2021

TRANSPORTATION SAFETY REPORT

Traffic Services

City of Greeley

2/16/2021

Contents

Introduction

The City of Greeley is dedicated to creating and maintaining a safe transportation system through safety improvements, traffic control, education, targeted enforcement, and evaluation. This report includes a review of crash data for the years 2016 through 2020, as well as a comparison of 2020 data to prior years. It is used as an aide to help Traffic Services staff identify and prioritize safety projects. The report also outlines and evaluates recent safety improvements and continuing efforts.

The COVID-19 pandemic had a significant impact on crash trends in 2020. Traffic levels dipped significantly in April and then leveled off at approximately 20% below 2019 levels. The reduced traffic and vehicle miles traveled impacted the number of total crashes in 2020 as well as when they occurred. The total number of crashes decreased by 25% from 2019 to 2020, injury crashes decreased by 44%, and peak period (AM and PM rush hour) crashes decreased by 40%.

Figure 1. Crashes by Month (2019 and 2020)

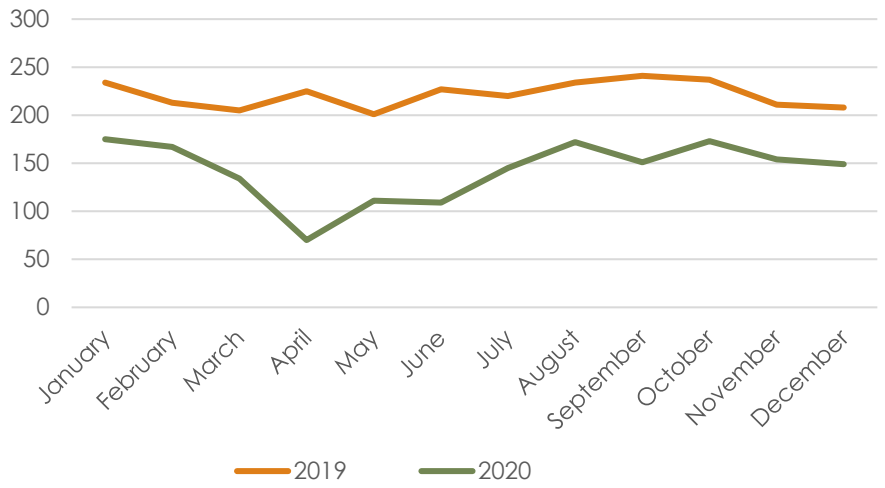
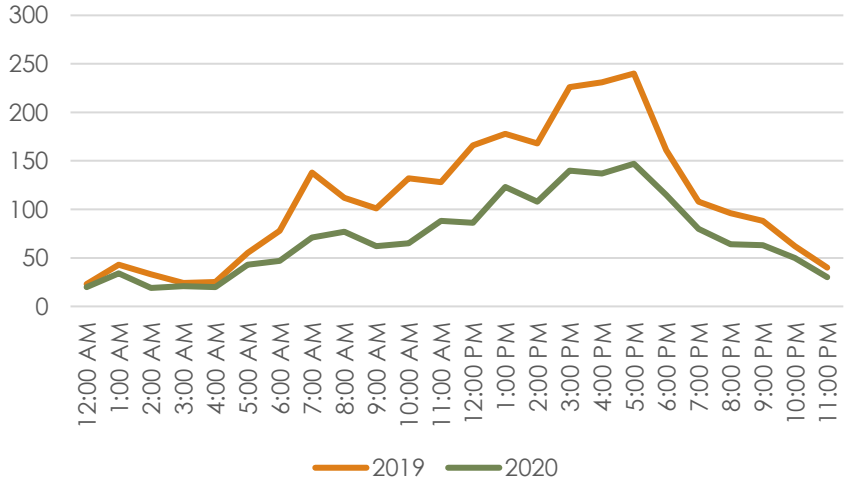


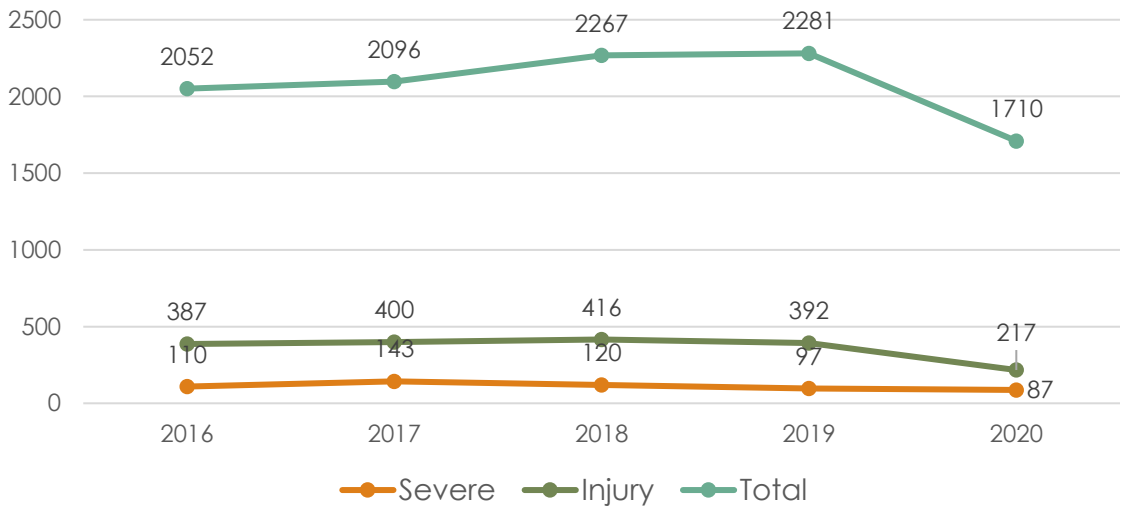
Figure 2. Crashes by Time of Day (2019 and 2020)



Overview

This section provides an overview of traffic crashes and associated trends and identifies key findings to help understand where and how crashes are occurring.

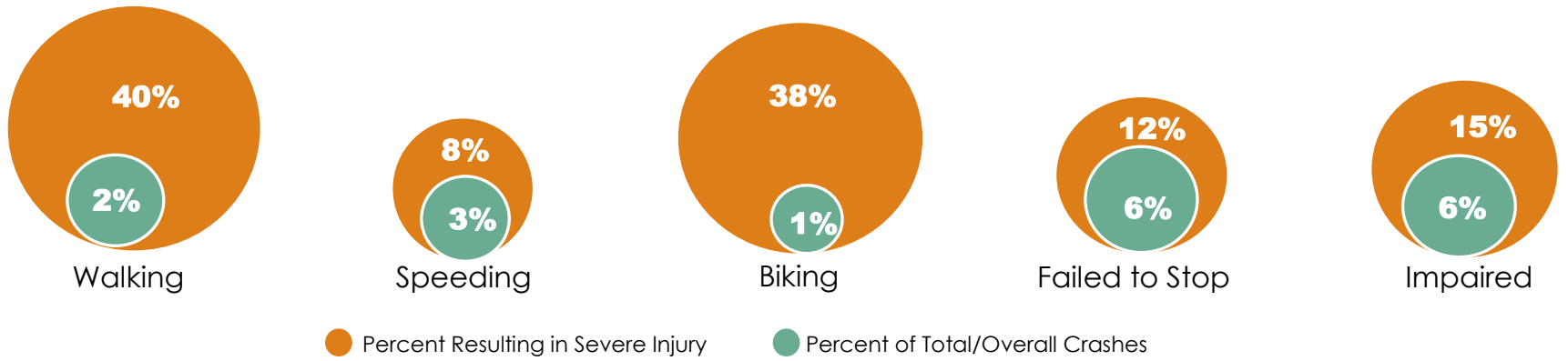
Figure 3. Crash Severity by Year



Between 2016 and 2020 there were an average ~2,000 crashes per year, 17% resulted in injury and 5% resulted in severe injury or death.

