

Comprehensive MIC Area Safety Action Plan – Phase 1 Project Summary

A data-driven systemic analysis of all arterial and collector roadways
within the MIC’s jurisdiction

The Duluth-Superior Metropolitan Interstate Council (MIC) is developing a [Comprehensive Safety Action Plan](#) in accordance with the US Department of Transportation’s [National Roadway Safety Strategy](#) and [Safe Systems Approach](#), and the Federal Highway Administration’s [Systemic Approach to Safety](#).

Its goal is to develop a holistic strategy to significantly reduce and eliminate roadway fatalities and serious injuries within the Duluth-Superior planning area, by identifying high-risk areas and implementing targeted interventions to improve road safety for all users.

In addition, it will support the Minnesota DOT (MnDOT) and the Wisconsin DOT (WisDOT) highway safety goals as part of their [2020-2024 \(MnDOT\)](#) and [2023-2027 \(WisDOT\)](#) Strategic Highway Safety Plans (SHSP) in service of their long term Towards Zero Deaths programs.

The US DOT has identified eight key components of a successful [Safety Action Plan](#):

1. Leadership Commitment and Goal Setting
2. Planning Structure
3. Safety Analysis
4. Engagement and Collaboration
5. Equity
6. Policy and Process Changes
7. Strategy and Project Selection
8. Progress and Transparency

As the first phase in the development of the MIC’s Safety Action Plan, AECOM, with input from advisory committee members, completed the technical **Safety Analysis (#3)** and **Strategy and Project Selection (#7)** components.

The advisory committee included representatives from all jurisdictions within the MIC study area, including municipalities, state DOTs, and Counties. Monthly meetings were held with this group to discuss study progress and to gather feedback and questions from the committee members. Additionally, two 4-hour workshop meetings were held at critical points throughout the study to gather their input.

The project was conducted by applying the FHWA’s [systemic approach to safety](#), which involves six major steps:

1. Identify focus crash types, facility types, and risk factors
2. Screen and prioritize candidate locations
3. Identify and select countermeasures
4. Prioritize systemic projects
5. Deliver Systemic Projects
6. Evaluate Systemic Safety Results

1. Identify focus crash types, facility types, and risk factors

Specific tasks included collection and consideration of all high severity crash data for all MIC area roadways functionally classified as collectors or arterials. An area-wide crash analysis was completed for high severity crashes, including creating crash trees and crash statistics. (Possible injury and property damage crashes were not included in this study). Crashes were disaggregated by crash type, location, functional classification, roadway geometrics, traffic volume, and other roadway characteristics.

The first 4-hour workshop with the advisory committee was held to determine the final list of risk factors to be included in this study. Crash risk factors were developed for each safety emphasis area based on roadway characteristics that contribute to the high severity crash history, such as AADT, occurrence of high severity crashes, speed limit, roadway geometric features, intersection features, land use, and pedestrian or bicycle facility features.

2. Screen and prioritize candidate locations

Engineering-related Safety Emphasis Areas (SEAs) were identified based on the results of the crash analysis. A safety emphasis area is an area with safety concerns that was identified in the systemic safety analysis. These Safety Emphasis Areas have a historically high occurrence of high severity crashes. The following SEAs were identified as part of this study:

- 1. Two-lane undivided rural roads with an Average Annual Daily Traffic (AADT) Less Than 5,000, with an Emphasis on Lane Departure Crashes**
 - 66% of sideswipe, lane departure, and head-on high severity crashes occurred on two-lane undivided roads; or 53% occurred on Rural two-lane undivided roads with <5,000 AADT.
 - 52% of all fatal crashes occurred on two-lane undivided roads and were either a head-on or run-off the road crash.
- 2. Urban Side Road Stop Control Intersections, with an Emphasis on Angle Crashes**
 - 80% of angle high severity crashes occur at intersections
 - 66% of all angle intersection high severity crashes occur at side road stop-controlled intersections, and 68% of those angle crashes at side road stop-controlled intersections occurred in urban locations.
- 3. Signalized Intersections along Multi-Lane Arterials, with an Emphasis on all Crash Types**
 - 60% of all study area high severity crashes occurred on arterials, but this roadway type only accounts for 35% of roadway miles in the study area.
 - 27% of all study area high severity crashes occurred on multi-lane arterials, but this road type only accounts for 12% of roadway miles in the study area.
 - 50% of KAB crashes on a multi-lane arterial occurred at an intersection, and 69% of those KAB crashes occurred at a signalized intersection.
- 4. Urban Intersections, with an Emphasis on Pedestrian and Bicycle Crashes**
 - 69% of high severity bicycle crashes occur at intersections with no existing bicycle accommodations.
 - 48% of high severity pedestrian crashes occur at intersections where the vehicle fails to yield to a ped in a marked crosswalk.

The identified risk factors were used to assess risk for roadway segments, curves, and intersections and prioritize at-risk crash locations. Priority was assigned to locations that met the most risk factor criteria. The list of risk factors for each safety emphasis area is attached.

3. Identify and select countermeasures

A second half-day advisory committee workshop was held to develop a list of possible safety strategies. These were developed using the follow resources: [FHWA approved safety countermeasures](#), [WisDOT Safety Engineering Strategies](#), [MnDOT's District Safety Plan Updates \(Big Book of Ideas\)](#), and various Crash Modification Factor (CMF) data. Additionally, the expected safety benefit of each safety strategy was determined based on available research.

Decision trees were created for each of the MIC safety emphasis areas to determine appropriate safety strategies. Recommended safety improvements and cost estimates were specifically assigned to the high- risk locations by applying the decision trees.

4. Prioritize systemic projects

Systemic safety strategies are most effective when applied throughout a corridor or at a series of intersections, rather than on an individual spot basis. As projects are developed, corridors can be reviewed in detail for application of the selected safety improvement strategies in a systemic manner.

Additionally, all at-risk intersections from safety emphasis areas 2, 3, and 4 were evaluated based on their combined risk corridor-wide systemic safety projects were developed. The list of corridor-wide intersection projects is shown as an attachment, including the estimated cost. This list of corridor-wide systemic safety projects is prioritized based on cost per weighted risk factor.

5. Deliver Systemic Projects

The final product of this initial phase of the MIC Safety Action Plan is a tool that focuses on the engineering-related safety emphasis areas and identifies safety strategies for locations that otherwise may not qualify for safety improvements. A detailed project-level review of each location would be necessary for selecting final safety countermeasures and costs. Recommendations may be implemented by MIC area jurisdictions in several ways, including:

- Systemic safety improvement projects
- Existing contracts
- Highway Safety Improvement Program (HSIP) projects
- As part of highway improvement projects
- Other upcoming local projects

Next Steps

In 2024, the MIC received a Safe Streets for All (SS4A) planning grant to complete the Comprehensive MIC Area Safety Action Plan. It will incorporate the two technical components completed by AECOM, and during the 2025-2026 planning process will address at least four of the remaining six components highlighted below:

- 1. Leadership Commitment and Goal Setting**
- 2. Planning Structure**
3. Safety Analysis
- 4. Engagement and Collaboration**
- 5. Equity**
- 6. Policy and Process Changes**
7. Strategy and Project Selection
- 8. Progress and Transparency**

The scope of work for a consultant RFP is currently being developed, but will likely include developing an equity-centered analysis and impact assessment of the Phase 1 findings, in collaboration with appropriate community partners; implementing strategies for public and political engagement to promote a shared goal of eliminating roadway fatalities and serious injuries throughout the greater Duluth-Superior area; reviewing existing policies from a Safe Systems perspective; and developing metrics to assess progress over time.

Safe Streets and Roads for All Action Plan Components

This document is not meant to replace the NOFO. Applicants should follow the instructions in the NOFO to correctly apply for a grant. See the SS4A website for more information: <https://www.transportation.gov/SS4A>

Leadership Commitment and Goal Setting



An official public commitment (e.g., resolution, policy, ordinance, etc.) by a high-ranking official and/or governing body (e.g., Mayor, City Council, Tribal Council, MPO Policy Board, etc.) to an eventual goal of zero roadway fatalities and serious injuries. The commitment must include a goal and timeline for eliminating roadway fatalities and serious injuries achieved through one, or both, of the following:

- (1) the target date for achieving zero roadway fatalities and serious injuries, OR
- (2) an ambitious percentage reduction of roadway fatalities and serious injuries by a specific date with an eventual goal of eliminating roadway fatalities and serious injuries.



Planning Structure

A committee, task force, implementation group, or similar body charged with oversight of the Action Plan development, implementation, and monitoring.



Safety Analysis

Analysis of existing conditions and historical trends that provides a baseline level of crashes involving fatalities and serious injuries across a jurisdiction, locality, Tribe, or region. Includes an analysis of locations where there are crashes and the severity of the crashes, as well as contributing factors and crash types by relevant road users (motorists, people walking, transit users, etc.). Analysis of systemic and specific safety needs is also performed, as needed (e.g., high-risk road features, specific safety needs of relevant road users, public health approaches, analysis of the built environment, demographic, and structural issues, etc.). To the extent practical, the analysis should include all roadways within the jurisdiction, without regard for ownership. Based on the analysis performed, a geospatial identification of higher-risk locations is developed (a High-Injury Network or equivalent).

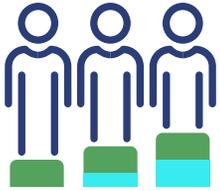


Engagement and Collaboration

Robust engagement with the public and relevant stakeholders, including the private sector and community groups, that allows for both community representation and feedback. Information received from engagement and collaboration is analyzed and incorporated into the Action Plan. Overlapping jurisdictions are included in the process. Plans and processes are coordinated and aligned with other governmental plans and planning processes to the extent practical.



Safe Streets and Roads for All Action Plan Components



Equity Considerations

Plan development using inclusive and representative processes. Underserved communities* are identified through data and other analyses in collaboration with appropriate partners. Analysis includes both population characteristics and initial equity impact assessments of the proposed projects and strategies.



Policy and Process Changes

Assessment of current policies, plans, guidelines, and/or standards (e.g., manuals) to identify opportunities to improve how processes prioritize transportation safety. The Action Plan discusses implementation through the adoption of revised or new policies, guidelines, and/or standards, as appropriate.



Strategy and Project Selections

Identification of a comprehensive set of projects and strategies, shaped by data, the best available evidence and noteworthy practices, as well as stakeholder input and equity considerations, that will address the safety problems described in the Action Plan. These strategies and countermeasures focus on a Safe System Approach, effective interventions, and consider multidisciplinary activities. To the extent practical, data limitations are identified and mitigated.

Once identified, the list of projects and strategies is prioritized in a list that provides time ranges for when the strategies and countermeasures will be deployed (e.g., short-, mid-, and long-term timeframes). The list should include specific projects and strategies, or descriptions of programs of projects and strategies, and explains prioritization criteria used. The list should contain interventions focused on infrastructure, behavioral, and/or operational safety.



Progress and Transparency

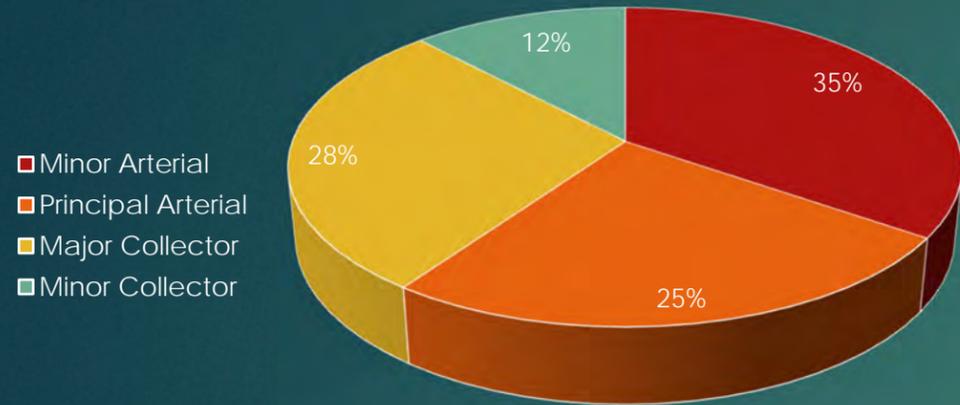
Method to measure progress over time after an Action Plan is developed or updated, including outcome data. Means to ensure ongoing transparency is established with residents and other relevant stakeholders. Must include, at a minimum, annual public and accessible reporting on progress toward reducing roadway fatalities and serious injuries, and public posting of the Action Plan online.

* An underserved community as defined for this NOFO is consistent with the Office of Management and Budget's Interim Guidance for the Justice40 Initiative <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf> and the Historically Disadvantaged Community designation, which includes U.S. Census tracts identified in this table <https://datahub.transportation.gov/stories/s/tsyd-k6ij>; any Tribal land; or any territory or possession of the United States.

