HIGHWAY 3
CORRIDOR STUDY

DRAFT REPORT
DECEMBER 2014

SANDERSON STEWART

ACKNOWLEDGEMENTS

The Highway 3 Corridor Planning Study was conducted under the direction of the Project Oversight Committee, which included the members listed below. Along with the input of numerous community members, the guidance of the Project Oversight Committee has been essential to the success of this process and is very much appreciated.

Project Oversight Committee

Candi Millar, City-County Planning Division

Wyeth Friday, City-County Planning Division

Scott Walker, City-County Planning Division

Lora Mattox, City-County Planning Division

Kim Annin, Airport Engineering & Planning

Terry Smith, City Engineering

Mike Black, County Public Works

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INTRODUCTION

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The Billings Metropolitan Planning Organization (MPO) has identified the need to conduct a corridor planning study along the Highway 3 corridor in Billings and Yellowstone County. The extents of the study area are from the North 27th Street roundabout west to the Apache Trail intersection that accesses the Indian Cliffs Subdivision (approximately 5 miles). This study provides an access management plan for the corridor including bike and pedestrian amenities along the Rim face, a parking plan and a stormwater management plan. This study addresses current vehicle and non-motorized traffic circulation and access along the corridor, as well as plans for future changes to traffic patterns caused by the Inner Beltloop connection and development activity.

The Highway 3 Corridor Planning Study was generally broken into four key areas for the purposes of the public meeting presentations and for summary in this report. They include: Traffic & Safety, Parking, Trails & Open Space, and Stormwater. Highlights of the study area are illustrated in Figure 1 on the following page.

Study Area Description

Montana Highway 3 is a National Highway System (NHS) non-interstate route that extends from Billings to Great Falls. In the project vicinity, Highway 3 generally runs east to west providing access to several public streets and numerous residential driveways. Currently, the facility has a single travel lane in each direction with left-turn lanes at Rod & Gun Club Road (eastbound), Zimmerman Place (westbound), Zimmerman Trail (westbound) and Apache Trail (westbound). Highway 3 also has right-turn lanes at its intersections with Rod & Gun Club Road (westbound) and Zimmerman Trail (eastbound).

The existing Montana Department of Transportation (MDT) right-of-way varies throughout the length of the study corridor, but generally extends approximately 50 to 100 feet on either side of the existing centerline for a total right-of-way width of 100 to 200 feet. An access management agreement exists for the properties along Highway 3 west of Zimmerman Trail. It was established via a Limited Access Resolution in 1990 and many of the approaches were constructed by MDT at that time.

The posted speed limit varies from 45 miles-per-hour (mph) to 70 mph along the corridor. The speed limit is 45 mph from the east end of the corridor at milepost 3.0 to milepost 3.5, increasing to 50 mph from milepost 3.5 to 6.5, and then 70 mph from milepost 6.5 to the west end of the corridor. These speed limits are the result of a 2007 speed study conducted by MDT that recommended reductions from the previous speed limit of 60 mph from milepost 3.5 to the west. These speed limits and reference posts are shown in Figure 3 on page 10.

HIGHWAY 3 CORRIDOR STUDY

STUDY AREA HIGHLIGHTS

CONSOLIDATE PARKING AREAS TO RELATE TO DEFINED TRAILHEADS AND SPUR CONNECTIONS

UTILIZE PUBLIC LAND TO VARY CONSISTENCY IN TRAIL AND CONNECT TO OTHER TRAILS IN VICINITY

APPROXIMATE LIMITS OF EXISTING MDT LIMITED ACCESS CONTROL ( )

APACHE TRAIL

HIGHWAY 3

ZONE 3
RURAL

FUTURE INNER BELT LOOP CONNECTION

ROD & GUN CLUB RD

ZIMMERMAN TRAIL

ZONE 2
RESIDENTIAL

ZONE 1
SCENIC

LOGAN INTERNATIONAL AIRPORT

HIGHWAY 3

N 27TH ST

CREATE A CONSISTENT BUFFER FROM HIGHWAY 3 TRAFFIC FOR MULTI-USE TRAIL

ZONE 3: HIGHLIGHTS

- ~ 100' R.O.W. (50' FROM CENTERLINE OF HWY 3)
- ~ ACCESS TO ZIMMERMAN PARK
- ~ EXTENSION TO INDIAN CLIFFS (APACHE TRAIL) AND SECTION OF STATE LAND
- ~ LARGER HIGHWAY BUFFER POTENTIAL UTILIZING ZIMMERMAN PARK (COUNTY)
- ~ OPPORTUNITY TO CONNECT TO GREATER BILLINGS TRAIL NETWORK AND MARATHON LOOP

ZONE 2: HIGHLIGHTS

- ~ 100' R.O.W. (50' FROM CENTERLINE OF HWY 3)
- ~ CONNECTIVITY TO RIMRUNNER NATURE TRAIL
- ~ ACCESS POINT/CROSSING AT ROD & GUN CLUB ROAD
- ~ POTENTIAL FUTURE INTEGRATION WITH INNER BELT LOOP
- ~ ACCESS & SPACING CONSIDERATIONS
- ~ CENTER TURN LANES & ACCEL/DECEL BAYS
- ~ NORTH SIDE VS. SOUTH SIDE TRAIL ALIGNMENT

ZONE 1: HIGHLIGHTS

- ~ R.O.W. VARIES (PER 1936 R.O.W. MAP).
- ~ NEED FOR PARKING TO BE DEFINED (SCENIC VISTAS AND RECREATIONAL OPPORTUNITIES)
- ~ LARGER HIGHWAY BUFFER POTENTIAL FOR TRAIL UTILIZING ESTABLISHED COUNTY PARK
- ~ OPPORTUNITY FOR ENHANCED ENTRANCE AND WELCOME TO THE COMMUNITY
- ~ STORMWATER MANAGEMENT NEEDS
- ~ NEED TO PROVIDE SAFE ACCESS TO ENTER/EXIT HWY FROM RIM FRONT PARKING AREAS

BILLINGS - YELLOWSTONE COUNTY MPO METROPOLITAN PLANNING ORGANIZATION

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DESIGNWORKSHOP

FIGURE 1 – STUDY AREA HIGHLIGHTS – EXISTING CONDITIONS

Goals & Objectives

The Highway 3 Corridor Planning Study provides an access management and transportation circulation plan for the Highway 3 corridor and incorporates bike/pedestrian facilities, a parking plan and a stormwater management plan along the top of the Rims. The following objectives were outlined by the Project Oversight Committee at the onset of the study. asterisk

1. Maintain consistency with existing community plans.
2. Identify and engage all relevant stakeholders.
3. Appropriately consider all transportation modes.
4. Optimize transportation corridor functionality.
5. Mitigate impacts of highway on adjacent land uses.
6. Mitigate stormwater impacts to adjacent land.
7. Enhance corridor as a scenic entryway to the City.
8. Enhance recreational and aesthetic opportunities along the Rims.
9. Develop list of cost effective projects.
10. Address impacts of Inner Beltloop project.

Public Participation Process

A thorough public participation process was conducted for the Highway 3 Corridor Planning Study in conformance with the 2009 Yellowstone County Board of Planning Participation Plan.

The following meetings were conducted as part of the plan development:

- **Project Oversight Committee** meetings were held monthly to discuss the direction of the planning study.
- **Public Meeting No. 1** was held on June 25, 2014 to introduce the corridor planning study to the public. Input was requested on four key components including: Traffic & Safety, Parking, Trails & Open Space, and Stormwater.
- **Rimrock Neighborhoods Task Force** meeting was attended on July 16, 2014 and a project overview was provided.
- **Public Meeting No. 2** was held on October 15, 2014 in order to present preliminary recommendations and gather public input through key pad polling.

The following dates were scheduled for review and approval of the Highway 3 Corridor Planning Study:

- **Technical Advisory Committee** – Presentation and action on December 18, 2014
- **Yellowstone County Planning Board** – Presentation on January 13, 2015 and public hearing/action on January 27, 2015
- **Billings City Council** – Presentation on February 2, 2015 and public hearing/action on February 9, 2015
- **Yellowstone County Commission** – Discussion on February 2, 2015 and presentation/action on February 3, 2015
- **Policy Coordinating Committee** – Final action on February 17, 2015

A project website was developed as a location to post draft documents for review and as a tool to request additional public input. The web address is www.sandersonstewart.com/projects/highway3. The final document will be posted on the City of Billings website at http://ci.billings.mt.us/DocumentCenter/View/26772.

Related Projects

Inner Beltloop. The Inner Beltloop is a proposed rural bypass roadway project that will provide a new connection between the Heights and West End regions of Billings. The south terminus of the new road has been proposed at the existing intersection of Highway 3 and Zimmerman Trail, but other options are still being considered. Alignment alternatives and intersection improvements were evaluated in the 2006 Inner Beltloop Connection Planning Study and the 2010 Inner Beltloop Design Traffic Report.

Zimmerman Trail. MDT recently completed a rock fall mitigation project on Zimmerman Trail and they are currently outlining a budget and scope for additional improvements to the corridor. The extent of those improvements was unknown at the time of this study, but a project is underway. MDT has also recently nominated an intersection improvement project with safety funds at Zimmerman Trail and Highway 3.

Billings Urban Area Long Range Transportation Plan. The 2014 transportation plan identifies long-range transportation projects in the area. It identifies improvements along Zimmerman Trail and the proposed Inner Beltloop, as well as a future connection between Highway 3 and Molt Road. It was utilized as a resource for future land use and traffic volume projections.

Billings Area Bikeway & Trail Master Plan. This plan outlines a proposed short-range, on-street bike lane along Highway 3 east of Rod & Gun Club Road and a long-range bike lane west of this intersection. The plan also identifies proposed short-range bike lanes on N 27th Street, Airport Road and Zimmerman Trail, as well as long-range bike lanes on Rod & Gun Club Road and the Inner Beltloop.

Billings Logan International Airport Master Plan. This master plan document provides an inventory of existing airport facilities, projects future airport demand, and evaluates alternatives for future improvements to the airport and surrounding areas. The master plan recommends future expansion of the airport land use development to the west on Highway 3, including additional hangars, an expanded rental car center and potential commercial development.

EXISTING CONDITIONS

2

Traffic & Safety

A thorough evaluation of existing conditions relative to traffic and safety was conducted to establish a baseline for this study. It included a review of available historic traffic data from MDT, collection of new peak hour turning movement counts at major intersections, and review and analysis of crash data provided by MDT for the past 10 years.

Traffic Volumes

Historic traffic volumes on the corridor links were acquired from MDT's database in the form of average annual daily traffic (AADT) volumes. Sanderson Stewart conducted PM peak hour turning movement counts at the major intersections in June 2014 and those counts were compared to hourly data recorded by MDT in 2013. Marvin & Associates evaluated the traffic volume data to ensure conservative and accurate traffic volumes were used in the traffic analysis. The intersection counts were increased by approximately 20% when it was determined that the 24-hour counts more accurately reflected the typical PM peak hour period.

The resulting AADT volumes and design hour (PM peak) turning movements at the key intersections are shown in Figure 2. Detailed traffic count data is included in Appendix A.

HIGHWAY 3
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2014 DESIGN HOUR TRAFFIC VOLUMES

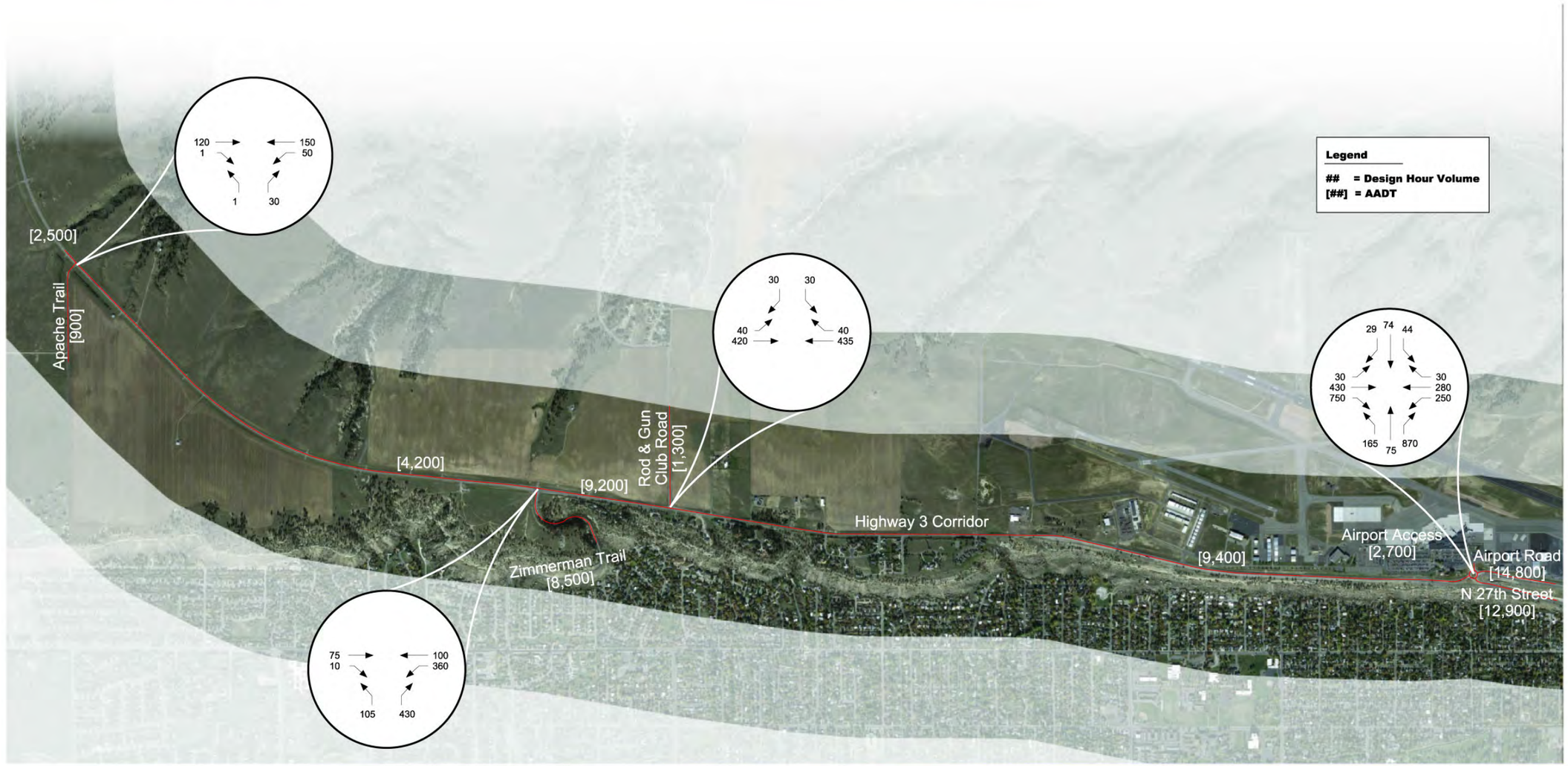

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FIGURE 2 – 2014 DESIGN HOUR TRAFFIC VOLUMES

Crash Data

A crash history analysis was conducted for Highway 3 from milepost 3.0 to milepost 8.2. Historical crash data was obtained from MDT for the ten-year period from January 1, 2004 through December 31, 2013. During this time period, 185 crashes were reported including 5 fatal crashes, 58 injury crashes, and 122 property damage only crashes.

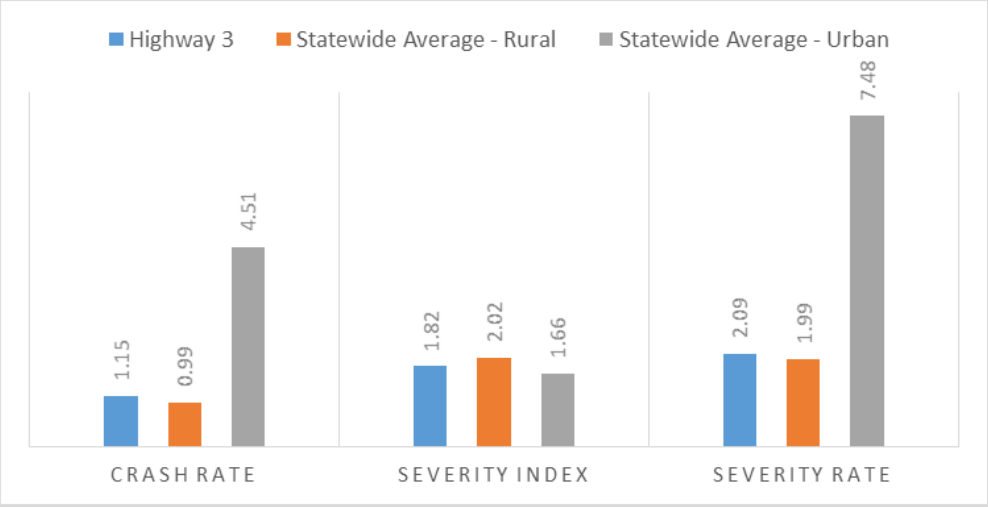
In general, the crashes along the study corridor do not appear to follow any trends associated with time of year, weather, lighting conditions, time of day, or horizontal roadway alignment. However, the location and number of crashes do appear to be influenced by intersections and access points along the corridor.

Three crash rate statistics were calculated to analyze the crash history: crash rate, severity index, and severity rate. The crash rate is defined as the number of crashes per million vehicle miles. The severity index is defined as the weighted average by crash severity, including fatal, injury, and property damage only crashes. Severity rate is defined as the crash rate multiplied by the severity index.

The crash rate statistics for the Highway 3 corridor are calculated based on AADT volumes measured during the ten-year period from 2004 through 2013. The crash rate for the 5.2-mile section of roadway was calculated at 1.15, the severity index at 1.82, and the severity rate at 2.09. As shown in Table 1, these numbers are compared to statewide average crash rates provided by MDT for the years 2008-2012. The average rates are used by MDT to help gauge the need for safety improvements for a roadway.

TABLE 1. CORRIDOR CRASH DATA STATISTICS

	Crash Rate	Severity Index	Severity Rate
Highway 3	1.15	1.82	2.09
Statewide Average – Rural	0.99	2.02	1.99
Statewide Average – Urban	4.51	1.66	7.48

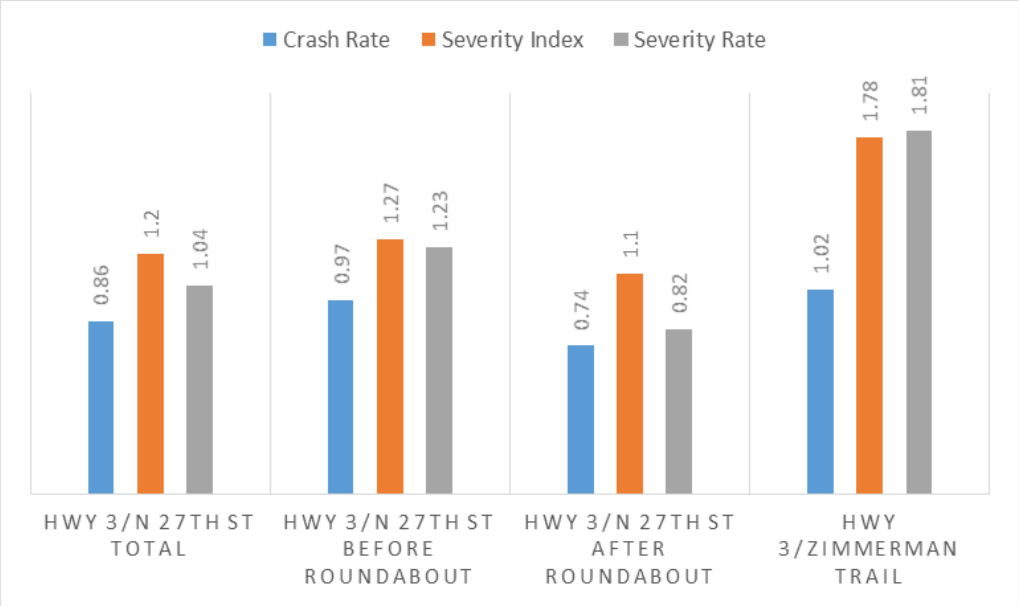


The calculated crash rate and severity rate for Highway 3 are slightly higher than the statewide average for rural roads, but lower than that for urban facilities. Conversely, the severity index for the study corridor is lower than the statewide average rate for a rural roadway, but higher than the average rate for an urban facility.

