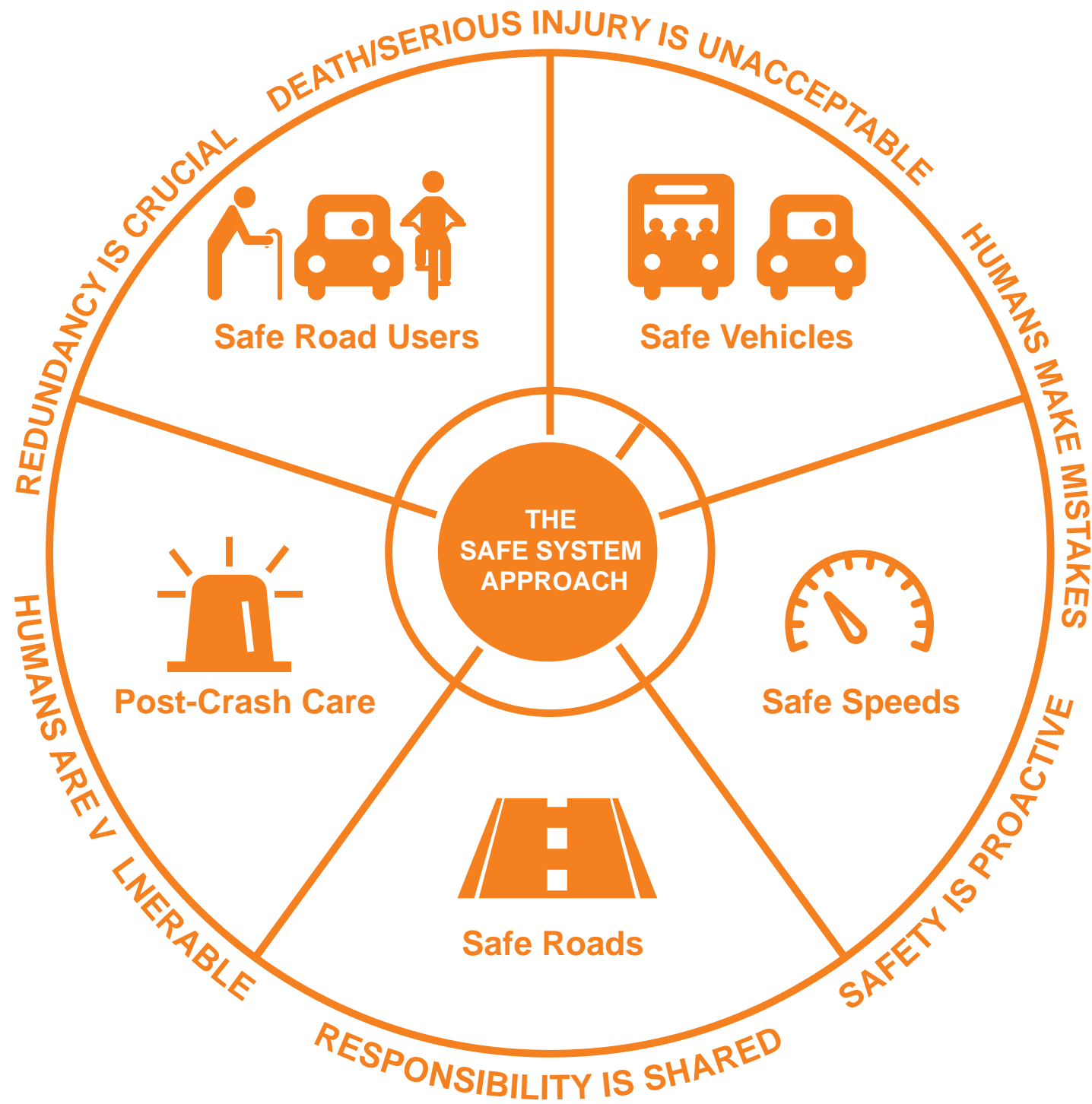


Town of Castle Rock Transportation Safety Action Plan

Safety First: Castle Rock's Road to Increased Safety

Town Council DRAFT for review and approval –
January 21, 2025





Letter of Support

January 2024

Dear Castle Rock Community Members:

It is our pleasure to present to you the Town of Castle Rock Transportation Safety Action Plan. This comprehensive plan is the result of technical analysis and extensive community engagement, both of which have been instrumental in continuing a culture of safety within our town. Our goal is to assist with reducing serious injuries and fatal crashes on our roadways.

Safety on Town roadways is a key element valued by the community. It's a significant focus of staff efforts. This plan enables the Town of Castle Rock to identify and implement critical improvements aimed at reducing the frequency and severity of crashes on our roadways. We recognize that the causes of crashes are varied and complex. Therefore, a collaborative and multifaceted approach is essential to effectively address these challenges.

While the causes of many crashes are not within the control of the Town, this plan leverages research-based recommendations to guide the identification and implementation of strategies that can assist with reducing fatal and serious injury crashes.

During the plan development, the Public Works Department, Fire Department, Police Department, and Communications Division worked closely together and with external stakeholders such as Colorado Department of Transportation and the Douglas County School District. This collaboration oriented the plan to address the most pressing transportation safety concerns and priorities of our community.

We remain committed to utilizing our finite resources toward enhancing vehicular, cyclist, and pedestrian safety on our streets. Together, we can create a safer community for everyone.

Sincerely,

Jason Gray

Mayor of Castle Rock

(Signature to be added upon Council approval)

Table of Contents

Chapter 1: The Road to Zero Goal	6
Chapter 2: Comprehensive Traffic Safety Analysis	10
Chapter 3: Community & Stakeholder Input	32
Chapter 4: Crash Profiles & Safety Intervention Toolbox	38
Chapter 5: Inclusion Considerations	50
Chapter 6: Action Plan	53
Chapter 7: Prioritization Guide	74

List of Figures

Figure 1. FHWA Safe System Approach Principles and Elements	8
Figure 2. Crash Trend Summary	11
Figure 3. Castle Rock Crash Rates Compared to Statewide and Nationwide Average	13
Figure 4. Fatal and Serious Injury Crashes on Castle Rock Roads, 2018 - 2022	14
Figure 5. Intersections with LOSS 3 and LOSS 4	16
Figure 6. Key Crash Types (Total vs KSI)	17
Figure 7. Broadside Crashes Resulting in Injuries or Deaths, 2018-2022	19
Figure 8. Approach Turn Crashes Resulting in Injuries or Deaths, 2018-2022	21
Figure 9. Rear End Crashes Resulting in Injuries or Deaths, 2018-2022	23
Figure 10. Roadway Departure Crashes Resulting in Injuries or Deaths, 2018-2022	25
Figure 11. Bicycle and Pedestrian Crashes Resulting in Injuries or Deaths, 2018-2022	27
Figure 12. High Injury Network	29
Figure 13. High Risk Network	30
Figure 14. Overlap of HIN with HRN	31
Figure 15. Heat Map Showing Density of Public Comments	34
Figure 16. Castle Rock Inclusion Index by Road Segment	52
Figure 17. Intersection Project Locations	63
Figure 18. Speed Management Corridors	71

List of Tables

Table 1. Matching Safety Interventions and Crash Types	48
Table 2. Intersection Projects	64
Table 3. Benefit-Cost Analysis Summary	77
Table 4. Locations by Prioritization Score	78
Table 5. Modify Right-turn Slip Lane from Free Movement to Yield (Install advanced yield or stop markings and signs)	80
Table 6. Improve Signal Timing (Coordination, Phases, Red, Yellow, or Operation)	80
Table 7. Apply Protected Left-turn Phasing	81
Table 8. Install Retroreflective Backplates	81
Table 9. Review TMC and Reduce Number of Lane	82
Table 10. Install Speed Table	82
Table 11. Install Advanced Detection Camera (VIVDS)	82
Table 12. Modify Median to Restrict Movement	82
Table 13. Install Additional Signal Head	82
Table 14. Apply Leading Ped/Bike Interval	82
Table 15. Clear Sight Triangle	83
Table 16. Setback Ped Crossing from the Intersection	83
Table 17. Install Curb Extension (Bulbout)	83
Table 18. Install Advanced Warning Beacon	83
Table 19. Install Two-sided STOP Sign (at the back of the STOP sign)	83
Table 20. Install All-Way STOP Control	84
Table 21. Apply No Right-turn on Red	84
Table 22. Install Ped/Bike Refuge Island	84
Table 23. Install All-weather Treatment Crosswalk	84
Table 24. Modify Median to Improve Offset	84
Table 25. Install Intersection Conflict Warning System	84
Table 26. Review Turn Lane Signage & Markings	85
Table 27. Install Traffic Signal	85
Table 28. Install Hybrid Beacon	85
Table 29. Install Roundabout	85

The Road to Zero Goal



Source: The Town of Castle Rock

The Town of Castle Rock’s target is to reduce fatalities and serious injuries on our roadways among all users. The following objectives used during the development of this plan will help us to achieve the Road to Zero Goal:

- **Safe Streets for All:** Use the Safe System approach acknowledging that road users make mistakes and system managers should design and manage the road system and adopt related policies to assist with minimizing the chances that those mistakes do not result in serious injuries or fatalities.
- **Inclusivity:** Engage a diverse cross-section of the Castle Rock community to develop a plan that accurately represents the community and utilizes finite resources to maximize safety.
- **Safety Culture:** Develop shared values, actions and behaviors that demonstrate a commitment to safety.
- **Data-driven:** Use collision data, peer best practices, contextual factors, local expertise, and other quantitative and qualitative data sources to inform an understanding of existing safety issues and identify countermeasures that will provide the greatest safety benefit and develop metrics to assess progress over time.
- **Implementable:** Prioritize projects based on a cost-benefit analysis and determine key projects that will be competitive for federal funding and assist staff with identifying funding sources for remaining projects.
- **Transparent:** Develop a public-facing, visually appealing dashboard that shares the latest collision statistics and trends with all community members to track plan progress over time.

Introduction

In an era where our interconnected community increasingly relies on efficient and secure transportation systems, the development and implementation of a Comprehensive Safety Action Plan is more critical than ever. The causes of vehicle crashes on roadways are widely variable, requiring a collaborative and multi-faceted approach to reduce them. Driver actions are the leading cause of crashes, presenting a significant challenge for the Town in reducing incidents resulting from user behavior, whether by drivers, pedestrians, or cyclists. It is important for readers to understand that the Town’s actions alone have limitations in improving safety.

This plan is founded on the Safe System approach—a holistic and proactive strategy aimed at ensuring the safety of all road users. Unlike traditional methods that often place the responsibility of safety solely on individuals, the Safe System approach acknowledges the complex interplay between human behavior, vehicles, infrastructure, and organizational policies.

The cornerstone of the Safe System approach is the understanding that human errors are inevitable and that transportation systems should strive to accommodate these mistakes without leading to fatalities or serious injuries. The Town’s efforts alone cannot eliminate crashes that result in severe injuries and fatalities. By focusing on creating a forgiving road environment, ensuring rapid response to crashes, fostering responsible road user behavior, and enforcing traffic laws, this plan aspires to build a transportation network where safety is ingrained in every aspect.

This plan acknowledges that the Town’s finite resources—through Police Enforcement, Emergency Response, Engineering, and Education—are limited in their ability to eliminate fatal and serious injury crashes. Therefore, the recommendations developed focus on maximizing the safety benefits with the available resources. The objectives of this Transportation Safety Action Plan are to systematically identify and mitigate risk factors, promote a culture of safety, and ensure sustainable, long-term improvements in road safety. These recommendations are based on research proven to reduce crashes that result in fatalities and serious injuries. This includes the deployment of advanced technologies, rigorous data analysis, stakeholder collaboration, and continuous assessment and refinement of safety measures. Ultimately, the goal is to progress towards a future with fewer traffic-related fatalities and serious injuries.

By embracing the principles of the Safe System approach, we embark on a path towards a safer, more resilient transportation network that protects and empowers all its users. This plan not only aims to save lives but also to create a more equitable, efficient, and higher quality of life and travel experience for everyone.

TRADITIONAL APPROACH

Traffic deaths are **INEVITABLE**

PERFECT human behavior

Prevent **COLLISIONS**

INDIVIDUAL responsibility

Saving lives is **EXPENSIVE**



SAFE SYSTEMS APPROACH

Traffic deaths are **PREVENTABLE**

Integrate **HUMAN FAILING** in approach

Reduce **FATAL AND SERIOUS CRASHES**

SYSTEMS approach

Saving lives is **NOT EXPENSIVE**

The **Vision** is **reducing** serious injury crashes and traffic fatalities.

Safe System Approach

This plan was developed using the principles of the Federal Highway Administration’s (FHWA’s) Safe System approach, which recognizes that humans make mistakes and that human bodies have limited ability to tolerate crash impacts. **Making mistakes on the roadway should not lead to death.** There are six principles that form the basis of the Safe System approach, shown in **Figure 1**. These principles form the basis of the safety analysis approach used in this plan and provide the framework for the Action Plan. While no single principle can eliminate crashes entirely, together they create a comprehensive system where each principle compensates for the gaps in others. All six principles of the Safe System approach are integrated into strategies in this plan to solve problems from multiple angles, but the implementation plan is primarily oriented toward Safer Roads and Safer Speeds. This plan is focused on advancing recommendations that the Town has the ability to influence based on statistical findings and transportation safety best practices on reducing serious and fatal crashes.

How this Action Plan Was Developed

This plan continues the focus on safety that the Town of Castle Rock has practiced through regular crash analysis and project identification. This Safety Action Plan was funded by a Safe Streets for All (SS4A) planning grant from the US Department of Transportation. Castle Rock’s proactive approach to identifying and prioritizing local infrastructure will greatly benefit from safety improvements to help reduce the number of serious crashes that result in fatality or serious injury.



Figure 1. FHWA Safe System Approach Principles and Elements

Plan Contents

This Plan includes the following major items:

- **A Comprehensive Traffic Safety Analysis** that identifies common serious crash types and locations, with particular focus on vulnerable users.
- **A High Injury Network (HIN)** that maps the streets in Castle Rock with the highest historic serious and fatal crash activity and a **High Risk Network (HRN)** that maps the highest risk factors for serious crashes.
- **Community and Stakeholder Engagement** that captures the perceived safety issues and priorities of the community and ensures action items correspond with local needs.
- **An Inclusion Index** to identify and prioritize roadways that people are likely to be using to access essential services.
- **A Toolbox of Systemic Safety Countermeasures** so the Town can systemically address the most serious crash types.
- **An Action Plan** that identifies strategies to improve safety through both engineering solutions and other actions.
- **An Implementation Guide** for staff to implement safety projects based on identified prioritization criteria and as funding is available.



Source: The Town of Castle Rock

Comprehensive Traffic Safety Analysis

“Thank you for taking on this issue. There have been some great improvements lately but there are many other areas that could use attention.”

– Town of Castle Rock Facebook Commenter

Since 2004, the Castle Rock Public Works Department has taken a proactive approach to traffic safety by publishing a biennial Motor Vehicle Crash Facts Report. This data-driven report analyzes collision trends to identify areas where the roadway environment may be a contributing factor. By leveraging these insights, Castle Rock has been able to implement targeted improvements, such as signal timing adjustments and infrastructure upgrades, to enhance safety in these high-risk locations. This Safety Action Plan has continued this approach to crash analysis to help identify improvements.

Crash Data Overview

A key component of this safety action plan is understanding crash activity that has happened on Castle Rock streets over the five years between 2018 and 2022. During this period, Castle Rock’s streets experienced 3,897 crashes involving 8,776 people which is an average of 2 crashes per day involving 5 people. Furthermore, 51 of these crashes caused 58 people to be seriously injured and 2 people were killed. A five-year period provides a robust dataset to identify statistically significant patterns and reduce the impact of anomalies or outliers that might skew the analysis if a shorter period were used. Over periods longer than five years, data collection methods, reporting standards, and even the definitions of crash types can change, making it difficult to ensure consistency and accuracy. Additionally, older crash data may not reflect current infrastructure conditions and changes in traffic volumes. While longer periods can help in understanding long-term trends, they can also dilute the impact of recent changes or improvements, which are common in Castle Rock. Therefore, a five-year period strikes a balance between having enough data for statistical significance and maintaining relevance to current conditions.

Between 2018 and 2022, one in six crashes resulted in injury or death. For every ten people involved in a crash, one person was seriously injured or killed. All crashes resulting in serious injury or death during the 5-year analysis period are shown in **Figure 2**. Since 2022, there have been seven fatalities at the time of this report (4 fatalities in 2023 and 3 fatalities in 2024.)

Annual Crash Data by Severity

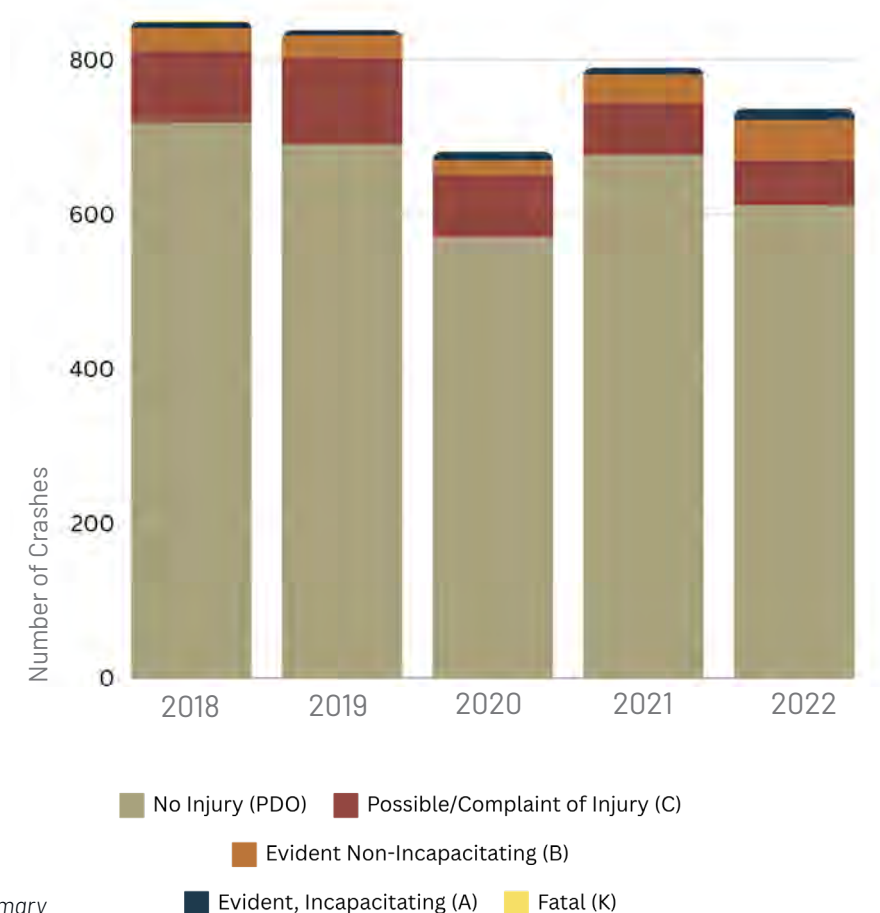


Figure 2. Crash Trend Summary

Figure 3 illustrates the number of total, serious injury, and fatal crashes normalized by the number of residents for Castle Rock, Colorado, and the United States. The crash rates per 100,000 residents in Castle Rock are consistently lower than the state and national averages across all categories. The total crash rate has decreased from 1,243 crashes per 100,000 people in 2018 to 866 crashes per 100,000 people in 2023. Similarly, serious injury crash rates have declined from 190 crashes per 100,000 people in 2018 to 155 per 100,000 people in 2023. The number of fatalities was 2 in 2018, dropped to 0 each year from 2019 to 2022, but increased to 5 in 2023 and has continued to rise in 2024. While Castle Rock rates are lower than state and national averages, there is still room to reduce the number of serious and fatal crashes on Castle Rock streets.

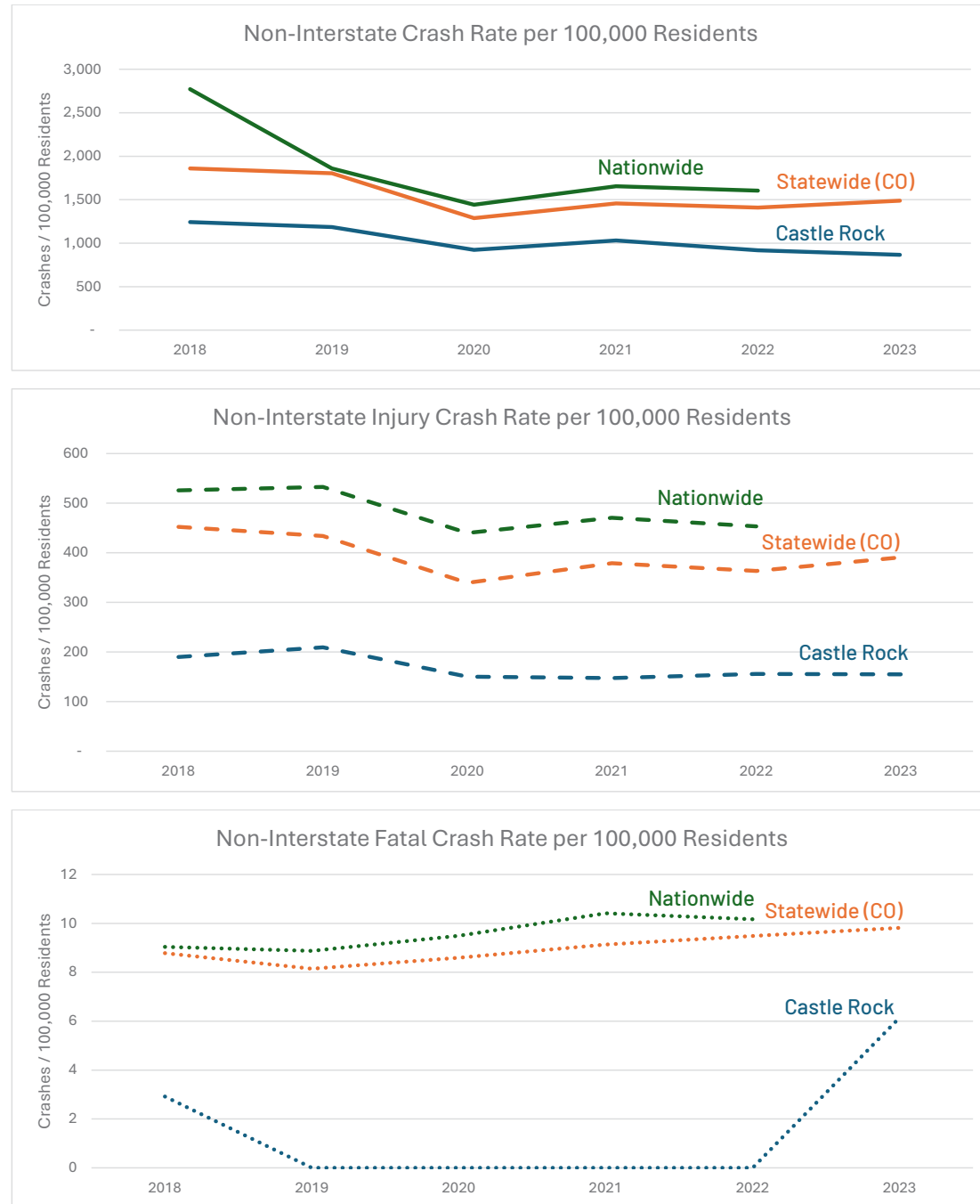
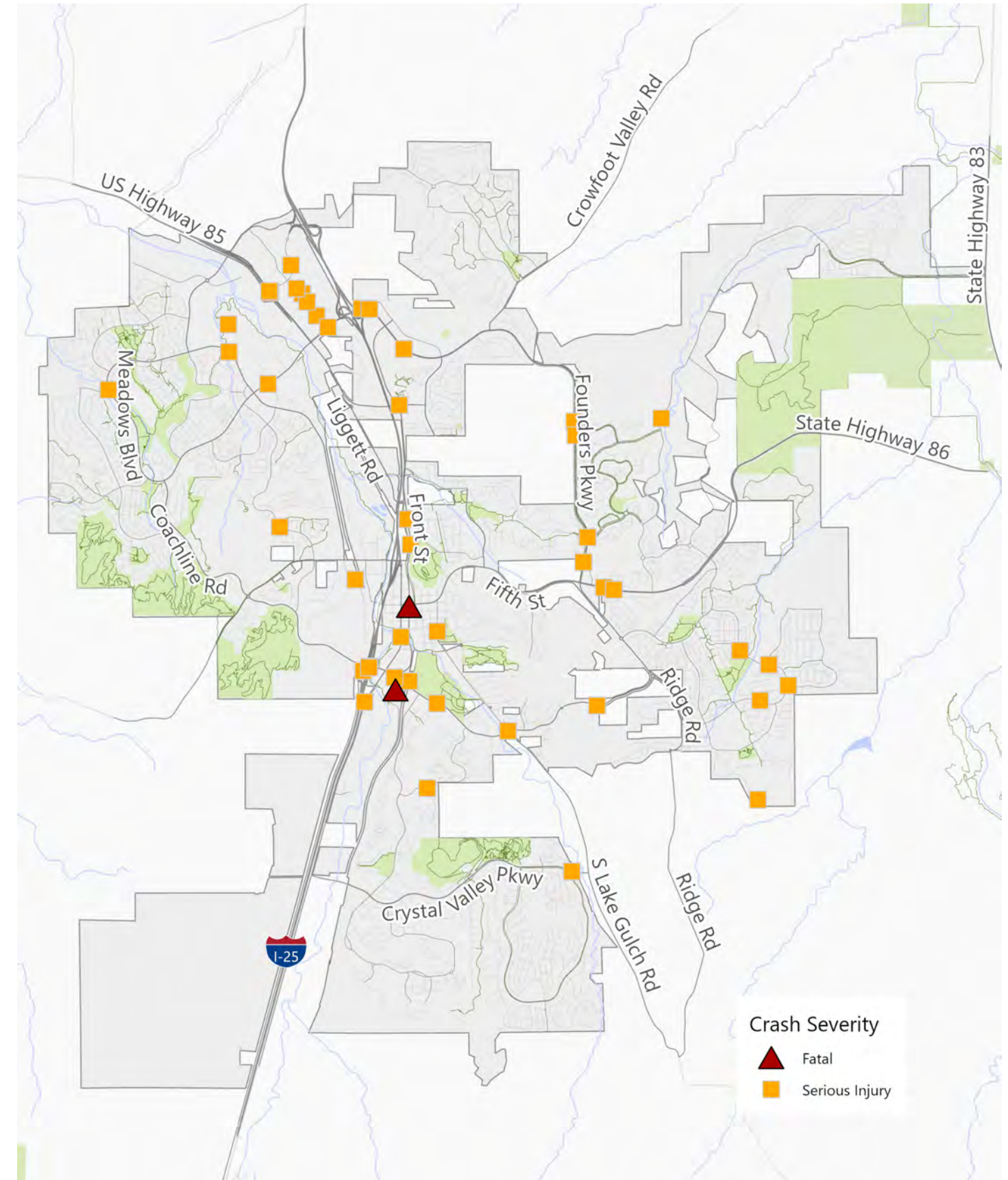