The severe crash data analysis identified six overrepresented categories of travel where there is a disproportionate number of severe crashes compared to the percent of overall crashes in these categories.

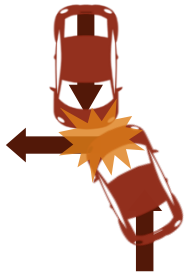
OVERREPRESENTED SEVERE CRASHES



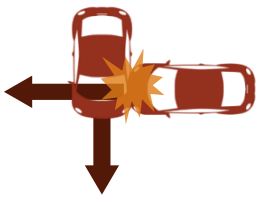
Correctable Crashes

The Traffic Division focuses on reducing other types of crashes such as left turn, broadside, rear-end, and crashes where a vehicle hits a stationary object. These crash types less frequently involve severe outcomes, but the city wants to mitigate the inconvenience, frustration, and costs of being involved in an injury or property damage crash.

Crashes that can be addressed with engineering measures such as signal operation, visibility improvements, capacity, geometric, or striping changes, are referred to as "correctable." Traffic services staff look for locations with high correctable crashes as primary candidates for safety improvements. The most severe vehicle crash types that are considered correctable are:



Left-turn- When someone making a left turn is hit by someone going straight.



Broadside or right angle- When one vehicle going straight hits another vehicle going straight in a right angle.

Figure 4. Percent of Crashes by Type

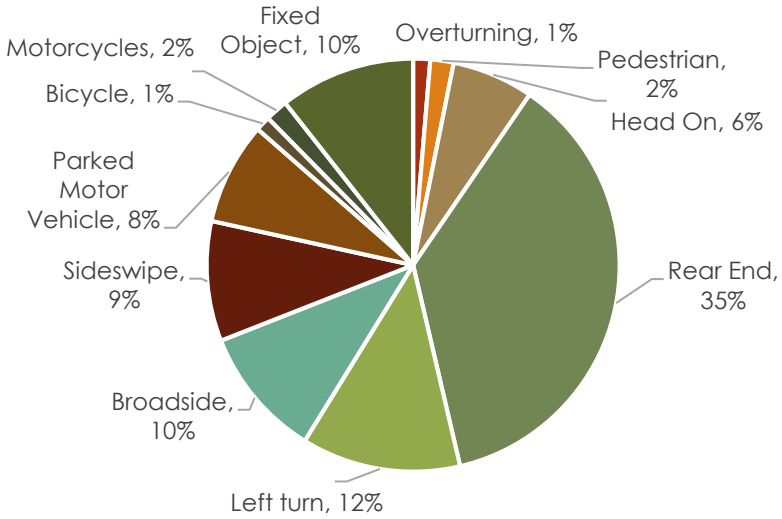
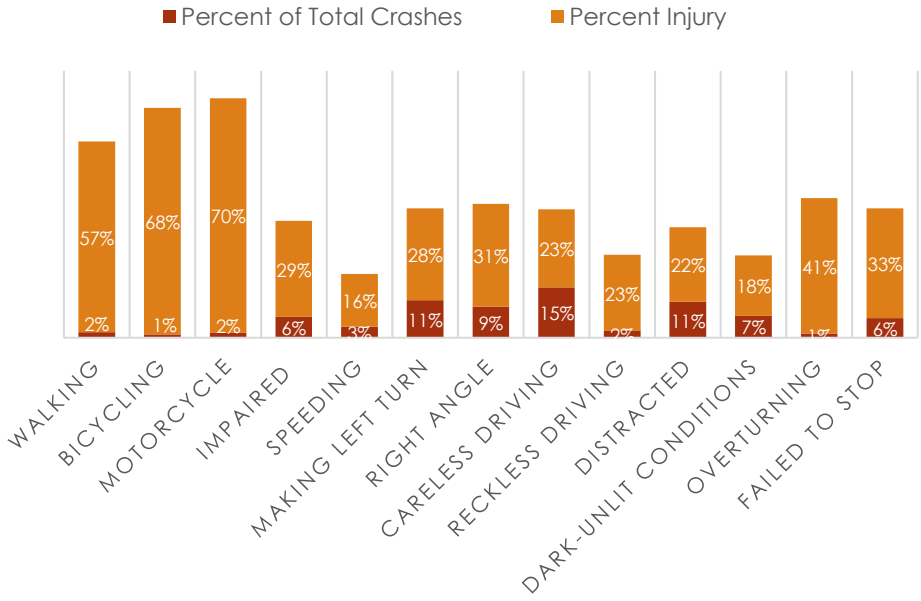


Figure 5. Percent Injury by Crash Type



Contributing Factors

Many crashes have contributing factors such as speeding, following too closely, distracted driving, or impairment. These crash types are best addressed through education and enforcement.

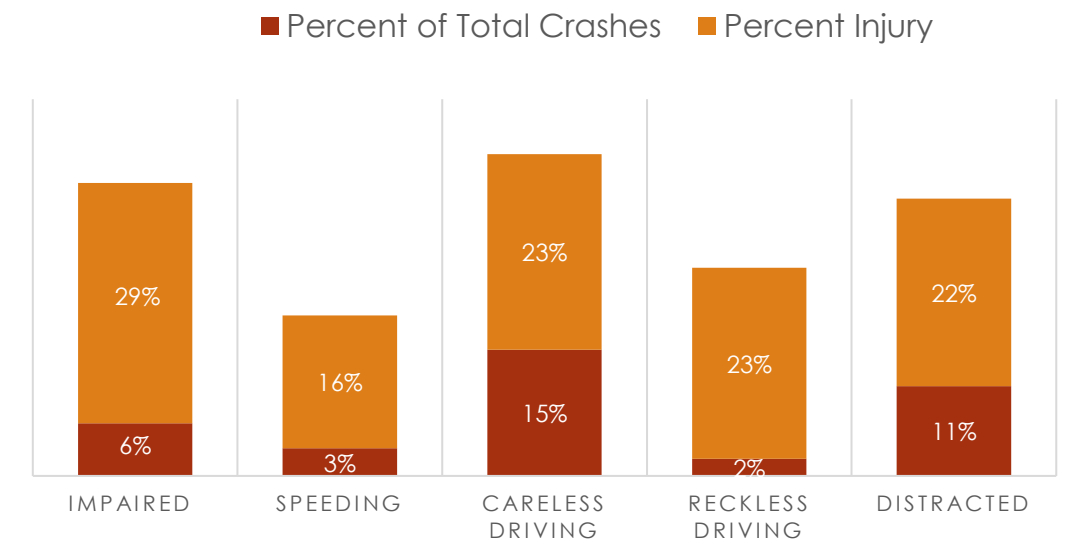


Figure 6. Percent Injury by Contributing Factor

While instances of careless and reckless driving are trending down, collisions involving impaired drivers increased by 3% from 2019 to 2020 and 48% from 2016 to 2020.