As a general rule, intersections with a crash rate greater than 1.0 crashes per million-entering-vehicles should be monitored further to determine if an inherent safety concern exists. For this study, crash rates were calculated for the intersections of Highway 3/North 27th Street and Highway 3/Zimmerman Trail. In addition, the crash data at the intersection of Highway 3 and North 27th Street was further analyzed before and after the construction of the roundabout in October 2009. These intersection crash data statistics are summarized in Table 2.

TABLE 2. INTERSECTION CRASH DATA STATISTICS

Intersection	Crash Rate	Severity Index	Severity Rate
Highway 3/N 27th St (2004-2013)	0.86	1.20	1.04
Before Roundabout (2004-2009)	0.97	1.27	1.23
After Roundabout (2009-2013)	0.74	1.10	0.82
Highway 3/Zimmerman Trail (2004-2013)	1.02	1.78	1.81



These calculations show that the crash rate improved significantly after the installation of the roundabout at Highway 3 and North 27th Street. The crash rate at the intersection of Highway 3 and Zimmerman Trail is slightly higher than the value suggested by MDT for monitoring (1.0) and may need to be improved in the future if the crash rate continues to increase.

Table 3 on the following page summarizes crash data for the corridor based on various characteristics such as location, weather and road conditions, crash type, and vehicle type. A majority of the crashes occurred at intersections along the corridor. Specifically, the highest number of crashes occurred at the intersections of Highway 3 with N 27th Street and Zimmerman Trail. The most prominent collision types (rear end, right angle and same-direction sideswipe) appear to be directly related to the high frequency of intersection crashes as opposed to crashes along areas with few access points. Figure 3 on page 10 provides a graphical representation of the same crash data.

During the ten-year analysis period, five (5) fatal crashes were reported. Two (2) of those crashes involved alcohol, two (2) crashes were head-on collisions, and two (2) involved a single vehicle. Through the course of analyzing the fatal crashes, no conclusive trends were identified that point toward specific traffic control improvements as an obvious mitigation measure.

There were 14 reported crashes involving a wild animal over the ten-year period. MDT Billings District Maintenance Division was contacted as well, and they reported 7 wildlife collisions during 2013 in which animals were removed from the roadway. The Maintenance Division also stated that this number is about average for the study corridor each year, and they do not feel the number of wildlife collisions is high relative to other area roadways. During 2013, only one crash involving a wild animal was listed in the crash history indicating that a low percentage of wild animal crashes are reported in the study area.

TABLE 3. CRASH DATA SUMMARY

Month	Crashes	%
January	12	6.5%
February	7	3.8%
March	22	11.9%
April	14	7.6%
May	10	5.4%
June	17	9.2%
July	14	7.6%
August	21	11.4%
September	19	10.3%
October	17	9.2%
November	17	9.2%
December	15	8.1%
Totals	185	100.0%

Day	Crashes	%
Sunday	29	15.7%
Monday	30	16.2%
Tuesday	24	13.0%
Wednesday	26	14.1%
Thursday	20	10.8%
Friday	30	16.2%
Saturday	26	14.1%
Totals	185	100.0%

Horiz. Align.	Crashes	%
Straight	115	62.2%
Curve	56	30.3%
Not Reported	14	7.6%
Totals	185	100.0%

Milepost	Crashes	%
3.0 - 3.4	73	39.5%
3.5 - 3.9	2	1.1%
4.0 - 4.4	7	3.8%
4.5 - 4.9	15	8.1%
5.0 - 5.4	17	9.2%
5.5 - 5.9	6	3.2%
6.0 - 6.4	51	27.6%
6.5 - 6.9	3	1.6%
7.0 - 7.4	3	1.6%
7.5 - 7.9	6	3.2%
8.0 - 8.4	2	1.1%
Totals	185	100.0%

Weather	Crashes	%
Clear	130	70.3%
Cloudy	31	16.8%
Snow	10	5.4%
Sleet	2	1.1%
Rain	4	2.2%
Fog	1	0.5%
Crosswinds	1	0.5%
Blowing Snow	6	3.2%
Totals	185	100.0%

Road Conditions	Crashes	%
Dry	148	80.0%
Wet	10	5.4%
Ice	9	4.9%
Snow/Slush	17	9.2%
Loose Gravel	1	0.5%
Totals	185	100.0%

Year	Crashes	%
2004	20	10.8%
2005	20	10.8%
2006	20	10.8%
2007	18	9.7%
2008	20	10.8%
2009	14	7.6%
2010	18	9.7%
2011	17	9.2%
2012	17	9.2%
2013	21	11.4%
Totals	185	100.0%

Crash Severity	Crashes	%
Fatal	5	2.7%
Injury Crash	59	31.9%
Prop. Damage Only	121	65.4%
Totals	185	100.0%

Note: Crash data summarized from 1/1/04 through 12/31/13

Collision Type	Crashes	%
Head On	6	3.2%
Rear End	63	34.1%
Right Angle	23	12.4%
Sideswipe SD	18	9.7%
Sideswipe OD	3	1.6%
Left Turn SD	2	1.1%
Left Turn OD	2	1.1%
Other/Unknown	68	36.8%
Totals	185	100.0%

Vehicle Type	Vehicles	%
Bicycle	1	0.3%
Motorcycle	6	1.9%
Passenger Car	101	32.3%
Mid-size Car	40	12.8%
Large Car	3	1.0%
SUV	52	16.6%
Van	12	3.8%
Pickup Truck	62	19.8%
Truck/Tractor	36	11.5%
Totals	313	100.0%

Light Conditions	Crashes	%
Dawn	2	1.1%
Daylight	124	67.0%
Dusk	2	1.1%
Dark-Lighted	15	8.1%
Dark-Not Lighted	41	22.2%
Unknown	1	0.5%
Totals	185	100.0%

Time of Day	Crashes	%
Before 6:00 am	18	9.7%
6:00 am - 9:00 am	27	14.6%
9:00 am- 12:00 pm	22	11.9%
12:00 pm - 3:00 pm	27	14.6%
3:00 pm - 6:00 pm	49	26.5%
6:00 pm - 9:00 pm	26	14.1%
After 9:00 pm	16	8.6%
Totals	185	100.0%

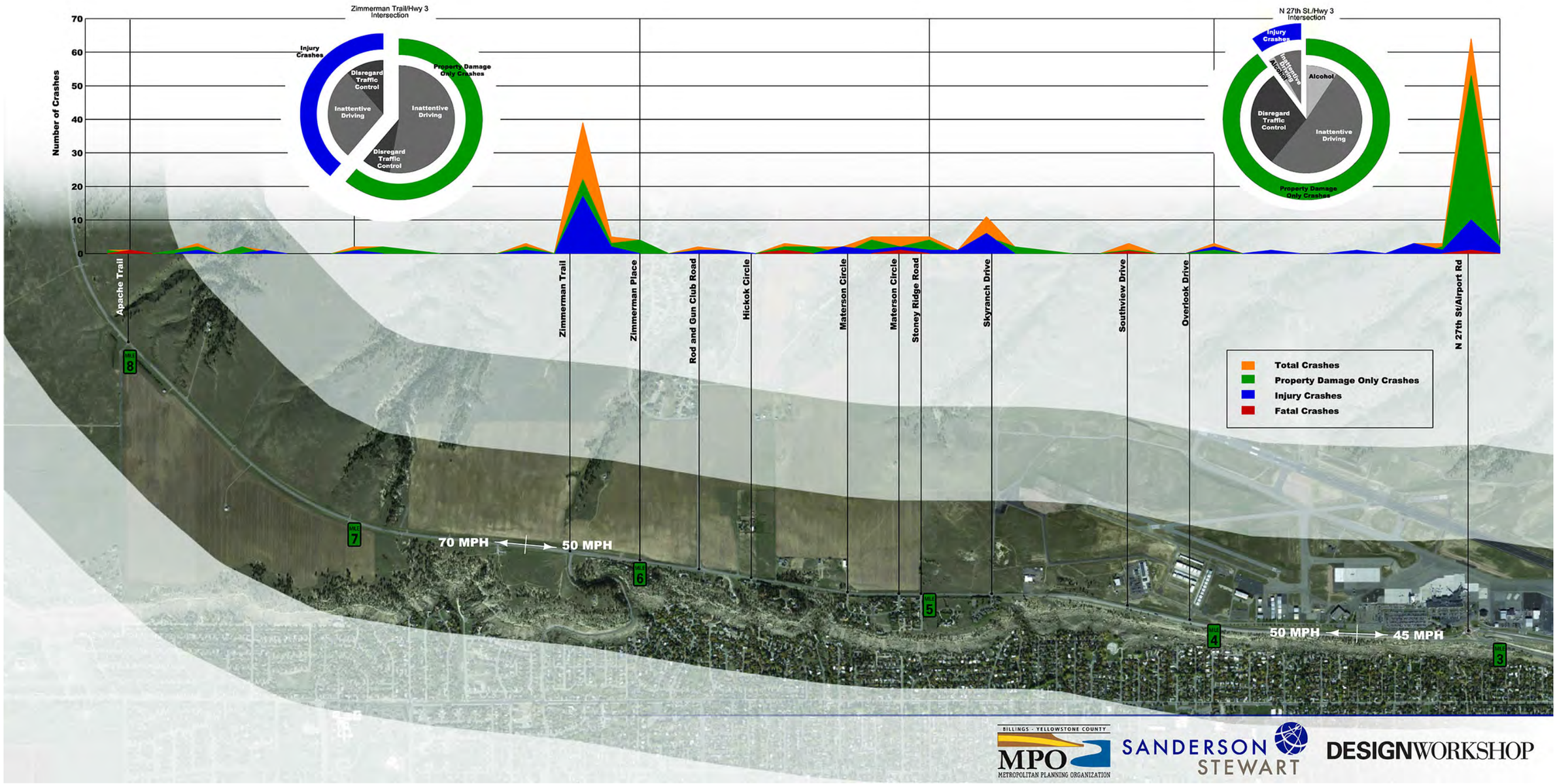


FIGURE 3 - CRASH DATA FIGURE

Parking

A parking inventory was conducted along the study corridor to evaluate the level of parking needed in the future. Counts were taken in May and August 2014 at the main Swords Park parking lot, the parking lot just east of the North 27th Street roundabout, the Zimmerman Park parking lot, and within the existing gravel parking area along Highway 3 west of North 27th Street, which was referred to as the Rimview Parking Area for the purposes of this report. These counts were then compared to the available parking capacity in each location, as summarized in Table 4 below. The results of this exercise show that the parking areas currently available provide adequate capacity relative to the demand.

