BAKER CORRIDOR
PLANNING STUDY

DRAFT
Existing and Projected Conditions Report

Baker Corridor Planning Study

March 2015

Prepared for:

Montana Department of Transportation

MONTANA MDT DEPARTMENT OF TRANSPORTATION

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Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
ACS	American Community Survey
ADT	Average Daily Traffic
BNSF	Burlington Northern Santa Fe
CAPS	Crucial Areas Planning System
CFR	Code of Federal Regulations
DEQ	Montana Department of Environmental Quality
DOC	Montana Department of Commerce
DOLI	Montana Department of Labor and Industry
EO	Executive Order
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FWP	Montana Department of Fish, Wildlife, and Parks
GIS	Geographic Information System
HUC	Hydrologic Unit Code
HV	Heavy Vehicle
LOS	Level of Service
LUST	Leaking Underground Storage Tank
LWCFA	Land and Water Conservation Fund Act
MAP-21	Moving Ahead for Progress in the 21st Century Act
MBTA	Migratory Bird Treaty Act
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFISH	Montana Fisheries Information System
MNHP	Montana Natural Heritage Program
MPDES	Montana Pollutant Discharge Elimination System
MSATs	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NBI	National Bridge Inventory
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System
NWI	National Wetlands Inventory
PESC	Permanent Erosion and Sediment Control
PM	Particulate Matter
PvMS	Pavement Management System
RP	Reference Post
SOC	Species of Concern
SSD	Stopping Sight Distance
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Load

USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank

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1. Introduction

The Montana Department of Transportation (MDT), in partnership with the Federal Highway Administration (FHWA), and in coordination with Fallon County and the City of Baker, is developing a corridor planning study that includes the City of Baker and surrounding vicinity. The *Baker Corridor Planning Study* is considered a pre-National Environmental Policy Act (NEPA)/Montana Environmental Policy Act (MEPA) process that will develop needs and objectives, identify and analyze improvement options, eliminate non-feasible options, and identify potential environmental impacts and constraints through public, resource agency, and stakeholder input.

The purpose of this report is to examine the existing and projected transportation conditions as well as the social, economic, and environmental setting within the corridor Study Area.

1.1 Study Area and Background

The City of Baker is located in Fallon County, in eastern Montana at the junction of U.S. Highway 12 (US 12) and Montana Highway 7 (MT 7). US 12 and MT 7 is Baker's main intersection, which is used by passenger vehicles both traveling through town and for local access, as well as truck traffic traveling to and from oil and gas development areas in the region.

US 12 and MT 7 within the Study Area are both functionally classified as Rural Minor Arterial routes on the Primary Highway System and Highway 493 (S-493) is classified as a Major Collector route on the Secondary Highway System. The Study Area includes a 9.1-mile segment of US 12 approximately between Reference Marker (RM) 79 and RM 88.1, a 5.7-mile segment of MT 7 approximately between RM 31.9 and RM 37.6, and a 2.1 mile segment of S-493 between RM 0 and RM 2.1. The Study Area includes the City of Baker and the Baker Municipal Airport. The BNSF Railway traverses the Study Area in a northwest-southeast direction. Within the Baker city limits the railroad is located immediately north of US 12. Land use in the Study Area is a diverse mix which includes residential, agricultural, oil and gas development, and recreational areas, among others. Figure 1 provides an overview of the Study Area.

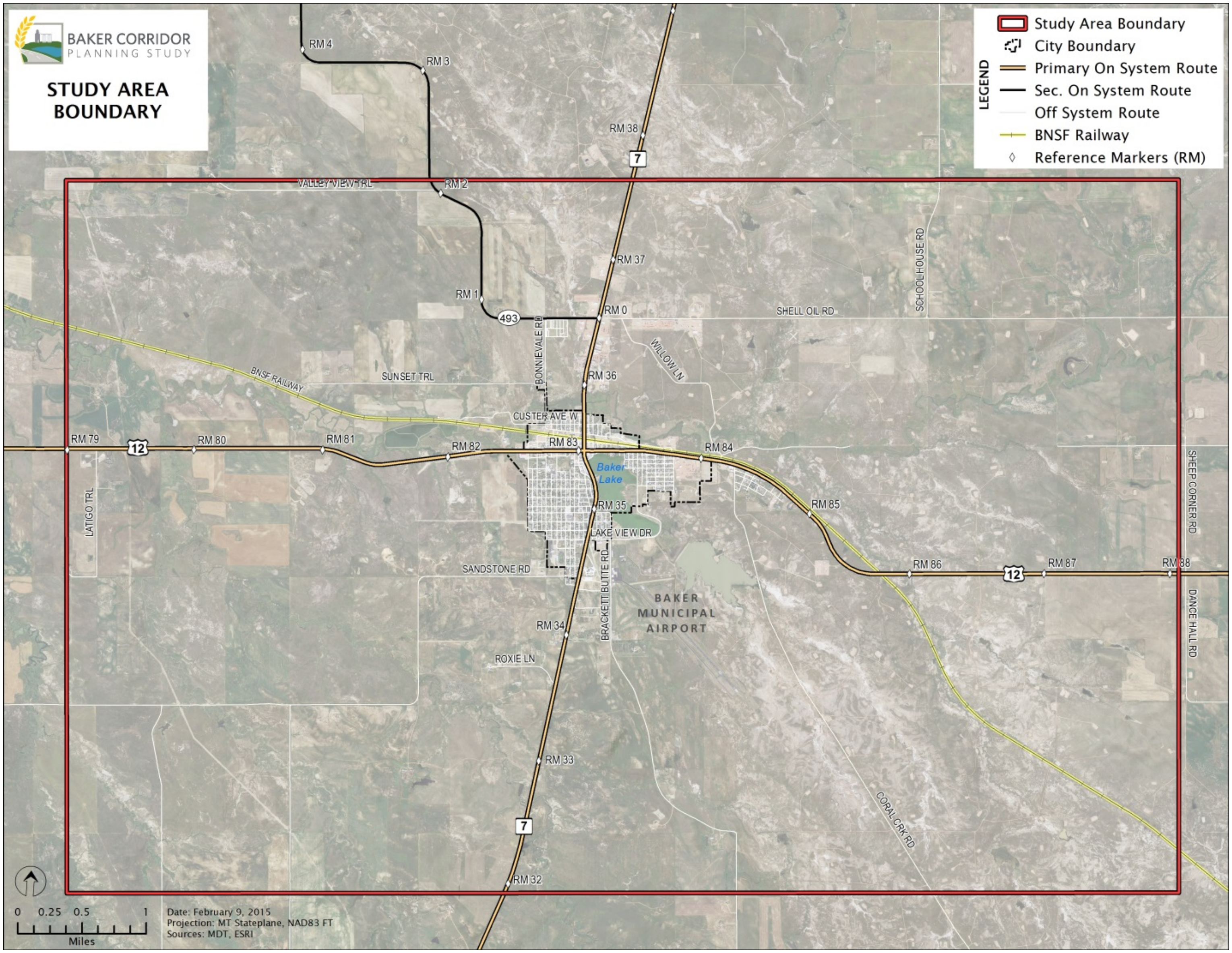

Figure 1: *Baker Corridor Planning Study* Area

2. Existing Socio-Economic Conditions

The following section provides an overview of the existing and projected socio-economic conditions for the Study Area. The information presented includes recent socio-economic data available at the county level, growth trends in population, labor force, occupation, and unemployment trends compared with historical and projected data. This information provides an overview of the short- and long-term economic conditions of the Study Area.

The Study Area is southwest of the Bakken oil field, which is experiencing a boom in oil production and related development. Effects from the Bakken region, as well as an increasing amount of local oil and gas development, have resulted in population increases and associated growth in Fallon County and the City of Baker. The majority of socio-economic data relate to this recent growth spurt within Eastern Montana. Similar to the regional and state-wide effects, population growth in and around Baker is contingent on oil and gas development and other supporting activities that may occur in the future.

2.1 Regional Population and Demographics

After the decline following the 1970s oil boom, Fallon County experienced negative population growth for several decades. Fallon County is now experiencing growth, in part due to recent technological advancements that allow for oil and natural gas that was once inaccessible to be extracted. As a result, the region has experienced economic growth and activity, which has generated a current increasing trend in the county's population. Table 1 below summarizes the population and demographic information for Fallon County.

Table 1: 2013 Census Estimates for Fallon County

Fallon County, Montana		Estimate	Percent
Total Population	Fallon County	3,085	100
	Baker	1,812	58.7
	Plevna	111	3.6
Race	White	3,074	97.8
	African American	4	0.1
	American Indian	66	2.1
	Asian	6	0.2
Ethnicity	Hispanic or Latino	15	0.5
Total Housing Units		1,472	100
	Occupied Housing Units	1,199	81.5
	Owner Occupied	863	
	Renter Occupied	336	
	Vacant	273	18.5

Source: American Community Survey (ACS) 2009-2013 5-Year Estimates

The 2013 population of Fallon County was 3,085, with nearly 60 percent of the county's population residing in the City of Baker. County residents are predominantly self-identified as Caucasian, consisting of almost 98 percent of the population. The American Indian population is slightly greater than 2 percent, compared with about 8 percent for the state as a whole. The Hispanic population is 0.5 percent, which is less than the state proportion.

The Montana Department of Commerce utilizes economic modeling software known as REMI, or Regional Economic Models, Inc., to produce county-level population projections. Figure 2 shows the observed population for Fallon County from 2000 to 2010 and population projections until the year 2030, produced with REMI. The general trend has been confirmed by the Montana Census and Economic Information Center.

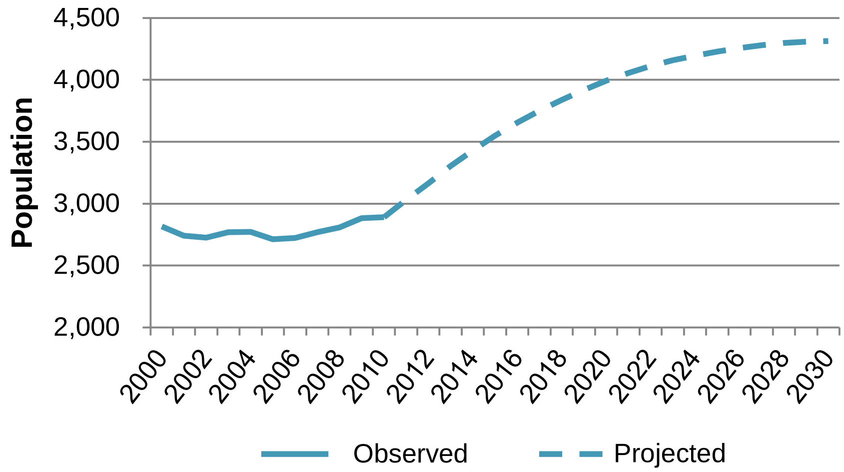

Figure 2: Fallon County Total Observed and Projected Population

For much of the first half of the last decade, the population of Fallon County remained constant; it has seen positive population growth since 2006. Fallon County's population is projected to increase by approximately 1,500 people by the year 2030, population growth rates greater than 3 percent could be expected until 2016. The population would then continue to increase at a slower rate through 2030. This type of growth trend is consistent with many counties in eastern Montana.

Figure 3 compares the actual populations observed through 2010 and projected to the year 2030 for both Fallon County and the State of Montana as a percentage of their respective populations in the year 2000. After 2010, the figure shows that Fallon County will have significant population growth, ultimately reaching around 150 percent of the 2000 population by 2030. Montana will see population growth after 2010 at a more moderate rate than that of Fallon County.

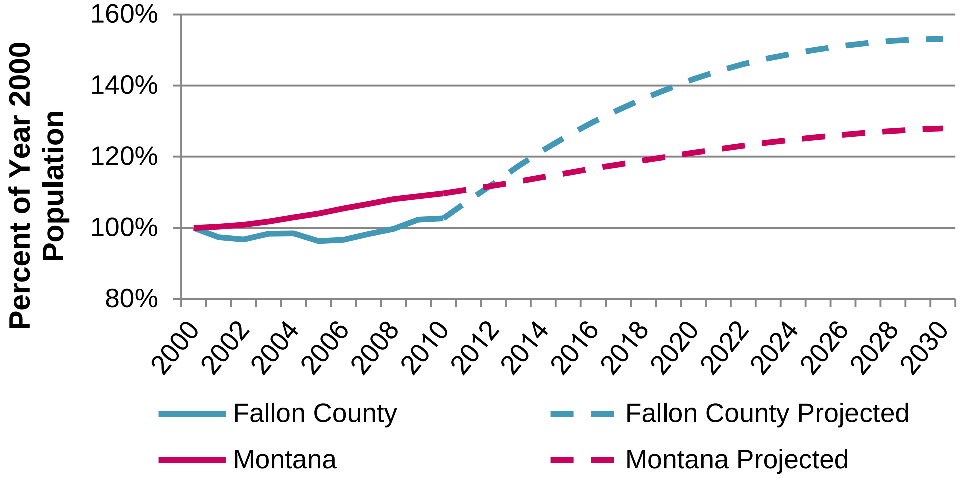

Figure 3: Montana and Fallon County Total Observed and Projected Population (Percent of 2000 population)

Figure 4 depicts the age distribution for Fallon County. The working-age population (ages 20 to 64) is expected to increase by about 500, reaching a high of about 60 percent of the population in 2013 and slowly declining to 50 percent by 2030. The decrease in the proportion of working-age members is because that segment will experience a slower growth rate than the rest of the population.

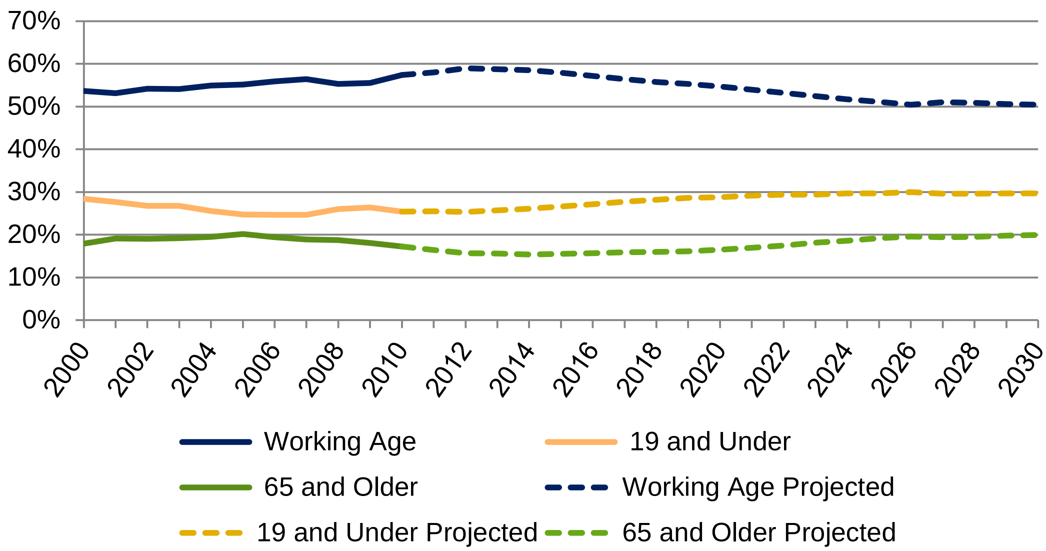

Figure 4: Fallon County Age Distribution (Projected after 2010)

The 19-and-under age group is expected to increase at a moderate rate from current levels to approximately 30 percent of the population by 2030. The population category of 65 and older is also expected to experience a slight increase in proportion of the population, to approximately 20 percent.

2.2 Baker Population and Demographics

Baker is the larger of two communities within Fallon County. According to 2013 American Community Survey (ACS), Baker has a population of 1,812. The 2000 and 2010 US Census found the population of Baker to be 1,695 and 1,741, respectively, implying that the city experienced a population increase of approximately 3 percent over that decade. Fallon County had an approximate 2 percent increase in population over that same time period, with a population of 2,837 in 2000 and 2,890 in 2010. Table 2 summarizes population and age distributions for Baker, Fallon County, and Montana.

Table 2: Age and Gender Data for Baker and Fallon County

Distribution	Baker		Fallon County		Montana	
	Number	%	Number	%	Number	%
Total Population	1,812	-	3,085	-	998,554	-
Male	898	49.6	1,570	50.9	501,549	50.2
Female	914	50.4	1,515	49.1	497,005	49.8
Under 18	401	22.1	791	25.6	222,295	22.3
18-64	1,135	62.6	1,802	58.4	623,298	62.4
65 and Over	276	15.2	492	16.0	152,961	15.3

Source: American Community Survey (ACS) 2009-2013 5-Year Estimates

The population of Baker is roughly 22 percent school-age children (under the age of 18) and approximately 62 percent working age (ages 18 to 64). This is consistent with the proportions seen within the State of Montana. The proportion of Baker's working age population is approximately 4 percent higher than the county-level proportion.

2.3 Regional Economy and Employment

Using data gathered through the ACS from 2008 to 2012, the US Census Bureau produced a 5-year estimate for employment by industry for Fallon County. The industry sector of agriculture, forestry, fishing, and hunting is the top field of employment, followed by educational services, and healthcare and social assistance. Table 3 summarizes Fallon County employment by industry.

Table 3: Fallon County Employment by Industry (2008-2012)

Industry	Estimate
Agriculture, forestry, fishing, and hunting	25.7%
Construction	8.5%
Manufacturing	2.9%
Wholesale Trade	3.1%
Retail Trade	7.4%
Transportation and warehousing, and utilities	6.1%
Information	2.7%
Finance and insurance, and real estate and rental and leasing	4.7%
Professional, scientific, and management, and administrative and water management services	5.5%
Educational services, and health care and social assistance	19.7%
Arts, entertainment, and recreation, and accommodation and food services	6.1%
Other services, except public administration	3.4%
Public Administration	4.1%

Source: American Community Survey (ACS) 2008-2012 5-Year Estimates

Regional Economy and Employment

Unemployment in Fallon County experienced fluctuations similar to those of the statewide rate for the last decade, but has continuously been below the state and national rate. When the recession began in 2007, the region continued to maintain low unemployment levels and did not face the rapid increases in unemployment that were observed at the state and national levels. The sustained levels of low unemployment can likely be attributed to the economic boom in the Bakken region. Figure 5 illustrates and compares the unemployment trends since 2000.

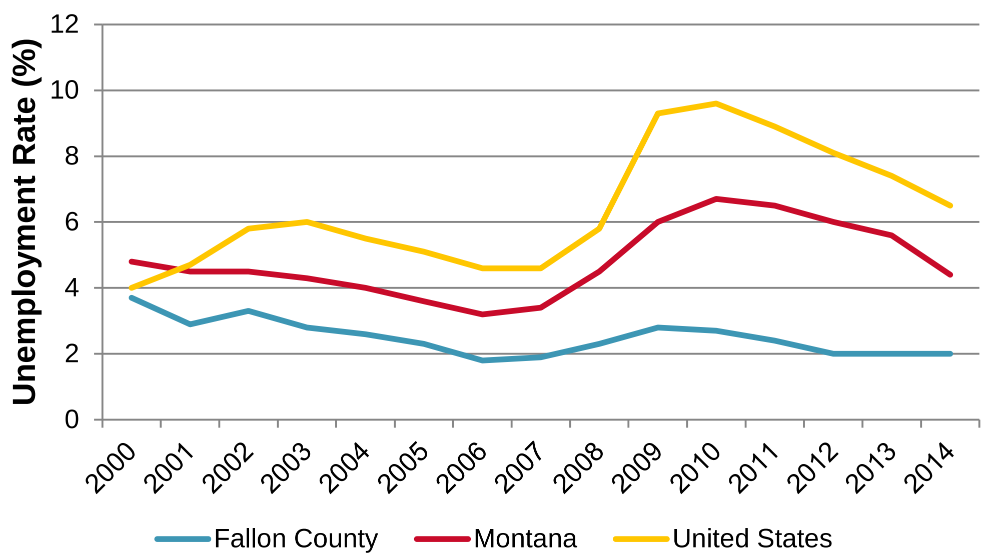

Figure 5: Unemployment Rate Comparison

Table 4 shows the most recent unemployment figures from the state and federal labor departments. With an unemployment rate of 1.4 percent, Fallon County has the lowest level of unemployment in the state. The unemployment rate in Fallon County is a third of the statewide rate and approximately a quarter of the national rate.

Table 4: November 2014 Unemployment Data (not seasonally adjusted)

Geography	Labor Force	Employed	Unemployed	Rate
Fallon County	2,123	2,094	29	1.4%
Montana	516,759	495,171	21,588	4.2%
United States	156,297,0000	147,666,000	8,630,000	5.5%

Source: MT Dept. of Labor and Industry Research and Analysis Bureau, 2015

The income distribution for Fallon County is noticeably different than for the state and nation. Figure 6 shows the percentage of the population in Fallon County, State of Montana, and the United States in income categories from the 2010 Census. Fallon County tends to have a smaller percentage of the population in the lower and higher income categories than the state of Montana and the United States, with the majority of the population falling in the middle of the distribution. Overall, Fallon County and Baker outperform the rest of Montana in terms of household income.

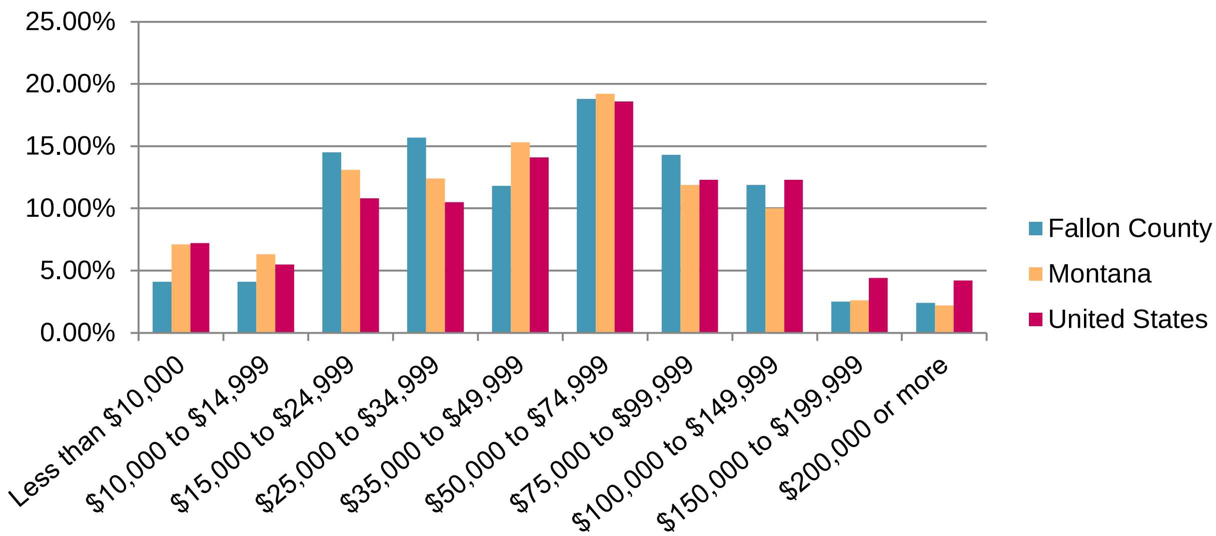

Figure 6: Income Distribution by Household

Figure 7 shows an estimation of the economic base of Fallon County in 2012 from the University of Montana Bureau of Business and Economic Research. The economic base of an economy refers to activities that bring income into an area or the economy that remains in the area. Although the figure considers only Fallon County, it is the best window available into the basic economy of the smaller Study Area.

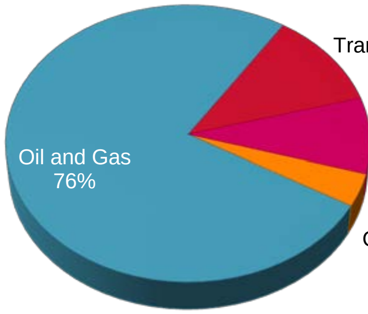

Figure 7: Economic Base of Fallon County, Montana (2012)

By far, the most influential share of the Fallon County economy is the energy industry (76 percent). The next largest portion of the economy is transportation (11 percent), which is likely influenced by the oil and gas industry, as well as agricultural products which are processed and shipped near and through the area. The remaining 13 percent of the economic base is comprised of agriculture and all other industries. Although Fallon County's economic base is composed largely of oil and gas, this industry may derive economic benefit from a share of the current activity of oil extraction in the Bakken region north and east of the Study Area.

3. Existing Roadway Conditions

The functional classification concept groups highways by the character of service they provide. Functional classification recognizes that the public highway network in Montana serves two basic functions: travel mobility and access to property. Arterial highways are characterized by capacity to quickly move relatively large volumes of traffic. They are intended to carry freight and people through an area. Within the Study Area, US 12 and MT 7 are both functionally classified as Rural Minor Arterial routes on the Primary Highway System. Because they contain the highest volumes of traffic and represent the major east-west and north-south transportation system, US 12 and MT 7 are the primary focus for existing roadway conditions.

US 12 provides Baker an east-west linkage to Interstate 94, approximately 80 miles to the west at the City of Miles City, and to North Dakota, approximately 13 miles to the east. MT 7 links Baker to Interstate 94 approximately 45 miles to the north at the Town of Wibaux. Within the Baker city limits, US 12 is Montana Avenue; MT 7 is Lake Street south of US 12 and is Main Street north of the US 12 intersection. Secondary Highway 493 (S-493), also known as Pennel Road, is classified as a Major Collector route on the Secondary Highway System. S-493 intersects MT 7 approximately 1 mile north of downtown Baker. S-493 is a two-lane road that is paved for the first mile, after which it is a gravel-surface roadway. Where available, data for S-493 are included in the existing roadway conditions analysis.

3.1 Traffic Data

The following section summarizes existing traffic conditions and provides a projection of future vehicular volumes and operations based on historical traffic growth rates for the Study Area. Both Average Daily Traffic (ADT) and turning movement count data were obtained within the Study Area to determine existing conditions and project future conditions. In addition, historic Annual Average Daily Traffic (AADT) was obtained within the Study Area.

Existing Traffic Volumes

Existing AADT at locations within and adjacent the Study Area are shown in Table 5. AADT on US 12 and MT 7 are highest at reference markers closest to the City of Baker, but there is additional volume using these corridors to access points outside the Study Area.

Table 5: Annual Average Daily Traffic

Site ID	Route	Reference Marker	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
13-1-4*	US 12	76.13	750	750	980	990	930	1,210	1,220	790	990	1,230
13-1-15	US 12	82.09	1,210	1,210	1,150	1,250	1,180	1,490	1,500	1,100	1470	1,560
13-1-16	US 12	82.60	4,000	4,000	4,330	4,460	3,600	3,730	4,530	4,590	3,750	3,790
13-1-17	US 12	82.65	3,610	3,690	4,310	4,440	3,470	3,590	3,690	3,740	3,520	3,320
13-1-18	US 12	83.07	3,170	3,170	2,780	2,820	2,650	2,600	2,610	2,700	2,280	2,350
13-1-5*	US 12	88.12	880	880	810	1,120	1,050	880	870	880	990	810
13-2-2*	MT 7	29.34	660	660	810	870	820	390	390	710	750	1,030
13-1-19	MT 7	34.32	1,050	1460	1,030	1,130	1,060	1,120	1,120	980	1,350	1,310
13-1-20	MT 7	35.14	2,020	2,680	2,320	2,390	2,000	2,070	2,080	2,320	2,370	2,460
13-1-21	MT 7	35.45	3,930	4,600	3,910	4,020	3,070	3,180	3,190	3,200	3,720	3,730

Site ID	Route	Reference Marker	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
13-1-22	MT 7	35.52	4,080	4,080	3,660	3,770	3,540	3,660	3,730	3,780	3,490	3,580
13-1-23	MT 7	35.76	2,500	2,500	2,760	2,860	2,690	2,910	2,920	2,610	2,690	2,990
13-1-7	MT 7	36.95	1,140	1,140	1,380	1,320	1,240	1,120	1,120	930	1,090	1,320
13-1-12	S-493	1.26	220	330	290	400	380	370	310	310	260	270

Source: MDT 2014
* Site located outside the Study Area Boundary.

Four locations were selected to collect ADT data within the Study Area on October 22, 2014. This data included vehicle classifications to determine a heavy vehicle (HV)[1] percent. Since this was a single day of data, an adjustment factor was applied to the single day count to determine an appropriate AADT. This factor was determined using monthly data at a continuous data recorder within the Study Area, on US 12 at RM 88.5. The continuous data recorder showed that October typically has higher ADT than other months of the year. Table 6 shows the ADT data as well as the adjusted AADT and HV percentage.

Table 6: Average Daily Traffic – October 22, 2014

Corridor	Reference Marker	ADT	AADT	HV
US 12	80	1,467	1,280	14%
US 12	87	1,296	1,130	20%
MT 7	31	834	730	21%
MT 7	37	1,439	1,260	29%

Source: MDT 2014

In addition to the historic AADT within the area, data were collected to supplement this analysis on October 22, 2014 and December 30, 2014. Turning movement counts were collected for a 12-hour period (7 AM through 7 PM) to ensure the peak period was included for the analysis. These counts included a breakdown by vehicle class that was used to determine an HV percentage for each movement. Figure 8 shows the peak period total and HV volumes for each of the six Study Area intersections. The peak period is the 1-hour period throughout the 12-hour study period that has the highest total intersection volume. Note that these can differ from intersection to intersection. Data reported in Figure 8 and used in further analysis and discussions represents the worst-case 1-hour period for each intersection analyzed. In addition to the turning movement volumes, Figure 8 also shows the existing traffic control, such as which legs of an intersection are stopped-controlled.

The Study Area has a high heavy vehicle percentage, as shown in the data from Table 6. As shown in Figure 8, the turning movement data indicates there are higher HV movements between the north and east legs of the intersection of US 12 with MT 7. Larger volumes of HVs

[1] MDT uses standard FHWA vehicle classifications when defining heavy vehicles. Throughout this document, heavy vehicles (HV) are any vehicles within classes 5 through 13 of FHWA's 13 Vehicle Classification system. This includes all vehicles that are two-axle, six-tire, single unit trucks up through seven or more axle, multi-trailer trucks.

make turns from southbound MT 7 to eastbound US 12 and westbound US 12 to northbound MT 7 throughout the day in addition to the peak period.

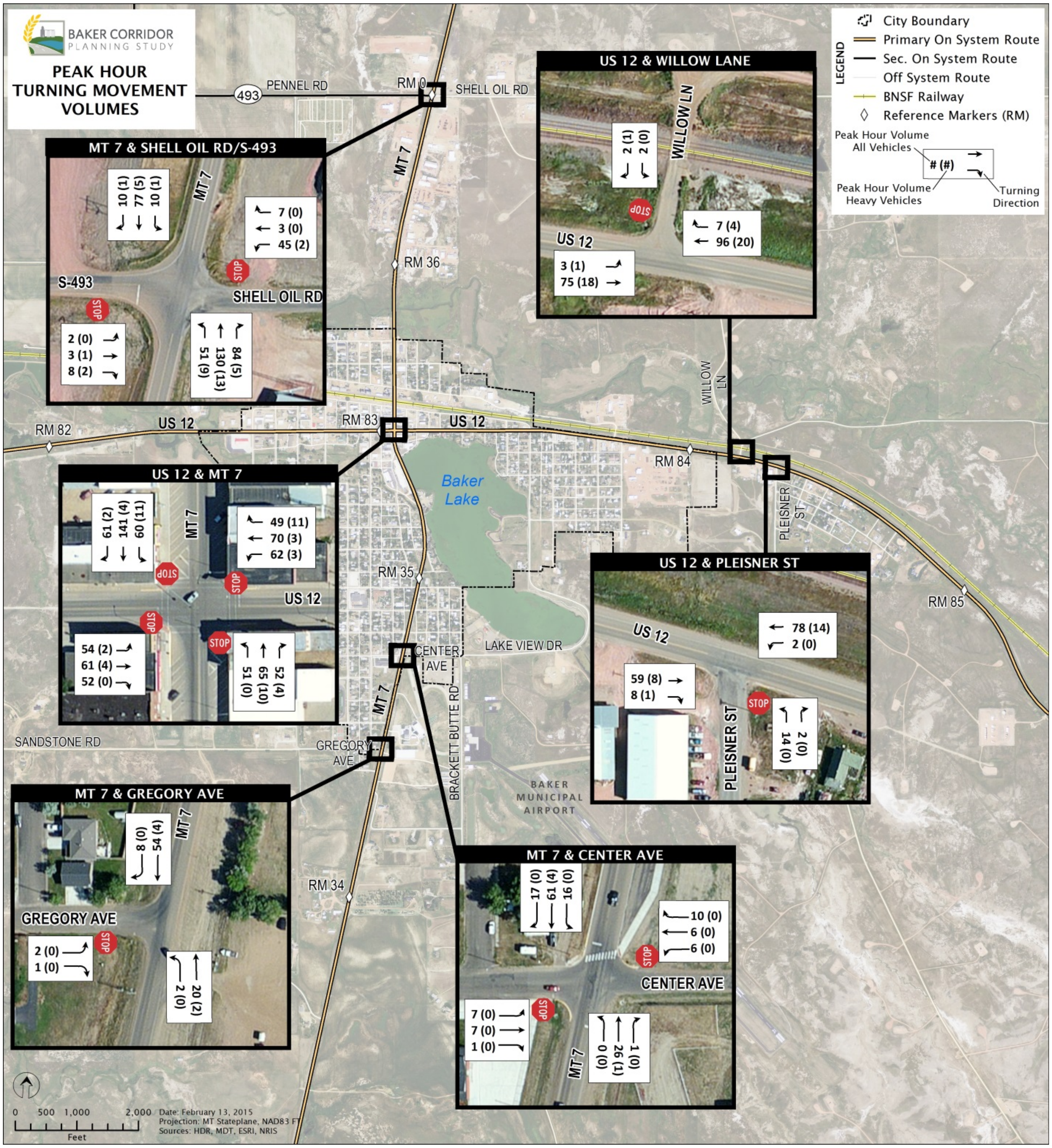

Figure 8: Peak Hour Turning Movement Counts

Peak-period turning movement counts were used to determine the existing Level of Service (LOS) within the Study Area. LOS refers to the degree of congestion on a roadway or at an intersection, measured in average delay, and based on the methodologies provided in the 2010 *Highway Capacity Manual*. LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), and LOS F represents forced-flow conditions (motorists experience very long delays and traffic volumes exceed roadway capacity). LOS B to E represents decreasing operational conditions. A traffic analysis program, known as Synchro (Version 8.0), was used to determine intersection delay and LOS for existing conditions. Table 7 shows existing conditions LOS at the six Study Area intersections. Per the MDT Traffic Engineering Manual, a non-NHS Primary highway facility has a minimum design criteria level of service C and a desirable level of service B for urban minor arterials. A detailed report of this analysis can be seen in Appendix A.

Table 7: Existing Conditions Level of Service during Peak Hour

Intersection	Peak Hour	Total Peak Hour Vehicles	Peak Hour HV Percentage (%)	LOS (Delay[1])
US 12 & MT 7	5:45 – 6:45 PM	778	7	B (14.4)
US 12 & Willow Lane	5:15 – 6:15 PM	185	24	A (9.6)
US 12 & Pleisner Street	2:45 – 3:45 PM	159	14	A (9.7)
MT 7 & Shell Oil Road/S-493	7:30 – 8:30 AM	428	9	C (15.2)
MT 7 & Center Ave	5:00 – 6:00 PM	158	3	A (9.7)
MT 7 & Gregory Ave	6:00 – 7:00 PM	87	7	A (8.8)

Note: The worst-performing leg LOS is shown for each intersection.
[1]Delay is shown in seconds.

Future Traffic Projections

There are a multitude of factors that affect an area's traffic growth over time and may include changes in economic conditions, population, land use, etc. Estimating future traffic growth based on the most recent historic traffic counts provides an indication of the recent economic activity occurring within the Study Area. An average annual growth rate (AAGR) was determined over a 5-year and 10-year period for each site using historic AADT counts from Table 5. Traffic volumes vary throughout the Study Area and each site produced a different growth rate, as well as a different growth rate at a 5-year period compared to a 10-year period. These calculated growth rates are shown in Table 8. In addition to the 5- and 10-year growth rates for all vehicles, Table 8 includes the growth rates for HVs at each site. When examining traffic volumes for all vehicle types, many of the sites had low or even negative growth rates over the two different periods, while some produced higher growth rates. Growth in HV volumes show a wider range, including negative to low growth over the two different periods to upwards of 17 to 23 percent. The 5-year growth rate (2009 to 2013) for HVs on MT 7 show consistently high growth rates throughout the Study Area.

Table 8: Historic AADT Growth Calculations by Site

Site ID	Corridor	Reference Marker	5-Year Growth %	5-Year Growth (HV) %	10-Year Growth %	10-Year Growth (HV) %
13-1-4*	US 12	76.13	5.8	3.9	5.7	1.1
13-1-15	US 12	82.09	5.7	3.9	2.9	1.1
13-1-16	US 12	82.60	1.0	3.9	-0.6	1.1
13-1-17	US 12	82.65	-0.9	0.5	-0.9	-0.1
13-1-18	US 12	83.07	-2.4	0.5	-3.3	-0.1

Site ID	Corridor	Reference Marker	5-Year Growth %	5-Year Growth (HV) %	10-Year Growth %	10-Year Growth (HV) %
13-1-5*	US 12	88.12	-5.1	0.5	-0.9	-0.1
13-2-2*	MT 7	29.34	4.7	19.9	5.1	10.6
13-1-19	MT 7	34.32	4.3	19.9	2.5	10.6
13-1-20	MT 7	35.14	4.2	7.6	2.2	4.2
13-1-21	MT 7	35.45	4.0	7.6	-0.6	4.2
13-1-22	MT 7	35.52	0.2	17.3	-1.4	9.3
13-1-23	MT 7	35.76	2.1	17.3	2.0	9.3
13-1-7	MT 7	36.95	1.3	17.3	1.6	9.3
13-1-12	S-493	1.26	-6.6	23.1	2.3	12.2

* Site located outside the Study Area Boundary.

Projected traffic conditions were analyzed for a 20-year growth period (for year 2034) based on known existing conditions and potential future development likely to occur within the Study Area and region. Future traffic volumes likely will vary based on the level of future economic development. Additionally, future truck volumes (HVs) may increase more dramatically over standard vehicles depending on the level of future development. As such, a range of growth rates were estimated to account for low-, medium-, and high-growth scenarios, and include:

- Low: 2% growth rate for all vehicles (passenger and heavy vehicles)
- Medium: 5% growth rate for all vehicles (passenger and heavy vehicles)
- High: 5% growth rate for standard vehicles, 10% growth rate for heavy vehicles

Future ADT volumes were estimated using the three growth rate scenarios and the results are shown in Table 9.

Table 9: Projected ADT Traffic Volumes (2034)

Site ID	Route	Reference Marker	Existing ADT[1]	2034		
				Low Growth (2%)	Medium Growth (5%)	High Growth (5% cars/trucks; 10% heavy vehicles
13-1-4*	US 12	76.13	1,230	1,900	3,400	4,000
13-1-15	US 12	82.09	1,560	2,400	4,300	4,900
13-1-16	US 12	82.60	3,790	5,700	10,600	11,100
13-1-17	US 12	82.65	3,320	5,000	9,200	10,000
13-1-18	US 12	83.07	2,350	3,600	6,500	7,300
13-1-5*	US 12	88.12	810	1,200	2,300	3,000
13-2-2*	MT 7	29.34	1,030	1,600	2,900	3,400
13-1-19	MT 7	34.32	1,310	2,000	3,600	4,200
13-1-20	MT 7	35.14	2,460	3,700	6,900	7,400
13-1-21	MT 7	35.45	3,730	5,700	10,400	11,000
13-1-22	MT 7	35.52	3,580	5,400	10,000	10,800
13-1-23	MT 7	35.76	2,990	4,500	8,300	9,100
13-1-7	MT 7	36.95	1,320	2,000	3,700	4,500
13-1-12	S-493	1.26	270	400	800	1,100

[1]*Source: MDT 2014*

Future turning movements were analyzed at the six Study Area intersections and LOS were calculated using the three growth scenarios described above for future year 2034. The future turning movement counts were analyzed for LOS using the existing intersection configurations. Table 10 shows the results of the intersection LOS analysis.

Table 10: Future Conditions (2034) Intersection Level of Service during Peak Hour

Intersection	LOS (Delay[1])			
	Existing Condition (2014)	Low Growth	Medium Growth	High Growth
US 12 & MT 7	B (14.4)	F (71.3)	F (>100)	F (>100)
US 12 & Willow Lane	A (9.6)	B (10.1)	B (11.9)	B (14.1)
US 12 & Pleisner Street	A (9.7)	B (10.4)	B (12.7)	B (14.4)
MT 7 & Shell Oil Road/S-493	C (15.2)	D (28.2)	F (>100)	F (>100)
MT 7 & Center Ave	A (9.7)	B (10.3)	B (12.4)	B (12.7)
MT 7 & Gregory Ave	A (8.8)	A (9.1)	A (9.6)	A (9.9)

Note: The worst-performing leg LOS is shown for each intersection.
[1]Delay is shown in seconds.

As shown in Table 10, the intersection of US 12 and MT 7, assuming existing geometric configurations, will operate at a failing level (LOS F) in the future under all growth scenarios. The MT 7 & Shell Oil Road/S-493 intersection is projected to operate at a failing level under the medium- and high-growth scenarios. More information on the LOS analysis can be found in Appendix A.

Railroad Crossing Queuing

There is an at-grade railroad crossing on MT 7 approximately 415 feet north of the intersection with US 12. The intersection of MT 7 and Railroad Avenue is immediately adjacent to the railroad crossing and decreases the amount of vehicle storage area on northbound MT 7. There is a stop bar located south of the at-grade crossing that allows for approximately 65 feet of storage before encroaching into the Railroad Avenue intersection, which does not accommodate a standard WB-67 vehicle. The grade crossing pavement marking begins at the south approach of the Railroad Avenue intersection, marking the beginning of the larger vehicle queuing area. This queuing area for northbound truck traffic on MT 7 is located approximately 115 feet south of the railroad crossing. In total, the approximate vehicle queue area available on MT 7 from Railroad Avenue to US 12 is 300 feet, which is enough to accommodate 3 semi-trailers (assuming a 100’ long WB-67 vehicle) or approximately 12 regular vehicles (assuming 25’ per vehicle).

3.2 Crash Analysis

Crash records spanning the 10-year period of 2004 to 2013 for the Study Area were examined to identify trends, if any, in the data. Crash records for locations along US 12 and MT 7 immediately adjacent, but outside of the Study Area, were also included in the analysis. The crash data were summarized to determine crash rates by roadway segment. Several indices are typically calculated to report the overall crash statistics for a given Study Area; definitions are as follows.

- Crash rate: The number of crashes per million vehicle miles of travel
- Severity index: The ratio of the sum of the level of crash degree to the total number of crashes
- Severity rate: The crash rate multiplied by the severity index

Figure 9 shows the crash locations within the Study Area as depicted by injury type.

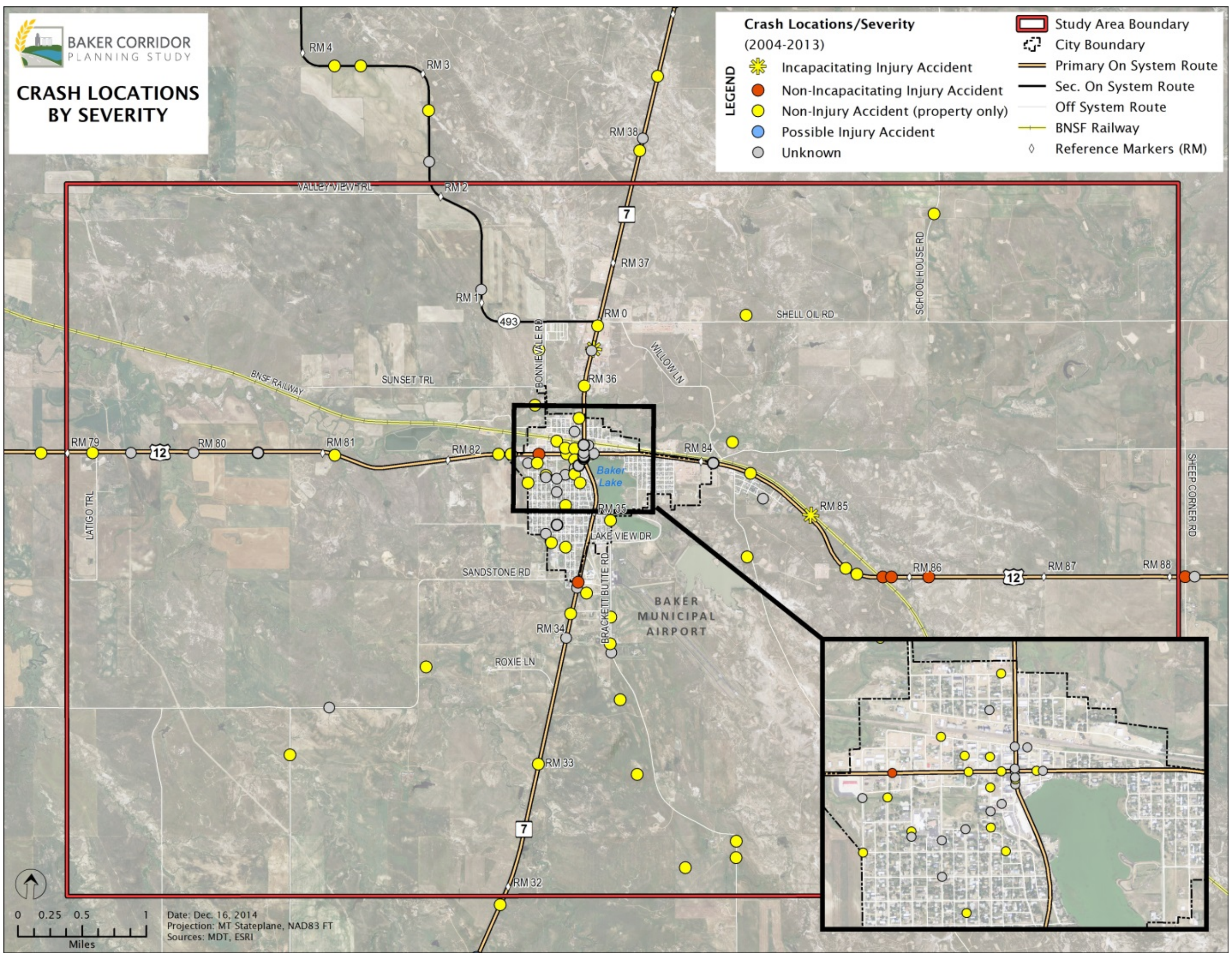

Figure 9: Study Area Crash Locations by Severity

Table 11 summarizes the crash statistics for sections of the two main corridors within the Study Area for all vehicle types (total crashes) and for HVs. Each corridor has a crash rate calculated based on the total crashes for the road segment within the city limits of Baker (urban) and for each of the segments outside the city limits (rural).

Table 11: Crash Statistics

	Total Crashes	Heavy Vehicle Crashes	Crash Rate	Severity Index	Severity Rate
US 12 (RM 77 – RM 82)	17	0	0.94	2.35	2.22
US 12 (RM 82 – RM 83.6)*	14	5	0.64	1.14	0.73
US 12 (RM 83.6 – RM 89)	13	3	0.72	2.15	1.55
MT 7 (RM 31 – RM 34.6)	7	1	0.45	1.57	0.71
MT 7 (RM 34.6 – RM 35.8)*	9	2	0.59	1.00	0.59
MT 7 (RM 35.8 – RM 39)	7	1	0.51	2.00	1.01
Rural Statewide Average[1]	-	-	1.11	2.18	2.41
Urban Statewide Average[1]	-	-	4.51	1.66	7.48

* Road segment located within city limits.
Source: MDT Traffic and Data Collection Analysis, 2014.
[1] *Source: Statewide Primary Route Crash Statistics: 2008 through 2012. MDT, 2015.*

The crash rates within the Study Area for the US 12 and MT 7 corridors, both rural and urban road segments, are below the overall statewide average for State Primary Routes. Table 12 shows the total number of crashes by collision type for US 12 and MT 7.

Table 12: Total Crashes by Collision Type

	Total Crashes	Rear End	Angle	Fixed Object	Roll Over	Other
US 12 (RM 77 – RM 82)	17	0	1	10	2	4
US 12 (RM 82 – RM 83.6)*	14	2	6	3	2	1
US 12 (RM 83.6 – RM 89)	13	3	1	3	4	2
MT 7 (RM 31 – RM 34.6)	7	0	1	3	3	0
MT 7 (RM 34.6 – RM 35.8)*	9	3	5	0	0	1
MT 7 (RM 35.8 – RM 39)	7	1	1	3	1	1

* Road segment located within city limits.
Source: MDT Traffic and Data Collection Analysis, 2014.

There were a variety of crash types within the Study Area as shown in Table 12. Rear end and angle crashes are more common within city limits where drivers perform turning movements entering and exiting the roadway. Fixed object and roll over crashes are more common on the rural portions of the Study Area highway corridors and typically resulted from driver error, weather conditions, or roadway geometric constraints such as curves or grades.

In reviewing the crash data in the Study Area, there were few crash types that occurred in a particular location or road segment that would indicate a higher crash potential. A majority of the contributing factors for crashes in the Study Area were inattentive or careless driving. As shown in Table 12, angle and rear end crashes were common within the Baker city limits, as would be expected. On US 12, five of the 14 crashes that occurred within Baker city limits involved heavy vehicles, although these crashes were of various types with differing contributing circumstances.

A majority of the Study Area crashes were property damage only crashes. One fatal injury crash located near RM 77 on US 12 (outside the Study Area) was recorded within the 10-year period where an improper turn resulted in a head-on collision.

3.3 Right-of-Way and Jurisdictions

Highway right-of-way along the US 12 and MT 7 corridors as well as the paved portion of S-493 is maintained by the State of Montana. Land ownership adjacent to the US 12 and MT 7 corridors within the Study Area is predominantly privately owned. US 12 has two large adjacent State-owned parcels located at approximately RM 80 (south of highway) and between RM 86 and 87 (north of highway). Fallon County owns several large land parcels within the Study Area, one of which (approximately RM 81) has US 12 passing through it. Although not located on the primary system, the Bureau of Land Management owns several parcels within the Study Area. Figure 10 depicts the general land ownership within the Study Area.

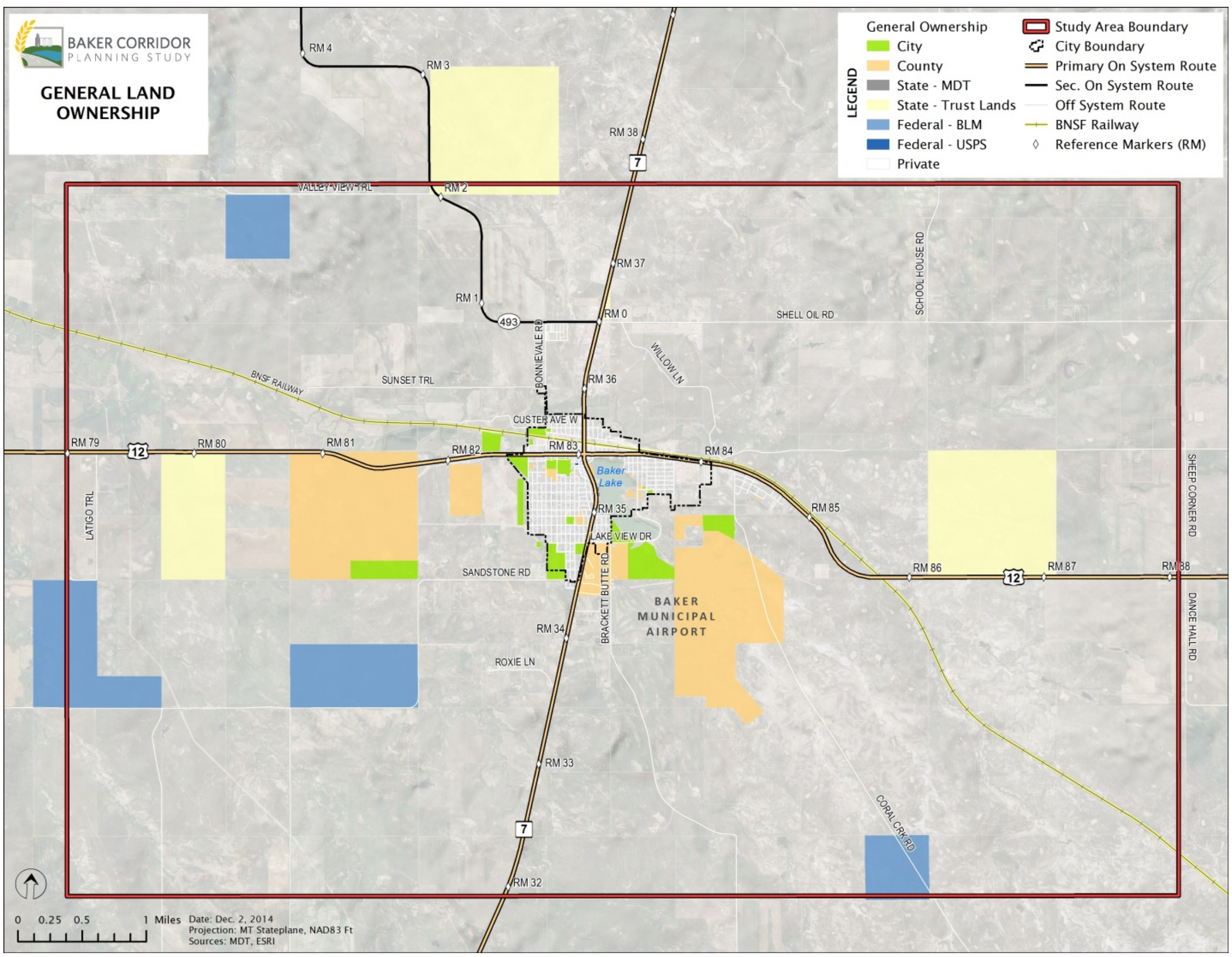

Figure 10: General Land Ownership in the Study Area

As-built construction drawings were reviewed to document existing right-of-way widths on either side of the roadway centerline for the segments of US 12, MT 7, and S-493 located within the Study Area. Right-of-way widths along US 12 vary from 31 feet to 130 feet on each side of centerline, the smaller widths occurring within Baker city limits. MT 7 right-of-way widths range from 20 feet to 177 feet from centerline. Similar to US 12, the smaller widths on MT 7 occur within Baker city limits. The existing right-of-way width along S-493 within the Study Area varies from 50 feet to 100 feet from centerline. Appendix B lists in detail the right-of-way widths by direction from roadway centerline.

3.4 Physical Characteristics

US 12 is an east-west highway spanning almost 2,500 miles from the Washington coast to Detroit that serves as a major linkage across the state. At Miles City on Interstate 94, US 12 splits off from the interstate and heads east for 89 miles, through the City of Baker, into North Dakota. Through the Study Area, US 12 is a two-lane highway with varying shoulder widths, and, where it passes through Baker city limits, has interspersed areas of parallel parking and sidewalks. MT 7 travels a total of 80.5 miles in a south-north direction beginning south of Baker in Ekalaka and heads north to its intersection with Interstate 94 at Wibaux. Through the Study Area, MT 7 is a two-lane highway, and, similar to US 12, has intermittent areas of parallel parking and sidewalks outside the immediate downtown area. Within the downtown area, MT 7 has on-street angled parking one block before and after its intersection with US 12. Speed limits vary throughout the Study Area. Figure 11 shows the posted speed limits for the Study Area.

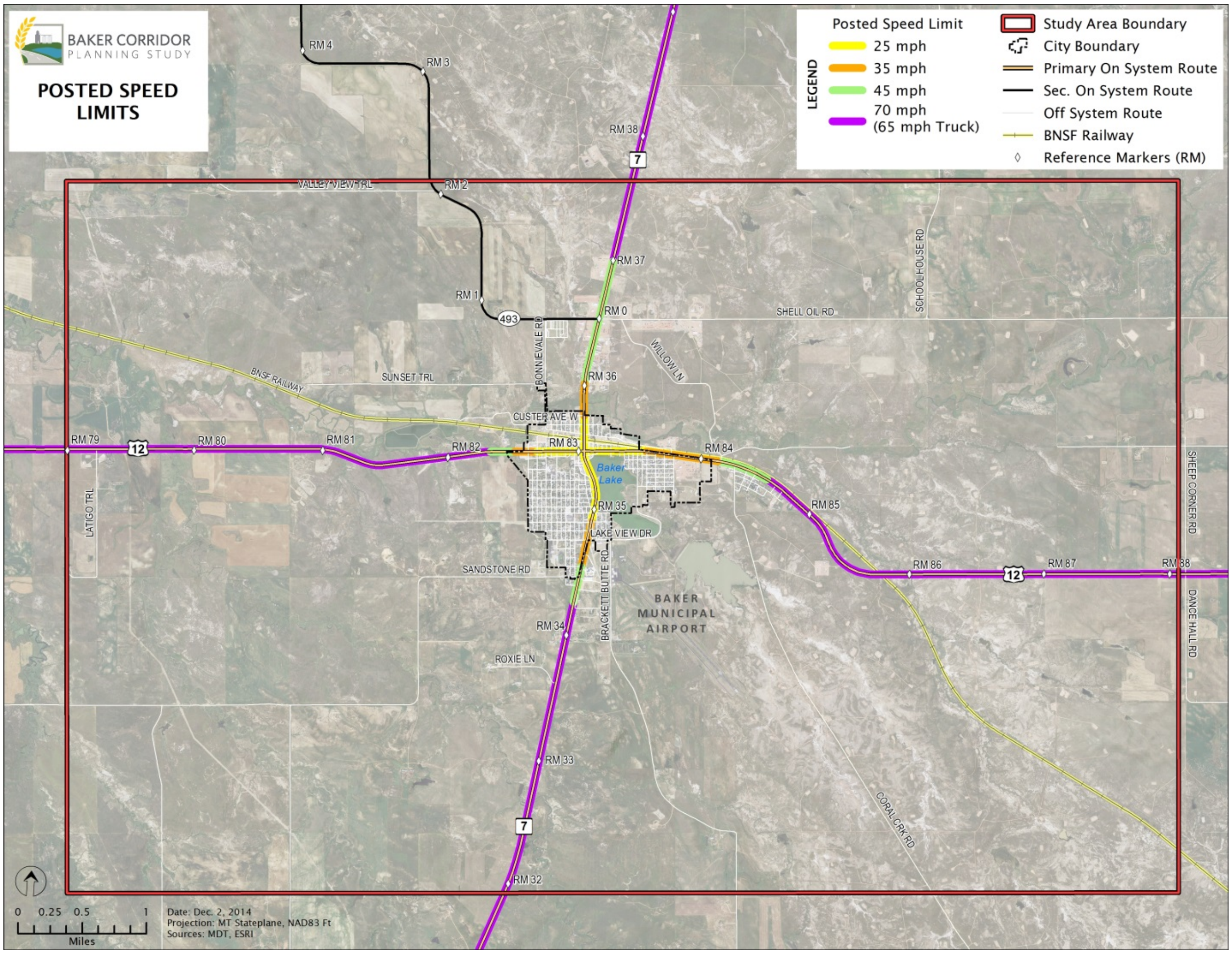

Figure 11: Posted Speed Limits

3.5 Roadway Design Standards

Operational characteristics of a roadway are governed by general design principles and controls as specified in the MDT *Road Design Manual*. While standards typically change over time, it should be noted that the following information is based on the current MDT design standards. Also note that areas not meeting current MDT design standards do not necessarily represent unsafe conditions or warrant improvements. The roadway design standards for US 12 and MT 7 within the Study Area are based on the current MDT design criteria for Rural and Urban Minor Arterials. MDT urban design criteria apply to sections of US 12 and MT 7 located within Baker city limits. Rural minor arterials are described as providing a mix of interstate and interregional travel service, which, in urban areas, can carry local bus routes and provide intra-community connections.

Roadway design speeds are controlled by factors such as topography, anticipated operating speed, adjacent land use, and functional classification of the highway. Per the MDT *Road Design Manual*, rural highways such as US 12 and MT 7 outside of Baker city limits have design speeds controlled primarily by topography and functional classification. Table 13 describes the design standards for Rural and Urban Minor Arterials.

Table 13: Geometric Design Criteria for Rural and Urban Minor Arterials (Non-NHS – Primary) U.S. Customary

Design Element			Design Criteria[2]					
Design Controls	Functional Classification		Rural Minor Arterial			Urban Minor Arterial		
						Curbed		Uncurbed
	Design Forecast Year		20 Years					
	[1]Design Speed	Level	60 mph			35 mph		35 mph
		Rolling	55 mph					
		Mountainous	45 mph					
	Level of Service		Level/Rolling: B Mountainous: C			Desirable: B Minimum: C		
Roadway Elements	[1]Travel Lane		12”					
	[1]Shoulder Width	Outside	Varies					
	Cross Slope	[1]Travel Lane	2% Typical					
		Shoulder	2% Typical					
	Median Width		Varies			N/A		
	TWLTL Width		N/A			16”		
Earth Cut Section	Ditch	Inslope	6:1 (Width: 10’)			N/A		6:1 (Des/4:1 Min)
		Width	10’ Minimum			N/A		10’ Min
		Slope	20:1 towards back slope			N/A		20:1 towards back slope
	Back Slope; Cut Depth at Slope Stake	0’ - 5’	5:1					
		5’ - 10’	Level/Rolling 4:1, Mountainous: 3:1					
		10’ - 15’	Level/Rolling: 3:1, Mountainous: 2:1					
		15’ - 20’	Level/Rolling: 2:1, Mountainous: 1:5:1					
		>20’	1:5:1					
Earth Fill Slopes	Fill Height at Slope Stake	0’ – 10”	6:1					
		10’ – 20’	4:1					
		20’ – 30’	3:1					
		>30’	2:1					
Alignment Elements	Design Speed		45 mph	55 mph	60 mph	30 mph	40 mph	50 mph
	[1]Stopping Sight Distance		360’	495’	570’	200’	305’	425’
	Passing Sight Distance		1625’	1885’	2135’	N/A	N/A	N/A
	[1]Minimum Radius		590’	960’	1200’	250’	533’	760’
	[1]Superelevation Rate		e_{max} = 8.0%			e_{max} = 4.0%		e_{max} = 8.0%
	[1]Vertical Curvature (K-value)	Crest	61	114	151	19	44	84
		Sag	79	115	136	37	64	96
	[1]Maximum Grade	Level	3%			7%	6%	
		Rolling	4%			8%	7%	
		Mountainous	7%			10%	9%	
	Minimum Vertical Clearance		17.0’					

Source: Montana Department of Transportation Road Design Manual, Chapter 12.2008
[1] Controlling design criteria (see Section 8.8 in the *Road Design Manual*).
[2] The Study Area only includes Level and Rolling Terrain.

3.6 Roadway Geometrics

Current as-built drawings for the highways within the Study Area were reviewed to identify areas of potential concern that fail to meet current MDT design standards. The current MDT design standards for Urban Minor Arterials were used to evaluate the segment of US 12 and MT 7 located within Baker city limits, and Rural Minor Arterial design standards were used for highway segments located outside city limits. The findings of the existing roadway geometrics within the Study Area are discussed in greater detail in the following sections. Areas not meeting current design standards are shown in Figure 12.

Horizontal Alignment

Horizontal alignment is a measure of the degree of turns and bends in the road. The horizontal alignments of the highways within the Study Area greatly affect the vehicular operations and safety of the overall roadway. The horizontal alignment design elements comply with specific limiting criteria, including minimum radii, superelevation rates, and sight distances.

Table 14 provides a summary of the horizontal alignment curvature for US 12, MT 7, and S-493. The table includes the location of the curve center (approximate RM), length, radius, and horizontal stopping sight distances. The analysis assumed urban design standards throughout Baker city limits. The evaluation noted only one curve located on S-493 that does not meet current minimum MDT design standards for level terrain. The curve represents the 90-degree curve located at RM 0.86 on S-493. Nine curves (four on US 12, four on MT 7, and one on S-493) failed to meet design standards for horizontal stopping sight distances. Stopping Sight Distance (SSD) is defined as the sum of the distance traveled during a drivers' perception/reaction or brake reaction time and the distance traveled while braking to a stop. Stopping sight distance issues were noted on US 12 east of Baker primarily with the horizontal curves west of the railroad overpass. Stopping sight distance issues on MT 7 occur on the hill near RM 33.5 and immediately north of Baker at RM 35.15 and RM 36.03.

Table 14: Horizontal Alignment

Approximate RM of Curve Center	Length Of Curve (FT)/(M)	Radius (FT)/(M)	Stopping Sight Distance (SSD) (FT)/(M)
MT 12 (P-2) FROM RM 79 TO RM 82.63 AS-BUILT PROJECT: STPP-2-2(9)77			
81.04	885.21	2,864.79	578
81.41	781.30	1,909.86	567
82.34	173.31	2,864.79	574
MT 12 (P-2) FROM RM 82.63 TO RM 83.78 AS-BUILT PROJECT: F-(86)19			
83.51	380.8	2,865	246
MT 12 (P-2) FROM RM 83.78 TO RM 88 AS-BUILT PROJECT: F-FG 86(30)			
84.65	3443.2	5,730	246
85.32	842.2	1,910	562
85.72	2256.7	1,910	538
MT 7 (P-27) FROM RM 32 TO RM 35 AS-BUILT PROJECT: STPP-STPE 27-2(14)29			

Approximate RM of Curve Center	Length Of Curve (FT)/(M)	Radius (FT)/(M)	Stopping Sight Distance (SSD) (FT)/(M)
32.13	*721.40*	*3,500*	*162*
33.41	*123.60*	*3,500*	*145*
33.55	*123.60*	*3,500*	*145*
35.15	*381.60*	*620*	*93*
MT 7 (P-27) FROM RM 35 TO RM 38 AS-BUILT PROJECT: F-2(12)			
36.03	1,365	5,730	241
ROUTE 493 (S-493) FROM RM 0 TO RM 2.5 AS-BUILT PROJECT: S-398(1)			
2.07	1,060.0	955.0	434
1.65	1,064.7	955.0	424
0.86	1,125.0	716.3	443

Notes:
a. Red text indicates a failure based on MDT design requirements.
b. *Italicized* text indicates metric.

Vertical Alignment

The vertical alignment relates to the variance in elevation of the roadway. The MDT *Road Design Manual* contains guidelines for the maximum grades on rural and urban minor arterials based on the terrain of the roadway. The maximum grade recommendations for rural level and rural rolling terrain are 3 percent and 4 percent, respectively. The maximum grade recommendations for urban level and urban rolling terrain are 6 percent and 7 percent, respectively. Other vertical alignment design criteria relate to the rate of vertical curvature (K-Value) and stopping sight distance. The K-Value is a measure of the horizontal distance required to produce a 1 percent change in gradient.

The terrain varies slightly throughout the Study Area. Alignment grades through the city limits of Baker are generally flat and meet the maximum grade design standards for urban minor arterials. Appendix B provides a summary of the vertical alignment curvature for US 12, MT 7, and S-493. Review of the as-built plans indicates that there is one curve on MT 7 that does not meet current MDT standards for level terrain. The existing vertical grade exceeds the allowed maximum at approximately RM 37.1, north of Baker. There are also three vertical curves located between RM 37.1 and 37.71 that failed to meet current design standards for vertical stopping sight distance. Design elements listed in Appendix B were determined based on the best available data provided by MDT.

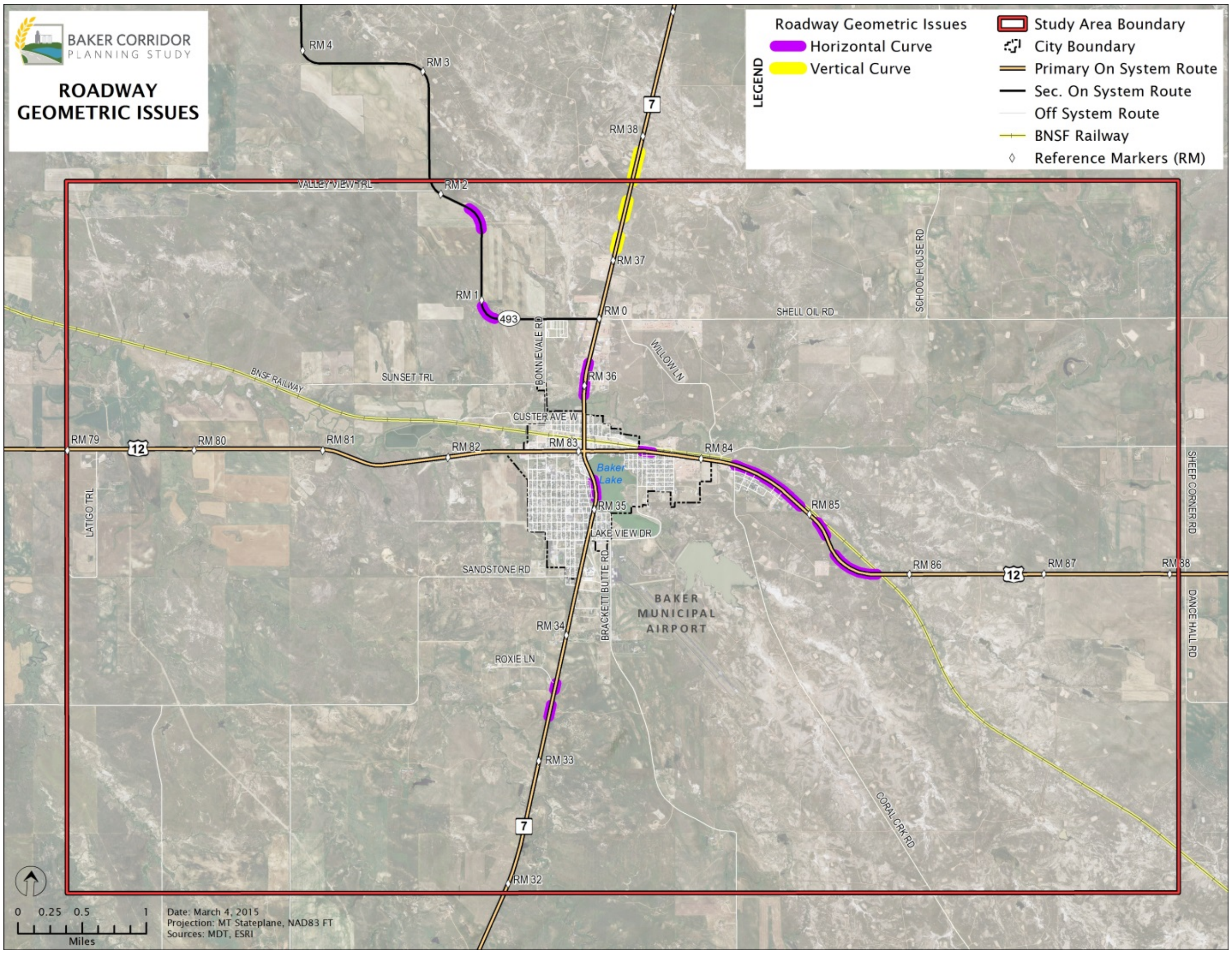

Figure 12: Roadway Geometric Issues

Intersection Turning Movements

The intersection of US 12 and MT 7 was analyzed to determine whether the existing geometric design layout is sufficient to accommodate proper turning movements for larger design vehicles. Anecdotal information suggests that semi-trailers commonly have difficulty making turning movements at this intersection and can conflict with either the opposing lane of traffic or vehicles parked in the angled parking along MT 7. Three design templates were used in analyzing the intersection: a WB-40, WB-50 and WB-67. A WB-40 is the smallest truck available (typically used for local delivery for restaurants and small retail) and has a 40' wheelbase (WB) as measured from the foremost axle to the rearmost axle. A WB-50 vehicle is an intermediate-sized semitrailer with a 50' wheelbase (WB). A WB-67 is a standard-sized semitrailer with a 67' wheelbase and is the typical design vehicle state routes.

The analysis determined that the existing layout of the US 12/MT 7 intersection is insufficient to accommodate left-turn movements of a WB-50 design vehicle. For both left-turn movements from US 12 onto MT 7, the inside wheel path conflicts with a stopped vehicle (shown as red in Figure 13) on MT 7. For turning movements from MT 7 onto US 12, the wheel path for the northbound to westbound left turn conflicts with the stopped vehicle. Figure 13 illustrates the left-turn movement from US 12 onto MT 7. All right-turn movements for the WB-50 can be made without conflict.

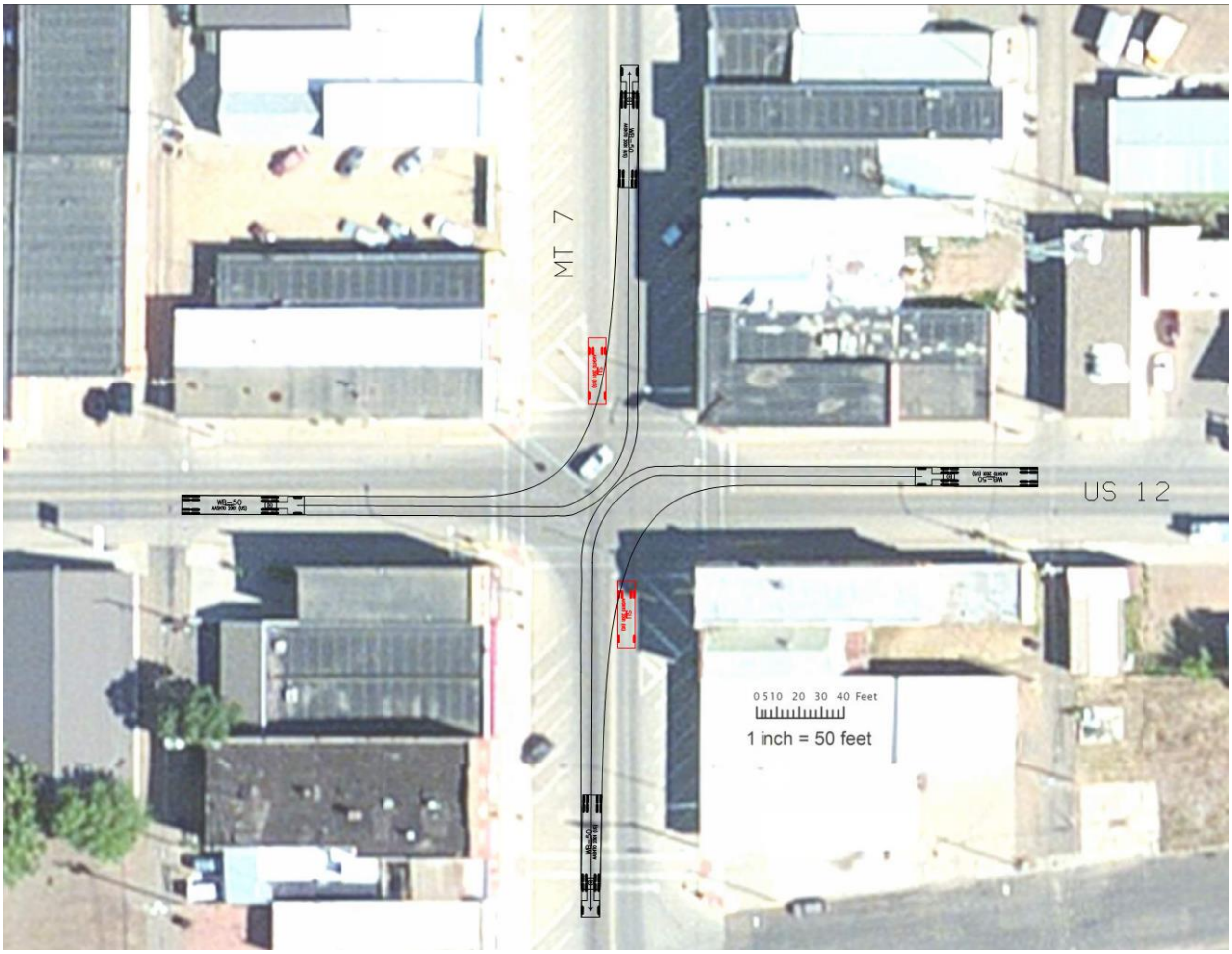

Figure 13: WB-50 Left-turn Movement from US 12 onto MT 7

The WB-67 design vehicle encountered conflicts at all four right-turn movements. Existing corner radii are not sufficient to prevent a truck of this size from rolling over curbing. The inside wheel path for the right-turn movement is extremely close to the existing curb return and crosses into two or three angled parking spaces. Because the shorter WB-50 could not make left-turn movements, it was unnecessary to test for the WB-67. It appears that the angled parking on the northwest and southeast corner of the intersection on MT 7 have been striped out with pavement markings to accommodate right turning vehicles. More detail can be found in Appendix B.

Roadside Clear Zones

The American Association of State Highway and Transportation Officials *Roadside Design Guide* defines a clear zone as the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired minimum width is dependent upon traffic volumes and speeds and on the roadside geometry.

Current MDT standards include recommended guidelines for clear zones in rural and urban roadway sections. The roadside clear zones were examined for US 12, MT 7, and S-493 within the Study Area. Based on this evaluation, one area of concern was identified on US 12 at RM 86.18 on both the north and south sides of the highway. Per the US 12 as-built plans, there is a 16’6” x 11’0” Structural Steel Plate Arch Pipe culvert at this location to accommodate the existing channel crossing. The drainage structure at this location includes concrete cutoff walls located approximately 32 feet from the edge of travel way, within the existing fill slope. Concrete curb is currently in place at this location on US 12 for drainage purposes. The existing side slopes appear to be 4:1 or steeper. Based on current MDT standards, a clear zone distance of at least 40 feet is required for this area of US 12.

Intersection Sight Distances

The intersections of the highways within the Study Area were examined for sight distance deficiencies. The intersection of US 12 and MT 7 is an all-way stop with flashing signal. Per Section 28.9.4 of the MDT *Traffic Engineering Manual*, intersections with all-way stop control need to provide sufficient sight distance so that the first stopped vehicle on each approach is visible to all other approaches. Based on this criterion, there is adequate sight distance at this intersection. The intersection of MT 7 and S-493 was analyzed for both approach and departure sight obstructions. Obstructions were not found within the sight triangles for either case.

3.7 Roadway Surfacing and Pavement Conditions

The MDT *Montana Road Log* was reviewed to obtain current characteristics of US 12, MT 7, and S-493. Information includes the surface type; surface, lane, and shoulder widths; surface and base thickness; and number of travel lanes. Table 15 contains the existing roadway surfacing information for US 12, MT 7, and S-493 within the Study Area. More information is found in Appendix E.

Table 15: Roadway Surface Characteristics for Major Study Area Roadways

SEGMENT REFERENCE MARKER (RM)	WIDTH (feet)			THICKNESS (inches)		SURFACE TYPE[1]	TRAVEL LANES
	Surface	Lane	Shoulder	Surface	Base		
US HIGHWAY 12 (P-2)							
76.954 – 82.187 *(enter Baker City Limits at 82.015)*	24	12	0	2.5	6.5	RMS	2
82.187 – 82.408	44	12	8	4.7	21.9	PMS	2
82.408 – 82.705 *(junction with MT 7 at 82.616)*	43	12	8	9.1	22.9	PCC	2
82.705 – 83.334	44	12	8	4.7	21.9	PMS	2
83.334 – 83.501	42	12	8	8.8	18.0	PMS	2
83.501 – 83.700 *(leave Baker City Limits at 83.616)*	42	12	8	8.8	15.0	PMS	2
83.700 – 84.076	42	12	8	7.6	18.0	PMS	2
84.076 – 85.235	42	12	8	8.8	18.0	PMS	2
85.235 – 88.615	35	12	5	8.8	18.0	PMS	2
MT HIGHWAY 7 (P-27)							
29.152 – 35.368 *(enter Baker City Limits at 34.644)*	28	12	2	3.5	13.0	PMS	2
35.368 – 35.549 *(junction with US12 at 35.473)*	73	12	8	9.1	17.7	PCC	2
35.549 – 35.563	40	12	8	10.8	17.7	PMS	2
35.563 – 35.716	40	12	8	9.9	12.0	PMS	2
35.716 – 44.407 *(leave Baker City Limits at 35.786)*	28	12	2	9.9	12.0	PMS	2
SECONDARY HIGHWAY 493 (S-493)							
0.000 – 1.000	28	12	2	4.2	15.6	PMS	2
1.000 – 4.877	24	-	-	0.0	0.0	GRV	2

Source: 2014 Montana Road Log
[1] RMS = "Road Mix Surfacing" - A compacted roadway, the surface of which is composed of 1 inch or more of gravel, stone, sand, or similar materials mixed on the roadway with bituminous materials.
PMS = "Plant Mix Surfacing - The same as "RMS" except mixed in a plant under precise specifications controlling the consistency of composition.
PCC = "Portland Cement Concrete" - A built up and compacted roadway with concrete surfacing.

Based on the MDT *Montana Road Log*, there is one section on US 12 that does not meet the current MDT standard for minimum pavement width. From RM 76.954 to 82.187, the existing pavement width is listed as 24 feet, made up of two 12-foot lanes and no shoulder. Per the MDT Road Design Manual, a minimum width of 28 feet is desired for rural minor arterials.

Pavement conditions within the Study Area are monitored annually by MDT through their Pavement Management System (PvMS). Information collected during the monitoring is translated into several metrics, which are used as performance measures to track and manage the pavement conditions throughout the state. Several pavement condition indices compiled as part of the PvMS are defined as follows:

- Ride Index (IRI) – Determined by using an internationally applied roughness index in inches per mile, and converting to a 0 to 100 scale.
- Rut Index (RI) – Calculated by converting rut depth to a 0 to 100 scale. Rut measurements are taken approximately every foot and averaged into one-tenth mile reported depths.
- Alligator Crack Index (ACI) – Measured by combining all load-associated cracking, and converting the index into a 0 to 100 scale.
- Miscellaneous Cracking Index (MCI) – Calculated by combining all non-load-associated cracking, and converting the index into a 0 to 100 scale.
- Overall Performance Index (OPI) – Determined by combining and placing various weighting factors on the IRI, RI, ACI, and MCI figures, and converting the index to a 0 to 100 scale. The OPI is calculated to provide a single index describing the current general health of a particular route or system.

Table 16 presents the pavement conditions for the segments of highway within the Study Area. The performance index scale used by the PvMS includes the following ratings: 80 to 100 is considered "good," 60 to 79.9 is considered "fair," and 0 to 59.9 is considered "poor." The target range for IRI on the Primary System is between 60 and 100 percent (below 60 percent in considered undesirable). IRI values for roadway segments falling below approximately 65 percent are considered for tentative construction projects. Based on the IRI performance measure target ranges, US 12 from RM 77.2 to RM 82.6 is approaching an undesirable level, and the segment from RM 82.6 to RM 83.749 has fallen into the "undesirable" range and would qualify for a construction program.

Table 16: Pavement Condition Indices for US 12 and MT 7

SEGMENT REFERENCE MARKER (RM)	RIDE INDEX (IRI)	RUT INDEX (RI)	ALLIGATOR CRACK INDEX (ACI)	MISC. CRACKING INDEX (MCI)	OVERALL PERFORMANCE INDEX (OPI)
US HIGHWAY 12 (P-2)					
77.2 – 82.6[1]	65.09	53.91	95.47	95.17	54.07
82.6 – 83.749	48.00	74.67	100.00	100.00	57.41
83.749 – 95.514	80.33	75.46	99.25	97.68	74.09
MT HIGHWAY 7 (P-27)					
29.0 – 35.4	72.07	75.71	98.35	97.99	69.57
35.4 – 44.5	67.95	70.79	98.19	95.58	64.64

Source: MDT Pavement Management System, 2014
[1] Portions of this segment were resurfaced in 2014 and likely are not reflected in PvMS at the time the report was created.

The OPI includes a combination of all indices listed in Table 16 and provides the most comprehensive index of the pavement condition. The segment of US 12 from RM 77.2 to RM 83.749 is in "poor" condition based on the performance index scale.

A pavement preservation project was recently completed in 2014 on US 12 that begins west of Baker outside the Study Area at approximately RM 77.2 and continues into the western city limits to approximately RM 82.6 near the Baker fire station. According to the MDT 2014 Statewide Transportation Improvement Program, the Baker – West project (UPN 7948) is located on US 12 and is a 5.42 mile overlay project.

3.8 Access Points

Access points located along US 12 and MT 7 within the Study Area were counted using 2013 aerial imagery within GIS and verified using Google Street View. Access points included any defined entrance/exit onto the Primary on-system routes, such as driveways to agricultural lands, businesses, residences, and private roads; alleyways; and intersections with local streets.

Table 17 and Table 18 provide a list of the number and density of access points within the Study Area by half-mile segment. In total, US 12 has 155 access points (66 on the north side and 89 on the south side of the highway) within the Study Area between RM 79 and RM 88.5. MT 7 has a total of 94 access points (49 on the east side and 45 on the west side) between RM 32 and RM 38. The density of access points increases dramatically within the city limits (rows highlighted in bold) due to the amount of residential driveways, alleys, and cross streets.

Table 17: Access Points along US 12

Reference Marker	North of US 12		South of US 12		Total	
	No. of Accesses	Density (access/mi)	No. of Accesses	Density (access/mi)	No. of Accesses	Density (access/mi)
79 to 79.5	1	2	2	4	3	6
79.5 to 80	1	2	0	0	1	2
80 to 80.5	0	0	1	2	1	2
80.5 to 81	1	2	1	2	2	4
81 to 81.5	1	2	2	4	3	6
81.5 to 82	1	2	1	2	2	4
82 to 82.5	5	10	3	6	8	16
82.5 to 83*	28	56	22	44	50	100
83 to 83.5*	20	40	22	44	42	84
83.5 to 84*	1	2	15	30	16	32
84 to 84.5	1	2	12	24	13	26
84.5 to 85	0	0	5	10	5	10
85 to 85.5	1	2	1	2	2	4
85.5 to 86	0	0	0	0	0	0
86 to 86.5	1	2	0	0	1	2
86.5 to 87	1	2	1	2	2	4
87 to 87.5	2	4	0	0	2	4
87.5 to 88	0	0	0	0	0	0
88 to 88.5	1	2	1	2	2	4

* Road segments and access points located within city limits.

Table 18: Access Points along MT 7

Reference Marker	East of MT 7		West of MT 7		Total	
	No. of Accesses	Density (access/mi)	No. of Accesses	Density (access/mi)	No. of Accesses	Density (access/mi)
32 to 32.5	1	2	1	2	2	4
32.5 to 33	3	6	2	4	5	10
33 to 33.5	1	2	1	2	2	4
33.5 to 34	2	4	2	4	4	8
34 to 34.5	4	8	2	4	6	12
34.5 to 35*	6	12	9	18	15	30
35 to 35.5*	7	14	9	18	16	32
35.5 to 36*	11	22	10	20	21	42
36 to 36.5	8	16	5	10	13	26
36.5 to 37	5	10	4	8	9	18
37 to 37.5	1	2	0	0	1	2
37.5 to38	1	2	1	2	2	4

* Road segments and access points located within city limits.

On highway facilities, the primary purposes of access control include maintaining the flow of traffic and the functional integrity of the highway, as well as enhancing public safety. Within city limits, it is typical to have a higher density of access points due to the higher densities of development and facilities. However, in urbanized areas with higher traffic volumes, high densities of access points have the potential to increase traffic-related accidents along a roadway due to the proximity of vehicles entering or exiting of the roadway.

3.9 Hydraulic Structures

As-built drawings were reviewed to develop an inventory of hydraulic structures located along US 12, MT 7, and S-493. Table 19 lists the culverts within the Study Area, including their approximate location, diameter, length, and where applicable, the stream or drainage crossed.

Table 19: Culvert Inventory

Approximate RM of Culvert	Size	Length	Remarks[1, 2]
MT 12 (P-2) FROM MP 79 TO MP 82.63 AS-BUILT PROJECT: STPP-2-2(9)77			
79.01	48"	156'	Drain
79.36	24"	128'	Drain
79.59	36"	130'	Drain
79.61	48"	124'	Drain
79.77	120"	120'	Drain; Red Butte Creek
79.78	120"	120'	Drain; Red Butte Creek
80.11	28.5"x18"	100'	Drain
80.22	73"x45"	128'	Drain; Unnamed tributary of Sandstone Creek
80.48	28"x20"	90'	Drain
80.61	24"	108'	Drain
81.15	54"	272'	Drain; Unnamed tributary of Sandstone Creek

Approximate RM of Culvert	Size	Length	Remarks[1, 2]
81.39	72"	180'	Drain; Unnamed tributary of Sandstone Creek
81.73	24"	166'	Drain
81.88	60"	176'	Drain
81.97	60"	238'	Drain; Unnamed tributary of Sandstone Creek
82.19	28"x20"	100'	Drain
82.24	28.5"x18"	96'	Drain; Unnamed tributary of Sandstone Creek
MT 12 (P-2) FROM MP 82.63 TO MP 83.78 AS-BUILT PROJECT: F-(86)19			
82.67	24"	66'	Drain
82.69	18"	164'	Drain
82.74	18"	310'	Drain
82.80	15"	124'	Drain
82.80	18"x11"	138'	Drain
83.46	29"x18"	58'	Drain
83.62	29"x18"	64'	Drain
MT 12 (P-2) FROM MP 83.78 TO MP 88 AS-BUILT PROJECT: F-FG 86(30)			
84.01	29"X18"	51'	Drain
84.21	24"	72'	Drain
84.48	30"	59'	Drain
84.58	30"	59'	Drain
84.65	24"	59'	Drain
84.77	24"	82'	Drain
84.78	24"	82'	Drain
85.22	24"	95'	Drain
85.60	24"	88'	Drain
85.79	24"	132'	Drain
85.90	48"	188'	Drain
86.18	198"x132"	122'	Drain; Unnamed tributary of Sandstone Creek
86.74	24"	90'	Drain
87.37	24"	97'	Drain
87.54	36"	124'	Drain
88.05	24"	120'	Drain
MT 7 (P-27) FROM MP 32 TO MP 35 AS-BUILT PROJECT: STPP-STPE 27-2(14)29 (METRIC)			
31.02	1350mm	78m	Drain
31.27	600mm	40.4m	Drain
31.36	600mm	53.8m	Drain
31.89	1240mm x 840mm	24.6m	Drain
32.22	750mm	36m	Drain
32.27	600mm	36.8m	Drain
32.66	2700mm	70Jm	Drain; Unnamed tributary of Red Butte Creek
32.77	600mm	47.2m	Drain
33.03	2400mm	42Jm	Drain; Red Butte Creek
33.20	900mm	32.8m	Drain; Unnamed tributary of Red Butte Creek

Approximate RM of Culvert	Size	Length	Remarks[1, 2]
33.40	600mm	26.4m	Drain
33.69	600mm	23.4m	Drain
33.78	600mm	44Jm	Drain
33.85	600mm	33.2m	Drain
34.05	600mm	38m	Drain
34.30	600mm	21.6m	Drain
34.53	725mm x 460mm	17Jm	Drain
34.65	600mm	21.3m	Drain
35.20	4800mm x 1200mm	36.6m	Drain; Unnamed tributary of Sandstone Creek
MT 7 (P-27) FROM MP 35 TO MP 38 AS-BUILT PROJECT: F-2(12)			
35.95	36"	78'	Drain; Unnamed tributary of Sandstone Creek
36.03	24"	70'	Drain
36.85	24"	72'	Drain
37.04	18"	38'	Drain; Unnamed tributary of Sandstone Creek
37.17	24"	67'	Drain
37.30	24"	86'	Drain
37.55	24"	98'	Drain
37.76	24"	96'	Drain
37.86	24"	92'	Drain
38.20	24"	85'	Drain
38.31	36"	62'	Drain
ROUTE 493 (S-493) FROM MP 0 TO MP 2.5 AS-BUILT PROJECT: S-398(1)			
2.48	24"	80'	Drain
2.31	24"	100'	Drain
1.89	24"	80'	Drain
1.52	24"	72'	Drain
0.98	24"	102'	Drain
0.90	24"	102'	Drain
0.76	24"	92'	Drain
0.41	24"	72'	Drain
0.20	96"	104'	Drain; Unnamed tributary of Sandstone Creek

[1] All culverts noted are located underneath the highways as identified in the as-built plans. Culverts located on highway approaches were not inventoried.
[2] The stream or drainage is noted where a mapped stream was identified on either the USGS topographic map or the National Hydrography Dataset GIS data. Mapped streams represent likely jurisdictional water bodies per USACE definition.

Several large historical flooding events have occurred within the Study Area. More information is presented in Section 4.1, Physical Environment, Floodplains and Floodways. Due to the mapped floodplain associated with Sandstone Creek, a hydraulic analysis would be recommended if an improvement option is forwarded from the Study that crosses a known or likely drainage or waterway.

3.10 Bridges

Bridges

There are a total of seven (7) bridges or structures located within the Study Area, according to the MDT *Bridge Management System*. Table 20 provides a brief summary of the bridges, including their general location, features intersected, and year the structure was built. Refer to Figure 14 for the locations of the bridges/structures. More information can be found in Appendix E.

Table 20: Bridges within the Study Area

Bridge ID	On/Off System	Location	Feature Intersect	Year Built
P00002082+06161	On System	US 12, RM 82.46	Drainage	1998
P00002085+07161	On System	US 12, RM 85.75	BNSF Railway	1968
P00027035+01721	On System	MT 7, RM 35.23	Baker Lake Overflow	2009
P00027035+08231	On System	MT 7, RM 35.86	Sandstone Creek	1941
L13673000+01001	Off System	Bonnievale Road	Sandstone Creek	1955
L13764000+07801	Off System	Custer Ave	Sandstone Creek	2012
L13848000+01001*	Off System	Ag Lane, near RM 82.5 on US 12	Sandstone Creek	2003

Source: MDT Bridge Management System, 2014
* Bridge replaced with box culvert in 2014/2015.

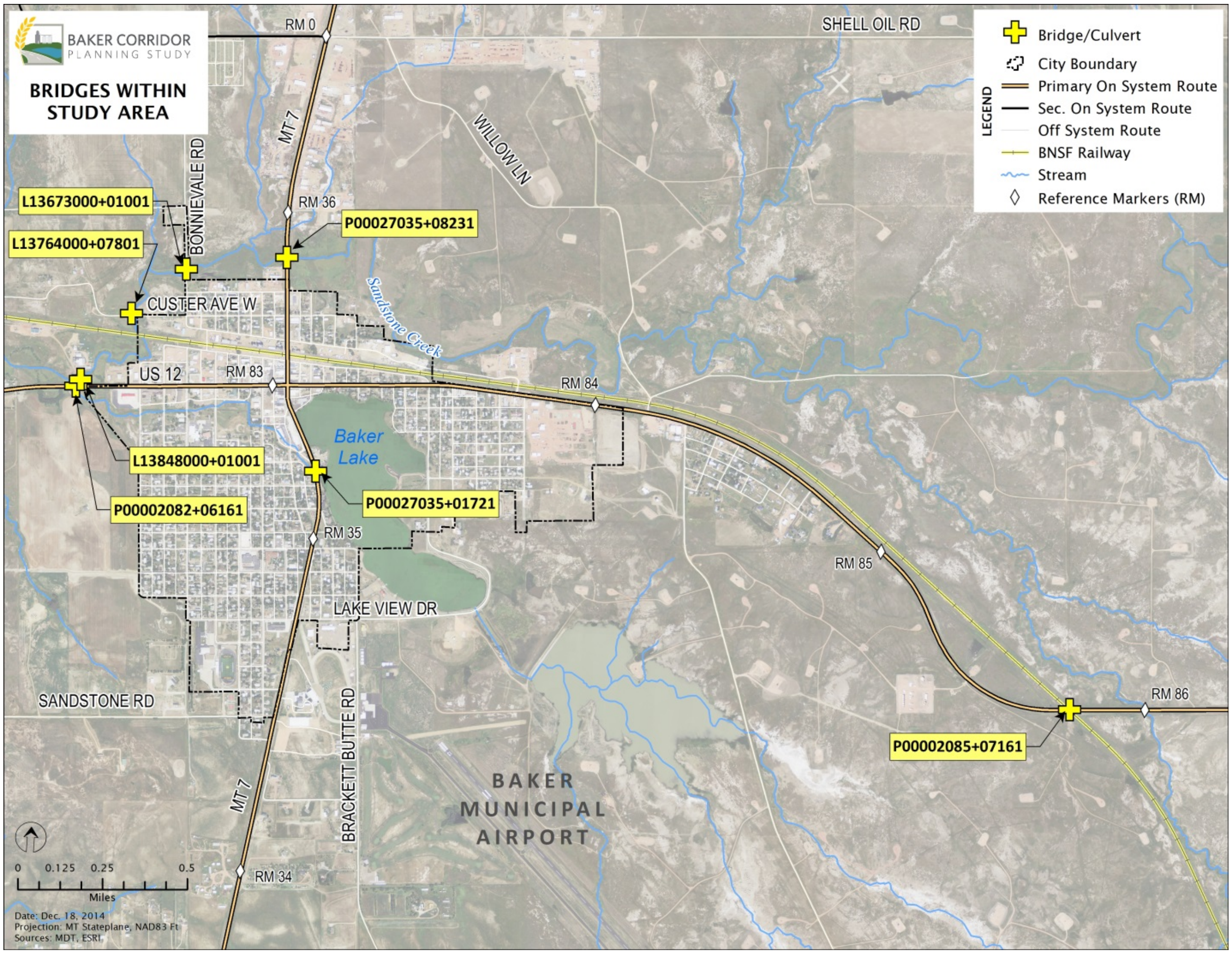

Figure 14: Bridges Located within the Study Area

The MDT Bridge Bureau regularly inspects and rates the bridges and structures located on the state's transportation system. Information available from the MDT Bridge Management System provides metrics on the condition of the structures based on the most current site inspection results. The Sufficiency Rating is a metric describing the overall health and replacement/rehabilitation eligibility of a bridge. The sufficiency rating formula is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value, which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage, in which 100 percent would represent an entirely sufficient bridge and 0 (zero) percent would represent an entirely insufficient or deficient bridge. Ratings of 0 to 49.9 percent are eligible for replacement and ratings of 50 to 80 percent are eligible for rehabilitation.

Prior to enactment of the Moving Ahead for Progress in the 21st Century Act (MAP-21), rehabilitation or replacement of eligible bridges was funded under the Highway Bridge Program. Under MAP-21, the Highway Bridge Program has been eliminated and off-system bridges (i.e., not located on the National Highway System) are now funded under the Surface Transportation Program and have to compete for limited funding.

The National Bridge Inventory (NBI) rating system is used within the MDT Bridge Management System to determine the structure status. To receive either structurally deficient or functionally obsolete classification, a highway bridge must meet the following criteria:

- Structurally Deficient:
  - A condition rating of 4 or less for any of the following: Deck, Superstructure, Substructure, or Culvert or Retaining Walls; or
  - An appraisal rating of 2 or less for either: Structural Evaluation or Waterway Adequacy.
- Functionally Obsolete:
  - A condition rating of 3 or less for any of the following: Deck Geometry, Underclearances, Approach Roadway Alignment; or
  - An appraisal rating of 3 for either: Structural Evaluation or Waterway Adequacy.

Table 21 provides the inspection results and structure status based on the NBI rating for the Study Area bridges.

Table 21: Bridge Conditions within the Study Area

Location	Bridge ID	Last Inspection Year	Sufficiency Rating	Structure Status (NBI Rating)
US 12, RM 82.46	P00002082+06161	2014	83	Not Deficient
US 12, RM 85.75	P00002085+07161	2014	77.1	Not Deficient
MT 7, RM 35.23	P00027035+01721	2014	93.3	Not Deficient
MT 7, RM 35.86	P00027035+08231	2014	69.6	Functionally Obsolete
Bonnievale Road	L13673000+01001	2013	73.2	Not Deficient
Custer Ave	L13764000+07801	2013	99.2	Not Deficient
Ag Lane, near RM 82.5 on US 12	L13848000+01001*	2013	47.9	Structurally Deficient

Source: MDT Bridge Management System, 2014
*This structure has been recently replaced and the database has not been updated for this new structure.

According to the MDT Bridge Management System inspection results, the bridge located just north of Baker on MT 7 at RM 35.86 spanning Sandstone Creek (P00027035+08231) has been categorized as Functionally Obsolete. Built in 1941, this bridge is approximately 64.5 feet long and contains three spans, with a wood/timber deck structure and bituminous deck surface type.

The bridge located on Ag Lane near RM 82.5 of US 12 also spanning Sandstone Creek (L13848000+01001) has been categorized as Structurally Deficient. Built in 2003, this structure measures 29.8 feet in length and consists of a wood/timber deck structure and gravel deck surface type. This structure has recently been replaced by a large box culvert structure and the results in Table 21 are not current for this bridge.

3.11 Other Transportation Modes

Rail

The BNSF Railway intersects the Study Area in an east-west direction. There are four BNSF Railway-operated at-grade rail crossings located throughout the Study Area and one grade-separated crossing underneath US 12 east of Baker. Within city limits there is an approximately 2-mile stretch of double track railroad siding. Table 22 provides information on the five railroad crossings located within the Study Area. If improvement options are developed that affect or cross the BNSF Railway, consideration of the current design standards will be necessary to comply with the specific railroad requirements.

Table 22: Railroad Crossings within the Study Area

Location	AADT	Warning Device / Crossing Type	Trains Per Day	# of Tracks	Train Switching	Speed Over Crossing
Baker, E 1.6 mi on US 12	990	RR Underpass, grade separated	5	0	0	40
Baker, E 0.2 mi (Willow Lane)	110	Cross bucks, at-grade	5	2	0	40
Berwald Rd	102	Cross bucks, at-grade	5	2	0	40
Main St (MT 7)	4509	Gates, at-grade	5	3	0	40
N 3rd St W	402	Gates, at-grade	5	3	0	40

Source: MDT, 2014

The crossing described as "Baker, E 0.2 mi" is located on Willow Lane immediately adjacent to US 12. This crossing has been identified by the community as having steeper grades, particularly on the north approach. A steep at-grade crossing can be problematic for some trucks, such as lowboy trailer truckers, which may cause the trucks to become high centered while crossing, rendering this crossing unusable for some trucks. This conflict then requires the trucks to use the crossing on MT 7, just north of downtown, thus adding additional heavy vehicular traffic to downtown streets. While there is a shoulder along the north side of US 12, a crossing closure at Willow Lane may cause vehicles to wait within the shoulder of the highway, which could create a safety issue.

Transit

Fallon County Transportation System provides local service within Baker Monday-Saturday between the hours of 8 AM and 4 PM. It is a demand-response service, primarily providing transport within Baker City limits. It also provides service to Miles City on the first Wednesday of each month and to Dickinson, North Dakota on the third Wednesday of each month. The Fallon County Transportation System provides occasional service to Plevna as requested. No other transit operations are known to operate within the Study Area.

Bicycles and Pedestrians

One separated path exists on Baker Lake that begins at Triangle Park, located on Lakeview Drive, and wraps around the southern end of the lake. Sidewalks exist adjacent to US 12 and

MT 7 in the immediate downtown area, although intermittently throughout the rest of the Study Area.

Air Service

Baker Municipal Airport (BHK) is located 1 mile southeast of Baker. The airport is owned by the City of Baker and Fallon County, and offers regional air service. The airport covers an area of 193 acres and includes one 4,898-foot-long runway. On average, the airport has approximately 19 aircraft operations per day. The Baker Municipal Airport represents a major constraint for potential improvement options in the Study Area southeast of Baker. Improvement options forwarded from the study will need to include appropriate buffer distances to avoid conflict with the airport's protected airspace.

3.12 Utilities

The Study Area includes many utilities, both along the primary highways of US 12 and MT 7 and throughout the urban area of Baker. Utilities include power, telephone, fiber optic, gas, and water/sewer. Outside city limits, utilities include interspersed overhead power and telephone lines that either parallel or cross the highways and appear to supply services to oil and gas development as well as to rural properties.

Information regarding Baker's water and wastewater systems was obtained from the Fallon County Growth Policy. The Growth Policy includes information regarding the potential infrastructure requirements necessary to accommodate planned growth associated with the construction of the Keystone XL Pipeline, and namely water and wastewater requirements for the proposed crew camp area. More information is included in Section 3.13, below.

The City of Baker's potable water system includes five city wells, three underground storage tanks (USTs), and water distribution lines throughout the city. The City's water is supplied by the five wells. Potable water is stored in the three buried concrete tanks on an elevated site on the east side of the city (see Section 4.1, below).

The City of Baker wastewater system includes several wastewater treatment lagoons, an irrigation water holding pond, a lift station located near the lagoons, and wastewater collection lines throughout the city. The collection lines connect Baker residences to a main wastewater pipe running east-west along US 12 out to the wastewater lagoons. Wastewater flow from the North Baker Sewer and Water District north of the city along MT 7 also contributes to the wastewater system. An irrigation pipe extends from the westernmost lagoon in a southeasterly direction to Sandstone Road, then travels east over to the golf course and is used for irrigation.

3.13 Relevant Projects and Planning Documents

Projects Occurring in the Study Area

Several planned projects have been identified within the Study Area, some of which have the potential to increase the demands on Baker's existing transportation system. Figure 15 shows the locations of several planned projects; additional information, where available, is provided below.

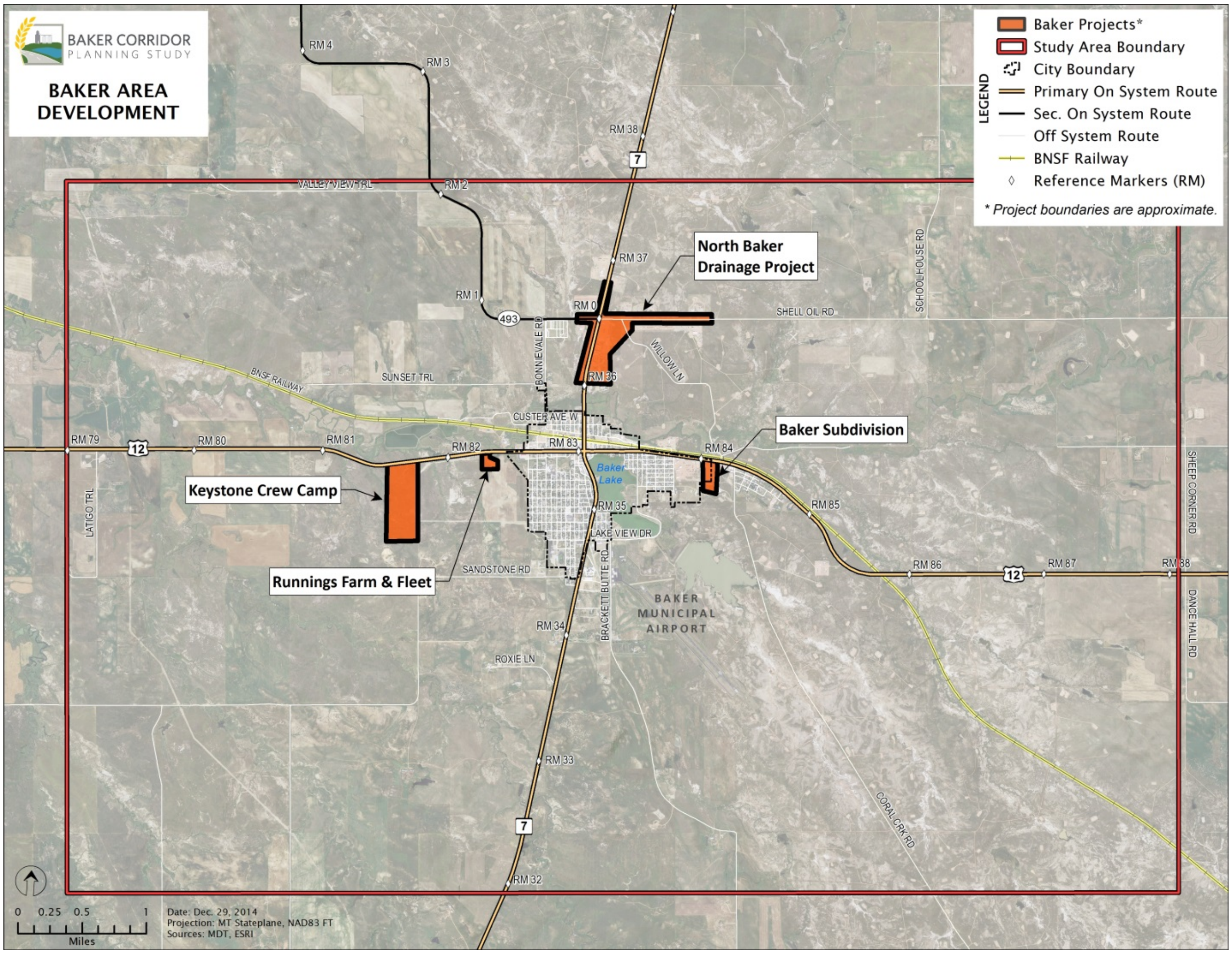

Figure 15: Planned Projects Occurring within the Study Area

NORTH BAKER DRAINAGE PROJECT

The North Baker Drainage Project is a proposed drainage improvement project located north of Baker, centered on the MT 7/S-493/Shell Oil Road intersection. Preliminary plans indicate this project includes roadside ditch improvements and modifications of several approaches to install new culverts and modify existing ones. If improvement options are forwarded from the study in the location of this intersection, consideration and/or coordination of these planned improvements should occur.

BAKER SUBDIVISION

The Baker Subdivision is located west of Baker on US 12. Information is not currently available on the anticipated number of homes to be constructed. This subdivision will create additional traffic on the west side of Baker. If improvement options are forwarded from the study in the location of this planned subdivision, consideration of these planned improvements should occur.

KEYSTONE XL PIPELINE DEVELOPMENT

The proposed Keystone XL Pipeline alignment passes through the western portion of the Study Area in a northwest-southeast direction, crosses US 12 between RM 80 and 81, and continues southeast across MT 7 and outside the Study Area. Figure 16 shows the approximate Keystone

XL pipeline alignment and associated facilities. In addition to the pipeline, the construction of the Bakken Marketlink Project is being proposed, which would consist of piping, booster pumps, meter manifolds, and a tank terminal. It is estimated that the Bakken Marketlink Project could include transport of between approximately 65,000 to 100,000 barrels per day to the Keystone XL Pipeline. The proposal includes a 5-mile pipeline connecting the Baker Tank Farm to the Keystone XL pipeline via the pump station and on ramp facility on S-493/Pennel Road. Based on this proposal, crude oil would be delivered via trucks to collection tank facilities both at the Baker Tank Farm located at approximately RM 74 on US 12 and the proposed tank facility located on S-493/Pennel Road. If built, the planned pipeline improvements could generate substantial traffic due to construction and ongoing use of the facilities.

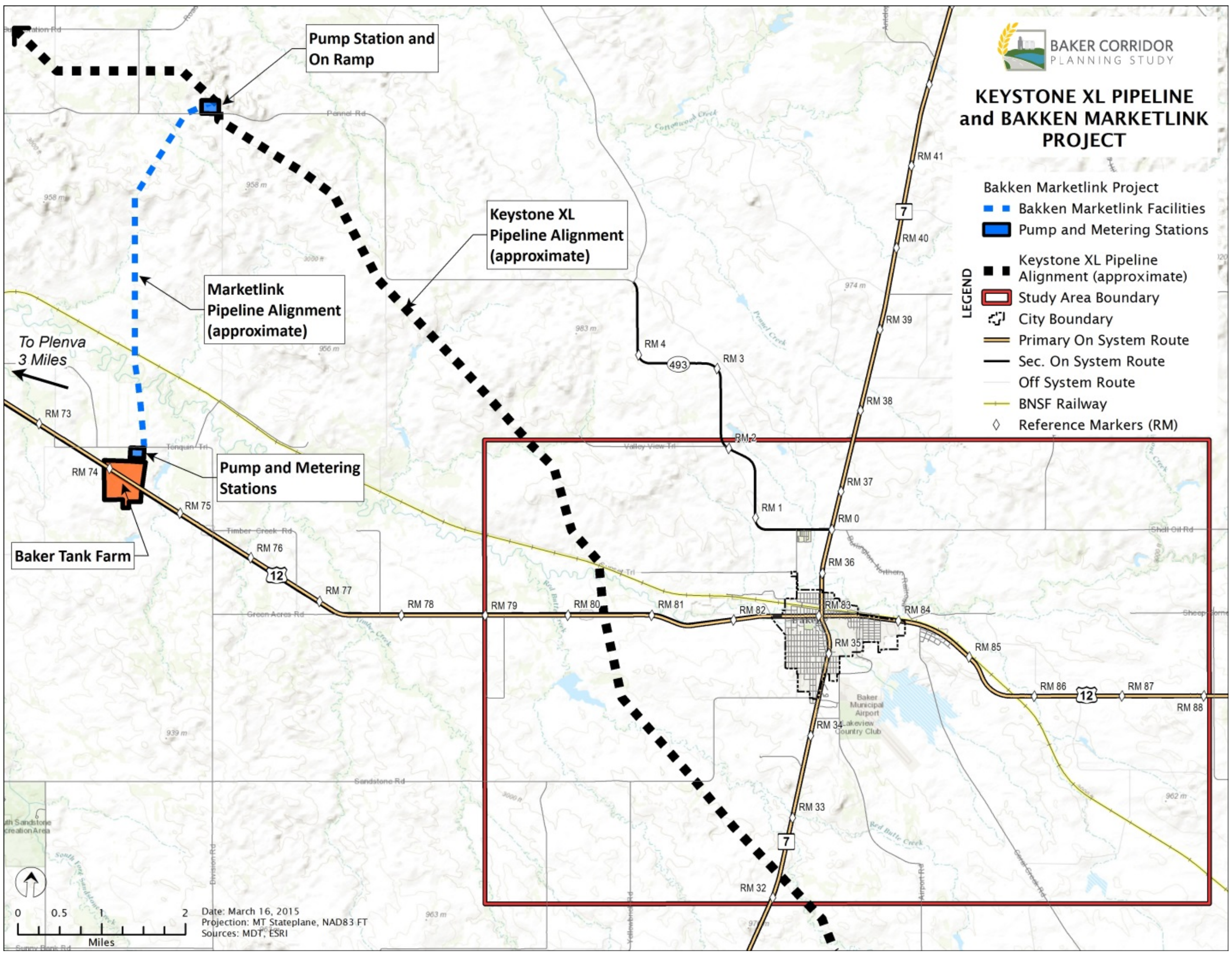

Figure 16: Proposed Keystone XL Pipeline and Bakken Marketlink Project

In anticipation of construction, a workforce camp area (crew camp) and contractor yard is being planned west of Baker immediately south of US 12 from the lagoons to provide a temporary location for housing while workers construct the pipeline. Once construction begins, the crew camp is expected to have a peak camp population of between 995 and 1,165 workers and an average of 500-800 workers over an estimated 6-month construction period spanning several years. Using peak residency numbers, a traffic analysis was conducted that estimated 360 vehicles would be entering/exiting the crew camp onto US 12 on a daily basis during morning/evening shifts. To offset impacts to the transportation system, MDT is requiring warning sign placement near the east/west entrances to the camp on US 12, as well as that the centerline be painted into a double yellow no-passing zone with additional “no passing zone” signage.

Construction of the proposed Keystone XL Pipeline crew camp facility would increase the current demand for water and wastewater service. As specified in the Fallon County Growth Policy, the City of Baker is in negotiations with Keystone XL Pipeline representatives for funds to offset infrastructure impacts generated by the crew camp. The City is seeking $2.5 million to fund the following infrastructure improvements:

- A new water well approximately 2,000 yards west of 6th Street
- A new 250,000-gallon water tank on the east side of the city at the top of a hill
- A fourth cell at the wastewater treatment facility that would function as an evaporation cell
- A 2-mile extension of an 8-inch sewer main to the crew camp site
- A 2-mile extension of a 6-inch water main to the crew camp site

Growth Policy

In 1999, the Montana Legislature revised the growth policy statute (76-1-601 through 76-1-607, MCA), which, among other revisions, set minimum requirements for the content of a local growth policy and to “*provide a framework for implementation activities, including capital improvements planning and subdivision regulation*.” Overall, local adoption of a growth policy creates a tool for community development and for land use planning and decision making within that jurisdiction.

In 2012, Fallon County updated their Growth Policy to include goals, objectives, and policies to facilitate decision-making related to future growth. According to the Growth Plan, the following statement is the community’s vision:

> *“Fallon County’s vision is to retain existing residents, provide amenities that improve quality of life, promote sustainable growth, diversify the local economy to minimize impacts during economic downturns, and mitigate impacts of rapid growth.”*

The Fallon County Growth Policy includes a list of community goals and objectives on a variety of topics that collectively shares their values and concerns over existing conditions and future development within the community. Specific to transportation, the 2012 Growth Policy provides the following specific goals and objectives:

<u>*Goals*</u>

- Reduce truck traffic levels in the City of Baker.
- Maintain safe streets and roads.
- Minimize disruption of traffic circulation caused by barriers such as the railroad.
- Plan for street and road extensions and preserve adequate right-of-way for such extensions.
- Protect Baker Municipal Airport’s air space.

Objectives

- Improve traffic safety and maintain existing streets and roads.
- Reduce disruptions to traffic circulation resulting from railroad operations.
- Identify and secure sand and gravel resources for future maintenance of county roads.
- Plan for new streets and roads in future growth areas by preserving right-of-way for street and road extensions.
- Maintain existing and future operations at the Baker Municipal Airport.

The Fallon County Growth Policy addresses needed infrastructure improvements to provide services to the west of the city to accommodate the planned Keystone XL Pipeline crew camp facility. The Growth Policy recommends further evaluations to quantify infrastructure requirements and develop design requirements and access management strategies along the US 12 corridor west of Baker.

MDT Highway Projects

According to the MDT 2014 Statewide Transportation Improvement Program, which identifies improvements to the state's transportation system for the period of 2014 to 2018, only one project is located within the Study Area. The Baker - West project (UPN 7948) located on US 12 is a 5.42 mile pavement overlay project beginning at RM 77.2 and was constructed in 2014.

4. Existing Environmental Conditions

This section provides an overview of resources present within the Study Area to determine potential constraints and opportunities for future transportation improvements. Information within this section was obtained from publically available reports, websites, and other available documentation. This information represents a planning-level investigation and is not a detailed environmental analysis.

If improvement options are forwarded from this study into project development, an analysis for compliance with the NEPA and MEPA will be completed as part of the MDT project development process.

4.1 Physical Environment

Soil Resources and Prime Farmland

Soils information was reviewed to determine the presence of prime and unique farmland in the Study Area to demonstrate compliance with the Farmland Protection Policy Act (FPPA). The FPPA is intended “to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland.”

The term “farmland” refers to prime farmland; some prime if irrigated farmland; unique farmland; and farmland, other than prime or unique farmland, that is of statewide importance. Prime farmland soils are those that have the best combination of physical and chemical characteristics for producing food, feed, and forage; the area must also be available for these uses. Prime farmland can be either non-irrigated or lands that would be considered prime if irrigated. Farmland of statewide importance is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, forage, and oilseed crops.

Soil surveys of the Study Area are available from the United States Department of Agriculture Natural Resources Conservation Service (NRCS). NRCS soil surveys indicate the presence of farmland of state or local importance, or prime farmland if irrigated within the Study Area. Specifically, areas classified as farmland of state or local importance make up the majority of area within 2 square miles surrounding the City of Baker (refer to Appendix C for more information).

Any forwarded improvement options that require right-of-way within identified farmlands and are supported with federal funds will require a CPA-106 Farmland Conversion Impact Rating Form for Linear Projects completed by MDT and coordinated with NRCS. The NRCS uses information from the impact rating form to keep inventory of the prime and important farmlands within the state.

Geologic Resources

Information on the geology and seismicity in the Study Area came from several published sources. Geologic mapping was reviewed for rock types, the presence of unconsolidated material, and fault lines. The seismicity and potential seismic hazards were also reviewed. This geologic information can help determine potential design and construction issues related to embankments and road design. The following is a brief summary of the geologic and seismic conditions present in the Study Area (refer to Appendix C for more information).

The Study Area covers upland plains dissected by and adjacent to Sandstone Creek. The dominant geologic feature of the area is the Cedar Creek Anticline, which traverses the Study Area from north-northeast to south-southwest, passing just east of the City of Baker. The geologic materials within the Study Area are the Pierre Shale, the Timber Lake, Trail City, and Colgate members of the Fox Hills Formation, the Hell Creek Formation, and the Ludlow member of the Fort Union Formation.

The Pierre Shale, Hell Creek Formation and Fox Hills Formation are Cretaceous-age bedrock consisting of shale, mudstone, siltstone, and sandstone. The Ludlow Member is Paleocene-age bedrock consisting of mudstone, siltstone, and sandstone. The bedrock is generally soft, weathers to bad-land topography, and swelling clays visible at the surface often show a characteristic “popcorn” texture.

These types of soils can create revegetation challenges. The clay heavy soil reacts in extremes to either the lack of or presence of moisture. The design of future projects forwarded from the study should consider including permanent erosion and sediment control (PESC) measures to extent practicable to help the soils stay in place long enough for the plants and grasses to take hold and revegetate the project. Native plant and grass types that can live in soils with high clay content should be chosen.

Improvements brought forward from the study will be subject to more detailed geotechnical analysis. Part of this detailed analysis may involve taking advance borings to evaluate soil characteristics at exact project locations. This is standard procedure for the majority of MDT road projects. The design of any improvements should take into consideration specific requirements that come from the detailed analysis.

Surface Waters

Topographic maps and geographic information system (GIS) data were reviewed to identify the location of surface water bodies such as rivers, streams, lakes, and reservoirs within the Study Area. Listed below and shown on Figure 17 are the primary water bodies within the Study Area.

- Sandstone Creek
- Deep Creek
- Red Butte Creek
- Baker Lake
- Timber Creek

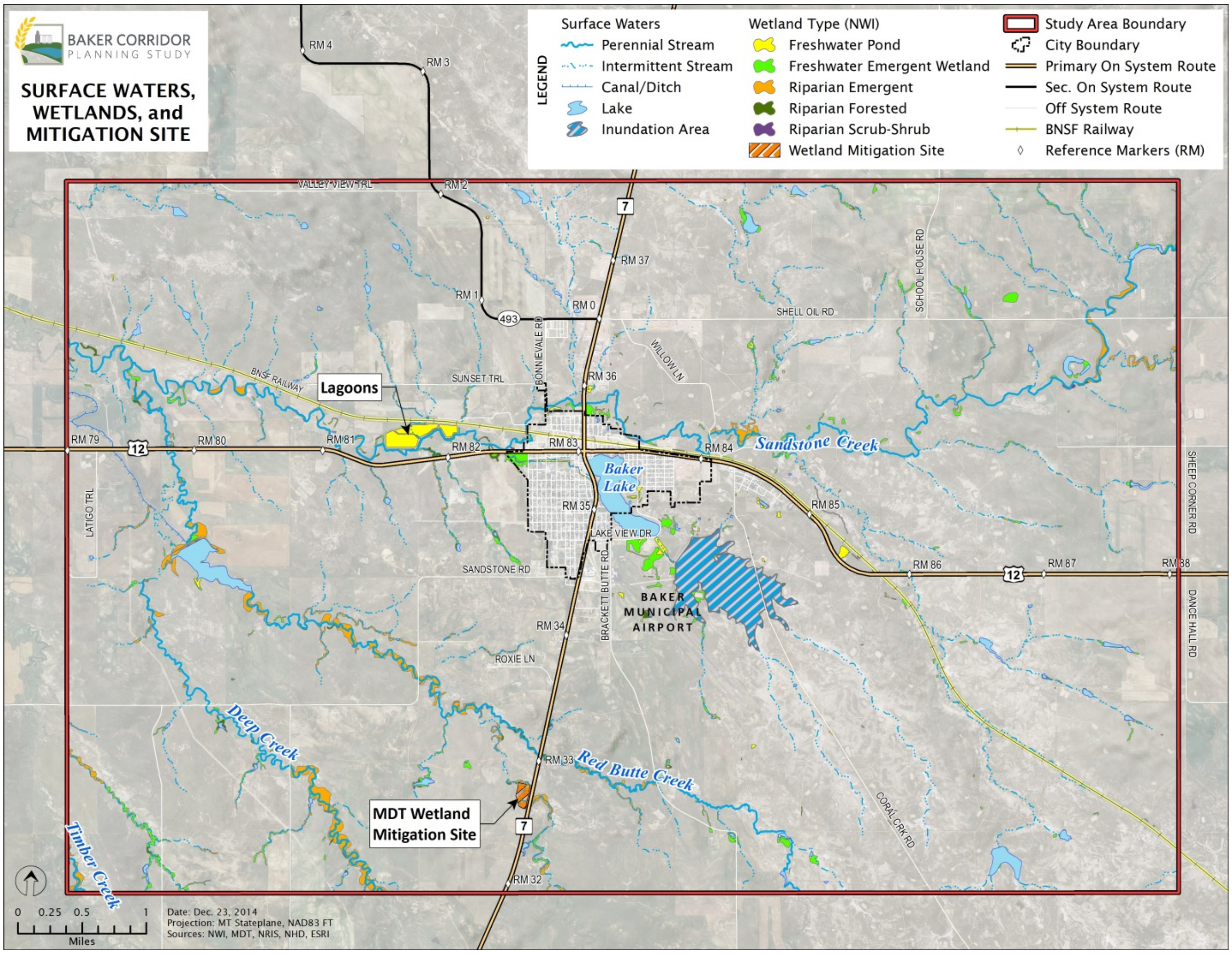

Figure 17: Surface Waters and Wetlands Located within the Study Area

A variety of additional surface waters, including unnamed streams, natural drainages, wetlands, and ponds are present in the Study Area. Impacts to any of these surface waters could occur from improvements such as culverts under the roadway, placement of fill, or rip rap armoring of banks. The United States Army Corps of Engineers (USACE), the Montana Department of Fish, Wildlife and Parks (FWP), and the Montana Department of Environmental Quality (DEQ) all regulate portions of work within surface waters. Coordination with federal, state, and local agencies would be necessary to determine the appropriate permits based on choice of improvement options forwarded from this study. Impacts should be avoided and minimized to the maximum extent practicable. Stream and wetland impacts may trigger compensatory mitigation requirements of the USACE. Construction of forwarded improvement options may trigger the need to obtain coverage under the Montana Pollutant Discharge Elimination System (MPDES) General Permit for Storm Water Discharges Associated with Construction Activity.

TOTAL MAXIMUM DAILY LOADS

The Study Area is located in the Lower Yellowstone Watershed (hydrologic unit code (HUC) 10100005). A search of the DEQ website revealed Sandstone Creek as the only stream on the 303d list within the Study Area (Table 23). Section 303, subsection "d" of the Clean Water Act requires the state of Montana to develop a list, subject to United States Environmental

Protection Agency (USEPA) approval, of water bodies that do not meet water quality standards. When water quality fails to meet state water quality standards, DEQ determines the causes and sources of pollutants in a sub-basin assessment and sets maximum pollutant levels, called total maximum daily loads (TMDL).

TMDLs set by DEQ become the basis for implementation plans to restore water quality to a level that supports State-designated beneficial water uses. The implementation plans identify and describe pollutant controls and management measures to be undertaken (such as best management practices), the mechanisms by which the selected measures would be put into action, and the individuals and entities responsible for implementation projects.

DEQ lists Sandstone Creek as having impairment in the Draft 2014 Integrated 303(d)/305(b) Water Quality Report for Montana. This water body is a Category 5, defined as waters where one or more applicable beneficial uses are impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat. Sandstone Creek is in the O'Fallon TMDL area, but at this time, the TMDL is not completed. One probable source of impairment is agriculture. The other is municipal point source discharges, which could be a result of release of water from wastewater treatment systems. Additionally, the Fallon Growth Policy notes watering of the golf course uses water from the sewage treatment plant. Highway construction and ongoing transportation corridor use are not likely contributors to nitrogen loading in Sandstone Creek, so the nitrogen impairment is unlikely to trigger design modification for future roadway projects. That said, if improvement options are advanced, it will be necessary to reconsider DEQ TMDL standards and potential impacts to water quality within receiving streams and watersheds in the Study Area.

Table 23: 303(d) Listed Streams in Study Area

Named Stream	Quadrant[1]	Category	Possible Impairment	Beneficial Uses
Sandstone Creek	N 1/2	5	Nitrate/Nitrite, Nitrogen(total)	Primary Contact Recreation, Aquatic Life

[1]Quadrants of Study Area used as approximation of location because Study Area is rectangular.

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act, created by Congress in 1968, provided for the protection of certain rivers, and their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, or cultural resources, or other similar values. Based on a review of the United States National Park Service website, none of the waterways within the Study Area carry the wild and scenic designation.

SEWAGE TREATMENT PONDS

Between RM 81 and RM 82 on the north side of US 12 is the City of Baker's three-pond wastewater treatment system. The Fallon Growth Policy noted that the City of Baker is seeking funding to expand this wastewater treatment system by adding an evaporation pond and possible expansion of the other ponds. Construction is currently underway on those improvements. Impacts to the wastewater treatment system should be avoided, as it will involve extra costs and possible land acquisition to offset associated impacts.

Groundwater

According to the Montana Bureau of Mines and Geology Groundwater Information Center, there are 1,682 wells on record in Fallon County. Some of these wells are located within the Study Area. The newest well on record is from July 16, 2014, and the oldest well on record is from October 1900. Approximately one-third (492) of the wells within Fallon County are at a depth of 0 to 99 feet. There are three statewide monitoring network wells in Fallon County. The wells in Fallon County have widely varying uses, with stockwater wells being the most common, followed by domestic wells.

The City of Baker has five public water supply wells ranging in depth 613 to 680 feet and three potable water USTs ranging in size from 100,000 gallons to 200,000 gallons (see Figure 18). Four of the wells are located on the northwest edge of Baker; the fifth well is on the southwest edge of town where the three USTs are similarly located. Public water supply wells have setbacks to ensure the wells are not contaminated. The typical setback is a 100-foot isolation zone inside which there should be no source of pollutant. The public water supply wells and underground potable water storage tanks are areas to be avoided during future project development.

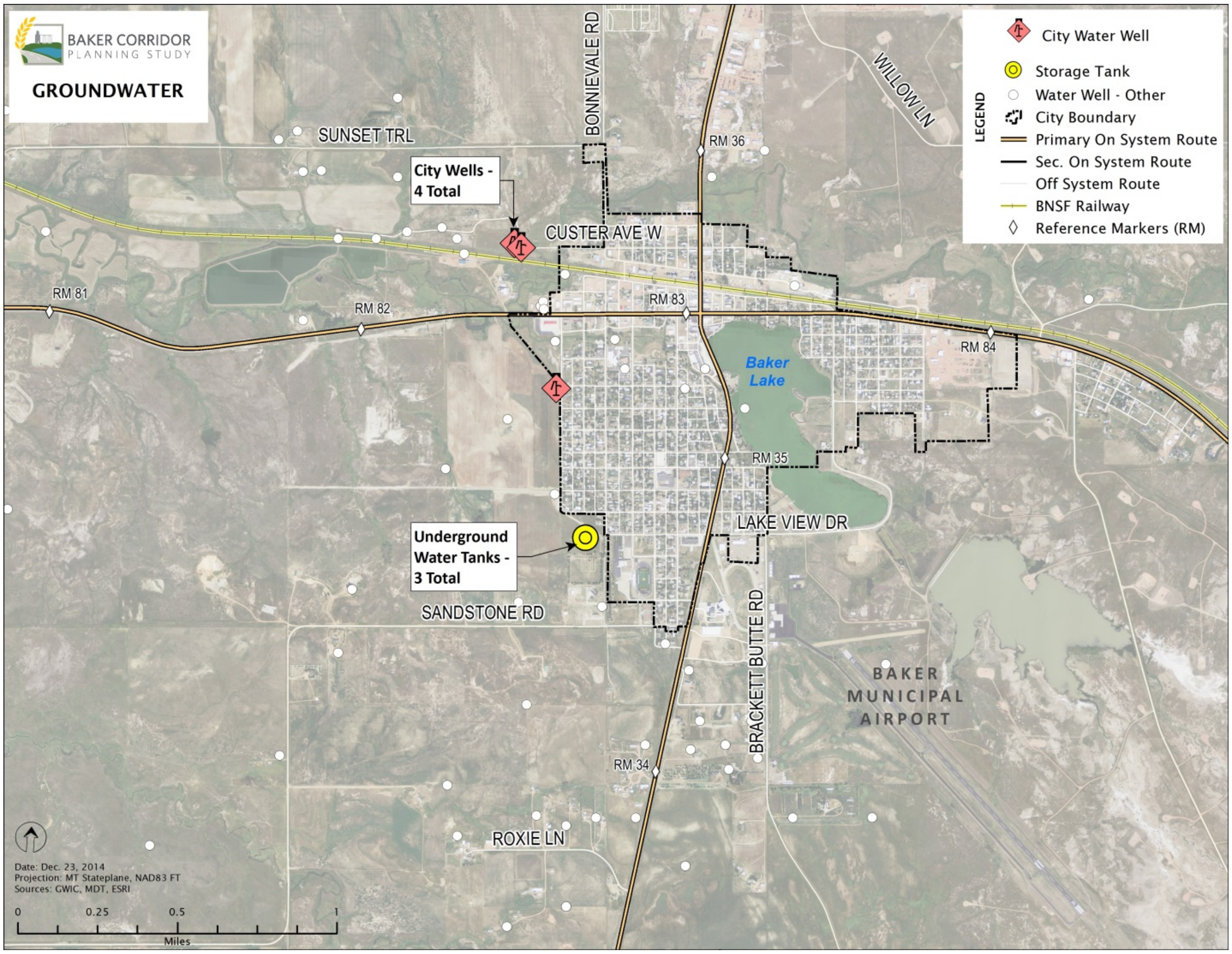

Figure 18: Groundwater Resources within the Study Area

Impacts to the municipal drinking water system should be avoided, as they will involve extra costs and possible land acquisition to offset associated impacts. Impacts to existing domestic wells will also need to be considered if improvement options are forwarded from the study.

Wetlands

The USACE defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs, and similar areas.

United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping data are available for this area from the NWI website or the Montana Natural Resource Information System (NRIS) (see Figure 17). The potential wetland areas identified within the Study Area are primarily along Sandstone Creek and in the areas surrounding Baker Lake. An MDT wetland mitigation site was created in 2010 as mitigation for unavoidable wetland impacts resulting from two MDT projects: Baker – South, and Junction S-322 – South. This site is located along MT 7 south of Baker (at Township 7 North, Range 59 East, Section 26; Latitude

46.3291, Longitude -140.2854). The MDT wetland mitigation site is currently not an USACE-approved mitigation bank.

The NWI database provides a planning-level assessment on probable wetlands within the Study Area. These maps are based on the USFWS definition of wetlands, which does not follow the USACE definition that MDT uses in wetland determination and delineation. NWI maps are typically generated based on aerial and satellite imagery, and are not suitable for MDT project wetland determination and/or delineation.

Future wetland delineations would be required if improvement options are forwarded from the study that could potentially impact wetlands. Future projects in the Study Area would need to incorporate project design features to avoid and minimize adverse impacts to wetlands to the maximum extent practicable. Unavoidable impacts to wetlands must be compensated through mitigation in accordance with the USACE regulatory requirements and/or requirements of Executive Order 11990. Work within jurisdictional wetlands would require a Clean Water Act 404 permit from the USACE. If required, mitigation for improvement options forwarded from the study would not be able to use mitigation credits from the MDT wetland mitigation site until approved by the USACE and would rather need to address mitigation separately for each project constructed.

Floodplains and Floodways

Executive Order 11988, Floodplain Management, requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities" for the following actions:

- Acquiring, managing, and disposing of federal lands and facilities;
- Providing federally undertaken, financed, or assisted construction and improvements; and
- Conducting federal activities and programs affecting land use, including but not limited to, water and related land resources planning, regulation, and licensing activities.

Federal-aid Policy Guide, 23 Code of Federal Regulations (CFR) 650, Bridges, Structures, and Hydraulics, provides “policies and procedures for the location and hydraulic design of highway encroachments on floodplains, including direct Federal highway projects administered by the [Federal Highway Administration (FHWA)].” This document defines “base flood” as the “flood or tide having a 1-percent chance of being exceeded in any given year” and “base flood plain” as the “area subject to flooding by the base flood.”

Federal Emergency Management Agency-issued flood maps for Fallon County indicate that four floodplain zones exist within the Study Area. Refer to Figure 19 for a depiction of mapped floodplains within the Study Area.

In 1985, the U.S. Department of Agriculture Soil Conservation Service prepared the *Sandstone Creek and Tributaries Flood Plain Management Study*. This report is a detailed study with defined flood elevations of Sandstone Creek through the City of Baker and created the regulated floodplain boundaries currently used by the Fallon County Floodplain Administrator.

Any improvement option(s) forwarded from this study would need to ensure impacts to the floodplain and Sandstone Creek are minimized. Modifications to the floodplain would involve additional project time and cost to the extent that map revisions are required.

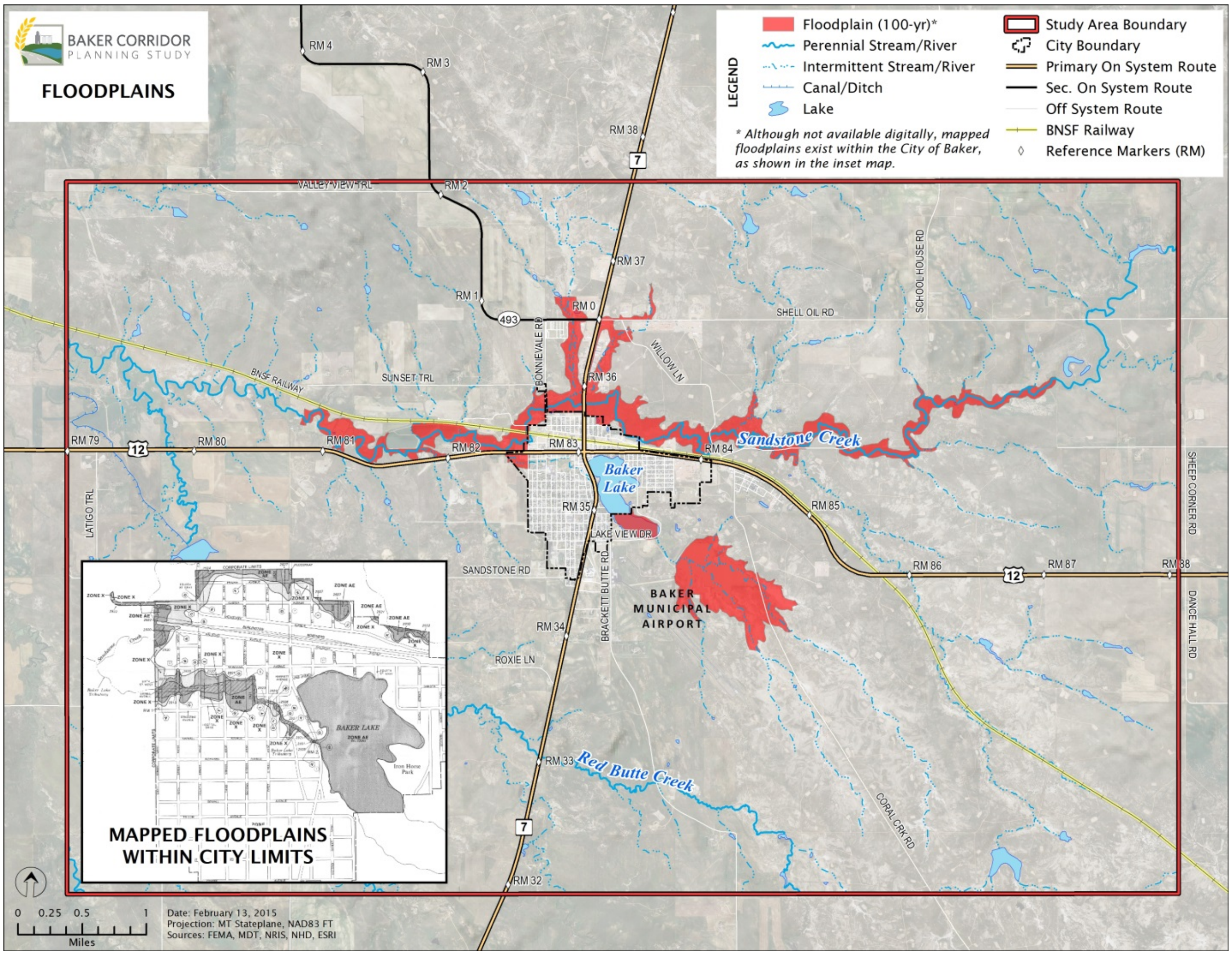

Figure 19: Mapped Floodplains within Study Area

Potential roadway improvements or new alignments occurring to the north of Baker have potential to affect the mapped floodplain for Sandstone Creek. Roadway development involving placement of fill within the regulatory floodplain would require a floodplain permit, necessitating coordination with the Fallon County Floodplain Administrator to minimize floodplain impacts and obtain necessary floodplain permits for project construction.

Irrigation

Irrigated agriculture land exists in Fallon County within the Study Area. Improvement options forwarded from this study have the potential to impact irrigation facilities. Impacts to irrigation facilities should be avoided when feasible, due to the additional costs (above typical project costs) associated with the redesign or relocation of the irrigation structure(s). Future modifications to existing irrigation canals, ditches, or pressurized systems could require consultation with the owners to minimize impacts to agricultural operations.

The Water Resources Survey map indicates the presence of one historical private irrigation system and ditch in the Study Area (refer to Appendix C for more information). More information is presented in Section 4.3, Recreational, Cultural and Historic Resources, below.

Air Quality

The USEPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM10 and PM2.5), sulfur dioxide, and lead. The USEPA designates communities that do not meet NAAQS as “non-attainment areas.” States are then required to develop a plan to control source emissions and ensure future attainment of NAAQS. The Study Area is not located in a non-attainment area for any of the criteria pollutants. Additionally, there are no non-attainment areas nearby. As a result, special design considerations will not be required in future project design to accommodate NAAQS non-attainment issues.

Depending on the scope of improvements considered in the Study Area, an evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment, which are known or suspected to cause cancer or other serious health and environmental effects.

Hazardous Substances

The NRIS database provides information on UST sites, leaking underground storage tank (LUST) sites, abandoned mine sites, remediation response sites, landfills, National Priority List sites, hazardous waste, crude oil pipelines, and toxic release inventory sites. The following is a brief summary of the primary sites within the Study Area that could impact potential future improvements and may require additional investigation or remediation (refer to Appendix C for more information).

UNDERGROUND STORAGE TANKS

Twenty-six individual USTs were identified within the Study Area. These USTs are registered to various businesses and entities in Baker, including the BNSF Railway, Fueling Facilities, and the Baker Municipal Airport. The majority of the active USTs are located within the city limits of Baker. There are two closed USTs outside the city limits of Baker. Additional investigation regarding the precise locations of the USTs may be necessary depending on the improvement options forwarded from this study.

LEAKING UNDERGROUND STORAGE TANKS

Six active and 10 inactive LUST sites were identified within the Study Area, most of which are within city limits. One inactive LUST site is noted to exist outside of the City of Baker. This location is immediately southwest of RM 37 on MT 7, north of Baker. If a project were to occur in close proximity to this site, or to the City of Baker itself, then further review or potential soil investigation may be necessary. Many of these LUST sites are Petroleum Tank Release

Cleanup Fund (PetroFund) sites. If LUSTs or contaminated soils are encountered, further investigation and possible remediation may be necessary. This could create additional costs associated with a forwarded improvement.

MINE SITES

The NRIS database identifies one abandoned mine site southwest of the intersection of US 12 and MT 7. There is the potential for other abandoned mine sites not currently listed in the NRIS database to exist southwest of Baker. If improvements are forwarded from the study, an on-the-ground field survey will be required to determine if the listed mine still exists and if other abandoned mines are present in the area of possible projects. If an abandoned mine site is located, additional investigation of the soils in this area may be necessary to determine if contamination exists.

The DEQ database identifies one opencut mining site southwest of Baker. The Fallon County Road Department is the permit holder of this opencut mining site.

If there are proposed improvements in the areas near a mine, there is the potential for impacts to project design and construction, and additional investigation may be necessary.

CRUDE OIL PIPELINE

The NRIS database identified one crude oil pipeline in the northwest corner of the Study Area (see Figure 20), but does not currently include detailed information on the pipeline. Considering the amount of oil and gas well development throughout the Study Area, it is probable that other sections of unmapped pipeline exist connecting the oil and gas wells to storage tanks and other facilities. If improvements are proposed in this area, additional research and coordination will be needed to identify any potential conflicts with the pipeline, and on-the-ground site visits and coordination with oil and gas well owners may be necessary.

OIL AND GAS PRODUCTION WELLS

Oil and gas development exists in the Study Area. Three oil and gas formations (Cedar Creek, Pennel, and Lookout Butte) are oriented slightly northwest-southeast and encompass the entire eastern Study Area. These formations contain hundreds of oil and gas wells and associated oil and gas infrastructure (see Figure 20). If future improvements occur in the eastern half of the Study Area, consideration should be given to avoid oil and gas infrastructure where practicable. If projects brought forward from the study occur in close proximity to the oil and gas wells, this would likely warrant additional soil investigations and coordination with oil and gas well owners to determine if contaminated soils are present.

HAZARDOUS WASTE HANDLERS

The DEQ data mapper depicts three hazardous waste handling facilities within the Study Area. They are as follows:

- One facility located in the town of Baker is listed as inactive and a conditionally exempt small-quantity generator;
- One facility located north of Baker on Shell Oil Road is listed as active and a conditionally exempt small-quantity generator;

- One facility located north of Baker on MT 7, immediately south of RM 37 (Nalco Company Baker Warehouse) is listed as active and a large-quantity generator.

It is unlikely that these facilities will impact projects forwarded from the study; however, if construction activities were to occur in close proximity to the Nalco Company Baker Warehouse, a soil investigation could be necessary to determine if contaminated soils are present. A soil investigation would incur additional costs above normal project expenditures. If contaminated soils are present, a special provision regarding handling contaminated soils would be recommended to be included in project documentation.

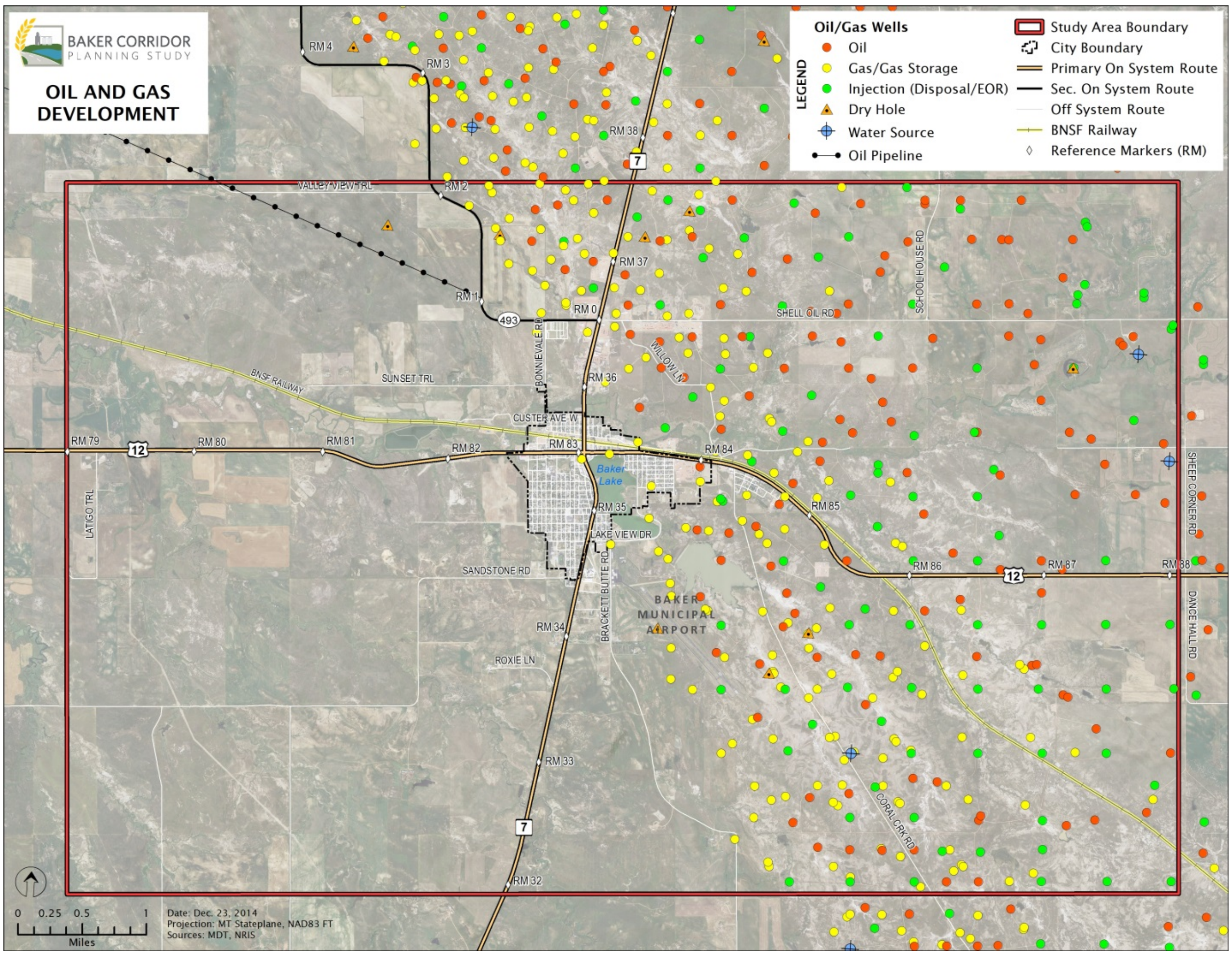

Figure 20: Oil and Gas Development within the Study Area

4.2 Biological Resources

Vegetation

A combination of Great Plains Mixedgrass Prairie, Cultivated Crops, and Big Sagebrush Steppe habitat dominate the land cover near the Study Area (refer to Appendix C). The majority of land coverage within the Study Area is Great Plains habitat, with a few other land cover types interspersed. Table 24 presents land cover listed by the Montana National Heritage Program (MNHP) for Fallon County.

Table 24: Fallon County Land Cover

Land Cover Type	% of Cover
Great Plains Mixedgrass Prairie	46
Big Sagebrush Steppe	16
Cultivated Crops	16
Great Plains Sand Prairie	7
Pasture/Hay	5
Great Plains Badlands	4
Great Plains Riparian	4

Source: MNHP, 2014

If improvement options are forwarded from the study, practices outlined in MDT standard specifications should be followed to minimize adverse impacts to vegetation and facilitate establishment of final stabilization of disturbed areas. Removal of mature trees and shrubs should be limited to the extent practicable.

NOXIOUS WEEDS

Noxious weeds can degrade native vegetative communities, damage riparian areas, compete with native plants, create fire hazards, degrade agricultural and recreational lands, and pose threats to the viability of livestock, humans, and wildlife. Areas with a history of disturbance, such as highway rights-of-way, are at particular risk of weed encroachment. The Invaders Database System lists 49 exotic plant species and 17 noxious weed species in Fallon County, some of which may be present in the Study Area. Fallon County has created a weed control plan that lists 26 noxious weed species as present in Fallon County.

Reseeding of disturbed areas with desirable native plant species will help to reduce the spread and establishment of noxious weeds and to re-establish permanent vegetation. If improvements are forwarded from the study, field surveys for noxious weeds should take place prior to any ground disturbance. In addition, coordination with the Fallon County Weed Board should occur.

General Wildlife Species

MAMMALS

The Study Area is home to a variety of mammal species, including white-tail deer, mule deer, pronghorn antelope, and coyote. Other common mammals potentially occurring in the Study Area include mountain lion, raccoon, striped skunk, badger, bobcat, red fox, beaver, muskrat, long-tailed weasel, white-tailed jackrabbit, western harvest mouse, deer mouse, and prairie vole. If improvement options are forwarded from the study, the need for and viability of wildlife crossing mitigation measures should be explored during the project development process.

AMPHIBIANS AND REPTILES

The MNHP Natural Heritage Tracker database records and maps documented observations of species in a known location. A review of the database was conducted for amphibian species known to occur within the Study Area. Species include, but are not limited to, the following:

- boreal chorus frog
- northern leopard frog

- barred tiger salamander
- greater short-horned lizard
- snapping turtle
- painted turtle
- gopher snake
- prairie rattlesnake
- terrestrial garter snake
- western hog-nosed snake

Any improvements forwarded from the study should take into consideration and minimize impacts to amphibian and reptile habitat where practicable.

BIRDS

The MNHP Natural Heritage Tracker database indicates there are more than 140 species of birds documented with the potential to occur and nest in the Study Area. These species include representative songbirds, birds of prey, waterfowl, owls, and shorebirds.

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). Under this strict liability law, it is unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver, or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not. Direct disturbance of a nest occupied with birds or eggs is prohibited under the law. The destruction of unoccupied nests of eagles; colonial nesters such as cormorants, herons, and pelicans; and some ground/cavity nesters such as burrowing owls or bank or cliff swallows may also be prohibited under the MBTA.

Data searches revealed that currently there are no known bald eagle or golden eagle nests within the Study Area. The Great Plains riparian habitat is a known ecological system associated with the golden eagle. Bald and golden eagles are protected under the MBTA and managed under the Bald and Golden Eagle Protection Act, which prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle or golden eagle, alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

Any improvements forwarded from this study should consider potential constraints that may result from nesting/breeding periods of migratory birds and presence of unknown or future bald and golden eagles nests. One of the constraints on projects is that any work involving the disturbance or removal of trees or structures associated with nesting birds will need to schedule this work to take place outside the typical nesting season of April 15 to August 15.

FISHERIES

There are only two aquatic resources listed as possessing warm water fishery resources in the Study Area (see Figure 17, above). Table 25 lists fisheries information for named streams within the Study Area.

Table 25: Fisheries Data

Named Stream within Study Area	Quadrant[1]	Fish Species Present
Sandstone Creek	N ½	Black Bullhead, Fathead Minnow, Yellow Perch, Common Carp, White Sucker, River Carpsucker, Green Sunfish, