SRF

DRAFT Memorandum

SRF No. 16586

To:	Jes Conz City of Williston
From:	SRF Consulting Group
Date:	December 15, 2023
Subject:	City of Williston Infrastructure Safety Action Plan

Task 2.2 Crash Analysis: Crash Analysis Summary & Findings

Executive Summary

Between 2018 and 2022, the City of Williston recorded over 2,701 total crashes of which 50 resulted in fatal or serious injuries. An analysis of these crashes was completed to identify crash trends among six modes: auto, heavy vehicle, pedestrian, bicycle, and motorcycle. The analysis includes an examination of the crashes by mode by basic crash report variables such as roadway characteristics or roadway ownership/jurisdiction. The correlations identified in the crash trend summary may be used by the City of Williston to help prioritize roadway safety investments in the future.

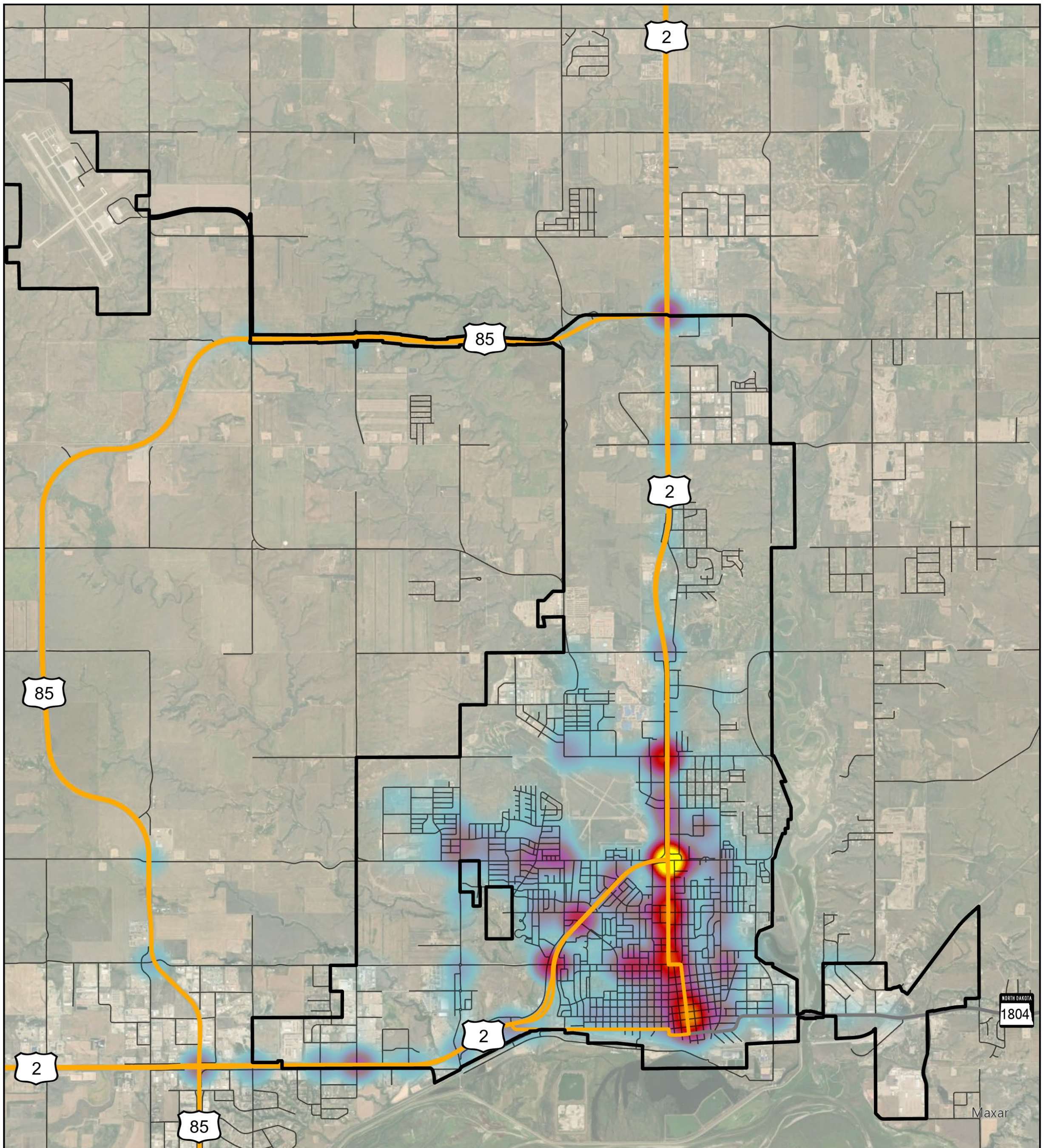
Introduction

A Safe System approach focuses on eliminating severe crashes (fatal and serious injury) using a proactive approach, understanding that humans are vulnerable and make mistakes, and our system needs to be designed to be accommodating. To make a difference and reduce the number of fatal and serious injury crashes within the study area, the City of Williston is developing the Infrastructure Safety Action Plan (ISAP).

The crash analysis is divided into two key categories: (1) general crash characteristics and (2) demographic and economic characteristics. The analysis includes available crash data from 2018 through 2022 provided by the North Dakota Department of Transportation (NDDOT). The KABCO injury scale is used and includes the following designations:

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

Throughout the memorandum, the crash trends are summarized by "**KA**" indicating fatal and serious injuries and "**BCO**," which includes non-serious injuries.



Legend

Study Area
Sparse
Dense

2018 - 2022 Crash Heat Map

0 0.5 1 2 Miles

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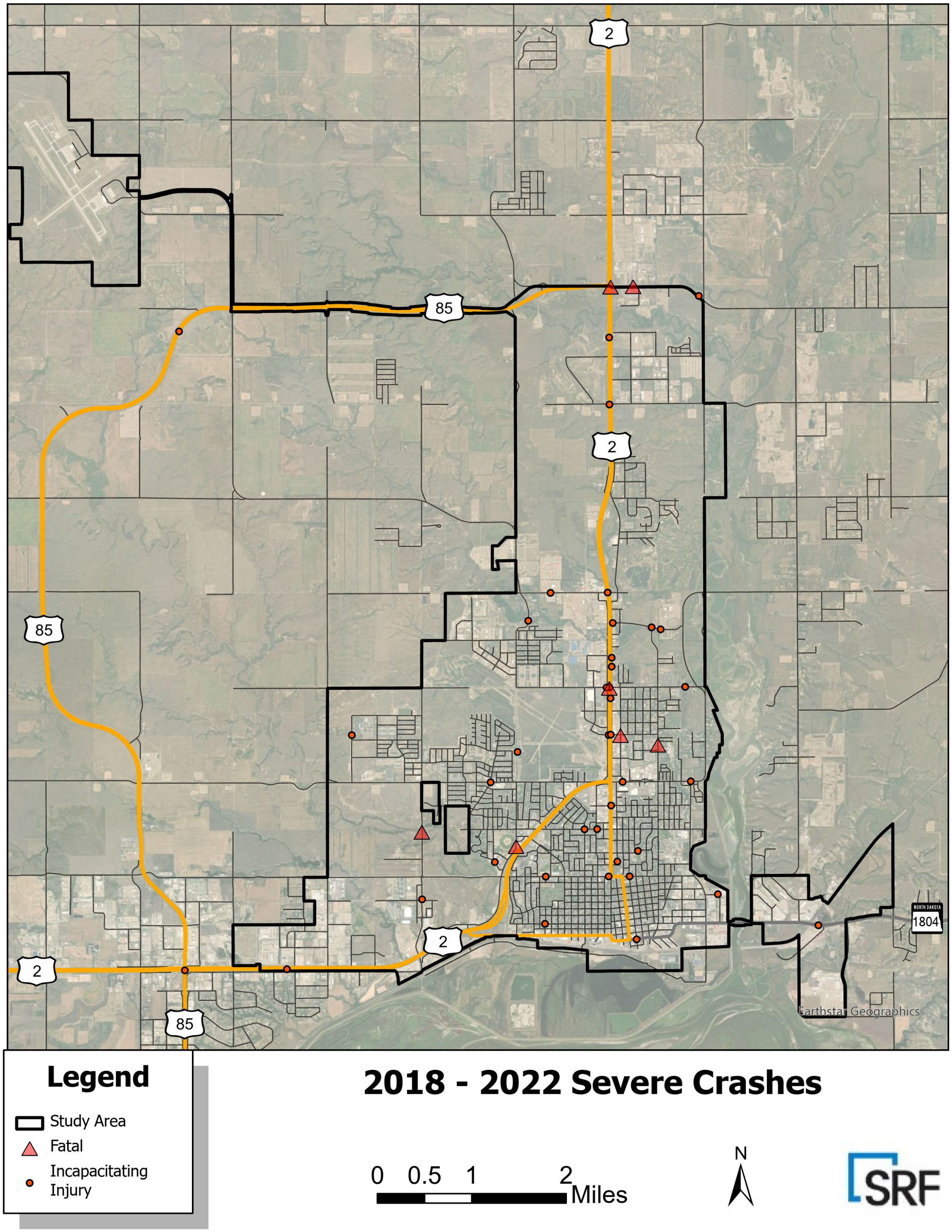
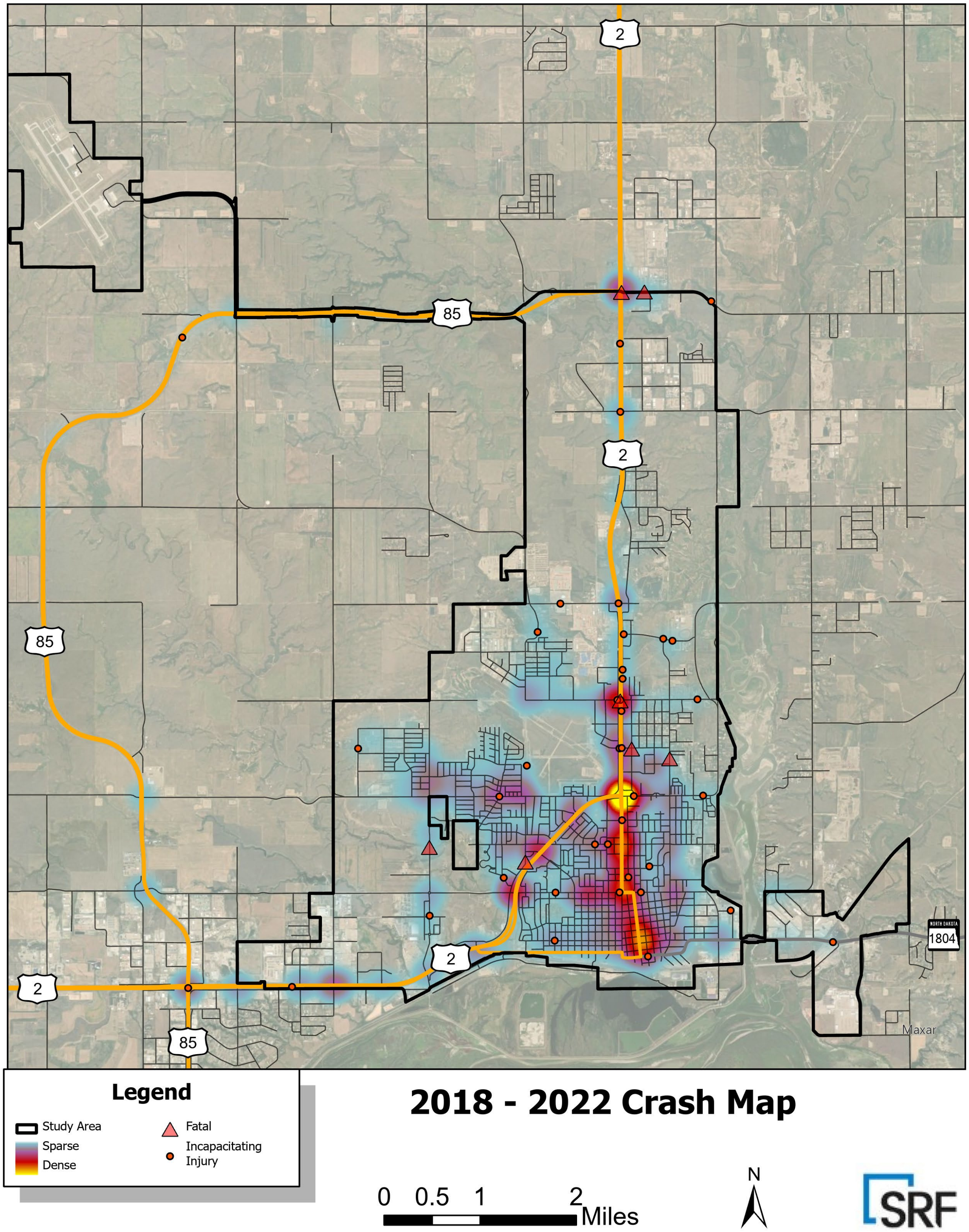


2018 - 2022 Severe Crashes



2018 - 2022 Crash Map

The data is further processed and grouped by mode (unit/vehicle type): automobile, bicycle, heavy vehicle, bicycle, pedestrian, and motorcycle. To categorize the modes, one record is created per mode when the unit and vehicle type are the same (ex. auto/auto). This scenario applied to most automobile crashes. The highest severity type is then recorded. Very few of the pedestrian, bicycle and motorcycle crashes involved another unit of the same type. If the unit and vehicle type are different (ex. auto/pedestrian), one record is created in each of the corresponding mode's crash dataset. Some crashes require further investigation of the descriptions to identify the appropriate mode.

Once the crashes are categorized by mode, crash factors are summarized and further broken down by segment (midblock) and intersection crash types. Crash factors include crash report variables as identified in the one-year crash dataset provided by NDDOT.

Crash Data Background

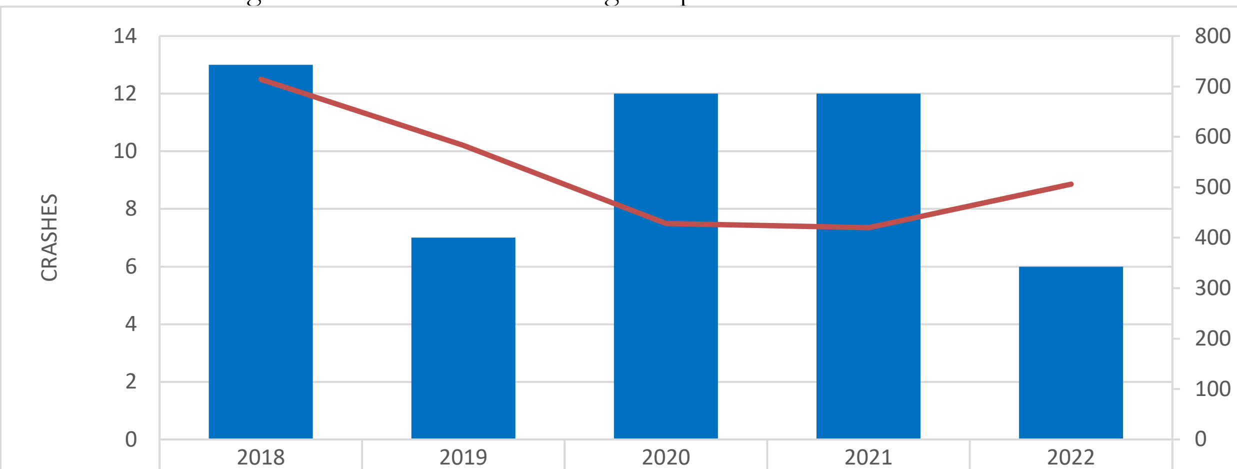
Crash data for the ISAP (safety action plan) comes directly from NDDOT crash reports. NDDOT collects data from law enforcement through an electronic crash reporting system, which is often entered at the scene of the crash. For transportation safety planning, the national best practice is to utilize the latest five years of complete crash data. For the ISAP, data from the last five full calendar years, or 2018 through 2022, is utilized. Historical data earlier than 2018 is not utilized because the safety action plan needs to analyze current trends. Focusing on more recent five-year crash trends helps the City of Williston implement safety improvements to address crash trends occurring today, including emerging trends, rather than trends that may have peaked and waned. Given the significant degree of physical development and change that has occurred to the City's transportation system during and following the last oil/gas boom in the first half of the 2010s, using the last five years of crash trends is especially important.