TABLE 4. PARKING INVENTORY & CAPACITY

Parking Count/Date		Swords Park Parking Lot	Parking Lot East of N 27th St/Airport Rd Roundabout	Zimmerman Park Parking Lot	Rimview Parking Area
May 2014 Inventory[1]	Count 1	12	4	15	7
	Count 2	10	4	7	7
	Count 3	8	3	8	8
	Count 4	10	5	5	12
August 2014 Inventory[1]	Count 1	5	6	8	4
	Count 2	5	4	6	0
	Count 3	4	2	5	3
	Count 4	4	2	6	4
May Average Demand		10	4	9	9
August Average Demand		5	4	6	3
Maximum Observed Demand[2]		12	6	15	12
Estimated Capacity[3]		20	30	30	N/A[5]
Available Spots During Max Demand[4]		8	24	15	N/A[5]

[1] Parking counts were one-time observations taken throughout one day for each of the listed months.

[2]Maximum Observed Demand is the highest observed parking taken during the parking inventory.

[3]Parking capacity was estimated based on the size of the parking areas.

[4]Available Spots During Max Demand is calculated as the Estimated Capacity minus the Maximum Observed Demand.

[5] No existing defined parking lot. Counts taken for comparison purposes for parking lot design.

Trails & Open Space

Figure 4 illustrates the existing trails and open space along the Highway 3 corridor. Existing paved trails are shown in blue, existing natural trails in red and future trails as a dashed red line like the future trail planned along the inner belt loop.

Figure 4 also illustrates the extensive parkland that exists along the top of the Rims. There are 300 acres of parks and open space within one mile of the corridor, as well as 12 miles of existing trails. That is something very unique to this corridor that would not be seen anywhere else in Billings. This is why the multi-modal and recreational components of this study are so important.

Also worth noting is the smaller map in the bottom left corner of Figure 4 that illustrates the proposed Marathon Loop trail that will eventually provide a continuous off-street loop around the entire city. The potential multi-use trail along the Highway 3 corridor presents an opportunity to fill in a missing gap in the Marathon Loop.

Stormwater

Figure 5 on page 14 illustrates the existing stormwater drainage patterns for the Highway 3 corridor based on topography. The different colors represent different drainage areas. The white arrows show the direction of flow and the yellow lines represent existing culverts.

Drainage areas toward the west end of the Highway 3 corridor generally flow to the north, while areas on the east end flow to the south (toward the Rims). This information, along with some additional analysis, will be used to help identify potential areas for stormwater detention.

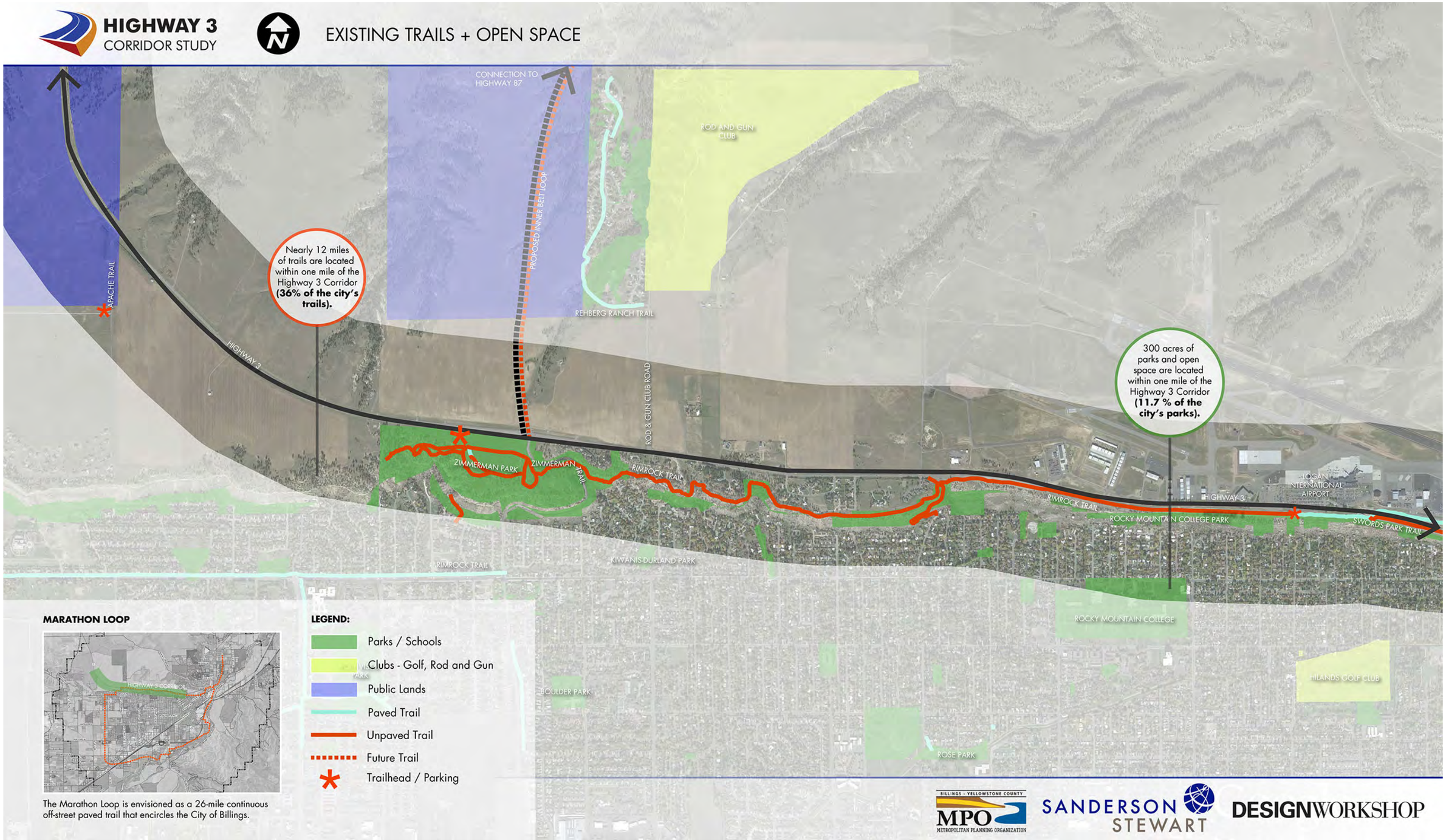


FIGURE 4 - CORRIDOR STUDY TRAILS

HIGHWAY 3
CORRIDOR STUDY

STORMWATER EXHIBIT

DRAINAGE AREA	AREA (ac)	CULVERT SIZE (in)
A1	6.06	24
A2	17.08	24
A3	23.61	24
A4	5.39	24
A5	6.81	24
A6	10.86	24
A7	57.54	24
A8	13.18	--
A9	24.66	24
A10	48.42	24
A11	15.30	36
A12	13.99	24
A13	28.09	30
A14	25.39	18
A15	105.28	48
A16	38.55	42

LEGEND

DRAINAGE FLOW

CULVERT
(SIZE VARIES)

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FIGURE 5 - STORMWATER DRAINAGE PATTERNS

CORRIDOR MODELING

3

Corridor traffic volumes were projected using a methodology based on existing traffic patterns at the four key corridor intersections, as described in greater detail in the following paragraphs. These volumes were then used to prepare a corridor model for the evaluation of traffic operations and ultimately, the evaluation of alternatives for improvement.

Traffic Volume Projections

Traffic patterns at the key intersections were converted to percentage distribution values to determine relative travel demand from and to separate corridor links. This resulted in an origin-destination trip table that was used to assign future travel patterns. The base trip table was reconfigured for future conditions involving the addition of the proposed Inner Beltloop connection link and anticipated demographic changes in the future design year 2035. These demographic projections were obtained from the 2014 Long Range Transportation Plan and are illustrated graphically in Figure 6. The model included substantial increases in population and employment in the areas just north of Highway 3. An extension of Apache Trail to the north was included to represent future access to development north of Highway 3 and west of the Inner Beltloop.

Ten years (2004-2013) of AADT data from MDT for the Highway 3 corridor was utilized to perform a historic growth analysis. The average annual growth rate was calculated for each link along the corridor and it was noted that all of the links had positive growth ranging from 0.2% to 5.5% annually. Multiplication factors were calculated using the annual percentage growth (compounded) to arrive at what is considered to be a conservatively high estimate of year 2035 volumes on the roadway links. In addition, a straight-line growth curve was calculated, which represented a low range estimate of year 2035 volumes. In order to add a measure of conservatism to this study, and for consistency with the Long Range Transportation Plan volumes, the high range volumes were used to predict year 2035 traffic volumes on the existing system.

Appendix A contains a series of calculations and trip tables that were used in the model's development. Model results for year 2035 traffic projections on the existing system are shown in Figure 7, which presents the AADT traffic on each roadway link and the design hour traffic at each of the key intersections. The highest Highway 3 AADT would be approximately 16,000 vehicles per day (vpd) between Zimmerman Trail and the Airport Road intersection.

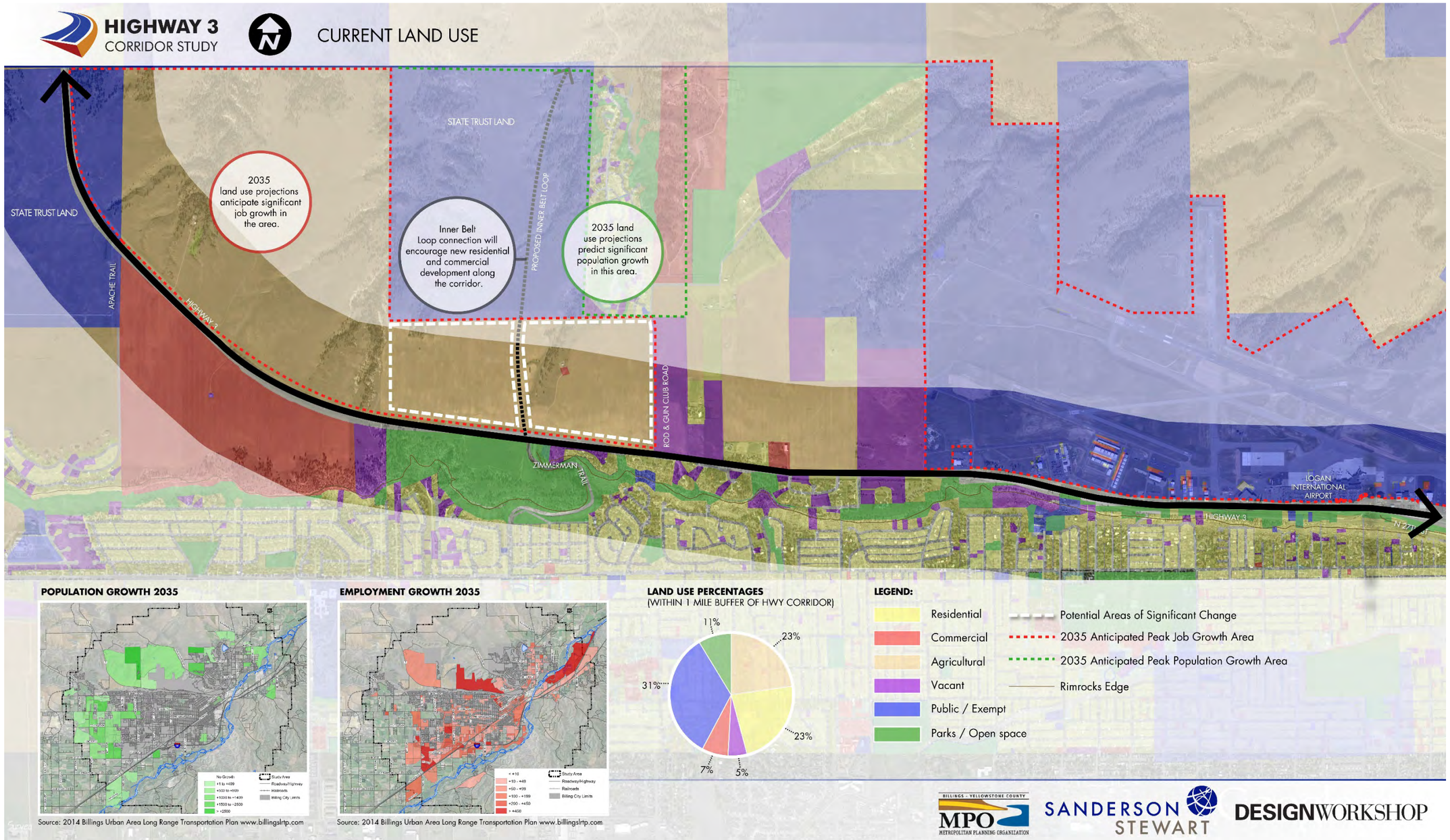

FIGURE 6 - EXISTING & PROJECTED LAND USE

HIGHWAY 3
CORRIDOR STUDY

2035 TRAFFIC VOLUME PROJECTIONS WITH INNER BELT LOOP & DEVELOPMENT BASED ON TRANSPORTATION PLAN HIGH LAND USE GROWTH SCENARIO

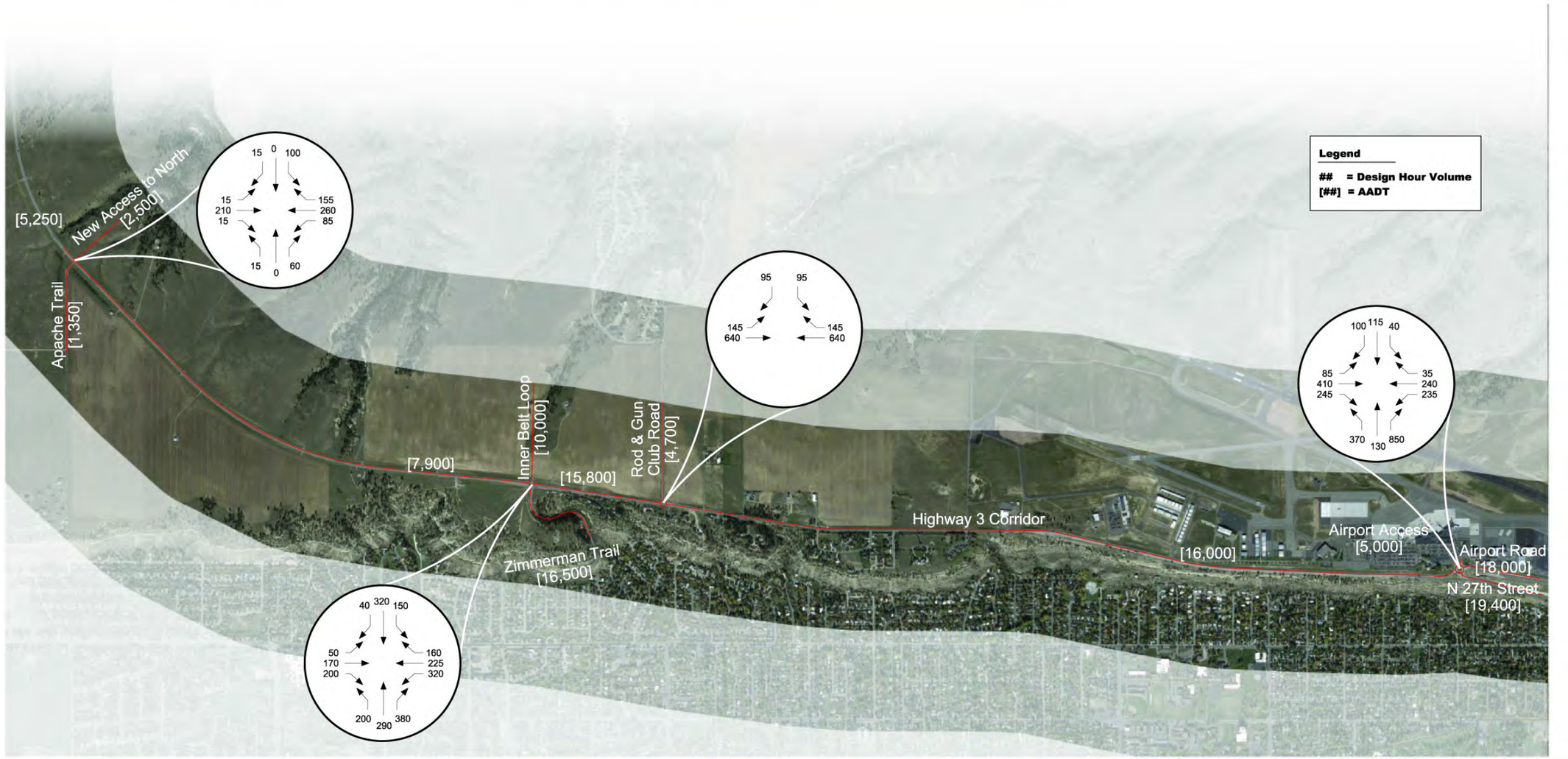

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FIGURE 7-2035 TRAFFIC VOLUME PROJECTIONS

Traffic Analysis

Capacity calculations were performed for existing and future conditions using Synchro 8, which is based on Highway Capacity Manual (HCM) methodologies. The HCM2000 defines level of service (LOS) as "a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, as well as comfort and convenience." LOS is a qualitative measure of the performance of an intersection. LOS values range from LOS A, indicating good operation and low vehicle delays, to LOS F, which indicates congestion and longer vehicle delays. A roundabout analysis program, Rodel Interactive, was also used to further evaluate conditions at intersections with existing and proposed roundabouts.

Both the City of Billings and MDT generally consider LOS C as the minimum standard for acceptable intersection operations. The existing capacity calculation results for this study show that all intersections and intersection approaches currently operate at an acceptable LOS, except for the north- and southbound (private drive) approaches at the Zimmerman Trail/Highway 3 intersection. LOS results for both existing and future conditions are presented in Table 5 and detailed Synchro reports are provided in Appendix B.

Three improvement alternatives were analyzed for the intersections within the project corridor as shown in Table 5. The first alternative is a no-build scenario in which the intersections at Zimmerman Trail and Rod & Gun Club Road would remain as two-way stop-controlled, as would the intermediate access intersections along the corridor. The second scenario (Alternative 1) proposes roundabouts at Zimmerman Trail and Rod & Gun Club Road, and stop control with three-quarter access at intermediate access intersections. The third scenario (Alternative 2) is similar to the second except signals were evaluated at the Zimmerman Trail and Rod & Gun Club Road intersections.

The capacity calculations conducted for 2035 traffic volumes show that many of the intersection approaches would not operate at an acceptable LOS for the no-build scenario. The results for both Alternative 1 and Alternative 2 indicate that intersections could be improved to acceptable levels with the installation of either signals or roundabouts at Zimmerman Trail and Rod & Gun Club Road. Both intersections project to operate well with single-lane roundabouts, but the signalized alternative for the Zimmerman Trail intersection would require left- and right-turn auxiliary lanes on all approaches and possibly even additional thru lanes in the northbound and southbound directions.