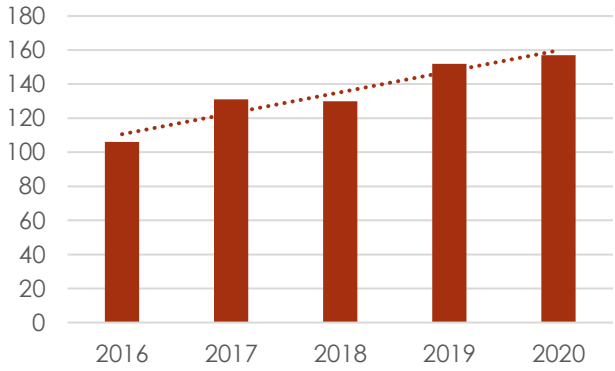


Figure 7. Collisions Involving Impaired Drivers

Fatal Crashes

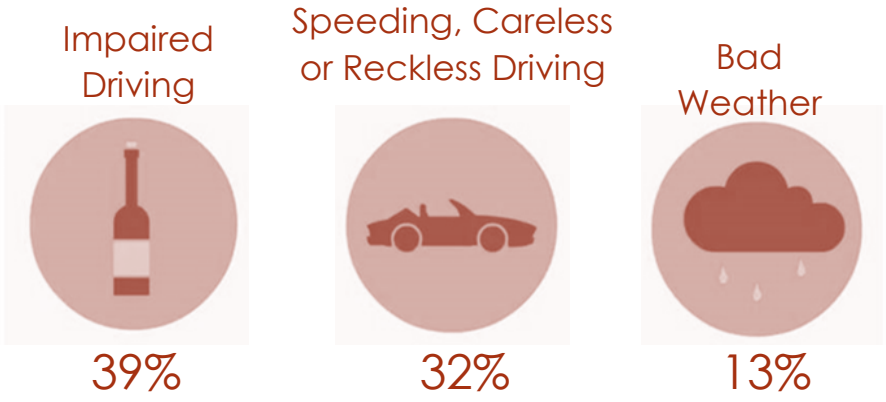
Fatal crashes are largely random, but can sometimes be prevented with driver education, enforcement and engineering measures. The fatal crash rate is calculated using population and average number of yearly fatalities. The below shows Greeley's fatal crash rate in comparison to other cities in Colorado. Many traffic safety experts have linked increases in traffic fatalities to the reduction of vehicle miles traveled. With fewer cars on the road, many drivers take the opportunity to travel at dangerous speeds.

The City of Greeley's fatal crash rate increased from 7.5 in 2019 to 8.4 in 2020.

Table 1. Fatal Crash Rates

City	Population	Fatal Vehicle Crashes								
		2014	2015	2016	2017	2018	2019	2020	Avg.	Fatal Crash Rate
Boulder	107,353	0	1	7	0	2	2	-------	2.0	2.1
Fort Collins	170,100	5	4	8	13	9	8	-------	7.8	13.3
Longmont	96,577	4	5	2	10	6	12	-------	6.5	6.3
Greeley	107,348	8	5	8	11	9	4	9	7.7	8.4
Lakewood	154,958	13	15	13	14	17	19	-------	15.2	23.5

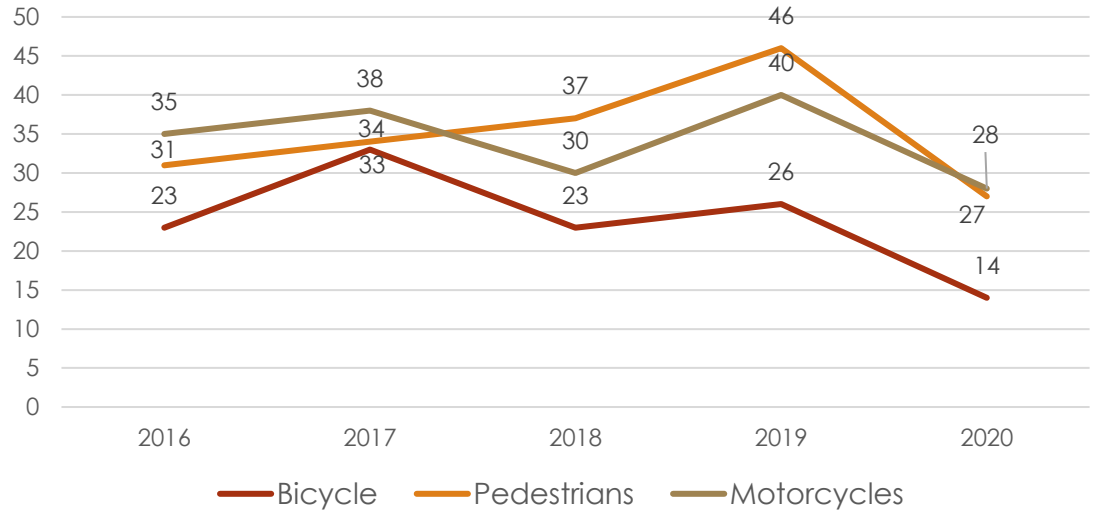
------- No available data



The figure to the left shows contributing factors to fatalities. Many fatalities involve impaired driving; 44% of the fatal crashes in 2020 involved impairment.

Road User Crash Trends

Figure 8. Vulnerable User Crashes by Year



The total number of vulnerable road user crashes decreased from 2019 to 2020. This can likely be attributed to less traffic and therefore fewer vehicle-road user crashes.

Despite an overall decrease in pedestrian crashes, there were three pedestrian fatalities in 2020.

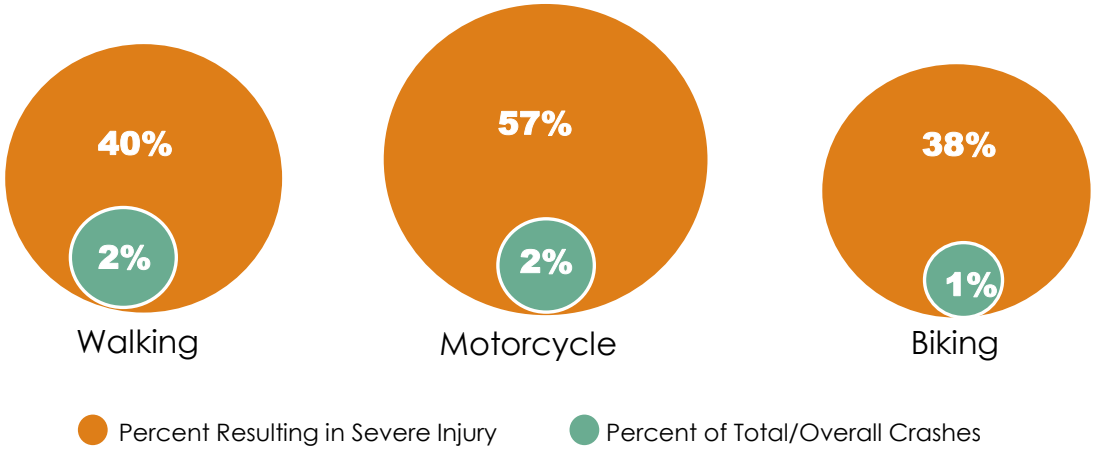
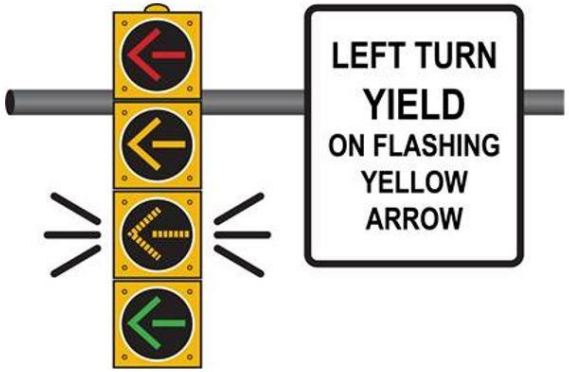


Figure 9. Percent of Total Crashes and Percent Injury

Safety Improvements to Date

Using a combination of education, enforcement and engineering, the City of Greeley is working towards reducing the number of crashes on public roads. Dangerous travel behaviors, such as impaired or distracted driving, can be countered through enforcement efforts and safety education outreach, while engineering treatments can help prevent intersection conflicts. In many cases, combining engineering measures, enforcement and education is the most effective way to reduce crashes.

Engineering Measures



- Continue to install proven safety measures such as flashing yellow arrows.
  - Assessed the need for flashing yellow arrows (FYA) on 10th St. Grant funding was sought to install FYAs at 47th Ave and 10th St and 59th Ave and 10th St.
- Work to improve **signal visibility and sight distance** issues at intersections.
  - 13 intersections on 10th St were selected for signal visibility improvements including side-of-pole mounted signal heads and high-visibility backplates.
  - Installed parking prohibition signage on the southwest corner of 10th St and 12th Ave to reduce sight visibility issues and broadside crashes.
  - Installed parking prohibition signage at intersection locations on 2900 block of 29th St to reduce sight visibility issues.
  - Continue to work with Forestry to trim hedges/bushes/trees to address sight visibility issues at intersections
- Work towards removing arterial corridors from **night-time "Flash" operation**.
  - Removed 8th Ave from "Flash" operation after 12AM to reduce crashes and improve pedestrian safety downtown.