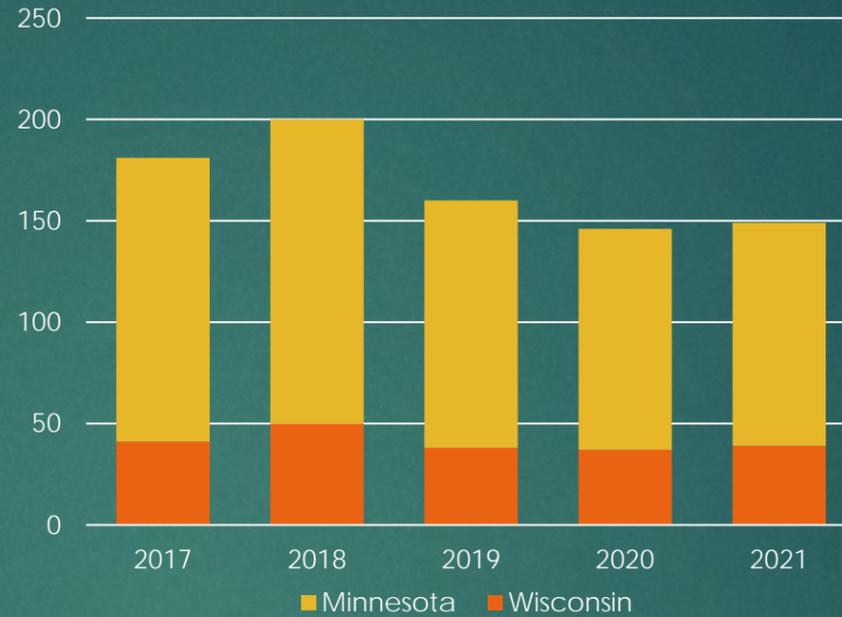


Crash Trends – 836 KAB Crashes

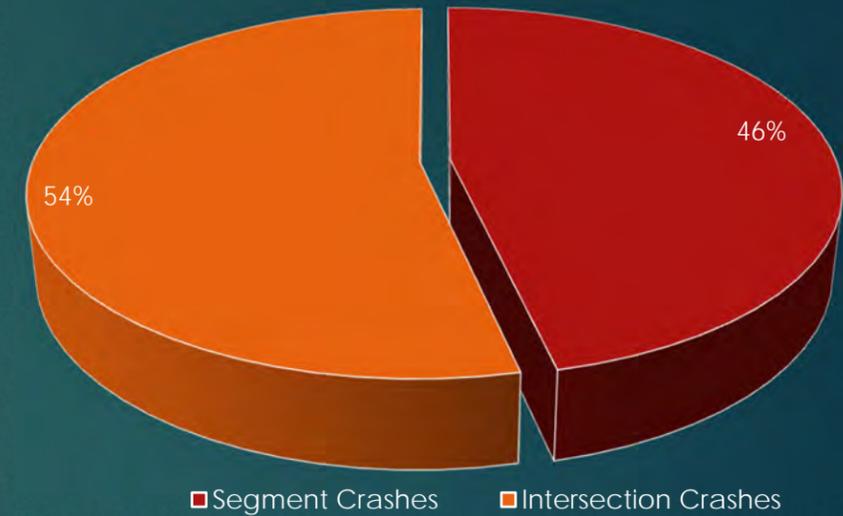
KAB Crashes by Functional Classification



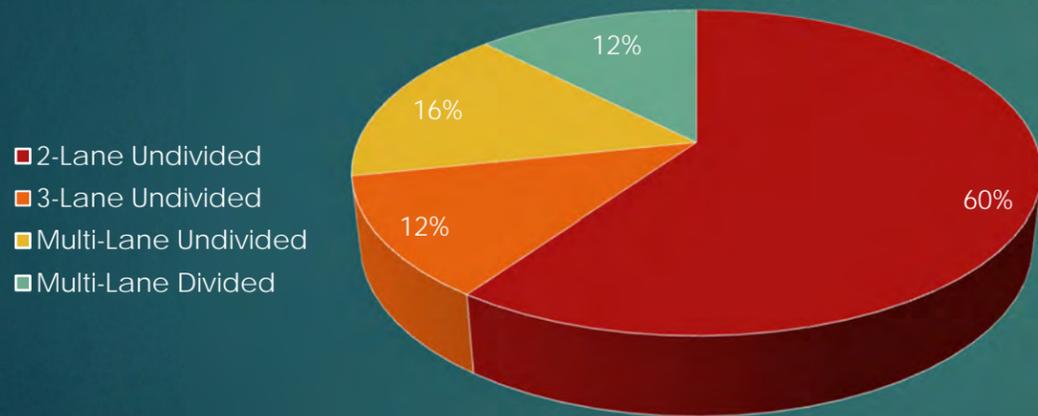
KAB Crashes by Year



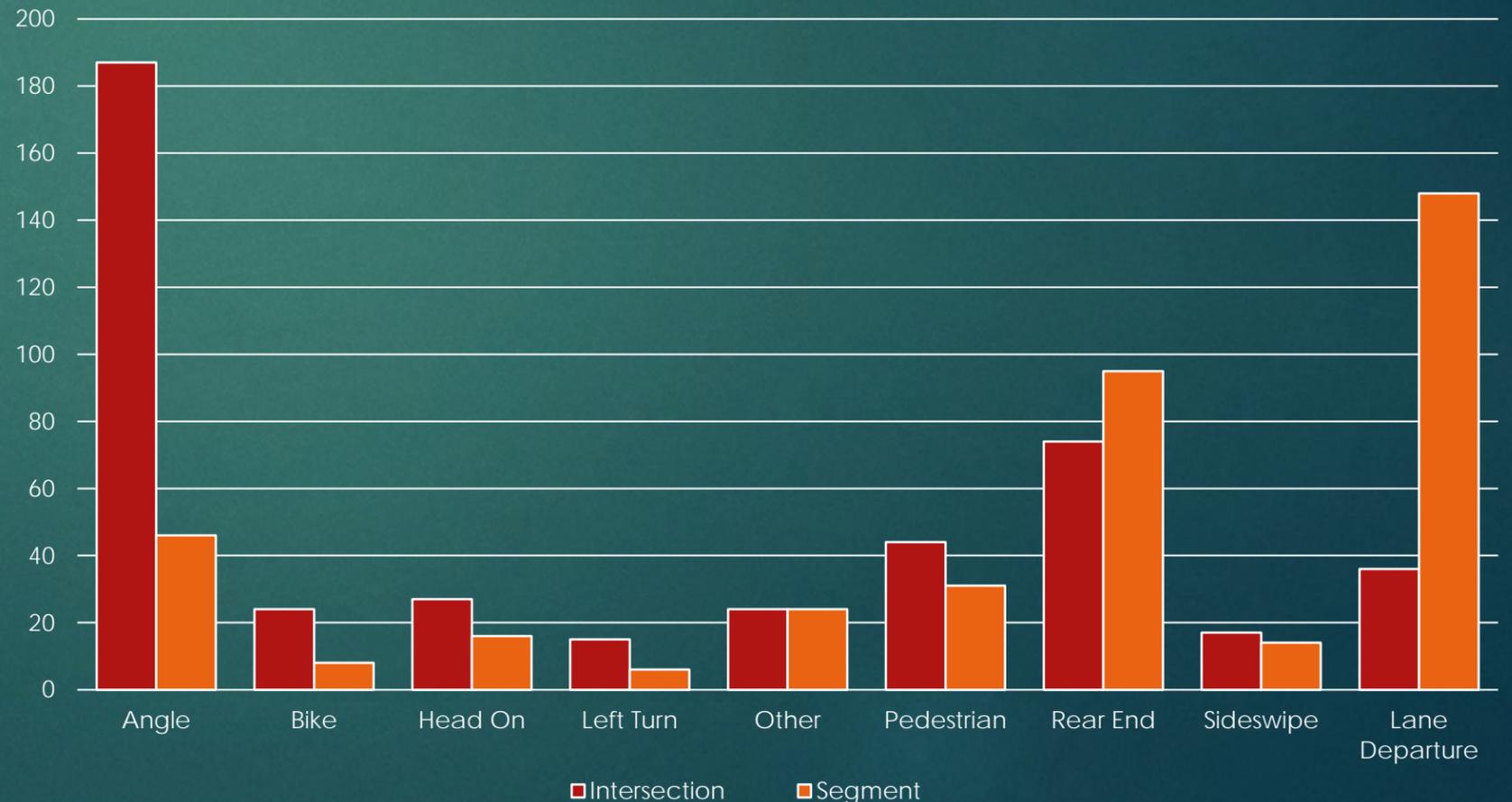
KAB Crashes by Location



KAB Crashes by Roadway Type



KAB Crashes by Crash Type and Location



Crashes by Municipality
Wisconsin

- City of Superior -- 164
- Town of Superior -- 22
- Town of Parkland -- 14
- Town of Lakeside -- 3
- Village of Superior -- 1
- Village of Oliver -- 1

Crashes by Municipality
Minnesota

- City of Duluth -- 429
- City of Hermantown -- 101
- Town of Midway -- 21
- City of Rice Lake -- 16
- Town of Duluth -- 15
- Town of Solway -- 14
- Town of Grand Lake -- 14
- Town of Lakewood -- 8
- Town of Canosia -- 7
- City of Proctor -- 6

5 Year KAB Crash Data (2017-2021)
1,042 Crashes
(770 / 272)

KAB Crashes (2017-2021) on Functional Classification System
836 (631 / 205)

Crash Removed
206 (139 / 67)

Interstate Crashes
96 (83 / 13)

Local Road Crashes
92 (44 / 48)

Deer Crashes
18 (12 / 6)

Area Type
Urban -- 582 (438 / 144)
Rural -- 254 (193 / 61)

Area Type
Principal Arterial -- 211 (137 / 74)
Minor Arterial -- 289 (224 / 65)
Collector -- 336 (270 / 66)

Pedestrian and Bicycle Crashes
107 (80 / 27)

Pavement Conditions
Snow/Ice/Slush 11 (9 / 2)
Wet 19 (12 / 7)
Dry 77 (59 / 18)

Time of Day
Day 79 (57 / 22)
Night 28 (22 / 6)

Area Type
Urban 99 (74 / 25)
Rural 8 (6 / 2)

Intersection Related
68 (46 / 22)

Segmented Related
39 (34 / 5)

Time of Day
Day 596 (456 / 140)
Night 133 (95 / 38)

Vehicle Crashes
729 (551 / 178)

Pavement Conditions
Snow/Ice/Slush 93 (75 / 18)
Wet 89 (66 / 23)
Dry 547 (410 / 137)