The dataset utilized for the safety action plan is tailored specifically to the City of Williston through NDDOT's one-year crash data tables. One-year data tables are assembled to provide the most comprehensive analysis of crash data. NDDOT also provides a five-year dataset that is more typically utilized by jurisdictions across the state; however, the five-year dataset is filtered and cleaned up by NDDOT planning and engineering staff, making a much-simplified version of the one-year dataset. Given the scope of the ISAP, SRF Consulting Group assembled one-year tables which are raw data files received by NDDOT from the electronic crash reporting system. The one-year tables provide as robust of a crash analysis as possible utilizing the state's available crash data therefore, Williston can tailor their crash data as they would like to organize it, rather than having NDDOT tailor and organize as currently occurs in the five-year crash data tables.

Crash Characteristics

General Summary

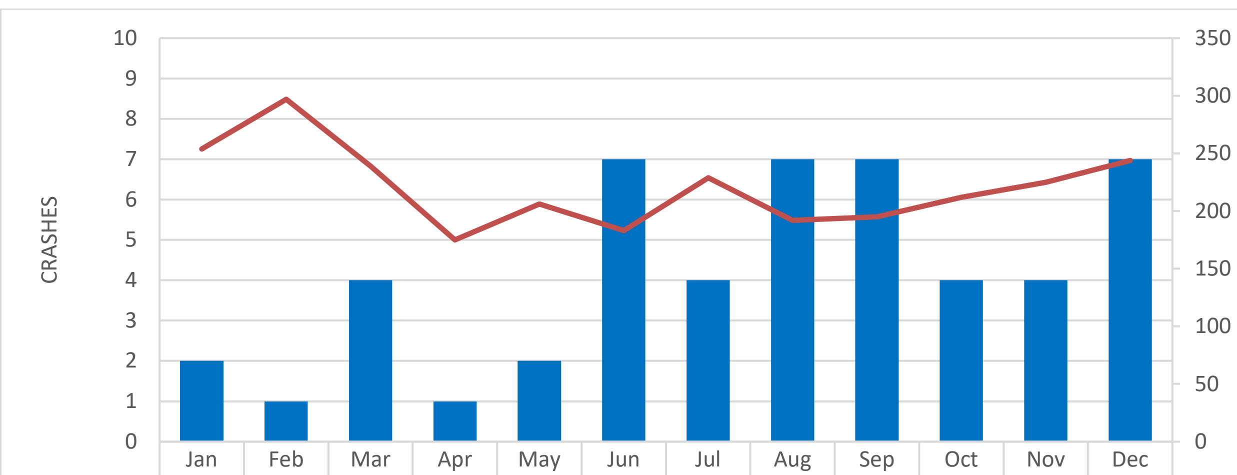
Within the City of Williston, over 2,700 crashes involving automobiles, heavy vehicles, bicycles, pedestrians, and motorcycles were recorded over the five-year period. Figure 1 indicates that there was an annual average of 10 severe crashes during this period.



	2018	2019	2020	2021	2022
KA	13	7	12	12	6
BCO	714	583	428	420	506

Figure 1 All-Mode Crash Severity by Year

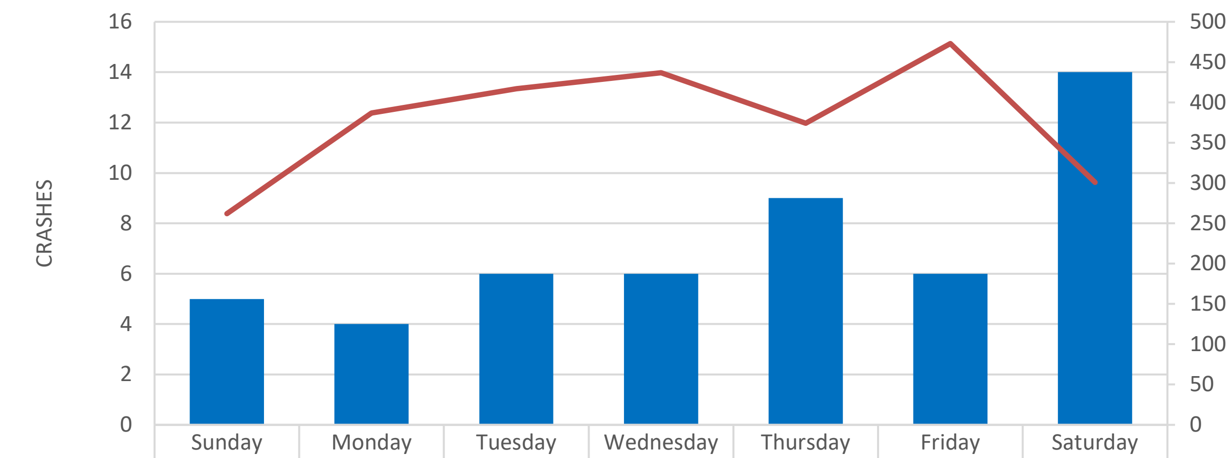
Figure 2 illustrates the average number of crashes per month during the five-year period. Fatal and serious injury crashes tend to peak during the summer months while BCO crashes tend to peak during the winter months.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
KA	2	1	4	1	2	7	4	7	7	4	4	7
BCO	254	297	239	175	206	183	229	192	195	212	225	244

Figure 2 All-Mode Crash Severity by Month of Year

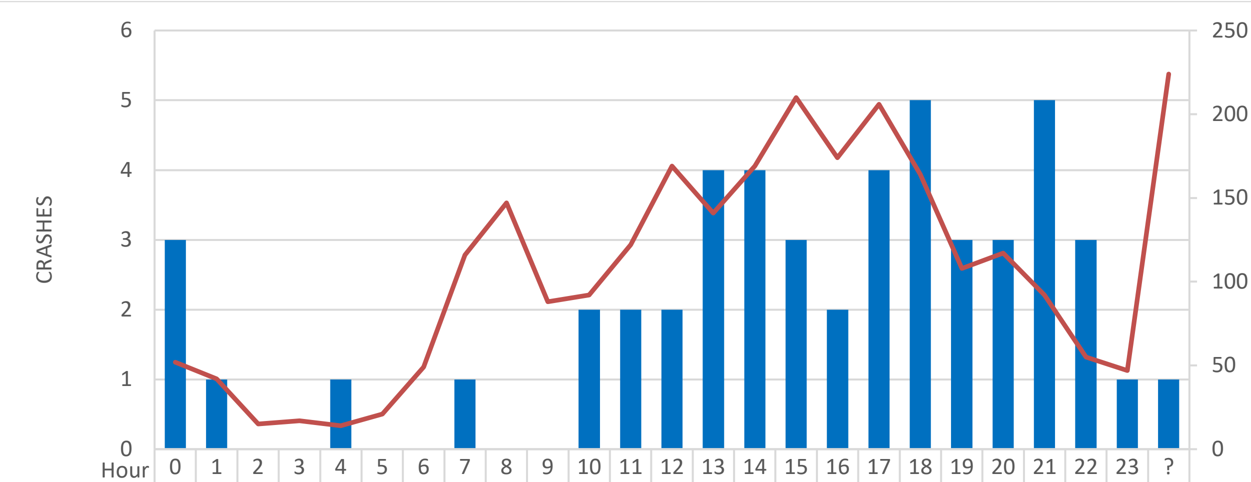
Figure 3 illustrates the average number of crashes per day of the week during the five-year period. Fatal and serious injury crashes tend to peak on Saturdays.



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
KA	5	4	6	6	9	6	14
BCO	262	387	417	437	374	473	301

Figure 3 All-Mode Crash Severity by Day of Week

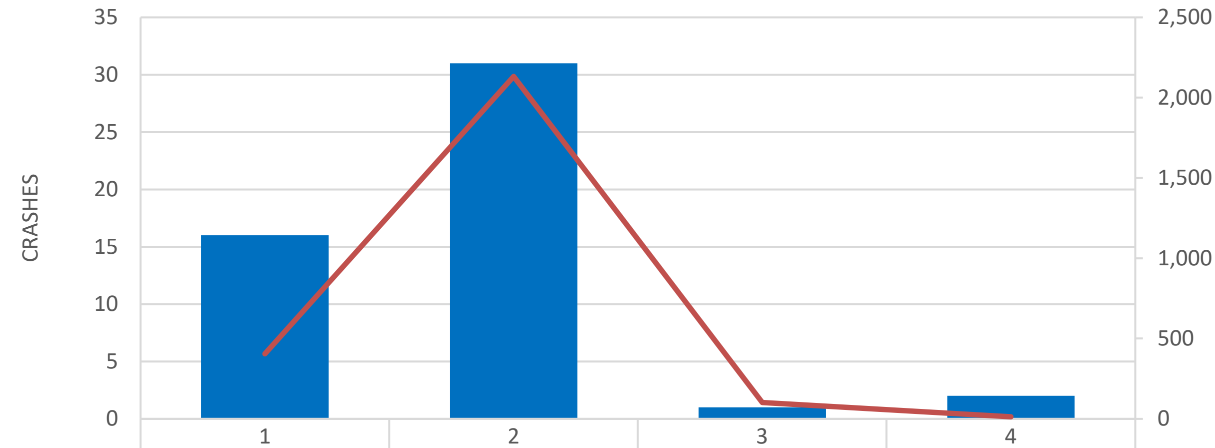
Figure 4 illustrates the average number of crashes per time of day during the five-year period. Fatal and serious injury crashes tend to peak in the afternoon and evening. Crashes without a recorded time of day are found under "?".



Hour	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	?
KA	3	1	0	0	1	0	0	1	0	0	2	2	2	4	4	3	2	4	5	3	3	5	3	1	1
BCO	52	42	15	17	14	21	49	116	147	88	92	122	169	141	169	210	174	206	164	108	117	92	55	47	224

Figure 4All-Mode Crash Severity by Hour of Day

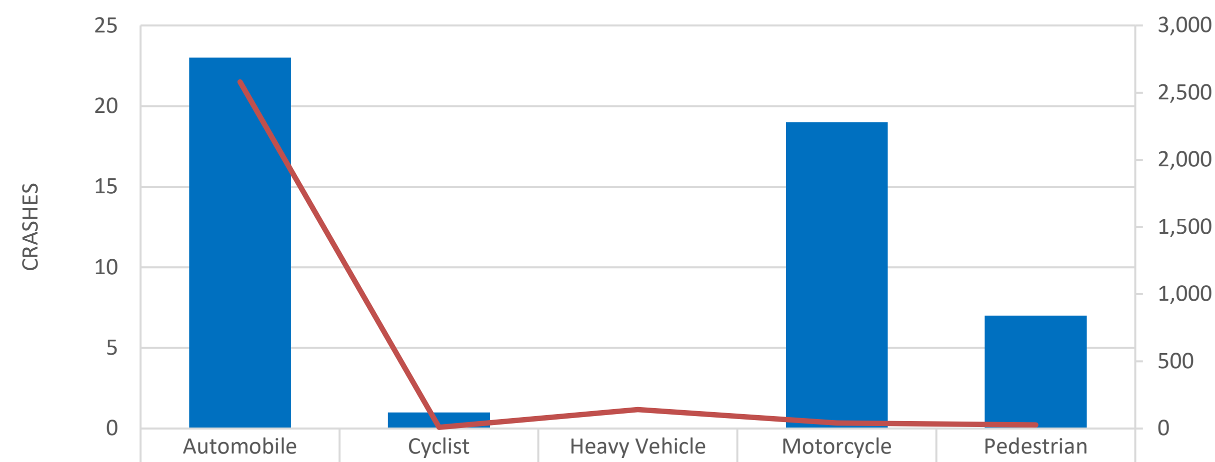
Figure 5 illustrates the crashes by the number of vehicles involved. Most of the fatal and serious injury crashes involved two or more vehicles.



	1	2	3	4
KA	16	31	1	2
BCO	405	2,132	101	13

Figure 5 All-Mode Crash Severity by Number of Involved Vehicles/Parties

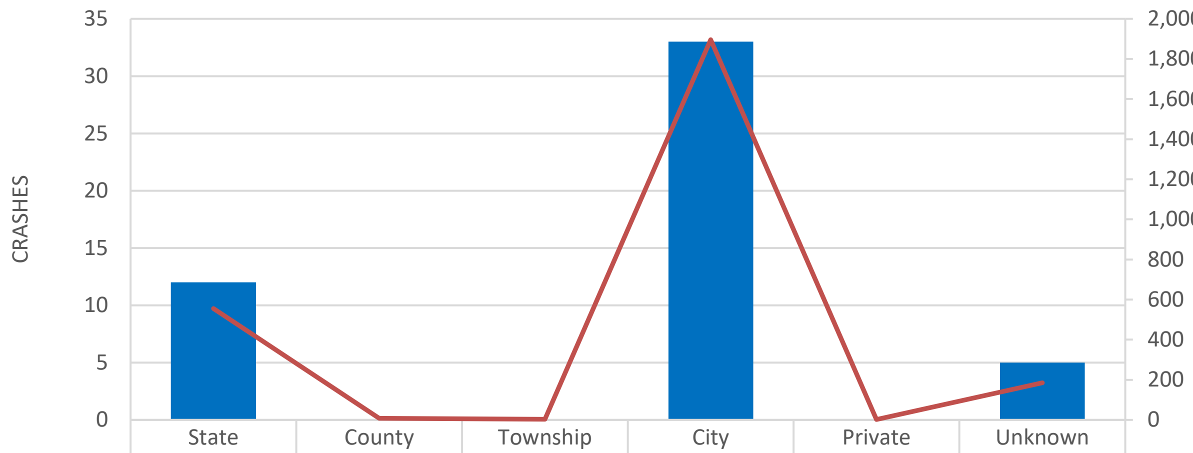
Figure 6 illustrates the number of crashes by mode and the most severe to each of the respective modes. Severe motorcycle crashes make up 45.2 percent of all motorcycle-involved crashes, severe pedestrian crashes make up 25.9 percent of all pedestrian-involved crashes, and severe bicyclist crashes make up 11.1 percent of all bicyclist-involved crashes; whereas severe automobile crashes make up 0.9 percent of all automobile-involved crashes and severe heavy vehicle crashes make up 0.0 (zero) percent of all heavy vehicle-involved crashes.



	Automobile	Cyclist	Heavy Vehicle	Motorcycle	Pedestrian
KA	23	1	0	19	7
BCO	2,580	9	140	42	27

Figure 6 All-Mode Crash Severity by Mode

Figure 7 illustrates the number of crashes by roadway jurisdiction. Most of the fatal and serious injury crashes occurred on city roadways. On City roads, 1.7 percent of crashes are severe; on State roads, 2.1 percent of crashes are severe; and on unknown jurisdictional roads, 2.6 percent of crashes are severe.