- Continue to implement appropriate **pedestrian crossing treatments** at locations where they are needed. Use pedestrian crossings such as **HAWK signals or Rapid Flashing Beacons** where appropriate. Prioritize safe crossing for **school aged children**.
  - New audible pedestrian push buttons were installed at 8th Avenue & 7th Street by the Fred Tjardes School.
  - Two HAWK signals will be installed at 4th St and Ditch No.3 Trail and 35th Ave and Ditch No.3 Trail.
  - Upsized crosswalk bars to improve visibility.
- Continue to implement **leading pedestrian phase/advanced walk signal timing** at intersections where there are pedestrian or bicycle crash trends and high numbers of pedestrian crossings.
  - Advanced walk was added to an intersection near Greeley West High School where students cross in high numbers during the lunch hour.
- Maintain **signage and striping** in accordance with industry best practices.
  - Upsized 97 pedestrian crossing signs on higher volume streets from 30" to 36" to comply with 2009 MUTCD standards.
  - Replaced 252 school zone signs.

- Continue to implement **protected left-turn phasing** at locations with high volumes of turning vehicles and crossing pedestrians or bicyclists.
- Maintain list of candidate traffic signal locations and conduct regular **signal warrant studies.**
  - Design of 37th Ave and Two Rivers Parkway in underway to address high volume and high numbers of injury crashes.
- Select **capacity improvement** projects that improve traffic flow as well as safety.
  - Extended the 47th Avenue and 20th southbound left turn lane from 150' to 250'
  - Installed new left-turn lanes along 4th Street from 23rd Ave – 35th Ave
  - Added dual left turn movements at 65th Ave and 20th St to help with congestion in the area.
- Work with **residents** to address speeding and traffic concerns.
  - Installed speed feedback signs at the 65th/59th Avenue curve and WCR 64 1/2 curve to alert drivers to slow down and mitigate crashes.
  - Installed edge lines along 6th Street from 25th Ave to 28th Ave to address resident concern about parked vehicle crashes.

Evaluation of Safety Improvements

After safety improvements are implemented, staff tracks whether or not the measure was effective over time.

22nd St and Hwy 85

Left turn crashes accounted for 46% of the total crashes at 22nd St and Hwy 85 and many involved northbound or southbound left turning vehicles. To address this crash trend staff worked with CDOT to implement a positive offset for the left turn lanes at this intersection. This improvement was completed in October of 2020, and no crashes occurred in 2020 after October. Staff will continue to monitor crashes at this intersection.

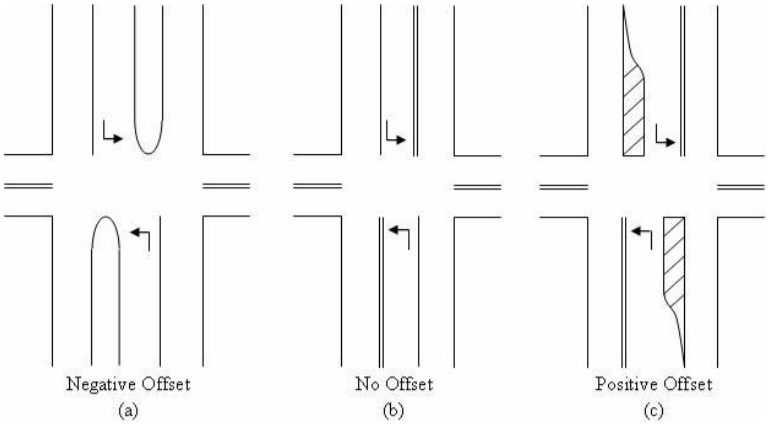


Figure 18. Left Turn Offset Exhibit

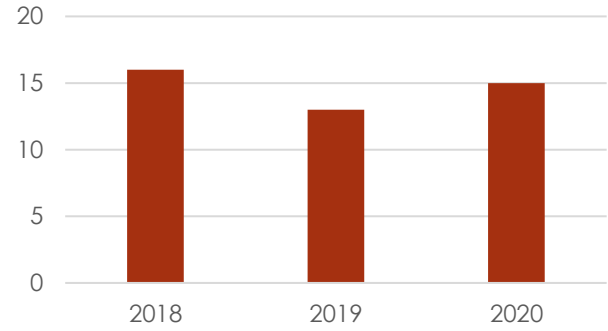


Figure 10. Crashes by year 22nd St and Hwy 85

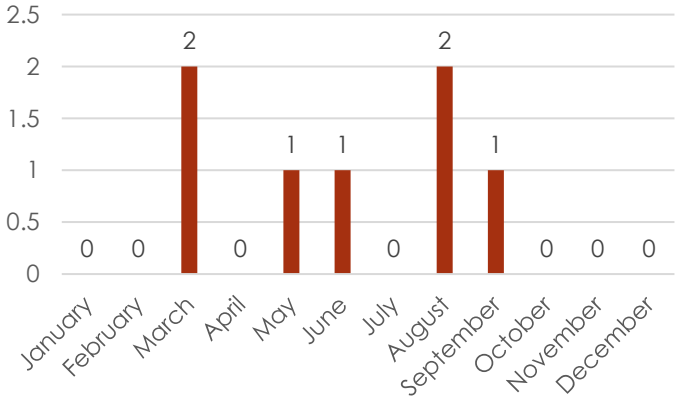
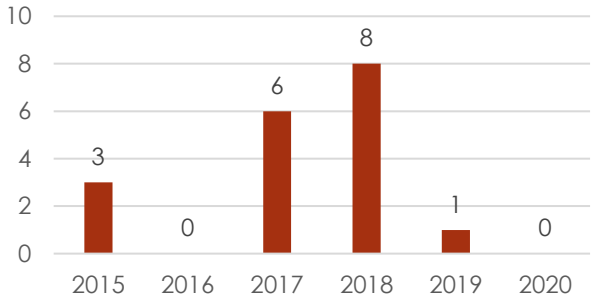


Figure 11. 2020 Crashes by Month

4th St and 66th Ave

The crash rate at this intersection spiked between in 2018, so staff determined that a signal was needed to ensure driver safety. The signal installation at 4th St and 66th Ave was completed in 2019, and far fewer crashes occurred at this intersection in 2019 and 2020.

Figure 12. Crashes by Year 4th St and 66th Ave



9th St/10th St and 21st Ave

The unsignalized intersections of 9th St and 21st and 10th St and 21st Ave were identified as potential safety issues for pedestrians and bicyclists due to long crossing distance. There were existing rapid flashing beacons at these crossings, however it was observed that compliance among vehicles was low.

Staff upsized the rapid flashing beacons at both of these intersections to promote safe pedestrian and bicycle crossings.

Before

After

83rd Ave and 10th St

Crashes began to increase at 83rd Ave and 10th St in 2018. The majority of these crashes were among left turning vehicles in the AM and PM rush hour periods. Staff adjusted the signal operation and implemented a protected left turn phase during morning and evening peak periods.

This safety measure was implemented in September of 2019 and the number of crashes decreased.

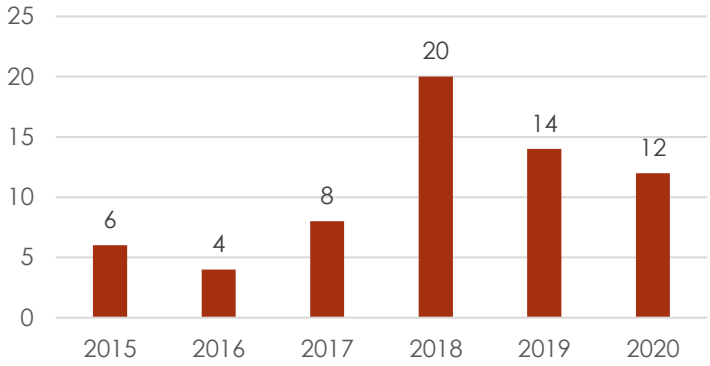
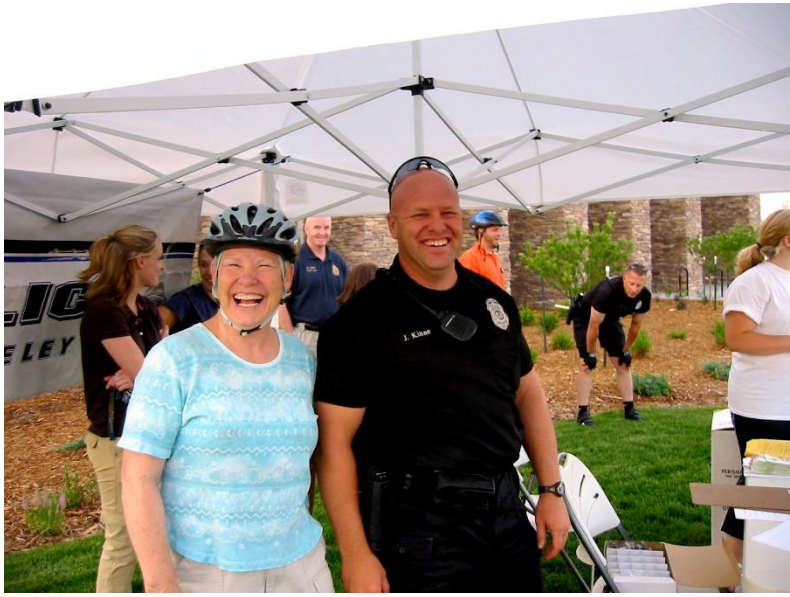


Figure 13.Yearly Crashes at 83rd Ave and 10th St

There was a 30% decrease in the total number of crashes between 2018 and 2019 and a 14% decrease from 2019 to 2020. Crashes occurring during AM and PM rush hour (7:00am-9:00am) and (4:00pm-6:00pm) also decreased by 55% from 2019 to 2020.

To improve signal visibility staff plans to install reflective signal backplates at this intersection using Highway Safety Improvement (HSIP) grant funding.

Enforcement and Education



- Continue to work with the Greeley Police Department on enforcement and education efforts.
- Continue to manage **Neighborhood Traffic Safety Program.**

  - Consistent coordination occurs between PD and Traffic Services to increase patrols in neighborhoods that participate in the **neighborhood speed watch program.**
- Continue to **share traffic study data** with PD related to speeding in residential areas.
  - When traffic services completes a traffic speed study and speed is a concern, information on the time of day, and number of vehicles speeding is shared with the PD Traffic Unit to inform patrol efforts.
- Continue to **provide information** to residents on transportation safety for all modes of travel.
  - Information on safe biking practices is posted on the Traffic Services website.
  - Brochures on neighborhood traffic safety are regularly provided to residents.
- Continue to **promote all modes** of travel.
  - The Switch Your Trip month encouraged people to switch as least one trip that they would normally take in a car to walking, biking, or another active mode.

Other Notable Progress

Project	*2019 Status*	*Current Status*
Hwy 34 Bypass and 35th Ave *Hwy 34 Bypass and 47th Ave*	The design for these interchanges has been started. CDOT construction funding has yet to be identified although Greeley has 30 million to contribute.	Design and environmental permitting process has started to make the project more shovel ready when funding is identified.
Hwy 34 Bypass and 11th Ave	Conceptual design completed as part of US 85/34 interchange design.	No funding identified to fully design or construct.
10th St and 35th Ave	30% design completed to reduce delay and improve safety.	Construction scheduled in 2024.
10th St and 47th Ave	Identified for future capacity improvements	Plans to begin 20% design in 2021 to reduce delay and improve safety.
10th St & 83rd Ave	Signal operation improvements completed resulting in a 30% decrease in crashes.	Improvement/construction scheduled for 2024.
16th St & 23rd Ave	30% design to be started to decrease delay and improve safety.	Planned Keep Greeley Moving Project.
37th St and Two Rivers Pkwy	30% design completed for intersection expansion and signalization.	Construction slated for 2022 in partnership with the City of Evans.
HWY 34 and CR 17	Highway Safety Improvement Grant (HSIP) funding to be awarded in 2023 to.	Highway Safety Improvement Grant (HSIP) funding to be awarded in 2023. CDOT began design for an interchange at this intersection.
23rd Ave Corridor	Identified for pedestrian improvements	Scope is being refined.

High Crash Locations 2016-2020

	Intersection	Total Crashes
1	35TH AVE & HWY 34 BYPASS	111
2	11TH AVE & HWY 34 BYPASS	109
3	47TH AVE & HWY 34 BYPASS	106
4	10TH ST & 35TH AVE	94
5	10TH ST &47TH AVE	86
6	83RD AVE & HWY 34 BYPASS	82
7	65TH AVE & HWY 34 BYPASS	68
8	22ND ST & HWY 85 BYPASS	67
9	47TH AVE & 20TH ST	62
10	10TH ST & 59TH AVE	61

Table 2. Top Ten Highest Crash Intersections:
Improvement Completed; Improvement Identified and Planned

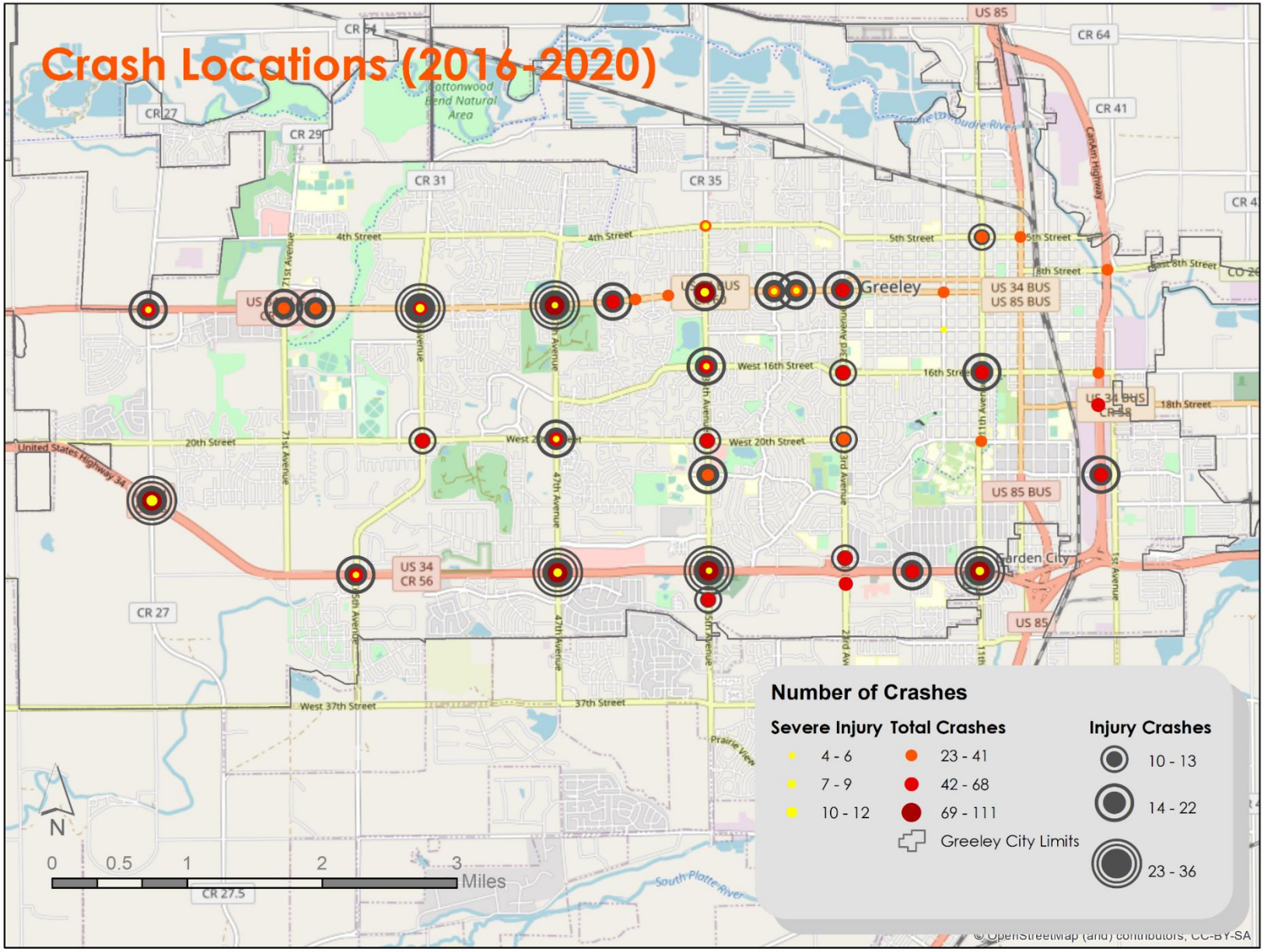
	Intersection	# of Injury Crashes
1	47TH AVE & HWY 34 BYPASS	36
2	83RD AVE & HWY 34 BYPASS	36
3	35TH AVE & HWY 34 BYPASS	35
4	11TH AVE & HWY 34 BYPASS	33
5	10TH ST & 47TH AVE	28
6	10TH ST & 59TH AVE	27
7	10TH ST & 35TH AVE	22
8	17TH AVE & HWY 34 BYPASS	19
9	22ND ST & HWY 85	19
10	10TH ST & 83RD AVE	18

Table 4. Top Ten Injury Crash Locations

	Intersection	# of Severe Injury Crashes
1	83RD AVE & HWY 34 BYPASS	12
2	10TH ST & 59TH AVE	9
3	11TH AVE & HWY 34 BYPASS	8
4	47TH AVE & HWY 34 BYPASS	8
5	10TH ST & 35TH AVE	7
6	20TH ST & 47TH AVE	6
7	10TH ST & 83RD AVE	6
8	10TH ST & 47TH AVE	6
9	35TH AVE & HWY 34 BYPASS	6
10	10TH ST & 26TH AVE	6

Table 3. Top Ten Severe Crash Locations

Figure 14. Highest Crash Locations (2016-2020)



2020 High Crash Locations

Generally, crashes decreased in 2020 among the 20 highest crash intersections.

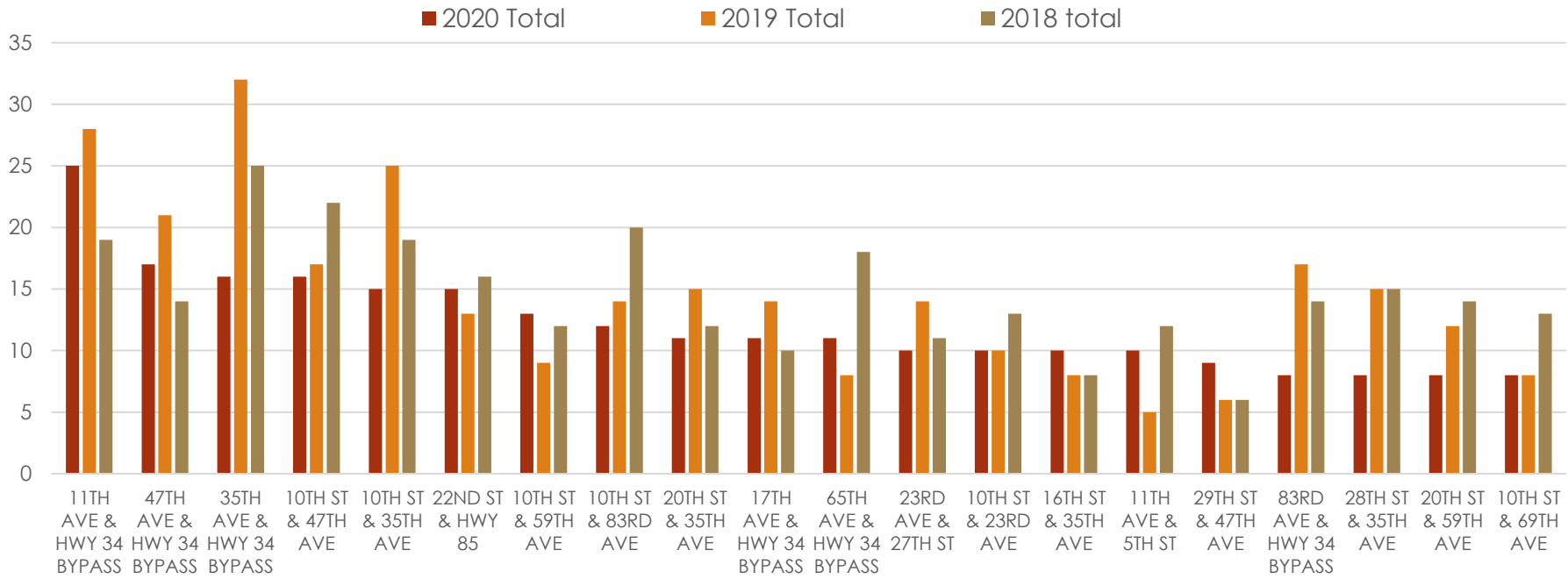
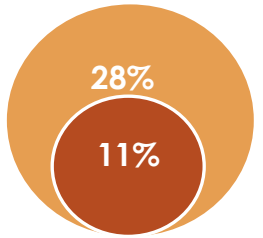


Figure 15. 2020 High Crash Locations

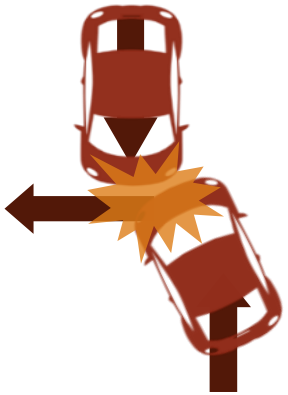
Despite lower traffic volumes, crashes increased at the following intersections from 2019 to 2020:

- 22nd St and Hwy 85
- 10th St and 59th Ave
- 65th Ave and Hwy 34 Bypass
- 16th St and 35th Ave
- 11th Ave and 5th St
- 29th St and 47th Ave

Left Turn Crashes



Left turn crashes occur when a left turning vehicles fails to yield to oncoming traffic and is struck by another vehicle. Left turn crashes can be caused by large volumes of left turns at an intersection, restricted sight distance, inadequate time for the yellow phase, absence of a dedicated left turn phase, inadequate time in the signal phasing for the number of left turns, excessive speeds, or other factors. Table 5 shows the intersections with a high number of left turn crashes from 2016-2020. Measures to address left turn crashes include:



- Install Flashing Yellow Arrows for left turn phases
- Retime the signal
- Add a protected left turn phase
- Increase the yellow phase
- Add an all red phase
- Add guide markings if there are dual left turn lanes
- Add capacity to the intersection

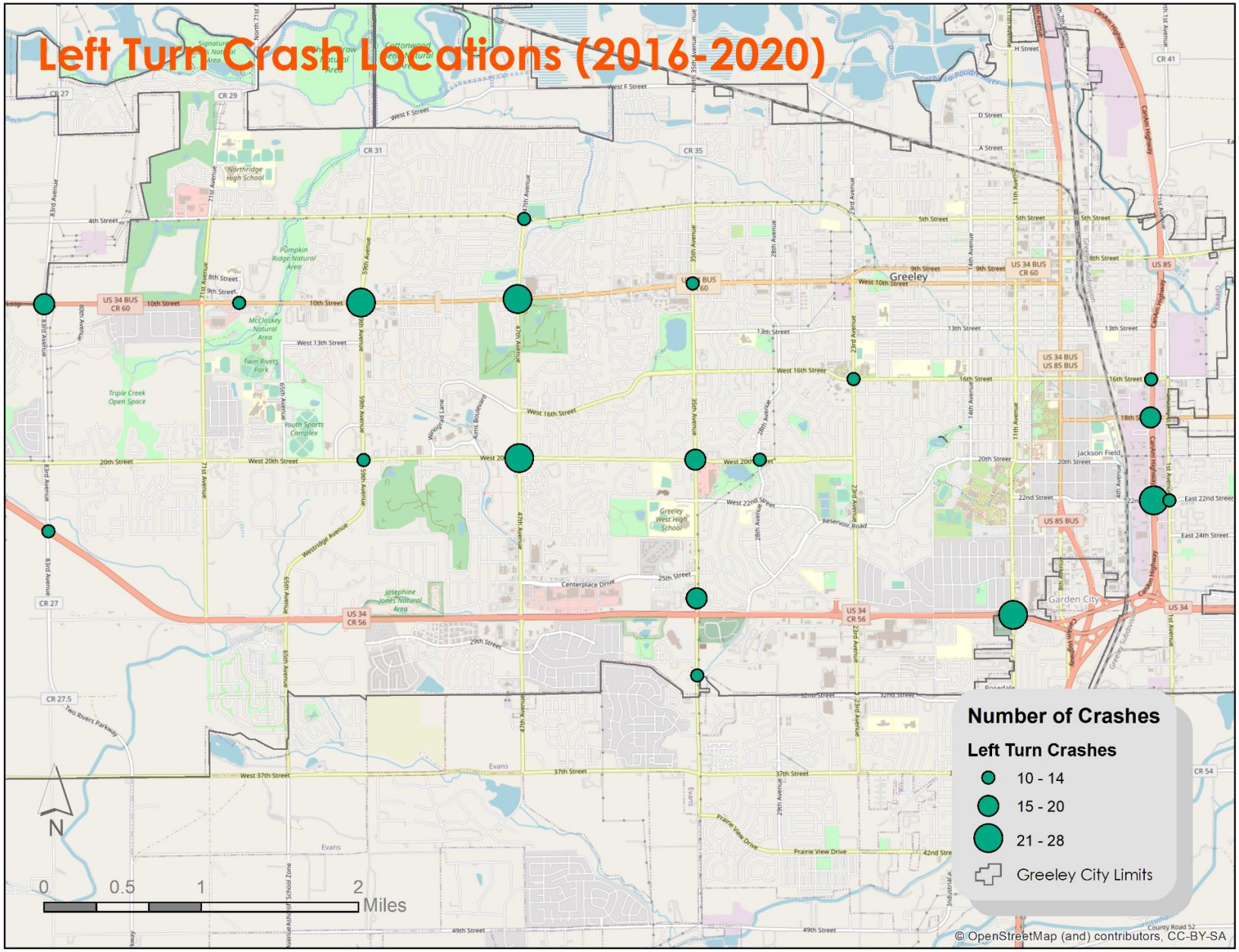
WHAT ARE THE DIFFERENT TYPES OF LEFT-TURN PHASING?

- Protected: You turn left while opposing traffic is stopped. You have the right of way.
- Permitted: You turn left when there is a gap in opposing traffic (vehicles, cyclists, or pedestrians). Opposing traffic has the right of way.

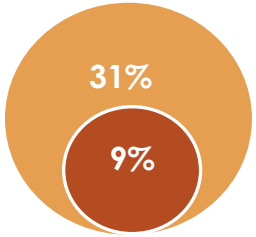
Intersection	Total Left Turn
11TH AVE & HWY 34 BYPASS	28
10TH ST & 47TH AVE	27
10TH ST & 59TH AVE	26
22ND ST & HWY 85	25
20TH ST & 47TH AVE	24
10TH ST & 83RD AVE	20
28TH ST & 35TH AVE	17
18TH ST & HWY 85	17
20TH ST & 35TH AVE	15
10TH ST & 35TH AVE	14
23RD AVE & 28TH ST	13
20TH ST & 28TH AVE	13
4TH ST & 66TH AVE	13
10TH ST & 69TH AVE	12
20TH ST & 59TH AVE	12
16TH ST & 23RD AVE	12

Table 5. Highest Left Turn Crash Intersections (2016-2020)
Improvement Completed
Improvement Identified and Planned

Figure 47.Highest Left Turn Crash Locations (2016-2020)



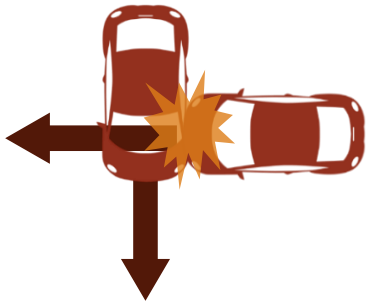
Broadside Crashes

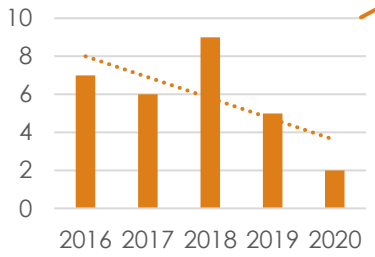


Broadside crashes also known as right angle, T-bone or through-through crashes occur when two vehicles that are going straight collide with one another. While only making up 9% of all crashes 31% of these crashes result in some type of injury.

These types of crashes occur at both signalized and unsignalized intersections and can be caused by restricted sight distance, poor signal visibility, inadequate roadway lighting, inadequate signal timing, speeding, inadequate traffic control devices, or other factors. Table 6 shows the intersections with a high number of broadside crashes from 2016-2020. The list includes both signalized and unsignalized locations. Measures to address broadside crashes include:

- Signal visibility enhancements such as side-of-pole mounted signal heads and high visibility backplates.
- Upgrading traffic control devices such as stop signs or installing a signal.
- Remove sight obstructions.
- Remove parking near corners.
- Install advance warning signs or beacons.
- Improve roadway lighting.
- Signal timing adjustments.