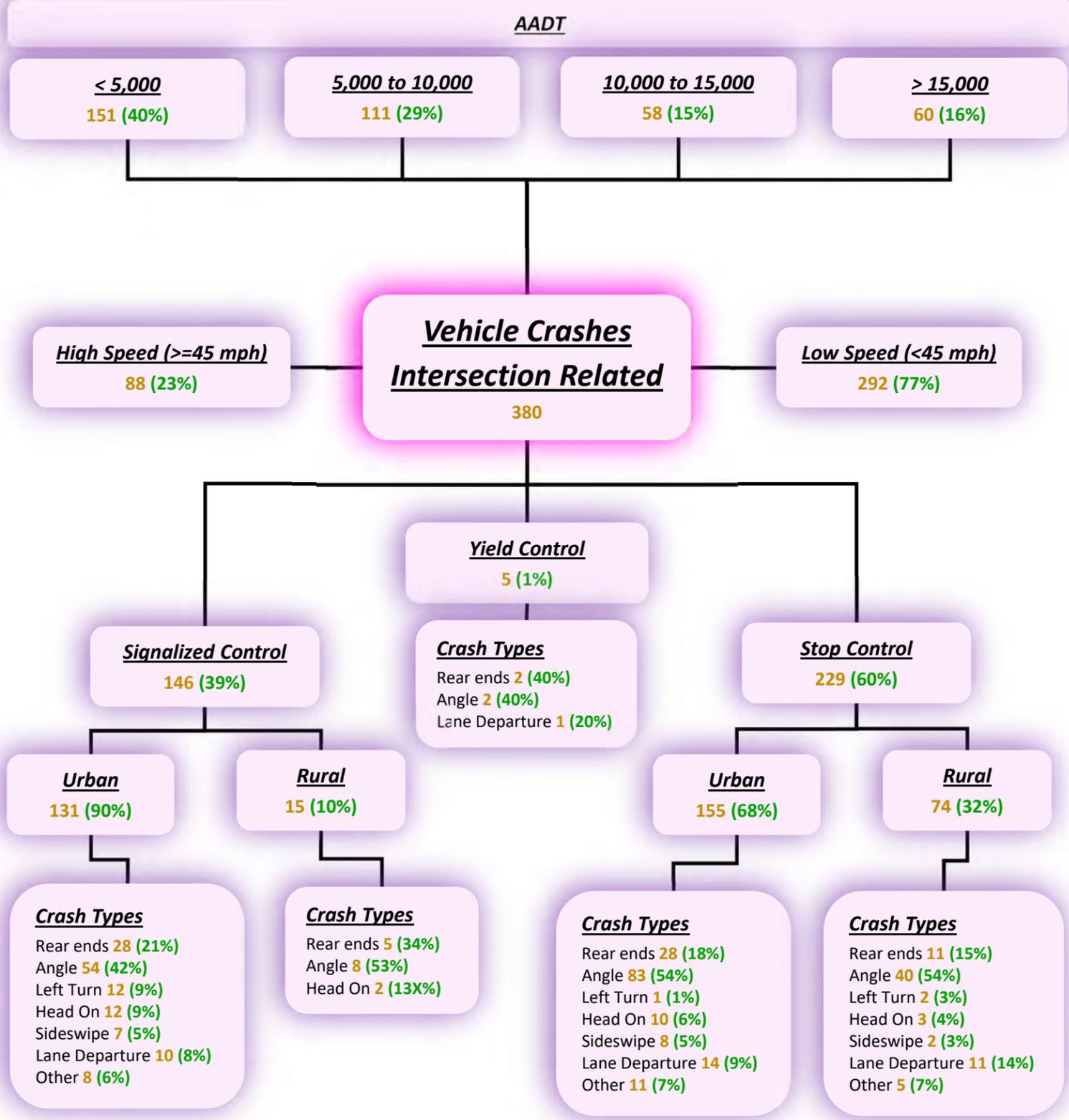
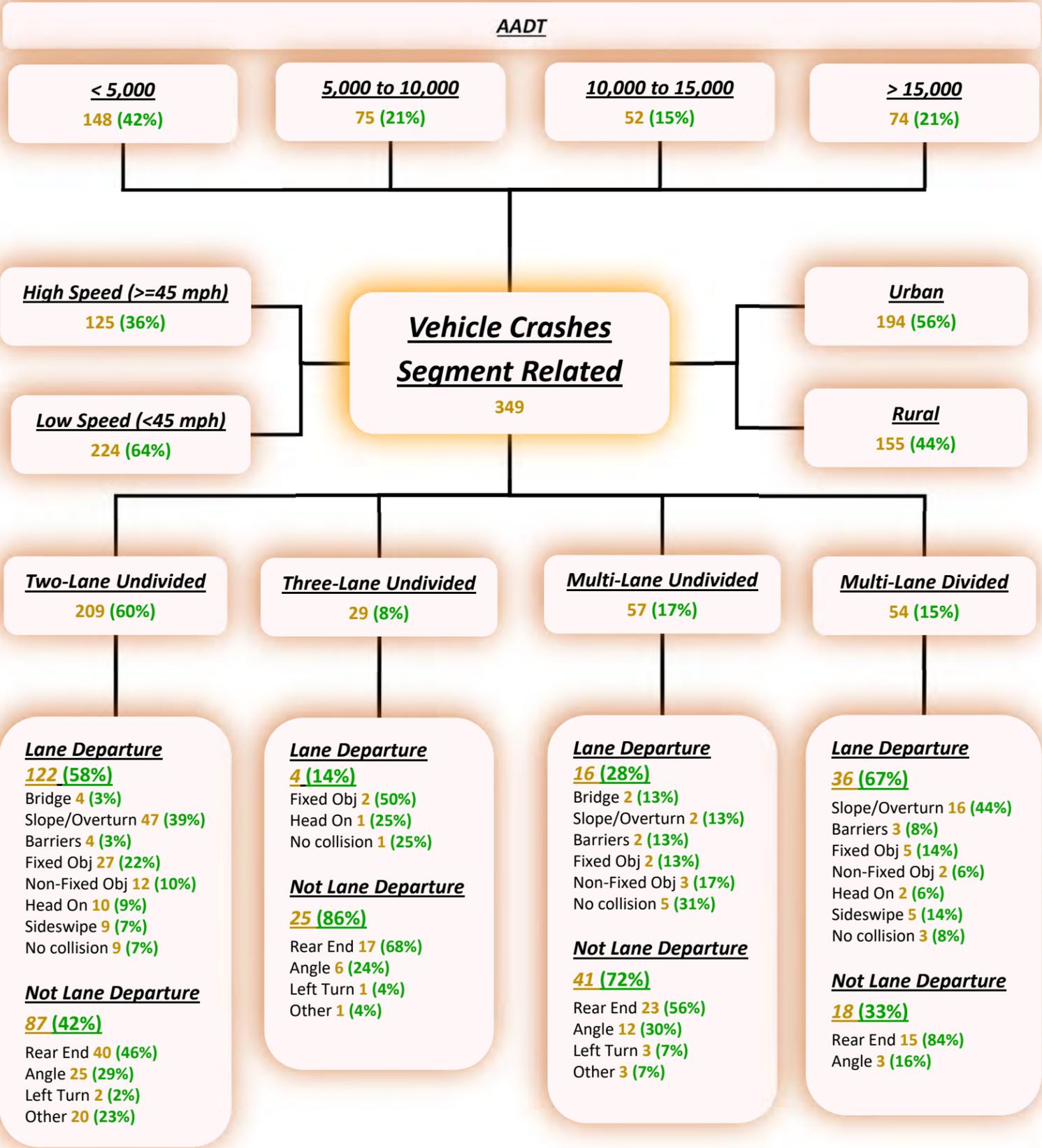
Segment Related
349 (252 / 97)

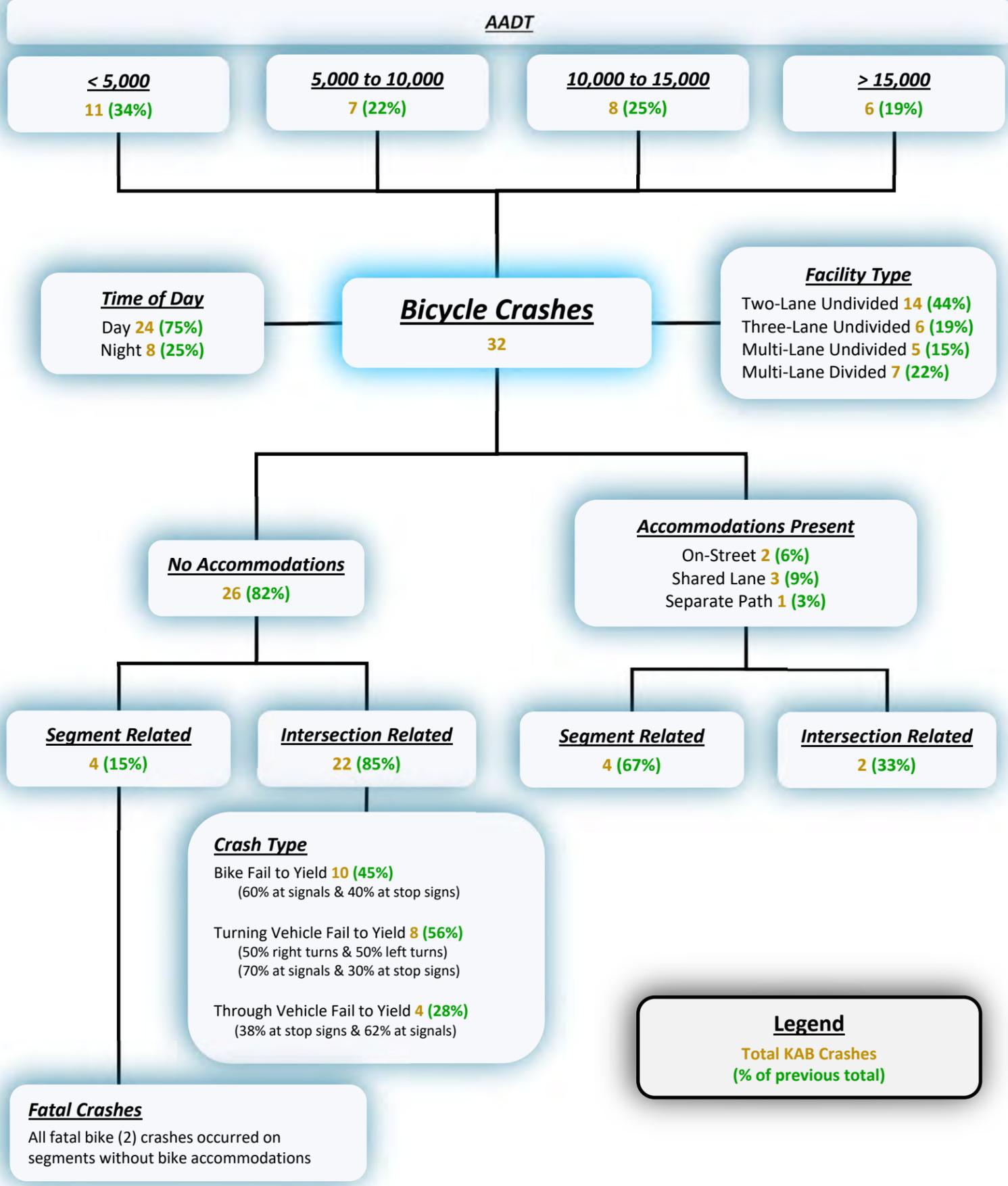
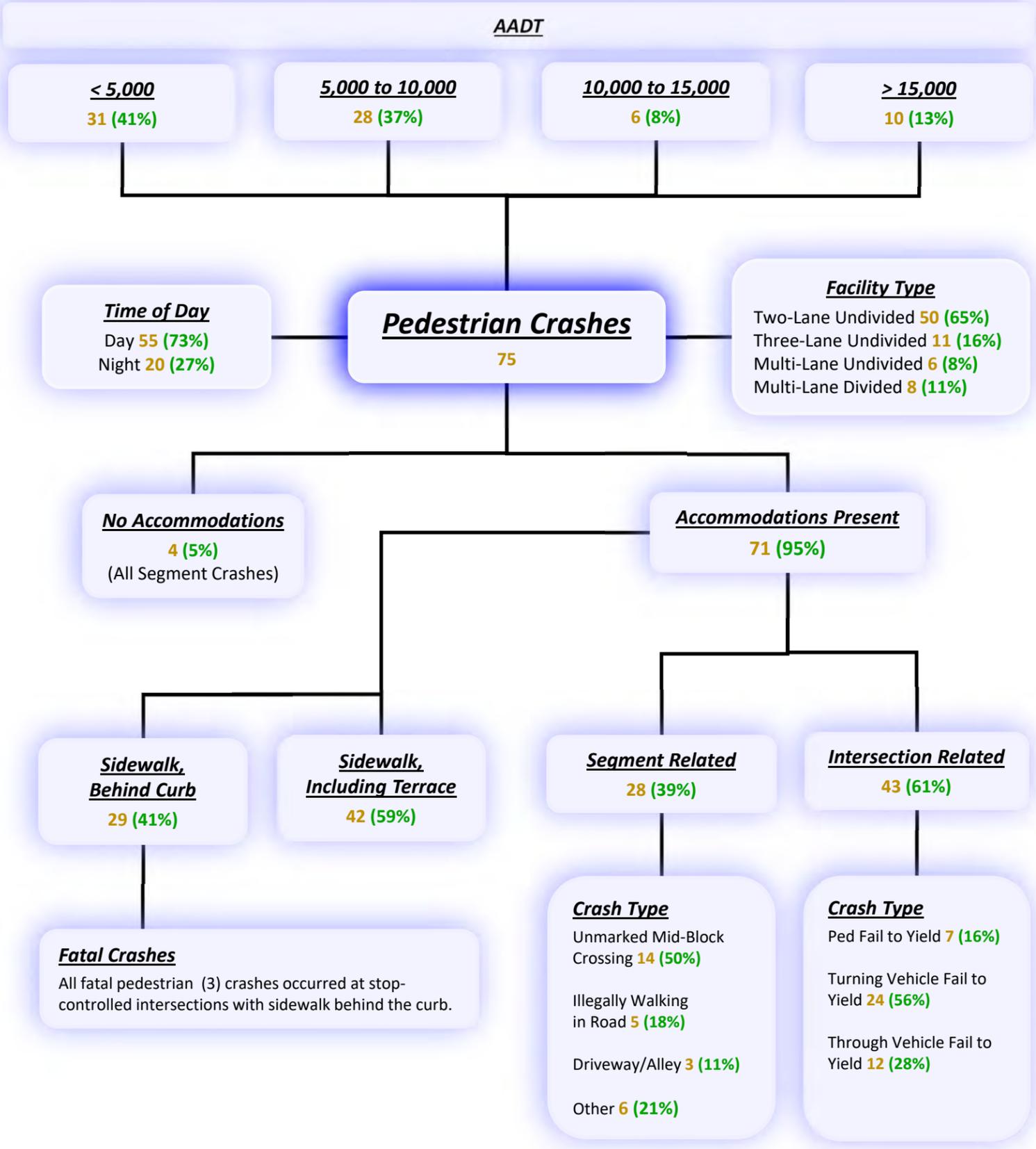
Intersection Related
380 (299 / 81)

Divided Roadway
44 (33 / 11)

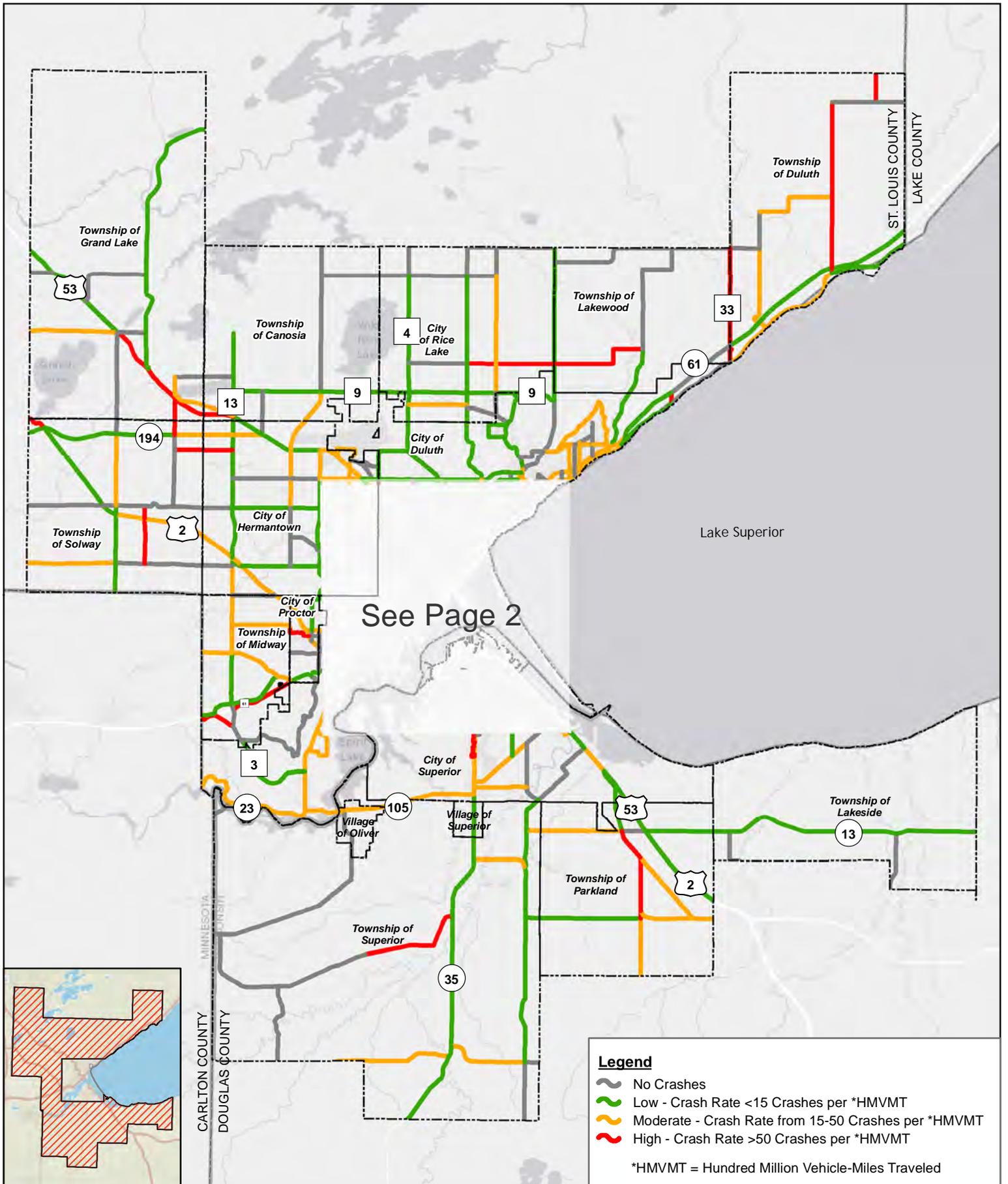
Undivided Roadway
336 (266 / 70)

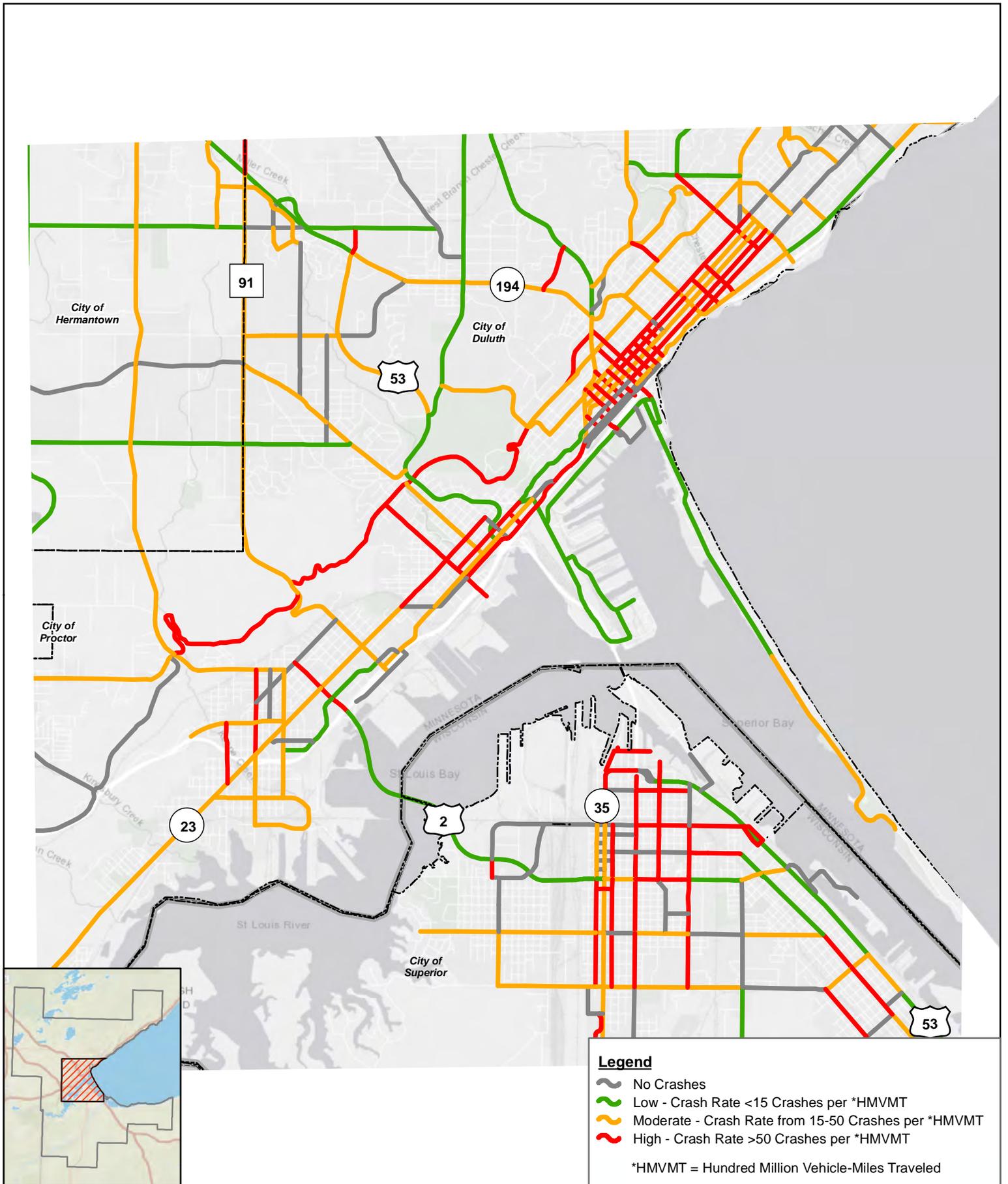
Legend
Total KAB Crashes
(MN KAB Crashes/WI KAB Crashes)





Legend
Total KAB Crashes (% of previous total)





Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 1:



Rural Two-Lane Undivided Roads With Less Than 5,000 AADT

360 miles of roads within Study Area

Risk Factors

Risk Factor - Segments	At-Risk Criteria	Data Source	Include in Study?
Density of Lane Departure KAB Crashes	<ul style="list-style-type: none"> ↳ >0.10 crashes per mile per 5 year period ★ >=0.50 crashes per mile per 5 year period 	AECOM	Yes
Curve Density	<ul style="list-style-type: none"> ↳ >=1 curve/s per mile ★ >=3 curves per mile 	Stakeholders & AECOM	Yes
Access Density (driveways, field entrances, unsignalized public streets)	<ul style="list-style-type: none"> ↳ >=7 & <15 ★ >=15 	AECOM	Yes
Edge Risk Assessment & Shoulder/Surface Type (steep slopes, fixed objects in clear zone)	<ul style="list-style-type: none"> ↳ No Paved Shoulder & No Deficiencies ↳ Paved Shoulder & 1 or 2 Deficiencies ★ No Paved Shoulder & 1 or 2 Deficiencies 	AECOM	Yes
Speed Limit	<ul style="list-style-type: none"> ↳ >=40 mph & <55 mph ★ >=55 mph 	AECOM	Yes
Roadway Width (of thru travel lanes)	<ul style="list-style-type: none"> ★ <24-feet 	AECOM	Yes
Presence of Edgeline and/or Centerline Rumble Strips	-	-	No Use as mitigation strategy
Presence of Edgeline and/or Centerline Pavement Markings	-	-	No Use as mitigation strategy
Risk Factor - Curves	Criteria	Data Source	Include in Study?
Occurrence of KAB Crashes on Curves	<ul style="list-style-type: none"> ↳ 1 crash per curve per 5 year period ★ >=2 crashes per curve per 5 per period 	Stakeholders & AECOM	Yes
Presence of Intersection on Curve or Visual Trap	<ul style="list-style-type: none"> ↳ Intersection on curve ★ Visual Trap & Int. on Curve 	AECOM	Yes
Curve Radii	<ul style="list-style-type: none"> ↳ >=500-feet to 1,000-feet ★ < 500-feet 	AECOM	Yes
Horizontal Curve Speed Differential	<ul style="list-style-type: none"> ↳ 5-10 mph (curve advisory speed sign present) ★ >10 mph (curve advisory speed sign present) ★ Curve Radius <=750', Speed Limit >=45 mph (no curve advisory speed sign present) 	Stakeholders & AECOM	Yes
Shoulder/Surface Type	<ul style="list-style-type: none"> ↳ Gravel Shoulder Only ★ No Paved shoulder 	AECOM	Yes



Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 2:

Urban Intersections

Side Road Stop Control

Angle Crashes

(167 Intersections)



Potential Risk Factors

Risk Factor	At-Risk Criteria	Data Source	Include in Study?
Occurrence of Angle Crashes	★ ≥ 1 crash per 5 year period	Stakeholders	Yes
Speed Limit on Major Road	↳ ≥ 30 mph ★ ≥ 40 mph	Stakeholders	Yes
Mainline Cross Section	↳ Multi-Lane, with median ★ Multi-Lane, no median	Stakeholders	Yes
Skew of Intersection	↳ > 5 degrees ★ ≥ 25 degrees	AECOM	Yes
Number of Entering Legs	★ 4 intersection legs	AECOM	Yes
Context Zone	★ Commercial, Retail, School, Library, Park	AECOM	Yes
Mainline AADT	↳ $\geq 5,000$ & $< 12,000$ ★ $\geq 12,000$	Stakeholders	Yes
Speed Limit on Minor Road			No
Intersection Location			No
Presence of On-Street Parking			No
Presence of Turn Lanes			No, Use as mitigation strategy

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 3:



Signalized Intersections Along Multi-Lane Arterials

(144 Intersections)

Risk Factors

Risk Factor	At-Risk Criteria	Data Source	Include in Study?
Number of KAB Crashes	<ul style="list-style-type: none"> ⚡ 1 crashes per 5 year period ★ 2 or more crashes per 5 year period 	AECOM	Yes
Speed Limit on Major Road	<ul style="list-style-type: none"> ⚡ >=35 mph ★ >=45 mph 	Stakeholders	Yes
Speed Limit on Minor Road	<ul style="list-style-type: none"> ⚡ >=30 mph ★ >=40 mph 	Stakeholders	Yes
Mainline AADT	<ul style="list-style-type: none"> ⚡ > 8,000 & < 12,000 ★ >=12,000 	Stakeholders	Yes
Skew of Intersection	<ul style="list-style-type: none"> ⚡ > 5 degrees ★ >= 20 degrees 	Stakeholders	Yes
Presence of Mainline Median	<ul style="list-style-type: none"> ⚡ Median on 1 Approach ★ No Median 	Stakeholders	Yes
Presence of Mainline Left Turn Lanes	<ul style="list-style-type: none"> ⚡ None on 1 Approach ★ None on all Approaches 	Stakeholders	Yes
Left Turn Signal Phasing, by Mainline Approach	<ul style="list-style-type: none"> ⚡ Permitted/Protected by Mainline Approach ★ Permitted Only by Mainline Approach 	Stakeholders (AECOM Collected for City of Duluth Intersections)	Yes
Signal Heads per Number of Mainline Thru Lanes	<ul style="list-style-type: none"> ⚡ <1:1 signal heads/lanes ★ <=1:2 signal heads/lanes 	Stakeholders (AECOM Collected for City of Duluth Intersections)	Yes
Access Within Influence Area	<ul style="list-style-type: none"> ⚡ 1-2 driveways ★ >=3 driveways 	Stakeholders (AECOM Collected for City of Duluth Intersections)	Yes
Mainline Left Turn Lane Alignment	<ul style="list-style-type: none"> ⚡ Zero Offset ★ Negative Offset 	Stakeholders	Yes
Isolated vs. Coordinated	<ul style="list-style-type: none"> ★ Isolated Signal 	Stakeholders	Yes
Presence of Signal Head Backplates			No, Use as Mitigation strategy



Safety Emphasis Areas

MIC Safety Action Plan

Urban Intersections

Pedestrian & Bicycle Crashes

(722 Intersections)

Risk Factors

Risk Factor	At-Risk Criteria	Potential Data Source	Include in Study?
Occurrence of Ped/Bike Crashes	<ul style="list-style-type: none"> ✎ 1 crash per 5 year period ★ >1 crash per 5 year period 	Stakeholders	Yes
Mainline AADT	<ul style="list-style-type: none"> ✎ > 5,000 & < 10,000 ★ >=10,000 	Stakeholders	Yes
Type of Traffic Control	★ Signalized	Stakeholders	Yes
Speed Limit on Major Road	<ul style="list-style-type: none"> ✎ 30 mph ★ >=35 mph 	Stakeholders	Yes
Number of Thru Lane on Major Approach	★ >2-lanes	AECOM	Yes
Presence of Bicycle Facilities (mainline)	<ul style="list-style-type: none"> ✎ Paved Shoulder ★ No Bike Facilities 	Stakeholders	Yes
Exposure Length (exclude median refuge)	<ul style="list-style-type: none"> ✎ >=36-ft & <50-ft ★ >=50-ft 	AECOM	Yes
Presence of Sidewalk (mainline)	<ul style="list-style-type: none"> ✎ Partial Sidewalk ★ No Sidewalk 	Stakeholders	Yes
Presence of Lighting	<ul style="list-style-type: none"> ✎ No Lighting on Minor Approaches ★ No Lighting 	Stakeholders	Yes
Presence of On-Street Parking (mainline)	★ Parking	AECOM	Yes
Presence of Pedestrian Generators	<ul style="list-style-type: none"> ✎ Commercial, Parks & School ✎ On DTA Route 	Stakeholder	Yes
Disadvantaged Neighborhoods	★ Adjacent to Disadvantaged Community	Stakeholder	Yes
Presence of Bus Stops			No, essentially included in Presence of Pedestrian Generators
Presence of Crosswalks			No, Use as Mitigation Strategy

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 1:



Rural Two-Lane Undivided Roads With Less Than 5,000 AADT

360 miles of roads within Study Area

Potential Countermeasures - Segments

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI Safety Data	Include in Study?
Install Shoulder Rumble Strips	N/A	35%: KA Lane Departure Crashes	8%: Injury Crashes 16%: Lane Departure Crashes	WisDOT Approved CMF CMF ID 3430 & 3442	Yes
Install Centerline Rumble Strips	N/A	36%	No WI Data CMF Clearinghouse: 4% to 11%		Yes
Provide Paved Shoulder	Edge Risk Assessment, Lane Width	17% to 31%	No WI Data CMF Clearinghouse: 12% (Run off Road)		Yes
Widen Paved Shoulder	Edge Risk Assessment, Lane Width	N/A	14%	WisDOT Approved CMF CMF ID 4078	Yes
Install Safety Edge (45 mph or Greater)	Edge Risk Assessment	24%	13%	WisDOT Approved CMF CMF ID 8658	Yes
Side Slope Improvements	Edge Risk Assessment	14% : KAB Rollover Crashes	N/A	N/A	Yes
Increase Edgeline from 4" to 6"	N/A	18%	No WI Data CMF Clearinghouse: 18% (All), 27% (Single Vehicle)		Yes
Install Barrier for Non-Recoverable Slopes	Edge Risk Assessment	35%: Injury Crashes	No WI Data CMF Clearinghouse: 9%		Yes
Clear Zone Maintenance (Clearing of Vegetation and Appropriate R/W Width)	Edge Risk Assessment	22% to 44%	N/A	N/A	Yes
Remove or Relocate Fixed Object	Edge Risk Assessment	No State Data CMF Clearinghouse: 38%		CMF ID 1024	Yes
Install Wet Reflective Pavement Markings	Edge Risk Assessment	N/A	40%: All Crashes 25%: Wet Crashes 30%: Nighttime Crashes (CMFs for multilane divided highways)	WisDOT Approved CMF CMF ID 8110, 8113, 8115	Yes
Increase Lane Width from 11-ft to 12-ft	Lane Width	No State Data CMF Clearinghouse: 5%		CMF ID 3	No

*MN Safety Data Collected From "District Safety Plan Updates – Safe Roads For All (2023)"

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 1:



Rural Two-Lane Undivided Roads With Less Than 5,000 AADT

Potential Countermeasures - Curves

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
High Friction Surface Treatment	Curve Radius	62%	Up to 67%	WisDOT Approved CMFs CMF ID 10353, 10355, 10332	Yes
Install Chevron Signs	Horizontal Curve Speed Differential	25%: Injury Nighttime Crashes	16% : Injury Crashes	WisDOT Approved CMF CMF ID 2438	Yes
Upgrade or install Fluorescent Curve Signs	Horizontal Curve Speed Differential	N/A	25%	WisDOT Approved CMF CMF ID 2433	Yes
Clear Zone Maintenance (Clearing of Vegetation and Appropriate R/W Width)	N/A	22% to 44%	N/A	N/A	Yes
Reconstruct Triangle Intersections on Curve to T-Intersection	Presence of Intersection or Visual Trap on Curve	No Safety Benefit Included, but part of list	N/A	N/A	Yes
Increase Edgeline from 4" to 6"	N/A	No Safety Benefit Included, but part of list	No WI Data CMF Clearinghouse: 18% (All), 27% (Single Vehicle)		Yes
In-Lane Curve Warning Pavement Markings	Horizontal Curve Speed Differential	N/A	N/A	FHWA Proven Safety Countermeasure	Yes
Install Barrier at Non-Recoverable Slopes	N/A	51%: KABC Lane Departure Crashes	No WI Data CMF Clearinghouse: 9%		Yes
Slope Flattening	N/A	No State Data FHWA says 22% when flattening from 1:4 to 1:6 or 8% from 1:3 to 1:4		FHWA Proven Safety Countermeasure	Yes
Add or Widen Paved Shoulders	Shoulder/Surface Type	N/A	N/A	FHWA Proven Safety Countermeasure	Yes
Update Curve Advisory Speeds	Curve Speed Differential	No State Data CMF Clearinghouse: 40%: for Installing Chevron Signs and Curve Warning Signs (No CMF for Curve Advisory Signs)			Yes
Install Wet Reflective Pavement Markings	Edge Risk Assessment	N/A	40%: All Crashes 25%: Wet Crashes 30%: Nighttime Crashes (CMFs for multilane divided highways)	WisDOT Approved CMF CMF ID 8110, 8113, 8115	Yes
Install Advance Intersection Flashing Beacons at TWSC Intersection	Curve prior to Intersection	N/A	5%: All 13%: Angle Crashes 8%: Rear End Crashes	WisDOT Approved CMF CMF ID 446/448/449	Yes

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 2:

Urban Intersections

Side Road Stop Control

Angle Crashes

(167 Intersections)



Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
Install Left Turn Lane - Mainline (One Approach)	N/A	N/A	Urban: 10% Rural: 18%	WisDOT Approved CMF Urban CMF ID 262 Rural CMF ID 4647	Yes
Install Left Turn Lane - Mainline (One Approach @ T-Intersection)	N/A	N/A	Urban: 7% Rural: 15%	WisDOT Approved CMF Urban CMF ID 4644 Rural CMF ID 4643	Yes
Install Left Turn Lane - Mainline (Both Approaches)	N/A	N/A	Urban: 19% Rural: 33%	WisDOT Approved CMF Urban CMF ID 270 Rural CMF ID 4648	Yes
Install Right Turn Lane- Mainline (One Approach)	N/A	44%	14%	WisDOT Approved CMF CMF ID 285	Yes
Install Right Turn Lane- Mainline (Both approaches)	N/A	44%	26%	WisDOT Approved CMF CMF ID 289	Yes
Road Diet (Lane Reconfiguration)	AADT, Speed	40%: Ped Crashes 47% Vehicle Crashes	N/A	FHWA Proven Safety Countermeasure: 19-47%	Yes
Continuous Green T-Intersection (Non-Signalized)	Occurrence of KAB Angle Crashes, Mainline AADT	12% (Signalized Option)	N/A	No safety information available on this non-signalized concept	Yes
Convert TWSC to Traffic Signal - 3 leg Intersection	Occurrence of KAB Angle Crashes, Mainline AADT	N/A	14%: Injury Crashes 34%: Angle Crashes (Injury) +50%: Rear End Crashes (Injury)	WisDOT Approved CMF CMF ID 316/317/318	No
Convert TWSC to Traffic Signal - 4 leg Intersection	Occurrence of KAB Angle Crashes, Mainline AADT	N/A	23% 67%: Angle Crashes (Injury) +39%: Rear End Crashes (Injury)	WisDOT Approved CMF CMF ID 319/320/321	No

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 2: Urban Intersections Side Road Stop Control Angle Crashes (167 Intersections)



Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
Convert TWSC to AWSC	Occurrence of KAB Angle Crashes, Context Zone	N/A	70%: All 75%: Angle Crashes 18%: Rear End 53%: Pedestrian	WisDOT Approved CMF CMF ID 3127/310/311/313	Yes
Convert TWSC Intersection to Single Lane Roundabout	Occurrence of KAB Angle Crashes, Mainline AADT	51%	58%: Injury Crashes +50% PDO Crashes	Wisconsin Study	Yes
Convert TWSC Intersection to Mini-Roundabout or Compact Roundabout	Occurrence of KAB Angle Crashes, Mainline AADT	61%: Injury Crashes (Mini-Roundabout)	N/A	CMF ID 11240, 11241 20%: All Crashes 61%: Injury Crashes	Yes
Install Advance Intersection Flashing Beacons at TWSC Intersection	N/A	N/A	5%: All 13%: Angle Crashes 8%: Rear End Crashes	WisDOT Approved CMF CMF ID 446/448/449	Yes
Convert Full Access Intersection to Minor RIRO Access	N/A	N/A	15%: All 40%: Injury Crashes 90%: Angle (All) 90%: Left Turn (All)	WisDOT Approved CMF Specific WI Study	Yes
Increase Triangle Sight Distance	N/A	N/A	56%: Injury Crashes	WisDOT Approved CMF CMF ID 1637/1638	Yes
Install or Upgrade Lighting	All	42%: Nighttime Crashes	N/A	FHWA Proven Countermeasure CMF ID 4462 shows 12%	Yes
Install Median with Marked Crosswalk (Mainline)	Mainline Cross Section, Context Zone	9%: Injury Crashes 86%: Fatal Bike & Ped Crashes	46%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 175	Yes
Install Pedestrian Curb Extension (In Areas with Parking)	Context Zone	30%: All Crashes	37%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 1786	Yes
Raised Crosswalk / Raised Intersection	Context Zone	45%	N/A	CMF ID 135 shows 36%	Yes
Install Retroreflective Strips on Stop Sign Posts	N/A	No Safety Benefit Included, but part of list	N/A	FHWA Proven Countermeasure	Yes
Reduce Lane Width	Speed Limit on Major/Minor Road	Up to 43%: Injury Crashes	N/A	N/A	Yes
Install Stop Bars on Side Road	N/A	N/A	N/A	FHWA Safety Countermeasure for HRRR for Unsignalized Intersections	Yes

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 3:



Signalized Intersections Along Multi-Lane Arterials

(144 Intersections)

Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI Safety Data	Include in Study?
Install Median at Intersection	Presence of Median	9%: All Crashes 89%: Fatal Bike/Ped Crashes	46%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 175	Yes
Realign Intersection	Intersection Skew	N/A	Dependent on Facility Type and Existing/Proposed Skew	WisDOT Approved CMF CMF ID 5188/5190/5189/5191	Yes
Convert Signal to AWSC	N/A	N/A	N/A	No CMF data to support this safety countermeasure	Yes
Install Left Turn Lane (One Approach)	Presence of Left Turn Lane	N/A	Urban: 10% Rural: 18%	WisDOT Approved CMF Urban CMF ID 262 Rural CMF ID 4647	Yes
Install Left Turn Lane (One Approach @ T-Intersection)	Presence of Left Turn Lane	N/A	Urban: 7% Rural: 15%	WisDOT Approved CMF Urban CMF ID 4644 Rural CMF ID 4643	Yes
Install Left Turn Lane (Both Approaches)	Presence of Left Turn Lane	N/A	Urban: 19% Rural: 33%	WisDOT Approved CMF Urban CMF ID 270 Rural CMF ID 4648	Yes
Install Flashing Yellow Arrow Signal Heads (Maintain Prot/Perm Phasing)	Left Turn Signal Phasing	37%: Left Turn	8%: (All Crashes 20%: Left Turn	WisDOT Approved CMF All Crashes CMF ID 4176 Left Turn Crashes CMF ID 4177	Yes
Install Flashing Yellow Arrow Signal Heads (Maintain Perm Phasing)	Left Turn Signal Phasing	N/A	37%	WisDOT Approved CMF CMF ID 4175	Yes
Change From Permitted to Protected/Permitted Left Turn Phasing	Left Turn Signal Phasing	N/A	14%: (Left Turn	WisDOT Approved CMF CMF ID 4270	Yes
Change From Permitted or Protected/Permitted to Protected Only Left Turn Phasing	Left Turn Signal Phasing	N/A	99%: Left Turn	WisDOT Approved CMF CMF ID 333	Yes
Improve Signal Head Visibility and Install Retroreflective Backplates	Signal Heads per Number of Thru Lanes	N/A	7%: All Crashes 23%: Angle	WisDOT Approved CMF All Crashes: CMF ID 1430 Angle Crashes: WI Data	Yes
Install Retroreflective Signal Head Backplates	Signal Heads per Number of Thru Lanes	15% 2024 Study Says No Safety Benefit	15%	WisDOT Approved CMF CMF ID 1410	Yes

*MN Safety Data Collected From "District Safety Plan Updates – Safe Roads For All (2023)"



Safety Emphasis Areas

MIC Safety Action Plan

Signalized Intersections Along Multi-Lane Arterials

(144 Intersections)

Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI Safety Data	Include in Study?
Close Driveway Near Intersection	Access Within Influence Area	N/A	N/A	N/A	Yes
Modify Access Near Intersection to RIRO	Access Within Influence Area	N/A	51% : Angle, Left Turn, Rear End Crashes	WisDOT Approved CMF CMF ID 8220	Yes
Improve Left Turn Lane Offset, Negative to Zero	Left Turn Lane Alignment	N/A	26%: Left Turn Crashes	WisDOT Approved CMF CMF ID 276	Yes
Provide Positive Offset to Left Turn Lanes	Left Turn Lane Alignment	N/A	34%	WisDOT Approved CMF CMF ID 6095	Yes
Corridor Signal timing to Reduce High-Speed Flow	Coordinated vs. Isolated & Speed	11%	N/A	N/A	Yes
Install Pedestrian Countdown Timer	N/A	9%: Ped Crashes	8%	WisDOT Approved CMF CMF ID 10115	Yes
Reduce Lane Width	Speed Limit on Major/Minor Road	Up to 43%: Injury Crashes	N/A	N/A	Yes
Leading Pedestrian Interval	N/A	59% : Bike & Ped Crashes	13%	WisDOT Approved CMF CMF ID 9916	Yes
Install or Upgrade Lighting	N/A	42% : Nighttime Crashes	N/A	FHWA Proven Countermeasure CMF ID 4462 shows 12%	Yes
High-Visibility Crosswalks	N/A	37% : Bike & Ped Crashes	40%: Ped Crashes	WisDOT Approve CMF CMF ID 4123	Yes
Road Diet (Lane Reconfiguration)	AADT, Left Turn Lanes, Speed	47% : All Crashes	N/A	FHWA Proven Safety Countermeasure: 19-47%	Yes
Improve Channelized Right Turn Angle	N/A	44%	60% Rear End and Sideswipe Crashes	WisDOT Approved CMF CMF ID 8431	Yes

*MN Safety Data Collected From "District Safety Plan Updates – Safe Roads For All (2023)"



Safety Emphasis Areas

MIC Safety Action Plan

Signalized Intersections Along Multi-Lane Arterials

(144 Intersections)

Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI Safety Data	Include in Study?
Convert Signal to Signalized RCUT/J-Turn Intersection	AADT, Intersection Skew, Presence of Median	22%	46%: Not exact match TWSC to J-turn	WisDOT Approved CMF CMF ID 4883	Yes
Convert Signal to Continuous Green T-Intersection	AADT	15%	N/A	CMF ID 8655 & 8656 shows 4% (All Crashes) and 16% (Injury Crashes)	Yes
Remove signal and convert Intersection to RIRO Intersection	AADT, Intersection Skew, Presence of Median	N/A	15%: All 40%: Injury Crashes 90%: Angle (All) 90%: Left Turn (All)	WisDOT Approved CMF Specific WI Study	Yes
Verify/Update Clearance Intervals	Speed Limit on Major/Minor Road	Up to 36% : Rear End Crashes	N/A	N/A	TBD
Add "Prepare to Stop When Flashing" Beacons for Mainline Approaches (>40 mph)	Speed Limit on Major/Minor Road	N/A	N/A	N/A	TBD
Convert Signal to Roundabout	N/A	51%	14%: Fatal & Injury Crashes +32% PDO Crashes	Wisconsin Study	TBD
Enforcement Confirmation Lights	N/A	71%: Disobeyed Signal Crashes	N/A	CMF ID 421 & 422 installation of red light cameras: 16% angle/left turn injury; +15%-24% for Rear End	Yes

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 4:

Urban Intersections

Pedestrian & Bicycle Crashes

722 Intersections



Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
Convert TWSC to Traffic Signal - 3 leg Intersection	Mainline AADT, Type of Traffic Control	N/A	14%: Injury Crashes 34%: Angle Crashes (Injury) +50%: Rear End Crashes (Injury)	WisDOT Approved CMF CMF ID 316/317/318	Yes
Convert TWSC to Traffic Signal - 4 leg Intersection	Mainline AADT, Type of Traffic Control	N/A	23% 67%: Angle Crashes (Injury) +39%: Rear End Crashes (Injury)	WisDOT Approved CMF CMF ID 319/320/321	Yes
Convert TWSC to AWSC	Mainline AADT, Type of Traffic Control	N/A	70%: All 75%: Angle Crashes 18%: Rear End 53%: Pedestrian	WisDOT Approved CMF CMF ID 3127/310/311/313	Yes
Convert AWSC Intersection to Roundabout	Mainline AADT, Type of Traffic Control	N/A	17%: Injury Crashes +47%: PDO Crashes	WisDOT Approved CMF Specific WI Study	Yes
Convert Signal to Roundabout	Mainline AADT, Type of Traffic Control	N/A	14%: Injury Crashes +32%: PDO Crashes	WisDOT Approved CMF Specific WI Study	Yes
Convert TWSC Intersection to Roundabout	Mainline AADT, Type of Traffic Control	51%: Injury Crashes	50% to 59%: Injury Crashes +16 to +50%: PDO Crashes	WisDOT Approved CMF Specific WI Study	Yes
Convert TWSC Intersection to Mini/Compact Roundabout	Mainline AADT, Type of Traffic Control	61%: Injury Crashes (Mini-Roundabout)	N/A	CMF ID 11240, 11241 20%: All Crashes 61%: Injury Crashes	Yes
Convert Full Access Intersection to Minor RIRO Access	Mainline AADT, Type of Traffic Control	N/A	15%: All 40%: Injury Crashes 90%: Angle (All) 90%: Left Turn (All)	WisDOT Approved CMF Specific WI Study	Yes
Convert Signal to AWSC	N/A	N/A	N/A	No CMF data to support this safety countermeasure	Yes
High-Visibility Crosswalks	Exposure Length, Speed Limit on Major Road	37%: Bike & Ped Crashes	40%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 4123	Yes
Install Median (Refuge) with Marked Crosswalk (Mainline)	Exposure Length	9%: Injury Crashes 86%: Fatal Bike & Ped Crashes	46%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 175	Yes
Install Pedestrian Curb Extension (In Areas with Parking)	Presence of Mainline Parking	30%: All Crashes	37%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 1786	Yes

Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 4:

Urban Intersections

Pedestrian & Bicycle Crashes

722 Intersections



Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
Rectangular Rapid Flashing Beacon (Unsignalized Intersections)	Traffic Control, Pedestrian Generators	69%: Pedestrian Crashes	48%: Pedestrian Crashes	WisDOT Approved CMF CMF ID 9024	Yes
Raised Crosswalk / Raised Intersection	Traffic Control, Occurrence of Crashes	45%	N/A	CMF ID 135 shows 36%	Yes
Enhanced Transit Stops (seating, shelter, dedicated bus lanes/pullouts)	Presence of Pedestrian Generators (MTU Stops)	45%	N/A	N/A	Yes
Leading Pedestrian Interval (Signalized Intersections)	Traffic Control, Presence of Pedestrian Generators	59% : Bike & Ped Crashes	13%: Ped Crashes	WisDOT Approved CMF CMF ID 9916	Yes
Install Pedestrian Countdown Timer (Signalized Intersections)	Traffic Control	9%: Ped Crashes	8%	WisDOT Approved CMF CMF ID 10115	Yes
Pedestrian Hybrid Beacon (Unsignalized Intersections)	Traffic Control, Presence of Pedestrian Generators	43%: Ped Crashes	55%: Ped Crashes	WisDOT Approved CMF CMF ID 10115	Yes
Install Sidewalk where No Sidewalk Exists	Presence of Sidewalk	N/A FHWA Proven Safety Countermeasure w/ 65-89% reduction in crashes involving a pedestrian walking along roadways	88%: Pedestrian	<u>US DOT Study</u> Only targets pedestrian crashes where the pedestrian is walking along roadways or a pedestrian crossing within 250-ft of an intersection where the intersection did not have sidewalks.	Yes
Green color pavement (Bike Facilities)	Presence of Bicycle Facilities	No Safety Benefit Included, but part of list	<u>NACTO Safety Efficacy Guide (2018)</u> : 10% increase in vehicles which yield to pedestrians. Rate of conflicts decreased from 0.95 to 0.59 conflicts per 100 bicyclists after colored pavement was added to conflict zones.		Yes
Bike Lanes Marked through Intersection	Presence of Bicycle Facilities	No Safety Benefit Included, but part of list	N/A	FHWA Proven Safety Countermeasure w/ 49% Reduction in Bike Crashes	Yes
Provide Flexible Delineator Posts Adjacent to Bike Lane (Existing Bike Lanes)	Presence of Bicycle Facilities	N/A	N/A	FHWA Proven Safety Countermeasure w/ 53% Reduction in Bike Crashes	Yes
Bike Box (Two-Stage Turn Queue Box)	Presence of Bicycle Facilities	No Safety Benefit Included, but part of list	N/A	N/A	Yes
Left Turn Calming where No Median Present (See Image on Following Page)	Occurrence of Crashes, Presence of Pedestrian Generators, Exposure Length	No Safety Benefit Included, but part of list	<u>City of Chicago Left Turn Traffic Calming Study</u> indicates 24% Crash Reduction and a 20% increase in left turn vehicles yielding to peds in crosswalks.		Yes



Safety Emphasis Areas

MIC Safety Action Plan



Safety Emphasis Area 4:

Urban Intersections

Pedestrian & Bicycle Crashes

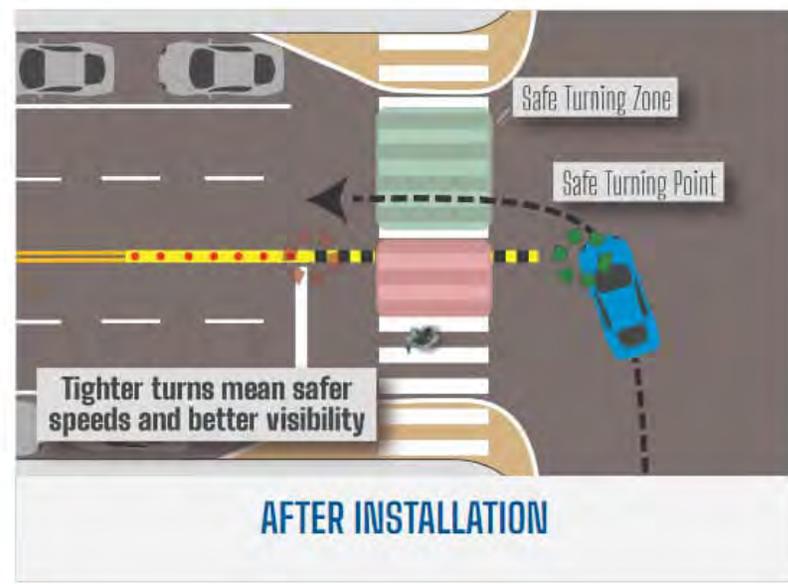
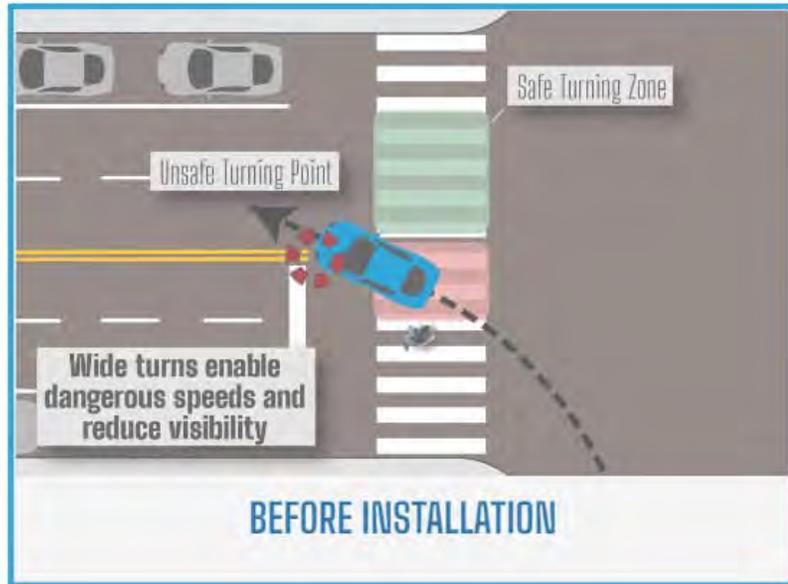
722 Intersections