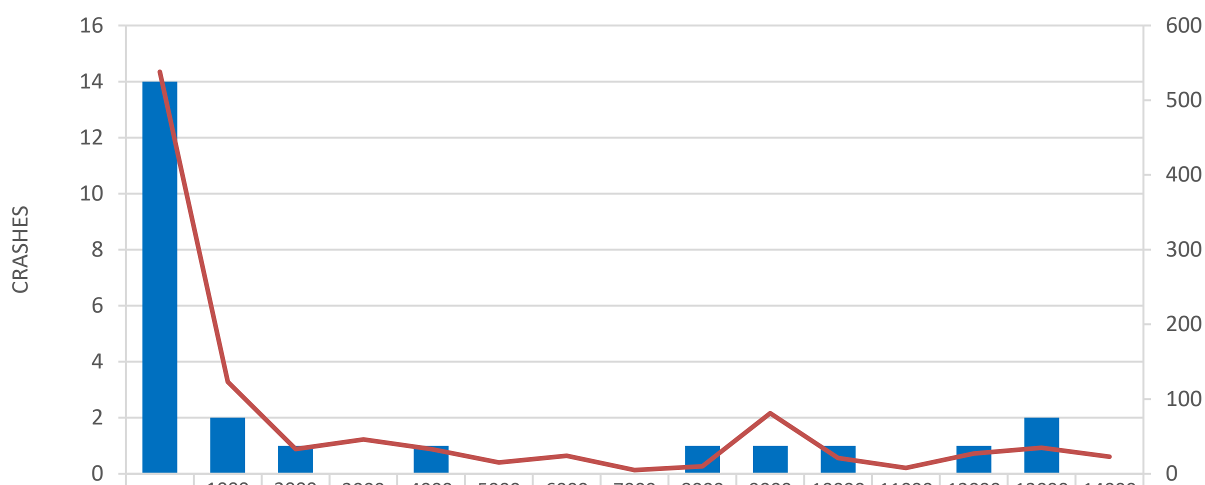


	State	County	Township	City	Private	Unknown
KA	12	0	0	33	0	5
BCO	556	8	4	1,896	2	185

Figure 7 All-Mode Crash Severity by Road Ownership/Jurisdiction

Segment-Related Crashes

Figure 8 illustrates the number of segment crashes by average annual daily traffic (AADT) or vehicles per day (vpd) for all modes of transportation. Most of the fatal and serious injury crashes occurred on low volume roadway segments (less than 1,000 vpd). Segments include roadways between intersections.

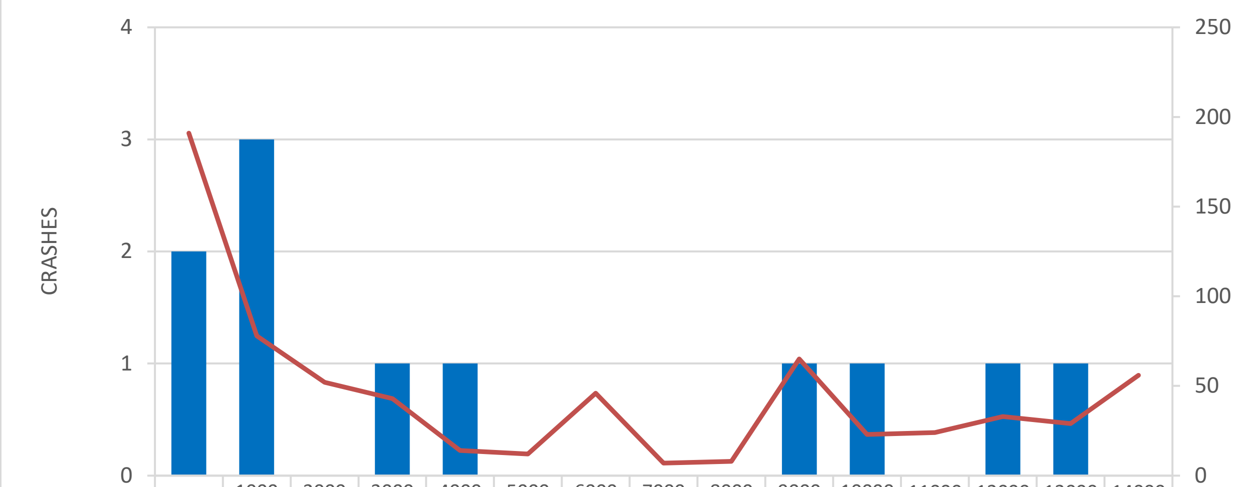


	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	14	2	1	0	1	0	0	0	1	1	1	0	1	2	0
BCO	538	123	33	46	33	15	24	5	10	81	21	8	27	35	23

Figure 8 All-Mode Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

Figure 9 also includes all modes and illustrates the number of intersection crashes by AADT or vpd. Most of the fatal and serious injury crashes occurred at low volume intersections.

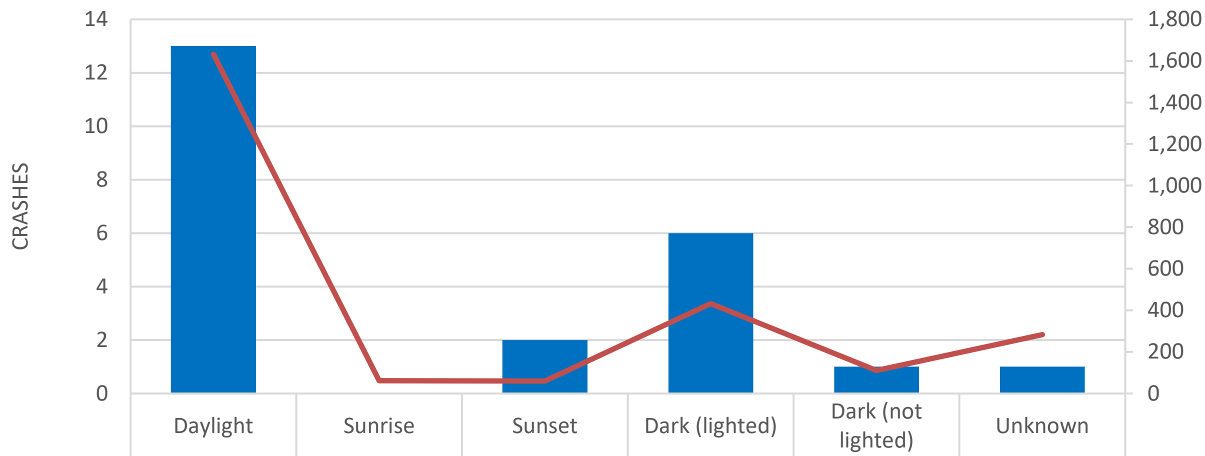


	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	2	3	0	1	1	0	0	0	0	1	1	0	1	1	0
BCO	191	78	52	43	14	12	46	7	8	65	23	24	33	29	56

Figure 9 All-Mode Crash Severity by AADT (intersection crashes only)

Automobiles

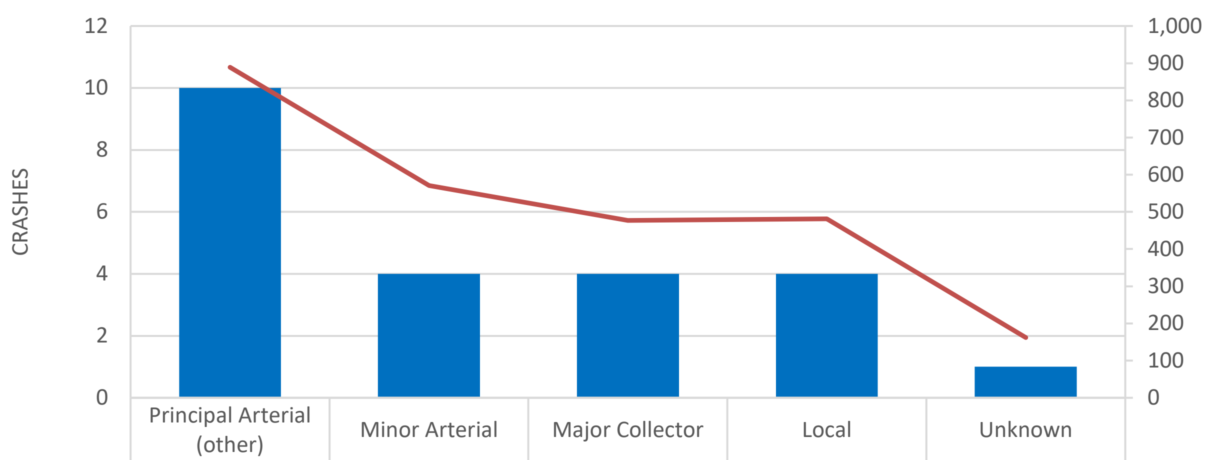
Figure 10 illustrates the number of automobile-involved crashes by lighting condition. Most fatal and serious injury automobile crashes occurred during daylight conditions, with another spike under Dark (lighted) conditions.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	13	0	2	6	1	1
BCO	1,632	61	60	433	111	283

Figure 10 Automobile Crash Severity by Lighting Conditions

Figure 11 illustrates the number of automobile-involved crashes by functional classification. Most fatal and serious injury automobile crashes occurred on Principal Arterials.

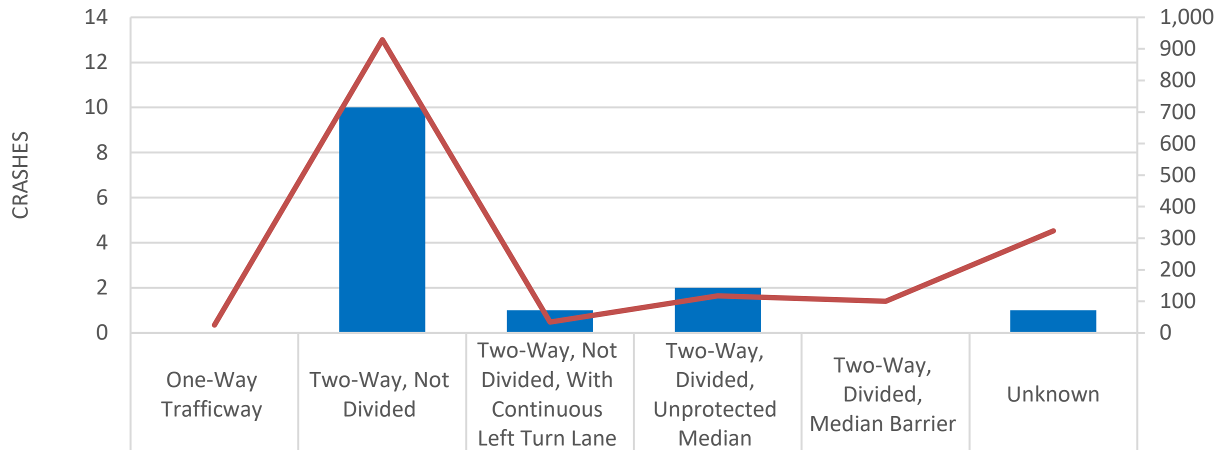


	Principal Arterial (other)	Minor Arterial	Major Collector	Local	Unknown
KA	10	4	4	4	1
BCO	889	571	477	481	162

Figure 11 Automobile Crash Severity by Functional Classification

Segment-Related Crashes

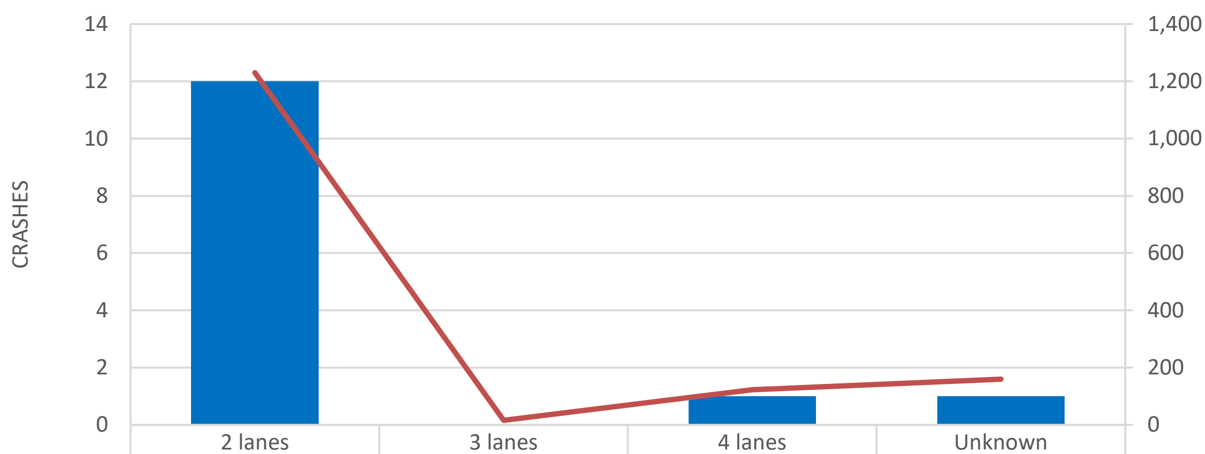
Figure 12 illustrates the number of automobile-involved segment crashes by midblock roadway configuration. Most fatal and serious injury segment crashes occurred on two-way undivided roadways.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	0	10	1	2	0	1
BCO	25	929	34	118	100	323

Figure 12 Automobile Crash Severity by Midblock Road Configuration (segment crashes only)

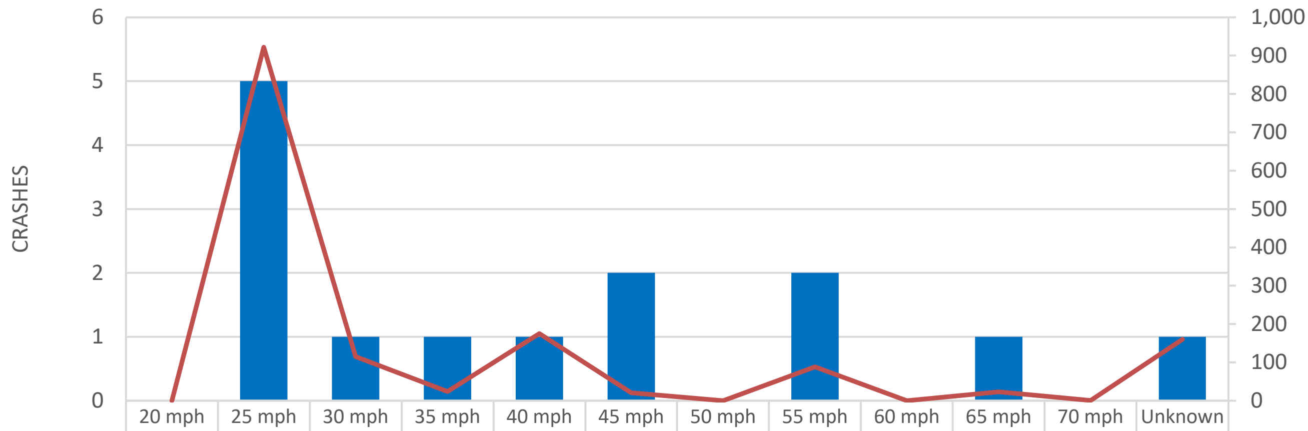
Figure 13 illustrates the number of automobile-involved segment crashes by number of lanes. Most fatal and serious injury segment crashes occurred on two-lane roadways.