Figure 3. Castle Rock Crash Rates Compared to Statewide and Nationwide Average

Figure 4. Fatal and Serious Injury Crashes on Castle Rock Roads, 2018 - 2022



Intersection Crashes:

Intersection-related crashes were studied to identify locations where crashes could be reduced. A tool called a Safety Performance Function (SPF) helps predict how many crashes are likely to occur at an intersection or on a roadway segment. This analysis leads to a rating called Level of Service of Safety (LOSS), which measures how much opportunity there is to reduce crashes overall or specifically serious injury or fatal crashes.

The LOSS scale has four levels:

- **LOSS-I:** Indicates low potential for crash reduction.
- **LOSS-II:** Indicates low to moderate potential for crash reduction.
- **LOSS-III:** Indicates moderate to high potential for crash reduction.
- **LOSS-IV:** Indicates high potential for crash reduction.

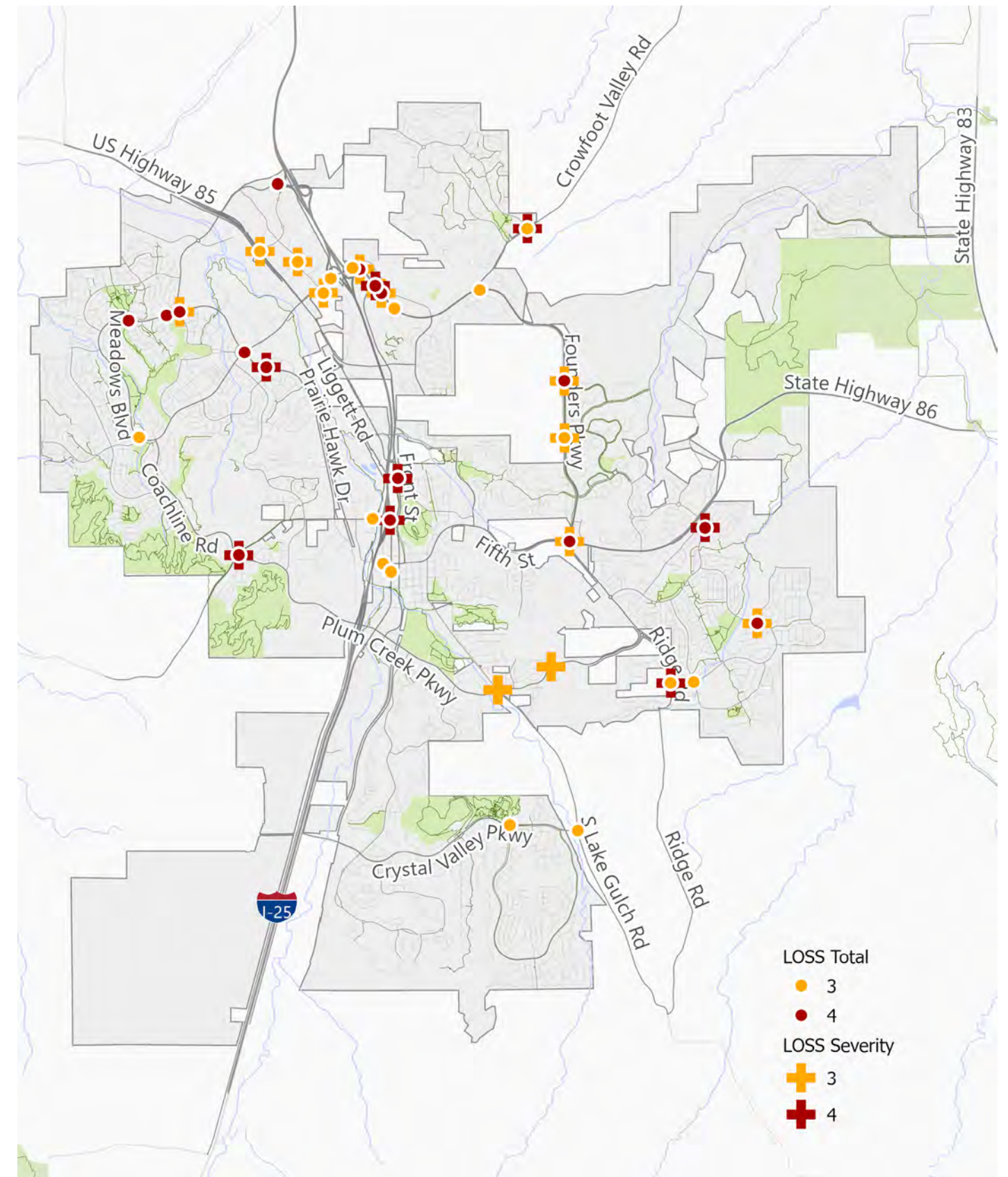
This scale helps prioritize areas where improvements can have the biggest impact on reducing crashes.

Intersections analyzed in Castle Rock that were categorized as LOSS-III or LOSS-IV for both total crashes and serious/fatal crashes are shown in **Figure 5** and indicate worse than expected safety performance or high potential for crash reduction.



Source: Fehr & Peers

Figure 5. Intersections with LOSS 3 and LOSS 4



Pedestrians and Bicyclists are Disproportionately Affected by Crashes:

Only 1.2% of all crashes in Castle Rock involved a pedestrian or bicyclist, but these crashes represented 10% fatal and serious injury crashes.

Although bicyclists and pedestrians are involved in fewer crashes, they face a significantly higher risk of serious injury or death. This highlights the importance of prioritizing vulnerable road users, those traveling outside of vehicles, in our roadway design. Ensuring the safety of everyone, regardless of their mode of travel, is essential for the residents and visitors of Castle Rock.



Source: Fehr & Peers

Key Crash Types

More than 90% of Killed or Seriously Injured (KSI) crashes in Castle Rock involved one of five crash types:

- **Broadside (T-bone) Crashes**
- **Approach Turn Crashes**
- **Rear-end Crashes**
- **Roadway Departure Crashes**
- **Pedestrian & Bicycle Crashes**

While rear-end crashes are the most common crashes in Castle Rock, they are much less likely to be serious, as demonstrated in **Figure 6**. The focus of this Safety Action Plan is on mitigating fatal and serious injury crashes, including the ones listed here most likely to result in serious injury or death. Similarly, while not in the top 5 crash types for all crashes, wildlife involved crashes resulted in very few KSI crashes so are not a focus of this plan.

Top 5 Crashes (2018-2022)

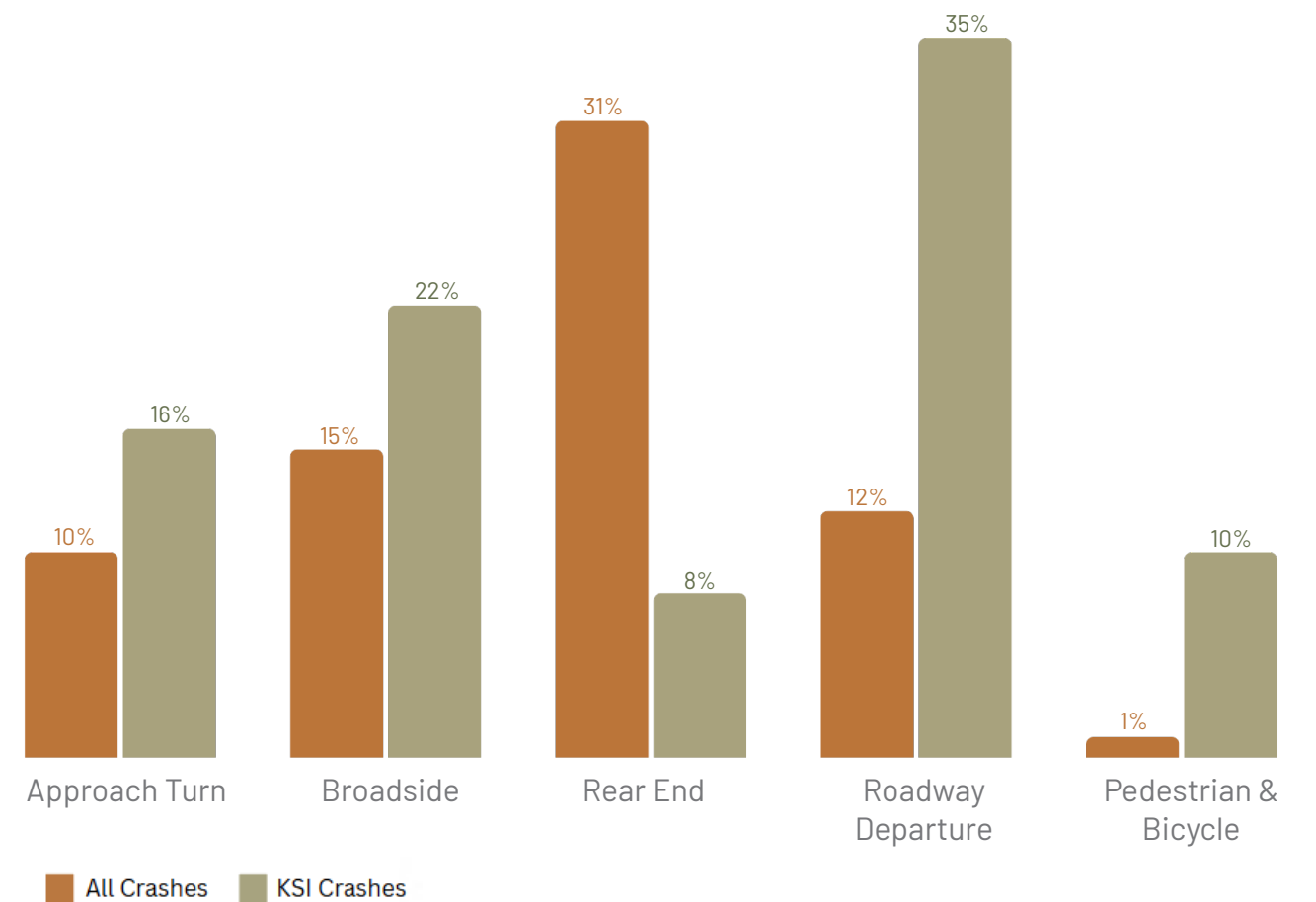
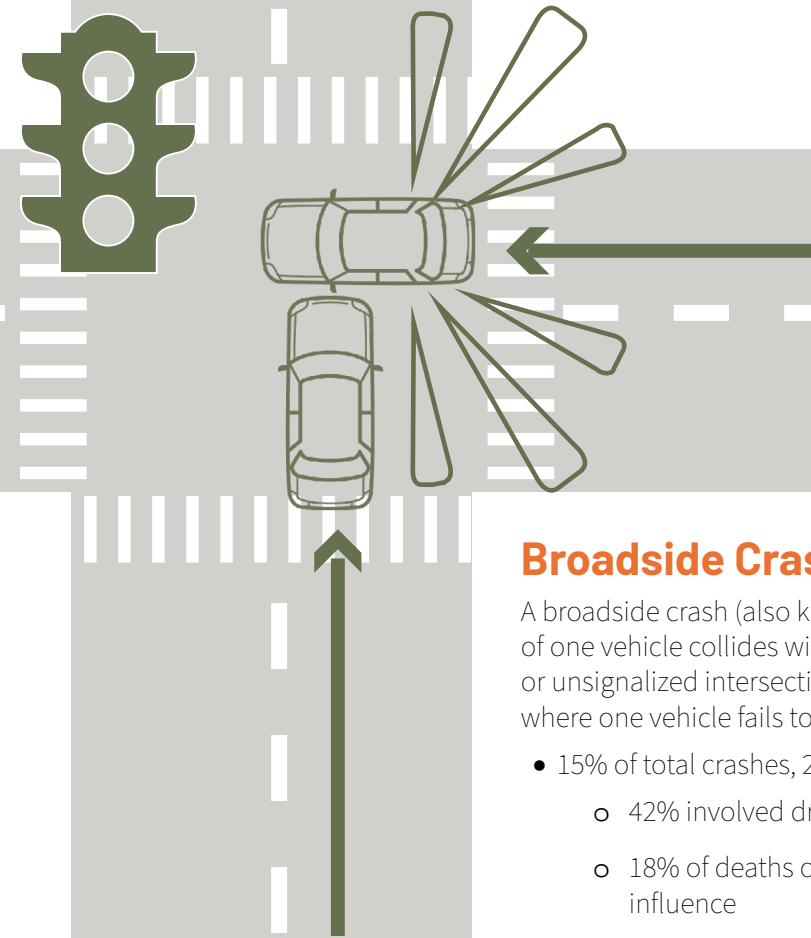


Figure 6. Key Crash Types (Total vs KSI)

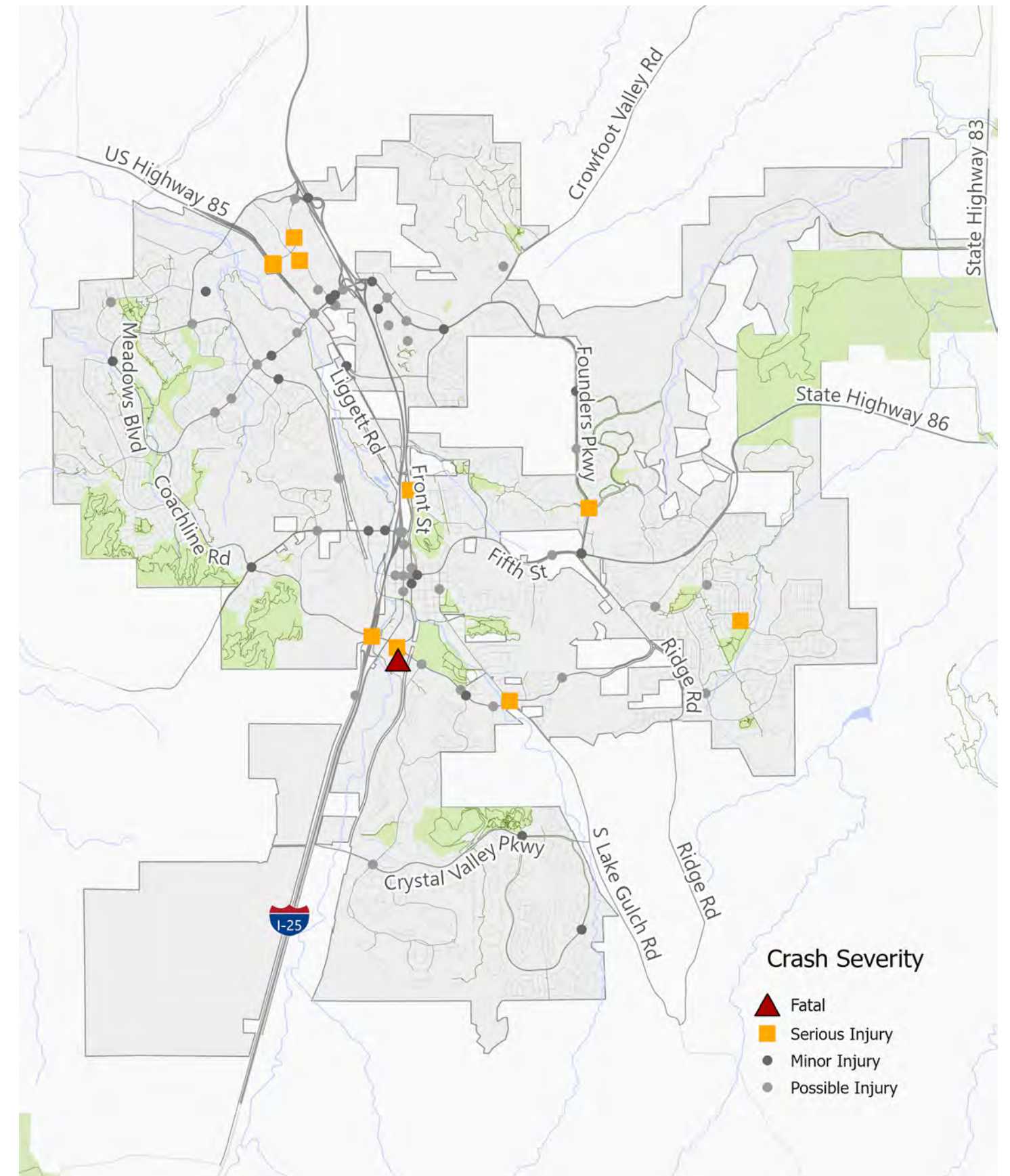


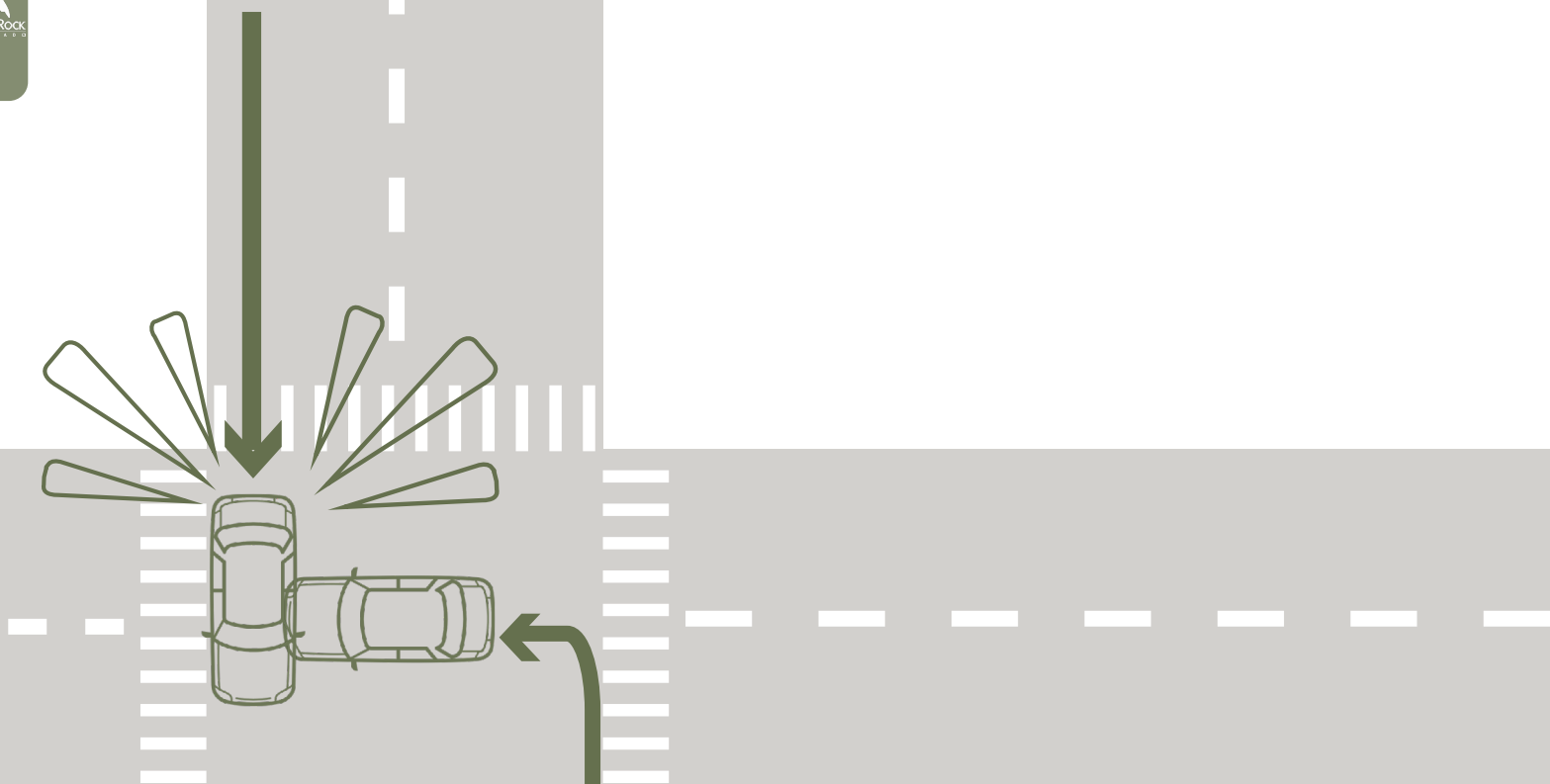
Broadside Crashes

A broadside crash (also known as a T-bone crash) occurs when the front of one vehicle collides with the side of another vehicle at a signalized or unsignalized intersection. These crashes often occur at intersections where one vehicle fails to yield the right of way or runs a red light.