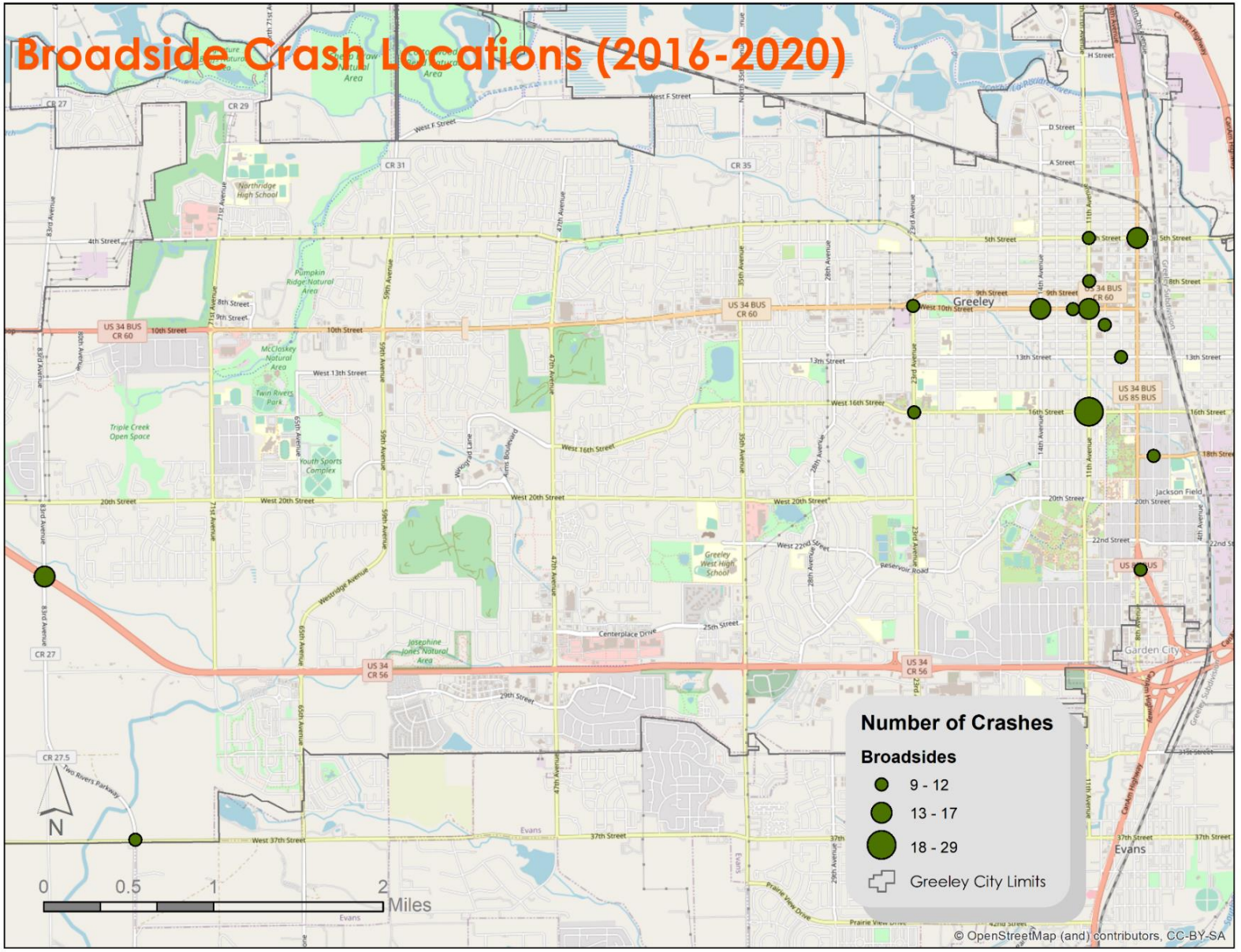


Identified as a high accident location in previous reports, staff removed this intersection from night-time flash operation in 2018 resulting in a downward trend.

Intersection	*Total Broadsides*
11TH AVE & 16TH ST	29
10TH ST & 14TH AVE	17
10TH ST & 11TH AVE	14
5TH ST & 8TH AVE	13
83RD AVE & HWY 34 BYPASS	13
13TH ST & 9TH AVE	12
11TH AVE & 5TH ST	12
10TH AVE & 11TH ST	12
11TH AVE & 8TH ST	11
37TH ST & TWO RIVERS PKWY	11
10TH ST & 23RD AVE	11
18TH ST & 7TH AVE	11
8TH AVE & HWY 85	10
10TH ST & 12TH AVE	9
16TH ST & 23RD AVE	9

Table 6. Highest Broadside Crash Locations (2016-2020)
Improvement Completed
Improvement Identified and Planned

Figure 17. Highest Broadside Crash Locations (2016-2020)



Pedestrian Crashes

The intersection with the highest number of pedestrian crashes has a rate of only one crash per year. Pedestrian-vehicle crashes make up about 2% of the total crashes in Greeley, but 58% of these crashes result in injury, and 40% result in severe injury or death. Measures to address pedestrian crashes include:

- Reducing crossing distances at intersections near schools or other areas with large numbers of pedestrians
- Traffic calming measures such as curb extensions and bulbouts
- Raised pedestrian crossings
- Improved crosswalk visibility
- Pedestrian refuge islands
- Signalized pedestrian crossings or HAWK signals
- Speeds below 30 miles per hour

Intersection	*Total Pedestrian Crashes*
11TH AVE & 26TH ST	5
14TH AVE & 15TH ST	4
23RD AVE & 31ST ST	3
11TH AVE & 23RD ST	3
23RD AVE & 27TH ST	3
10TH ST & 28TH AVE	3

Table 7. Highest Pedestrian Crash Locations (2016-2020)
Improvement Completed
Improvement Identified and Planned

Bike Crashes

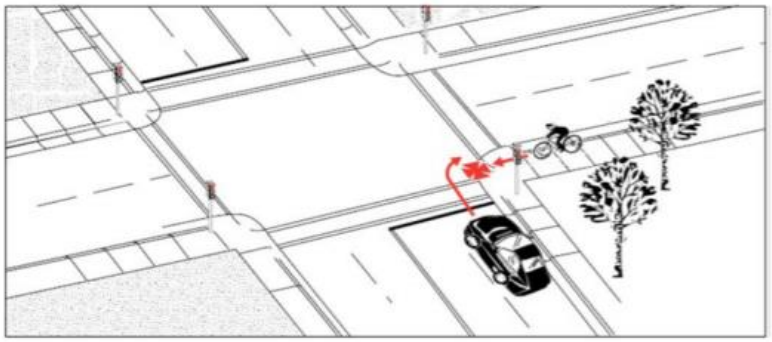
Bike-vehicle crashes make up only 1% of the total crashes in Greeley, but 67% of these crashes result in injury, and 38% result in severe injury or death. Measures to address bike crashes include:

- Bike lanes with wide buffers
- Bike lanes that extend up to intersections
- Driver education and awareness
- Improved pavement markings
- Bicyclist education
- Protected left turn phasing at intersections

Intersection	*Bike Crashes*
16TH ST & 35TH AVE	4
10TH ST & 35TH AVE	3
16TH ST & 8TH AVE	3
28TH ST & 35TH AVE	3
11TH AVE & 5TH ST	3
21ST AVE & 9TH ST	3

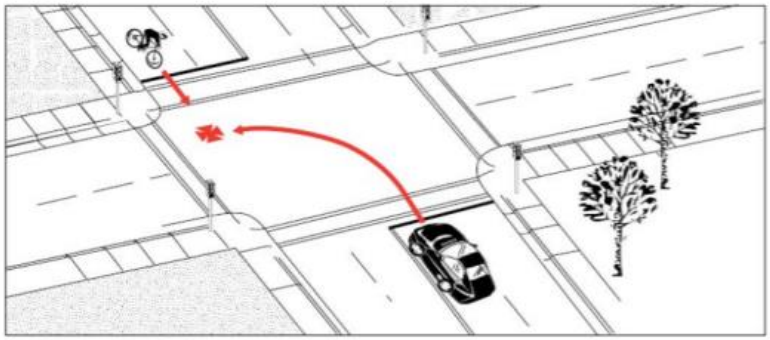
Table 8. Highest Bike Crash Locations (2016-2020)
Improvement Completed
Improvement Identified and Planned

Common Bike Crash Types



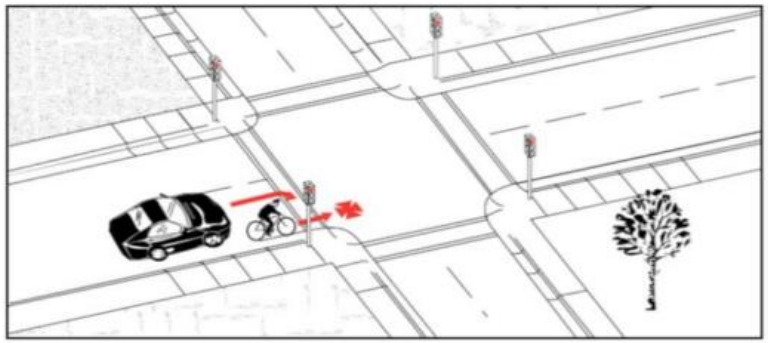
Right Angle

Right angle crashes are the most common type of bike crash. The majority of right angle crashes involve a bike riding against traffic on the sidewalk or street.



Approach Turn

Where a bicyclist is hit by a left turning vehicle.



Overtaking Turn

Where a bicyclist is hit by a right turning vehicle. Also known as the "right hook" crash.

Figure 18. Highest Bike and Pedestrian Crash Locations (2016-2020)