	2 lanes	3 lanes	4 lanes	Unknown
KA	12	0	1	1
BCO	1,230	16	123	160

Figure 13 Automobile Crash Severity by Midblock Number of Lanes (segment crashes only)

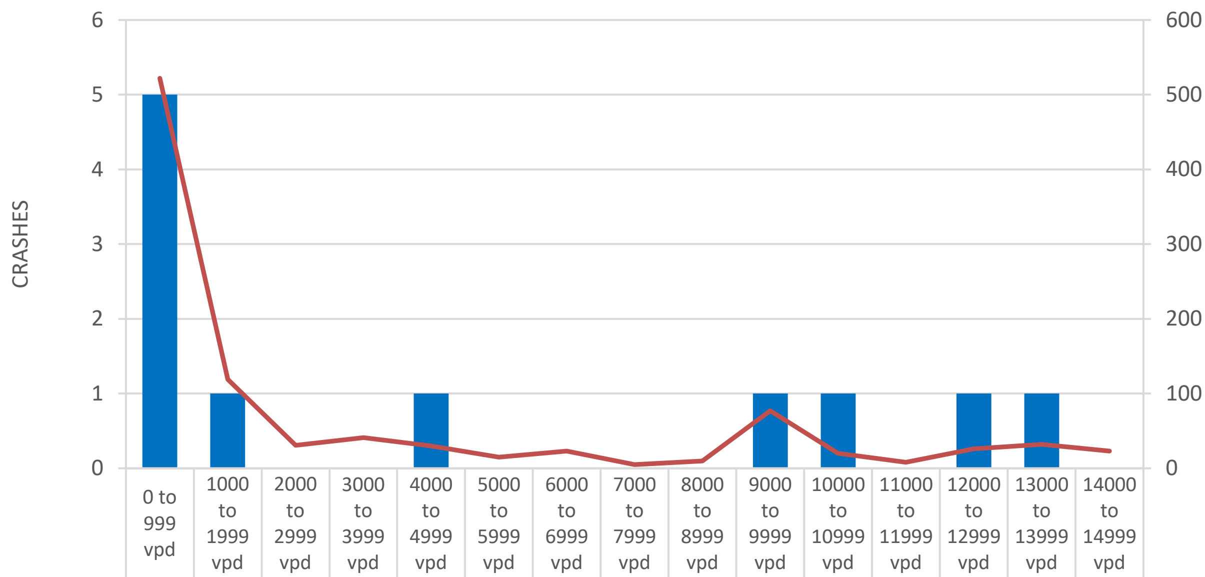
Figure 14 illustrates the number of automobile-involved segment crashes by speed limit. Most fatal and serious injury segment crashes occurred on roadways with a speed limit of 25 mph.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	Unknown
KA	0	5	1	1	1	2	0	2	0	1	0	1
BCO	0	922	115	24	175	21	0	88	0	23	1	160

Figure 14 Automobile Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 15 illustrates the number of automobile-involved segment crashes by AADT or vpd. Most of the fatal and serious injury crashes occurred on low volume roadways (less than 1,000 vpd).

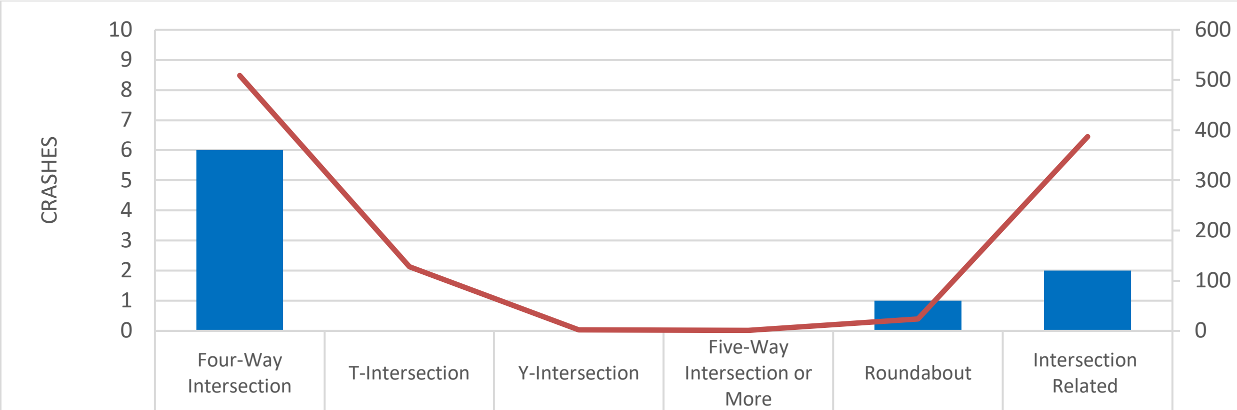


	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	5	1	0	0	1	0	0	0	0	1	1	0	1	1	0
BCO	522	119	31	41	30	15	23	5	10	77	20	8	26	32	23

Figure 15 Automobile Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

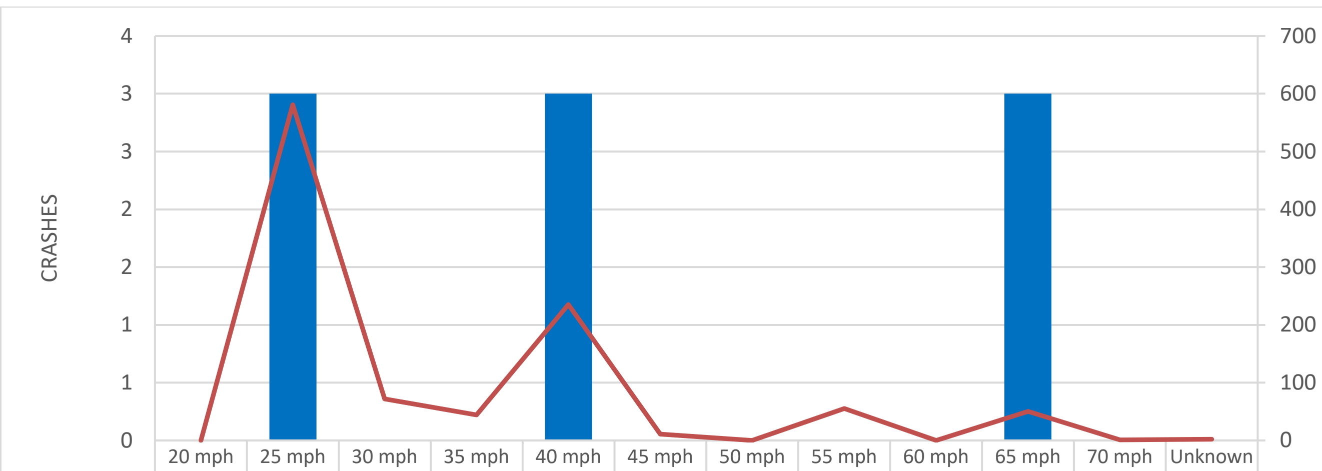
Figure 16 illustrates the number of automobile-involved intersection crashes by intersection configuration. Most fatal and serious injury intersection crashes occurred at four-way intersections.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related
KA	6	0	0	0	1	2
BCO	509	128	2	1	24	387

Figure 16 Automobile Crash Severity by Intersection Configuration (intersection crashes only)

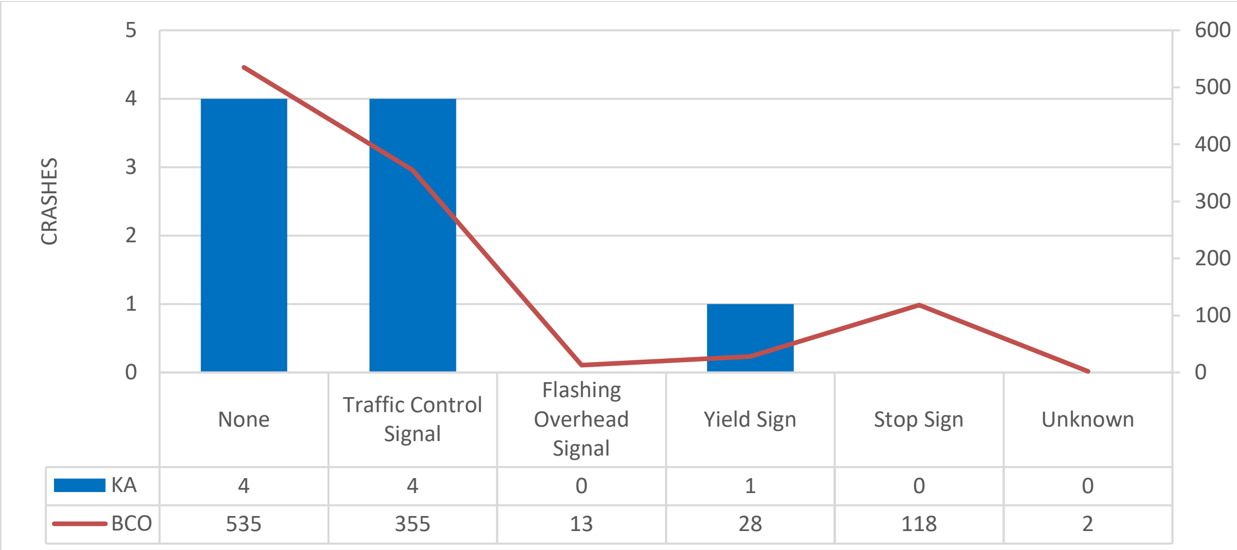
Figure 17 illustrates the number of automobile-involved intersection crashes by maximum speed limit. The fatal and serious injury crashes were distributed evenly among intersections with a maximum speed limit of 25 mph, 40 mph, and 65 mph.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	Unknown
KA	0	3	0	0	3	0	0	0	0	3	0	0
BCO	0	581	72	44	235	11	0	55	0	50	1	2

Figure 17 Automobile Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

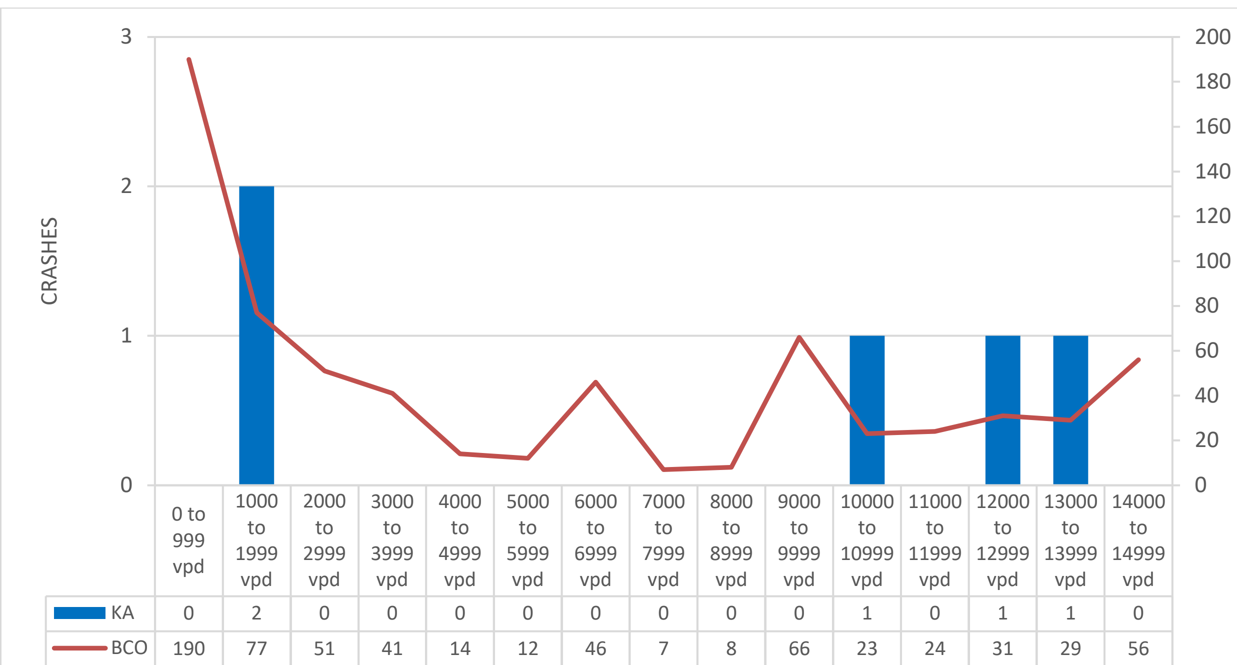
Figure 18 illustrates the number of automobile-involved intersection crashes by intersection traffic control device. Most fatal and serious injury intersection crashes occurred at uncontrolled and signalized intersections. There was also one severe crash at a yield-controlled intersection.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign	Unknown
KA	4	4	0	1	0	0
BCO	535	355	13	28	118	2

Figure 18 Automobile Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 19 illustrates the number of automobile-involved intersection crashes by maximum AADT or vpd. Most fatal and serious injury intersection crashes occurred at intersections with a maximum AADT between 10,000 and 14,000.



	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	0	2	0	0	0	0	0	0	0	0	1	0	1	1	0
BCO	190	77	51	41	14	12	46	7	8	66	23	24	31	29	56

Figure 19 Automobile Crash Severity by AADT (intersection crashes only)

Heavy Vehicles

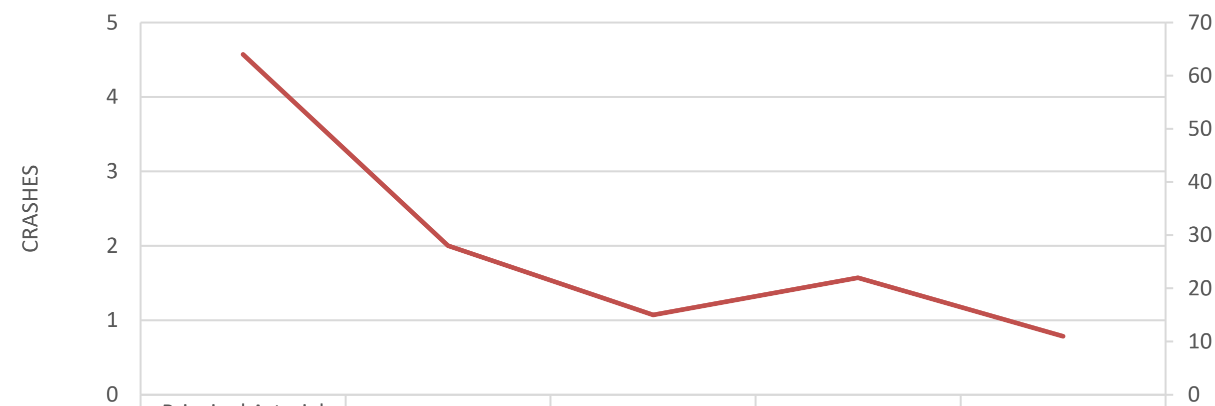
Figures 20-28 illustrate different characteristics for crashes involving heavy vehicles. The five-year period evaluated did not show any fatal or serious injury crashes for operators of heavy vehicles. The analysis therefore highlights the characteristics of BCO crashes.

Figure 20 illustrates the number of heavy vehicle-involved crashes by lighting condition. Most BCO crashes for operators of heavy vehicles during the five-year period occurred during daylight hours with a smaller spike under Dark (lighted) conditions.

	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	0	0	0	0	0	0
BCO	97	1	1	22	10	9

Figure 20 Heavy Vehicle Crash Severity by Lighting Conditions

Figure 21 illustrates the number of heavy vehicle-involved crashes by functional classification. Most BCO crashes for operators of heavy vehicles during the five-year period occurred on Principal Arterials.



	Principal Arterial (other)	Minor Arterial	Major Collector	Local	Unknown
KA	0	0	0	0	0
BCO	64	28	15	22	11

Figure 21 Heavy Vehicle Crash Severity by Functional Classification

Segment-Related Crashes

Figure 22 illustrates the number of heavy vehicle-involved segment crashes by midblock roadway configuration. Most BCO crashes for operators of heavy vehicles during the five-year period occurred on two-way undivided roadways.

	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	0	0	0	0	0	0
BCO	1	47	2	12	9	22

Figure 22 Heavy Vehicle Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 23 illustrates the number of heavy vehicles involved in a segment crash by number of lanes. Most BCO crashes for operators of heavy vehicles during the five-year period occurred on two lane roadways.

	2 lanes	3 lanes	4 lanes	Unknown
KA	0	0	0	0
BCO	73	0	9	11

Figure 23 Heavy Vehicle Crash Severity by Midblock Number of Lanes (segment crashes only)

Figure 24 illustrates the number of heavy vehicles-involved segment crashes by speed limit. Most BCO segment crashes occurred on roadways with a speed limit of 25 mph.

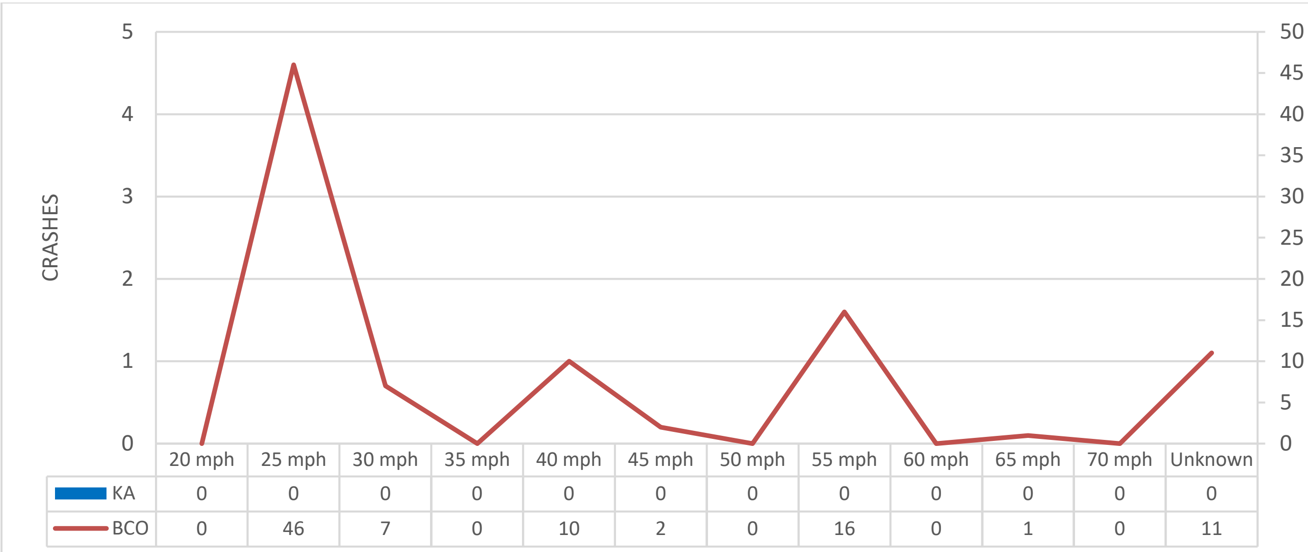


Figure 24 Heavy Vehicle Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 25 illustrates the number of heavy vehicle-involved segment crashes by AADT or vpd. Most BCO crashes for operators of heavy vehicles during the five-year period occurred on low volume roadways (less than 1,000 vpd).

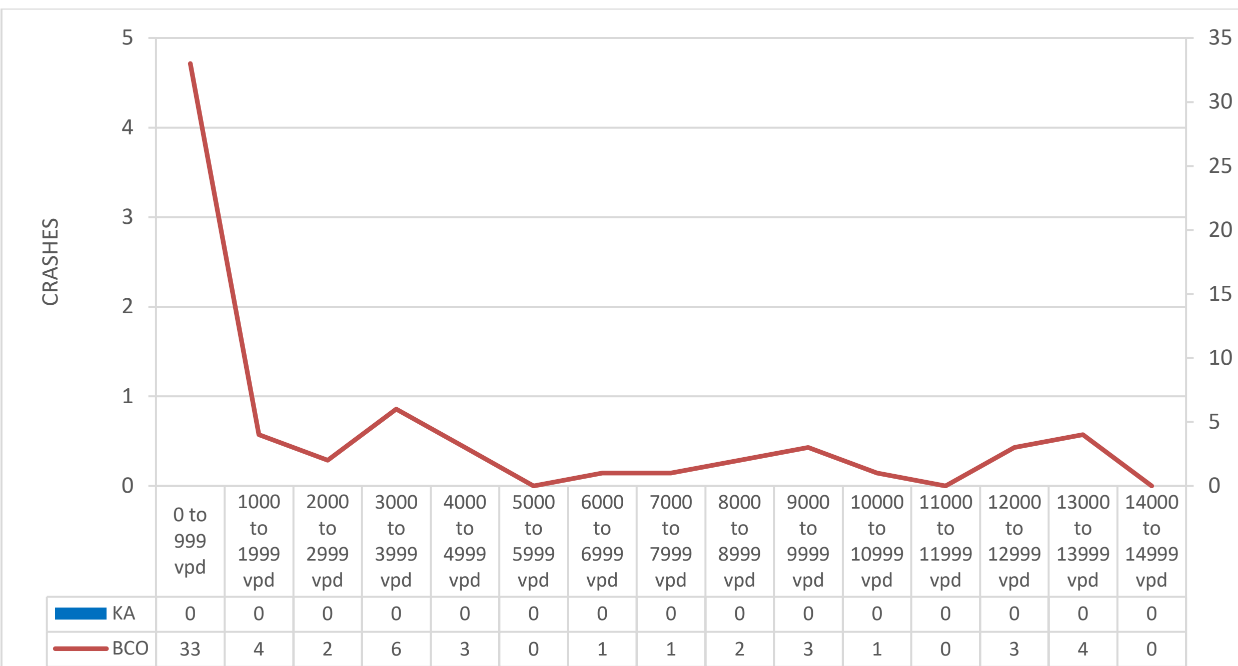


Figure 25 Heavy Vehicle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

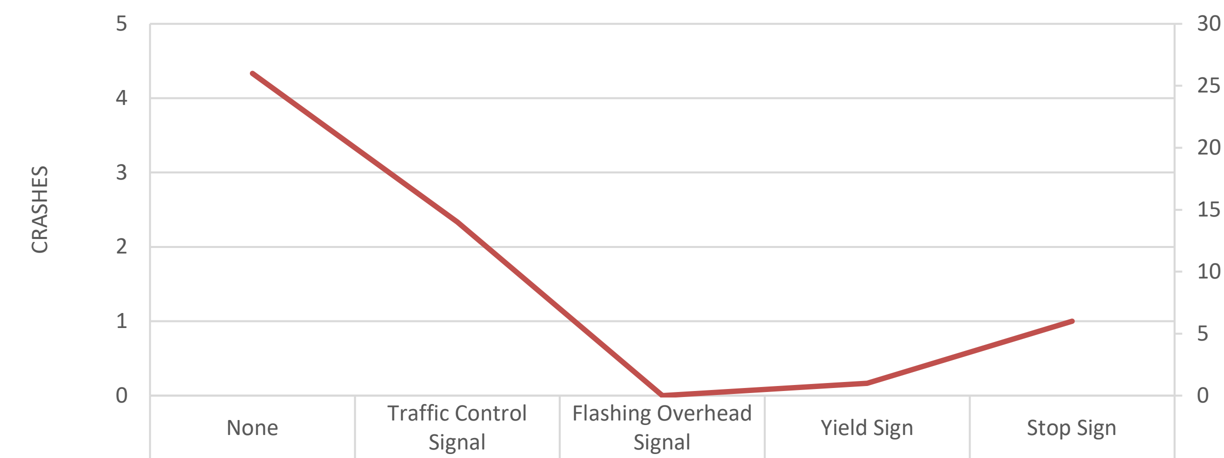
Figure 26 illustrates the number of heavy vehicle-involved intersection crashes by intersection configuration. Most BCO crashes for operators of heavy vehicles during the five-year period occurred at four-way intersections or were intersection related. Intersection related crashes are those near an intersection but not within.

Figure 26 Heavy Vehicle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 27 illustrates the number of heavy vehicle-involved intersection crashes by maximum speed limit. Most BCO crashes for operators of heavy vehicles during the five-year period occurred on 25 mph roadways.

Figure 27 Heavy Vehicle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 28 illustrates the number of heavy vehicle-involved intersection crashes by intersection traffic control device. Most BCO crashes for operators of heavy vehicles during the five-year period occurred at intersections with no traffic control device.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign
KA	0	0	0	0	0
BCO	26	14	0	1	6

Figure 28 Heavy Vehicle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 29 illustrates the number of heavy vehicle-involved intersection crashes by maximum AADT or vpd. Most BCO crashes for operators of heavy vehicles during the five-year period occurred at intersections with a low AADT (less than 1,000 vpd).

	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	8	4	1	5	0	0	0	1	0	2	0	0	4	1	1

Figure 29 Heavy Vehicle Crash Severity by AADT (intersection crashes only)

Bicyclists

Figure 30 illustrates the number of bicyclist-involved crashes by lighting conditions. The single fatal or serious injury crash occurred during Daylight conditions.

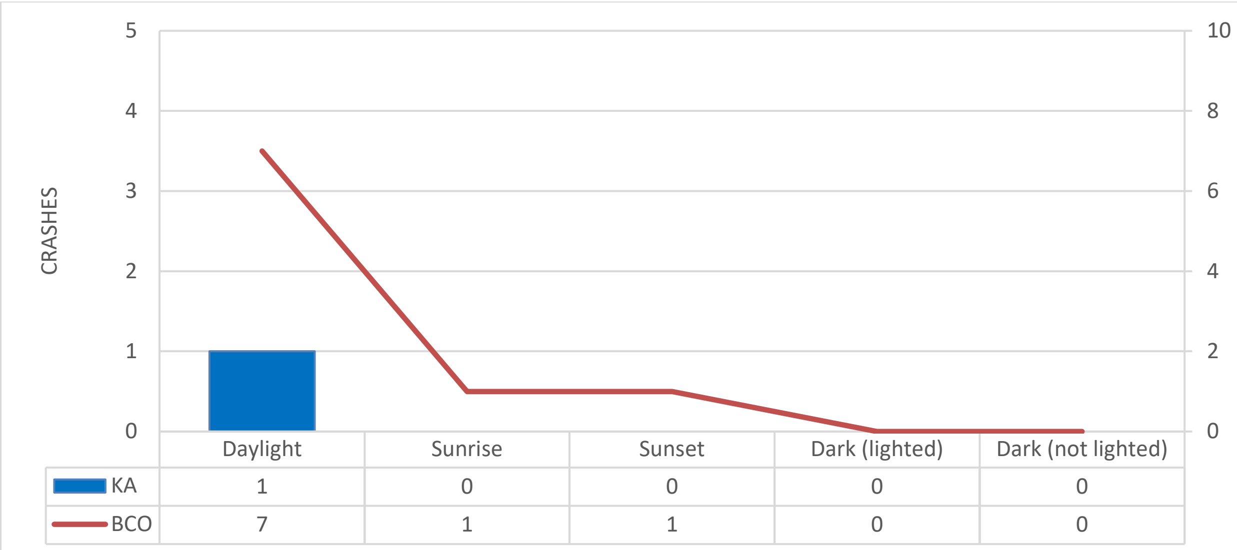


Figure 30 Cyclist Crash Severity by Lighting Conditions

Figure 31 illustrates the number of bicyclist-involved crashes by functional classification. The single fatal or serious injury crash occurred on a Major Collector.

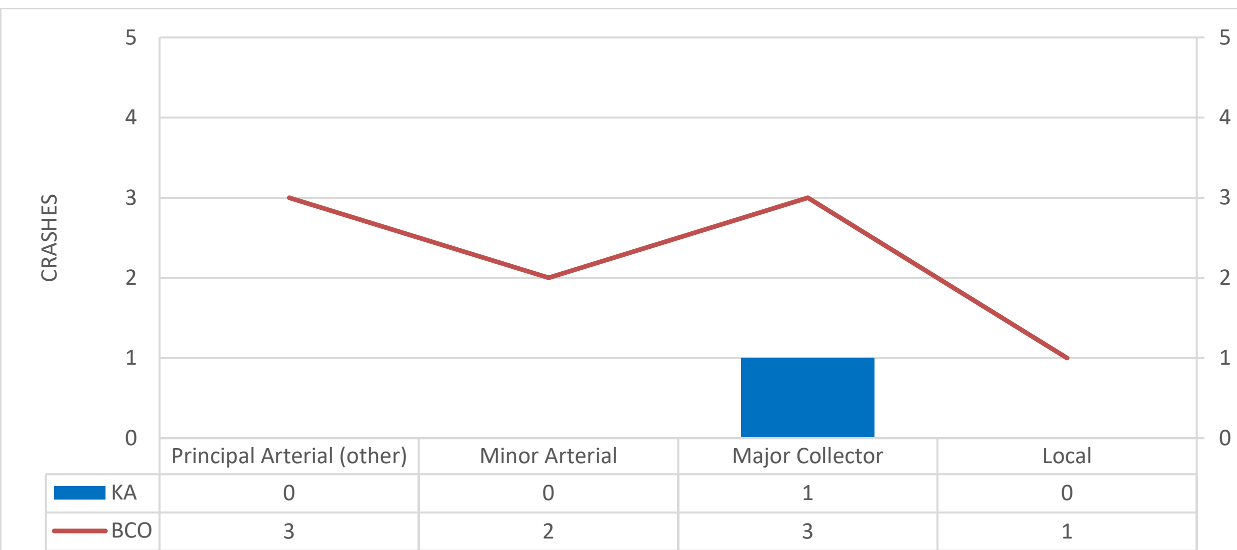


Figure 31 Cyclist Crash Severity by Functional Classification

Segment-Related Crashes

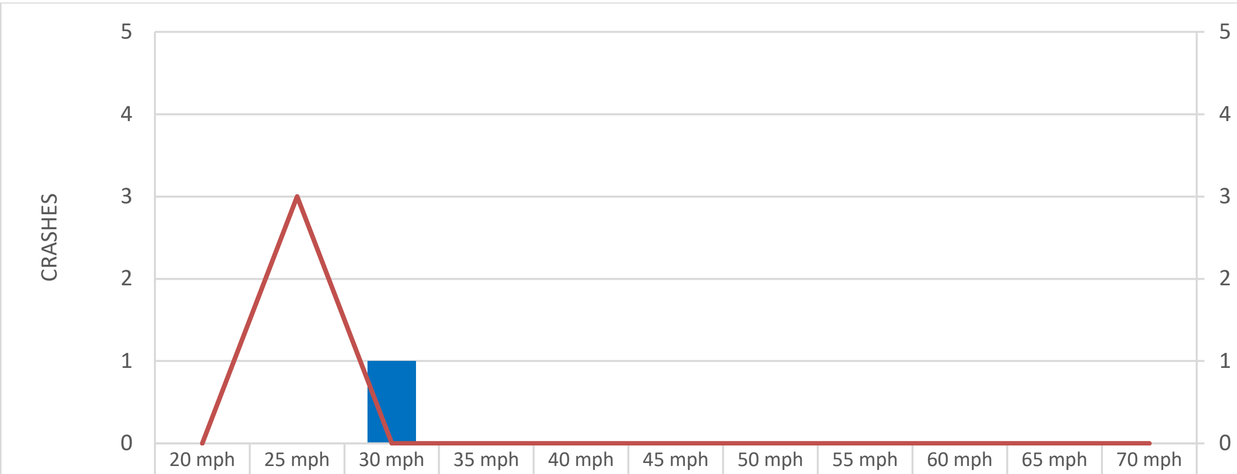
Figure 32 illustrates the number of bicyclist-involved segment crashes by midblock roadway configuration. The single fatal or serious injury segment crash occurred on a two-way undivided roadway.

Figure 32 Cyclist Crash Severity by Midblock Road Configuration (segment crashes only)

Figure 33 illustrates the number of bicyclist-involved segment crashes by number of lanes. The single fatal or serious injury segment crash occurred on a two-lane roadway.

Figure 33 Cyclist Crash Severity by Midblock Number of Lanes (segment crashes only)

Figure 34 illustrates the number of bicyclist-involved segment crashes by speed limit. There was one fatal or serious injury segment crash on a roadway with a speed limit of 30 mph. All BCO segment crashes occurred on roadways with a speed limit of 25 mph.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph
KA	0	0	1	0	0	0	0	0	0	0	0
BCO	0	3	0	0	0	0	0	0	0	0	0

Figure 34 Cyclist Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 35 illustrates the number of bicyclist-involved in a segment crash by AADT or vpd.

	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Figure 35 Cyclist Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

Figure 36 illustrates the number of bicyclist-involved intersection crashes by intersection configuration.

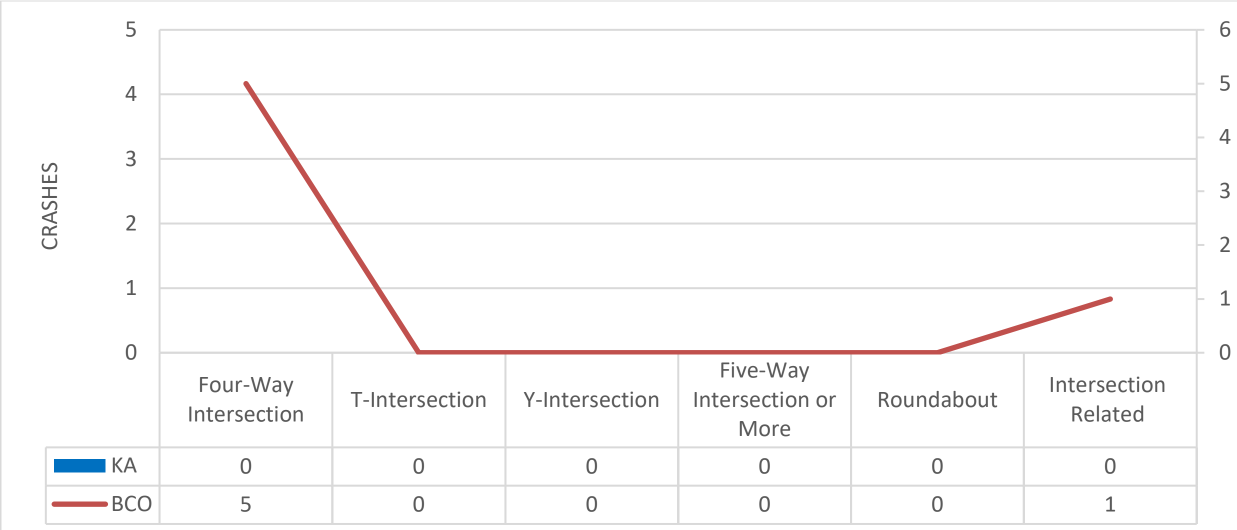
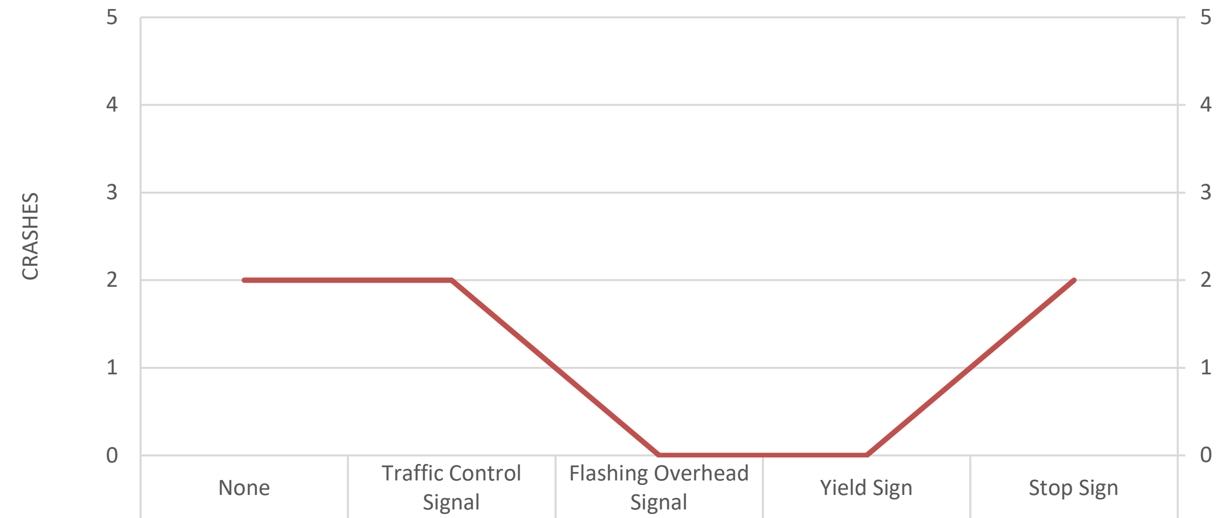


Figure 36 Cyclist Crash Severity by Intersection Configuration (intersection crashes only)

Figure 37 illustrates the number of bicyclist-involved intersection crashes by speed limit.

Figure 37 Cyclist Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

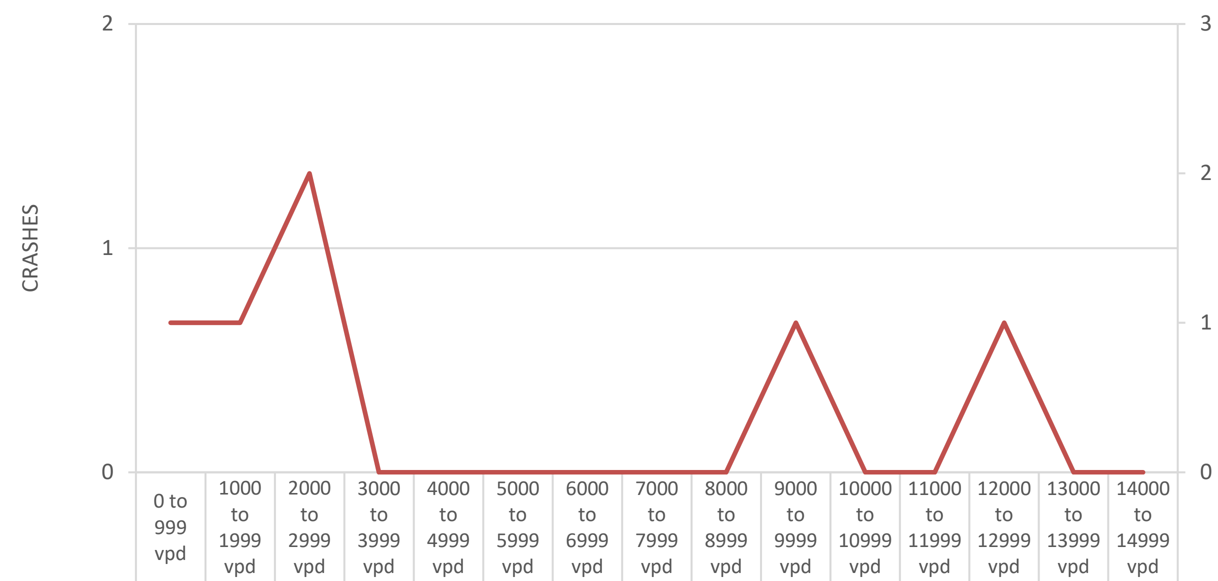
Figure 38 illustrates the number of bicyclist-involved intersection crashes by intersection traffic control device.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign
KA	0	0	0	0	0
BCO	2	2	0	0	2

Figure 38 Cyclist Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 39 illustrates the number of bicyclist-involved intersection crashes by maximum AADT.

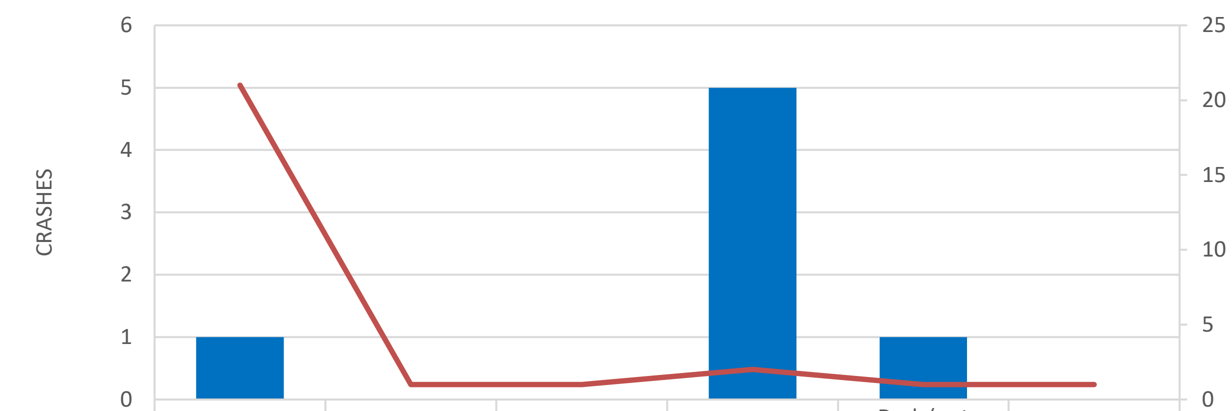


	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	1	1	2	0	0	0	0	0	0	1	0	0	1	0	0

Figure 39 Cyclist Crash Severity by AADT (intersection crashes only)

Pedestrians

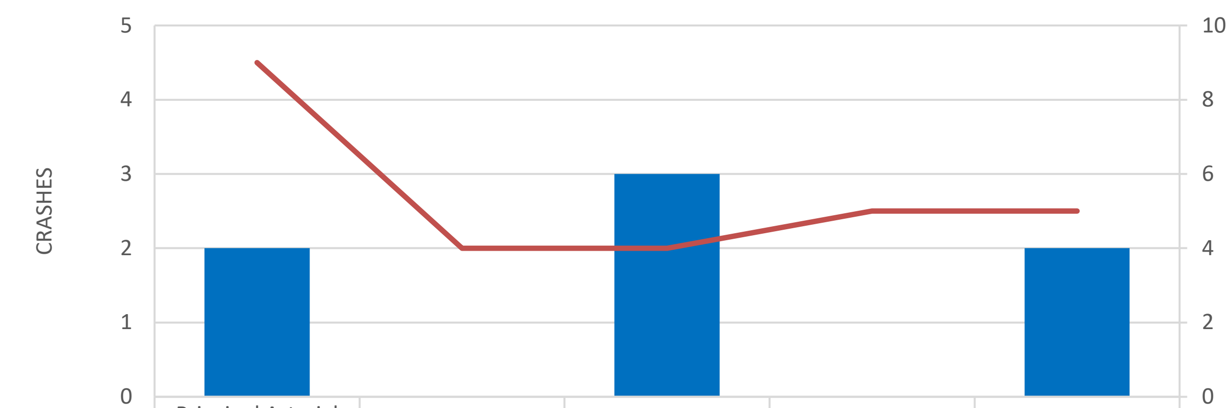
Figure 40 illustrates the number of pedestrian-involved crashes by lighting condition. Most fatal and serious injury pedestrian crashes occurred during Dark (lighted) conditions.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	1	0	0	5	1	0
BCO	21	1	1	2	1	1

Figure 40 Pedestrian Crash Severity by Lighting Conditions

Figure 41 illustrates the number of pedestrian-involved crashes by functional classification. Most fatal and serious crashes (three) occurred on Major Collectors; however, two fatal and serious injury crashes occurred on Principal Arterials or Unknown. Further analysis of Unknown functional analysis is forthcoming.

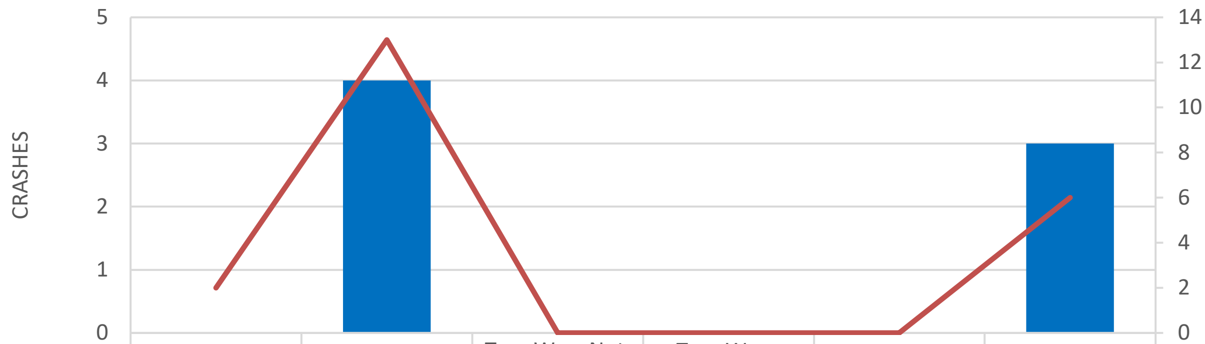


	Principal Arterial (other)	Minor Arterial	Major Collector	Local	Unknown
KA	2	0	3	0	2
BCO	9	4	4	5	5

Figure 41 Pedestrian Crash Severity by Functional Classification

Segment-Related Crashes

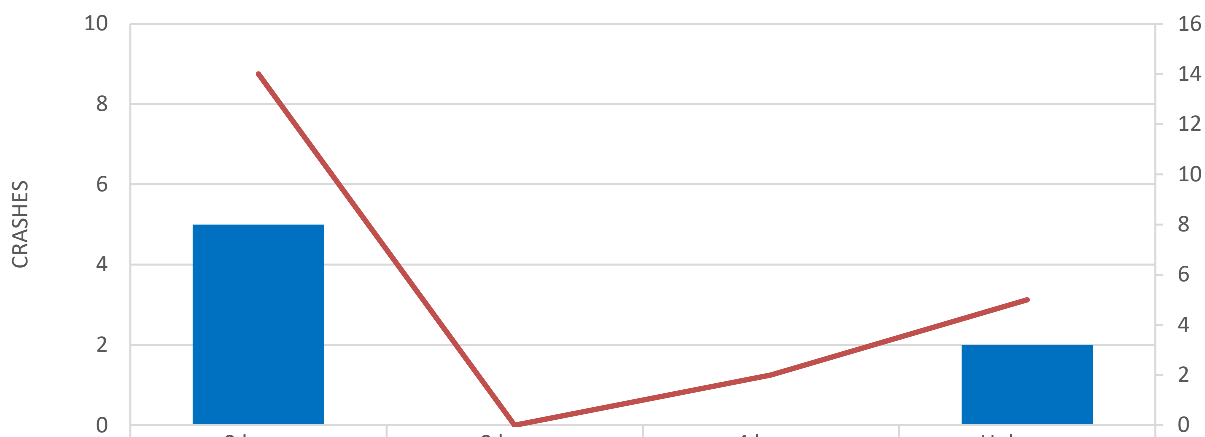
Figure 42 illustrates the number of pedestrian-involved segment crashes by midblock roadway configuration. Most fatal and serious injury segment crashes occurred on two-way undivided roadways.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	0	4	0	0	0	3
BCO	2	13	0	0	0	6

Figure 42 Pedestrian Crash Severity by Midblock Road Configuration (segment crashes only)

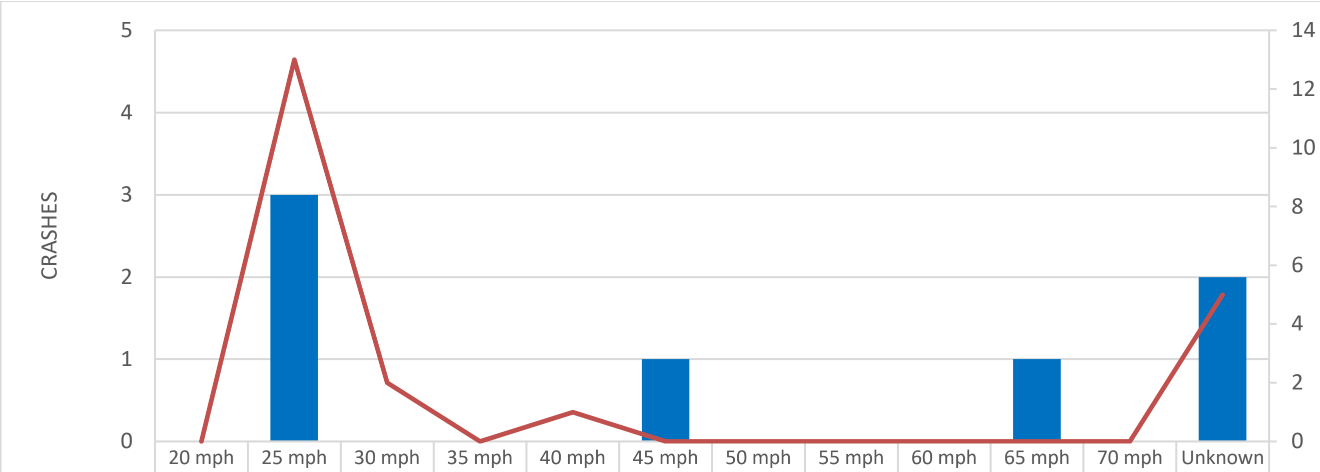
Figure 43 illustrates the number of pedestrian-involved segment crashes by number of lanes. Most fatal and serious injury segment crashes occurred on two-lane roadways.



