Chapter 2 Existing Transportation System

2.1 Introduction

In an effort to clearly understand the existing traffic conditions in the community, it was necessary to gather current information about different aspects of the transportation system. Intersection turning movement counts were collected during the summer and fall of 2010, during the months of August, September, and October, while school was in session. Data were used to determine current operational characteristics, and to identify any traffic concerns that may exist or that may arise within the foreseeable future. A variety of information was gathered to help evaluate the system including:

- Existing roadway functional classifications;
- Existing roadway sections;
- Intersection turning movement counts;
- Current traffic signal operation information;
- Intersection data required to conduct level of service analyses;
- Access location information; and
- Traffic crash records.

2.2 Roadway Functional Classification System

A community's transportation system is made up of a hierarchy of roadways, with each roadway being classified according to certain criteria. Some of these criteria are geometric configurations, traffic volumes, spacing in the community transportation grid, and speeds. It is standard practice to examine roadways that are functionally classified as a collector, minor arterial, or as a principal arterial in a regional transportation plan project. The reasoning for examining the collector, minor arterial, and principal arterial roadways, and not local roadways, is that when the major roadway system (i.e. collectors or above) is functioning to an acceptable level, then the local roadways are not used beyond their intended function. As such, the overall health of a regional transportation system can be typically characterized by the health of the major roadway network. Nine routes within the plan area boundary are defined by FHWA classifications and are functionally classified as follows:

1. US 93 – Principal Arterial
2. MT 35 – Minor Arterial
3. Secondary 354/Main St. & Rocky Point Road – Major Collector
4. Skyline Drive/1st Street East, Tower Road, Valley View Road, Minesinger Trail, and North Reservoir Road – Minor Collector

Roadway functional classifications are typically defined as principal arterials; minor arterials; collector routes; and as local streets. Although these can apply to both an urban and rural area with slight modifications, but since Polson has a population less than 5,000, Polson is classified as a rural area. Traffic volumes may differ on developed and rural sections of a street, it is important to maintain coordinated right-of-way standards to allow for efficient operation of roadways. A description of the rural, functional roadway classifications is provided in the following sections.

Rural Principal Arterial System – The rural principal arterial system consists of a network of routes with the following service characteristics:

1. Corridor movement with trip length and density suitable for substantial statewide or interstate travel with higher travel speeds.
2. Movements between all, or virtually all, urban areas with populations over 50,000 and a large majority of those with populations over 25,000.
3. Integrated movement without stub connections except where unusual geographic or traffic flow conditions dictate otherwise (e.g., international boundary connections or connections to coastal cities).

In the more densely populated states, this class of highway includes most (but not all) heavily traveled routes that might warrant multilane improvements in the majority of states; the principal arterial system provides for relatively high travel speeds and includes most (if not all) existing rural freeways. The rural principal arterial system is stratified into the following two design types: (1) freeways and (2) other principal arterials.

Rural Minor Arterial System – The rural minor arterial road system, in conjunction with the rural principal arterial system, forms a network with the following service characteristics:

1. Linkage of cities, larger towns, and other traffic generators (such as major resort areas) that are capable of attracting travel over similarly long distances.
2. Integrated interstate and intercounty service.
3. Internal spacing consistent with population density, so that all developed areas of the state are within reasonable distances of arterial highways.
4. Corridor movements consistent with items (1) through (3) with trip lengths and travel densities greater than those predominantly served by rural collector or local systems.

Minor arterials therefore constitute routes, the design of which should be expected to provide for increased speeds and minimum interference to through movement.

Rural Collector System – The rural collector routes generally serve travel of primarily intracounty rather than statewide importance and constitute those routes on which (regardless of traffic volume) predominant travel distances are shorter than on arterial routes. Consequently, more moderate speeds may be typical. To define rural collectors more clearly, this system is subclassified according to the following criteria:

- Major Collector Roads. These routes (1) serve county seats not on arterial routes, larger towns not directly served by the higher systems, and other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, and important mining and agricultural areas; (2) link these places with nearby larger towns or cities, or with routes of higher classifications; and (3) serve the more important intracounty travel corridors.

- Minor Collector Roads. These routes should (1) be spaced at intervals consistent with population density to accumulate traffic from local roads and bring all developed areas within reasonable distances of collector roads; (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural Local Road System – The rural local road system, in comparison to collectors and arterial systems, primarily provides access to land adjacent to the collector network and serves travel over relatively short distances. The local road system constitutes all rural roads not classified as principal arterials, minor arterials, or as collector roads. A very low-volume rural local road is a road that has a design ADT of 400 vehicles per day or less. The *AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT < 400).*

Table 2.1 contains a summary of the major street network within the plan area boundary along with the associated FHWA functional classifications and route purpose, and also shown in Figure 2-1.

Table 2.1 FHWA Functional Street Classifications for Polson Area

Classification	Primary Function
FHWA Classified Routes	
Principal Arterial ◆ US Highway 93	Mobility
Minor Arterial ◆ MT 35	Land Access / Mobility
Major Collector ◆ Secondary 354/Main Street ◆ Rocky Point Road	Land Access / Mobility
Minor Collectors ◆ Skyline Drive/ 1st Street East ◆ Valley View Road (Kerr Dam Road) ◆ Tower Road ◆ North Reservoir Road ◆ Minesinger Trail	Land Access

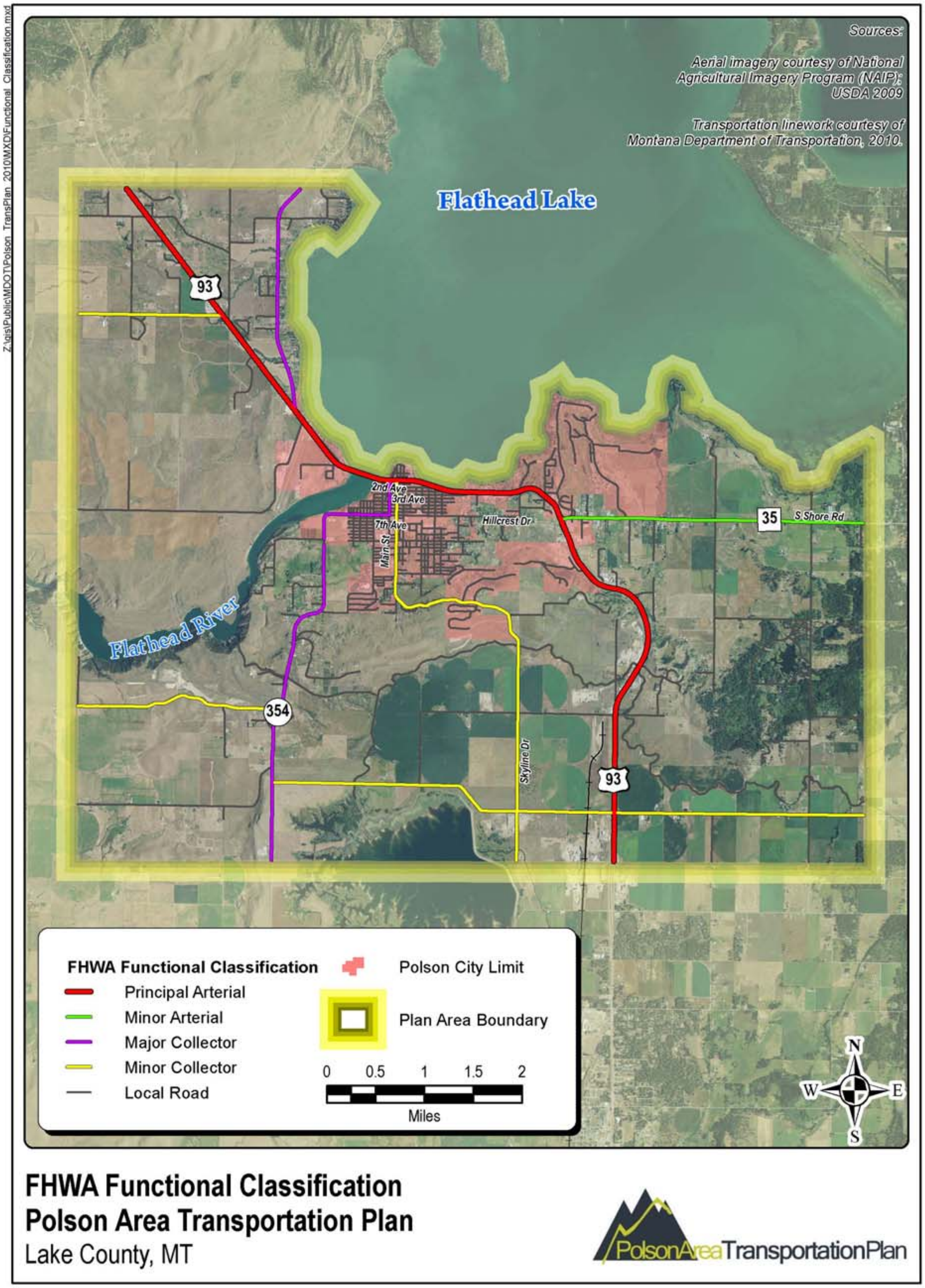


Figure 2-1 FHWA Roadway Functional Classification

2.3 Existing Intersection Levels of Service

Roadway systems are controlled by the function of major intersections within a developed area. Intersection failure directly reduces the number of vehicles that can be accommodated during the peak hours which have the highest demand and the roadway capacity of a corridor. As a result of this strong impact on corridor function, intersection improvements can be a cost-effective means of increasing a corridor's traffic capacity. In some circumstances, corridor expansion projects may be able to be delayed with correct intersection improvements. Due to the substantial portion of total expense for roadway construction projects used for design, construction, mobilization, and adjacent area rehabilitation, a careful analysis must be made of the expected service life from intersection-only improvements. If adequate design life is achieved with only improvements to the intersection, then a corridor expansion is not the most efficient solution. With that key cost factor in mind, it is important to determine how well the major intersections are functioning by determining their Level of Service (LOS).

