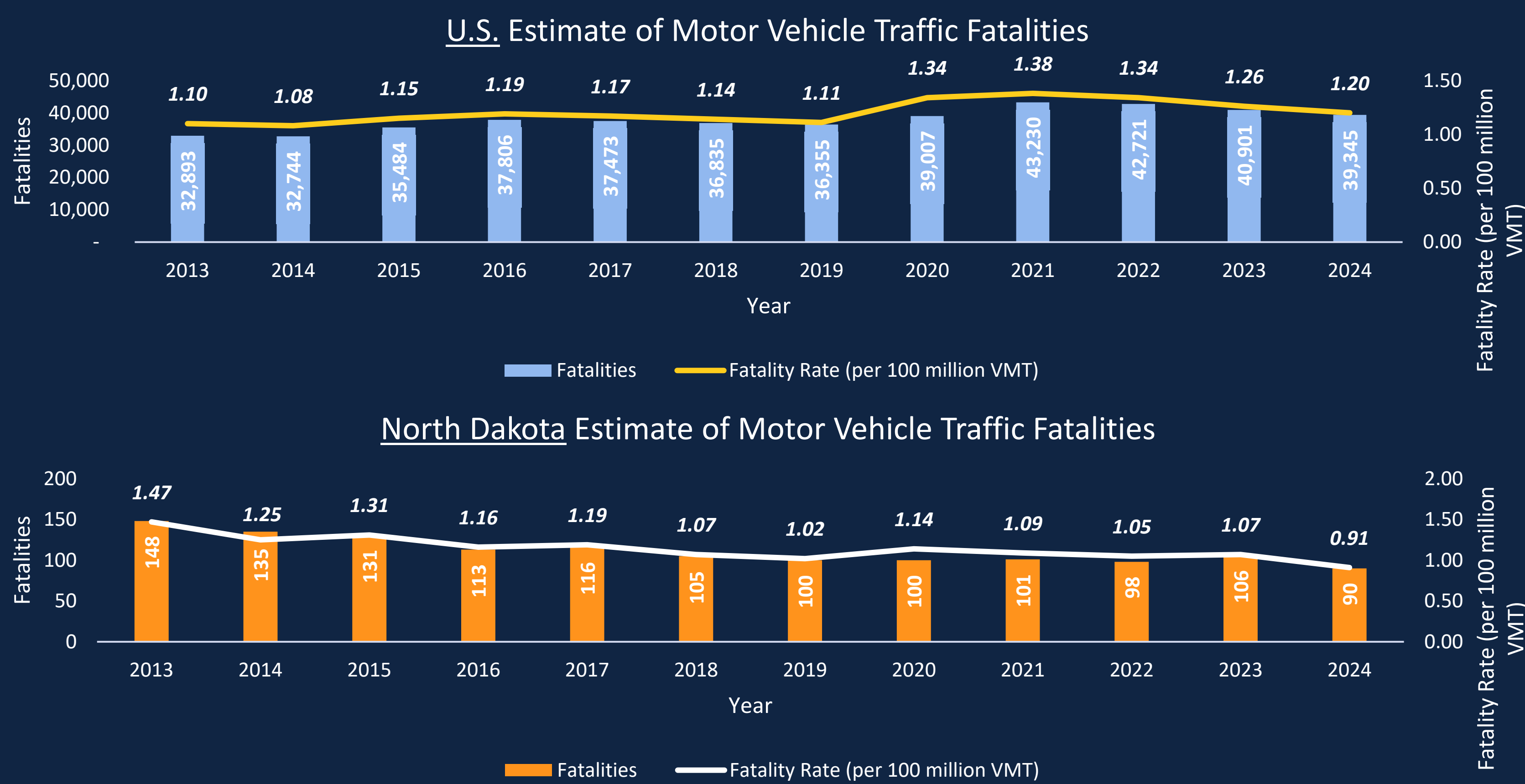
Why the Safety Policy Study?

National & State Context

Traffic fatalities peaked in 2021 in the U.S., with over 43,000 lives lost on American streets and highways (**Figure 2**).

Nationally, fatalities have come down since 2021, coinciding with a new, modern approach to transportation safety and focused attention on the dangers of American roads.

Figure 2. Estimate of Motor Vehicle Traffic Fatalities (2013-2024)



North Dakota's trend is different, with fatalities peaking in 2013 and steady progress moving towards the State's vision of eliminating crash fatalities and serious injuries. **North Dakota's estimate of 2024 fatalities and fatality rate was the lowest the state has seen in decades.** Through the Study, the BMMPO and local jurisdictional partners can continue capitalizing on cutting-edge transportation policy and approach to forward not only the State's vision, but also the Bismarck-Mandan region's vision for traveling safety on public streets and highways.

Modern Approach to Traffic Safety

Adopted in 2022 after the 2021 peak of fatalities on U.S. roads and highways, the U.S. Department of Transportation's (USDOT's) Safe System Approach (SSA) is the foundational strategy of the National Roadway Safety Strategy (NRSS) and is proven to substantially reduce fatalities and serious injuries. USDOT has adopted the SSA to address contributing crash factors and promote comprehensive layers of protection to prevent crashes and mitigate crash severity. This approach recognizes that humans make mistakes, humans are vulnerable, and redundant measures are needed to protect all road users.

The SSA provides a modern update to USDOT's vision Toward Zero Deaths (TZD). As highlighted in **Figure 3**, there are several differences between the previous, or traditional approach to transportation safety, and the SSA, or modern approach to transportation safety.

Figure 3. Traditional Approach vs Safe System Approach (SSA)

Traditional Approach	VS	Safe System Approach (SSA)
Frames traffic deaths as being inevitable		Frames traffic deaths as preventable
Aims to fix humans		Aims to fix systems
Expects perfect human behavior		Acknowledges that humans make mistakes
Aims to prevent all crashes		Aims to prevent fatal and serious injury crashes
Exclusively addresses traffic engineering		Considers the roadway system as a whole
Doesn't consider disproportionate impacts		Considers road safety as an issue of social concern

The SSA is comprised of five (5) core elements, as shown in **Figure 4**. The Safety Policy Study incorporates and highlights SSA core elements throughout the plan.

Figure 4. Core Elements of the Safe System Approach (SSA)

SAFE ROAD USERS

All road users, including those walking, biking, riding, and driving, should always operate in a safe and responsible manner when on the roadway.

SAFE VEHICLES

Vehicles are designed incorporating the latest technology and used in appropriate ways (such as always wearing a seat belt) to minimize crash severity and frequency.

POST-CRASH CARE

Receiving quick emergency medical care following a crash is essential to assist those who have been injured and to reduce fatalities.

SAFE SPEEDS

Safer speed setting, education, and enforcement are promoted across all road environments to reduce kinetic forces associated with crashes to a tolerable level on the human body.

SAFE ROADS

Roads are designed to accommodate human mistakes, encourage safe behavior, and reduce crash severity and frequency.

Federal Transportation Safety Funding

The Study will help guide the BMMPO and local jurisdictions towards successful implementation of transportation safety strategies. Implementing strategies can require substantial effort including funding. Aside from typical state and local funding source, the Study identifies resource for pursuing federal funding to implement safety strategies in the Bismarck-Mandan region.

Highway Safety Improvement Program (HSIP)

The State of North Dakota administers the Highway Safety Improvement Program (HSIP), which acts as the implementation arm of the State's Strategic Highway Safety Plan (SHSP) and Highway Safety Plan (HSP). Every year, the State solicits for HSIP funding, a core federal aid program. Originally included in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), signed into law on August 10, 2005, HSIP has been continuously included in subsequent Highway Bills through today. Designed to reduce traffic fatalities and serious injuries, all HSIP projects must relate to at least one of the priority emphasis areas identified in North Dakota's SHSP, *Vision Zero*. Highway Safety Improvement Program (HSIP) projects are programmed through BMMPO's Transportation Improvement Program (TIP) and NDDOT's Statewide Transportation Improvement Program (STIP).

North Dakota receives HSIP funding from USDOT based on formula, and distributes HSIP funding across the state through a competitive process. Typical of federal funding programs, the HSIP cost participation is as follows:

- 90% Federal/ 10% State (Primary Regional System)
- 90% Federal/ 5% State/ 5% Local (Secondary Regional System)
- 90% Federal/ 10% Local (typical other federal aid routes)

The Study identifies future strategies and project locations eligible for HSIP funds, a key resource for implementation of the Study moving forward.

Safe Streets and Roads for All (SS4A) Program

The Bipartisan Infrastructure Law (BIL) enacted by the U.S. Congress in 2021 established the Safe Streets and Roads for All (SS4A) Grant Program; a new transportation safety-focused funding source, to implement the NRSS and SSA. The SS4A program provides discretionary grants to local, regional, and Tribal governments focused on the prevention of deaths and serious injuries on the local and regional roadway system. Unlike HSIP funds, SS4A funds are eligible for projects on local roads, which are typically excluded from federal aid routes (federal functional classification of Collector, Arterial, and Freeway/Interstate).

Unlike HSIP funding where North Dakota consistently receives an annual allocation through formula, USDOT allocates SS4A funding across the U.S. through a discretionary or competitive process. Applications are submitted directly to USDOT for:

- Planning & Demonstration Grants
- Implementation Grants

The Safety Policy Study for the BMMPO's Metropolitan Planning Area (MPA) opens the door to SS4A implementation funds by serving as a certified Safety Action Plan (SAP), a requirement to apply for the program. It has yet to be determined if the SS4A program will remain as a core federal aid program in future Highway Bills or reauthorizations thereof.

The Study provides SS4A program eligibility to the BMMPO and local jurisdictional partners for planning and demonstration, and implementation grants for projects within the MPA.

Regardless of the status of SS4A as a core federal aid program in the future, the Study provides critical, modern transportation safety guidance to BMMPO and local jurisdictions, forwarding a regional vision and approach.

Safety Policy Study Components and Certification as a Safety Action Plan (SAP)

As highlighted in **Table 1** the Study aligns with key components required by USDOT to be certified as a Safety Action Plan and therefore eligible for SS4A implementation funds.

Bismarck-Mandan MPO's Safety Policy Study opens the door to SS4A implementation funds for the region:

Upon adoption, the Safety Policy Study will serve as the region's Safety Action Plan, which is required for local jurisdictions to be eligible for discretionary SS4A funding (Implementation & Planning/Demonstration grants).

Table 1. Safety Action Plan Components & Relations to Study

Safety Action Plan Component[1]	Safety Policy Study
Leadership Commitment & Goal Setting	▪ Resolution of Adoption ▪ Chapter 2 – Multimodal Transportation Safety
Planning Structure	▪ Chapter 4 – Public Engagement ▪ Chapter 8 – Implementation
Safety Analysis	▪ Chapter 2 – Multimodal Transportation Safety

Safety Action Plan Component[1]	Safety Policy Study
	▪ Chapter 5 – Data Analysis ▪ Chapter 6 – High-Injury Network Results
Engagement & Collaboration	▪ Chapter 4 – Public Engagement
Policy & Process Change	▪ Chapter 3 – Current State of Practice
Strategy & Project Selections	▪ Chapter 7 – Safety Strategies & Toolkit ▪ Chapter 8 – Implementation
Progress & Transparency	▪ Chapter 2 – Multimodal Transportation Safety ▪ Chapter 8 – Implementation

[1]Based on SS4A fiscal year (FY) 2025 SS4A Self-Certification Worksheet.

A FY25 Self-Certification Worksheet is provided in **Appendix G.**

Chapter 2 - Multimodal Transportation Safety In the Region

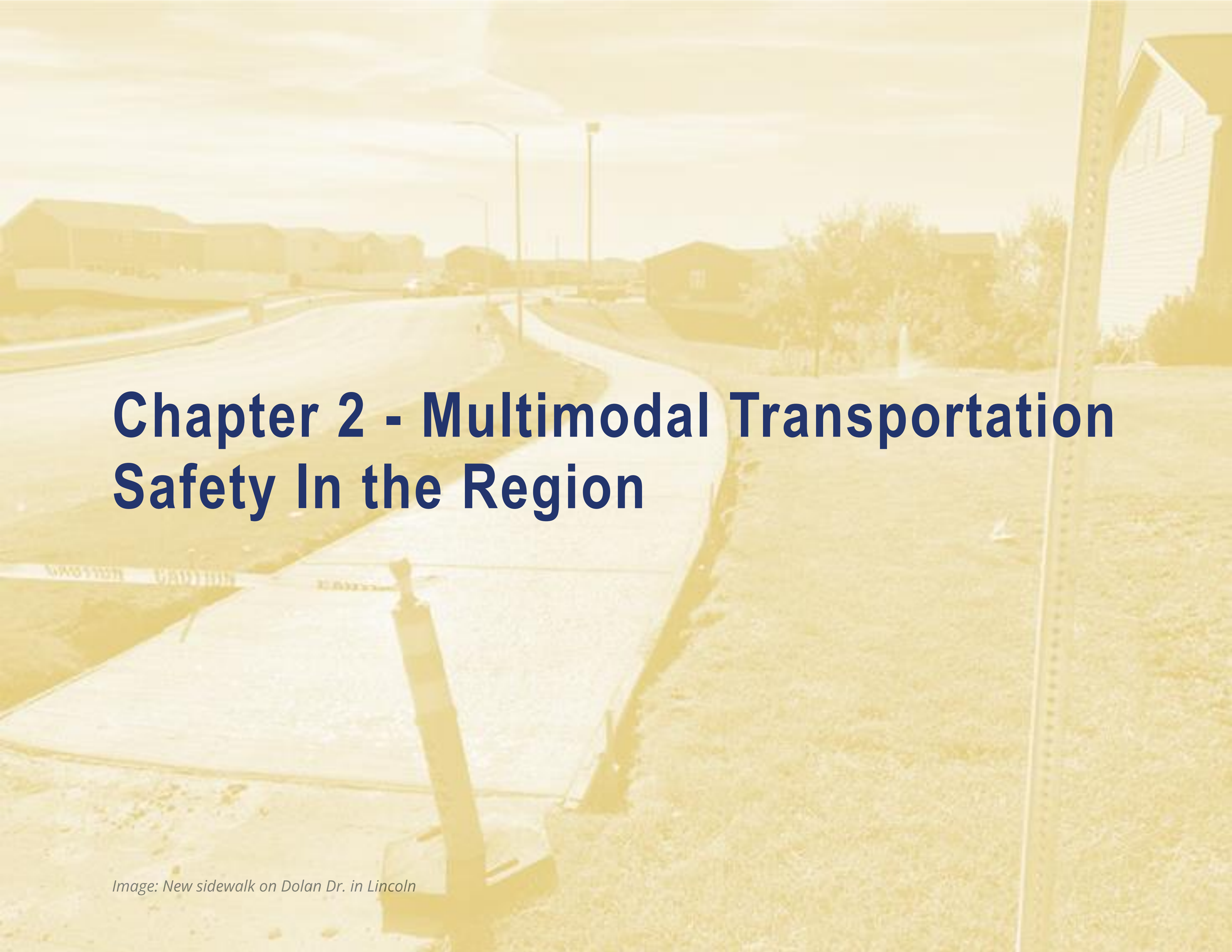


Image: New sidewalk on Dolan Dr. in Lincoln

Historical Crash Trend Summary

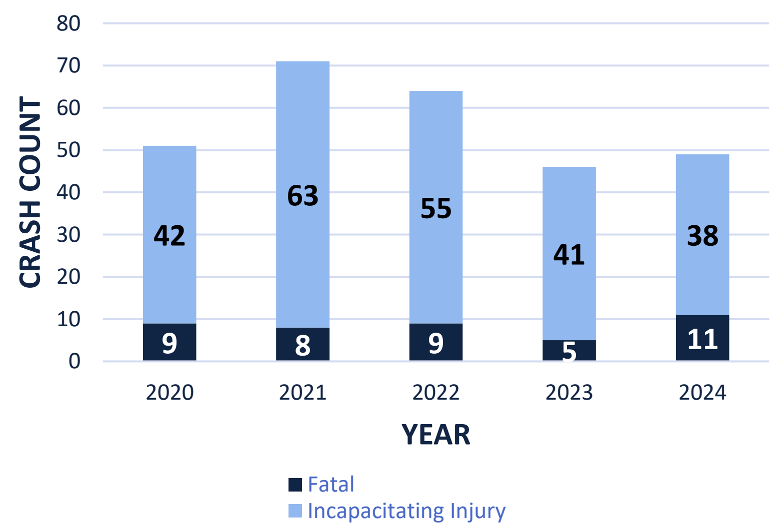
The most recent five years of available crash data was analyzed for BMMPO's MPA as part of the Study. Between 2020 and 2024, there were a total of 17,497 crashes recorded across all modes of travel in the Bismarck-Mandan region. Of all crashes, 281 were severe, resulting in a fatal or incapacitating injury. The chart of severe crashes by year is shown in **Figure 5**.

The crash analysis included herein utilizes the KABCO severity injury scale; a standard system used by law enforcement across the U.S. to classify the severity of injuries in a traffic accident. **K=Fatal Injury, A=Incapacitating Injury, B=Minor Injury, C=Possible Injury, and O=Property Damage Only**

In the Bismarck-Mandan region, over the timeframe analyzed, severe crashes peaked in 2021 causing an uptick in crashes resulting in incapacitating injuries; fatal crashes remained relatively flat. The 2021 increase in severity follows national trends, and according to North Dakota's SHSP, contributing factors for 2021 severe crashes across the state included:

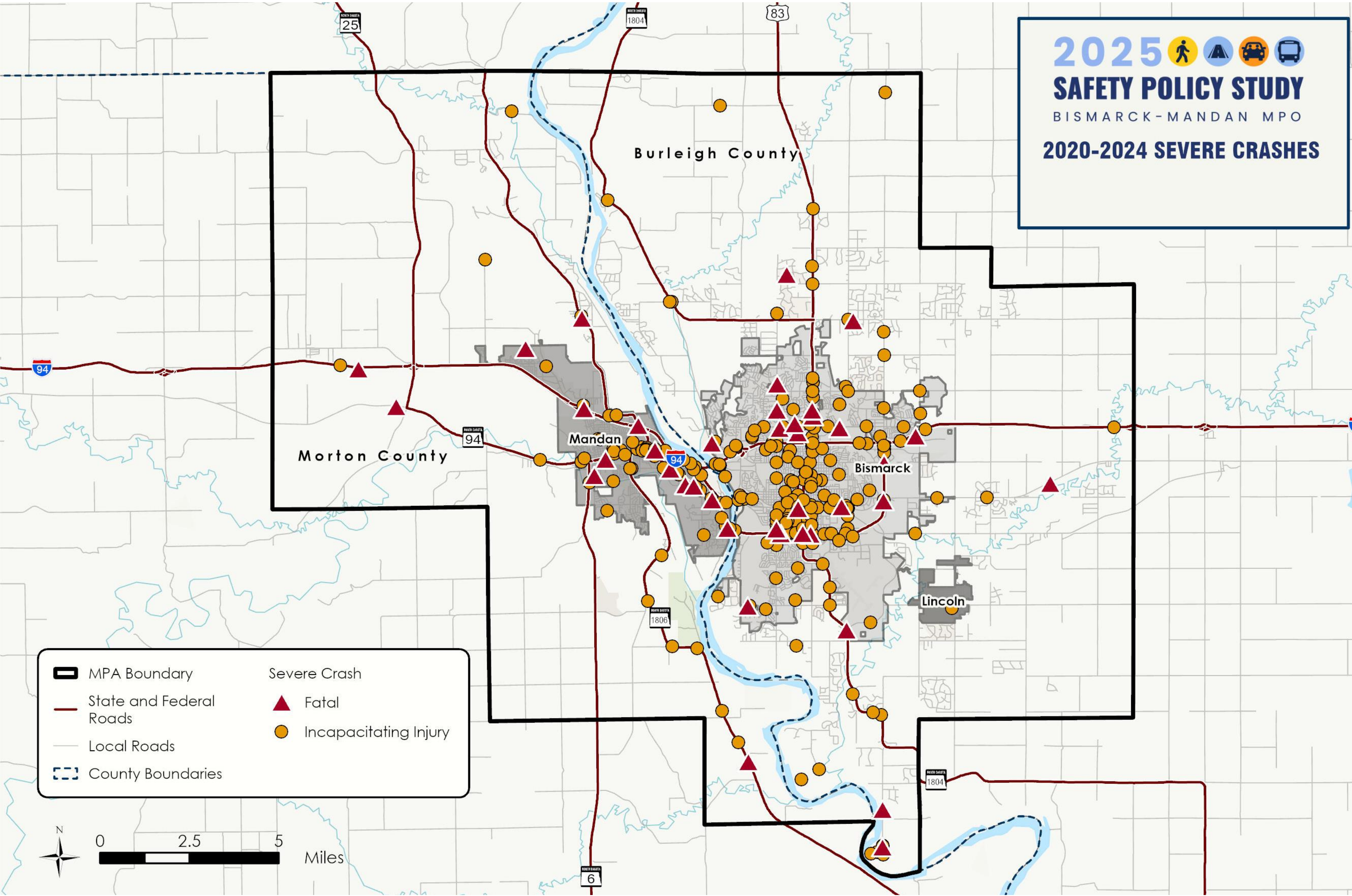
- Unbelted Occupants as the leading contributing factor;
- Increase in Speeding-related severe crashes; and
- Increase in lane departure crashes.

Figure 5. Fatal and Incapacitating Injury Crashes by Year



Additionally, 2021 also saw the peak of vulnerable users such as pedestrian, bicycle, and motorcycle crashes within the MPA. The overall peak of fatal and incapacitating injury crashes in the MPA in 2021 is likely attributed to an increase in crashes with vulnerable users, who face the highest risk of death and life-changing injuries when involved in a crash. Severe crash locations from 2020 to 2024 are mapped in **Figure 6.**

Figure 6. 2020-2024 Severe Crashes in the Bismarck-Mandan Region



Regional Multimodal Crash Trends

Key trends and themes of crashes within the MPA are highlighted below. A detailed, technical summary of crash data is provided in **Appendix A**.

Crashes Involving Vulnerable Users

Vulnerable users in the MPA face much higher risk of fatal and incapacitating injury when involved in a crash compared to all other vehicle occupants. Alarming trends are identified in **Table 3** and **Figure 7**.

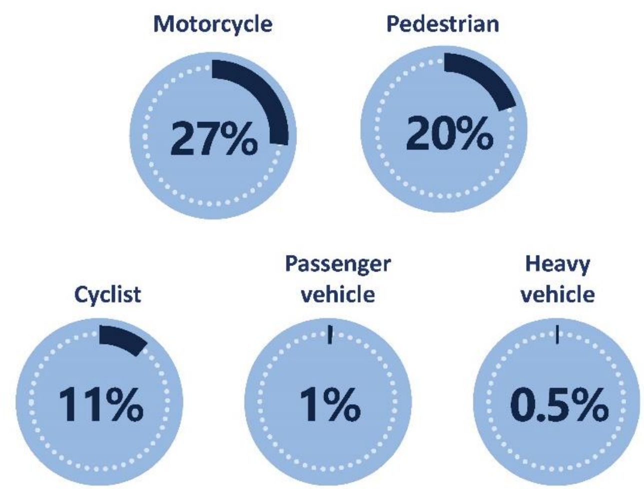
After peaking in 2021, severe crashes came down in 2022, 2023, and 2024; however, the proportion of bicycle, pedestrian, and motorcycle crashes have increased over the five-year analysis period.

Table 2. Percentage of total crashes per year

Mode	2020	2021	2022	2023	2024
	0.6%	0.5%	0.4%	0.6%	0.7%
	0.9%	1.2%	0.9%	1.5%	1.4%
	1.4%	1.6%	1.2%	1.4%	1.6%
Total % of crashes involving vulnerable modes	2.8%	3.4%	2.5%	3.5%	3.7%

Most alarming about the increasing proportion of crashes with vulnerable users, is the fact that people walking, biking, or riding a motorcycle face significantly higher risk of fatal and incapacitating injuries when involved in a crash compared to all other vehicle occupants.

Figure 7. Severe Proportion Crashes by Mode (2020-2024)



Seasonal Considerations

In the MPA and across North Dakota, it is common for people to assume that the Winter season is the most dangerous time to travel due to snowy and icy conditions; however, this is not the case. As shown in **Table 4.** Percentage of total severe crashes by season are shown in **Figure 8**, severe crashes are overrepresented in Summer and Fall.

For purposes of seasonal crash analyses, the following seasons were used for the MPA:

- Spring – March, April, and May
- Summer – June, July, and August
- Fall – September, October, and November
- Winter – December, January, and February

In the MPA, Winter sees a significant increase in total crashes; however, there are significantly less severe crashes during this season. There are several likely factors attributable to the seasonal severe crash concentrations seen in the region:

- In Winter, snow storage on the edge of streets visually narrows travel lanes, decreasing vehicle speeds and severity of crash incidents.
- Snowy and icy road conditions in Winter contribute to more crashes overall.
- Vulnerable users and multimodal traffic are highest in Summer and Fall, increasing severity of crash incidents.

Rural Roads

In the MPA, people involved in crashes on Township and County roads are at a higher risk of death and incapacitating injury when involved in a crash than other roadways in the BMMPO MPA, like urban roads. As highlighted in **Table 5** , although a vast majority of crashes occur on State-owned and City-owned streets, rural roads owned by Counties and Townships have the highest proportion of severe crash outcomes.

Table 3. Percentage of total severe crashes by season

Season	% of Annual Tavel	% of Total Severe Crashes
Spring	24.8%	22.1%
Summer	25.1%	34.9%
Fall	26.5%	28.1%
Winter	23.5%	14.9%

Figure 8. Fatal and Incapacitating Injury Crashes by Season

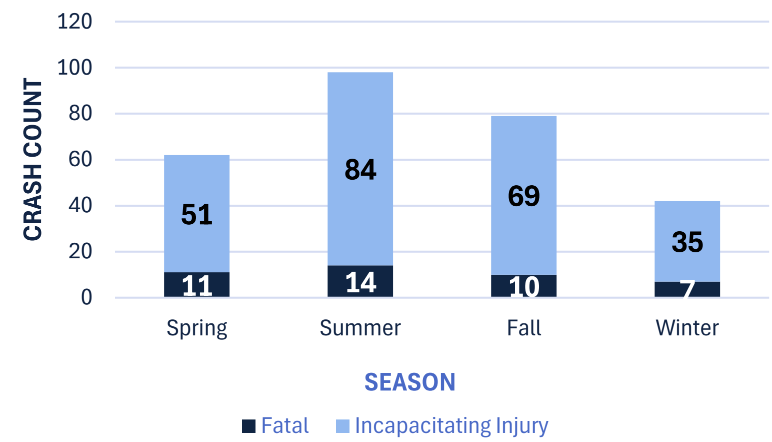


Table 4. Percentage of crashes by jurisdiction

Jurisdiction	% of Total Crashes in MPA	% of Severe Crashes on Jurisdiction Subtype
State	34.1%	2.4%
County	20.5%	4.2%
Township	0.7%	7.1%
City	48.4%	1.3%

County- and Township-owned streets are typically rural in nature with the following characteristics:

- Ditch swale stormwater (no curb nor gutter)
- No lighting or limited lighting
- Some paved, mostly unpaved (Township roads are rarely paved)
- Higher-speed limits, typically 45–55mph unless posted otherwise

Rural streets are not uniquely dangerous to the BMMPO's MPA; however, rural roadways pose a unique safety challenge across North Dakota and the United States. According to the USDOT, rural roads account for 43 percent of all roadway deaths in America, despite only 20 percent of the U.S. population living in rural areas. Many of these fatal crashes result from crash types such as single-vehicle run off road, speeding, and impairment – all of which are core, safety emphasis areas of the State and analyzed in this Safety Policy Study.

Crash Emphasis Areas

North Dakota's 2024 *Vision Zero* Plan or Strategic Highway Safety Plan (SHSP) identifies 15 Priority Emphasis Areas that represent the key crash contributing factors with the greatest potential to reduce severe crashes across the state. The State's emphasis areas identified in the SHSP are tracked in crash reports statewide. The emphasis areas are organized around the holistic, Safe System Approach. The following section covers the top eight (8) severe crash focus areas contributing to severe crashes in the BMMPO's MPA. It is important to note that a single crash incident may be reported with multiple combinations of safety emphasis areas tagged as contributing factors.

Intersection Related

51% of severe crashes in the MPA occurred at or near intersections. ***1.8% of intersection crashes resulted in a severe crash.***

Intersection-related crashes are the most common emphasis area associated with severe crashes in the BMMPO's MPA. Intersection related crashes contribute to 45 percent of total crashes and 51 percent of severe crashes. Intersections are naturally higher-risk locations due to the number of potential conflict points – both for vehicles and multimodal traffic or non-motorists. According to the North Dakota Strategic Highway Safety Plan (SHSP), between 2017 and 2021:

- 68 percent of intersection fatalities occurred in rural areas
- 64 percent occurred on state-owned streets
- Intersection related crashes contributed to 48 percent of older-driver severe crashes.

Intersection related crashes contributed to numerous other high-prevalence emphasis areas and resulted in a significantly disproportionate number of severe crashes in the MPA.

Younger-Driver (Aged 14-20 years)

25% of severe crashes in the MPA involve a younger driver. ***1.6% of younger-driver crashes resulted in a severe crash.***

A younger-driver was involved in just over 25 percent of total crashes and nearly one (1) out of every four (4) severe crashes in the BMMPO's MPA. The prevalence of crashes involving young drivers is increasing. According to the North Dakota SHSP, between 2017 and 2021:

- 73 percent of young driver fatalities involved a male driver.
- Unbelted vehicle occupants contributed to 46 percent of young driver severe crashes.
- aggressive driving contributed to 41 percent of young driver severe crashes.

Younger drivers contributed to numerous other high-prevalence emphasis areas for severe crashes in the MPA. There is a not a propensity for more resultant severe crashes when a younger driver is involved in the MPA.

Unbelted Occupants

25% of severe crashes in the MPA involve an unbelted occupant. ***8.8% of these crashes resulted in a severe crash.***

Unbelted vehicle occupants contributed to less than five (5) percent of total crashes, but was involved in nearly one (1) out of every four (4) severe crashes in the BMMPO's MPA. Unbelted vehicle occupants have been a major safety issue affecting the state of North Dakota. According to the North Dakota SHSP, between 2017 and 2021, unbelted vehicle occupants:

- was the number one contributing factor for fatalities and the third for serious injuries.
- 57 percent of crashes involving an unbelted occupant resulted in a fatality and 46 percent in a serious injury.
- contributed to 60 percent of impaired driving severe crashes.
- contributed to 46 percent of younger driver severe crashes.
- contributed to 39 percent of older driver severe crashes.
- contributed to 41 percent of intersection severe crashes.
- contributed to 58 percent of lane departure severe crashes.

Unbelted vehicle occupants contributed to numerous other high-prevalence emphasis areas and resulted in a significantly disproportionate number of severe crashes in the MPA.

Motorcycle Crashes

23% of severe crashes in the MPA involve a motorcyclist. ***27% of motorcycle crashes resulted in a severe crash.***

In the BMMPO's MPA, motorcycle crashes make up just over one (1) percent of total crashes; however, were involved in 23 percent of total severe crashes. Motorcyclists have the highest risk in the nation of experiencing severe crashes. According to the NHSTA – in 2023, the fatality rate of motorcyclists was almost 28 times higher than passenger car occupants per 100 million vehicle miles traveled (VMT). In the same year, 15 percent of all traffic fatalities in the United States were motorcyclists.

Motorcycle-involved crashes contributed to numerous other high-prevalence emphasis areas and resulted in a significantly disproportionate number of severe crashes in the MPA.

In North Dakota, in 2022:

- 67 percent of motorcycle fatalities were not wearing a helmet.
- 90 percent of motorcycle fatalities were male.
- 42 percent of motorcycle fatalities were alcohol positive (with known alcohol test results).

Comparatively, in the MPA between 2020-2024:

- 55 percent of severe motorcycle crashes involved riders not wearing a helmet.
- 55 percent of severe motorcycle crashes were intersection related.
- 38 percent of severe motorcycle crashes were single-vehicle run off road crashes.
- 33 percent of severe motorcycle crashes were speeding related.
- 27 percent of severe motorcycle crashes involved a younger driver.
- 21 percent of severe motorcycle crashes involved an older driver.
- 21 percent of severe motorcycle crashes involved an impaired road user.

Older Drivers (Aged 65+)

23% of severe crashes in the MPA involve older drivers. ***1.8% of older driver crashes resulted in a severe crash.***

In the MPA, older drivers are involved in 21 percent of total crashes and 23 percent of severe crashes. According to the North Dakota SHSP, between 2017 and 2021:

- older driver fatalities increased by 47 percent and serious injuries increased by 80 percent.
- Intersection related crashes contributed to 48 percent of older driver severe crashes.
- Unbelted vehicle occupants contributed to 39 percent of older driver severe crashes.
- Speeding/aggressive driving contributed to 28 percent of older driver severe crashes.

Older drivers contributed to numerous other high-prevalence emphasis areas for severe crashes in the MPA. There is a slight propensity for more resultant severe crashes when an older driver is involved in the MPA.

Speeding

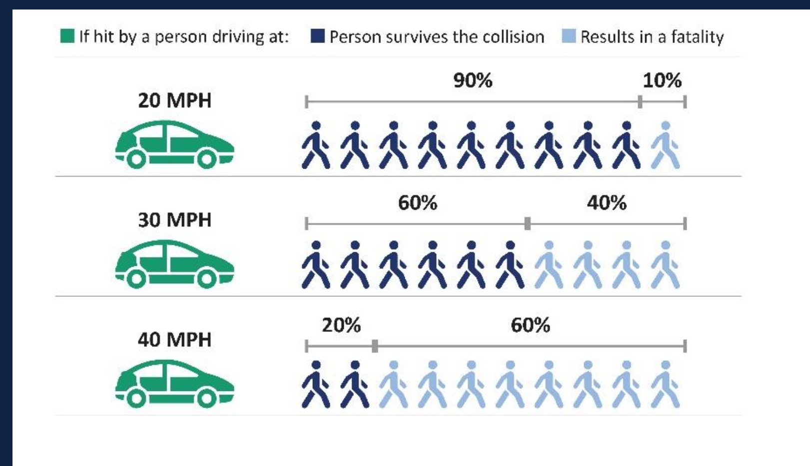
23% of severe crashes in the MPA involve speeding. ***2.7% of speeding related crashes resulted in a severe crash.***

In BMMPO's MPA, 14 percent of total crashes and 23 percent of severe crashes involved speeding. Speeding is another prevalent behavioral challenge factoring into crashes and plays a major factor in the severity of a crash. According to the NHTSA, the probability of a fatal or incapacitating injury doubles for every 10 mph over 50 mph that a vehicle travels. The risk is much higher for vulnerable road users (see **Figure 9**). According to the North Dakota SHSP, between 2017 and 2021:

- Speeding was a contributing factor in 34 percent of fatal and 40 percent of incapacitating injury crashes.
- Speeding/aggressive driving was a contributing factor in 50 percent of impaired driving severe crashes.
- Speeding/aggressive driving was a contributing factor in 44 percent of unbelted vehicle occupants severe crashes.
- Speeding/aggressive driving was a contributing factor in 41 percent of younger driver severe crashes.
- Speeding/aggressive driving was a contributing factor in 28 percent of older driver severe crashes.
- Speeding/aggressive driving was a contributing factor in 32 percent of intersection related severe crashes.
- Speeding/aggressive driving was a contributing factor in 44 percent of lane departure severe crashes.
- 77 percent of speeding fatalities were male.

Speeding contributed to numerous other high-prevalence emphasis areas and resulted in a disproportionate number of severe crashes in the MPA.

Figure 9. Vulnerable Road User Fatality Risk by Vehicle Speed



Single Vehicle Run Off Road

23% of severe crashes were single-vehicle run off the road. ***3.1% of single-vehicle run off road crashes resulted in a severe crash.***

In the MPA, 12 percent of total crashes and 23 percent of severe crashes were single-vehicle run off road crashes. Single vehicle run off the road crashes are very common in more rural contexts, which makes up a large portion of the BMMPO's MPA. According to the FHWA, each year more than half of all highway fatalities across the United States are attributed to road departures such as crossing an edgeline, centerline, or other types of lane departures. According to the North Dakota SHSP, between 2017 and 2021:

- Lane departure was a contributing factor in 48 percent of fatal and 49 percent of incapacitating injury crashes.
- Lane departure was a contributing factor in 63 percent of impaired driving severe crashes.
- Lane departure was a contributing factor in 59 percent of unbelted vehicle occupants severe crashes.
- Lane departure was a contributing factor in 43 percent of young driver severe crashes.

Lane departure contributed to numerous other high-prevalence emphasis areas and resulted in a disproportionate number of severe crashes in the MPA.

Impaired Driving

22% of severe crashes in the MPA involve an impaired driver. ***7.7% of impaired driving crashes resulted in a severe crash.***

In BMMPO's MPA, less than five (5) percent of total crashes involved an impaired driver, but 22 percent of severe crashes involved an impaired driver. Impaired driving is another significant issue in North Dakota. According to the North Dakota SHSP, between 2017 and 2021:

- Impaired driving contributed to 36 percent of fatal and 28 percent of incapacitating injury crashes.
- 78 percent of impaired driving fatalities were male.
- Lane departure was a contributing factor in 63 percent of impaired driving severe crashes.
- Unbelted vehicle occupants was a contributing factor in 60 percent of impaired driving severe crashes.
- Speeding/aggressive driving was a contributing factor in 50 percent of impaired driving severe crashes.

Additionally, according to the CDC , in 2020, alcohol-impaired drivers accounted for 30 percent of all traffic-related deaths in the nation. While the number of people nation-wide killed in crashes involving drug-impaired drivers is not known, a study from seven trauma centers of 4,243 drivers who were seriously injured in crashes found that 54 percent of drivers test positive for alcohol and/or drugs.

Impaired driving contributed to numerous other high-prevalence emphasis areas and resulted in a disproportionate number of severe crashes in the MPA.

Bis-Man Transit

Bis-Man Transit is the primary transit provider in the region. The non-profit service provides key connections between Bismarck, Mandan, and Lincoln. The Capital Area Transit (CAT) system is a fixed-route system throughout Bismarck and Mandan with six routes. Bis-Man Transit also operates paratransit service for eligible riders with disabilities to get to and from essential services and meet every day needs.

The most common type of crash was contact with another vehicle, with 53 crashes during that period, followed by sideswipe at 14 crashes and merging at 11 crashes. Annual crashes were lowest in 2021 at 15, and rose slightly in 2022 and 2023 to 26, with a slight drop in 2024 to 22.

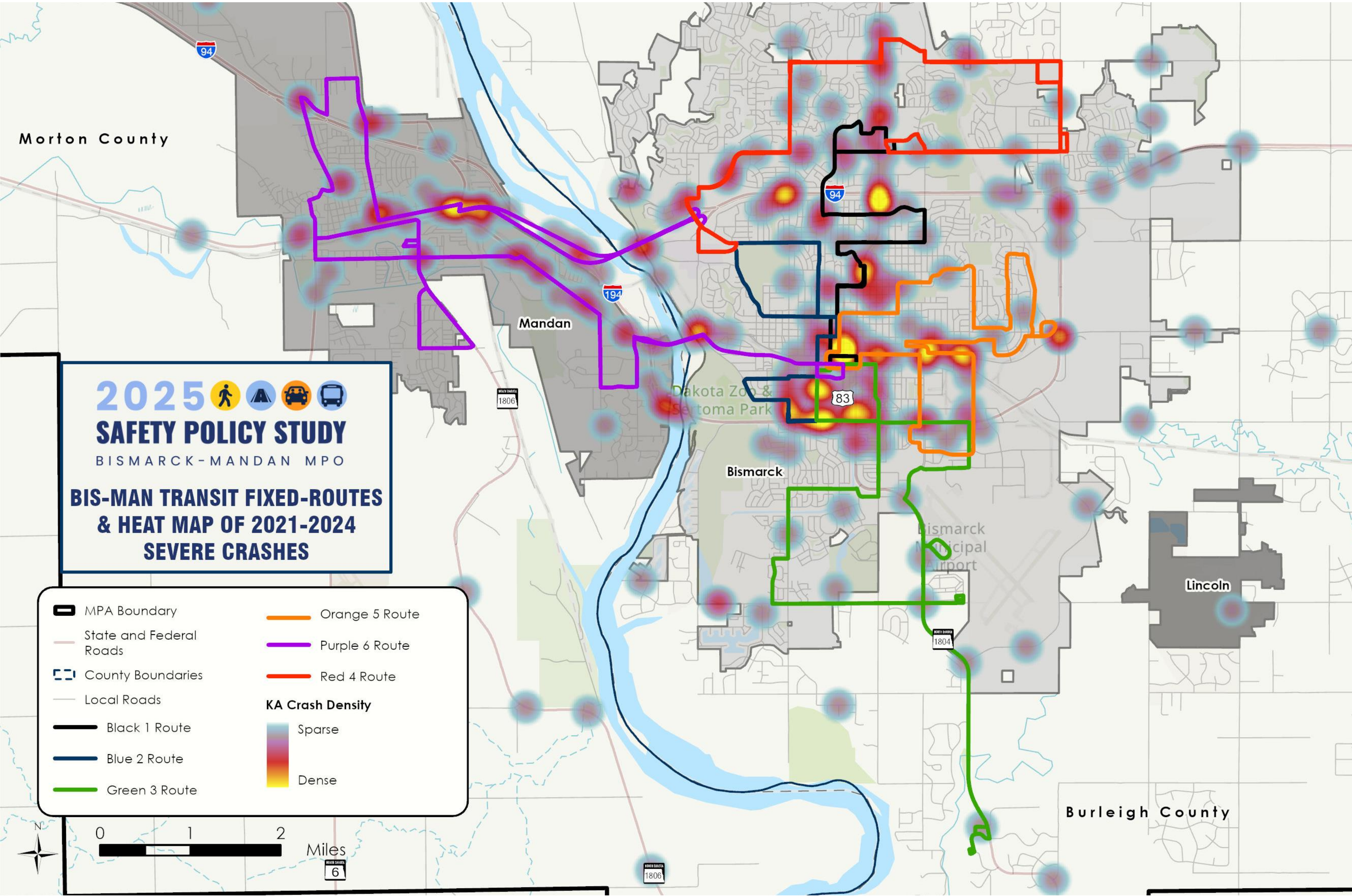
Paratransit vehicles were in more crashes than any individual bus route, with a total of 19 crashes, but made up only approximately 20% of total crashes. The majority of the crashes occurred in daylight conditions, however this is expected, due to the operating hours for the routes consisting primarily of daytime service. However, a total of 36 crashes occurred in wet, snowy, or icy conditions, indicating that these conditions may be a good area of focus for safety improvement efforts.

Although there were no severe transit-involved crashes, transit fixed-routes do overlap severe crash locations.

Figure 10 shows the fixed-route transit system in context of 2020-2024 severe crashes.

Between July of 2020 and January of 2025, Bis-Man Transit vehicles were in 96 crashes, averaging 22 transit-involved crashes every year. No transit-involved crashes resulted in a fatal or incapacitating injury.

Figure 10. 2020-2024 Severe Crash Heat Map and Bis-Man Transit Fixed-Routes



Rail Safety

Although only two rail lines (BNSF Railway and Dakota Missouri Valley Western) are currently operational, there were four (4) major railroad lines within the MPA between for the period of grade crossing incidents analyzed. The four (4) lines are shown in **Figure 11**. Although major streets and highways are separated from railroad crossings (grade separated crossings), there are many at-grade railroad crossings of streets. Since thorough record-keeping began, there have been reported crashes involving trains.

On average, since the 1970s, less than one (0.78) train-related crash per year is reported in both Burleigh and Morton Counties. Through years 2020-2024, the average is 1.0, on pace to match or exceed the 1990s; the decade with the most train-involved crash incidents in the region.

Table 6 shows the number of train-related crashes in Burleigh and Morton Counties. Given the long history and integration of railroads in the Bismarck-Mandan region's infrastructure, all available Federal Railroad Administration (FRA) grade crossing accident/incident reports were pulled and supplemented by more recent data from NDDOT (for 2023 and 2024):

Table 5. Number of Grade Crossing Incidents/Accidents (FRA)

Railroad in the MPA	1970s	1980s	1990s	2000s	2010s	2020	2021	2022	2023	2024
Burlington Northern[1]	7	7	5	-	-	-	-	-	-	-
*BNSF	-	-	3	4	6	-	1	2	-	1
Dakota Missouri Valley Western[3]	-	-	2	-	2	1	-	-	-	-
Soo[2]	1	1	-	-	-	-	-	-	-	-
TOTAL	**8**	**8**	**10**	**4**	**8**	**1**	**1**	**2**	**0**	**1**

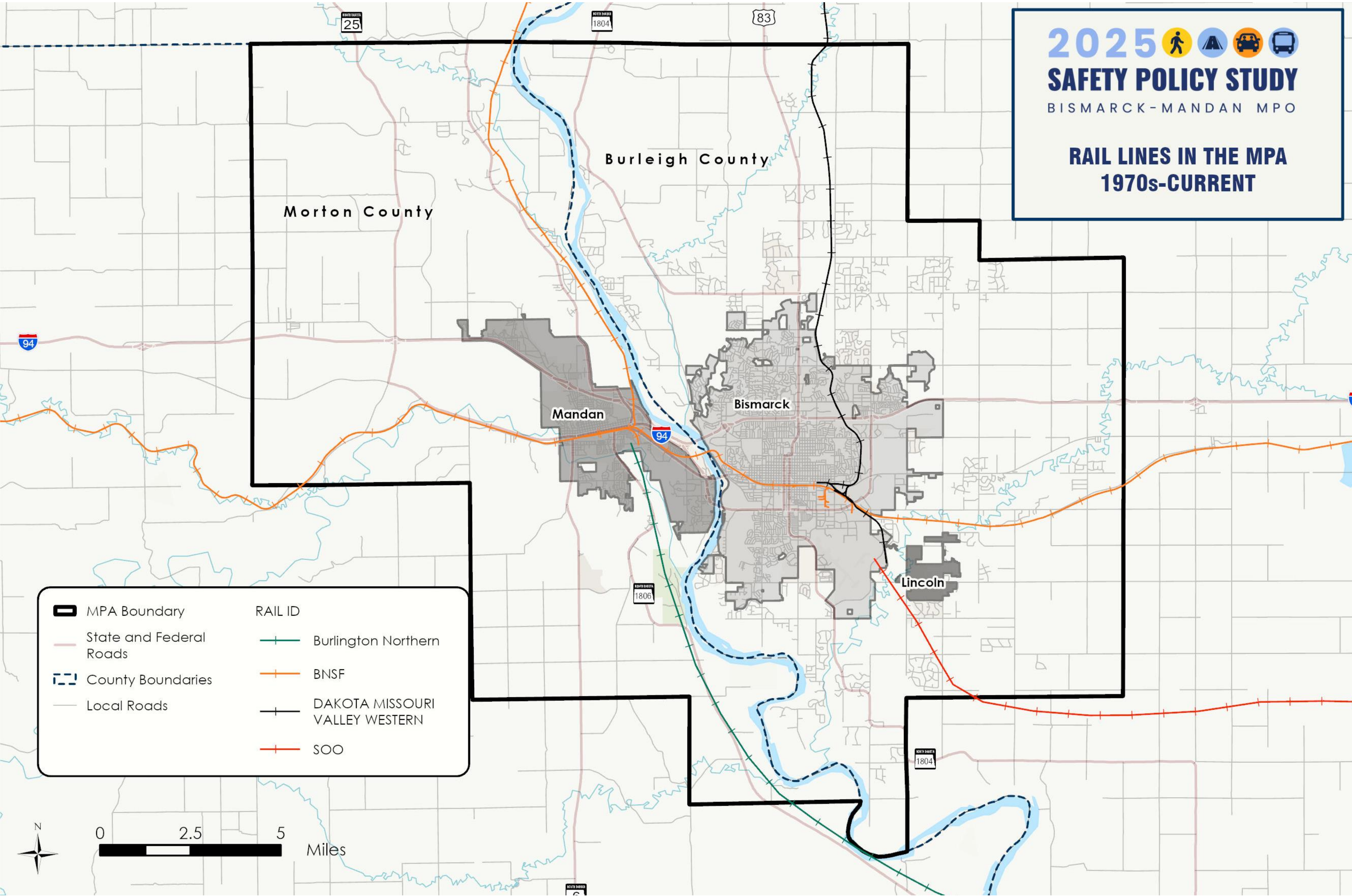
*BNSF Railway wasn't created until 1995, through a consolidation of many smaller lines including Burlington Northern (BN) and the Atchinson, Topeka, and Santa Fe Railway (ATSF).

[1] Burlington Northern line closed in the 1990s.

[2] Soo line closed in the 1980s.

[3] Note that in some cases in Bismarck, Dakota Missouri Valley Western may operate on railroad owned by BNSF.

Figure 11. Railroads in the MPA



Vision & Goals

The Bismarck-Mandan MPO seeks proven strategies to achieve a vision for a safer regional transportation system for all users. The Safety Policy Study **establishes a vision of zero traffic-related deaths and life-changing injuries** on streets within the Bismarck-Mandan region, with a specific goal of a 50 percent reduction from 2021 historic crash data to 35 or fewer annual deaths and life-changing injuries by 2050.

Achieving zero severe (fatal and life-changing injury) crashes requires the region's leadership, staff, and even residents, to prioritize safety, and to collaborate with regional partners to do the same. Achieving the vision requires priority and focus on physical engineering efforts and non-engineering efforts such as educational campaigns, high-visibility enforcement, agency collaboration, and policy refinement. **Bismarck-Mandan MPO's vision will be measured on an annual basis starting in 2026, by the percent change in fatal and life-changing injury crashes.**

Vision

Zero traffic-related deaths and life-changing injuries on streets within the Bismarck-Mandan region.

Goal

Fifty percent (50%) reduction in annual fatal and life-changing injury crashes by 2050, or 35 fatal and serious injury crashes or fewer.

Tracking the Goal

A year over year percentage change in severe crashes should be monitored by the BMMPO. To reach the target, an approximate two (2) to three (3) percent reduction would be considered on track. A five-year rolling average should be used to estimate the reduction from 2021's peak of 71 severe crashes (e.g. for the period of 2020-2024, the rolling average equals 56.2 severe crashes). This process is very similar to the data tracked for BMMPO's Performance Measure 1 safety targets, and Safety Policy Study performance review should occur at the same time.

Chapter 3 - State of Practice

Image: Rural rail crossing in northeast Morton County

Safety Practice in the Bismarck-Mandan Region

Several plans, policies, and programs address road safety in the Bismarck-Mandan MPA. This Chapter focuses on literature and programs of the national, state, and local levels relating to road safety.

National policies and programs include the National Roadway Safety Strategy (NRSS) & Safe System Approach (SSA), National Public Transportation Plan, Safe Routes to School (SRTS), Operation Lifesaver, Americans with Disabilities Act (ADA), and Complete Streets movement. These policies emphasize the need to safely accommodate all travel modes.

Statewide plans that emphasize enhancing safety include:

- Transportation Connection: North Dakota's Long-Range Transportation Plan
- ND Moves: Statewide Active and Public Transportation Plan
- North Dakota Vision Zero Strategic Highway Safety Plan
- North Dakota 2024-2026 Highway Safety Plan
- North Dakota Highway Safety Improvement Program (HSIP)
- North Dakota Local Road Safety Program
- NDDOT Traffic Operations Manual

At the local level, BMMPO and jurisdictional partners lead traffic safety efforts focusing on local priorities and recommendations for future road improvements within the region and local jurisdictions.

The Bismarck-Mandan MPO and local partners have completed the following plans, policies, and studies to address safety for all roadway users. These documents include a wide range of activities, and provide a solid foundation the region to promote roadway safety.

- Arrive 2050 Metropolitan Transportation Plan (MTP)
- Bismarck-Mandan Bike and Pedestrian Plan
- School Crossing Safety Studies (Bismarck and Mandan)
- Bismarck-Mandan Intersection Analysis Study
- Safe Routs to Services/Complete Streets Study

See **Appendix B** for additional information on local, regional, and state safety plans and policies guiding the BMMPO plan area.

Transportation Connection: North Dakota's Long-Range Transportation Plan

Published in June of 2021, *Transportation Connection* is the State of North Dakota's long-range plan and is intended to be "an adaptable and comprehensive strategic framework for all things transportation across North Dakota through 2045". The LRTP lists five (5) key objectives:

- Improving transportation safety for all modes.
- Maintaining existing infrastructure.
- Improving connectivity.
- Increasing available travel information and improving operations.
- Modernizing operations and increasing sustainability of funding sources.

***Transportation Connection* relevance to the Safety Policy Study:**

This Study closely aligns to the State's statewide, multimodal transportation safety objectives. An emphasis on improving connectivity and multimodal safety supports efforts to improve road user safety across every transportation mode. The Study also aligns with the State's holistic safety objective, by identifying both engineering and non-engineering safety countermeasures.

Figure 12. *Transportation Connection* Key Objectives (NDDOT)

ND Moves: Statewide Active and Public Transportation Plan

Published in April 2019, *ND Moves* provides guidance for integrating active and public transportation into state and local systems. *ND Moves* outlines recommendations and an implementation framework to address identified needs and opportunities for all modes of mobility, including public transit, walking, and bicycling, over the next 20 years. The plan leverages existing assets and seeks to combine systems for greater public benefit.

Active Transportation Goals:

- Increase active transportation use in North Dakota.
- Allocate funds for infrastructure, education, and programming.
- Maintain and expand the active transportation network for sustainability.
- Engage with citizens, agencies, and stakeholders for implementation.
- Ensure seamless multimodal travel across the state.
- Create a safe environment for all users.
- Utilize technology to advance active and public transportation.
- Promote active transportation for better community health outcomes.

Public Transit Goals:

- Improve transit options within and between communities.
- Maintain or increase funding for public transit.
- Keep public transit assets in good condition.
- Promote public transit as a vital travel option.
- Foster collaboration across the statewide transit network.
- Enhance public transit safety statewide.

***ND Moves* relevance to the Safety Policy Study:**

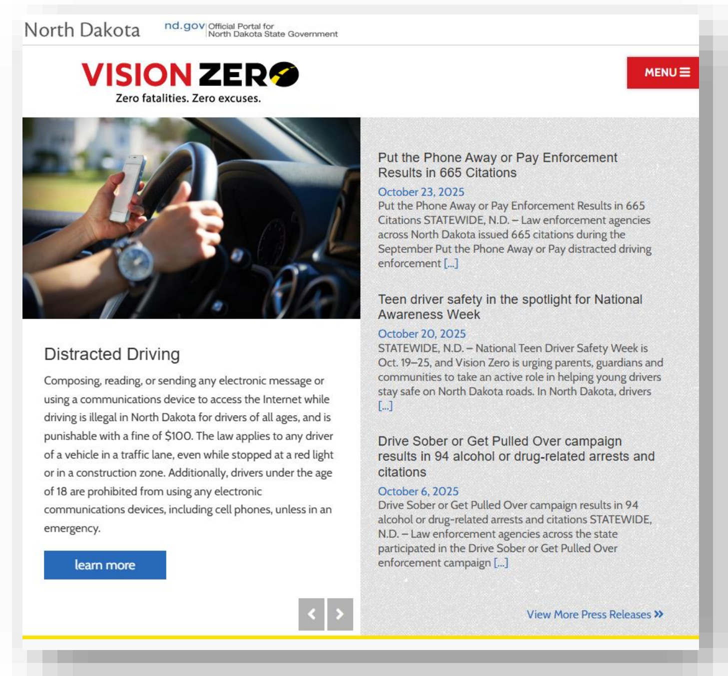
ND Moves focuses on active transportation (walking and bicycling) and public transit integration. The Study supports the State's active and public transit goals by including all modes in the safety analysis and developing subsequent safety strategies for each. The importance of data collection and evaluation guide the Safety Policy Study to refine safety recommendations using evidence-based, or proven approaches. *ND Moves'* network expansion and maintenance are other priorities of the plan that support the Safety Policy Study's objective of guiding long-lasting, adaptable safety improvements now and into the future.

North Dakota Vision Zero Strategic Highway Safety Plan

Published in 2024, North Dakota's Strategic Highway Safety Plan (SHSP), also known as the *Vision Zero* Plan, is a data-driven, comprehensive plan that outlines goals, objectives, and strategies to advance North Dakota's goal of zero traffic fatalities or serious injuries. The SHSP is updated every five (5) years to reflect crash trends and emerging safety strategies. The most recent SHSP includes a Vulnerable Road User (VRU) Safety Assessment, and incorporates the NRSS's SSA, as mandated by the Bipartisan Infrastructure Law (BIL). The Plan includes *Vision Zero* initiatives such as:

- Redesigning streets to reduce conflict points and encourage mobility while enhancing safety.
- Conducting high-visibility enforcement of existing laws.
- Integrating technology innovations that make vehicles, roads, and drivers safer.
- Collaborating with the legislature to ensure state laws represent best practices in traffic safety.
- Promoting campaigns to educate communities on safe driving behaviors and the Vision Zero safety strategy.

Figure 13. *Vision Zero* Home Page (visionzero.nd.gov)



***Vision Zero* relevance to the Safety Policy Study:**

Vision Zero highlights transportation crash data trends in North Dakota and lays out priorities to address multimodal transportation safety statewide. The Study incorporates information and policy direction from *Vision Zero* in nearly every Chapter, from the multimodal safety analysis to the vision and goals, and safety countermeasure strategies.

North Dakota 2024-2026 Highway Safety Plan

Updated every three (3) years, NDDOT's Highway Safety Plan (HSP) focuses on the State's SHSP to monitor progress and evaluate traffic safety. After the SHSP identifies priorities and implementation strategies, the HSP identifies performance measures to gauge progress in the priority areas identified in the SHSP, sets annual goals for each of the performance measures, tracks year-to-year trends in those performance measures, and identifies countermeasure strategies to address each of the priority areas identified by the SHSP. Those priority emphasis areas include:

- Unbelted vehicle occupants.
- Lane departure crashes.
- Alcohol and/or drug-related crashes.
- Speeding/aggressive driving.
- Intersections.
- Older drivers.
- Heavy vehicles.
- Younger drivers.
- Vulnerable road users – pedestrians/bicyclists

ND HSP's relevance to the Safety Policy Study:

There are approximately $26.8 million dollars allocated to NDDOT through the National Highway Traffic Safety Administration (NHTSA), the State of North Dakota, and through the Bipartisan Infrastructure Law (BIL) for statewide countermeasure strategies programmed in the FY2024-2026 HSP. The Safety Policy Study aligns to policies and strategies identified in the HSP to improve performance and address the State's crash emphasis areas across the MPA.

North Dakota Highway Safety Improvement Program (HSIP)

North Dakota's Highway Safety Improvement Program (HSIP) acts as the implementation arm of the SHSP and HSP. Every year, the State solicits for HSIP funding, which is a federal-aid program designed to reduce traffic fatalities and serious injuries across the state. All HSIP projects must relate to at least one of the priority emphasis areas identified in the SHSP. HSIP projects are programmed through the Bismarck-Mandan MPO's Transportation Improvement Program (TIP) and NDDOT's Statewide Transportation Improvement Program (STIP).

As part of the HSIP, every year, NDDOT publishes high crash locations from across the state for urban and rural locations. Projects submitted by local jurisdictions are not required to be at high crash locations.

ND HSIP's relevance to the Safety Policy Study:

The Safety Policy Study strongly considers NDDOT's HSIP guidebook to identify appropriate safety countermeasure strategies and to prioritize high crash locations for implementation across the MPA.

Figure 14. How to Apply for HSIP (NDDOT)

HOW TO APPLY

- Review your LRSP document and select any desired projects. The back of each document has completed HSIP project application forms. That form is all that needs to be submitted as documentation for LRSP projects. Consider grouping forms in an application to create larger projects.
- Use your knowledge of your system and your experience. Think about any other potential locations and projects that may fit eligibility and have the potential to reduce severe crashes.
- Complete a safety engineering study. A safety engineering study is an analysis and evaluation of available information to diagnose safety concerns and the identification of countermeasures to address the concerns. A study may include but is not limited to:
  - Location map clearly indicating where the proposed project is located.
  - Crash data analysis (Contact jjschlosser@nd.gov to get crash data from NDDOT).
  - Not all projects have to be high crash locations, projects may address a reduction in crash potential fo an identified crash issue.
  - Traffic volume data if applicable.
  - Input from stakeholders such as law enforcement, EMS, roadway maintenance, schools, etc.
  - Information from a site visit to document items such as sight lines, physical limitations, traffic movements, and adjacent land uses.
  - Explanation of safety concern and how proposed countermeasure will address concern.
  - The level of study will depend on the scope and complexity of the proposed project. Refer to the NDDOT website for traffic operations resources to assist in completion of studies.
- Identify scope of project and prepare cost estimate.
- Complete your HSIP project application by completing the SFN form and submit with your safety engineering study by email to hsip@nd.gov no later than December 31.

Feel free to contact Justin Schlosser (jjschlosser@nd.gov or 701-328-2673), for assistance regarding questions you may have about project eligibility and/or the application process.

NDDOT HSIP GUIDEBOOK
AUGUST 2021 | 7 | 23 USC § 409 Documents
NDDOT Reserves All Objections

North Dakota Local Road Safety Program

The Local Road Safety Program (LRSP) was prepared for all regions in North Dakota as part of North Dakota's statewide highway safety planning process between 2012-2015. The program was published prior to the current SHSP and focused on the goal of reducing severe crashes (as opposed to eliminating them); however, the program provided significant guidance to local jurisdictions by documenting at-risk locations, identifying effective low-cost safety improvement strategies, and positioning each region in North Dakota to compete for available safety funds (HSIP). Plans conducted through the program divide priority emphasis areas into two categories:

1. Driver behavior-related, and
2. Infrastructure related.

The LRSP identifies crash profiles from the crashes within the two (2) emphasis areas listed above and proposes countermeasures and safety improvement strategies for each of the crash profiles.

***LRSP's* relevance to the Safety Policy Study:**

The LRSP's emphasis on both driver behavior and infrastructure-related safety priorities aligns with key considerations of the 2025 Safety Policy Study. The crash profiles and countermeasures outlined in the LRSP for Burleigh and Morton Counties serve as reference points for regional safety issues and identifying applicable low-cost strategies for improving safety outcomes. Given the age of the LRSP plans developed for Burleigh and Morton Counties, the Safety Policy Study does not place great emphasis on the resources; however, both plans were highly successful in implementation of safety strategy on rural roads and pursuing HSIP funds.

NDDOT Traffic Operations Manual

Updated in August 2025, the manual describes typical NDDOT practice for traffic operations work. The manual serves as a source of context for transportation safety analysis and engineering practices specific to North Dakota. The manual specifically states that it is not intended to conflict or replace commonly accepted references such as the MUTCD, AASHTO Green Book, Highway Capacity Manual, Highway Safety Manual, Access Management Manual, etc.

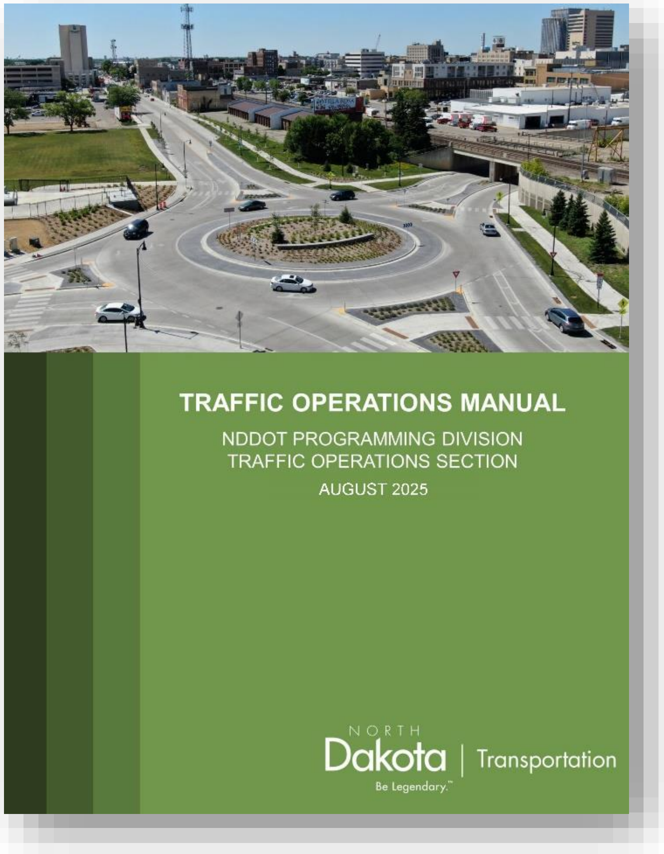
Traffic Operation Manual's relevance to the Safety Policy Study:

The manual outlines North Dakota-specific traffic operations and safety practices, which may directly support the Safety Policy Study and ensure alignment with regional engineering and planning standards. The document also lists safety recommendations and best practices to comply with national safety standards. The manual's direct focus on traffic operations studies, general safety analysis, roadway geometry, traffic signals, and access management will help evaluate and improve intersection safety, multimodal accessibility, and congestion reduction strategies.

Topics covered in the manual include:

- Traffic operations studies
- General safety and traffic analysis
- Roadway geometry
- Traffic signals
- Access management

Figure 15. Traffic Operations Manual Cover Page (NDDOT)



Arrive 2050 Metropolitan Transportation Plan (MTP)

Arrive 2050 (MTP), adopted in December 2024, is the BMMPO's road map for guiding the development of the region's multimodal transportation system. The plan reflects local conditions and assesses the performance of the MPA's transportation system with input from local agencies, NDDOT, FHWA, and FTA. The MTP is a performance-based plan that identifies performance measures and targets to further regional priorities while supporting state performance targets. *Arrive 2050* builds off the 2045 MTP to continue metropolitan transportation planning in the region while incorporating the findings and recommendations of plans and studies that have been completed since the publication of the 2045 MTP. *Arrive 2050* lists the following goals and objectives related to the Safety Policy Study:

1. Increased safety and security by reducing crash frequency and severity and implementing safe system features.
2. Improved infrastructure condition (for bridges and pavement).
3. Congestion reduction.
4. Increased system reliability for freight movement and economic vitality.
5. Increase in alternative transportation modes to automobile travel.
6. Increase environmental sustainability.
7. Increased project delivery efficiency.

***Arrive 2050's* relevance to the Safety Policy Study:**

Arrive 2050 supports efforts to find effective ways to reduce crashes and protect road users and directly supports the goals and objectives of the Safety Policy Study. The document also integrates data analysis and performance measures, which provides a framework to assess regional safety trends and set safety policies in the Safety Policy Study. Safety-specific funding and implementation projects are identified in *Arrive 2050*.

Bismarck-Mandan Bike and Pedestrian Plan

Published in December of 2017, the Bike and Pedestrian Plan's stated vision is to "convey that bicycling and walking are safe, comfortable, and convenient choices for all people, in hopes of creating an environment in which people feel comfortable and safe to bicycle and walk in Bismarck and Mandan." The Plan describes existing conditions, reviews relevant plans, programs, and policies, lays out engineering, education, encouragement, enforcement, and evaluation of strategies to achieve the Plan's goals, and identifies prioritized implementation steps. The five (5) goals of the Plan are:

1. Increasing the number of bicycling and walking trips made by people in Bismarck and Mandan.
2. Developing a connected network of bicycling and walking routes throughout both communities in partnership with local, regional and state partners. Connecting bicycling and walking routes to community destinations and other transportation systems, including transit.
3. Building and maintaining safe and comfortable bicycling and walking facilities for people of all ages and abilities. Supporting driving, walking and bicycling behaviors that increase the safety of people who walk and bicycle.
4. Protecting the public's investment in the bicycling and walking system over the long-term and ensure system accessibility all year round.
5. Integrating bicycle and pedestrian facilities with project designs during the development review process, as new commercial and residential projects are planned.

Bike & Ped Plan's relevance to the Safety Policy Study:

The plan directly supports the Safety Policy Study's goals through the description of infrastructure improvements and behavioral strategies. The plan encourages development of a comprehensive and safe multimodal transportation system, along with implementation of maintenance strategies, data-driven decision-making and policy recommendations.

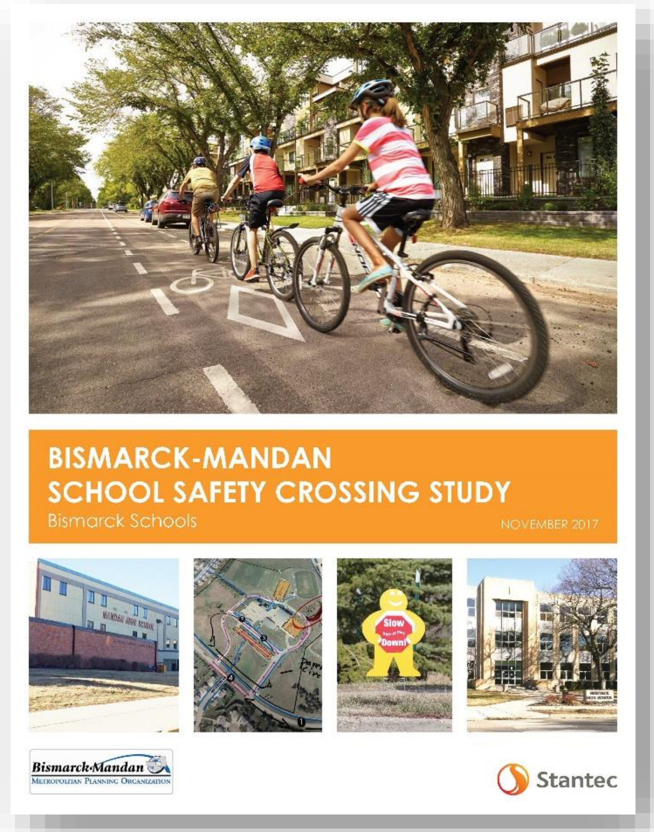
School Crossing Safety Studies (Bismarck, Mandan)

Published in November 2017, the two (2) safety studies outline existing programs and policies, detail the outreach/engagement efforts and results, describe existing safety conditions at local school crossings, and lay out recommendations for implementation programs, policies, and infrastructure improvements to enhance safety at those crossings.

School Crossing Safety Studies' relevance to the Safety Policy Study:

Both studies reinforce efforts to protect vulnerable road users, especially school-aged or younger users of the regional transportation system; align with goals to enhance crosswalks, signage, and traffic control near schools; support community-driven solutions to address safety concerns; provide a foundation for safety programs and enforcement strategies.

Figure 16. School Safety Crossing Study Cover Page



Bismarck-Mandan Intersection Analysis Study

Published in December of 2020, the Intersection Analysis Study consists of four (4) main components:

1. **Macro-Level Analysis**: High-level review of all study intersections to identify issues that require further analysis.
2. **Micro-Level Analysis**: Detailed analysis of potential improvements and comparison of alternatives to mitigate issues at the 65 intersections identified in the macro-level review.
3. **Improvement Plan**: Implementing the improvements identified in the micro-level analysis.
4. **Traffic Engineering Playbooks**: Repeatable process developed for Bismarck and Mandan that the Cities can utilize to address local transportation issues at specific locations that do not necessarily justify a larger corridor- or subarea-level analysis.

The results of all four (4) components will be useful during the analysis of existing safety conditions and the process of developing proposed improvement strategies and best practices.

Intersection Analysis Study's relevance to the Safety Policy Study:

The study's macro- and micro-level analyses have a structured approach to identifying and addressing intersection safety issues. The identification of specific intersection improvements guides multimodal safety enhancements and congestion reduction strategies. The study also includes a repeatable methodology for evaluating and mitigating intersection safety concerns, which supports the broader goals of Vision Zero and proactive safety interventions forwarded in the Safety Policy Study.

Safe Routes to Services/Complete Streets Study

Published in December of 2024, the study identifies priority improvement areas using data analysis and community feedback and offers actionable recommendations. Solutions address immediate safety issues and start the process of long-term infrastructure improvement. The study provides a framework for implementing the strategies identified and securing future funding opportunities. This study aims to establish a safe, inclusive, and equitable transportation planning model that paves the way for a more connected and accessible transportation system, prioritizing the voices and needs of those most affected by current mobility challenges.

The Complete Streets component is another key focus of the study, integrated at all levels of planning and decision-making. Its primary objectives include enhancing safety by reducing crashes, boosting fixed-route transit ridership, and expanding the network of bicycle facilities. This initiative is deeply embedded in community engagement efforts, project-specific planning, policymaking, and year-round, four-season transportation planning to ensure accessibility and usability for all.

Safe Routes to Services/Complete Streets Study's relevance to the Safety Policy Study:

The study is evidence-based and specifically prioritizes the needs of vulnerable populations and those most affected by mobility challenges including low-income households; racial and ethnic minorities; individuals with disabilities; older adults; and those with limited English proficiency. Additionally, the study supports public engagement and transportation solutions which consider all users. The socioeconomic and demographic analysis, immediate safety interventions, and long-term infrastructure planning are directly relevant to the Safety Policy Study.

Policy and Process Changes

With guidance from the federal government and State of North Dakota, the BMMPO and local jurisdictions have laid a very solid foundation of policies, plans and studies, and guidelines to forward transportation safety in the MPA. The Safety Policy Study incorporates policy and process changes to complement and build from the body of multimodal-safety planning work in the MPA. The following policy and process changes are highlighted in the Study.

Establishing a Vision Zero

As highlighted in **Chapter 2**, the Study defines a target date for significantly reducing roadway fatalities and incapacitating injuries. The vision of eliminating fatalities and incapacitating injuries has never been an adopted policy of the BMMPO and is an ambitious, clear stance on multimodal transportation safety for the region.

Guiding Safety Strategy

Chapter 7 and **Chapter 8** will guide multimodal safety investment for the region, providing a robust toolbox of engineering and non-engineering safety countermeasures that may be applied in the MPA. Rather than multiple plans outlining strategies, the Study compiles a set of safety countermeasure strategies in a single, accessible resource.

Identifying Crash Trends & High-Injury Network (HIN)

Highlighted in **Chapter 2** and **Chapter 5**, the Study is driven by a robust data-driven process to identify crash trends. Also, the Study identifies characteristic crash profiles that contribute to the region's High-Injury Network (HIN) or other areas with high concentrations of crashes, especially fatal and incapacitating injury crashes. Although similar to the way NDDOT identifies high crash locations in the MPA, the Study includes key differences in the analysis:

- Focus on severe crashes;
- Trends are identified from severe crashes across the entire MPA;
- A modal analysis is provided;
- Fatal and incapacitating injury crashes are weighed equally high;
- Minor injury, possible injury, and property damage only crashes are weighed less than severe crashes, to varying degrees, varying by mode.

Aligning with the USDOT NRSS & SSA

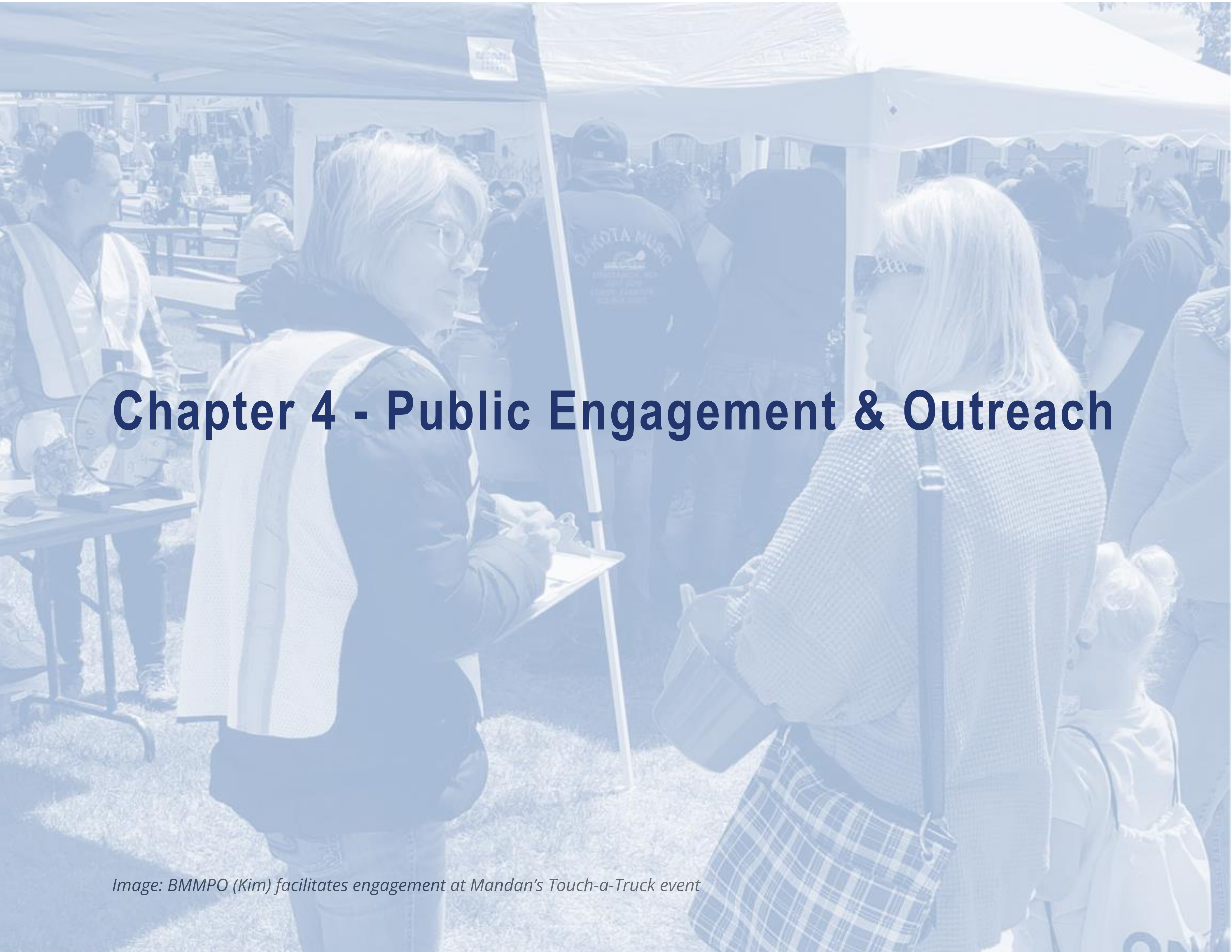
As introduced in **Chapter 1** and throughout the document, the Study employs and aligns closely with a modern, Safe System Approach (SSA) to multimodal transportation safety. This places less onus on engineering solutions and provides a more holistic approach to transportation safety in the MPA.

Safety-Specific Public Engagement

Highlighted in **Chapter 4**, engagement from stakeholders and community members as part of the Study informs safety strategies and prioritization of projects. All of the BMMPO's studies include public engagement; however, the Study's safety-specific focus is new to the MPA.

Prioritizing Investment

As highlighted in **Chapter 8**, the Study prioritizes locations for investments that improve safety and guide future investment.



Chapter 4 - Public Engagement & Outreach

Image: BMMPO (Kim) facilitates engagement at Mandan's Touch-a-Truck event

Summary of Study Engagement

Public participation is a cornerstone of the Study. Guided by BMMPO's *Public Participation Plan (PPP)*, engagement activities were designed to gather diverse perspectives from residents, stakeholders, and partner agencies to identify key transportation safety concerns.

The goal of this engagement process was to ensure transportation safety strategies reflect real-world experiences and priorities across all modes: vehicle, bicycle, pedestrian, transit, freight, and off-highway vehicles (OHVs). Activities were intentionally inclusive of traditionally underrepresented voices, including youth, older adults, people with disabilities, and rural residents. The full summary of public engagement is in **Appendix C**.

Engagement was conducted between April and August 2025 and included:

- **Community Conversations** at public events in Bismarck and Mandan.
- **Focus Groups** with first responders, youth, and active transportation stakeholders.
- **Stakeholder Interviews** with freight and OHV professionals.
- **Youth Perspective Survey**, distributed through local schools and community channels.

Figure 17. Safety Policy Study Booth at Mandan's Touch-a-Truck Event (May 17, 2025)

A multi-layered approach ensured participation from individuals representing different generations, geographies, and transportation experiences, including neighborhood residents and students, as well as commercial drivers and emergency responders. Together, these voices reveal a shared commitment to improving safety, accessibility, and accountability across the region's transportation system.

Engagement Methodology

Engagement activities aligned with the BMMPO's goals of early involvement, inclusive opportunities, and clear communication. Participation methods were tailored to reach people where they live, work, and travel, combining face-to-face outreach with a Study webpage and targeted stakeholder discussions.

Figure 18. Safety Policy Study Booth at the Bis-Man Earth Day Festival (April 29, 2025)

All feedback was coded thematically to identify recurring issues and shared priorities. The analysis compiles comments, quotes, and mapped concerns to ensure that each perspective — whether public, private, or institutional — was represented equally.

While the public engagement process captured a wide range of opinions, concerns, and experiences, it is essential to recognize that these perspectives represent how people *perceive safety*, not necessarily the measured causes of crashes or injuries.

This engagement is intended to understand how residents, workers, and visitors experience the regional transportation system in their daily lives.

Some perceptions may reflect discomfort with design features, such as roundabouts or traffic-calming measures, that research has shown to improve safety and reduce severe crashes. Others, may reveal areas where public education, enforcement, or communication could complement engineering solutions.

Taken together, these perspectives provide valuable context for identifying both the perceived and actual factors influencing transportation safety in the Bismarck-Mandan region.

Advertising the Study

Guided by the BMMPO's PPP, the Study and all public engagement opportunities were advertised in the following ways:

- Project webpage
- BMMPO social media page
- Legal advertisement
- Press release

The project webpage was updated frequently, and included an email subscription option for interested members of the public and other stakeholders to receive email notifications about the Study's key milestones and engagement opportunities.

Focus groups were assembled through direct communication via phone calls and/or emails to potential participants.

Engagement Activities

A summary of the types of engagement activities conducted as part of the Study is highlighted in **Table 7**.

Table 6. Engagement Activities

Engagement Activity	Description	Participants	Format
Community Conversations	Pop-up booths at public events at the Earth Day Celebration & Touch-a-Truck	General public, families, youth, residents, visitors	In-person mapping, comment boards
Focus Groups	Structured discussions exploring safety by mode and role	First responders and active transportation advocates	Facilitated discussions
Stakeholder Interviews	Semi-structured interviews	Trucking and logistics companies & advocacy organizations, OHV state program manager	In-person and online individual and small group interviews
Youth Perspective Survey	Online questionnaire on safety experiences	Youth ages 13-19 from the MPO area	Digital survey

Key Findings and Outcomes

Safety Areas of Concern

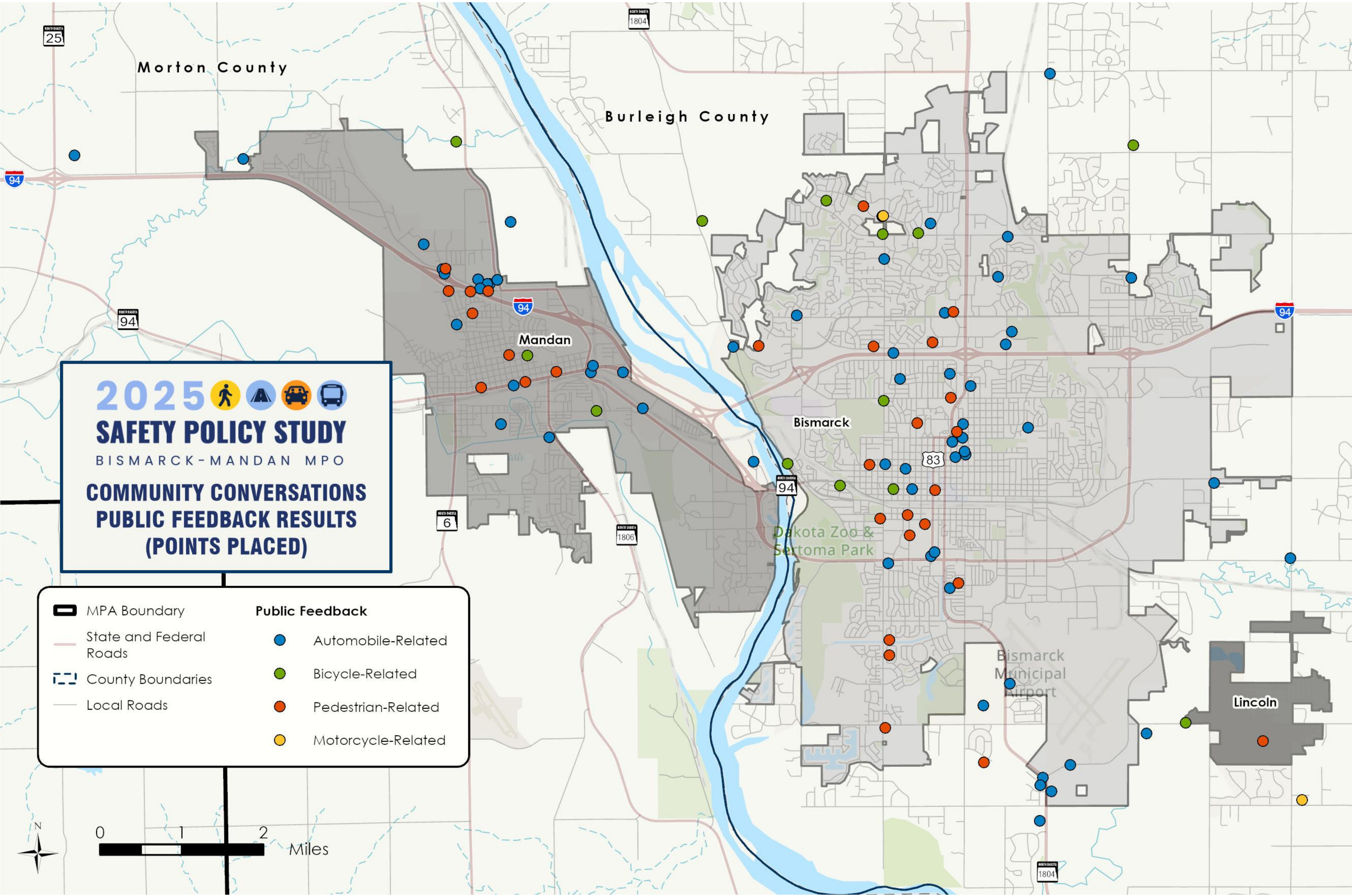
At both community conversations events, the project team set up maps of the region asking people to place a sticker on specific areas within the MPA where they had a transportation safety concern. People who participated by placing a sticker on the map also submitted a written comment of their specific safety concern(s) for that location. Additionally, the project team provided different stickers for modal-specific concerns. The following types of stickers were provided:

- Bicycle
- Pedestrian

- Motorcycle
- Automobile/Car
- Transit/Bus

The results from the exercise at both community conversations events are shown in **Figure 19.** In total, 109 stickers were placed comprised of 60 automobile-related, 29 pedestrian-related, 13 bicycle-related, and two (2) motorcycle-related locations.

Figure 19. Community Conversations – Safety Areas of Concern Results



Pedestrian and Bicycle Safety

Across all outreach activities, pedestrian safety emerged as the highest safety priority. Participants described unsafe crossings near schools, poor visibility, and a lack of infrastructure continuity or gaps in the network. Youth and adults alike expressed frustration with fading crosswalk paint, missing sidewalks, and inconsistent maintenance.

> **Participant Thoughts on Pedestrian Safety & Crossings**
>
> *"Drivers still go through despite flashing lights and crosswalks." –* Community Conversation participant, Touch-a-Truck Event

Shared pedestrian and bicyclist observations:

- Unprotected crossings near schools and parks (e.g., Solheim Elementary, Century Avenue)
- Trail and sidewalk gaps connecting neighborhoods, workplaces, and commercial areas
- Poor visibility and inadequate lighting along pedestrian corridors
- The need for better maintenance, particularly snow and debris removal

Whether voiced by families, active transportation advocates, or freight operators observing pedestrian conflicts, the message was consistent: **safer infrastructure and maintenance practices benefit everyone.**

Driver Behavior and Distracted Driving

Nearly all participants named distracted, impatient, and aggressive driving as significant threats to roadway safety. First responders described frequent crash responses linked to phone use; community members noted speeding in residential zones; freight operators highlighted conflicts caused by driver inattention. **Participants widely supported stronger education and enforcement campaigns to curb distracted driving and promote courteous behavior behind the wheel.**

> **Participant Thoughts on Distracted and Impatient Driving**
>
> *"We've turned into a society where we sit at green lights and run red ones because you're on your da** phone." –* First Responders Focus Group Participant

Common driver behavior concerns:

- Phone use while driving or at intersections
- Speeding near schools and parks
- Tailgating and failure to yield at crosswalks
- Inconsistent enforcement of existing traffic laws

Infrastructure Gaps & Intersection Design

Infrastructure gaps and challenging intersections were cited by nearly every participant group. Freight operators described difficult turning movements and congestion; bicyclists and pedestrians noted inconsistent connections; residents identified confusing roundabouts and short light cycles. **Together, these findings suggest that design consistency and multimodal considerations are critical for future safety investments.**

Common infrastructure/intersection locations and challenges:

- Congestion at high-volume intersections such as U.S. Highway 83, 19th Street, and Washington Street
- Roundabouts are too small for local delivery/service truck maneuvering
- Sidewalks that end abruptly or lack ADA-compliant transitions
- Need for clearer signage and signal timing that accounts for pedestrians and freight

Transit Accessibility & Reliability

Transit users and service providers agreed that coverage, frequency, and stop safety limit the usability of public transit. Participants across demographics noted that limited evening hours and long wait times discourage regular ridership. **Expanding reliable, accessible transit options can advance rider experience for the region's most vulnerable populations and improve overall system safety.**

Common feedback about transit:

- Improve route connections between residential, college, and employment centers
- Enhance lighting and visibility at stops for safety and comfort
- Explore later or weekend service to reduce reliance on single-occupancy vehicles

Freight and Commercial Vehicle Operations

Participants in the freight industry emphasized infrastructure bottlenecks, insufficient truck parking, and driver education needs. Residents also raised concerns about congestion and safety in freight corridors. **Collaboration between agencies and carriers can improve operational efficiency and enhance public safety.**

Key points on freight and commercial vehicles:

- Shortage of secure truck parking with basic amenities
- Tight turning radii and congestion at major intersections
- Need for public education on safe driving around large trucks

Off-Highway & Micromobility Vehicle Use

Use of off-highway vehicles (OHVs), e-bikes, scooters, and golf carts is increasing within city limits and rural edges. Participants cited confusion about where such vehicles are permitted and emphasized the importance of consistent enforcement and clear communication of rules. **Ensuring that emerging modes coexist safely with traditional traffic is an evolving need.**

Shared priorities for OHVs:

- Clarify local ordinances for OHV and micromobility use
- Increase education on helmet use and age requirements
- Coordinate enforcement among city, county, and state agencies

Seasonal Conditions and Maintenance

Winter weather and construction seasons present recurring safety challenges. All participant groups recognized that snow, ice, and poor lighting increase crash risk and limit accessibility for pedestrians and bicyclists. **Maintaining safe conditions year-round supports the region's goal of efficient, multimodal mobility.**

Consensus themes on seasonal conditions and maintenance:

- Timely and consistent snow and ice removal
- Clear visibility and lighting during dark winter months
- Maintenance of sidewalks, trails, and shoulders after storms or construction

Education, Enforcement & Collaboration

Education and outreach were viewed as essential to long-term safety improvements. Participants across all backgrounds and sectors called for continued partnerships among schools, law enforcement, and local governments to promote awareness and accountability on the regional transportation system. **By fostering consistent messages and shared responsibility, education and enforcement can shape safer habits throughout the community.**

Representative ideas about education, enforcement, and collaboration:

- Expand defensive-driving and pedestrian safety education in schools
- Provide community presentations or "safety days" in public spaces
- Increase visibility of enforcement in high-risk areas
- Use plain-language communication and accessible outreach materials

Conclusion & Recommendations

Public engagement across the MPA produced a unified message: **transportation safety is a shared responsibility**. Participants represented many roles and experiences, from residents, students, first responders, truck drivers, recreational riders, to planners and engineers; people's concerns converged on several core priorities as summarized in **Table 8**.

While this engagement captured perspectives from a wide range of travelers, motorcyclists were not directly represented. As a mode with a disproportionate share of severe crashes, involving motorcycle riders and organizations in future discussions will be essential to developing a fully inclusive approach to transportation safety in the MPA.

These findings demonstrate the value of bringing diverse perspectives together to shape a holistic view of transportation safety. Each participant, whether a daily commuter, professional driver, emergency responder, or local resident, offered insight into how people experience the transportation system and where improvements can make a difference. The BMMPO will use this input to guide safety priorities, inform data-driven decisions, and support a transportation network that is safe, efficient, and responsive to all users.

Table 7. Transportation Safety Priorities

Transportation Safety Priority	Description
Enhance pedestrian and bicycle infrastructure	Ensure safe, continuous, and accessible routes for all modes of travel in the MPA.
Address distracted and aggressive driving	Focus efforts through education and enforcement campaigns.
Improve design and maintenance of intersections and corridors	Establish practices to accommodate all users, including freight where applicable.
Expand and secure transit options	Increase safety and mobility to reduce risk for transit riders.
Clarify and enforce regulations	Focus efforts on emerging micromobility technologies and OHVs.
Sustain year-round maintenance	Continue addressing seasonal travel challenges through visibility-improvement strategies and timely snow removal.
Strengthen education and collaboration	Bring together community members, local schools, local agencies, and law enforcement to collaboration on educational opportunities.

Chapter 5 - Data Analysis

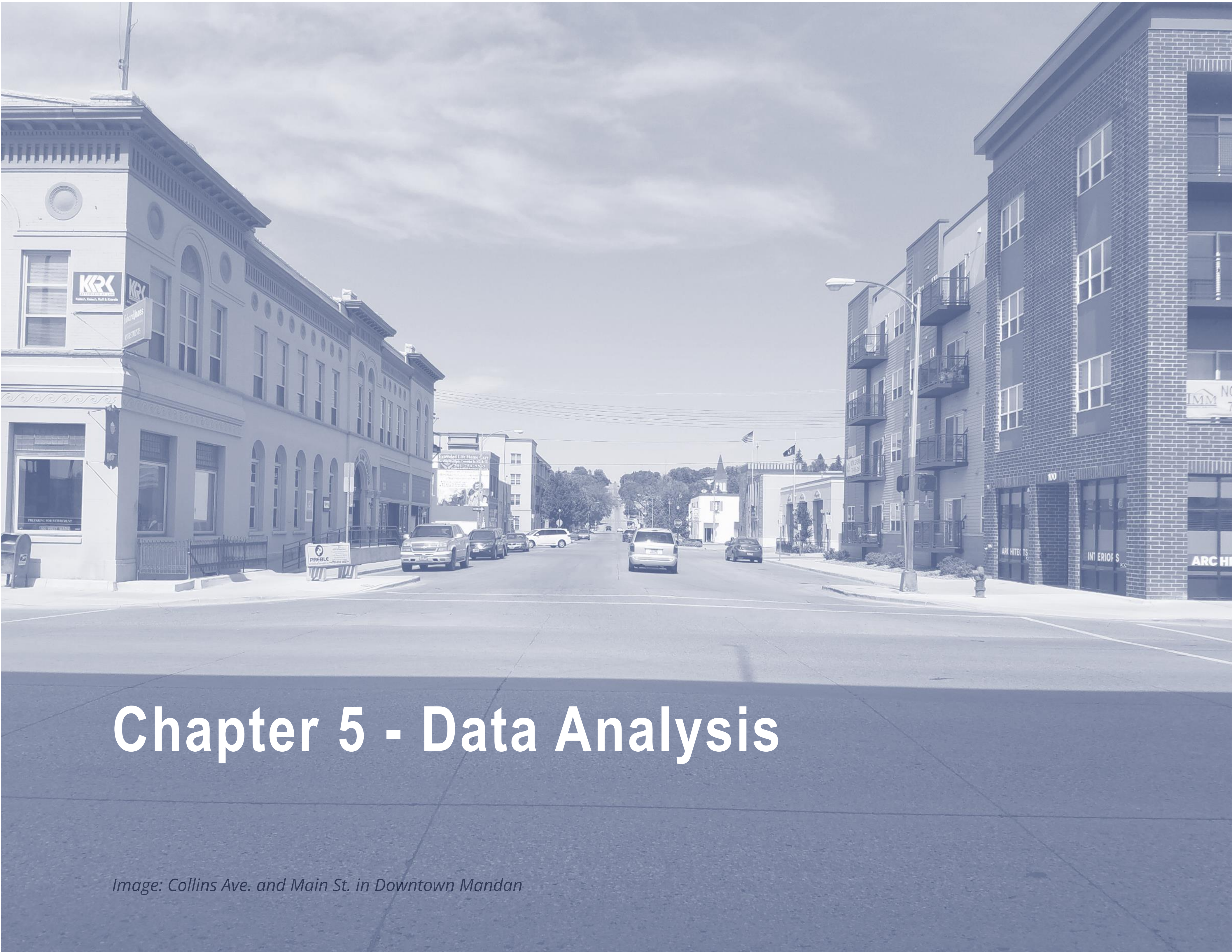


Image: Collins Ave. and Main St. in Downtown Mandan

Safety Analysis

The safety analysis is provided as two (2) key components within the Safety Policy Study:

1. Historical Crash Trend Summary (see **Chapter 2**)
2. High-Injury Network Analysis (see **Chapter 6**)

Crash data was processed and categorized by key factors such as time, location, mode of transportation, environmental and road conditions, traffic characteristics, and roadway features. This organization helps identify factors contributing to crash frequency and severity, revealing high-risk locations and situations within the BMMPO's regional multimodal transportation network.

Crash Data Background

The Study uses data sourced directly from NDDOT crash reports, as collected by law enforcement agencies statewide through an electronic reporting system. In alignment with national best practices for transportation safety planning, the most recent five-years of complete crash data are used to ensure relevance and accuracy.

Crash data from 2020 through 2024 was analyzed as part of this Study.

Crash data in North Dakota is compiled by the Highway Safety Division of NDDOT and is available in both one-year and five-year data formats. Many jurisdictions across the State utilize NDDOT's pre-assembled five-year crash datasets, curated and streamlined by the Highway Safety Division for ease of use.

To support a more granular and customized analysis, the project team utilized individual one-year crash data tables. The data tables provide raw, unfiltered crash data extracted directly from NDDOT's electronic crash reporting system, which collects information from law enforcement at or shortly after the crash scene. The one-year crash data tables include five (5) separate tables organized in the following manner:

- **Crash Master Table** – provides general data regarding the crash.
- **Occupant Table** – provides details regarding each occupant involved in the crash, as applicable.
- **Operator Table** – provides details regarding the operator(s) involved in the crash.
- **Pedestrian Table** – provides details regarding pedestrians involved in the crash, as applicable.
- **Unit Table** – provides details regarding the type(s) of vehicles involved in the crash, as applicable.

Using one-year tables provided several advantages over the five-year tables:

- **Consistency** across years, as each dataset is delivered raw and unfiltered.
- **Comprehensive details** such as mode(s) involved in the crash and data regarding occupants, which become aggregated in the five-year dataset.
- **Analytical flexibility** allowing the project team to apply custom filtering and categorization methods tailored to a robust modal crash analysis.

A robust modal crash analysis is critical to assemble the Study's High-Injury Network (HIN) analysis.

High Injury Network (HIN)

As a part of the Study's safety analysis, a High-Injury Network (HIN) was developed. The HIN included all roadways within the BMMPO planning area except for Interstates which are removed from the nonmotorized networks because of the strong, local focus of the Study. The elimination of these roads is standard practice due to their operational differences (higher speeds, higher volumes, and access control) as well as ineligibility for SS4A funds. The HIN in the MPA includes street segments which meet a certain threshold of crashes and crash severity on the street; for example, a one-mile segment with three (3) severe crashes would receive a HIN crash score of 9.0.

What is a High Injury Network?

The High-Injury Network (HIN) identifies streets or locations where a high number of severe crash concentrations have occurred along a corridor-level segment for the most recent five-year period (2020-2024). The HIN represents a prioritized subset of the BMMPO's overall regional transportation network, focusing on streets with the highest prevalence of severe crashes.

For example, the HIN may identify a one-mile segment of corridor; however, severe crashes may be concentrated at a single intersection or other specific, shorter location.

Additionally, Interstates or freeways are typically not owned and operated by local agencies and the focus of the Study is to identify a list of priority locations for local agencies to focus on. The results of the all-mode HIN analysis are shown in **Figure 21** and further detailed in **Chapter 6**. Additional details about HIN methodology can be found in **Appendix D**.

HIN Quick Facts*

- 9.0% of the streets in the BMMPO's MPA are on the all-mode HIN (112.9 miles)
- The all-mode HIN accounts for 73.9% of all fatal and incapacitating injury crashes
- 3.2% of the streets in the MPA are on the nonmotorized HIN (40.0 miles).
- The nonmotorized HIN accounts for 67.4% of all nonmotorized fatal and incapacitating injury crashes.
- 85.8 miles of streets in the MPA are on the motorized HIN (85.8 miles).
- The motorized HIN accounts for 64.8% of all motorized fatal and incapacitating injury crashes.

*All-mode HIN quick fact totals are not a sum of all motorized and nonmotorized HIN and contributing severe crashes. For example, portions of the all-mode HIN may overlap with specific motorized and nonmotorized HINs.

The HIN is more than just a heat map of severe crash locations (see **Figure 20)**; it provides significantly more focus on specific corridors within BMMPO's regional transportation system as shown in **Figure 21**. Nine (9) percent of the BMMPO's regional transportation network contributes nearly 74 percent of all fatal and incapacitating injury crashes. The HIN analysis of the Study provides critical, strategic focus to prioritize locations on the regional transportation system where the greatest impact to multimodal safety can be made.

High Crash Locations

The NDDOT publishes high crash locations annually as part of the statewide HSIP update. Two (2) lists identifying the top 50 highest urban crash locations and top 25 highest rural crash locations across North Dakota are compiled; (1) Urban High crash Locations and (2) Rural High Crash Locations. The latest high crash locations are mapped on **Figure 22** and listed in **Table 10**. There are 18 total locations identified in BMMPO's MPA, one (1) in Mandan, 16 in Bismarck, and one (1) in Burleigh County.

How does the HIN differ from NDDOT's High Crash Locations?

Similarities and differences of the HIN analysis and NDDOT's High Crash Location analysis are highlighted in **Table 9.** The methodology (Data Crash Weights) and application of each analysis are starkly different; however, each analysis serves as a complimentary tool for prioritizing potential safety strategies and future safety projects across BMMPO's MPA.

Table 8. HIN Comparison to NDDOT's High Crash Locations

Component	HIN (BMMPO)	High Crash Locations (NDDOT)
Locations	*More corridor focused.* 1. The HIN is tailored to the BMMPO's MPA, and displayed by corridor. The HIN focus can be adjusted by establishing crash score thresholds. (All 16 2022-2024 Urban High Crash Locations are on the all-mode HIN). 2. The HIN doesn't always appear on rural networks, as severe crash densities are typically less and severe crashes more sporadic (The one 2022-2024 Rural High Crash Location is on the all-mode HIN).	*More intersection focused.* 1. Top 50, statewide urban high crash locations are listed by intersection (17 locations in BMMPO's urbanized area). 2. Top 25, statewide rural high crash locations are listed by corridor (reference points) or intersection (1 location in BMMPO's MPA).
Data	*Typically sorted by travel mode. Periodical, data analysis to identify themes or contributing crash factors at a granular level.* 1. Published as part of this Study in 2025. 2. Utilized 5-years of NDDOT crash data (2020-2024). Does not breakout annual crash totals, based on 5-year summary. 3. HIN designation is based upon crash severity at specific locations and on specific corridors including Local roads. 4. Includes breakout of travel mode, HIN corridor length, number and severity of crashes, manner of crash, traffic volume, functional classification, adjacent land use, speed limit, configuration/traffic control, jurisdictional ownership, and others.	*Not sorted by travel mode. Annually updated data analysis to monitor trends statewide or at a higher-level.* 1. Published annually, typically in July. 2. Utilized 3-years of NDDOT crash data (2022-2024). Includes breakout of annual crash totals for each location. 3. High Crash Location designation is based upon crash severity at specific locations and on specific corridors excluding Local roads. 4. Includes crash trends describing increase in crashes, decrease in crashes, steady. Also includes information regarding prevalent manner of crash or vulnerable modes involved.

Component	HIN (BMMPO)	High Crash Locations (NDDOT)
Crash Weights	*Sole focus on severe crashes including fatal and/or incapacitating injury crashes.* 1. Weighted by KABCO severity scale. 2. Utilizes nominal weighting scale to balance HIN representation on the local network. Through best practices identified in **Appendix D**, HIN weighting is set to identify a focused street network contributing to the majority of severe crashes in the MPA. 3. Variable weight formula = ("K" Crashes) X 3.0 + ("A" Crashes) X 3.0 + ("B" Crashes) X 1.0 a. "B" crashes are only included in weighting formula for specific, vulnerable modal HINs including pedestrian, bicycle, and motorcycle.	*Focus on severe crashes including fatal and/or incapacitating injury crashes; however, can have zero (0) severe crashes and still be identified as a High Crash Location.* 1. Weighted by KABCO severity scale. 2. Utilizes Equivalent Property Damage Only (EPDO) weighting factors based on FHWA's *Crash Costs for Highway Safety Analysis (2018).* Adjusts fatal crash weight from 542:1 to 100:1 so as not to jump single fatal crash locations to the top of ranking lists. 3. Weight formula = ("K" Crashes) X 100 + ("A" Crashes) X 55 + ("B" Crashes) X 17 + ("C" Crashes) X 11 + "PDO" Crashes
Application	*The HIN identifies priority corridors, at the local level, to focus implementation efforts that will have the biggest impact on saving lives.* 1. The FHWA provides guidance on performing HIN analyses, as an emerging strategy to focus safety analyses in local jurisdictions. 2. Information about whether a project is located on the jurisdiction's HIN is required in Safe Streets and Roads for All (SS4A) Implementation grant applications; however, it is not a requirement of the program for the project to be on the HIN. 3. Used by the BMMPO and jurisdictional partners to identify priority implementation locations, to scope projects, establish higher-level policy based upon granular data and apparent themes, scope safety projects, pursue SS4A funding, and pursue HSIP funding.	*The High Crash Locations identify the top 50 urban and top 25 rural intersections or corridors statewide, to track the safety trend at specific locations and identify potential HSIP project locations.* 1. High Crash Locations are published as part of ND's HSIP update, ahead of HSIP funding solicitation. 2. Projects submitted to NDDOT HSIP funding are not required to be on the High Crash Location listing. 3. Used by jurisdictions across the state to identify potential safety challenges and to identify/scope safety projects, and pursue HSIP funding.

Figure 20. Heat Map of 2020-2024 Crashes in the Bismarck-Mandan Region

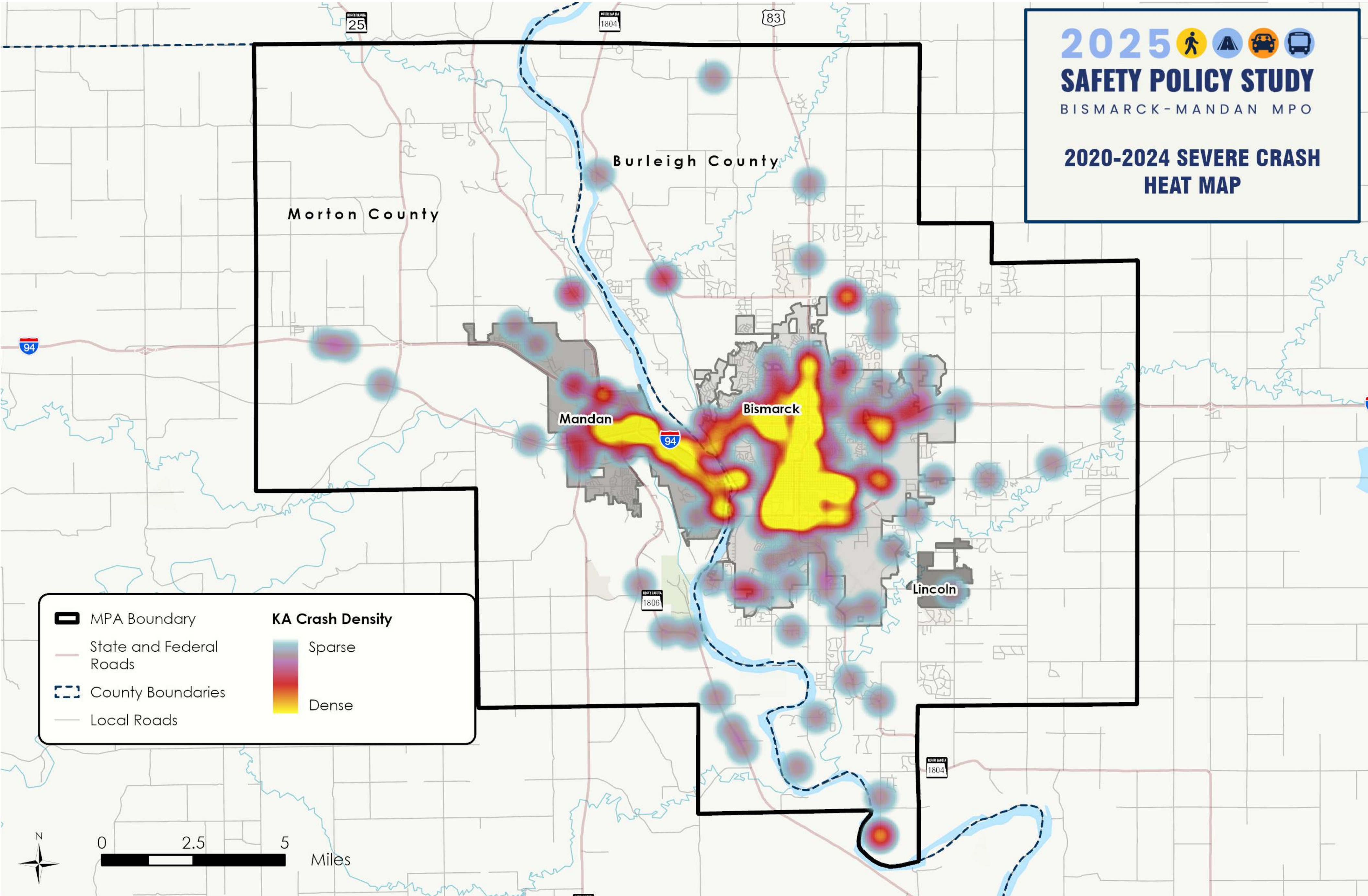


Figure 21. All-Mode HIN Map (No Interstates, No Auto B Crashes)

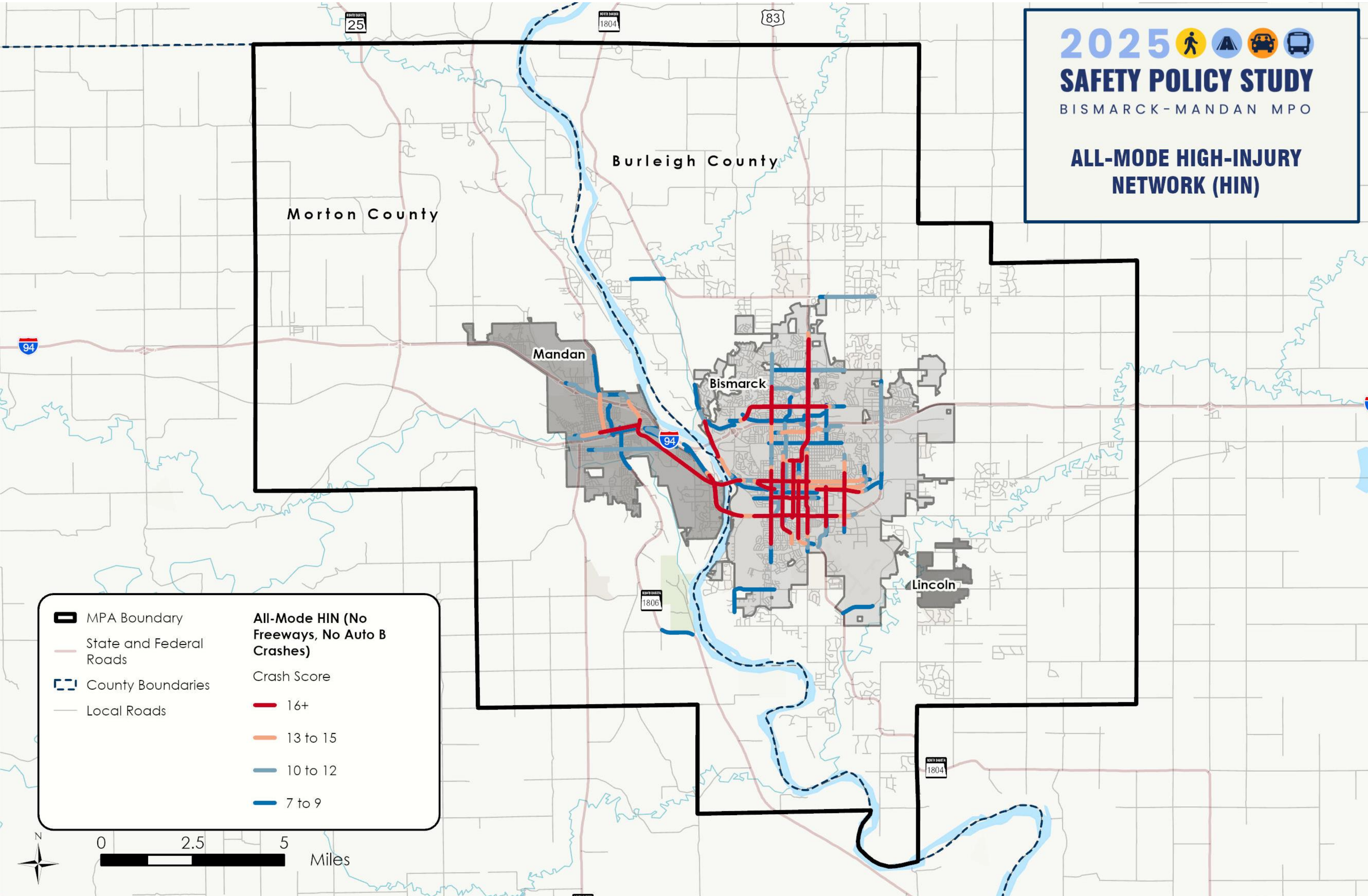
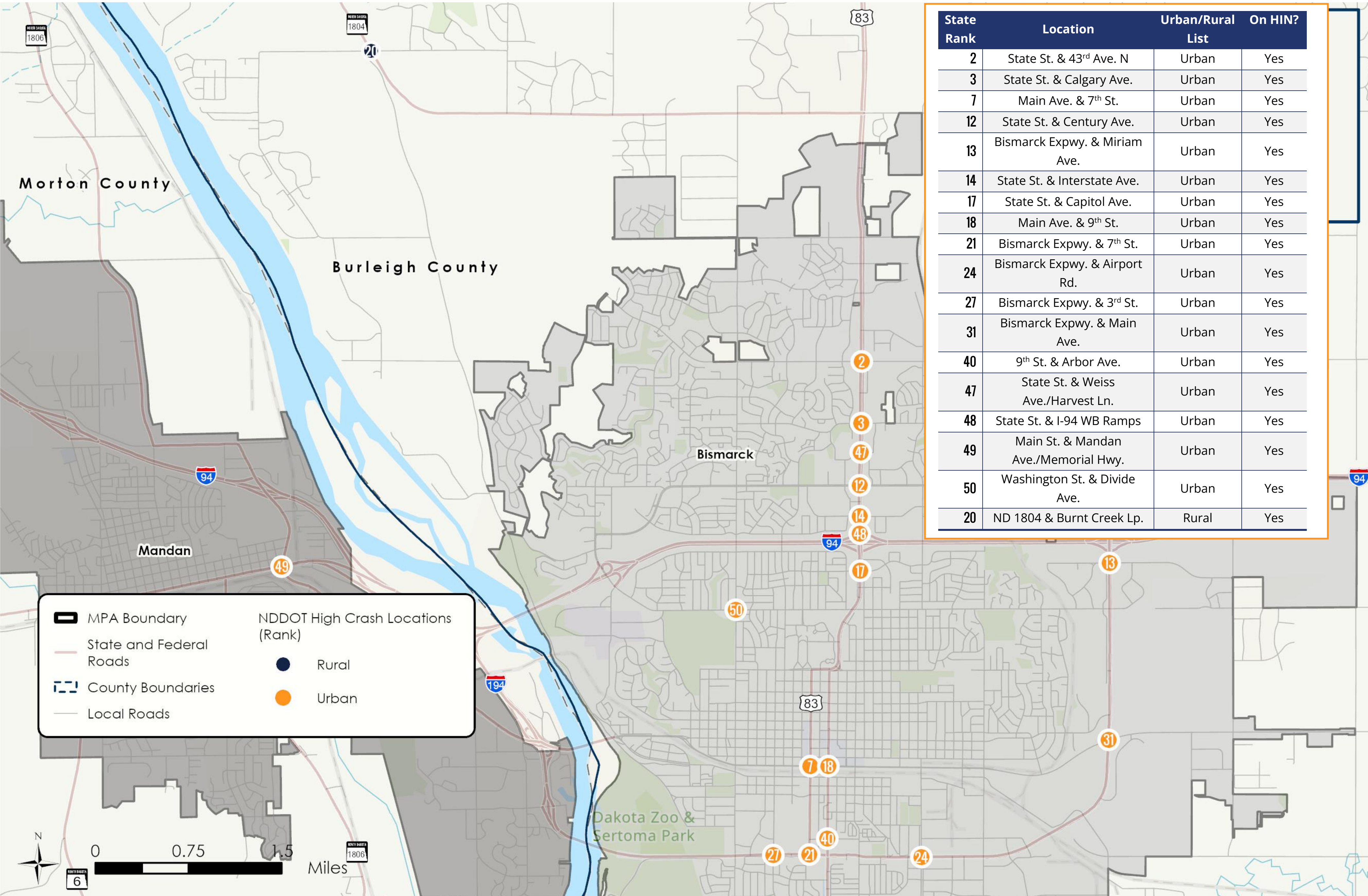


Figure 22. 2022-2024 High Crash Locations in the MPA, Urban & Rural (NDDOT)



State Rank	Location	Urban/Rural List	On HIN?
2	State St. & 43rd Ave. N	Urban	Yes
3	State St. & Calgary Ave.	Urban	Yes
7	Main Ave. & 7th St.	Urban	Yes
12	State St. & Century Ave.	Urban	Yes
13	Bismarck Expwy. & Miriam Ave.	Urban	Yes
14	State St. & Interstate Ave.	Urban	Yes
17	State St. & Capitol Ave.	Urban	Yes
18	Main Ave. & 9th St.	Urban	Yes
21	Bismarck Expwy. & 7th St.	Urban	Yes
24	Bismarck Expwy. & Airport Rd.	Urban	Yes
27	Bismarck Expwy. & 3rd St.	Urban	Yes
31	Bismarck Expwy. & Main Ave.	Urban	Yes
40	9th St. & Arbor Ave.	Urban	Yes
47	State St. & Weiss Ave./Harvest Ln.	Urban	Yes
48	State St. & I-94 WB Ramps	Urban	Yes
49	Main St. & Mandan Ave./Memorial Hwy.	Urban	Yes
50	Washington St. & Divide Ave.	Urban	Yes
20	ND 1804 & Burnt Creek Lp.	Rural	Yes

Demographics Analysis

It is well known that the transportation system influences communities' quality of life and the experiences people have in their everyday lives. The Study performed a spatial analysis to deepen the understanding of the demographic composition of the BMMPO's MPA, resulting in the identification of areas of persistent poverty (APP). Also called underserved communities by the USDOT, areas of persistent poverty are defined as census tracts which have a poverty rate of at least 20 percent as measured by the 2014-2018 five-year data series available from the American Community Survey Areas of Persistent Poverty (APP) are identified to be consistent with SS4A Notice of Funding Opportunity (NOFO) definitions of underserved communities and information requested by USDOT when completing future implementation grant applications. Transportation safety improvements can positively impact access to education opportunities, jobs, and quality of life.

There are no Areas of Persistent Poverty (APP) within BMMPO's MPA. The closest APP is 100-miles south, on the Standing Rock Indian Reservation.

The BMMPO has identified vulnerable users of the regional transportation system and populations more susceptible to being involved in a severe crash. Recently, BMMPO and jurisdictional partners completed the *Safe Routes to Services & Complete Streets Study* to dive into specific demographics of vulnerable populations in the region.

Disadvantaged Communities

The following areas were flagged as the top disadvantaged communities in the MPA through the *Safe Routes to Services & Complete Streets Study*. Disadvantaged communities were identified in the region based on three (3) socioeconomic indicators:

1. Percent of population that is black, indigenous, or persons of color (BIPOC).
2. Percent of population that is below 150% of the Federal Poverty Level.
3. Percent of households with at least one person with a disability.

Table 11 describes the five (5) areas defined by the *Safe Routes to Services & Complete Street Study* for the MPA; or the locations with the highest prevalence of the indicators listed above.

Table 9. BMMPO Disadvantaged Communities

Municipality	Boundary
Bismarck	**Area 1** - North Washington to Century Avenue and West Interstate Avenue to West Century Avenue
	Area 2 - East Avenue C to East Avenue B and 9th Street North to North 26th Street
	Area 3 - East Bismarck Expressway and East Watcher Avenue to University Drive to South 3rd Street
Mandan	**Area 4** - 10th Avenue Southwest to 6th Avenue Southwest and Hear River to West Main Street
	Area 5- Sunset Drive to Collins Avenue and Division Street Northwest to Interstate 94

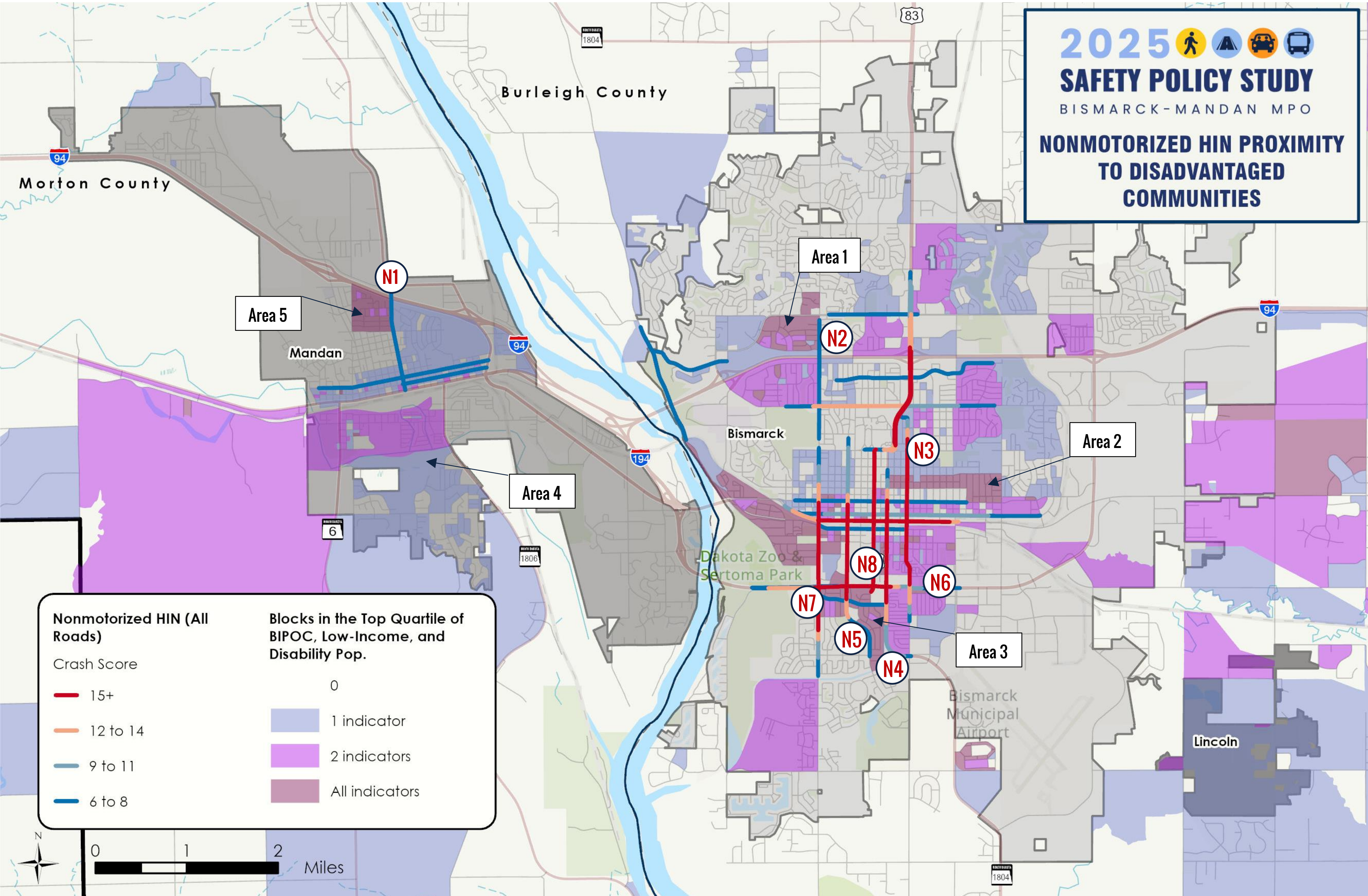
The BMMPO's disadvantaged communities include people most susceptible to negative impacts of the transportation system. For example, people living in poverty may not have access to a personal vehicle or may be more susceptible to vehicle maintenance and operating costs resulting in more reliance on traveling through alternative means, such as walking, biking, and/or riding transit. People with disabilities also experience the transportation system differently, regardless of travel; however, may also be more reliant upon alternative transportation options.

When considering demographics in the MPA, it is important to identify HIN corridors in proximity to the most vulnerable communities. **Figure 23** shows the nonmotorized HIN (representing severe crashes involving pedestrians and bicyclists) overlayed with the top indicators of being a disadvantaged community. Nonmotorized HIN corridors near identified disadvantaged communities are important to note, as disadvantaged communities include people most likely to rely on alternative modes of transportation to go about their daily lives. Said corridors are listed in **Table 12**.

Table 10. Nonmotorized HIN Corridors near Disadvantaged Communities

Label	Corridor (Location)	Nearby Disadvantaged Communities
N1	Collins Ave. (Mandan)	Area 5
N2	Washington St. (Bismarck)	Area 1 & Area 3
N3	12th St. (Bismarck)	Area 2
N4	9th St./University Dr. (Bismarck)	Area 2 & Area 3
N5	3rd St. (Bismarck)	Area 3
N6	Bismarck Expwy. (Bismarck)	Area 3
N7	Denver Ave. (Bismarck)	Area 3
N8	7th St. (Bismarck)	Area 3

Figure 23. BMMPO Disadvantaged Communities Scoring



Chapter 6 - High-Injury Network Results

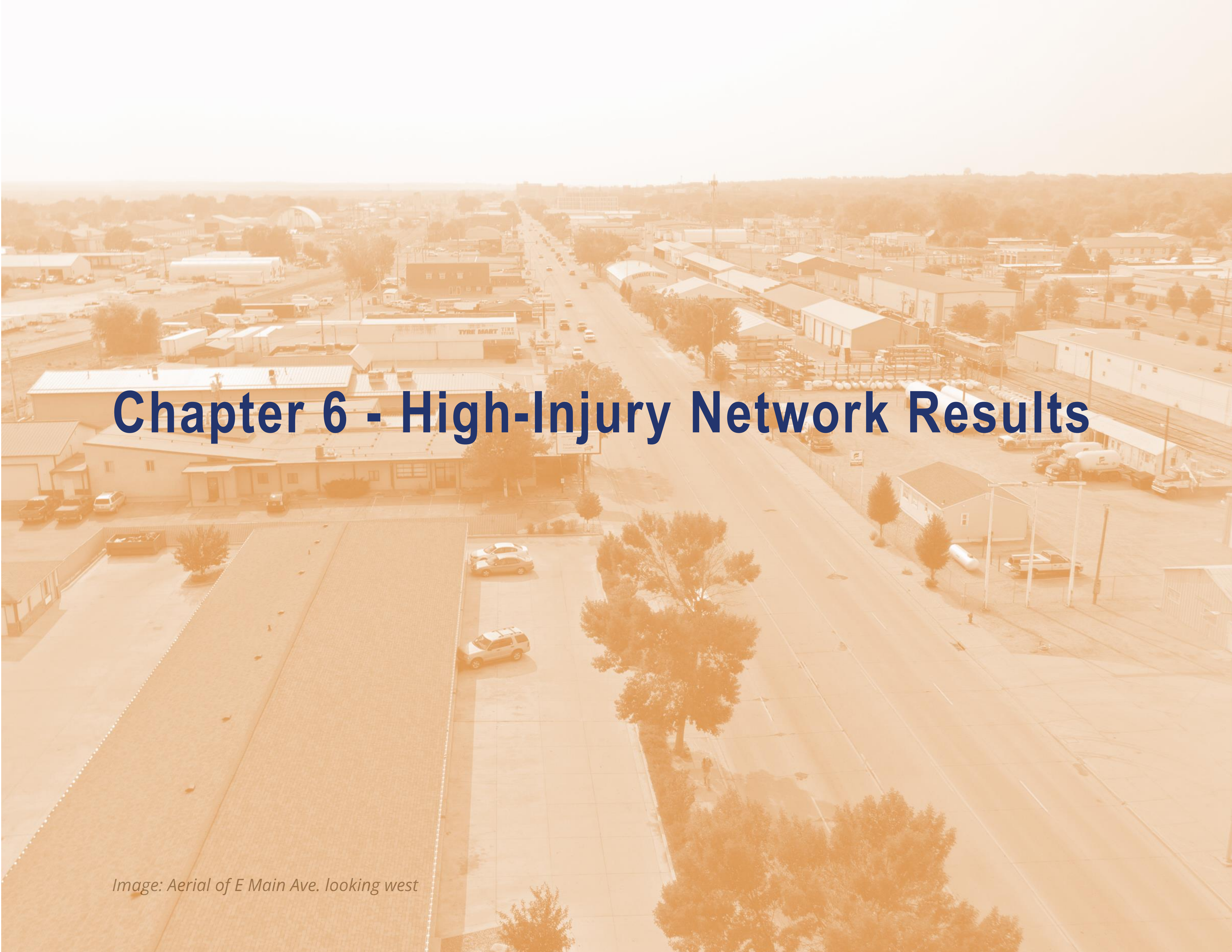


Image: Aerial of E Main Ave. looking west

Modal High-Injury Network (HIN) Results

The HIN analysis for the BMMPO's MPA is broken out into five (5) mode-specific networks:

1. Pedestrian HIN
2. Bicycle HIN
3. Motorcycle HIN
4. Automobile HIN
5. All-Mode HIN

Heavy Vehicle HIN

No HIN was identified for Heavy Vehicles or Commercial Vehicles. This is typical for HINs in North Dakota, as operators and occupants of heavy vehicles typically have less severe outcomes than other, smaller vehicles. Severe crash densities for heavy commercial vehicles are too low to show up on a specific, heavy vehicle HIN; however, severe heavy vehicle crashes do contribute to the all-mode HIN. See **Appendix D** for information about the HIN analysis methodology.

Each network identifies locations on the BMMPO's regional transportation system that contribute to a significant proportion of severe crashes. Analysis results and key themes or crash profiles of each modal HIN are provided within this chapter.

Crash Profiles

Detailed modal HIN location sheets were assembled for the top two (2) scoring tiers of each modal HIN. Modal HIN location sheets are included in **Appendix E**.

Through the findings of **Appendix E**, the Study has developed crash profiles for each, identifying characteristics of each modal HIN with common severe crash factors. The crash profiles consider various crash attributes, roadway attributes, roadway characteristics, and land use context to identify the most prevalent factors of severe crashes for each mode of travel. The following information was used to establish crash profiles from the top two (2) scoring tiers, outlining the most prominent characteristics associated with severe crashes in the MPA.

Functional Classification

Provides information about the strategic categorization of the regional transportation network. The functional classification hierarchy defines the street's intended role in the overall network.

Speed Limit

Identifies the posted speed limit on the corridor; however, speed limit is not always an indication of typical traffic-speed, which can be higher or lower than the posted speed limit.

Traffic Volume

Provides an estimate of Average Annualized Daily Traffic (AADT) or how many vehicles per day (VPD) the corridor accommodates.

Configuration

Identifies the number of lanes and whether the street is divided or undivided (e.g. physically separated by travel direction).

Land Use Context

Provides information about the corridor's prominent adjacent land use such as commercial, mixed use, residential, etc.

Streetscape

A description of streetscape for each corridor was defined to refer to the degree by which a street is framed in the built environment. For example, research[1] suggests that surrounding vertical elements such as buildings, walls, and trees can significantly impact the function, safety, and people's perception of the street. There are two streetscape classifications used in the crash profiles:

1. **Enclosed** – typically has nearby vertical elements, in proportion to the width of the street; 1:1 vertical to street width. More defined boundaries (minimal building setbacks); less visual openness which can help create a greater sense of place, calm traffic, and increase attentiveness of surroundings.
2. **Open** – contrast to enclosed, typically lacks nearby vertical definition. Less defined boundaries (large building setbacks); more visual openness which can increase the prevalence of speeding; often auto-oriented land uses; and shown to have a higher incidence of severe crashes as compared to enclosed streetscape counterparts.

Crash Location, Crash Severity, & Manner of Crash

Provides a summary on the number and description of crash locations, crash severity, and manner of crash along each modal HIN corridor included in **Appendix E**.

[1] Bagheri, S.; Mojaradi, B.; Kamboozia N.; Faizi, M. Heliyon Journal, Volume 10, Issue 13. (2024). *Analyzing the effects of streetscape and land use on urban accidents and predicting future accidents by using machine learning*

Pedestrian High-Injury Network (HIN)

The pedestrian HIN is shown in **Figure 24** and listed in **Table 11**. Corridors included on the pedestrian HIN are only identified in Bismarck and include:

Table 11. Pedestrian High-Injury Network (HIN) Corridors

Label	Corridor (Location)	Termini From	Termini To
P1*	**State St.**	**Harvest Ln.**	**E Boulevard Ave.**
P2	N Washington St.	Independence Ave.	Arikara Ave.
P3	E Capitol Ave.	N 20th St.	N 2nd St.
P4	Divide Ave.	N 26th St.	Assumption Dr.
P5	12th St.	Braman Ave.	Park Ave.
P6	E Boulevard Ave.	State St.	N 6th St.
P7*	**3rd St.**	**Arikara Ave.**	**E Wachter Ave.**
P8*	**7th St.**	**E Boulevard Ave.**	**Bismarck Expy.**
P9*	**9th St.**	**E C Ave.**	**Bismarck Expy.**
P10	E Broadway Ave.	N 6th St.	N 20th St.
P11*	**Main Ave.**	**Airport Rd.**	**N Bell St.**
P12*	**Bismarck Expy.**	**12th St. SE**	**Riverfront Trail tunnel**
P13	Denver Ave.	University Dr.	S Washington St.
P14	University Dr.	Bismarck Expy.	12th St. SE

*Included within the top two (2) pedestrian HIN scoring tiers.

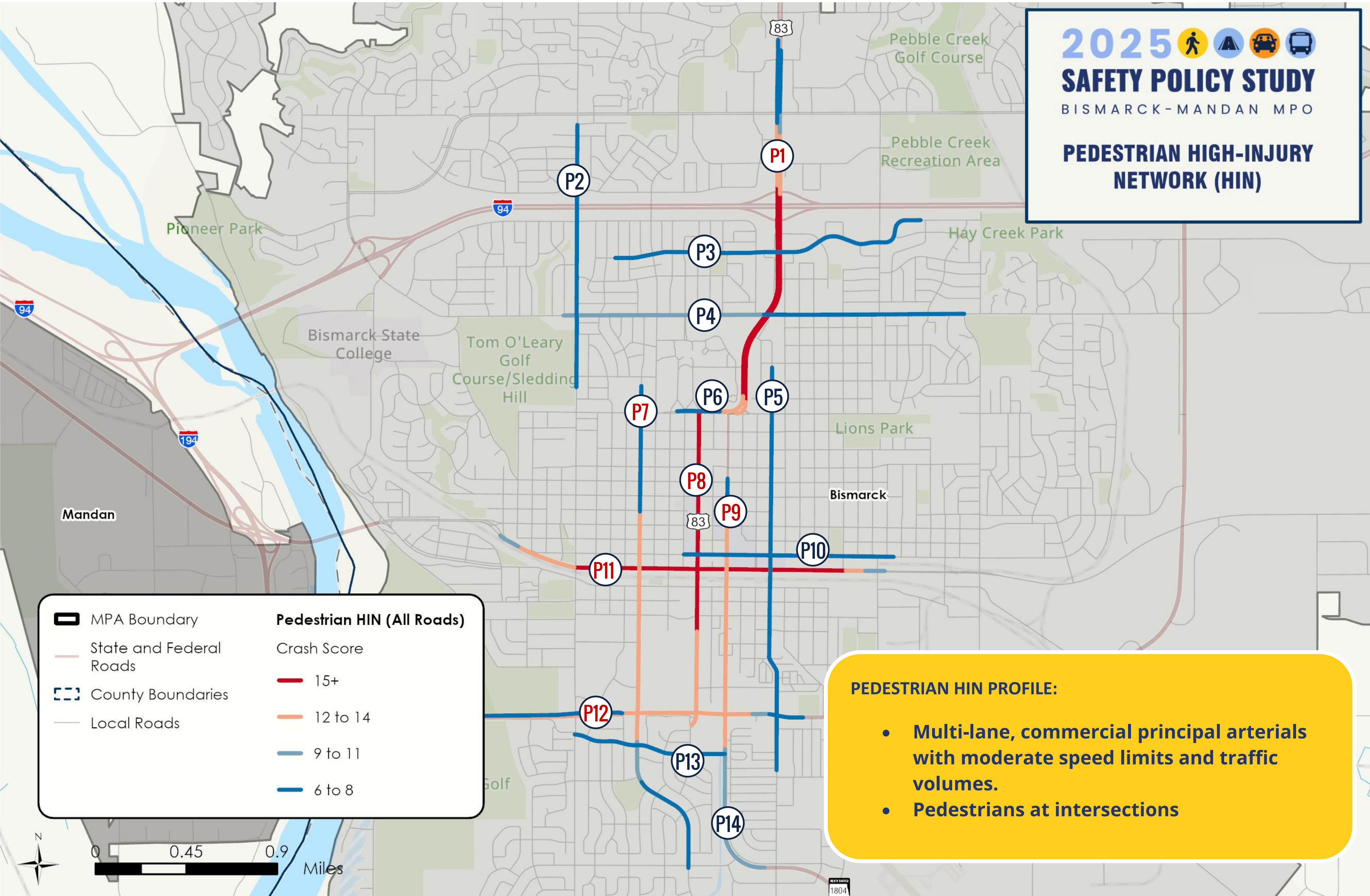
Pedestrian HIN Key Themes

The top scoring pedestrian HIN corridors are located on multi-lane, commercial principal arterials with moderate speed limits and moderate traffic volumes. Contributing pedestrian HIN crashes are virtually all associated with intersections. The following information summarizes common characteristics of the top scoring or most injurious (severe crashes) pedestrian HIN.

TOP SCORING PEDESTRIAN HIN STREET CHARACTERISTICS	
Location (& Jurisdiction)	Bismarck (State)
Functional Classification	Principal Arterials
Speed Limit	> 30mph
Average AADT	> 10,000 VPD
Configuration	≥ 3-lane undivided
Land Use Context	Varies. Primarily commercial with portions of residential or other land use category.
Streetscape	Open

TOP SCORING PEDESTRIAN HIN CRASH CHARACTERISTICS	
Location (typology)	Intersections
Severity	K=2, A=13, B=21
Manner of Crash	Pedestrian-involved (non collision with a motor vehicle). Speed not a factor in any of the crashes.

Figure 24. Pedestrian HIN Map (No Interstates, Includes Pedestrian "B" Crashes)



Bicycle High-Injury Network (HIN)

The bicycle HIN is shown in **Figure 25** and listed in **Table 12**. Corridors included on the bicycle HIN are identified in Bismarck and Mandan, including:

Table 12. Bicycle High-Injury Network (HIN) Corridors

Label	Corridor (Location)	Termini From	Termini To
B1*	**Collins Ave. (Mandan)**	**I-94**	**Main St.**
B2*	**2nd St. (Mandan)**	**Mandan Ave.**	**9th Ave. NW**
B3*	**1st St. NE (Mandan)**	**Mandan Ave.**	**Collins Ave.**
B4*	**12th St. (Bismarck)**	**Braman Ave.**	**Virginia Ave.**
B5*	**Washington St. (Bismarck)**	**W Boulevard Ave.**	**Wachter Ave.**

*Included within the top two (2) bicycle HIN scoring tiers.

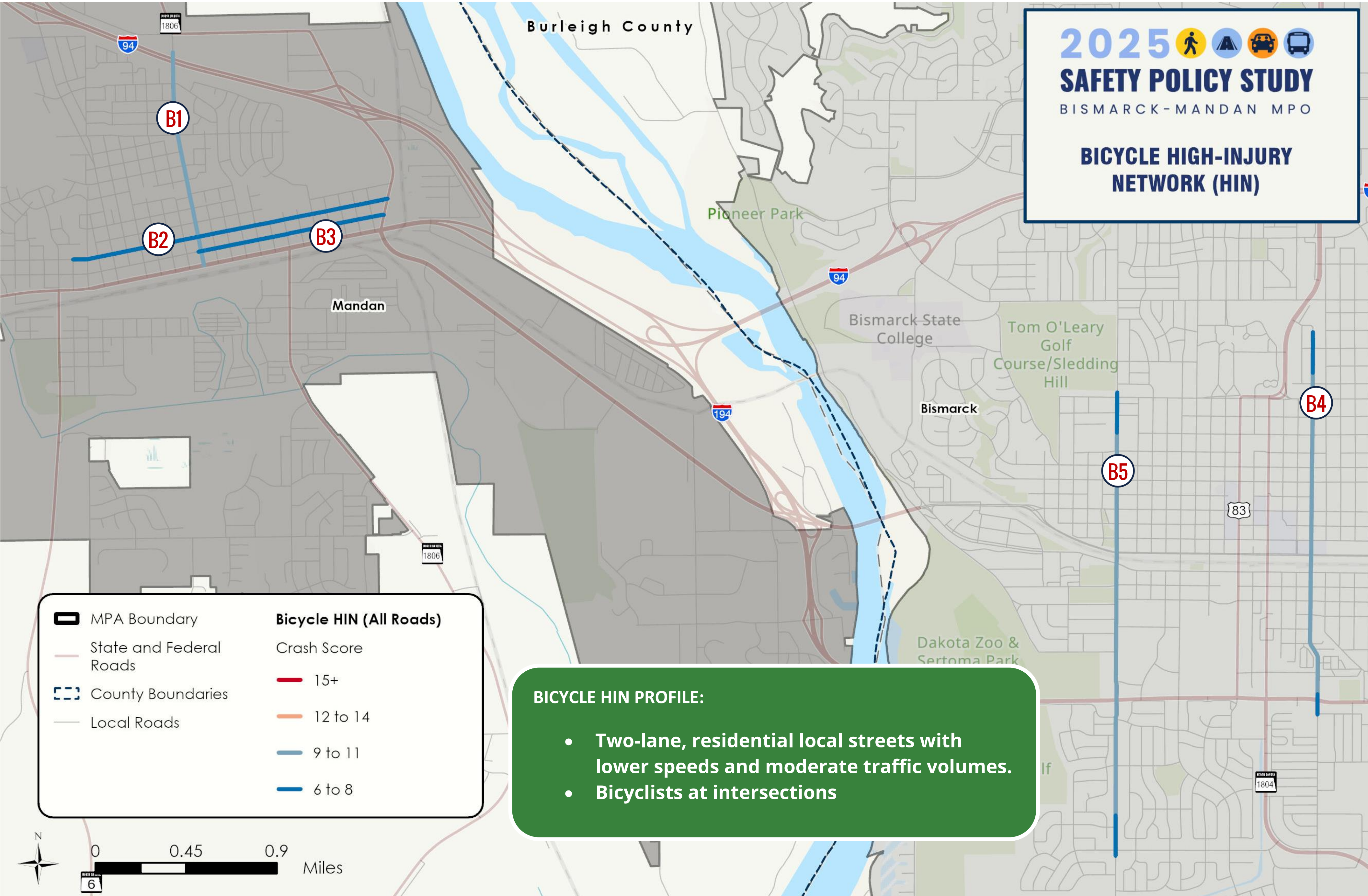
Bicycle HIN Themes

The top scoring bicycle HIN corridors are located on two-lane, residential local streets with lower speed limits and moderate traffic volumes. Contributing bicycle HIN crashes are virtually all associated with intersections. The following information summarizes common characteristics of the top scoring or most injurious (severe crashes) bicycle HIN.

TOP SCORING BICYCLE HIN STREET CHARACTERISTICS	
Location (& Jurisdiction)	Mandan & Bismarck (Local)
Speed Limit	25mph
Functional Classification	Local
Average AADT	< 5,000 VPD
Configuration	2-lane undivided
Land Use	Primarily commercial with portions of mixed use and commercial.
Streetscape	Open

TOP SCORING BICYCLE HIN CRASH CHARACTERISTICS	
Location (typology)	Intersections
Severity	K=0, A=8, B=18
Manner of Crash	Bicyclist-involved (non collision with a motor vehicle). Speed not a factor in any of the crashes.

Figure 25. Bicycle HIN Map (No Interstates, Includes Bicycle “B” Crashes)



BICYCLE HIN PROFILE:

- **Two-lane, residential local streets with lower speeds and moderate traffic volumes.**
- **Bicyclists at intersections**

Motorcycle High-Injury Network (HIN)

The motorcycle HIN is shown in **Figure 26** and listed in **Table 13**. Corridors included on the motorcycle HIN are:

Table 13. Motorcycle High-Injury Network (HIN) Corridors

Label	Corridor (Location)	Termini From	Termini To
M1	Burnt Creek Lp. (CR 139) (Burleigh County)	ND 1804	1-mile west of ND 1804.
M2	Collins Ave./ND 1806 (Mandan)	Beretta St. NW	1st St.
M3	Old Red Trl. (Mandan)	Mandan Ave.	Sunset Dr.
M4	E Century Ave. (Bismarck)	Nebraska Dr.	N 4th St.
M5	W Century Ave. (Bismarck)	Ontario Ln.	Clydesdale Dr.
M6	State St. (Bismarck)	I-94	E Boulevard Ave.
M7*	**Memorial Hwy. (Mandan)**	**Old Red Trl.**	**Berreth St.**
M8	12th St. (Bismarck)	E Ave. A	Park Ave.
M9*	**Washington St. (Bismarck)**	**W Ave. D**	**Wachter Ave.**
M10	E Rosser Ave. (Bismarck)	N 33rd St.	N 17th St.
M11*	**Main Ave. (Bismarck)**	**Eastdale Dr.**	**Berreth St.**
M12	River Rd. (Bismarck)	Burnt Boat Dr.	Fraine Barracks Rd.
M13	Bismarck Expwy. (Bismarck)	S 18th St.	S 3rd St.
M14	England St./W Burleigh Ave. (Bismarck/Burleigh)	Rutland Dr.	Voyager Pl.
M15	Desert Rd. (Burleigh)	Kimball Recreation/OHV Area	

* Included within the top two (2) motorcycle HIN scoring tiers.

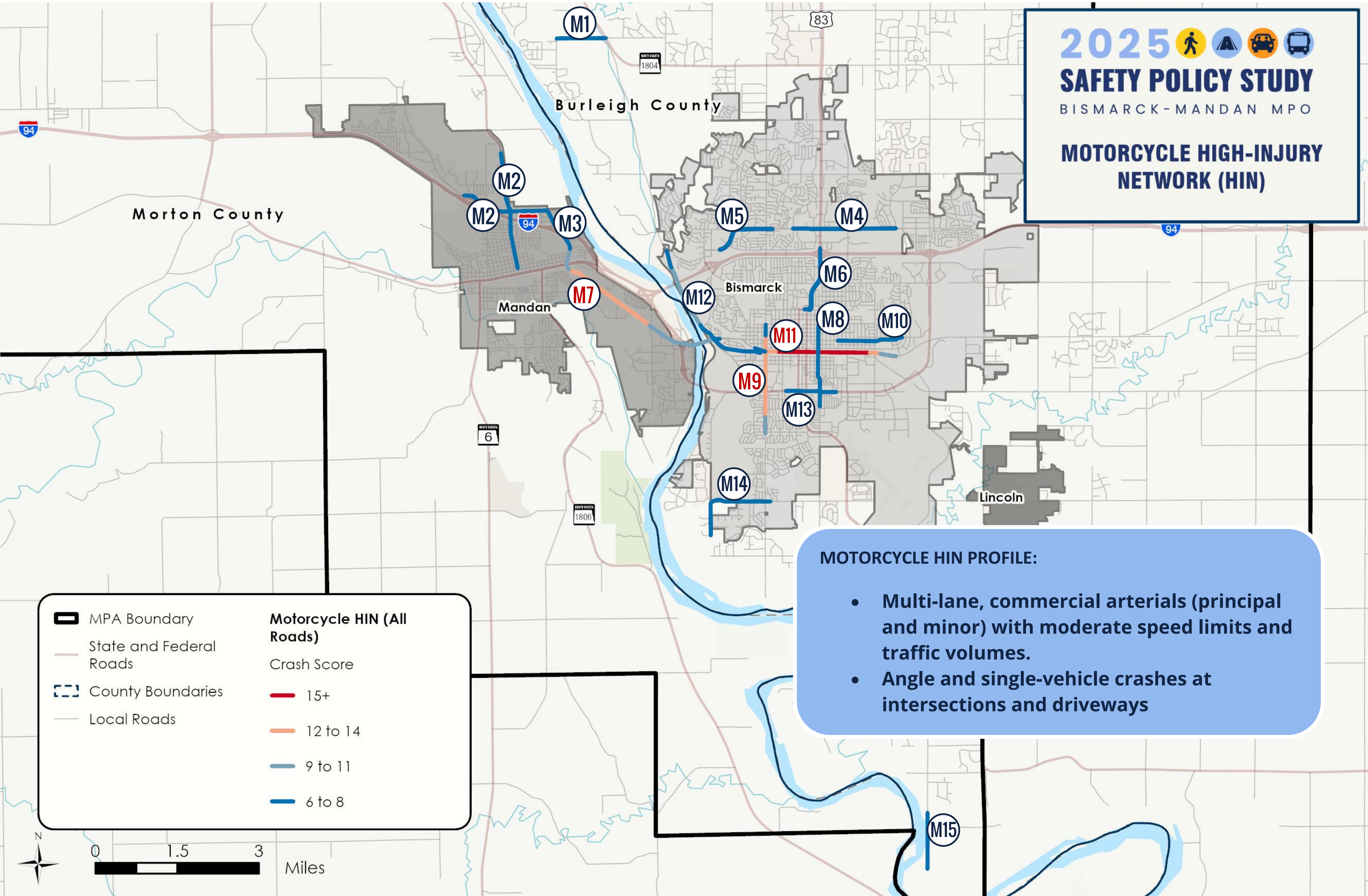
Motorcycle HIN Themes

The top scoring motorcycle HIN corridors are located on multi-lane, commercial arterials (principal and minor) with moderate speed limits and moderate traffic volumes. Prominent contributing motorcycle HIN crashes are angle and single vehicle crashes at intersections and driveways. The following information summarizes common characteristics of the top scoring or most injurious (severe crashes) motorcycle HIN.

TOP SCORING MOTORCYCLE HIN STREET CHARACTERISTICS	
Location (& Jurisdiction)	Bismarck & Mandan (State)
Speed Limit	> 30mph
Functional Classification	Principal & Minor Arterials
Average AADT	> 10,000 VPD
Configuration	≥ 3-lane undivided
Land Use	Primarily commercial with lesser portions of mixed use and residential.
Streetscape	Open

TOP SCORING MOTORCYCLE HIN CRASH CHARACTERISTICS	
Location (typology)	Intersections
Severity	K=1, A=10, B=16
Manner of Crash	Angle=9, Single vehicle=9, Rear end=5, Sideswipe=4, Head-on=1, Speed=5

Figure 26. Motorcycle HIN Map (No Interstates, Includes Motorcycle "B" Crashes)



Automobile High-Injury Network (HIN)

The automobile HIN is shown in **Figure 27** and listed in **Table 14**. Corridors included on the automobile HIN are:

Table 14. Automobile High-Injury Network (HIN) Corridors

Label	Corridor (Location)	Termini From	Termini To
V1*	**State St. (Bismarck)**	**57th Ave. NW**	**E Boulevard Ave.**
V2	E Calgary Ave. (Bismarck)	State. St.	N Washington St.
V3	Centennial Rd./N Bismarck Expwy. (Bismarck)	Saratoga Ave.	E Main Ave.
V4*	**Century Ave. (Bismarck)**	**State St.**	**Tyler Pkwy.**
V5	N Washington St. (Bismarck)	I-94	Boulevard Ave.
V6	Memorial Hwy./W Main Ave. (Mandan/Bismarck)	Lake Ave.	24th Ave. SE
V7	E Boulevard Ave. (Bismarck)	State St.	N 5th St.
V8	26th St. (Bismarck)	Valley View Ave.	Lee Ave.
V9	7th St. (Bismarck)	E Boulevard Ave.	E Arbor Ave.
V10*	**3rd St. (Bismarck)**	**E Ave. F**	**Atlanta Dr.**
V11	9th St./University Dr. (Bismarck)	E Ave. B	12th St. SE
V12	Airport Rd. (Bismarck)	E Broadway Ave.	Morrison Ave.
V13	Main Ave. (Bismarck)	Eastdale Dr.	N Bell St.
V14	S 12th St. (Bismarck)	E Main Ave.	American Ave.
V15*	**Bismarck Expwy. (Bismarck)**	**Burlington Dr.**	**Riverwood Golf Course**
V16	**W Bismarck Expwy. (Mandan)**	**I-94**	**Missouri River**

* Included within the top two (2) automobile HIN scoring tiers.

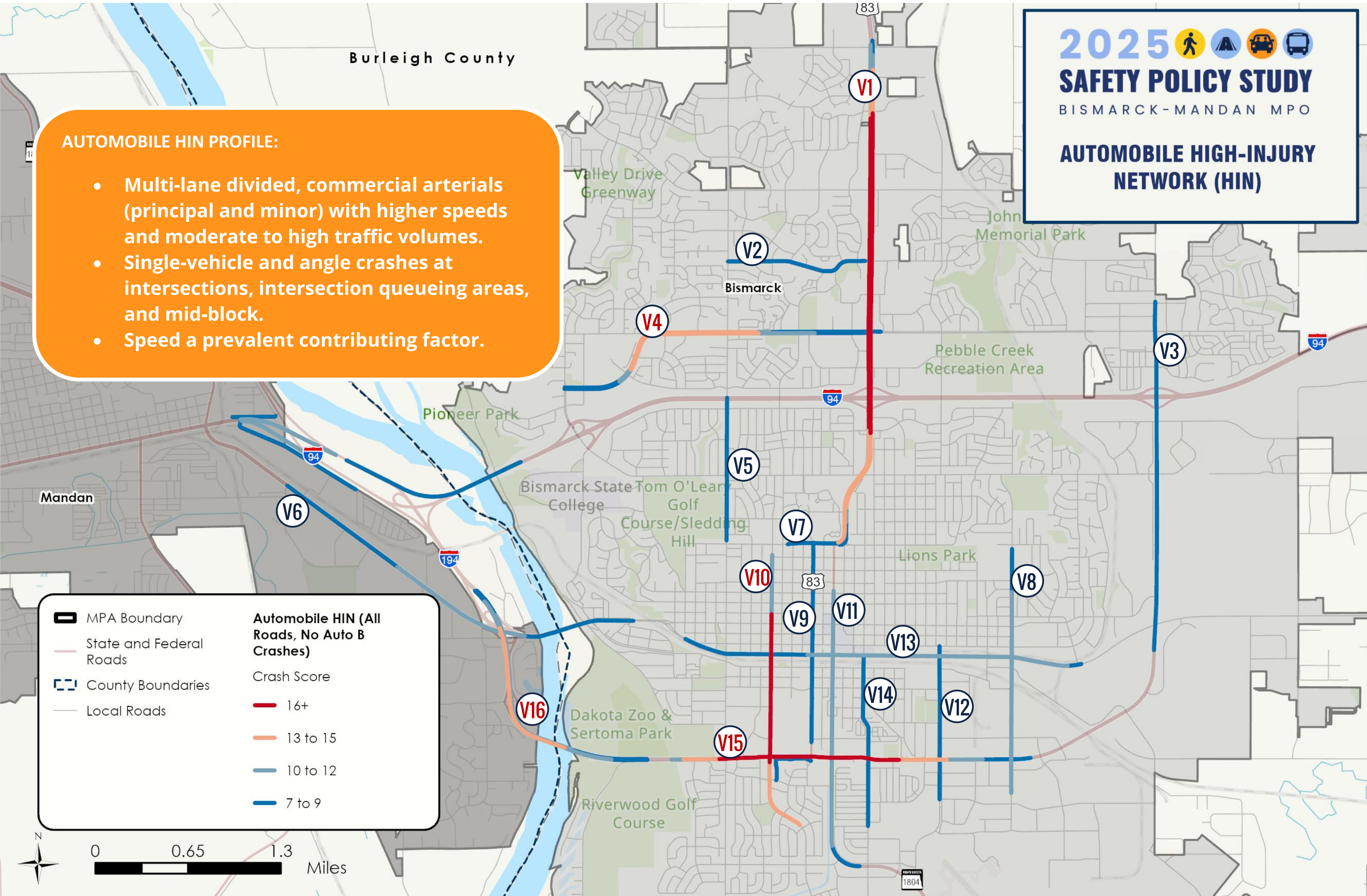
Automobile HIN Themes

The top scoring automobile HIN corridors are located on multi-lane, commercial arterials (principal and minor) with higher speed limits and moderate to high traffic volumes. Prominent contributing automobile HIN crashes are single vehicle and angle crashes at intersections and mid-block locations. Speed is a prominent contributing factor. The following information summarizes common characteristics of the top scoring or most injurious (severe crashes) automobile HIN.

TOP SCORING AUTOMOBILE HIN STREET CHARACTERISTICS	
Location (& Jurisdiction)	Bismarck & Mandan (State)
Speed Limit	> 35mph
Functional Classification	Principal & Minor Arterials
Average AADT	> 10,000 VPD
Configuration	≥ 2-lane divided
Land Use	Primarily commercial with lesser portions of residential, mixed use, and other land uses.
Streetscape	Open

TOP SCORING AUTOMOBILE HIN CRASH CHARACTERISTICS	
Location (typology)	Intersections, queueing areas, and mid-block.
Severity	K=6, A=39, B=219 (B crashes do not contribute to the crash score)
Manner of Crash	Angle=15, Single vehicle=19, Rear end=7, Sideswipe=3, Head-on=1, Speed=13

Figure 27. Automobile HIN Map (No Interstates, Excludes Automobile "B" Crashes)



All-Mode High-Injury Network (HIN)

The all-mode HIN is shown in **Figure 28** and listed in **Table 15**. Corridors included on the all-mode HIN are:

Table 15. All-Modes High-Injury Network (HIN) Corridors

Label	Corridor (Location)	Termini From	Termini To
X1	Burnt Creek Lp. (CR 139) (Burleigh County)	ND 1804	1-mile west of ND 1804.
X2	71st Ave. NE	N 19th St.	Fox Haven Lp.
X3*	**State St. (US 83)**	**57th Ave. NE**	**E Boulevard Ave.**
X4*	**Washington St.**	**Medora Ave.**	**Victoria Cir.**
X5*	**ND 1806/Collins Ave.**	**Cinder Dr.**	**E Main St.**
X6	43rd Ave. NE	N Washington St.	26th St. NE
X7	Centennial Rd./N Bismarck Expwy.	Knudsen Ave.	E Main Ave.
X8*	**River Rd.**	**Near Promontory Park**	**Riverside Park Dr.**
X9	E Calgary Ave.	Washington St.	State St. (US 83)
X10	Old Red Trl.	Near Arco GS	Mandan Ave.
X11*	**Mandan Ave.**	**Old Red Trl.**	**Memorial Hwy.**
X12	3rd Ave. NE	15th St. NE	E Main St.
X13*	**Century Ave.**	**Tyler Pkwy.**	**Hay Creek/RR**
X14	N 4th St.	Montreal St.	E Main Ave.
X15	Interstate Ave.	MDU Resources	N 19th St.
X16	Burnt Boat Dr.	River Rd.	Clydesdale Dr.
X17*	**2nd St.**	**12th St. NW**	**Mandan Ave.**
X18	1st St.	14th St. NW	Mandan Ave.
X19	3rd St.	Railway Ave.	Twin City Dr.
X20	6th Ave./ND 1806	2nd St. NE	11th St. SE
X21*	**Memorial Hwy.**	**Mandan Ave.**	**W Main Ave.**
X22	N 19th St.	E Century Ave.	E Divide Ave.
X23*	**E Capitol Ave.**	**N Kavaney Dr.**	**N 23rd St.**
X24	E Divide Ave.	N Washington St.	N 26th St.
X25*	**12th St.**	**Braman Ave.**	**Tacoma Ave.**
X26*	**3rd St.**	**E Arikara Ave.**	**E Wachter Ave.**
X27	E Boulevard Ave.	N 4th St.	State St. (US 83)
X28*	**26th St.**	**E Boulevard Ave.**	**Lockheed Dr.**
X29*	**9th St./University Dr.**	**E Boulevard Ave.**	**Piper St.**
X30*	**7th St.**	**E Boulevard Ave.**	**Columbia Dr.**
X31*	**Broadway Ave./N 34th St.**	**N Mandan St.**	**Eastview Dr.**

Label	Corridor (Location)	Termini From	Termini To
X32*	**Rosser Ave.**	**N Bell St.**	**N 35th St.**
X33*	**Main Ave.**	**E Bismarck Expwy.**	**Memorial Hwy.**
X34	Fraine Barracks Rd./E Front Ave.	River Rd.	S 16th St.
X35*	**Bowen Ave.**	**Riverside Park Rd.**	**S 17th St.**
X36*	**Airport Rd.**	**E Broadway Ave.**	**University Dr.**
X37	E Indiana Ave.	S Washington St.	S 3rd St.
X38	S 2nd St.	E Front Ave.	Bismarck Expwy.
X39	Bozeman Dr./ E Bismarck Expwy Frontage Rd.	E Denver Ave.	S 7th St.
X40	Airport Rd. Frontage Rd.	E Bismarck Expwy.	Airway Ave.
X41*	**Bismarck Expwy.**	**Memorial Hwy.**	**Burlington Dr.**
X42	England St./W Burleigh Ave.	Voyager Dr.	Rutland Dr.
X43	Yegen Rd.	University Dr.	Airport
X44	ND 1806	46th St. SW	Fort Lincoln Rd.
X45*	**W Bismarck Expwy.**	**I-94**	**Missouri River.**

* Included within the top two (2) all-mode HIN scoring tiers.

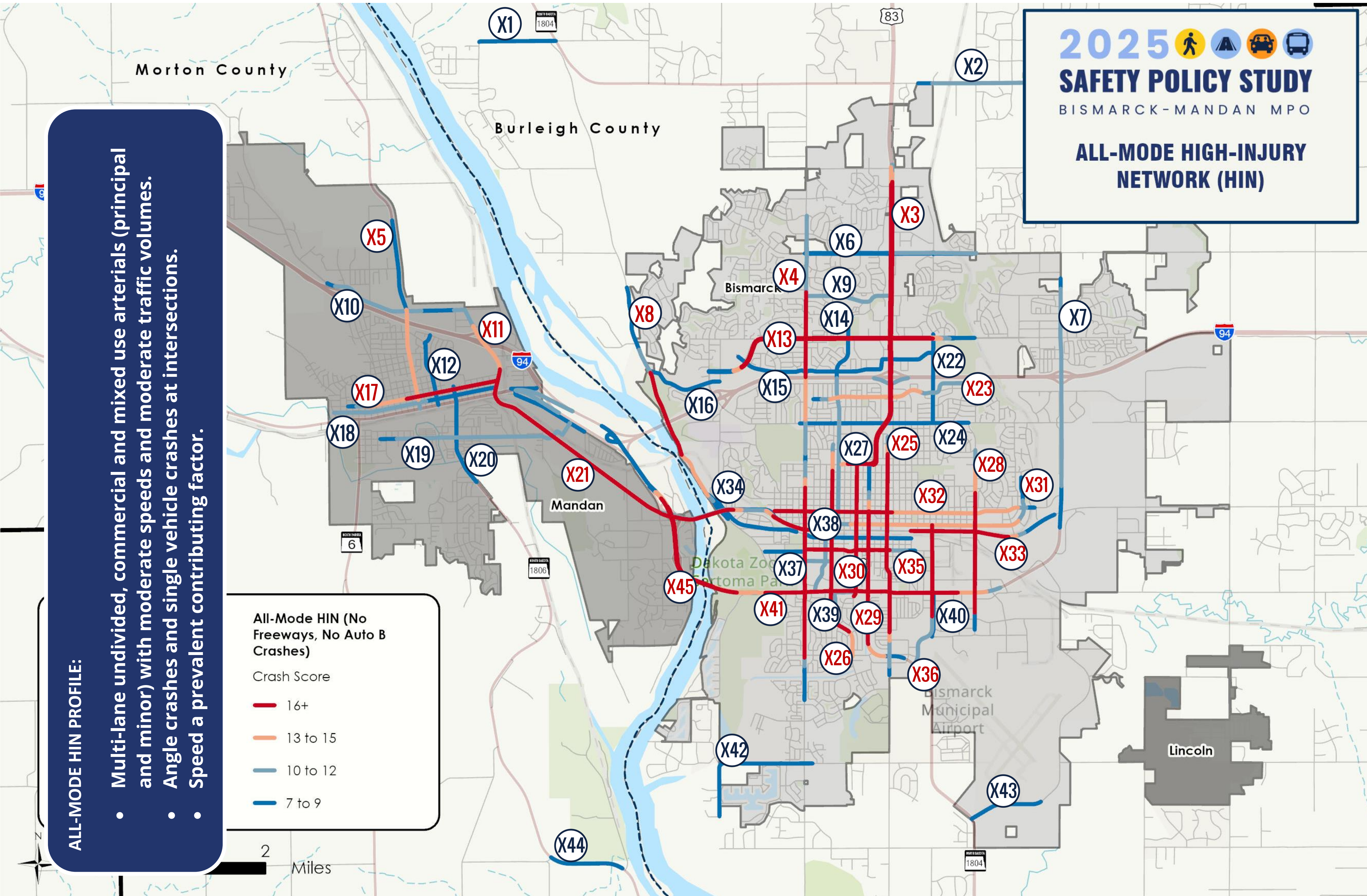
All-Mode HIN Themes

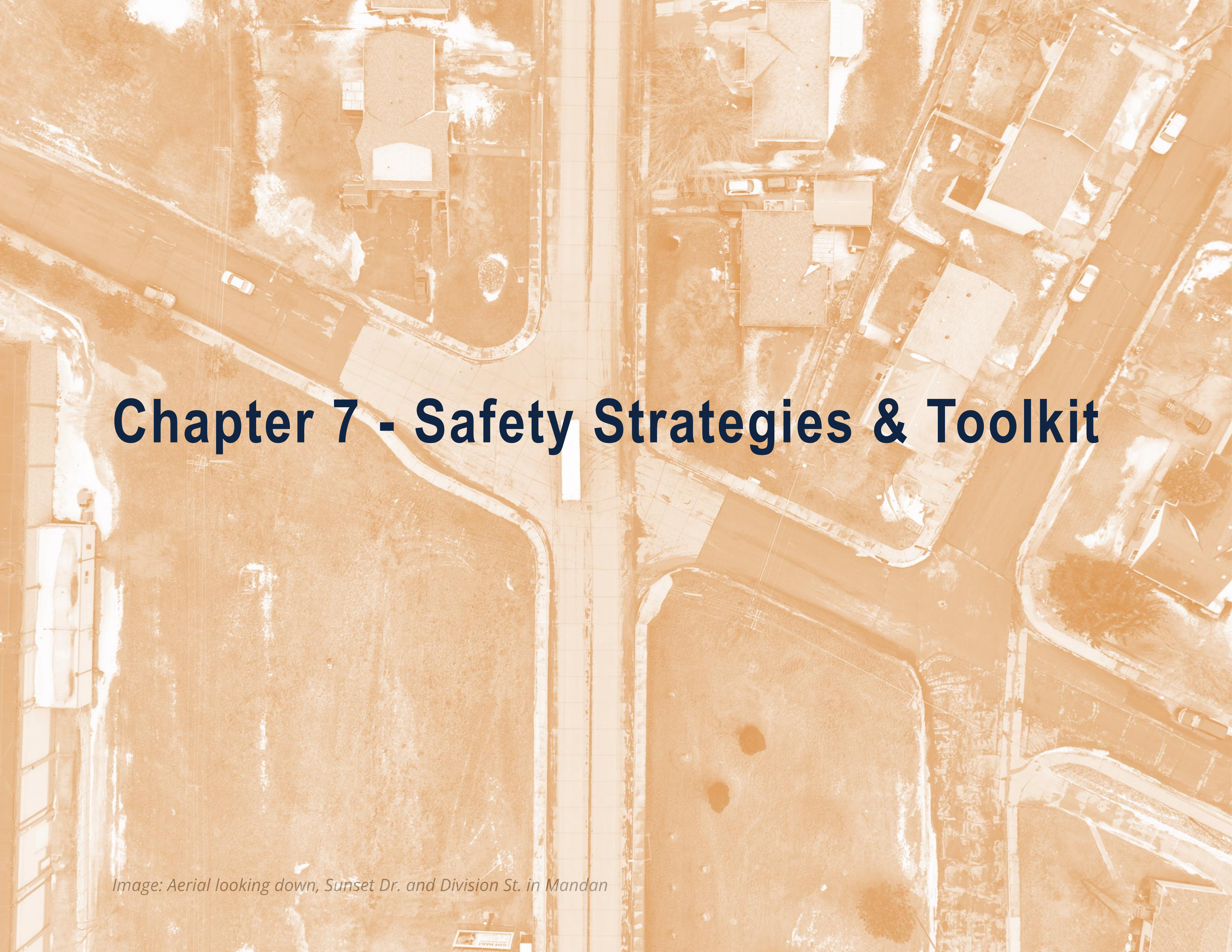
The top scoring all-mode HIN corridors are located primarily on multi-lane undivided, commercial and mixed use arterials (principal and minor) with moderate speed limits and moderate traffic volumes. Prominent contributing all-mode HIN crashes are angle and single vehicle crashes at intersections. Speed is a prominent contributing factor. The following information summarizes common characteristics of the top scoring or most injurious (severe crashes) pedestrian HIN.

TOP SCORING ALL-MODE HIN STREET CHARACTERISTICS	
Location (& Jurisdiction)	Varies
Speed Limit	> 30mph
Functional Classification	Principal & Minor Arterials
Average AADT	< 10,000 VPD
Configuration	Varies, 2- and 3-lane undivided most prominent.
Land Use	Primarily commercial with lesser portions of mixed use, residential, and other land uses.
Streetscape	Open

TOP SCORING ALL-MODE HIN CRASH CHARACTERISTICS	
Location (typology)	Intersections
Severity	K=21, A=142, B=154
Severity Automobile	K=11, A=81
Severity Pedestrian	K=6, A=26, B=49
Severity Bicycle	K=0, A=8, B=54
Severity Motorcycle	K=4, A=27, B=50
Manner of Crash	Angle=64, Single Vehicle=61, Rear End=26, Sideswipe=14, Head On=13, Rear to Side=2, Speed=38, Intersection=229

Figure 28. All-Mode HIN Map (No Interstate or Auto B Crashes)





Chapter 7 - Safety Strategies & Toolkit

Image: Aerial looking down, Sunset Dr. and Division St. in Mandan

Introduction

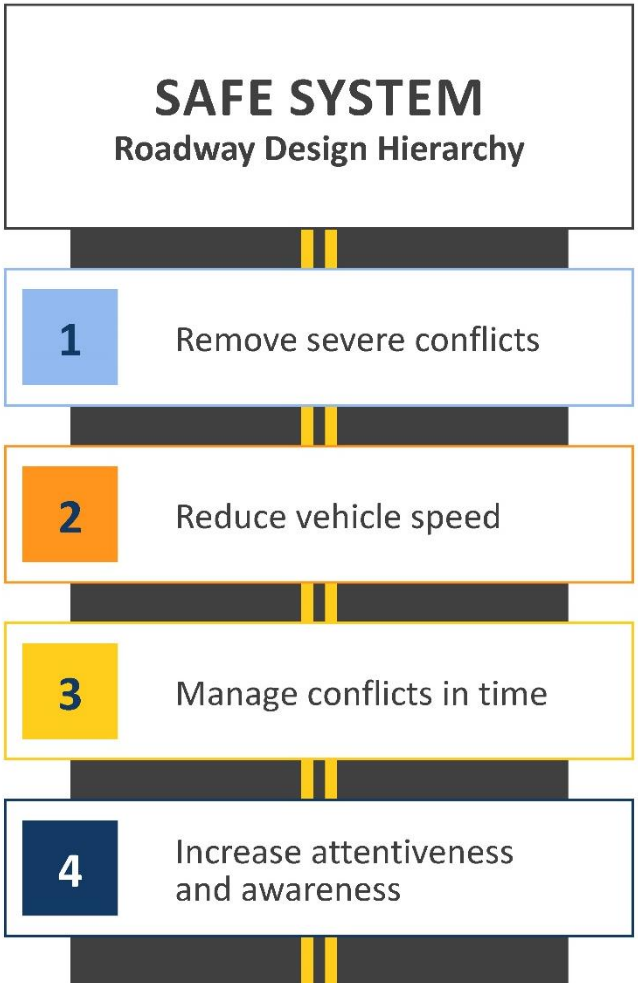
Safety strategies were identified to improve safety in high-risk or key areas of concern in the BMMPO's MPA. These safety strategies include countermeasures which are data-driven and proven safety strategies from FHWA's Proven Safety Countermeasures, FHWA's Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, and the Crash Modification Factor Clearinghouse. The countermeasures discussed in the following pages include multimodal engineering strategies and non-engineering strategies.

Safe Systems Hierarchy

To assist transportation agencies and practitioners to identify and prioritize countermeasures and strategies, the Federal Highway Administration (FHWA) developed the Safe System Roadway Design Hierarchy (SSRDH). The SSRDH is a tool that characterizes engineering and infrastructure-based countermeasures and strategies relative to their alignment with the SSA. As shown in **Figure 29,** the SSRDH includes four tiers in alignment with the SSA including.

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds
3. Manage Conflicts in Time
4. Increase Attentiveness and Awareness

Figure 29. Safe System Roadway Design Hierarchy (FHWA)



Tiers one (1) through three (3) focus on countermeasures and strategies related to removing roadway conflicts, managing speeds, and separating vulnerable road users. Tier four (4) identifies countermeasures and strategies to improve road user attentiveness and awareness to alert road users of risks so appropriate action or road user behavior can take place.

Engineering Strategies

A set of engineering priority strategies have been identified by location type: urban and rural. These priority strategies were chosen based on the crash profiles, engagement feedback, and unique set of challenges facing the BMMPO and partner jurisdictions. An abbreviated list of priority engineering strategies is described in more detail below. An expanded list is shown in **Table 16** for urban strategies and **Table 17** for rural strategies. The strategy list includes the following key information:

- Street location typology
- Description
- Estimated implementation cost
- Strategy effectiveness based on Crash Reduction Factor (CRF)
    - Low (CRF of 0-29 percent)
    - Moderate (CRF of 30-59 percent)
    - High (CRF of 59 percent or more).
- Applicable SSRDH tier

See **Appendix F** for the complete toolkit of strategies and strategy selection guidance.

Priority Engineering Strategies

Priority engineering strategies are identified based on potential to address key severe crash themes in **Chapter 2** and HIN crash profiles in **Chapter 6**.

Vulnerable Road Users

Priority engineering strategies to increase safety for vulnerable users focus on increasing visibility and driver awareness, removing conflicts, and filling gaps in bicycle and pedestrian network. Examples include:

Bicyclists

- **Bike Lane / Boulevard** – A designated on-street space or low-traffic roadway that prioritizes bicyclists, reducing interactions with faster-moving vehicles.
- **Buffered Bike Lane** – A bike lane with painted buffer zones that increase separation from traffic or parked cars, enhancing rider comfort and safety.
- **Separated Trail / Path** – An off-street facility shared by bicyclists and pedestrians, completely removed from vehicular traffic for safer travel.
- **Grade Separated Pedestrian Crossing (Underpass/Overpass)** – Physical separation of bicycle and pedestrian crossing; typically bringing a

sidewalk or shared use path over or under the street.

- **Lighting** – lighting to increase visibility of bicyclists and pedestrians; typically at crossing locations or intersections.

Pedestrians

- **Sidewalks, Trail / Path** – Designed walking areas separated from roadways that reduce pedestrian exposure to vehicle traffic.
- **High-Intensity Activated Crosswalk (HAWK) Beacon / Pedestrian Hybrid Beacon (PHB)** – A signalized crossing that stops traffic when activated, allowing pedestrians crossing at unsignalized crosswalks, increasing driver yield rates.
- **Rapid Rectangular Flashing Beacons** – Flashing light that alert drivers to pedestrians crossing at unsignalized crosswalks, increasing driver yield rates.
- **Curb Extensions / Bulb-Outs** – Physical extension of curbs at intersections to shorten crossing distances and improve pedestrian visibility.
- **Raised Crosswalks** – Crosswalk constructed with a speed table or vertical elevation change which increases driver's visibility of the crosswalk an
- **No Right Turn on Red** – Signage or adaptive signal at intersections prohibiting right turns on red. Typically to reduce right turn crashes involving pedestrians and bicyclists.
- **Pedestrian Barriers to Prevent Mid-Block Crossing** – Commonly a fence used in the median of divided streets to restrict pedestrian's ability to cross at unmarked mid-block locations.

Motorcyclists

- **Access Management** – Reduce driveway conflict points, typically through consolidation.
- **High-Friction Surface Treatments** – Specialized pavement materials applied to curves or intersections to reduce skidding and improve traction for motorcyclists.
- **Improved Curve Signage and Delineation** – Clear, visible signs and markings help motorcyclist anticipate curve and adjust speed appropriately.
- **Edgeline Rumble Strips** – Audible and tactile warning placed along road edges that alert distracted drivers without intruding into the motorcyclists' travel path. **Intersection Lighting and Visibility Enhancements** – Better lighting at intersections improves motorcyclists visibility to other road users, reducing crash risk.

Vulnerable User Implementation Opportunities:

- **Pedestrian, Bicycle, and Motorcycle HIN Corridors**
- **Disadvantaged Communities**
- **Bis-Man Transit Fixed-Routes**

Intersection-Related

Intersections were the most prominent in every single modal HIN's crash profile. In addition to the vulnerable user intersection strategies identified, the following strategies are oriented toward vehicles.

- **Roundabout** – Circular intersections that slow vehicle speed and reduce conflict points, lowering the risk and severity of crashes.
- **Mini Roundabout –** Similar to roundabout but takes up less right-of-way making it easier for application at existing intersections.
- **Lane Constrictor Intersection** – Reduced lane widths and median buffer space on the major, uncontrolled legs of a stop controlled intersection to reduce speed through the intersection.
- **Signalized or Unsignalized RCUT –** Removes left-turn conflict points by constructing a median and U-turn lanes. Left-hand turns are replaced by right-hand turns and subsequent U-turn. Traffic signals may also be utilized at the intersection.
- **Reduce-Turn / Right-Turn Lanes** – Separate turn lanes that organize vehicle movement and reduce turning conflicts with through traffic.
- **Lighting –** Enhanced illumination at intersections improves visibility for all users, especially at nighttime or during low-light conditions.
- **Confirmation Lights** – Supplemental signals that indicate when a red light has been activated, helping law enforcement and improving driver compliance.
- **Corridor Signal Timing to Reduce High-Speed Flow** – Sequential signal timing to reduce high-speed traffic from going through multiple signals in a row while still maintaining good flow of traffic.
- **Appropriately Timed Yellow Change Intervals** – The length of time between green and red lights at signalized intersections. Proper timing is important to maximize signal timing and make sure the intersection is clear before the next leg gets a green light.

Speeding

Speeding was identified as a prominent factor of the motorcycle and automobile HINs' contributing crash profiles.

- **Road Diet (3- & 5-Lane Conversions)** – Reducing the number of travel lanes help calm traffic, lower speeds, and improve safety for all road users.
- **Reduce Lane Width** – Narrower lanes encourage slower driving by increasing driver attentiveness and perceived risk.
- **Curb Extensions / Bulb-Outs** – Sidewalk widenings at intersections that shorten crossing distances and improve pedestrian visibility.

- **Horizontal Chicanes** – Alternating curb extensions or lane shifts create a winding path that naturally slows vehicles.
- **Appropriate Speeds** – Designing roads to match safe, context-sensitive speed limits reduces crash severity and improves safety for all users.
- **Dynamic Speed Feedback Sign** – Speed limit signs with dynamic display that shows drivers speed as they go by, typically most effective where a street transitions from a higher to lower speed limit.

Single Vehicle Run Off Road

- **Enhanced Edgeline (6" or 8")** -
- **Rumble Strips (Centerline and Edgeline)** – Audible and tactile warnings alert drivers when they drift from their lane, helping prevent roadway departures.
- **Clear Zone Maintenance** – Keeping roadside areas free of fixed objects provides space for out-of-control vehicles to recover safely.
- **Delineators** – Reflective roadside markers improve nighttime and low-visibility guidance, helping drivers stay on the road.
- **Non-Recoverable Inslope Protection** – Barriers or treatments on steep roadside slopes prevent vehicles from overturning or crashing off-road.
- **Shoulder Paving (2', 4', or 6')** – Paved shoulders offer recovery space for vehicles that veer off the travel lane, reducing crash severity.
- **Ditch/Embankment/Side Slope Improvements** – Improves the slope of ditches by making them less steep, to increase the likelihood of recovery for vehicles that depart the roadway.

Impaired Driving

- **Wrong-Way Driving Detection** – Technology that alerts drivers and authorities when a vehicle enters a roadway in the wrong direction, helping prevent head-on collisions.
- **Median Barrier** – A physical barrier that separates opposing traffic lanes, prevent crossover crashes often associated with impaired driving.
- **Non-Recoverable Inslope Protection** – Safety treatments on steep roadside slopes that reduce the severity of crashes when impaired drivers leave the roadway.

Single vehicle run off road and impaired driving are contributing factor in 23% and 22% of severe crashes in the MPA, respectively. The priority strategies above are geared towards rural and limited urban applications.

Table 16. Urban Safety Countermeasures

Urban Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	Description	Estimated Implementation Cost	Estimated Effectiveness*	Remove Severe Conflicts	Reduce Vehicle Speeds	Manage Conflicts in Time	Increase Attentiveness & Awareness
Segment	Access Management	High ($400,000 or more per mile.)	High (44% reduction of all crash severities and types.)	X			
Segment	Bike Lane/ Boulevard	Moderate/High ($125,000-$400,000 per mile.)	*57% reduction of all crash severities and types.	X			X
Segment	Buffered Bike Lane	Moderate/ High ($125,000-$400,000 per mile).	*57% reduction of all crash severities and types.	X			
Segment	Divided Roadway	Moderate/ High ($250,000-$700,000 per mile).	39% reduction of fatal and injury crashes.	X			
Segment	Median Barriers	High ($725,000 per mile).	39% reduction of fatal and injury crashes.	X	X		
Segment	Road Diet (3- & 5-lane conversions)	Moderate/High ($50,000-$450,000 per mile).	47% reduction of all crash severities and types.	X	X		
Segment	Variable Advisory Speed Limits	Low (Less than $15,000 per location).	29% reduction of all crash severities and types.		X		
Segment	Cycle Track	High ($400,000 or more per mile).	57% reduction of all crash severities and types.	X			
Segment	Dynamic Speed Feedback Sign	Low ($25,000 per location).	7% reduction of all crash severities and types.		X		X
Segment	Appropriate Speeds	Low/Moderate ($15,000-$125,000 per mile).	17% reduction of fatal crashes.		X		
Segment	Horizontal Chicanes	Low/Moderate ($25,000-$300,000 per location).	*29% reduction of all crash severities and types.		X		
Segment	Pedestrian Barriers to Prevent Mid-Block Crossing	Moderate ($300,000 per mile).	48% reduction of fatal and injury crashes.	X			

Urban Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Segment	Plowable Centerline Reflective Markers	Less than $15,000 per mile.	24% reduction of all severities, nighttime crashes.				X
Segment	Reduce Lane Width	$15,000-125,000 per mile.	Up to 43% reduction of fatal and injury crashes.		X		
Segment	Sidewalks, trail/path.	$125,000-$400,000 per mile.	40% reduction of all severities, pedestrian-involved crashes.	X			
Segment	Urbanization	$400,000 or more per mile.	Varies, undetermined*		X		
Segment	Wrong-Way Driving Detection	$15,000-$125,000 per location.	*Up to 60% reduction of wrong-way crashes.				X
Segment	Speed Cameras	$50,000-$125,000 per location.	54% reduction of all crash severities and types.		X		
Bike/Ped Crossing or Intersection	Advance 'Yield Here' Sign & Stop Bar	Less than $15,000 per location.	25% reduction of all severities, pedestrian-involved crashes.			X	X
Bike/Ped Crossing or Intersection	No Right Turn on Red	$15,000 to $125,000 per intersection.	98% reduction of pedestrian-involved, right turn failing to yield to pedestrian crashes.		X	X	
Bike/Ped Crossing or Intersection	Colored Pavement/ Brick Pavers	Low/Moderate ($20,000 to $125,000 per intersection).*	Varies, undetermined.		X		X
Bike/Ped Crossing or Intersection	Curb Extensions/Bump Outs	Low ($15,000 per bump out).	Varies, undetermined.		X		X

Urban Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Bike/Ped Crossing or Intersection	Grade Separated Pedestrian Underpass/ Overpass	High ($800,000 or more per location).	Up to 100% reduction of bicycle and pedestrian-involved crashes.	X			
Bike/Ped Crossing or Intersection	High-Intensity Activated Cross/Walk (HAWK) Beacon/ Pedestrian Hybrid Beacon (PHB)	$125,000-$400,000 per location.	43% reduction of all severities, pedestrian-involved crashes.			X	X
Bike/Ped Crossing or Intersection	In-Street Pedestrian Crossing Sign	Less than $15,000 per location.	Varies, undetermined.				X
Bike/Ped Crossing or Intersection	Lighting at Crosswalk	$15,000-$50,000 per location.	23% reduction of fatal and injury crashes.				X
Bike/Ped Crossing or Intersection	Median Refuge Island	$15,000-$50,000 per location.	9% reduction of fatal and injury crashes and 86% reduction of fatal bicycle-involved and pedestrian-involved crashes.		X		X
Bike/Ped Crossing or Intersection	Midblock Crosswalks	Low ($15,000 to $50,000 per location).	Varies, depending upon additional visibility enhancements and other safety countermeasures implemented.				X
Bike/Ped Crossing or Intersection	Parking Restrictions on the Crosswalk Approach	Less than $15,000 per location.	20% reduction of fatal and injury crashes.				X

Urban Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Bike/Ped Crossing or Intersection	Pedestal-Mounted Flashing Signal Beacons	Low ($10,000 per location).	Up to 43% of all crash severities and types.			X	X
Bike/Ped Crossing or Intersection	Raised Crosswalk	$15,000-$50,000 per location.	45% reduction of fatal and injury, pedestrian-involved crashes.		X		X
Bike/Ped Crossing or Intersection	Rectangular Rapid Flashing Beacons (RRFBs) with Refuge Island	Low ($45,000 per location).	69% reduction of all pedestrian-involved crashes.		X	X	X
Bike/Ped Crossing or Intersection	Warning Sign with Edgemounted LED	Less than $15,000 per location.	Up to 43% reduction of all crash severities and types.				X
Bike/Ped Crossing or Intersection	Overhead Pedestrian Warning Sign	$50,000-$125,000 per location.	Varies, undetermined.			X	X
Bike/Ped Crossing or Intersection	Lead Pedestrian Interval	Less than $15,000 per location (if signal has capability).	59% reduction of all pedestrian-involved crashes.	X		X	
Bike/Ped Crossing or Intersection	Pedestrian Countdown Timers	$15,000-$50,000 per location (if signal has capability).	9% reduction of all pedestrian-involved crashes.			X	
Intersection	Signalized or Unsignalized RCUT	High ($1.5 million to $2.25 million per intersection).	22% reduction of fatal and injury crashes.	X		X	
Intersection	Roundabout	High ($2.5 million to $3 million for a single-lane roundabout).	51% reduction of injury crashes.	X	X		

Urban Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Intersection	Mini Roundabout	$100,000-$400,000 or more per intersection.	61% reduction of fatal and injury crashes.	X	X		
Intersection	Lane Constrictor Intersection	$10,000-$30,000 per intersection.	32% reduction of all crash severities & types.		X		
Intersection	Lighting	Low/Moderate ($30,000-$125,000 per intersection).	42% reduction of all nighttime crashes.				X
Intersection	Dedicated Left-Turn/ Right-Turn Lanes	$50,000-$100,000 per intersection.	34% reduction of all angle crashes and 44% reduction of all crash severities and types.	X			
Intersection	Flashing Yellow Arrow	$50,000-$100,000 per intersection.	37% reduction of all left turn crashes.			X	
Intersection	Remove Sightline Obstructions	Less than $10,000 per intersection.	*Up to 40% reduction of all crash severities and types.				X
Intersection	Reflective Signal Head Backplate	Less than $10,000 per intersection.	15% reduction of all crash severities and types.				X
Intersection	Confirmation Lights	Less than $10,000 per intersection.	71% reduction of all disobeyed signal crashes.				X
Intersection	Corridor Signal Timing to reduce high-speed flow	Less than $10,000 per intersection.	11% reduction of injury crashes.		X	X	
Intersection	Appropriately timed yellow change intervals	Less than $10,000 per intersection.	Up to 36% reduction of rear end crashes.			X	

*Indicates that countermeasure has been "tried", with the noted effectiveness; however, not yet considered a "proven" safety countermeasure by FHWA.

Table 17. Rural Safety Countermeasures

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	Description	Estimated Implementation Cost	Estimated Effectiveness*	Remove Severe Conflicts	Reduce Vehicle Speeds	Manage Conflicts in Time	Increase Attentiveness & Awareness
Segment	Access Management	Low/Moderate ($10,000-$350,000 per mile.)	High (Up to 50% reduction of all crash severities and types.)	X			
Segment	Centerline Rumble/Sinusoidal Mumble	Low (Less than $10,000 per mile.)	Moderate (36% reduction of severe, single-vehicle run off road crashes on 2-lane rural roads.)				X
Segment	Clear Zone Maintenance/Enhancements	Low/Moderate ($10,000-$350,000 per mile.)	Moderate/High (Varies, clear zone enhancements from 3.3 feet to 16.7 feet: 22% reduction of all crash severities and types. From 16.7 feet to 30 feet: 44 percent reduction of all crash severities and types.)	X			
Segment	Ditch/ Embankment / Side Slope Improvements	Moderate/High ($50,000 to $350,000 per mile).	Low (14% reduction of fatal and injury-, rollover crashes.)	X			
Segment	Divided Roadway (buffers or median)	Moderate/High ($60,000 to $1 million per mile).	Moderate/High (43% reduction of fatal crashes and 30% reduction of injury crashes.)	X			
Segment	Enhanced Edgeline (6" or 8")	Low (Less than $10,000 per mile.)	Low (18% reduction of all crash severities and types.)				X
Segment	Non-Recoverable Inslope Protection (guardrail)	Moderate/High ($200,000 to $350,000 per mile).	Moderate (35% reduction of fatal and injury crashes.)	X			

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Segment	Passing Lanes	High ($350,000 or more per mile.)	Moderate (32% reduction of all crash severities and types.)	X		X	
Segment	Plowable Centerline Reflective Markers	Low (Less than $10,000 per mile.)	Moderate (33% reduction of all crash severities, nighttime crashes.)				X
Segment	Safety Edge	Low ($45,000 per mile).	Moderate (24% reduction of all severities, run off road crashes.)	X			
Segment	Separated Bike Trail/Path	Moderate/High ($200,00 to $350,000 per mile).	High (65-89% reduction of all bicycle and pedestrian-involved crashes.)	X			
Segment	Shoulder Paving (2', 4', or 6')	Moderate/High ($60,000-$350,000 or more per mile.	Low/Moderate (17%-31% reduction of fatal and injury crashes, 2-lane arterial roads.)	X			
Segment	Shoulder/Edgeline Rumble	Low (Less than $10,000 per mile.)	Moderate (32% reduction of severe, single vehicle run off road crashes, 2-lane roads.)				X
Segment	Snow Fencing	High ($675,000 per mile).	*High (Up to 62% reduction of all crash severities and types.)	X			
Segment	Dynamic Speed Limit Signs	Low ($15,000-$50,000 per location.)	Low (5% reduction of all crash severities and types.)		X		X
Segment	Upgrade Signs / Oversized Regulatory Signs	Low (Less than $10,000 per mile.)	Low (5% reduction of all crash severities and types.)		X		X

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Curve	Chevrons	Low (Less than $5,000 per curve.)	Moderate (25% reduction of all crash severities, nighttime non-intersection crashes.)				X
Curve	Clear Zone Maintenance/Enhancements	Low/High ($10,000-$350,000 per mile.)	Moderate/High (Varies, clear zone enhancements from 3.3 feet to 16.7 feet: 22% reduction of all crash severities and types. From 16.7 feet to 30 feet: 44 percent reduction of all crash severities and types.)	X			
Curve	Delineators	Low (Less than $5,000 per curve.)	Moderate (28% reduction of all crash severities, non-intersection crashes.)				X
Curve	Dynamic Curve Signing	Low ($20,000-$40,000 per curve.)	High (44% reduction of all crash severities and types.)				X
Curve	Enhanced Edgeline (6" or 8")	Low (Less than $10,000 per mile.)	Low (18% reduction of all crash severities and types.)				X
Curve	High-Friction Surface Treatment	Moderate ($80,000 or more per curve.)	High (62% reduction of all crash severities and types and 86% reduction of all wet road crashes.)	X	X		
Curve	Lighting	Low ($20,000-$40,000 per curve.)	High (73% reduction of fatal crashes on curves, nighttime crashes.)				X

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Curve	Non-Recoverable Inslope Protection (guardrail)	Moderate ($60,000 to $350,000 per mile).	Moderate (35% reduction of fatal and injury crashes.)	X			
Curve	Retroreflective Strips on Signposts	Low (Less than $5,000 per curve.)	*Low/Moderate (18% reduction of fatal and injury crashes, and 27% reduction of all nighttime crashes.)				X
Curve	Shoulder Paving (2', 4', or 6')	Moderate/High ($60,000-$350,000 or more per mile).	Low (6% reduction of injury crashes.)	X			
Curve	TT to Single T	Moderate ($80,000 or more per curve.)	Varies	X			
Intersection	All-Way Stop	Low (Less than $10,000 per intersection).	High (68% reduction of all crash severities and types.)	X		X	
Intersection	Continuous Green T	High ($300,000-$500,000 per intersection).	Low (15% reduction of fatal and injury crashes.)	X		X	
Intersection	Oversized Warning Signs/Stop Signs/Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low (Less than $10,000 per intersection.)	Moderate (25% reduction of all crash severities and types, stop controlled intersections.)		X		X
Intersection	High-Friction Surface Treatment	Moderate ($60,000-$200,000 per intersection.)	High (62% reduction of all crash severities and types and 86% reduction of all wet road crashes.)	X	X		

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Intersection	J-Turn/ Restricted Crossing U-Turn (RCUT)	Moderate/High ($250,000 to $1.25 million per intersection).	Moderate/High (35% reduction of all crash severities and types and 71% reduction of all fatal and injury crashes.)	X		X	
Intersection	LED Stop Signs/ Flashing Beacons	Low (Less than $10,000 per intersection.)	Low/High (42% reduction of all crash severities, angle crashes for LED sign installation and 16% reduction of all crash severities, angle crashes for beacon sign installation.)			X	X
Intersection	Lighting (and approaches)	Low/Moderate ($30,000-$125,000 per intersection).	Moderate (33% reduction of all severity, angle crashes.)				X
Intersection	Median Acceleration Lane	Moderate ($60,000-$200,000 per intersection.)	Moderate (40% reduction of all severity, rear end crashes.)	X		X	
Intersection	Offset T-Intersection	High ($600,000 per intersection).	*Moderate/High (Up to 30% reduction of all crash severities and types, and up to 69% reduction of all angle crashes/crossing maneuver related crashes.)	X		X	

Rural Safety Countermeasures				Safe System Hierarchy Tiers			
Location Typology	**Description**	**Estimated Implementation Cost**	**Estimated Effectiveness***	**Remove Severe Conflicts**	**Reduce Vehicle Speeds**	**Manage Conflicts in Time**	**Increase Attentiveness & Awareness**
Intersection	Remove Sightline Obstructions/ Maintain Vision Triangles	Low (Less than $10,000 per intersection.)	Moderate (Up to 40% reduction of all crash severities and types.)	X			
Intersection	Remove Skew/ Realign	High ($50,000-$300,000 per intersection).	Moderate (Up to 30% reduction of all crash severities and types.)	X			
Intersection	Roundabout	High ($2.5 million to $3 million for a single-lane roundabout).	High (51% reduction of fatal and injury crashes and 69% reduction of fatal, serious and minor injury crashes.)	X	X		
Intersection	Through Activated Warning System	Low ($10,000-$30,000 per intersection.)	Moderate (30% reduction of all crash severities and types.)			X	X
Intersection	Transverse Rumble Strips	Less than $10,000 per intersection.	29% reduction of fatal and injury crashes and up to 40% reduction of all crash severities and types.				X
Intersection	Turn Lanes (offset/ channelized)	Low/Moderate ($30,000-$200,000 per intersection.)	Low/High (Crash reduction varies between 12%-44% dependent on specific intersection configuration and other factors.)	X			

*Indicates that countermeasure has been "tried", with the noted effectiveness; however, is not yet considered a "proven" safety countermeasure by FHWA.

Building Safety Beyond Infrastructure

A safe transportation system is built not only with concrete and paint but also through knowledge, habits, and shared responsibility. While engineering and built environments make roads safer, the way people drive, walk, bike, and share the road often determines the outcome of every trip.

Non-engineering strategies, those that rely on education, enforcement, encouragement, and emergency services, play an equally important role in the MPA. These efforts strengthen a "safety culture" that supports the BMMPO's vision of eliminating serious injuries and fatalities on the streets of Bismarck, Mandan, Lincoln, and surrounding areas.

Community members who participated in conversations, focus groups, and surveys repeatedly said the same thing: people want to feel safe using any mode of travel, at any time of day. They want to understand the rules, trust other travelers to follow them, and see visible efforts to encourage positive behavior.

Education and Awareness

Public awareness and education are the foundation of safer behavior. Members of the regional community requested more consistent, practical, and relatable safety messages that resonate with people in their everyday lives.

Everyday Awareness Campaigns

Residents, youth, and professional drivers all identified distracted driving as one of the most serious risks on local roads. Campaigns that make drivers think twice, such as Vision Zero's "*Drive Sober or Get Pulled Over*" or "*Click It or Ticket*," have proven effective statewide and can be customized for Bismarck-Mandan.

> "We've turned into a society where we sit at green lights and run red ones because we're on our d*mn phones." - First Responder.

In the youth survey, nearly every respondent mentioned distracted or impaired driving as their top safety concern. Public campaigns should utilize plain language, strong visuals, and digital platforms such as Snapchat, TikTok, and Instagram, where youth report learning about community news.

School and Youth Engagement

Multiple stakeholders and youth participants identified gaps in driver and rider education, noting that young people often leave driver's education without real-world skills such as managing road rage, interacting with commercial trucks, or making safe choices around distractions.

Young people consistently say they want to be part of the solution. They asked for safety education that goes beyond the driver's handbook, something interactive, story-based, and led by relatable voices.

Law enforcement, the freight industry, and other representatives expressed frustration that local school districts have been difficult to access for safety presentations and programs such as the "No Zone" truck visibility demonstration. Several organizations have youth-focused safety programs that are not currently implemented in Bismarck-Mandan area schools.

To close this gap, the MPO can help convene a partnership between local school district administrators, law enforcement, and state-level safety organizations to explore new opportunities for youth engagement. The goal is to introduce safety education earlier, reinforce it often, and make it relevant through practical, hands-on experiences.

"Safety education starts young. Talking about real consequences and smart decisions makes a bigger impact than just reading rules." - Youth Participant.

Opportunities to Explore:

- Initiate dialogue with administrations from both private and public Bismarck and Mandan area schools to identify pathways for incorporating safety education within existing courses, such as health or physics, and examine how transportation safety programs can align with current curriculum goals rather than add to classroom workload.
- Strive to have local Vision Zero Schools. The 2024 Vision Zero Schools Campaign was recognized due to its statewide success in reducing distracted driving through student-led initiatives and peer ambassador programs.
- Host annual "Transportation Safety Week" in collaboration with schools, law enforcement, and community partners. Activities could include distracted driving simulators, "No Zone" truck demonstrations, and mock crash or impairment

North Dakota Safety Council's (NDSC's) "Alive at 25" Teen Driver Program

This classroom connection program focuses on defensive driving and peer influence through short courses led by trained instructors. Students who complete the course often receive insurance discounts.

https://www.ndsc.org/alive-at-25/

awareness events timed to coincide with the spring season.

- Create youth advisory or ambassador programs to engage students in designing social media content, posters, or short videos on local transportation safety themes. These can connect directly with NDDOT's Vision Zero outreach channels.
- Partner with post-secondary institutions, such as Bismarck State College's commercial driving program, to bridge high school students into career awareness events that also reinforce safety culture.

Work Zone Safety Awareness Campaigns

Although not identified as a key issue by local residents, there were several work zone related severe crashes in the BMMPO's MPA between 2020-2024. During the summer months, when multimodal traffic peaks in the region, so does construction activity. The people working to maintain and reconstruct the regional transportation system often work alongside high-speed traffic and have greater interaction with traveling vehicles. Work zone awareness campaigns provide a friendly reminder about the importance of noticing road workers. Social media and other communication campaigns may be effective during National Work Zone Awareness Week (NWZAW) every Spring, which helps raise awareness about the dangers of work zones and encourage extra caution from drivers. Hashtags like "#Orange4Safety" or "#NWZAW" can help build awareness. Activities could include a "Go Orange Day" where people are encouraged to wear orange, show support, and build further awareness about work zone safety.

Key Messages:

- "Work Zones are temporary. Actions behind the wheel can last forever"
- "You play a role in work safety. Work with us"
- "Be Work Zone Alert"

Community Collaboration and Partnerships

Regional Transportation Safety Workshop

Bringing people together around shared safety goals can spark collaboration and long-term change. A regional Transportation Safety Workshop would provide the BMMPO with an opportunity to gather partners, share crash data, and develop strategies that integrate engineering, enforcement, education, and emergency response efforts.

The event would invite participants from across the transportation system, including MPO staff, engineers, public works directors, planners, law enforcement officials, insurance companies, healthcare providers, freight industry representatives, social service providers, faith-based organizations, employers, motorcycle and active transportation advocates and users, developers, school officials, seniors, and youth. Each group brings a unique perspective, from understanding risk exposure on the road to communicating safety messages through trusted networks.

The workshop's purpose is to connect disciplines that rarely meet in the same room and identify actionable, non-engineering strategies that can reduce severe injuries and fatalities. Facilitated discussions would use recent crash data to highlight local emphasis areas, followed by breakout sessions where mixed teams brainstorm realistic and data-driven solutions. These could include new driver education partnerships, community enforcement campaigns, or shared messaging that promotes a culture of traffic safety.

Expected outcomes include:

- A short list of locally supported safety strategies and pilot ideas.
- Identification of implementation partners, potential funding resources, and project champions.
- Renewed partnerships between public agencies, businesses, and community advocates.
- A shared commitment to measurable reductions in serious injuries and fatalities.

When diverse partners collaborate toward a vision of "zero severe crashes", communities can align their efforts, discover new solutions, and foster sustained public awareness. A local transportation safety workshop could build this same sense of ownership for the Bismarck-Mandan region, turning data into dialogue and dialogue into collective action.

Community Workshops and Demonstrations

Hands-on workshops, such as pop-up safety events or temporary design demonstrations, can make safety tangible. Drawing from the principles of tactical urbanism, these short-term, low-cost, and scalable projects allow communities to test ideas before committing to permanent investments.

What is Tactical Urbanism?

Tactical urbanism is a hands-on approach to community design that uses short-term, low-cost, and scalable projects to test ideas for improving streets and public spaces.

Examples include pop-up crosswalks, temporary curb extensions, parklets, and quick-build bike lanes.

The goal is simple: try small, learn fast, and build lasting change. By transforming ideas into temporary, real-world demonstrations, tactical urbanism gives residents and decision-makers a chance to see how new street designs or safety strategies feel in practice. These projects make safety visible, empower community creativity, provide high-quality public feedback, and show that safer streets don't always require major construction, just collaboration and imagination.

Motorcycle Safety and Rider Awareness

Motorcyclists are among the most vulnerable travelers in the MPA. Crash data shows motorcyclists experience a disproportionate number of incapacitating injuries and fatalities as compared to any other travel mode, often in collisions where helmets were not worn. Because riders lack the physical protection afforded to other vehicle occupants, seemingly minor crashes can have severe consequences.

Shared Responsibility & Public Awareness

Campaigns such as "Ride Smart" and "Look Twice for Motorcycles" remind everyone, drivers and riders alike, that safety is a shared responsibility. Simple messages, such as "Check twice before turning" or "Motorcycles are closer than they appear," can be promoted through billboards, social media, and Spring kickoff events when motorcyclists return to the road.

Local dealerships, repair shops, and insurance partners can help extend these messages, reinforcing that riders are part of the same community as every other road user.

Peer to Peer Education and Mentorship

Research and experience indicate that fellow riders have the most influence on riders. Groups like the Harley Owners Group (H.O.G.), ABATE of North Dakota, and other local motorcycle clubs have long promoted safe riding through mentorship and community rides. "Ride Safe, Ride Often" events provide informal training on group-ride communication, defensive riding techniques, and gear use. Establishing similar pre-season safety workshops or ride-in clinics in Bismarck-Mandan could help new and returning riders refresh their skills in a supportive environment.

Promoting Helmet and Gear Use

Protective gear remains the most effective way to reduce the severity of injuries. Campaigns such as "Gear Up, Every Ride, Every Time" show real-world examples of how helmets and abrasion-resistant clothing prevent life-threatening injuries and severe crash outcomes. Visual demonstrations at public events, dealership open houses, or summer festivals can help normalize helmet use as a sign of experience, rather than restriction. Partnering with healthcare providers or trauma centers can further humanize the message by connecting it to real outcomes.

Visibility, Enforcement, and Seasonal Outreach

Motorcyclists often face unique visibility challenges. Joint enforcement and outreach efforts, such as "Safe Ride

Weekends," can bring law enforcement officers and rider groups together to focus on awareness rather than punishment. Coordinated campaigns at the start of each riding season can remind both drivers and riders to refresh their awareness, watch for blind spots, and prepare bikes for safe operation.

Enforcement and Behavior Change

Effective enforcement is about fairness, visibility, and education, not just citations. People are more likely to follow rules when they see that safety laws are applied consistently and clearly. Pairing enforcement with a media campaign, such as "Safe Streets Week," helps people view it as a community partnership rather than a punitive measure.

> "Distracted driving is a really big problem; cell phones are a large issue. Education on how to share the road with trucks is needed." - Freight Stakeholder.

Focused Enforcement in High-Crash Corridors

Data from the MPO's High-Injury Network can inform short, targeted enforcement periods at locations where crashes frequently occur. Portable feedback signs, "Your Speed" trailers, and joint patrols can make enforcement visible but approachable.

Partnering with Employers

Local employers can play a major role in normalizing safe driving behavior by implementing structured reward and recognition programs. When organizations recognize incident-free driving records, safe-driving pledges, and publicly celebrate safe drivers, they build morale, create friendly competition, and embed safety into workplace culture. Research and best practices (OSHA employer guidelines; fleet-industry incentive programs) show that incentive-based approaches help reduce collisions, improve retention among drivers, and align business goals with safety outcomes.

- Build on Freight Industry Best Practices: Freight companies already utilize in-cab cameras and safety policies that exceed state requirements. Their experience can be shared with driver education programs or company fleet training sessions.
- Establish a Safe-Driving Pledge Program: Local employers (municipal fleets, transit operators, school buses, landscaping firms, delivery services) sign a pledge committing to zero preventable crashes for a defined period (e.g., 12 months). Use public signage, internal-staff announcements, and encourage peer accountability.
- Integration with Public Safety Campaigns: Connect employer programs with the BMMPO's broader education/enforcement/encouragement strategies. For example, messaging in employee programs that

can reinforce community-wide campaigns (e.g., seatbelt use, distracted driving, motorcycle safety), under a "Safe Driving Challenge" umbrella.

Encouragement and Community Engagement

Encouragement programs reward safe choices and build positive peer pressure to do the right thing. Parents and youth often raise concerns about safety near schools and parks. Expanding the Safe Routes to School and Safe Routes to Parks efforts, which are already a national best practice, can combine education, encouragement, and evaluation.

Ideas include:

- "Walk and Roll Wednesdays" or "Bike Bus" days.
- Student-created safety murals or signage.
- Neighborhood "Slow Down" pledge campaigns.

"20 is Plenty" – Slowing Down for Safer Neighborhoods

This safety campaign encourages drivers to slow down to 20 mph on neighborhood streets. NDCC §39-09 establishes a default speed limit of 25 mph on residential streets; however, jurisdictions can lower this limit through local ordinances.

Recognizing Safe Behavior

Positive recognition can be powerful. The BMMPO could highlight safe behavior through short features, "Saved by the Belt" stories, driver spotlights, or youth safety awards at community events. These celebrations help make safety visible and relatable.

> "It is not a race. People should be proud to drive smart." - Youth Comment.

Emergency Services and Coordination

When crashes do occur, fast and coordinated responses save lives, and the information gathered afterward helps prevent similar incidents in the future.

Strengthen Data Sharing

First responders and hospitals collect valuable crash information that can help pinpoint risk patterns. Building a shared, regional traffic safety data network that links police, EMS, and BMMPO stakeholders can improve trend analysis and near-miss reporting. This coordination mirrors successful approaches in other MPOs across the U.S., where integrating crash data, citations, and hospital records has allowed traffic safety partners to target education and enforcement more effectively.

Rural and Off-Highway Safety

Stakeholders for off-highway vehicles (OHVs) highlighted an increase in crashes on public roads and confusion over operating rules. A combined effort between counties, law enforcement, and recreation clubs can include:

- Refresher safety training for youth riders and parents.
- Helmet awareness and free helmet distribution events.
- Coordination with emergency responders for off-road crash responses.

> "We're seeing more adults using OHVs for transportation, not just recreation. That changes the safety conversation." - OHV Stakeholder

Access and Inclusion

A truly safe system works for everyone. Youth, seniors, people with disabilities, and residents without vehicles often face the highest risks when using sidewalks and crossings.

Potential actions can include:

- Creating plain-language safety materials and translating them into multiple languages.
- Partnering with senior centers, disability advocates, and schools to co-design outreach campaigns.
- Hosting "Community Safety Walks" where residents document unsafe conditions and share stories directly with local leaders.

These inclusive efforts ensure that everyone's perspective is heard and that the solutions reflect real, lived experiences.

> "There are dark spots where people walk, and drivers can't see them. Street lighting is safety, it's not just convenience." - Community Conversation Participant

Policy and Regulations

Transportation safety may be considered in nearly every local policy and regulation.

Land Development Code and other Regulations

The local land development code and subdivision regulations can provide opportunities to proactively address safety in the regional built environment. For example, local land development code can provide opportunities to address systematic crash risk factors including:

- **Boulevard Trees** – Local jurisdictions may consider evaluating the boulevard tree standard to require minimum spacing of boulevard trees by functional classification. Include detail regarding responsibilities of planting and address double-fronting lots.

- **On-Street Parking** – Consider regulations on local and collector roadways to encourage on-street parking in applicable areas where utilization will be high and/or driveway spacing allows for utilization. Utilized on-street parking can visually narrow the roadway. If on-street parking is underutilized, driving lanes may visually appear wider, which can lead to an increase in traffic speed.
- **Street/Lane Width** – Local jurisdictions may consider revising road and/or driving lane widths by using language such as a maximum width or not to exceed width. An 11-foot wide maximum travel lane is encouraged however, different standards may be modified within reason based upon roadway characteristics or functional classification and surrounding land use.
- **Street Network Circuity** – Consider street circuity when reviewing subdivision applications. Street network circuity provides a measure of efficiency to help improve traffic operations and safety on local streets by considering the directness of vehicular travel. Street Network Circuity can be calculated by dividing the network distance by the Euclidean (as the crow flies) distance. The lower the calculated ratio, the higher the connectivity and directness of travel.

Hypothetical Street Network Circuity Example:

Traditional neighborhoods with grid street networks have a lower network circuity ratio (more directness, higher efficiency) than modern subdivisions with curvilinear and/or dead-end streets (cul-de-sacs).

In this case travelers in the modern subdivision may have to travel indirectly to get to a desired destination. This inefficiency of travel can lead to speeding, higher traffic and cut-thru traffic on local neighborhood streets, causing local roads to operate beyond their intended functional classification.

Access Management

BMMPO's local jurisdictions should enforce access management policies to consolidate driveways on corridors which do not conform. Prioritize access management and access driveway consolidation in corridor studies and during street reconstruction projects.

Scooter & Bike Share (Micromobility)

Throughout public and stakeholder engagement, people mentioned their concerns with e-scooters, particularly in downtown Bismarck. While micromobility is a known tool to bolster non-vehicular travel in dense commercial areas, and can serve as a critical first-mile/last-mile connector for transit riders, there is concern that the vehicles do not belong on sidewalks nor on the street. Given the e-scooter's integration with technology, Bismarck should review the agreement between the e-scooter company and the City to identify potential revisions that may positively impact safety and perception of safety of e-scooter operators.

Potential actions include:

- Adjust hours of operation to prohibit use late at night or during "bar close." E-scooters do not replace a sober ride.
- Push for geo-fencing capabilities to prohibit e-scooter use on sidewalks, on streets, and/or along certain corridors downtown.

The bike-share is relatively new in Bismarck, particularly for any e-assist bikes that may be included as part of the fleet. The City should watch closely for similar challenges that are associated with the e-scooters.

Innovative Technology

Technology continues to rapidly evolve, especially in vehicles and connected infrastructure. The BMMPO and partner jurisdictions should continue to monitor closely; however, more vehicles on the market today have autonomous technologies providing increased safety and driver awareness including blind spot detection, adaptive cruise control, lane assist, and in some cases self-driving capabilities. Because there is not yet a national standard for vehicle to infrastructure communication, advancements are being made through artificial intelligence and enhanced imaging and sensor technologies that can interpret real world conditions. Therefore, maintaining legible signage and striping across the regional transportation system will be critical, as vehicles will continue to scan surroundings for cues on conditions.

Safer Vehicle Fleets

Local jurisdictions should consider innovative vehicle safety features in City and County vehicle fleet purchases to improve public-employees' driver awareness and safer driving practices.

In some cases, employers may implement strict employee driving policies. The State of North Dakota has a distracted driving policy, banning all cell phone use (even hands free) and other device use while driving for work. Employees who violate the policy can face disciplinary action, including termination, making safe driving practices a condition of employment.

Moving Forward Together

Engineering and built-environment improvements are essential, but people make the system safe. Through public education, rider mentorship, and respectful enforcement, the BMMPO can help foster a culture where safety is a shared community priority, whether behind the wheel, on two wheels, or on foot. Education, enforcement, encouragement, and coordinated emergency services together form the foundation of a community that values every traveler's life. By combining these people-centered strategies with thoughtful roadway investments, the BMMPO and its partners can build a transportation system that is safe, connected, and inclusive for all.

> Every voice, from the cab of a semi-truck to the seat of a bicycle, adds insight. Safety grows stronger when the entire community participates.

Legislative Change

The BMMPO's jurisdictional partners may advocate or champion legislation at the State and/or local level to improve safety in specific locations, or regarding specific modes.

Safety Cameras

Safety cameras include traffic cameras that catch speeding or red-light violations to monitor and enforce traffic laws. For example, in some cases, safety cameras enforce speed limits by identifying speeding vehicles, capturing the license plate and registration information, issuing a speeding ticket violation, and mailing the speeding ticket violation to the vehicle's registered owner. Currently, it is illegal to implement safety cameras in North Dakota; however, there is evidence of significant effectiveness from across the United States. According to the Des Moines Register, crashes near three automated traffic enforcement cameras were cut in half after cameras were installed, compared to the six (6) years before the program began.

New York City's safety camera pilot program installed enforcement cameras in 20 school zones starting in 2013 using fixed and mobile devices. The cameras operated one hour before and one hour after school activities and the speed threshold was set at 10mph over the speed limit. The program was expanded to 140 school speed zones in 2014 and is the largest network of safety cameras in the U.S. The results are considered a significant success, with the pilot program reporting, where school zone speed cameras were present:

- 63 percent decrease in speed,
- 15 percent decrease in crashes,

- 17 percent reduction in injuries, and
- 55 percent reduction in fatalities.

Off-Highway Vehicles (OHVs)

Local jurisdictions should review North Dakota's rules, regulations, and definitions around OHVs and golf carts. Currently, there are known challenges with education and enforcement, with the State allowing operators as young as 12 years old, and growing use of OHVs for daily use or primary travel mode. Additionally, OHV and golf cart classifications are complicated and evolving fast, with emerging vehicle technology and growing OHV-market demand. Local jurisdictional partners should advocate for clear, common sense legislation to help ensure safety education and proper operation, clear rules and vehicle classifications, regulations, and enforcement of OHVs. For example, legislation may be focused on vehicle and rider requirements such as required protective gear, seat belt use, vehicle size and suitability for age(s) of use, and passenger limits. Operating procedures may also be explored including designated or prohibited use areas, visibility enhancements, speed and awareness, and noise standards. The State currently requires registration of OHVs, depending upon classification and requires a safety course for younger operators. There have been ongoing discussions at the State level, to modernize OHV definitions and regulations.

Mandatory Helmet Laws

North Dakota law requires motorcycle riders under the age of 18 to wear a helmet. Some states across the U.S. have similar such laws requiring younger riders to wear a helmet; however, several states have mandatory helmet requirements for motorcycle riders, regardless of age. For example, California has had a mandatory helmet law since 1992. After implementation of the helmet use law, statewide motorcycle crash fatalities decreased by 37.5 percent, from 523 fatalities in 1991 to 327 in 1992. California estimated 92 to 122 lives were saved because of the law's implementation. Additionally, head injuries decreased significantly among fatal and injury motorcycle crashes.

Micromobility and E-Devices

State and local governments across the country have established legislation for micromobility devices such as E-bikes and E-scooters, which have an electric-powered motor providing pedal-assist or stand-alone throttle. Legislation should ensure defining and classifying rules an emerging fleet of potential devices including but no limited to: E-bikes, E-scooters, and other platformed devices such as electronic skateboards, one-wheeled devices, and others. With emerging technologies and growing demand, micromobility and E-devices are important to consider when establishing laws and regulations around rider requirements and operating procedures. Legislation should consider safety to define specific classifications of devices based upon speed and motor type (pedal-assist or stand-alone throttle). Age restrictions, helmet use, and licensing requirements may also be considered for faster, more powerful vehicles. Use of these devices on sidewalks should be prohibited, especially in areas with significant pedestrian traffic and traffic laws should apply to all devices. Targeting use of devices while intoxicated is also critical, as many users try to use micromobility and e-devices as alternatives to a sober ride.

Distracted Driving

Distracted driving is contributing factor in many crashes in the region, North Dakota, and across the U.S. Several states have passed laws to enforce “hands-free” cell phone use while driving. For example, in 2019, Minnesota passed a hands-free law and began high-visibility enforcement; however, there has not been a significant impact to severe crashes in the state. Distracted driving remains a significant challenge and while legislation may help build awareness, there are likely more cultural or societal changes that must occur to see more positive outcomes.

Penalties

In 2023, North Dakota made seat belt enforcement a primary law, meaning law enforcement could stop people for not wearing a seat belt. Additionally, in 2025, North Dakota increased the minimum penalty structure for speeding tickets. Preliminary observations and data suggest both laws have had a positive impact on seat belt use and speeding across the state. Penalties should be evaluated from time to time to ensure better safety and operating practices by drivers. Seat belt use, speeding, distracted driving, reckless driving, and intoxicated driving are all areas where legislative opportunities exist to enhance enforcement, explore penalty structures, and increase safe driving practices in the State.

Other Multimodal Strategies

The Study considers all modes of transportation in safety strategy development, including transit and where railroads and streets conflict, at at-grade rail crossings in the MPA. The following high-level strategies should be championed by the BMMPO and local jurisdictions moving forward to forward a comprehensive, multimodal safety approach on the regional transportation network.

Transit Strategies

Bis-Man Transit fixed routes primarily operate through a flagging system; where transit riders physically “wave” the bus indicating their intent to ride and for the bus to stop. There are limited designated bus stops in the region; however, the BMMPO and jurisdictional partners should continue to identify opportunities to include the following in plans, corridor studies, and reconstruction projects:

- **Bus turnouts –** provides a designated lane or stopping area along the street to remove transit vehicles from conflicts with traffic.
- **Designated stops with shelters –** increases visibility of transit riders, to remove severe conflicts and conflicts in time, currently associated with the flagging system

Figure 30. Potential Bus Stop/Pull Out Area – E. Main Corridor Study

On the Road Safety

Improving transit safety while vehicles are in operation depends heavily on skilled drivers and well-maintained equipment. Comprehensive driver training programs should emphasize safe operating practices in all weather conditions, with particular focus on navigating wet, icy, or low-visibility environments, as over one third of Bis-Man Transit's crashes occurred in these conditions. Regular refresher courses and simulations can help drivers remain prepared for seasonal challenges and emergency situations. Equally important is a rigorous maintenance program that ensures buses are in good condition. This includes frequent inspections of brakes, tires, wipers, lights, and heating systems to maintain traction, visibility, and passenger comfort.

The BMMPO and Bis-Man Transit should also keep a pulse on technological advancements for the safety of transit riders on the road. Vehicle technology is rapidly evolving to include innovative safety systems:

- **Collision avoidance systems** – Uses sensors to detect potential crashes and alert the driver or operator with visual and auditory warnings. Some advanced systems can even apply the brakes and/or take other actions to mitigate or prevent the collision.
- **Lane departure warning systems** – Uses sensors to detect lane departure and alert the driver or operator with visual and auditory warnings. Some advanced systems can automatically steer the vehicle back into the lane.
- **Onboard cameras for monitoring passenger and driver safety** – Used to identify and mitigate unsafe passenger and driver behavior, typically after something has been flagged. Some advanced

systems can automatically detect driver cell phone use or other unsafe driver-behaviors (e.g. drowsiness).

- **Mirrorless camera systems** – Video-based replacement for traditional side mirrors. Cameras and digital driver-display provide a wider, clearer view of surrounding to eliminate blind spots.
- **External warning systems for pedestrians** – Video-based or sensor based system used to detect pedestrians and alert the driver or operator with visual and auditory warnings.

Bus Stop Accessibility and ADA Compliance

For future designated areas identified by Bis-Man Transit, the BMMPO, and other partner jurisdictions, creating ADA-accessible bus stops will be essential. Accessibility and ADA compliance standards are not only to meet legal requirements but also to enhance safety, comfort, and convenience for all transit riders in the BMMPO's MPA. Ensuring compliance with the Americans with Disabilities Act (ADA) helps make public transportation inclusive for people with disabilities, older adults, and anyone with mobility challenges. An accessible bus stop should include a stable, firm, and slip-resistant boarding surface, with unobstructed pathways linking the boarding area to sidewalks, curb ramps, crosswalks for safe, direct travel. Boarding zones should align with bus doors to reduce gaps and elevation differences, while tactile warning strips can assist passengers with visual impairment. Amenities such as shelters and seating should provide adequate maneuvering space and incorporate accessible features like armrests or leaning supports. Importantly, these design improvements don't just benefit those with disabilities, they enhance safety, ease of movement, and overall usability for all riders. See Table 3 for specific bus stop accessibility and ADA standards.

Table 18. Accessibility and ADA Standards for Bus Stops

Requirement Category	Description	ADA Standard/ Best Practice
Boarding and Alighting Area	A solid, steady, non-slip surface designed to support access for wheelchairs and mobility aids.	Minimum 5 ft x 8 ft (1.5 m x 2.4 m) clear boarding pad
Path of Travel	An uninterrupted, obstacle-free route for pedestrians leading from the stop to the sidewalk or destination.	Minimum 3 ft (0.9 m) clear width; slope ≤ 1:48 (2%)
Curb Ramps	Ensures an accessible link between the street, sidewalk, and boarding area.	Ramp slope ≤ 1:12; tactile warning surface at street edge
Shelter Accessibility	Unobstructed space inside the shelter to accommodate mobility aids.	Minimum 30 in x 48 in wheelchair space

Requirement Category	Description	ADA Standard/ Best Practice
Signage & Information	Content available in inclusive formats, such as Braille, to serve passengers with vision loss.	High-contrast, sans-serif text; mounted at 48–60 in height
Lighting	Sufficient lighting to ensure visibility and safety during nighttime hours.	≥ 10 lux (1 foot-candle) at boarding area
Tactile Warning Strips	Tactile warning surface along the curb edge to notify passengers with visual impairments.	24 in (0.6 m) deep, truncated dome pattern
Seating	Inclusive seating equipped with armrests to support easy use and stability.	At least one accessible seat location per shelter
Sign Placement	Located to ensure unobstructed viewing for all passengers, whether sitting or standing.	48–60 in height; readable from 10–15 ft distance

Safety at the Stop

Passenger safety and comfort at bus stops play a crucial role in creating a positive transit experience and encouraging greater ridership. A safe bus stop features well-lit waiting areas, clear sightlines for both passengers and bus operators, and convenient access to secure pedestrian crossings to minimize traffic conflicts. Comfort and safety are improved through weather-protective shelters, adequate seating, and thoughtful design that incorporates shade, wind barriers, and heating elements to keep passengers warm during the winter months, while also reducing exposure to environmental hazards. Equally important to actual safety is the perception of safety. When passengers feel secure and confident in their surroundings, they are more likely to use transit regularly and view it as a dependable travel option.

> "As a single woman, there are people who regularly like to ride the bus and follow women off the bus who appear to be alone." - Youth Comment

Stops should be located along visible, active areas to encourage natural surveillance and, where appropriate, include safety features such as security cameras, emergency call boxes, and real-time arrival information to reduce uncertainty and waiting anxiety. Ongoing attention to accessibility, cleanliness, and maintenance ensures that passengers feel welcome, comfortable, and at ease while waiting.

CPTED Principles at Bus Stops for Passenger Safety and Comfort

Crime Prevention Through Environmental Design (CPTED) is a proactive approach to improving safety by shaping the physical environment to reduce crime opportunities and enhance a sense of security. When applied to bus stops, CPTED principles can be implemented through the following strategies:

- **Natural Surveillance:** Locate bus stops in active, well-traveled areas where pedestrians, drivers, and nearby businesses can easily observe activities. Avoid secluded or hidden locations.
- **Clear Sightlines:** Preserve open visibility between the stop, approaching buses, and the surrounding environment by trimming vegetation and preventing visual obstructions.
- **Territorial Reinforcement:** Communicate ownership and care by using consistent branding, maintaining infrastructure, and providing adequate lighting to show that the stop is part of a managed system.
- **Access Control:** Design walkways, curb ramps, and shelter entries to promote safe, intentional movement and reduce unsafe crossings or loitering in poorly lit spaces.
- **Maintenance and Upkeep:** Maintain a clean, well-cared-for stop by repairing damage promptly and removing graffiti quickly to demonstrate ongoing management and discourage vandalism.

Rail Crossing Safety Improvements

Rail crossings, where roadways and railways intersect at the same level, are critical points in the MPA’s transportation network that pose a significant safety risk to people living in and traveling through the area. Accidents at these highway-rail grade crossings remain a leading cause of rail-related fatalities in the region. Therefore, the continuous push for safety improvements is an important and collaborative endeavor.

The goal of safety improvements is to mitigate the risk of collisions between trains and vehicles or pedestrians, which are often very dangerous due to the train's inability to stop quickly. These efforts are shared among railroads, government agencies (local, state, and federal), and the public. Key strategies for enhancement fall into three main categories Education, Enforcement and Engineering. By strategically combining these strategies, the region can enhance safety and work toward the goal of zero incidents at all rail crossings.

Education

By strategically leveraging the regional metropolitan planning process, BMMPO can lead the development of highly visible, multilingual public awareness campaigns—like the "Don't Risk It" initiative—that utilize crash data to target high-risk groups such as young drivers and commercial operators across various platforms, including social media, and roadway signage or messaging boards.

Enforcement

While MPOs do not have direct policing authority, the BMMPO and jurisdictional partners can play the role of regional convener for the "Enforcement" component of rail safety. Acting as a coordinator to ensure enforcement efforts are strategic and effective:

- BMMPO should work with NDDOT to improve regional rail-related crash data to identify and map "hot spot" crossings and times where violations such as driving around gates or illegal trespassing are most frequent.
- Sharing this information with local and state law enforcement agencies.

Increased coordination allows local agencies to deploy focused enforcement, often in conjunction with railroad police, at the highest-risk locations, maximizing the impact of limited resources and creating highly visible deterrents. Furthermore, the BMMPO can help secure funding, such as federal Highway Safety Improvement Program (HSIP) funds, which can sometimes support behavioral countermeasures like enforcement campaigns. At the legislative level, local jurisdictions can work to foster collaboration with state representatives to ensure that penalties for rail crossing violations are serious and consistently applied across the region, thereby reinforcing the rail crossing safety message.

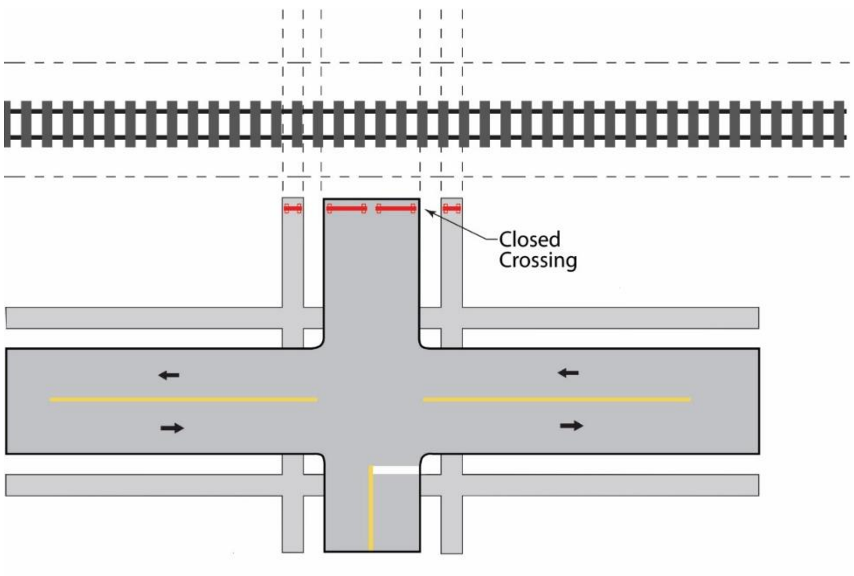
Engineering

BMMPO plays a non-construction role in the engineering component of rail crossing safety but can assist in prioritizing and programming the necessary funding for large-scale, life-saving infrastructure projects. The primary strategy is to use data-driven planning to allocate federal and state resources, such as Section 130 and competitive grant funds. Prioritizing the most impactful physical improvements. Below is a list of crossing treatments that are known to improve safety that the BMMPO and partner jurisdictions can use to improve crossing safety.

Crossing Consolidation/ Crossing Closure

Crossing consolidation is a cost-effective safety strategy that involves permanently closing unnecessary, redundant, or low-volume at-grade rail crossings and rerouting the traffic to a nearby, upgraded crossing. This practice is recognized as a highly effective way to improve safety because the core principle is simple: the safest crossing is one that doesn't exist. By reducing the total number of intersections where vehicles and trains can conflict, consolidation significantly decreases the exposure to risk, allowing limited safety resources to be focused on the fewer remaining, essential crossings. Closure of a crossing often requires the construction of a cul-de-sac to allow vehicles to turn around if needed but may require additional right of way. Other costs can vary significantly by location.

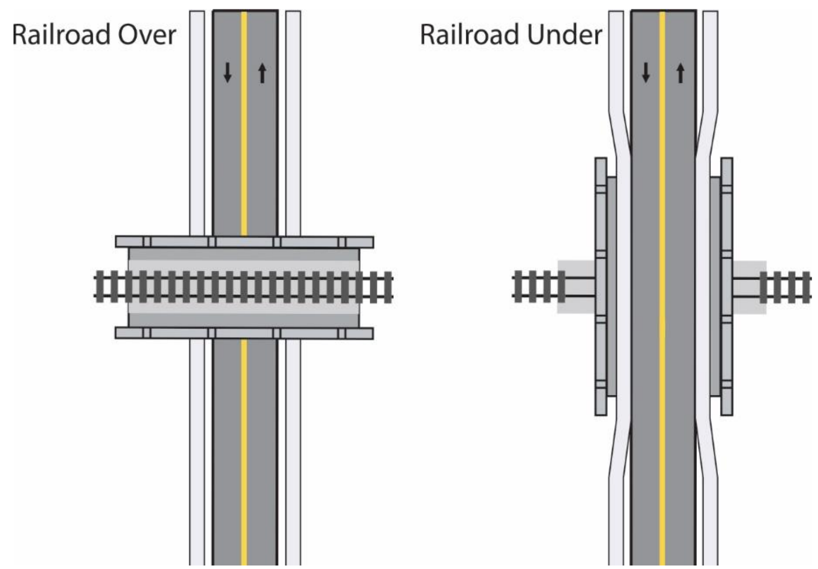
Figure 32. Crossing Consolidation/Crossing Closure - Plan View



Grade Separation

Grade separation includes the construction of an overpass or an underpass to carry the road or the railway over or under the other. Grade separation is the most effective engineering solution for improving safety at railroad crossings by physically separating the train and vehicle pathways, it completely eliminates the conflict point between road traffic and rail traffic, which in turn removes the possibility of a train-vehicle collision. Beyond safety, this strategy also boosts efficiency by ending traffic delays caused by waiting for trains, reduces vehicle idling and emissions, and allows trains to maintain speeds, making it a critical component for high-speed rail corridors. While very effective, these projects are expensive and require extensive planning and construction and may require additional right of way to construct the necessary structures.

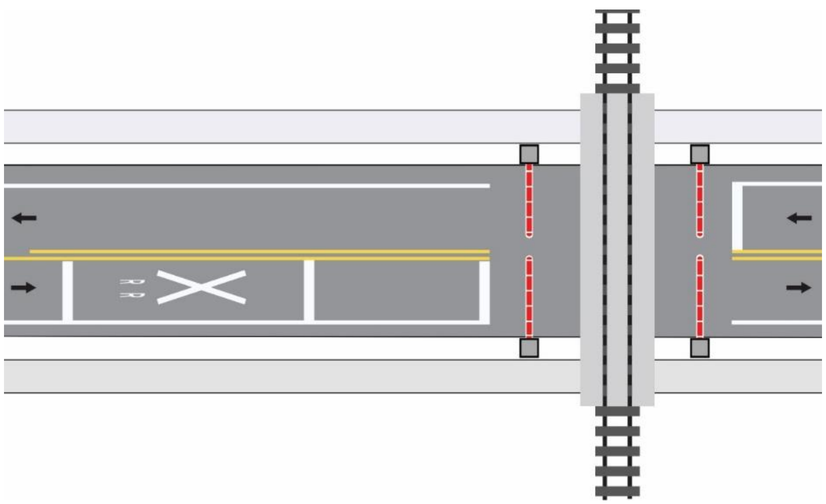
Figure 31. Grade Separation – Plan View



Four Quad Gates

Four-quadrant gates are an effective active warning system designed to virtually eliminate the dangerous and illegal maneuver of driving around lowered crossing gates. Unlike traditional two-quadrant gates that only block the entrance lanes, the four-quadrant system features gates on both the entrance and exit side of the tracks, effectively creating a "closed" barrier. A critical component is the use of a time delay for the descent of the exit gates, which allows any vehicles already on the tracks to safely clear the crossing before the area is fully sealed. This improvement option has the advantage of causing minimal impact to accessing adjacent properties.

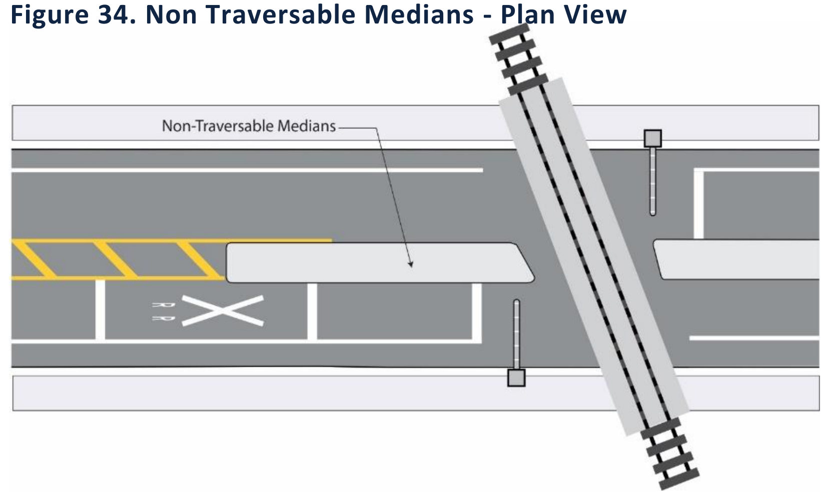
Figure 33. Four Quad Gates - Plan View



Non-Traversable Medians

Non-traversable medians prevent motorists from swerving into the opposing lane to bypass the warning system. Accesses should be closed or relocated if they are within the extents of the median. When no other access options exist, private accesses may remain within the extents of the median but would be limited to right-in/right-out access. Non-traversable medians are generally four feet wide and six inches tall, and the length of several queueing vehicles, but may vary depending on roadway limitations. In some cases, crossing improvements may be difficult or impossible due to the configuration of roadways, accesses, and other factors. Cost estimates for medians range significantly depending on the need for roadway widening, access modifications, drainage, and other associated modifications.

Figure 34. Non Traversable Medians - Plan View



Channelization Devices and Delineators

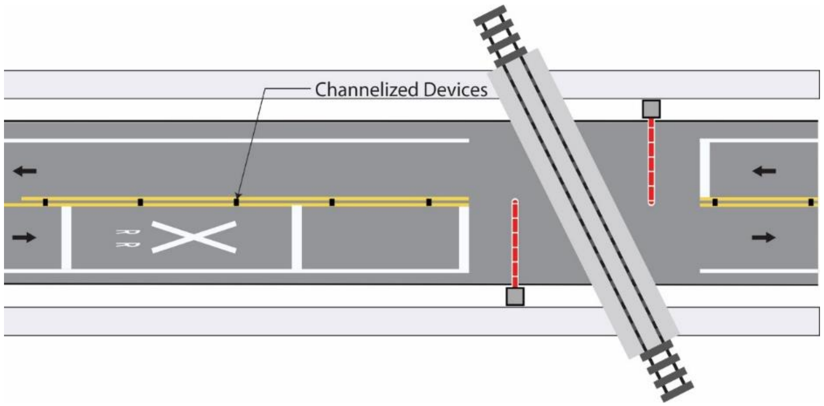
Channelization devices can function similarly or work in conjunction with non-traversable medians. At crossings without gates, post-mounted delineators can be placed along the roadway's shoulder to clearly mark the roadway alignment and the crossing's presence.

At active crossings with gates, flexible tubular delineators or vertical panels are often mounted on non-traversable medians along the centerline. Alternatively, they can be used in place of medians where cost, narrow roadway width, or other roadway conditions must be considered.

When used along the centerline, channelization physically discourages and visually impedes the dangerous practice of driving around lowered gates—a major cause of fatal collisions—by preventing motorists from swerving into the opposing lane to bypass the warning system.

While channelization devices are easy to install, they require regular replacement especially in the winter with snow removal and contribute to annual roadway maintenance costs.

Figure 35. Channelization Devices & Delineators – Plan View



Improved Geometrics

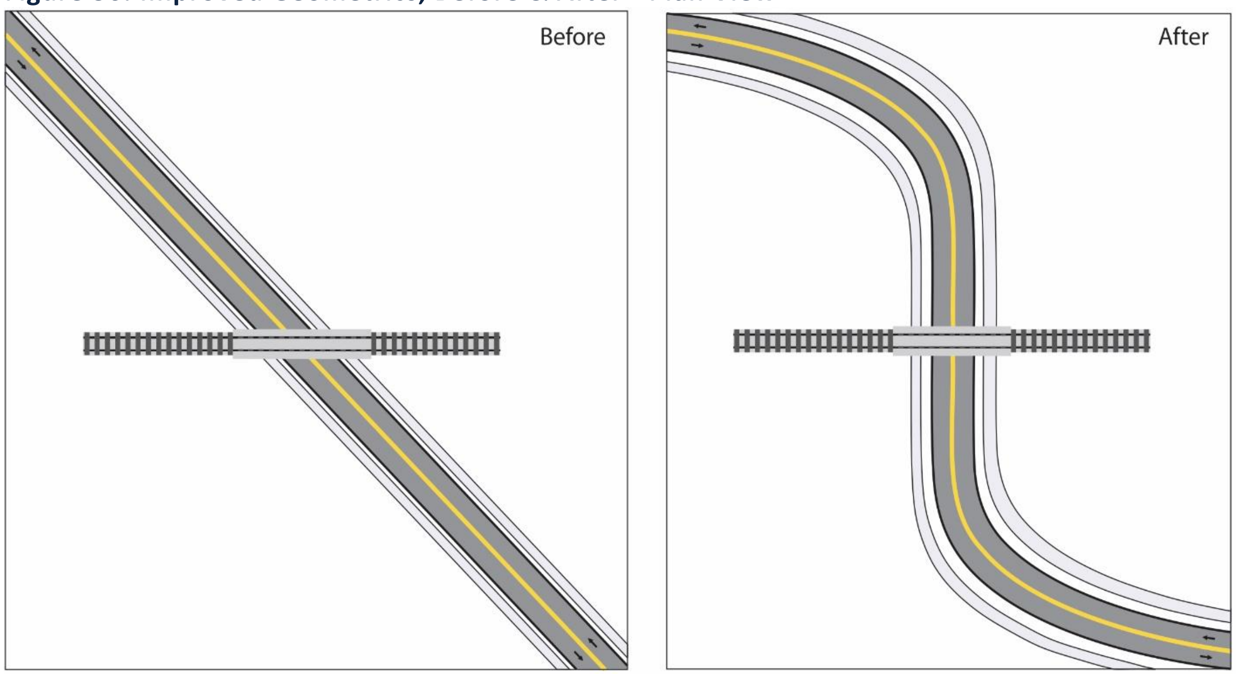
Improving geometric design can be a helpful way to improve safety at railroad crossings, with a primary goal of reducing the skew angle between the highway and the track. Ideally, the highway should intersect the railroad tracks as close to a 90-degree angle as possible.

A high degree of skew forces motorists to look uncomfortably over their shoulder to check for oncoming trains, which reduces sight distance and increases the time a vehicle spends on the tracks.

Additionally, large skew angles can cause vehicle tires, especially those of bicycles and motorcycles, to become trapped in the flangeway gap, posing a serious crash hazard. Realigning the roadway to minimize the skew improves the driver's viewing angle, enhances rideability, and helps traffic control devices be seen clearly.

Improving the geometrics at a crossing can be costly depending on necessary roadway reconstruction and may require additional right-of-way.

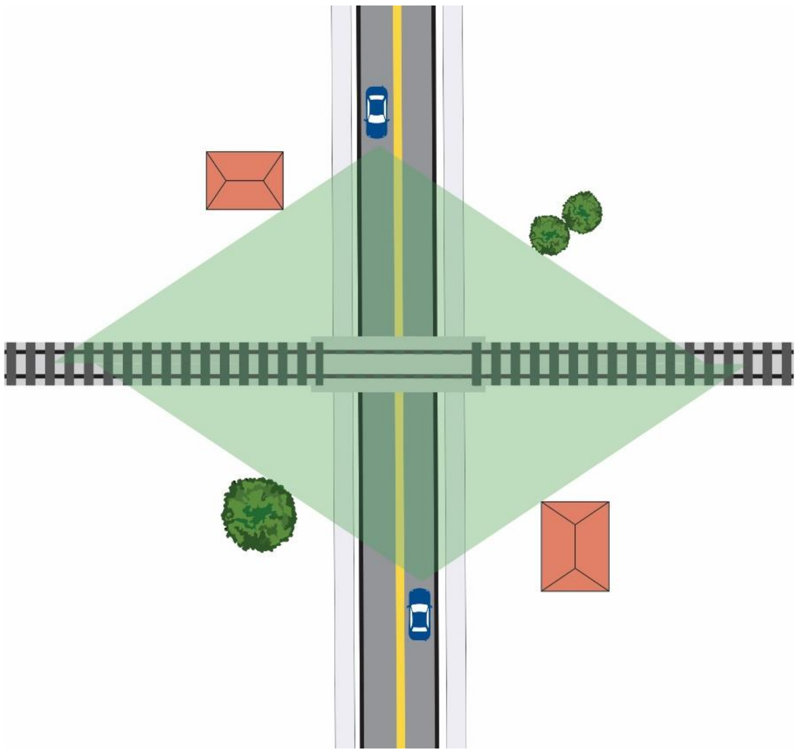
Figure 36. Improved Geometrics, Before & After - Plan View



Vision Triangle Clearing

The concept of a vision triangle is helpful when considering safety at a railroad crossing, particularly at passive crossings that lack gates or flashing lights. These triangular areas are defined by the highway approach and the railroad track, extending a necessary distance to ensure a driver has sufficient sight distance to see an approaching train and safely stop before the tracks, or cross the tracks if no train is present. Obstructions like vegetation, signs, structures, or stored rail equipment within this triangle should be removed or minimized. Maintaining a clear vision triangle a shared responsibility crucial for preventing collisions. The dimensions of this clear area are determined by factors like the speed of both vehicles and trains.

Figure 37. Vision Triangle Clearing - Plan View



Upgrade to Active Warning Devices

Upgrading a passive railroad crossing to include active warning devices is one of the most effective and common strategies for improving safety. Active warnings, such as automatically activated flashing lights and gates, provide a direct, unmistakable alert when a train is approaching, engaging both visual and auditory senses. Unlike static signs that rely entirely on driver vigilance, these dynamic systems compel a response by physically blocking the roadway with a gate, significantly reducing the likelihood of a collision. Studies have consistently shown a high effectiveness value for upgrading from passive systems to gates and lights, as the clear warning and physical barrier drastically lower the risk of a motorist misjudging a train's speed or ignoring a static sign. Costs vary depending on treatment type. At some intersections, it may be necessary to coordinate the traffic signals with the active warning devices.

Chapter 8 - Implementation & Road to Zero

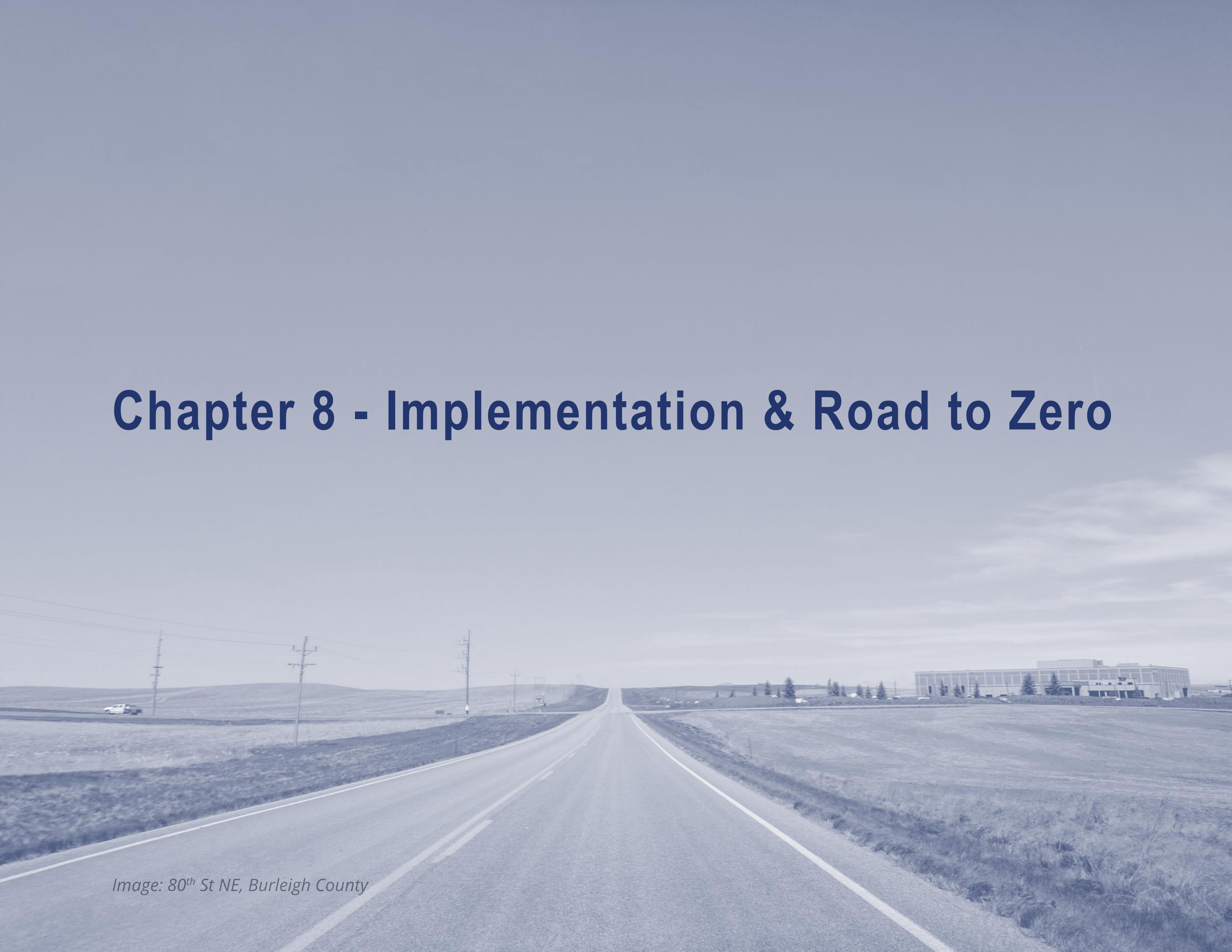


Image: 80th St NE, Burleigh County

Putting the Toolkit into Action

The engineering safety countermeasures and non-engineering safety strategies detailed in the previous chapter include a wide range of potential recommendations. Specifically, the strategies should be used to start addressing severe crash corridors and intersections on the HIN and other challenges identified by the public through stakeholder and community engagement. Moving forward, these tools can continue to be applied based on future community input and crash data gathered after Plan adoption as the MPO and jurisdictional partners continue down the road to eliminating fatal and incapacitating injury crashes.

Prioritized Locations

Prioritized locations identified on the regional transportation system incorporate critical overlays of quantitative and qualitative data. Information used to identify priority locations includes the following:

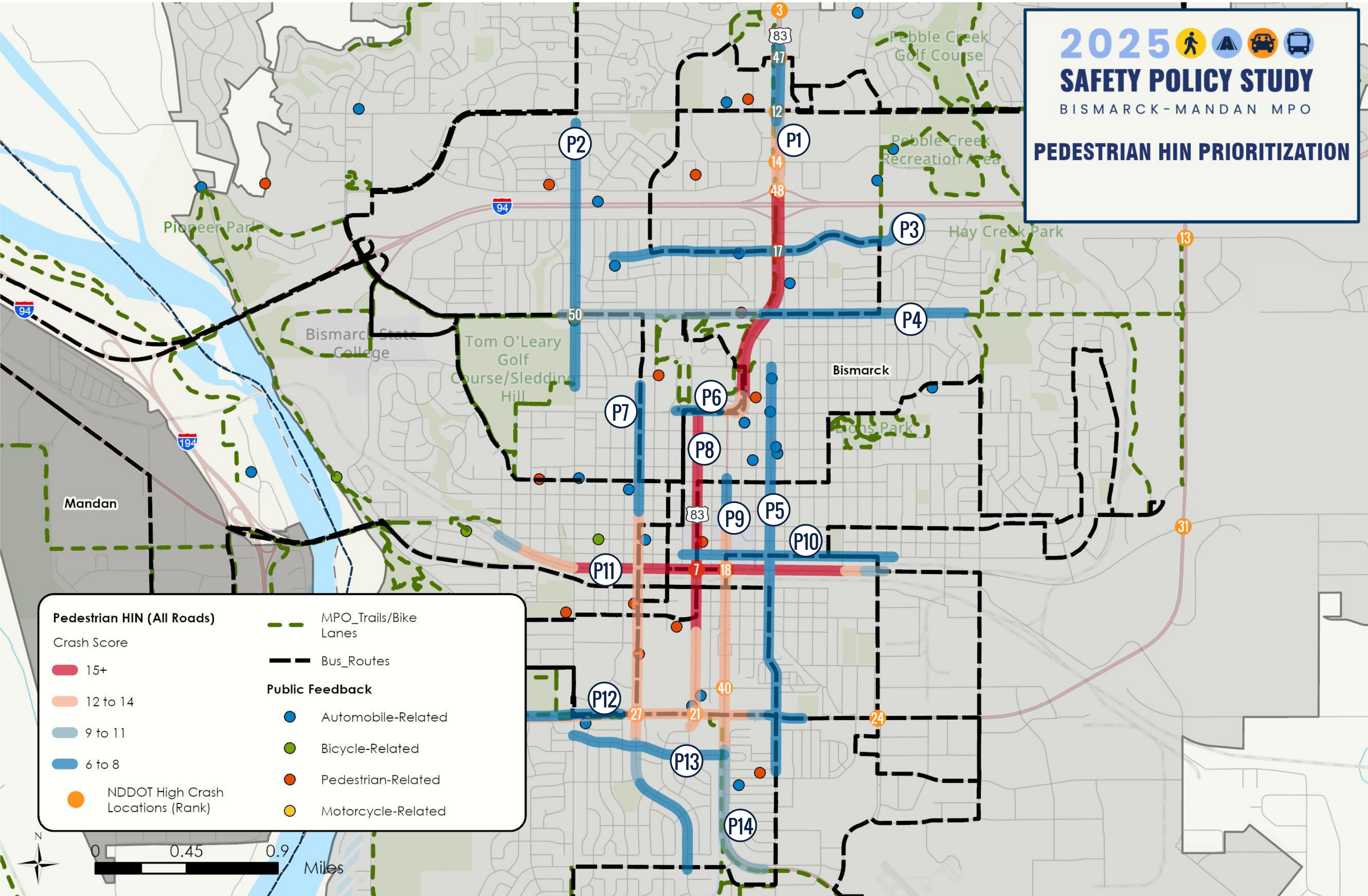
- Modal HIN
- NDDOT High Crash Locations
- Public Feedback
- Other Information, as applicable

Pedestrian Priority Locations

Table 19. Pedestrian High-Injury Network (HIN) Prioritization

Label	Corridor (Location)	HIN Score (top 2 tiers)	NDDOT High Crash Location(s)	Trail Connection	Transit Connection	Public Comment	TOTAL SCORE
P1	State St.	X	X	X	X	X	5
P2	Washington St.		X	X	X		3
P3	E Capitol Ave.		X	X	X	X	4
P4	Divide Ave.		X	X	X	X	4
P5	12th St.				X	X	2
P6	E Boulevard Ave.			X	X		2
P7	3rd St.	X	X		X	X	4
P8	7th St.	X	X	X	X	X	5
P9	9th St.	X	X	X	X		4
P10	E Broadway Ave.				X		1
P11	Main Ave.	X	X		X		3
P12	Bismarck Expy.	X	X	X	X	X	5
P13	Denver Ave.			X			2
P14	University Dr.	X		X	X		3

Figure 38. Pedestrian HIN Prioritization

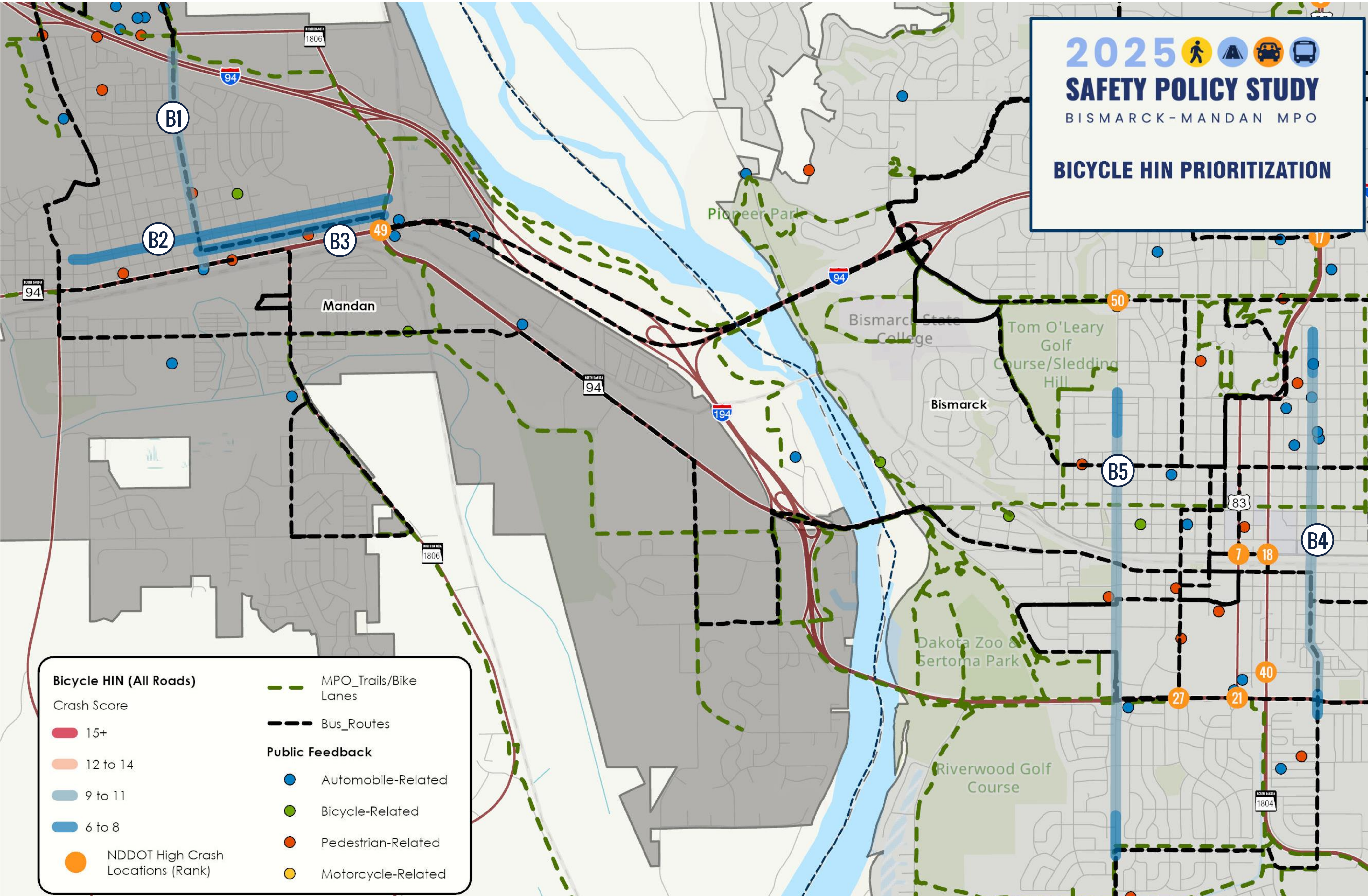


Bicycle Priority Locations

Table 20. Bicycle High-Injury Network (HIN) Prioritization

Label	Corridor (Location)	HIN Score (top 2 tiers)	NDDOT High Crash Location(s)	Trail/Bike Lane Connection	Transit Connection	Public Comment	TOTAL SCORE
B1	Collins Ave. (Mandan)	X		X	X	X	4
B2	2nd St. (Mandan)	X		X	X		3
B3	1st St. NE (Mandan)	X		X	X	X	4
B4	12th St. (Bismarck)	X		X	X	X	4
B5	Washington St. (Bismarck)	X		X	X	X	4

Figure 39. Bicycle HIN Prioritization

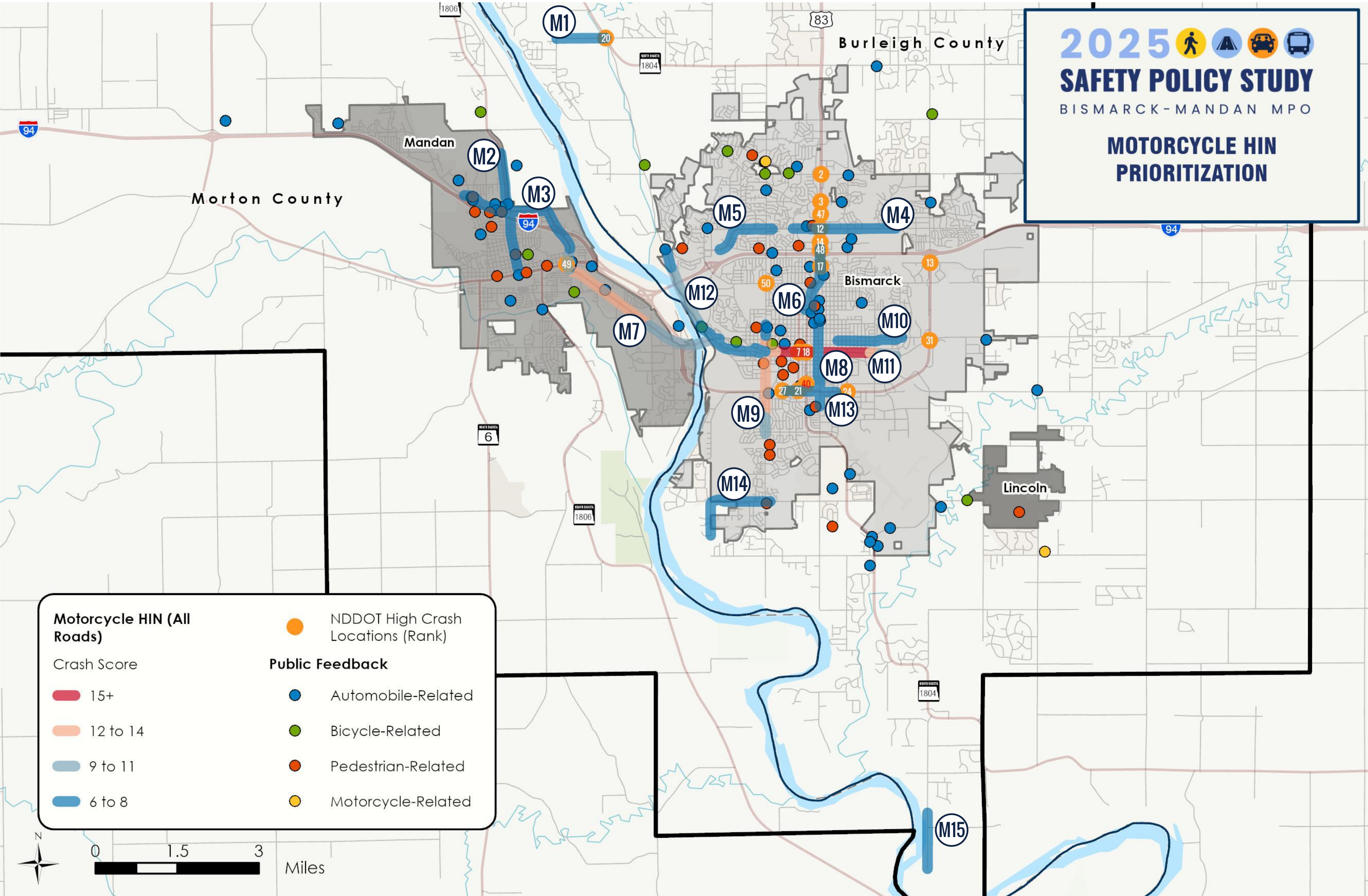


Motorcycle Priority Locations

Table 21. Motorcycle High-Injury Network (HIN) Prioritization

Label	Corridor (Location)	HIN Score (top 2 tiers)	NDDOT High Crash Location(s)	Public Comment	TOTAL SCORE
M1	Burnt Creek Lp. (CR 139) (Burleigh County)		X		1
M2	Collins Ave./ND 1806 (Mandan)			X	1
M3	Old Red Trl. (Mandan)			X	1
M4	E Century Ave. (Bismarck)		X		1
M5	W Century Ave. (Bismarck)				0
M6	State St. (Bismarck)		X	X	2
M7	Memorial Hwy. (Mandan)	X	X	X	3
M8	12th St. (Bismarck)			X	1
M9	Washington St. (Bismarck)	X		X	2
M10	E Rosser Ave. (Bismarck)				0
M11	Main Ave. (Bismarck)	X	X		2
M12	River Rd. (Bismarck)			X	1
M13	Bismarck Expwy. (Bismarck)		X	X	2
M14	England St./W Burleigh Ave. (Bismarck/Burleigh)			X	1
M15	Desert Rd. (Burleigh)				0

Figure 40. Motorcycle HIN Prioritization

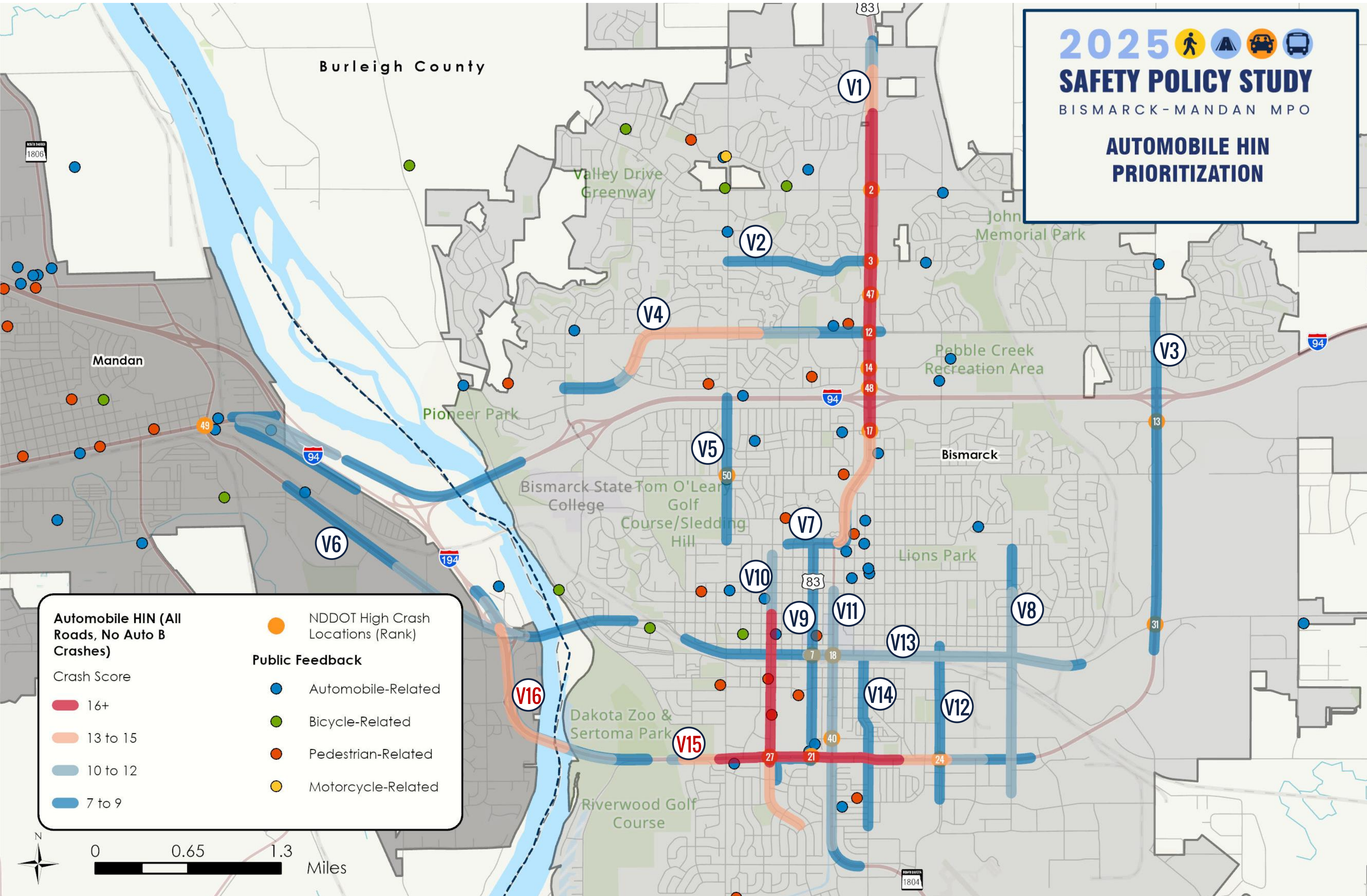


Automobile Priority Locations

Table 22. Automobile High-Injury Network (HIN) Prioritization

Label	Corridor (Location)	HIN Score (top 2 tiers)	NDDOT High Crash Location(s)	Public Comment	TOTAL SCORE
V1	State St. (Bismarck)	X	X	X	3
V2	E Calgary Ave. (Bismarck)		X		1
V3	Centennial Rd./N Bismarck Expwy. (Bismarck)		X		1
V4	Century Ave. (Bismarck)	X	X	X	3
V5	N Washington St. (Bismarck)		X		1
V6	Memorial Hwy./W Main Ave. (Mandan/Bismarck)		X	X	2
V7	E Boulevard Ave. (Bismarck)				0
V8	26th St. (Bismarck)				0
V9	7th St. (Bismarck)		X	X	2
V10	3rd St. (Bismarck)	X	X	X	3
V11	9th St./University Dr. (Bismarck)		X		1
V12	Airport Rd. (Bismarck)		X		1
V13	Main Ave. (Bismarck)		X		1
V14	S 12th St. (Bismarck)		X		1
V15	Bismarck Expwy. (Bismarck)	X	X	X	3
V16	W Bismarck Expwy. (Mandan)	X			1

Figure 41. Automobile HIN Prioritization



Prioritized Implementation Actions

As BMMPO and partner jurisdictions seek to improve safety, the Study includes several actions related more generally to roadway infrastructure, behavior, and policy and programs. BMMPO commits to prioritizing these actions as part of its comprehensive plan to improve safety.

Roadway Infrastructure Actions

- Implement safety countermeasure strategies for priority locations, continue prioritizing safety in all levels of project scope, including on pavement preservation and other routine-maintenance projects, as applicable.
- Prioritize low-cost, high-impact strategies on rural roads, outside of the urbanized area.
- Design the roadside to include protection systems (such as cable median, crash cushions and guardrail end treatments) or manage roadside vegetation, trees and other fixed objects and consider alterations to steep ditch slopes to minimize the severity of crashes, especially on higher speed and rural roads.
- Proactively implement safety conversions (for example 4-to-3 lane safety conversions) or other safety treatments to address high injury 4-lane undivided streets. This may only be applicable where traffic operations and analysis indicate streets will still have acceptable capacity.
- Implement pedestrian and bicycle safety strategies near schools, libraries, and other potential high-pedestrian traffic areas such as commercial corridors and other institutional land uses.
- Implement low-cost quick-build spot and systemic safety improvements through demonstration projects. Test ideas, collect feedback from the public, and seek to strategically upgrade to more long-term improvements.

Behavioral Actions

- Champion and implement non-engineering strategies for priority safety challenges in the BMMPO's MPA.
- Continue implementing a Complete Streets approach in the metropolitan transportation planning process.
- Engage schools and youth population in the region. Work with partners to find opportunities to provide education and build traffic safety awareness directly with school-aged (K-12) populations.
- Champion motorcycle safety and rider awareness and educational campaigns.
- Expand enforcement of school zone laws.
- Support high-visibility enforcement campaigns that specifically target speeding, unrestrained occupants, distracted driving, and impaired driving.
- Continue to evaluate and implement speed management techniques related to roadway design, roadway surface, traffic control, community education, and speed enforcement

Growing Safety Culture within BMMPO

Foundational change has already begun within the BMMPO's MPA. Through the process of creating this Study, BMMPO engaged communities to identify opportunities to address transportation safety and change the safety culture. The cultural actions (CAs) listed in **Table 23** will support the region's vision to achieve zero traffic-related fatal and incapacitating injury crashes on streets within the MPA by 2050. Further, CAs will serve as the groundwork for the implementation of countermeasures identified through this Study's development and analysis process.

Potential Funding Opportunities

The BMMPO and partner jurisdictions have a variety of funding sources that can be used to address safety across the MPA. Sources can be used to reconstruct roadways, install ped/bike facilities, implement education and enforcement strategies, and complete other transportation-related projects that improve safety. Coordination with Township, City, and State agencies will also be important to harness available funding. In addition, there are some competitive grant programs that BMMPO could harness as well. Below is an overview of potential state and federal grant funding opportunities anticipated to be available in 2026 and beyond.

Table 23. BMMPO Cultural Actions (CA)

#	Action	Timeline
CA.1	BMMPO's Policy Board adopts Study and commits to the Safety Vision and Goal for the MPA.	Q4 2025
CA.2	Share the Study's deliverables and analysis, including GIS data to all local governments within the BMMPO MPA for analysis and identification of countermeasures to implement.	Q1 2026
CA.3	Incorporate tracking and evaluation of progress toward the Study's implementation, vision, and goal. The BMMPO will incorporate into routine, recurring procedures of the Technical Advisory Committee (TAC). Such as through development of the annual Monitoring Report Update and annual Performance Measure 1 review.	Initiate: Q3 2026 Annually, thereafter
CA.4	Continue to engage local partners to monitor progress on the Study.	Continuous
CA.5	BMMPO will coordinate and assist local agencies to apply for funding to address roadway safety priorities including an application for the Safe Streets and Roads for All (SS4A) grant program, if applicable.	Annually

#	Action	Timeline
CA.6	Incorporate the HIN, crash profiles, and potential strategies into long range metropolitan transportation planning efforts.	Continuous
CA.7	Continue to update datasets and evaluate crash data for the MPA to guide safety strategies and decision-making.	Continuous
CA.8	Monitor progress on an annual basis toward regional safety vision and goals, convening an annual meeting with local partners to review crash statistics and the Study's implementation efforts.	Annually
CA.9	Present annually to the BMMPO Policy Board on the status of Study actions and strategy implementation.	Annually
CA.10	Establish a specific "Regional Traffic Safety" or "Multimodal Traffic Safety" subcommittee comprised of TAC members, to be tasked with implementation, tracking, and evaluation of the Study's vision and goal. Identify additional members including representation from law enforcement, emergency services, freight, bike and ped, and schools including higher education.	Long-Term

Highway Safety Improvement Program (HSIP)

The Federal Highway Administration (FHWA) administers the Highway Safety Improvement Program (HSIP), which provides funding to projects designed to improve travel safety. Per FHWA guidance, HSIP funding "requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance." The HSIP program provides funding for roadway construction or reconstruction projects designed to decrease the frequency and/or severity of all types of crashes including vehicles, pedestrians, bicycles, and other non-motorized vehicles. Funding can only be used for construction costs. The program runs on a biennial basis with the next opportunity in the fourth quarter of 2025. Federal funds provide 90 percent with a 10 percent match from the local agency or the State of North Dakota.

Safe Streets for All (SS4A)

USDOT's Safe Streets and Roads for All (SS4A) is intended to fund more than $1 billion each year through FY 2026 for regional, local, and tribal initiatives which significantly reduce or eliminate roadway fatalities and serious injuries.

With the completion of this Study, BMMPO and its stakeholders are eligible to apply for implementation and supplemental or demonstration activity funding.

Transportation Alternatives (TA) Program

The NDDOT Transportation Alternatives (TA) Program provides funds for county, city, township, and tribal governments for pedestrian and bicycle crossing improvements, off-street bicycle and pedestrian facilities, on-road bicycle facilities, and traffic control and safety devices. The program requires a 20 percent match. Example projects include Safe Routes to School plans, crossing signal plans and infrastructure, trail or shared use path feasibility studies, trail resurfacing, new trails/paths/bike lanes/sidewalks, and wayfinding or visibility upgrades such as pavement markings.

Flexible Transportation Fund (Flex Funds)

The Flex Fund was established by the 68th Legislative Assembly to complement the Federal Aid Highway program and further support an interconnected transportation system in North Dakota. The funds are used to improve transportation infrastructure on and off the state highway system, and to match local funds and federal discretionary grant funds. Non-oil producing counties, and cities in non-oil counties are eligible to apply. Priority will be given to projects that match federal or private funding, improve local corridors, and received preliminary engineering funding in the previous Flex Fund solicitation round. This program advances the mission of reducing maintenance and operation costs, efficiently moving people and goods, improving safety, connectivity, and longevity of the existing transportation network.

Other BMMPO Funding Opportunities

Typical funding programs available to the BMMPO and partner jurisdictions should also be used to implement safety strategies of the Study as part of larger projects including:

- Urban and Regional Programs

Transit Safety Funding Opportunities

Transit safety strategies may be funded through Bis-Man Transit's typical funding programs to maintain the vehicle fleet and upgrade facilities and equipment. Funding opportunities include:

- FTA Section 5307
- FTA Section 5310
- FTA Section 5339

Rail Crossing Opportunities

There are several opportunities to implement safety strategies at rail grade crossings in the MPA including:

- FRA Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program

- FRA Railroad Crossing Elimination (RCE) Program
- FHWA Section 130 Railway-Highway Crossings Program
- NDDOT Rail Crossing Program

Evaluation and Tracking

As led by the BMMPO, the Safety Policy Study Steering Committee has been tasked with overall development of this Study. Moving forward, the BMMPO and the TAC will be responsible for implementation, evaluation, and tracking of progress toward eliminating traffic-related fatalities and incapacitating injuries on streets in the MPA. A majority of the Study's Steering Committee members are also TAC members, which provides valuable insight and momentum to make progress and forward the vision of eliminating traffic-related fatal and incapacitating injuries.

The BMMPO will use an annual report card to evaluate progress toward this Study's vision and safety goal. The yearly reporting will be posted on BMMPO's website and will include the status of Study implementation and the most recent crash statistics. BMMPO will convene a meeting with local partners and relevant departments annually to review the report, which should be incorporated into the MPO's current recurring processes.

Specific performance measures to track in the annual report card should include:

- **Number of fatal and incapacitating injury crashes by mode and location (map/table).**
- **Five-year rolling average of total severe crashes (table).**
- **Number of safety engineering projects implemented by strategy, location and investment amount (narrative, bulleted list).**
- **Number of non-engineering countermeasures implemented by type of strategy, location (if applicable), and investment amount (narrative, bulleted list, if quantifiable).**

MEMORANDUM

SRF Project No. 16072

To:	Kim Riepl Bismarck-Mandan Metropolitan Planning Organization
From:	SRF Consulting Group
Date:	August 21, 2025
Subject:	2025 Safety Policy Study – Crash Data Analysis & Trend Summary

TASK 5 SAFETY ANALYSIS: CRASH DATA ANALYSIS & TREND SUMMARY

Executive Summary

Between 2020 and 2024, within the Bismarck-Mandan Metropolitan Planning Organization's (MPO's) Metropolitan Planning Area (MPA), a total of 17,497 crashes were recorded, including 281 which involved fatal or serious (incapacitating) injuries. Bismarck-Mandan MPO's MPA is identified in **Figure 1.** This analysis explores crash trends across six transportation mode categories: (1) all modes or all crashes, (2) passenger vehicles or only crashes involving passenger vehicles, (3) heavy vehicles or only crashes involving heavy vehicles, (4) bicycles or only crashes involving bicycles[1], (5) pedestrians or only crashes involving pedestrians, and (6) motorcycles or only crashes involving motorcycles. Additionally, a safety assessment examines crashes by mode using key variables from crash reports, such as roadway characteristics and ownership or jurisdiction. The findings from this crash trend summary will establish the following:

- Identify general safety trends that stand out across the MPA
- Guide policy recommendations related to transportation safety for the MPO and all member jurisdictions
- Guide goal setting for Safe Streets and Roads for All implementation, such as the identification of safety improvement targets by transportation mode
- Help to highlight and frame transportation safety issues that support the final deliverable (navigable pdf tool)

[1] 'Bicycles' refers to all pedalcycles, or human-powered vehicles which may or may not be limited to bicycles, tricycles, hand cycles, and other human-, pedal-powered, or similar vehicles.

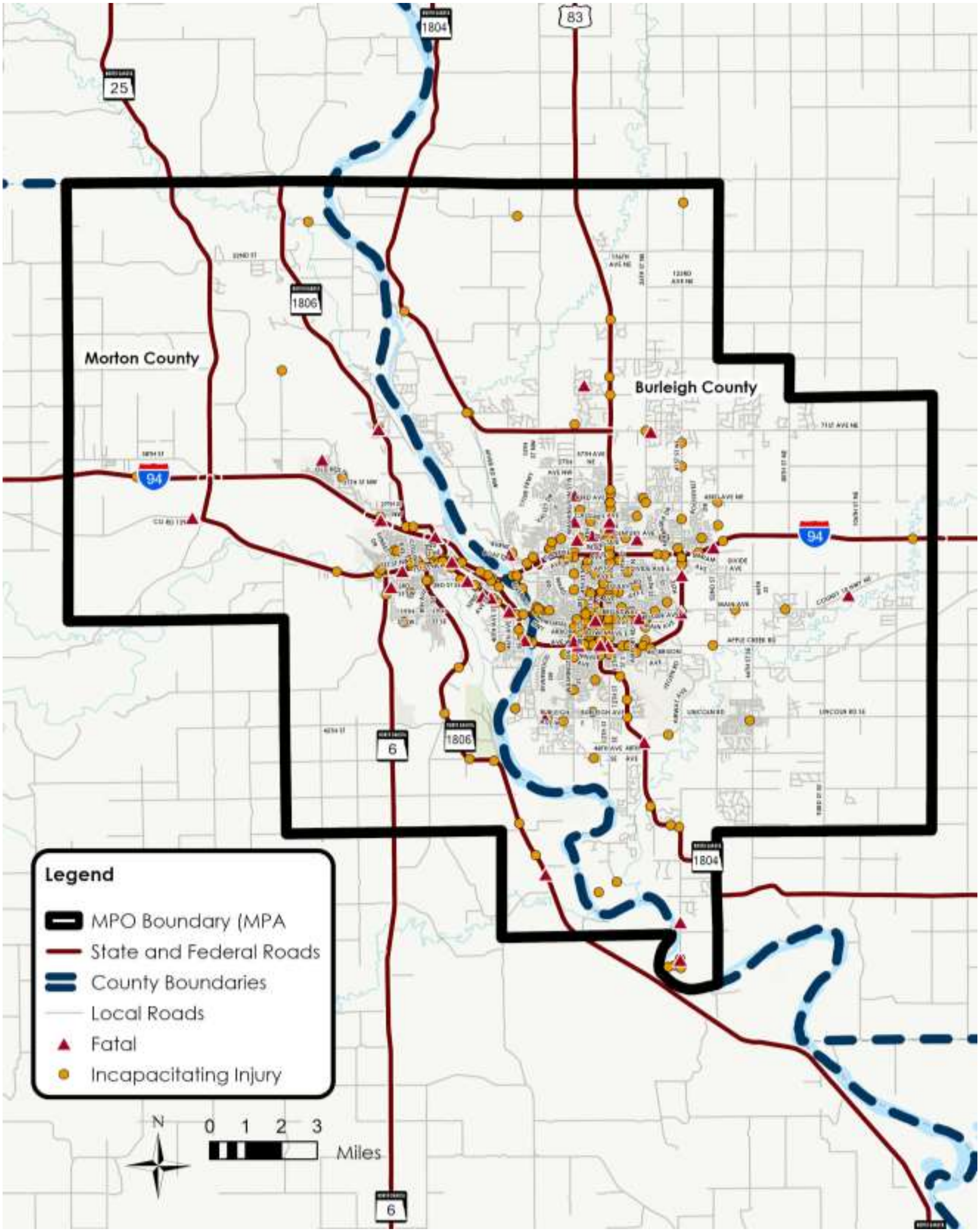


Figure 1. Metropolitan Planning Area (MPA) and Severe (KA) Crashes 2020-2024

Introduction

The Safe System Approach seeks to eliminate severe crashes, those causing fatalities and serious injuries, by proactively addressing risk factors. The approach is grounded in the understanding that humans are fallible and physically vulnerable, and therefore, the transportation system must be designed to anticipate errors and minimize consequences. To effectively reduce the number of severe crashes, the Safe System Approach relies on thorough analysis of crash data and emerging trends.

The crash analysis is divided into two key categories: (1) crash data background and (2) crash characteristics. The analysis includes available crash data from 2020 through 2024 provided by the North Dakota Department of Transportation (NDDOT). Crash trends are categorized using the terms "**KA**" to represent fatal and serious injury crashes, and "**BCO**," which includes non-serious injuries. These classifications are based on the KABCO injury scale shown on **Table 1**.

Table 1. KABCO Injury Scale

Severe (more injurious)	**Non-Severe (less injurious)**
K - involves a fatal injury **A** - incapacitating injury (serious injury)	**B** - non-incapacitating injury **C** - possible injury **O** - no injury or a property damage-only (PDO) crash

Crash data is processed and categorized based on key factors such as time, location, mode of transportation, environmental and road conditions, traffic characteristics, and roadway features.

Organizing the data in this way helps identify factors that contribute to crash frequency and severity, revealing patterns and high-risk situations within the transportation system. Once crashes are grouped by contributing factors, additional analysis is performed to uncover trends, potential behavioral contributors, and systemic vulnerabilities.

Crash data insights help inform targeted strategies, such as engineering improvements, educational campaigns, enforcement efforts, and/or policy changes, to support data-driven safety planning and effective resource allocation.

Crash Data Background

Crash data used in the Safety Policy Study is sourced directly from North Dakota Department of Transportation (NDDOT) crash reports. These reports are collected from law enforcement agencies through an electronic reporting system, with much of the data entered at the crash scene. In alignment with national best practices for transportation safety planning, the most recent five years of complete crash data are used to ensure relevance and accuracy. For this plan, data from the calendar years 2020 through 2024 is analyzed.

Data from before 2020 is excluded from this Safety Policy Study, as the primary focus is on evaluating current and emerging crash trends. By concentrating on more recent data, the Bismarck-Mandan MPO can develop safety strategies that respond to present-day conditions rather than outdated patterns that may have already been addressed or diminished. This approach is especially important given the significant growth and ongoing development in the Bismarck-Mandan MPO area over the past decade, which has led to continuous changes and expansion within the region's transportation network.

Crash data in North Dakota is compiled by the Highway Safety Division of the North Dakota Department of Transportation (NDDOT) and is available in both one-year and five-year formats. While many jurisdictions across the state typically utilize NDDOT's pre-assembled five-year crash datasets – curated and streamlined by the Highway Safety Division for ease of use – the Safety Policy Study uses a more detailed and flexible dataset.

To support a more granular and customized analysis, the project team requested from NDDOT, individual one-year crash data tables for the years 2020 through 2024. These one-year datasets represent raw, unfiltered crash data extracted directly from NDDOT's electronic crash reporting system, which collects information from law enforcement at or shortly after the crash scene. The one-year crash data tables include five (5) separate tables organized in the following manner:

1. Crash Master (table) provides general data regarding crash
2. Occupant (table) provides details regarding occupants involved in the crash, as applicable
3. Operator (table) provides details regarding operators involved in the crash
4. Pedestrian (table) provides details regarding pedestrians involved in the crash, as applicable
5. Unit (table) provides details regarding the type of vehicles involved in the crash

Using these one-year tables provided several advantages:

- **Consistency** across years, as each dataset is formatted similarly without post-processing filters applied.
- **Comprehensive detail**, preserving fields that may be excluded or aggregated in the five-year dataset.
- **Analytical flexibility**, allowing the project team to apply custom filtering and categorization methods tailored to the needs of Bismarck-Mandan MPO's Safety Policy Study.

Limitations to Crash Data

NDDOT-supplied crash data allows for a detailed review of crash data for roadway segments and intersections across various modes. Within these categories, crash data characteristics are further analyzed. Data entered by law enforcement agencies for the crash data is limited for some of the crash characteristics presented in this memorandum. Some of the crash characteristics shown below include a category labeled as 'Unknown' (may also be shown as 'Unk'). This category is provided where the law enforcement agency entering the crash detail was unable to supply information about a specific crash characteristic. For most crash characteristics the 'Unknown' category is recorded minimally. However, the following crash characteristics had a majority 'Unknown' selections; therefore, the associated data was not reviewed as it is not helpful for this analysis.

- 'Number of lane' characteristics for segment crashes across all modes.
- 'Roadway configuration' characteristics for pedestrian segment crashes.

Key Takeaways – 2020 through 2024 Historical Crash Evaluation

- **17,497 crashes were recorded within the Bismarck-Mandan MPO's MPA**
  - Average 56 severe (KA) crashes annually (281 total severe crashes)
  - Average 3,443 non-severe (BCO) crashes annually (17,216 total non-severe crashes)
  - 2021 saw the most severe crashes (71) and highest proportion of severe crashes (2.0% of total annual crashes)
- **Summer and Fall seasons' severe crashes are overrepresented (higher proportion of severe crashes) when compared to estimated annual percentage of VMT and percentage of total crashes.**
  - Spring saw the lowest total crashes (21.8%), had the second lowest estimated annual percentage of VMT (24.8%) and second lowest total severe crashes (22.1%).
  - Summer saw the second lowest total crashes (24.0%), had the second highest estimated annual percentage of VMT (25.1%) and highest total severe crashes (34.9%).
  - Fall saw the second highest total crashes (24.8%), had the highest estimated annual percentage of VMT (26.5%) and the second highest total severe crashes (28.1%).
  - Winter saw the highest total crashes (29.4%), but had the lowest estimated annual percentage of VMT (23.5%) and lowest total severe crashes (14.9%).
- **All crashes including severe crashes peak through the middle of the day between regular business hours (7:00a.m.-7:00p.m.).**
  - Severe crashes are highest between 3:00p.m.-6:00p.m.
  - The percentage of severe crashes compared to total hourly crashes is highest between 7:00p.m.-4:00a.m.
- **Bicyclists, Pedestrians, and Motorcyclists are at the greatest risk of death and life-changing injuries when involved in a crash, with motorcyclists being most susceptible.**
  - Automobile or passenger vehicle crashes account for 97.9 percent (17,136 crashes) of total crashes and 56.6 percent (159 severe crashes) of total severe crashes.
    - 0.9 percent of automobile crashes were severe.
  - Bicycle-involved crashes account for 0.6 percent (98 crashes) of total crashes and 3.9 percent (11 severe crashes) of total severe crashes.
    - 11.2 percent of bicycle-involved crashes were severe.
  - Heavy vehicle crashes account for 4.3 percent (755 crashes) of total crashes and 1.4 percent (4 severe crashes) of total severe crashes.
    - 0.5 percent of heavy vehicle crashes were severe.
  - Motorcycle-involved crashes account for 1.4 percent (248 crashes) of total crashes and 23.5 percent (66 severe crashes) of total severe crashes.
    - 26.6 percent of motorcycle -involved crashes were severe.
  - Pedestrian-involved crashes account for 1.2 percent (207 crashes) of total crashes and 14.9 percent (42 severe crashes) of total severe crashes.
    - 20.3 percent of pedestrian-involved crashes were severe.
- **Travelers on Township and County roads are at a greater risk of death and life-changing injuries when involved in a crash, with Township road travelers being most susceptible.**
  - 0.7 percent (127 crashes) of total crashes and 3.2 percent (9 severe crashes) of severe crashes occurred on Township-owned roadways.

        - 7 percent of all crashes on Township roads resulted in death or life-changing injury.
    - 2 percent (359 crashes) of total crashes and 5.3 percent (15 severe crashes) of severe crashes occurred on County-owned roadways.
        - 4 percent of all crashes on County roads resulted in death or life-changing injury.
    - 34 percent (5,966 crashes) of total crashes and 50 percent (141 severe crashes) of severe crashes occurred on State-owned roadways.
        - 2 percent of all crashes on State roads resulted in death or life-changing injury.
    - 48 percent (8,470 crashes) of total crashes and 38 percent (108 severe crashes) of severe crashes occurred on City-owned roadways.
        - 1 percent of all crashes on City roads resulted in death or life-changing injury.
- **In the Bismarck-Mandan MPO, the top five NDDOT focus areas attributed to severe crashes include (note that a single crash may include multiple focus areas):**
    - Intersection related (51 percent), younger driver (25 percent), unbelted vehicle occupant (25 percent), motorcyclist (24 percent), and older driver (23 percent).
    - 14 percent (2,395 crashes) of total crashes and 23 percent (64 severe crashes) of severe crashes involved speeding
    - 12 percent (2,089 crashes) of total crashes and 23 percent (64 severe crashes) of severe crashes were single vehicle run off road crashes
    - 4.6 percent (803 crashes) of total crashes and 22 percent (62 severe crashes) of severe crashes involved an impaired road user
- **Travelers on higher speed roadways are at a greater risk of death and life-changing injuries when involved in a crash.**
    - 56 percent of severe crashes occurred on segments (158 severe crashes).
        - 61 severe segment crashes (46 percent of severe segment crashes) occurred on two-way, undivided streets.
        - Of total non-intersection (segment) severe crashes, 25 percent (39 severe crashes) occurred on principal arterials, 22 percent (34 severe crashes) occurred on minor arterials, 12 percent (19 severe crashes) occurred on collectors, and 22 percent (34 severe crashes) occurred on local roads.
        - Proportionally, non-intersection severe crashes make up 5 percent (9 severe crashes) of 75 mph, 11 percent (4 severe crashes) of 65 mph, 7 percent (26 severe crashes) of 55 mph, and 3 percent (25 severe crashes) of 40 mph roads.
    - 44 percent of severe crashes occurred at intersections or were intersection-related (123 severe crashes).
        - 55 severe intersection crashes (45 percent) occurred at intersections with no traffic control, another 52 severe intersection crashes (42 percent) occurred at traffic signal controlled intersections.
        - Of total intersection-related severe crashes, 8 percent (10 severe crashes) occurred at Interstate intersections, 54 percent (67 severe crashes) occurred at principal arterial intersections, 11 percent (26 severe crashes) occurred at minor arterial intersections, 7 percent (9 severe crashes) occurred at collector

intersections, and 9 percent (11 severe crashes) occurred at local street intersections.

- Proportionally, intersection-related severe crashes make up 7 percent (16 severe crashes) of 55 mph, 2 percent (23 severe crashes) of 40 mph, and 2 percent of 35 mph maximum intersection speed crashes.

Crash Characteristics

All Modes

All Mode General Characteristic Crashes

Over the five-year period:

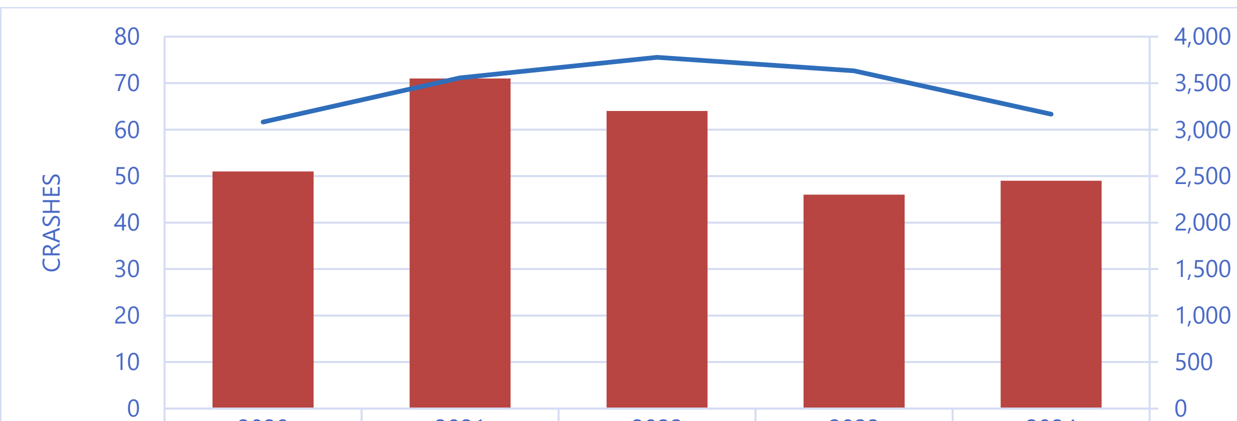
- 17,497 crashes were recorded within the Bismarck-Mandan MPO area, encompassing all severity levels; fatal injuries (K), incapacitating injuries (A), non-incapacitating injuries (B), possible injuries (C), and no injury/property damage only (O).

- As shown in **Figure 2,** the Bismarck-Mandan Region experienced an annual average of 56 severe crashes across all modes.

- Approximately 3,443 non-severe crashes on average.

- Severe (KA) crashes and non-severe (BCO) were highest (over the five-year period analyzed) in 2021, with 71 and 3,557 crashes, respectively.

- Proportionally, severe crashes made up 1.6% of 2020, 2.0% of 2021, 1.7% of 2022, 1.3% of 2023, and 1.5% of 2024 annual total crashes.

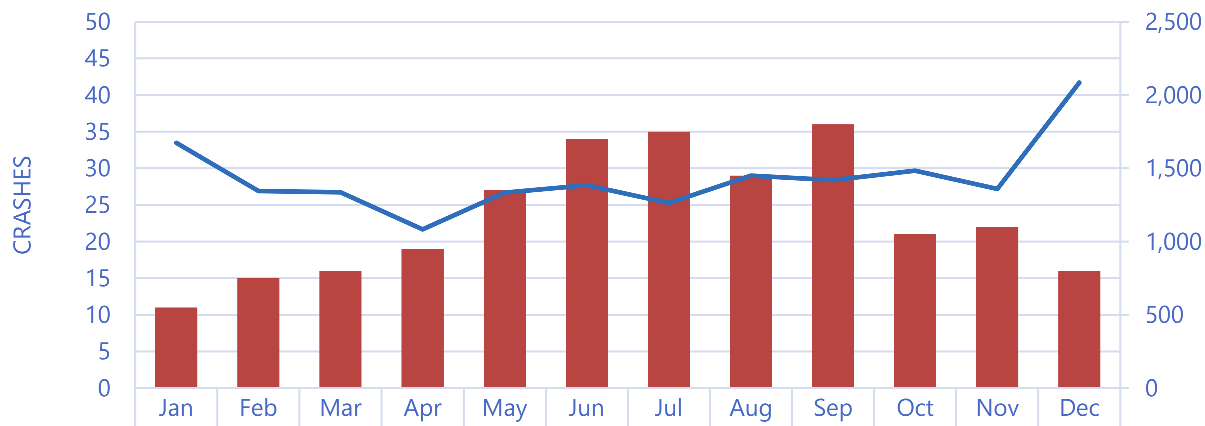


	2020	2021	2022	2023	2024
KA	51	71	64	46	49
BCO	3,082	3,557	3,778	3,632	3,167

Figure 2. All-Mode Crash Severity by Year

Figure 3 illustrates all-mode crashes by month during the five-year period.

- Severe crashes peak through the Summer months (May – September) with relatively linear numbers throughout all other months.
- The five-month timeframe from May through September makes up 57 percent of all severe crashes.
- Non-severe crashes peak in December (12 percent of non-severe crashes) and January (10 percent of non-severe).
- June, July, and September both have a proportionally high number of severe crashes at about 2 percent, 3 percent, and 3 percent of total monthly crashes, respectively.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
KA	11	15	16	19	27	34	35	29	36	21	22	16
BCO	1,674	1,345	1,336	1,083	1,334	1,384	1,263	1,450	1,419	1,484	1,359	2,085

Figure 3. All-Mode Crash Severity by Month of Year

Table 2 summarizes seasonal severe, non-severe, proportionality, and estimated percentage of annual vehicle-miles traveled (VMT). Proportionally, severe crashes appear to be overrepresented in Summer and Fall based on each season’s estimated percentage of annual VMT.

- Summer contributes 25.1% of estimated annual VMT and 24.0% of total crashes; however, 34.9% of severe crashes occurred in Summer, highlighting an approximate 10% overrepresentation.
- Fall contributes 26.5% of estimated annual VMT and 24.8% of total crashes; however, 28.1% of severe crashes occurred in Fall, highlighting an approximate 3% overrepresentation.

Season	Est. % of Annual Travel[1]	KA Crashes	BCO Crashes	Subtotal Crashes	KA Percent of Total KA Crashes	KA Percent of Subtotal Crashes	Percent of Total Crashes
Spring	24.8%	62	3,753	3,815	22.1%	1.6%	21.8%
Summer	25.1%	98	4,097	4,195	34.9%	2.3%	24.0%
Fall	26.5%	79	4,262	4,341	28.1%	1.8%	24.8%
Winter	23.5%	42	5,104	5,146	14.9%	0.8%	29.4%
Total	**100%**	**281**	**17,216**	**17,497**	**100.0%**	**1.6%**	**100.0%**

Spring = March, April, and May
Summer = June, July, and August
Fall = September, October, and November
Winter = December, January, February
[1] NDDOT Planning & Asset Management Division. (2024). North Dakota 2023 Traffic Report. Urban Collector proportions used as baseline (PDF pg. 37/pg. 32).

Table 2. All-Mode Crash Counts and Proportions by Month of Year

Figure 4 illustrates all-mode crashes by day of week during the five-year period.

- Severe crashes are distributed throughout the week with highest concentrations on Wednesdays (16 percent), Fridays (17 percent), and Saturdays (16 percent).
- Non-severe crashes are more commonly concentrated on weekdays.

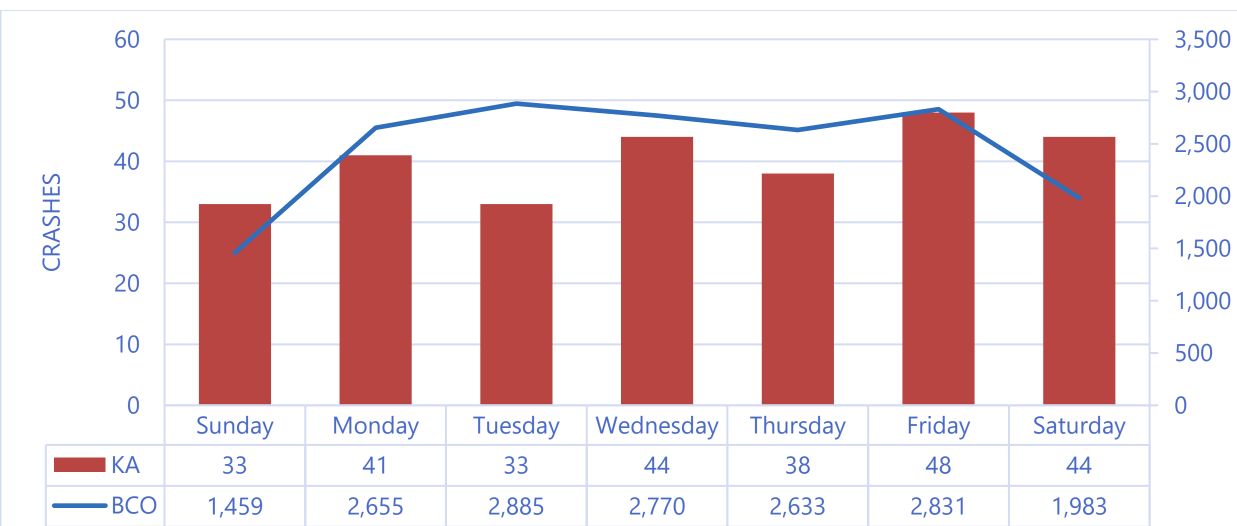
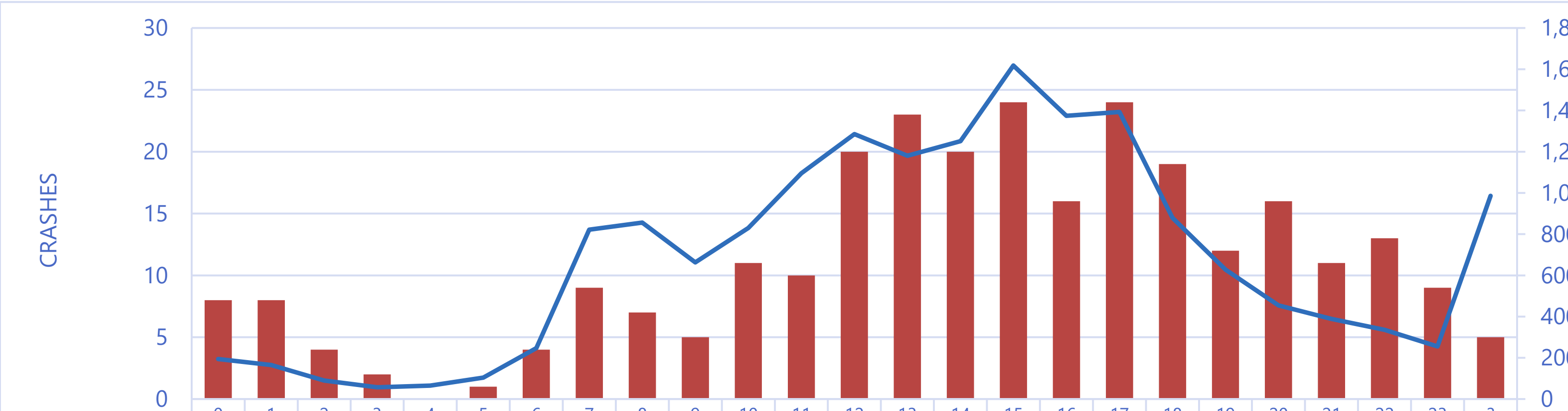


Figure 4. All-Mode Crash Severity by Day of Week

Figure 5 illustrates all-mode crashes by time of day during the five-year period.

- Non-severe crashes mostly peak from 11 a.m. to 5 p.m..
- Crashes with no recorded time of day are found under "?".
- Severe crashes have the highest concentrations within the 3 p.m. (15) and 5 p.m. (17) hours.



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	?
KA	8	8	4	2	0	1	4	9	7	5	11	10	20	23	20	24	16	24	19	12	16	11	13	9	5
BCO	194	165	90	57	65	104	247	822	856	663	830	1,095	1,285	1,180	1,251	1,618	1,374	1,393	879	628	454	389	336	255	986

Figure 5. All-Mode Crash Severity by Hour of Day

Figure 6 and **Table 3** illustrates all-mode crashes by mode and the most severe injury suffered by a person traveling by that mode.

- Automobile crashes make up 56 percent of all severe crashes, motorcycle crashes – 23 percent, pedestrian crashes – 15 percent, bicyclist crashes – 4 percent, and heavy vehicle crashes – 1 percent of all severe crashes.
- **Proportionally, severe crashes make up 0.9 percent of all automobile crashes, 11 percent of all bicyclist crashes, 0.5 percent of all heavy vehicle crashes, 27 percent of all motorcycle crashes, and 20 percent of all pedestrian crashes.**
- Motorcycle-involved crashes contribute 1.4% of total crashes; however, 23.5% of severe crashes involved a motorcycle, highlighting an approximate 22% overrepresentation.
- Pedestrian-involved crashes contribute 1.2% of total crashes; however, 14.9% of severe crashes involved a pedestrian, highlighting an approximate 14% overrepresentation.
- Bicycle-involved crashes contribute 0.6% of total crashes; however, 3.9% of severe crashes involved a bicycle, highlighting an approximate 3% overrepresentation.

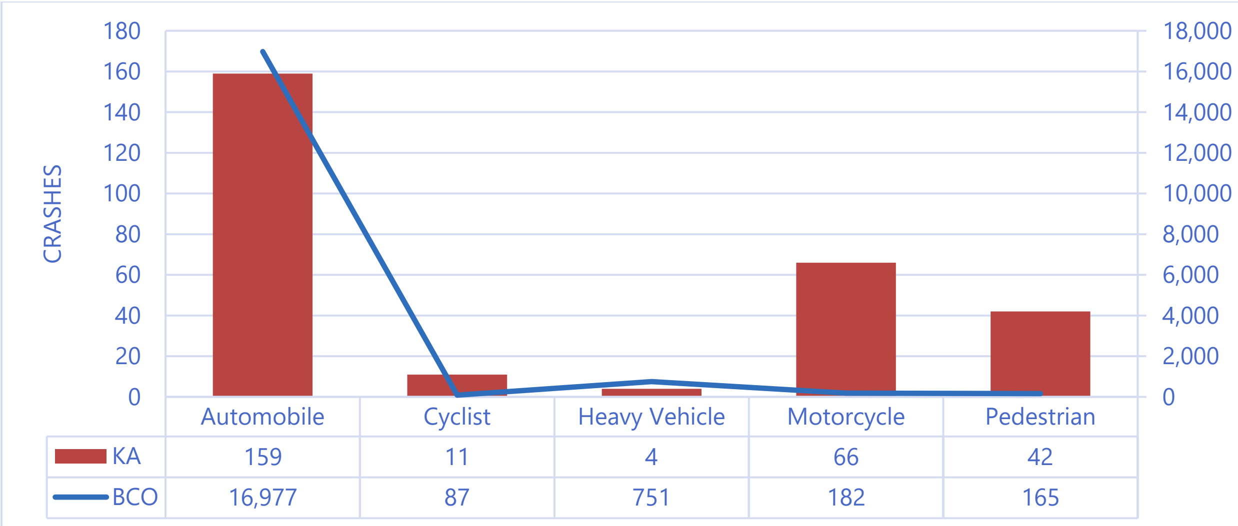


Figure 6. All-Mode Crash Severity by Mode

Mode	KA Crashes	BCO Crashes	Subtotal Crashes	KA Percent of Total KA Crashes	KA Percent of Subtotal Crashes	Percent of Total Crashes
Automobile	159	16,977	17136	56.6%	0.9%	97.9%
Cyclist	11	87	98	3.9%	11.2%	0.6%
Heavy	4	751	755	1.4%	0.5%	4.3%
Motorcyclist	66	182	248	23.5%	26.6%	1.4%
Pedestrian	42	165	207	14.9%	20.3%	1.2%
Total	**281**	**17,216**	**17,497**	**100.0%**	**1.6%**	**100.0%**

Table 3. All-Mode Crash Severity by Mode & Crash Proportionality

Figure 7 illustrates the number of all-mode crashes by Burleigh and Morton Counties.

- With respect to each county, most severe (75 percent) and non-severe (90 percent) crashes occurred in Burleigh County, whereas the rest occurred in Morton County.

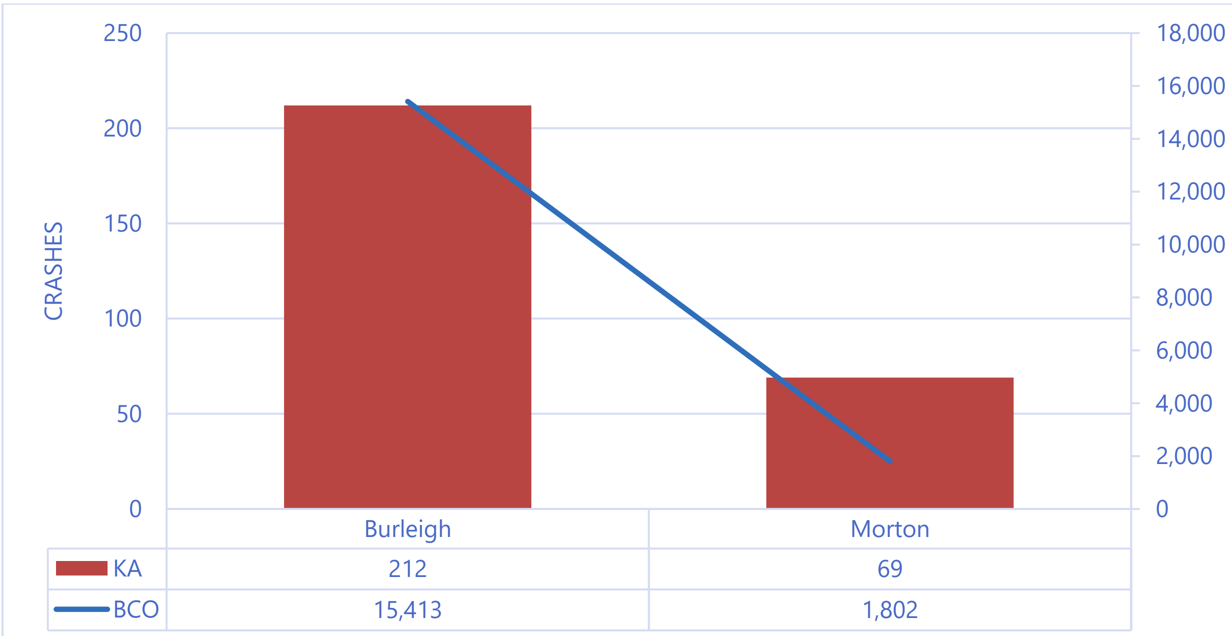
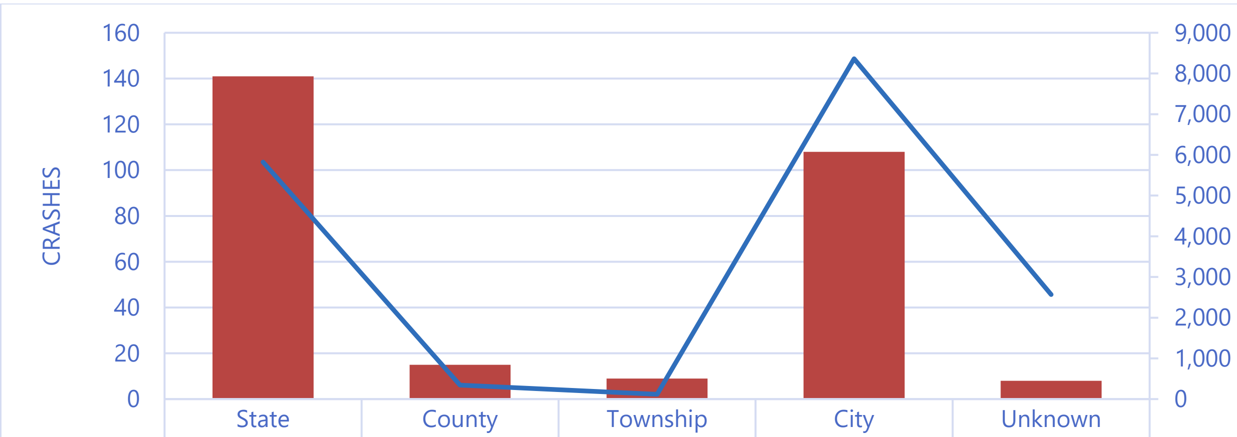


Figure 7. All-Mode Crash Severity by Counties

Figure 8 illustrates the number of all-mode crashes by road ownership.

- 50 percent of severe crashes occurred on roads owned by the state, 38 percent – on roads owned by cities, 5 percent – on roads owned by counties, 3 percent – on roads owned by cities, and 3 percent – on roads owned by unknown jurisdictions.

- Proportionally, severe crashes make up 2 percent of all crashes on state, 4 percent of all crashes on county, 7 percent of all crashes on township, and 1 percent of all crashes on city roads.

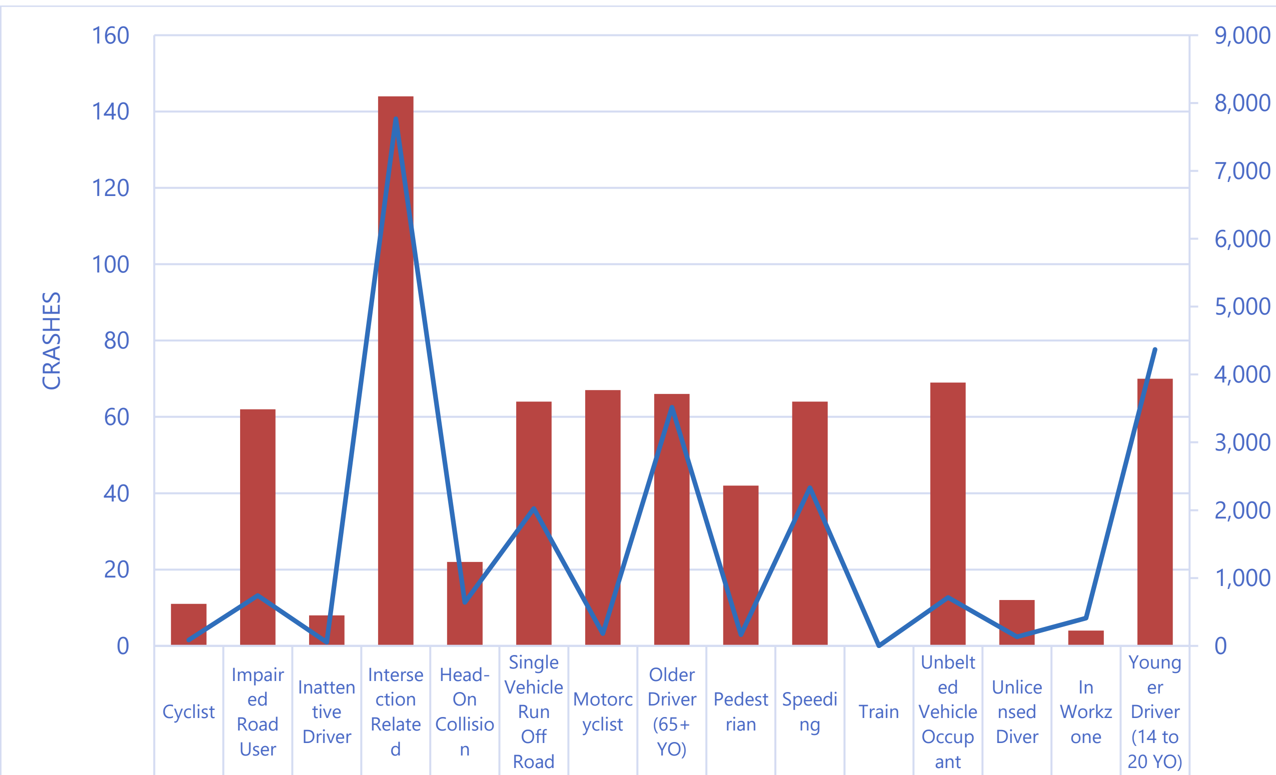


	State	County	Township	City	Unknown
KA	141	15	9	108	8
BCO	5,825	344	118	8,362	2,567

Figure 8. All-Mode Crash Severity by Road Ownership

Figure 9 illustrates the number of all-mode crashes by combined NDDOT focus areas identified in North Dakota's current Vision Zero Plan. Focus areas with the highest percentage of all severe crashes include the following:

- Intersection-related (51 percent); motorcyclist-related (24 percent), unbelted vehicle occupant-related (25 percent), and young driver-related (25 percent each).
- Non-severe crashes exhibit different percentages of crashes: intersection-related make up 34 percent, young driver-related make up 19 percent, and older driver-related make up 15 percent.
- Proportionally, severe crashes make up 11 percent of cyclist, 7 percent of impaired road user, 13 percent of inattentive driver, 2 percent of intersection related, 3 percent of head-on collision, 3 percent of single vehicle run off road, 27 percent of motorcyclist, 2 percent of older driver (65+ YO), 20 percent of pedestrian, 3 percent of speeding, 8 percent of unbelted vehicle occupant, 8 percent of unlicensed driver, 1 percent of workzone, and 2 percent of younger driver (14 to 20 YO) involved crashes.



	Cyclist	Impaired Road User	Inattentive Driver	Intersection Related	Head-On Collision	Single Vehicle Run Off Road	Motorcyclist	Older Driver (65+ YO)	Pedestrian	Speeding	Train	Unbelted Vehicle Occupant	Unlicensed Diver	In Workzone	Younger Driver (14 to 20 YO)
KA	11	62	8	144	22	64	67	66	42	64	0	69	12	4	70
BCO	87	741	54	7,769	641	2,025	181	3,518	165	2,331	1	713	134	410	4,369

Figure 9. All-Mode Crash Severity by Combined Focus Areas

All Mode Segment-Related Crashes

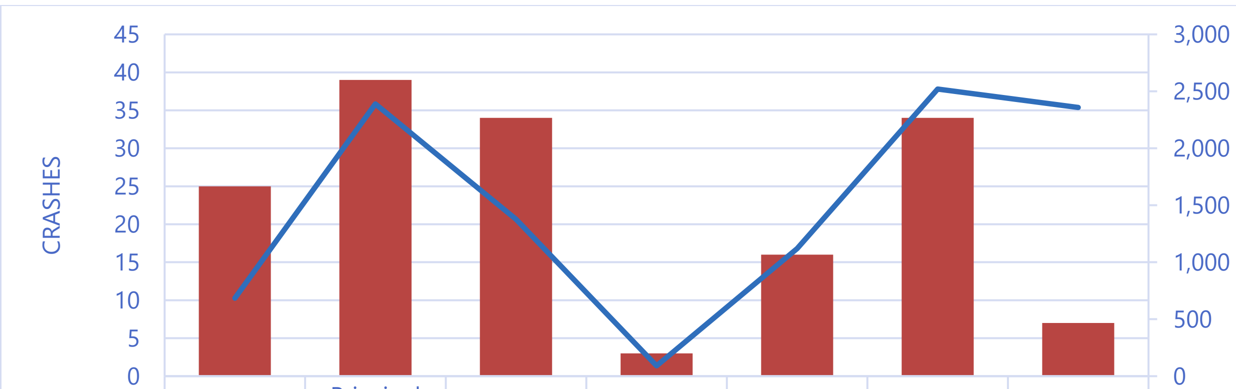
Segment-related crashes are those which occur away from intersections. In NDDOT's crash data, crashes are coded with 'intersection' and 'intersection-related' tags. Segment-related crashes are those which do not have either intersection or intersection-related tags. 'Intersection' tags include crashes reported within or immediately adjacent to an intersection and 'intersection-related' tags include crashes where queuing is occurring due to the presence of an intersection, usually 300 feet or further from an intersection.

- Of the 17,497 crashes which occurred over the five-year period, 10,713 (61 percent) crashes were segment related. Of the 281 severe (KA) crashes which occurred over the five-year period, 158 (56 percent) were segment related.

Figure 10 illustrates the number of all-mode segment crashes by functional classification.

- 25 percent of severe crashes occurred on principal arterials, 22 percent – on minor arterials, and 22 percent – on local roads.

- Proportionally, severe crashes make up 4 percent of Interstate crashes, 2 percent of Principal Arterial crashes, 2 percent of Minor Arterial crashes, 2 percent of Collector crashes, and 1 percent of Local crashes.



	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local	Unknown
KA	25	39	34	3	16	34	7
BCO	685	2,390	1,377	91	1,120	2,520	2,358

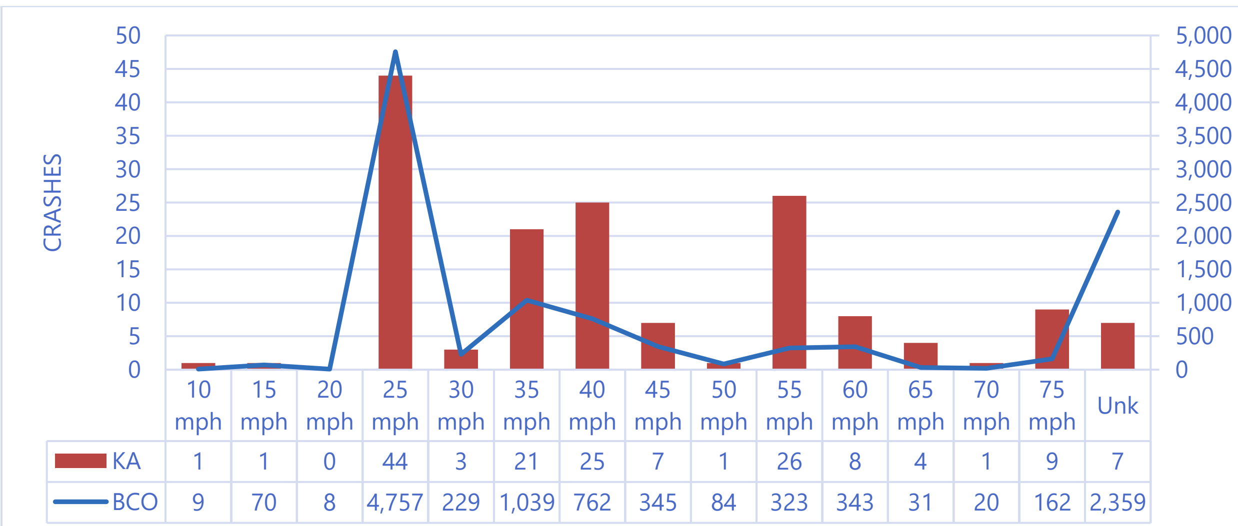
Figure 10. All-Mode Crash Severity by Functional Classification (segment crashes only)

Figure 11 indicates all-mode-related crashes by segment speed limit (mph).

- A majority, or 28 percent, of severe segment crashes occurred on roadways with a speed limit of 25 mph, 16 percent occurred on roadways with a speed limit of 55 mph, 16 percent – on roadways with a speed limit of 40 mph, and 13 percent – on roadways with a speed limit of 35 mph.

- Segments with speed limits of 25 mph and unknown speed account for 67 percent of all non-severe accidents. Crashes with no record for speed limit data are reported as "Unk".

- Proportionally, severe crashes make up 10 percent of 10 mph, 1 percent of 15mph, 1 percent of 25 mph, 1 percent of 30 mph, 2 percent of 35 mph, 3 percent of 40 mph, 2 percent of 45 mph, 1 percent of 50 mph, 7 percent of 55 mph, 2 percent of 60 mph, 11 percent of 65 mph, 5 percent of 70 mph, and 5 percent of 75 mph roads.



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	Unk
KA	1	1	0	44	3	21	25	7	1	26	8	4	1	9	7
BCO	9	70	8	4,757	229	1,039	762	345	84	323	343	31	20	162	2,359

Figure 11. All-Mode Crash Severity by Segment Speed Limit (segment crashes only)

Figure 12 includes the number of segment-related crashes by road configuration.

- Most severe crashes happened on two-way undivided roadways (46 percent) followed by two-way divided with unprotected median (16 percent), and two-way divided with median barrier roadways (14 percent).
- Most non-severe crashes occurred on unknown type roads (46 percent), and two-way undivided roadways (38 percent).
- Proportionally, severe crashes make up 1 percent of one-way, 2 percent of two way undivided, 5 percent of two way undivided with center left turn lane, 4 percent of two-way divided with unprotected median, 3 percent of two-way divided with median barrier, and 0.4 percent of unknown configured roads.

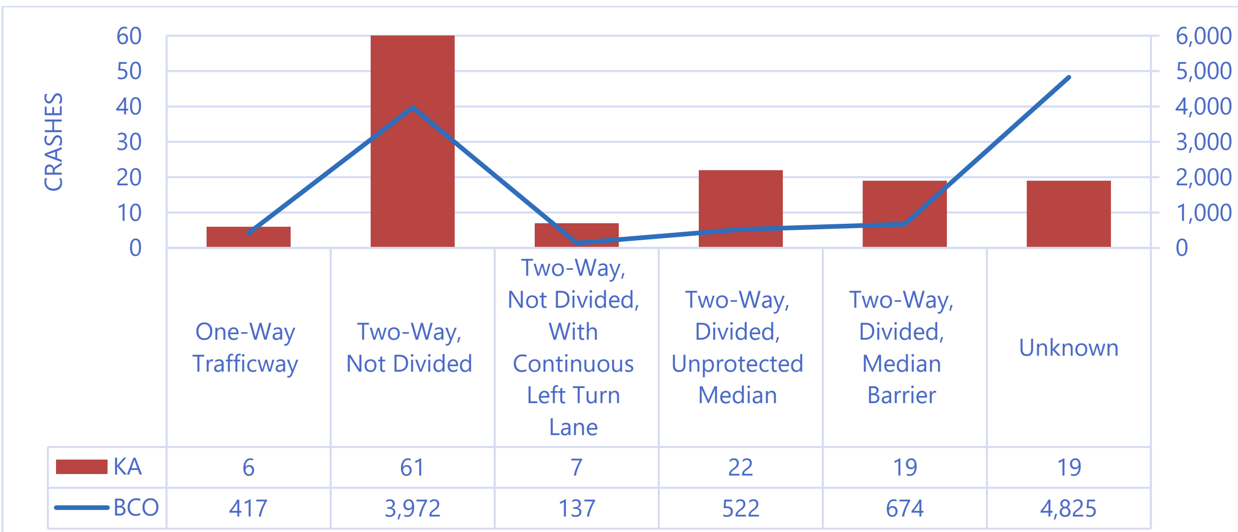


Figure 12. Passenger Vehicle Crash Severity by Functional Classification (segment crashes only)

All Mode Intersection-Related Crashes

Intersection-related crashes occur at or near intersections. In NDDOT's crash data, crashes are coded with 'intersection' and 'intersection-related' tags. Intersection crashes are those which occurred in proximity to an intersection while intersection-related refers to traffic queuing, in some cases 300 or more feet away from the intersection. Of the 17,497 crashes which occurred over the five-year period, 6,798 (39 percent) crashes are considered intersection or intersection-related crashes. Of the 281severe crashes which occurred over the five-year period, 123 (44 percent) were intersection or intersection-related.

Figure 13 illustrates the number of all-mode intersection crashes by functional classification.

- Most of the severe crashes (54 percent) occurred on principal arterials followed by minor arterials (21 percent).
- Non-severe crashes are distributed similarly, with 57 percent occurring on principal arterials, 18 percent – on minor arterials, and 12 percent – on local roads.
- Proportionally, severe crashes make up 4 percent of Interstate intersection, 2 percent of Principal Arterial intersection, 2 percent of Minor Arterial intersection, 2 percent of Collector intersection, and 1 percent of Local intersection crashes.

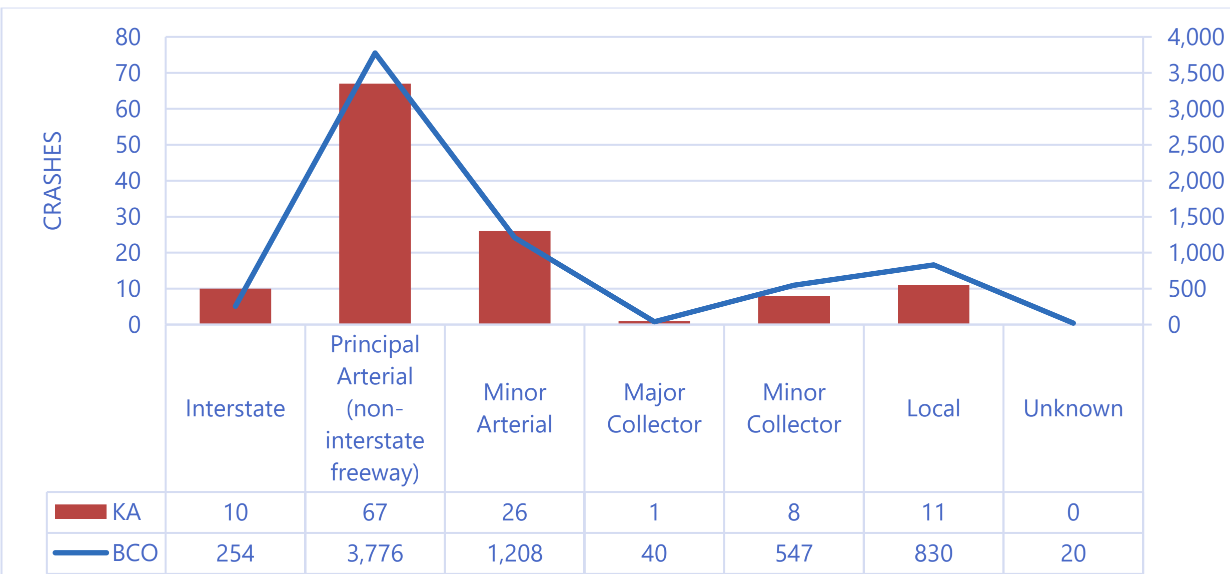
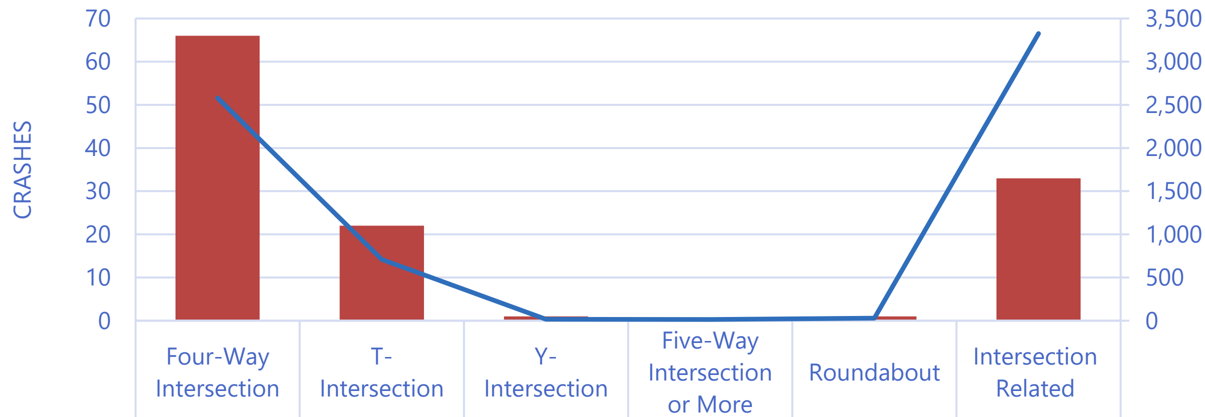


Figure 13. All-Mode Crash Severity by Functional Classification (intersection crashes only)

Figure 14 illustrates all mode-involved intersection crashes by intersection configuration. Intersection related crashes are near an intersection but not within, related to intersection queueing. In the case of intersection-related, the intersection configuration is not coded.

- Four-way intersections contributed 54 percent of severe crashes.
- A vast majority of non-severe crashes occurred at four-way intersections (39 percent) or were intersection related (50 percent).
- Proportionally, severe crashes make up 2 percent of four-way intersection, 3 percent of T-intersection, 6 percent of Y-intersection, 3 percent of roundabout, and 1 percent of intersection related crashes.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related
KA	66	22	1	0	1	33
BCO	2,580	710	16	14	29	3,326

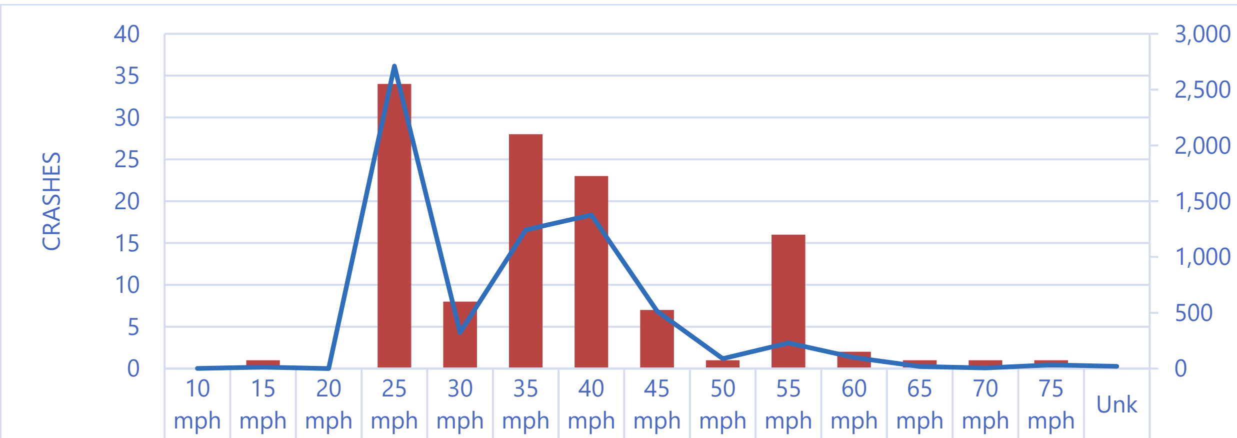
Figure 14. All-Mode Crash Severity by Intersection Configuration (intersection crashes only)

Figure 15 illustrates all-mode-involved intersection crashes by maximum speed limit. Crashes with no record for speed limit data are reported as "Unk".

- The highest prevalence of severe intersection crashes occurred at intersections with max speed limits of 25 mph (28 percent), 35 mph (23 percent), and 40 mph (19 percent).

- The majority, or 62 percent, of non-severe crashes occurred at intersections with speed limits between 25 mph and 40 mph.

- Proportionally, severe crashes make up 8 percent of 15 mph, 1 percent of 25 mph, 2 percent of 30 mph, 2 percent of 35 mph, 2 percent of 40 mph, 1 percent of 45 mph, 1 percent of 50 mph, 7 percent of 55 mph, 2 percent of 60 mph, 5 percent of 65 mph, 14 percent of 70 mph, and 3 percent of 75 mph maximum intersection speed crashes.



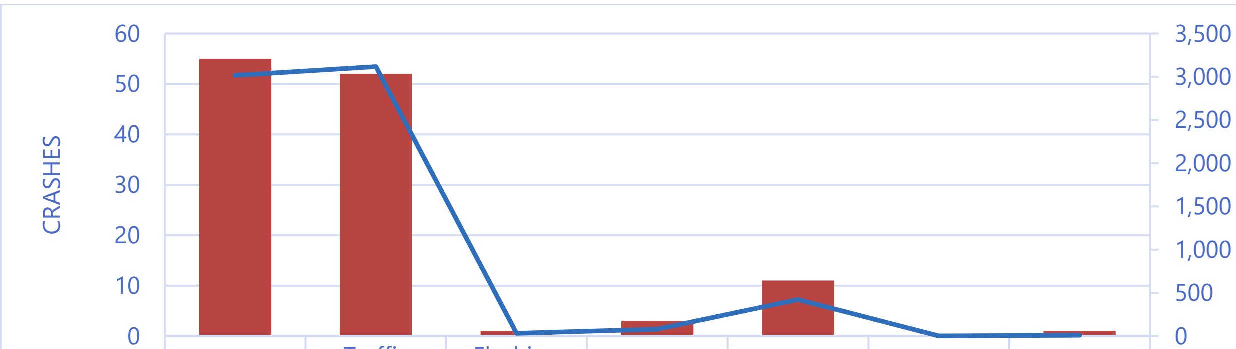
	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	Unk
KA	0	1	0	34	8	28	23	7	1	16	2	1	1	1	0
BCO	1	12	0	2,711	323	1,243	1,377	513	89	230	99	18	6	33	20

Figure 15. All-Mode Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 16 illustrates all mode-crashes by intersection traffic control device. Crashes with no record for intersection control devices are recorded as unknown.

- A vast majority of severe intersection crashes occurred at uncontrolled (45 percent) and signalized intersections (42 percent).

- Uncontrolled and signalized intersections contribute to 92 percent of non-severe crashes. Proportionally, severe crashes make up 2 percent of no traffic control device, 2 percent of traffic control signal, 3 percent of flashing overhead signal, 4 percent of yield sign, and 11 percent of unknown intersection crashes.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Officer / Flagperson	Unknown
KA	55	52	1	3	11	0	1
BCO	3,016	3,117	32	79	422	1	8

Figure 16. All-Mode Crash Severity by Intersection Traffic Control Device (intersection crashes only)

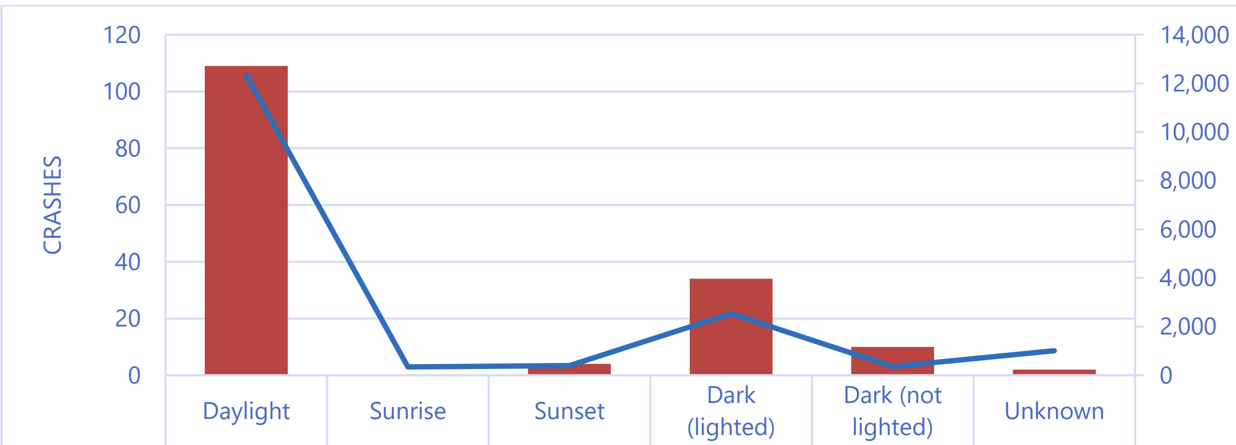
Passenger Vehicles

General Characteristic Crashes

Figure 17 indicates passenger vehicle-related crashes by lighting condition. The crashes with no record for lighting conditions are classified as unknown.

- Most (69 percent) severe (KA) passenger vehicle crashes occurred during daylight conditions, with the other peak during dark (lighted) conditions (21 percent).

- Proportionally, severe crashes make up 1 percent of daylight, 1 percent of sunset, 1 percent of dark (lighted), and 3 percent of dark (not lighted) condition crashes on segments (non-intersection) involving passenger vehicles.



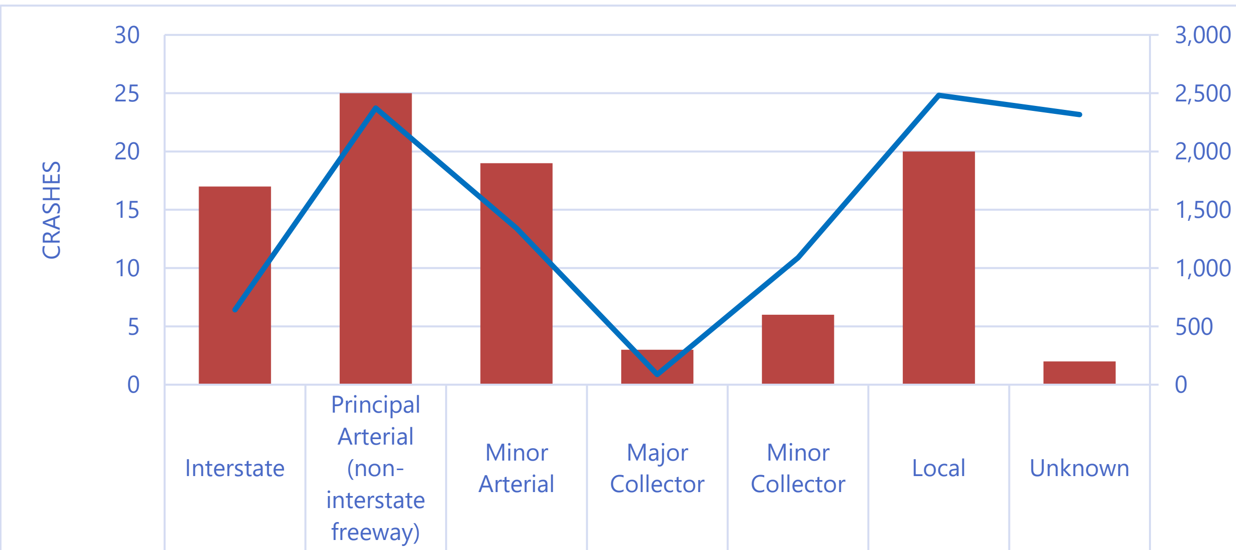
	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	109	0	4	34	10	2
BCO	12,336	344	394	2,536	360	1,007

Figure 17. Passenger Vehicle Crash Severity by Lighting Conditions

Passenger Vehicle Segment-Related Crashes

Figure 18 includes the number of passenger vehicle segment crashes by functional classification.

- Most severe crashes happened on principal arterials (27 percent), followed by local roads (22 percent), minor arterials (21 percent), Interstate (18 percent), and collectors (10 percent).
- Most non-severe crashes occurred on principal arterial roads (57 percent), minor arterials (18 percent), and interstates (4 percent).
- Proportionally, severe crashes make up 3 percent of interstate, 1 percent of principal arterial, 1 percent of minor arterial, 1 percent of collector, and 1 percent of local road crashes on segments (non-intersection) involving passenger vehicles.



	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local	Unknown
KA	17	25	19	3	6	20	2
BCO	642	2,372	1,342	87	1,089	2,482	2,316

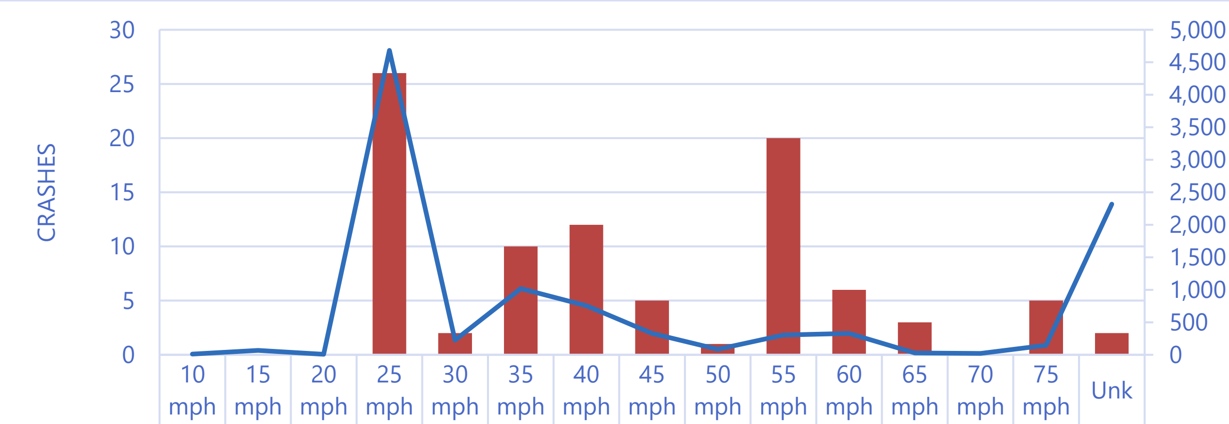
Figure 18. Passenger Vehicle Crash Severity by Functional Classification (segment crashes only)

Figure 19 indicates passenger vehicle crashes by segment speed limit. Crashes with no record for speed limit data are reported as "Unk".

- A majority, or 28 percent, of severe segment crashes occurred on roadways with a speed limit of 25 mph, 22 percent occurred on roadways with a speed limit of 55 mph, 13 percent – on roadways with a speed limit of 40 mph, and 11 percent – on roadways with a speed limit of 35 mph.

- Segments with speed limits of 25 mph and unknown speed account for 67 percent of all non-severe crashes.

- Proportionally, severe crashes make up 0.5 percent of 25 mph, 1 percent of 30 mph, 1 percent of 35 mph, 2 percent of 40 mph, 2 percent of 45 mph, 1 percent of 50 mph, 6 percent of 55 mph, 2 percent of 60 mph, 9 percent of 65 mph, and 3 percent of 75 mph segment (non-intersection) crashes involving passenger vehicles.



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	Unk
KA	0	0	0	26	2	10	12	5	1	20	6	3	0	5	2
BCO	10	69	8	4,683	226	1,019	756	328	84	304	330	29	20	147	2,317

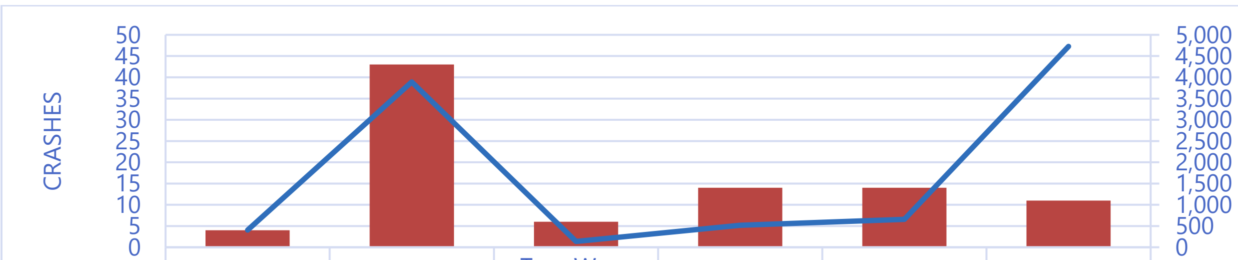
Figure 19. Passenger Vehicle Crash Severity by Segment Speed Limit (segment crashes only)

Figure 20 illustrates passenger vehicle crashes by segment road configuration.

- A vast majority of severe crashes occurred on two-way undivided (51 percent), two-way divided (with an unprotected median), and two-way divided (with a median barrier) roadways (each at 15 percent).

- Roadways with an unknown configuration and two-way undivided roadways contribute to 84 percent of non-severe crashes.

- Proportionally, severe crashes make up 1 percent of one-way, 1 percent of two-way undivided, 4 percent of two-way undivided with center left turn lane, 3 percent of two-way divided with unprotected median, and 2 percent of two-way divided with median barrier segment (non-intersection) crashes involving passenger vehicles.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	4	43	6	14	14	11
BCO	403	3,890	137	517	656	4,727

Figure 20. Passenger Vehicle Crash Severity by Segment Road Configuration (segment crashes only)

Passenger Vehicle Intersection-Related Crashes

Figure 21 includes the number of intersection-related passenger vehicle crashes by functional classification.

- Most severe crashes occurred on principal arterials (55 percent) followed by minor arterials (21 percent), and interstates (12 percent).
- Most non-severe crashes occurred on principal arterials (57 percent), minor arterials (18 percent), and locals (12 percent).
- Proportionally, severe passenger vehicle crashes at intersections make up 2 percent on interstates, 1 percent on principal arterials, 1 percent on minor arterials, 1 percent on collectors, and 0.5 percent on Local streets.

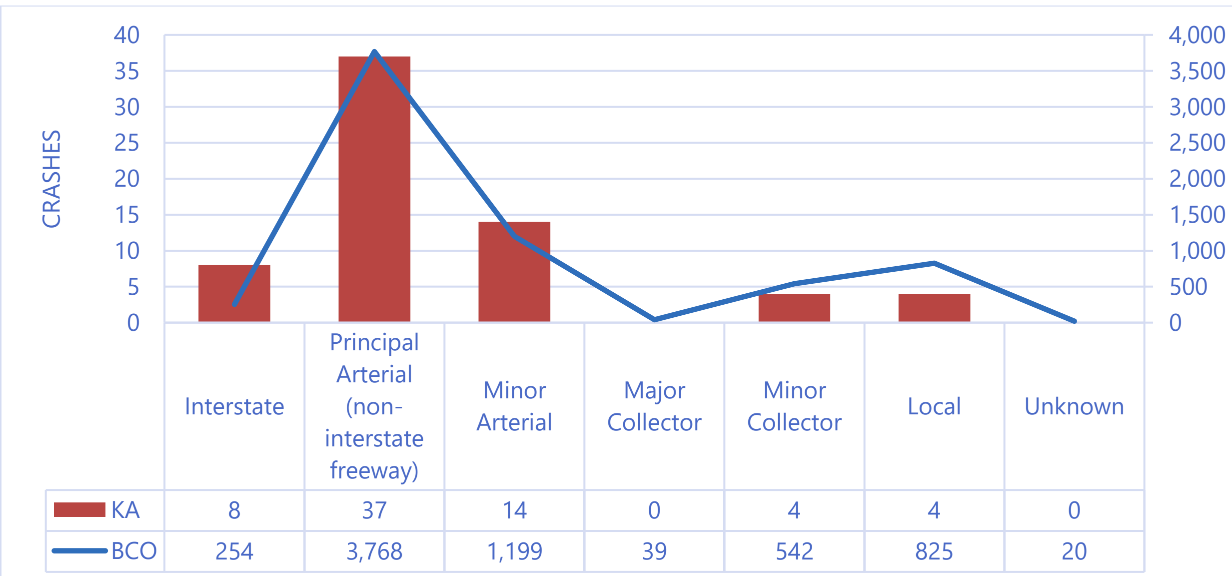
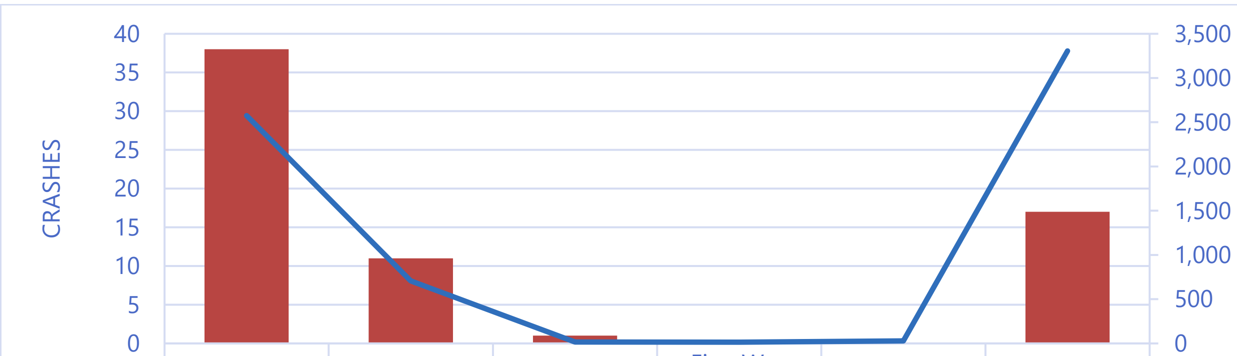


Figure 21. Passenger Vehicle Crash Severity by Functional Classification (intersection crashes only)

Figure 22 illustrates passenger vehicle intersection crashes by intersection configuration. Intersection related crashes are those near an intersection but not within, related to intersection queueing. In the case of intersection-related, the intersection configuration is not coded.

- Four-way intersections contributed to 57 percent of severe crashes.
- A vast majority of non-severe crashes occurred at four-way intersections (39 percent) or were intersection related (50 percent).
- Proportionally, severe crashes make up 1 percent of four-way, 2 percent of T-intersection, 6 percent of Y-intersection, and 0.5 percent of intersection related passenger vehicle crashes.

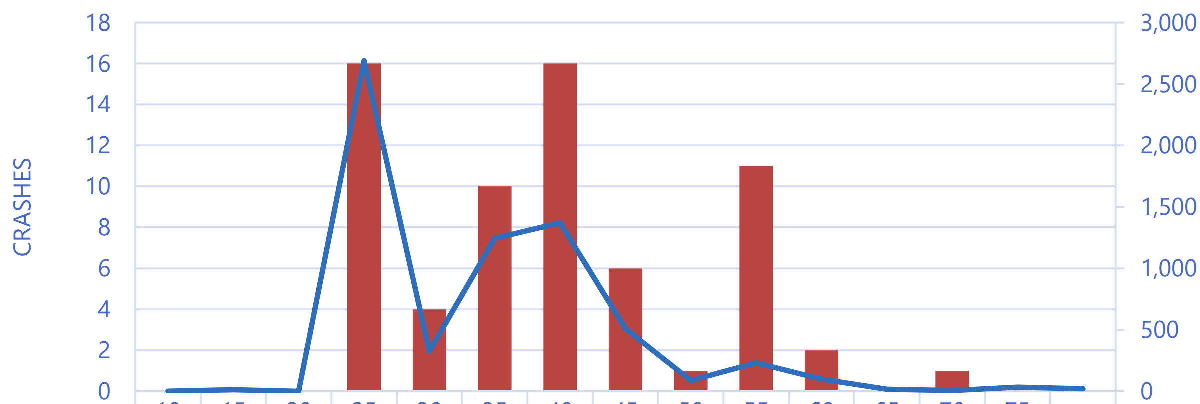


	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related
KA	38	11	1	0	0	17
BCO	2,575	707	16	14	29	3,306

Figure 22. Passenger Vehicle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 23 illustrates passenger vehicle-involved intersection crashes by maximum speed limit.

- The highest prevalence of severe intersection crashes occurred at intersections with max speed limits of 25 mph and 40 mph (each at 24 percent), 55 mph (16 percent), and 35 mph (15 percent).
- The majority, or 85 percent, of non-severe crashes occurred at intersections with speed limits between 25 mph and 40 mph.
- Proportionally, severe passenger vehicle-involved intersection crashes make up 0.5 percent of 25 mph, 1 percent of 30 mph, 1 percent of 35 mph, 1 percent of 40 mph, 1 percent of 45 mph, 1 percent of 50 mph, 5 percent of 55 mph, 2 percent of 60 mph, and 14 percent of 70 mph max speed limit intersections.

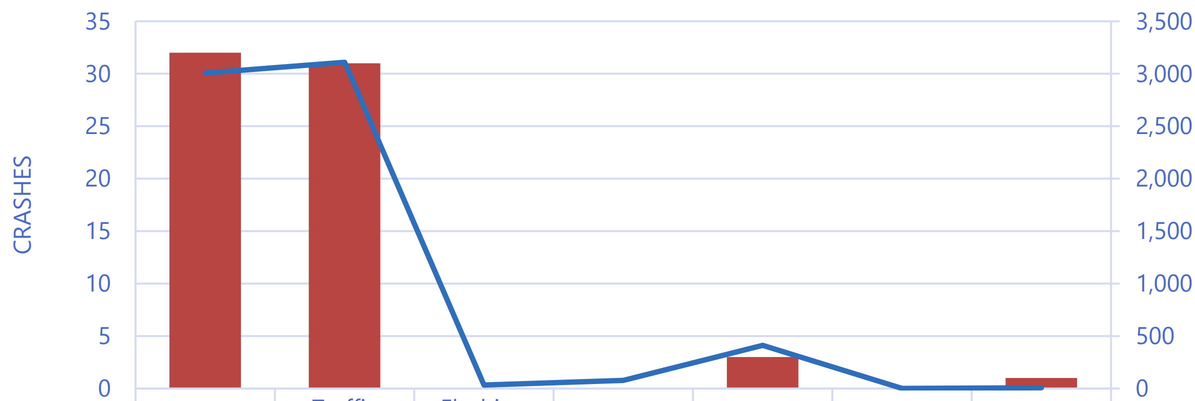


	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	Unk
KA	0	0	0	16	4	10	16	6	1	11	2	0	1	0	0
BCO	1	13	0	2,690	325	1,244	1,370	509	88	232	99	17	6	33	20

Figure 23. Passenger Vehicle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 24 illustrates passenger vehicle-involved crashes by intersection traffic control device. Crashes with no record for intersection control devices are recorded as unknown.

- A vast majority of severe intersection crashes occurred at uncontrolled (48 percent) and signalized intersections (46 percent).
- Uncontrolled and signalized intersections contribute to 92 percent of non-severe crashes. Proportionally, severe passenger vehicle-involved crashes make up 1 percent of uncontrolled, 1 percent of signalized, 1 percent of stop, and 11 percent of unknown traffic control intersections.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Officer / Flagperson	Unknown
KA	32	31	0	0	3	0	1
BCO	3,007	3,109	33	77	412	1	8

Figure 24. Passenger Vehicle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Heavy Vehicle

Heavy Vehicle Segment-Related Crashes

Figure 25 shows the number of heavy vehicle-involved segment (non-intersection) crashes by functional classification.

- Most severe crashes (75 percent) for operators of heavy vehicles during the five-year period occurred on interstates.

- All non-severe crashes are distributed evenly among all roadway types with a slight peak on local roads (23 percent).

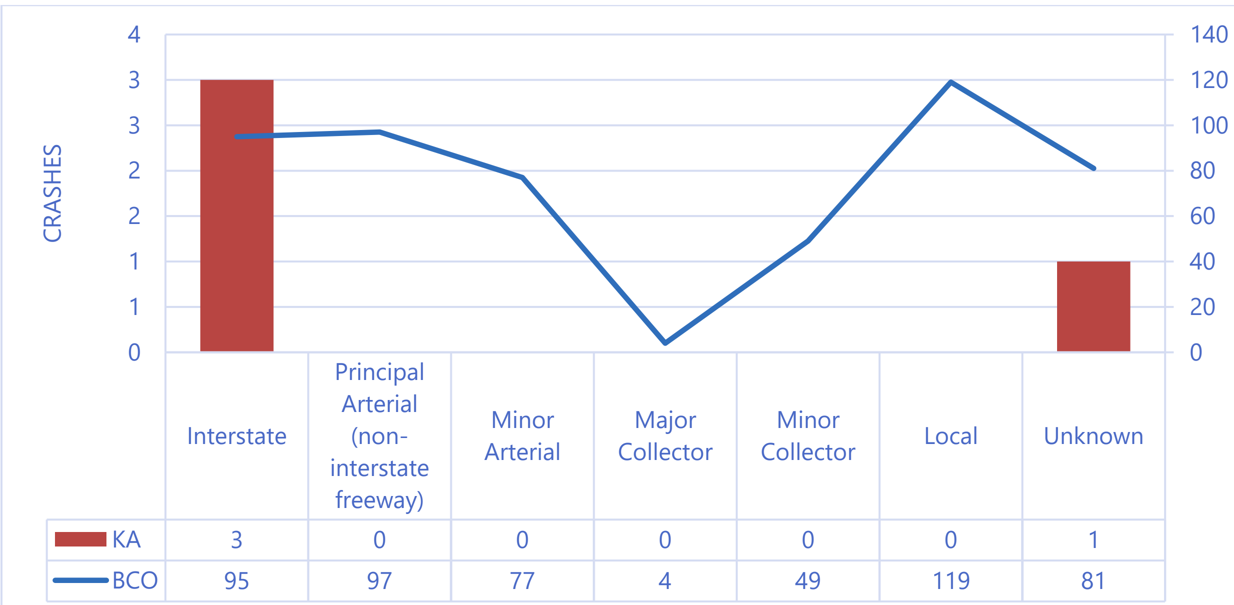
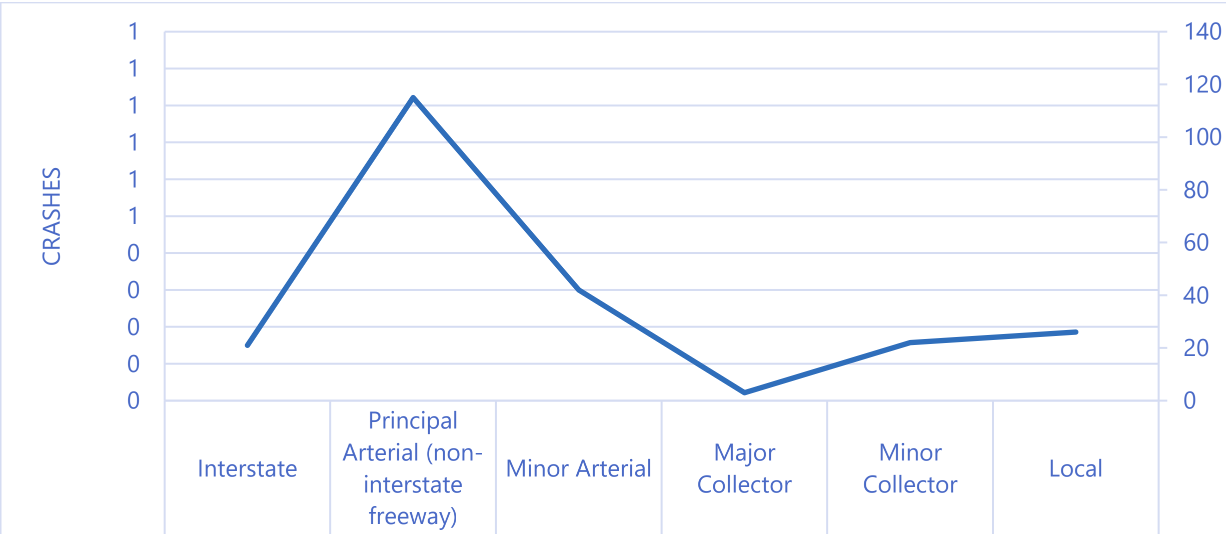


Figure 25. Heavy Vehicle Crash Severity by Functional Classification (segment crashes only)

Heavy Vehicle Intersection-Related Crashes

Figure 26 indicates the number of heavy vehicle-involved intersection crashes by functional classification.

- No severe crashes were recorded, while most non-severe crashes (50 percent) occurred on principal arterials.



	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local
KA	0	0	0	0	0	0
BCO	21	115	42	3	22	26

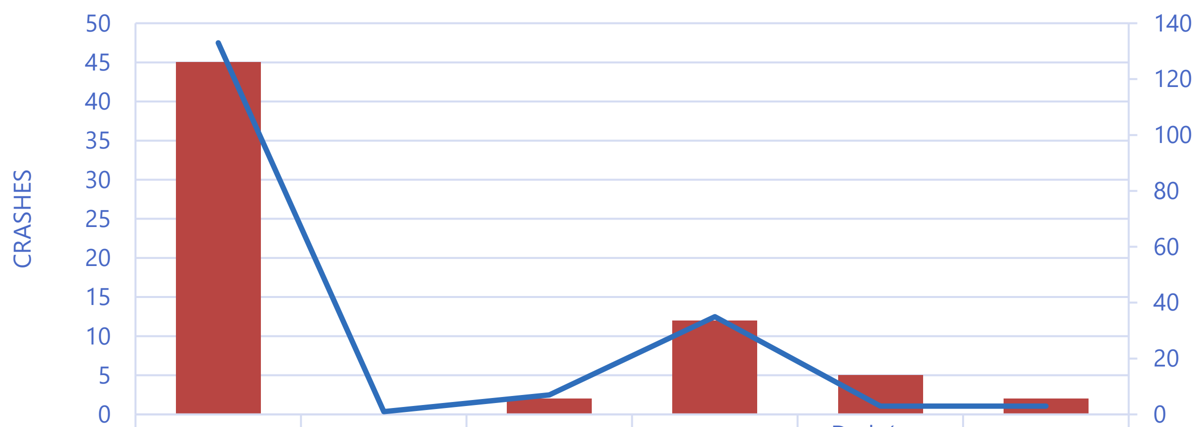
Figure 26. Heavy Vehicle Crash Severity by Functional Classification (intersection crashes only)

Motorcycle

Motorcycle General Characteristic Crashes

Figure 27 indicates the number of motorcycle-involved crashes by lighting conditions.

- Most severe motorcycle crashes (68 percent) occurred during daylight conditions, followed by dark (lighted) with 18 percent.
- A majority, or 73 percent, of non-severe motorcycle-involved crashes occurred during daylight.
- Proportionally, severe motorcycle-involved crashes make up 25 percent of daylight, 22 percent of sunset, 26 percent of dark (lighted), 62 percent of dark (not lighted), and 40 percent of unknown lighting condition motorcycle crashes.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	45	0	2	12	5	2
BCO	133	1	7	35	3	3

Figure 27. Motorcycle Crash Severity by Lighting Conditions

Figure 28 illustrates the number of motorcycle-involved crashes by functional classification.

- Most severe crashes occurred on interstates (32 percent), principal arterials (26 percent), local roads and minor collectors (each at 15 percent).
- Proportionally, severe motorcycle-involved crashes make up 66 percent of Interstate, 26 percent of principal arterial, 36 percent of minor arterial, 25 percent of collector, and 20 percent of local road motorcycle crashes.

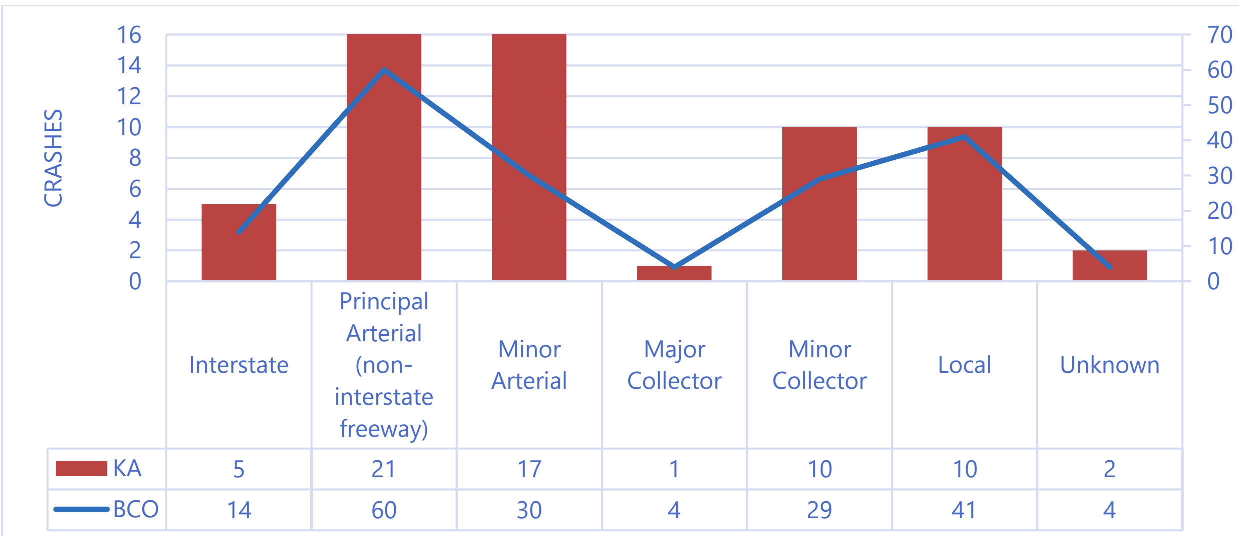


Figure 28. Motorcycle Crash Severity by Functional Classification

Motorcycle Segment-Related Crashes

Figure 29 illustrates the number of motorcycle-involved intersection crashes by functional classification.

- Most of the severe crashes (85 percent) occurred on principal arterials, minor arterials, minor collectors, and local roads.
- Proportionally, severe motorcycle-involved intersection crashes make up 32 percent of principal arterial, 24 percent of minor arterial, 5 percent of collector, and 17 percent of local road motorcycle crashes.

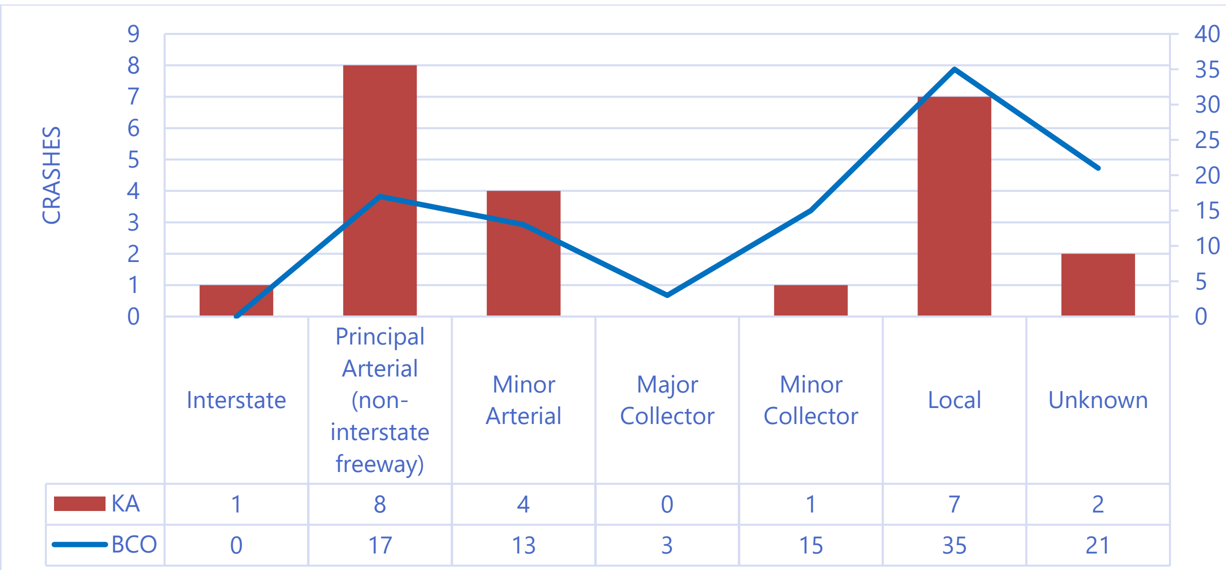
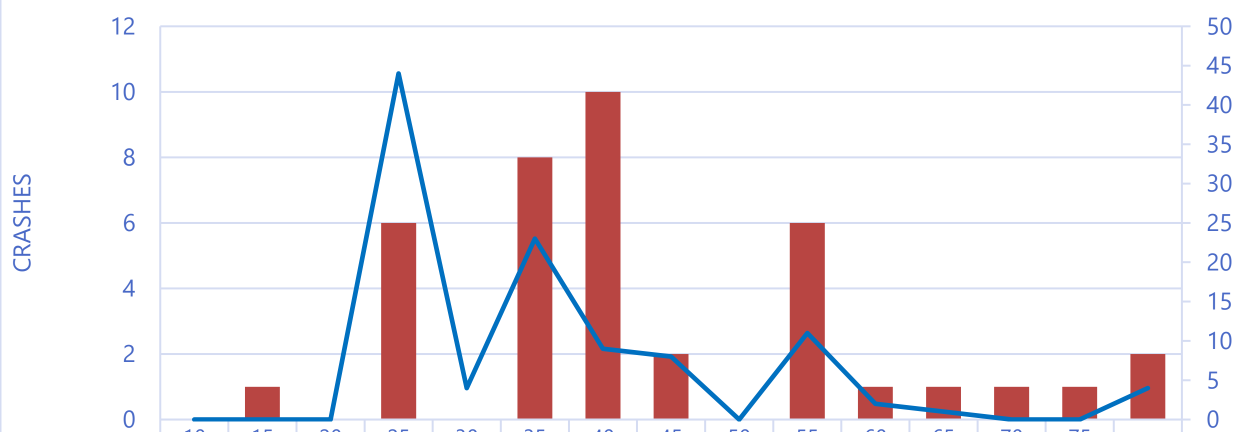


Figure 29. Motorcycle Crash Severity by Functional Classification (segment crashes only)

Figure 30 illustrates the number of motorcycle-involved segment crashes by speed limit.

- Most severe motorcycle crashes occurred on segments with speed limits of 40 mph (26 percent), 35 mph (21 percent), 25 mph (15 percent), and 55 mph (15 percent).
- Proportionally, severe motorcycle-involved crashes make up 12 percent of 25 mph, 26 percent of 35 mph, 53 percent of 40 mph, 20 percent of 45 mph, 35 percent of 55 mph, 33 percent of 60 mph, and 50 percent of 65 mph segment motorcycle crashes.



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	0	1	0	6	0	8	10	2	0	6	1	1	1	1	2
BCO	0	0	0	44	4	23	9	8	0	11	2	1	0	0	4

Figure 30. Motorcycle Crash Severity by Segment Speed Limit (segment crashes only)

Figure 31 illustrates the number of motorcycle-involved segment crashes by roadway configuration.

- Most severe segment crashes (46 percent) occurred on two-way undivided roadways.
- Proportionally, severe motorcycle-involved crashes make up 29 percent of one-way, 21 percent of two-way undivided, 50 percent of two-way divided with center left turn lane, 46 percent of two-way divided with unprotected median, and 40 percent of two-way divided with median barrier segment motorcycle crashes.

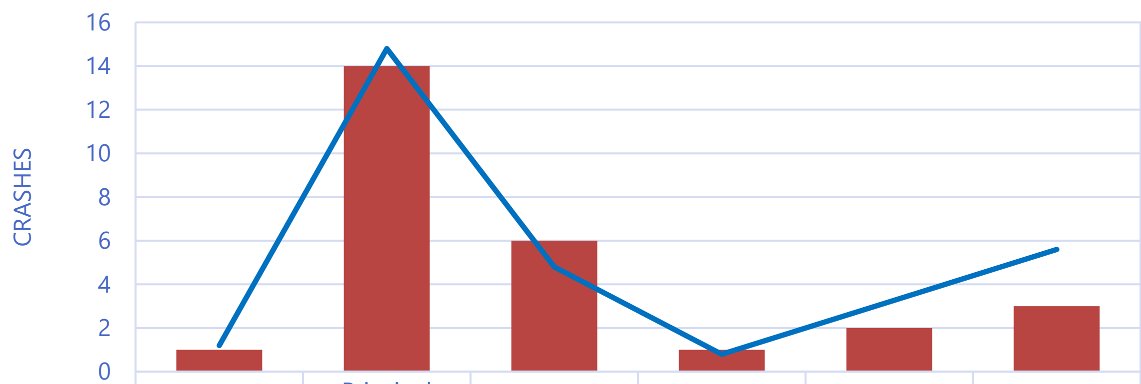
Figure 31. Motorcycle Crash Severity by Segment Road Configuration (segment crashes only)

Motorcycle Intersection-Related Crashes

Figure 32 indicates the number of motorcycle-involved intersection crashes by functional classification.

- Most severe motorcycle crashes occurred on intersections with principal arterials (52 percent) and minor arterials (22 percent), and collectors and local roads (both 11 percent).

- Proportionally, severe motorcycle-involved intersection crashes make up 33 percent of Interstate, 27 percent of principal arterial, 33 percent of minor arterial, 23 percent of collector, and 18 percent of local road intersection crashes (motorcycle-involved).

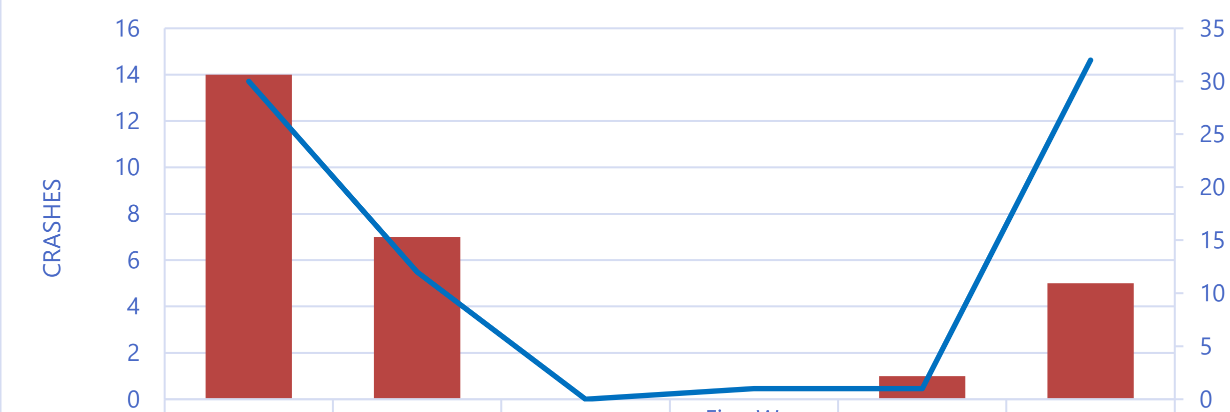


	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local
KA	1	14	6	1	2	3
BCO	3	37	12	2	8	14

Figure 32. Motorcycle Crash Severity by Functional Classification (intersection crashes only)

Figure 33 indicates the number of motorcycle-involved intersection crashes by intersection configuration.

- Most severe motorcycle intersection crashes (52 percent) occurred at four-way intersections.
- Proportionally, severe motorcycle-involved intersection crashes make up 32 percent of four-way, 37 percent of T-intersection, 50 percent of roundabout, and 14 percent of intersection-related crashes (motorcycle-involved).



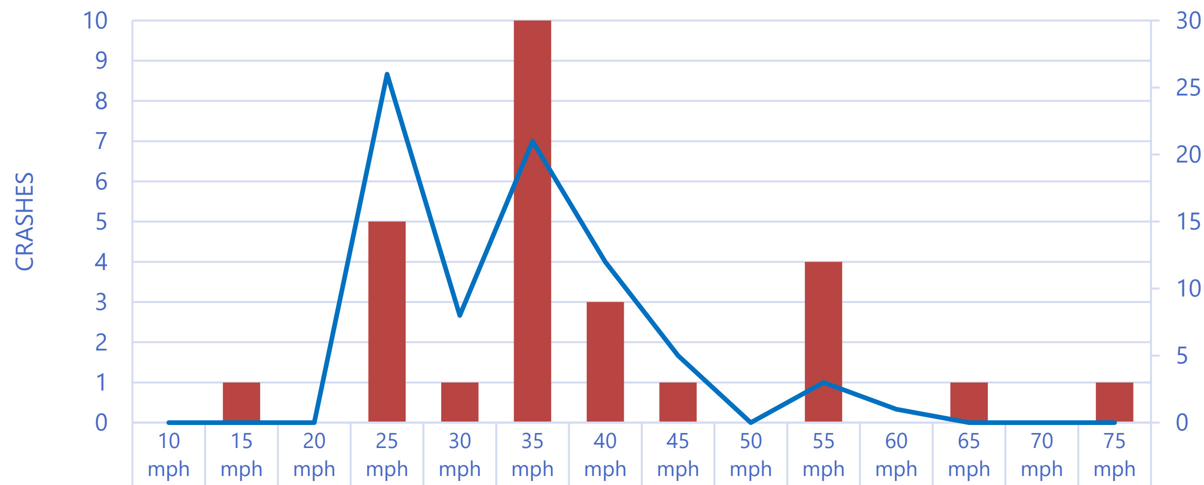
	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related
KA	14	7	0	0	1	5
BCO	30	12	0	1	1	32

Figure 33. Motorcycle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 34 illustrates the number of motorcycle-involved intersection crashes by maximum speed limit.

- Most of the severe crashes (37 percent) occurred at intersections with a maximum speed limit of 35 mph, followed by 19 percent with a maximum speed limit of 25 mph, and 15 percent with a maximum speed limit of 55 mph.

- Proportionally, severe motorcycle-involved intersection crashes make up 16 percent of 25 mph, 11 percent of 30 mph, 32 percent of 35 mph, 20 percent of 40 mph, 17 percent of 45 mph, and 57 percent of 55 mph intersection maximum speed limit crashes (motorcycle-involved).



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph
KA	0	1	0	5	1	10	3	1	0	4	0	1	0	1
BCO	0	0	0	26	8	21	12	5	0	3	1	0	0	0

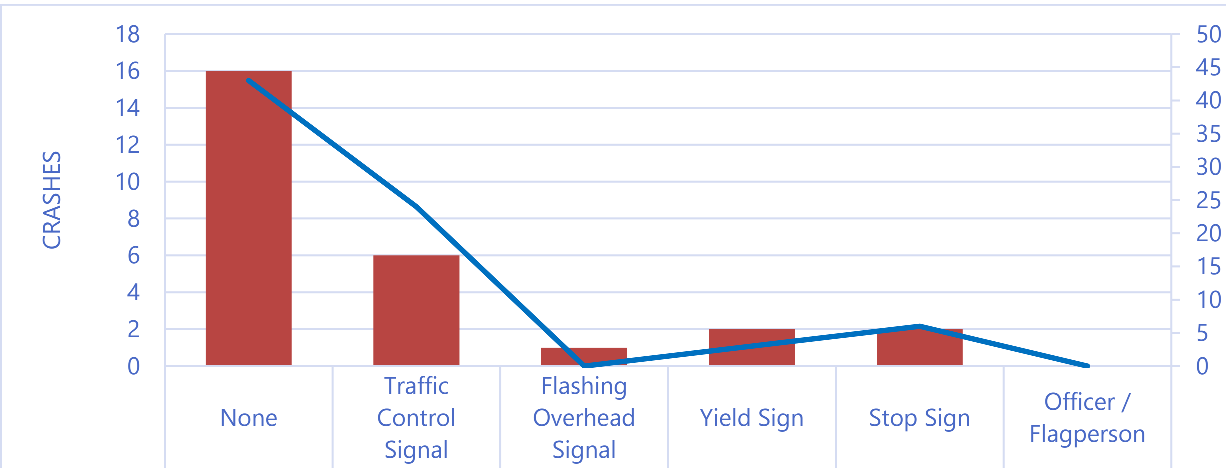
Figure 34. Motorcycle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 35 illustrates the number of motorcycle-involved intersection crashes by intersection traffic control device.

- A majority of severe motorcycle intersection crashes (59 percent) occurred at uncontrolled intersections.

- 22 percent of severe motorcycle intersection crashes occurred at signalized intersections.

- Proportionally, severe motorcycle-involved intersection crashes make up 27 percent of uncontrolled, 20 percent of signalized, 40 percent of yield, and 25 percent of stop controlled intersection crashes (motorcycle-involved).



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Officer / Flagperson
KA	16	6	1	2	2	0
BCO	43	24	0	3	6	0

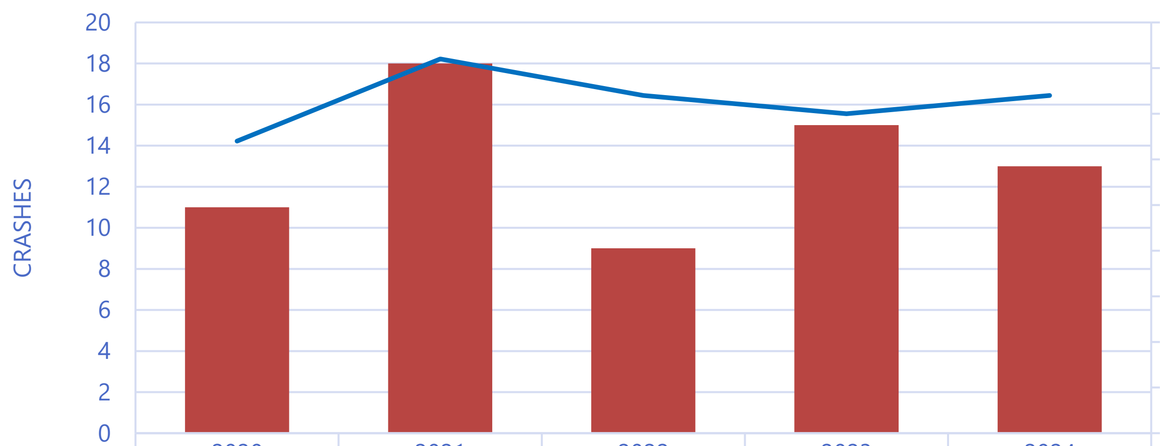
Figure 35. Motorcycle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Motorcycle Yearly Crashes

- Over the five-year period, 248 motorcycle crashes were recorded within the BMMPO area, encompassing all severity levels: fatal injuries (K), incapacitating injuries (A), non-incapacitating injuries (B), possible injuries (C), and no injury/property damage only (O).

- As shown in **Figure 36,** the Bismarck-Mandan Region experienced an annual average of about 13 severe motorcycle crashes and approximately 36 non-severe crashes.

- Within the five-year period (2020-2024) analyzed, severe (KA) crashes and non-severe (BCO) were highest in 2021, with 18 and 41 crashes, respectively.



	2020	2021	2022	2023	2024
KA	11	18	9	15	13
BCO	32	41	37	35	37

Figure 36. Motorcycle Crash Severity by Year

Motorcycle Month of Year Crashes

Figure 37 illustrates motorcycle crashes by month during the five-year period.

- As expected, severe crashes peak seasonally, June through July, with relatively linear numbers throughout all other months of April through October.
- The three-month Summer season from June through August makes up 47 percent of all severe motorcycle crashes.
- The severe motorcycle crash proportion of total monthly motorcycle crashes varies significantly month-to-month with severe motorcycle crashes making up approximately 50 percent in February, 64 percent in April, 28 percent in May, 27 percent in June, 27 percent in July, 16 percent in August, 28 percent in September, 26 percent in October, and 33 percent of total monthly motorcycle crashes in November.

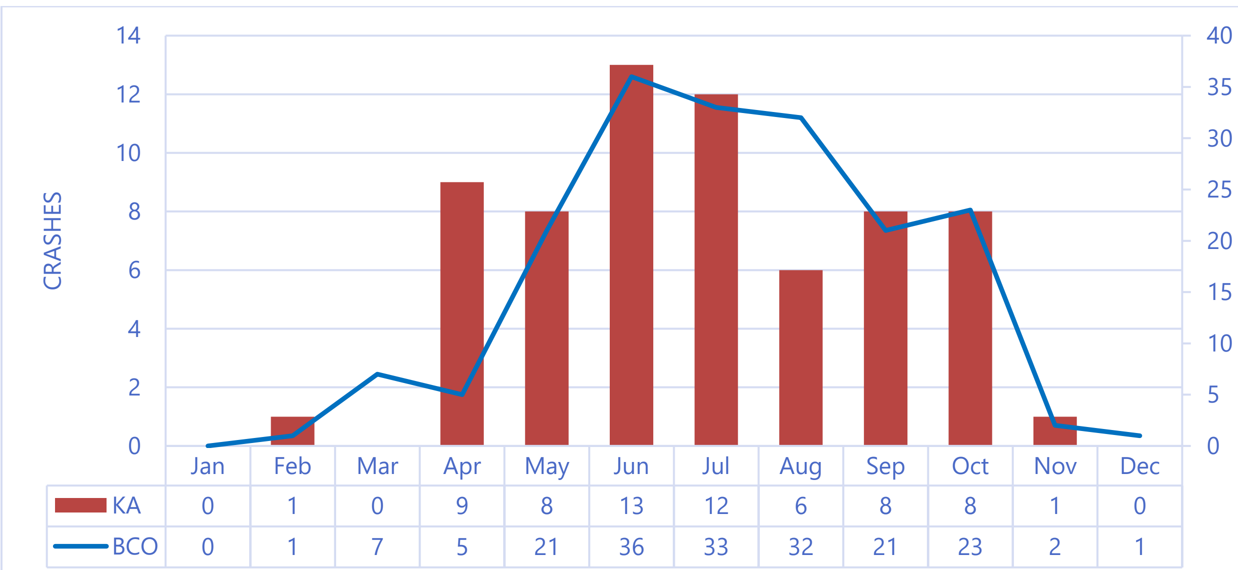


Figure 37. Motorcycle Crash Severity by Month of Year

Table 4 summarizes seasonal motorcycle crashes and crash proportionality. Proportionally, severe crashes appear to be overrepresented in Spring, Fall, and Winter. **Figure 38** displays motorcycle crashes by season.

- Spring contributes 20.2% of total motorcycle crashes; however, 25.8% of severe motorcycle crashes occurred in Spring, highlighting an approximate 6% overrepresentation.
- Fall contributes 25.4% of total motorcycle crashes; however, 25.8% of severe motorcycle crashes occurred in Spring, highlighting an approximate 0.4% overrepresentation.
- Winter contributes 1.2% of total motorcycle crashes; however, 1.4% of severe motorcycle crashes occurred in Winter, highlighting an approximate 0.2% overrepresentation.

Season	KA Crashes	BCO Crashes	Subtotal Crashes	KA Percent of Total KA Crashes	KA Percent of Subtotal Crashes	Percent of Total Crashes
Spring	17	33	50	25.8%	34.0%	20.2%
Summer	31	101	132	47.0%	23.5%	53.2%
Fall	17	46	63	25.8%	27.0%	25.4%
Winter	1	2	3	1.4%	33.3%	1.2%
Total	**66**	**182**	**248**	**100.0%**	**29.5%**	**100.0%**

Spring = March, April, and May
Summer = June, July, and August
Fall = September, October, and November
Winter = December, January, February

Table 4. Motorcycle Crash Counts and Proportions by Season of Year

Motorcycle Seasonal Crashes

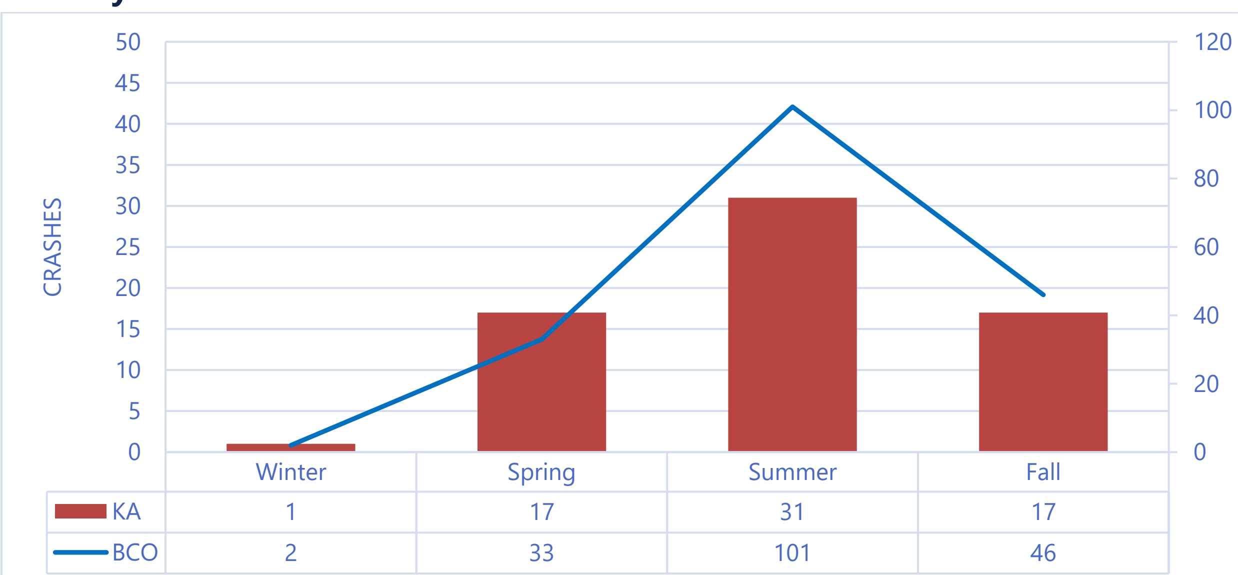


Figure 38. Motorcycle Crash Severity by Season

Motorcycle Focus Area Crashes

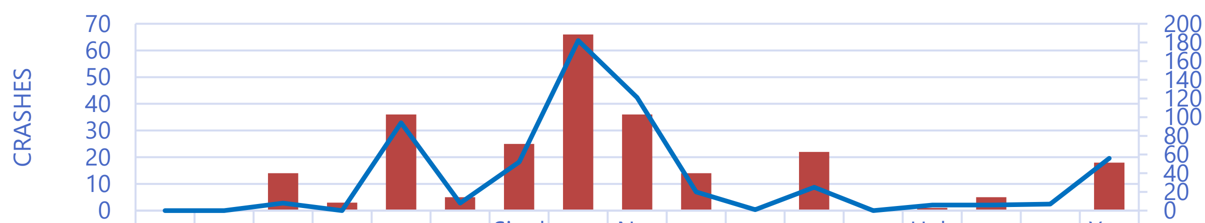
Figure 39 illustrates the number of motorcycle crashes by combined NDDOT focus area identified in North Dakota's current Vision Zero Plan. Note that a single crash may represent multiple focus areas identified.

- 66 severe motorcycle crashes occurred.
- Focus areas making up the highest proportion of all severe motorcycle crashes include the following: not wearing a helmet (55 percent), intersection-related (55 percent), single vehicle

run off road (38 percent), speeding (33 percent), younger driver (27 percent), older driver (21 percent), and impaired road user (21 percent).

- Non-severe motorcycle crashes exhibit different proportions of focus areas: not wearing a helmet (66 percent), intersection related (52 percent) younger driver (31 percent), single vehicle run off road (29 percent), speeding (14 percent), and older driver (11 percent).

- Proportionally, severe crashes make up 100 percent of inattentive driver, 63 percent of impaired road user, 47 percent of speeding, 45 percent of unlicensed driver, 41 percent of older driver, 38 percent of head on collision, 32 percent of single vehicle run off road, 28 percent of intersection related, 23 percent of not wearing a helmet, and 24 percent of younger driver involved motorcycle crashes.



	Commercial Vehicle	Cyclist	Impaired Road User	Inattentive Driver	Intersection Related	Head-On Collision	Single Vehicle Run Off Road	Motorcyclist	Not Wearing Helmet (Motorcyclis...	Older Driver (65+ YO)	Pedestrian	Speeding	Train	Unbelted Vehicle Occupant	Unlicensed Diver	In Workzone	Younger Driver (14 to 20 YO)
KA	0	0	14	3	36	5	25	66	36	14	0	22	0	1	5	0	18
BCO	0	0	8	0	94	8	52	182	121	20	1	25	0	6	6	7	56

Figure 39. Motorcycle Crash Severity by Focus Area

Bicycle

Bicycle General Characteristic Crashes

Figure 40 illustrates the number of bicyclist-involved crashes by lighting conditions.

- Most severe (82 percent) and non-severe (83 percent) crashes occurred during daylight conditions.

- Proportionally, severe bicyclist-involved crashes make up 11 percent of daylight and 8 percent of dark (lighted) light condition crashes (bicyclist-involved).

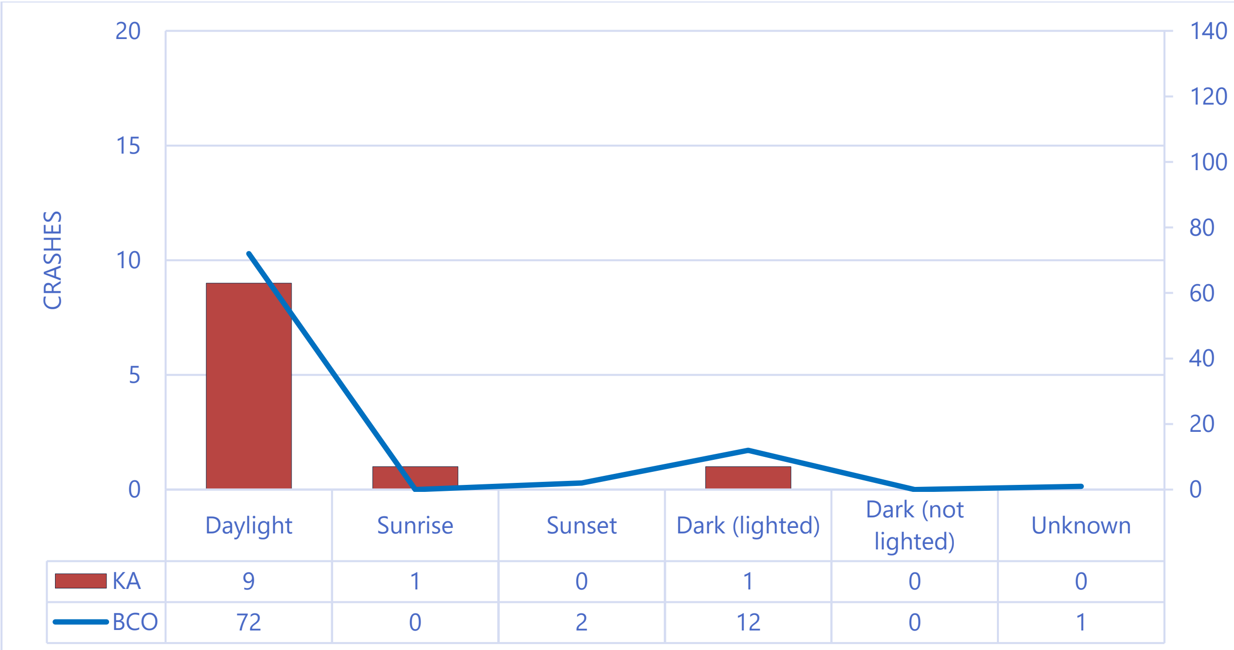


Figure 40. Bicycle Crash Severity by Lighting Conditions

Figure 41 indicates the number of bicyclist-involved crashes by functional classification.

- Most severe crashes occurred on principal arterials (45 percent), minor arterials (27 percent), and local roads (18 percent).
- Proportionally, severe bicyclist-involved crashes make up 13 percent of principal arterial, 14 percent of minor arterial, 8 percent of collector, and 11 percent of local roads (bicyclist-involved).

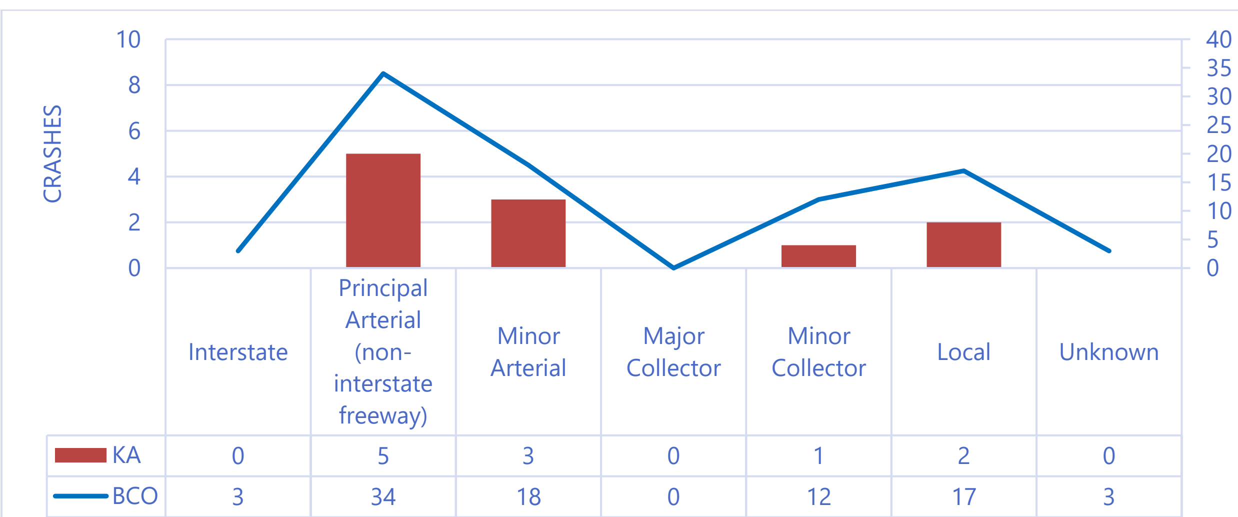


Figure 41. Bicycle Crash Severity by Functional Classification

Bicycle Segment-Related Crashes

Figure 42 illustrates the number of bicyclist-involved segment crashes by functional classification.

- The only severe crash occurred on a minor collector.

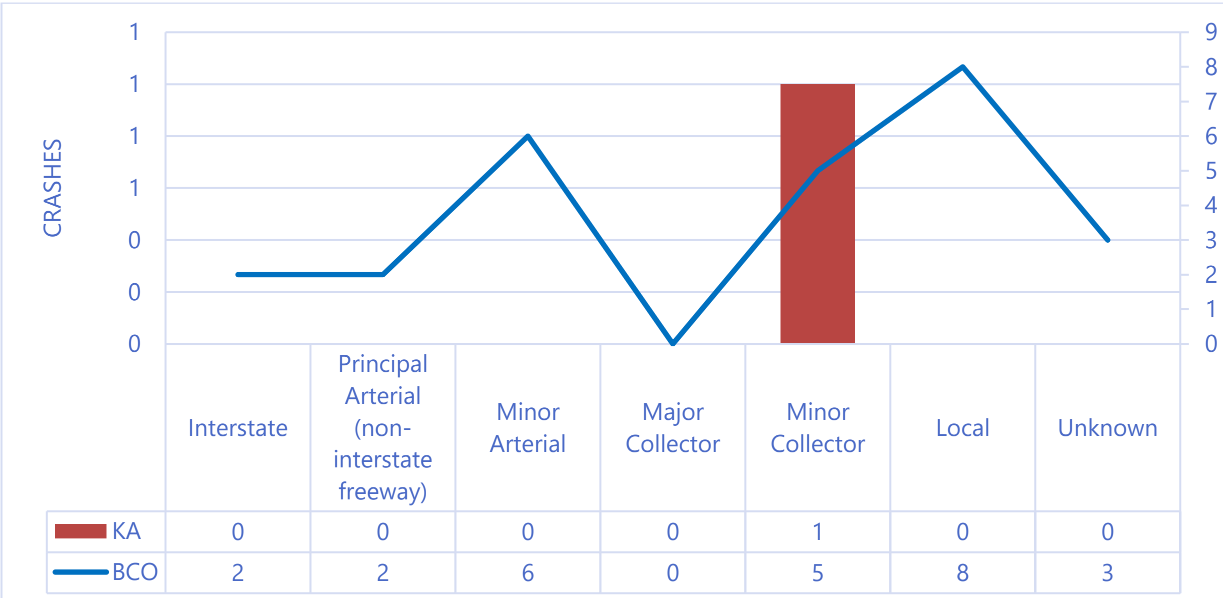


Figure 42. Bicycle Crash Severity by Functional Classification (segment crashes only)

Figure 43 illustrates the number of bicyclist-involved segment crashes by speed limit.

- The only severe crash occurred on a roadway with a speed limit of 35 mph.

Figure 43. Bicycle Crash Severity by Segment Speed Limit (segment crashes only)

Figure 44 illustrates the number of bicyclist-involved segment crashes by roadway configuration.

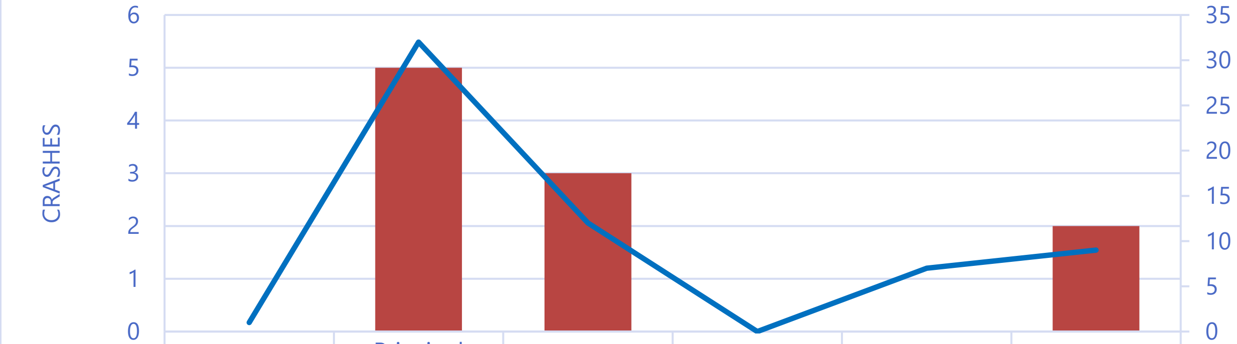
- The only severe crash occurred on a two-way undivided roadway.

Figure 44. Bicycle Crash Severity by Segment Road Configuration (segment crashes only)

Bicycle Intersection-Related Crashes

Figure 45 indicates the number of bicyclist-involved intersection crashes by functional classification.

- Most severe crashes occurred on principal arterials (50 percent), minor arterials (30 percent), and local roads (20 percent).
- Proportionally, severe bicyclist-involved intersection crashes make up 14 percent of principal arterial, 20 percent of minor arterial, and 18 percent of local road crashes (bicyclist-involved).



	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local
KA	0	5	3	0	0	2
BCO	1	32	12	0	7	9

Figure 45. Bicycle Crash Severity by Functional Classification (intersection crashes only

Figure 46 indicates the number of bicyclist-involved intersection crashes by intersection configuration.

- Most severe crashes occurred on four-way (40 percent), T-intersections (20 percent), or were intersection related (40 percent).

- Proportionally, severe bicyclist-involved crashes make up 13 percent of four-way, 20 percent of T-intersection, and 14 percent of intersection-related crashes (bicyclist-involved).

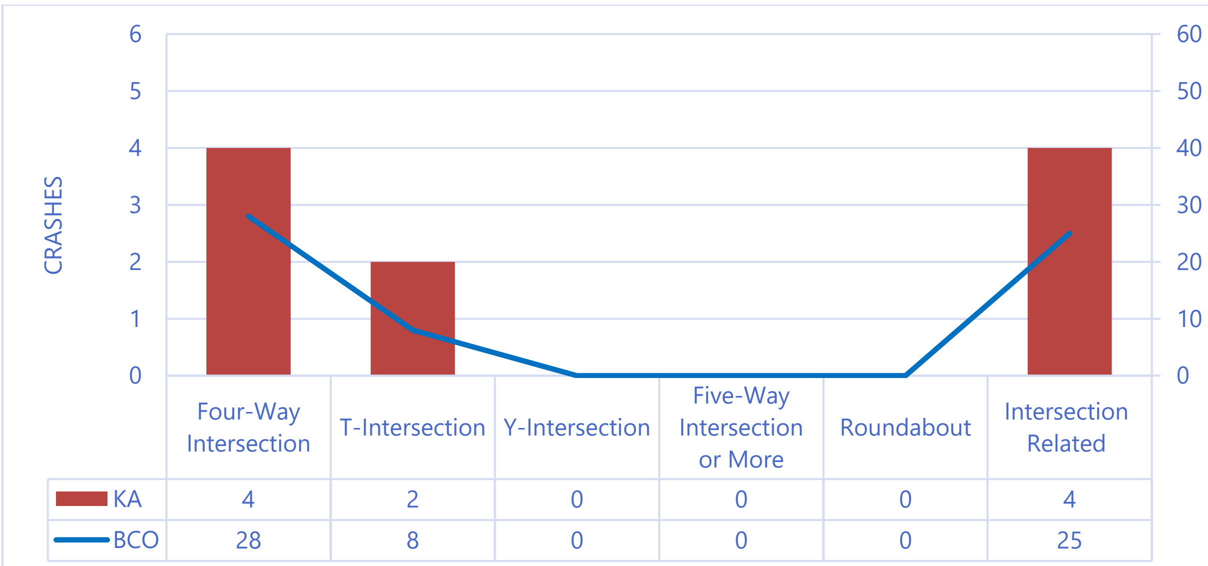
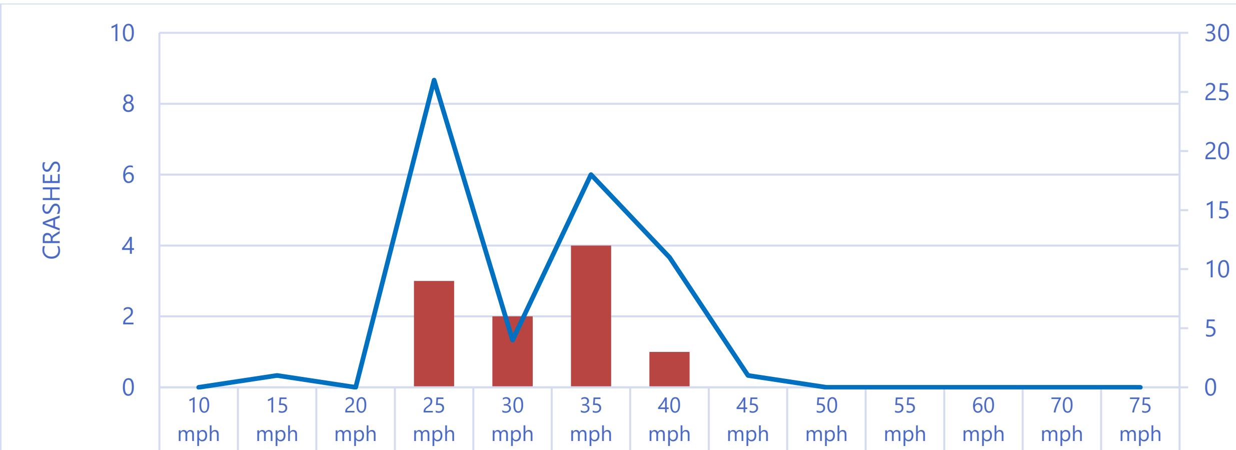


Figure 46. Bicycle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 47 illustrates the number of bicyclist-involved intersection crashes by maximum speed limit.

- Most severe crashes occurred at intersections with speed limits of 35 mph (40 percent), 25 mph (30 percent), 30 mph (20 percent).
- Proportionally, severe bicyclist-involved intersection crashes make up 10 percent of 25 mph, 33 percent of 30 mph, 18 percent of 35 mph, and 8 percent of 40 mph maximum speed limit intersection crashes (bicyclist-involved).



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	70 mph	75 mph
KA	0	0	0	3	2	4	1	0	0	0	0	0	0
BCO	0	1	0	26	4	18	11	1	0	0	0	0	0

Figure 47. Bicycle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 48 illustrates the number of bicyclist-involved intersection crashes by intersection traffic control device.

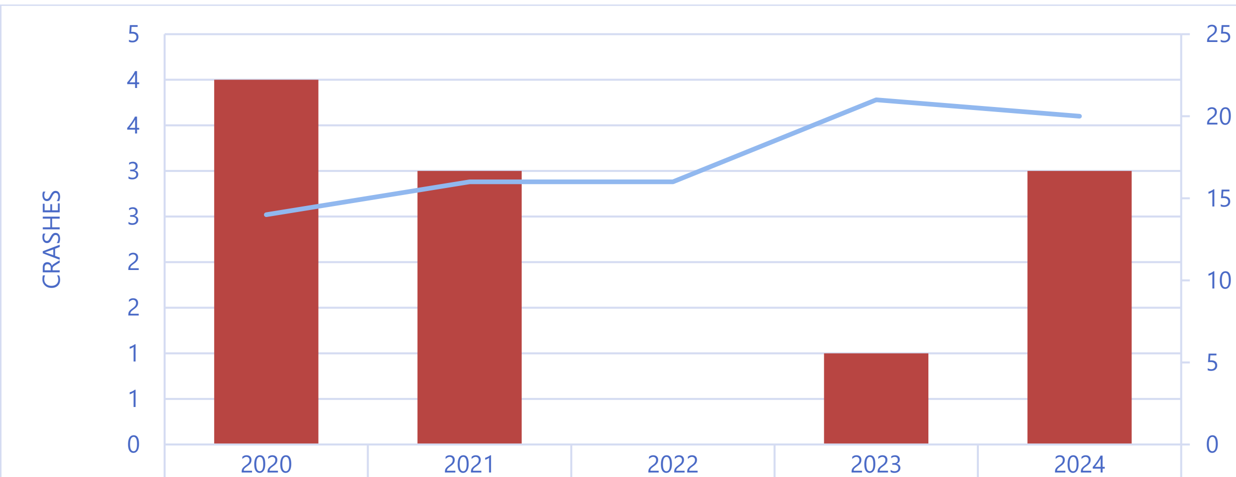
- Most severe crashes occurred at stop sign (60 percent), uncontrolled (20 percent), and signalized (20 percent) intersections.
- Proportionally, severe bicyclist-involved intersection crashes make up 13 percent of uncontrolled, 7 percent of signalized, and 24 percent of stop controlled intersection crashes (bicyclist-involved).

Figure 48. Bicycle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Bicycle Yearly Crashes

Figure 49 shows the number of bicyclist-involved crashes by year.

- Most severe bicycle crashes occurred in 2020 (36 percent) followed by 2021 and 2024 (27 percent each).
- The highest severe proportion of bicyclist-involved crashes was in 2020 (22 percent).
- Overall, 2022 had the fewest bicyclist-involved crashes (16 percent of total) with none reported as severe.



	2020	2021	2022	2023	2024
KA	4	3	0	1	3
BCO	14	16	16	21	20

Figure 49. Bicycle Crash Severity by Year

Bicycle Month of Year Crashes

Figure 50 illustrates the number of bicyclist-involved crashes by month of year.

- Severe crashes were evenly distributed over the months with 1 (9 percent) each, except for January and December with no severe crashes and July with 2 (18 percent).
- July had the most bicyclist-involved crashes for all severities with a total of 19 (19 percent).
- Throughout the five-year period, no bicyclist-involved crashes were reported in the month of January.

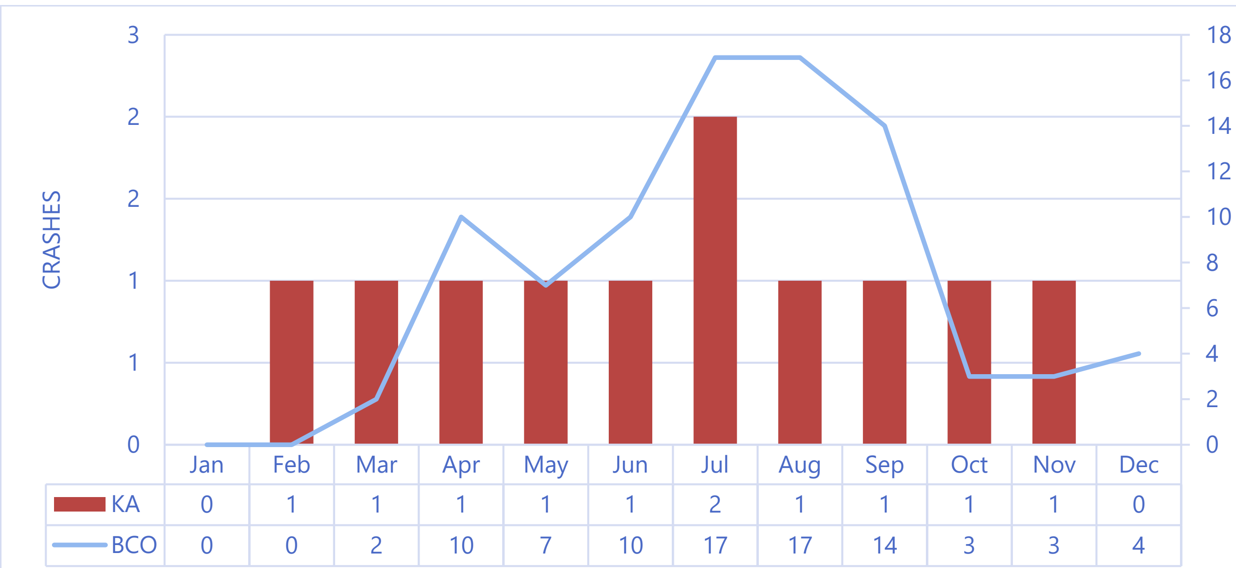


Figure 50. Bicycle Crash Severity by Month of Year

Bicycle Seasonal Crashes

Figure 51 shows the number of bicyclist-involved crashes by season.

- Severe crashes were highest in the summer (36 percent) and lowest in the winter (9 percent).
- Summer had the highest number of total crashes (49 percent) but the lowest proportion of severe crashes (8 percent).
- Winter had the fewest total crashes with 5 (5 percent) but had the highest proportion of severe crashes (25 percent).

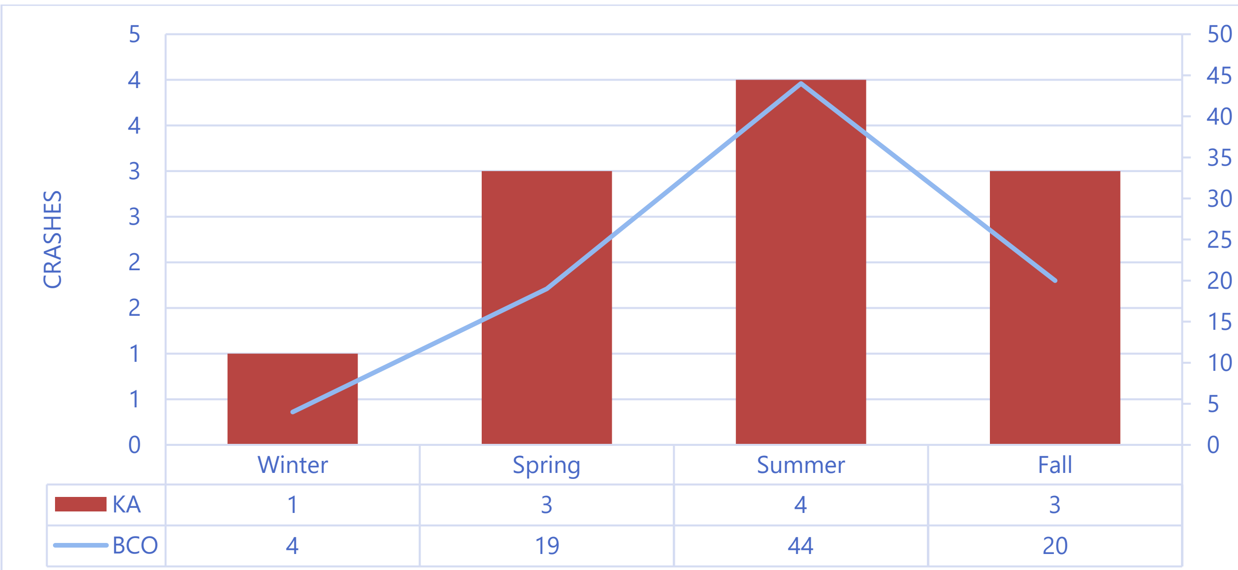
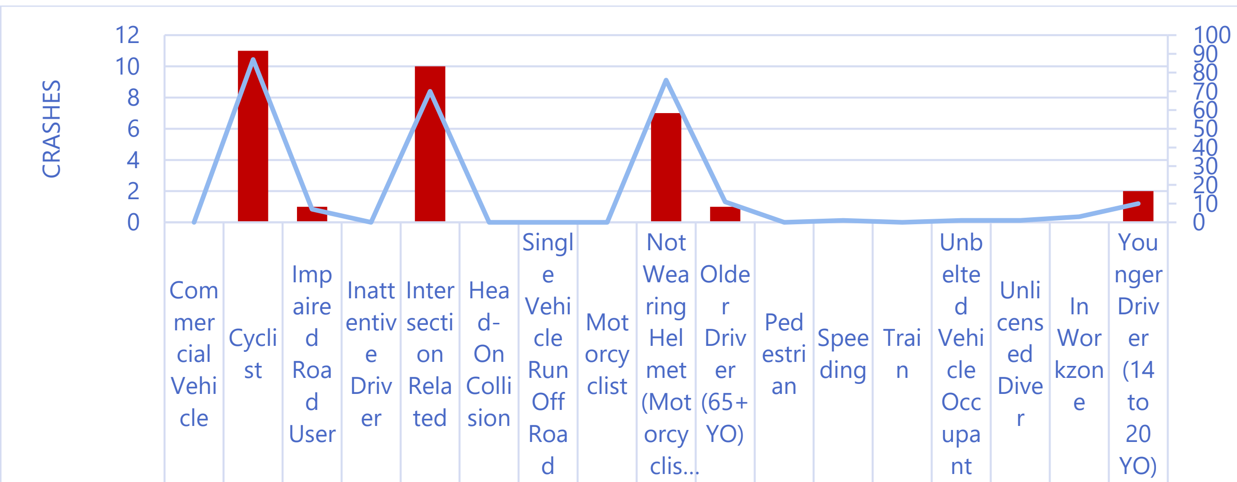


Figure 51. Bicycle Crash Severity by Season

Bicycle Focus Area Crashes

Figure 52 illustrates the number of bicyclist-involved crashes by combined NDDOT focus area identified in North Dakota's current Vision Zero Plan. Note that a single crash may represent multiple focus areas identified.