TABLE 5. CAPACITY CALCULATION RESULTS

Intersection	Approach	Existing (2014) PM Peak			2035 No-Build PM Peak			2035 Alternative 1 (Roundabouts) PM Peak			2035 Alternative 2 (Signals) PM Peak			Notes
		Avg Delay (s/veh)	LOS	Max Queue (veh)	Avg Delay (s/veh)	LOS	Max Queue (veh)	Avg Delay (s/veh)	LOS	Max Queue (veh)	Avg Delay (s/veh)	LOS	Max Queue (veh)	
Intersection Control		*One-way Stop Control*			*Two-way Stop Control*			*Two-way Stop Control*			*Two-way Stop Control*			
Apache Trail & Highway 3	EB	0.0	A	0	8.4	A	1	8.4	A	1	8.4	A	1	No Change in Traffic Control
	WB	7.6	A	1	1.4	A	1	1.4	A	1	1.4	A	1	
	NB	9.1	A	1	9.2	A	1	9.2	A	1	9.2	A	1	
	SB	--	--	--	25.7	C	2	25.7	C	2	25.7	C	2	
Intersection Control		*One-way Stop Control*			*Two-way Stop Control*			*Two-way Stop Control*			*Two-way Stop Control*			
Intermediate Access Intersection	EB	0.0	A	0	0.1	A	0	0.1	A	0	0.1	A	0	No Change in Traffic Control
	WB	0.0	A	0	0.1	A	0	0.1	A	0	0.1	A	0	
	NB	10.6	B	1	10.6	B	1	10.6	B	1	10.6	B	1	
	SB	--	--	--	21.1	C	1	21.1	C	1	21.1	C	1	
Intersection Control		*Two-way Stop Control*			*Two-way Stop Control*			*Roundabout*			*Signal*			
Zimmerman Trail & Highway 3	EB	0.0	A	0	0.8	A	1	16.8	C	1	25.2	C	7	Auxiliary Left and Right-turn Lanes all approaches, 2 NB/SB Thru Lanes
	WB	7.8	A	1	5.1	A	2	12.6	B	1	34.1	C	10	
	NB	35.9	E	5	Error	F	Error	16.2	C	2	21.5	C	8	
	SB	34.5	D	1	Error	F	Error	23.4	C	3	33.8	C	4	
Intersection Control		*One-way Stop Control*			*One-way Stop Control*			*Stop Control, 3/4 Access*			*Stop Control, 3/4 Access*			
Intermediate Access Intersection	EB	0.0	A	0	0.0	A	0	0.0	A	0	0.0	A	0	3/4 Access (NB/SB Right-Turn Only)
	WB	8.4	A	0	9.3	A	1	9.3	A	1	9.3	A	1	
	NB	16.6	C	1	30.1	D	1	14.5	B	1	14.5	B	1	
	SB	--	--	--	--	--	--	--	--	--	--	--	--	
Intersection Control		*Two-way Stop Control*			*Two-way Stop Control*			*Roundabout*			*Signal*			
Rod & Gun Club Road & Highway 3	EB	0.7	A	1	2.0	A	1	16.2	C	2	12.6	B	9	No Change in Lane Confirgurations for Signalized Option
	WB	0.0	A	0	0.0	A	0	16.8	C	3	23.2	C	16	
	NB	10.8	B	0	12.9	B	0	7.8	A	0	0.0	A	0	
	SB	18.5	C	1	303.4	F	11	12.6	B	0	12.0	B	3	
Intersection Control		*Two-way Stop Control*			*Two-way Stop Control*			*Stop Control, 3/4 Access*			*Stop Control, 3/4 Access*			
Intermediate Access Intersection	EB	0.0	A	0	1.1	A	1	0.4	A	1	0.4	A	1	3/4 Access (NB/SB Right-Turn Only)
	WB	0.1	A	0	0.5	A	1	0.2	A	1	0.2	A	1	
	NB	16.8	C	1	53.5	F	1	15.3	C	1	15.3	C	1	
	SB	16.9	C	1	62.4	F	2	17.9	C	1	17.9	C	1	
Intersection Control		*Roundabout*			*Roundabout*			*Roundabout*			*Roundabout*			
E Airport Road & Highway 3	EB	13.2	B	1	14.4	B	1	14.4	B	1	14.4	B	1	No Change in Traffic Control
	WB	10.8	B	1	11.4	B	1	11.4	B	1	11.4	B	1	
	NB	12.0	B	1	15.0	C	1	15.0	C	1	15.0	C	1	
	SB	12.0	B	1	14.4	B	1	14.4	B	1	14.4	B	1	

RECOMMENDED IMPROVEMENTS

4

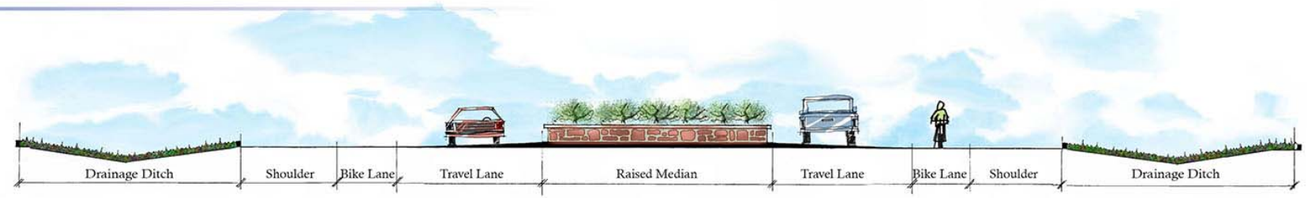
The preceding evaluation of existing conditions and analysis of projected future traffic operations, drainage and other study considerations resulted in many recommended improvements for the Highway 3 corridor. Those recommendations have again been organized by the four key project elements: Traffic & Safety, Parking, Trails & Open Space, and Stormwater. The overall improvements incorporating all of these elements are illustrated in Figure 8 on the following page.

It is important to note that these recommendations represent a vision for the corridor, but further engineering analysis will be required to confirm the feasibility and details of design.

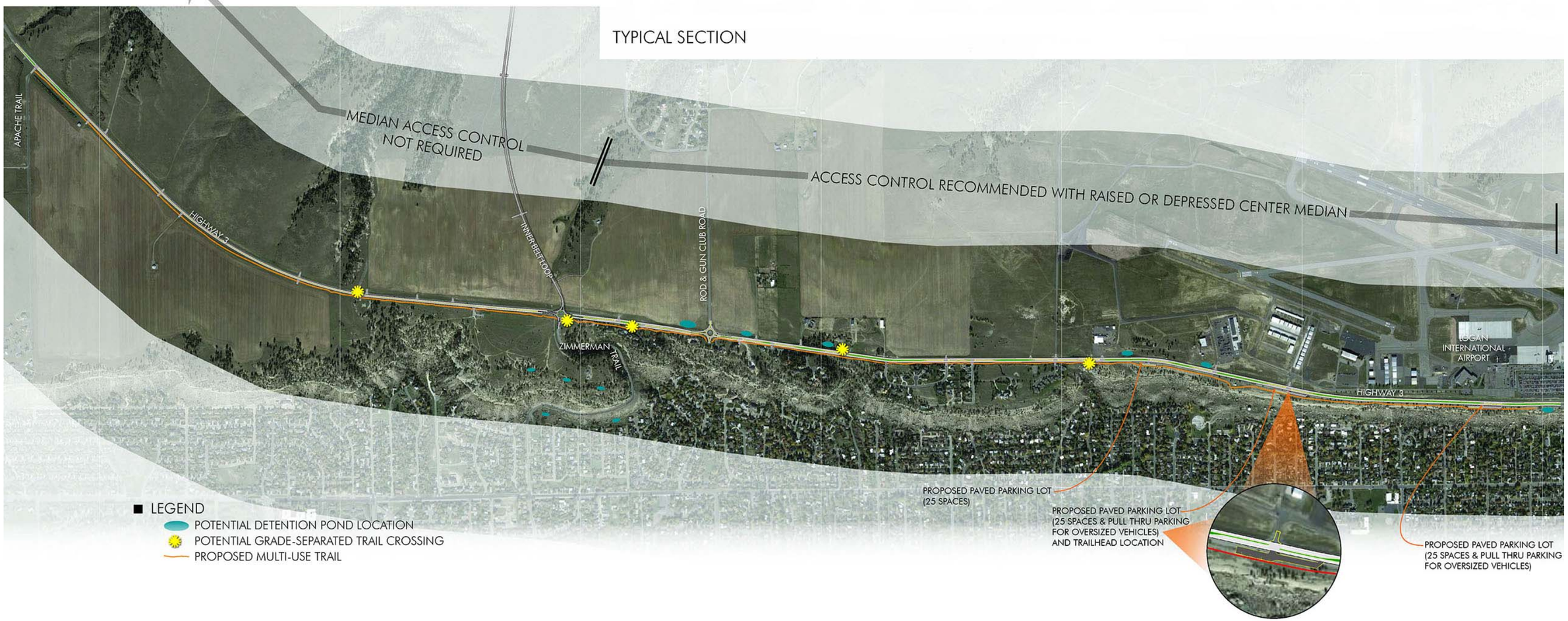
Traffic & Safety

The proposed corridor improvements were based on the year 2035 traffic volume projections, the resulting capacity calculations, and other considerations previously discussed in the report. In general, all design elements for this project should be implemented with the ultimate goal of constructing a cohesive corridor that operates safely and efficiently for all modes of traffic. The recommended improvements should ultimately be designed to MDT, AASHTO, MUTCD, and other standards as appropriate.

PROPOSED CORRIDOR IMPROVEMENTS



TYPICAL SECTION



BILLINGS - YELLOWSTONE COUNTY MPO METROPOLITAN PLANNING ORGANIZATION
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FIGURE 8 - PROPOSED CORRIDOR IMPROVEMENTS

Typical Section

A three-lane typical section is recommended from Zimmerman Trail to North 27th Street. Figure 9 on the following page shows the concept typical sections that were presented for public input. The recommended section consists of a single travel lane in each direction, bike lanes, left-turn lanes and some form of median to provide a level of access control needed for safety and to provide an acceptable level of service for traffic operations at minor intersections along the corridor. As a result, several of the intersections may be limited to three-quarter access, where both left and right turns are allowed onto the side street but access to Highway 3 from the side street would be limited to right-turn only. Vehicles wanting to make a left turn onto Highway 3 would need to make a right turn and then a u-turn at the next downstream intersection or median opening. The restriction on left-turn movements from the side streets provides for operations at LOS C or better, even with 2035 volumes.

West of Zimmerman Trail, a two lane section similar to the existing facility would be adequate for 2035 volume projections. There will be new accesses and turning traffic added with future development on both sides of the highway, but volumes are low enough that it should operate at an acceptable level without much modification. Future left-turn lanes should be evaluated at higher-volume accesses, similar to the existing left-turn lane at Apache Trail, but median control is not needed from a traffic operations standpoint. Many of the private approaches along this stretch have already been constructed by MDT based on the limited access resolution. These and other future approach locations will need to be further evaluated during the design process and as the area develops.

An acceleration lane was also considered relative to MDT guidelines for traffic turning right onto Highway 3 from Apache Trail. An acceleration lane is not recommended at this time because a considerable amount of reserve capacity would be available for design year traffic volumes, there is not a significant history of crashes associated with the right-turn movement, and intersection sight distance is adequate.

Intersections

There are two intersections along the corridor that will require a higher level of traffic control in the future: Zimmerman Trail and Rod & Gun Club Road. Traffic signals and roundabouts were both evaluated as mitigation alternatives for these intersections. It was determined that roundabouts would provide for better overall operations and efficiency at both locations.

For the purposes of this analysis, it was assumed that the Inner Beltloop would intersect Highway 3 at the Zimmerman Trail intersection. With the volumes that are projected for that connection, the signalized alternative would require auxiliary right and left turn lanes on all approaches and possibly an extra thru lane for both northbound and southbound traffic. In comparison, the traffic volumes could easily be accommodated via a single lane roundabout with an extra slip lane for northbound right-turning traffic.

The Rod & Gun Club Road intersection would operate well with either a traffic signal and existing lane configurations or a single-lane roundabout. Because a roundabout is the preferred alternative at Zimmerman Trail, it is recommended that a roundabout be installed at Rod & Gun Club Road as well to maintain consistency along the corridor.

Overall, it is expected that roundabouts will provide greater safety benefits due to lower speeds and lower severity of crashes (as is typical at roundabout intersections). There will still be crashes, but the severity of those crashes should be considerably lower and fatal collisions at roundabouts are extremely rare.

MDT recently announced that they have nominated an intersection improvement project with safety funds based on the crash history at the Zimmerman Trail/Highway 3 intersection. These improvements will not be part of the Zimmerman Trail design project because of the funding source associated with the road project, but this project will be constructed at the same time as the Zimmerman Trail project. This study and other previous studies have recommended a roundabout in this location, but MDT will reevaluate both options before proceeding with design. Those improvements are anticipated to be programmed for construction in 2017, so they will likely be the first project constructed for the corridor and will set the stage for all future improvements.

The roundabout design in both locations will require specific accommodations for bicyclists and pedestrians in coordination with the design of the multi-use trail and bike lanes.

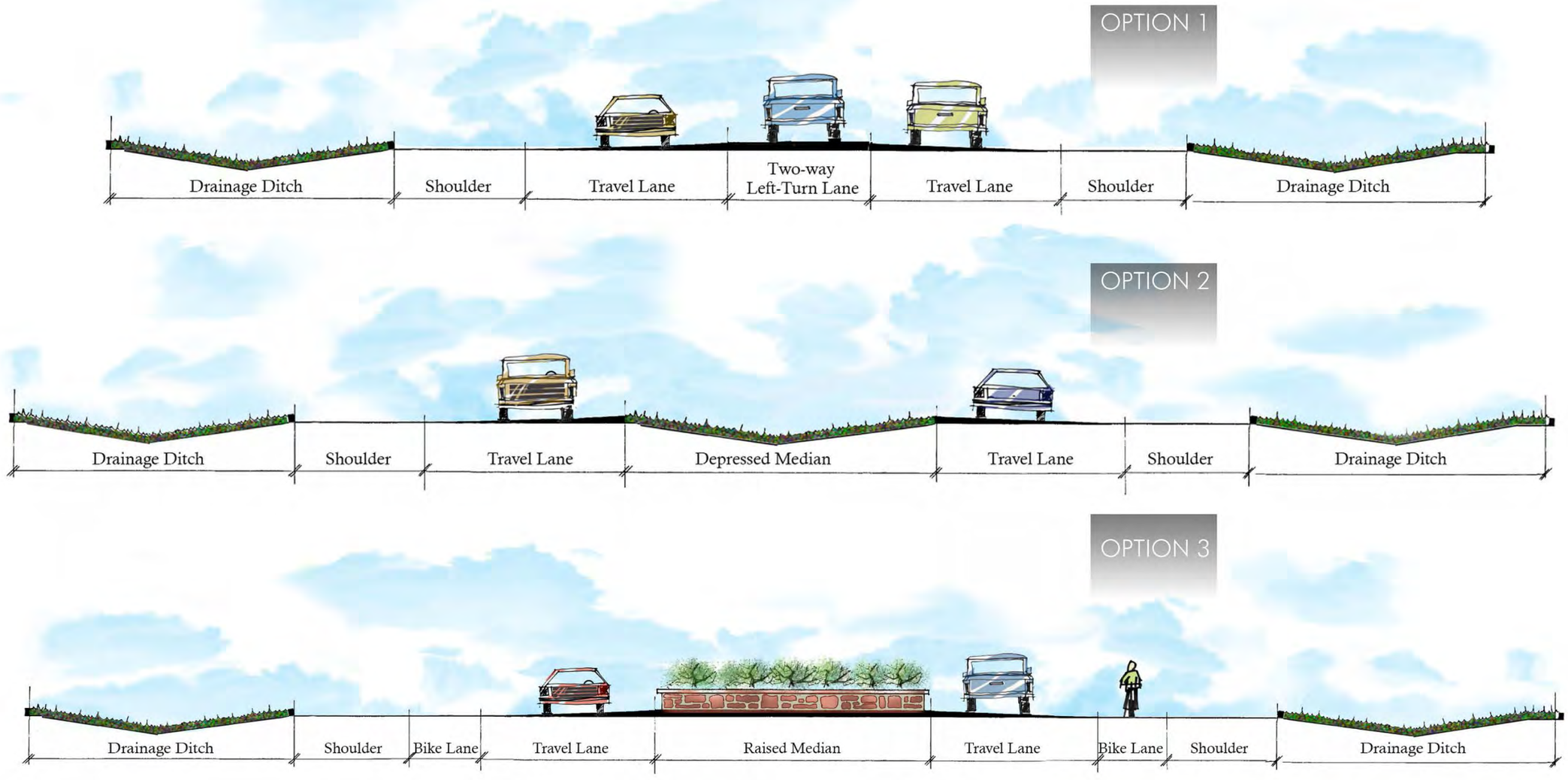

FIGURE 9 - PROPOSED SECTIONS

Parking

Another important aspect of this project addresses the existing gravel parking area along Highway 3 and adjacent to the Rims across from the airport. Based on the inventory and observations of this parking area and other parking areas at Swords Park and Zimmerman Park, it is recommended that three paved parking lots be constructed within this area: one at either end of the gravel area and one in the middle. Each parking lot should be large enough to accommodate approximately 25 vehicles. Areas between the new paved parking lots should be restored with native vegetation and drainage swales as illustrated in Figures 11 and 12.

In addition to the parking areas for passenger vehicles, it is recommended that two of the three lots be designed to accommodate pull-thru parking for oversized vehicles. Parking for oversized vehicles, including trucks, RV's and trailers, can be isolated using this type of parking configuration.

At the center parking lot, a more enhanced trailhead is recommended, including restrooms, a picnic shelter and other trailhead amenities, similar to what exists at Swords Park. This parking lot would be near the pump station building where the existing access road can be used to install a paved trail that would drop down below the Rim face and provide easy access to the existing natural trails. The ease of tying into the existing natural trail system is the primary reason why this is an ideal location for an enhanced trailhead.

Figures 10-12 illustrate the potential parking lot locations, how they would function in relation to the proposed trail location, and perhaps, most importantly, how these gravel areas can be restored with native landscaping to mimic the appearance of the existing Swords Park area.

Trails & Open Space

Through conversations and site visits with members of the Project Oversight Committee and the consultant team, a proposed multi-use trail alignment was developed with the goal of enhancing access to existing trails and highlighting the views from the top of the Rims. There is a strong desire to preserve the natural trails that exist along the Rims, so the proposed paved trail is not intended to replace them but rather to compliment them. As shown in Figure 8, the proposed trail would parallel Highway 3 and run along the south side of the highway through what is currently the expansive gravel parking area.

Through the stretch of residential development between the highway and the Rims, the proposed trail would remain within the highway right-of-way. The trail design at several proposed coulee crossings presents a challenge, but a safe and practical design is feasible. The trail will have to drop below the highway grade hugging the slope behind the guardrail and will require some support from retaining walls. These areas also present several good opportunities for grade separated crossings (pedestrian underpasses) since the trail will naturally be required to drop below the grade of the roadway. A cross-section of one of these underpass locations is illustrated in Figure 13.

Stormwater

Stormwater within the project vicinity generally flows to the north on the west end of the corridor and to the south (toward the Rims) on the east end of the corridor. Stormwater flowing over the Rims has presented a major problem in the past for the residential properties located below. In order to mitigate this problem, stormwater detention will be required. A concept for potential detention pond locations is illustrated in Figure 8. This figure is conceptual in nature only and a full hydraulic study will be required upon development to determine actual pond location, size and feasibility.

Standing water is a major concern for the airport because of its potential to attract waterfowl, so the detention ponds should only be installed if they can be designed to drain within 24-36 hours. Because of the soil conditions in this area, it may be necessary to incorporate some type of outfall with the detention pond design. The outfall would need to be designed so the stormwater does not consolidate to a point where the flow increases over the Rims in any particular location.

The goal is to slow the water down by way of the detention ponds and release it at a rate less than the pre-developed rate, but the City of Billings has expressed concerns about sending more water over the Rims. The ultimate design of these facilities will require a significant amount of input from the Airport and the City of Billings Engineering Division in order to balance these competing design challenges. The allowable release rate, the size of the ponds, and other elements will have to be determined through the design process. In order to fully address the issues with runoff over the Rims, some additional work will be required below the Rims as well.

A significant number of comments received at the first public meeting for this study were directed more toward the stormwater issues on Zimmerman Trail than Highway 3. Improvements to Zimmerman Trail are somewhat outside of the scope of this study, but they were considered nonetheless. Detention ponds located closer to the Rims within the Zimmerman Park area and on the south side of Zimmerman Trail would be needed to mitigate the issues associated with runoff. These locations are shown on the proposed improvements graphic in Figure 8, but they will need to be further evaluated as part of a separate project.