Level of Service (LOS) for an intersection is a qualitative measure developed by the transportation profession to quantify driver perception for such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles. It provides a scale that is intended to match the perception by motorists of the operation of the intersection. LOS provides a way to identify intersections that are experiencing operational difficulties, as well as provide a scale to compare intersections with each other. The LOS scale represents the full range of operating conditions and is based on the ability of an intersection to accommodate the amount of traffic using it. The scale ranges from "A" which indicates little, if any, vehicle delay, to "F" which indicates substantial vehicle delay and traffic congestion. The LOS analysis was conducted according to the procedures outlined in the Transportation Research Board's Highway Capacity Manual – Special Report 209 using the Highway Capacity Software, version 4.1f.

In order to calculate the LOS, traffic volumes at 16 intersections were counted during the summer and fall of 2010. These intersections included five signalized intersections and 11 unsignalized intersections in the Polson area. Each intersection was counted between 7:00 a.m. to 9:00 a.m. and 4:00 p.m. and 6:00 p.m., to ensure that the intersection's peak volumes were represented. Based upon this data, the operational characteristics of each intersection were obtained.

2.3.1 Signalized Intersections

For signalized intersections, recent research has determined that average control delay per vehicle is the best available measure of LOS. Control delay takes into account uniform delay, incremental delay, and initial queue delay. The amount of control delay that a vehicle experiences is approximately equal to the time elapsed from when a vehicle joins a queue at the intersection (or arrives at the stop line when there is no queue) until the vehicle departs from the stopped position at the head of the queue. The control delay is primarily a function of volume, capacity, cycle length, green ratio, and the pattern of vehicle arrivals.

The following table identifies the relationship between LOS and average control delay per vehicle. The procedures used to evaluate signalized intersections use detailed information on geometry, lane use, signal timing, peak hour volumes, arrival types, and other parameters. This information is then used to calculate delays and determine the capacity of each intersection. Generally, an intersection is determined to be functioning adequately if operating at LOS C or better, at all times**.** Table 2.2 shows the LOS by control delay for signalized intersections.

Table 2.2 Level of Service Criteria (Signalized Intersections)

LOS	Control Delay per Vehicle (sec)
A	≤ 10
B	> 10 to 20
C	> 20 to 35
D	> 35 to 50
E	> 50 to 80
F	> 80

Source: The Transportation Research Board's *Highway Capacity Manual*

By using these techniques and the data collected in the summer and fall of 2010, the LOS for the signalized intersections was calculated. Table 2.3 shows the AM and PM peak hour LOS for each individual leg of the intersections, as well as the intersections as a whole. The intersection LOS is shown graphically in Figure 2-2.

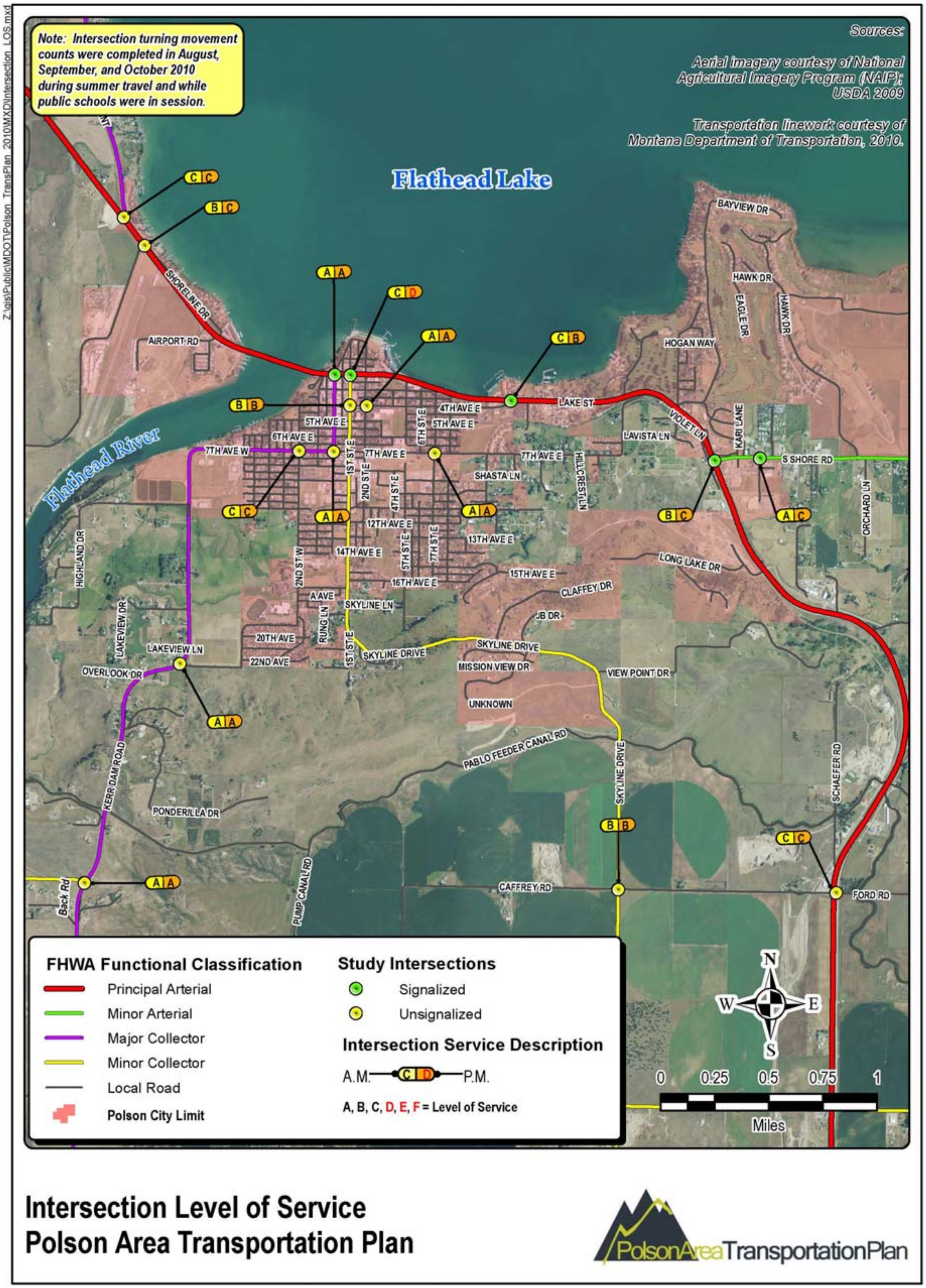


Figure 2-2 Intersection Level of Service

Table 2.3 Existing (2010) Level of Service for Signalized Intersections

Intersection	AM Peak Hour					PM Peak Hour				
	EB	WB	NB	SB	INT	EB	WB	NB	SB	INT
US 93 & South Shore Road (MT 35)	-	C	A	B	B	-	C	B	C	C
US 93 (3rd Avenue East) & 4th Avenue East	A	A	F	D	C	A	A	F	D	B
US 93 (2nd Avenue East) & 1st Street East	C	C	C	B	C	C	C	D	C	**D**
US 93 (2nd Avenue East) & Main Street*	A	A	*N/A*	E	A	A	A	*N/A*	E	A
South Shore Road (MT 35) & Heritage Lane	A	A	E	-	A	A	A	F	-	C

(Abbreviations used are as follows: EB = eastbound; WB = westbound; NB = northbound; SB = southbound; INT = intersections as a whole; N/A = not applicable). * Main Street NB approach under construction during time of data collection.

2.3.2 Unsignalized Intersections

Level of service for unsignalized intersections is based on the delay experienced by each movement within the intersection, rather than on the overall stopped delay per vehicle at the intersection. This difference from the method used for signalized intersections is necessary because the operating characteristics of a stop-controlled intersection are substantially different. Driver expectations and perceptions are entirely different. For two-way stop controlled intersections, the through traffic on the major (uncontrolled) roadway experiences no delay at the intersection. Conversely, vehicles turning left from the minor roadway experience more delay than other movements and at times can experience substantial delay. Vehicles on the minor roadway, which are turning right or going across the major roadway, experience less delay than those turning left from the same approach. Due to this situation, the LOS assigned to a two-way stop controlled intersection is based on the average delay for vehicles on the minor roadway approach.

LOS for all-way stop controlled intersections is also based on delay experienced by the vehicles at the intersection. Since there is no uncontrolled roadway, the highest delay could be experienced by any of the approaching roadways. Therefore, the LOS is based on the approach with the highest delay as shown in Table 2.4, which shows the LOS criteria for both the all-way and two-way stop controlled intersections.

Table 2.4 Level of Service Criteria (Unsignalized Intersections)

Level of Service	Delay (seconds/vehicle)
A	0 - 10
B	> 10 to 15
C	> 15 to 25
D	> 25 to 35
E	> 35 to 50
F	> 50

Source: The Transportation Research Board's *Highway Capacity Manual*

By using the above guidelines, the data collected in the summer and fall of 2010 and calculation techniques for two-way stop controls and all-way stop controls, the LOS was calculated for 11 intersections. Table 2.5 shows the detailed results of the performance level turning movement breakout for each unsignalized intersection.

Table 2.5 Existing (2010) Level of Service for Unsignalized Intersections

Unsignalized Intersection	AM Peak Hour			PM Peak Hour		
	Delay (sec/veh)	LOS	v/c	Delay (sec/veh)	LOS	v/c
US 93 & Rocky Point Road						
Eastbound Left/Thru	7.60	A	0.01	8.30	A	0.00
Southbound Left/Right	16.30	C	0.33	15.60	C	0.20
US 93 & Irvine Flats Road						
Eastbound Left/Thru/Right	7.70	A	0.01	8.20	A	0.01
Westbound Left/Thru/Right	8.60	A	0.02	8.00	A	0.01
Northbound Left/Thru/Right	11.80	B	0.02	13.40	B	0.08
Southbound Left/Thru/Right	13.90	B	0.02	18.80	C	0.17
US 93 & Caffrey Road						
Eastbound Left/Thru/Right	12.10	B	0.15	12.60	B	0.17
Westbound Left/Thru/Right	23.60	C	0.04	18.50	C	0.03
Northbound Left	8.30	A	0.11	8.60	A	0.00
Southbound Left	8.20	A	0.00	8.80	A	0.07
4th Avenue East & 1st Street East *						
Eastbound Left/Thru/Right	8.59	A	-	8.82	A	-
Westbound Left/Thru/Right	9.62	A	-	9.92	A	-
Northbound Left/Thru/Right	10.84	B	-	11.30	B	-
Southbound Left/Thru/Right	10.11	B	-	10.95	B	-

Unsignalized Intersection	AM Peak Hour Delay (sec/veh)	AM LOS	AM v/c	PM Peak Hour Delay (sec/veh)	PM LOS	PM v/c
4th Avenue East & 2nd Street East *						
Eastbound Left/Thru/Right	8.31	A	-	8.04	A	-
Westbound Left/Thru/Right	8.25	A	-	7.87	A	-
Northbound Left/Thru/Right	7.87	A	-	8.05	A	-
Southbound Left/Thru/Right	8.38	A	-	7.90	A	-
7th Avenue & Main Street *						
Eastbound Left/Thru/Right	8.45	A	-	8.85	A	-
Westbound Left/Thru/Right	8.73	A	-	9.37	A	-
Northbound Left/Thru/Right	8.00	A	-	8.51	A	-
*Southbound Left/Thru/Right ***	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
7th Avenue West & 2nd Street West						
Eastbound Left/Thru/Right	7.40	A	0.00	7.60	A	0.00
Westbound Left/Thru/Right	8.30	A	0.21	7.80	A	0.11
Northbound Left/Thru/Right	13.00	B	0.24	13.30	B	0.35
Southbound Left/Thru/Right	24.80	C	0.12	18.40	C	0.11
7th Avenue East & 7th Street East *						
Eastbound Left/Thru/Right	8.22	A	-	9.04	A	-
Westbound Left/Thru/Right	8.10	A	-	8.60	A	-
Northbound Left/Thru/Right	8.18	A	-	8.60	A	-
Southbound Left/Thru/Right	7.84	A	-	8.67	A	-
Skyline Drive & Caffrey Road						
Eastbound Left/Thru/Right	11.3	B	0.01	10.30	B	0.02
Westbound Left/Thru/Right	9.20	A	0.13	9.20	A	0.10
Northbound Left/Thru/Right	7.30	A	0.01	7.30	A	0.01
Southbound Left/Thru/Right	7.40	A	0.04	7.30	A	0.03
Kerr Dam Road (Secondary 354) & Grenier Lane						
Westbound Left/Thru/Right	9.40	A	0.02	9.50	A	0.05
Southbound Left/Thru/Right	7.60	A	0.01	7.40	A	0.01
Northbound Left/Thru/Right	7.30	A	0.00	7.40	A	0.00
Kerr Dam Road (Secondary 354) & Back Road						
Eastbound Left/Thru/Right	9.50	A	0.06	9.40	A	0.03

Unsignalized Intersection	AM Peak Hour Delay (sec/veh)	AM Peak Hour LOS	AM Peak Hour v/c	PM Peak Hour Delay (sec/veh)	PM Peak Hour LOS	PM Peak Hour v/c
Southbound Left/Thru/Right	7.40	A	0.00	7.30	A	0.00
Northbound Left/Thru/Right	7.30	A	0.01	7.40	A	0.01

(Abbreviations used are as follows: N/A = not applicable). * HCM methodology does not compute v/c ratios for four–way stop controlled intersections. ** Main Street SB approach under construction during time of data collection.

The existing conditions LOS study in the Polson area shows that one signalized intersection is currently functioning at LOS D or lower. Intersection US 93 (2nd Avenue East) & 1st Street East functions at LOS D during the PM Peak. This intersection of specific concern indicates a potential opportunity for closer examination and further intersection improvement measures to mitigate "operational" conditions.

2.4 Percentage of Truck Traffic

Truck traffic within the study area is a concern both with the public and with local government officials. Based on a data review of the turning movement counts at each of the 16 intersections studied, Table 2.6 shows the percentage of truck traffic for the intersection as a whole during the AM and PM traffic counts.

Table 2.6 Truck Traffic Percentages

Intersection	Traffic Control	AM %	PM %
US 93 & South Shore Road	S	6.6%	3.7%
US 93 (3rd Avenue East) & 4th Avenue East	S	5.8%	3.1%
US 93 (2nd Avenue East) & 1st Street East	S	5.0%	3.5%
US 93 (2nd Avenue East) & Main Street *	S	3.8%	3.7%
South Shore Road (MT 35) & Heritage Lane	S	7.4%	3.2%
US 93 & Rocky Point Road	U-1W	4.3%	4.0%
US 93 & Irvine Flats Road	U-1W	4.9%	5.2%
US 93 & Caffrey Road	U-2W	6.2%	4.4%
4th Avenue East & 1st Street East	U-4W	2.6%	2.0%
4th Avenue East & 2nd Street East	U-4W	0.6%	0.2%

Intersection	Traffic Control	AM %	PM %
7th Avenue & Main Street *	U-4W	2.7%	0.9%
7th Avenue West & 2nd Street West	U-2W	3.7%	1.4%
7th Avenue East & 7th Street East	U-4W	2.7%	1.9%
Skyline Drive & Caffrey Road	U-2W	12.3%	12.4%
Kerr Dam Road & Grenier Lane	U-1W	5.0%	5.1%
Kerr Dam Road & Back Road	U-1W	9.7%	6.3%

S=Signalized; U-1W=Unsignalized one-way stop controlled; U-2W=Unsignalized two-way stop controlled; U-4W=Unsignalized four-way stop controlled. *Main Street under construction during data collection.

2.5 Existing Crash Analysis

The purpose of this section is to document different crash characteristics of the 16 major intersections within the plan area, as identified by the Technical Oversight Committee. Three different methods of intersection analysis were performed to identify those specific intersections that may warrant further study. These included: 1) ranking the intersections by number of crashes, 2) MDT's severity index, and 3) intersection crash rate. The crash information, which was provided by MDT's Traffic and Safety Bureau, covered the three-year time period from January 1, 2007 to December 31, 2009.

The first analysis looks at the total number of crashes over the three-year period at each intersection and ranks them from most (16) to fewest (0) number of crashes. Results are listed in Table 2.7 and shown on Figure 2-3.

Table 2.7 Intersection Crashes in the Three-Year Period

(January 2, 2007 thru December 31, 2009)

INTERSECTION	Traffic Control	# CRASHES
Intersections with 15 - 19 crashes		
US 93 & South Shore Road	S	16
Intersections with 10 - 14 crashes		
US 93 & 4th Avenue East	S	11
Intersections with 5 - 9 crashes		
US 93 & Main Street	S	6
7th Avenue & Main Street	U-4W	5
Intersections with 0 - 4 crashes		
US 93 & 1st Street East	S	4

INTERSECTION	Traffic Control	# CRASHES
US 93 & Rocky Point Road	U-1W	4
US 93 & Irvine Flats Road	U-1W	3
Kerr Dam Road & Grenier Lane	U-1W	3
4th Avenue East & 2nd Street East	U-4W	2
7th Avenue East & 7th Street East	U-4W	2
South Shore Road & Heritage Lane	S	1
4th Avenue East & 1st Street East	U-4W	1
7th Avenue West & 2nd Street West	U-2W	1
Skyline Drive & Caffrey Road	U-2W	1
US 93 & Caffrey Road	U-2W	0
Kerr Dam Road & Back Road	U-1W	0

S = Signalized intersection;
U-1W = Unsignalized one-way stop controlled;
U-2W = Unsignalized two-way stop controlled;
U-4W = Unsignalized four-way stop controlled.

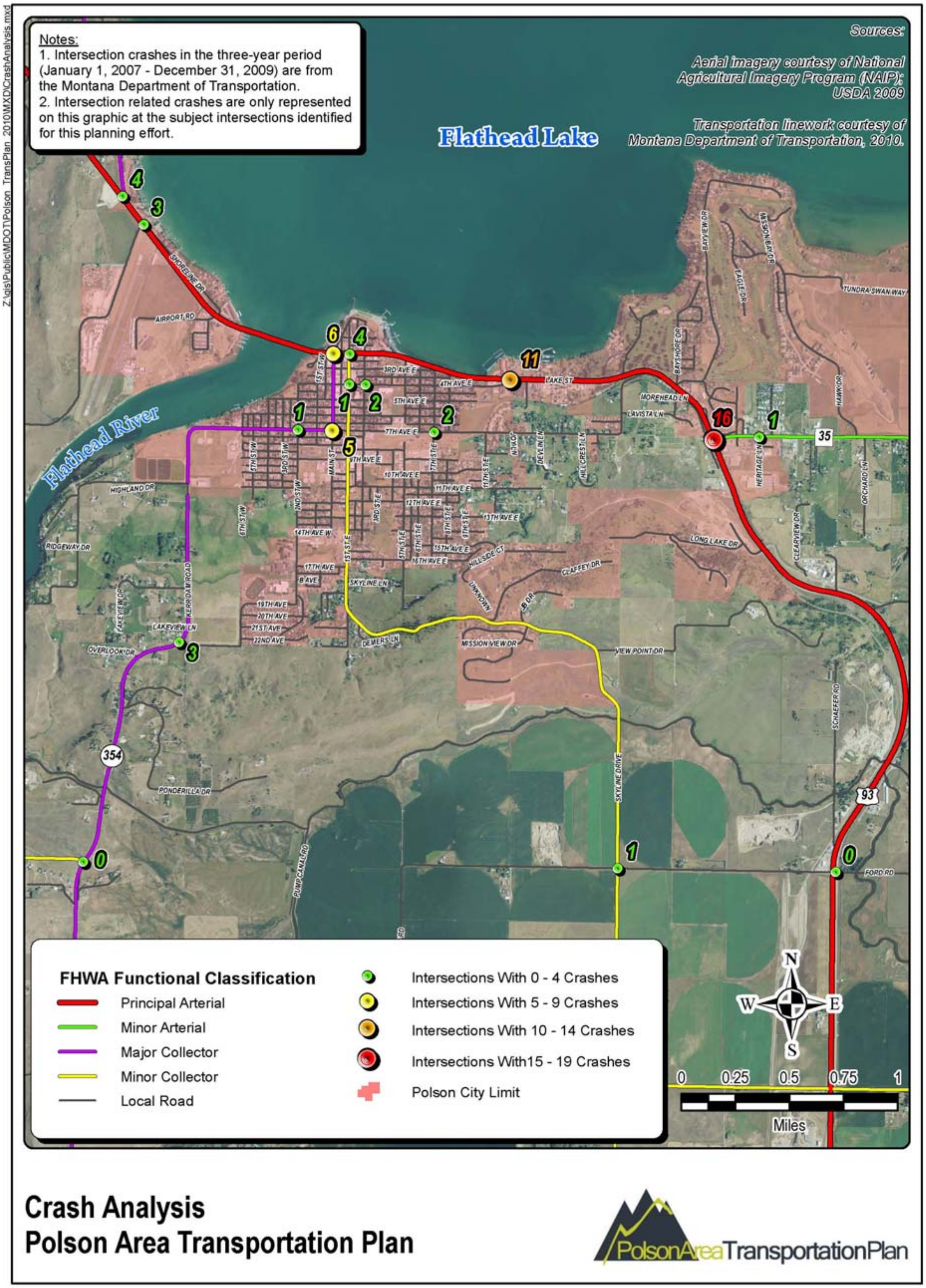


Figure 2-3 Crash Analysis

The second analysis calculated the MDT "severity index rating." The severity index is a ratio used to identify where the most severe types of crashes occur. Crashes were broken into three categories of severity: property damage only (PDO), non-incapacitating injury or possible injury crash, and fatality or incapacitating injury. Each of these three types is given a different rating: one (1) for a property damage only crash; three (3) for a non-incapacitating injury or possible injury crash; and eight (8) for a crash that resulted in a fatality or incapacitating injury. The MDT severity index for the intersections in the analysis is shown in Table 2.8. The calculation used to figure the severity index rating is as follows:

$$\textit{MDT Severity Index} = \frac{1(\#PDO) + 3(\#\,Non\text{-}Incapacitating\ or\ Possible\ Injury) + 8(\#Fatality\ or\ Incapacitating\ Injury)}{Total\ Number\ of\ Crashes}$$

Table 2.8 Intersection Crash Analysis – MDT Severity Index

(January 2, 2007 thru December 31, 2009)

INTERSECTION	PDO	Possible/Non-Incapacitating Injury	Fatality/ Incapacitating Injury*	Severity Index
Intersections with 4.00 – 4.99 Severity Index				
7th Avenue East & 7th Street East	1	0	1	4.50
Intersections with 3.00 – 3.99 Severity Index				
7th Avenue West & 2nd Street West	0	1	0	3.00
Skyline Drive & Caffrey Road	0	1	0	3.00
Intersections with 2.00 – 2.99 Severity Index				
US 93 & South Shore Road**	11	3	2	2.25
US 93 & Rocky Point Road	2	2	0	2.00
Intersections with 1.00 – 1.99 Severity Index				
7th Avenue & Main Street	3	2	0	1.80
US 93 & 4th Avenue East	7	4	0	1.73
US 93 & Irvine Flats Road	2	1	0	1.67
Kerr Dam Road & Grenier Lane	2	1	0	1.67
US 93 & 1st Street East	3	1	0	1.50
US 93 & Main Street	6	0	0	1.00
South Shore Road & Heritage Lane	1	0	0	1.00
4th Avenue East & 1st Street East	1	0	0	1.00
4th Avenue East & 2nd Street East	2	0	0	1.00
Intersections with 0.00 – 0.99 Severity Index				
US 93 & Caffrey Road	0	0	0	0.00
Kerr Dam Road & Back Road	0	0	0	0.00

*Crashes were incapacitating injuries only.

**Even though this intersection has 2 incapacitating injury crashes, it also exhibited 11 PDs, which influence the calculation of the severity index.

The third analysis ranked the number of crashes against the annual average daily traffic (AADT) entering each intersection, expressed in crashes per million entering vehicles (MEV). A summary of the intersections in the analysis is shown in Table 2.9. The formula used to determine the intersection crash rate is as follows:

$$\textit{Intersection Crash Rate} = \frac{\textit{Total number of crashes in study period} \times 10^6}{\textit{AADT} \times 365\ \textit{Days/Year} \times \textit{Study Period (in years)}}$$

Table 2.9 Intersection Crash Rate

(January 2, 2007 thru December 31, 2009)

Intersection	Traffic Control	Number of Crashes	Volume	Rate
Intersections with 1.00 – 1.49 Crash Rate				
Kerr Dam Road & Grenier Lane	U-1W	3	1,860	1.47
Intersections with 0.50 – 0.99 Crash Rate				
7th Avenue & Main Street	U-4W	5	4,740	0.96
US 93 & South Shore Road	S	16	17,310	0.84
US 93 & 4th Avenue East	S	11	13,820	0.73
4th Avenue East & 2nd Street East	U-4W	2	3,090	0.59
US 93 & Main Street	S	6	10,950	0.50
US 93 & Rocky Point Road	U-1W	4	7,240	0.50
Intersections with 0.00 – 0.49 Crash Rate				
Skyline Drive & Caffrey Road	U-2W	1	2,040	0.45
7th Avenue East & 7th Street East	U-4W	2	4,320	0.42
US 93 & Irvine Flats Road	U-1W	3	7,770	0.35
US 93 & 1st Street East	S	4	14,400	0.25
7th Avenue West & 2nd Street West	U-2W	1	5,880	0.16
4th Avenue East & 1st Street East	U-4W	1	6,790	0.13
South Shore Road & Heritage Lane	S	1	9,540	0.10
US 93 & Caffrey Road	U-2W	0	11,190	0.00
Kerr Dam Road & Back Road	U-1W	0	1,470	0.00

S = Signalized intersection;
U-1W = Unsignalized one-way stop controlled;
U-2W = Unsignalized two-way stop controlled;
U-4W = Unsignalized four-way stop controlled.
**AADT was calculated by adding the entering peak PM volumes of all legs of the intersection and multiplying by 10. (Assumes peak hour PM volumes are 10% of AADT.)*

In order to give the intersections included in the crash analysis an even rating, a composite rating score was developed on the basis of three analyses presented above. Intersections were rated on the basis of their position on each of the three previous tables, giving each equal weight. For example, the intersection of US 93 and South Shore Road was given a ranking of 1 for its position in Table 2.7, another ranking of 4 for its position in Table 2.8, and a ranking of 3 for its location in Table 2.9. Thus its composite rating is 8. Table 2.10 shows the composite rating of each intersection.

Table 2.10 Intersection Crash Analysis – Composite Ranking

(January 2, 2007 thru December 31, 2009)

Intersection	Crash # Ranking	Severity Index Ranking	Crash Rate Ranking	Composite Ranking
US 93 & South Shore Road	1	4	3	8
7th Avenue & Main Street	4	6	2	12
US 93 & 4th Avenue East	2	7	4	13
US 93 & Rocky Point Road	5	5	6	16
Kerr Dam Road & Grenier Lane	7	8	1	16
7th Avenue East & 7th Street East	9	1	9	19
US 93 & Main Street	3	11	6	20
Skyline Drive & Caffrey Road	11	2	8	21
7th Avenue West & 2nd Street West	11	2	12	25
US 93 & Irvine Flats Road	7	8	10	25
4th Avenue East & 2nd Street East	9	11	5	25
US 93 & 1st Street East	5	10	11	26
4th Avenue East & 1st Street East	11	11	13	35
South Shore Road & Heritage Lane	11	11	14	36
US 93 & Caffrey Road	15	15	15	45
Kerr Dam Road & Back Road	15	15	15	45

The composite rating method identified the top five intersections that need to be evaluated further to determine what type of mitigation measures may be possible to reduce specific crash trends (if any) and/or severity. These five intersections are as follows:

- US 93 & South Shore Road;
- 7th Avenue & Main Street;
- US 93 & 4th Avenue East;
- US 93 & Rocky Point Road; and
- Kerr Dam Road & Grenier Lane.

2.6 *Statewide Safety Data Trend Analysis*

Transportation safety is more than just fixing a road or writing a citation. Transportation safety has to be a multi-faceted, coordinated effort that includes Education, Enforcement, Engineering, and Emergency Medical Services (the 4 E's of safety) in order to be most effective.

In addition to assessing the number and locations of crashes in the greater Polson area, comprehensive safety data were also reviewed to examine potential trends in age groups, crash types, impaired crashes, and other influences. The examination of comprehensive safety is strongly encouraged by the MDT and FHWA to better understand the cause of crashes, and to determine whether there are trends that could be correctable. Although not a true "Comprehensive Safety Analysis" (i.e. this analysis only examines the data and portrays a brief summary), this section does document the crash data provided by MDT for the 2005 to 2009 period for Polson, as compared to all the incorporated cities in Montana. Thus, the information provided in this section of the Plan highlights specific crash characteristics that occurred in Polson in variance to all incorporated Montana cities. Overall, the examination of crash data is very important in identifying specific crash trends and traffic safety issues in the greater Polson community.

2.6.1 General Crash Information

In the five-year time span, there were 295 reported crashes in Polson that resulted in 104 reported injuries. There were no fatalities related to crashes from 2005 to 2009.

Crash Severity: The crash severity of the 295 reported crashes is summarized in Table 2.11, and the trend is consistent with statewide averages.

Table 2.11 Crash Severity

(Crash data for 2005 - 2009)

Crash Severity	Polson		All Montana Cities	
	No.	Percent	No.	Percent
Fatal	0	0.0%	125	0.2%
Injury	66	22.4%	13,499	23.6%
Property Damage Only	229	77.6%	43,651	76.2%
Total Crashes	295	-	57,278	-

Crashes by Month, Day, and Hour: In Polson, crash data show a high frequency of crashes in the summer months, a rate higher than other Montana cities. This frequency could be associated with an increase in tourism traffic during the summer months. Mondays and Fridays are the most common days in which crashes occur in Polson with a prevalence of crashes taking place during late-morning and late-afternoon hours. The crash day and crash hour statistics are higher in Polson than in other Montana cities. Table 2.12 shows the crashes in Polson and other Montana cities by month, day, and hour.

Table 2.12 Crashes by Month, Day, and Hour

(Crash data for 2005 - 2009)

	Polson	All Montana Cities
Crash Month		
June/July/August	33.2%	23.6%
December/January	13.9%	21.2%
Crash Day		
Monday	18.3%	15.4%
Friday	22.0%	18.1%
Crash Hour		
9 A.M. – Noon	18.3%	14.4%
2 P.M. – 5 P.M.	31.5%	25.1%

Crashes by Weather, Light, and Road Conditions: Most reported crashes in Polson occur on clear days, during daylight, and on dry roads. This is typical of all incorporated cities in Montana, but it happens more often in Polson. When compared to other cities, reported Polson crashes tend not to occur on wet or icy roads. Table 2.13 shows crashes by weather, light, and by road conditions.

Table 2.13 Crashes by Weather, Light, and Road Conditions

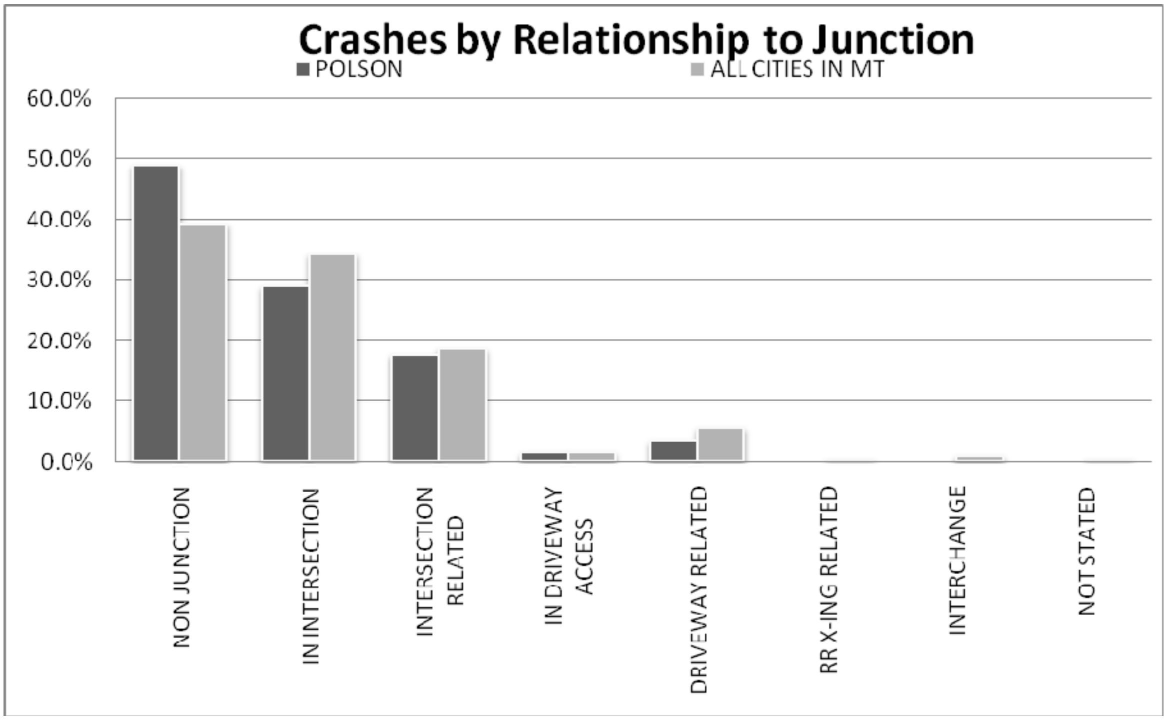
(Crash data for 2005 - 2009)

	Polson	All Montana Cities
Crashes by Weather Condition		
Clear	72.2%	59.8%
Cloudy	18.0%	26.6%
Rain	2.0%	1.2%
Snow	4.7%	5.7%
Crashes by Light Condition		
Daylight	79.7%	73.6%
Dark – Lighted	10.2%	15.2%
Dark – Not Lighted	8.5%	7.1%
Crashes by Road Condition		
Dry	77.3%	69.0%
Wet	6.1%	9.8%
Snow or Slush	8.1%	8.2%
Ice	7.5%	11.3%

Crashes by Relationship to Junction: Chart 2-1 shows the crash relationships relative to the junction of an intersection, driveway, interchange, or railroad crossing. Nearly half of the crashes in Polson are non-junction related, which is higher than other cities. The high percentage of non-junction related crashes could be associated with the high frequency of access points. The prevalence of access points may cause acceleration and deceleration issues as drivers attempt to negotiate into and out of accesses.

Chart 2-1

(Crash data for 2005 - 2009)



2.6.2 Driver Information

Driver demographics identify trends based on gender and age of drivers involved in crashes. There is approximately a 50-41 split in male to female drivers. Driver's age is commonly recorded in Polson crashes. Drivers with the highest percent involvement in crashes are 15- to 19-year-olds, which is typical in Montana city crashes. However, there is a higher involvement of drivers from 40- to 44-years-old and 50- to 74-years-old in Polson crashes. Although there are very few drivers under the age of 15 involved in crashes (7 reported in Polson from 2005-2009), as a percent of all drivers involved in crashes this is markedly higher than in other cities in Montana. Chart 2-2 and 2-3 show drivers by gender and age, respectively.

Chart 2-2

(Crash data for 2005 - 2009)

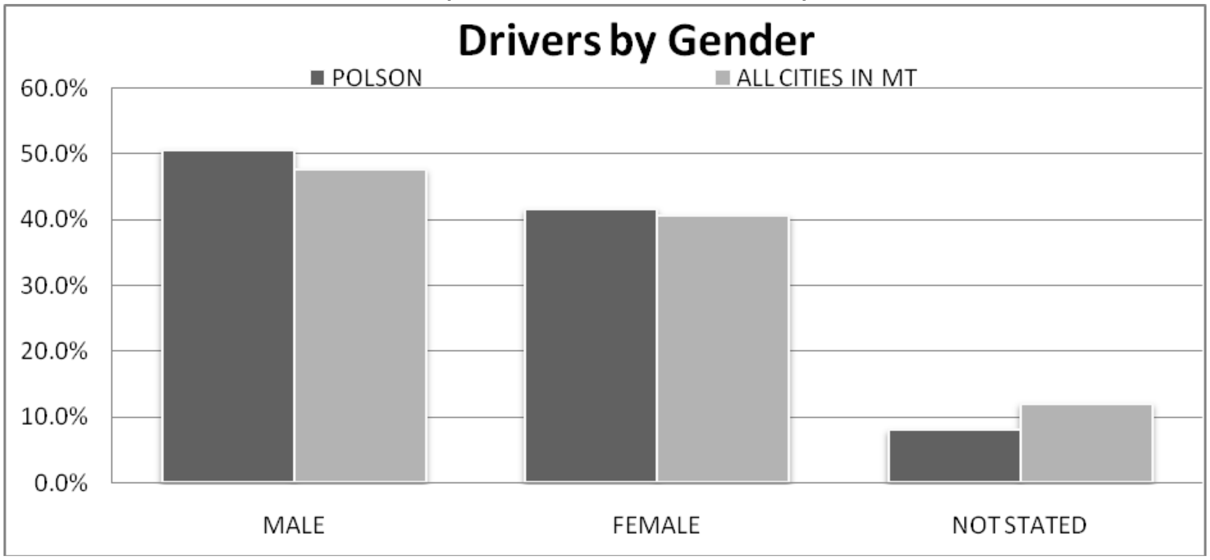
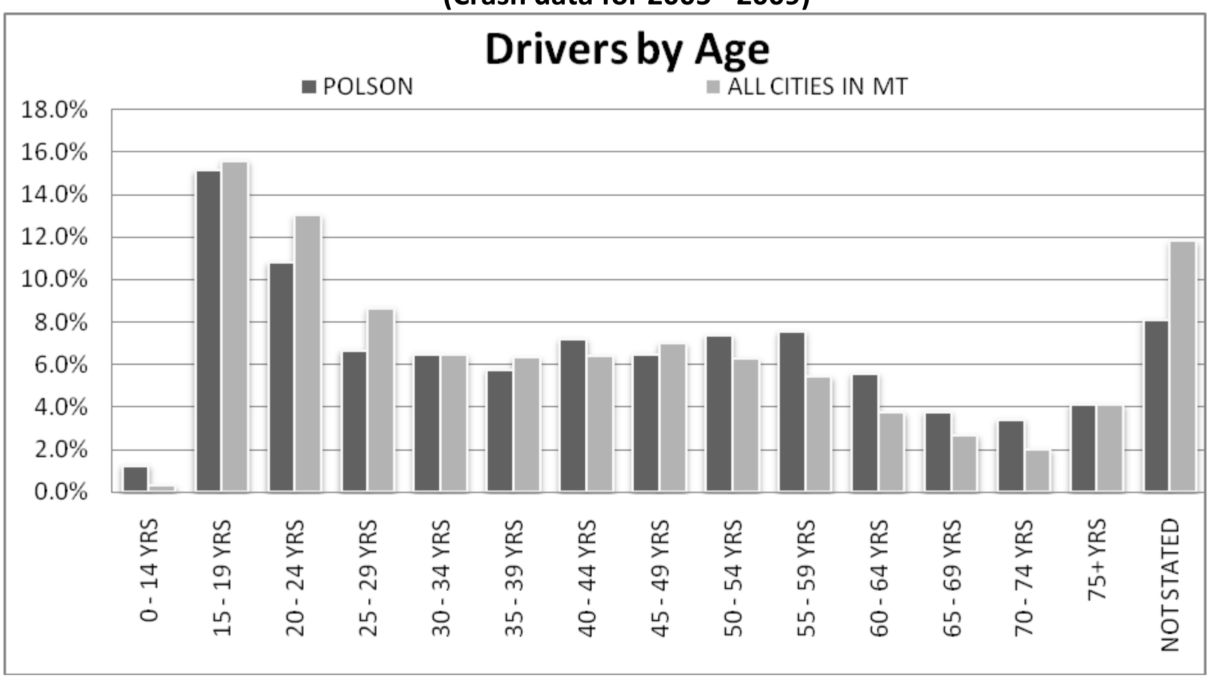


Chart 2-3

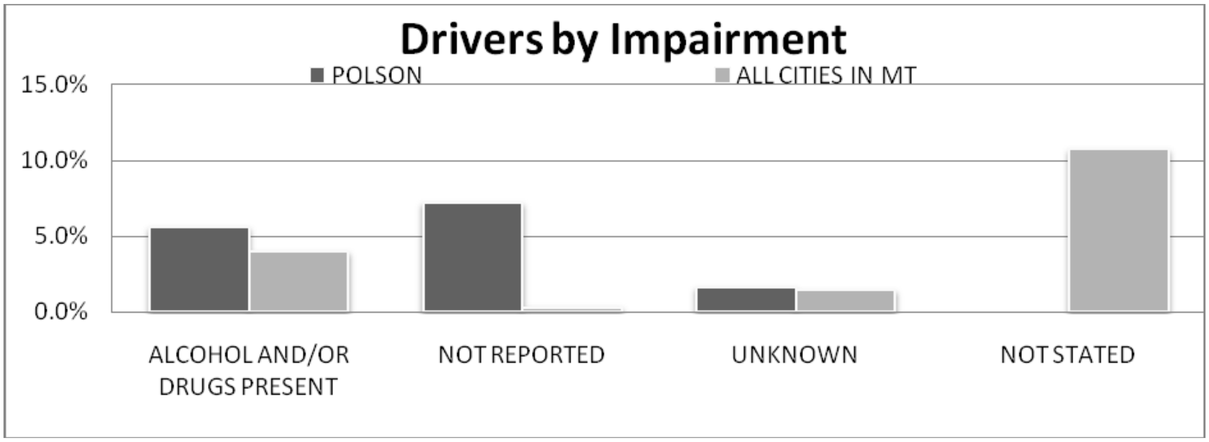
(Crash data for 2005 - 2009)



Over the past five years in Polson, 14.4% of the reported drivers had the presence of alcohol and/or drugs, which is lower than 16.5% for all cities in Montana. In order to effectively show the drivers by impairment, Chart 2-4 represents only those drivers that had some level of alcohol and/or drugs present or if the presence of alcohol and/or drugs was not reported by the law enforcement officer, it was unknown, or not stated. The chart shows that when the presence of alcohol and/or drugs was known, stated, and/or reported, Polson had a higher percent of drivers with the presence of alcohol and/or drugs (5.6% of the drivers), compared to all cities in Montana (4.0% of the drivers).

Chart 2-4

(Crash data for 2005 - 2009)



2.6.3 Injury Information

As stated previously, there were 104 injuries in traffic crashes and no fatalities in Polson from 2005 to 2009. Such a small number does not allow for too much in-depth analysis of any apparent problems.

Types of Injuries: As a percent of all injuries, Polson has fewer incapacitating and non-incapacitating injuries than all the incorporated cities. There are a higher percent of "other" injuries which are complaints of injuries without outward, physical signs (such as whip-lash or headaches). The types of injuries are shown in Table 2-14.

Table 2.14 Types of Injuries

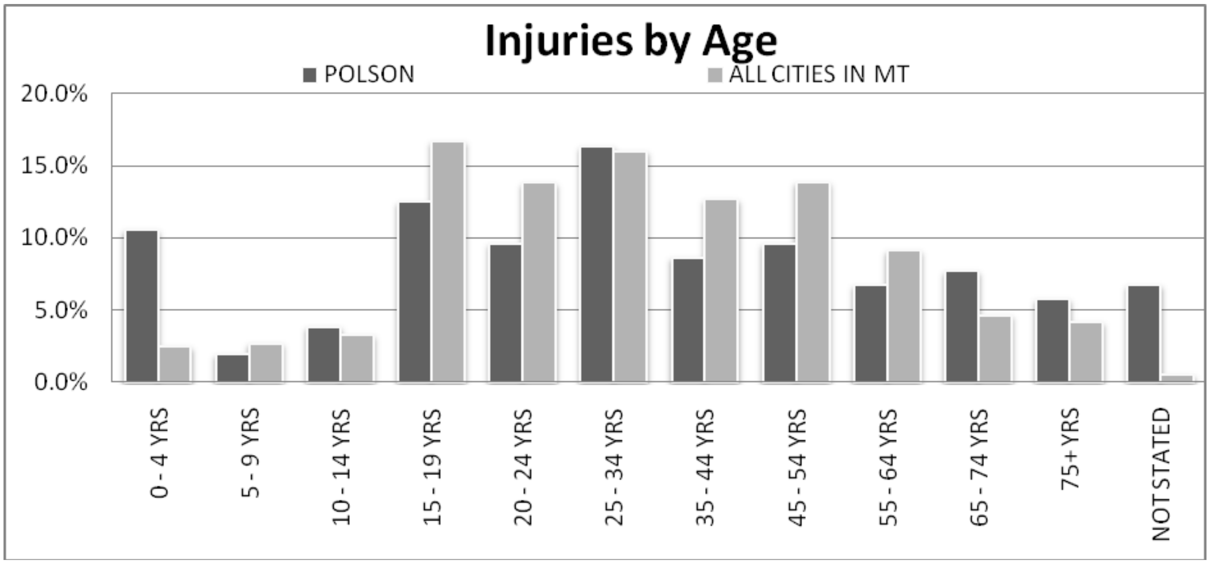
(Crash data for 2005 - 2009)

Injuries	Polson		All Montana Cities	
	No.	Percent	No.	Percent
Fatal	0	0.0%	130	0.7%
Incapacitating	6	5.8%	1,446	7.5%
Non-Incapacitating	17	16.3%	3,617	18.7%
Other	81	77.9%	14,149	73.2%
Total Injuries	104	-	19,342	-

Injuries by Age: Although the ages of those injured in crashes in Polson vary widely, the highest number of injuries occurs to 25- to 34-year-olds. Seven of the injured people did not have an age stated on the crash report, and these seven "age-less" people could make Chart 2-5 vary greatly if the ages were known. It was reported that eleven children between the ages of 0 and 4 were injured. As a percent of all injured, this number is over four times the percent of injuries this age group sees compared to other Montana city crashes. The injuries by age are shown in Chart 2-5.

Chart 2-5

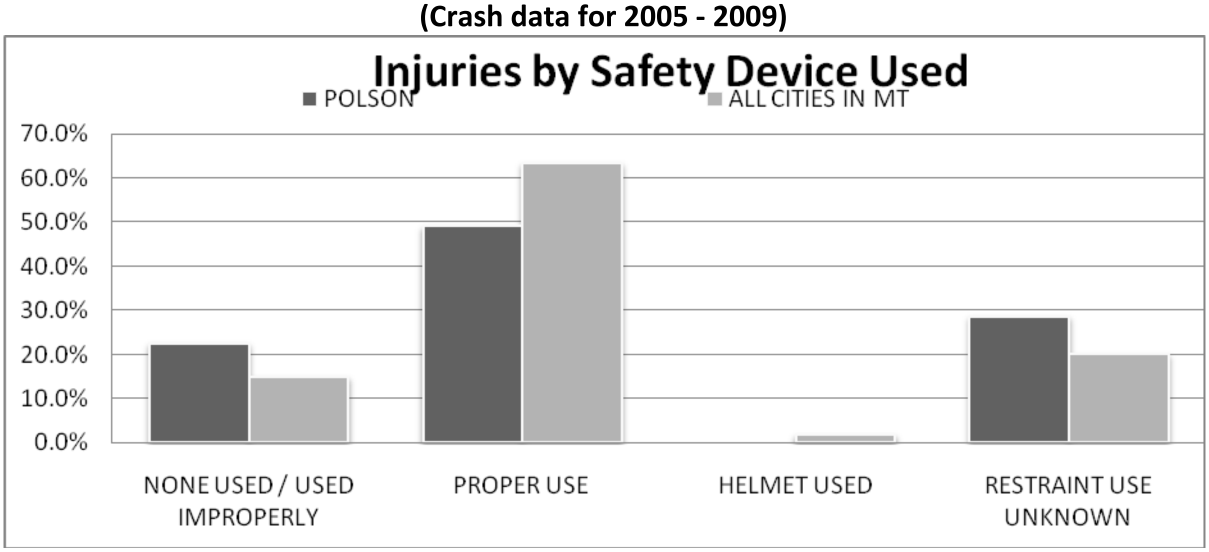
(Crash data for 2005 - 2009)



Injuries by Safety Device Used: A higher number of people injured in crashes in Polson did not use their seat belt properly compared to other Montana cities (49% of the people injured in Polson crashes versus 63.4% in all cities). Chart 2-6 shows the percent of injuries for vehicle occupants and motorcyclists based on the proper use of a safety device (seat belt, child safety seat, motorcycle helmet).

Chart 2-6

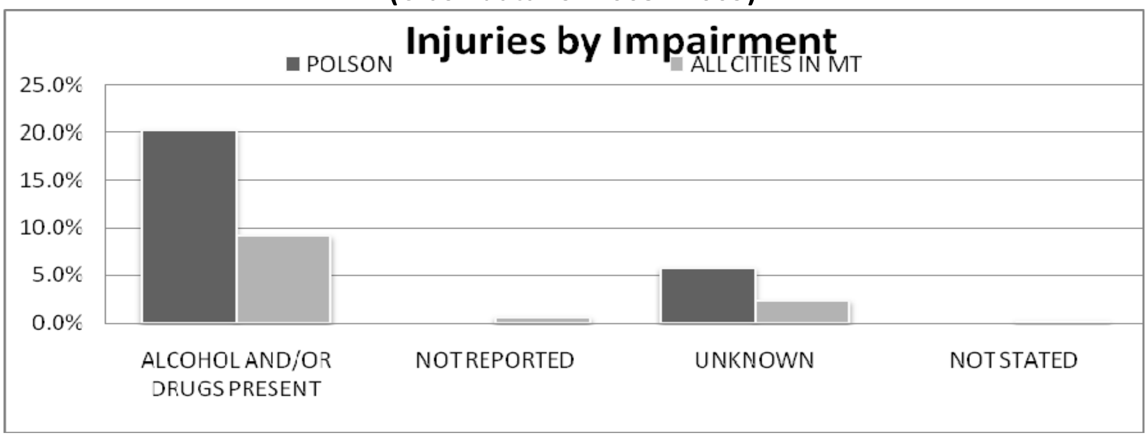
(Crash data for 2005 - 2009)



Injuries by Impairment: Whereas Chart 2-4 represented the drivers by impairment, this discussion only includes data when an injury occurred. When an injury occurred during a crash between 2005 and 2009, 26% of the reported injuries in Polson had the presence of alcohol and/or drugs, compared to 22.4% for all cities in Montana. Chart 2-7 represents only those injuries that had alcohol and/or drugs present, it was not reported by the law enforcement officer, it was unknown, or not stated. The chart shows not only the higher percent of injuries with the presence of alcohol and/or drugs in Polson, but also shows the higher percent of injuries listed on crash reports with their sobriety unknown compared to all cities in Montana. All of the injuries from crashes in Polson had some sort of sobriety information reported.

Chart 2-7

(Crash data for 2005 - 2009)



2.6.4 Vehicle Information

There were 556 vehicles involved in the 295 crashes in Polson from 2005 to 2009. Polson follows the normal trend for urban crashes, 83.1% of the crashes involve multiple vehicles. Pickups, truck-tractors, and bicycles have a higher occurrence of being involved in crashes in Polson compared to crashes in other Montana cities. Table 2-15 shows those body styles most commonly seen in urban crashes.

Table 2.15 Types of Vehicles Involved in Crashes

(Crash data for 2005 - 2009)

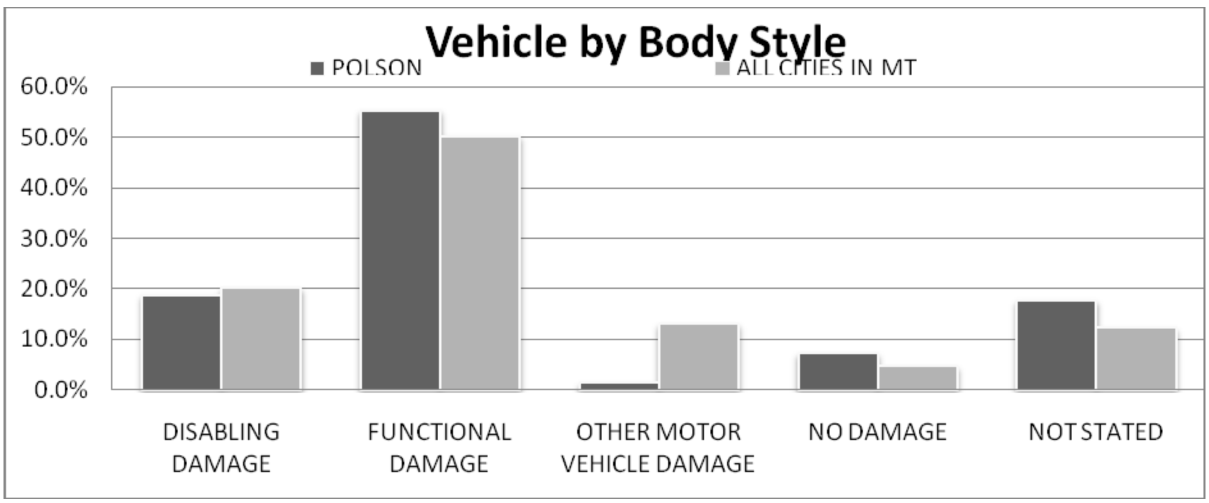
Vehicle by Body Style	Polson	All Montana Cities
Passenger Car	45.9%	49.8%
Pickup	25.4%	23.1%
SUV	13.9%	13.2%
Van/Mini-Van	5.4%	5.6%
Truck-Tractor	3.3%	1.8%
Motorcycle	0.7%	0.8%
Bicycle	1.3%	0.7%
Unknown/Not Stated	3.0%	2.1%

Vehicles involved in urban crashes typically do not have trailers attached to them (95.4% of all vehicles involved in crashes in all incorporated cities in Montana). The same is true in Polson with 95.9% of all vehicles involved. In the case where a trailer style has been stated in the report, they typically are utility trailers, cargo trailers, and recreational trailers. It also does not mean that the trailer attached to the vehicle caused the crash.

Montana vehicles are the predominant vehicles involved in Polson crashes, while 4.1% of the vehicles are from out of state. Chart 2-8 shows the damage severity of the vehicle. This is another measure of the severity of the crash, especially for property-damage only crashes. Over 17% of the vehicles do not have damage severity stated, so the full extent of the severity of crashes as demonstrated by damage to vehicles occurring in Polson is unknown.

Chart 2-8

(Crash data for 2005 - 2009)

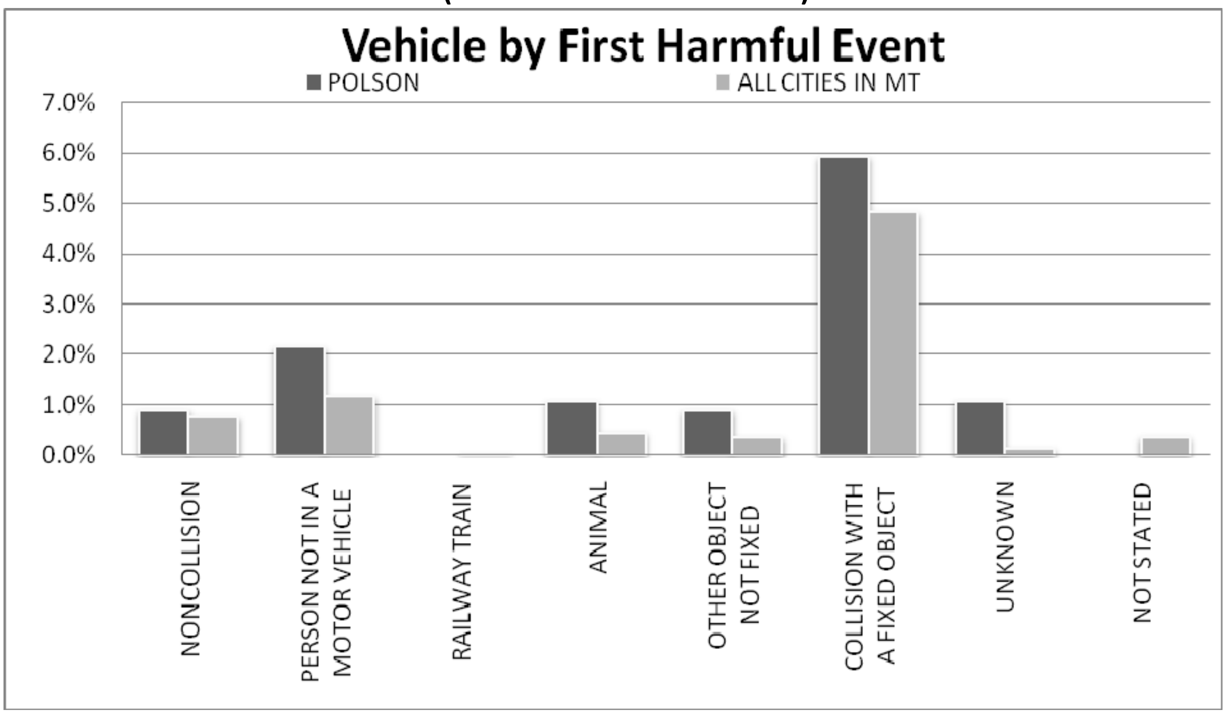


Crashes were analyzed based on "vehicle by first harmful event" to identify collision types. It is known that most of the crashes in Polson were multi-vehicle crashes. Therefore, "collisions with another motor vehicle" is the most common first harmful event reported per vehicle with 77.9% of the report crashes. Chart 2-9 shows the percent of vehicles by the reported first harmful event, excluding collisions with another motor vehicle in order to show variations in other collision types.

Collisions with fixed objects are the most common first harmful event and are higher than other cities in Montana. Fixed objects include, but are not limited to, utility poles, trees, and embankments.

Chart 2-9

(Crash data for 2005 - 2009)

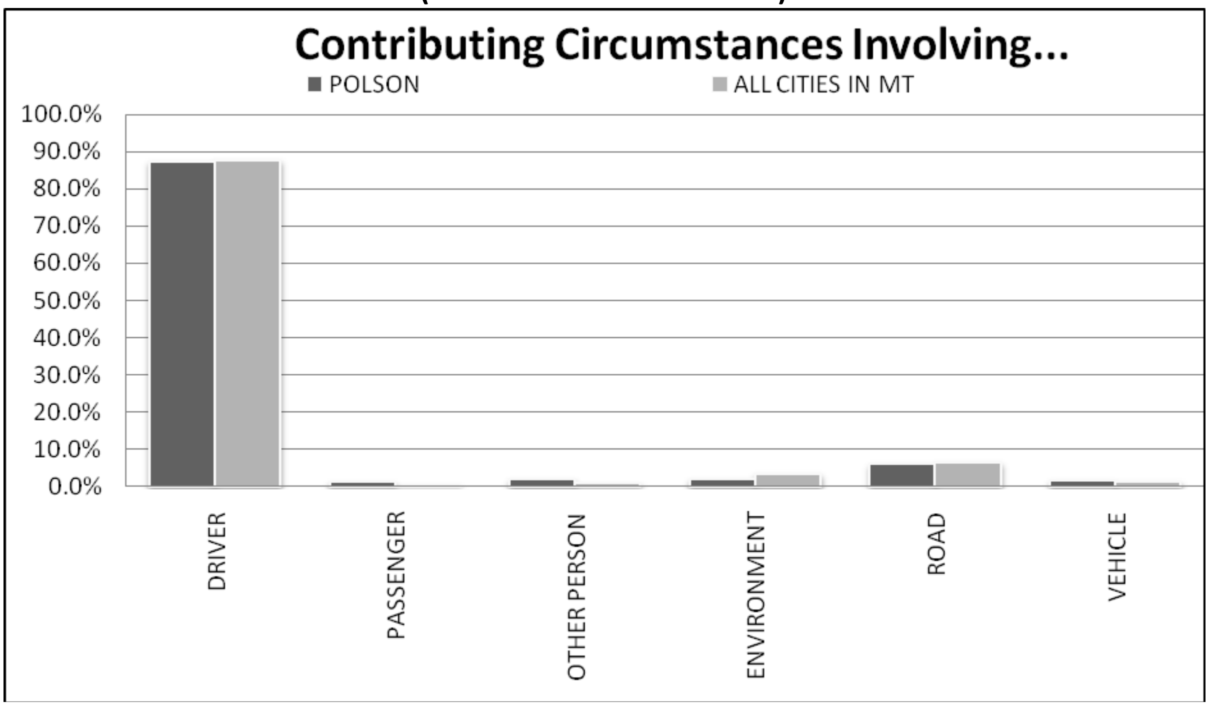


2.6.5 Contributing Circumstances

In crash reports, zero to five contributing circumstances can be listed for each vehicle involved in the crash. Contributing circumstances fall under six categories: driver, passenger, other person, environment, road, and vehicle. Generally, the responding officer identifies the single most probable contributing circumstances of the crash. As shown in Chart 2-10, contributing circumstances involving the driver of the motor vehicle are largely the most common. Determining contributing circumstances in crash reports is very subjective and may vary according to the officers completing the reports. Thus, caution should be taken when using contributing circumstances as an indicator of traffic safety issues.

Chart 2-10

(Crash data for 2005 - 2009)



Ice is the major contributing circumstance involving roads and is common in Montana. Obstructions and other road conditions were also noted in Polson crashes. Environmental factors commonly reported in Polson crashes were rain or snow, sign obstruction, and other. These environmental factors were also noted in urban crashes in other Montana cities. When the other person is noted as being a contributing circumstance to a crash, most of the time the reason was due to the other person failing to yield the right-of-way or disregarding the traffic control device.

Since contributing circumstances involving drivers are predominant in Polson crashes, it is important to determine if there are trends associated with the drivers. Chart 2-11 represents contributing circumstances involving the driver. "Inattentive driving" is the most prevalent circumstance in Polson, similar to other Montana cities. "Failed to yield to right of way" and "following too closely" are both other common contributing circumstances, with "following too closely" in Polson occurring more frequently than in other Montana cities.

Chart 2-11

(Crash data for 2005 - 2009)