- 15% of total crashes, 22% of KSI
 - 42% involved drivers who failed to yield right-of-way
 - 18% of deaths or serious injuries involved driving under the influence
 - 12% involved inexperienced drivers

Figure 7. Broadside Crashes Resulting in Injuries or Deaths, 2018-2022



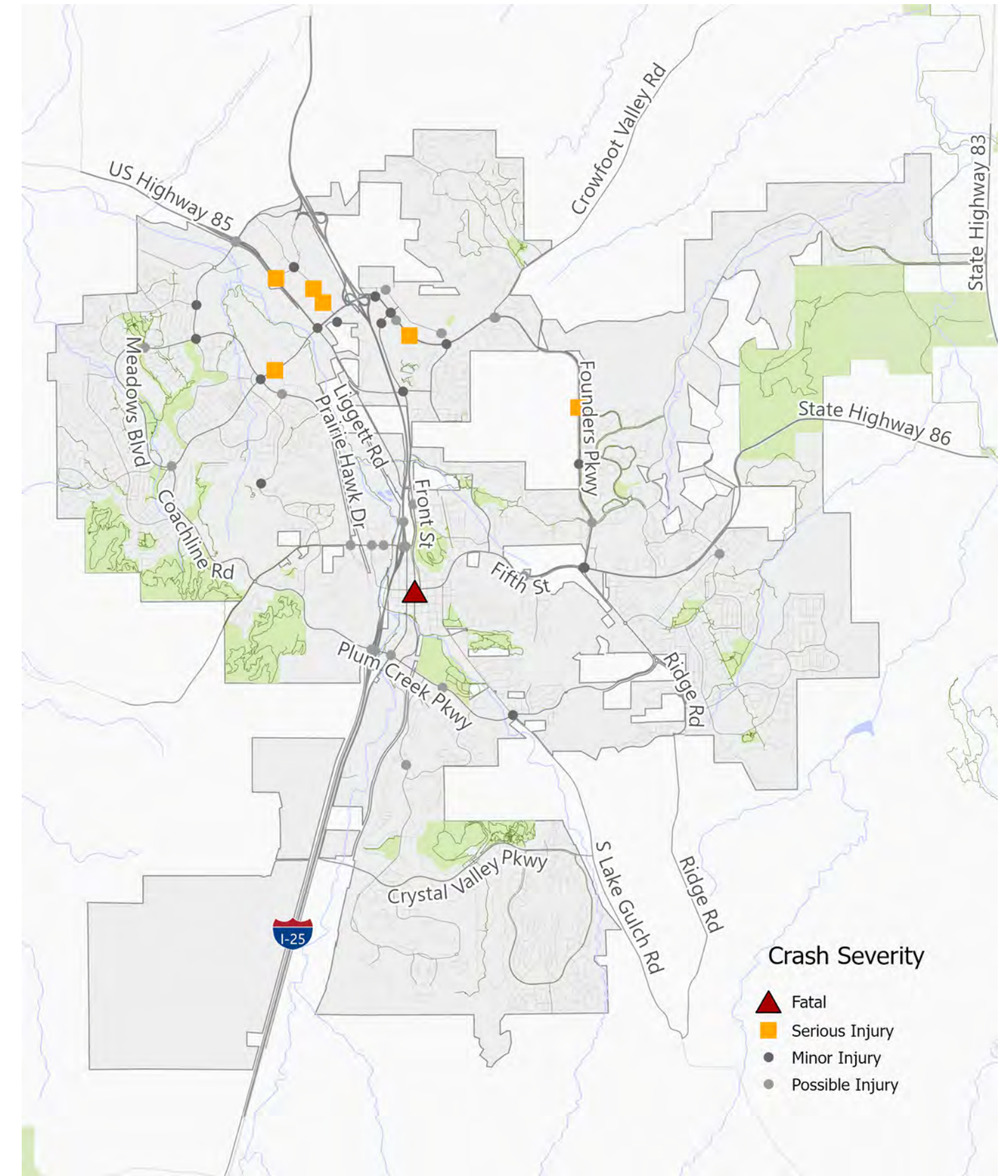


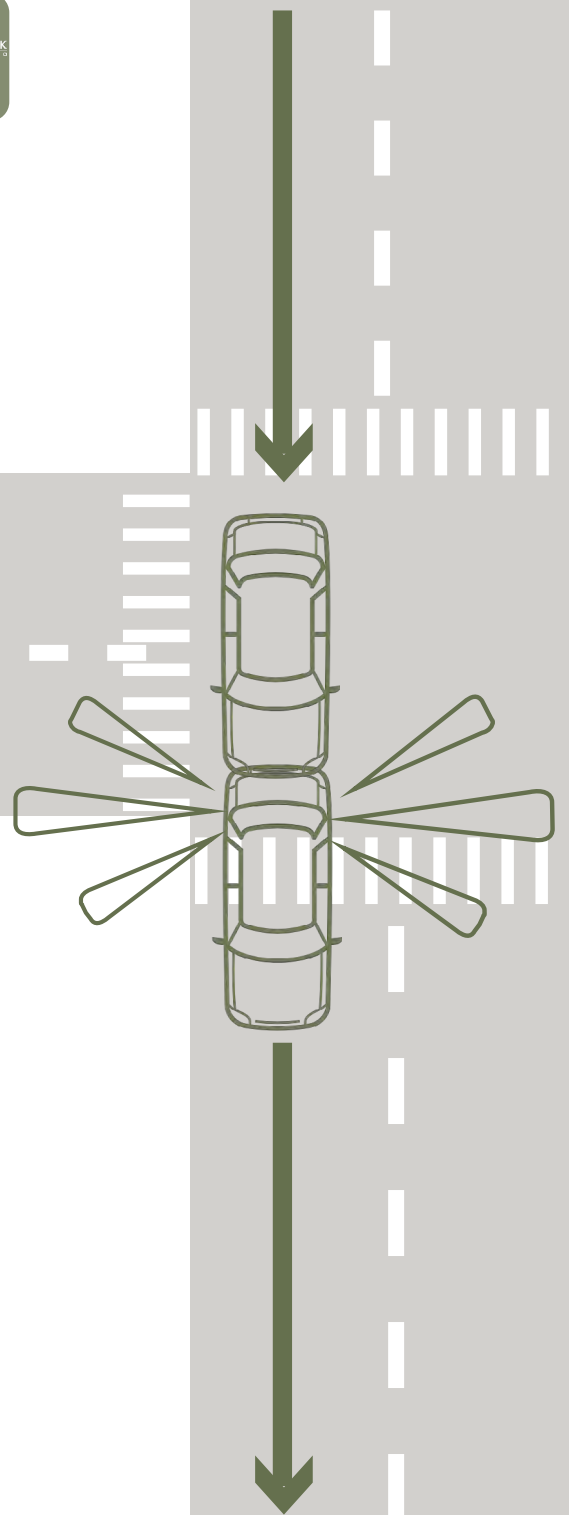
Approach Turn Crashes

Approach turn crash occurs when a vehicle making a turn (usually a left turn) collides with an oncoming vehicle that is either traveling straight or turning. These crashes typically happen at intersections, both signalized and unsignalized.

- 10% of total crashes, 16% of KSI
 - 81% involved drivers who failed to yield right-of-way
 - 15% involved inexperience drivers

Figure 8. Approach Turn Crashes Resulting in Injuries or Deaths, 2018-2022



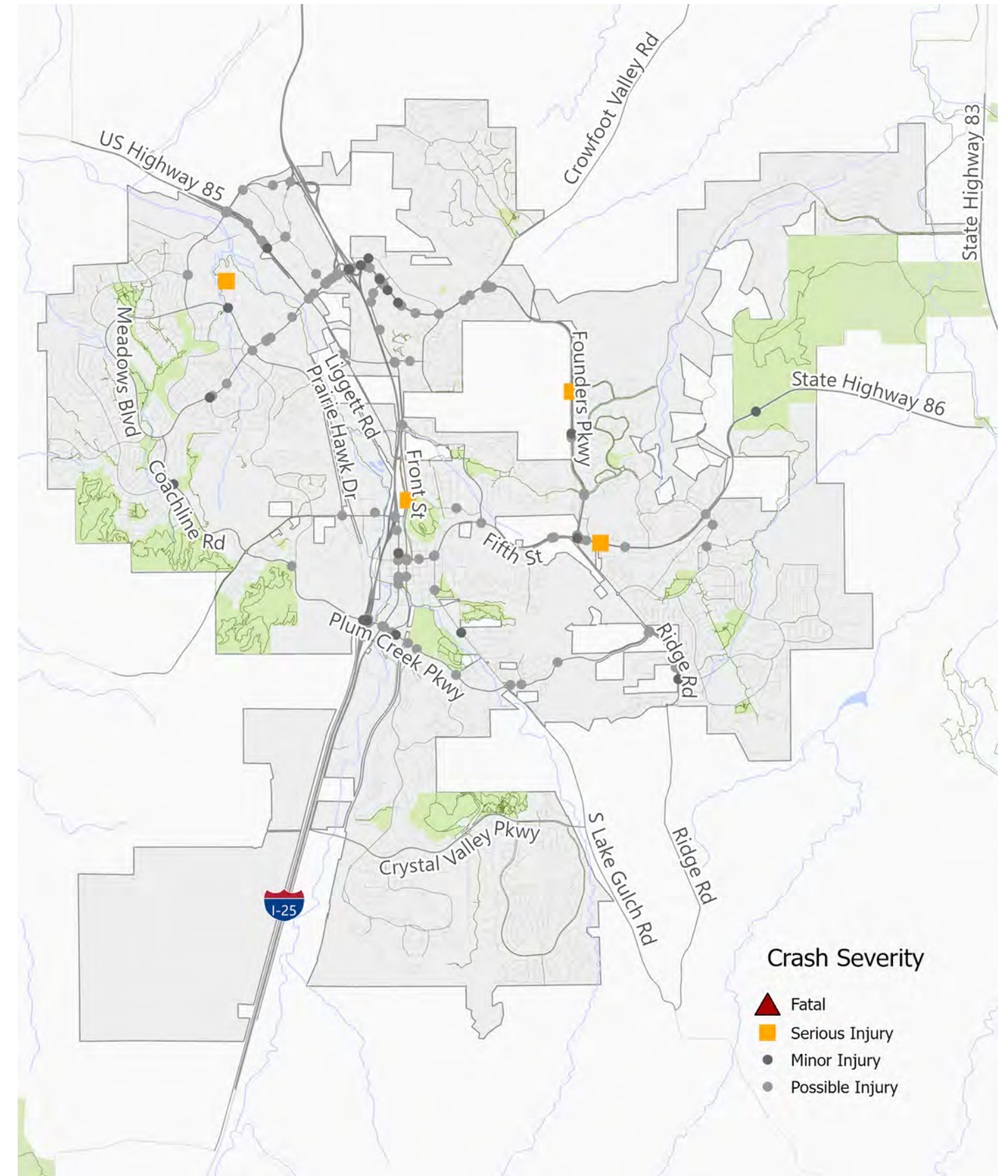


Rear End Crashes

A rear-end crash occurs when one vehicle collides with the back of another vehicle.

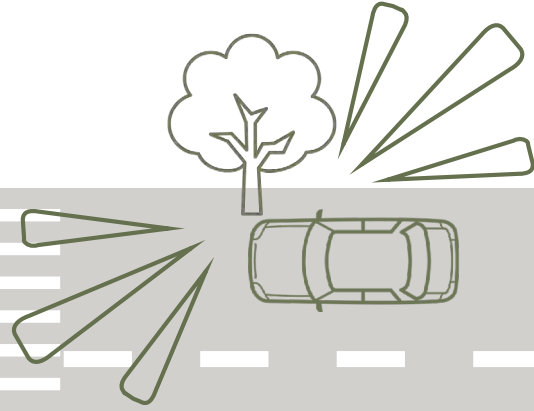
- 31% of total crashes, 8% of KSI
 - 100% of death or serious injury from rear end impacts involved high speed vehicles (>35 MPH) as noted in the crash reports

Figure 9. Rear End Crashes Resulting in Injuries or Deaths, 2018-2022



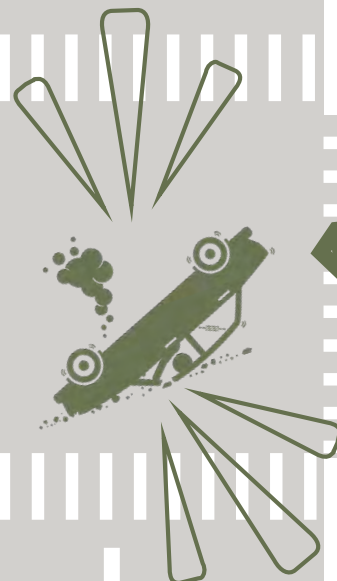
Roadway Departure Crashes

A roadway departure crash occurs when a vehicle exits a designated travel lane and enters the shoulder, median, or roadside and collides with fixed objects (such as trees, poles, or guardrails) or the vehicle rolls over.



Fixed Objects

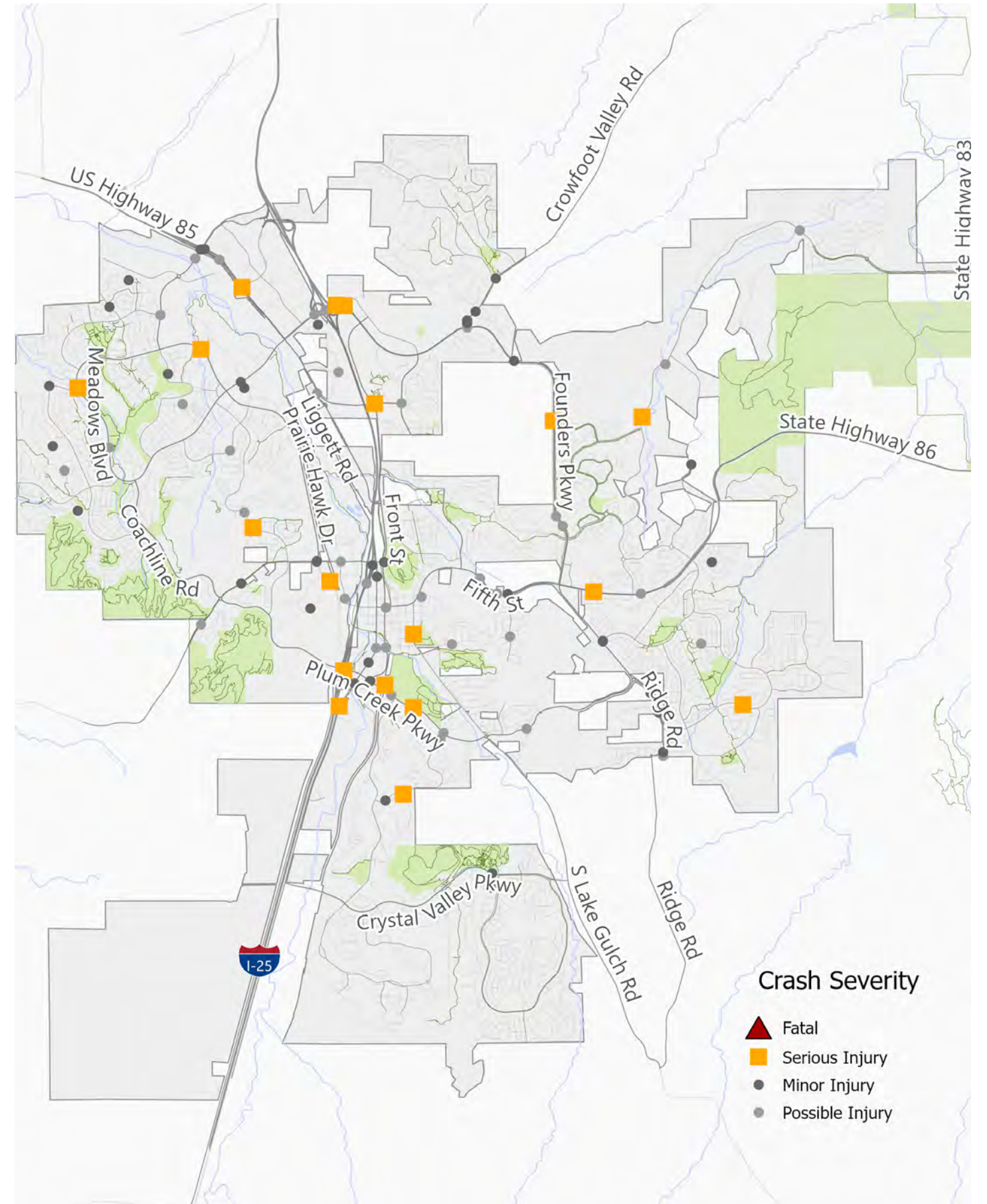
- 11% of total crashes, 25% of KSI
 - 33% involved vehicle movements in the wrong lane
 - 32% involved high speed vehicles (> 35 MPH)
 - 15% involved drivers who were under the influence of alcohol and drugs
 - 11% involved inexperienced drivers



Overturning Crashes

- 1% of total crashes, 10% of KSI
 - **1 in every 8 overturning crashes resulted in death or serious injury**
 - 49% involved vehicle movements in the wrong lane
 - 31% involved high speed vehicles (> 35 MPH)
 - 29% involved drivers who were under the influence of alcohol and drugs
 - 13% involved inexperienced drivers

Figure 10. Roadway Departure Crashes Resulting in Injuries or Deaths, 2018-2022



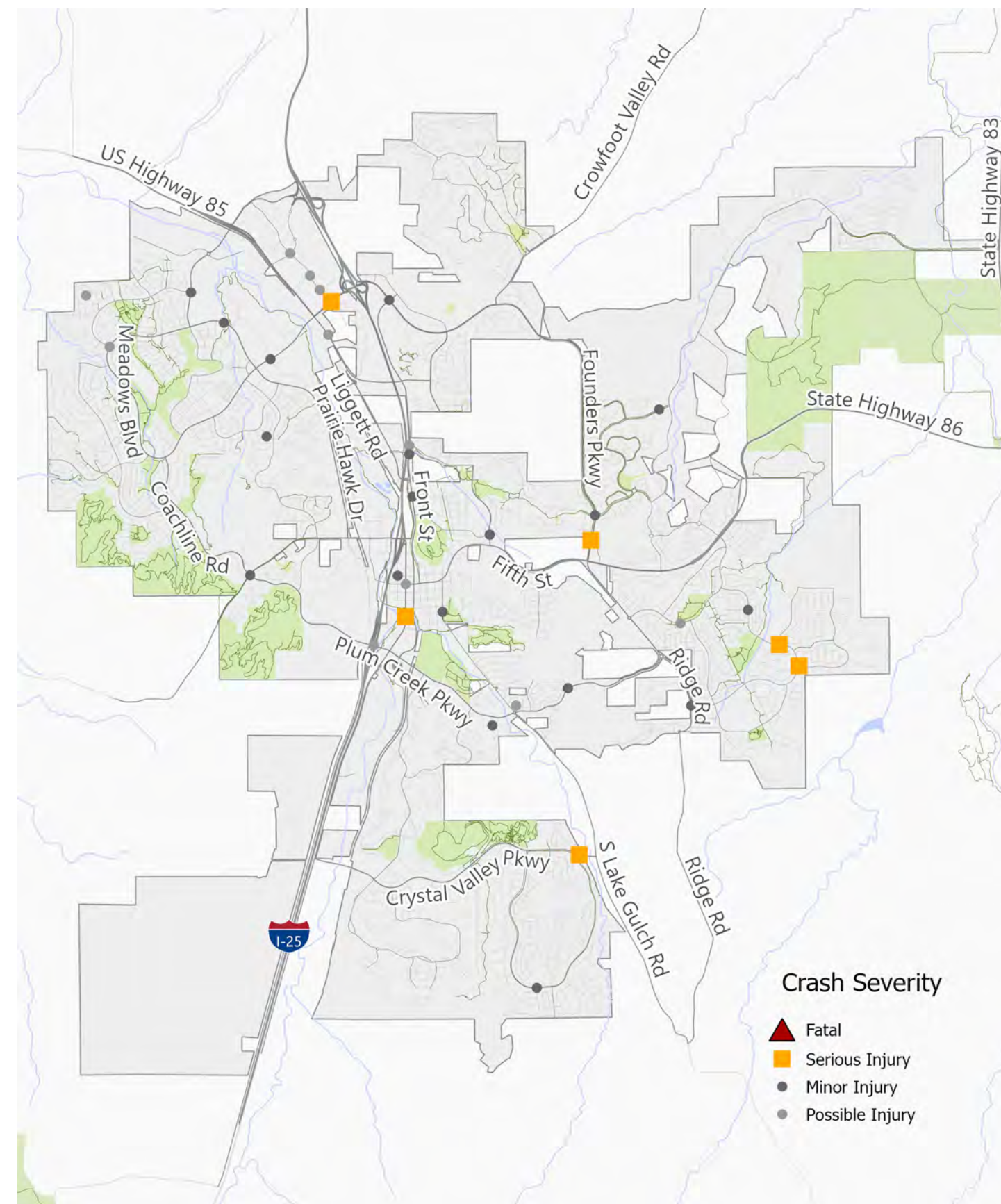


Pedestrians & Bicyclist-involved Crashes

A pedestrian- or bicyclist-involved crash occurs when a pedestrian or bicyclist is struck by a vehicle in a public space, such as a roadway or crosswalk.

- Pedestrian-involved: 0.5% of total crashes, 6% of KSI crashes
 - **1 in 6 pedestrian-involved crashes resulted in death or serious injury**
- Bicyclist-involved crashes: 0.7% of total crashes, 4% of KSI crashes
 - **1 in 15 involved crashes resulted in death or serious injury**

Figure 11. Bicycle and Pedestrian Crashes Resulting in Injuries or Deaths, 2018-2022



Historic Crash Locations & Risk Factor Analysis

The High Injury Network (HIN) includes the street segments that have experienced the highest concentration of serious and fatal crashes in Castle Rock, and the High Risk Network (HRN) includes streets that have been identified with multiple risk factors that lead to serious crashes.

The HIN and HRN networks were developed using two separate analysis processes. The HIN used statistical analysis to identify roads with the most serious crashes by accounting for the frequency of historic KSI crashes over a 5-year period. The HRN predicts potential future crashes based on roadway context by analyzing contextual risk factors present in historic serious and fatal crashes, then applying these factors to all roads in Castle Rock. Combined, these networks are a key tool the Town to prioritize safety projects, focusing interventions on locations where they are likely to have the greatest impact.



Source: Town of Castle Rock

Historic Crash Locations

The historic analysis identified the streets in Castle Rock where a disproportionately high number of fatal and serious crashes happened between 2018 and 2022. The result is the High Injury Network which represents 10% of the Town's streets but accounts for 82% of crashes resulting in serious injury or fatality. These streets have experienced more than one fatal or serious injury crash on every mile of street.