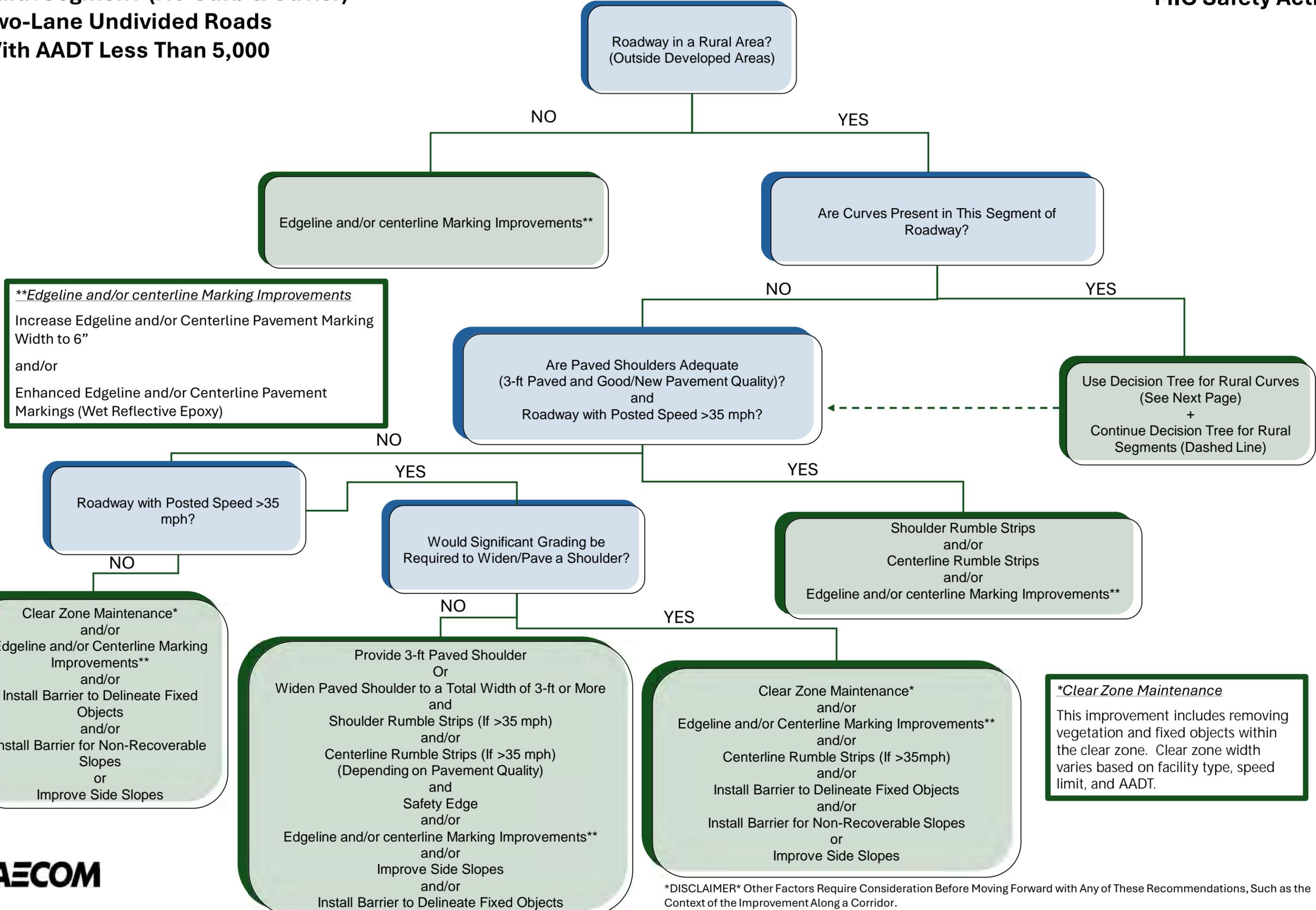
Potential Countermeasures

Safety Countermeasure	In Response to Which Risk Factor?	MN* Safety Benefit (% Crash Reduction)	WI Safety Benefit (% Crash Reduction)	Source of WI or Other Safety Data	Include in Study?
Install or Upgrade Lighting	Presence of Lighting	42%: Nighttime Crashes	N/A	FHWA Proven Countermeasure CMF ID 4462 shows 12%	Yes
Road Diet (Lane Reconfiguration)	AADT, Speed, Bike Accommodations	40%: Ped Crashes 47% Vehicle Crashes	N/A	FHWA Proven Safety Countermeasure: 19-47%	Yes
Verify/Update Pedestrian Clearance Intervals	Presence of Sidewalk, Type of Traffic Control	N/A	N/A	No CMF data to support this safety countermeasure	Yes
Install Bicycle Signal Heads	Presence of Bicycle Facilities, Type of Traffic Control	N/A	N/A	FHWA states bike signals can be used to make traveling through an intersection safer for bicyclists, and will minimize conflicts between bicyclists and other vehicles to clarify right-of-way.	Yes
Install Bike Lanes or Bike Path	Presence of Bicycle Facilities	57% (Lanes)	N/A	No CMF data to support this safety countermeasure. FHWA states that the addition of bicycle lanes can reduce crashes up to 49% for total crashes on urban 4-lane undivided collectors and local roads and 30% for 2-lane undivided collectors and local roads.	Yes
Reduce Lane Width	Speed Limit on Major/Minor Road	Up to 43%: Injury Crashes	N/A	N/A	Yes

Left Turn Traffic Calming



**Rural Segment (No Curb & Gutter)
Two-Lane Undivided Roads
With AADT Less Than 5,000**



****Edgeline and/or centerline Marking Improvements**
Increase Edgeline and/or Centerline Pavement Marking Width to 6"
and/or
Enhanced Edgeline and/or Centerline Pavement Markings (Wet Reflective Epoxy)

***Clear Zone Maintenance**
This improvement includes removing vegetation and fixed objects within the clear zone. Clear zone width varies based on facility type, speed limit, and AADT.

DISCLAIMER Other Factors Require Consideration Before Moving Forward with Any of These Recommendations, Such as the Context of the Improvement Along a Corridor.



**Rural Curves (No Curb & Gutter)
Two-Lane Undivided Roads
With AADT Less Than 5,000**

Curve in a Rural Area?
(Outside Developed Areas)

Intersection Near Curve
- Install Flashing Beacons with Warning 'Stop Ahead' Signs if Curve is Adjacent to a stop control intersection.

**Clear Zone Maintenance*
This improvement includes removing vegetation and fixed objects within the clear zone. Clear zone width varies based on facility type, speed limit, and AADT.

***Edgeline and/or centerline Marking Improvements*
Increase Edgeline and/or Centerline Pavement Marking Width to 6"
and/or
Enhanced Edgeline and/or Centerline Pavement Markings (Wet Reflective Epoxy)

Triangle Intersections on Curves
Reconstruct a triangle intersection, or an intersection with a visual trap, on a curve to a T-Intersection with as close to a 90 degree approach angle as possible.

Edgeline and/or centerline Marking Improvements**

Is There a History of Lane Departure Crashes on The Curve?

Are Paved Shoulders Adequate (3-ft Paved and Good/New Pavement Quality)? and Roadway with Posted Speed >35 mph?
+
Continue on to curve signing requirements (dashed line)

Consider High Friction Surface Treatment (If >40 mph) + Continue on to paved shoulder requirements (dashed line)

Roadway with Posted Speed >35 mph?

Would Significant Grading be Required to Widen/Pave a Shoulder?

Shoulder Rumble Strips and/or Centerline Rumble Strips and/or Edgeline and/or centerline Marking Improvements**

Re-evaluate the Curve Signing and Updating to Meet MUTCD and State Policy as Necessary.^

Upgrade to Fluorescent Signs and/or In-Lane Curve Warning Pavement Markings

Clear Zone Maintenance* and/or Edgeline and/or Centerline Marking Improvements** and/or Install Barrier to Delineate Fixed Objects and/or Install Barrier for Non-Recoverable Slopes or Improve Side Slopes

Provide 3-ft Paved Shoulder Or Widen Paved Shoulder to a Total Width of 3-ft or More and Shoulder Rumble Strips (If >35mph) and/or Centerline Rumble Strips (If >35 mph) (Depending on Pavement Quality) and Safety Edge and/or Edgeline and/or centerline Marking Improvements** and/or Improve Side Slopes and/or Install Barrier to Delineate Fixed Objects

Clear Zone Maintenance* and/or Edgeline and/or Centerline Marking Improvements** and/or Centerline Rumble Strips (If >35 mph) and/or Install Barrier to Delineate Fixed Objects and/or Install Barrier for Non-Recoverable Slopes or Improve Side Slopes

Are There Existing Chevrons or Night Arrows on The Curve?

Install Chevrons And/or Install Night Arrows

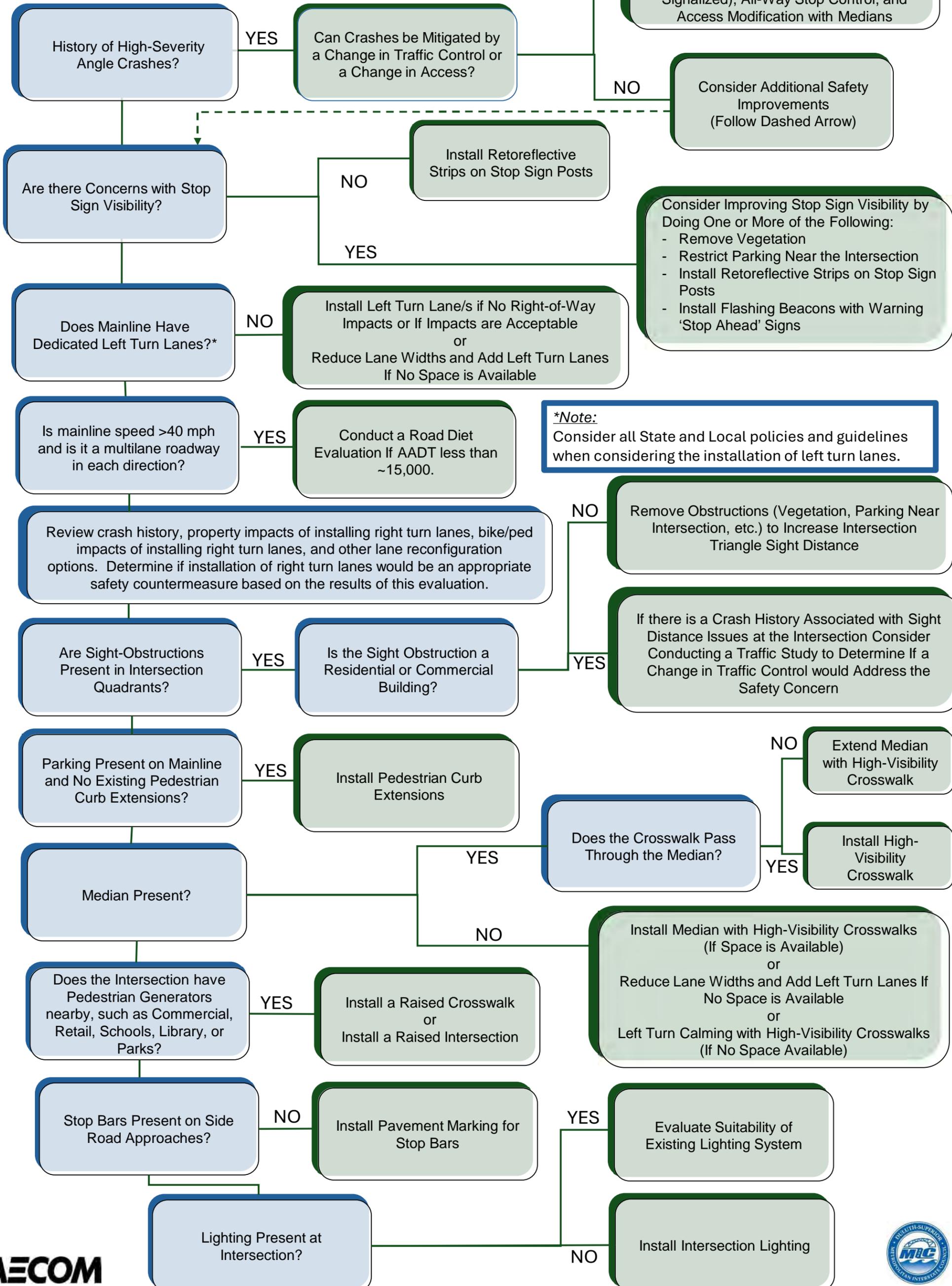
^Update Signing to Meet MUTCD and State Policy
- Curve Warning Signs
• Required if curve is less than posted or Statutory Speeds and
• Curve Advisory Speed is >=35 mph
- Curve Turn Sign
- Required if curve is less than posted or statutory speeds and
- Curve advisory speed is <=30 mph
- Advisory Plaque
- Required if speed difference is >=15 mph (>=10 mph for WisDOT)
- Chevrons and/or Night Arrows
- Required if speed difference is >=15 mph

DISCLAIMER Other Factors Require Consideration Before Moving Forward with Any of These Recommendations, Such as the Context of the Improvement Along a Corridor.