Key Pad Polling Results

During the second public meeting, a key pad polling system was utilized to gather public opinions regarding various proposed design alternatives. Approximately 30 people participated in the key pad polling, including representatives from the City, County and MDT that were in attendance at the public meeting. Following the public meeting, several public comments were received through the project website, primarily indicating the desire to include bike lanes along Highway 3 for the entire study length.

Table 6 on the following page provides a summary of the top-rated response(s) for each question presented. A complete compilation of the key pad polling results is provided in Appendix C. Many of the top-rated features are illustrated in the perspective views provided in Figures 10-13.

A complete summary of recommended projects for the Highway 3 corridor is provided in Table 7 on page 30. Although the projects are numbered, they are not listed in any particular order.

TABLE 6. KEY PAD POLLING SUMMARY

Question Summary [1]	Top-Rated Response [2]	
	Percent of Total Votes	Description
1. Roadway alternatives?	50%	2-lane with a center turn lane
	50%	2-lane with a center median
2. Median/access control alternatives?	41%	Raised median - with landscaping
3. Entry feature (Y/N and location)?	45%	Yes, located a Zimmerman Park
4. Bike lanes (Y/N and location)?	44%	Yes, along the entire corridor
5. New trail alternatives: East (Airport to Sky Ranch Drive)?	62%	Add a paved multi-use trail parallel to the roadway
6. Current trail alternatives: Central (Sky Ranch Drive to Zimmerman Park)?	42%	No change to the existing trail
7. New trail alternatives: Central (Sky Ranch Drive to Zimmerman Park)?	58%	Add a paved multi-use trail parallel to the roadway
8. New trail alternatives: West (Zimmerman Park to Apache Trail)?	58%	Add a paved multi-use trail parallel to the highway
9. New trail alternatives: North Side (location along north side of Highway 3)?	43%	Entire corridor
10. Grade-separated trail crossing locations? [3]	31%	Trail Crossing #3
11. Parking/trailhead locations? [4]	29%	Parking Area #1
12. Parking/trailhead vehicle accommodation?	52%	Provide parking for recreational vehicles and trailers only (no truck parking)
13. Parking/trailhead overnight parking allowed?	76%	No
14. Landscape character of corridor?	46%	A native restoration aesthetic that closely mimics the surrounding environment and uses only native plant materials
	46%	An enhanced native aesthetic that primarily uses native plant material and also incorporates ornamental elements at focused locations
15. Incorporate street trees (Y/N and location)?	39%	Yes, in specific areas only (parking areas, trailheads, etc.)
	39%	No
16. Incorporate pedestrian lighting (Y/N and location)?	61%	Yes, in specific areas only (parking areas, trailheads, etc.)
17. Addressing stormwater challenges?	52%	"Green infrastructure" solutions typically comprised of landscape and surface drainage facilities

[1] Complete question descriptions are shown in Appendix C.

[2] Remaining lower-rated responses and additional voting information are shown in Appendix C.

[3] See Figure 8 for potential grade-separated trail crossings locations.

[4] See Figure 8 for potential parking and trailhead locations.

HIGHWAY 3 CORRIDOR STUDY

PARKING AND TRAILHEAD AT OVERLOOK (OPTION 2)

EXISTING

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FIGURE 10-PERSPECTIVE VIEW OF PROPOSED CORRIDOR IMPROVEMENTS (1)

HIGHWAY 3 CORRIDOR STUDY

NATIVE REVEGETATION, PARKING AND TRAIL IMPROVEMENTS

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FIGURE 11-PERSPECTIVE VIEW OF PROPOSED CORRIDOR IMPROVEMENTS (2)

HIGHWAY 3 CORRIDOR STUDY

NATIVE REVEGETATION, PARKING AND TRAIL IMPROVEMENTS

EXISTING

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FIGURE 12-PERSPECTIVE VIEW OF PROPOSED CORRIDOR IMPROVEMENTS (3)

HIGHWAY 3 CORRIDOR STUDY

CORRIDOR IMPROVEMENTS AT GRADE-SEPARATED CROSSING

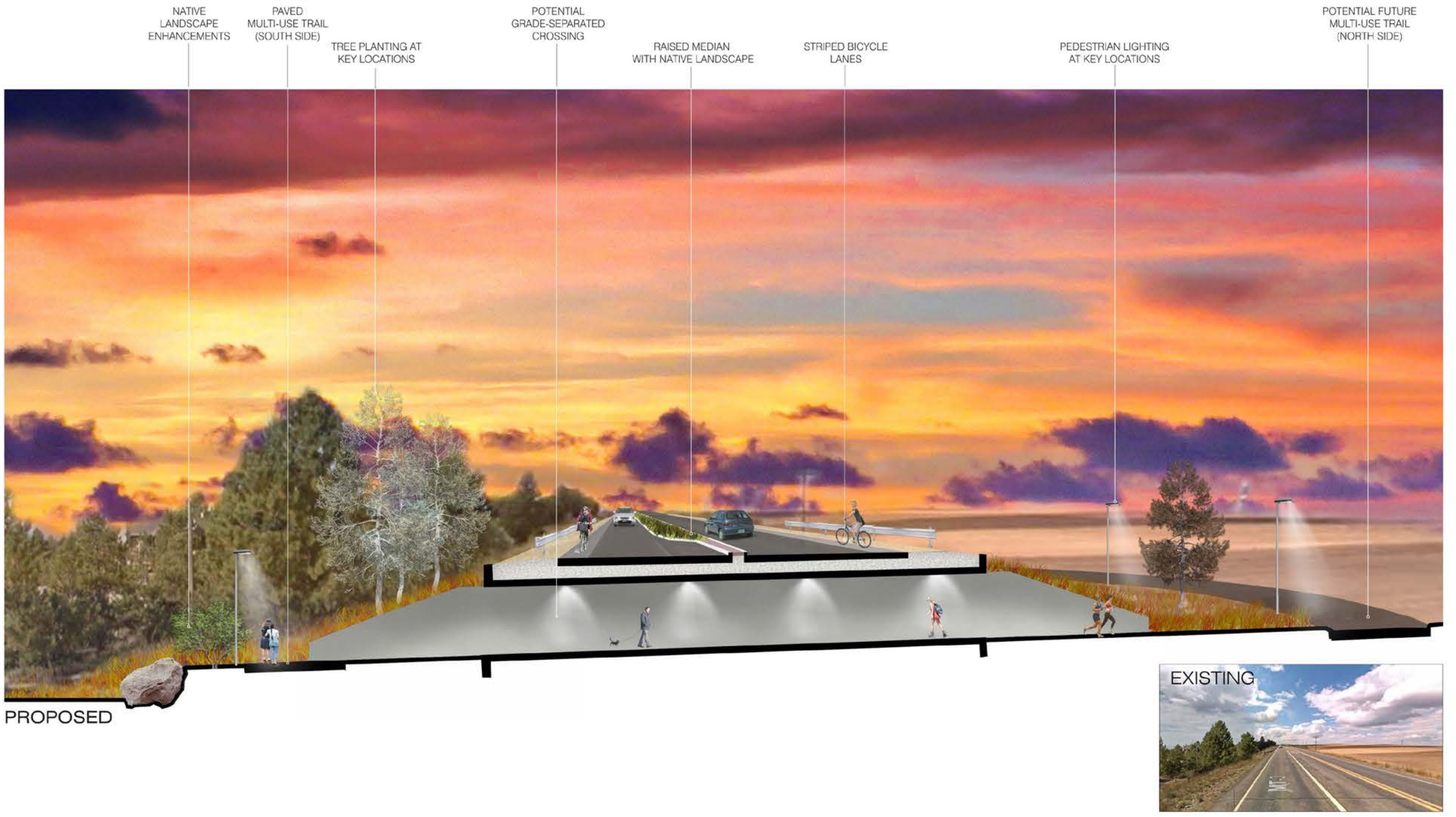

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FIGURE 13-PERSPECTIVE VIEW OF PROPOSED CORRIDOR IMPROVEMENTS (4)

TABLE 7. SUMMARY OF RECOMMENDED PROJECTS

Recommended Highway 3 Projects	Anticipated Cost
1. Install roundabout at Highway 3/Zimmerman Trail, including single circulating lane, northbound slip-lane for right-turning vehicles, bike and pedestrian accomodations.	$1.5 million
2. Install roundabout at Highway 3/Rod & Gun Club Road, including single circulating lane, single-lane approaches, and bike and pedestrian accomodations.	$1.5 million
3. Widen Highway 3 from N 27th Street to Zimmerman Trail (approximately 3 miles), including one thru lane each direction, bike lanes, center left-turn lanes and a median with native landscaping.	$4.5 million
4. Widen Highway 3 from Zimmerman Trail to Apache Trail (approximately 2 miles), including one thru lane each direction, bike lanes, and center turn lanes where needed for future development.	$2.6 million
5. Construct paved multi-use trail along south side of Highway 3 from N 27th Street to Apache Trail.	$2.25 million
6. Install bike/pedestrian underpasses as needed for multi-use trail connection across Zimmerman Trail, and north/south connections across Highway 3 for future development.	$500,000 each
7. Construct paved parking lot in central location across from the airport, including 25 parking spaces and pull-thru parking for oversized vehicles. Consider other trailhead amenities (restrooms, picnic shelter, etc.) in this location.	$350,000
8. Construct paved parking lot in east location (closest to N 27th Street), including 25 parking spaces and pull-thru parking for oversized vehicles.	$300,000
9. Construct paved parking lot in west location, including 25 parking spaces.	$250,000
10. Restore existing gravel area between new paved parking lots with native landscaping and natural drainage features.	$800,000
11. Install entryway feature along south side of Highway 3 near Zimmerman Park.	$50,000
12. Consider installation of proposed detention ponds along corridor, including a full hydraulic analysis to determine appropriate pond location, size and feasibility. The anticipated cost includes nine ponds designed to store the 100-year storm, outfall structures, and land acquisition.	$2.5 million
13. Consider future paved multi-use trail on the north side of the highway as area development occurs.	$2.0 million

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