- 11 severe bicycle crashes occurred.
- Focus areas making up the highest proportion of all severe bicycle crashes include the following: intersection related (91 percent), not wearing a helmet (64 percent), younger driver (18 percent), older driver (9 percent), and impaired road user (9 percent).
- Non-severe bicycle crashes exhibit different proportions of focus areas for the 87 total non-severe bicycle crashes over the five-year period analyzed: not wearing a helmet (66 percent), intersection related (80 percent), older driver (13 percent), younger driver (11 percent), impaired driver (8 percent), and in work zone (3 percent).
- Proportionally, severe bicycle crashes make up 17 percent of younger driver, 14 percent of impaired road user, 14 percent of intersection related, 9 percent of not wearing a helmet, and 8 percent of older driver involved bicycle crashes.



	Commercial Vehicle	Cyclist	Impaired Road User	Inattentive Driver	Intersection Related	Head-On Collision	Single Vehicle Run Off Road	Motorcyclist	Not Wearing Helmet (Motorcyclis...	Older Driver (65+ YO)	Pedestrian	Speeding	Train	Unbelted Vehicle Occupant	Unlicensed Diver	In Workzone	Younger Driver (14 to 20 YO)
KA	0	11	1	0	10	0	0	0	7	1	0	0	0	0	0	0	2
BCO	0	87	7	0	70	0	0	0	76	11	0	1	0	1	1	3	10

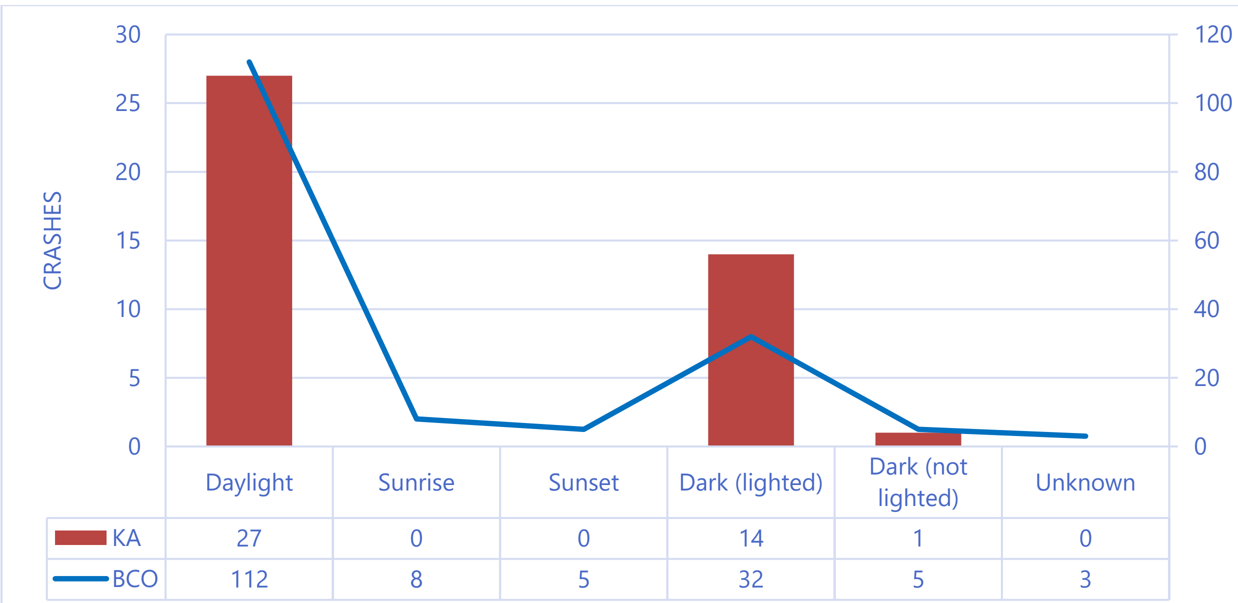
Figure 52. Bicycle Crash Severity by Focus Area

Pedestrian

Pedestrian General Characteristic Crashes

Figure 53 indicates the number of pedestrian-involved crashes by lighting condition.

- Most severe pedestrian crashes, or 64 percent, occurred during daylight conditions, followed by dark (lighted) conditions with 33 percent.
- Proportionally, severe pedestrian-involved crashes make up 19 percent of daylight, 30 percent of dark (lighted), and 20 percent of dark (not lighted) lighting condition crashes (pedestrian-involved).

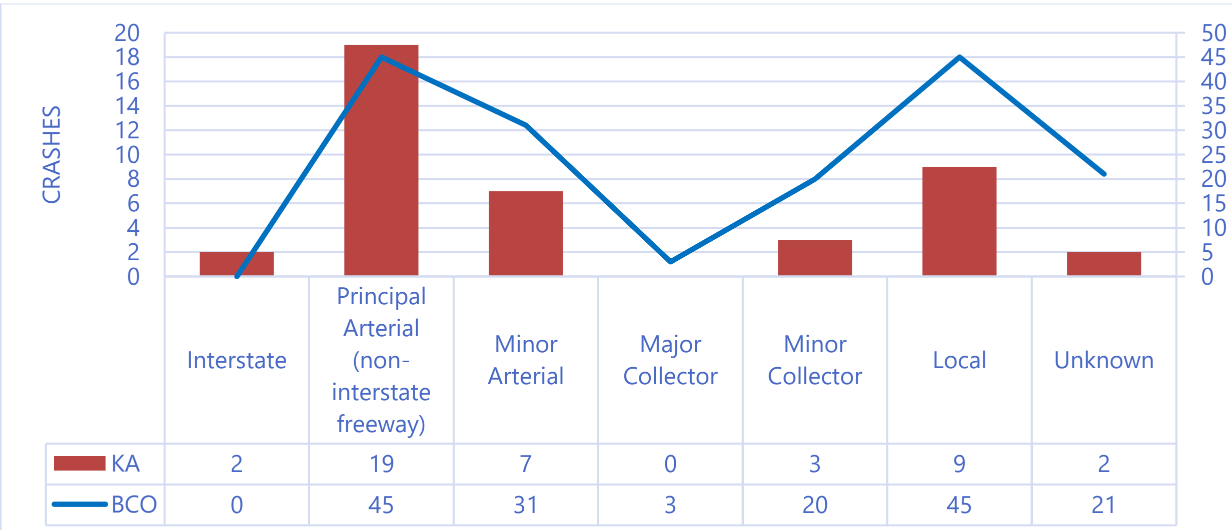


	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	27	0	0	14	1	0
BCO	112	8	5	32	5	3

Figure 53. Pedestrian Crash Severity by Lighting Conditions

Figure 54 illustrates the number of pedestrian-involved crashes by functional classification.

- Most severe crashes occurred on principal arterials (45 percent), minor arterials (17 percent), and local roads (21 percent).
- Proportionally, pedestrian-involved crashes make up 30 percent of principal arterial, 18 percent of minor arterial, 12 percent of collector, and 17 percent of local road crashes (pedestrian-involved).



	Interstate	Principal Arterial (non-interstate freeway)	Minor Arterial	Major Collector	Minor Collector	Local	Unknown
KA	2	19	7	0	3	9	2
BCO	0	45	31	3	20	45	21

Figure 54. Pedestrian Crash Severity by Functional Classification

Pedestrian Segment-Related Crashes

Figure 55 illustrates the number of pedestrian-involved segment crashes by functional classification.

- Most of the severe crashes (82 percent) occurred on principal arterials, minor arterials, and local roads.

- Proportionally, severe pedestrian-involved segment crashes make up 32 percent of principal arterial, 24 percent of minor arterial, 5 percent of minor arterial, and 17 percent of local road segment crashes (pedestrian-involved).

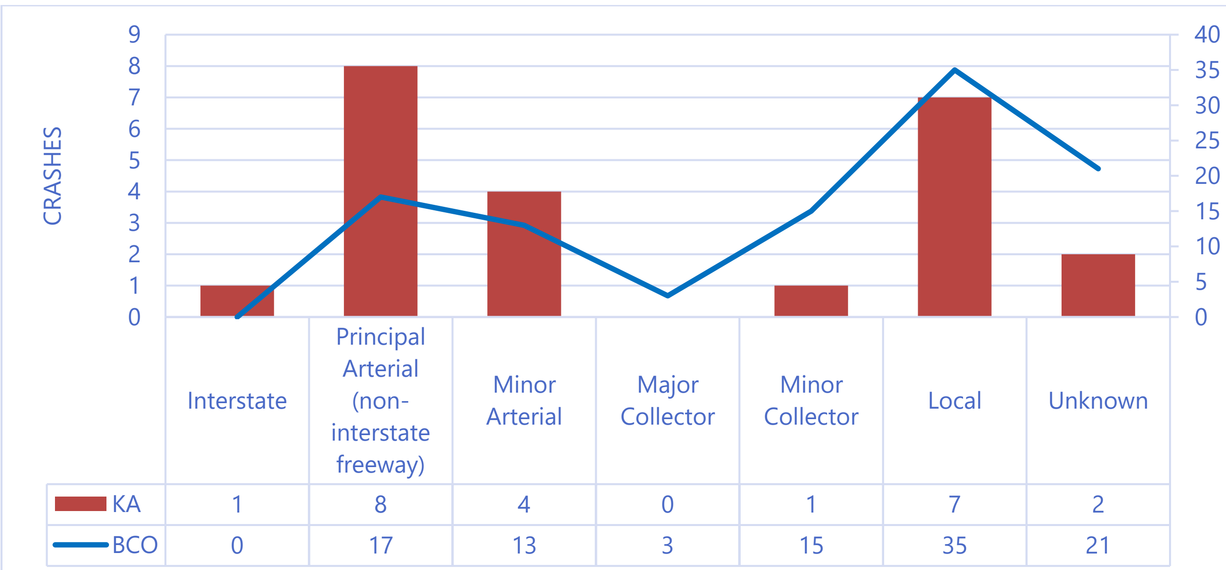
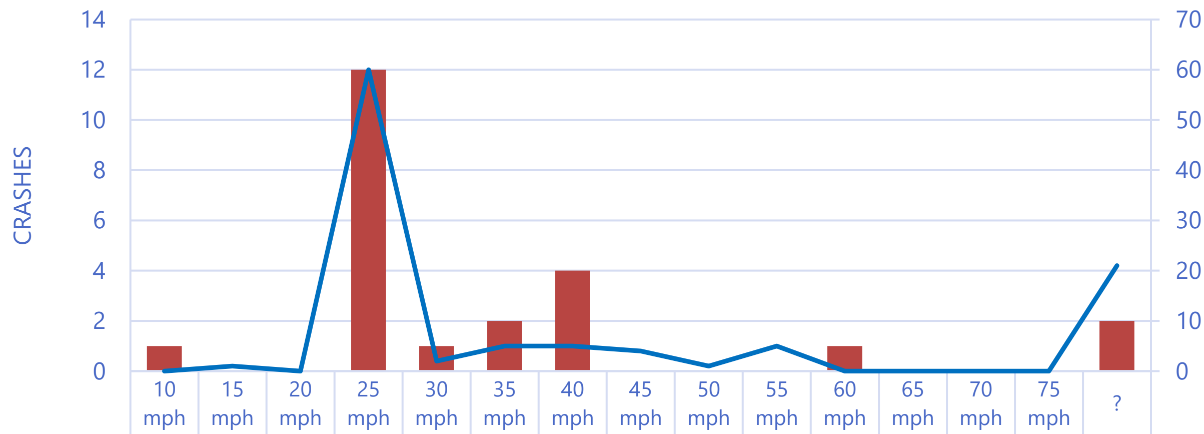


Figure 55. Pedestrian Crash Severity by Functional Classification (segment crashes only)

Figure 56 shows the number of pedestrian-involved segment crashes by speed limit.

- Severe segment crashes occurred on roadways with a speed limit of 10 mph (4 percent), 25 mph (52 percent), 30 mph (4 percent), 35 mph (9 percent), 40 mph (17 percent), and 60 mph (4 percent).

- Proportionally, severe pedestrian-involved segment crashes make up 17 percent of 25 mph, 33 percent of 30 mph, 29 percent of 35 mph, and 44 percent of 40 mph segment crashes (pedestrian-involved).



	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	75 mph	?
KA	1	0	0	12	1	2	4	0	0	0	1	0	0	0	2
BCO	0	1	0	60	2	5	5	4	1	5	0	0	0	0	21

Figure 56. Pedestrian Crash Severity by Segment Speed Limit (segment crashes only)

Pedestrian Intersection-Related Crashes

Figure 57 illustrates the number of pedestrian-involved intersection crashes by functional classification.

- Most severe crashes occurred on principal arterials (58 percent), minor arterials (16 percent), collectors and local roads (each at 11 percent).
- Proportionally, severe pedestrian-involved intersection crashes make up 28 percent of principal arterial, 14 percent of minor arterial, 40 percent of collector, and 20 percent of local road crashes (pedestrian-involved).

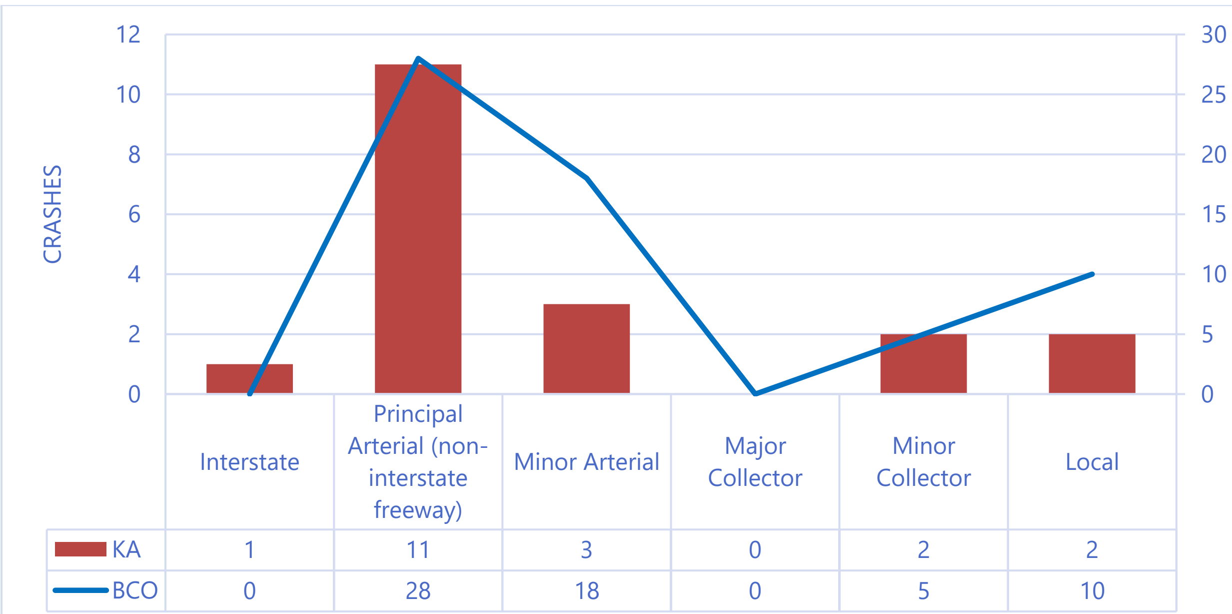


Figure 57. Pedestrian Crash Severity by Functional Classification (intersection crashes only)

Figure 58 illustrates the number of pedestrian-involved intersection crashes by intersection configuration.

- Most severe crashes occurred at four-way intersections (53 percent) or were intersection related (37 percent).

- Proportionally, severe pedestrian-involved intersection crashes make up 31 percent of four-way, 14 percent of T-intersection, and 21 percent of intersection-related crashes (pedestrian-involved).

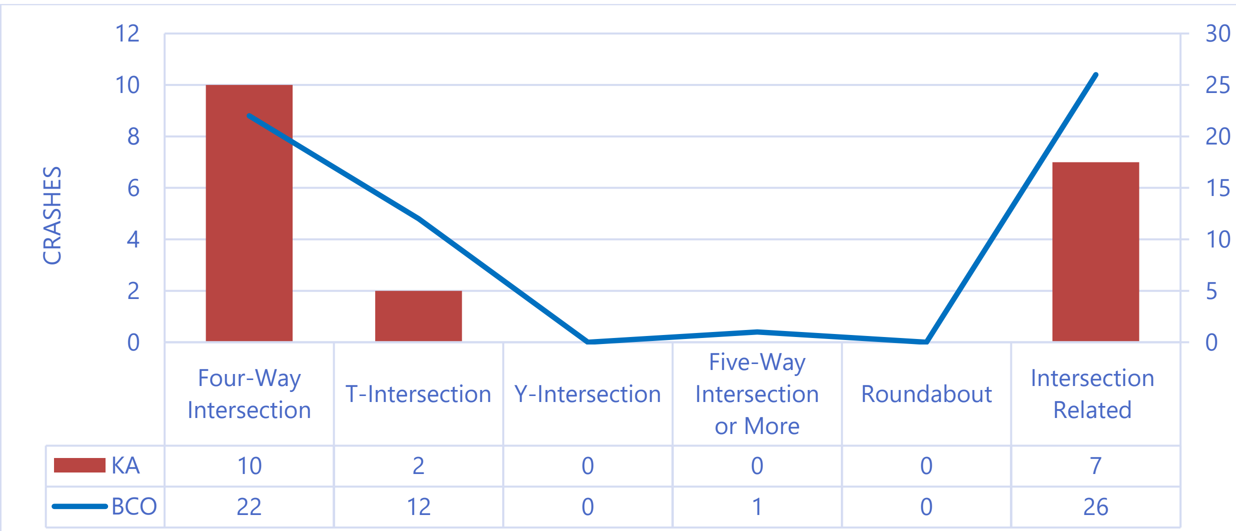
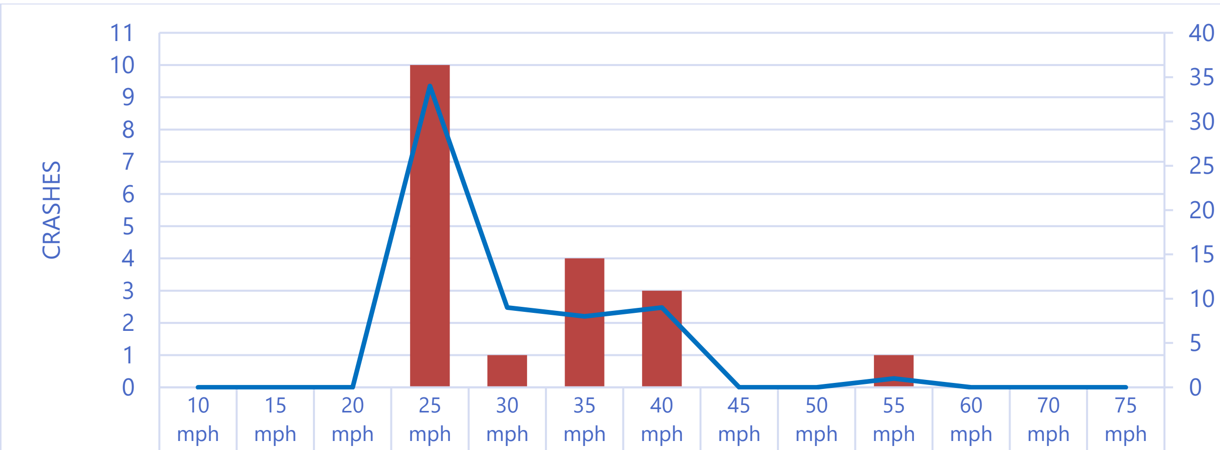


Figure 58. Pedestrian Crash Severity by Intersection Configuration (intersection crashes only)

Figure 59 indicates the number of pedestrian-involved intersection crashes by maximum speed limit.

- Most severe crashes occurred at intersections with maximum speed limits of 25 mph (53 percent), 35 mph (21 percent), and 40 mph (16 percent).
- Proportionally, severe pedestrian-involved intersection crashes make up 23 percent of 25 mph, 10 percent of 30 mph, 33 percent of 35 mph, 25 percent of 40 mph, and 50 percent of 55 mph maximum speed limit intersection crashes (pedestrian-involved).



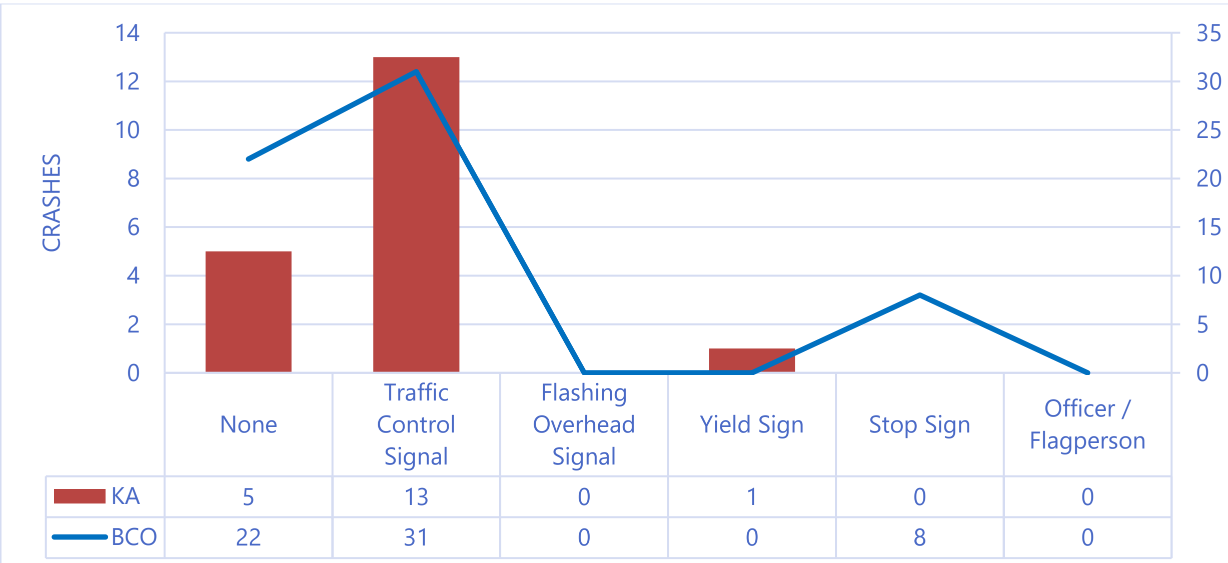
	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	70 mph	75 mph
KA	0	0	0	10	1	4	3	0	0	1	0	0	0
BCO	0	0	0	34	9	8	9	0	0	1	0	0	0

Figure 59. Pedestrian Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 60 illustrates the number of pedestrian-involved intersection crashes by intersection traffic control device.

- Most severe crashes occurred at signalized (68 percent) and uncontrolled (26 percent) intersections.

- Proportionally, severe pedestrian-involved intersection crashes make up 19 percent of uncontrolled and 30 percent of signalized intersection crashes (pedestrian-involved).



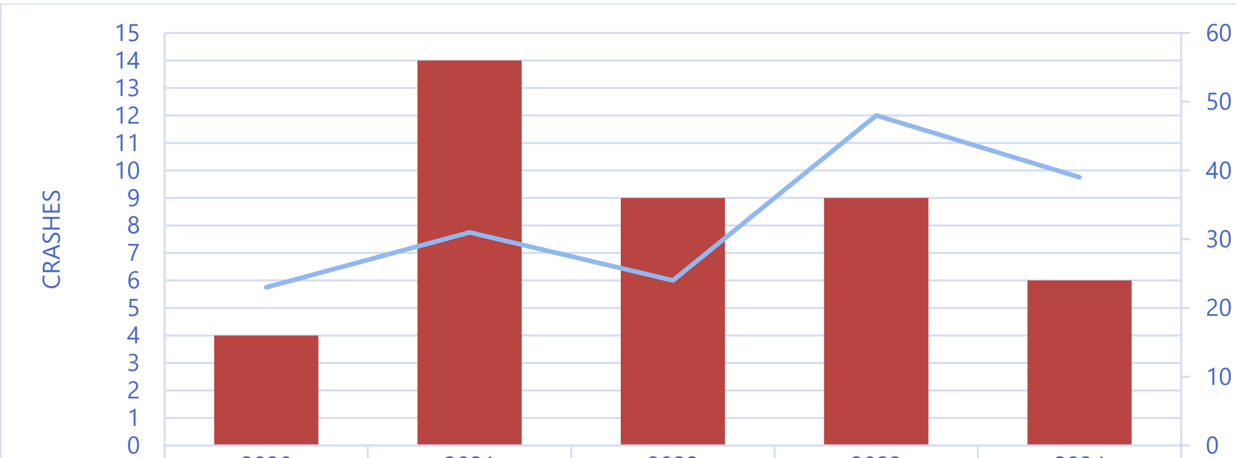
	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Officer / Flagperson
KA	5	13	0	1	0	0
BCO	22	31	0	0	8	0

Figure 60. Pedestrian Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Pedestrian Yearly Crashes

Figure 61 shows the number of pedestrian-involved crashes by year.

- 42 severe pedestrian crashes and 165 non-severe pedestrian crashes occurred.
- Most severe pedestrian crashes occurred in 2021 (31 percent) followed by 2022 and 2023 (20 percent each).
- Proportionally, severe pedestrian-involved crashes make up 15 percent of 2020, 31 percent of 2021, 27 percent of 2022, 16 percent of 2023, and 13 percent of 2024 pedestrian-involved crashes.



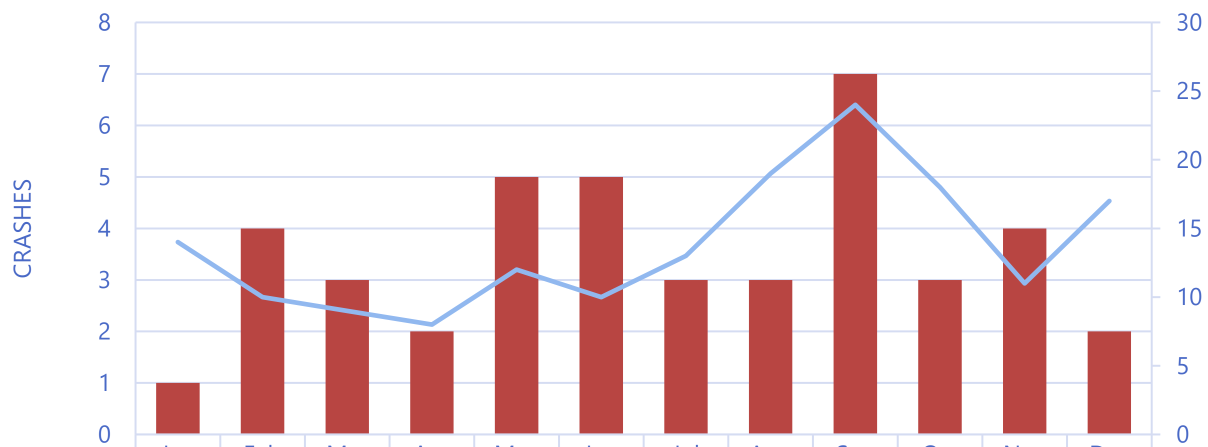
	2020	2021	2022	2023	2024
KA	4	14	9	9	6
BCO	23	31	24	48	39

Figure 61. Pedestrian Crash Severity by Year

Pedestrian Month of Year Crashes

Figure 62 illustrates the number of pedestrian-involved crashes by month of year.

- September is the month with the most severe crashes (16 percent) followed by May and June (12 percent each).
- Proportionally, severe pedestrian-involved crashes make up 7 percent of January, 29 percent of February, 25 percent of March, 20 percent of April, 29 percent of May, 33 percent of June, 19 percent of July, 14 percent of August, 23 percent of September, 14 percent of October, 27 percent of November, and 11 percent of December pedestrian-involved crashes.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
KA	1	4	3	2	5	5	3	3	7	3	4	2
BCO	14	10	9	8	12	10	13	19	24	18	11	17

Figure 62. Pedestrian Crash Severity by Month of Year

Pedestrian Seasonal Crashes

Table 5 and **Figure 63** summarize seasonal pedestrian crashes and crash proportionality. Proportionally, severe crashes appear to be overrepresented in Spring, Summer, and Fall.

- Spring contributes 18.8% of total pedestrian crashes; however, 23.8% of severe pedestrian crashes occurred in Spring, highlighting a 5% overrepresentation.
- Summer contributes 25.6% of total pedestrian crashes; however, 26.2% of severe pedestrian crashes occurred in Summer, highlighting a 0.6% overrepresentation.
- Fall contributes 32.4% of total pedestrian crashes; however, 33.3% of severe pedestrian crashes occurred in Fall, highlighting a 0.9% overrepresentation.

Season	KA Crashes	BCO Crashes	Subtotal Crashes	KA Percent of Total KA Crashes	KA Percent of Subtotal Crashes	Percent of Total Crashes
Spring	10	29	39	23.8%	25.6%	18.8%
Summer	11	42	53	26.2%	20.8%	25.6%
Fall	14	53	67	33.3%	20.9%	32.4%
Winter	7	41	48	16.7%	14.6%	23.2%
Total	**42**	**165**	**207**	**100.0%**	**20.3%**	**100.0%**

Spring = March, April, and May
Summer = June, July, and August
Fall = September, October, and November
Winter = December, January, February
Table 5. Pedestrian Crash Counts and Proportions by Season of Year

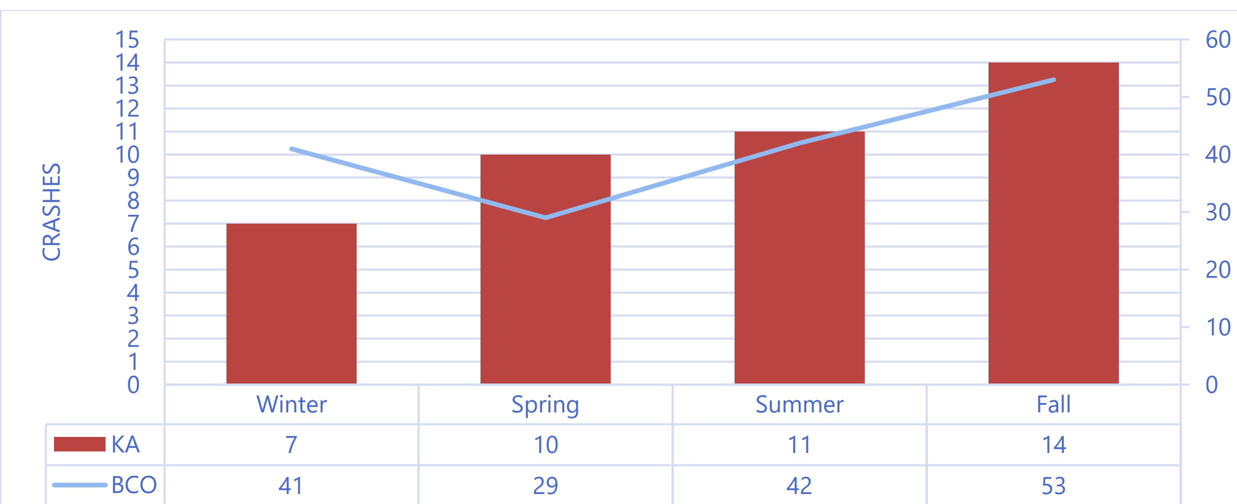
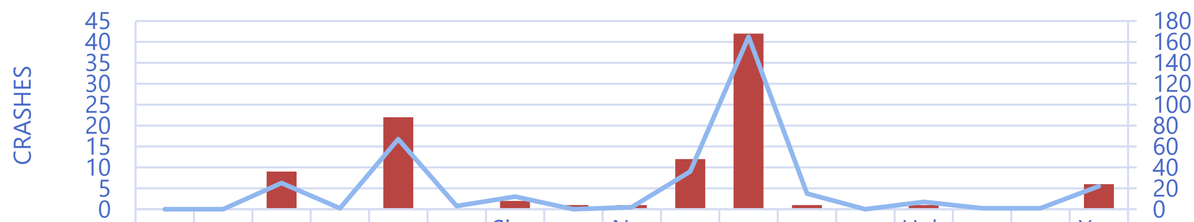


Figure 63. Pedestrian Crash Severity by Season

Pedestrian Focus Area Crashes

Figure 64 illustrates the number of pedestrian-involved crashes by combined NDDOT focus area identified in North Dakota's current Vision Zero Plan. Note that a single crash may represent multiple focus areas identified.

- 42 severe pedestrian crashes occurred.
- Focus areas making up the highest proportion of all severe pedestrian crashes include the following: intersection related (52 percent), older driver (29 percent), impaired road user (21 percent), and younger driver (14 percent).
- Non-severe pedestrian crashes exhibit different proportions of focus areas for the 165 total non-severe pedestrian crashes over the five-year period analyzed: intersection related (41 percent), older driver (22 percent), impaired road user (15 percent), younger driver (13 percent), and speeding (9 percent).
- Proportionally, severe pedestrian crashes make up 26 percent of impaired road user, 25 percent of intersection related, 25 percent of older driver, 21 percent of younger driver, and 6 percent of speeding involved pedestrian crashes.



	Commercial Vehicle	Cyclist	Impaired Road User	Inattentive Driver	Intersection Related	Head-On Collision	Single Vehicle Run Off Road	Motorcyclist	Not Wearing Helmet (Motorcyclis…	Older Driver (65+ YO)	Pedestrian	Speeding	Train	Unbelted Vehicle Occupant	Unlicensed Diver	In Workzone	Younger Driver (14 to 20 YO)
KA	0	0	9	0	22	0	2	1	1	12	42	1	0	1	0	0	6
BCO	0	0	25	1	67	3	12	0	2	36	165	15	0	7	1	1	22

Figure 64. Pedestrian Crash Severity by Focus Area

Work Zone

Work Zone Yearly Crashes

Figure 65 shows the number of crashes in work zones by year.

- There were only 4 severe crashes reported in work zones between 2020 and 2024, with 2 (50 percent) occurring in 2022 and 1 in 2021 and 2023 (25 percent year).
- Proportionally, severe work zone crashes make up 5 percent of 2022, 2 percent of 2021, and 1 percent of 2023 work zone crashes.
- 37 percent of total work zone crashes occurred in 2023 while only 10 percent occurred in 2022.

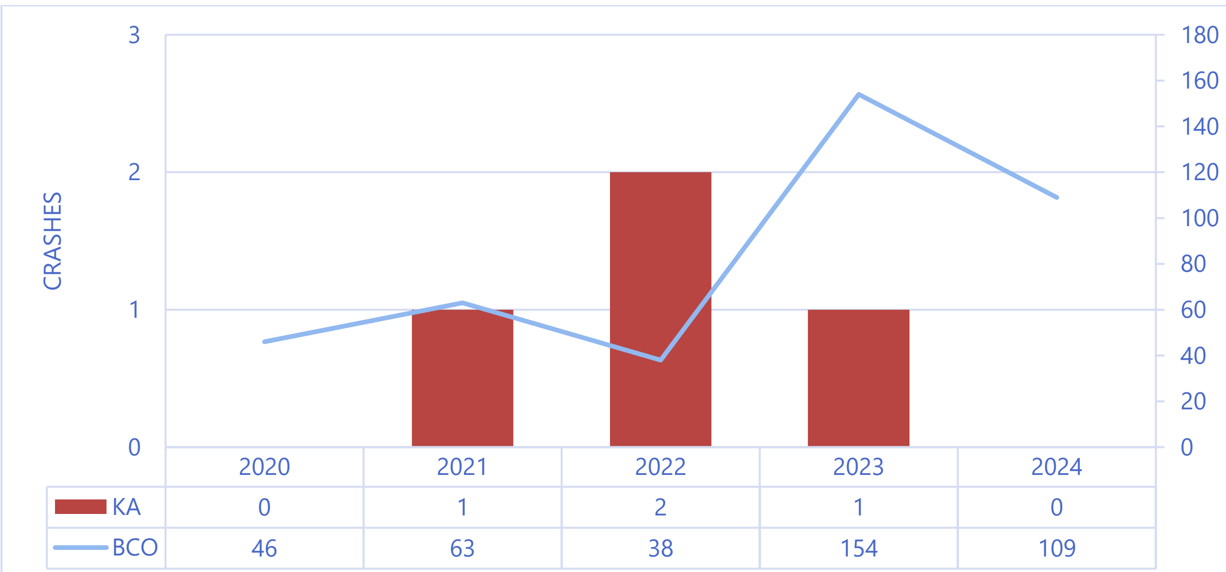


Figure 65. Work Zone Crash Severity by Year

Off Highway Vehicles (OHVs)

Off-Highway Vehicle Yearly Crashes

Figure 66 shows the number of OHV-involved crashes by year.

- 21 severe and 40 non-severe OHV-involved crashes occurred.
- Most severe crashes occurred in 2022 (27 percent).
- Proportionally, severe OHV crashes make up 21 percent of 2020, 15 percent of 2021, 40 percent of 2022, 43 percent of 2023, and 27 percent of 2024 OHV-involved crashes.

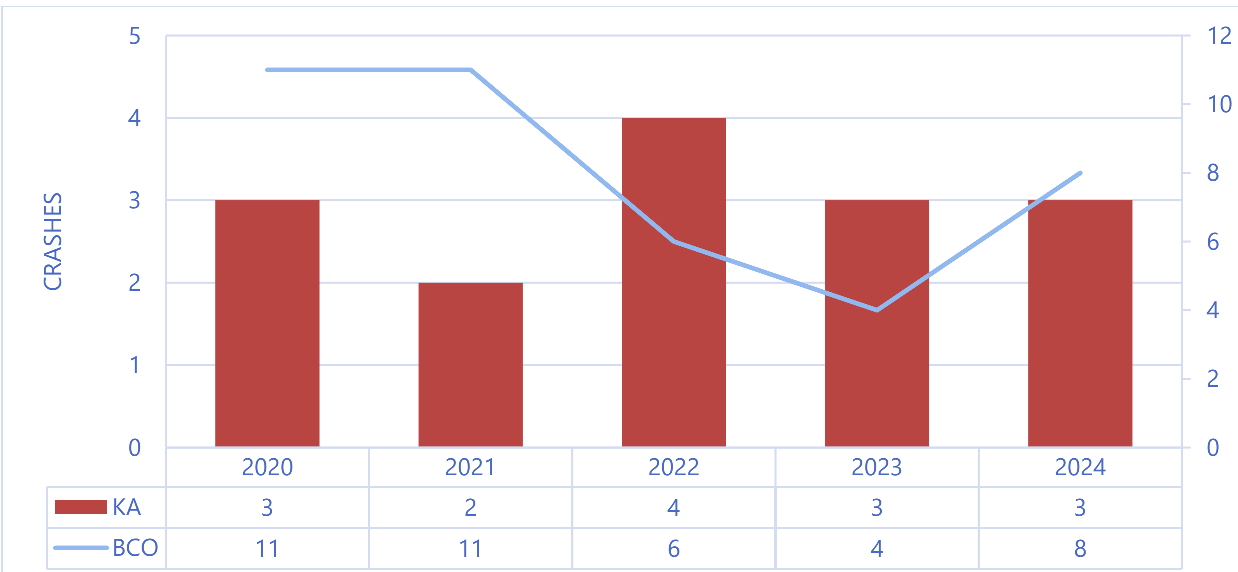
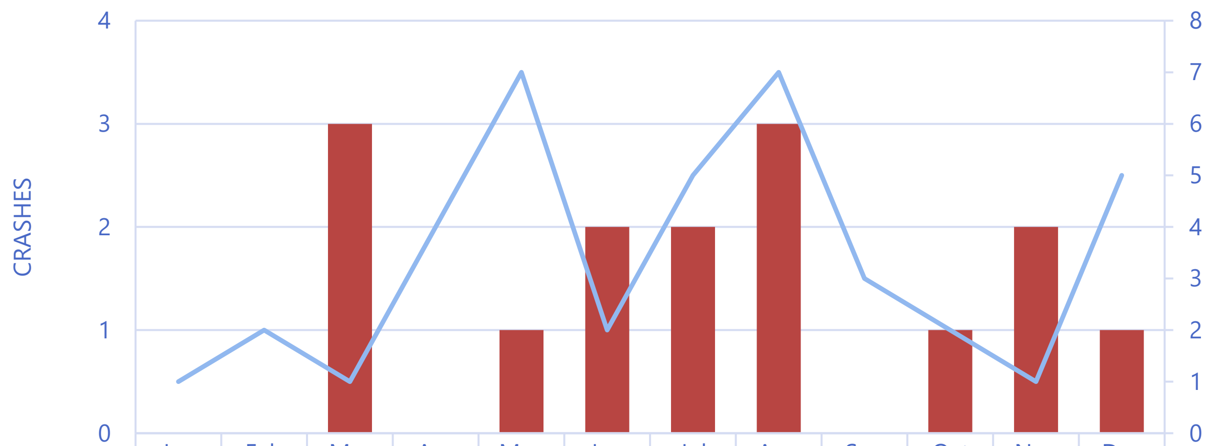


Figure 66. OHV Crash Severity by Year

Off-Highway Vehicle Month of Year Crashes

Figure 67 illustrates the number of OHV-involved crashes by month of year.

- Most severe crashes occurred in March and August (20 percent each).
- Proportionally, severe OHV crashes make up 75 percent of March, 66 percent of November, and 50 percent of June OHV-involved crashes.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
KA	0	0	3	0	1	2	2	3	0	1	2	1
BCO	1	2	1	4	7	2	5	7	3	2	1	5

Figure 67. OHV Crash Severity by Month of Year

Off-Highway Vehicle Seasonal Crashes

Figure 68 shows the number of OHV-involved crashes by season.

- Most severe crashes occurred in Summer (47 percent) follow by spring (27 percent), fall (20 percent), and winter (7 percent).
- Proportionally, severe OHV crashes make up 33 percent of summer, 33 percent of fall, 25 percent of spring, and 11 percent of winter OHV-involved crashes.

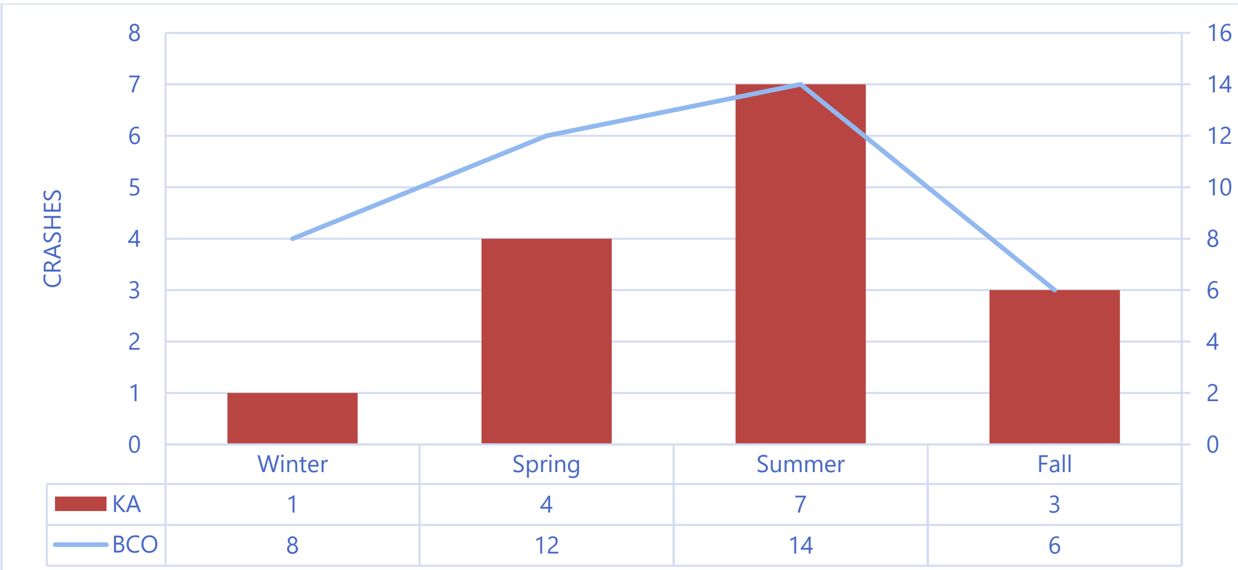


Figure 68. OHV Crash Severity by Season

Off-Highway Vehicle Focus Area Crashes

Figure 69 illustrates the number of OHV-involved crashes by combined NDDOT focus area identified in North Dakota's current Vision Zero Plan. Note that a single crash may represent multiple focus areas identified.

- 21 severe OHV crashes occurred.
- Focus areas making up the highest proportion of all severe OHV crashes include the following: not wearing a helmet (53 percent), single vehicle run off road (38 percent), younger driver (24%), speeding (19%), and impaired road user (14 percent).
- Non-severe OHV crashes exhibit different proportions of focus areas for the 40 total non-severe OHV crashes over the five-year period analyzed: not wearing a helmet (75 percent), single vehicle run off road (53%), intersection related (38 percent), younger driver (28 percent), and speeding (13 percent).
- Proportionally, severe OHV crashes make up 60 percent of impaired road user, 12 percent of intersection related, 28 percent of single vehicle run off road, 27 percent of not wearing a helmet, 44 percent of speeding, and 31 percent of younger driver involved OHV crashes.

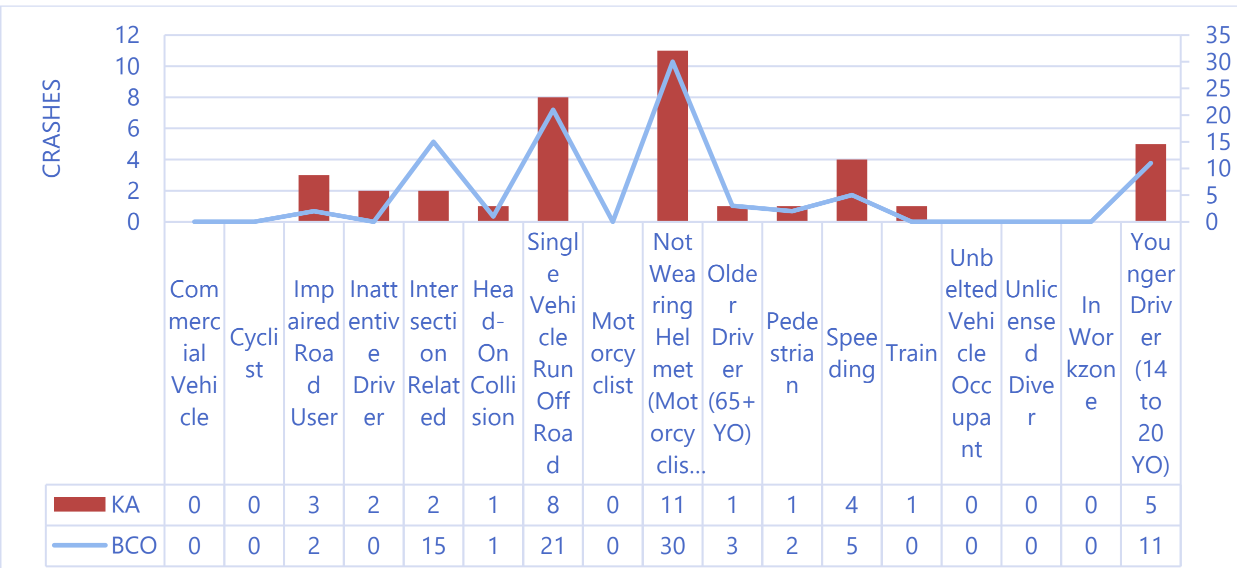


Figure 69. OHV Crash Severity by Focus Area

Summary of Trends

Over the five year period of 2020-2024, severe crashes peaked in 2021, with severe crashes down in years 2023 and 2024 as compared to other years; however, bicycle and pedestrian crashes, and the proportion thereof have increased over the five-year period.

When involved in a crash, motorcyclists, bicyclists, and pedestrians are at the highest risk of death and life-changing injury, reflecting vulnerability of these travel modes when involved in a crash with larger and/or faster-moving vehicles.

Severe crashes are overrepresented in Summer and Fall, reflecting higher multimodal traffic and higher travel speeds.

People involved in crashes on Township and County roads are at a higher risk of death and life-changing injury; however, a vast majority of crashes including severe crashes in the Bismarck-Mandan region occurred on State and City streets.

Nearly one out of every four severe crashes involved someone considered a younger-driver (14-20 years old), involved someone considered an older-driver (65 years old or older), involved someone who was impaired, and/or someone who was not using a seatbelt.

Memorandum

SRF No. 16072

To: Kim Riepl
Bismarck-Mandan Metropolitan Planning Organization

From: SRF Consulting Group

Date: March 3, 2025

Subject: Literature & Policy Review – 2025 Safety Policy Study

Task 2.1: Literature & Policy Review

Table of Contents

Introduction

The Bismarck-Mandan Metropolitan Planning Organization (BMMPO) 2025 Safety Policy Study (study) is guided by an extensive literature review of transportation safety policies and plans at the local, state, and federal levels. These documents establish goals, objectives, and recommended actions that align with best practices in transportation safety planning. The primary themes from the policy analysis emphasize Vision Zero, data-driven decision-making, multimodal safety improvements, infrastructure maintenance, congestion reduction, freight movement, environmental sustainability, and public engagement. The Literature and Policy Review Memo (memo) provides a review of BMMPO (local/regional), North Dakota Department of Transportation (state), and Federal Highway Administration (federal) resources to ensure the Safety Policy Study is informed by an established framework and aligns with broader transportation planning efforts.

Executive Summary - Key Takeaways

This memo provides a comprehensive analysis of transportation safety strategies, leveraging regional and state-level information for the study analysis and recommendations. The memo examines crash data trends, identifies critical risk factors, and informs a range of safety interventions aligned with Vision Zero principles. Additionally, the memo's review should be consulted throughout the study to ensure alignment with best practices.

Key Takeaways:

- Documentation analysis indicates an upward trend in certain crash types, such as at intersections and along high-speed corridors.
- Key contributors to crashes include speeding, impaired driving, and pedestrian-involved incidents.
- Recommendations include enhanced traffic calming measures, improved pedestrian and cyclist infrastructure, and stronger enforcement policies.
- A phased approach is suggested, focusing on immediate interventions, mid-term policy adjustments, and long-term infrastructure improvements.
- Effective safety improvements require coordination among transportation agencies, law enforcement, and community stakeholders.
- The review aligns with Vision Zero objectives and emphasizes data-driven decision-making to eliminate roadway fatalities and serious injuries.

Review of Relevant Plans and Policies

USDOT National Roadway Safety Strategy

First published on January 27, 2022, the U.S. Department of Transportation's (USDOT's) National Roadway Safety Strategy (NRSS) aims to significantly reduce roadway fatalities and serious injuries in the United States. The strategy is based on the Safe System Approach which acknowledges that human mistakes are inevitable but are possible to prevent from leading to severe consequences.

Figure 1. U.S. Department of Transportation's Safe System Approach

Elements of the NRSS include (see Figure 1):

- **Safer People:** Promoting responsible behavior among road users through education, enforcement, and incentives.
- **Safer Roads:** Designing and maintaining roadways that prioritize safety for all users, including pedestrians, cyclists, and motorists.
- **Safer Vehicles:** Encouraging the adoption of advanced vehicle safety technologies to prevent crashes and mitigate their impact.
- **Safer Speeds:** Implementing policies and engineering solutions to ensure appropriate speed limits and reduce the likelihood of high-speed crashes.
- **Post-Crash Care:** Enhancing emergency response and medical services to improve survival rates and recovery outcomes.

The USDOT regularly updates the NRSS with progress reports to assess effectiveness and refine strategies. The strategy also includes the Allies in Action initiative, which encourages organizations to commit to specific safety actions.

Relevance to the 2025 Safety Policy Study: The NRSS's focus on promoting responsible road user behavior aligns with the MPO's study public engagement goals. Special emphasis on roadway design improvements would also support the efforts to enhance multimodal safety and prioritize infrastructure maintenance for all users, including pedestrians and cyclists. Alignment of the Safety Policy Study to the NRSS will be a critical eligibility component for future Safe Streets and Roads for All (SS4A) program funds. The SS4A program was established under the Infrastructure Investment and Jobs Act (IIJA), which was signed into law on November 15, 2021. The program provides $5 billion in funding over five years (2022-2026) to support local initiatives aimed at preventing roadway deaths and serious injuries. The SS4A program's intended purpose is to improve road safety by funding regional, local, and tribal efforts to develop and implement comprehensive safety action plans and infrastructure projects.

Key Content:
- Overview – Pages 1-4.
- Crash Data Summary – Pages 7-10.
- Safety Strategies – Pages 5-6.
- Implementation Process – 11-30.

National Public Transportation Safety Plan

The updated National Public Transportation Safety Plan, published by the Federal Transit Administration (FTA) on April 9, 2024, describes enhanced transit safety performance and responds to new requirements in the Bipartisan Infrastructure Law. The plan introduces seven (7) new safety performance measures, with the required targets for transit agencies. The performance measures focus on reducing bus collisions and improving transit worker safety. Additionally, the plan includes updated voluntary safety standards for public transportation vehicles and operations. The document provides recommended practices to help agencies assess and mitigate safety risks, organized into 11 categories.

Relevance to the 2025 Safety Policy Study: The plan focuses on Vision Zero principles, reducing transit-related collisions, and enhancing worker safety, which complement the MPO's study goals of improving transportation safety across all modes. The emphasis on voluntary safety standards and recommended practices can guide local efforts to enhance transit infrastructure, reduce congestion, and improve safety for all transportation users.

Key Content:

- Overview – Pages 4-5.
- Crash Data Summary – N/A.
- Safety Strategies – Pages 11-18.
- Implementation Process – 6-10.

Transportation Connection: North Dakota's Long-Range Transportation Plan

Published in June of 2021, Transportation Connection is the State of North Dakota's long-range plan and is intended to be "an adaptable and comprehensive strategic framework for all things transportation across North Dakota through 2045". The LRTP lists five (5) key objectives:

- Improving transportation safety for all modes.
- Maintaining existing infrastructure.
- Improving connectivity.
- Increasing available travel information and improving operations.
- Modernizing operations and increasing sustainability of funding sources.

Relevance to the 2025 Safety Policy Study: Transportation Connection will provide insights into the 2025 Safety Policy Study to align safety improvements with statewide, multimodal transportation strategies. The emphasis on improving connectivity and multimodal safety supports efforts to improve road user safety across different transportation modes.

Key Content:

- Overview – Pages 3-12.
- Crash Data Summary – N/A.
- Safety Strategies – N/A.
- Implementation Process – Pages 13-18.

ND Moves: Statewide Active and Public Transportation Plan

Published in April 2019, the plan provides guidance for integrating active and public transportation into state and local systems. ND Moves outlines recommendations and an implementation framework to address identified needs and opportunities for all modes of mobility, including public transit, walking, and bicycling, over the next 20 years. The plan leverages existing assets and seeks to combine systems for greater public benefit.

Active transportation goals:

- Increase active transportation use in North Dakota.
- Allocate funds for infrastructure, education, and programming.
- Maintain and expand the active transportation network for sustainability.
- Engage with citizens, agencies, and stakeholders for implementation.
- Ensure seamless multimodal travel across the state.
- Create a safe environment for all users.
- Utilize technology to advance active and public transportation.
- Promote active transportation for better community health outcomes.

Public transit goals:

- Improve transit options within and between communities.
- Maintain or increase funding for public transit.
- Keep public transit assets in good condition.
- Promote public transit as a vital travel option.
- Foster collaboration across the statewide transit network.
- Enhance public transit safety statewide.

Relevance to the 2025 Safety Policy Study: The plan focuses on active transportation (walking and bicycling) and public transit integration, which is highly relevant to the Safety Policy Study. As a result, both initiatives prioritize seamless multimodal travel. The importance of data collection and evaluation would also guide Safety Policy Study to refine safety recommendations using evidence-based approaches. Network expansion and maintenance are other priorities of the plan that support the Safety Policy Study's objective of creating long-lasting, adaptable safety improvements.

Key Content:

- Overview – Pages 1-7.
- Crash Data Summary – Pages 26-32.
- Safety Strategies – Pages 112-130.
- Implementation Process – 131-140.

North Dakota Vision Zero Strategic Highway Safety Plan

Published in 2024, North Dakota's Strategic Highway Safety Plan (SHSP), also known as the Vision Zero Plan, is a data-driven, comprehensive plan that outlines goals, objectives, and strategies to advance North Dakota's goal of zero traffic fatalities or serious injuries. The SHSP is updated every five (5) years to reflect crash trends and emerging safety strategies. The most recent SHSP includes a Vulnerable Road User (VRU) Safety Assessment as mandated by the Infrastructure Investment and Jobs Act (IIJA). The Plan includes Vision Zero initiatives such as:

- Redesigning streets to reduce conflict points and encourage mobility while enhancing safety.
- Conducting high-visibility enforcement of existing laws.
- Integrating technology innovations that make vehicles, roads, and drivers safer.
- Collaborating with the legislature to ensure state laws represent best practices in traffic safety.
- Promoting campaigns to educate communities on safe driving behaviors and the Vision Zero safety strategy.

Relevance to the 2025 Safety Policy Study: The priorities and implementation strategies laid out in the SHSP will influence the countermeasures and best practices proposed by the project team – especially on roads and intersections under NDDOT's jurisdiction. The findings of the SHSP will inspire the existing safety conditions analysis conducted at the regional level. Where possible, the project team will look for areas of overlap between the goals and strategies outlined in the SHSP and the priorities and countermeasures identified as part of the 2025 Safety Study.

Key Content:

- Overview – Pages 1-9.
- Crash Data Summary – Pages 12-18.
- Safety Strategies – Pages 52-55.
- Implementation Process – Pages 60-72.

North Dakota 2024-2026 Highway Safety Plan

Updated every three (3) years, NDDOT's Highway Safety Plan (HSP) focuses on the agency's SHSP to monitor progress and evaluate traffic safety. After the SHSP identifies priorities and implementation strategies, the HSP identifies performance measures to gauge progress in the priority areas identified in the SHSP, sets annual goals for each of the performance measures, tracks year-to-year trends in those performance measures, and identifies countermeasure strategies to address each of the priority areas identified by the SHSP. Those priority emphasis areas include:

- Unbelted vehicle occupants.
- Lane departure crashes.
- Alcohol and/or drug-related crashes.
- Speeding/aggressive driving.
- Intersections.
- Older drivers.
- Heavy vehicles.
- Younger drivers.
- Vulnerable road users – pedestrians/bicyclists/motorcyclists/ATVs.

Relevance to the 2025 Safety Policy Study: There are approximately $26.8 million dollars allocated to NDDOT through the National Highway Traffic Safety Administration (NHTSA), the State of North Dakota, and through the Bipartisan Infrastructure Law (BIL) for statewide countermeasure strategies programmed in the FY2024-2026 HSP. It will be important to understand NDDOT's efforts and align the 2025 Safety Policy Study to policies and strategies identified in the HSP.

Key Content:

- Overview – Pages 3-8.
- Crash Data Summary – Pages 15-30.
- Safety Strategies – Pages 9-13.
- Implementation Process – Pages 47-62.

North Dakota Highway Safety Improvement Program (HSIP)

North Dakota's Highway Safety Improvement Program (HSIP) acts as the implementation arm of the SHSP and HSP. Every year, the State solicits for HSIP funding, which is a federal-aid program designed to reduce traffic fatalities and serious injuries. All HSIP projects must relate to at least one of the priority emphasis areas identified in the SHSP. HSIP projects are programmed through the Bismarck-Mandan MPO's Transportation Improvement Program (TIP) and NDDOT's Statewide Transportation Improvement Program (STIP).

Relevance to the 2025 Safety Policy Study: Eligibility for HSIP funds must be considered when identifying countermeasures and best practices.

Key Content:

- Overview – Page 3.
- Crash Data Summary – Pages 5-7.
- Safety Strategies – Page 5.
- Implementation Process – Page 7.

North Dakota Local Road Safety Program (Morton, Burleigh, Bismarck)

The Local Road Safety Program (LRSP) was prepared for all regions in North Dakota as part of North Dakota's statewide highway safety planning process between 2012-2015. The program was published prior to the current SHSP and thus has the goal of reducing severe crashes (as opposed to eliminating them) by documenting at-risk locations, identifying effective low-cost safety improvement strategies, and better positioning each region in North Dakota to compete for available safety funds. The program document divides priority emphasis areas into two categories:

1. Driver behavior-related, and
2. Infrastructure related.

The LRSP identifies crash profiles from the crashes within the two (2) emphasis areas listed above and proposes countermeasures and safety improvement strategies for each of the crash profiles.

Relevance to the 2025 Safety Policy Study: The LRSP's emphasis on both driver behavior and infrastructure-related safety priorities aligns with key considerations of the 2025 Safety Policy Study. The crash profiles and countermeasures outlined in the LRSP will serve as reference points for identifying regional safety issues and determining applicable strategies for improving safety outcomes. Additionally, the LRSP's documentation of cost-effective solutions will help inform budget-conscious recommendations within the study.

Key Content:

- Overview – Pages 1-1 – 1-6.
- Crash Data Summary – Pages 2-1 – 2-31.
- Safety Strategies – Pages 3-1 – 3-13 (Morton.
- Implementation Process – 4-1 – 4-44.
    - Mandan: 4-21 – 4-23. (Morton Link)
    - Morton: 4-20. (Morton Link)
    - Bismarck: 4-13 – 4-15 (Bismarck Link)
    - Burleigh: 4-10 – 4-12 (Burleigh Link)

NDDOT Traffic Operations Manual

Published in February 2025, the manual describes typical NDDOT practice for traffic operations work. The manual serves as a source of context for transportation safety analysis and engineering practices specific to North Dakota. The manual specifically states that it is not intended to conflict or replace commonly accepted references such as the MUTCD, AASHTO Green Book, Highway Capacity Manual, Highway Safety Manual, Access Management Manual, etc. Topics covered in the manual include:

- Traffic operations studies
- General safety and traffic analysis
- Roadway geometry
- Traffic signals
- Access management

Relevance to the 2025 Safety Policy Study: The manual outlines North Dakota-specific traffic operations and safety practices, which may directly support the Safety Policy Study and ensure alignment with regional engineering and planning standards. The document also lists safety recommendations and best practices to comply with national safety standards. The manual's direct focus on traffic operations studies, general safety analysis, roadway geometry, traffic signals, and access management will help evaluate and improve intersection safety, multimodal accessibility, and congestion reduction strategies.

Key Content:

- Overview – Pages 4-5.
- Crash Data Summary – Page 18.
- Safety Strategies – Pages 14-52.
- Implementation Process – N/A.

Arrive 2050 Metropolitan Transportation Plan (MTP)

The *Arrive 2050* MTP, published in December 2024, is the BMMPO's road map for guiding the development of the region's multimodal transportation system. The plan reflects local conditions and assesses the performance of the Bismarck-Mandan region's transportation system with input from local agencies, North Dakota Department of Transportation (NDDOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). The MTP is a performance-based plan that identifies performance measures and targets to further regional priorities while supporting state performance targets. Arrive 2050 builds off the 2045 MTP (Arrive 2045) to continue metropolitan transportation planning in the Bismarck-Mandan region while incorporating the findings and recommendations of plans and studies that have been completed since the publication of the 2045 MTP. The 2050 MTP lists the following goals and objectives related to the Safety Policy Study:

1. Increased safety and security by reducing crash frequency and severity and implementing safe system features.
2. Improved infrastructure condition (for bridges and pavement).
3. Congestion reduction.
4. Increased system reliability for freight movement and economic vitality.
5. Increase in alternative transportation modes to automobile travel.
6. Increase environmental sustainability.
7. Increased project delivery efficiency.

Relevance to the 2025 Safety Policy Study: Arrive 2050 supports efforts to find effective ways to reduce crashes and protect road users and directly supports the objectives of the Safety Policy Study. The document also integrates data analysis and performance measures, which provides a framework to assess regional safety trends and evaluate the effectiveness of safety policies.

Safety-specific funding and implementation projects are identified in Arrive 2050. However, the MTP is undergoing a formal amendment and approval process. Upon final action of the MTP amendment, the Safety Policy Study will reflect Arrive 2050, as amended.

Key Content:

- Overview – Pages 1-22.
- Crash Data Summary – Pages 35-45
- Safety Strategies – 69-71.
- Implementation Process – Pages 75-119.

Bismarck-Mandan Bike and Pedestrian Plan

Published in December of 2017, the Bike and Pedestrian Plan's stated vision is to "convey that bicycling and walking are safe, comfortable, and convenient choices for all people, in hopes of creating an environment in which people feel comfortable and safe to bicycle and walk in Bismarck and Mandan." The Plan describes existing conditions, reviews relevant plans, programs, and policies, lays out engineering, education, encouragement, enforcement, and evaluation strategies to achieve the Plan's goals, and identifies prioritized implementation steps. The five (5) goals of the Plan are:

1. Increasing the number of bicycling and walking trips made by people in Bismarck and Mandan.
2. Developing a connected network of bicycling and walking routes throughout both communities in partnership with local, regional and state partners. Connecting bicycling and walking routes to community destinations and other transportation systems, including transit.
3. Building and maintaining safe and comfortable bicycling and walking facilities for people of all ages and abilities. Supporting driving, walking and bicycling behaviors that increase the safety of people who walk and bicycle.
4. Protecting the public's investment in the bicycling and walking system over the long-term and ensure system accessibility all year round.
5. Integrating bicycle and pedestrian facilities with project designs during the development review process, as new commercial and residential projects are planned.

Relevance to the 2025 Safety Policy Study: The plan directly supports the Safety Policy Study's goals through the description of infrastructure improvements and behavioral strategies, development of a comprehensive and safe multimodal transportation system, maintenance strategies, data-driven decision-making and policy recommendations.

Key Content:
- Overview – Pages 13-14.
- Crash Data Summary – Pages 15-19.
- Safety Strategies – Pages 48-53.
- Implementation Process – Pages 57-75.

School Crossing Safety Studies (Bismarck, Mandan)

Published in November 2017, the two (2) safety studies outline existing programs and policies, detail the outreach/engagement efforts and results, describe existing safety conditions at local school crossings, and lay out recommendations for implementation programs, policies, and infrastructure improvements to improve safety at those crossings.

Relevance to the 2025 Safety Policy Study: Both studies reinforce efforts to protect vulnerable road users, especially school-aged or younger users of the regional transportation system; align with goals to enhance crosswalks, signage, and traffic control near schools; support community-driven solutions to address safety concerns; provide a foundation for safety programs and enforcement strategies.

Key Content (Bismarck):
- Overview – Pages 4-7.
- Crash Data Summary – Pages 11-12.
- Safety Strategies – Pages 9-17.
- Implementation Process – Pages 50-309.

Key Content (Mandan):
- Overview – Pages 4-7.
- Crash Data Summary – Page 11.
- Safety Strategies – Pages 25-35.
- Implementation Process – Pages 46-137.

Bismarck-Mandan Intersection Analysis Study

Published in December of 2020, the study consists of four (4) main components:

1. **Macro-Level Analysis:** High-level review of all study intersections to identify issues that require further analysis.

2. **Micro-Level Analysis:** Detailed analysis of potential improvements and comparison of alternatives to mitigate issues at the 65 intersections identified in the macro-level review.
3. **Improvement Plan:** Implementing the improvements identified in the micro-level analysis.
4. **Traffic Engineering Playbooks:** Repeatable process developed for Bismarck and Mandan that the Cities can utilize to address local transportation issues at specific locations that do not necessarily justify a larger corridor- or subarea-level analysis.

The results of all four (4) components will be useful during the analysis of existing safety conditions and the process of developing proposed improvement strategies and best practices.

Relevance to the 2025 Safety Policy Study: The study's macro- and micro-level analyses have a structured approach to identifying and addressing intersection safety issues. The identification of specific intersection improvements guides multimodal safety enhancements and congestion reduction strategies. The study also includes a repeatable methodology for evaluating and mitigating intersection safety concerns, which supports the broader goals of Vision Zero and proactive safety interventions.

Key Content:

- Overview – Pages 1-4.
- Crash Data Summary – Pages 7-17; 26-29; 33-38
- Safety Strategies – Pages 33-38.
- Implementation Process – Pages 47-49.

Safe Routes to Services/Complete Streets Study

Published in December of 2024, the study identifies priority improvement areas using data analysis and community feedback and offers actionable recommendations. Solutions address immediate safety issues and start the process of long-term infrastructure improvement. The study provides a framework for implementing the strategies identified and securing future funding opportunities. This study aims to establish a safe, inclusive, and equitable transportation planning model that paves the way for a more connected and accessible transportation system, prioritizing the voices and needs of those most affected by current mobility challenges.

The Complete Streets component is another key focus of the study, integrated at all levels of planning and decision-making. Its primary objectives include enhancing safety by reducing crashes, boosting fixed-route transit ridership, and expanding the network of bicycle facilities. This initiative is deeply embedded in community engagement efforts, project-specific planning, policymaking, and year-round, four-season transportation planning to ensure accessibility and usability for all.

Relevance to the 2025 Safety Policy Study: The study is evidence-based and specifically prioritizes the needs of vulnerable populations and those most affected by mobility challenges including low-income households; racial and ethnic minorities; individuals with disabilities; older adults; and those with limited English proficiency. Additionally, the study supports public engagement and transportation solutions which consider all users. Immediate safety interventions and long-term infrastructure planning are listed as an improvement framework and are directly relevant to the Safety Policy Study.

Key Content:

- Overview – Pages 1-13.
- Crash Data Summary – Pages 3; 52.
- Safety Strategies – Pages 57-70.
- Implementation Process – Pages 70-83.

2025
SAFETY POLICY STUDY
BISMARCK-MANDAN MPO

TRANSPORTATION SAFETY COMMUNITY CONVERSATIONS
KEY THEMES REPORT
BISMARCK-MANDAN METROPOLITAN PLANNING ORGANIZATION

OVERVIEW

This report presents a qualitative analysis of community feedback regarding transportation safety concerns within the Bismarck-Mandan Metropolitan Planning Organization (MPO) area. Data was collected during public events and through mapped comment submissions in spring 2025. Feedback was gathered from two primary sources: attendees at the Earth Day Celebration in Bismarck, which took place on April 29, 2025, and the Touch-a-Truck Event held in Mandan on May 17, 2025.

Comments were linked to a comment point reference map that identifies specific areas or locations, visually plotting concerns within the MPO area. The commenter classified the comments by mode type, such as vehicle, bicycle, pedestrian, motorcycle, transit, or freight.

Anecdotal evidence suggests that a diverse group of participants contributed to this input, including individuals from various age groups, families with children, and people of different racial and gender identities. This diversity demonstrates strong representation across demographics and transportation modes, ranging from walking and biking to driving and public transit.

KEY THEMES AND FINDINGS

1. **Pedestrian Safety.** Pedestrian safety emerged as a widespread concern. Many participants noted the presence of ineffective or dangerous crosswalks, especially in residential and school areas, and emphasized that high traffic speeds pose a significant risk to pedestrians.

"Dangerous crosswalks: traffic doesn't slow down – areas not visible to let cars know people are crossing" (E-F, E-V)
"Street between Municipal Ballpark and park is dangerous for pedestrians… Needs a flashing signal" (E-16)
"Crosswalk to Solheim Elementary" (T-Q)

Qualitative Analysis by:

Emergent
STRATEGIES GROUP

2. **Traffic Congestion and Poor Intersection Design.** Traffic congestion and poorly designed intersections also received strong feedback. Community members reported experiencing backups during peak travel times, particularly during school hours, and expressed confusion about navigating roundabouts and making challenging turns.

"Intersection with lights; lots of traffic backed up due to middle school and high school" (E-C)
"Sunset – ORT: short distance, people not yielding westbound" (T-I)
"Too small roundabout—'I almost got hit coming here'" (E-3)

3. **Inadequate Signage and Traffic Signal Lights (Control of traffic flow and crossing safety).** Participants raised concerns about traffic signal lights, particularly the timing and effectiveness of signals for both vehicles and pedestrians. These comments emphasized that overly short light cycles and driver non-compliance at flashing signals created unsafe crossing conditions. Driver behavior further contributed to this safety concern.

"Stop light is so fast, especially for the turn lane" (E-17)
"No signage saying school bus stop" (E-R)
"Drivers still go through despite flashing lights and crosswalk" (T-L)
"Just removed street lights on 3rd & Thayer: can't cross 3rd easily" (T-U)

4. **Bicycle Infrastructure and Safety.** Bicycle infrastructure and safety were often noted as areas needing improvement. Participants requested protected or separated bike lanes, particularly along busy corridors, and expressed concerns about trails being placed too close to vehicle lanes.

"River Road needs a separated path heading out to 1804 for commuting" (E-6)
"Bike trail 3 feet from the road – unsafe way" (T-H)
"No bike, no sidewalk bridge to McDonald's" (T-M)

5. **Speeding and Driver Behavior.** Speeding and problematic driver behavior, especially in residential and school zones, as well as near parks, were recurring themes. Community members reported frequent speeding and a failure to yield to pedestrians.

"Trailer court speeders – ped" (E-I)
"Speeding on Capitol Avenue" (E-21)
"Tyler Parkway: Speeding. Already talked to City about it, it's so bad." (T-6)

6. **Street lighting (Illumination for visibility and safety).** Numerous references to poorly lit intersections and inadequate visibility creating safety hazards. Many people described dark areas that pose a danger to pedestrians and requested the restoration of removed street lighting.

"4th Street could use street lights" (E-7)

CONCLUSION

The community feedback gathered through these public engagement efforts provides insight into the challenges and priorities that residents, visitors, and workers face when traveling in the Bismarck-Mandan area. The concerns consistently centered on pedestrian safety, driver behavior, gaps in bike and pedestrian infrastructure, traffic congestion, and insufficient traffic signals and visibility. Collectively, these themes highlight a shared desire for safer, more accessible, and more connected transportation options that serve all users, regardless of mode.

This input is intended to inform future planning discussions, guide prioritization of safety improvements, and support ongoing collaboration between the MPO, local jurisdictions, and community partners. By integrating these perspectives into broader transportation strategies, decision-makers can move toward solutions that not only address immediate concerns but also contribute to a long-term vision of a safer, more inclusive, and resilient transportation system.

Bismarck-Mandan MPO
Transportation Safety Plan
Community Comments
April 29, 2025

ID	Comment
E-A	Boulevard/State
E-B	Landslide area: wider/conditions
E-C	Intersection w/lights; lots of traffic backed up due to middle school and high school
E-D	4-way stop should be roundabout – very congested during peak travel times
E-E	Bike/ped path, west on Lincoln Rd. Link to University/BPR paths
F	Dangerous crosswalks: traffic doesn't slow down – areas not visible to let cars know people are crossing
E-G	19th Street by Simle Middle School – traffic drives too fast
E-H	Imperial Valley: no sidewalks, car traffic too fast for pedestrians
E-I	Trailer court speeders – ped
E-J	Unmarked intersection
E-K	19th/Interstate Ave by Shiloh school/Pebble Creek very congested
E-L	Ave E/12th School bus stops and oncoming traffic doesn't stop
E-M	No path to connect Misty Waters
E-N	Crosswalk not helpful
E-O	Dangerous area to get onto Main
E-P	N Washington – Intersection @ Slate Drive – Driving – turning south
E-Q	Burleigh & Washington RRFBI – fed activated @roundeabout for those in bike path
E-R	School bus stops on road – speeding traffic. No signage saying bus stop
E-S	Lack of ped/bike – lots of traffic
E-T	Bike crossing: Washington/Broadway
E-U	Centennial – Need light at turn to apartments
E-V	Dangerous crosswalks: traffic doesn't slow down – areas not visible to let cars know people are crossing
E-W	Imperial Valley: car traffic is too fast
E-X	3rd St /Indiana – Sidewalk needs repair
E-Y	Bike/Ped bridge crossing Rosser/Main needs repair
E-Z	Century Ave out of HS parking lot
E-1	Frontage Rd (North): Distance between off ramp & frontage rd is too close. People think they are turning onto the frontage, but are entering I-94 on the eastbound off ramp. Frontage Road itself needs shoulder & less steep inslopes
E-2	Too many signs
E-3	Too small roundabout "I almost got hit coming here, its too small."
E-4	Highway 1806 is difficult to get onto in the morning.
E-5	Crosswalks & road speed: need to have lighting. Cars driving too fast. *Durango – Medora is very busy.

E-6	River Road needs a separated path heading out to 1804 for commuting. Lots of long-distance bikes.
E-7	4th Street could use street lights.
E-8	River Rd & Barracks: Lots of walking/bike/cars at one intersection.
E-9	Boulevard & State St.: Layout of the intersection. High accident area.
E-10	Increased traffic on Old Red Trail
E-11	Horizon Market & North Washington Street intersection has many turning movements.
E-12	Two intersection by the Sanford hospital to the parking garage and valet parking area.
E-14	Pedestrian Crossing – Lots of fast cars moving w/e off 7th.
E-15	Crossing from the hotels to the mall. Safety to cross 7th.
E-16	Street between Municipal Ballpark and park is dangerous for pedestrians, many cross during, before and after games. Needs a flashing signal or something to alert drivers.
E-17	Turnpike & Washington: Stop light is so fast. Especially for the turn lane.
E-18	Avenue E & 12th St: High accident area. Rock in Boulevard have been placed as a safety barrier by the property owner.
E-19	Trucks on Yegen Rd is a safety concern. Left hand turn on University to Lincoln.
E-20	Lincoln: lack of sidewalks difficult to walk & bike to park.
E-21	Speeding on Capitol Avenue
E-22	Intersection of State S. & Boulevard is terrifying – probably should consider changing the layout.
E-23	43rd & DCN Building the hillside blocks view from the traffic from the east.
E-24	Pothole on State St.
E-25	Safety for the kids to walk to the high school
E-26	Safety for the kids to walk to the high school
E-27	Intersection by McDonalds-lots of accidents
E-28	Left Turn issues; Washington/Ave C

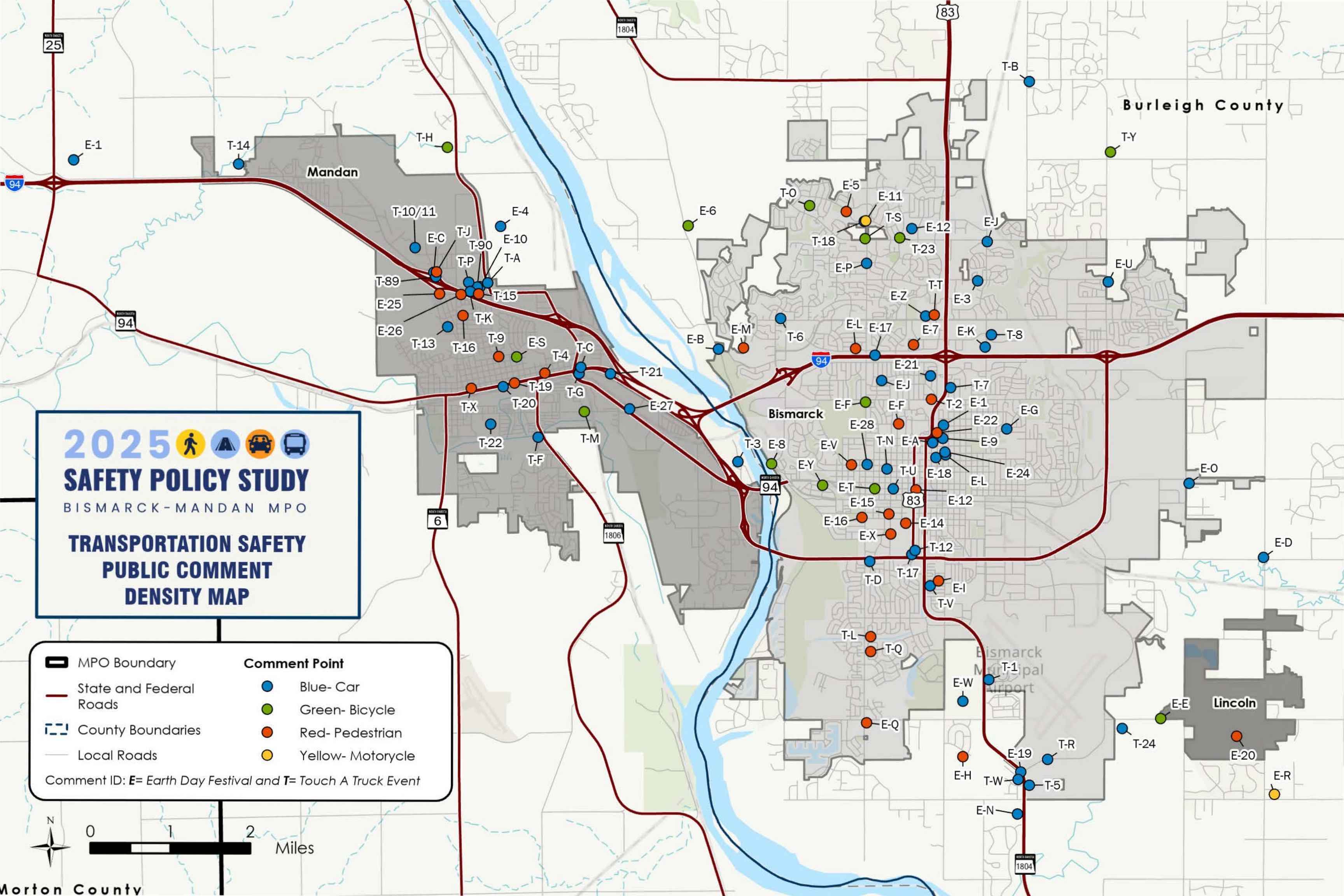
(*) indicate that there is no sticker on the board correlating with this comment.

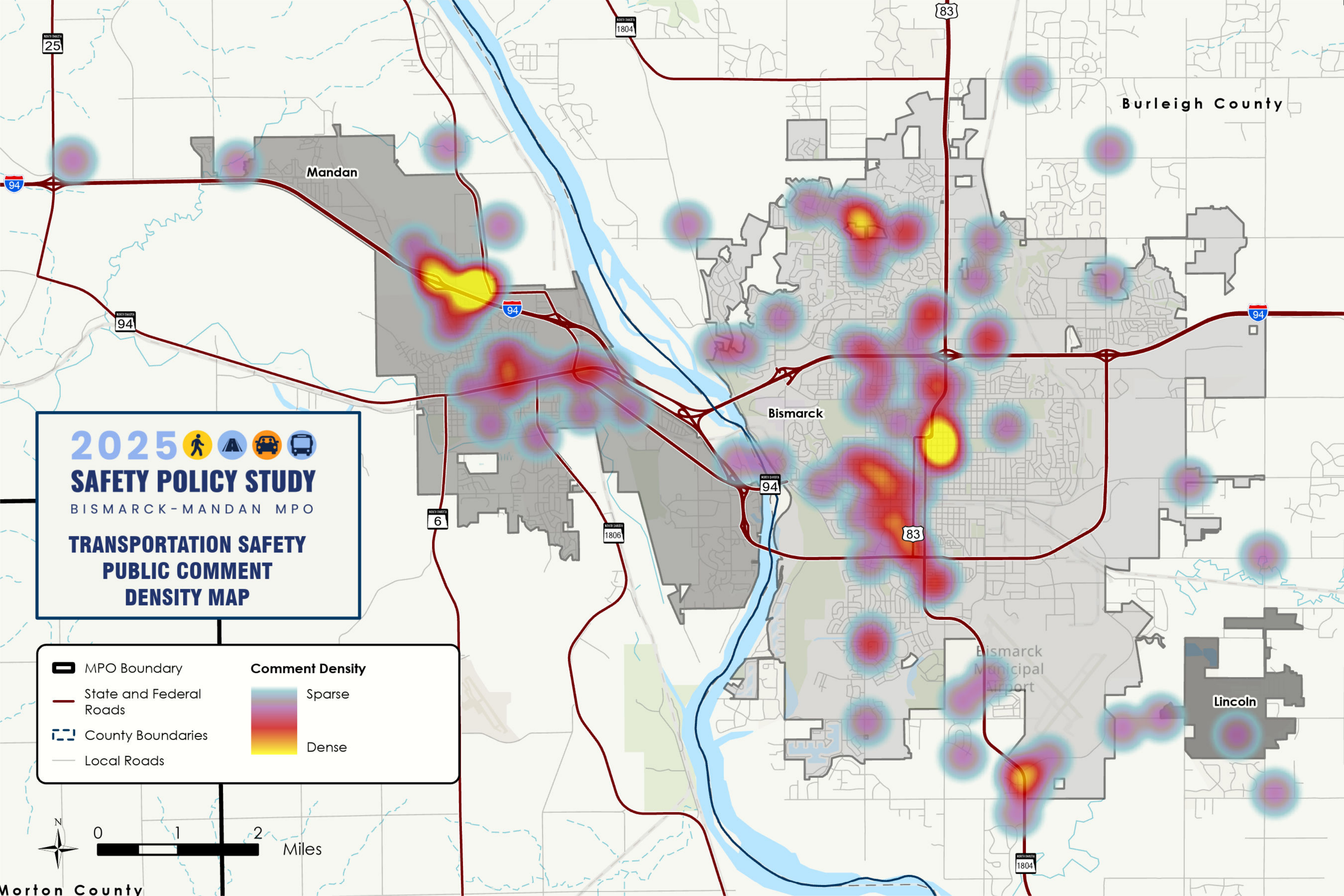
Bismarck-Mandan MPO
Transportation Safety Plan
Community Comments
May 17, 2025

ID	Comment
T-A	Removed vegetation undergrowth along I-94 and now there is significant noise pollution into the neighborhood.
T-B	71st Avenue NE and 26th Street NE is a bad intersection.
T-C	Freeway entrance to Mandan by Culvers needs law enforcement presence.
T-D	Ivy Avenue and South 2nd Street by the McDonalds. People don't stop at the stop sign (on Ivy Avenue) when nobody is coming from the north or south.
T-E	New roundabout near the new Mandan High School. People are just getting used to it.
T-F	Visibility is difficult when the trees are in flower (Spring).
T-G	High Accident area by the Mandan Burger King (Mandan Ave-1st St NE-13th Ave NE and E. Main Street)
T-H	Shaw Drive and Schlosser Drive North – bike trail 3-feet from the road – unsafe way
T-I	Sunset – ORT Intersection alignment: short distance people not yielding westbound; easier to turn right not left.
T-J	Sunset – ORT: N/S and E/W crossing is really hard for pedestrians.
T-K	Collins Roundabout: drivers rear end in entering and exiting
T-L	South Washington Street by Solheim Elementary: Getting across, cars still go through despite flashing lights and crosswalk.
T-M	No bike, no sidewalk bridge to McDonalds (Trolley) |Narcan Safety: Little Free Pantry; Mobile N Payer
T-N	2nd Street N and Avenue B: Poor intersection sight distance
T-O	Elk Ridge Park: bikes go across w/o safe crossing. Young riders by themselves.
T-P	Sunset Intersection: Dangerous!
T-Q	Crosswalk to Solheim Elementary
T-R	Intersections need roundabouts: traffic back up at University/Yegan and Lincoln Rd/Yegan
T-S	Crossing Washington Street to get to Horizon is problematic for kids.
T-T	Students crossing from Century High School to gas station: don't use crosswalks.
T-U	Just removed street lights on 3rd & Thayer: can't cross 3rd easily.
T-V	University Drive – South of 9th Street: lots of traffic speeding.
T-W	Lots of accidents and traffic heading into town go fast. Cars turning from Yegan onto University don't wait, they turn into traffic.
T-X	Crosswalks & curbs are not safe: cars don't see kids crossing
T-Y	It is hard to bicycle along 71st Ave and Centennial
T-1	Turning into airport, hard to see.
T-2	Crossing Divide on foot to get to Capitol
T-3	Merging onto Expressway; lanes need to be extended. Expressway onto Main is difficult.
T-4	East Main Street and 2nd Avenue NE (Mandan); Curb cuts were placed without crosswalks.
T-5	Needs street lighting for illumination
T-6	Tyler Parkway: Speeding. Already talked to City about it, its so bad.

T-7	Distracted Driving entire stretch of State Street.
T-8	19th- Avenue, Century & Interstate: can't get out of Shiloh School
T-9	Difficult road crossing between church and Old High School (Collins Avenue?) and Lions Park.
T10/11	27th Street North and Jude Lane NW: The road pavement conditions are bad.
T-10/11	27th Street North (Mandan) the road grade is very steep and vehicles struggle to go up the street during winter conditions
T-12	Put back the stoplight on South 7th Street and East Arbor Avenue at the Mall exit. It is tough to get through that intersection.
T-13	Street along Mandan Middle School. The construction is tearing up the street and it needs to be repaired. The Streets in the Mandan Historic District need to be repaved.
T-14	Needs more gravel and the culverts are washing out. There are several soft spots in the road.
T-15	Walmart/MHS in the afternoon: not enough traffic control for pedestrians. Also there are blindspots for vehicles.
T-16	Lewis & Clark Elementary school: Speeding: no beacon, but there is a crossing after school, but not before.
T-17	Stoplight removal on 7th and Arbor and 9th and Arbor: Lots of accidents. Put traffic control lights back.
T-18	Washington at State: after reconstruction became very hard to get out onto Washington Street southbound from East (State) or west sides. Very dangerous!
T-19	Pizza Rach: Curb cuts/ramps, but no crossing. People try to cross but traffic doesn't stop.
T-20	Collins and Main: Outside lane must turn right – it drops off – people swerve into left lane at the last minute.
T-21	Eastbound on-ramp: 2 lanes turns to 1 lane – the merge creates speeding issues to get in front of other cars. Cameras to get licensed plat numbers to issue speeding tickets or something.
T-22	Makeshift road by Kist Livestock: dangerous surface
T-23	43rd Avenue NE and Normandy is dangerous and hard to get out onto.
T-24	Needs street lighting for illumination
*	Harmon Lake: 68% of Morton County Taxes; $21M to construct fire house and water tower. Todd Roth, Chad Radke/Brad Isles/Patrick Martin (Morton County Emergency Management. Morton County meet hazard mitigation.

* no sticker on the board correlating with this comment.


2025
SAFETY POLICY STUDY
BISMARCK-MANDAN MPO
TRANSPORTATION SAFETY PUBLIC COMMENT DENSITY MAP
MPO Boundary
State and Federal Roads
County Boundaries
Local Roads
Comment Point
Blue- Car
Green- Bicycle
Red- Pedestrian
Yellow- Motorycle
Comment ID: E= Earth Day Festival and T= Touch A Truck Event
Mandan
Bismarck
Lincoln
Burleigh County
Morton County
Bismarck Municipal Airport
0 1 2 Miles
N



2025
SAFETY POLICY STUDY
BISMARCK-MANDAN MPO
TRANSPORTATION SAFETY PUBLIC COMMENT DENSITY MAP
MPO Boundary
State and Federal Roads
County Boundaries
Local Roads
Comment Density
Sparse
Dense
0
1
2
Miles
N
Mandan
Bismarck
Lincoln
Bismarck Municipal Airport
Burleigh County
Morton County
25
94
1804
83
6
1806

2025 SAFETY POLICY STUDY
BISMARCK-MANDAN MPO

TRANSPORTATION SAFETY FREIGHT STAKEHOLDER REPORT
BISMARCK-MANDAN METROPOLITAN PLANNING ORGANIZATION

OVERVIEW

This report summarizes key findings from interviews and notes gathered during discussions with three representatives of the freight industry in the Bismarck-Mandan region in August 2025. The purpose of these conversations was to gain a better understanding of the perspectives, experiences, and concerns of freight operators regarding transportation safety. These insights provide valuable context for regional planning and highlight areas where policy, infrastructure, and education may be improved to enhance freight safety and efficiency.

KEY THEMES AND FINDINGS

Truck Parking and Driver Facilities. Participants emphasized that both short-haul and long-haul drivers face unique challenges, particularly the shortage of secure truck parking and adequate rest facilities. Existing truck stops, such as those in Mandan and at Oasis, offer overnight parking and amenities. Other than the new truck stop under construction at Sterling (35 miles to the east), the Bismarck-Mandan area truck stops are often quite full. This shortage creates safety challenges when drivers are forced to park in unsafe or unauthorized areas. Stakeholders emphasized that during inclement weather, the absence of proper facilities forces drivers into difficult situations where stopping is necessary but safe options are unavailable.

The concern extended beyond convenience; theft and crime were also identified as risks linked to inadequate facilities. Participants stressed that secure parking areas should include not only space for trucks but also driver amenities such as showers, food, and fuel. This reflects a broader call for investment in infrastructure that recognizes both the operational and personal safety needs of drivers.

"Theft is quite an issue in the area, lack of truck parking in Bismarck… need secure facilities with amenities like showers, food, etc."

Stakeholder Interview & Summary by: Emergent STRATEGIES GROUP

Infrastructure Bottlenecks and Roadway Design. Freight operators identified multiple corridors and intersections where congestion and poor design create recurring safety and efficiency challenges. High-priority problem areas included the Centennial/Oasis interchange, Hwy 83 bypass, and 19th Street from 43rd to Divide. The smaller roundabouts in the area were described as particularly problematic, with trucks struggling to maneuver through tight turns.

"Small roundabout on 19th [Street and E. Calgary Avenue] is VERY difficult to maneuver for trucks. Actually, all of 19th... very congested."

Beyond specific intersections, participants voiced concern over the lack of regional capacity. There is a long-term need for an additional Missouri River crossing to support freight traffic and reduce pressure on existing routes. These bottlenecks not only slow freight movement but also contribute to conflicts with general motorists, who may not understand the challenges of navigating large vehicles in tight or congested areas. Addressing these issues will require both localized fixes, such as redesigning roundabouts, and broader investments in regional connectivity.

Interactions with General Motorists. Participants observed that many general motorists lack awareness of how to share the road with trucks safely. They emphasized the importance of public education on safe passing, adequate following distances, and blind spot awareness.

"General motorists aren't comfortable with semis on the roads... education to the public to know how to pass and give more space is needed."

The North Dakota Motor Carriers Association's "Share the Road - No Zone" campaign is a program designed to teach high school students how to share the road with large trucks. This program is well-received in several schools across North Dakota; however, this program has not been integrated into Bismarck-Mandan area schools.

The consequences of this gap in public understanding are serious, as motorists frequently make unsafe maneuvers that endanger themselves and truck drivers alike. Stakeholders recommended renewed outreach efforts targeted at schools, new driver training, and community campaigns to improve road-sharing behaviors.

Distracted Driving and Enforcement. Distracted driving, particularly cell phone use, was described as one of the most significant threats to roadway safety. Freight companies have implemented strict no-phone policies and rely on in-cab cameras to monitor compliance. This represents a strong safety culture within their operations. However, participants emphasized the contrast between these industry standards and the behavior of the general driving public, where cell phone use while driving is common and largely goes unchecked.

Stakeholders noted that enforcement for passenger vehicles is inconsistent with the limited resources available to address the scale of the problem. They also expressed concern that the risks posed by distracted drivers undermine the efforts of professional truck operators who are already held to high safety standards.

"Distracted driving is a really big problem – cell phones are a large issue."

In addition to stricter enforcement, stakeholders called for broader public education campaigns to raise awareness of the dangers of distracted driving. They suggested these campaigns could be modeled after past successful efforts to reduce drunk driving and increase seatbelt use, aiming to shift cultural attitudes and reduce risky behaviors on the road.

Regulatory Enforcement Gaps. While commercial vehicles are heavily monitored and regulated, participants highlighted enforcement gaps at the local level. Unlike the Highway Patrol, local law enforcement agencies do not have specialized commercial motor vehicle (CMV) units. This leaves many local hauls less regulated and increases the risk of unsafe practices slipping through oversight.

Stakeholders noted that this imbalance creates a double standard where interstate carriers are heavily scrutinized while some local operators avoid similar levels of compliance. Strengthening local enforcement capacity could improve safety for both freight operators and the public.

Weather and Seasonal Conditions. Freight operators acknowledged that the cities and NDDOT generally do a good job maintaining main roads in winter, but seasonal conditions remain a safety challenge. Snow, ice, and high winds create hazards that demand constant vigilance. Drivers rely on in-cab technology, dash cameras, and real-time road condition data to make informed decisions about routing and stopping.

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*"Winter weather – the city does a pretty good job at keeping main roads clear…
technology improvements have been really helpful."*

Stakeholders highlighted that while maintenance crews are effective, severe weather events can still overwhelm the system and increase risks for trucks that require more stopping distance and stability than smaller vehicles. These observations underscore the importance of both infrastructure maintenance and continued investment in technology that helps drivers adapt to conditions.

Collaboration and Education Opportunities. Stronger collaboration between freight companies, schools, and public agencies was viewed as essential to improving safety. Stakeholders suggested that schools in particular should play a greater role in raising awareness among new drivers about how to interact safely with trucks. Programs like TrainND were cited as opportunities for partnerships to expand training and awareness campaigns. This collaborative approach could also help bridge the divide between freight operators and the public to foster a shared understanding of responsibilities on the road.

"Schools need to do more to raise awareness among new drivers. Could collaborate with truck companies to do this."

CONCLUSION

From inadequate truck parking and infrastructure bottlenecks to distracted driving and gaps in enforcement, the freight industry representatives identified a range of transportation safety challenges in the Bismarck-Mandan area. While technology and internal company policies are helping improve safety, participants stressed the importance of community education, investment in infrastructure, and closer collaboration with law enforcement and schools. Addressing these issues will be vital to ensuring that freight can move efficiently and safely, supporting both regional commerce and public safety.

2025 SAFETY POLICY STUDY
BISMARCK-MANDAN MPO

TRANSPORTATION SAFETY OHV STAKEHOLDER INTERVIEW
NOTABLE TRENDS AND FINDINGS
BISMARCK-MANDAN METROPOLITAN PLANNING ORGANIZATION

OVERVIEW

This report provides a qualitative and data-driven analysis of off-highway vehicle (OHV) and snowmobile safety in the Bismarck-Mandan region. Drawing from a stakeholder interview with the state program manager for OHVs and snowmobiles, along with supplemental crash, citation, and EMS call data, the findings highlight both regulatory challenges and emerging safety trends. Key themes include increasing use of OHVs as transportation, youth involvement in roadway incidents, and gaps in enforcement due to unclear regulations.

Crash and EMS data underscore the seriousness of these concerns, with high rates of pediatric rollover and head injuries. At the same time, citation records reveal that adults also account for a significant share of roadway incidents. Snowmobiles appear to pose fewer challenges due to established trail systems, though risks rise in harsher winters. Together, these insights provide a comprehensive picture of current risks and opportunities for improving OHV and snowmobile safety across the region.

KEY TRENDS AND FINDINGS

Regulatory Complexity and Enforcement Challenges. The interview highlighted that confusion around North Dakota Century Code (NDCC) 39-29 continues to complicate the enforcement of OHV regulations. The distinctions between Class I, II, and III OHVs are not well understood by the public or by many local officers, particularly when weight and size come into play. This lack of clarity may lead to ambiguous law enforcement across jurisdictions. Although counties now have explicit authority, the uneven understanding of the law contributes to enforcement gaps and frustration for both users and law enforcement.

"Local officials in Burleigh County initially believed they didn't have the authority to regulate OHVs, which meant youth were driving on ditches and gravel roads until the law was clarified." – State Chief of Recreation

Stakeholder Interview & Summary by: Emergent STRATEGIES GROUP

Youth Operation and Safety Risks. Youth operation of OHVs remains one of the most pressing safety concerns in the Bismarck-Mandan area. Current law allows 12–16-year-olds to operate after completing a basic safety course, but this training focuses narrowly on OHV handling and does not adequately prepare youth for roadway hazards.

> *"The biggest issue from law enforcement is age – [youth] took the safety class and were authorized to operate."*

Crash and EMS data reinforce these risks: pediatric calls from 2020–2023 show dozens of incidents across North Dakota annually involving riders under 16, with the majority linked to rollovers, ejections, and head or spinal injuries. Many of these crashes occurred on or near public roadways rather than in recreational settings, underscoring the shift of OHVs into traffic environments. Helmet use was inconsistent, with citation data showing only partial compliance with protective equipment requirements.

One official remarked that these roadway crashes increasingly resemble traffic collisions rather than recreational accidents, highlighting the blurred boundary between OHVs and motor vehicles. One recommendation is to potentially restrict roadway use until operators hold a license or permit and align age thresholds with manufacturer guidance to reduce the risk of severe injury.

Use of OHVs as Transportation. While originally intended for recreation, OHVs are increasingly being used for everyday transportation by both youth and adults. Citation data show that many violations are written for adult operators, suggesting that roadway use has become normalized beyond recreational riding. Stakeholders noted that this trend is shifting the safety conversation, as OHV crashes on roadways now look less like trail accidents and more like conventional vehicle collisions.

> *"We're seeing more adults using OHVs as their primary mode of travel, not just kids riding for fun."*

Crash data support this observation: adults between the ages of 20 and 40 account for a growing share of OHV crashes on roadways, compared with younger riders whose incidents are more often linked to trail use. This shift raises questions about whether OHVs should be regulated more closely to align with the risks of regular roadway travel.

Emerging Modes: Golf Carts and Low-Speed Vehicles. Golf carts and low-speed vehicles are becoming a growing part of the safety landscape, creating new classification and enforcement challenges. Some models qualify as "low-speed vehicles" under NDCC and require a driver's license, while others fall under OHV regulations depending on their speed capabilities. This inconsistency leads to confusion among users and law enforcement alike.

"People don't always understand whether their golf cart is a low-speed vehicle or an OHV — and enforcement varies by jurisdiction."

Citation data confirms that violations involving these vehicles, while still modest in number, are rising in residential neighborhoods and near golf courses. Stakeholders noted that as these modes increase in popularity, municipalities like Bismarck and Mandan will need to refine ordinances to clarify where and how they can safely operate.

Snowmobiles. Compared with OHVs, snowmobiles present fewer conflicts in the Bismarck-Mandan area because their use is concentrated on dedicated trail systems managed by local snowmobile clubs and the state parks department. Stakeholders noted that snowmobile riders tend to be experienced and that club systems help reinforce safe riding practices. However, mild winters in recent years have reduced local activity, leading to fewer enforcement challenges.

"Snowmobiles are less of an issue here, unless it's a heavy winter. The trails keep them separate from traffic."

Crash and citation data confirm this trend: snowmobile-related incidents are far fewer than OHV-related cases, though spikes occur during years with deeper snowpack and more frequent trail use. This suggests that snowmobile safety is primarily a function of seasonal conditions, but monitoring remains important to ensure preparedness during high-use winters.

CONCLUSION

The combined interview and data analysis highlight significant safety risks tied to OHV use in the Bismarck-Mandan area, particularly among youth and adult riders who increasingly operate on public roadways. Key challenges include regulatory ambiguity, inconsistent enforcement, and the growing use of OHVs as transportation rather than recreation. Crash and EMS data confirm high injury risks for both youth and adults, with pediatric cases disproportionately involving rollovers, ejections, and head injuries. Snowmobiles appear less problematic overall, though their risks rise during high-use winters. Moving forward, stakeholders identified the need for clearer laws, expanded training that incorporates roadway safety, stronger helmet compliance, and consistent enforcement across jurisdictions to reduce crashes and improve safety outcomes.

2025

SAFETY POLICY STUDY

BISMARCK-MANDAN MPO

TRANSPORTATION SAFETY FOCUS GROUPS KEY THEMES REPORT
BISMARCK-MANDAN METROPOLITAN PLANNING ORGANIZATION

OVERVIEW

This report synthesizes findings from three focus groups conducted in May 2025, which gathered input from first responders, active transportation stakeholders, and youth participants. The purpose is to better understand transportation safety concerns across all modes of travel: vehicle, transit, pedestrian, bicycle, and micromobility. The results of the Key Themes Report will be used to supplement the quantitative safety analysis and inform the subsequent prioritization of safety strategies and recommendations in the Safety Policy Study. The following themes emerged consistently and significantly across all participant groups.

KEY THEMES AND FINDINGS

1. **Distracted and Impatient Driving.** Participants across all focus groups identified distracted driving (e.g., phone use), aggressive behavior, and general driver impatience as significant threats to road safety. Common concerns included:

- Increased use of phones at traffic signals and while driving.

> *"We've turned into a society where we sit at green lights and run red ones because you're on your damn phone." — First Responders Focus Group*

- Drivers fail to yield to pedestrians, especially at crosswalks and school zones, where participants described frequent close calls and inattentiveness. Youth and adult respondents noted that drivers often speed through marked crossings or fail to recognize the right-of-way of pedestrians, creating unsafe conditions and discouraging walking or biking.