	2 lanes	3 lanes	4 lanes	Unknown
KA	5	0	0	2
BCO	14	0	2	5

Figure 43 Pedestrian Crash Severity by Midblock Number of Lanes (segment crashes only)

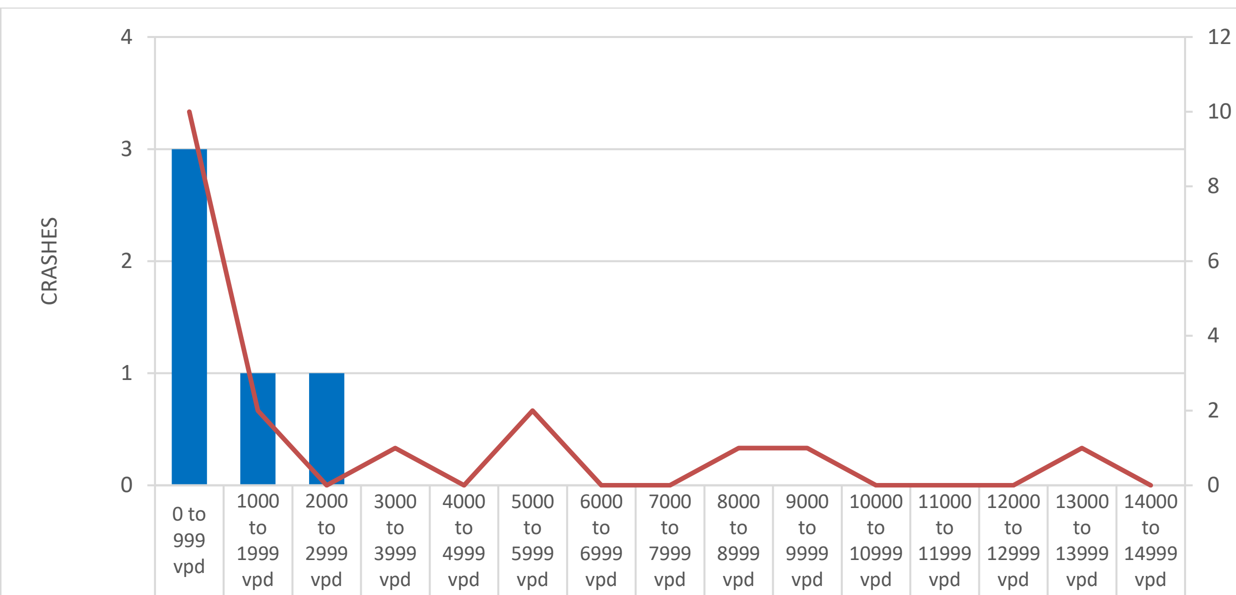
Figure 44 illustrates the number of pedestrian-involved segment crashes by speed limit. Most fatal and serious injury segment crashes occurred on roadways with a speed limit of 25 mph. Some occur on roadways where the speed limit was unknown. Further analysis of unknown speed limit is forthcoming.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	Unknown
KA	0	3	0	0	0	1	0	0	0	1	0	2
BCO	0	13	2	0	1	0	0	0	0	0	0	5

Figure 44 Pedestrian Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 45 illustrates the number of pedestrian-involved segment crashes by AADT or vpd. Most of the fatal and serious injury crashes occurred on low volume roadways (less than 1,000 vpd).

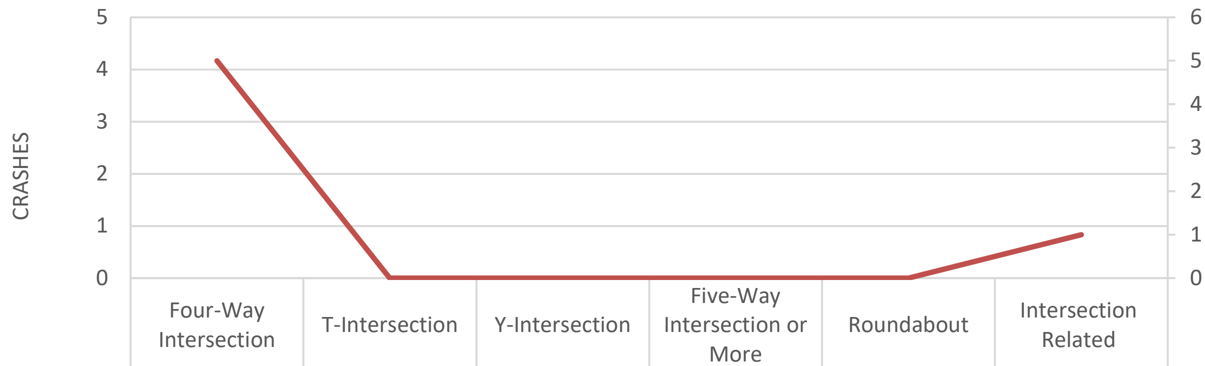


	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
BCO	10	2	0	1	0	2	0	0	1	1	0	0	0	1	0

Figure 45 Pedestrian Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

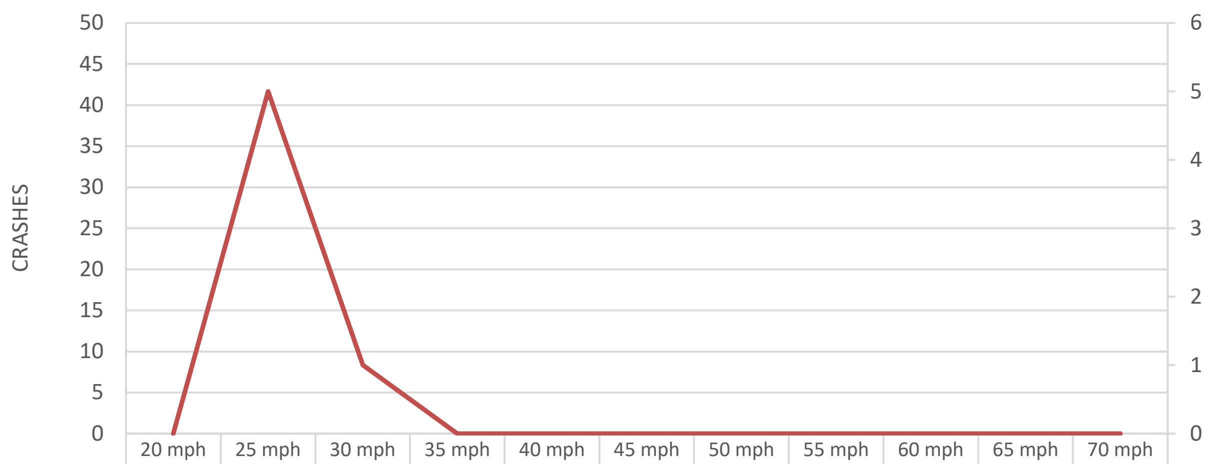
Figure 46 illustrates the number of pedestrian-involved intersection crashes by intersection configuration. There were no pedestrians that were involved in a fatal or serious injury crashes at intersections.



	Four-Way Intersection	T-Intersection	Y-Intersection	Five-Way Intersection or More	Roundabout	Intersection Related
KA	0	0	0	0	0	0
BCO	5	0	0	0	0	1

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

Figure 47 illustrates the number of pedestrian-involved intersection crashes by maximum speed limit. There were no pedestrians that were involved in a fatal or serious injury crashes at intersections.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph
KA	0	0	0	0	0	0	0	0	0	0	0
BCO	0	5	1	0	0	0	0	0	0	0	0

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

Figure 48 illustrates the number of pedestrian-involved in an intersection crash by intersection traffic control device. There were no pedestrians that were involved in a fatal or serious injury crashes at intersections.

	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign
KA	0	0	0	0	0
BCO	4	2	0	0	0

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

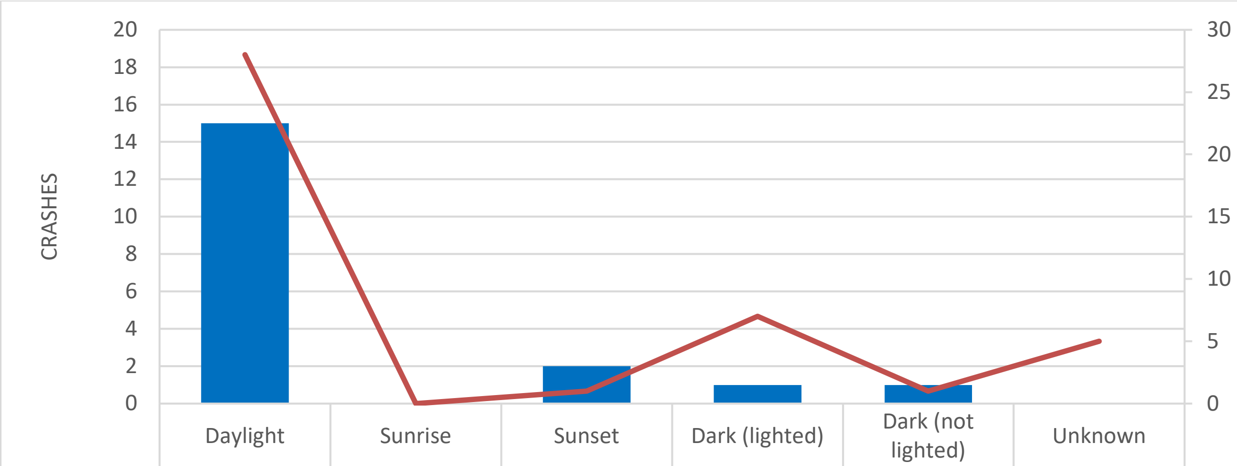
Figure 49 illustrates the number of pedestrian-involved intersection crashes by maximum AADT or vpd. There were no pedestrians that were involved in a fatal or serious injury crashes at intersections.

	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCO	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0

Figure 49 Pedestrian Crash Severity by AADT (intersection crashes only)

Motorcycles

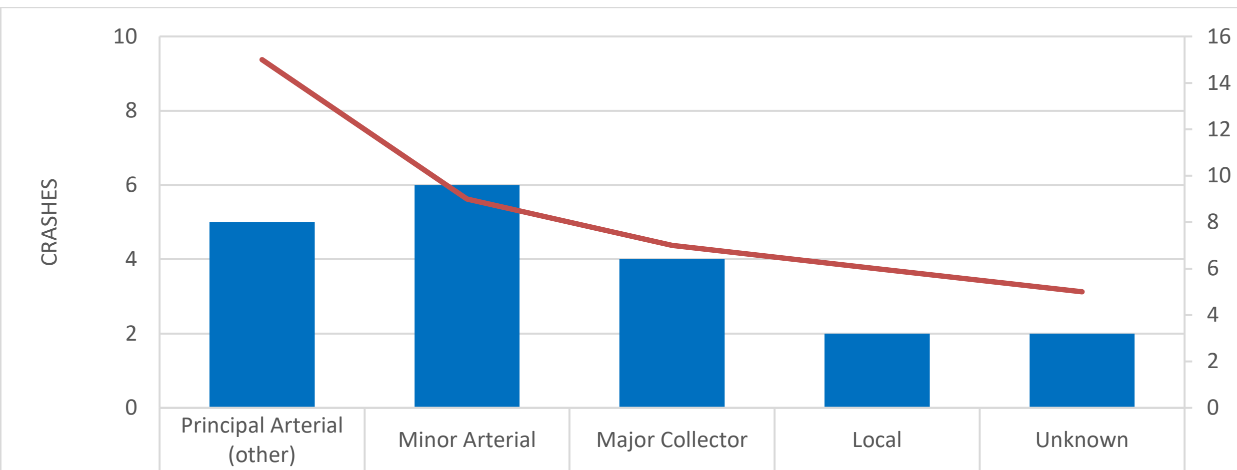
Figure 50 illustrates the number of motorcycle-involved crashes by lighting condition. Most fatal and serious injury motorcycle crashes occurred during Daylight conditions.



	Daylight	Sunrise	Sunset	Dark (lighted)	Dark (not lighted)	Unknown
KA	15	0	2	1	1	0
BCO	28	0	1	7	1	5

Figure 50 Motorcycle Crash Severity by Lighting Conditions

Figure 51 illustrates the number of motorcycle-involved crashes by functional classification. Most fatal and serious injury crashes occurred on Minor Arterials; however, fatal and serious injury crashes also occurred on Principal Arterials and Major Collectors.