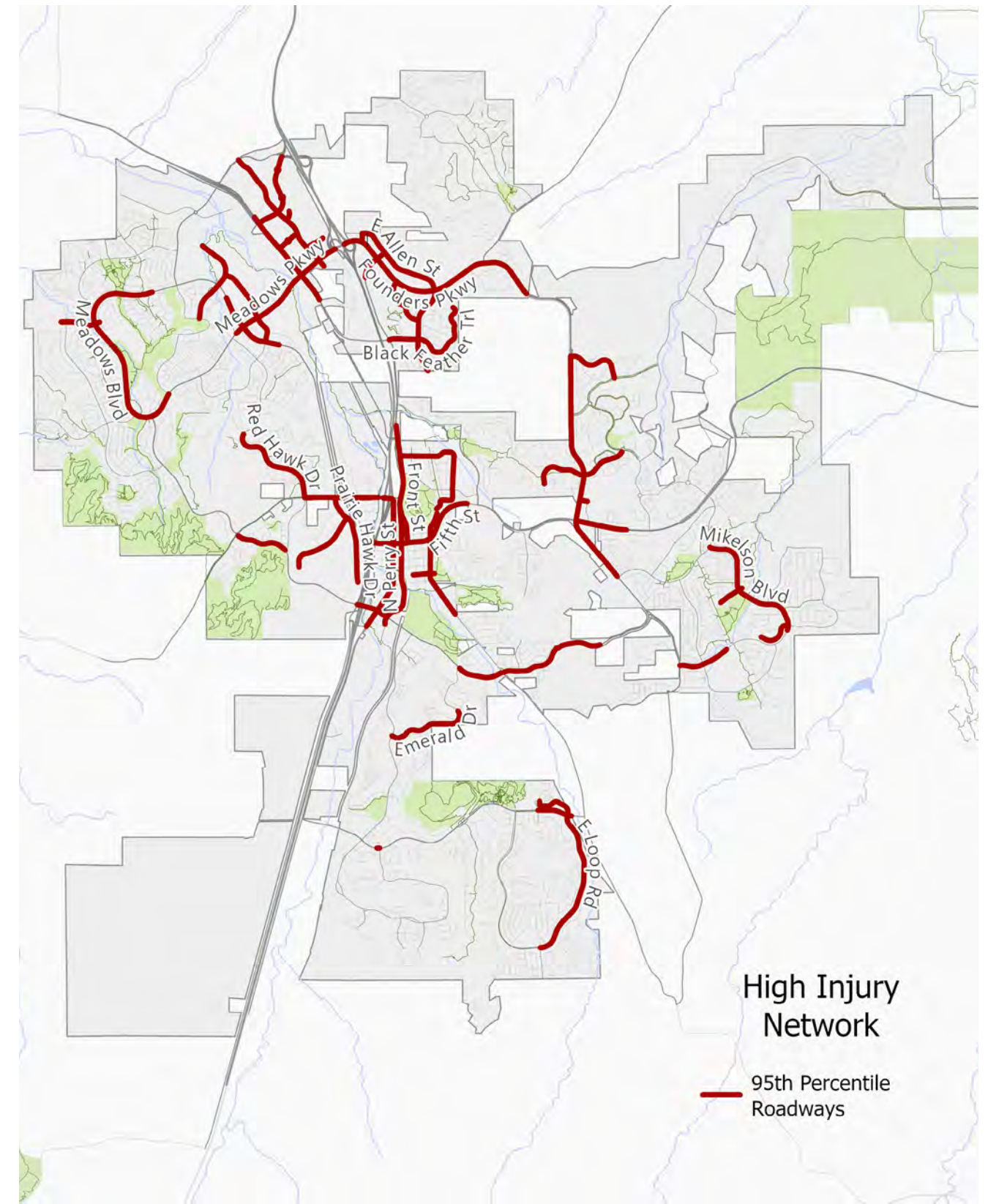


Figure 12. High Injury Network

Risk Factor Analysis

The proactive analysis to identify streets with multiple risk factors was used to identify a high concentration of roadway characteristics that have been most associated with serious crashes in Castle Rock. This analysis provides a statistically significant basis for identifying roads with a higher likelihood of future serious and fatal crashes, even if serious crashes have not occurred as frequently in the past. The result of this analysis is the High Risk Network (HRN.) The HRN frequently overlaps with the High Injury Network but also contains other roadways within Castle Rock. Following Highway Safety Manual and NCHRP 893 guidance, crash data was paired with contextual factors¹.

On each roadway, the presence of just one or two risk factors does not provide enough to have a location included in the HRN, but the more contextual factors present on a road lead to greater certainty that the specific road segment is at a higher risk for serious and fatal crashes. Roads with four or more of the following contextual factors found to be most associated with fatal and serious injury crashes are included in the HRN:

- Lower posted speed, multi-lane roads
- Non-residential highway, arterial, and collector roads
- Intersections with traffic signals
- Locations with a high number of hard braking and quick acceleration events according to Connected Vehicle Data (CVD)
- Business/commercial and multi-family residential areas
- Curvature along high-speed roads
- Locations where community members expressed traffic safety concerns

Including the HRN in prioritizing safety improvements allows for data-driven decisions regarding proactive systemic safety improvements, giving higher priority to roads with multiple contextual risk factors.

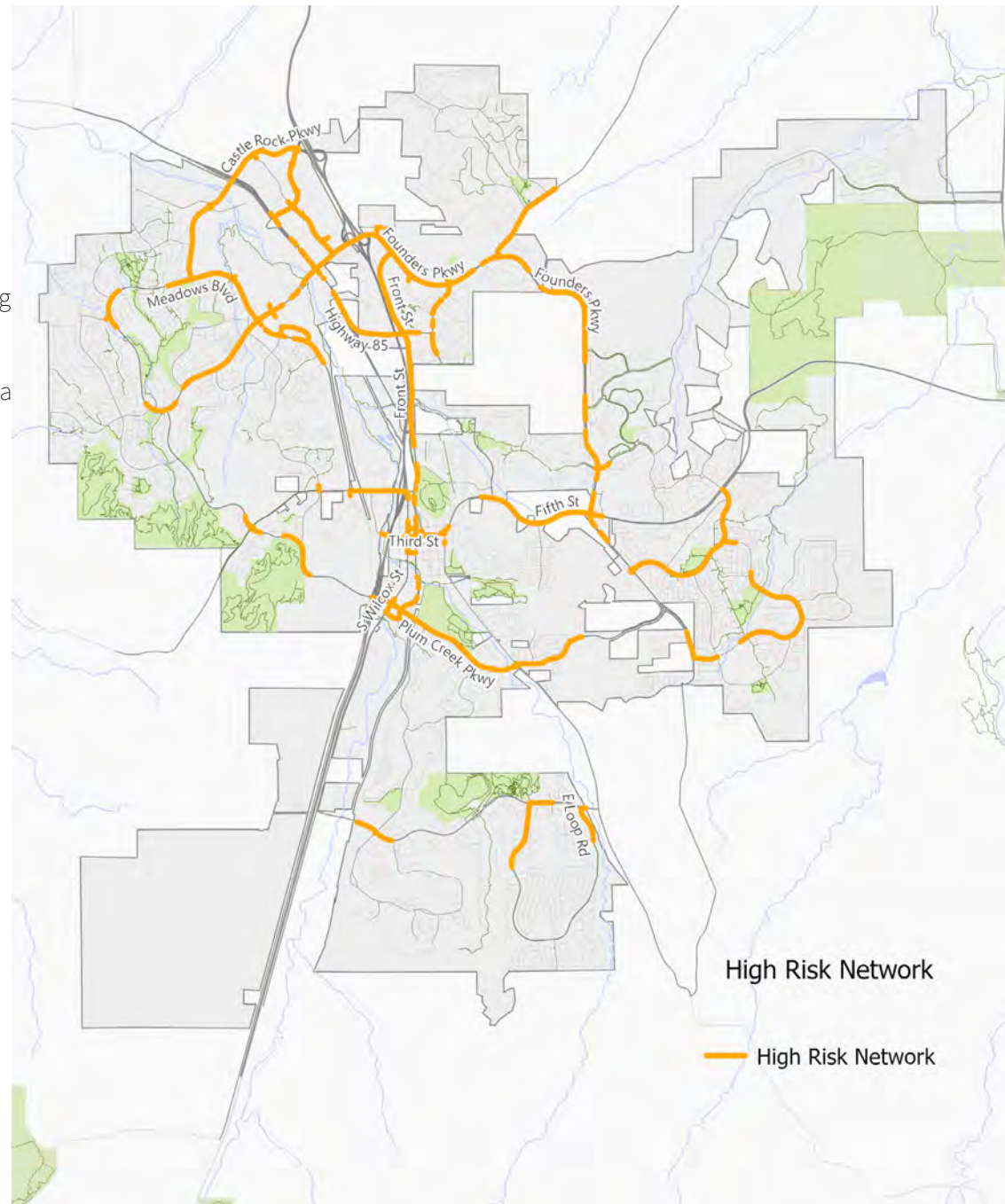


Figure 13. High Risk Network

Castle Rock's High Injury + High Risk Network

The combined High Injury Network and High Risk Network covers only 7% of the Town's streets but accounts for 73% of the crashes in Castle Rock that caused a death or serious injury.

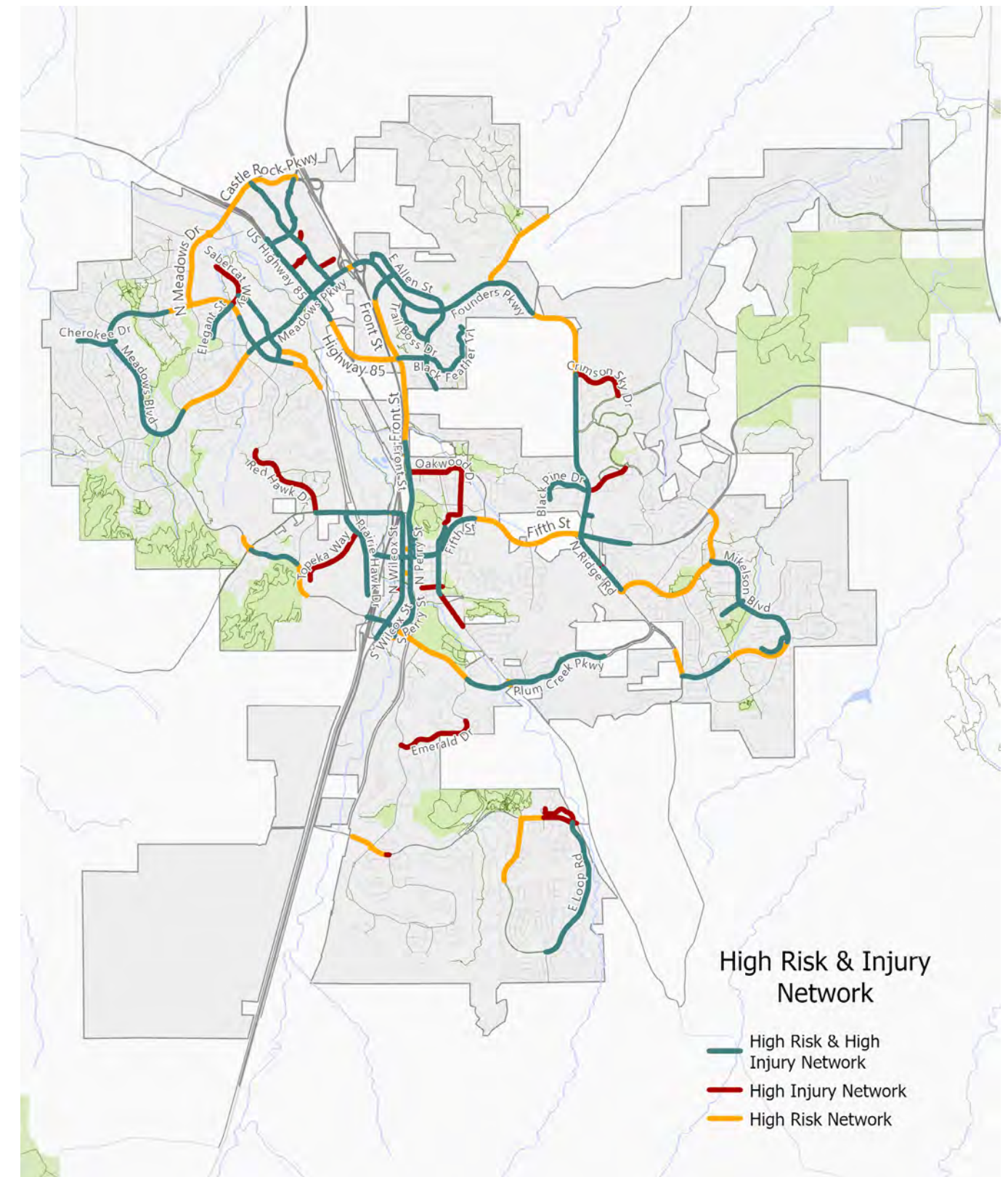


Figure 14. Overlap of HIN with HRN

1 <https://highways.dot.gov/safety/data-analysis-tools/rsdp/rsdp-tools/nchrp-report-893-systemic-pedestrian-safety-analysis>

Community & Stakeholder Input

“Thank you for the effort to obtain community input and for sharing this data”

– Town of Castle Rock Survey Taker

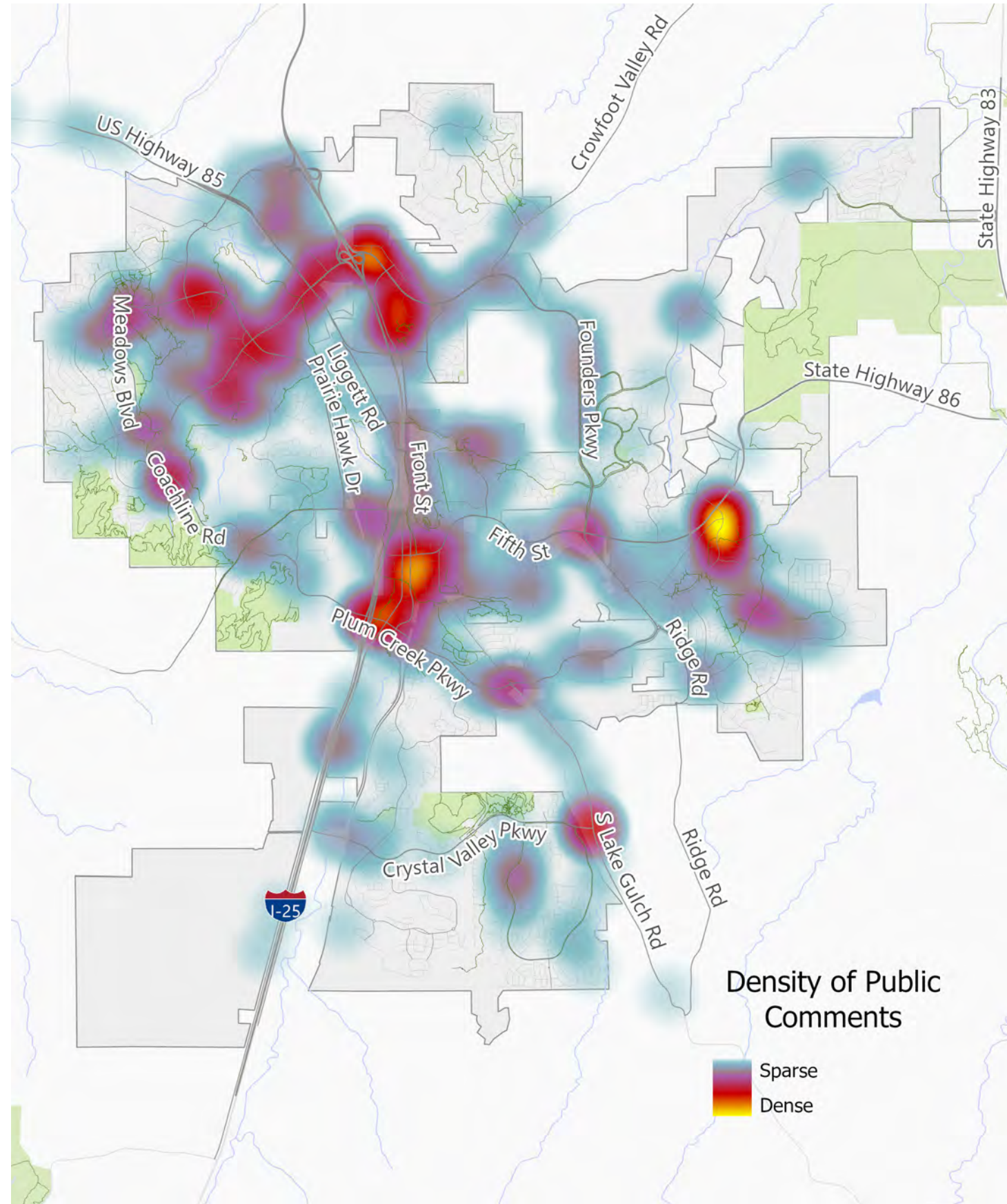
Community engagement helped to identify traffic safety concerns and potential solutions in Castle Rock. The Safe Streets for All project team completed two phases of community engagement and stakeholder engagement to develop the Safe Streets for All Action Plan. In the first phase of outreach, the public was surveyed to best understand their transportation safety concerns and where those concerns were most prominent throughout the Town of Castle Rock. In the second phase of outreach, we introduced the public to a variety of safety countermeasures that could be adopted as part of this project and gauged their opinion on the effectiveness of these countermeasures. All community outreach was gathered to bolster the statistically significant crash analysis and provide additional context to prioritization of mitigations based on the crash analysis.

Identifying Issues – Phase 1 Community Outreach

In early 2024, community members in the Town of Castle Rock were asked to share their traffic safety concerns. The Town hosted an online survey to gather feedback and an interactive online map where people could record location-specific safety concerns. The survey was distributed via Town social media channels and emailed to various stakeholder groups including business groups, homeowners associations, senior centers, developmental disability centers and schools. Our team also hosted a booth at the Castle Rock Recreation Center to encourage people to take the survey. At the end of the comment period, 530 contributions had been made to the interactive online map and 329 people responded to our survey, giving us valuable information on where surveyed community members felt unsafe traveling by foot, bike and/or vehicle. **Appendix A** includes a summary of Phase 1 engagement activities and results. The high response rate is a sufficient sample size to be statistically significant representation of Castle Rock community members with a 95% confidence level. However, the respondents were not sampled to confirm that the same is representative and free from bias.

The top three traffic safety concerns identified through the survey include speeding (63%), distracted driving (41%), and red light or stop sign running (39%). The locations where public comments were received during the mapping process are shown in **Figure 15**. The areas with the most concerns recorded on the map were Meadows Parkway and Founders Parkway which included pedestrian concerns, near miss concerns, and speed concerns.

Figure 15. Density of Public Comments.



Getting Feedback on Solutions – Phase 2 Community Outreach

Town hosted an online survey requesting feedback regarding these safety countermeasures. The survey was again distributed via Town social media channels and emailed to various stakeholder groups including business groups, homeowners associations, senior centers, developmental disability centers and schools. Our team also hosted a booth at the First Friday concert series in Festival Park in early July and engaged in thoughtful discussion with many concertgoers. At the end of the comment period for the second survey, 264 people responded to our survey, which helped add to the statistical crash analysis and document perceptions on which safety countermeasures would be best incorporated in the Town of Castle Rock. Project recommendations are a result of the statistical crash analysis and influenced by public feedback.



Source: Fehr & Peers

While the survey respondents are not necessarily representative of the whole Town, the following was gathered from surveyed respondents during the Phase 2 community engagement effort:

- **91%** of survey respondents were supportive of a speed management program or supportive with a few concerns.
- **92%** of survey respondents were supportive of red-light running countermeasures or supportive with a few concerns.
- On a scale of 1 through 5 (with 5 being “extremely important”):
 - **42%** of survey respondents said it is extremely important that projects with a Level of Service of Safety Score (LOSS) of 3 or 4 are prioritized.
 - **51%** of survey respondents said it was extremely important that projects within the High Injury Network (HIN) or High Risk Network (HRN) were prioritized.
 - **26%** of survey respondents said it was extremely important that priority projects are located on a roadway of High Equity Need.
- The top three intersections that should be prioritized for safety improvements include:
 - **Founders Parkway and Allen Way**
 - **Highway 85 and Promenade Parkway**
 - **Factory Shop Boulevard and New Beale Street**

Stakeholder Engagement

In addition to the core Town staff that were involved in the development of this plan, additional stakeholders were included during the phases of plan development to ensure coordination with Castle Rock Police Department, Fire and Rescue, traffic operations, Geographic Information Systems, and other Town leadership. Members of these groups coordinated on the projects and programs and guided recommendations in this action plan.

Engagement also included coordination with regional partners to coordinate regional goals, partnership opportunities, and other relevant regional safety projects as well as gather input to guide recommendations. Regional partners who were invited to participate included representatives from the Douglas County School District and the Colorado Department of Transportation.



Source: Town of Castle Rock

Crash Profiles & Safety Intervention Toolbox

“I support improvements that allow law enforcement to focus on more important, non-traffic safety concerns”

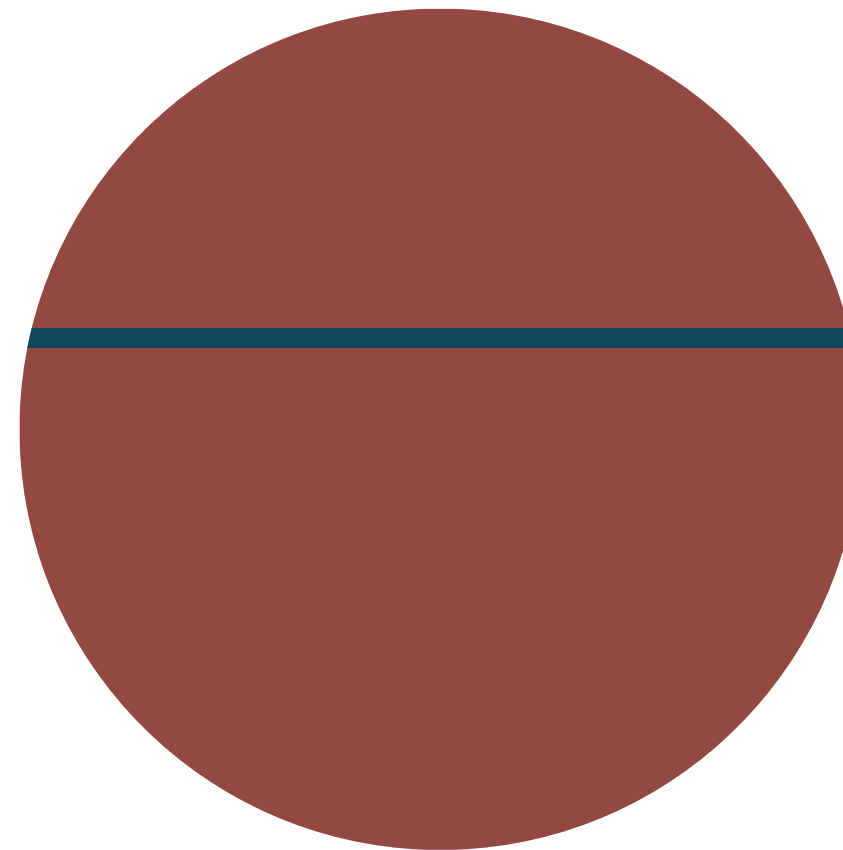
– Town of Castle Rock Survey Taker

Five crash profiles were identified in Castle Rock that represent the most common crash types that result in fatal and serious injury crashes. Collectively, these crash types represent 90% of serious crashes that occurred in Castle Rock from 2018 to 2022.

- **Profile 1: Pedestrian & Bicyclist-Involved Crashes**
- **Profile 2: Roadway Departure Crashes – Fixed Objects & Overturning Crashes**
- **Profile 3: Broadside Crashes & Approach Turn Crashes at Unsignalized Intersections**
- **Profile 4: Broadside Crashes & Approach Turn Crashes at Signalized Intersections**
- **Profile 5: Rear-End Crashes**

Identifying these crash profiles helps determine the most effective safety countermeasures for locations that have experienced or may experience these types of serious or fatal crashes. Each crash profile includes a list of engineering safety interventions that the Town can apply to mitigate the crash, with descriptions provided in the Safety Interventions section below. A toolbox of relevant safety interventions is also provided in **Appendix B**.

Profile 1: Pedestrian & Bicyclist-Involved Crashes



Common Factors:

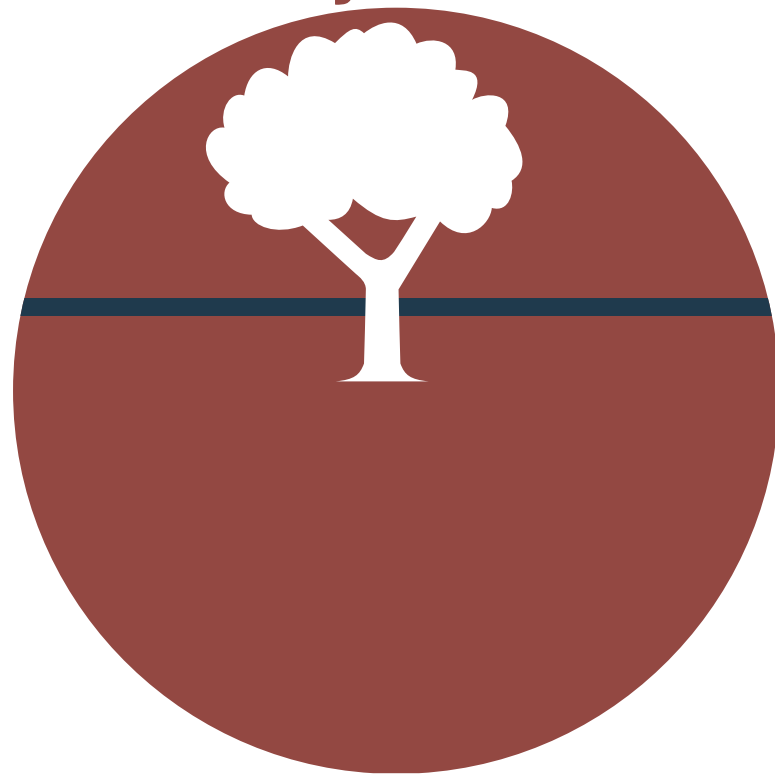
- Lack of Infrastructure
- Long Crossing Distance
- Failure to Yield ROW

Potential Safety Interventions:

- Dedicated Bike Lanes and Sidewalks
- Crosswalk Improvements
- Curb Extensions
- Pedestrian Refuge Island
- Leading Pedestrian Interval
- Rectangular Rapid Flashing Beacon
- Pedestrian Hybrid Beacon/Traffic Signal
- Traffic Calming Measures



Profile 2: Roadway Departure Crashes - Fixed Objects & Overturning Crashes



Common Factors:

- Speeding
- Poor Curve Visibility
- Distracted Driving

Potential Safety Interventions:

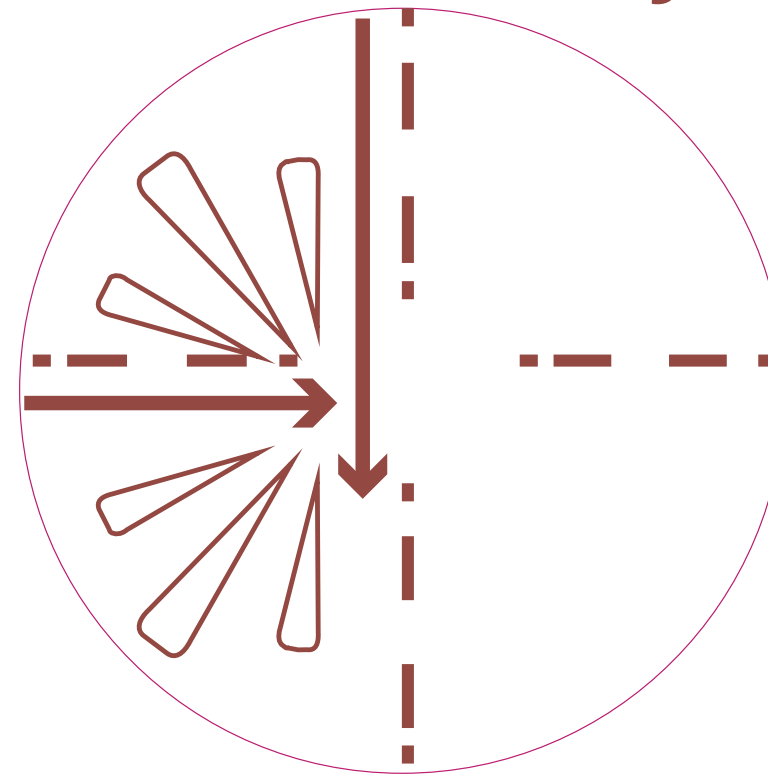
- Self-enforcing Roadway Designs that naturally encourage safe driving speeds through design and visual cues
- Traffic Calming Measures
- Advance Warning Signs
- Object Markers
- Lighting Enhancement

12%
of All
Crashes

14%
of Injury
Crashes

35%
of KSI
Crashes

Profile 4: Broadside Crashes & Approach Turn Crashes at Unsignalized Intersections



Common Factors:

- Poor Visibility
- Failure to Yield ROW
- Drivers Inattentiveness

Potential Safety Interventions:

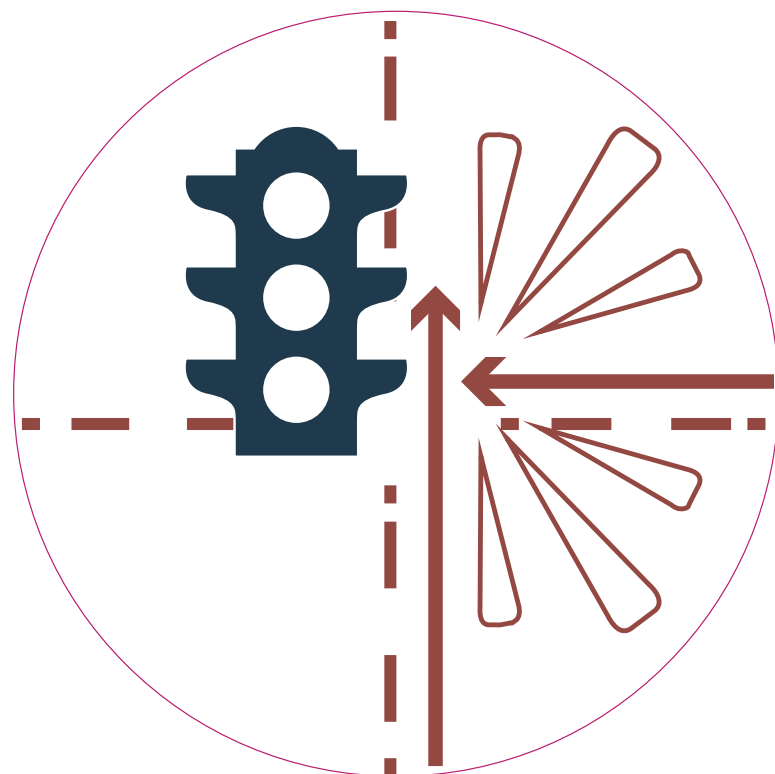
- Clear Sight Triangle
- Positive Offset Left-Turns
- All Way Stop Control
- Traffic Signal
- Roundabout
- Flashing Beacon
- Intersection Conflict Warning System

14%
of All
Crashes

17%
of Injury
Crashes

22%
of KSI
Crashes

Profile 3: Broadside Crashes & Approach Turn Crashes at Signalized Intersections



Common Factors:

- Poor Signal Visibility
- Poor Signal Timing & Phasing
- Signal Violation

Potential Safety Improvements:

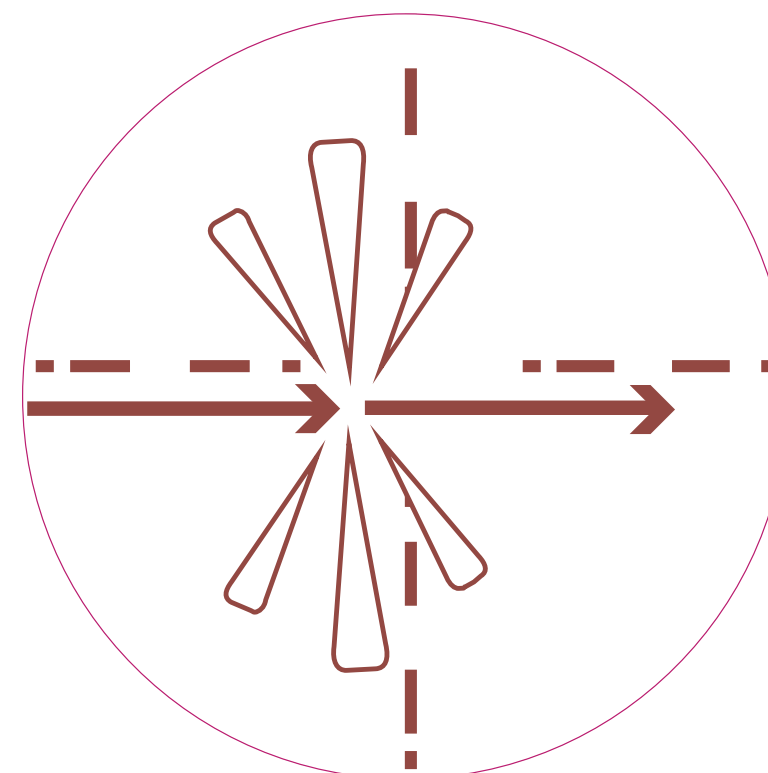
- Additional Signal Head
- Retro-reflective Backplates
- Protected Left-turn Phase
- Signal Coordination
- Yellow and Red Clearance Intervals
- Advanced Dilemma-Zone Detection
- Detection-based Red Clearance Extension

11%
of All
Crashes

17%
of Injury
Crashes

16%
of KSI
Crashes

Profile 5: Rear-End Crashes



Common Factors:

- Heavy Traffic Conditions
- Speeding
- Weather Conditions
- Tailgating

Potential Safety Investments:

- Adaptive Signal Control
- Signal Coordination
- Self-Enforcing Roadway Designs
- Traffic Calming Measures
- Improved Pavement Friction

31%
of All
Crashes

31%
of Injury
Crashes

8%
of KSI
Crashes

Consolidated Safety Countermeasures

The Safe System Approach is a multifaceted strategy to create safer streets. The following list of consolidated safety interventions provide a toolbox the Town of Castle Rock can apply at strategic locations or systemically across the Town's transportation system to create safer roads.

The interventions are physical and operational changes designed to reduce the occurrence of the common serious crash types observed in Castle Rock. These changes encourage safer behaviors among all roadway users and enhance safe travel for the most vulnerable users, especially pedestrians and bicyclists. The primary goal of the interventions are to reduce speed, improve visibility, and minimize potential conflict points between users. Implementation of these consolidated safety countermeasures at specific locations is documented in the implementation chapter and based on statistical crash analysis at the locations.

Some interventions are more complex requiring more intervention while others are simpler fixes. To reduce the potential of impacting emergency response vehicles, interventions need to be evaluated at each location to identify any potential emergency response or access concerns.

Dedicated Bike Lanes and Sidewalks



Sidewalk

Adding sidewalks provides a separated and continuous facility for people to walk along the roadway.



Shared-Use Path

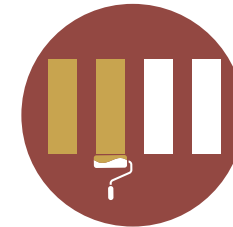
Shared-use paths or trails are off-street facilities that provide exclusive use for nonmotorized travel, including bicyclists and pedestrians. They could be located alongside a roadway or exist in a separate right-of-way.



Bike Lane

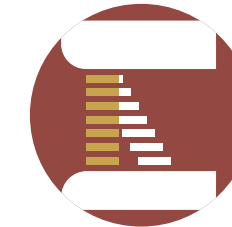
Bike lanes designate an exclusive space for bicyclists using pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic.

Pedestrian/Bicycle Crossing



High-Visibility Crosswalk

A high-visibility crosswalk has a striped pattern with ladder markings made of high-visibility material, such as thermoplastic, instead of paint. A high-visibility crosswalk improves the visibility of marked crosswalks and provides motorists with a cue to slow down.



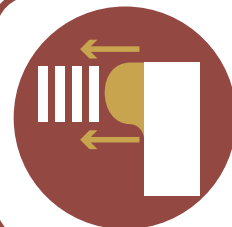
Setback of Shared-Use Path

Setback refers to positioning the shared-use path at a certain distance from the main roadway to enhance visibility, reduce conflicts, and allow sufficient reaction time between drivers, bicyclists, and pedestrians.



Pedestrian Refuge Medians

A raised median, or refuge island, is a raised barrier in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection.



Curb-Extension

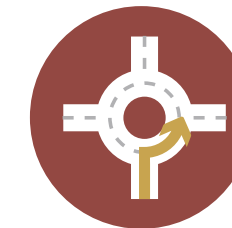
A curb extension is a traffic calming measure that widens the sidewalk for a short distance to shorten the pedestrian crossing. This reduces the crossing distance and allows pedestrians and drivers to see each other when parked vehicles would otherwise block visibility.

Intersection Control



Install Traffic Signal

Traffic signals at intersections control the flow of traffic by assigning right-of-way to different movements at different times. Some traffic signal phasing is more effective at reducing the likelihood of serious injury collisions.



Roundabout

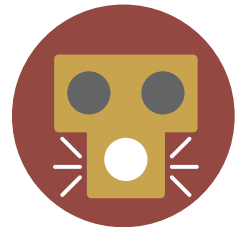
A roundabout is a type of circular intersection in which road traffic is permitted to flow in one direction around a central island, and priority is typically given to traffic already in the junction. The geometry of a roundabout forces drivers to reduce speeds as they proceed through the intersection; the range of vehicle speeds is also narrowed, reducing the severity of crashes when they do occur.



All-Way Stop Control

An all-way stop-controlled intersection requires all vehicles to stop before crossing the intersection. An all-way stop controlled intersection reduces the risk of severe conflicts as long as all road users see and obey the stop signs.

Pedestrian/Bicycle Signal



Pedestrian Hybrid Beacon

A pedestrian-hybrid beacon (PHB) is used at unsignalized intersections or mid-block crosswalks to notify oncoming motorists to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB only illuminates when a pedestrian activates it via a pushbutton.



RRFB

A rectangular rapid flashing beacon (RRFB) is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. An RRFB increases the visibility of marked crosswalks and provides motorists with a cue to slow down and yield to pedestrians.



Extend Walk Phase

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations, such as children and older adults.



Leading Pedestrian Interval

A leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green light. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right. A leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right.

Roadway Departure



Improved Pavement Friction

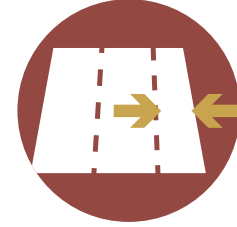
High friction surface treatments improve a vehicle's ability to stay on the roadway as well as come to a stop over a shorter distance. The treatment can be used to help address roadway departure crashes and/or intersection crashes on approach to signalized or unsignalized intersections.



Safety Edge

A safety edge is a treatment intended to minimize the severity of roadway or lane departure crashes. With this treatment, the shoulder pavement edge is sloped at an angle (30-35 degrees) to make it easier for a driver to safely reenter the roadway after inadvertently driving onto the shoulder.

Speed Management



Lane Narrowing

Lane narrowing reduces the width of the marked vehicle lanes to encourage motorists to travel at slower speeds. Lane narrowing can also help reallocate existing roadway space to other road users.



Reducing Posted Speed Limit

Reducing a posted speed limit is a traffic management strategy aimed at enhancing safety, especially in areas with higher pedestrian activity, accident history, or changing road conditions. An engineering evaluation is needed to support reducing posted speeds at specific locations.



Speed Table

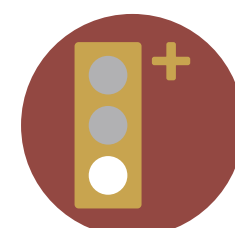
These traffic calming devices use vertical deflection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds.



Speed Feedback Sign

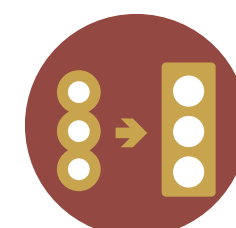
A speed feedback sign notifies drivers of their current speed, usually followed by a reminder of the posted speed limit. A speed feedback sign provides a cue for drivers to check their speed and slow down. Continuous use of these signs may lead to less effectiveness over time. An engineering evaluation is needed to support reducing posted speeds at specific locations.

Signal Head Visibility Improvement



Additional Signal Head

Additional signal heads allow drivers to anticipate signal changes farther away from intersections. Supplemental traffic signals may be placed on the near side of an intersection, far-left, far-right, or very high.



Retroreflective Backplates

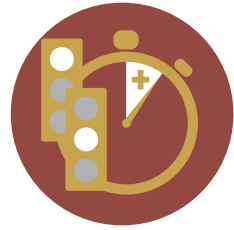
Retroreflective borders enhance the visibility of traffic signals for aging and color vision impaired drivers enabling them to understand which signal indication is illuminated.

Signal Timing & Phasing



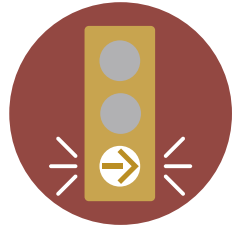
Signal Coordination

Signal coordination is a strategy that synchronizes signals along a corridor to reduce stoppage time for vehicles. This can improve the flow of traffic and reduce frustration for drivers.



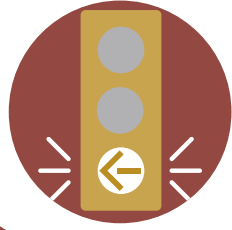
Yellow and Red Intervals

Extending yellow and all red time allows drivers a few additional seconds at the end of a signal phase to cross through a signalized intersection.



Protected Right-Turn

Prohibiting right-run-on-red movements can help prevent crashes between vehicles turning right on red from one street and through vehicles on the cross street, and crashes involving pedestrians. Protecting this movement increases compliance over just signing a right-turn-on-red prohibition.



Protected Left-Turn

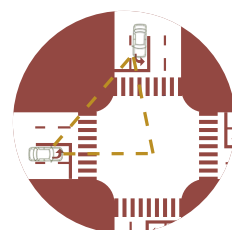
A protected left turn can be implemented at signalized intersections (with existing left turns pockets) that currently have a permissive left-turn or no left-turn protection. Providing protected left-turn phases for signalized intersections removes the need for the drivers to navigate through gaps in oncoming/opposing through vehicles. This treatment can be implemented all day or only during peak periods when available gaps in traffic are less frequent.

Sight Distance



Lighting

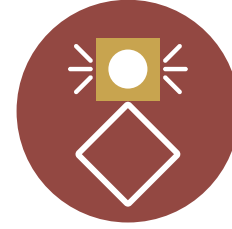
Providing roadway lighting increases driver awareness and can improve visibility of other road users and/or objects in the roadway.



Remove Visibility Obstructions

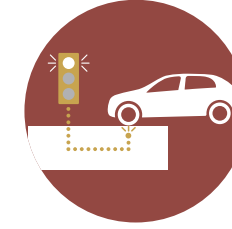
Clearing a sight triangle involves removing or relocating obstructions within the designated triangular area at an intersection to ensure that drivers, pedestrians, and bicyclists have a clear view of oncoming traffic.

Signal Violation Measures



Flashing Beacon as Advance Warning

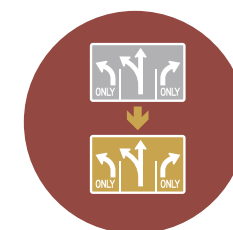
A flashing beacon as advanced warning is a blinking light with signage to notify motorists of an upcoming intersection or crosswalk. This treatment is more effective when activated with a signal or intersection queue to warn about stopped traffic or with a right light.



Advanced Dilemma-Zone Detection

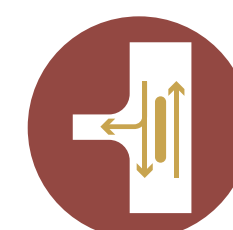
The advanced dilemma-zone detection system adjusts the start time of the yellow-signal phase (i.e. earlier or later) based on observed vehicle locations and speeds. It minimizes the number of drivers that are faced with the dilemma of determining if they should stop or drive through the intersection based on their speed and distance from the intersection.

Turning Movement Improvement



Signs and Marking Improvements

Intersection signs and markings improvement refers to the process of enhancing the visibility, clarity, and effectiveness of traffic signs and pavement markings at intersections to promote safety and improve traffic flow.



Median Modification to Restrict/Improve Turning Movements

A directional median opening restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. A directional median opening to restrict left turn improves safety by reducing the number of conflict points.

Table 1: Matching Safety Interventions and Crash Types

Counter Measures	Pedestrian & Bicyclist-Involved Crashes			Roadway Departure Crashes - Fixed Objects & Overturning Crashes			Broadside & Approach Turn Crashes at Signalized Intersections			Broadside & Approach Turn Crashes at Unsignalized Intersections			Rear-End Crashes		
	Lack of Infrastructure	Inappropriate Crossing Distance	Failure to Yield ROW	Speeding	Poor Curve Visibility	Distracted Driving	Poor Signal Visibility	Poor Signal Timing & Phasing	Signal Violation	Poor Visibility	Failure to Yield ROW	Drivers Inattentiveness	Heavy Traffic Conditions	Speeding	Weather Conditions
Install Sidewalk	●														
Install Shared-Use Path	●														
Install Bike Lane	●														
Install High Visibility Crosswalk			●												
Setback of Shared-Use Path			●												
Pedestrian Refuge Medians		●													
Curb Extension		●		●									●		
Install Pedestrian Hybrid Beacon			●												
Install Rectangular Rapid Flashing Beacon			●												
Leading Pedestrian Interval			●												
Extend Walk Phase Signal Timing			●												
Improved Pavement Friction				●									●	●	
Safety Edge						●									
Lane Narrowing				●									●		
Reduce Posted Speed Limit				●									●		
Install Speed Table			●	●									●		
Speed Feedback Sign				●									●		

Counter Measures

Counter Measures	Pedestrian & Bicyclist-Involved Crashes			Roadway Departure Crashes - Fixed Objects & Overturning Crashes			Broadside & Approach Turn Crashes at Signalized Intersections			Broadside & Approach Turn Crashes at Unsignalized Intersections			Rear-End Crashes		
	Lack of Infrastructure	Inappropriate Crossing Distance	Failure to Yield ROW	Speeding	Poor Curve Visibility	Distracted Driving	Poor Signal Visibility	Poor Signal Timing & Phasing	Signal Violation	Poor Visibility	Failure to Yield ROW	Drivers Inattentiveness	Heavy Traffic Conditions	Speeding	Weather Conditions
Lighting	●				●		●			●			●		
Remove Visibility Obstructions					●		●			●			●		
Signal Coordination								●	●				●		
Signal Re-phasing (Extend Yellow & All Red)								●	●						
Protected Left-Turn Operations								●							
Protected Right-Turn Operations								●							
Install Traffic Support			●								●				
Roundabout			●	●				●		●			●	●	
All-Way Stop Control			●	●						●			●	●	
Additional Signal Head							●								
Retroreflective Backplates							●								
Flashing Beacon as Advance Warning				●			●					●		●	
Advance Dilemma-Zone Detection				●				●						●	
Signs and Marking Improvements			●		●						●				
Median Modification to Restrict/ Improve Turning Movements											●				

Inclusion Considerations

“Thank you for working so hard to keep our community safe.”

– Town of Castle Rock Survey Taker

Castle Rock developed an inclusion index for this action plan to identify roadways that people are likely to be using to access essential services. This inclusion index will be used as a prioritization factor for projects outlined in this plan.

The Castle Rock inclusion index layers demographic data with a roadway’s proximity to inclusion-related destinations. Inclusion-related destinations serve lower-income residents, seniors, and residents and businesses in older neighborhoods and include destinations such as schools, bus stops, and senior centers. Although the US Department of Transportation has developed an equity index¹ to help identify historically under served areas, this tool does not provide the level of detail needed to understand the nuanced travel behaviors of residents and visitors of Castle Rock. In addition, travelers who rely on the road network are not exclusively Castle Rock residents and may have different demographic backgrounds than Castle Rock residents.

Figure 16 shows the inclusion index scores of all roadways in Castle Rock. The following inclusion-related destinations were used to calculate the inclusion index:

- Schools
- Government and social service buildings (e.g., libraries, Special Supplemental Nutrition Program for Woman, Infants, and Children (WIC) grocery stores, community centers)
- Lower-wage jobs (jobs that pay less than \$3,333/month²)
- Low-income or senior housing

Demographic data used to calculate the inclusion index includes the following:

- Denver Regional Council of Governments equity score, which includes factors such as income, age, race and ethnicity.
- Colorado Department of Public Health and Environment EnviroScreen score for pollution and climate burden, which integrates environmental exposures to pollution and climate change vulnerability.

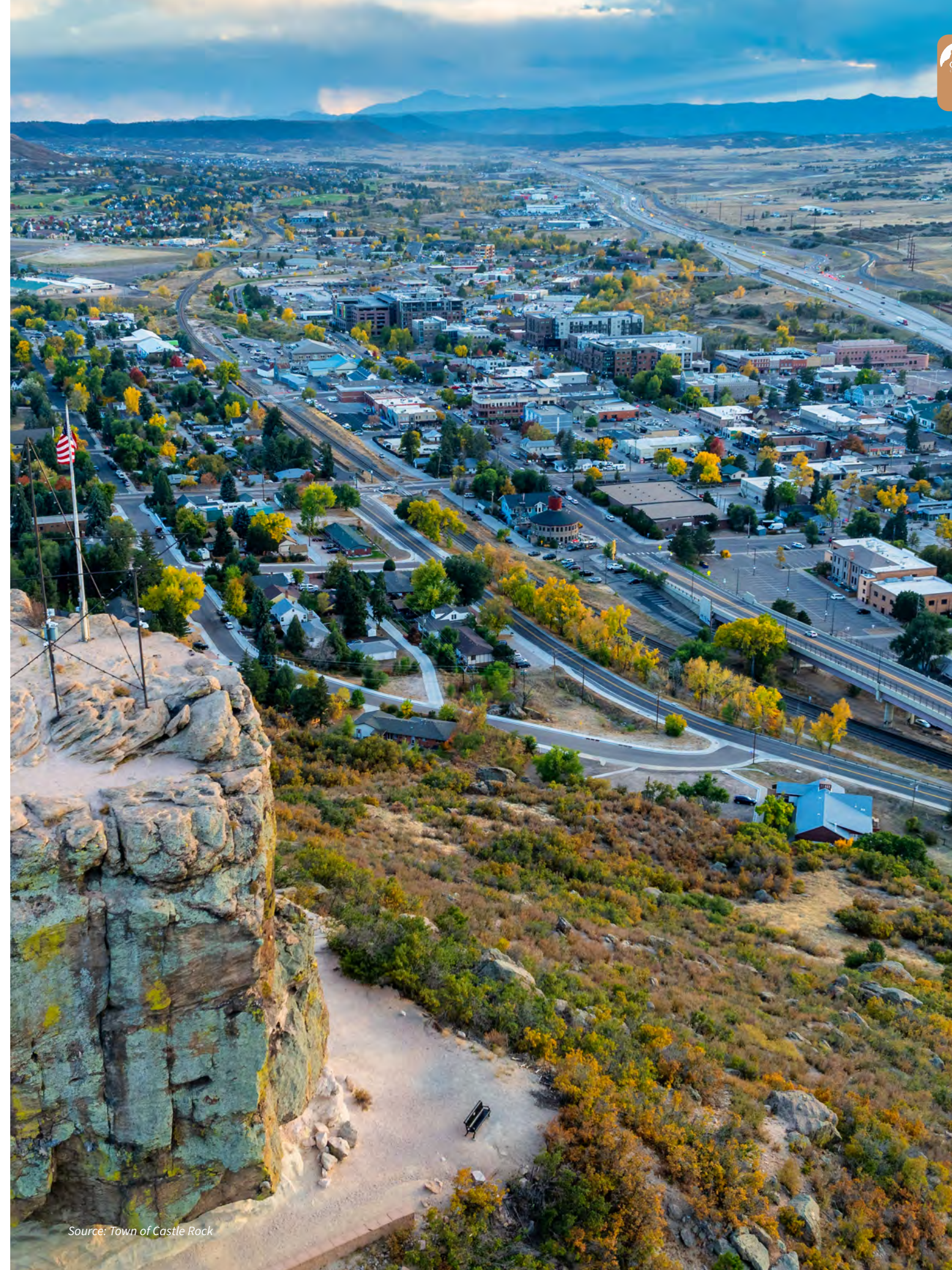
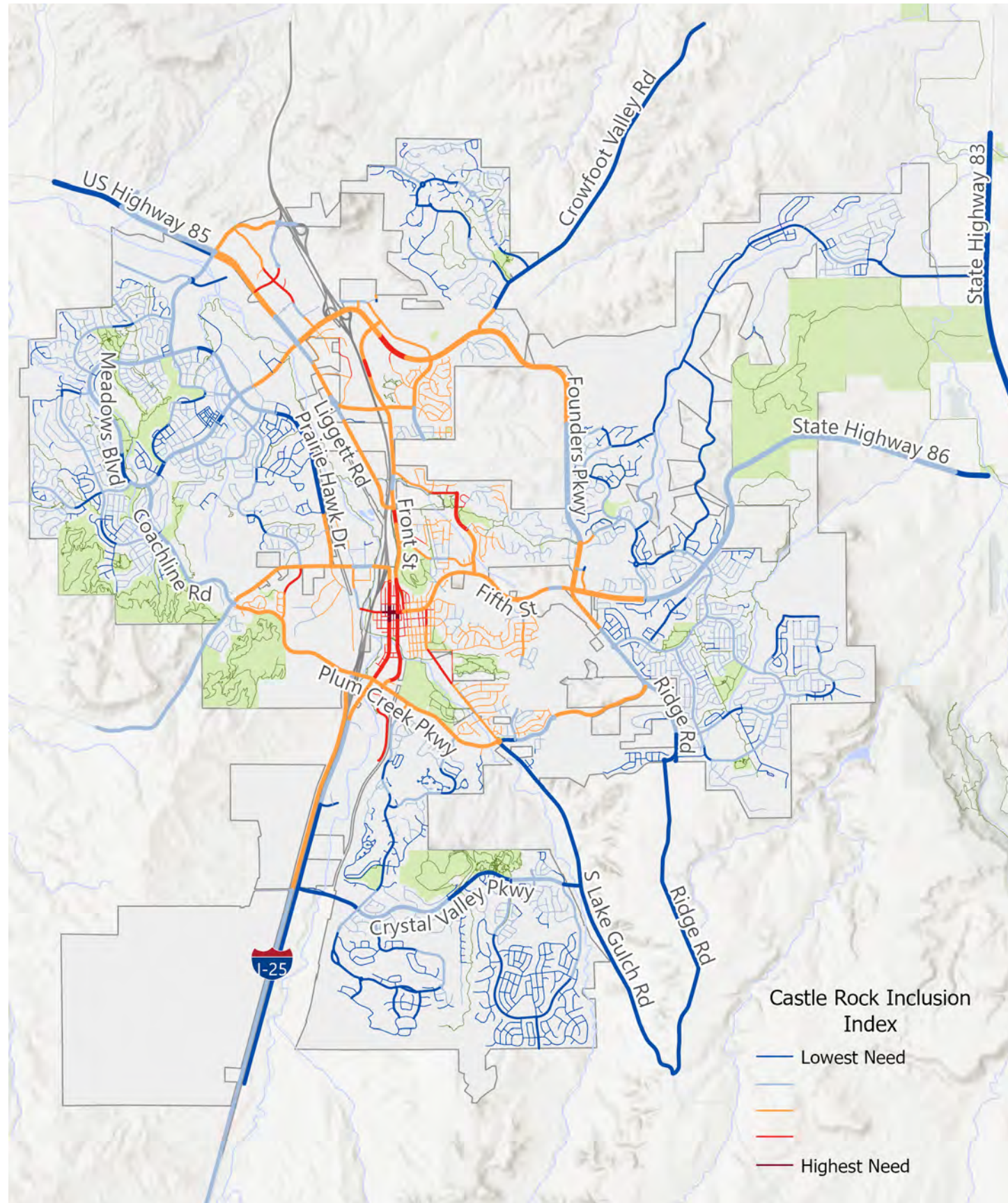
Each street segment in Castle Rock received an inclusion score based on proximity to these inclusion-related destinations, with more nearby destinations resulting in higher scores. To account for demographic variables, a point was added to any street that fell within areas with a relatively high DRCOG equity index score or high CDPHE pollution and climate burden score.

This approach is not exhaustive of all inclusion-related destinations and demographic factors that shape road users’ vulnerability and may overlook areas that have historically experienced under-investment. Compared to existing indices, however, Castle Rock’s inclusion index provides the level of detail and nuance needed to inform the Town’s investment in safer streets.

¹ US Department of Transportation. 2023. Equitable Transportation Community Explorer. Available at <https://www.transportation.gov/priorities/equity/justice40/etc-explorer>.

² The living wage in Douglas County is \$4,676/month. Job data are from the 2021 US Census Longitudinal Employer-Household Dynamics dataset.

Figure 16. Castle Rock Inclusion Index by Road Segment



Source: Town of Castle Rock

Action Plan

“I hope this plan comes to fruition and improvements are made to the Castle Rock area”

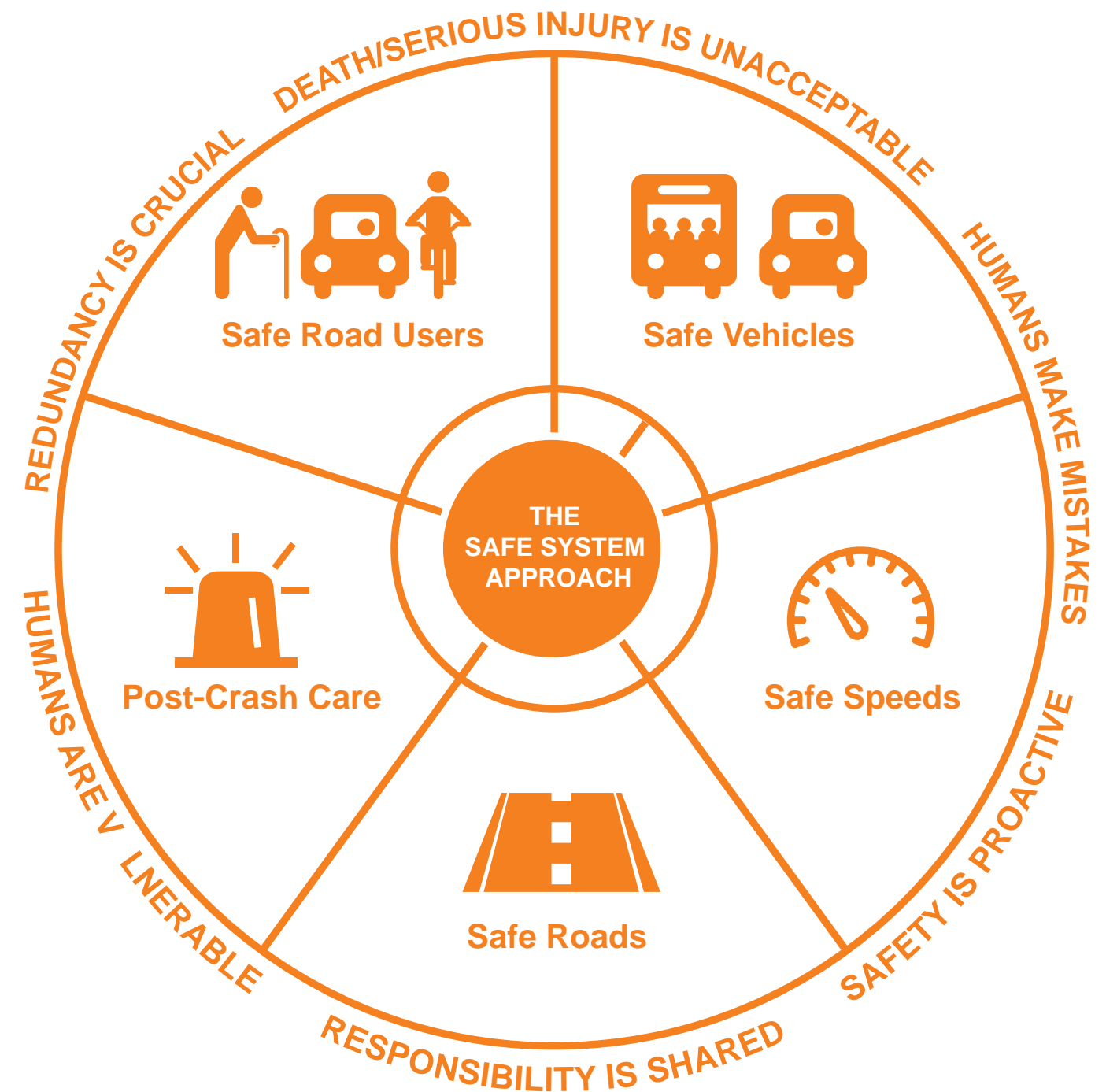
- Town of Castle Rock Survey Taker

Castle Rock is committed to reducing serious and fatal crashes and has outlined a path to achieve this goal. Recommended actions outlined in this section identify the responsible party, partners to collaborate with, and timeline to help the Town meet the goals. Many of the actions in this plan will be a collaborative effort of multiple departments within the Town as well as other agencies. Castle Rock Public Works will lead the implementation of this plan.

Safe System Approach Oriented Action Plan

The Action Plan is organized according to the five principles from the Safe System Approach that can comprehensively address safety within the road system. There are things Castle Rock has influence on to improve safety on the Town’s roads by responding to each of these five principles with actions that the Town can influence.

Because the Town has more influence on road design, construction, and enforcement, the biggest area of influence for the Town to increase safety falls within the “Safer Roads” and “Safer Speeds” principles of the Safe System Approach. While many of the actions and funds will be directed at these two elements, Castle Rock will also act as appropriate and feasible to support safer people, safer vehicles, and post-crash care.



Safer Roads

Design roadway environments to mitigate human mistakes and account for injury tolerances, to encourage safer behaviors, and to facilitate safe travel by the most vulnerable users.

Action	Description	Responsible Party	Partners	Target*
Capital Projects				
Implement Safety Interventions at Priority Project Locations	See the Prioritization Guide in Chapter 7.	Public Works		2030
Implement Systemic Safety Interventions Across the Town	See Systemic Safety Interventions.	Public Works		2040
Implement Quick-Build Solutions	Develop and deploy quick-build solutions—such as temporary barriers, paint, or signage—to rapidly address urgent safety issues while more permanent infrastructure changes are being planned. These solutions provide immediate benefits and allow for real-time testing and community feedback. Quick build solutions will typically be recommended by the Rapid Responses Team to serious crashes.	Public Works	Police	2035
Policy & Funding				
Prioritize Safety in Capital Improvement Projects	Embed safety as a high priority in the Capital Improvement Project process, ensuring that infrastructure investments contribute to safer transportation systems.	Public Works		2030
Update Transportation Design Criteria Manual with Safe System Principles	Review and update Transportation Design Criteria Manual with a focus on reducing traffic fatalities and serious injuries through design and policy changes. This should include left-turn and right-turn policies (to prioritize protected turns), signal timing (crosswalks, LPI, etc.), and target operating speed among others, all known to reduce or eliminate serious injury and fatal crashes.	Public Works		2030
Prioritize Safety in Street Improvement Projects Triggered by Development	Update Traffic Impact Analysis standards to ensure that street improvement projects triggered by new developments incorporate safety enhancements in alignment with technical standards and Road to Zero goals.	Public Works	Developers	2030
Evaluate Options for Dedicated Sustainable Revenue Stream for Safety Projects	Consider prioritizing a safety focused sustainable annual capital projects funding source for implementing high priority projects, systemic safety improvements, and to match grant funding opportunities.	Public Works	Staff and by approval, Town Council	2026
Reference Transportation Master Plan and DRCOG Active Transportation Plan	Utilize the DRCOG Active Transportation Plan and Castle Rock Transportation Master Plan to address gaps in the sidewalk and bike network.	Public Works	DRCOG	2030
Enforcement & Education				
Combine Safety Improvements with Events	When resources exist, pair safety improvement projects with planned community events to raise awareness and encourage public engagement in road safety efforts.	Public Works	Communications	Ongoing

Action	Description	Responsible Party	Partners	Target*
Maintain and Regularly Update Crash Dashboard	Regularly update the community about traffic safety initiatives and programs using the online crash dashboard.	Public Works	Communications	Ongoing
Collaboration				
Evaluate Options for Public Engagement	Develop and maintain an interactive map where residents can report locations with safety issues.	Public Works		2026
Collaborate with Internal Stakeholders	Regularly coordinate between traffic, Police Department, Fire and Rescue, and school districts on safety improvements	Public Works	Police Department, Fire and Rescue, Communications	Ongoing
Performance Monitoring & Reporting				
Monitor Crash Data Before and After Safety Improvements with Ongoing Crash Statistics Report	Continue to produce a report that provides crash data that shows injury and fatality frequency trends. Include analysis of crash data before and after implementing safety improvements to measure effectiveness and guide future interventions.	Public Works	CDOT	Biennially

*Target time frames are subject to resource availability.

Safer Speeds

Promote safer speeds in all roadway environments through a combination of thoughtful and context-appropriate roadway design, appropriate speed-limit setting, targeted education, outreach campaigns, and enforcement.

Action	Description	Responsible Party	Partners	Target*
Policy & Funding				
Use Safe System Approach to Re-evaluate Posted Speed Limits on Roadways Identified for Speed Management	Establish context-based target operating speeds on streets identified for speed management and lower speed limits as appropriate to match those targets. Pair with appropriate design and enforcement measures, to reduce the likelihood and severity of crashes.	Public Works	CDOT	2030
Enforcement & Education				
Explore Advanced Technology Systems and Enforcement	Explore the use of technology systems for school zones and other high priority areas, coupled with high-visibility signage and publicity, to deter speeding and red-light violations.	Police Department	Town Council, Public Works	2030

*Target time frames are subject to resource availability.

Safer People

Encourage safe, responsible driving and behavior by people who use Castle Rock's roads and create conditions that prioritize their ability to reach their destination unharmed.

Action	Description	Responsible Party	Partners	Target*
Policy & Funding				
Explore a Safe Ride Home Program Option	Explore developing partnerships to offer promotional codes for free or discounted rides home from establishments or events in Castle Rock to reduce the potential for DUI, drowsy driving, or distracted driving. This program could be focused on high-risk holidays or event days or applied more broadly to weekend nights.	Town of Castle Rock	Police Department, Communications, Transportation Network Company operators, local businesses	2030
Enforcement & Education				
High Visibility DUI Enforcement	Continue participation in the CDOT High Visibility Enforcement grant which covers 16 enforcement periods annually.	Police Department	Communications	Ongoing
Child Passenger Safety Program	Promote the ongoing car seat education program (CRgov.com/CarSeats)	Fire and Rescue Department	Communications, Hospitals/Pediatricians	2030
New Driver Accountability Program	Coordinate with Douglas County School District to establish a driver education incentive to encourage safer driving behavior with new drivers.	Public Works	Douglas County School District, Communications, Police Department	2030
Safe Routes to School Program	Conduct Safe Routes to School studies for all K-12 campuses in Castle Rock to identify and address barriers to safe walking and biking for students. Prioritize campuses on or near the High Risk Network.	Public Works	DRCOG, Douglas County School District	Ongoing
Consider Matching Fines with Safety Outcomes	Consider adjusting fines for traffic violations to reflect the severity of safety risks posed, with higher fines for repeat offenders and behaviors that have a direct impact on public safety.	Town Council	Police Department, Public Works	2030
Pair Education with Key Engineering Countermeasures	Educational materials can be used to teach people how to use new and unfamiliar safety countermeasures, such as Pedestrian Hybrid Beacons (PHBs), roundabouts, or protected bikeways. These materials can consist of informational signs or demonstration videos.	Public Works	Communications	Ongoing
Enforcement Priorities	Use crash history and the High Risk Network corridors as one criterion for where to concentrate enforcement efforts.	Police Department	Public Works	Ongoing
Collaboration				
Facilitate Interdepartmental Safety Meetings	Establish regular meetings between Public Works, Police Department, and Communications to collaboratively identify unsafe behaviors, enforce regulations, and communicate safety initiatives to the public.	Public Works	Police Department, Communications	Ongoing

*Target time frames are subject to resource availability.

Safer Vehicles

Expand the availability of vehicle systems and features that help to prevent crashes and minimize the impact of crashes on both occupants and non-occupants.

Action	Description	Responsible Party	Partners	Target*
Policy & Funding				
Connected and Autonomous (CAT) Vehicle Readiness Planning	Prepare to address the challenges posed by CAT technology. Some strategies for preparation include educating the public on current and future safety features and limitations, developing signing and striping standards.	Public Works	Communications	Ongoing
Enforcement & Education				
Enforcement of Existing Laws Related to Vehicle Safety	Continued enforcement of existing vehicle safety laws, such as seatbelt use and vehicle maintenance, to reduce crash risks and improve overall safety.	Police Department	Communications	Ongoing
Collaboration				
DRCOG Vision Zero Working Group	Maintain active involvement in the Denver Regional Council of Governments Vision Zero Working Group to collaborate on regional safety initiatives and advocate for stronger vehicle safety legislation at the state and federal levels.	Public Works	DRCOG, neighboring jurisdictions	Ongoing

*Target time frames are subject to resource availability.

Post-Crash Care

Enhance the survivability of crashes through expedient access to emergency medical care, while creating a safe working environment for vital first responders and preventing secondary crashes through robust traffic incident management practices.

Action	Description	Responsible Party	Partners	Target*
Capital Projects				
Ensure Emergency Vehicle Preemption at All Signalized Intersections	Install and work with first responders to ensure emergency vehicle preemption (EVP) is working properly at all traffic signals in Castle Rock to reliably give approaching emergency vehicles a green signal.	Public Works	Police Department, Fire and Rescue	2035
Enforcement & Education				
Participate in National TIM Responder Training Program	Encourage first responders to participate in the National Traffic Incident Management (TIM) Responder Training Program to coordinate response to traffic incidents, increase clearance times, and improve safety for both responders and motorists.	Police Department, Fire and Rescue, medical providers, tow companies	Public Works	Ongoing
Collaboration				
Deploy Response Team to Investigate Serious and Fatal Crashes	Employ an internal, multi-departmental communication strategy in response to serious and fatal collisions. The protocol should outline a path forward for Public Works staff to be a part of the immediate on-the ground response to an investigation of serious and fatal collisions, ensuring a multi-disciplinary response team focused both on the behavioral and engineering elements of a collision. Development of this multi-disciplinary team can also support timely data sharing among city departments and identify quick-build solutions.	Public Works	Police Department	2030

*Target time frames are subject to resource availability.

Priority Safety Projects

Due to limited resources, the time needed for project design and construction, and the scale of improvements required, it is not possible for the Town to implement all safety interventions at once. Therefore, this plan highlights priority project locations where safety measures will have the most significant impact. These locations may be the focus for safety improvements. However, safety measures at other locations can still happen during the same period, either as part of a broader safety program or when opportunities arise from other projects.

The priority locations for safety improvements in Castle Rock include both intersections and corridors. Corridor projects involve managing access, improving pedestrian crossings, and controlling speeds.

The Town of Castle Rock follows a Pavement Maintenance Program schedule which rotates around Town in five distinct areas, every five years. This provides focus and leverages contractor mobilization costs to get better pricing for improvements and also provides an opportunity to incorporate safety projects in parallel with pavement maintenance projects. This allows for revising curb lines and markings on the roadway without having to grind or remove new infrastructure. Integrating some of the identified safety improvements into this regular maintenance program is routine practice and suggested to continue to result in a more efficient process.

Intersection Projects

Priority intersections were identified based on a statistical evaluation of crash history and prioritized based on proximity to the High Injury Network, the High Risk Network, and community feedback. Most of the prioritized intersections are on the High Injury Network and High Risk Network; however, those that are not were included because they either had a high serious injury crash rate, were the scene of a fatality, or were identified by multiple community members' safety concerns. For each priority intersection, one of the top crash types was identified as the main safety concern based on crash history and current intersection operations. Potential safety measures were also identified for each location. As part of the implementation, the Town will assess the feasibility of each recommended safety measure to address the identified crash types.

Figure 17. Intersection Project Locations

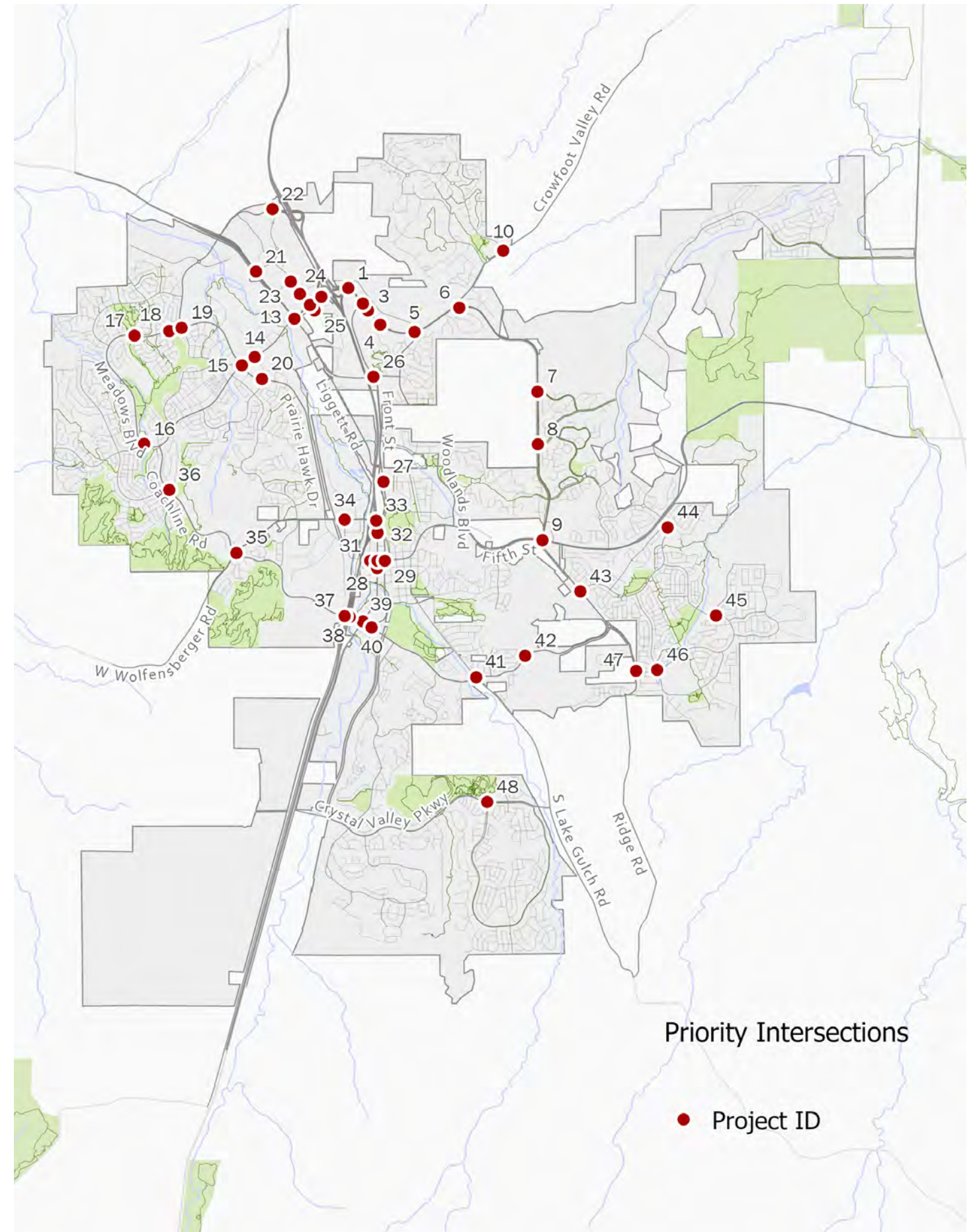


Table 2. Intersection Projects

Legend

- Primary Treatment
- Alternative Treatment

ID	Intersection	Control Type	Speed Management	Land-use Policy	Install Traffic Signal	Signal Rephasing	Signal Coordination	Appropriate Left-turn Phasing	No Right-turn on Red	Leading Bike/Ped Interval	Additional Signal Head	Retroreflective Backplates	Advance Detection Camera (VIVDS)	Advance Warning Beacon	Install Intersection Conflict Warning System	Review Turn Lane Signage & Markings	Install Turn Lane Signage	Durable Marking for Turn Lanes	Curb Extension	Median Modification to Improve Offset	Median Modification to Restrict Movement	Modify Right-Turn Slip Lane from Free to Yield	Collect TMC, Review, and Consider # Lane Reduction	Roundabout	All-Way STOP Sign	Install Two-sided STOP Sign	Install Hybrid Beacon	RRFB	Install Crosswalk Pavement Markings	All-weather Treatment Crosswalk	Crossing Setback from the Intersection	Ped/Bike Refuge Island	Curb-Extension (Bulb-outs)	Speed Table	Clear Sight Triangle	
1	Founders Pkwy and HWY 86	Allen Way	●			●	●	●			●																									
2	Founders Pkwy and HWY 86	Front Street	●			●	●	●		●		●	●																							
3	Founders Pkwy and HWY 86	Metzler Way	●																		●															
4	Founders Pkwy and HWY 86	Trail Boss Drive	●			●	●	●				●	●																							
5	Founders Pkwy and HWY 86	Woodlands Boulevard	●			●	●	●				●	●																							
6	Founders Pkwy and HWY 86	Crowfoot Valley Road	●			●	●				■	●		●																						
7	Founders Pkwy and HWY 86	Crimson Sky Drive	●		●																■													●		
8	Founders Pkwy and HWY 86	Rising Sun Drive	●			●		●					●																							
9	Founders Pkwy and HWY 86	Ridge Road and Fifth Street	●			●	●	●				●																								
10	Sapphire Pointe Blvd	Crowfoot Valley Road			●																															
11	Meadows Pkwy	I-25 SB Ramps	●				●																													
12	Meadows Pkwy	Factory Shops Blvd	●		●	●		●			●	●			●		●																	■		
13	Meadows Pkwy	Sante Fe Drive and Highway 86	●			●	●			●		●	●	●		●																		■		
14	Meadows Pkwy	Limelight Avenue	●			●	●	●				●		●																						
15	Meadows Pkwy	Meadows Blvd and Prairie Hawk Dr	●			●	●	●				●																								
16	Meadows Blvd	Morning View Drive																		●				■		●	■								●	
17	Meadows Blvd	Springmeadow Circle (West)																		●					●	●									●	

ID	Intersection		Control Type	Speed Management	Land-use Policy	Install Traffic Signal	Signal Rephasing	Signal Coordination	Appropriate Left-turn Phasing	No Right-turn on Red	Leading Bike/Ped Interval	Additional Signal Head	Retroreflective Backplates	Advance Detection Camera (VIVDS)	Advance Warning Beacon	Install Intersection Conflict Warning System	Review Turn Lane Signage & Markings	Install Turn Lane Signage	Durable Marking for Turn Lanes	Curb Extension	Median Modification to Improve Offset	Median Modification to Restrict Movement	Modify Right-Turn Slip Lane from Free to Yield	Collect TMC, Review, and Consider # Lane Reduction	Roundabout	All-Way STOP Sign	Install Two-sided STOP Sign	Install Hybrid Beacon	RRFB	Install Crosswalk Pavement Markings	All-weather Treatment Crosswalk	Crossing Setback from the Intersection	Ped/Bike Refuge Island	Curb-Extension (Bulb-outs)	Speed Table	Clear Sight Triangle			
18	Meadows Blvd	Springmeadow Circle (East)	Side-Street STOP																		●															■			
19	Meadows Blvd	N Meadows Drive	Signal						●				●				●																					●	
20	Low Meadow Blvd	Prairie Hawk Drive				●																																	
21	Promenade Pkwy	Highway 86	Signal	●	●				●				●																										
22	Promenade Pkwy	Castle Rock Pkwy	Roundabout														●							■															
23	Factory Shops Blvd	New Beale Street	Side-Street STOP																																				
24	Factory Shops Blvd	New Memphis Ct	Signal				●	●	●		●						●		●																				
25	Castleton Drive	Genoa Way	Side-Street STOP																			●																	
26	Front Street	Blackfeather Trail	Signal				●					●	●																										
27	Front Street	Oakwood Drive	Side-Street STOP																																				●
28	Fourth Street	Wilcox Street	Side-Street STOP			●		●																	■		●	●											
29	Fifth Street	Perry Street	Signal				●						●				●								■														
30	Fifth Street	Wilcox Street	Signal				●	●			●		●																										
31	Fifth Street	Jerry Street	Side-Street STOP																					●			■												
32	Eighth Street	Wilcox Street	Side-Street STOP					●																															●
33	I-25 NB Off and On Ramp	Wolfensberger Road	Signal				●	●	●			●	●				●																						
34	Wolfensberger Road	Park Street	Signal						●				●	●																									

ID	Intersection	Control Type	Speed Management	Land-use Policy	Install Traffic Signal	Signal Rephasing	Signal Coordination	Appropriate Left-turn Phasing	No Right-turn on Red	Leading Bike/Ped Interval	Additional Signal Head	Retroreflective Backplates	Advance Detection Camera (VIVDS)	Advance Warning Beacon	Install Intersection Conflict Warning System	Review Turn Lane Signage & Markings	Install Turn Lane Signage	Durable Marking for Turn Lanes	Curb Extension	Median Modification to Improve Offset	Median Modification to Restrict Movement	Modify Right-Turn Slip Lane from Free to Yield	Collect TMC, Review, and Consider # Lane Reduction	Roundabout	All-Way STOP Sign	Install Two-sided STOP Sign	Install Hybrid Beacon	RRFB	Install Crosswalk Pavement Markings	All-weather Treatment Crosswalk	Crossing Setback from the Intersection	Ped/Bike Refuge Island	Curb-Extension (Bulb-outs)	Speed Table	Clear Sight Triangle		
35	Wolfensberger Road	Plum Creek Pkwy and Coachline Rd	Roundabout														●																				
36	Foothills	Coachline Road	All-way STOP		●																			■		●										●	
37	I-25 NB Off and On Ramps	Plum Creek Pkwy	Signal	●		●	●	●		●		●																									
38	I-25 SB Off and On Ramps and Frontage Road	Plum Creek Pkwy	Signal	●		●	●											●																			
39	Plum Creek Pkwy	Wilcox Street	Signal	●		●	●	●				●						●																			
40	Plum Creek Pkwy	Perry Street	Signal	●		●	●	●				●						●																			
41	Plum Creek Pkwy	Lake Gulch Road and Gilbert Street	Roundabout	●												●																					
42	Plum Creek Pkwy	Eaton Circle	Roundabout	●												●																					
43	Enderud Blvd	Ridge Road	Roundabout													●																					
44	Enderud Blvd	Heritage Ave East	Side-Street STOP																							●		●								●	
45	Mikelson Blvd	Mitchell St and Millbridge Ave																								●		●								●	
46	Mikelson Blvd	Lantern Trail	Side-Street STOP	●																			●													●	
47	Mikelson Blvd	Ridge Road South	Side-Street STOP	●																						●										●	
48	Crystal Valley Pkwy	West Loop Road	Side-Street STOP												●																					●	

Speed Management Priority Corridors

Creating a comprehensive speed management program can reduce roadway fatalities that include speeding as a contributing factor by addressing concerns of undesirable speeds at specific locations. Speed management involves setting context appropriate speed limits defined using data and engineering analysis, designing streets that encourage safe driving speeds, and enforcing those speed limits. Speed management on Castle Rock’s roadways is crucial because slower speeds reduce the likelihood of crashes and make roads safer for everyone- drivers, pedestrians, and bicyclists. Speeding is the top safety concern cited by community members and is the most common factor in fatal and serious injury crashes. When vehicles travel at lower speeds, drivers have more time to react, and any crashes that do occur are less likely to result in serious injuries or fatalities. Speed management is essential for creating safer streets and is a critical part of the Road to Zero.

The risk of serious crashes is highest in areas with heavy traffic, high vehicle speeds, and many pedestrians and bicyclists. Priority street segments for speed management interventions include corridors where these factors are relevant and on the High Risk Network. These include Meadows Parkway and Meadows Boulevard, Founders Parkway, and Plum Creek Parkway as shown in **Figure 18**.

The following suite of interventions to reduce speeds to safer levels can be considered:

- Evaluate reducing speed limits, coupled with necessary enforcement and education.
- Evaluate reducing travel lane width to a maximum of 11-feet with turn lanes reduced to 10-feet, as appropriate .
- Incorporate transverse lane markings with lane narrowing.
- Consider permanent speed feedback signs flashing “Slow Down” message when speed exceeds a preset limit (most effective when coupled with enforcement).
- Define Speed Enforcement Corridors with regular, targeted speed enforcement combined with a public awareness program
- Consider intersection design revisions, with raised intersections or crosswalks, pedestrian bulb-outs, offset lanes, monument features, and smaller turning radii. These techniques work by narrowing the street’s cross-section or providing visual cues to motorists to travel slower, while benefiting pedestrians and bicyclists through shorter crossings and higher visibility

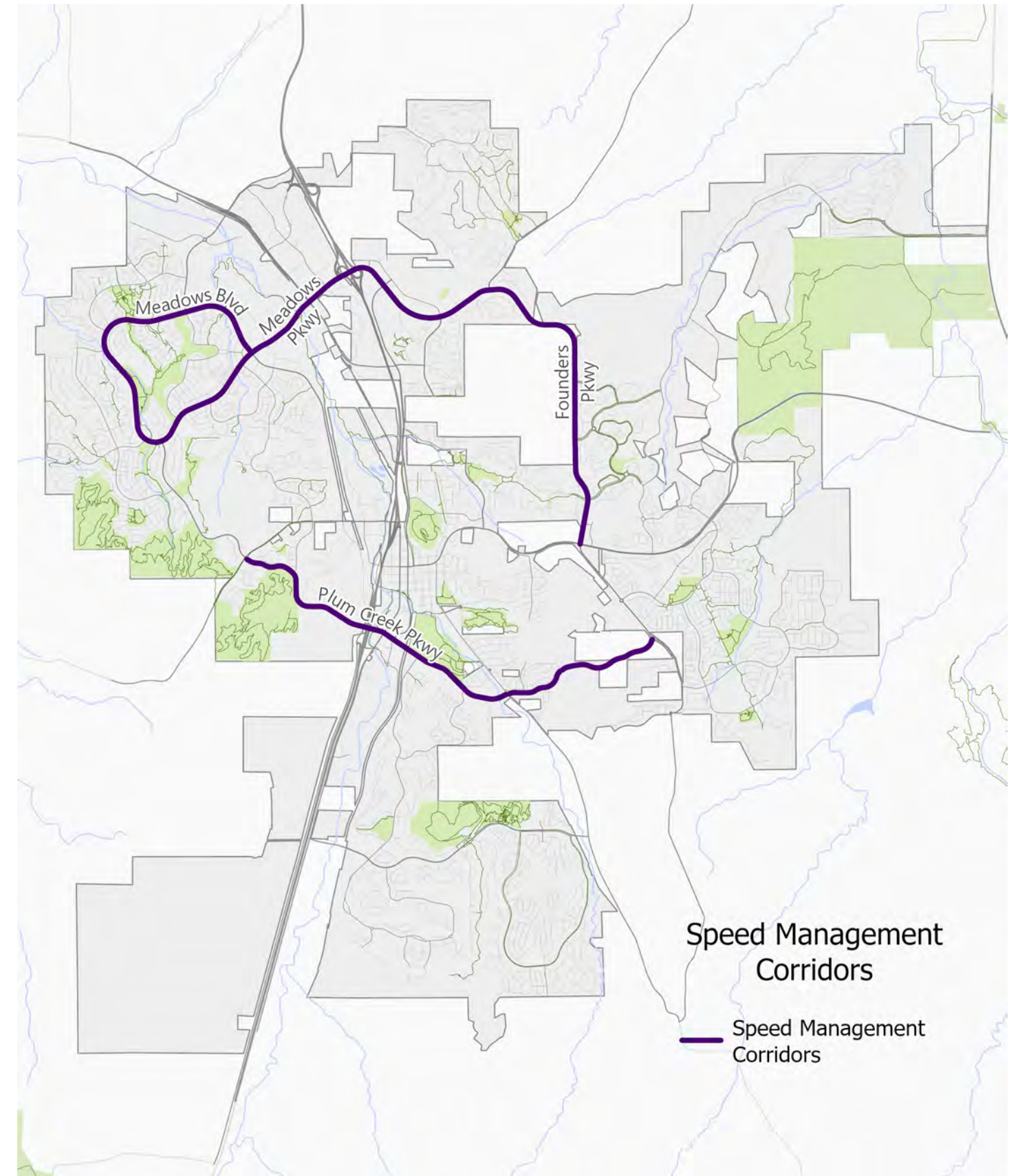


Source: Adobe Stock



Source: Adobe Stock

Figure 18 - Speed Management Corridors



Systemic Safety Improvements

While Castle Rock is working towards the implementation of safety countermeasures at the highest priority locations, the Town will also advance safety improvements across the entire Town. Systemic improvements can be implemented as stand-alone systemic safety projects at multiple locations across the Town, or when opportunities arise during other related construction projects, such as street reconstruction, or as part of other street maintenance programs. Where applicable, these interventions should be reflected in the Town's street design and signal design standards. System safety improvements that were identified during the development of this safety action plan include:

Left-Turn Improvements

- Consider protected left-turn signal phasing at signalized intersections to reduce approach turn crashes.
- Install four-section heads for left-turn signal phasing (whenever a traffic signal is upgraded or installed) to allow for flexible left-turn operations and use of flashing yellow arrow during permitted phases.
- Design uncontrolled left-turn lanes where there are opposing left-turn lanes to have positive offset.

Pedestrian & Bicycle Improvements

- Install directional curb ramps at all intersections in the Town with pedestrian crossings.
- Apply pedestrian/bicycle crossing safety interventions including Pedestrian Hybrid Beacons (PHB), Rectangular Rapid Flashing Beacon (RRFB), pedestrian refuge islands, curb extensions, and other treatments on major streets per the DRCOG Active Transportation Plan and CDOT uncontrolled crossing guidelines. Develop Town specific pedestrian crossing guidelines.

- Regularly maintain marked pedestrian crossings to be clearly visible.
- Apply appropriate turn radius and geometry design of right-turn slip lanes and consider raised crosswalk components to achieve the desired turning speed and driver visibility.
- In areas where the Town allows vertical traffic calming devices, install raised crosswalks to elevate the crossing area, slowing vehicle speeds and increasing pedestrian visibility.
- Design trails that are parallel to major streets to be setback 15 to 25 feet prior to stop controlled intersections and major driveways to allow a driver to yield to the path crossing and cross traffic separately.

Red-Light Running Improvements

- Install retro-reflective backplates on all signal heads in the Town.
- Coordinate signal timing on arterial road corridors.
- Evaluate and potentially adjust yellow and all-red signal phasing.
- Apply speed management safety interventions on major streets.
- Dilemma zone signal timing adjustments and advanced warning systems.



Source: Fehr & Peers

Performance Monitoring and Transparency

The Town of Castle Rock has already been conducting a biennial crash report which includes improvement recommendations. To continue to monitor progress toward reducing serious and fatal crashes and provide transparency to the public, this process will continue and will include an update to the progress tracking and outcomes of projects. Outcomes are the measures of effectiveness that the Town is hoping to influence, such as the number of crashes, but has no direct control over. These items will also be updated and tracked on the Town's online crash dashboard in addition to the biennial report.

Prioritization Guide

“I think it is great to try to reduce traffic collisions with unique intersection design.”

- Town of Castle Rock Survey Taker

The priority project list that emerged from the Castle Rock Safety Action Plan was prioritized based on a set of criteria including the potential benefits of a project against its financial costs and also on location based characteristics. The methodology for intersection projects and speed management prioritization is defined in this guide.

In addition to the projects listed in this guide, the High Injury Network and High Risk Network can be used to help prioritize routine maintenance work that comes up in different areas within the Town of Castle Rock to prioritize safety improvements alongside maintenance work.



Intersection Projects Methodology

Intersection safety improvement projects were prioritized using the following methodology:

- Projects were grouped by safety intervention and organized by those with the highest to lowest benefit-to-cost ratio (BCR). Project locations within each safety intervention category were categorized as High (BCR (10 or more), Medium BCR (between 1 and 10), and Low BCR (less than 1).
- Within each safety intervention grouping, locations of specific projects were further prioritized by three location-based criteria, as described below. A score of 0 to 100 was given for each location-based criterion, for a total possible score of up to 500. Locations with a higher score were prioritized.

Benefit-Cost Analysis

The benefit-cost analysis (BCA) measures the potential safety benefits of a project against its financial costs. Rather than favoring the cheapest projects, this strategy seeks to prioritize projects expected to have the greatest impact on crash reduction relative to their cost.

A BCA was performed for each potential safety intervention at each priority intersection location. For each safety intervention, relevant crash modification factors (CMFs) were selected based on context and application in Castle Rock. Most CMFs were obtained from the U.S. Department of Transportation's (USDOT's) Crash Modification Factors Clearinghouse and all corresponding studies were at minimum 3-star quality. For countermeasures where a CMF was not available on the USDOT Crash Modification Factor Clearinghouse, the Local Road Safety Manual for California's Local Road Owners was used as a substitute given that such a resource does not exist in Colorado.

Countermeasure service life was obtained from the CMF Clearinghouse. For countermeasures with varying lengths of service life, the average length of service life was used. The cost of deaths, nonfatal disabling injuries, and property damage crashes were obtained from the most recent Colorado Department of Transportation's (CDOT's) Colorado Highway Safety Improvement Program (CHSIP).

The project costs used in the BCA are planning level cost estimates and do not reflect any necessary design, right-of-way acquisition, or labor costs.

A benefit cost analysis for each potential safety intervention at all priority intersection locations is shown in **Table 3**.



Source: Fehr & Peers

Table 3: Benefit-Cost Analysis Summary

Safety Recommendation	Crash Modification Factor	Number of Locations	Total Estimated Benefits	Total Estimated Project Costs	Benefit-Cost Ratio
Speed Management	15% Reduction in Mean Speed	3	\$ 17,906,240	\$ -	-
Modify Right-turn Slip Lane from Free Movement to Yield	Install advanced yield or stop markings and signs	5	\$ 7,736,930	\$ 8,913	868.1
Improve Signal Timing (Coordination, Phases, Red, Yellow, or Operation)	Improve Signal Timing (Coordination, Phases, Red, Yellow, or Operation)	23	\$ 15,768,600	\$ 32,890	479.4
Apply Protected Left-turn Phasing	Change from Permitted-protected to Protected on Major Approach	13	\$ 35,628,120	\$ 120,958	294.5
Install Retroreflective Backplates	Add Retroreflective Backplate	18	\$ 13,548,000	\$ 88,853	152.5
Review TMC and Reduce Number of Lane	Converting two-lane roundabout to single-lane roundabout	1	\$ 7,084,450	\$ 64,325	110.1
Install Speed Table	Install speed humps	2	\$ 8,923,200	\$ 89,125	100.1
Install Advanced Detection Camera (VIVDS)	Provide Advanced Dilemma Zone Detection for rural high speed approaches	6	\$ 8,073,000	\$ 131,130	61.6
Modify Median to Restrict Movement	Install Raised Median	4	\$ 15,628,520	\$ 230,640	67.8
Install Additional Signal Head	Install additional signal head (to have one over each approach lane)	5	\$ 5,991,440	\$ 138,801	43.2
Apply Leading Ped/Bike Interval	Leading Pedestrian Intervals	5	\$ 227,240	\$ 8,525	26.7
Clear Sight Triangle	Increase Triangle Sight Distance	11	\$ 5,785,700	\$ 227,400	25.4
Setback Ped Crossing from the Intersection	Install crosswalk on one minor approach	3	\$ 2,629,250	\$ 113,274	23.2
Install Curb Extension (Bulbout)	Install/Upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	1	\$ 3,663,800	\$ 216,613	16.9
Install Advanced Warning Beacon	Install Flashing Beacons as Advance Warning	3	\$ 3,050,400	\$ 180,000	16.9
Install Two-sided STOP Sign (at the back of the STOP sign)	Implement systemic signing and marking improvements at stop-controlled intersections	8	\$ 158,570	\$ 11,200	14.2
Install All-Way STOP Control	Convert to All-Way Stop Control (from 2-way or Yield Control)	1	\$ 68,000	\$ 5,580	12.2
Apply No Right-turn on Red	Prohibit Right-Turn-on-Red	1	\$ 70,770	\$ 6,481	10.9
Install Ped/Bike Refuge Island	Install Raised Median / Refuge Islands (NSI)	3	\$ 1,409,400	\$ 172,980	8.1
Install All-weather Treatment Crosswalk	Install High-Visibility Crosswalk	4	\$ 313,200	\$ 50,220	6.2
Modify Median to Improve Offset	Improve Left-turn Lane Offset to Create Positive Offset	3	\$ 363,280	\$ 63,473	5.7
Install Intersection Conflict Warning System	Install an intersection conflict warning system (ICWS) with post mounted signs (various messages) and flashers at the intersection on minor; loop on major	1	\$ 143,340	\$ 29,063	4.9
Review Turn Lane Signage & Markings	Implement systemic signing and visibility improvements at signalized intersections	15	\$ 1,262,980	\$ 492,900	2.6
Install Traffic Signal	Install Traffic Signal	5	\$ 7,684,560	\$ 2,331,520	3.3
Install Hybrid Beacon	Install a pedestrian hybrid beacon (PHB or HAWK)	2	\$ 175,490	\$ 293,528	0.6
Install Roundabout	Convert intersection to roundabout	6	\$ 2,810,720	\$ 12,000,000	0.2

Location-Based Criteria

The following criteria were used to prioritize locations for implementation of priority projects in Castle Rock. Each location received a separate percentile score for each criterion. The percentile score is a measure of how common the criteria is relative to other locations. For example, a location with three nearby bike or pedestrian involved crashes received a score of 82, which means that 82% of locations had fewer nearby crashes and only 18% of locations had more crashes. Thus, each location received a score of 0 to 100 for each criterion, with a total possible score of 500. The HIN and HRN impact the location-based criteria the most, and the inclusion index, public comment, and vulnerable user crash history also impact the total location criteria score.

- High Injury or High Risk Network:** Considers if the project is located on the HIN or HRN. If not located on either, the project scores 0 points. If located on only HIN or HRN, the project scores 100 points. If located on both the HIN and HRN the project scores 200 points.
- Inclusion Index:** Considers the likelihood that a project will reduce disparities in risk to traffic fatalities and serious injuries. The Inclusion Index identifies roadways in Castle Rock that are likely to be used to access essential services. Projects in areas with a higher inclusion index will be prioritized.
- Public Comment:** As part of the community engagement process, the public was invited during two different phases of the project to provide comments on an interactive map. Residents indicated locations in Castle Rock where they have traffic safety concerns or would like to see safety improvements. Project locations that received more public comments received a higher public comment score while projects few or no public comments received a lower public comment score.
- Vulnerable User Crash History:** Pedestrians and bicyclists are more likely to be injured or killed in a traffic crash in Castle Rock. Mitigating these types of crashes is a priority of this Safety Action Plan. Locations with a crash history involving pedestrians and bicyclists will receive a higher score in this category.

Prioritized Project List by Safety Intervention

Projects are grouped by safety intervention as shown in **Table 5** through **29**, with safety intervention groupings ordered by the countermeasure with highest combined benefit-cost ratio (BCR) to the lowest. Within each table, project locations are prioritized on the methodology described above. This includes first ordering by BCR category (high, medium, low), then within each category individual projects are prioritized based on the location-based criteria prioritization score.

Table 4: Locations by Prioritization Score

MAP ID	Location Based Criteria	1st Tier			2nd Tier		Location Priority Score
		HIN	HRN	Ped/Bike Crash History	Inclusion Index	Near Public Comments	
38	I-25 NB Off and On Ramps & Plum Creek Pkwy	100	80	100	60	75	415
2	Founders Pkwy/Hwy 86 & Front St	100	90	50	60	75	375
1	Founders Pkwy/Hwy 86 & Allen Wy	100	90		60	100	350
30	Fifth St & Wilcox St	100	70	50	100	25	345
35	Wolfensberger Rd & Plum Creek Pkwy / Coachline Rd	100	60	50	60	75	345
47	Mikelson Blvd & Ridge Rd S	100	80	100	40	25	345
14	Meadows Pkwy & Limelight Ave	100	80	50	60	50	340
27	Front St & Oakwood Dr	100	60	50	80	50	340
42	Plum Creek Pkwy & Eaton Cir	100	80	50	60	50	340
37	I-25 SB Off and On Ramps / Frontage Rd & Plum Creek Pkwy	100	80		60	100	340

Table 4 cont.: Locations by Prioritization Score

MAP ID	Location Based Criteria	1st Tier			2nd Tier		Location Priority Score
		HIN	HRN	Ped/Bike Crash History	Inclusion Index	Near Public Comments	
24	Factory Shops Blvd & New Memphis Ct	100	70	50	60	50	330
6	Founders Pkwy/Hwy 86 & Crowfoot Valley Rd	100	90		60	75	325
9	Founders Pkwy/Hwy 86 & Ridge Rd / Fifth St	100	90		60	75	325
40	Plum Creek Pkwy & Perry St	100	90		80	50	320
13	Meadows Pkwy & Santa Fe Dr / Hwy 85	100	80		60	75	315
41	Plum Creek Pkwy & Lake Gulch Rd / Gilbert St	100	80		60	75	315
23	Factory Shops Blvd & New Beale St	100	60	50	80	25	315
20	Low Meadow Blvd & Prairie Hawk Dr	100	70		40	100	310
45	Mikelson Blvd & Mitchell St / Millbridge Ave	100	70	50	40	50	310
39	Plum Creek Pkwy & Wilcox St	100	100		80	25	305
5	Founders Pkwy/Hwy 86 & Woodlands Blvd	100	90		60	50	300
17	Meadows Blvd & Springmeadow Cir (West)	100	60		40	100	300
26	Front St & Blackfeather Trl	100	90		60	50	300
4	Founders Pkwy/Hwy 86 & Trail Boss Dr	100	90		80	25	295
15	Meadows Pkwy & Meadows Blvd / Prairie Hawk Dr	100	80	50	40	25	295
29	Fifth St & Perry St	100	70		100	25	295
12	Meadows Pkwy & Factory Shops Blvd	100	80		60	50	290
34	Wolfensberger Rd & Park St	100	80		60	50	290
21	Promenade Pkwy & CanAm Hwy/Hwy 85	100	80		80	25	285
28	Fourth St & Wilcox St	100	60		100	25	285
31	Fifth St & Jerry St	100	60		100	25	285
22	Promenade Pkwy & Castle Rock Pkwy	100	70		60	50	280
11	Meadows Pkwy & I-25 SB Ramps	100	90		60	25	275
7	Founders Pkwy/Hwy 86 & Crimson Sky Drive	100	60		60	50	270
3	Founders Pkwy/Hwy 86 & Metzler Wy	100	60		80	25	265
32	Eighth St & Wilcox St	100	60		80	25	265
8	Founders Pkwy/Hwy 86 & Rising Sun Dr	100	70		40	50	260
43	Enderud Blvd & Ridge Rd	100	60		40	50	250
46	Mikelson Blvd & Lantern Trl	100	60		40	50	250
25	Castleton Dr & Genoa Way	100	60		60	25	245
33	I-25 NB Off and On Ramp & Wolfensberger Rd	100	60		60	25	245
18	Meadows Blvd & Springmeadow Cir (East)		60		40	25	225
19	Meadows Blvd & N Meadows Dr		80		40	100	220
44	Enderud Blvd & Heritage Ave E		70		40	100	210
36	Foothills & Coachline Rd		50		40	100	190
16	Meadows Blvd & Morning View Dr		70		40	50	160
48	Crystal Valley Pkwy & W Loop Rd		60		40	25	125
10	Sapphire Pointe Blvd & Crowfoot Valley Rd		70		20	25	115

Prioritized Project List by Safety Intervention

Table 5: Modify Right-turn Slip Lane from Free Movement to Yield (Install advanced yield or stop markings and signs)

Prioritization Category	Location	BCR	Location Based Prioritization Score
VERY HIGH	I-25 NB Off and On Ramps & Plum Creek Pkwy	1266.8	415
VERY HIGH	I-25 SB Off and On Ramps / Frontage Rd & Plum Creek Pkwy	292.4	340
VERY HIGH	Plum Creek Pkwy & Perry St	1354.6	320
VERY HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	672.3	315
VERY HIGH	Meadows Pkwy & Factory Shops Blvd	754.4	290

Table 6: Improve Signal Timing (Coordination, Phases, Red, Yellow, or Operation)

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	I-25 NB Off and On Ramps & Plum Creek Pkwy	1038.9	415
VERY HIGH	Founders Pkwy/Hwy 86 & Front St	927.7	375
VERY HIGH	Founders Pkwy/Hwy 86 & Allen Wy	969.2	350
VERY HIGH	I-25 SB Off and On Ramps / Frontage Rd & Plum Creek Pkwy	239.8	340
VERY HIGH	Meadows Pkwy & Limelight Ave	498.9	340
VERY HIGH	Factory Shops Blvd & New Memphis Ct	549.0	330
VERY HIGH	Founders Pkwy/Hwy 86 & Crowfoot Valley Rd	283.0	325
VERY HIGH	Founders Pkwy/Hwy 86 & Ridge Rd / Fifth St	668.4	325
VERY HIGH	Plum Creek Pkwy & Perry St	1110.8	320
VERY HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	551.3	315
VERY HIGH	Plum Creek Pkwy & Wilcox St	207.1	305
VERY HIGH	Founders Pkwy/Hwy 86 & Woodlands Blvd	403.8	300
VERY HIGH	Front St & Blackfeather Trl	225.5	300
VERY HIGH	Meadows Pkwy & Meadows Blvd / Prairie Hawk Dr	343.6	295
VERY HIGH	Founders Pkwy/Hwy 86 & Trail Boss Dr	596.4	295
VERY HIGH	Fifth St & Perry St	494.7	295
VERY HIGH	Meadows Pkwy & Factory Shops Blvd	618.7	290
VERY HIGH	Meadows Pkwy & I-25 SB Ramps	318.9	275
VERY HIGH	Founders Pkwy/Hwy 86 & Rising Sun Dr	232.4	260
VERY HIGH	I-25 NB Off and On Ramp & Wolfensberger Rd	527.0	245
VERY HIGH	Fifth St & Wilcox St	118.1	345
MEDIUM	Fourth St & Wilcox St	28.5	285
MEDIUM	Eighth St & Wilcox St	75.1	265

Table 7: Apply Protected Left-turn Phasing

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	I-25 NB Off and On Ramps & Plum Creek Pkwy	1080.5	415
VERY HIGH	Founders Pkwy/Hwy 86 & Front St	345.1	375
VERY HIGH	Founders Pkwy/Hwy 86 & Allen Wy	525.8	350
VERY HIGH	Meadows Pkwy & Limelight Ave	674.3	340
VERY HIGH	Factory Shops Blvd & New Memphis Ct	1012.0	330
VERY HIGH	Founders Pkwy/Hwy 86 & Ridge Rd / Fifth St	162.6	325
VERY HIGH	Founders Pkwy/Hwy 86 & Woodlands Blvd	145.2	300
VERY HIGH	Founders Pkwy/Hwy 86 & Trail Boss Dr	116.4	295
VERY HIGH	Meadows Pkwy & Meadows Blvd / Prairie Hawk Dr	310.1	295
VERY HIGH	Wolfensberger Rd & Park St	313.8	290
VERY HIGH	Promenade Pkwy & CanAm Hwy/Hwy 85	324.1	285
VERY HIGH	Founders Pkwy/Hwy 86 & Rising Sun Dr	236.9	260
VERY HIGH	Meadows Blvd & N Meadows Dr	338.6	220

Table 8: Install Retroreflective Backplates

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	I-25 NB Off and On Ramps & Plum Creek Pkwy	353.2	415
VERY HIGH	Founders Pkwy/Hwy 86 & Front St	210.3	375
VERY HIGH	Founders Pkwy/Hwy 86 & Crowfoot Valley Rd	110.0	325
VERY HIGH	Founders Pkwy/Hwy 86 & Ridge Rd / Fifth St	151.5	325
VERY HIGH	Plum Creek Pkwy & Perry St	302.1	320
VERY HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	136.3	315
VERY HIGH	Plum Creek Pkwy & Wilcox St	281.6	305
VERY HIGH	Founders Pkwy/Hwy 86 & Woodlands Blvd	109.8	300
VERY HIGH	Founders Pkwy/Hwy 86 & Trail Boss Dr	202.8	295
VERY HIGH	Fifth St & Perry St	168.2	295
VERY HIGH	Meadows Pkwy & Factory Shops Blvd	112.2	290
VERY HIGH	Promenade Pkwy & CanAm Hwy/Hwy 85	314.7	285
VERY HIGH	I-25 NB Off and On Ramp & Wolfensberger Rd	204.8	245
HIGH	Fifth St & Wilcox St	40.2	345
HIGH	Front St & Blackfeather Trl	61.3	300
MEDIUM	Meadows Pkwy & Meadows Blvd / Prairie Hawk Dr	71.9	295
MEDIUM	Wolfensberger Rd & Park St	58.5	290
MEDIUM	Meadows Blvd & N Meadows Dr	59.4	220

Table 9: Review TMC and Reduce Number of Lane

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	Promenade Pkwy & Castle Rock Pkwy	110.1	280

Table 10: Install Speed Table

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	Meadows Pkwy & Factory Shops Blvd	264.7	290
HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	59.0	315

Table 11: Install Advanced Detection Camera (VIVDS)

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	Founders Pkwy/Hwy 86 & Front St	112.9	375
HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	50.7	315
HIGH	Founders Pkwy/Hwy 86 & Woodlands Blvd	48.7	300
MEDIUM	Founders Pkwy/Hwy 86 & Trail Boss Dr	78.4	295
MEDIUM	Meadows Pkwy & Factory Shops Blvd	50.0	290
MEDIUM	Founders Pkwy/Hwy 86 & Rising Sun Dr	28.6	260

Table 12: Modify Median to Restrict Movement

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	Founders Pkwy/Hwy 86 & Crimson Sky Drive	119.3	270
HIGH	Front St. & Oakwood Dr	90.3	340
MEDIUM	Founders Pkwy/Hwy 86 & Metzler Wy	31.1	265
MEDIUM	Castleton Dr & Genoa Way	30.2	245

Table 13: Install Additional Signal Head

Prioritization Category	Location	BCR	Location-Based Prioritization Score
VERY HIGH	I-25 SB Off and On Ramps / Frontage Rd & Plum Creek Pkwy	134.0	340
VERY HIGH	Founders Pkwy/Hwy 86 & Crowfoot Valley Rd	158.2	325
VERY HIGH	Front St & Blackfeather Trl	126.1	300
VERY HIGH	I-25 NB Off and On Ramp & Wolfensberger Rd	294.6	245
HIGH	Founders Pkwy/Hwy 86 & Allen Wy	21.6	350

Table 14: Apply Leading Ped/Bike Interval

Prioritization Category	Location	BCR	Location-based Prioritization Score
HIGH	I-25 NB Off and On Ramps & Plum Creek Pkwy	30.5	415
HIGH	Founders Pkwy/Hwy 86 & Front St	49.3	375
HIGH	Fifth St & Wilcox St	26.7	345
HIGH	Factory Shops Blvd & New Memphis Ct	26.7	330
LOW	Meadows Pkwy & Santa Fe Dr / Hwy 85	0.0	315

Table 15: Clear Sight Triangle

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Front St & Oakwood Dr	79.8	340
VERY HIGH	Founders Pkwy/Hwy 86 & Crimson Sky Drive	105.9	270
MEDIUM	Meadows Blvd & N Meadows Dr	8.8	220
HIGH	Meadows Blvd & Springmeadow Cir (West)	5.6	300
MEDIUM	Eighth St & Wilcox St	21.4	265
MEDIUM	Mikelson Blvd & Lantern Trl	7.5	250
MEDIUM	Enderud Blvd & Heritage Ave E	45.1	210
MEDIUM	Foothills & Coachline Rd	41.5	190
LOW	Meadows Blvd & Springmeadow Cir (East)	0.0	225
LOW	Meadows Blvd & Morning View Dr	0.0	160
LOW	Crystal Valley Pkwy & W Loop Rd	13.8	125

Table 16: Setback Ped Crossing from the Intersection

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Front St & Oakwood Dr	31.6	340
HIGH	Factory Shops Blvd & New Beale St	20.1	315
MEDIUM	Meadows Blvd & N Meadows Dr	17.9	220

Table 17: Install Curb Extension (Bulbout)

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Factory Shops Blvd & New Memphis Ct	16.9	330

Table 18: Install Advanced Warning Beacon

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Meadows Pkwy & Limelight Ave	19.0	340
HIGH	Founders Pkwy/Hwy 86 & Crowfoot Valley Rd	10.8	325
HIGH	Meadows Pkwy & Santa Fe Dr / Hwy 85	21.0	315

Table 19: Install Two-sided STOP Sign (at the back of the STOP sign)

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Meadows Blvd & Springmeadow Cir (West)	14.2	300
MEDIUM	Fifth St & Jerry St	15.2	285
MEDIUM	Fourth St & Wilcox St	8.1	285
MEDIUM	Mikelson Blvd & Lantern Trl	11.1	250
MEDIUM	Meadows Blvd & Springmeadow Cir (East)	6.0	225
MEDIUM	Enderud Blvd & Heritage Ave E	30.5	210
MEDIUM	Foothills & Coachline Rd	20.2	190
MEDIUM	Meadows Blvd & Morning View Dr	8.1	160

Table 20: Install All-Way STOP Control

Prioritization Category	Location	BCR	Location-Based Prioritization Score
MEDIUM	Fourth St & Wilcox St	12.2	285

Table 21: Apply No Right-turn on Red

Prioritization Category	Location	BCR	Location-Based Prioritization Score
MEDIUM	Meadows Pkwy & Factory Shops Blvd	10.9	290

Table 22: Install Ped/Bike Refuge Island

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Mikelson Blvd & Ridge Rd S	13.8	345
HIGH	Front St & Oakwood Dr	6.9	340
LOW	Factory Shops Blvd & New Beale St	3.7	315

Table 23: Install All-weather Treatment Crosswalk

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Mikelson Blvd & Ridge Rd S	28.5	345
HIGH	Front St & Oakwood Dr	20.4	340
LOW	Fifth St & Wilcox St	1.4	345
LOW	Meadows Blvd & N Meadows Dr	0.0	220

Table 24: Modify Median to Improve Offset

Prioritization Category	Location	BCR	Location-based Prioritization Score
HIGH	Meadows Blvd & Springmeadow Cir (West)	13.5	300
LOW	Meadows Blvd & Springmeadow Cir (East)	2.4	225
LOW	Meadows Blvd & Morning View Dr	1.2	160

Table 25: Install Intersection Conflict Warning System

Prioritization Category	Location	BCR	Location-Based Prioritization Score
LOW	Crystal Valley Pkwy & W Loop Rd	4.9	125

Table 26: Review Turn Lane Signage & Markings

Prioritization Category	Location	BCR	Location-Based Prioritization Score
HIGH	Plum Creek Pkwy & Perry St	7.3	320
LOW	Wolfensberger Rd & Plum Creek Pkwy / Coachline Rd	1.5	345
LOW	I-25 SB Off and On Ramps / Frontage Rd & Plum Creek Pkwy	1.6	340
LOW	Plum Creek Pkwy & Eaton Cir	0.9	340
LOW	Factory Shops Blvd & New Memphis Ct	3.6	330
LOW	Plum Creek Pkwy & Lake Gulch Rd / Gilbert St	2.4	315
LOW	Meadows Pkwy & Santa Fe Dr / Hwy 85	3.6	315
LOW	Plum Creek Pkwy & Wilcox St	1.4	305
LOW	Fifth St & Perry St	3.2	295
LOW	Meadows Pkwy & Factory Shops Blvd	4.0	290
LOW	Promenade Pkwy & Castle Rock Pkwy	2.4	280
LOW	Enderud Blvd & Ridge Rd	1.0	250
LOW	I-25 NB Off and On Ramp & Wolfensberger Rd	3.4	245
LOW	Meadows Blvd & N Meadows Dr	1.4	220
LOW	Enderud Blvd & Heritage Ave E	0.7	210

Table 27: Install Traffic Signal

Prioritization Category	Location	BCR	Location-Based Prioritization Score
MEDIUM	Founders Pkwy/Hwy 86 & Crimson Sky Drive	8.3	270
LOW	Low Meadow Blvd & Prairie Hawk Dr	4.1	310
LOW	Fourth St & Wilcox St	0.5	285
LOW	Foothills & Coachline Rd	1.1	190
LOW	Sapphire Pointe Blvd & Crowfoot Valley Rd	2.5	115

Table 28: Install Hybrid Beacon

Prioritization Category	Location	BCR	Location-Based Prioritization Score
LOW	Meadows Blvd & Springmeadow Cir (West)	0.8	300
LOW	Meadows Blvd & Morning View Dr	0.4	160

Table 29: Install Roundabout

Prioritization Category	Location	BCR	Location-based Prioritization Score
LOW	Mikelson Blvd & Mitchell St / Millbridge Ave	0.9	310
LOW	Fifth St & Perry St	0.2	295
LOW	Fourth St & Wilcox St	0.0	285
LOW	Fifth St & Jerry St	0.1	285
LOW	Foothills & Coachline Rd	0.2	190
LOW	Meadows Blvd & Morning View Dr	0.0	160



Source: Town of Castle Rock