- Aggressive driving such as tailgating, speeding in residential areas, and passing slower or cautious drivers—particularly around schools or when drivers encounter cyclists or pedestrians—contributes to an unsafe and stressful travel environment for all road users.

Focus Group Facilitation & Summary by: Emergent STRATEGIES GROUP

2. **Incomplete and Inconsistent Infrastructure.** A major concern across all groups was the lack of consistent, safe, and connected infrastructure for non-motorized users:

- Youth highlighted incomplete sidewalks and trails, faded crosswalks, and road crossings that are unsafe or too short, particularly at high-traffic corridors such as Century Avenue, State Street, and Expressway. Participants in the Active Transportation focus group echoed these concerns, noting significant gaps between public sidewalks and commercial destinations, as well as a lack of continuity in bike infrastructure. First responders added that they frequently see pedestrian traffic along roads that lack sidewalks or shoulders altogether, especially near jails, highway corridors, and transitional rural areas, further underscoring the need for a more connected and accessible network.

"There have been countless times I have been forced to run or bike on the side of a busy road because either the sidewalk or trail ends." — Youth Survey Response

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- Bike lanes are inconsistent and often lack protection, especially in Mandan, where some streets have no designated bike facilities at all, and others abruptly end without connecting to the larger trail network. Participants pointed out that this forces cyclists to share lanes with fast-moving traffic, raising the risk of conflict and discouraging everyday biking.

- Trails and sidewalks are often obstructed or poorly maintained. When a site experiences new or renovated development, instances may arise where business driveways or access cuts damage shared-use paths, creating hazardous conditions for pedestrians, cyclists, and strollers.

- Poor connections from public sidewalks to commercial centers. Note the following quote as one specific example.

"There is no pedestrian facility from Century Ave into the commercial center... you have to walk through traffic." — Active Transportation Focus Group, referring to walking to the commercial development between West Interstate Avenue and 15th Street Northwest from the Touchmark Retirement Community

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3. **Unsafe Use of Micromobility Devices.** Electric scooters and e-bikes are often seen as unregulated and dangerous when misused.

- First responders reported instances of DUI and reckless operation: "*They are a major problem.*"

- Youth and adults expressed discomfort with fast-moving micromobility devices sharing pedestrian or vehicle space. Youth and adults noted that e-scooters and e-bikes often operate too fast for sidewalks or trails and lack a clear space within the road network. Several respondents advocated for separation from vehicle traffic.

"I don't trust myself on scooters or golf carts... they are so unstable and dangerous on roads." — Youth Survey Response

- Lack of clarity or enforcement of where these devices belong (roads, sidewalks, trails), leading to confusion and inconsistent use across the community. Participants reported seeing scooters and e-bikes speeding on sidewalks, weaving through pedestrian areas, or riding in traffic lanes without wearing safety gear, which contributes to safety concerns and legal ambiguity.

4. **Seasonal and Weather-Related Hazards.** Snow, ice, and construction repeatedly hinder safe and accessible transportation. All groups noted winter driving as a safety risk due to decreased visibility and poor road conditions. Youth often avoid walking or biking altogether during winter months.

- Youth and pedestrians emphasized inconsistent snow removal on sidewalks and medians, creating dangerous or impassable conditions and poor visibility, which increases crash risk.
- Several rural roads (e.g., Old Red Trail) consistently freeze over the travel lanes and become impassable, which hinders emergency response access.

"There's some roads that... drain water across the travel lane. At night, it freezes. It's pure ice every morning." — First Responders Focus Group

5. **Education and Enforcement Gaps.** Participants identified a need for consistent education on laws, safe behavior, and enforcement of traffic rules. There is a strong desire for more public education and targeted enforcement:

- First responders want greater access to schools for drivers and safety education.

"I've been trying to get into public schools to do talks for defensive driving... they say they don't have time." — First Responders Focus Group

- Youth requested simplified and relatable traffic safety messaging, emphasizing that current materials, like driver's education content, can be overly complex or use unfamiliar terminology. Respondents suggested using plain language, real-life examples, and peer-oriented presentations to improve understanding and engagement.

- Inconsistent enforcement of traffic laws (e.g., yielding at crosswalks, overtaking school buses) was flagged as a gap. Youth requested more visible enforcement of speeding and reckless driving, as well as better protection for non-vehicle users. At the same time, some also noted the unjust treatment of people using alternative transportation modes.

6. **Safety Challenges in Rural and Growing Areas.** Rapid suburban and rural growth is putting pressure on outdated infrastructure and increasing safety risks:

- First Responders mentioned expanding areas like Lincoln and Southeast Bismarck that require road widening and updated designs to accommodate traffic volumes.

- Wildlife crossings and poor rural road conditions (gravel, no shoulders) are frequent issues.

"Some rural roads haven't been graded in a long time... not enough warning signs." — Youth Survey Response

- Active transportation users flagged increased development near trail corridors and schools that are adding turning conflicts and speeding risks.

7. **Inaccessible and Underused Public Transit.** Transit is limited in coverage and timing, affecting its usability and perceived safety.

    - One-hour or longer wait times discourage regular use.

"If you miss that bus, you either have to wait another hour or two hours or figure out something else." — Active Transportation Focus Group

- Youth and adults cited harassment, limited-service hours, and lack of direct routes as barriers.

"As a single woman, there are people who regularly like to ride the bus and follow women off the bus who appear to be alone." — Youth Survey Response

- The desire for better connections between colleges (Bismarck State College, University of Mary, and United Tribes Technical College) and downtown nightlife areas, particularly during evening hours. One participant noted, "*If we could get more of that college age group living in good quarters downtown, where all the bars are... then you'd have good transit late at night to get them home safely*," highlighting the need for reliable late-night options to reduce unsafe driving and support students' social mobility.

CONCLUSION

Overall, concerns about transportation safety are systemic and impact all modes. The main themes focus on driver behavior, infrastructure weaknesses, the rising use of micromobility, and limited support for non-vehicle users. The findings suggest a need for comprehensive improvements, including physical infrastructure upgrades, behavior change campaigns, and policy or regulatory changes to promote safe, multimodal travel.

The data from these focus groups show a common concern for safety and a willingness among community members to support changes. Fixing driver behavior, filling infrastructure gaps, and regulating micromobility, while improving education and transit access, will create safer and more equitable transportation options for everyone.

SRF

MEMORANDUM

SRF Project No. 16072

To: Kim Riepl
Bismarck-Mandan Metropolitan Planning Organization

From: SRF Consulting Group

Date: August 21, 2025

Subject: 2025 Safety Policy Study – High-Injury Network

High Injury Network Analysis

Introduction

The Bismarck-Mandan Metropolitan Planning Organization's (Bismarck-Mandan MPO's) 2025 Safety Policy Study relies on a thorough understanding of crash trends to inform strategic investments in projects aimed at improving the safety of all road users throughout the Bismarck-Mandan MPO's Metropolitan Planning Area (MPA). One component of the analysis needed to gain that understanding is a High-Injury Network (HIN) for the MPA.

A High Injury Network (HIN) is a subset of a road network that has been identified as having high concentrations of historical crashes that resulted in severe injuries. Unlike a heatmap, an HIN looks at the densities of severe crashes along a corridor and selects the portions of corridors that have concerningly high concentrations of crashes. The crash densities are calculated using a sliding window approach where a "window" of a predetermined length "slides" along the corridor at a specific increment and the density of injuries that occurred within that window are calculated and assigned to the segments within that window. This reduces edge effects at the ends of corridors, allows injuries along a corridor to be included in the analysis whether they occurred at an intersection or somewhere midblock, and ensures that the segments selected are an appropriate length (i.e. the length of the sliding window). Based on user-defined criteria, a minimum crash density is selected and any road segment with a calculated injury density above that threshold is included in the HIN. The resulting HIN represents a prioritized subset of the road network, focusing on roadway corridors with the highest prevalence of historical, severe crashes.

Developing a High-Injury Network

The development of an HIN consists of six steps: (1) compiling the crash data, (2) creating a base road network, (3) creating short and long windows from a base road network, (4) assigning crashes to long windows, (5) calculating short and long window scores, and (6) setting a minimum short window crash score threshold for inclusion in the final selection. All six steps are described below.

Step 1: Compiling the Crash Data

The project team utilized crash data provided by the North Dakota Department of Transportation (NDDOT) for crashes that occurred in Bismarck-Mandan MPO's MPA over the last 5 years (2020-2024). The data was provided in the five-table format (Crash Master, Unit, Pedestrian, Operator, and Occupant). Each unit (an automobile or a pedestrian) involved in a crash was sorted into a mode based on the *Unit Configuration* field from the Unit crash table. Those modes include:

- Passenger Automobile
- Heavy Vehicle (truck)
- Motorcycle
- Pedestrian
- Bicycle

In addition to the five modes listed above, units could be sorted into three additional mode types which were then excluded from analysis: other (people riding on/in ATVs, farm equipment, horses, etc.), parked/unoccupied automobiles, and hit-and-run automobiles. The crashes were then sorted into the three categories in **Table 1** to denote whether they would be included in the calculations for the all-mode, nonmotorized, and/or motorized HINs.

Table 1. Modes of transportation and the HINs they are included in

HIN Category	Modes Included
All-Mode	All
Nonmotorized	Bicycle and Pedestrian
Motorized	Passenger Automobile, Heavy Vehicle, and Motorcycle

After classifying each unit by mode and excluding units with atypical characteristics, units without occupants, and units on which there was little to no information, the project team determined the Most Severe Injury (MSI) suffered by a person using each of the five modes. The severity of injuries is denoted using the KABCO scale, which consists of five crash severities that are used as an industry shorthand when discussing crash severity. **Table 2** includes descriptions of each of the codes and categorizes them into severe and non-severe groups. As an example of assigning modal MSIs using the KABCO scale, if a passenger car with a driver (operator) and two passengers (occupants) strikes a person walking in a crosswalk (pedestrian) and the pedestrian is killed (K), the driver receives a non-incapacitating injury (B), and the two passengers are suspected of having minor injuries (C), the MSI for someone in an automobile would be a minor injury (B), the MSI for a pedestrian would be a fatality (K), and the MSI for the other modes (heavy automobile, cyclist, and motorcycle) would be null. MSIs were also calculated for all modes, motorized only, and non-motorized only.

Table 2. KABCO injury scale

Severe (more injurious)	Non-Severe (less injurious)
K - involves a fatal injury **A** - incapacitating injury (serious injury)	**B** - non-incapacitating injury **C** - possible injury **O** - no injury or a property damage-only (PDO) crash

Step 2: Creating a Base Network

To reduce the number of artificial and unnecessary breaks in the analysis network, the project team manually validated the network topology and geometrics. The first step of this process consisted of adjusting road segments that were missing or improperly aligned and simplifying complex intersections such as roundabouts to ensure contiguous road segments that intersect at only one location. The second step consisted of merging the individual segments that form each road into contiguous corridors by dissolving the lines based on the street name. These contiguous lines were then used to create the short and long window analysis segments.

Step 3: Creating Short and Long Windows from a Base Network

Once the base network was finished, the corridors were then split into 0.1-mile segments, called "short windows", that correspond to the increment by which the long window is moved along the corridor. In the example shown in **Figure 1**, the main corridor is shown as a road at the top of the diagram and measures 0.8 miles long. The short windows (represented by the green line segments at the top of the diagram in **Figure 1**) are the same length as the increment by which the sliding long window slides. The short windows are split from the corridor starting at one end (in this case, on the left end) which results in short windows of 0.1 mile each.

The sliding windows, often referred to as "long windows" (represented by the blue lines in **Figure 1**), are created by merging short windows in overlapping groups of five or ten to create 0.5- or 1.0-mile-long windows, respectively. In **Figure 1**, the standard long window length is 0.5 miles and therefore consists of five short windows. As the long windows get closer to the ends of the corridor, the long windows decrease in length to ensure that each short window has the same number of long windows overlapping it. In the example, Long Windows A, B, C, D, H, I, J, K, and L are shorter than the standard 0.5 miles.

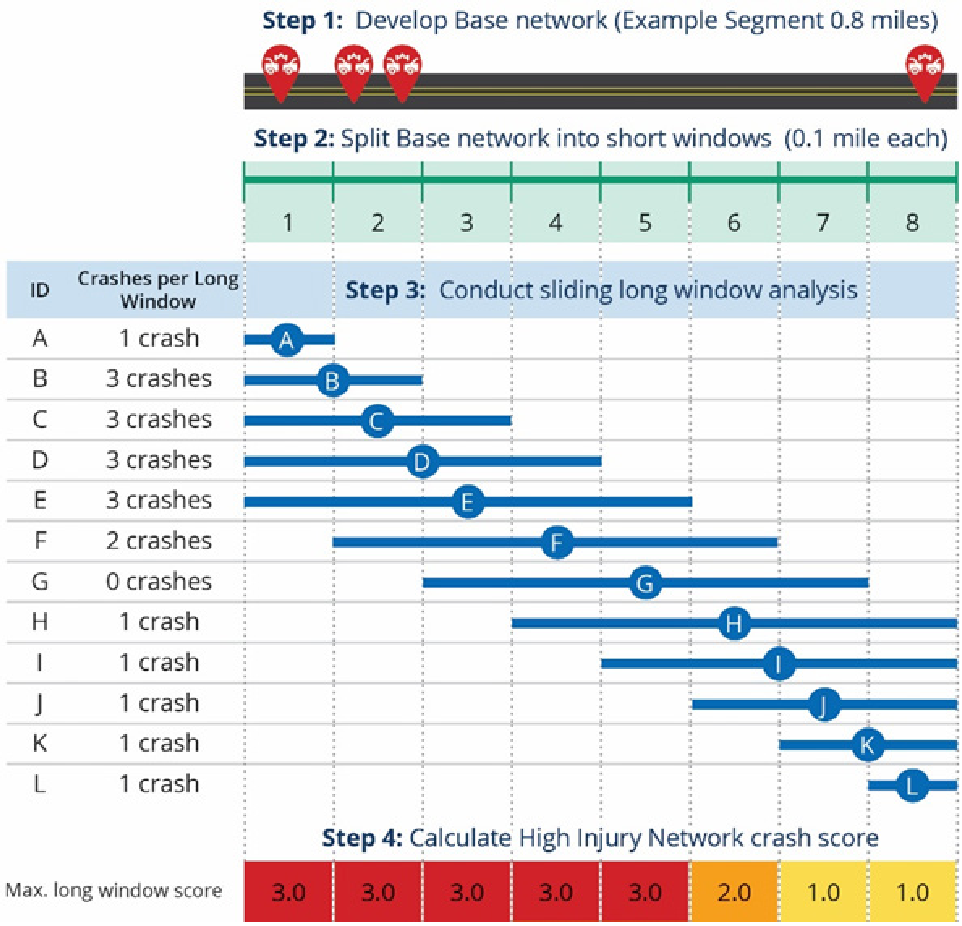


Figure 1. Diagram illustrating the sliding window analysis

Step 4: Assigning Crashes to Long Windows

Once the long windows have been created from the short windows, the individual crashes are mapped to the long windows. To account for the width of the road, minor inaccuracies in the coordinates assigned to each crash, and discrepancies in the geometries representing roads in different datasets, a buffer of 50 meters is used when joining the crashes to the long windows. 50 meters was selected as the buffer distance because it captures the majority of crashes along segments even in cases where crashes occurred on divided roadways or were imprecisely geolocated. While using a buffer helps reduce the number of crashes that are unintentionally left off of a long window, it does increase the likelihood of crashes being assigned to too many long windows – especially at intersections and in locations where two roads run parallel to each other such as frontage roads along freeways. The effects of this over-assignment of crashes to long windows is mitigated by manually excluding short windows that have been assigned an erroneously high injury score. Because an individual crash that occurred at an intersection may be assigned to long windows from both of the intersecting corridors, there is no need to split the crash between the two corridors. After all, a crash that occurs at an intersection occurs on both corridors and splitting the crash between the two corridors would result in the undercounting of intersection crashes across the entire network.

Step 5: Calculating Short and Long Window Crash Scores

Once the crash points were joined to the long windows, the crash score for each long window was calculated based on the number and severity of crashes that are joined to it. The long window crash scores were, in turn, used to calculate the short window crash scores. In the example shown in Figure 1, the long window crash score (equal to the Crashes per Long Window column on the righthand side of the figure) simply reflects the number of crashes that lie within a given long window. For simplicity's sake, the example does not employ any weighting by severity. In other words, one crash equates to one point as opposed to the relative weights (discussed later in this section) that are assigned to each severity in the actual analysis.

The short window score is calculated as the maximum score of any of the long windows that overlap it. In **Figure 1**, Short Window 6 has a maximum long window score of 2.0, which comes from long window F. In the example shown in **Figure 1**, if the threshold for inclusion in the HIN is set to 2.0, six short windows (1, 2, 3, 4, 5, and 6) have scores above the threshold (3.0, 3.0, 3.0, 3.0, 3.0, and 2.0, respectively), resulting in a total of 0.6 miles included in the HIN.

To maintain the focus on the most harmful crashes despite their relative infrequency, only the K, A, and B crashes are considered in the crash score calculations. To further reduce the likelihood of less severe (and far more prevalent) crash types overshadowing the most harmful crash types, two additional measures are employed: the K and A crashes are given a relative weight of 3 and the B crashes are given a weight of 1, and the automobile B crashes are excluded entirely from the crash score calculations. As seen in **Table 3***, Automobile B crashes account for approximately 56% of all K, A, and B crashes and 78% of all B crashes in Bismarck-Mandan MPO's MPA; removing them from the crash score calculations ensures that these relatively minor injuries do not overshadow the other modes' crashes.

**All-Modes totals are not necessarily a sum of all motorized and all nonmotorized crashes. For example, a crash that was a pedestrian B crash and an automobile O crash would show up as a motorized O crash, a nonmotorized B crash, and an all-modes B crash.*

Table 3. Most Severe Injury (MSI) by mode

Mode	K	A	B	C	O	Total
Passenger Automobile	22	137	1,147	1,131	14,699	17,136
Heavy Vehicle	2	2	11	8	732	755
Motorcycle	10	56	103	21	58	248
All Motorized*	***34***	***194***	***1,256***	***1,154***	***14,822***	***17,460***

Table 3 Cont'd: Severe Injury (MSI) by mode

Mode	K	A	B	C	O	Total
Bicycle	0	11	63	12	12	98
Pedestrian	8	34	68	36	61	207
All Nonmotorized*	***8***	***45***	***131***	***48***	***73***	***305***
All Modes	**42**	**239**	**1,385**	**1,201**	**14,630**	**17,497**

Step 6: Setting a Minimum Threshold for Inclusion in the HIN

The HIN is identified using crash score thresholds across the MPA. The project team uses the following rough targets to recommend thresholds, which vary by mode:

- **Coverage of target (KAB) crashes** – are at least 40% of the target crashes covered by the HIN?
- **Mileage or extent of HIN streets and intersections** – is the total length of the HIN less than 10% of the total length of the entire network?
- **Natural breaks** – does increasing or decreasing the threshold result in a significant change in severe crash density on the network? Are there natural breaks in the data where severe crash density dramatically changes?
- **Minimum threshold** – thresholds that are too low dilute the meaning of HIN. The team recommends a minimum crash score threshold of 6.0 for all modes, which equates to at least two life-changing crashes (e.g. two K or A crashes, one K or A crash and three B crashes, etc.) per mile over the past five years.

In short: minimum thresholds should be set high enough to imply a spatial pattern of severe crashes – HIN segment status should not be driven by just one severe crash.

The four targets above are sometimes at odds with one another and should be balanced. For example, covering 50% or more of KA crashes may result in an unreasonable number of miles being included in the HIN or may require a minimum crash score threshold that is so low that even segments with just one crash end up being included in the HIN. The project team recommends erring on the side of a higher minimum crash score threshold to provide a more targeted HIN.

Table 4 shows the combined length of all segments in the network and the total number of KAB crashes by mode and compares them to the combined lengths of the segments selected and count and percentage of the KAB crashes covered by each mode's HIN as defined by their proposed thresholds.

Table 4. Threshold-setting metrics for each modal HIN (non-freeway roads only) at proposed thresholds

Mode	Total Network Miles	Total Crashes*	Proposed Threshold	Network Miles on HIN	Crashes* on HIN
Passenger Automobile	1,250	159	7	42.3 (3.4%)	84 (52.8%)
Heavy Vehicle	1,250	15	6	2.2 (0.2%)	2 (13.3%)
Motorcycle	1,250	169	6	30.0 (2.4%)	78 (46.2%)
All Motorized^	***1,250***	***341***	***7***	***85.8 (6.9%)***	***221 (64.8%)***
Bicycle	1,250	74	6	7.7 (0.6%)	27 (36.5%)
Pedestrian	1,250	110	6	24.2 (1.9%)	58 (52.7%)
All Nonmotorized^	***1,250***	***184***	***6***	***40.0 (3.2%)***	***124 (67.4%)***
All Modes	**1,250**	**524**	**7**	**112.9 (9.0%)**	**387 (73.9%)**

**Crash counts include K, A, and B crashes except for automobile B crashes*

^All-Modes totals are not necessarily a sum of all motorized and all nonmotorized crashes. For example, portions of the modal HIN may overlap and specific stretches of road may be included on the motorized HIN and nonmotorized HIN..

In cases where crashes resulting in severe injuries to a given mode are particularly infrequent and/or sparsely distributed, there may not be any network segments with scores above the minimum meaningful threshold of 6.0. In these instances, it is recommended that the HIN results be supplemented with proactive or systemic methods to help identify safety needs in areas with few or no identified HIN streets. Proactive or systemic methods to identify safety needs may include physical roadway attributes, operational configurations, adjacent land use, and/or stakeholder feedback to identify dangerous locations for multimodal transportation users in the MPA.

Overview of Results

As seen in **Table 4**, the minimum meaningful value (6.0) was applied to all modes as the crash score threshold. This resulted in the all-mode HIN as shown in the Figures below:

- 112.9 miles of roadway in the MPA (9.0% of the 1,250 miles of roads in the MPA) were selected in the all-modes HIN (**Figure 2** & **Figure 3**).
- 40.0 miles of roadway in the MPA (3.2% of the 1,250 miles of roads in the MPA) were selected in the nonmotorized HIN (**Figure 9**, **Figure 8**, & **Figure 7**).
- 85.8 miles of roadway in the MPA (6.9% of the 1,250 miles of roads in the MPA) were selected in the motorized HIN (**Figure 6**, **Figure 5**, & **Figure 4**).

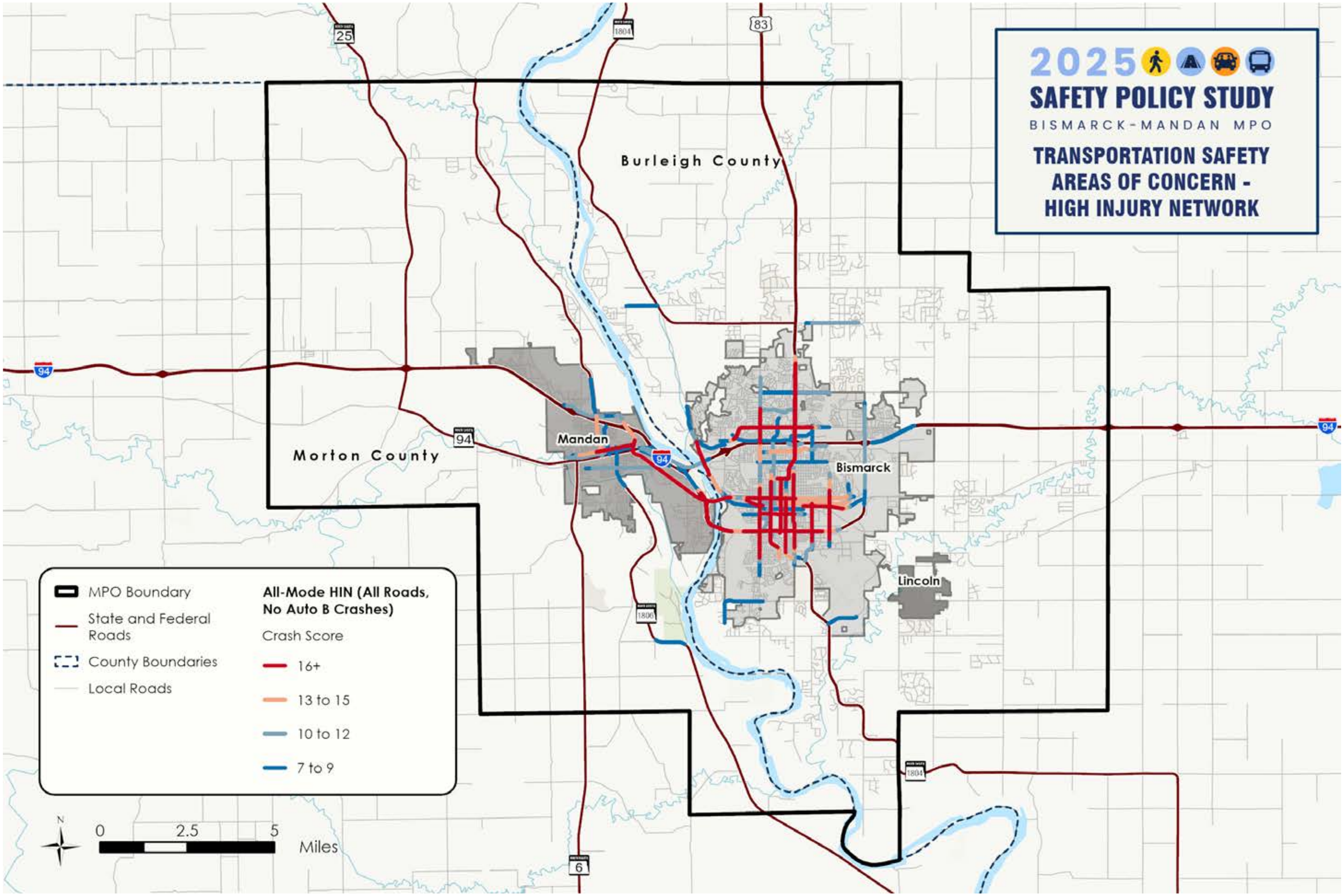


Figure 2. All-modes HIN for Bismarck-Mandan MPO's MPA (2020-2024)

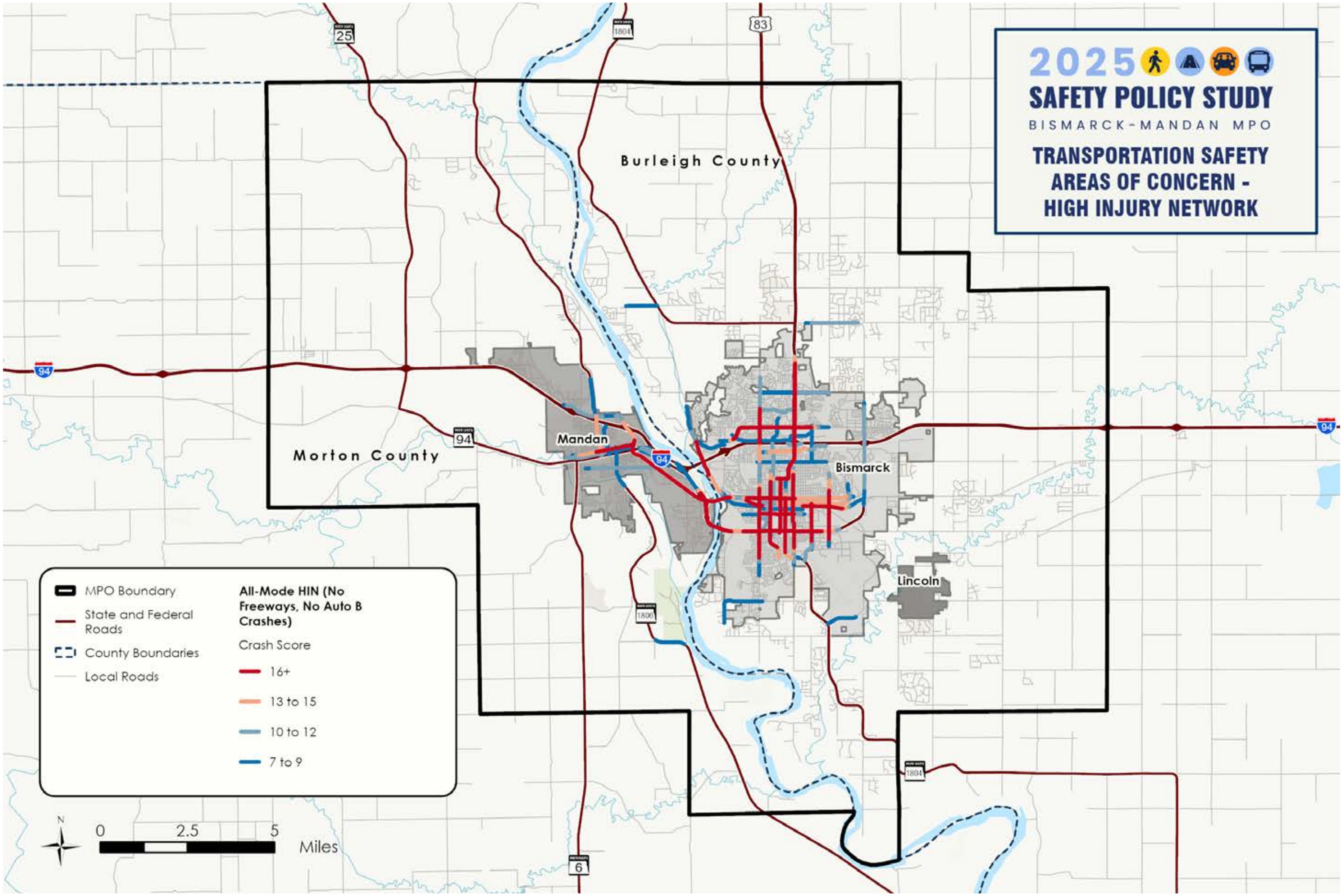


Figure 3. All-modes (No Freeways) HIN for Bismarck-Mandan MPO's MPA (2020-2024)

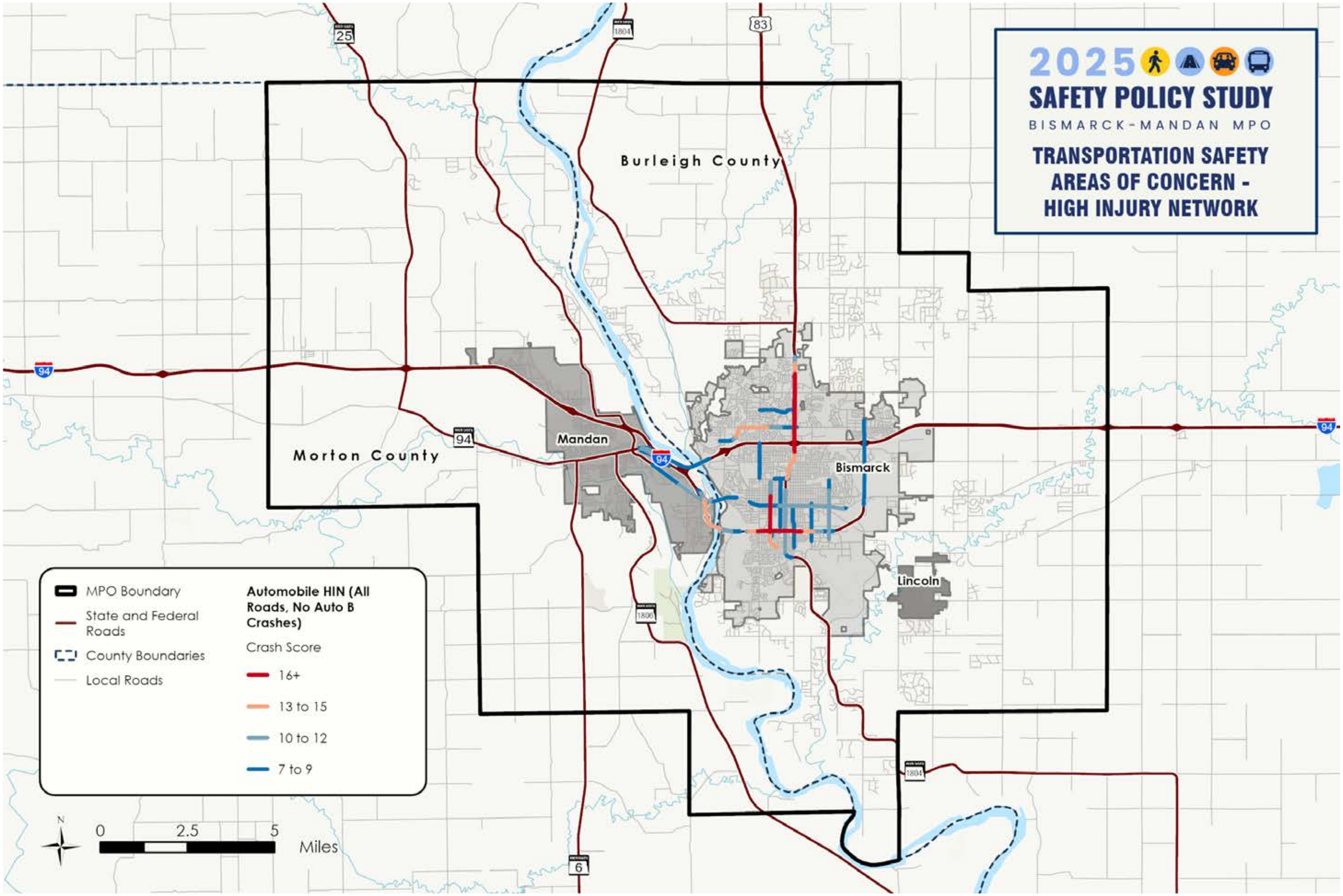


Figure 4. Passenger Automobile HIN for Bismarck-Mandan MPO's MPA (2020-2024)

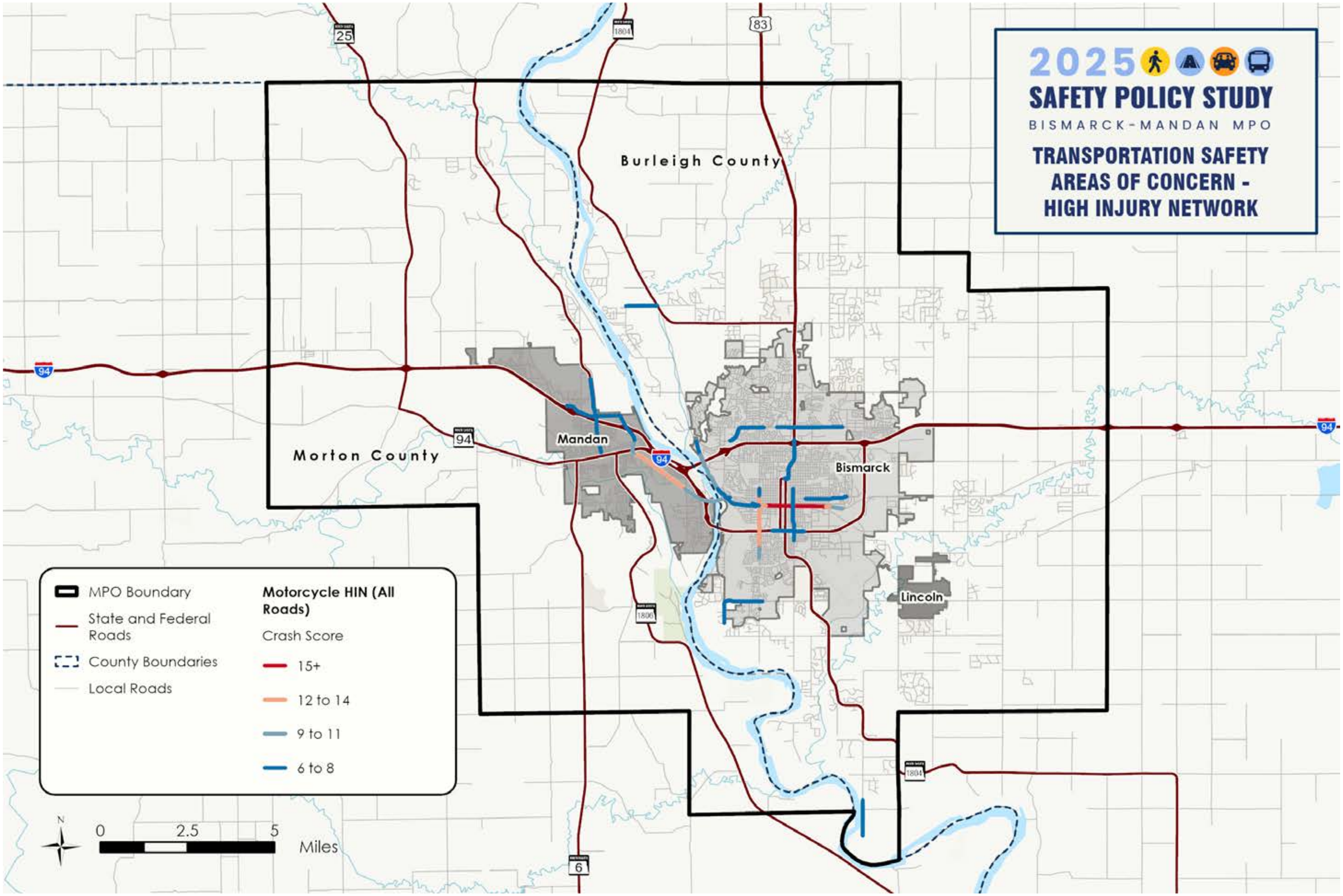


Figure 5. Motorcycle HIN for Bismarck-Mandan MPO's MPA (2020-2024)

SRF

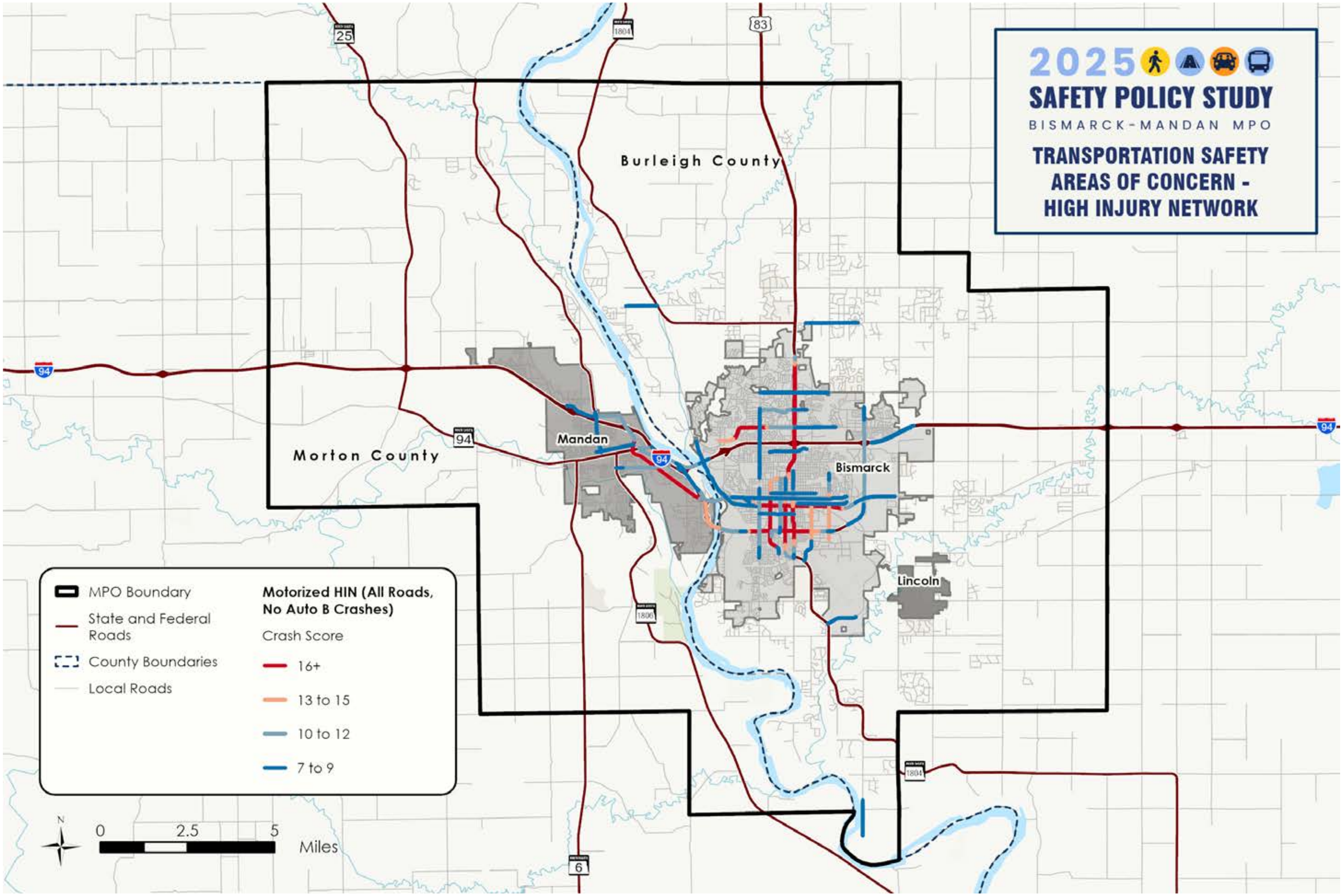


Figure 6. Motorized HIN for Bismarck-Mandan MPO's MPA (2020-2024)

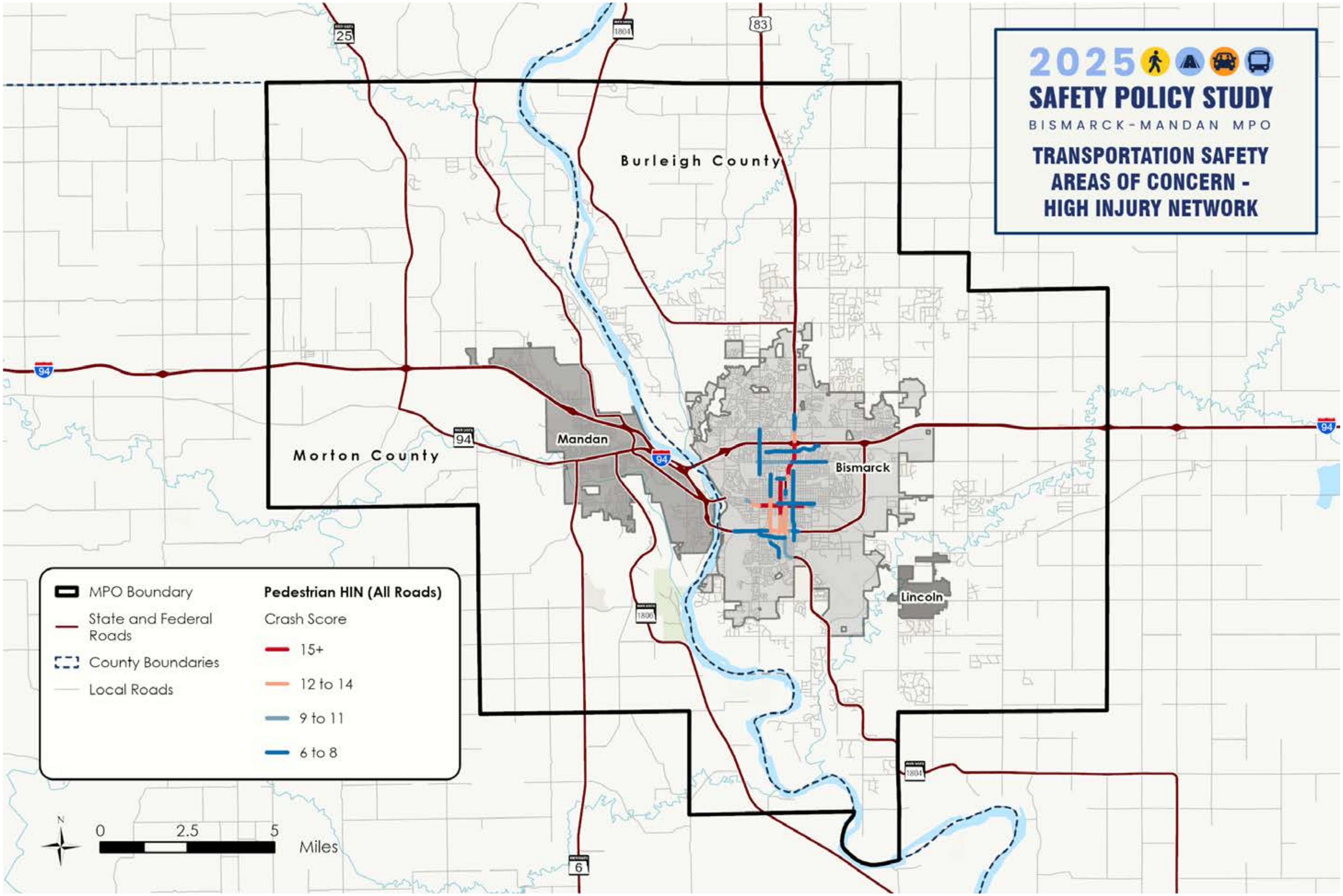


Figure 7. Pedestrian HIN for Bismarck-Mandan MPO's MPA (2020-2024)

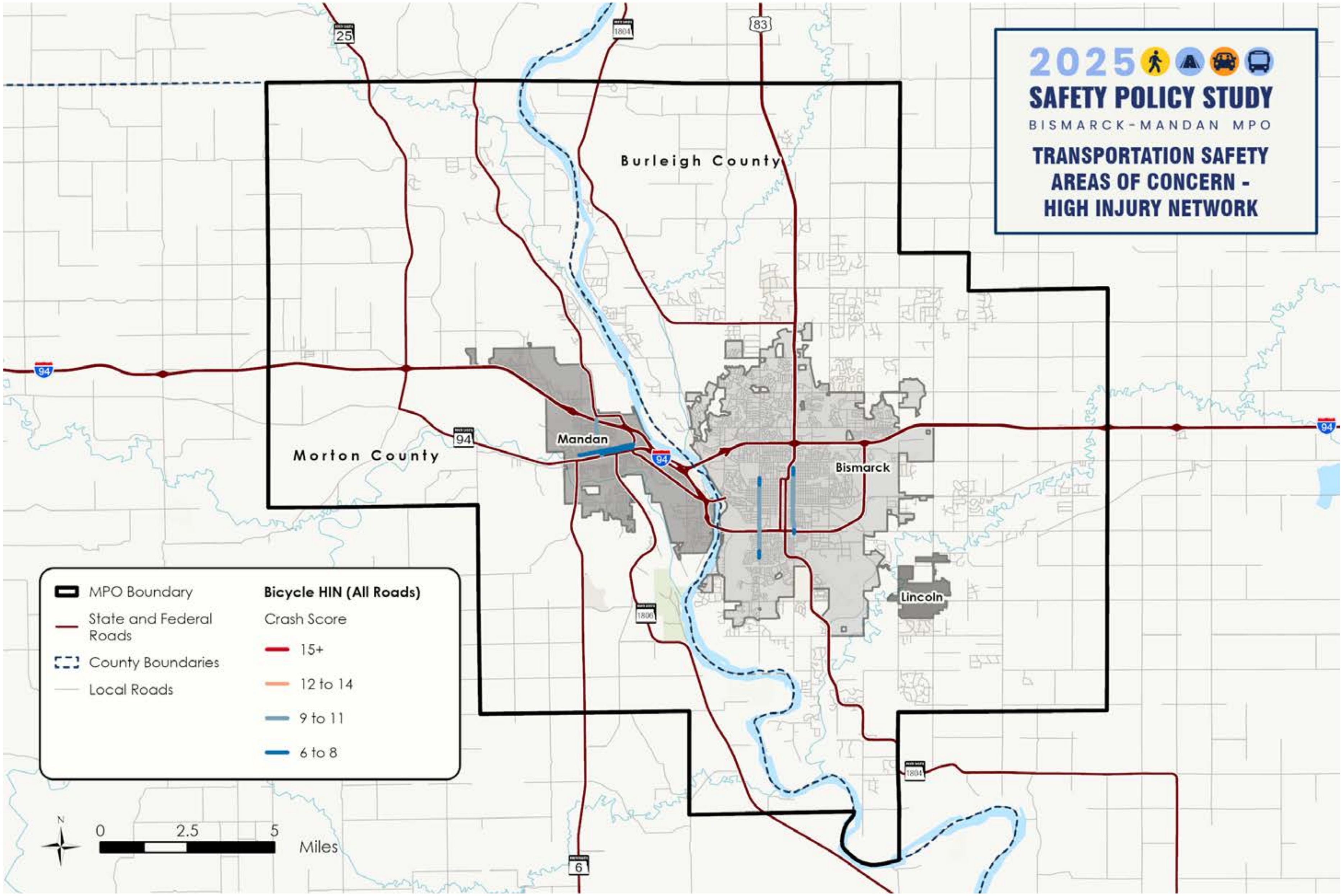


Figure 8. Bicycle HIN for Bismarck-Mandan MPO's MPA (2020-2024)

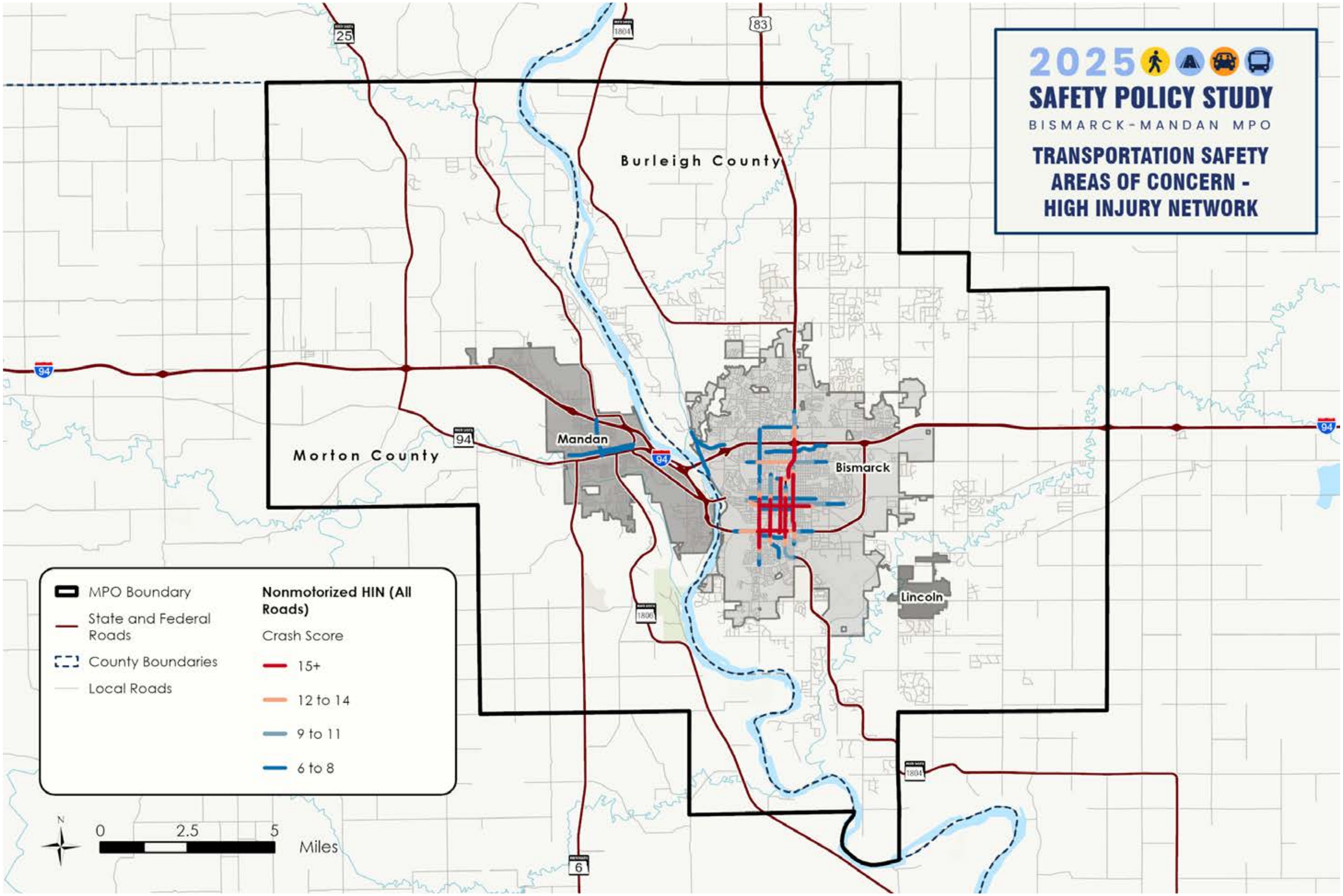


Figure 9. Nonmotorized HIN for Bismarck-Mandan MPO's MPA (2020-2024)

PEDESTRIAN HIGH INJURY NETWORK

3rd Street

E Avenue A to E Denver Drive

Bismarck, ND

5 Crashes contributing to the High Injury Network

13 - 14 HIN Score Range

1.1 Miles Corridor Length

Minor Arterial Functional Classification

City Ownership

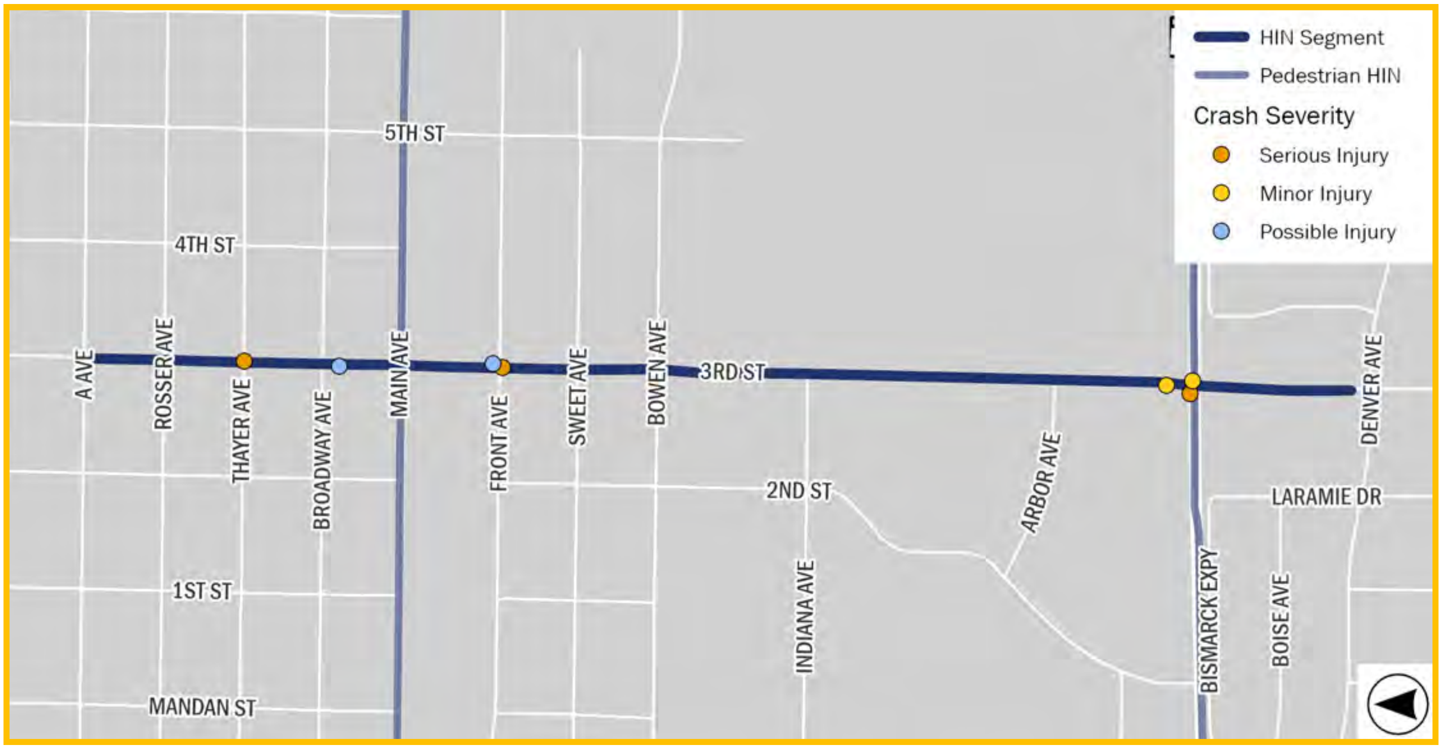
25 Speed Limit (MPH)

6,261 - 13,266 Average Daily Traffic

Corridor Overview

3rd Street is a 1.1 mile section of roadway with five (5) crashes contributing to it being on the Pedestrian High Injury Network. The contributing crashes include **three (3) incapacitating injury and two (2) minor injury crashes**. Additionally, there were two possible injury pedestrian crashes along the corridor. Speed was not considered a factor in any of the crashes.

This Bismarck owned segment of the HIN is from E Avenue A to E Denver Drive and is a minor arterial. The street is undivided with two lanes in each direction with a center turn lane north of Main Avenue. Between Main Avenue and Bismarck Expressway, 3rd Street has two lanes both directions with a center turn lane. South of Bismarck Expressway, the street reduces to one lane in each direction. The land use is generally commercial north of Bismarck Expressway and residential to the south. The streetscape is open north of Rosser Avenue then enclosed between Rosser and W Bowen Avenue before returning to being open. **Severe pedestrian crashes are concentrated at intersections; most prominently at the intersection of 3rd St. & Bismarck Expwy.**



PEDESTRIAN HIGH INJURY NETWORK

7th Street

E Boulevard Avenue to Colombia Drive

Bismarck, ND

3 Crashes contributing to the High Injury Network

8 - 15 HIN Score Range

1.6 Miles Corridor Length

Principal Arterial Functional Classification

State / City Ownership

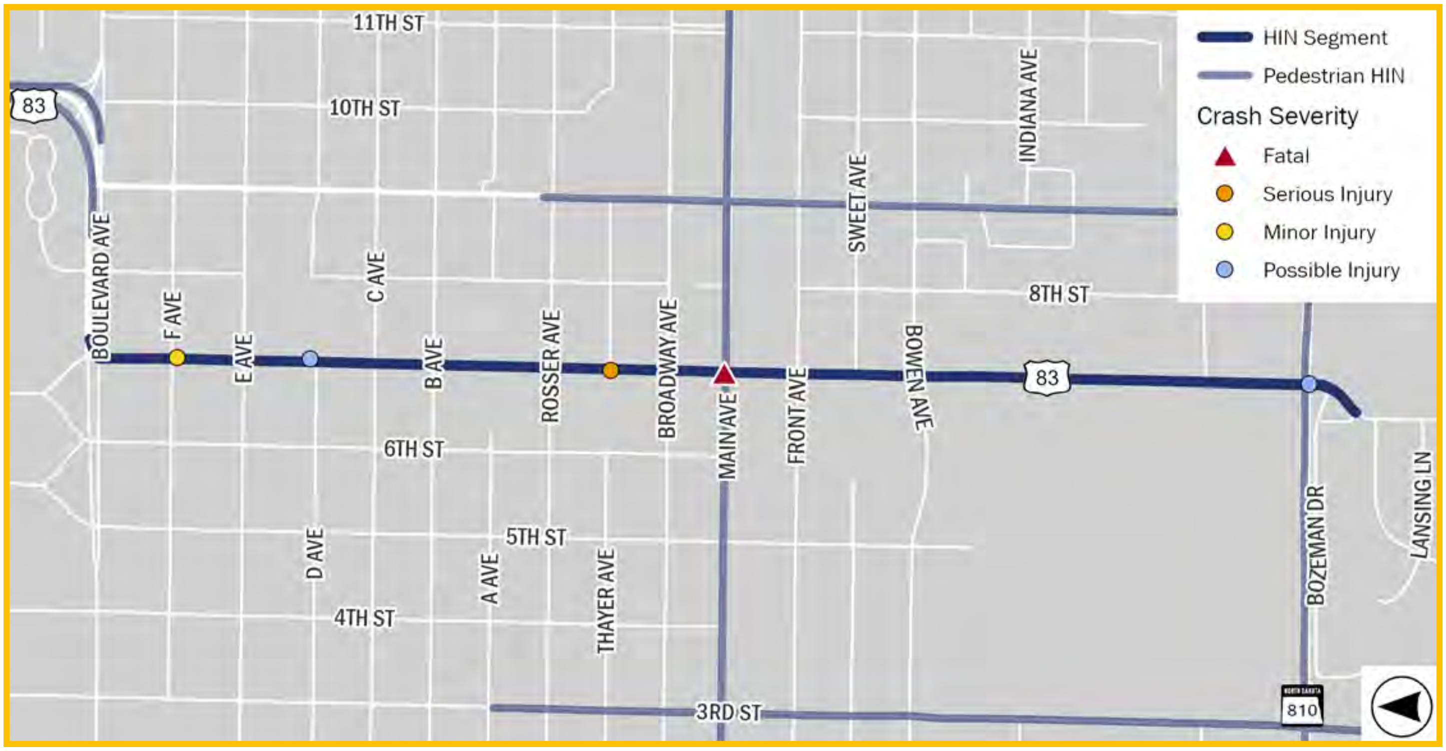
15 - 35 Speed Limit (MPH)

2,662 - 14,408 Average Daily Traffic

Corridor Overview

7th Street is a 1.6 mile section of roadway with three (3) crashes contributing to it being on the Pedestrian High Injury Network. The contributing crashes resulted in **one (1) death, one (1) incapacitating injury, and one (1) minor injury.** There were also two possible injury crashes along the corridor. Speed was not considered a factor in any of the crashes.

7th Street is a principal arterial roadway between E Boulevard Avenue to Colombia Drive and is State owned north of Bismarck Expressway (US 83), and Bismarck owned to the south. The street begins as an undivided one way southbound street with two travel lanes with parking on both sides. It then expands to four lanes at E Avenue A with no parking until Bismarck Expressway. The land use is mixed use and residential north of E Avenue A, commercial to Bismarck Expressway, and mixed use to the south. The streetscape is predominantly open other than where it is enclosed between W Boulevard to Main Avenue. **Severe pedestrian crashes are concentrated at intersections; with the fatal pedestrian crash at the intersection of 7th St. & Main Ave. and incapacitating injury crashes at E Thayer Ave. and E D Ave. (Bismarck High School).**



PEDESTRIAN HIGH INJURY NETWORK

9th Street/University Drive

E Rosser Avenue to E Denver Drive

Bismarck, ND

5 Crashes contributing to the High Injury Network

9 - 13 HIN Score Range

1.1 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

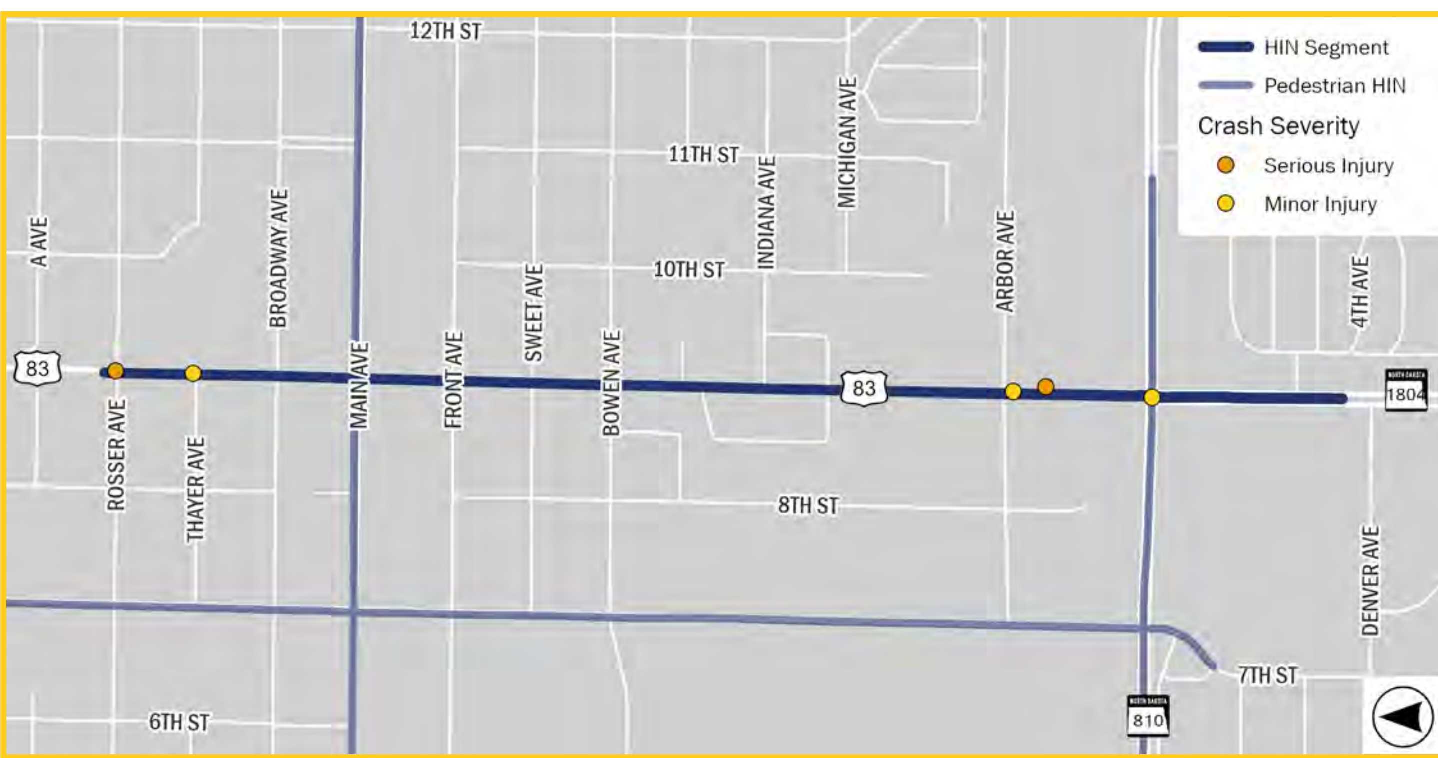
25 - 35 Speed Limit (MPH)

12,298 - 16,241 Average Daily Traffic

Corridor Overview

9th Street/University Drive is a 1.1 mile section of roadway with five (5) crashes contributing to it being on the Pedestrian High Injury Network. The contributing crashes include **two (2) incapacitating injury and three (3) minor injury crashes**. Speed was not considered a factor in any of the crashes.

This State owned principal arterial segment of the HIN is from E Rosser Avenue to E Denver Drive. The street is an undivided five (5) lane with two (2) travel lanes in each direction and a center turn lane. University Drive is a northbound one way north of Bismarck Expressway with four (4) lanes with no on-street parking on either side. The land use is largely commercial north of E Sweet Street. It also has mixed use and commercial land uses and is more residential near Denver Drive on the south end. The streetscape is open except between Main Avenue and E Front Avenue. **Severe pedestrian crashes are concentrated at intersections; and one mid-block incapacitating injury crash just south of Arbor Ave.**



PEDESTRIAN HIGH INJURY NETWORK

Bismarck Expressway

Riverwood Drive to S 11th Street

Bismarck, ND

7 Crashes contributing to the High Injury Network

12 - 13 HIN Score Range

1.3 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

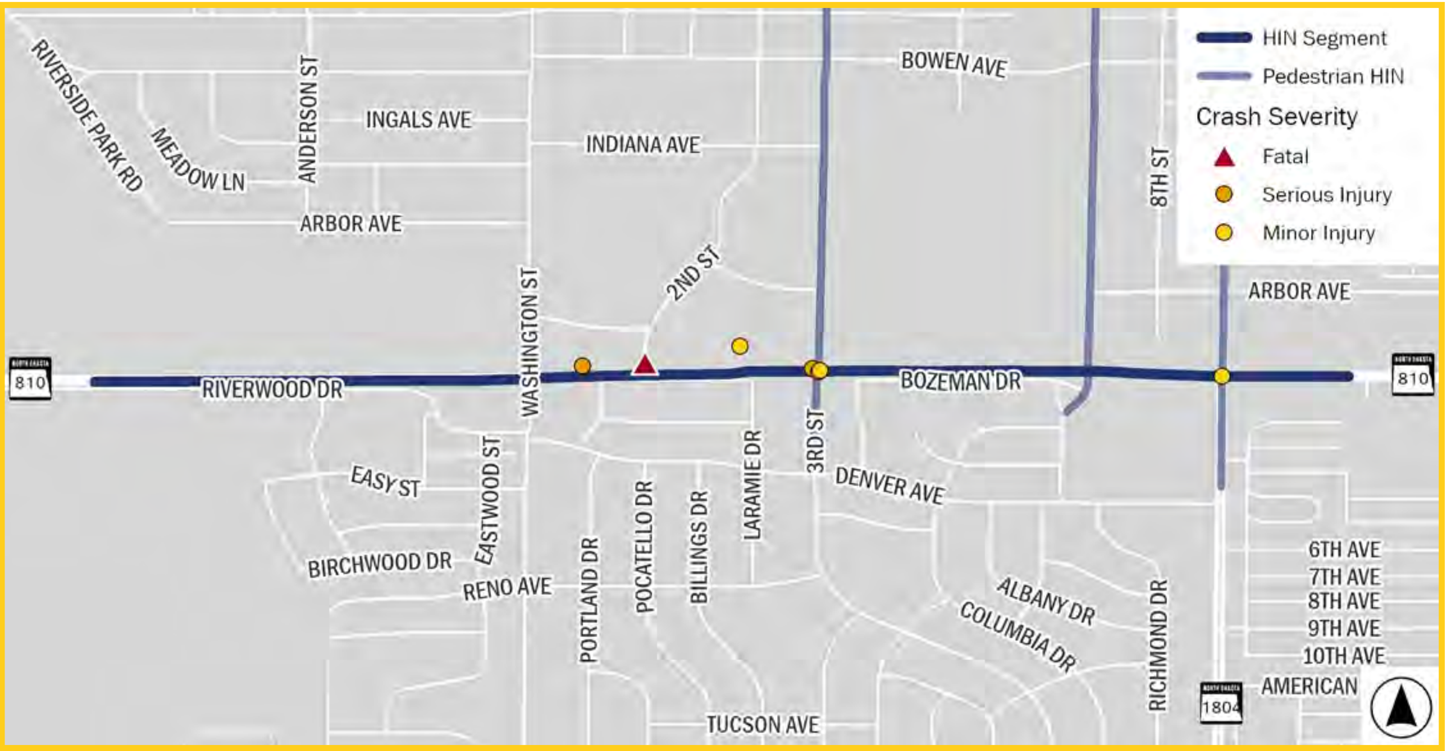
40 - 55 Speed Limit (MPH)

2,793 - 30,492 Average Daily Traffic

Corridor Overview

Bismarck Expressway is a 1.3 mile section of roadway with seven (7) pedestrian crashes contributing to it being on the Pedestrian High Injury Network. The contributing crashes include one (1) fatality, **two (2) incapacitating injury and four (3) minor injury crashes**. Speed was not considered a factor in any of the crashes.

This State owned principal arterial segment of the HIN begins between Riverwood Drive and Westwood Street and goes to S 11th Street. The street is divided west of Laramie Drive with two lanes in each direction with center left turn lane and right turn lanes at major intersections. The land use west of S Washington and commercial to the east with an open streetscape. **Pedestrian crashes are concentrated at intersections; most prominently at the intersection of Bismarck Expwy. & 3rd St. The one (1) fatal pedestrian crash occurred at the intersection of Bismarck Expwy. & 2nd Street. Given the location of some of the minor injury crashes, it appears that adjacent land use and auto-oriented development is a contributing factor for this segment's designation on the HIN.**



PEDESTRIAN HIGH INJURY NETWORK

Main Avenue

N Bell Street to Airport Road

Bismarck, ND

7 Crashes contributing to the High Injury Network

13 - 16 HIN Score Range

1.7 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

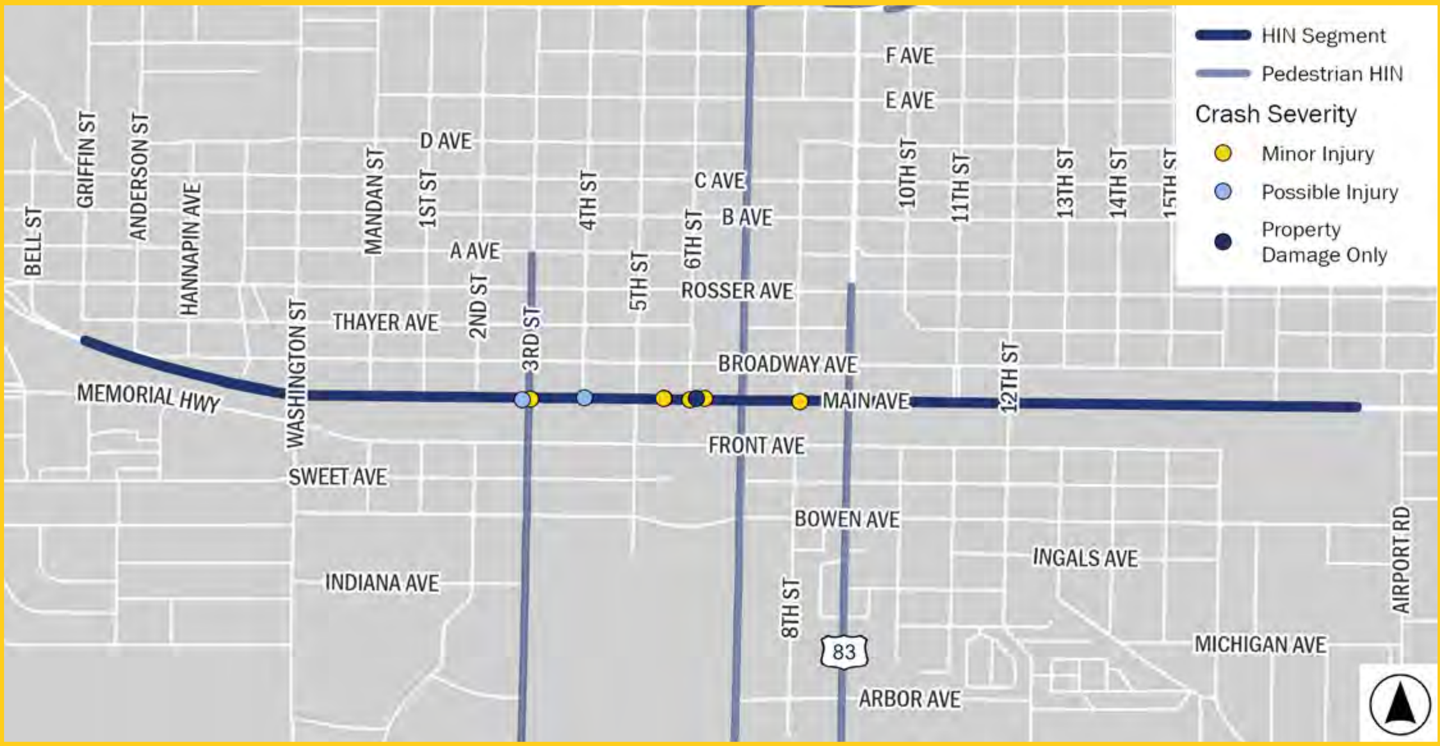
25 - 40 Speed Limit (MPH)

3,916 - 13,338 Average Daily Traffic

Corridor Overview

Main Avenue is a 1.7 mile section of roadway with seven (7) crashes contributing to it being on the Pedestrian High Injury Network. The contributing were **all minor injury crashes**. There were also two (2) possible injury, and one (1) property damage only crashes. Speed was not considered a factor in any of the injury or possible injury crashes.

Main Avenue is a state owned principal arterial segment of the HIN is from N Bell Street to Airport Road. On the east end, the street is undivided with one (1) eastbound lane and two (2) westbound lanes before entering downtown Bismarck where it changes to one (1) lane in each direction with a center turn lane. In this section there is on-street parking on both sides with right turn lanes at major intersections. Main Avenue runs through downtown Bismarck with many commercial businesses east of S Washington St. The streetscape is enclosed downtown, but otherwise open. East of S Washington there are predominantly mixed use commercial land uses, typical of a downtown environment. **Pedestrian crashes are concentrated at intersections; most prominently at the intersection of 6th St. & Main Ave. There was one mid-block minor injury crash between 5th & 6th St.**



PEDESTRIAN HIGH INJURY NETWORK

State Street (Northbound)

E Century Avenue to E Boulevard Avenue

Bismarck, ND

2 Crashes contributing to the High Injury Network

12 - 15* HIN Score Range

1.5 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

30 - 40 Speed Limit (MPH)

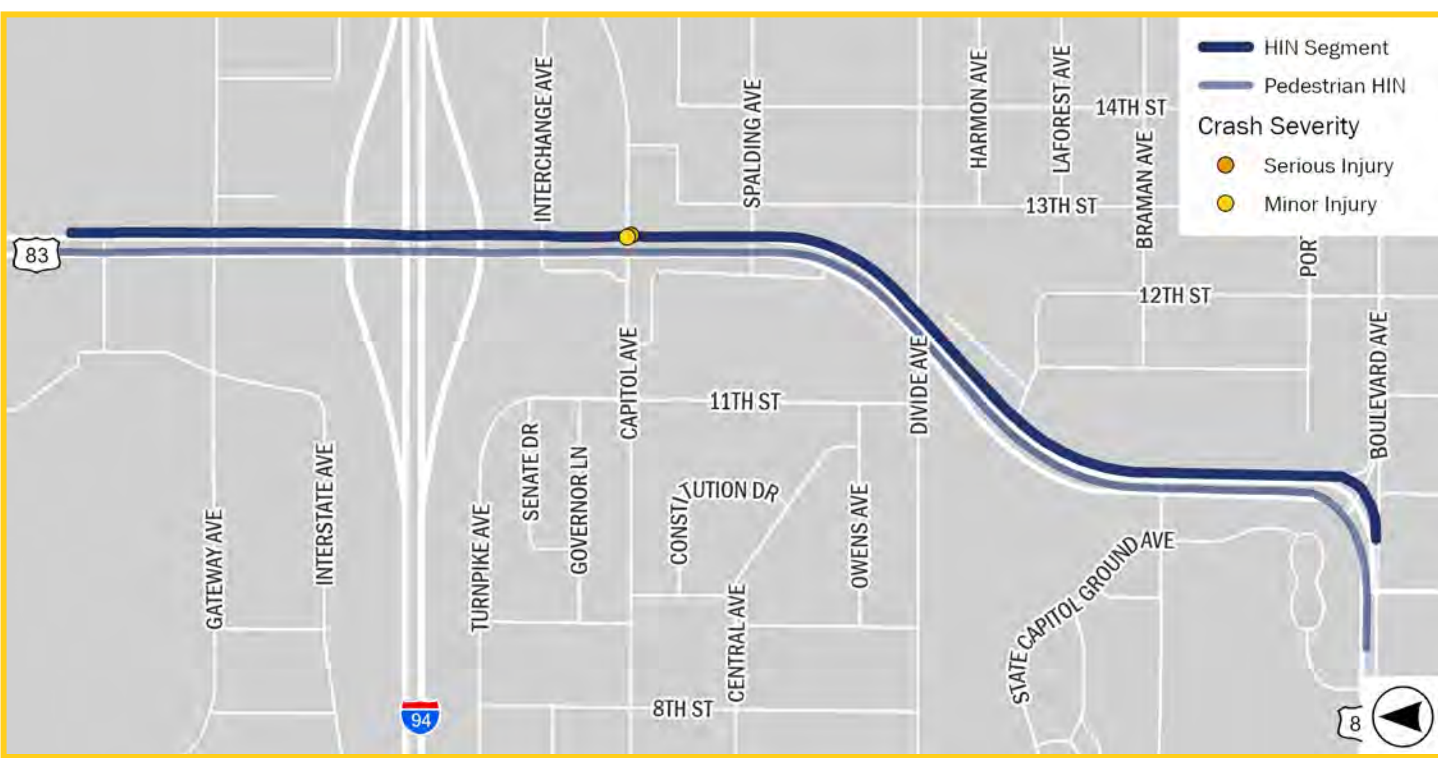
13,536 - 22,113 Average Daily Traffic

Corridor Overview

The northbound lanes of State Street is a 1.5 mile section of roadway with two (2) crashes contributing to it being on the Pedestrian High Injury Network. The crashes include **one (1) incapacitating injury and one (1) minor injury crash**. Speed was not considered a factor in either of the crashes.

State Street (US 83) is a State owned principal arterial segment of the HIN is from E Century Avenue to E Boulevard Avenue. The street is a divided roadway with three (3) lanes in each direction and turn lanes at major intersections. The land use is institutional south of E Divide Avenue and commercial north of it. The streetscape is open throughout. **Severe and minor injury pedestrian crashes are concentrated at the intersection of State St. & Capitol Ave.**

**The HIN score range is reflective of both directions of travel on State St.*



PEDESTRIAN HIGH INJURY NETWORK

State Street (Southbound)

E Century Avenue to E Boulevard Avenue

Bismarck, ND

5 Crashes contributing to the High Injury Network

8 - 15 HIN Score Range

1.6 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

30 - 40 Speed Limit (MPH)

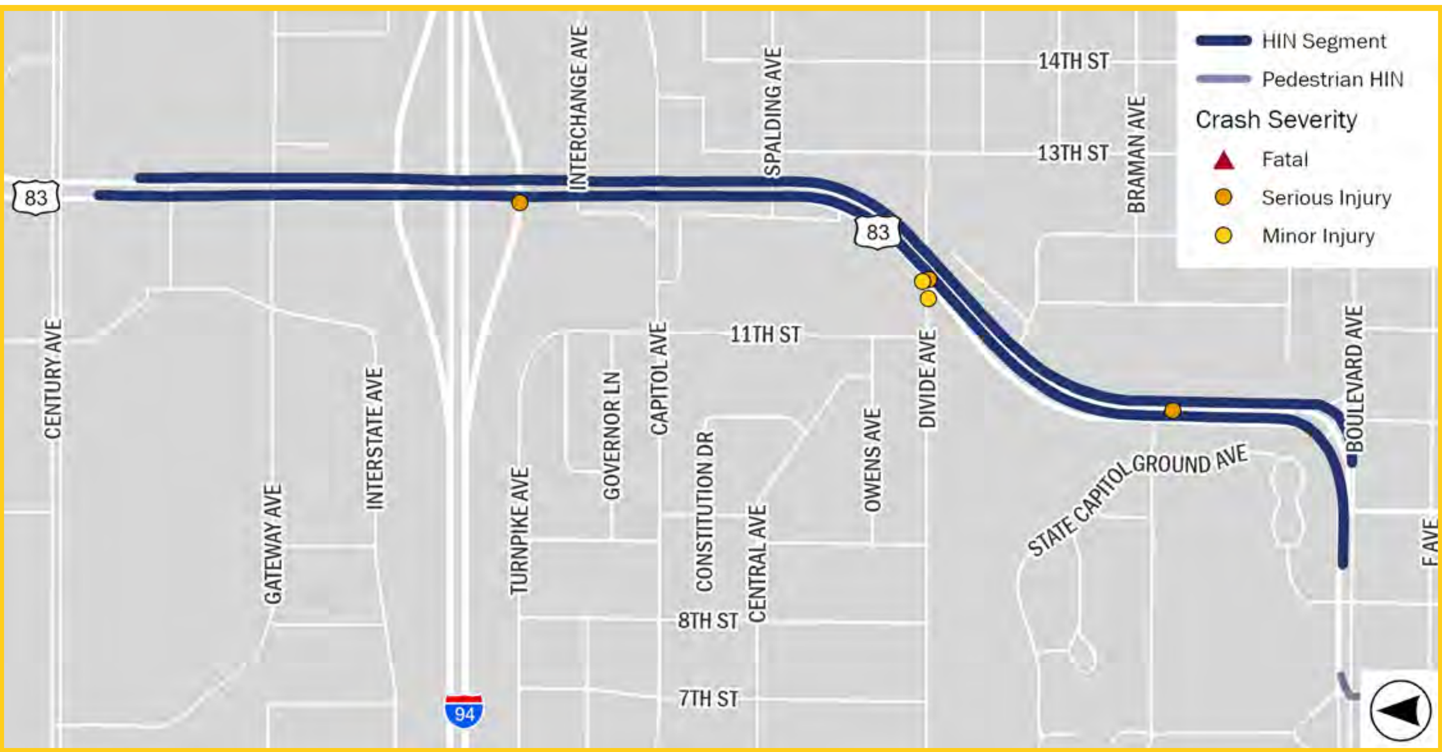
11,761 - 23,975 Average Daily Traffic

Corridor Overview

The southbound lanes of State Street are a 1.6 mile section of roadway with five (5) crashes contributing to it being on the Pedestrian High Injury Network. The contributing crashes resulted in **three (3) incapacitating injuries and two (2) minor injuries.** Speed was not considered a factor in any of the crashes.

State Street (US 83) is a State owned principal arterial segment of the HIN from E Century Avenue to E Boulevard Avenue. The street is a divided roadway with three (3) lanes in each direction and turn lanes at major intersections. The land use is institutional south of E Divide Avenue and commercial north of it. The streetscape is open throughout. **One (1) severe pedestrian crash occurred mid-block, south of the State Capitol entrance, one (1) severe pedestrian crash occurred at the State St. & Divide Ave. intersection, and one (1) severe pedestrian crash occurred at the State. St. & I-94 eastbound exit ramp intersection. Both minor injury crashes also occurred at the State St. & Divide Ave. intersection.**

**The HIN score range is reflective of both directions of travel on State St.*



BICYCLE HIGH INJURY NETWORK

12th Street

Braman Avenue to E Bismarck Expressway

Bismarck, ND

6 Crashes contributing to the High Injury Network

6 - 7 HIN Score Range

1.9 Miles Corridor Length

Local / Minor Arterial Functional Classification

City Ownership

25 Speed Limit (MPH)

315 - 4,908 Average Daily Traffic

Corridor Overview

12th Street is a 1.9 mile section of roadway with six (6) crashes contributing to it being on the Bicycle High Injury Network. The contributing crashes include **one (1) serious injury and five (5) minor injury crashes**. There was also one (1) possible injury crash in the segment. Speed was not considered a factor in any of the crashes.

This Bismarck owned segment of the HIN is from Braman Avenue to E Bismarck Expressway. The segment is a local roadway north of Rosser Avenue and minor arterial south of it. The street is an undivided two (2) lane roadway with parking on both sides north of E Broadway Avenue. Between E Broadway Avenue and W Main Avenue it has two (2) lanes with a center turn lane. South of W Main Avenue it returns to two (2) lane with left turn lanes at major intersections. The land use varies along the corridor with residential uses north of E Boadway, commercial between Broadway and E Sweet Avenue. Land uses return to being residential before changing to mixed use near E Bismarck Expressway. The streetscape is open other than between Main Avenue and E Front Avenue. **Severe and minor injury bicycle crashes occurred at four (4) separate intersections. One (1) minor injury crash occurred mid-block between A Ave and B Ave.**

BICYCLE HIGH INJURY NETWORK

1st Street NE

Collins Avenue to Mandan Avenue

Mandan, ND

2 Crashes contributing to the High Injury Network

6 HIN Score

0.9 Miles Corridor Length

Local Functional Classification

City Ownership

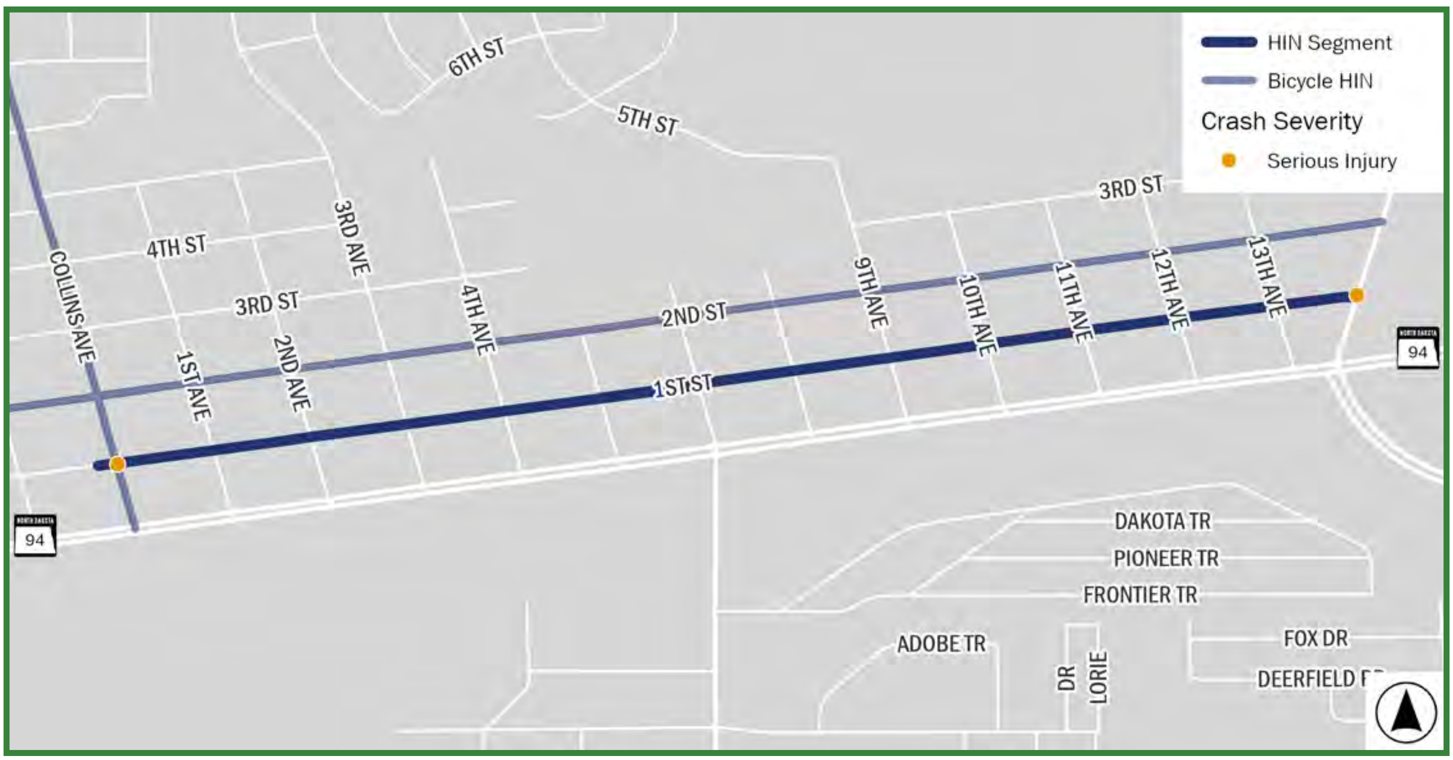
25 Speed Limit (MPH)

270 - 3,349 Average Daily Traffic

Corridor Overview

1st Street NE is a 0.9 mile section of roadway with two (2) crashes contributing to it being on the Bicycle High Injury Network. The crashes resulted in **two (2) serious injuries**. Speed was not considered a factor in either of the crashes.

This Mandan owned segment of the HIN is from Collins Avenue to Mandan Avenue and is a local roadway. The street is an undivided two (2) lane roadway with angle parking near Collins Avenue and Mandan Avenue. Between these major intersections, the street has parallel parking. The land use is largely mixed use and becomes more commercial on east end near Mandan Avenue. The streetscape is enclosed between Collins Avenue and 1st Avenue NE but otherwise is open. **Severe bicycle crashes occurred at the intersections of 1st St. NE & Collins Ave. and 1st St. NE & Mandan Ave.**



BICYCLE HIGH INJURY NETWORK

2nd Street

9th Avenue NW to Mandan Avenue

Mandan, ND

4 Crashes contributing to the High Injury Network

6 HIN Score

1.6 Miles Corridor Length

Local Functional Classification

City Ownership

25 Speed Limit (MPH)

54 - 341 Average Daily Traffic

Corridor Overview

2nd Street is a 1.6 mile section of roadway with four (4) crashes contributing to it being on the Bicycle High Injury Network. The contributing crashes resulted in **one (1) incapacitating injuries and three (3) minor injuries.** Speed was not considered a factor in any of the crashes.

This Mandan owned segment of the HIN is from 9th Avenue NW to Mandan Ave. and is a local roadway. The land use is generally residential along the two (2) lane undivided street with parallel parking on both sides The streetscape is open along the street. There are a few businesses and service buildings where there is angle on-street parking. **One (1) incapacitating injury and one (1) minor injury bicycle crash occurred at the intersection of 2nd St. & Collins Ave. One (1) minor injury bicycle crash occurred at the intersection of 2nd St. & 2nd Ave. NE and one (1) minor injury bicycle crash occurred on 2nd St. between the 5th Ave. NE offset intersections.**

BICYCLE HIGH INJURY NETWORK

Collins Avenue

Interstate 94 to E Main Street

Mandan, ND

3 Crashes contributing to the High Injury Network

7 HIN Score

1.1 Miles Corridor Length

Minor Arterial Functional Classification

State Ownership

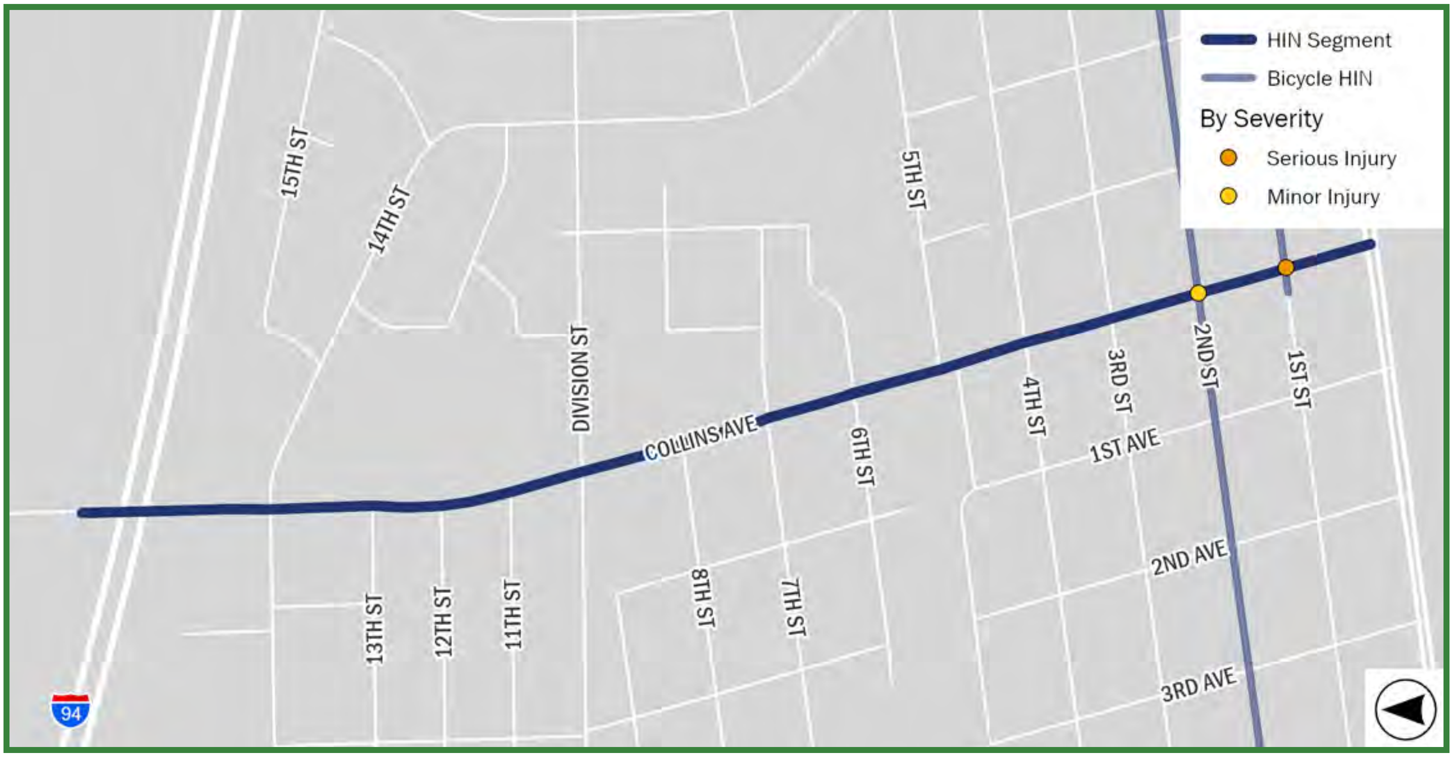
30 Speed Limit (MPH)

2,502 - 5,487 Average Daily Traffic

Corridor Overview

Collins Avenue is a 1.1 mile section of roadway with three (3) crashes contributing to it being on the Bicycle High Injury Network. The crashes resulted in **two (2) incapacitating injuries and one (1) minor injury**. Speed was not considered a factor in any of the crashes.

This HIN segment is a State owned street from Interstate 94 to Main Street and is a minor arterial roadway. The street is an undivided two (2) lane roadway with parallel parking in some areas. In downtown Mandan, there is angle parking on both sides of street. The land use is generally residential north of 3rd Street, then mixed use. The streetscape is open and becomes enclosed at 1st Street to Main Street. **All crashes occurred at intersections. One (1) incapacitating injury crash occurred at the Collins Ave. & 1st St. intersection. One (1) incapacitating injury crash and one (1) minor injury crash occurred at the intersection of Collins Ave. & 2nd St.**



BICYCLE HIGH INJURY NETWORK

Washington Street

W Boulevard Avenue to E Wachter Avenue

Bismarck, ND

11 Crashes contributing to the High Injury Network

6 - 11 HIN Score Range

2.3 Miles Corridor Length

Minor Arterial / Principal Arterial Functional Classification

City Ownership

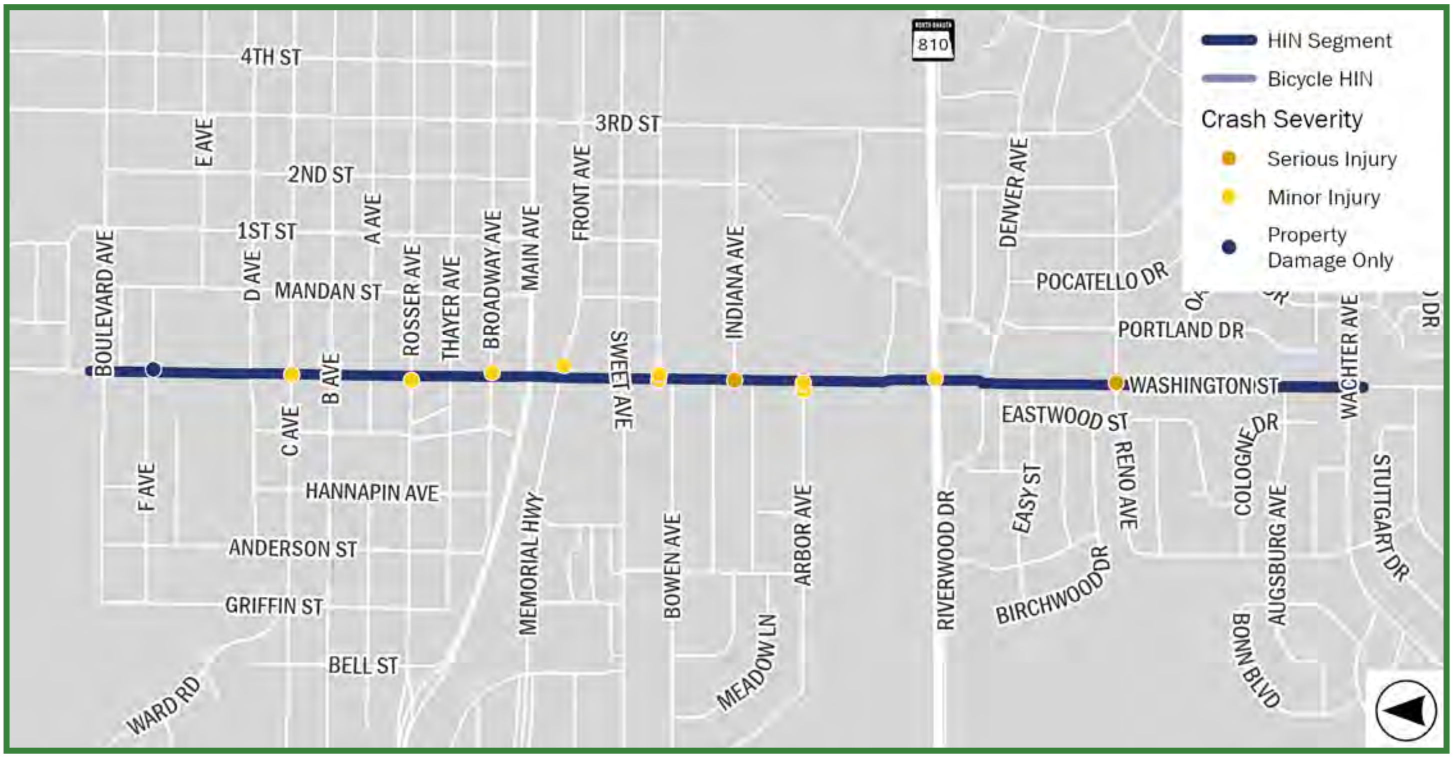
25 - 35 Speed Limit (MPH)

5,170 - 14,960 Average Daily Traffic

Corridor Overview

Washington Street is a 2.3 mile section of roadway with 11 crashes contributing to it being on the Bicycle High Injury Network. The contributing crashes include **two (2) incapacitating injury, and nine (9) minor injury crashes**. There was also one (1) property damage only bicycle crash. Speed was not considered a factor in any of the crashes.

This Bismarck owned segment of the HIN is from W Boulevard Avenue to E Wachter Avenue. It is a minor arterial north of Rosser Avenue and a principal arterial south of it. The street is an undivided two lane roadway with on-street parking on both sides north of W Avenue D. South of Avenue D, a center turn lane is added and on-street parking is removed to W Rosser Avenue. South of Rosser Avenue, the street expands to two (2) lanes in each direction with a center turn lanes to W Denver Avenue with additional turn lanes at Bismarck Expressway. South of Denver Avenue, the street has two (2) lanes in each direction and no center turn lane. The corridor has an open streetscape throughout with residential land uses north of Rosser Avenue, mixed use between Rosser Avenue and W Arbor Avenue, commercial between W Arbor Avenue and Denver Avenue and residential south. **All 11 contributing bicycle crashes occurred at various intersections along Washington St. with concentrations of two (2) minor injury crashes a piece at W Bowen Ave. and W Reno Ave. W Reno Ave. provides a direct route to the Wachter Aquatic Complex and Dorothy Moses Elementary School.**



MOTORCYCLE HIGH INJURY NETWORK

Main Avenue

S Washington Street to S 26th Street

Bismarck, ND

17 Crashes contributing to the High Injury Network

12 - 19 HIN Score Range

2.1 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

25 - 35 Speed Limit (MPH)

7,286 - 9,623 Average Daily Traffic

Corridor Overview

Main Avenue is a 2.1 mile section of roadway with 17 crashes contributing to it being on the Motorcycle High Injury Network. The contributing crashes include **four (4) incapacitating injury and 13 minor injury crashes**. These injury crashes resulted from **six (6) single vehicle, five (5) angle, four (4) rear end, and two (2) sideswipe crashes**. **Speed was a factor in four (4) of the crashes.** There were also two (2) possible injury and three (3) property damage only motorcycle crashes in this section.

Main Avenue is a State owned principal arterial roadway on the HIN from S Washington Street to S 26th Street. The street is undivided and is a three (3) lane roadway with one (1) travel lane in each direction and center left turn lane. There is parking on both sides and has right turn lanes at major intersections. The street expands on the east side with two (2) travel lanes in each direction with a center turn lane. The land use is commercial along the length of the corridor with an enclosed streetscape west of 7th St., otherwise open. **13 contributing motorcycle crashes occurred at or near intersections along Main Ave. with concentrations at 24th St., Airport Rd., 12th St., 6th St., and 4th St. Severe crashes are concentrated west of 9th St. (5-lane).**

MOTORCYCLE HIGH INJURY NETWORK

Memorial Highway

18th Avenue SE to 39th Avenue SE

Mandan, ND

5 Crashes contributing to the High Injury Network

12 HIN Score

1.8 Miles Corridor Length

Minor Arterial Functional Classification

State Ownership

40 Speed Limit (MPH)

1,528 - 4,629 Average Daily Traffic

Corridor Overview

Memorial Highway is a 1.8 mile section of roadway with five (5) crashes contributing to it being on the Motorcycle High Injury Network. The crashes resulted in **one (1) death from an angle crash** where speeding was not a factor. There were **four (4) incapacitating injuries resulting from one (1) single vehicle, one (1) head on, one (1) angle, and one (1) sideswipe crash**. **Speed was acknowledge as a factor in the single vehicle crash.**

This State owned minor arterial segment of the HIN is from 18th Avenue SE to 39th Avenue SE. The street is an undivided street with two lanes in each direction with a center left turn lane. The land use along the corridor s commercial with an open streetscape. **Contributing motorcycle crashes are split between intersections (Fatal at 3rd St. SE and incapacitating injury at Riverwood Ave.) and mid-block. Given the manner of crashes, access driveways likely play a factor in mid-block crashes.**

MOTORCYCLE HIGH INJURY NETWORK

Washington Street

W Avenue A to Augsburg Avenue

Bismarck, ND

6 Crashes contributing to the High Injury Network

12 HIN Score

1.5 Miles Corridor Length

Minor Arterial / Principal Arterial Functional Classification

State Ownership

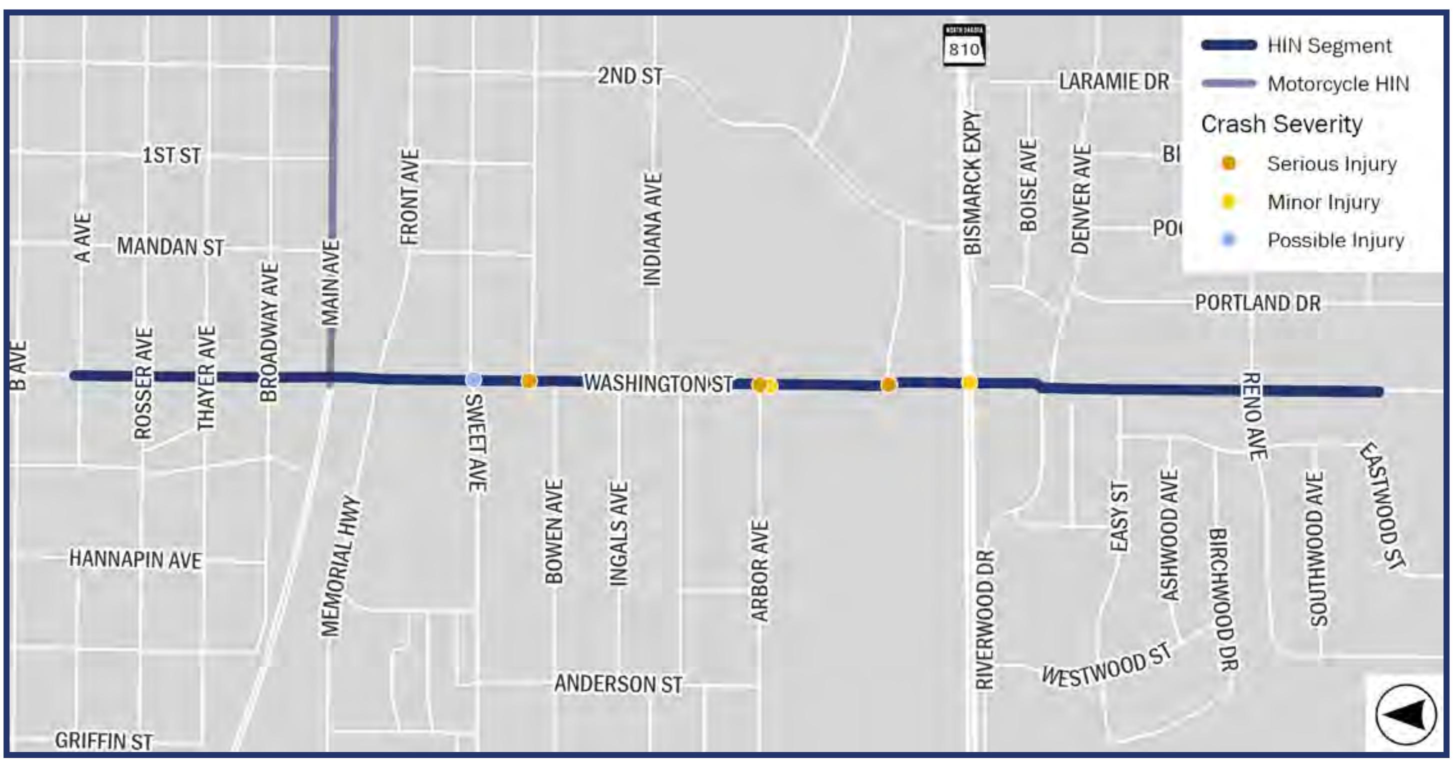
25 - 35 Speed Limit (MPH)

5,170 - 11,471 Average Daily Traffic

Corridor Overview

Washington Street is a 1.5 mile section of roadway with six (6) crashes contributing to it being on the Motorcycle High Injury Network. The crashes resulted in **three (3) incapacitating and three (3) minor injuries**. **Two (2) of the crashes were angle, two (2) single vehicle, one (1) rear end, and one (1) sideswipe crash**. There was also one (1) possible injury single vehicle motorcycle crash in this section.

Washington Street is part of the HIN from W Avenue A to between W Reno Avenue and Augsburg Avenue. The street is a Bismarck owned principal arterial for the majority of the segment but classified as a minor arterial for the one (1) block north of Rosser Avenue. The street is an undivided street with two (2) lanes in each direction and turn lanes between Rosser and W Denver Avenue with additional turn lanes at Bismarck Expressway. South of Denver Avenue, the street has two (2) lanes in each direction and no center turn lane. The corridor has an open streetscape throughout with land uses that are residential north of Rosser Avenue, mixed use between Rosser Avenue and W Arbor Avenue, commercial between W Arbor Avenue and Denver Avenue and residential south. **All six (6) contributing motorcycle crashes occurred at intersections with the highest concentration, of two (2) motorcycle crashes at the intersection of S Washington St. & W Arbor Ave.**



AUTOMOBILE HIGH INJURY NETWORK

3rd Street

E Avenue A to Atlanta Drive

Bismarck, ND

8 Crashes contributing to the High Injury Network

15 - 18 HIN Score Range

1.6 Miles Corridor Length

Minor Collector / Minor Arterial Functional Classification

City Ownership

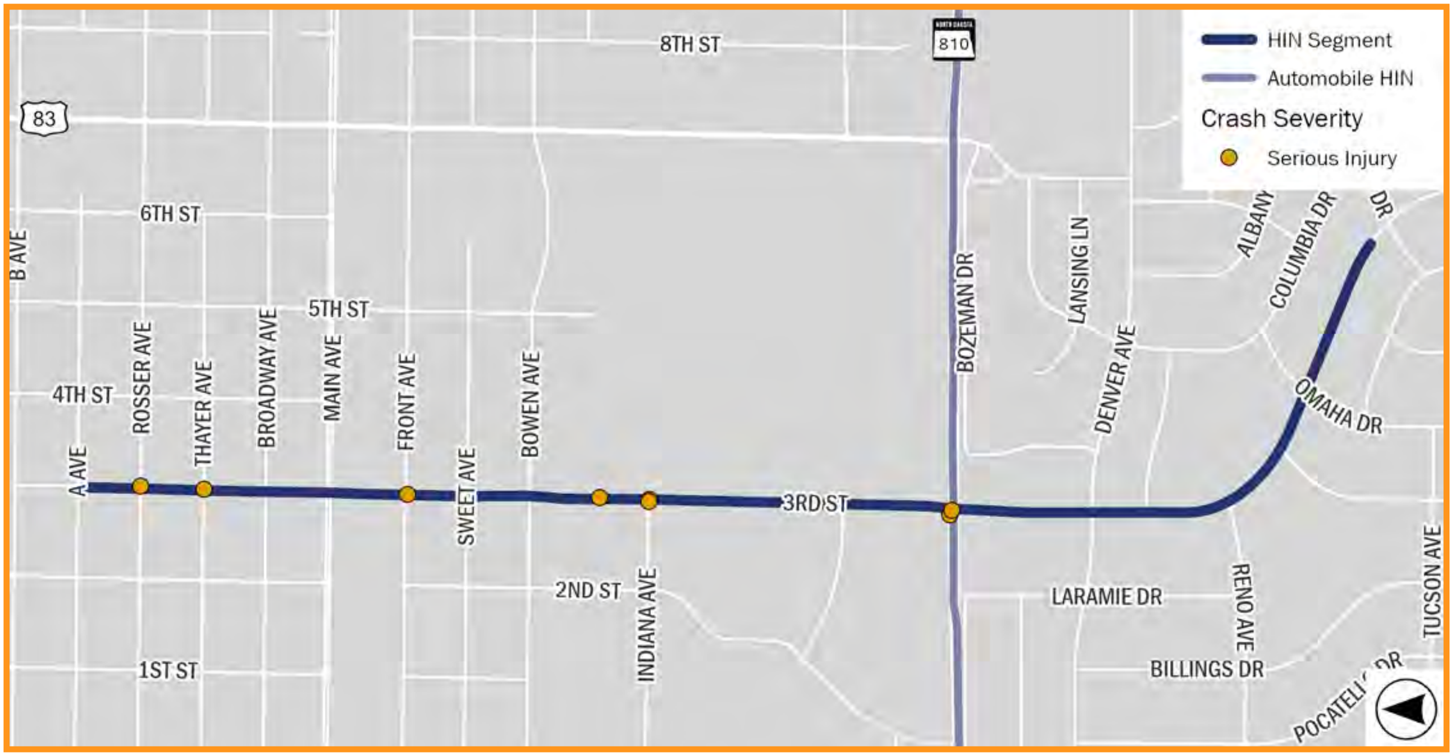
25 Speed Limit (MPH)

4,534 - 13,266 Average Daily Traffic

Corridor Overview

3rd Street is a 1.6 mile section of roadway with eight (8) crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **eight (8) incapacitating injuries from four (4) angle, one (1) head on, and three (3) single vehicle crashes**. Speed was not considered a factor in any of the crashes.

This HIN segment is from E Avenue A to Atlanta Drive and is Bismarck owned. The street is a minor arterial north of Bismarck Expressway and a minor collector south of the expressway. The street is undivided with one (1) travel lane in each direction with center left turn lane north of Main Avenue. At Main Avenue the street expands to having two lanes (2) in each direction with a center turn lane south to Bismarck Expressway. South of the Bismarck Expressway there is one (1) travel lane in each direction. The land use is commercial north of Bismarck Expressway and residential to the south. The streetscape is open other than between W Rosser Avenue and W Bowen Avenue. **Seven (7) contributing automobile crashes occurred at intersections with the highest concentration, of two incapacitating injury (2) automobile crashes at the 3rd St. intersections of Indiana Ave. & Bozeman Dr. There was one (1) mid-block crash between Bowen Ave. and Indiana Ave.**



AUTOMOBILE HIGH INJURY NETWORK

E Bismarck Expressway

Westwood Street to Airport Road

Bismarck, ND

9 Crashes contributing to the High Injury Network

15 - 24 HIN Score Range

1.8 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

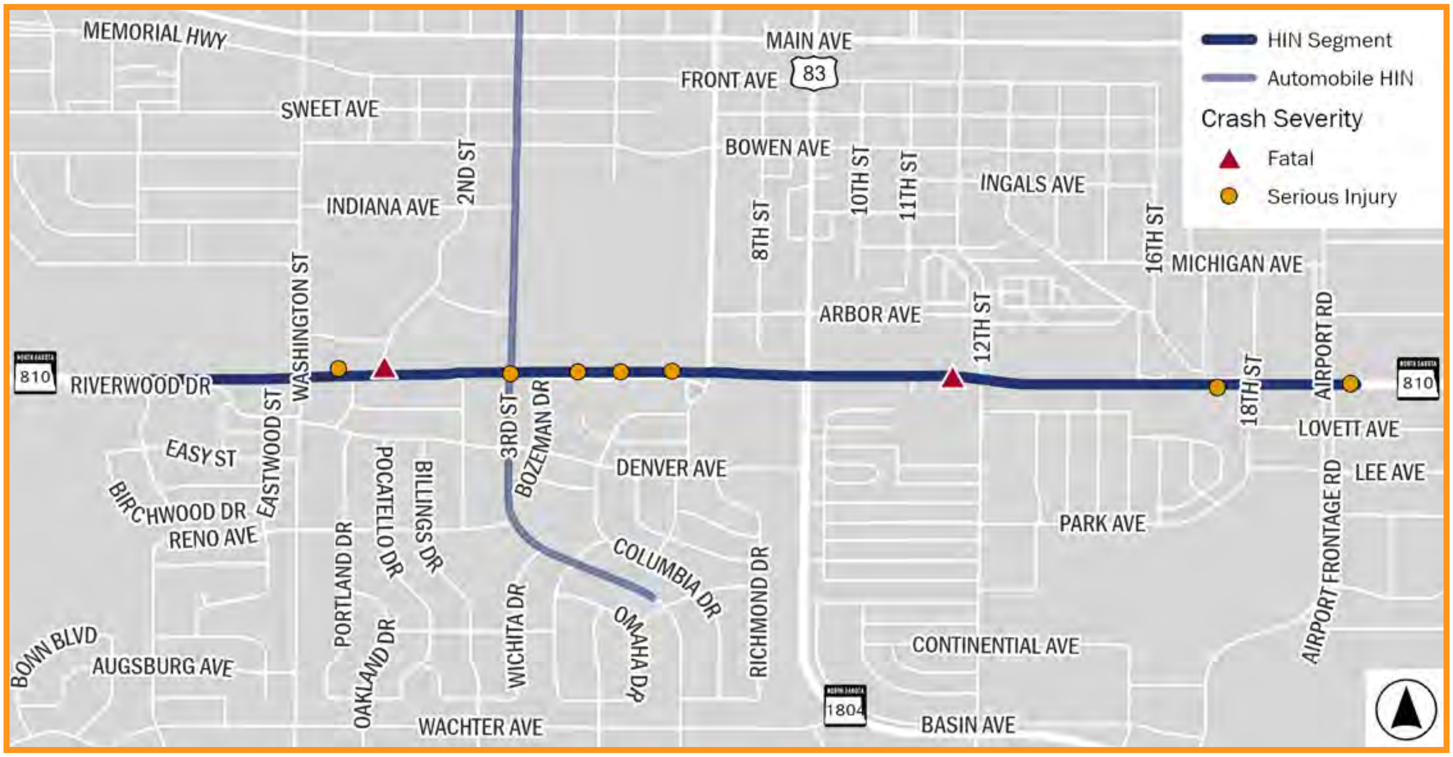
40 - 55 Speed Limit (MPH)

2,793 - 30,492 Average Daily Traffic

Corridor Overview

E Bismarck Expressway is a 1.8 mile section of roadway with nine (9) crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **two (2) deaths from one (1) single vehicle crash and one (1) rear end crash**. There were also **seven (7) incapacitating injury crashes resulting from three (3) angle, four (4) single vehicle, and two (2) rear end crashes**. **Speed was acknowledged as a factor in three (3) of the incapacitating injury crashes**.

This segment of the HIN is from Westwood Street to Airport Road and is a principal arterial owned by the State. Bismarck Expressway is a four (4) lane divided roadway west of Laramie Drive. The road changes to being undivided near S Washington Street with two (2) lanes in each direction with center left and right turn lanes at major intersections. The land use is commercial east of S Washington Street with an open streetscape. **Seven (7) of the contributing automobile crashes occurred at mid-blocks or portions of Bismarck Expressway with queueing lanes (intersection-related) with the highest concentration between 7th St. and S Washington St. near the Kirkwood Mall. Given the manner of crashes, speed, and high traffic volumes, operational challenges likely play a factor in many contributing crashes.**



AUTOMOBILE HIGH INJURY NETWORK

Century Avenue (Eastbound)

Interstate Avenue to Winnipeg Drive

Bismarck, ND

1 Crash contributing to the High Injury Network

15* HIN Score

1.0 Mile Corridor Length

Principal Arterial Functional Classification

City Ownership

35 Speed Limit (MPH)

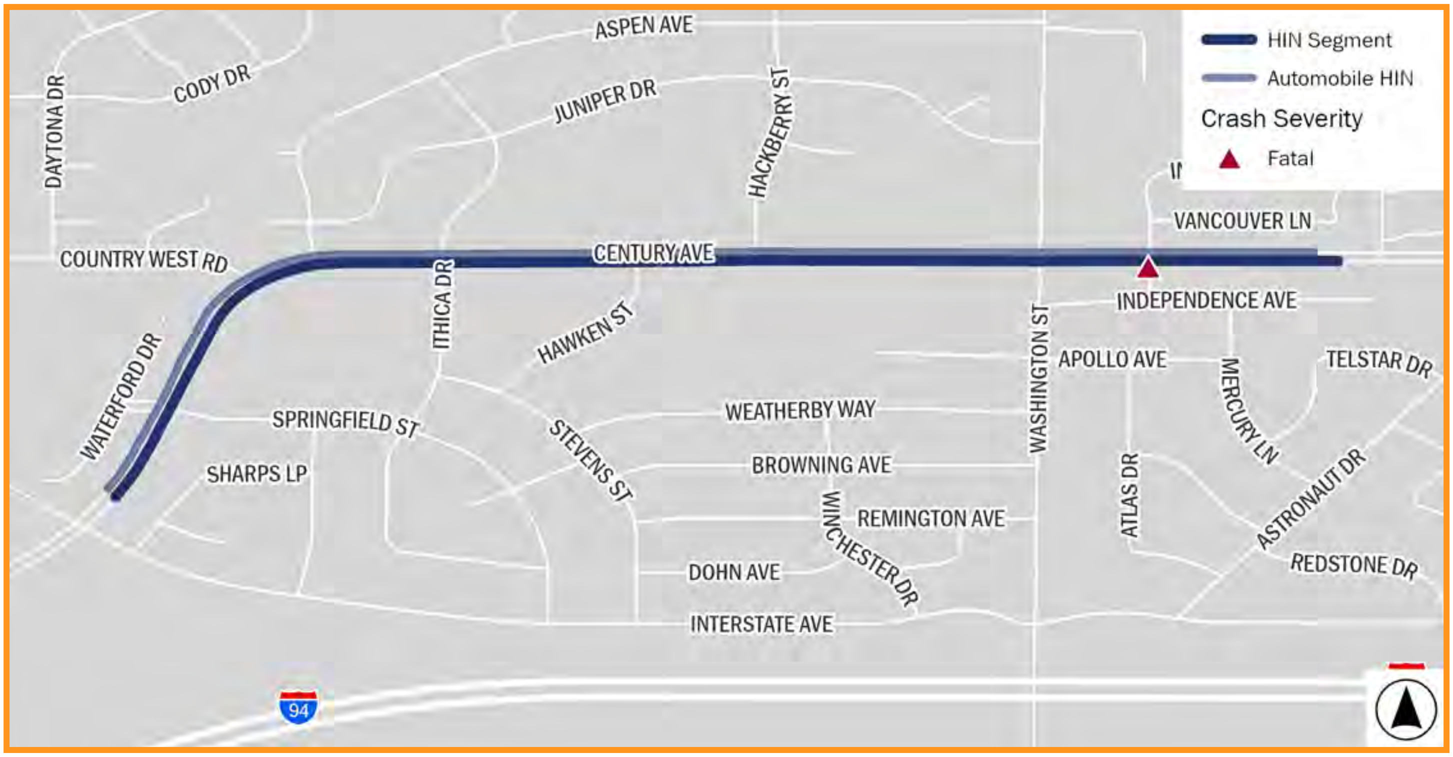
3,600 - 4,558 Average Daily Traffic

Corridor Overview

The eastbound lanes of Century Avenue are a 1.0 mile section of roadway with one (1) crash contributing to it being on the Automobile High Injury Network. **The crash resulted in a death from an angle crash where speed was acknowledged as a contributing factor.**

This segment of the HIN is from Interstate Avenue to Winnipeg Drive and is a city owned principal arterial. The street is divided with two (2) lanes in each direction with left turn lanes at major intersections. The land use is residential east of Hackberry Street, mixed use from Hackberry Street to Ontario Lane, and residential east of Ontario Lane. The streetscape is open throughout. **The eastbound fatal automobile crash occurred at the intersection of Century Ave. & Ontario Ln.**

**The HIN score range is reflective of both directions of travel on Century Ave.*



AUTOMOBILE HIGH INJURY NETWORK

Century Avenue (Westbound)

Interstate Avenue to Winnipeg Drive

Bismarck, ND

4 Crashes contributing to the High Injury Network

15* HIN Score

1.0 Mile Corridor Length

Principal Arterial Functional Classification

City Ownership

35 Speed Limit (MPH)

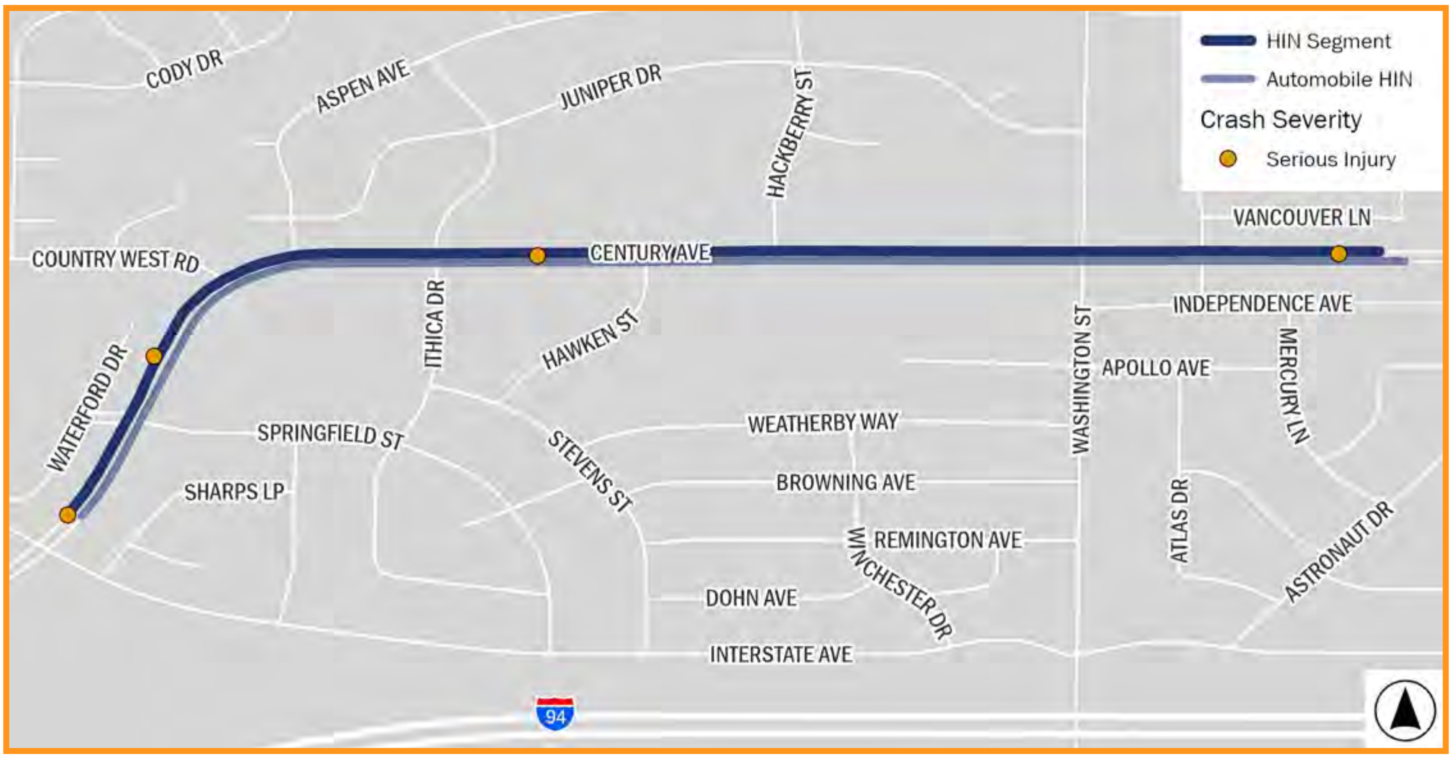
3,253 - 4,340 Average Daily Traffic

Corridor Overview

The westbound lanes of Century Avenue are a 1.0 mile section of roadway with four (4) crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **four (4) incapacitating injuries from three (3) single vehicle crashes and one (1) rear end crash. Speed was acknowledge as a factor in two (2) of the crashes**.

This segment of the HIN is from Interstate Avenue to Winnipeg Drive and is a city owned principal arterial. The street is divided with two lanes in each direction with left turn lanes at major intersections. The land use is residential east of Hackberry Street, mixed use from Hackberry Street to Ontario Lane, and residential east of Ontario Lane. The streetscape is open throughout. **All four (4) of the contributing automobile crashes occurred at mid-block locations.**

**The HIN score range is reflective of both directions of travel on Century Ave.*



AUTOMOBILE HIGH INJURY NETWORK

State Street (Northbound)

Brookside Lane to E Boulevard Avenue

Bismarck, ND

9 Crashes contributing to the High Injury Network

15 - 21 HIN Score Range

3.1 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

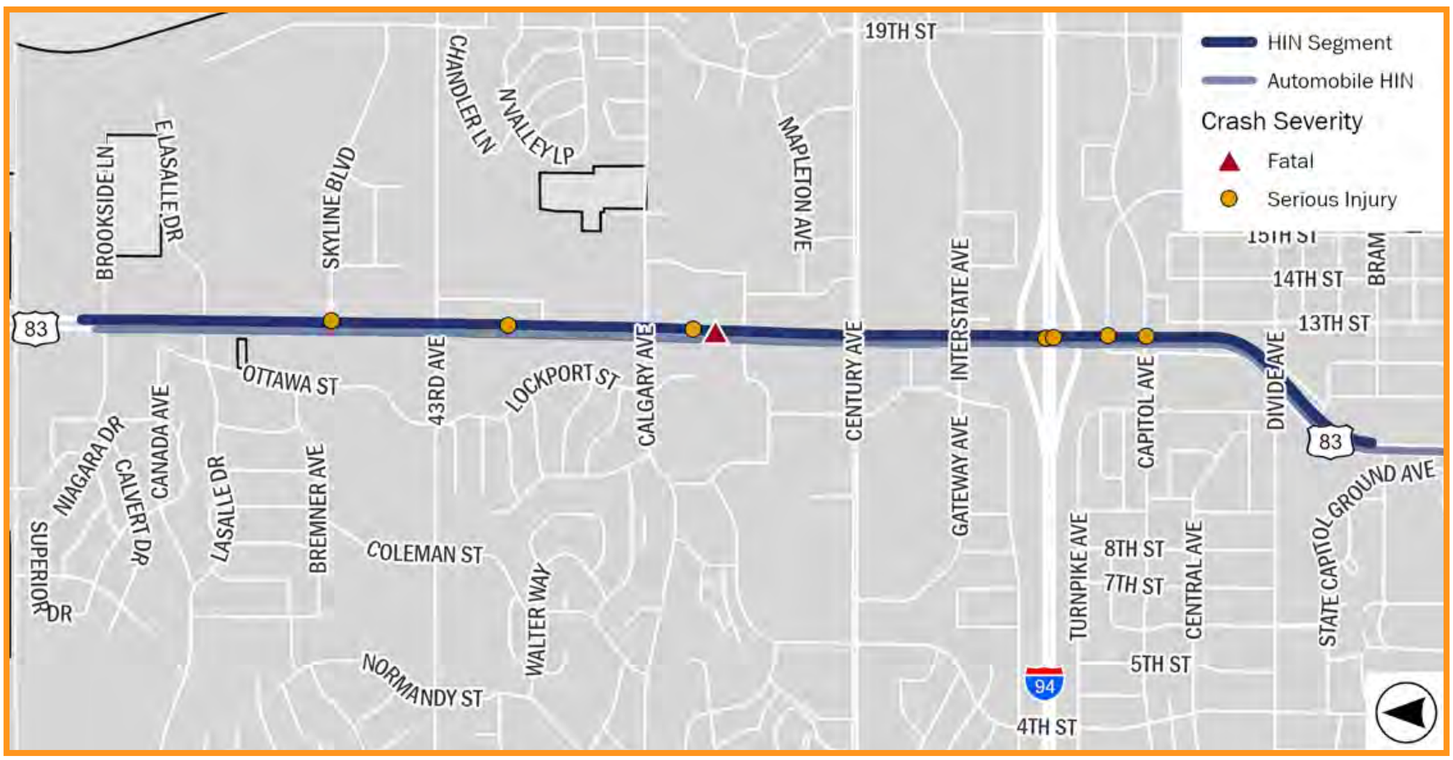
40 - 45 Speed Limit (MPH)

8,934 - 22,113 Average Daily Traffic

Corridor Overview

The northbound lanes of State Street are a 3.1 mile section of roadway with nine (9) crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **one (1) death from a single vehicle crash and eight (8) serious injuries from five (5) angle, one (1) single vehicle, one (1) rear end, and one (1) sideswipe crash. Speed was a factor in two (2) of the serious injury crashes.**

This segment of the HIN is from Brookside Lane to E Boulevard Avenue and is a State owned principal arterial. State St. is divided with three (3) lanes in each direction and left turn lanes at major intersections. The land use is institutional south of E Divide Avenue and commercial north with an open streetscape. **Four (4) of the contributing automobile crashes occurred at between Capitol Ave. and the I-94 bridge, two (2) including the one (1) fatal crash occurred between Calgary Ave. and Harvet Ln., and one (1) occurred at the intersection of State St. and Skyline Blvd. Given the manner of crashes, speed, high traffic volumes, and operational challenges likely play a factor in many of this HIN segment's contributing crashes.**



AUTOMOBILE HIGH INJURY NETWORK

State Street (Southbound)

Brookside Lane to E Boulevard Avenue

Bismarck, ND

12 Crashes contributing to the High Injury Network

15 - 21 HIN Score Range

3.3 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

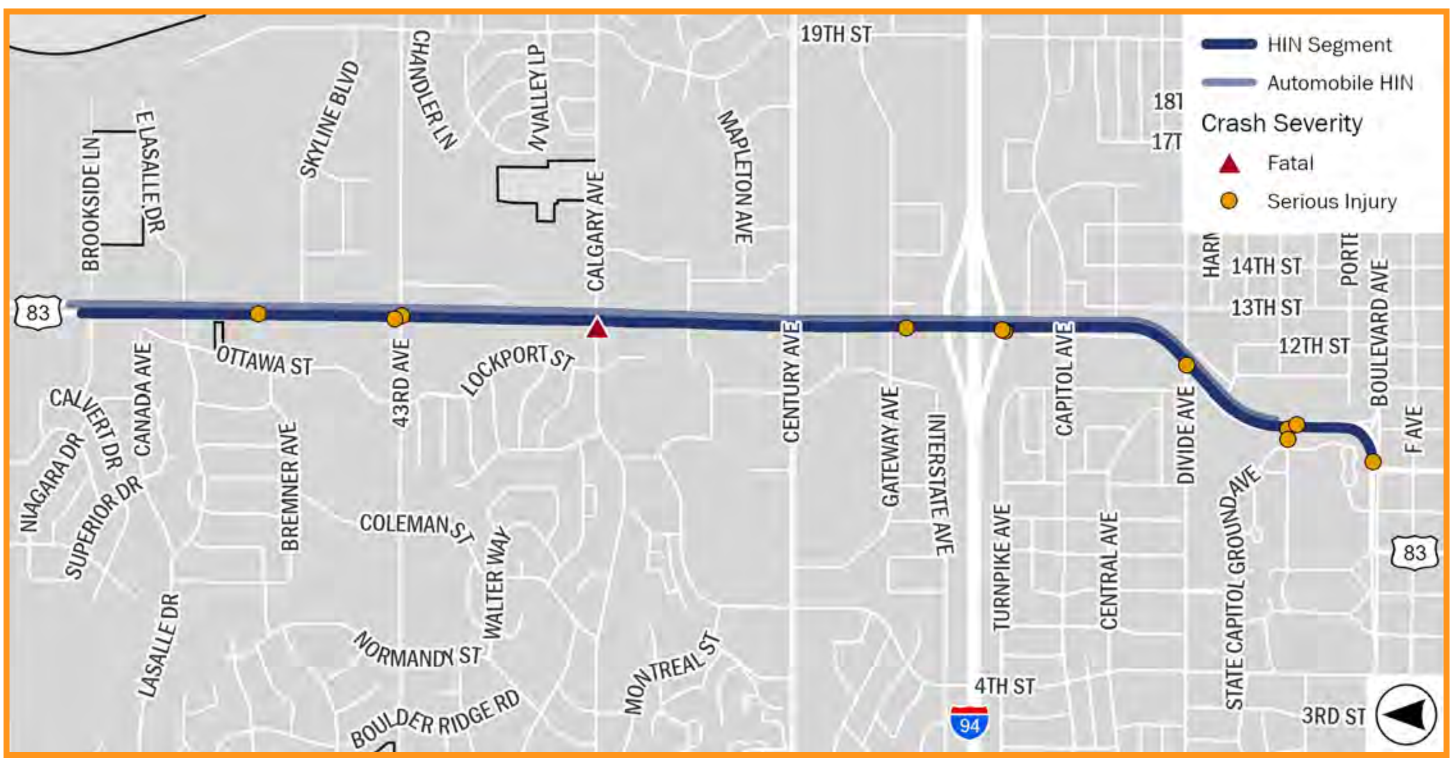
30 - 45 Speed Limit (MPH)

10,572 - 23,975 Average Daily Traffic

Corridor Overview

The southbound lanes of State Street are a 3.3 mile section of roadway with 12 crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **one (1) death from a single vehicle crash where speed was acknowledged as a factor. The 11 serious injuries were caused by two (2) angle, five (5) single vehicle, two (2) rear end, and two (2) sideswipe crashes. Speed was a factor in one (1) of the serious injury crashes.**

This segment of the HIN is from Brookside Lane to E Boulevard Avenue is a State owned principal arterial. The street is divided with three (3) lanes in each direction and left turn lanes at major intersections. The land use is institutional south of E Divide Avenue and commercial north with an open streetscape. **Ten of the contributing automobile crashes occurred intersections, with highest prevalence at State St. intersections with 43rd Ave. and Capitol Ground Ave. The one (1) fatal crash occurred at the State St. & Calgary Ave. intersection. Given the manner of crashes, speed, high traffic volumes, and operational challenges likely play a factor in many of this HIN segment's contributing crashes.**



AUTOMOBILE HIGH INJURY NETWORK

W Bismarck Expressway (Eastbound and Westbound)

Interstate 94 interchange to Missouri River

Mandan, ND

5 Crashes contributing to the High Injury Network

15 HIN Score

1.1 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

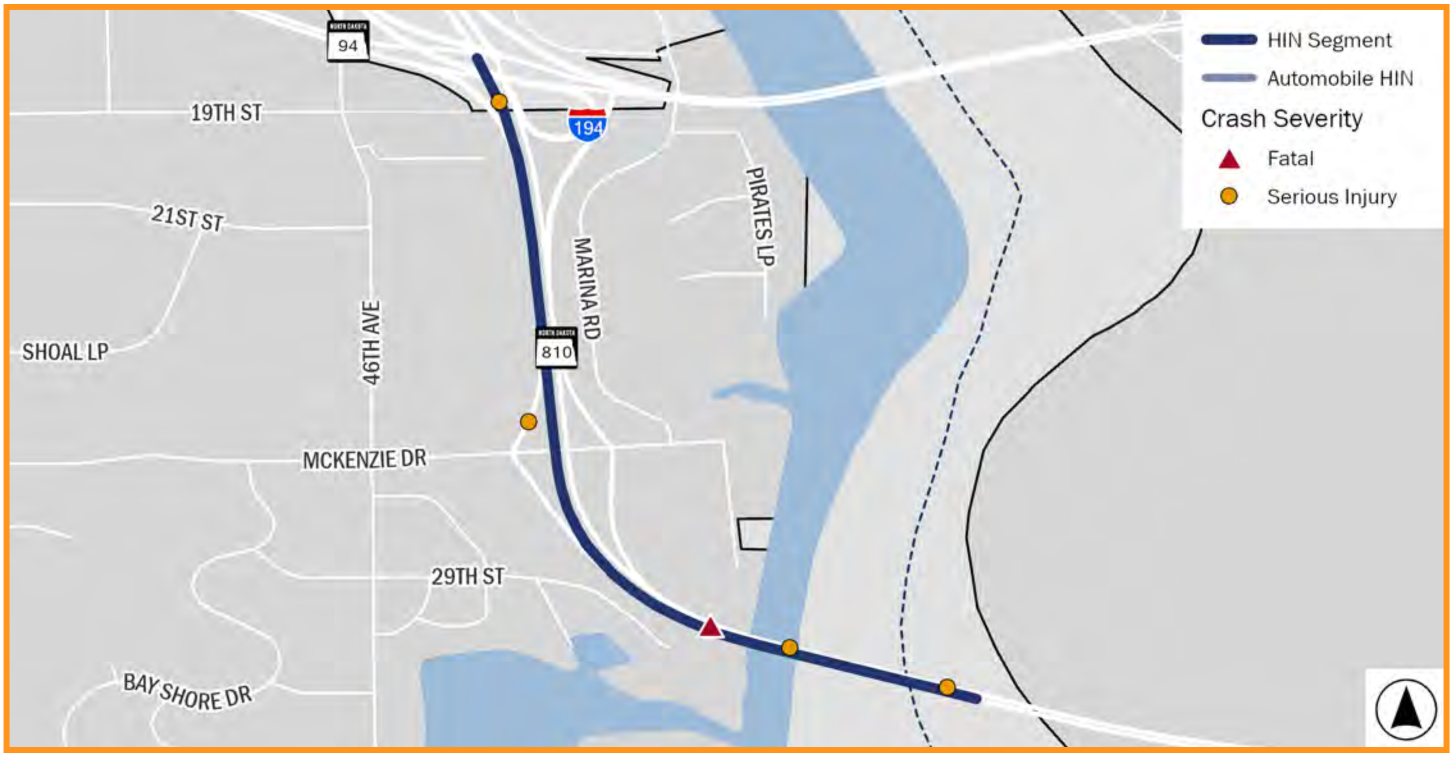
45 - 55 Speed Limit (MPH)

12,439 - 14,118 Average Daily Traffic

Corridor Overview

W Bismarck Expressway is a 1.1 mile section of roadway with five (5) crashes contributing to it being on the Automobile High Injury Network. The crashes resulted in **one (1) fatality from a single vehicle crash and four (4) incapacitating injuries. Incapacitating injury crashes included two (2) rear end and two (2) single vehicle crashes. Speed was acknowledged as a factor in three (3) of the crashes.**

This State owned segment of the HIN is from the interchange with Interstate 94 to the bridge across the Missouri River. The Expressway is a divided limited access highway with two (2) lanes in each direction with shoulders. **One fatal and two incapacitating injury crashes were in the westbound lanes, with the fatality located near the curve incapacitating injuries on the bridge over the Missouri River. The two (2) eastbound incapacitating injury crashes occurred on or near exit ramps with one (1) near the I-94 offramp and one (1) on the eastbound McKenzie Dr. exit.**



ALL MODES HIGH INJURY NETWORK

12th Street

Braman Avenue to Continental Avenue

Bismarck, ND

18 Crashes contributing to the High Injury Network

13 - 26 HIN Score Range

2.3 Miles Corridor Length

Local / Minor Collector Functional Classification

City Ownership

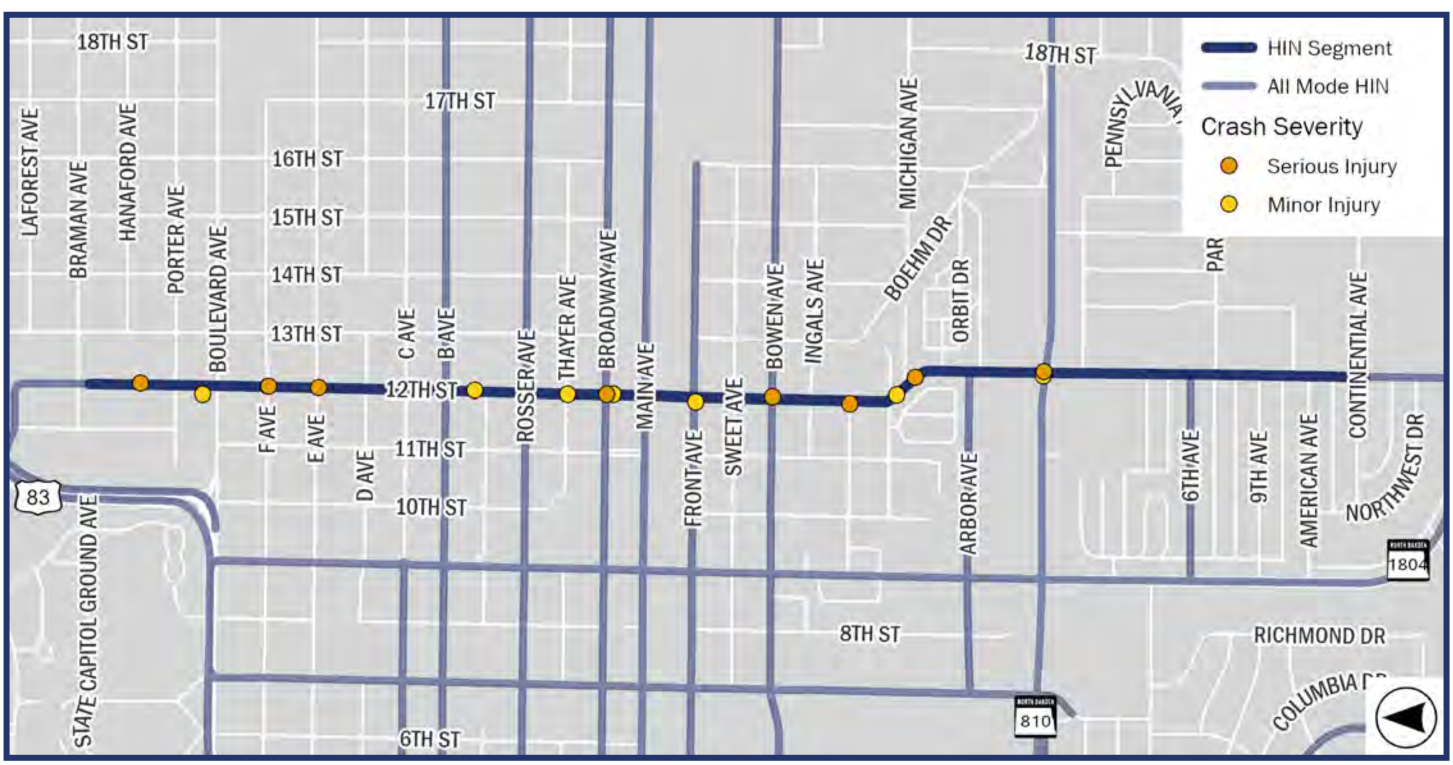
25 Speed Limit (MPH)

315 - 4,908 Average Daily Traffic

Corridor Overview

12th Street is a 2.3 mile section of roadway with 18 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **nine (9) incapacitating injuries and 9 minor injuries. Contributing crashes included five (5) pedestrian, seven (7) bicycle, and six (6) motorized crashes. Crashes involving motorized modes included three (3) angle crashes and three (3) single vehicle crashes. Speed was acknowledged as a contributing factor for two (2) of the motorized mode crashes.**

12th Street is a city owned segment of the HIN from Braman Avenue to Continental Avenue. It is a local street north of Rosser Avenue and a minor collector south of it. The street is undivided with two (2) lane with parking and turn lanes near major intersections. The land use is residential north of Broadway Avenue and changes to commercial between Broadway Avenue and Sweet Avenue. Land uses return to being residential to Arbor Avenue, before changing to mixed use south of Bismarck Expressway. The street has an open streetscape except between Main and E Front Avenue. **13 of the 18 contributing all modes crashes occurred at intersections and are slightly concentrated at 12th St. intersections with Broadway Ave. and Bismarck Expwy.**



ALL MODES HIGH INJURY NETWORK

26th Street

Valleyview Avenue to Lee Avenue

Bismarck, ND

8 Crashes contributing to the High Injury Network

15 - 18 HIN Score Range

1.7 Miles Corridor Length

Minor Arterial Functional Classification

City Ownership

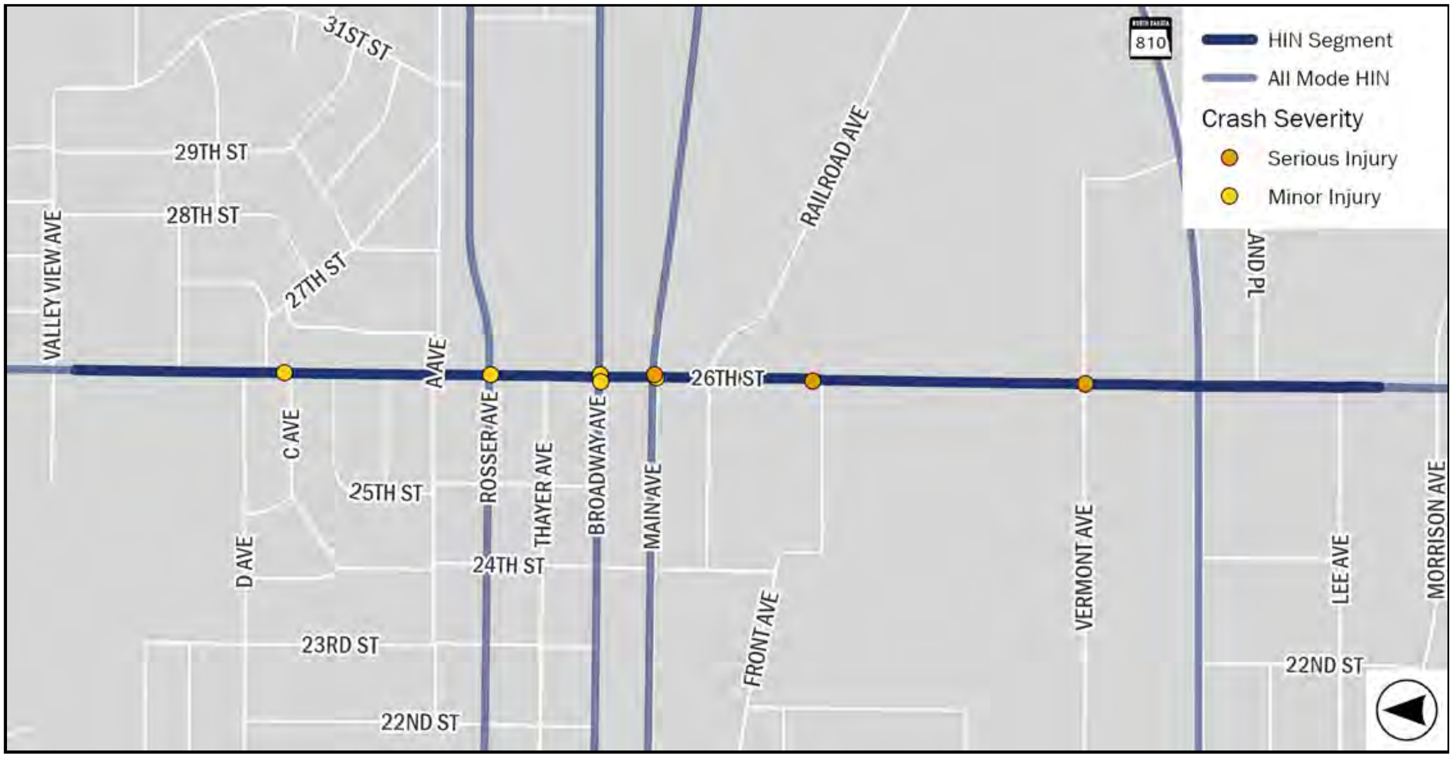
25 - 35 Speed Limit (MPH)

3,890 - 13,837 Average Daily Traffic

Corridor Overview

26th Street is a 1.7 mile section of roadway with eight (8) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **three (3) incapacitating injuries and 5 minor injuries. Contributing crashes included one (1) pedestrian, one (1) bicycle, and two (2) motorized crashes. Crashes involving motorized modes included two (2) angle, one (1) head on, one (1) single vehicle, and one rear end crash.** Speed was not a contributing factor for any of the crashes.

This segment of the HIN is from Valleyview Avenue to Lee Avenue and is a city owned minor arterial. 26th Street is an undivided three (3) lane road without parking. The land use is residential north of E Avenue A, mixed use between E Avenue A and Main Avenue, then commercial south of Main Avenue. The streetscape is open throughout. **Seven (7) of the eight (8) contributing crashes occurred at intersections, with slight concentrations at 26th St. intersections with Broadway Ave. and Main Ave.**



ALL MODES HIGH INJURY NETWORK

2nd Street

9th Avenue NW to Mandan Avenue

Mandan, ND

8 Crashes contributing to the High Injury Network

13 - 18 HIN Score Range

1.6 Miles Corridor Length

Local Functional Classification

City Ownership

25 Speed Limit (MPH)

54 - 341 Average Daily Traffic

Corridor Overview

2nd Street is a 1.6 mile section of roadway with eight (8) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **two (2) incapacitating injuries and six (6) minor injuries. Contributing crashes included three (3) pedestrian, three (3) bicycle, and two (2) motorized crashes. Crashes involving motorized modes included one (2) angle and one (1) single vehicle, and one rear end crash. Speed was a contributing factor in one (1) of the crashes.**

This HIN segment is a local street from 9th Avenue NW to Mandan Avenue. This city owned street is an undivided two lane roadway with parallel parking on both sides with angle parking near businesses and service buildings. The land use is mixed use with an open streetscape. **Four (4) of the contributing crashes occurred at intersections, with slight concentrations at the 2nd St. intersections of Collins Ave. and 3rd Ave.**

ALL MODES HIGH INJURY NETWORK

E Broadway Avenue

N 6th Street to Soo Line Drive

Bismarck, ND

12 Crashes contributing to the High Injury Network

13 - 15 HIN Score Range

2.0 Miles Corridor Length

Local / Minor Collector / Minor Arterial Functional Classification

City Ownership

25 Speed Limit (MPH)

571 - 4,324 Average Daily Traffic

Corridor Overview

E Broadway Avenue is a two (2) mile section of roadway with 12 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in one (1) death, four (4) incapacitating injuries, and seven (7) minor injuries. Contributing crashes included **four (4) pedestrian, four (4) bicycle, and four (4) motorized crashes. Crashes involving motorized modes included three (3) single vehicle and one (1) angle crash. Speed was a contributing factor in one (1) of the crashes.**

This city owned segment of the HIN is from N 6th Street to Soo Line Drive. The street is a minor collector west of 7th Street, minor arterial from 7th to 26th Street, and local east of 26th-Street. West of 26th Street, E Broadway Avenue is an undivided street with one travel lane in each direction with a center turn lane and parking on both sides. East of 26th, it is a two lane street with parking. The land use is commercial throughout with an open streetscape besides between N 6th Street and N 7th Street. **Eight (8) of the contributing crashes occurred at intersections with a fatal pedestrian crash occurring at the intersection of Broadway Ave. & 24th St.**

ALL MODES HIGH INJURY NETWORK

3rd Street

E Arikara Avenue to E Wachter Avenue

Bismarck, ND

20 Crashes contributing to the High Injury Network

13 - 35 HIN Score Range

2.5 Miles Corridor Length

Local / Minor Collector / Minor Arterial Functional Classification

City Ownership

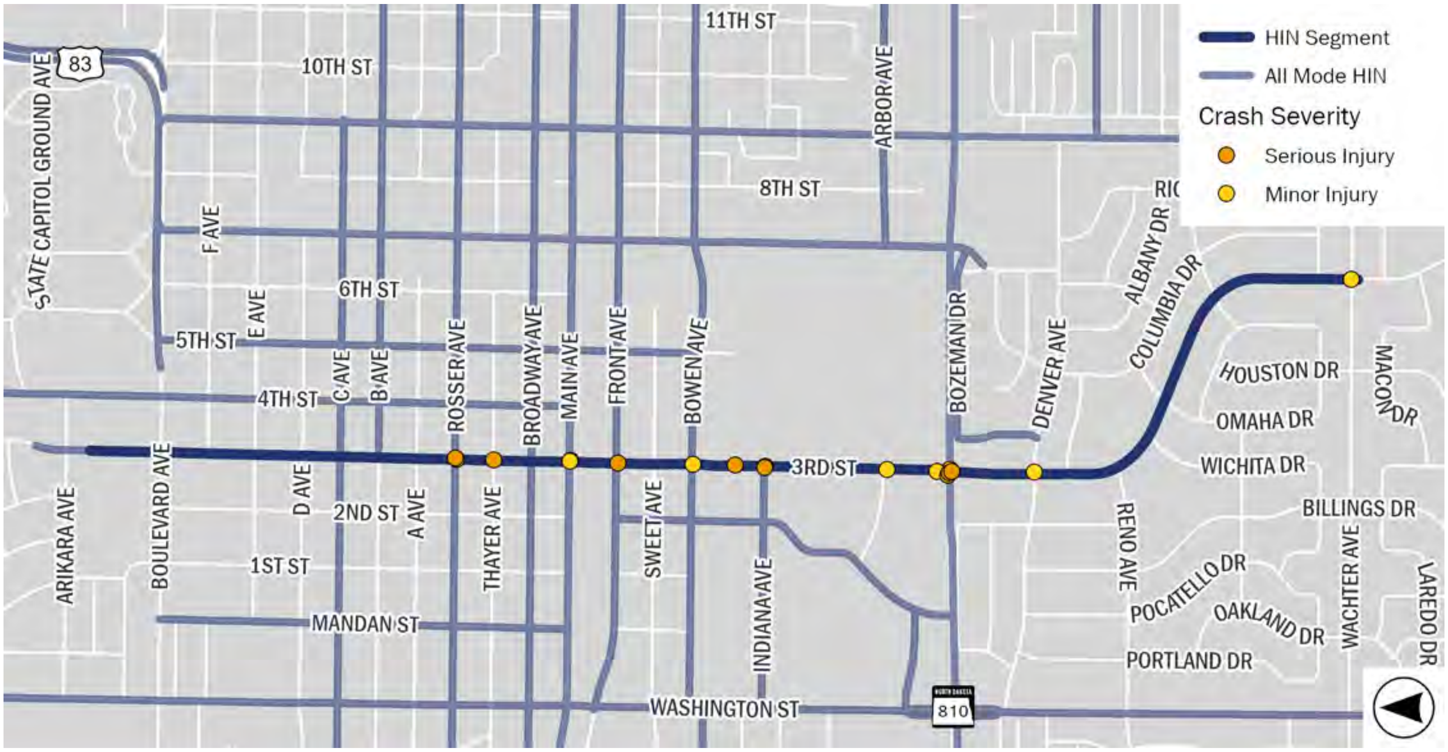
25 Speed Limit (MPH)

4,391 - 13,266 Average Daily Traffic

Corridor Overview

3rd Street is a 2.5 mile section of roadway with 20 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, four (4) incapacitating injuries, and seven (7) minor injuries.** Contributing crashes included **10 pedestrian, one (1) bicycle, and nine (9) motorized crashes. Crashes involving motorized modes included six (6) angle, one (1) head on, and two (2) single vehicle crashes. Speed was a contributing factor in one (1) of the crashes.**

This segment of the HIN is from E Arikara Avenue to E Wachter Avenue and is owned by the city. 3rd Street's classified changes throughout starting as a local street north of W Boulevard Avenue before changing to minor arterial and minor collector. The street is an undivided with two lanes and parking on both sides north of E Avenue A, the street then adds a center turn lane from E Avenue A to Main Avenue. Between Main Avenue and Bismarck Expressway, 3rd Street has five lanes. South of the expressway, the street returns to having two lanes with parking on both sides. The land use is generally Mixed Use and residential north of E Avenue A, commercial to Bismarck Expressway and residential at the southern end. The streetscape is open besides between Rosser Avenue and Bowen Avenue. **18 of the contributing crashes occurred at intersections with concentration at the 3rd St. & Bismarck Expwy. Intersection.**



ALL MODES HIGH INJURY NETWORK

7th Street

E Boulevard Avenue to Colombia Drive

Bismarck, ND

16 Crashes contributing to the High Injury Network

16 - 30 HIN Score Range

1.6 Miles Corridor Length

Local / Principal Arterial Functional Classification

City / State Ownership

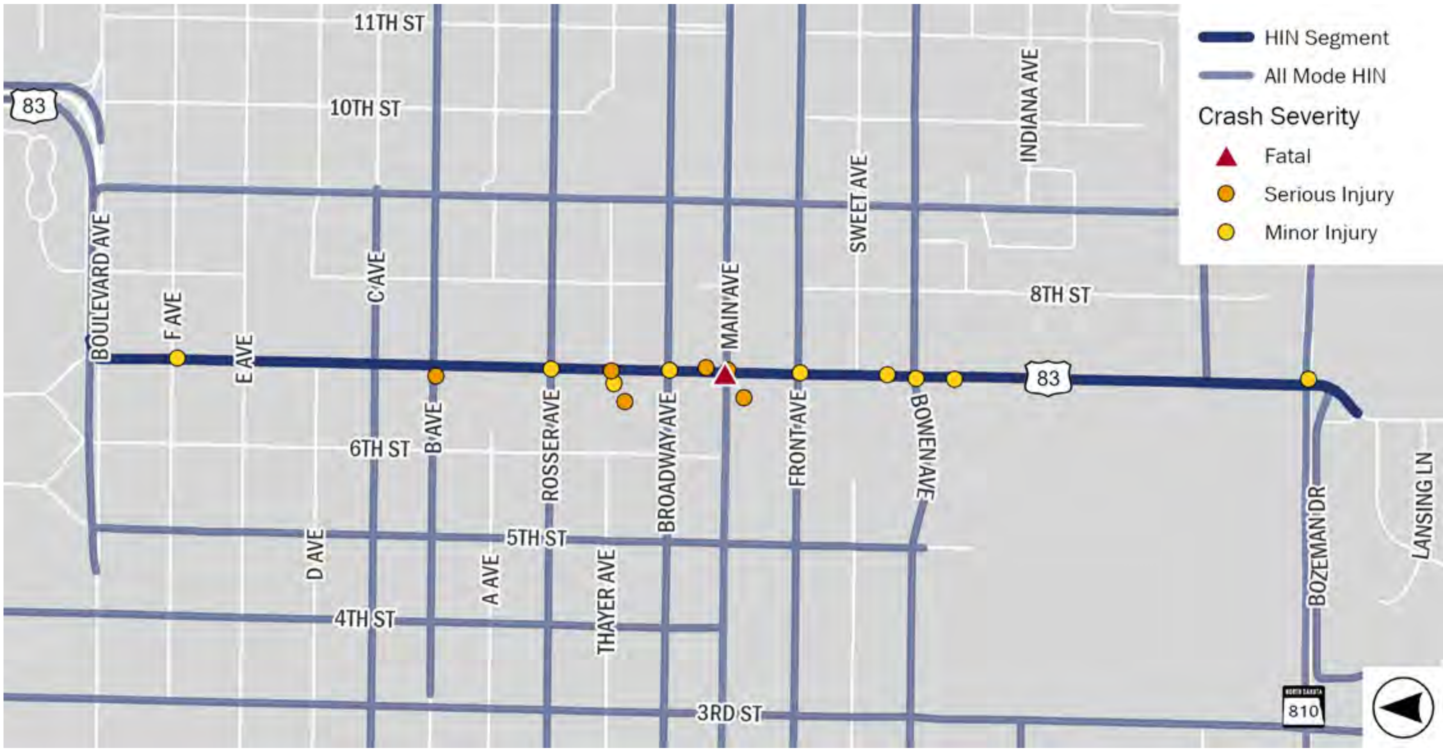
15 - 35 Speed Limit (MPH)

2,662 - 14,408 Average Daily Traffic

Corridor Overview

7th Street is a 1.6 mile section of roadway with 16 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, six (6) incapacitating injuries, and nine (9) minor injuries.** Contributing crashes included **seven (7) pedestrian, three (3) bicycle, and six (6) motorized crashes. Crashes involving motorized modes included three (3) angle, one (1) rear end, and one (1) sideswipe crash. Speed was a contributing factor in three (3) of the crashes.**

This segment of HIN is state owned north of Bismarck Expressway and city owned south of it. The street is a principal arterial from E Boulevard Avenue to Bismarck Expressway and local south to Colombia Drive. The street is an undivided southbound one way which begins with two travel lanes and parking on both sides, and later expands to four lanes at E Avenue A without parking until Bismarck Expressway. The land use is mixed use and residential north of E Avenue A, commercial to Bismarck Expressway, and mixed use south of the expressway. The streetscape is open besides between Rosser Avenue and Main Avenue. **10 of the contributing crashes occurred at intersections. Severe crashes were concentrated between Main Ave. and B Ave.**



ALL MODES HIGH INJURY NETWORK

9th St./University Drive

E Avenue B to S 12th Street

Bismarck, ND

18 Crashes contributing to the High Injury Network

13 - 19 HIN Score Range

1.9 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

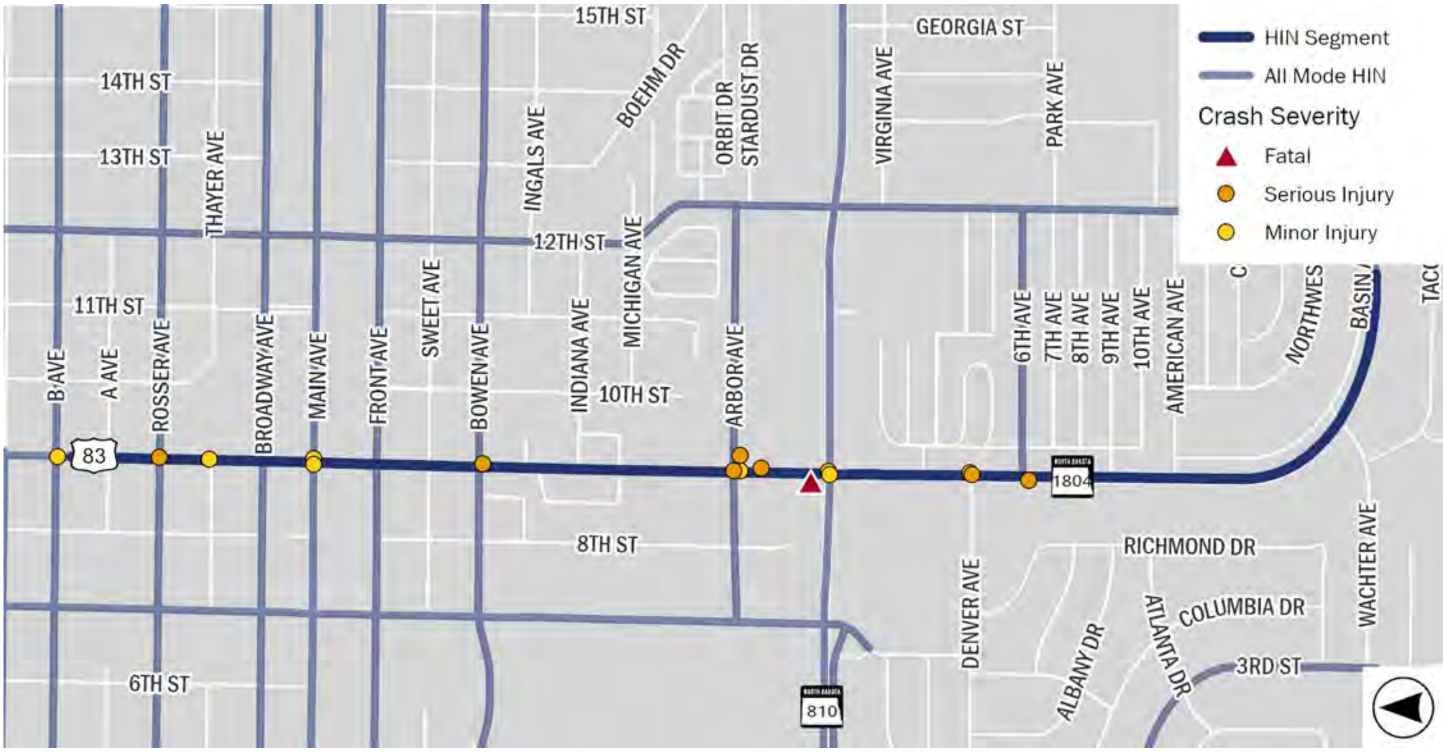
25 - 35 Speed Limit (MPH)

12,298 - 19,365 Average Daily Traffic

Corridor Overview

9th St./University Drive is a 1.9 mile section of roadway with 18 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, seven (7) incapacitating injuries, and 10 minor injuries.** Contributing crashes included **seven (7) pedestrian, four (4) bicycle, and seven (7) motorized crashes. Crashes involving motorized modes included three (3) angle, three (2) sideswipe, and one (1) single vehicle crash. Speed was a contributing factor in one (1) of the crashes.**

This State owned segment of the HIN is from E Avenue B to S 12th Street is a principal arterial roadway. On the south end of the segment University Drive is an undivided five lane street a center turn lane and two travel lanes in each direction. North of Bismarck Expressway, it becomes a northbound one way with four lanes and no parking on either side of the Street until E Avenue C where it continues as a one way but only two lanes with parking on both sides. The land use is residential on the south end, and mixed use and commercial north of it. The streetscape is open besides between Rosser Avenue and Bowen Avenue. **All 18 contributing crashes occurred at intersections, most prominently located at the intersections of 9th St. & Arbor Ave. and Bismarck Expwy.**



ALL MODES HIGH INJURY NETWORK

Airport Road

E Broadway Avenue to Morrison Avenue

Bismarck, ND

7 Crashes contributing to the High Injury Network

17 - 21 HIN Score Range

1.1 Miles Corridor Length

Minor Arterial Functional Classification

City Ownership

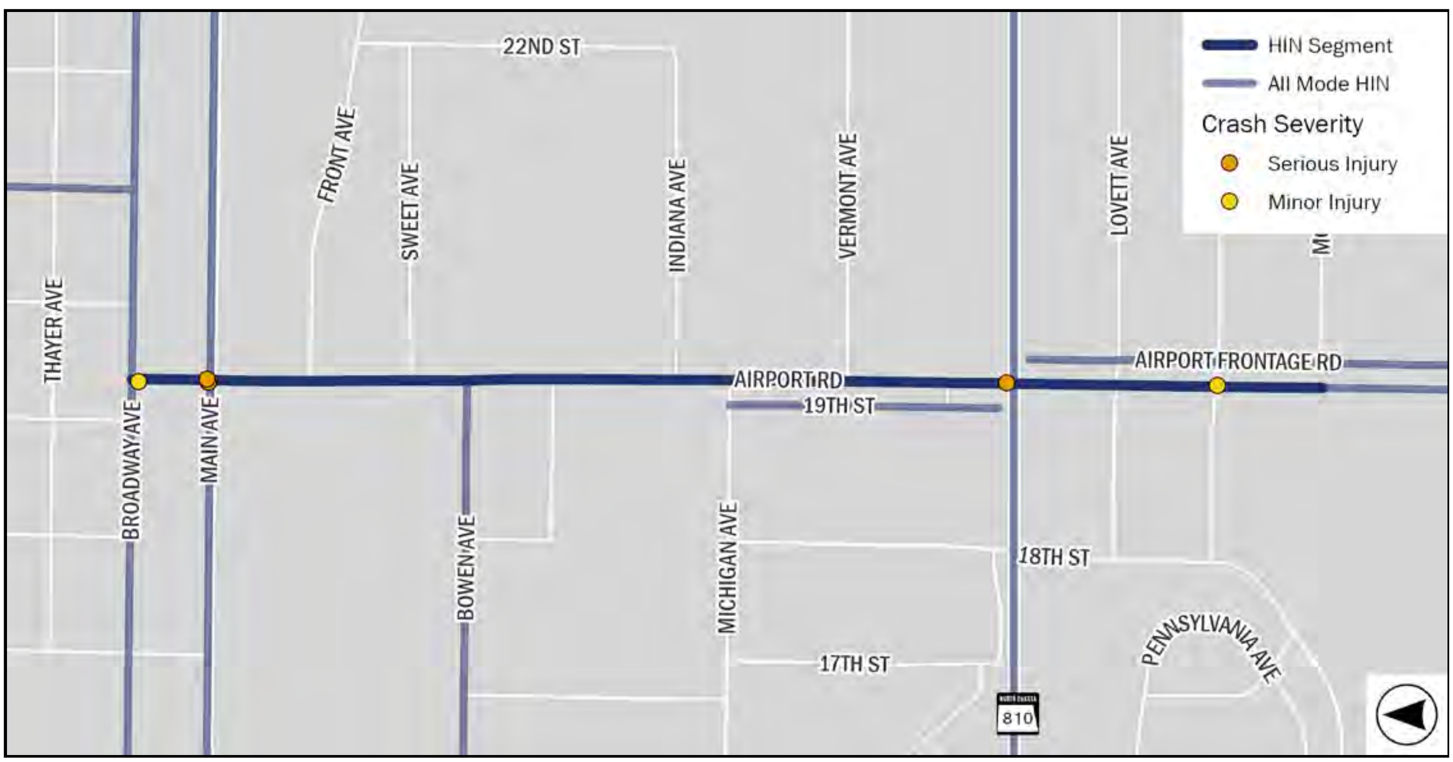
25 - 35 Speed Limit (MPH)

2,387 - 10,842 Average Daily Traffic

Corridor Overview

Airport Road is a 1.1 mile section of roadway with seven (7) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **four (4) incapacitating injuries and three (3) minor injuries.** Contributing crashes included **one (1) pedestrian and six (6) motorized crashes. Crashes involving motorized modes included three (3) angle, one (2) rear end, and one (1) single vehicle crash. Speed was a contributing factor in two (2) of the crashes.**

This segment of the HIN is from E Broadway Avenue to Morrison Avenue and is a city owned minor arterial. The street is an undivided five (5) lane roadway with two (2) travel lanes in each direction and a center turn lane. There is no on-street parking. The land use is commercial with an open streetscape besides where it is enclosed when going under the RR tracks between Main and E Front Avenue. **All seven (7) contributing crashes occurred at intersections, most prominently at the intersection of Airport Rd. & Main Ave.**



ALL MODES HIGH INJURY NETWORK

River Road

Burnt Boat Drive to Fraine Barracks Road

Bismarck, ND

7 Crashes contributing to the High Injury Network

13 - 17 HIN Score Range

1.6 Miles Corridor Length

Minor Collector Functional Classification

City Ownership

25 - 35 Speed Limit (MPH)

1,979 - 2,048 Average Daily Traffic

Corridor Overview

River Road is a 1.6 mile section of roadway with four crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, three (3) incapacitating injuries, and three (3) minor injuries.** Contributing crashes included **one (1) pedestrian, one (1) bicycle, and five (5) motorcycle crashes. Crashes involving motorcycles included were all single vehicle crashes. Speed was a contributing factor in three (3) of the crashes.**

This segment of the HIN is from Burnt Boat Drive to Fraine Barracks Road and is a city owned minor collector. The street is parallel to the river with open space along most of the undivided two way road with two travel lanes and no on-street parking. **The one (1) fatal pedestrian crash occurred at the intersection of River Rd. & Burnt Boat Dr. Three (3) incapacitating injury crashes occurred on River Rd. south of I-94 and included one (1) bicycle crash and two (2) motorcycle crashes.**

ALL MODES HIGH INJURY NETWORK

Bismarck Expressway

Riverwood Drive to Burlington Drive

Bismarck, ND

37 Crashes contributing to the High Injury Network

15 - 32 HIN Score Range

2.7 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

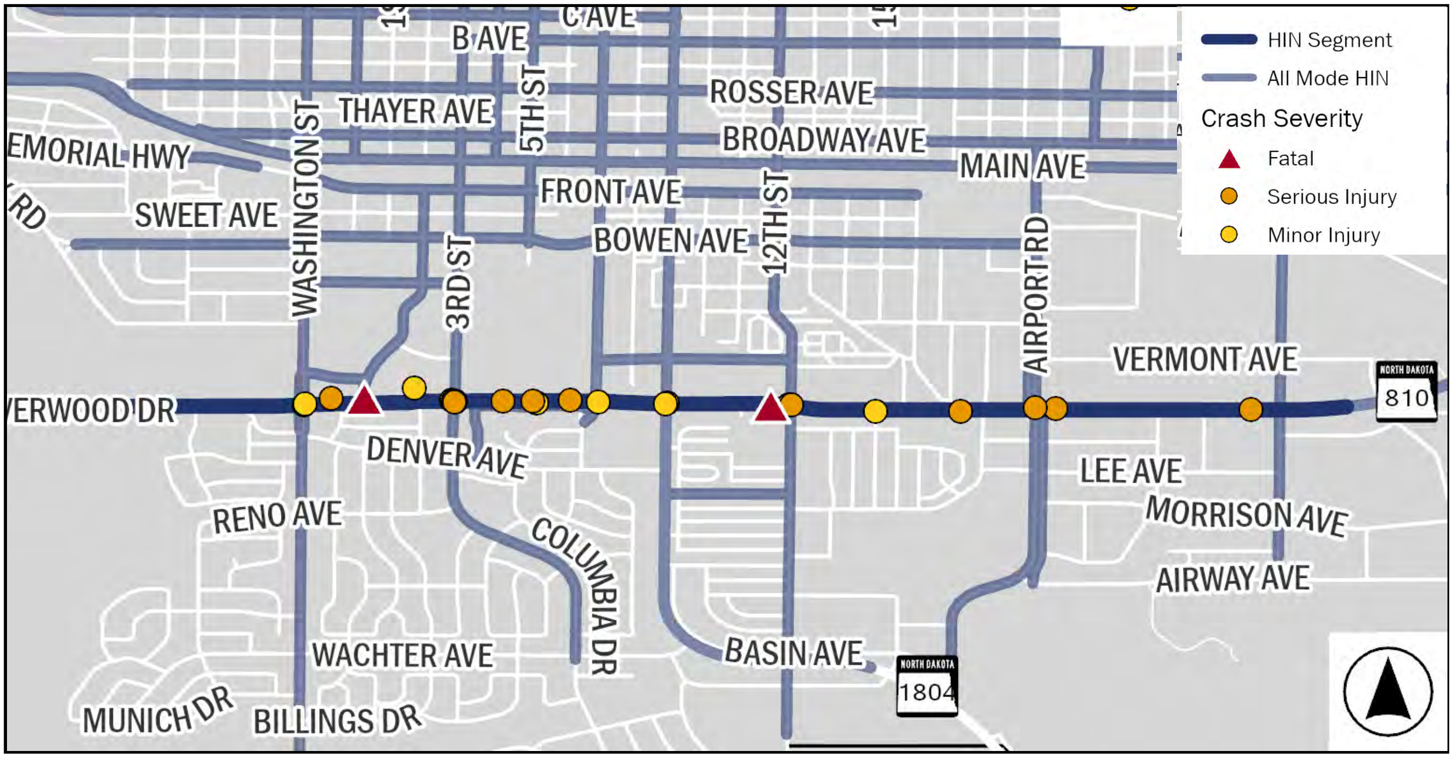
40 - 55 Speed Limit (MPH)

2,793 - 30,492 Average Daily Traffic

Corridor Overview

Bismarck Expressway is a 2.7 mile section of roadway with 37 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **five (5) deaths, 22 incapacitating injuries, and 13 minor injuries.** Contributing crashes included **nine (9) pedestrian, four (4) bicycle, and 27 motorized crashes. Crashes involving motorized modes included nine (9) angle, seven (7) head on, six (6) rear end, two (2) single vehicle, one sideswipe, and one rear to side crash. Speed was a contributing factor in three (3) of the crashes.**

This segment of the HIN is from Between Riverwood Drive and Burlington Drive. Bismarck Expwy. is a State owned principal arterial. The street is divided west of Laramie Drive with two (2) lanes in both directions and multiple turn lanes at major intersections. There two (2) lanes in both directions with center turn lane on the eastern end of the corridor. The land use is generally Commercial east of Washington and open space to west. The streetscape is open. **26 of the crashes occurred at intersections. Crashes are spread along the corridor with concentrations in the western half.**



ALL MODES HIGH INJURY NETWORK

W Bismarck Expressway (Eastbound)

Interstate 94 to Riverwood Drive

Bismarck / Mandan, ND

2 Crashes contributing to the High Injury Network

9 - 19* HIN Score Range

1.9 Miles Corridor Length

Minor Arterial / Principal Arterial Functional Classification

State Ownership

45 - 55 Speed Limit (MPH)

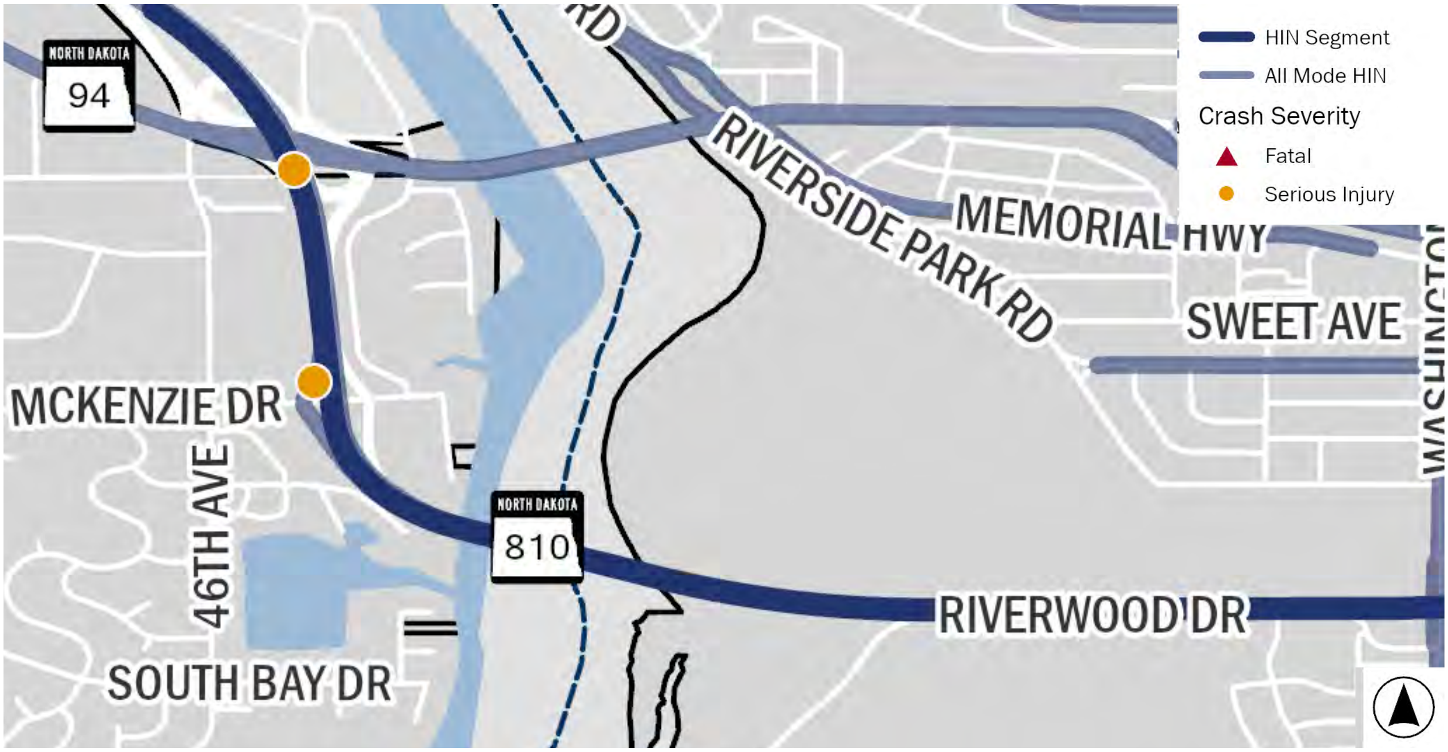
11,875 - 14,118 Average Daily Traffic

Corridor Overview

The eastbound lanes of W Bismarck Expressway is a 1.9 mile section of roadway with two (2) crashes contributing to it being on the All Modes High Injury Network. The crashes which both happened in Mandan resulted in **two (2) incapacitating injuries from single vehicle crashes. Speed was a factor in both crashes.**

This state owned segment of the HIN is begins north of the interchange with Interstate 94 in Mandan and goes to east of Riverwood Drive in Bismarck. The expressway is a divided, limited access highway with two (2) lanes in each direction with shoulders. **One (1) of the contributing crashes occurred near the W Bismarck Expwy on-ramp from Memorial Hwy and one (1) occurred on the westbound exit ramp for McKenzie Dr.**

**The HIN score range is reflective of both directions of travel on W Bismarck Expwy.*



ALL MODES HIGH INJURY NETWORK

W Bismarck Expressway (Westbound)

Interstate 94 to Riverwood Drive

Bismarck / Mandan, ND

6 Crashes contributing to the High Injury Network

10 - 19* HIN Score Range

2.0 Miles Corridor Length

Minor Arterial / Principal Arterial Functional Classification

State Ownership

45 - 55 Speed Limit (MPH)

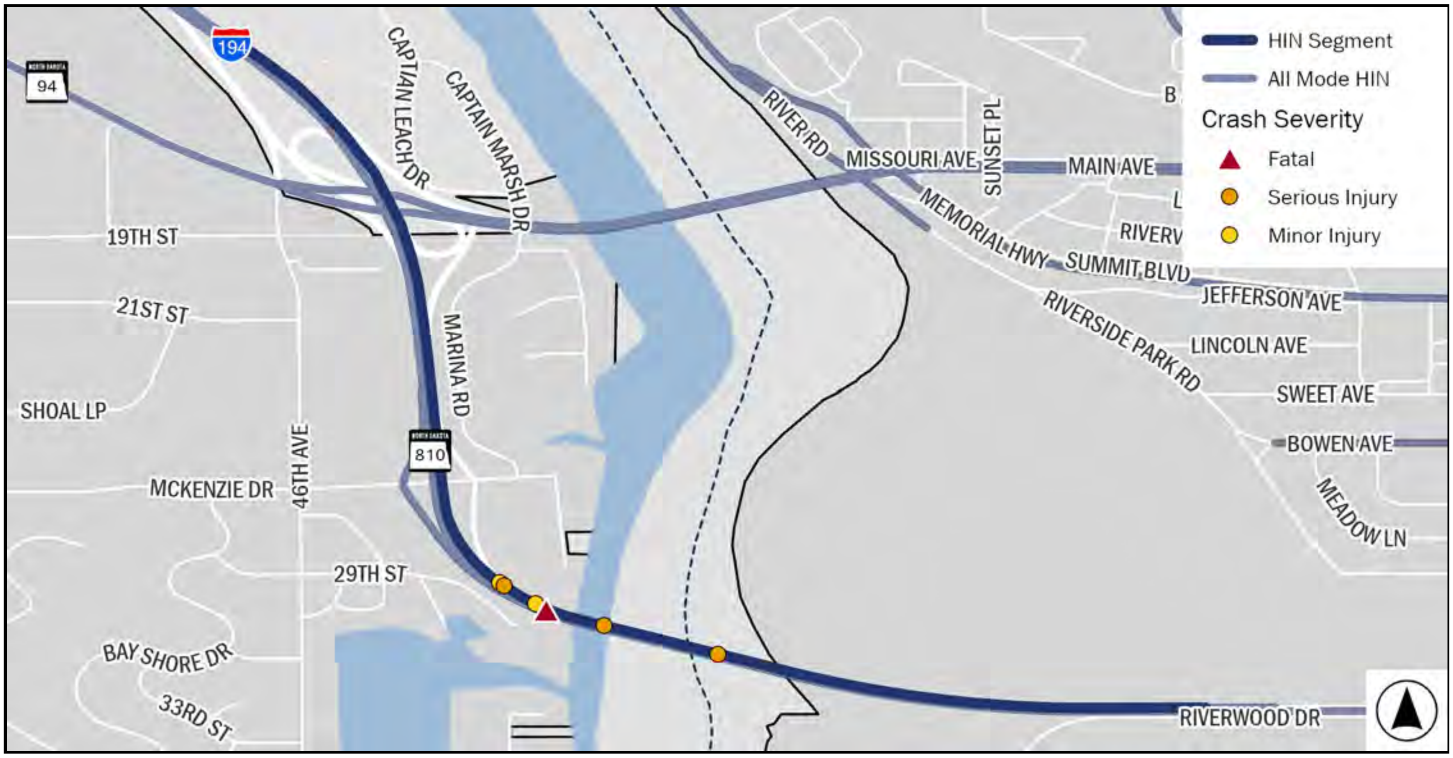
12,606 - 16,085 Average Daily Traffic

Corridor Overview

The westbound lanes of W Bismarck Expressway is a 2.0 mile section of roadway with six crashes contributing to it being on the All Modes High Injury Network. The crashes resulted in one (1) death, three (3) incapacitating injuries, and two (2) minor injuries. The fatal crash was a single vehicle crash and the incapacitating injury crashes were a caused by two (2) rear end crashes and one (1) pedestrian involved crash. Speed was acknowledge as a factor in two (2) of the crashes.

This State owned segment of the HIN is begins north of the interchange with Interstate 94 in Mandan and goes to east of Riverwood Drive in Bismarck. The W Bismarck Expwy is a divided, limited access highway with two (2) lanes in each direction with shoulders. All of the west-bound crashes took place in Mandan or on the bridge over the Missouri River.

**The HIN score range is reflective of both directions of travel on W Bismarck Expwy*



ALL MODES HIGH INJURY NETWORK

Bowen Avenue

S Washington Street to 13th Street

Bismarck, ND

8 Crashes contributing to the High Injury Network

17 HIN Score

1.0 Mile Corridor Length

Minor Collector Functional Classification

City Ownership

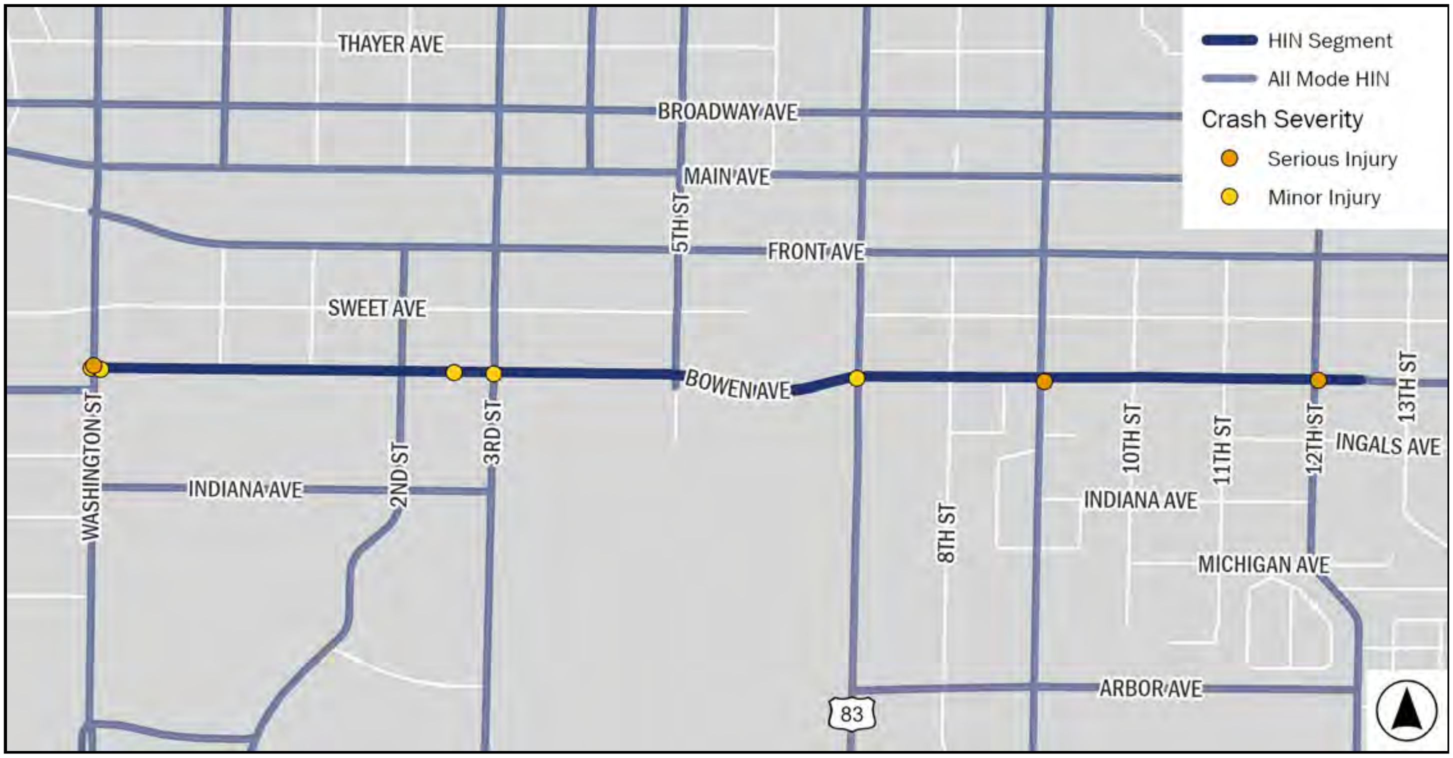
25 Speed Limit (MPH)

350 - 3,510 Average Daily Traffic

Corridor Overview

Bowen Avenue is a 1.0 mile section of roadway with eight (8) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **three (3) incapacitating injuries and five (5) minor injuries.** Contributing crashes included **five (5) bicycle and three motorized crashes. Crashes involving motorized modes included one (1) angle, one (1) rear end, and one (1) sideswipe crash.** Speed was not a contributing factor in any of the crashes.

This city owned minor collector segment of the HIN is from S Washington Street to between 12th and 13th Street. The street is undivided with two (2) lanes and on-street parking on both sides. Between 3rd Street and 7th Street there is a center left turn lane. East of 7th it returns to having two (2) lane with on-street parking on each side. The land use is mixed use and commercial west of S 9th Street and residential to the east with an open streetscape throughout. **Six (6) of the contributing crashes occurred at intersections, with a concentration of crashes at the intersection of Bowen Ave. & Washington St.**



ALL MODES HIGH INJURY NETWORK

Capitol Avenue

N 3rd Street to Capitol Way

Bismarck, ND

6 Crashes contributing to the High Injury Network

10 - 36 HIN Score Range

1.1 Miles Corridor Length

Local / Principal Arterial Functional Classification

City Ownership

25 Speed Limit (MPH)

1,270 - 5,747 Average Daily Traffic

Corridor Overview

Capitol Avenue is a 1.1 mile section of roadway with six (6) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **two (2) incapacitating injuries and four (4) minor injuries.** Contributing crashes included **one (1) pedestrian, two (2) bicycle, and three (3) motorized crashes. Crashes involving motorized modes included two (2) single vehicle and one (1)** angle crash. Speed was a contributing factor in one (1) of the crashes.

This city owned segment of the HIN is from N 3rd Street to Capitol Way. Capitol Avenue is a local street west of 4th Street and a principal arterial to the east. The street is undivided with two lane and parking on both sides. Th street has turn lanes at State Street. The land use is residential west of N 11th Street and mixed use to the east. The streetscape is open throughout the corridor. **Three (3) of the contributing crashes occurred at intersections including two minor injury crashes at the intersection of Capitol Ave. & 19th St.**

ALL MODES HIGH INJURY NETWORK

Century Avenue (Eastbound)

Clydesdale Drive to Iowa Lane

Bismarck, ND

7 Crashes contributing to the High Injury Network

13 - 36 HIN Score Range

2.6 Miles Corridor Length

Principal Arterial Functional Classification

City Ownership

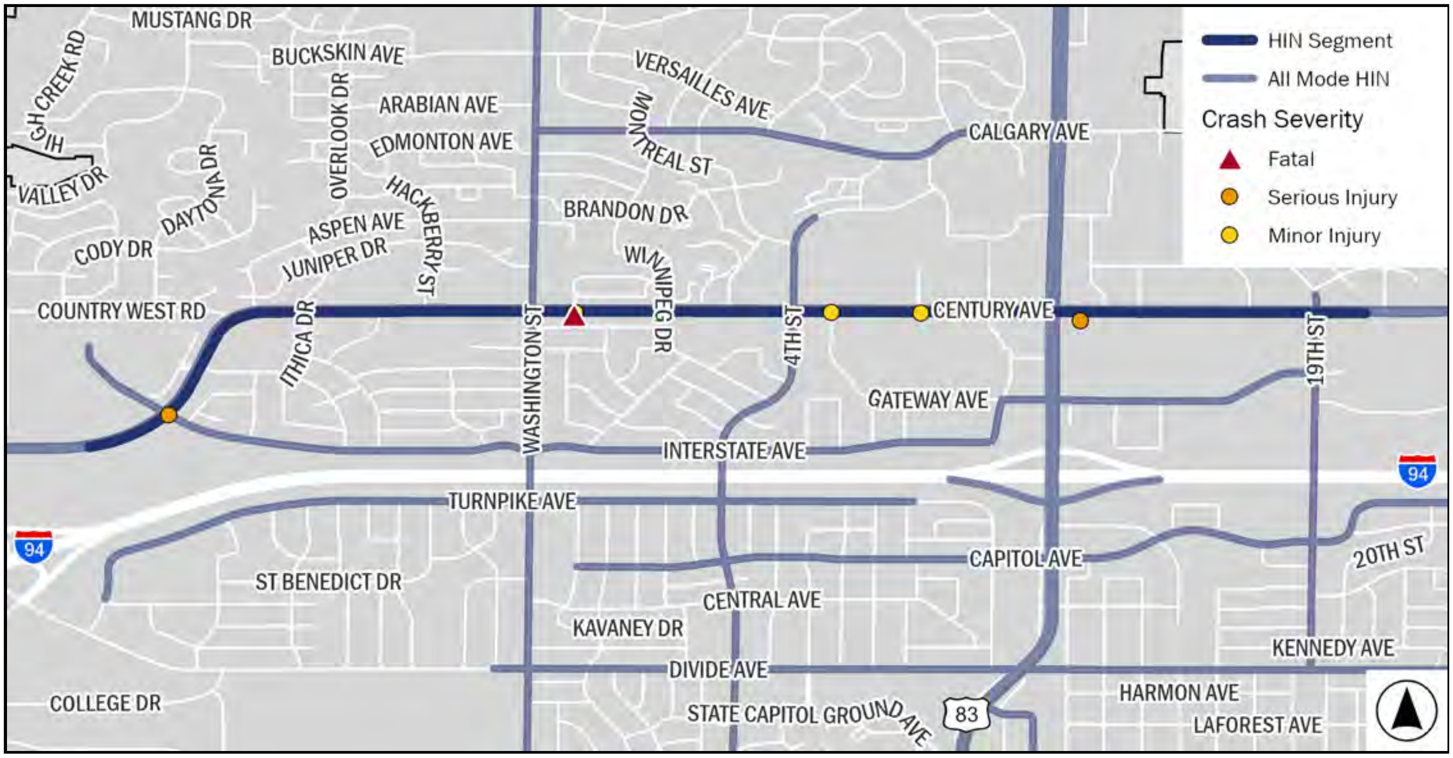
35 Speed Limit (MPH)

3,600 - 8,957 Average Daily Traffic

Corridor Overview

The eastbound lanes of Century Avenue are a 2.6 mile section of roadway with seven (7) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, two (2) incapacitating injuries, and four (4) minor injuries.** Contributing crashes included **three (3) pedestrian, one (1) bicycle, and three (3) motorized crashes. Crashes involving motorized modes included two (2) angle and one (1) single vehicle crash. Speed was a contributing factor in one (1) of the crashes.**

This principal arterial segment of the HIN is owned by the city and runs from between Clydesdale Drive and W Interstate Avenue to Iowa Lane. The street is divided with two (2) lanes in each direction with left turn lanes at major intersections. The street has an open streetscape with commercial land uses near W Interstate Avenue, residential and mixed use from W Interstate Avenue to 4th Street, and commercial east of 4th Street. **Four (4) of the contributing crashes occurred at intersections, with the one (1) fatal crash occurring at the intersection of Century Ave. & Ontario Ln.**



ALL MODES HIGH INJURY NETWORK

Century Avenue (Westbound)

Clydesdale Drive to Iowa Lane

Bismarck, ND

11 Crashes contributing to the High Injury Network

14 - 36 HIN Score Range

2.6 Miles Corridor Length

Principal Arterial Functional Classification

City Ownership

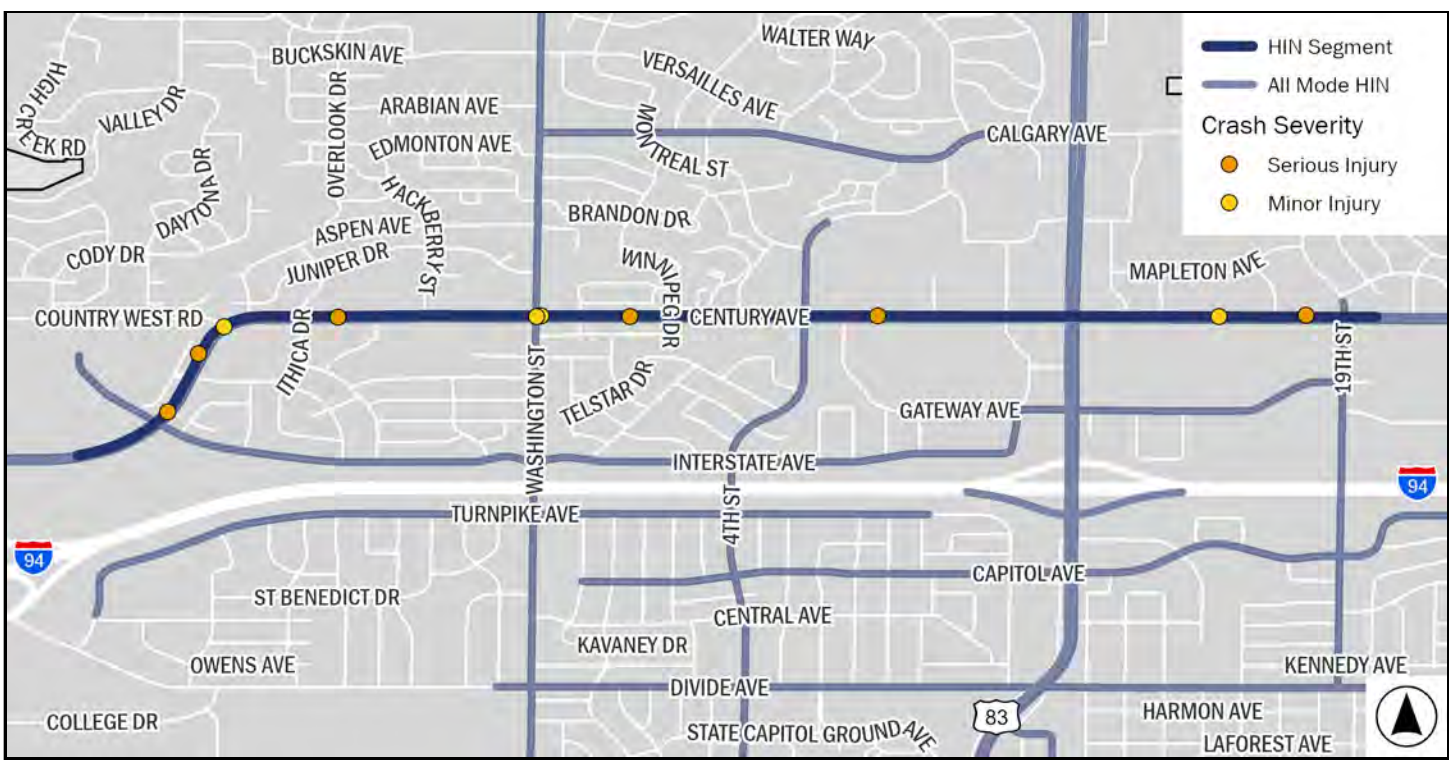
35 Speed Limit (MPH)

3,253 - 9,020 Average Daily Traffic

Corridor Overview

The westbound lanes of Century Avenue are a 2.6 mile section of roadway with 11 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, six (6) incapacitating injuries, and four (4) minor injuries.** Contributing crashes included **five (5) automobile and six (6) motorcycle crashes. Crashes involving motorized modes included seven (7) single vehicle, two (2) angle, and two (2) rear end crashes**. **Speed was a contributing factor in three (3) of the crashes.**

This principal arterial segment of the HIN is owned by the city and runs from between Clydesdale Drive and W Interstate Avenue to Iowa Lane. The street is divided with two (2) lanes in each direction with left turn lanes at major intersections. The street has an open streetscape with commercial land uses near W Interstate Avenue, residential and mixed use from W Interstate Avenue to 4th Street, and commercial east of 4th Street. **Five (5) of the crashes occurred at intersections. The one (1) fatal crash was a motorcycle crash and occurred at the intersection of Century Ave. & Arizona Dr. Over half of the contributing crashes occurred at or west of Washington St.**



ALL MODES HIGH INJURY NETWORK

Collins Avenue

Old Red Trail NE to 1st Avenue NW

Mandan, ND

5 Crashes contributing to the High Injury Network

11 - 13 HIN Score Range

1.1 Miles Corridor Length

Local Functional Classification

State Ownership

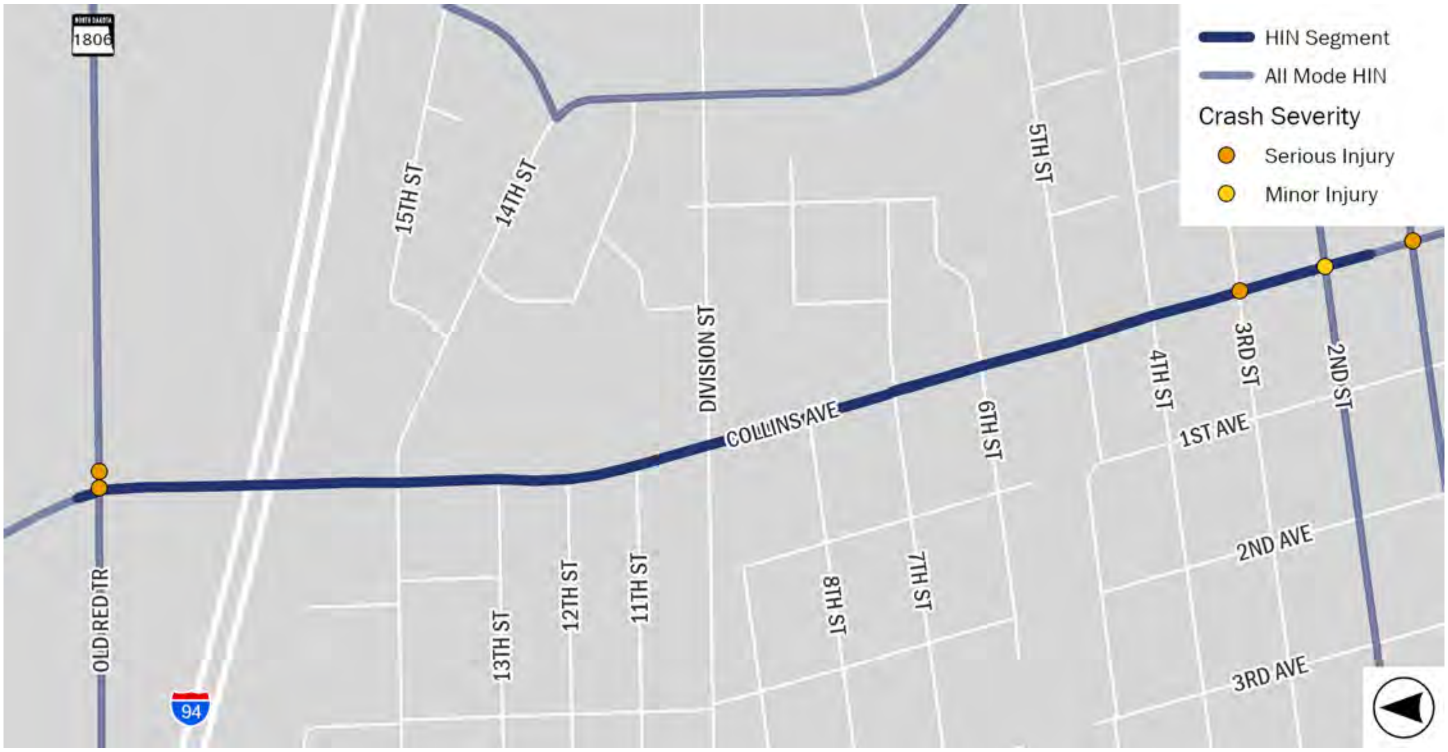
10 - 30 Speed Limit (MPH)

4,341 - 5,487 Average Daily Traffic

Corridor Overview

Collins Avenue is a 1.1 mile section of roadway with five (5) crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **four (4) incapacitating injuries and one (1) minor injury.** Contributing crashes included **two (2) bicycle, one (1) automobile, and two (2) motorcycle crashes. Crashes involving motorized modes were all single vehicle crashes. Speed was a contributing factor in one (1) of the crashes.**

This State owned segment of the HIN is from Old Red Trail NE to 1st Avenue NW and is a local street. The Street is an undivided two (2) lane roadway with on-street parallel parking in some areas and on-street angle parking in downtown on both sides of street. The land use is generally mixed use with an open streetscape. **Three (3) of the crashes occurred at intersections. The two (2) incapacitating injury crashes which occurred at the intersection of Collins Ave. & Old Red Trl. happened in 2023, prior to the conversion to a roundabout intersection configuration.**



ALL MODES HIGH INJURY NETWORK

Main Avenue

N Bell Street to Eastdale Drive

Bismarck, ND

37 Crashes contributing to the High Injury Network

7 - 40 HIN Score Range

3.0 Miles Corridor Length

Principal Arterial Functional Classification

City / State Ownership

25 - 50 Speed Limit (MPH)

3,620 - 15,728 Average Daily Traffic

Corridor Overview

Main Avenue is a 3.0 mile section of roadway with 37 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, 12 incapacitating injuries, and 24 minor injuries.** Contributing crashes included **11 pedestrian, two (2) bicycle, and 24 motorized crashes. Crashes involving motorized modes included nine (9) angle, eight (8) single vehicle, five (5) rear end, and two (2) sideswipe crashes**. **Speed was a contributing factor in five (5) of the crashes.**

This principal arterial segment of HIN is from west of N Bell Street to Eastdale Drive. The Street is state owned west of 26th Street and city owned to the east. The street is undivided throughout with one eastbound lane and 2 westbound lanes on the western portion before transitioning to a three lane street with a center turn lane near downtown Bismarck. In downtown, the street has parking on both sides with right turn lanes at major intersections. East of downtown it becomes a five lane road with a center turn lane. The land use is commercial after crossing over Washington Street with an enclosed streetscape between Washington Street and 26th Street. **28 of the crashes occurred at intersections, with concentrations at Main Ave. intersections with other major streets including 7th St., 9th St., 12th St., 26th St., Airport Rd. and 3rd St.**

ALL MODES HIGH INJURY NETWORK

Mandan Avenue / Memorial Highway / W Main Avenue

16th Street NE to Lake Avenue

Bismarck / Mandan, ND

22 Crashes contributing to the High Injury Network

11 - 26 HIN Score Range

4.3 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

25 - 55 Speed Limit (MPH)

1,472 - 13,196 Average Daily Traffic

Corridor Overview

This segment is a 4.3 mile section of roadway with 22 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **five (5) deaths, 11 incapacitating injuries, and six (6) minor injuries.** Contributing crashes included **one (1) pedestrian, four (4) bicycle, and 17 motorized crashes. Crashes involving motorized modes included six (6) angle, five (5) single vehicle, three (3) head on, two (2) sideswipe, and one (1) rear end crash. Speed was a contributing factor in four (4) of the crashes.**

This State owned segment of the HIN begins at 16th Street NE in Mandan and goes to Lake Avenue in Bismarck. The Mandan Avenue portion of the network is from 16th Street NE to E Main Street. The avenue is undivided with one (1) lane in each direction with a center turn lane. At E Main Street, the roadway becomes Memorial Highway expands to having two (2) lanes in each direction with a center turn lane as it goes through a commercial area. The highway becomes divided and has two (2) lanes in each direction when going over the Missouri River. On the Bismarck side, Memorial Highway becomes W Main Avenue and remains divided but has large multilane intersections with Fraine Barracks Road/ Memorial Highway. **12 of the crashes were at intersections , with one fatal crash occurring at the Mandan Ave. & westbound I-94 ramp intersection and two (2) fatal crashes occurring at the Memorial Hwy. & 3rd St. intersection The two (2) other fatal crashes were not intersection related.**

ALL MODES HIGH INJURY NETWORK

State Street (Northbound)

57th Avenue NE to N 9th Street

Bismarck, ND

12 Crashes contributing to the High Injury Network

13 - 36 HIN Score Range

3.5 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

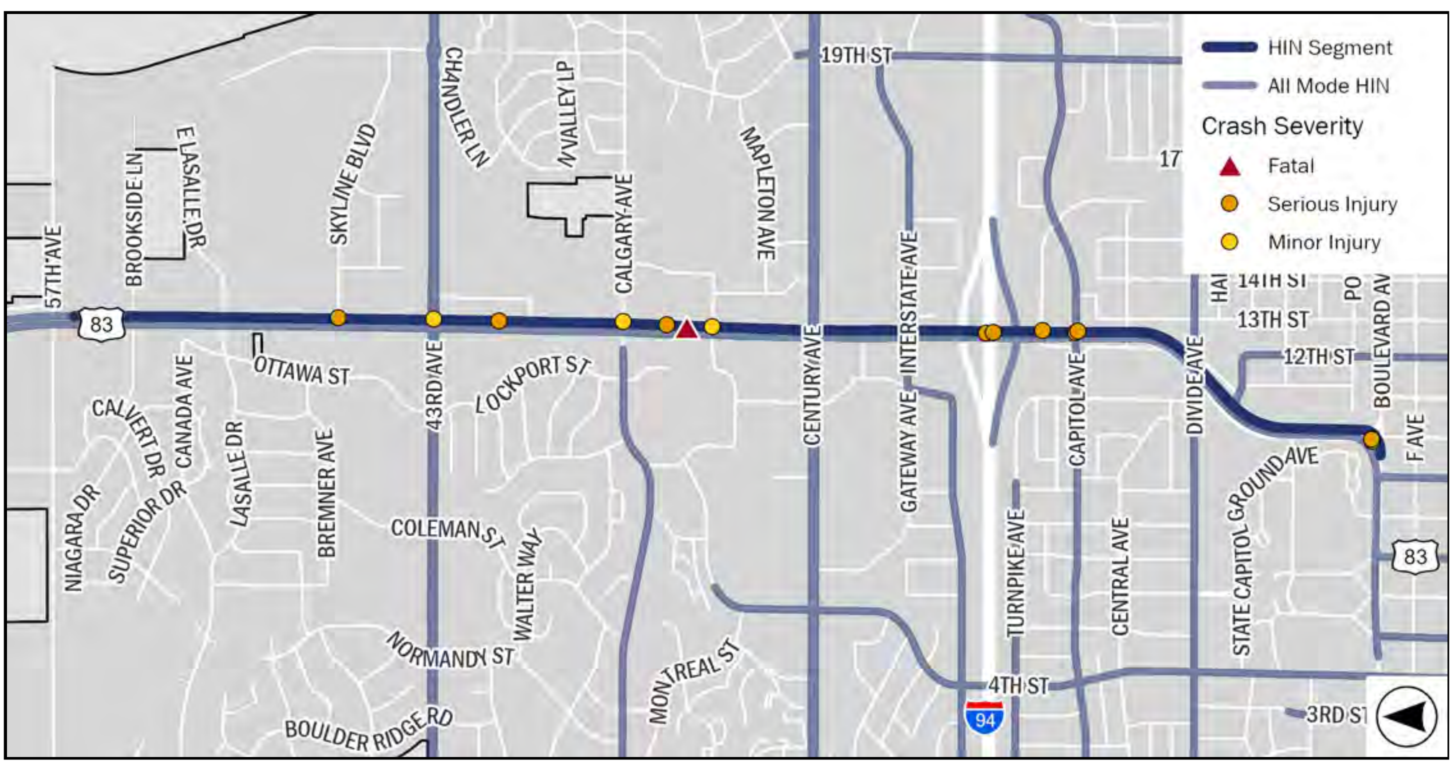
30 - 45 Speed Limit (MPH)

8,934 - 22,113 Average Daily Traffic

Corridor Overview

The northbound lanes of State Street are a 3.5 mile section of roadway with 12 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, eight (8) incapacitating injuries, and three (3) minor injuries.** Contributing crashes included **two (2) pedestrian, one (1) bicycle, and nine (9) motorized crashes. Crashes involving motorized modes included five (5) angle, one (1) single vehicle, one (1) rear end, and one (1) sideswipe. Speed was a contributing factor in two (2) of the crashes.**

This segment of the HIN is from 57th Avenue NE to N 9th Street and is a principal arterial street owned by the State. The street is divided with three (3) lanes in each direction with left turn lanes at major intersections. The land use is commercial north of E Divide and institutional south of E Divide with an open streetscape throughout. **10 of the contributing crashes occurred at intersections, with concentrations of crashes between the Capitol Ave. intersection and the I-94 bridge, and between Harvest Ln. and Calgary Ave.**



ALL MODES HIGH INJURY NETWORK

State Street (Southbound)

57th Avenue NE to N 4th Street

Bismarck, ND

19 Crashes contributing to the High Injury Network

13 - 39 HIN Score Range

3.9 Miles Corridor Length

Principal Arterial Functional Classification

State Ownership

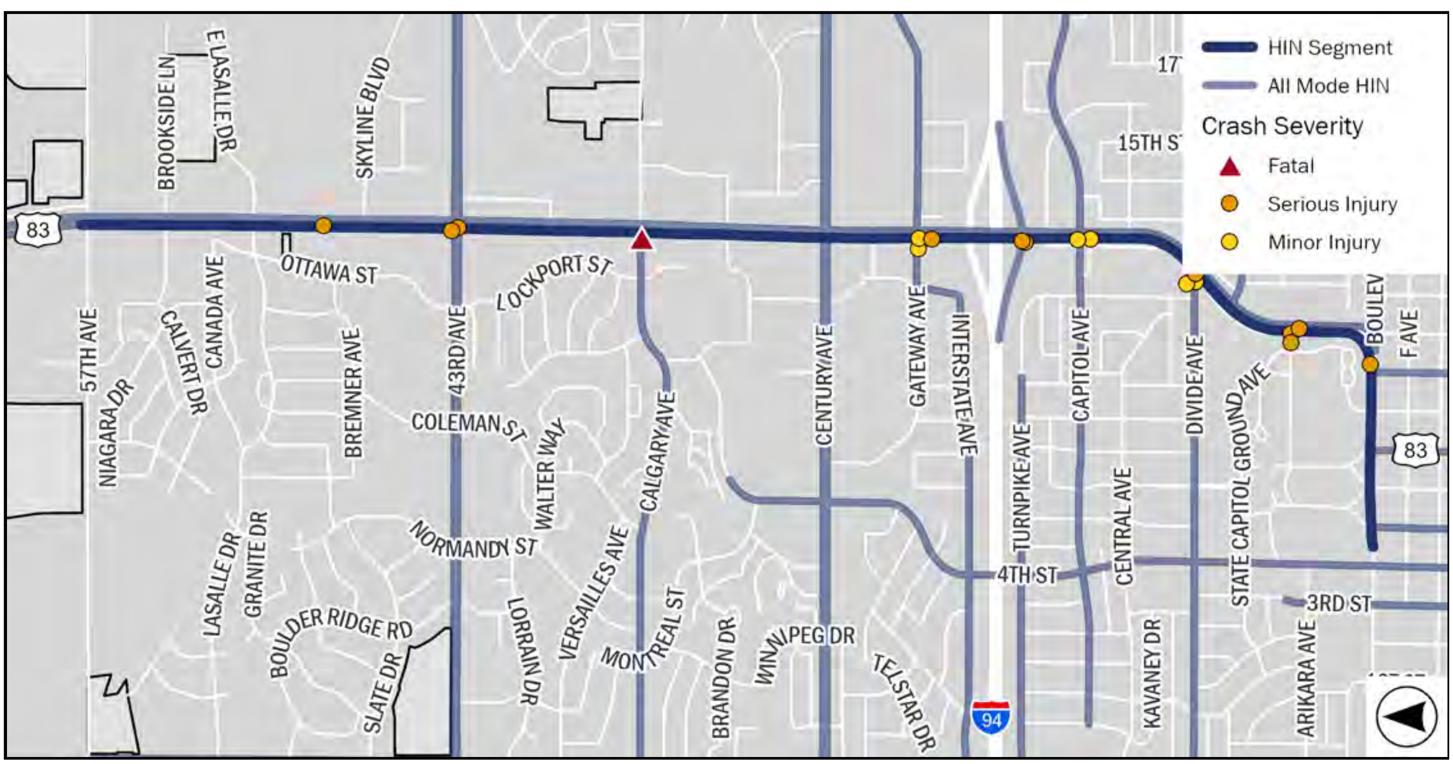
30 - 45 Speed Limit (MPH)

2,507 - 23,975 Average Daily Traffic

Corridor Overview

The southbound lanes of State Street are a 3.9 mile section of roadway with 19 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **one (1) death, 11 incapacitating injuries, and seven (7) minor injuries.** Contributing crashes included **six (6) pedestrian, two (2) bicycle, and 11 motorized crashes. Crashes involving motorized modes included four (4) single vehicle, three (3) rear end, two (2) angle, and two (2) sideswipe crashes. Speed was a contributing factor in two (2) of the crashes.**

This segment of the HIN is from 57th Avenue NE to N 4th Street and is a principal arterial street owned by the state. The street is divided with three lanes in each direction with left turn lanes at major intersections. The land use is generally commercial north of E Divide and institutional south of E Divide with an open streetscape throughout. **13 of the contributing crashes occurred at intersections. The one (1) fatal crash occurred at the State St. & Calgary Ave. intersection. Other prominent crash locations along State St. include the State Capitol Ground Ave., 43rd Ave., Divide Ave., Gateway Ave., and the I-94 eastbound ramp intersections.**



ALL MODES HIGH INJURY NETWORK

Rosser Avenue

N Bell Avenue to N 33rd Street

Bismarck, ND

12 Crashes contributing to the High Injury Network

14 - 17 HIN Score Range

2.9 Miles Corridor Length

Minor Arterial Functional Classification

City Ownership

25 - 30 Speed Limit (MPH)

4,290 - 11,110 Average Daily Traffic

Corridor Overview

Rosser Avenue is a 2.9 mile section of roadway with 12 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **four (4) incapacitating injuries and eight (8) minor injuries.** Contributing crashes included **four (4) pedestrian, four (4) bicycle, and four motorized crashes. Crashes involving motorized modes included three (3) angle and one (1) head on crash.** Speed was not a contributing factor in any of the crashes.

This city owned minor arterial segment of the HIN is from N Bell Avenue to N 33rd Street. The street is undivided with two (2) lanes and on-street parking on both sides west of 2nd Street. At 2nd Street there is a center turn lane until 9th Street. East of 9th Street, Rosser Avenue has one (1) lane in each direction with parking and painted bike lane beginning at 12th Street. The land use is residential west of Washington, mixed use between Washington and 3rd Street, commercial between 3rd and 12th Street, Rosser Avenue alternates between residential and mixed use east of 12th Street. The streetscape is enclosed between N 2nd Street and N 10th Street but is otherwise open. **All contributing crashes occurred at intersections. Over half of the contributing crashes occurred between 9th St. and Washington St.**

ALL MODES HIGH INJURY NETWORK

Washington Street

Between West Avenue D and F and W Wachter Avenue

Bismarck, ND

25 Crashes contributing to the High Injury Network

14 - 29 HIN Score Range

3.6 Miles Corridor Length

Minor Arterial / Principal Arterial Functional Classification

City Ownership

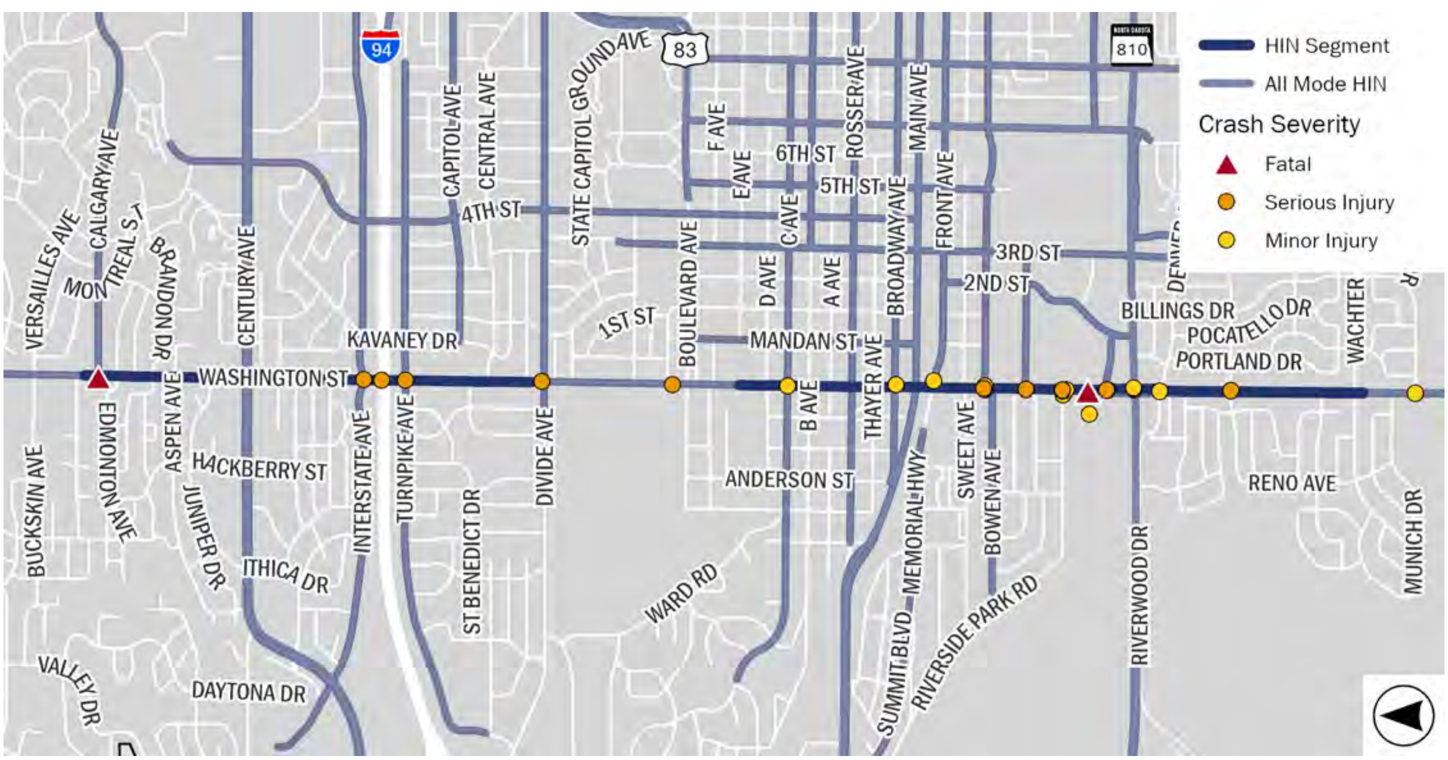
25 - 35 Speed Limit (MPH)

5,170 - 18,143 Average Daily Traffic

Corridor Overview

Washington Street is a 3.6 mile section of roadway with 25 crashes contributing to it being on the All Modes High Injury Network. The contributing crashes resulted in **two (2) deaths, 10 incapacitating injuries, and 13 minor injuries.** Contributing crashes included **five (5) pedestrian, 10 bicycle, and 10 motorized crashes. Crashes involving motorized modes included four (4) rear end, three (3) angle, two (2) single vehicle, and one (1) sideswipe crash. Speed was a contributing factor in one (1) of the crashes.**

This segment of HIN on Washington Street begins between West Avenue D and F and goes south to W Wachter Avenue. The Street is city owned and is a minor arterial north of Rosser Avenue, and a principal arterial south of it. The undivided street has one (1) lane in each direction with a center turn lane north of W Rosser Avenue. South of Rosser Avenue, the street expands to two (2) lanes in each direction with a center turn lanes to W Denver Avenue with additional turn lanes at Bismarck Expressway. South of Denver Avenue, the street has two (2) lanes in each direction without a center turn lane. The corridor has an open streetscape throughout with residential land uses north of Rosser Avenue, mixed use between Rosser Avenue and W Arbor Avenue, commercial between W Arbor Avenue and Denver Avenue and residential south. **21 of the contributing crashes occurred at intersections along Washington St, with significant concentration from Bowen Ave to Riverwood Dr. One (1) of the contributing fatal crashes occurred at the Washington St. & Calgary Ave. intersection, and the other contributing fatal crash occurred mid-block between Arbor Ave. and Ivy Ave.**



2025 SAFETY POLICY STUDY

BISMARCK-MANDAN MPO

Appendix F – Safety Countermeasure Toolkit

December 8, 2025

Bismarck-Mandan Metropolitan Planning Organization

Introduction

The Strategy Toolkit is a range of facilities, treatments, strategies, and actions to make the roadways in the Bismarck-Mandan Metropolitan Planning Organization's (BMMPO's) Metropolitan Planning Area (MPA) safer for users of all modes. This Toolkit focuses on safety for all modes. The Toolkit may be used by agencies to help identify potential strategies to consider in priority locations on corridors and at intersections by reviewing the categories and relevance to key findings. Complimentary strategies and initiatives should be considered when implementing traffic safety strategies to build redundancy in the multimodal transportation network and to support a change to safety culture. Each strategy includes an estimated cost, crash reduction factor (CRF) or effectiveness and a connection to the Safe System Hierarchy. That said, there is no one-size-fits-all approach. Engineers should use their engineering judgment and seek expert advice when necessary.

How to use the Toolkit

The Toolkit supports the implementation of the Safety Policy Study (Study) by providing a comprehensive framework of roadway safety strategies that can be tailored to specific locations, enabling engineers and planners to prioritize and effectively apply safety improvements. Additionally, the Toolkit serves as a valuable resources for identifying potential strategies for projects and funding by outlining the expected crash reduction or effectiveness, estimating high-level implementation costs, facilitating informed decision-making and strategic investment in roadway safety.

The Toolkit guides users through a framework of questions to narrow down options and compiles a list of potential strategies for any given combination of answers focusing on high-level attributes, including context/area type, facility type, divided or undivided roadway, and the relevance to findings. From there, depending on the attribute combinations, users may select the relevance to the Study findings, existing roadway geometry, road user type, and desired cost range. It is critical to understand that this Toolkit applies a one-size-fits-most approach to a problem that inherently demands tailored solutions, and should therefore serve as an initial reference, to be supplemented with project-specific data and engineering judgement.

Toolkit Legend

Estimated Implementation Costs

Each strategy includes a cost estimate, indicated by Low, Moderate, or High, that reflects relative estimate of implementation cost as shown in **Table 1.** A legend is also provided to explain the cost range. Some strategies' costs vary widely and may fall into multiple cost ranges, depending on length, context, and materials scoped as part of implementation. When costs varied, estimated costs categories may be described as a range and visually coded with the higher value . Strategies may also have quick-build options that are lower cost, while delivering the same or similar safety benefits.

Table 1. Estimated Implementation Cost

Category	Description
Low	Less than $50,000
Moderate	$50,000 to $250,000
High	Greater than $250,000

NIZATION

Estimated Effectiveness

Each Strategy includes an estimate of effectiveness, based on Crash Reduction Factor (CRF). Categories include Low, Moderate, or High, that reflects the relative estimate of effectiveness in reducing crashes after implementation. Some strategies' effectiveness may vary, therefore may be described as a range and visually coded with the higher value . Additionally, strategy effectiveness described with a "*" indicate the countermeasure has been "tried" with the listed effectiveness. "Tried" strategies include strategies which have anecdotal evidence that the strategy may work; however, no formal study or crash modification factor exists to reliably measure the effectiveness. Strategies without the "*-Tried" designation include strategies:

- Supported by documented national research studies and/or the Crash Modification Factor (CMF) Clearinghouse, and/or
- Appear in the list of FHWA Proven Safety Countermeasures.

Table 2. Estimated Effectiveness

Category	Description
Low	0 to 20% reduction
Moderate	21 to 40% reduction
High	Greater than 41% reduction
Tried	* Anecdotal evidence that the strategy may work; however, no formal study or crash modification factor exists to reliably measure the effectiveness.

Safe System Roadway Design Hierarchy Tiers

The U.S. Department of Transportation (USDOT) adopted the Safe System Approach (SSA) in 2022, which is a guiding paradigm in developing modern, safety studies and safety plans across the nation. The SSA is a roadway safety framework that seeks to eliminate road traffic deaths and serious injuries by designing and building roadways to accommodate human mistakes and human vulnerability on the road. The Toolkit references the Safe System Roadway Design Hierarchy (SSRDH) as part of the output. The Federal Highway Administration (FHWA) developed the SSRDH to assist transportation agencies and practitioners to identify and prioritize infrastructure-based strategies relative to their alignment with the SSA. Some strategies align with multiple tiers:

- **Tier 1 – Remove Severe Conflicts**
- **Tier 2 – Reduce Vehicle Speeds**
- **Tier 3 – Manage Conflicts in Time**
- **Tier 4 – Increase Attentiveness & Awareness**

Toolkit Sources

Source & Link Description
FHWA Proven Safety Countermeasures
NHTSA Countermeasures That Work
FHWA Safe System Roadway Design Hierarchy
NDHRP 926, Guidance to Improve Pedestrian and Bicyclist Safety Strategies at Intersections
MnDOT District Safety Plan Road Safety Strategies (“Big Book of Ideas”

Safety Countermeasure Toolkit

Rural Strategies

- Typical for rural roadways without urbanization (i.e. curb & gutter, underground utilities) nor adjacent urban land uses.
- Categories:
  - Intersection
  - Segment
  - Curve

Urban Strategies

- Typical for urbanized roadways with urban land uses.
- Categories:
  - Intersection
  - Segment
  - Bike/Ped Crossing

Bismarck-Mandan
Metropolitan Planning Organization

What is the street cross section?

Rural

Typical for rural roadways without urbanization (i.e. curb & gutter, underground utilities) nor adjacent urban land uses.

Urban

Typical for urbanized roadways with urban land uses.

What is the urban location typology?

Intersection	Segment	Bike/Ped Crossing

BACK To Street Cross Section

What is the rural pavement material?

Paved	Unpaved

BACK To Street Cross Section

Rural Unpaved Roadway Strategies

HOME

Gravel Roadway Countermeasures

Like the paved roadway network, the gravel portion of Burleigh and Morton Counties' should also be evaluated for safety countermeasures. Signage improvements—such as chevrons on curves or advance warning signs at sight-limited intersections—follow the same guidance and protocols used on the paved system. However, gravel roads present additional challenges, primarily due to their unpredictable surface conditions. Recommended improvement types include:

- Gravel surfacing
- Strengthening and improving cross sections, particularly along heavy commercial vehicle/truck corridors
- Enhancing drainage for both the gravel surface and side slopes
- Improving and maintaining clear zones
- Enhancing sign visibility
- Considering full reconstruction where appropriate

Addressing safety on the gravel system is critical, as a majority of both Burleigh and Morton Counties' roadway networks consist of gravel roads.

Gravel Surfacing

Gravel surfaced roads can change quickly from a smooth, dust free surface to a dusty, rutted and washboard surface. Traffic and weather constantly alter the condition of gravel roads. The key to gravel road safety in BMMPO's MPA is to continue to improve through maintenance best practices. Because such a large percentage of the Burleigh and Morton Counties' roadway systems are gravel, maintenance must be prioritized.

Providing adequate binder to a well graded surface aggregate is an investment to consider. Quality aggregate material is critical. Tailoring the surface aggregate specifications to include a higher percentage of binder aggregates (#200 sieve) and understanding the type of binder (silty versus loamy fines) results in a better aggregate surfaced roadway. Ensuring that the aggregate base is designed to carry the expected traffic is also a key consideration.

Strength/Crown/Shoulders (Cross section issues)

Heavy commercial traffic squashes a cross section when there is not adequate aggregate base to carry traffic especially in areas with poor subgrade quality. A strategic plan on heavy truck use corridors is a good start for prioritized investments for increased aggregate thickness. This is ideal for routes not planned to be paved.

Table 3 provides a guide for determining gravel layer thickness by considering subgrade support condition and projected daily truck volumes.

Bismarck-Mandan Metropolitan Planning Organization

Rural Unpaved Roadway Strategies

HOME

Table 3. Gravel Layer Thickness Guidelines

Estimated Daily Heavy Trucks	Subgrade Support Condition	Suggested Minimum Gravel Thickness, mm (in.)
0-5	Low	165 (6.5)
0-5	Med	140 (5.5)
0-5	High	115 (4.5)
5-10	Low	215 (8.5)
5-10	Med	180 (7.0)
5-10	High	140 (5.5)
10-25	Low	290 (11.5)
10-25	Med	230 (9.0)
10-25	High	180 (7.0)
25-50	Low	370 (14.5)
25-50	Med	290 (11.5)
25-50	High	215 (8.5)

Source: Upper Great Plains Transportation Institute NDLTAP

Drainage

Great managers of gravel roads understand how critically important it is to maintain roadway drainage properties. Ensuring appropriate crown with quality surfacing aggregate is a key element to prevent rutting and washboards resulting from oversaturated material. Also important is continuous improvement to roadside drainage. Maintaining well vegetated, gentle slopes creates a more forgiving clear zone for errant vehicles leaving the traveling surface. Good slopes also create good drainage and prevent erosion from silting in ditch bottoms, which typically requires more frequent ditch cleaning.

Clear Zones

Understanding the safe systems approach pivots on one key fact. *Drivers make mistakes.* Like the paved system, evaluating the clear zone for steep slopes or obstructions like trees and utility poles can help identify focus areas to design more forgiving roadsides to driver mistakes that reduce the severity of crashes. If the clear zone obstruction cannot be eliminated, then consider signage and markings of hazards. Clear zones also require some vegetation control to ensure adequate sight distances and good visibility for animal crossings. See clear zone strategy sheet HERE.

Sign Visibility

Traffic signs along unpaved roads often get dirty from dust which can make them hard to see and reduces the retro reflectivity. Maintenance staff should be aware to watch for dirty signs and clean them as needed.

Rural Unpaved Roadway Strategies

Reconstruction

When the safety issues are related to sight distance rather than surface conditions, various approaches can be considered. Installing chevrons/delineators and advance warning signs on curves can improve driver expectation of the road ahead. Removing vegetation in intersection sight corners and on the roadside/clear zone can improve sight distance. Reconstruction should be considered at locations where improvements can be made to intersection alignment and access points to fields can be consolidated.

Unpaved Road Maintenance Resources

Resource
FHWA, "Unpaved Roads: Safety Needs and Treatments: (Washington, DC: FHWA-SA-14-094)
Veneziano, D. *Low Cost Safety Countermeasures for Unpaved and Gravel Roads*, Iowa State University Institute for Transportation: Ames, IA. October, 2020
G. Huntington, "Road Geometry, Surface Materials Are Key to Safety on Gravel Roads," *Safety Compass Newsletter* FHWA, 6:2 (6) Fall 2012.
Design Guidance Table from FHWA Gravel Roads Manual/Upper Great Plains Transportation Institute (UGPTI) North Dakota Local Technical Assistance Program (NDLTAP)

What is the rural location typology?

Intersection	Segment	Curve

BACK To Rural Pavement Material

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
All-Way Stop	Low	*Low	X		X	
Continuous Green T	High	Low	X		X	
Oversized Warning Signs/Stop Signs/ Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low	Moderate		X		X
High-Friction Surface Treatment	Moderate	High	X	X		
J-Turn/ Restricted Crossing U-Turn (RCUT)	Mod./High	Mod./High	X		X	
LED Stop Signs/ Flashing Beacons	Low	Low/High			X	X
Lighting	Low/Mod.	Moderate				**X**
Median Acceleration Lane	Moderate	Moderate	X		X	
Offset T-Intersection	High	Mod./High	X		X	
Remove Sightline Obstructions/ Maintain Vision Triangles	Low	Low/Mod.	X			
Remove Skew/ Realign	Mod./High	Moderate	X			
Roundabout	High	High	X	X		
Through Activated Warning System	Low	Moderate			X	X
Transverse Rumble Strips	Low	Moderate				X
Turn Lanes	Low/Mod.	Low/High	X			

BACK To Rural Location Typology

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
All-Way Stop	Low	*Low	X		X	
Continuous Green T	High	Low	X		X	
High-Friction Surface Treatment	Moderate	High	X	X		
J-Turn/ Restricted Crossing U-Turn (RCUT)	Mod./High	Mod./High	X		X	
Median Acceleration Lane	Moderate	Moderate	X		X	
Offset T-Intersection	High	Mod./High	X		X	
Remove Sightline Obstructions/ Maintain Vision Triangles	Low	Low/Mod.	X			
Remove Skew/ Realign	Mod./High	Moderate	X			
Roundabout	High	High	X	X		
Turn Lanes	Low/Mod.	Low/High	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
All-Way Stop	Low	*Low	X		X	
High-Friction Surface Treatment	Moderate	High	X	X		
Remove Sightline Obstructions/ Maintain Vision Triangles	Low	Low/Mod.	X			
Remove Skew/ Realign	Mod./High	Moderate	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Oversized Warning Signs/Stop Signs/ Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low	Moderate		X		X
High-Friction Surface Treatment	Moderate	High	X	X		
Roundabout	High	High	X	X		

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Oversized Warning Signs/Stop Signs/ Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low	Moderate		X		X
High-Friction Surface Treatment	Moderate	High	X	X		

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
All-Way Stop	Low	*Low	X		X	
Continuous Green T	High	Low	X		X	
J-Turn/ Restricted Crossing U-Turn (RCUT)	Mod./High	Mod./High	X		X	
LED Stop Signs/ Flashing Beacons	Low	Low/High			X	X
Median Acceleration Lane	Moderate	Moderate	X		X	
Offset T-Intersection	High	Mod./High	X		X	
Through Activated Warning System	Low	Moderate			X	X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
All-Way Stop	Low	*Low	X		X	
LED Stop Signs/ Flashing Beacons	Low	Low/High			X	X
Through Activated Warning System	Low	Moderate			X	X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Bismarck-Mandan
Metropolitan Planning Organization

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Oversized Warning Signs/Stop Signs/ Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low	Moderate		X		X
LED Stop Signs/ Flashing Beacons	Low	Low/High			X	X
Lighting	Low/Mod.	Moderate				**X**
Through Activated Warning System	Low	Moderate			X	X
Transverse Rumble Strips	Low	Moderate				X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Rural Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Oversized Warning Signs/Stop Signs/ Enhanced Stop Bar/ Retroreflective Strips on Sign Posts	Low	Moderate		X		X
LED Stop Signs/ Flashing Beacons	Low	Low/High			X	X
Through Activated Warning System	Low	Moderate			X	X
Transverse Rumble Strips	Low	Moderate				X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Intersection Strategies

Rural Intersection Strategies

All-Way Stop

Cost

Less than $10,000 per intersection.

Purpose

Converts uncontrolled or two-way stop controlled intersection to all-way stop control at each leg of intersection.

Considerations

Review the NDDOT Traffic Operations Manual for recommendations on 4-way stop control.

Effectiveness

All-way stop conversion:

68% Reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Rural Intersection Strategies

Continuous Green T

Cost

$300,000-$500,000 per intersection.

Purpose

Allows for one direction of travel (top part of the T) to continuously go through the intersection while the bottom portion of the T will operate like a normal T with a channelized lane for left-turns.

Considerations

Should only be considered for high-volume intersections with significant angle and/or rear end crash history.

Effectiveness

15% Reduction of fatal and injury crashes.

SSRDH Tier

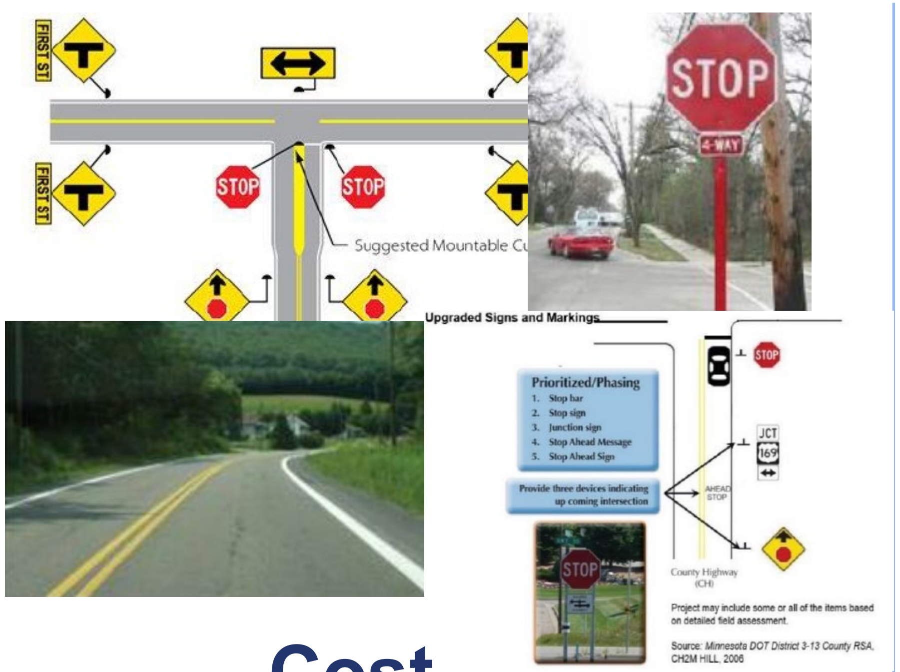
1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Rural Intersection Strategies

Oversized Warning Signs/ Stop Signs/ Enhanced Stop Bar/ Retroflective Strips on Sign Posts



Cost

Less than $10,000 per intersection.

Purpose

Multi-pronged approach through signage and striping to increase intersection visibility.

Considerations

Low-cost, moderate effectiveness. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

25% Reduction of all crash severities and types, stop controlled intersections.

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

BACK

Rural Intersection Strategies

High-Friction Surface Treatment

Cost

$60,000-$200,000 per intersection.

Purpose

Pavement treatment that helps drivers maintain friction and therefor, better control of their vehicle (I.e. shorter stopping distance).

Considerations

May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

62% Reduction of all crash severities and types, and

86% Reduction of all wet road crashes.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

J-Turn/ Restricted Crossing U-Turn (RCUT)

Cost

$250,000-$1.25 million per intersection.

Purpose

Reduces conflict by eliminating left-turn conflict (i.e. right-only).

Considerations

Should only be considered for high-volume intersections with significant angle and/or rear end crash history.

Effectiveness

35% Reduction of all crash severities and types, and

71% Reduction of all fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

LED Stop Signs/ Flashing Beacons

Cost

Less than $10,000 per intersection.

Purpose

Replaces standard stop signs with flashing LED signs.

Considerations

Low-cost, high effectiveness. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

42% Reduction of all crash severities, angle crashes (LED) and

16% Reduction of all crash severities, angle crashes (beacon).

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

Rural Intersection Strategies

Lighting (and approaches)

Cost

$30,000-$125,000 per intersection.

Purpose

Used at intersection and approaches to improve visibility during dark conditions.

Considerations

Should only be considered for high-volume intersections with history of nighttime and/or dark lighting conditions. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

33% Reduction of all crash severities, angle crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Rural Intersection Strategies

Median Acceleration Lane

Cost

$60,000-$200,000 per intersection.

Purpose

Auxiliary lane that allows for left-turning traffic to accelerate after turning.

Considerations

Should only be considered for high-volume intersections with significant rear end and/or sideswipe crash history.

Effectiveness

40% Reduction of all crash severities, rear end crashes.

SSRDH Tier

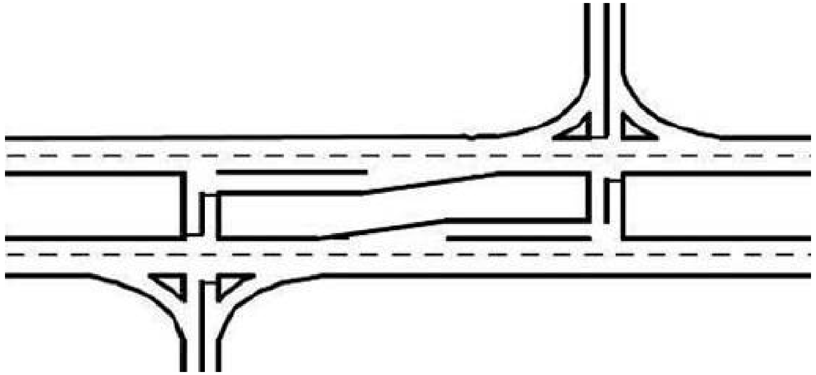
1. Remove Severe Conflicts
3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

Offset T-Intersection



Cost

$600,000 per intersection.

Purpose

Can be used in place of a traditional 4-leg intersection to reduce the total number of conflict points.

Considerations

Should only be considered for high-volume offset T-intersections with significant angle, sideswipe, and/or rear end crash history.

Effectiveness

Up to **30%** reduction of all crash severities and types, and

Up to **69%** reduction of all crash severities, angle crashes/ crossing maneuvers.*

SSRDH Tier

1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

Remove Sightline Obstructions/ Maintain Vision Triangles

Cost

Less than $10,000 per intersection.

Purpose

Properly maintained clear zone allows for safe sight distance for drivers and increases the likelihood of vehicle recovery, if roadway departure is involved.

Considerations

Low-cost, moderate effectiveness.

Effectiveness

Up to **40%** reduction of all crash severities and types.*

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

Remove Skew/ Realign

Cost

$50,000-$300,000 per intersection.

Purpose

Improve intersecting road alignment to improve sightlines/visibility.

Considerations

Should be considered for all skewed intersections and timed with routine reconstruction or rehabilitation projects, as applicable.

Effectiveness

Up to **30%** reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Intersection Strategies

Roundabout

Cost

$2.5 million-$3 million per intersection.

Purpose

Circular intersection where traffic flow is slowed and severe intersection conflict points are reduced.

Considerations

Should only be considered for high-volume intersections with significant angle and/or rear end crash history.

Effectiveness

51% Reduction of fatal and injury (KABC) crashes, and

69% Reduction of all fatal and injury (KAB) crashes.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Rural Intersection Strategies

Through Activated Warning System

Cost

$10,000-$30,000 per intersection.

Purpose

Uses sensors and signs to signal when vehicles are approaching an intersection from the intersecting leg. Increases awareness and visibility of conflicting traffic.

Considerations

Should be considered for higher volume intersections with known stop violations, or intersections with significant freight thru-traffic. May also be considered a "tried" motorcycle-specific strategy.

Effectiveness

30% Reduction of all crash severities and types.

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

Rural Intersection Strategies

Transverse Rumble Strips

Cost

Less than $10,000 per intersection.

Purpose

Series of long, milled sections across the travel lane to audibly alert drivers of an upcoming stop sign/traffic control.

Considerations

Low-cost, moderate effectiveness. May also be considered a "tried" motorcycle-specific strategy.

Effectiveness

29% Reduction of fatal and injury crashes, and

Up to **40%** reduction of all crash severities, and types.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Intersection Strategies

Turn Lanes (offset/ channelized)

Cost

$30,000-$200,000 per intersection.

Purpose

Additional lanes for traffic that is turning. Used to separate through-traffic from turning traffic that might be yielding.

Considerations

Review the NDDOT Traffic Operations Manual for recommendations on turn lanes.

Effectiveness

Between **12%-44%** reduction of all crash severities, and types depending upon specific intersection configuration and other factors.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	Low/High	Low/High	X			
Centerline Rumble	Low	Moderate				X
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
Ditch/ Embankment/ Side Slope Improvements	Low/High	Low	X			
Divided Roadway	Mod./High	Mod./High	X			
Enhanced Edgeline	Low	Low				X
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Passing Lanes	High	Moderate	X		X	
Plowable Centerline Reflective Markers	Low	Moderate				X
Safety Edge	Low	Moderate	X			
Separated Bike Trail/Path	Mod./High	High	X			
Shoulder Paving	Mod./High	Low/Mod.	X			
Shoulder/ Edgeline Rumble	Low	Moderate				X
Snow Fencing	High	*Low/High	X			
Dynamic Speed Limit Signs	Low	Low		X		X
Upgrade Signs/ Oversized Regulatory Signs	Low	*Low		X		X

BACK To Rural Location Typology

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	Low/High	Low/High	X			
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
Ditch/ Embankment/ Side Slope Improvements	Low/High	Low	X			
Divided Roadway	Mod./High	Mod./High	X			
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Passing Lanes	High	Moderate	X		X	
Safety Edge	Low	Moderate	X			
Separated Bike Trail/Path	Mod./High	High	X			
Shoulder Paving	Mod./High	Low/Mod.	X			
Snow Fencing	High	*Low/High	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Segment Strategies

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	Low/High	Low/High	X			
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
Ditch/ Embankment/ Side Slope Improvements	Low/High	Low	X			
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Safety Edge	Low	Moderate	X			
Shoulder Paving	Mod./High	Low/Mod.	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Segment Strategies

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Dynamic Speed Limit Signs	Low	Low		X		X
Upgrade Signs/ Oversized Regulatory Signs	Low	*Low		X		X

***All Listed, Appropriate for Low Traffic Volumes**

BACK To Rural Segment Strategies

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Passing Lanes	High	Moderate	X		X	

***All Listed, Not Appropriate for Low Traffic Volumes**

BACK To Rural Segment Strategies

Rural Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Centerline Rumble	Low	Moderate				X
Enhanced Edgeline	Low	Low				X
Plowable Centerline Reflective Markers	Low	Moderate				X
Shoulder/ Edgeline Rumble	Low	Moderate				X
Dynamic Speed Limit Signs	Low	Low		X		X
Upgrade Signs/ Oversized Regulatory Signs	Low	*Low		X		X

***All Listed, Appropriate for Low Traffic Volumes**

BACK To Rural Segment Strategies

Rural Segment Strategies

Access Management

Cost

$10,000-$350,000 per mile.

Purpose

Reduce conflict points, typically through consolidation.

Considerations

Review and evaluate guidelines frequently, time access management with routine reconstruction or rehabilitation projects, as applicable.

Effectiveness

Up to **50%** reduction of all crash severities, and types.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Centerline Rumble/ Sinusoidal Mumble Strips

Cost

Less than $10,000 per mile.

Purpose

Series of short, milled sections along the centerline to audibly alert drivers when they cross. Sinusoidal rumble strips may be used to decrease noise pollution.

Considerations

Low-cost, moderate effectiveness. Should be priority strategy for paved county roads. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

36% Reduction of severe crashes, single-vehicle run off road crashes on 2-lane rural roads.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Clear Zone Maintenance/ Enhancements

Cost

$10,000-$350,000 per mile.

Purpose

Properly maintained clear zone allows for safe sight distance for drivers and increases the likelihood of vehicle recovery, if roadway departure is involved.

Considerations

Low-cost, moderate effectiveness. Should be a priority strategy for all county roads.

Effectiveness

Varies, clearzone enhancements from 3.3' to 16.7': **22%** reduction of all crash severities and types. From 16.7' to 30': **44%** reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Ditch/ Embankment/ Side Slope Improvements

Cost

$350,000 or more per mile.

Purpose

Improved embankments or ditch slopes increase the likelihood a vehicle that departed the roadway can safely recover.

Considerations

Low-cost, low effectiveness. Should be a priority strategy for all county roads.

Effectiveness

14% Reduction of fatal and injury crashes, rollover/overturn crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Divided Roadway (buffers or median)

Cost

$60,000-$1 million per mile.

Purpose

Adds space between head-on traffic, sometimes with barriers such concrete, high-tension cable, or delineators.

Considerations

Should be considered for higher volume segments with head on crashes or illegal passing violations.

Effectiveness

43% Reduction of fatal crashes, and **30%** Reduction of injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Enhanced Edgeline (6” or 8”)

Cost

Less than $10,000 per mile.

Purpose

Increases visibility of edgeline/ road.

Considerations

Low-cost, low effectiveness. Should be a priority strategy for all county roads. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

18% Reduction of all crash severities and types.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Rural Segment Strategies

Non-Recoverable Inslope Protection (guardrail)

Cost

$200,000-$350,000 per mile.

Purpose

Guardrail or barrier protecting drivers from steep slopes in which they would not be able to regain control of their vehicle until the bottom (if vehicle departs the roadway).

Considerations

Determine need through clearzone evaluation and design speed. Review the NDDOT Design Manual for recommendations on guardrail. Clearzone guidance can be found here, and guardrail runout length here.

Effectiveness

35% Reduction of fatal and injury crashes.

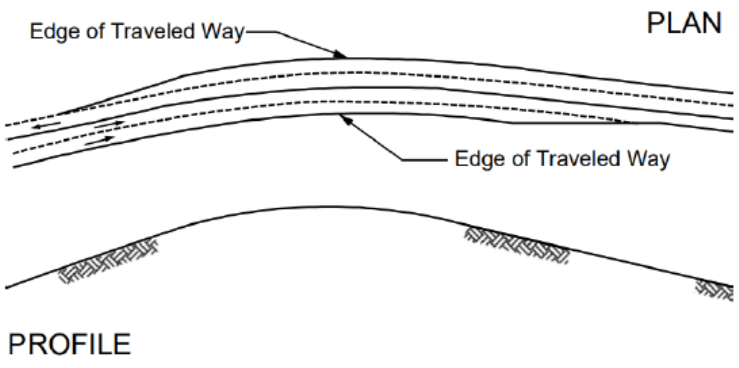
SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Segment Strategies

Passing Lanes



Climbing Lanes Overlapping on Crest

Cost

$350,000 or more per mile.

Purpose

Short segments on two lane roads where an extra lane gives traffic time to pass slower-moving traffic without going into oncoming traffic lane. Generally, lanes are installed on the uphill side of a vertical curve or on flat segments with alternating passing lanes for a 2+1 configuration.

Considerations

Should be considered for higher volume arterial segments with head on crashes, illegal or dangerous passing conditions, and/or high freight traffic.

Effectiveness

32% Reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Plowable Centerline Reflective Markers

Cost

Less than $10,000 per mile.

Purpose

Increase visibility of centerline and road in low-light conditions.

Considerations

Low-cost, moderate effectiveness. Should be considered for higher volume segments with nighttime and/or dark lighting condition crashes. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

33% Reduction of all crash severities, nighttime crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Rural Segment Strategies

Safety Edge

Cost

$45,000 per mile.

Purpose

Sloped transition at the edge of pavement to reduce a sudden, vertical drop off. Increases likelihood of vehicle recovery, if roadway departure involved.

Considerations

Low-cost, moderate effectiveness. Should be priority strategy for paved county roads.

Effectiveness

24% Reduction of all crash severities, run off road crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Segment Strategies

Separated Bike Trail/ Path

Cost

$200,000-$350,000 per mile.

Purpose

Separate facility for pedestrians and bicyclists.

Considerations

Should be used to make known bike/ped connections between existing bike/ped facilities.

Effectiveness

65-89% Reduction of all bicycle and pedestrian-involved crashes.*

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Shoulder Paving (2’, 4’, or 6’)

Cost

$60,000-$350,000 or more per mile.

Purpose

Paved shoulders improve drivers' ability to recover when crossing the edgeline.

Considerations

Should be priority strategy for paved county roads, with wider shoulders for higher traffic volume segments.

Effectiveness

17%-31% Reduction of fatal and injury crashes, 2-lane arterial roads.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Shoulder/ Edgeline Rumble

Purpose

Series of short, milled sections along the shoulder/edgeline to audibly alert drivers when they cross. Sinusoidal rumble strips may be used to decrease noise pollution.

Effectiveness

32% Reduction of severe crashes, single vehicle run off road crashes on 2-lane roads.

Cost

Less than $10,000 per mile.

Considerations

Low-cost, moderate effectiveness. Should be a priority strategy for all county roads. May also be considered a “tried” motorcycle-specific strategy.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Snow Fencing

Cost

$675,000 per mile.

Purpose

Fencing, typically within ROW or on leased private property in areas prone to blowing snow. Fence is designed to decrease blowing snow.

Considerations

Should be considered for high volume east-west segments with known blowing snow challenges and/or high freight traffic.

Effectiveness

Up to **62%** reduction of all crash severities and types.*

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Dynamic Speed Limit Signs

Cost

$15,000-$50,000 per location.

Purpose

Speed limit signs with dynamic display that shows drivers' real-time speed as they travel past the sign.

Considerations

Should be considered for segments at speed transition zones where the speed transitions from high-speed to low-speed, typically in urban or residential areas. May also be considered a "tried" motorcycle-specific strategy.

Effectiveness

5% Reduction of all crash severities and types.

SSRDH Tier

2. Reduce Vehicle Speeds

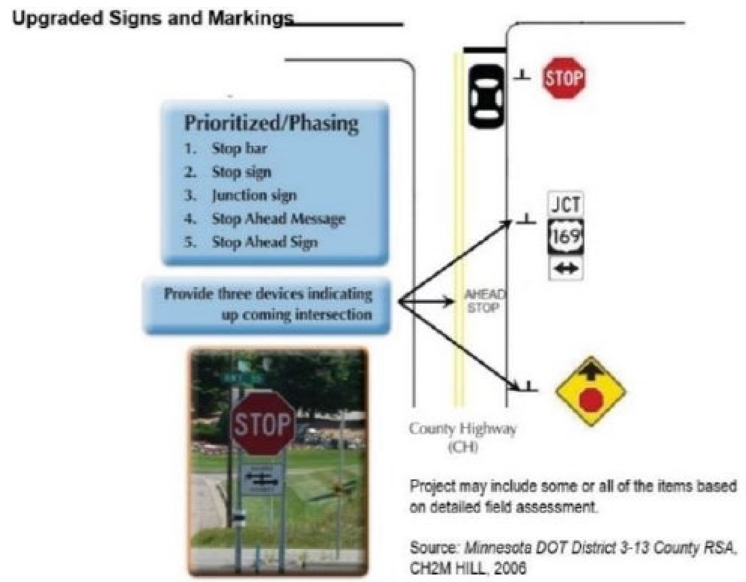
4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Segment Strategies

Upgrade Signs/ Oversized Regulatory Signs



Cost

Less than $10,000 per mile.

Purpose

Ensure standard signs with proper reflectivity. Oversized regulatory signs are larger than standard MUTCD requirements, due to various conditions such as speed or volume.

Considerations

Low-cost, low effectiveness. Should be a priority strategy for all county roads. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

5% Reduction of all crash severities and types.*

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Chevrons	Low	Moderate				X
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
Delineators	Low	Moderate				X
Dynamic Curve Signing	Low/Mod.	High				X
Enhanced Edgeline (6” or 8”)	Low	Low				X
High-Friction Surface Treatment	Mod./High	High	X	X		
Lighting	Low/Mod.	High				X
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Retroreflective Strips on Signposts	Low	*Low/Mod.				X
Shoulder Paving (2’, 4’, or 6’)	Mod./High	Low	X			
TT to Single T	Mod./High	Varies	X			

BACK To Rural Location Typology

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
High-Friction Surface Treatment	Mod./High	High	X	X		
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Shoulder Paving (2', 4', or 6')	Mod./High	Low	X			
TT to Single T	Mod./High	Varies	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Curve Strategies

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Clear Zone Maintenance/ Enhancements	Low/High	Mod./High	X			
High-Friction Surface Treatment	Mod./High	High	X	X		
Non-Recoverable Inslope Protection	Mod./High	Moderate	X			
Shoulder Paving (2', 4', or 6')	Mod./High	Low	X			

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Curve Strategies

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
High-Friction Surface Treatment	Mod./High	High	X	X		

***All Listed, Appropriate for Low Traffic Volumes**

BACK To Rural Curve Strategies

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness

***No Strategies Identified in Tier 3 – Conflicts in Time**

BACK To Rural Curve Strategies

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Chevrons	Low	Moderate				X
Delineators	Low	Moderate				X
Dynamic Curve Signing	Low/Mod.	High				X
Enhanced Edgeline (6” or 8”)	Low	Low				X
Lighting	Low/Mod.	High				X
Retroreflective Strips on Signposts	Low	*Low/Mod.				X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Curve Strategies

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Chevrons	Low	Moderate				X
Delineators	Low	Moderate				X
Enhanced Edgeline (6” or 8”)	Low	Low				X
Retroreflective Strips on Signposts	Low	*Low/Mod.				X

Additional Filter: Sort for Low Traffic Volumes

Low Traffic Volumes

BACK To Rural Curve Strategies

Rural Curve Strategies

Chevrons

Cost

Less than $5,000 per curve.

Purpose

Signs used along curves to alert drivers of the curve in the road.

Considerations

Low-cost, moderate effectiveness. Should be a priority strategy for all county curves. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

25% Reduction of all crash severities, nighttime non-intersection crashes.*

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Rural Curve Strategies

Clear Zone Maintenance/ Enhancements

Cost

$10,000-$350,000 per mile.

Purpose

Properly maintained clear zone allows for safe sight distance for drivers and increases the likelihood of vehicle recovery, if roadway departure is involved.

Considerations

Low-cost, high effectiveness. Should be a priority strategy for all curves.

Effectiveness

Varies, clearzone enhancements from 3.3' to 16.7': **22%** reduction of all crash severities and types. From 16.7' to 30': **44%** reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Curve Strategies

Delineators

Cost

Less than $5,000 per curve.

Purpose

Small signs used along curves to direct vehicles and alert drivers of roadside hazards.

Considerations

Low-cost, moderate effectiveness. Prioritize at high traffic curves with history of nighttime and/or dark lighting condition crashes. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

28% Reduction of all crash severities, non-intersection crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Rural Curve Strategies

Dynamic Curve Signing

Cost

$20,000-$40,000 per curve.

Purpose

Adaptive, uses sequential, blinking chevron signs to inform drivers of the upcoming curve in the road.

Considerations

Prioritize at high traffic curves with history of nighttime and/or dark lighting condition crashes. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

44% Reduction of all crash severities and types.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

Enhanced Edgeline (6” or 8”)

Cost

Less than $10,000 per mile.

Purpose

Increases visibility of edgeline/ road.

Considerations

Low-cost, low effectiveness. Should be a priority strategy for all county roads. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

18% Reduction of all crash severities and types.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

High-Friction Surface Treatment

Cost

$80,000 or more per curve.

Purpose

Pavement treatment that helps drivers maintain friction and therefor, better control of their vehicle (I.e. shorter stopping distance).

Considerations

May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

62% Reduction of all crash severities and types, and

86% Reduction of all wet road crashes.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Rural Curve Strategies

Lighting

Cost

$20,000-$40,000 per curve.

Purpose

Improve curve visibility during dark conditions.

Considerations

Low-cost, high effectiveness. Prioritize at high traffic curves with history of nighttime and/or dark lighting condition crashes. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

73% Reduction of fatal crashes, nighttime crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

Non-Recoverable Inslope Protection (guardrail)

Cost

$60,000-$350,000 per mile.

Purpose

Guardrail or barrier protecting drivers from steep slopes in which they would not be able to regain control of their vehicle until the bottom (if vehicle departs the roadway).

Considerations

Determine need through clearzone evaluation and design speed. Review the NDDOT Design Manual for recommendations on guardrail. Clearzone guidance can be found here, and guardrail runout length here.

Effectiveness

35% Reduction of fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Rural Curve Strategies

Retroreflective Strips on Signposts

Cost

Less than $5,000 per curve.

Purpose

Increase visibility of signs, especially in dark conditions.

Considerations

Low-cost, moderate effectiveness. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

18% Reduction of fatal and injury crashes, and*

27% Reduction of all nighttime crashes.*

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

Shoulder Paving (2’, 4’, or 6’)

Cost

$40,000-$80,000 per curve.

Purpose

Paved shoulders improve drivers' ability to recover when crossing the edgeline.

Considerations

Should be priority strategy for paved county roads, with wider shoulders for higher traffic volume segments.

Effectiveness

6% Reduction of injury crashes.

SSRDH Tier

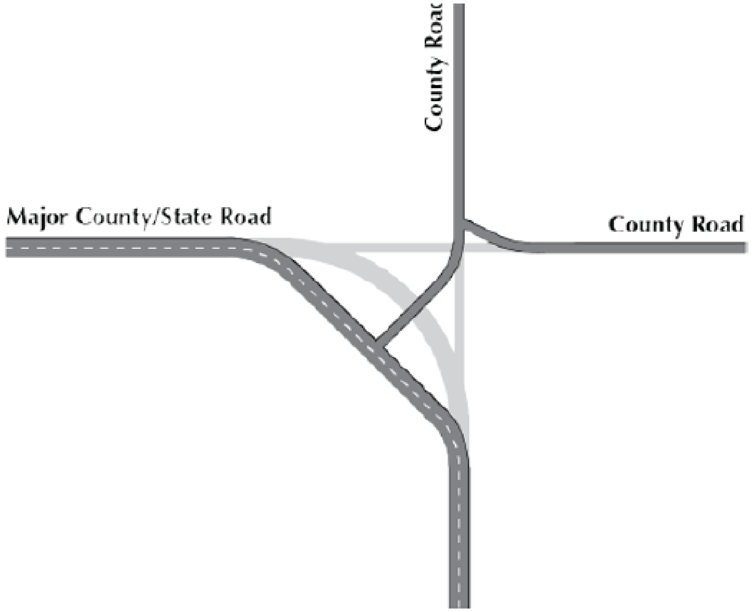
1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Rural Curve Strategies

TT to Single T



Cost

$80,000 or more per intersection.

Purpose

Reconstructing two T-intersections into a single T-intersection to decrease the number of conflict points.

Considerations

Should be considered for higher traffic volume curves with a TT configuration.

Effectiveness

***varies**

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan
Metropolitan Planning Organization

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Signalized or Unsignalized RCUT	High	Moderate	X		X	
Roundabout	High	High	X	X		
Mini Roundabout	Mod./High	High	X	X		
Lane Constrictor Intersection	Low	Moderate		X		
Lighting	Low/Mod.	Moderate				X
Dedicated Left-Turn/ Right-Turn Lanes	Mod./High	Mod./High	X			
Flashing Yellow Arrow	Mod./High	Moderate			X	
Remove Sightline Obstructions	Low	*Low/Mod.				X
Reflective Signal Head Backplate	Low	Low				X
Confirmation Lights	Low	High				X
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	
Appropriately Timed Yellow Change Intervals	Low	Moderate			X	

BACK To Urban Location Typology

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Signalized or Unsignalized RCUT	High	Moderate	X		X	
Roundabout	High	High	X	X		
Mini Roundabout	Mod./High	High	X	X		
Dedicated Left-Turn/ Right-Turn Lanes	Mod./High	Mod./High	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Mini Roundabout	Mod./High	High	X	X		
Dedicated Left-Turn/ Right-Turn Lanes	Mod./High	Mod./High	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | High Classification | ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Signalized or Unsignalized RCUT	High	Moderate	X		X	
Roundabout	High	High	X	X		
Dedicated Left-Turn/ Right-Turn Lanes	Mod./High	Mod./High	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Mini Roundabout	Mod./High	High	X	X		

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Roundabout	High	High	X	X		
Mini Roundabout	Mod./High	High	X	X		
Lane Constrictor Intersection	Low	Moderate		X		
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Mini Roundabout	Mod./High	High	X	X		
Lane Constrictor Intersection	Low	Moderate		X		

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Roundabout	High	High	X	X		
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Bismarck-Mandan
Metropolitan Planning Organization

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Mini Roundabout	Mod./High	High	X	X		
Lane Constrictor Intersection	Low	Moderate		X		
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Signalized or Unsignalized RCUT	High	Moderate	X		X	
Flashing Yellow Arrow	Mod./High	Moderate			X	
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	
Appropriately Timed Yellow Change Intervals	Low	Moderate			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Flashing Yellow Arrow	Mod./High	Moderate			X	
Appropriately Timed Yellow Change Intervals	Low	Moderate			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Signalized or Unsignalized RCUT	High	Moderate	X		X	
Flashing Yellow Arrow	Mod./High	Moderate			X	
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	
Appropriately Timed Yellow Change Intervals	Low	Moderate			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | **High Classification** | ROW Constraint

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Flashing Yellow Arrow	Mod./High	Moderate			X	
Corridor Signal Timing to Reduce High-Speed Flow	Low	Low		X	X	
Appropriately Timed Yellow Change Intervals	Low	Moderate			X	

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Intersection Strategies

Bismarck-Mandan
Metropolitan Planning Organization

Urban Intersection Strategies

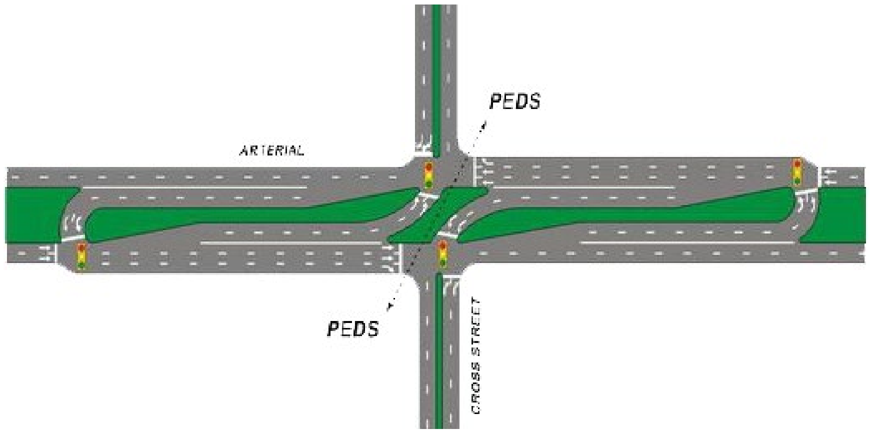
Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Lighting	Low/Mod.	Moderate				X
Remove Sightline Obstructions	Low	*Low/Mod.				X
Reflective Signal Head Backplate	Low	Low				X
Confirmation Lights	Low	High				X

***All Listed, Appropriate for Any Functional Classification & Right-of-Way Constraint**

BACK To Urban Intersection Strategies

Urban Intersection Strategies

Signalized RCUT



Cost

$1.5 million-$2.25 million per intersection.

Purpose

RCUT decrease the amount of conflict points caused by traditional left turns. Signalized RCUTs add signals at each turn location.

Considerations

Should be considered for higher traffic volume arterial intersections with significant angle and/or rear end crash history.

Effectiveness

22% Reduction of fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Roundabout

Cost

$2.5 million-$3 million per intersection (for single-lane roundabout).

Purpose

Circular intersection where traffic flow is slowed and severe intersection conflict points are reduced.

Considerations

Should be considered for higher traffic volume arterial roads with significant angle and/or rear end crash history. Should be considered a traffic calming strategy.

Effectiveness

51% Reduction of fatal and injury (KABC) crashes, and

69% Reduction of all fatal and injury (KAB) crashes.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Mini Roundabout

Cost

$100,000-$400,000 or more per intersection.

Purpose

Circular intersection where traffic flow is slowed and severe intersection conflict points are reduced. Much smaller than traditional roundabouts, taking up less right-of-way.

Considerations

Should be considered for intersections with angle and/or rear end crash history or other operational challenges. Should be considered a traffic calming strategy.

Effectiveness

61% Reduction of fatal and injury crashes.

SSRDH Tier

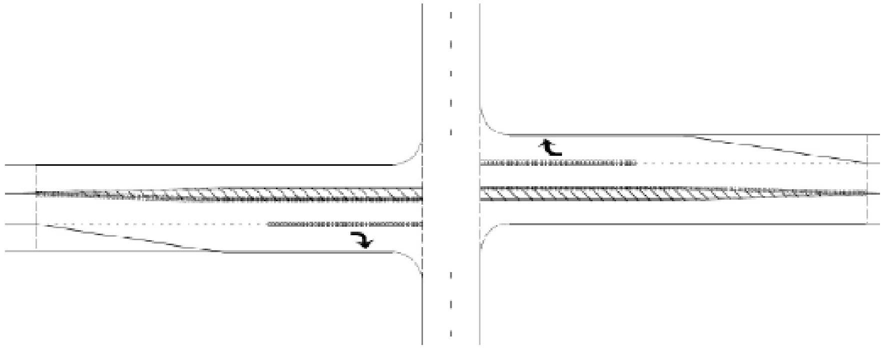
1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Lane Constrictor Intersection



Purpose

Reduced lane widths and median buffer space on the major, uncontrolled legs of a stop-controlled intersection.

Effectiveness

32% Reduction of all crash severities and types.

Cost

$10,000-$30,000 per intersection.

Considerations

Should be considered for intersections with significant angle and/or rear end crash history. Should be considered a traffic calming strategy.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Urban Intersection Strategies

Lighting

Cost

$30,000-$100,000 per intersection.

Purpose

Used at intersection and approaches to improve visibility during dark conditions.

Considerations

Low-cost, high effectiveness. Prioritize at all urban intersections, as applicable. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

42% Reduction of all nighttime crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Urban Intersection Strategies

Dedicated Left-Turn/ Right-Turn Lanes

Cost

$50,000-$100,000 per intersection.

Purpose

Additional lanes for traffic that is turning. Used to separate through-traffic from turning traffic that might be yielding.

Considerations

Review the NDDOT Traffic Operations Manual for recommendations on turn lanes.

Effectiveness

34% Reduction of all angle crashes, and **44%** Reduction of all crash severities and types.

SSRDH Tier

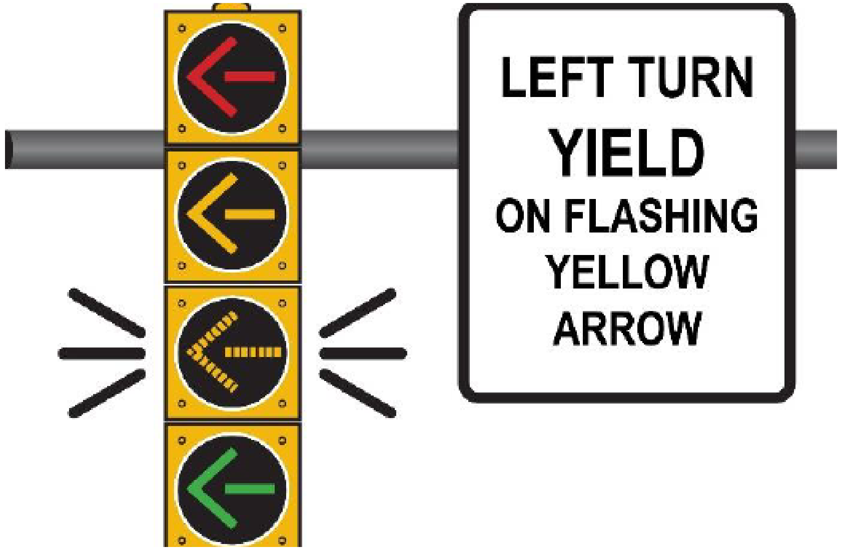
1. Remove Severe Conflicts
2. Reduce Vehicle Speeds
3. Manage Conflicts in Time
4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Flashing Yellow Arrow



Cost

$50,000-$100,000 per intersection.

Purpose

Allows for left turning traffic to turn once they have yielded to oncoming thru-traffic. Safest with zero or positive-offset left turn lanes.

Considerations

The region is already using these; however, should consider use only with negative left-turn offset.

Effectiveness

37% Reduction of all left turn crashes.

SSRDH Tier

3. Manage Conflicts in Time

BACK

Urban Intersection Strategies

Remove Sightline Obstructions/ Maintain Vision Triangles

Purpose

Proper sightlines allow for safe sight distance for drivers and increases visibility and awareness at intersections.

Effectiveness

Up to **40%** reduction of all crash severities and types.*

Cost

Less than $10,000 per intersection.

Considerations

Low-cost, moderate effectiveness. Should be applied within reason, based on land use and street context.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Urban Intersection Strategies

Reflective Signal Head Backplate

Cost

Less than $10,000 per intersection.

Purpose

Reflective signal head back plates are reflective plates on the back of the signal heads to improve visibility of the signals.

Considerations

Low cost, low effectiveness. The region is already using these. May be considered a “tried” motorcycle strategy.

Effectiveness

15% Reduction of all crash severities and types.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Confirmation Lights

Cost

Less than $10,000 per intersection.

Purpose

Blue light on the back or top of a signal which lights up to confirm when the perpendicular or cross traffic has a red light. Allows downstream law enforcement to confirm when someone has run a red light on the intersecting street.

Considerations

Low cost; however, effectiveness may only be as good as enforcement of running red lights after implementation. The region is already using these.

Effectiveness

71% Reduction of all disobeyed signal crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Intersection Strategies

Corridor Signal Timing to Reduce High-Speed Flow

Cost

Less than $10,000 per intersection.

Purpose

Sequential signal timing to reduce high-speed traffic from going through multiple signals in a row while still maintaining a good flow of traffic.

Considerations

Low cost, low effectiveness. Prioritize on arterial roads with history of speed-related crashes.

Effectiveness

11% Reduction of injury crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan
Metropolitan Planning Organization

Urban Intersection Strategies

Appropriately Timed Yellow Change Intervals

Cost

Less than $10,000 per intersection.

Purpose

Length of time between the green and red, when the signal is yellow. Proper timing is important to maximize signal timing and make sure the intersection is clear before the next leg gets a green light.

Considerations

Low cost, moderate effectiveness. The region is already doing this; however, consider re-evaluating at intersections with significant history of angle and/or rear end crashes.

Effectiveness

Up to **36%** reduction of rear end crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	High	High	X			
Bike Lane/ Boulevard	Mod./High	*High	X			X
Buffered Bike Lane	Mod./High	*High	X			
Divided Roadway	Mod./High	Moderate	X			
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Variable Advisory Speed Limits	Low	Moderate		X		
Cycle Track	High	High	X			
Dynamic Speed Feedback Sign	Low	Low		X		X
Appropriate Speeds	Low/Mod.	Low		X		
Horizontal Chicanes	Low/Mod.	*Moderate		X		
Pedestrian Barriers to Prevent Mid-Block Crossing	High	High	X			
Plowable Centerline Reflective Markers	Low	Moderate				X
Reduce Lane Width	Low/Mod.	Low/High		X		
Sidewalks, Trail/ Path	Mod./High	Moderate	X			
Urbanization	High	Varies		X		
Wrong-Way Driving Detection	Low/Mod.	*Low/High				X
Speed Cameras	Low/Mod.	High		X		

BACK To Urban Location Typology

Bismarck-Mandan
Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	High	High	X			
Bike Lane/ Boulevard	Mod./High	*High	X			X
Buffered Bike Lane	Mod./High	*High	X			
Divided Roadway	Mod./High	Moderate	X			
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Cycle Track	High	High	X			
Pedestrian Barriers to Prevent Mid-Block Crossing	High	High	X			
Sidewalks, Trail/ Path	Mod./High	Moderate	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Bike Lane/ Boulevard	Mod./High	*High	X			X
Buffered Bike Lane	Mod./High	*High	X			
Road Diet	Low/High	High	X	X		
Sidewalks, Trail/ Path	Mod./High	Moderate	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	High	High	X			
Buffered Bike Lane	Mod./High	*High	X			
Divided Roadway	Mod./High	Moderate	X			
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Cycle Track	High	High	X			
Pedestrian Barriers to Prevent Mid-Block Crossing	High	High	X			
Sidewalks, Trail/ Path	Mod./High	Moderate	X			

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan
Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Access Management	High	High	X			
Bike Lane/ Boulevard	Mod./High	*High	X			X
Buffered Bike Lane	Mod./High	*High	X			
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Pedestrian Barriers to Prevent Mid-Block Crossing	High	High	X			
Sidewalks, Trail/ Path	Mod./High	Moderate	X			

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Variable Advisory Speed Limits	Low	Moderate		X		
Dynamic Speed Feedback Sign	Low	Low		X		X
Appropriate Speeds	Low/Mod.	Low		X		
Horizontal Chicanes	Low/Mod.	*Moderate		X		
Reduce Lane Width	Low/Mod.	Low/High		X		
Urbanization	High	Varies		X		
Speed Cameras	Mod./High	High		X		

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Road Diet	Low/High	High	X	X		
Dynamic Speed Feedback Sign	Low	Low		X		X
Appropriate Speeds	Low/Mod.	Low		X		
Horizontal Chicanes	Low/Mod.	*Moderate		X		
Reduce Lane Width	Low/Mod.	Low/High		X		
Urbanization	High	Varies		X		

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Variable Advisory Speed Limits	Low	Moderate		X		
Dynamic Speed Feedback Sign	Low	Low		X		X
Appropriate Speeds	Low/Mod.	Low		X		
Reduce Lane Width	Low/Mod.	Low/High		X		
Urbanization	High	Varies		X		
Speed Cameras	Mod./High	High		X		

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
Median Barriers	High	Moderate	X	X		
Road Diet	Low/High	High	X	X		
Variable Advisory Speed Limits	Low	Moderate		X		
Dynamic Speed Feedback Sign	Low	Low		X		X
Appropriate Speeds	Low/Mod.	Low		X		
Horizontal Chicanes	Low/Mod.	*Moderate		X		
Reduce Lane Width	Low/Mod.	Low/High		X		
Urbanization	High	Varies		X		
Speed Cameras	Mod./High	High		X		

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Bike Lane/ Boulevard	Mod./High	*High	X			X
Dynamic Speed Feedback Sign	Low	Low		X		X
Plowable Centerline Reflective Markers	Low	Moderate				X
Wrong-Way Driving Detection	Low/Mod.	*Low/High				X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Bike Lane/ Boulevard	Mod./High	*High	X			X
Plowable Centerline Reflective Markers	Low	Moderate				X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Dynamic Speed Feedback Sign	Low	Low		X		X
Plowable Centerline Reflective Markers	Low	Moderate				X
Wrong-Way Driving Detection	Low/Mod.	*Low/High				X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Bike Lane/ Boulevard	Mod./High	*High	X			X
Dynamic Speed Feedback Sign	Low	Low		X		X
Plowable Centerline Reflective Markers	Low	Moderate				X
Wrong-Way Driving Detection	Low/Mod.	*Low/High				X

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Segment Strategies

Urban Segment Strategies

Access Management

Cost

$400,000 or more per mile.

Purpose

Reduce conflict points, typically through consolidation.

Considerations

Review and evaluate guidelines frequently, time access management with routine reconstruction or rehabilitation projects, as applicable.

Effectiveness

44% Reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds
3. Manage Conflicts in Time
4. Increase Driver Attentiveness and Awareness

BACK

Urban Segment Strategies

Bike Lane/ Boulevard

Cost

$125,000-$400,000 per mile.

Purpose

Dedicated lane for bicyclists on the roadway or in boulevard case, shared space for bicycles and vehicles.

Considerations

Consider on local and collector streets to make strategic bike connections. May be considered a traffic calming strategy.

Effectiveness

57% Reduction of all crash severities and types.* (MnDOT Big Book of Ideas PDF pg. 19)

SSRDH Tier

1. Remove Severe Conflicts

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Buffered Bike Lane

Purpose

Bike lane separated by buffer zone or barrier such as striping/flexible delineators or curb.

Effectiveness

57% Reduction of all crash severities and types.* (MnDOT Big Book of Ideas PDF pg. 19)

SSRDH Tier

1. Remove Severe Conflicts

Cost

$400,000 per mile.

Considerations

Consider on arterial streets to make strategic bike connections. May be considered a traffic calming strategy.

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Divided Roadway

Cost

$250,000-$700,000 per mile.

Purpose

Add separation between opposing traffic, striped or physical median.

Considerations

Should be considered for segments with access management and/or operational challenges. May be considered a traffic calming strategy if lanes are narrowed to accommodate separation.

Effectiveness

39% Reduction of fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Median Barriers

Cost

$725,000 per mile.

Purpose

Physical median separating opposing traffic.

Considerations

Should be considered for higher volume segments with access management and/or operational challenges. May be considered a traffic calming strategy if lanes are narrowed to accommodate separation.

Effectiveness

39% Reduction of fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Urban Segment Strategies

Road Diet (3- & 5-lane conversions)

Cost

$15,000-$125,000 or more per mile.

Purpose

Roadway reconfiguration to change the total number of lanes. Typically, an existing 4-lane undivided roadway is changed to a 3-lane roadway.

Considerations

Consider only if traffic and traffic projections can be accommodated (capacity). May be considered a traffic calming strategy if lanes are narrowed to accommodate separation or if street is visually narrowed.

Effectiveness

47% Reduction of all crash severities and types.

SSRDH Tier

1. Remove Severe Conflicts
2. Reduce Vehicle Speeds

BACK

Urban Segment Strategies

Variable Advisory Speed Limits

Cost

Less than $15,000 per mile.

Purpose

Advisory speed limit signs with a dynamic display which may be adjusted, typically to reflect inclement weather conditions.

Considerations

Consider on high traffic arterial roadways for inclement weather scenarios including but not limited to snowy and/or icy conditions.

Effectiveness

29% Reduction of all crash severities and types.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Urban Segment Strategies

Cycle Track

Purpose

Two-way, separated bike lane on one side of the road.

Considerations

Consider on arterial streets to make strategic bike connections. May be considered a traffic calming strategy.

Effectiveness

57% Reduction of all crash severities and types.* (MnDOT Big Book of Ideas PDF pg. 19)

SSRDH Tier

1. Remove Severe Conflicts

Cost

$400,000 or more per mile.

BACK

Urban Segment Strategies

Dynamic Speed Feedback Sign

Cost

$15,000-$50,000 per location.

Purpose

Speed limit signs with dynamic display that shows drivers' real-time speed as they drive past.

Considerations

Should be considered for segments at speed transition zones where the speed transitions from high-speed to low-speed. May also be considered a "tried" motorcycle-specific strategy.

Effectiveness

7% Reduction of all crash severities and types.

SSRDH Tier

2. Reduce Vehicle Speeds

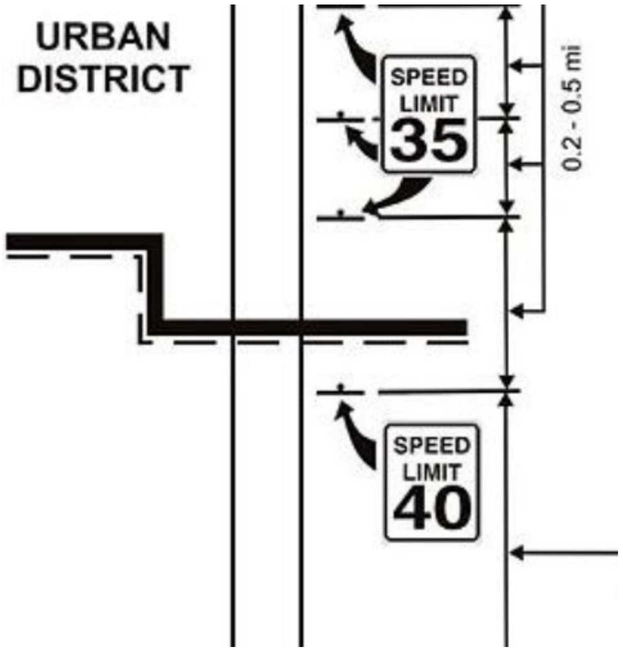
4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Appropriate Speeds



Cost

$15,000-$125,000 per mile.

Purpose

Setting speed limit/road design speeds based not only on road characteristics but based on all factors such as bicycle and pedestrian traffic, driveway density, and context.

Considerations

Should be considered as context-sensitive strategy and includes more than just changing speed limit signs but change in street design to help influence appropriate speeds for the context.

Effectiveness

17% Reduction of fatal crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Urban Segment Strategies

Horizontal Chicanes

Cost

$15,000-$50,000 per location.

Purpose

Creates an S-shaped path by alternating horizontal deflections through staggered curb extensions or other means to force vehicles into lateral shifts.

Considerations

Should only be considered on local and collector roadways. Should be considered a traffic calming strategy.

Effectiveness

29% Reduction of all crash severities and types.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Pedestrian Barriers to Prevent Mid-Block Crossing

Cost

$50,000-$125,000 per mile.

Purpose

Commonly a fence used to restrict pedestrians' ability to cross at unmarked mid-blocks.

Considerations

Should only be considered on divided, high-speed roadways with known pedestrian and bicyclist traffic, especially in locations generating walking and biking traffic that may be located mid-block.

Effectiveness

48% Reduction of fatal and injury crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Urban Segment Strategies

Plowable Centerline Reflective Markers

Cost

Less than $10,000 per mile.

Purpose

Increase visibility of centerline and road in low-light conditions.

Considerations

Low-cost, moderate effectiveness. Should be considered for higher volume segments with nighttime and/or dark lighting condition crashes. May also be considered a “tried” motorcycle-specific strategy.

Effectiveness

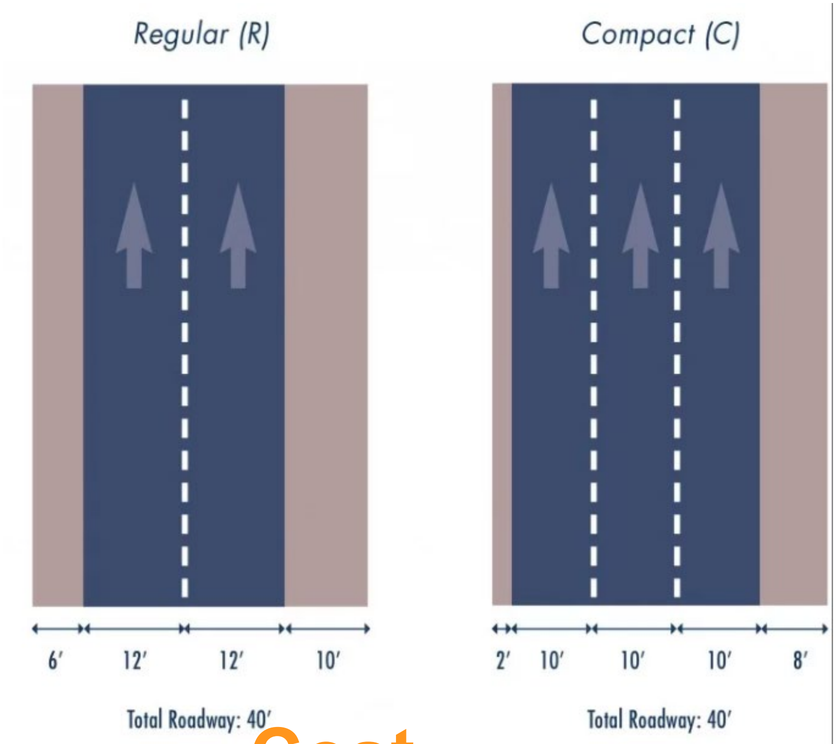
24% Reduction of all crash severities, nighttime crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

Urban Segment Strategies

Reduce Lane Width



Cost

$15,000-$125,000 per mile.

Purpose

Decreases driving or travel-lane width on roadways, typically through physical striping or standard design.

Considerations

Moderate cost, potentially high effectiveness. Should urban roads with known speeding and speed-related crashes. Should also be considered a traffic calming strategy.

Effectiveness

Up to **43%** reduction of fatal and injury crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Sidewalks, Trail/ Path

Cost

$125,000-$400,000 per mile.

Purpose

Paved paths for pedestrians, typically parallel to roadways and sometimes built wide enough to accommodate walkers and bikers.

Considerations

Consider along high-speed arterial streets and other streets to make strategic bike connections.

Effectiveness

40% Reduction of all bicycle and pedestrian-involved crashes.

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Segment Strategies

Urbanization

Cost

$400,000 or more per mile.

Purpose

Typically used to make road feel urban, with close peripheral building lines/frontage.

Considerations

Consider on streets with urban development densities and land uses, and multimodal traffic. May be considered a traffic calming strategy depending on visual narrowing of the street through urbanization.

Effectiveness

*Varies, undetermined.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Urban Segment Strategies

Wrong-Way Driving Detection

Cost

$15,000-$125,000 per location.

Purpose

Adaptive system that alerts drivers when they travel down a one-way roadway in the wrong direction. Includes signage and flashing beacon.

Considerations

Consider on divided arterial streets and freeways which may have confusing configurations that may result or have resulted in wrong-way crashes.

Effectiveness

Up to **60%** reduction of wrong-way crashes.*

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Urban Segment Strategies

Speed Safety Cameras

Cost

$50,000-$125,000 per location.

Purpose

Speed safety cameras detect speeding and capture photo or video evidence of vehicles that pass a set speed threshold.

Considerations

If and when North Dakota legislation changes, consider on arterial streets and freeways with known speeding or speed-related crashes. May be considered a traffic calming strategy for arterials.

Effectiveness

54% reduction of all crash severities and types.

SSRDH Tier

2. Reduce Vehicle Speeds

BACK

Urban Bike/Ped Crossing Strategies

BACK To Urban Location Typology

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
No Right Turn on Red	Low/Mod.	Low		X	X	
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
Grade Separated Pedestrian Underpass/ Overpass	High	High	X			
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
In-Street Pedestrian Crossing Sign	Low	Varies				X
Lighting at Crosswalk	Low	Moderate				X
Median Refuge Island	Low	Low/High		X		X
Midblock Crosswalks	Low	Varies				X
Parking Restrictions on the Crosswalk Approach	Low	Moderate				X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Warning Sign with Edgemounted LED	Low/Mod.	Varies				X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X
Lead Pedestrian Interval	Low	High	X		X	
Pedestrian Countdown Timers	Low	Low			X	

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Grade Separated Pedestrian Underpass/ Overpass	High	High	X			
Lead Pedestrian Interval	Low	High	X		X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Lead Pedestrian Interval	Low	High	X		X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Grade Separated Pedestrian Underpass/ Overpass	High	High	X			
Lead Pedestrian Interval	Low	High	X		X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Bismarck-Mandan
Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Lead Pedestrian Interval	Low	High	X		X	

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
No Right Turn on Red	Low/Mod.	Low		X	X	
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
Median Refuge Island	Low	Low/High		X		X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
No Right Turn on Red	Low/Mod.	Low		X	X	
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
Median Refuge Island	Low	Low/High		X		X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
No Right Turn on Red	Low/Mod.	Low		X	X	
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
Median Refuge Island	Low	Low/High		X		X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	**2. Vehicle Speeds**	3. Conflicts in Time	4. Attentiveness/Awareness
No Right Turn on Red	Low/Mod.	Low		X	X	
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
Median Refuge Island	Low	Low/High		X		X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Advance ‘Yield Here’ Sign & Yield Line	Low	Moderate			X	X
No Right Turn on Red	Low/Mod.	Low		X	X	
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X
Lead Pedestrian Interval	Low	High	X		X	
Pedestrian Countdown Timers	Low	Low			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | **High Classification** | **ROW Constraint**

BACK To Urban Bike/Ped Crossing Strategies

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
No Right Turn on Red	Low/Mod.	Low		X	X	
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Lead Pedestrian Interval	Low	High	X		X	
Pedestrian Countdown Timers	Low	Low			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | High Classification | ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	**3. Conflicts in Time**	4. Attentiveness/Awareness
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
No Right Turn on Red	Low/Mod.	Low		X	X	
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X
Lead Pedestrian Interval	Low	High	X		X	
Pedestrian Countdown Timers	Low	Low			X	

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
No Right Turn on Red	Low/Mod.	Low		X	X	
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
Pedestal-Mounted Flashing Signal Beacons	Low	High			X	X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X
Lead Pedestrian Interval	Low	High	X		X	
Pedestrian Countdown Timers	Low	Low			X	

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

Low Classification

High Classification

ROW Constraint

BACK To Urban Bike/Ped Crossing Strategies

Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
In-Street Pedestrian Crossing Sign	Low	Varies				X
Lighting at Crosswalk	Low	Moderate				X
Median Refuge Island	Low	Low/High		X		X
Midblock Crosswalks	Low	Varies				X
Parking Restrictions on the Crosswalk Approach	Low	Moderate				X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Warning Sign with Edgemounted LED	Low/Mod.	Varies				X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification

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ROW Constraint

Urban Bike/Ped Crossing Strategies

BACK To Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
In-Street Pedestrian Crossing Sign	Low	Varies				X
Lighting at Crosswalk	Low	Moderate				X
Median Refuge Island	Low	Low/High		X		X
Midblock Crosswalks	Low	Varies				X
Parking Restrictions on the Crosswalk Approach	Low	Moderate				X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Warning Sign with Edgemounted LED	Low	*High				X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | **High Classification** | **ROW Constraint**

Urban Bike/Ped Crossing Strategies

BACK To Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	**4. Attentiveness/Awareness**
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
Lighting at Crosswalk	Low	Moderate				X
Median Refuge Island	Low	Low/High		X		X
Parking Restrictions on the Crosswalk Approach	Low	Moderate				X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Warning Sign with Edgemounted LED	Low/Mod.	Varies				X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X

Additional Filters: Sort for Functional Classification & Right-of-Way Constraint

Low Classification | **High Classification** | ROW Constraint

Urban Bike/Ped Crossing Strategies

BACK To Urban Bike/Ped Crossing Strategies

Description	Estimated Cost	Estimated CRF	Safe System Hierarchy Tiers (Click Tier to Sort)			
			1. Severe Conflicts	2. Vehicle Speeds	3. Conflicts in Time	4. Attentiveness/Awareness
Advance 'Yield Here' Sign & Yield Line	Low	Moderate			X	X
Colored Pavement/ Brick Pavers	Low/Mod.	Varies		X		X
Curb Extensions/ Bump Outs	Moderate	Varies		X		X
High-Intensity Activated CrossWalk (HAWK)/ Pedestrian Hybrid Beacon (PHB)	Mod./High	High			X	X
In-Street Pedestrian Crossing Sign	Low	Varies				X
Lighting at Crosswalk	Low	Moderate				X
Median Refuge Island	Low	Low/High		X		X
Midblock Crosswalks	Low	Varies				X
Parking Restrictions on the Crosswalk Approach	Low	Moderate				X
Pedestal-Mounted Flashing Signal Beacons	Low	Varies			X	X
Raised Crosswalks	Low	High		X		X
Rectangular Rapid Flashing Beacons (RRFBs)	Low	High		X	X	X
Warning Sign with Edgemounted LED	Low/Mod.	Varies				X
Overhead Pedestrian Warning Sign	Low/Mod.	Varies			X	X

Additional Filters: Sort for Functional Classification & **Right-of-Way Constraint**

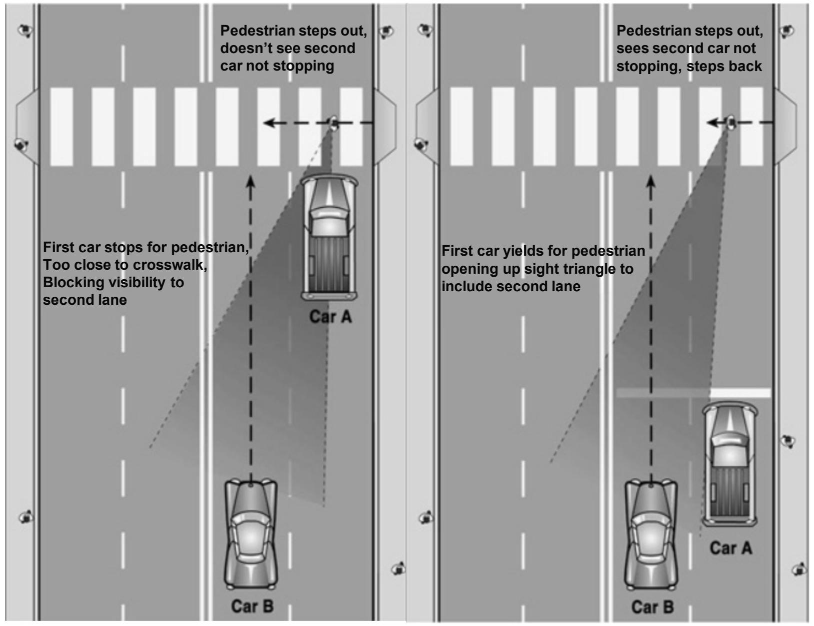
Low Classification

High Classification

ROW Constraint

Urban Bike/Ped Crossing Strategies

Advance 'Yield Here' Sign & Yield Line



Cost

Less than $15,000 per location.

Purpose

Typical of mid-block, increases visibility and delineation of where vehicles should yield to safely allow pedestrians to cross.

Considerations

Consider at any marked crosswalk, prioritizing those crossing multilane, arterial roadways or intersections.

Effectiveness

25% Reduction of all severities, pedestrian-involved crashes.

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

No Right Turn on Red

Cost

$15,000-$125,000 per intersection.

Purpose

Signage, may include adaptive signal (programmed for high bike/ped traffic) at signalized intersections prohibiting right turns on red. Typically to reduce right turn crashes involving bicyclists and pedestrians.

Considerations

Consider at signalized arterial roadways with significant pedestrian or bicyclist crashes with right-turning vehicles.

Effectiveness

9% Reduction of all crash types and severities.*

SSRDH Tier

2. Reduce Vehicle Speeds
3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Colored Pavement/ Brick Pavers

Cost

$15,000-$125,000 per intersection.

Purpose

Typical of intersections or streets with high pedestrian and bicyclist traffic. Increase visibility of specific locations with high pedestrian and bicyclist traffic. If stamped pavement or pavers are used may include visual and physical/audible cues for drivers.

Considerations

Consider at intersections or crossings with significant pedestrian and/or bicyclist traffic. May be considered a traffic calming strategy.

Effectiveness

* Varies, undetermined.

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Curb Extensions/ Bump Outs

Cost

$15,000-$125,000 per intersection.

Purpose

Typically installed at crossing locations at intersections and mid-block. Curb extensions decrease the crossing distance for pedestrians by physically extending the curb (bump out) into the road, and increase pedestrian visibility prior to crossing.

Considerations

Consider at all crosswalk locations including intersections and midblock, as applicable. Prioritize known pedestrian and bicyclist traffic areas and/or crossing locations with known speeding or speed-related crashes. Should be considered a traffic calming strategy. Installation should be contingent on achieving proper drainage to avoid water ponding at intersections.

Effectiveness

* Varies, undetermined.

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Grade Separated Pedestrian Underpass/ Overpass

Cost

$400,000 or more per location.

Purpose

Physical separation of bicycle and pedestrian crossing; typically bringing a sidewalk or path over or under the street/other barrier.

Considerations

Consider for crossings of high-speed (35mph min.), high-volume arterial roadways with significant pedestrian or bicyclist traffic.

Effectiveness

Up to **100%** reduction of bicycle and pedestrian-involved crashes.*

SSRDH Tier

1. Remove Severe Conflicts

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

High-Intensity Activated CrossWalk (HAWK) Beacon/ Pedestrian Hybrid Beacon (PHB)

Cost

$125,000-$400,000 per location.

Purpose

Typical of mid-block treatment or other non-signalized crossings to increase drivers' awareness of pedestrian crossing through flashing lights when the system is activated by push-button or permissive detection.

Considerations

Consider for midblock crossings of high-speed (35mph min.), arterial roadways with significant pedestrian or bicyclist traffic.

Effectiveness

43% Reduction of all crash severities, pedestrian-involved crashes.

SSRDH Tier

3. Manage Conflicts in Time
4. Increase Driver Attentiveness and Awareness

BACK

Urban Bike/Ped Crossing Strategies

In-Street Pedestrian Crossing Sign

Cost

Less than $15,000 per location.

Purpose

Sign that can be placed within a crosswalk or on a centerline to increase drivers' visibility of crosswalk.

Considerations

Consider for crossings of low-speed (30 mph max.) roadways with significant pedestrian or bicyclist traffic. May be considered a traffic calming strategy.

Effectiveness

*Varies, undetermined.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

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Urban Bike/Ped Crossing Strategies

Lighting at Crosswalk

Cost

$15,000-$50,000 per location.

Purpose

Lighting to increase visibility of crossing locations during dark conditions.

Considerations

Consider for crossings of with significant pedestrian or bicyclist traffic or with history of nighttime and/or dark light condition crashes.

Effectiveness

23% Reduction of fatal and injury crashes.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Median Refuge Island

Cost

$15,000-$50,000 per location.

Purpose

Typical of mid-block or other uncontrolled intersections provides median space in the roadway where pedestrians have protection from vehicular traffic.

Considerations

Consider for midblock crossings of multi-lane and/or divided roadways with significant pedestrian or bicyclist traffic. May be considered a traffic calming strategy. Should also be paired with other Tier 4 and/or Tier 3 strategies.

Effectiveness

9% Reduction of fatal and injury crashes, and

86% Reduction of fatal bicycle and pedestrian-involved crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

BACK

Urban Bike/Ped Crossing Strategies

Midblock Crosswalks

Cost

Varies

Purpose

Non-intersection pedestrian crossing to facilitate desired crossing locations not well served by the existing multimodal transportation network. Typically includes high-visibility strategies with various crash reduction factors as identified/ described elsewhere.

Considerations

Consider for midblock crossings of roadways with significant pedestrian or bicyclist traffic. Must be paired with other Tier 4 and/or Tier 3 strategies.

Effectiveness

* Varies, depending upon additional visibility enhancements and other countermeasures implemented.

SSRDH Tier

4. Increase Driver Attentiveness and Awareness

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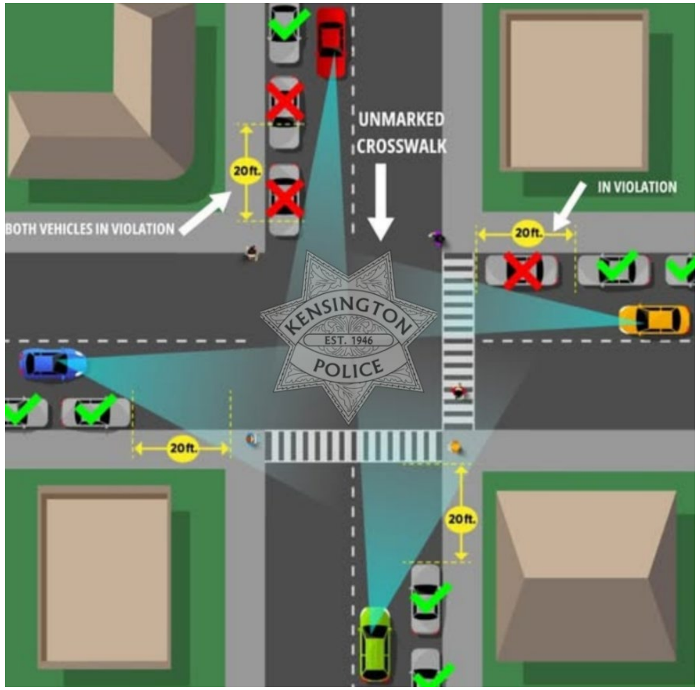
Urban Bike/Ped Crossing Strategies

Parking Restrictions on the Crosswalk Approach



Cost

Less than $15,000 per location/intersection.

Purpose

Prohibits on-street parking near mid-block crosswalk or intersection to increase drivers' visibility and awareness of crossing location.

Considerations

Consider for crossings of roadways with significant on-street parking utilization.

Effectiveness

20% Reduction of fatal and injury crashes.

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

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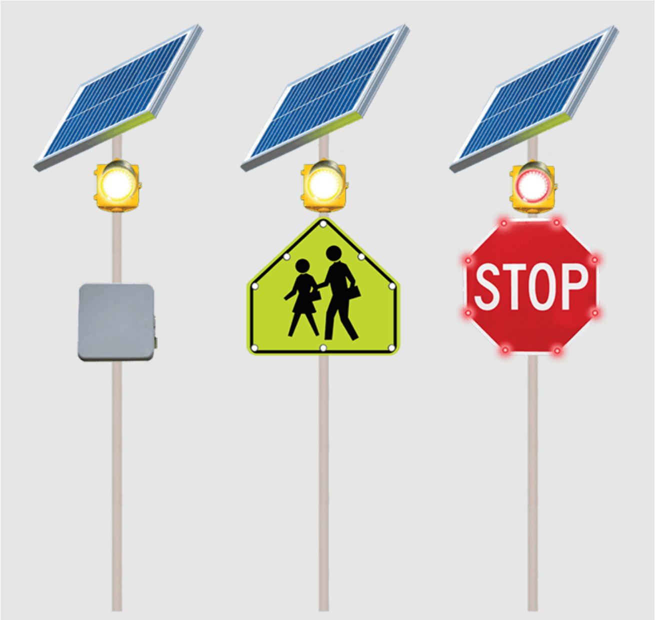
Urban Bike/Ped Crossing Strategies

Pedestal-Mounted Flashing Signal Beacons



Cost

$15,000-$50,000 per intersection.

Purpose

Typically round, yellow or red lights which may be automatically timed to operate during parts of day with high-pedestrian traffic, push-activated, or permissive detection.

Considerations

Consider along roadways with significant pedestrian or bicyclist traffic. Most effective if dynamic, or operational during specific times of day (i.e. school zones, downtown, public/institutional areas, etc.).

Effectiveness

*Varies

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

Urban Bike/Ped Crossing Strategies

Raised Crosswalk

Cost

$15,000-$50,000 per location.

Purpose

Crosswalk is constructed with a speed table or vertical elevation change which increases drivers' visibility of the crosswalk and causes significant speed reduction for vehicle to navigate comfortably.

Considerations

Should only be considered on local and collector roadways. Should be considered a traffic calming strategy. Prioritize at midblock crossing locations; however, raised intersections may also be implemented strategically.

Effectiveness

45% Reduction of fatal and injury crashes, pedestrian-involved crashes.

SSRDH Tier

2. Reduce Vehicle Speeds

4. Increase Driver Attentiveness and Awareness

BACK

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Urban Bike/Ped Crossing Strategies

Rectangular Rapid Flashing Beacons (RRFBs)

Cost

$70,000-$100,000 per location.

Purpose

Typical of non-signalized crossings to increase driver awareness of pedestrian crossings through flashing lights when the system is activated by push button or permissive detection.

Considerations

Should only be considered on low- and moderate-speed (35 mph max.) roadways at midblock crossings. Must be push-activated or adaptive to be most effective.

Effectiveness

69% Reduction of all pedestrian-involved crashes.

SSRDH Tier

2. Reduce Vehicle Speeds
3. Manage Conflicts in Time
4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Warning Sign with Edgemounted LED

Cost

$15,000-$100,000 per location.

Purpose

Sign with flashing LED to increase drivers' visibility and awareness of pedestrian crossing locations or high pedestrian traffic locations. Typically, LED flashing is timed to operate during applicable times of day and/or days of week (i.e. school zone signs, etc.).

Considerations

Should only be considered on low- and moderate-speed (35 mph max.) roadways at midblock crossings. Should be push-activated or adaptive to be most effective or may be used like pedestal-mounted flashing signal beacons.

Effectiveness

*Varies

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

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Urban Bike/Ped Crossing Strategies

Overhead Pedestrian Warning Sign

Purpose

Sign over the roadway warning drivers of upcoming pedestrian crossing location or high pedestrian traffic location.

Effectiveness

*Varies, undetermined.

Cost

$50,000-$125,000 per location.

Considerations

Should be considered for crossings of collector and arterial roadways. Should be paired with other Tier 4 and/or Tier 3 strategies.

SSRDH Tier

3. Manage Conflicts in Time

4. Increase Driver Attentiveness and Awareness

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Lead Pedestrian Interval

Cost

Less than $15,000 per location (dependent on signal capabilities).

Purpose

Traffic signal timing allows pedestrians to start crossing before green lights are given to general traffic.

Considerations

Should be considered for signalized intersections of collector and arterial roadways with significant pedestrian and bicyclist traffic. Pushbuttons for pedestrians waiting to cross improve the effectiveness. May be paired with no right turn on red at high pedestrian traffic intersections.

Effectiveness

59% Reduction of all pedestrian-involved crashes.

SSRDH Tier

1. Remove Severe Conflicts
3. Manage Conflicts in Time

BACK

Bismarck-Mandan Metropolitan Planning Organization

Urban Bike/Ped Crossing Strategies

Pedestrian Countdown Timers

Cost

$15,000-$50,000 per location (dependent on signal capabilities).

Purpose

Traffic signal visually and audibly alerts pedestrians to how much longer they have to cross the street/in the crosswalk.

Considerations

The region is already doing this; however, consider re-evaluating at signalized intersections with significant history of angle and/or rear end crashes. Consider also that timer may indicate to drivers when the light is about to change.

Effectiveness

9% Reduction of all pedestrian-involved crashes.

SSRDH Tier

3. Manage Conflicts in Time

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