Urban Intersections with Side Road Stop Control: Angle Crashes

Answer Each Question in the Blue Boxes to Assist in Selecting Appropriate Safety Countermeasures

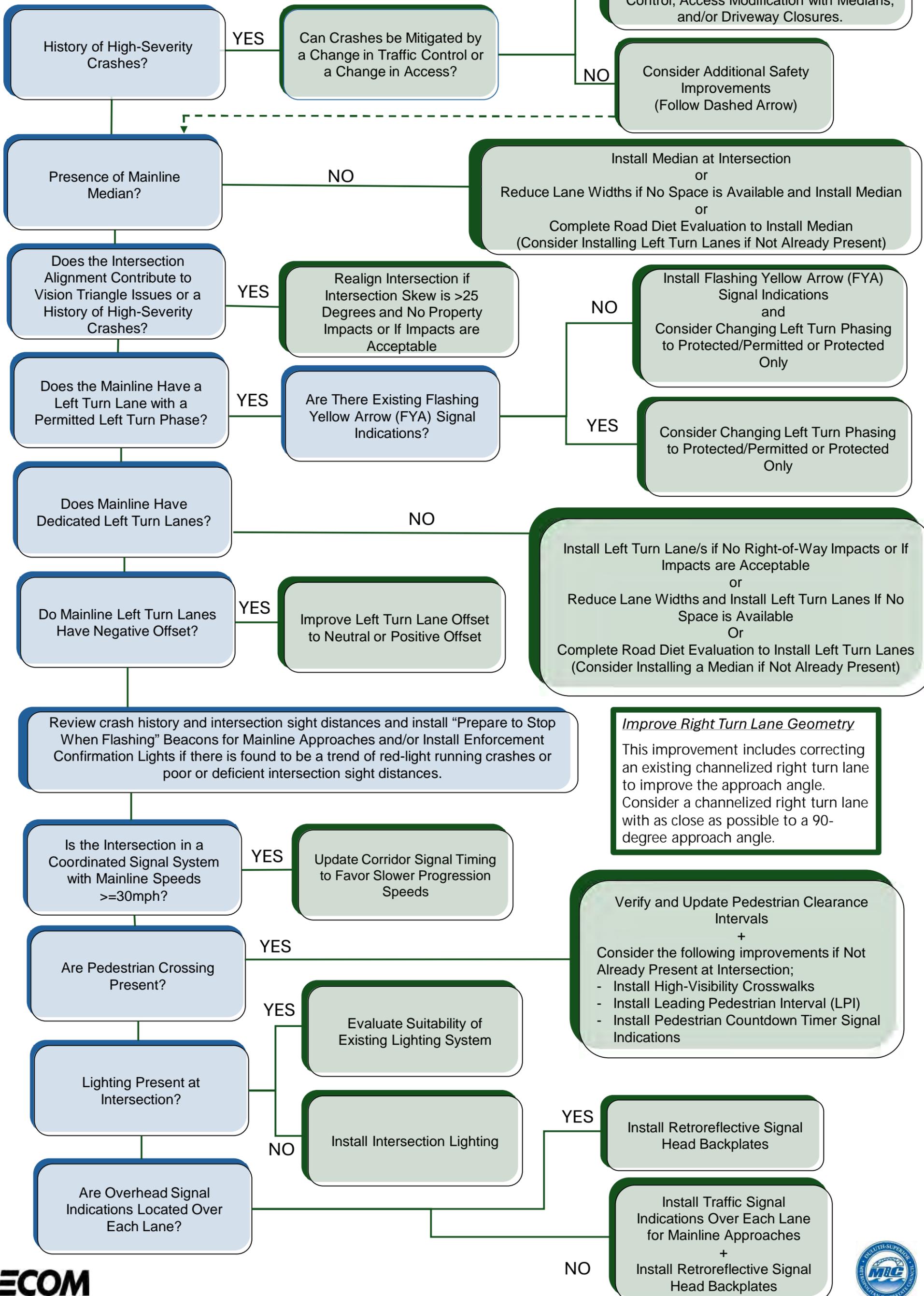


DISCLAIMER Other Factors Require Consideration Before Moving Forward with Any of These Recommendations, Such as the Context of the Improvement Along a Corridor.

Signalized Intersections Along Mult-Lane Arterials

MIC Safety Action Plan

Answer Each Question in the Blue Boxes to Assist in Selecting Appropriate Safety Countermeasures



Improve Right Turn Lane Geometry
This improvement includes correcting an existing channelized right turn lane to improve the approach angle. Consider a channelized right turn lane with as close as possible to a 90-degree approach angle.

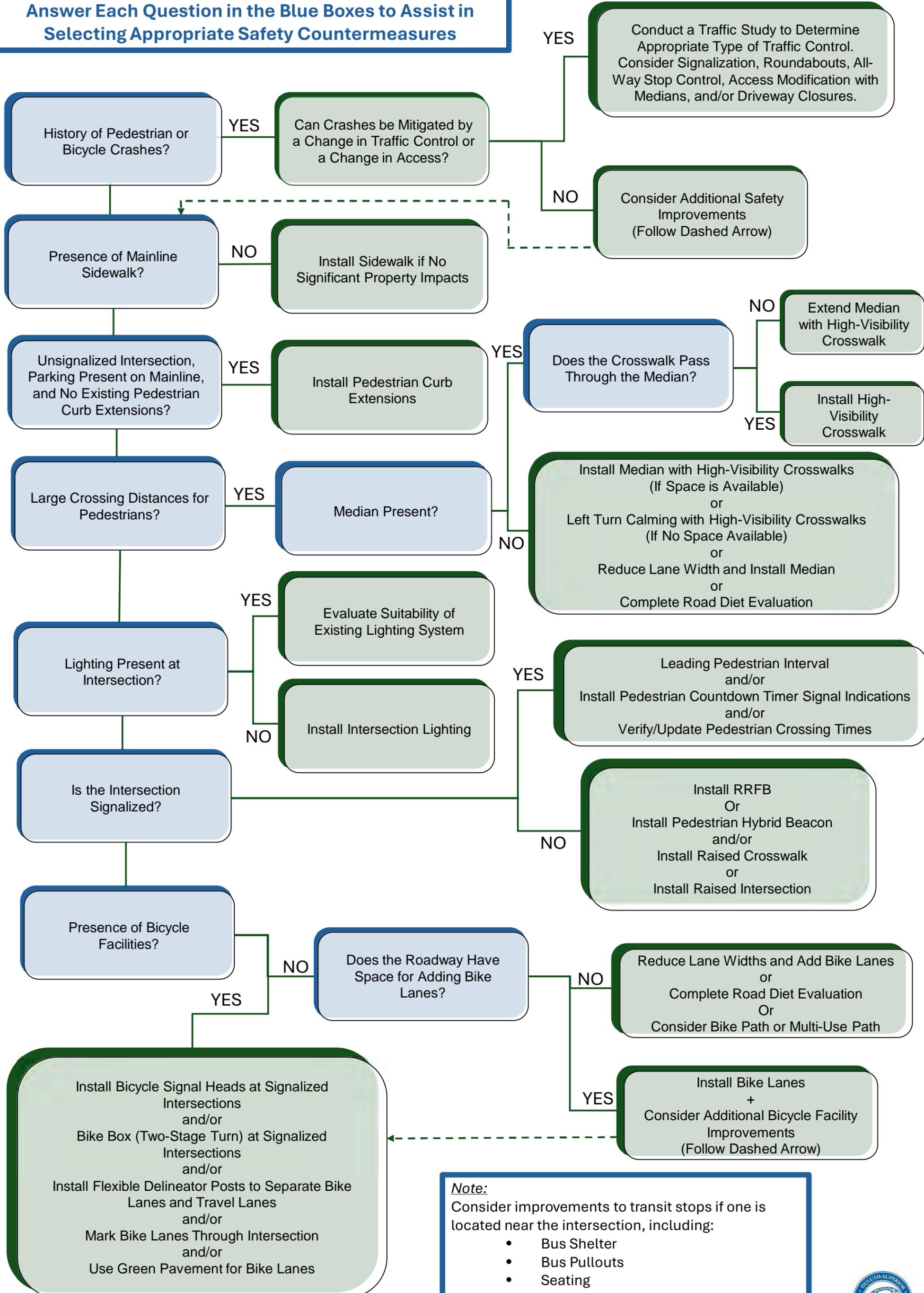
Verify and Update Pedestrian Clearance Intervals
+
Consider the following improvements if Not Already Present at Intersection;
- Install High-Visibility Crosswalks
- Install Leading Pedestrian Interval (LPI)
- Install Pedestrian Countdown Timer Signal Indications



DISCLAIMER Other Factors Require Consideration Before Moving Forward with Any of These Recommendations, Such as the Context of the Improvement Along a Corridor.

Urban Intersections: Pedestrian and Bicycle Crashes

Answer Each Question in the Blue Boxes to Assist in Selecting Appropriate Safety Countermeasures



Note:

Consider improvements to transit stops if one is located near the intersection, including:

- Bus Shelter
- Bus Pullouts
- Seating
- Lighting
- Pedestrian Accessibility



Corridor-Wide Intersection Safety Projects



Corridor	State	Limits	Length (Mi)	# of Intersections in Tier 1 or Tier 2 Locations	Total Cost	Weighted Risk Factor	Total Prioritization (\$/Weight)	Notes
Superior St	Minnesota	1st Ave E to 14th Ave E	0.2	12	\$ 2,467,000	92.83	\$ 27,000	The Lake Ave & Superior St intersection is included in the Lake Ave safety project
2nd St	Minnesota	4th Ave W to 3rd Ave E	0.6	8	\$ 2,034,000	64.44	\$ 32,000	
Lake Ave	Minnesota	Superior St to 4th St	0.2	3	\$ 993,000	25.00	\$ 40,000	The Lake Ave & 2nd St intersection is included in the 2nd St corridor safety project
Grand Ave	Minnesota	59th Ave to Central Ave	0.4	3	\$ 939,000	23.33	\$ 41,000	
4th St	Minnesota	3rd Ave E to 5th Ave E	0.2	3	\$ 1,258,000	21.62	\$ 59,000	
46th Ave	Minnesota	Mike Colalito Dr/1st St to Grand Ave	0.2	2	\$ 917,000	13.89	\$ 67,000	
6th Ave/Central Entrance Dr	Minnesota	3rd St to 10th St	0.5	4	\$ 3,648,000	49.44	\$ 74,000	
Woodland Ave	Minnesota	Kent Rd/8th St to Oxford St	1.5	6	\$ 6,115,000	68.89	\$ 89,000	
US 2/Belknap St	Wisconsin	Banks Ave to Catlin Ave	1	6	\$ 4,345,000	47.78	\$ 91,000	
Tower Ave/Hwy 35	Wisconsin	58th St to 31st St	2.3	7	\$ 9,240,000	84.49	\$ 110,000	
CSAH 4/Mesaba Ave	Minnesota	3rd St to Skyline Parkway	1	6	\$ 5,855,000	52.32	\$ 112,000	
Hammond Ave	Wisconsin	Broadway St to 5th St	0.4	5	\$ 5,394,000	44.55	\$ 122,000	
Tower Ave/Hwy 35 - 2	Wisconsin	28th St to Broadway St	1.5	9	\$ 12,476,000	100.45	\$ 125,000	
MNTH 23 (Grand Ave)	Wisconsin	88th Ave to 63rd Ave	3.2	5	\$ 5,784,000	44.44	\$ 131,000	
USTH 53/Miller Trunk Hwy - 2	Minnesota	CSAH 32/Arrowhead Rd to USTH 53/Joshua Ave	2.7	5	\$ 4,175,000	31.67	\$ 132,000	
USH 53/2nd St - 2	Wisconsin	USH 2/Belknap St to Grand Ave	1.5	5	\$ 7,046,000	50.96	\$ 139,000	
USTH 53/Trinity Rd	Minnesota	Piedmont Ave to Mall Dr	2.5	4	\$ 4,168,000	27.78	\$ 151,000	MnDOT identified portions of this corridor which have planned pavement and M/O projects in 2028 and 2029.
TH 194/Central Entrance	Minnesota	Mall Dr to Pecan Ave	2.2	9	\$ 17,000,000	109.44	\$ 156,000	MnDOT identified majority of this corridor to have planned pavement/reconstruction projects in 2028 and 2029.
USH 53/2nd St	Wisconsin	3rd St/50th Ave to Marina Dr/9th Ave	3.8	7	\$ 9,757,000	59.04	\$ 166,000	
Arrowhead Rd	Minnesota	CSAH 90/Arlington Ave to Rice Lake Rd	0.4	2	\$ 3,179,000	13.89	\$ 229,000	
27th Ave	Minnesota	Helm St/I-35 WB Ramps to 1st St	0.2	2	\$ 3,696,000	13.33	\$ 278,000	
USTH 53/Miller Trunk Hwy	Minnesota	CSAH 13 (Midway Rd) to Stebner Rd	4.5	4	\$ 7,197,000	21.11	\$ 341,000	
Superior St - 2	Minnesota	43rd Ave to 47th Ave	0.4	2	\$ 4,744,000	12.73	\$ 373,000	