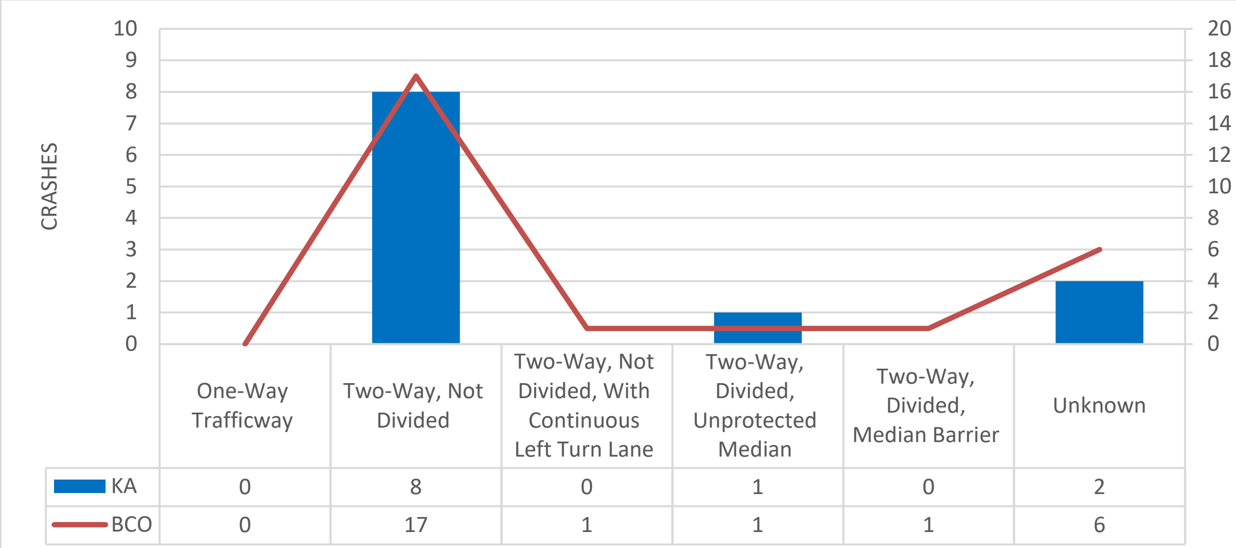


	Principal Arterial (other)	Minor Arterial	Major Collector	Local	Unknown
KA	5	6	4	2	2
BCO	15	9	7	6	5

Figure 51 Motorcycle Crash Severity by Functional Class

Segment-Related Crashes

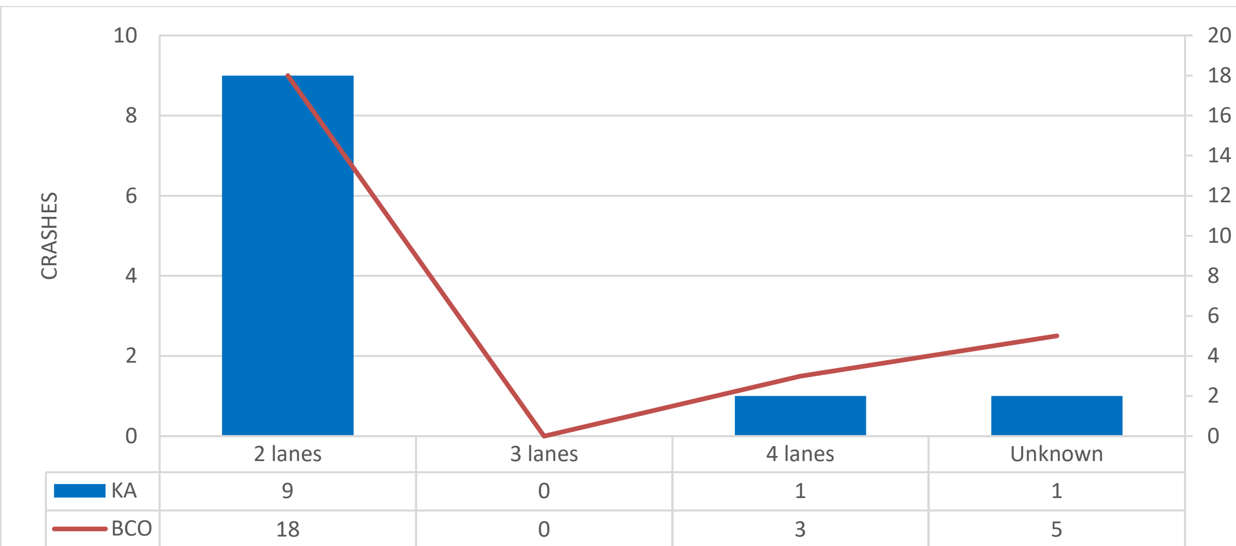
Figure 52 illustrates the number of motorcycle-involved segment crashes by midblock roadway configuration. Most fatal and serious injury segment crashes occurred on two-way undivided roadways.



	One-Way Trafficway	Two-Way, Not Divided	Two-Way, Not Divided, With Continuous Left Turn Lane	Two-Way, Divided, Unprotected Median	Two-Way, Divided, Median Barrier	Unknown
KA	0	8	0	1	0	2
BCO	0	17	1	1	1	6

Figure 52 Motorcycle Crash Severity by Midblock Road Configuration (segment crashes only)

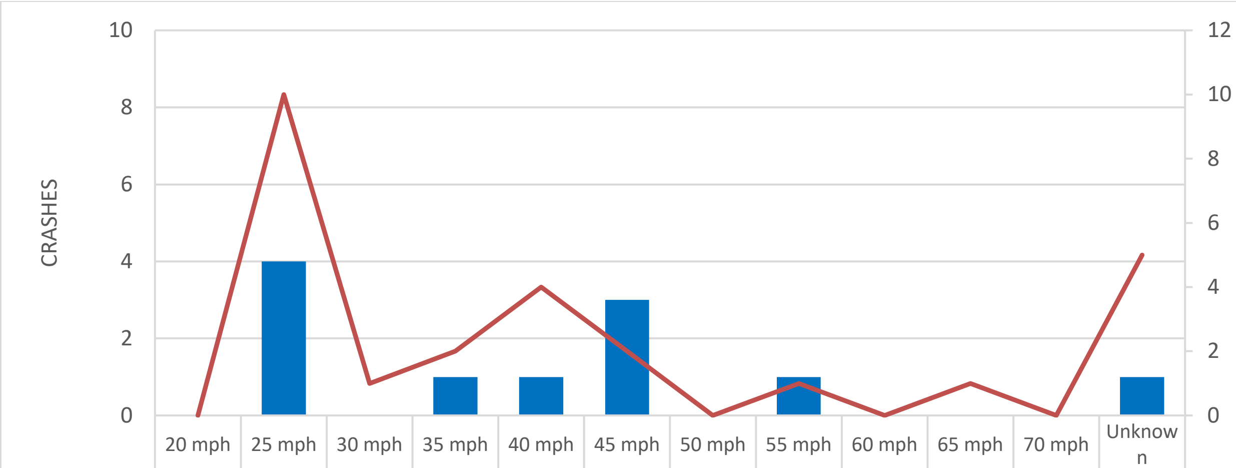
Figure 53 illustrates the number of motorcycle-involved segment crashes by number of lanes. Most fatal and serious injury segment crashes occurred on two-lane roadways.



	2 lanes	3 lanes	4 lanes	Unknown
KA	9	0	1	1
BCO	18	0	3	5

Figure 53 Motorcycle Crash Severity by Midblock Number of Lanes (segment crashes only)

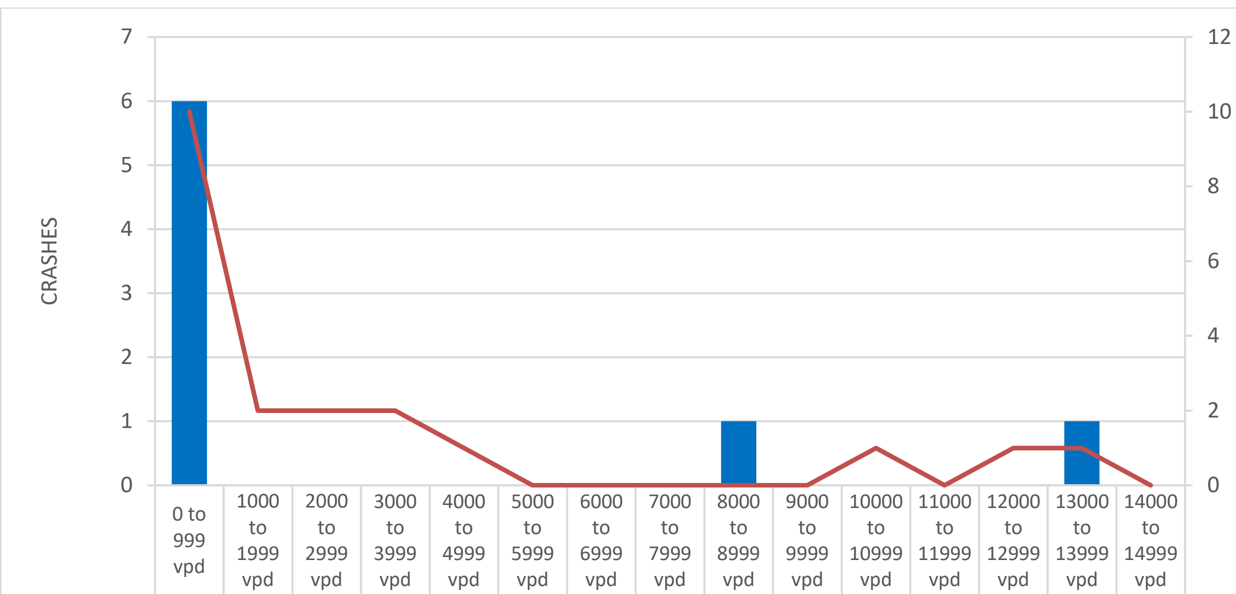
Figure 54 illustrates the number of motorcycle-involved segment crashes by speed limit. The most fatal and serious injury segment crashes occurred on a roadways with speed limits between 25 and 45 mph.



	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph	Unknown
KA	0	4	0	1	1	3	0	1	0	0	0	1
BCO	0	10	1	2	4	2	0	1	0	1	0	5

Figure 54 Motorcycle Crash Severity by Midblock Speed Limit (segment crashes only)

Figure 55 illustrates the number of motorcycle-involved segment crashes by AADT or vpd. Most of the fatal and serious injury crashes occurred on low volume roadways (less than 1,000 vpd).



	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	6	0	0	0	0	0	0	0	1	0	0	0	0	1	0
BCO	10	2	2	2	1	0	0	0	0	0	1	0	1	1	0

Figure 55 Motorcycle Crash Severity by AADT (segment crashes only)

Intersection-Related Crashes

Figure 56 illustrates the number of motorcycle-involved intersection crashes by intersection configuration. Most fatal and serious injury intersection crashes occurred at four-way intersections.

Figure 56 Motorcycle Crash Severity by Intersection Configuration (intersection crashes only)

Figure 57 illustrates the number of motorcycle-involved intersection crashes by maximum speed limit. Most of the fatal and serious injury crashes occurred at intersections with a maximum speed limit of 25 mph.

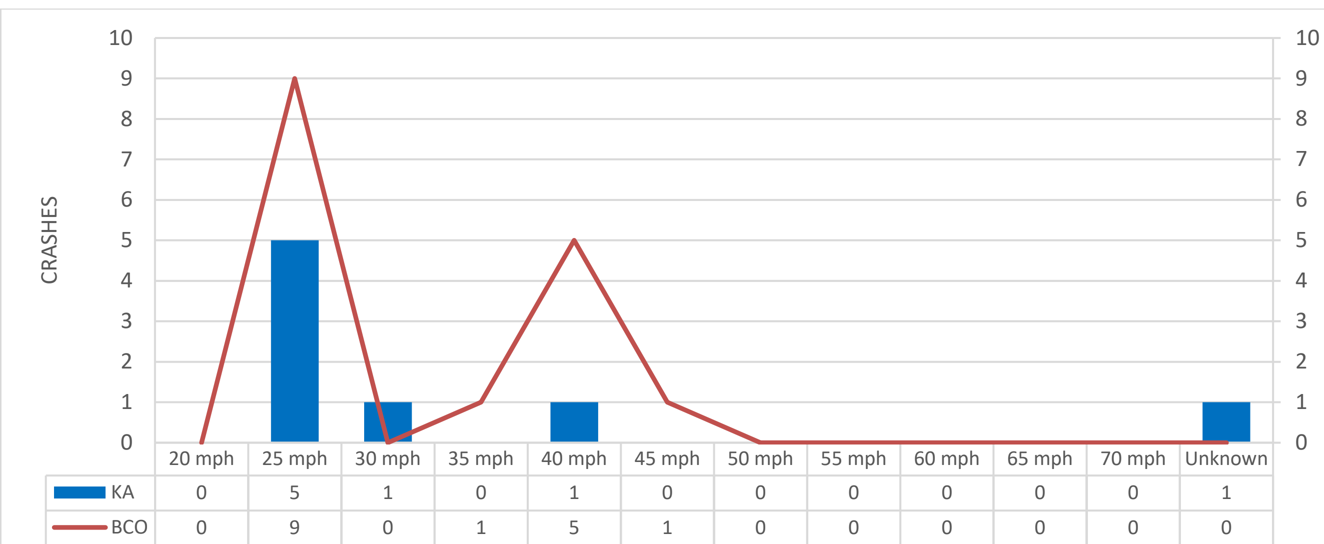
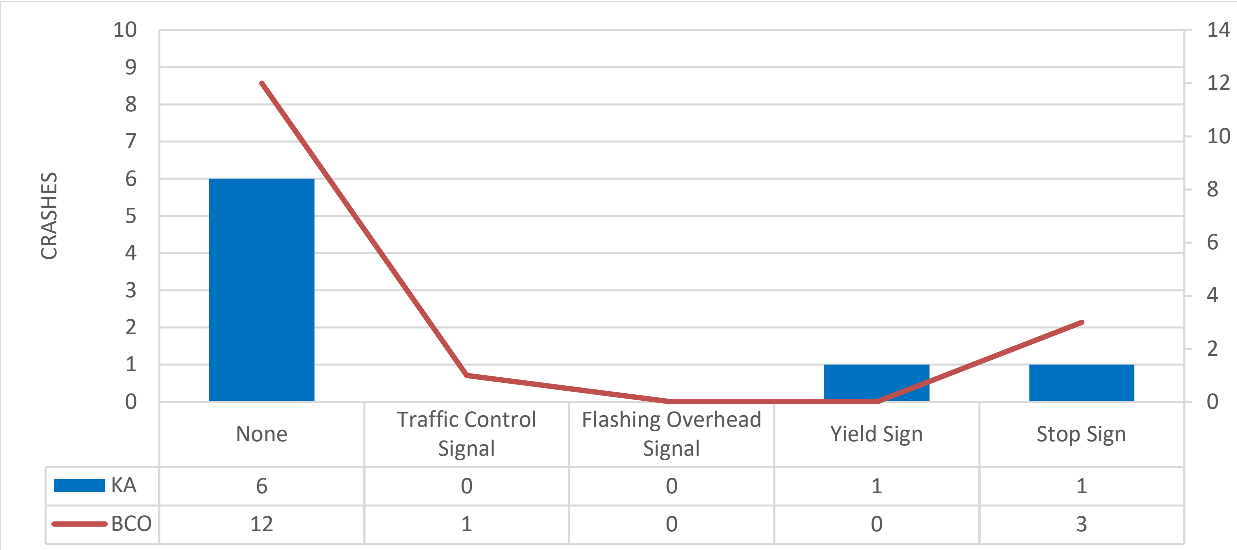


Figure 57 Motorcycle Crash Severity by Intersection Maximum Speed Limit (intersection crashes only)

Figure 58 illustrates the number of motorcycle-involved intersection crashes by intersection traffic control device. Most fatal and serious injury intersection crashes occurred at uncontrolled intersections.



	None	Traffic Control Signal	Flashing Overhead Signal	Yield Sign	Stop Sign
KA	6	0	0	1	1
BCO	12	1	0	0	3

Figure 58 Motorcycle Crash Severity by Intersection Traffic Control Device (intersection crashes only)

Figure 59 illustrates the number of motorcycle-involved intersection crashes by maximum AADT or vpd. The fatal and serious injury intersection crashes occurred at intersections with AADTs ranging from 0 to 5000 vpd.

	0 to 999 vpd	1000 to 1999 vpd	2000 to 2999 vpd	3000 to 3999 vpd	4000 to 4999 vpd	5000 to 5999 vpd	6000 to 6999 vpd	7000 to 7999 vpd	8000 to 8999 vpd	9000 to 9999 vpd	10000 to 10999 vpd	11000 to 11999 vpd	12000 to 12999 vpd	13000 to 13999 vpd	14000 to 14999 vpd
KA	2	1	0	1	1	0	0	0	0	1	0	0	0	0	0
BCO	3	1	1	1	1	0	0	0	0	1	1	0	0	1	0

Figure 59 Motorcycle Crash Severity by AADT (intersection crashes only)

Crash Profiles (3 each by mode)

Williston's ISAP and crash analysis scope will identify up to three (3) crash profiles that represent the causes of most prevalent fatal and serious injury crashes in the study area. Each crash profile will include an evaluation of crash types, land use context, road user behavior, and mode to identify key crash trends. The project team will synthesize the crash analysis review results, high-injury network analysis review, policy review, and stakeholder input to develop each crash profile. For example, a safety action plan in a bordering state had the following:

- Crash Profile 1: Motor Vehicle Crashes in Commercial Areas
- Crash Profile 2: Left Turn/U-Turn-Related Motor Vehicle Crashes at Signalized Intersections
- Crash Profile 3: Pedestrian/Bicyclist-related Crashes in Commercial Areas along Arterials

SRF proposes to have an extended meeting with City Engineering staff (could be just a longer check-in meeting) in the first half of January for SRF to present our recommendations on crash profiles. The team will also need all community input results for this work, and we will also review the land use context in GIS.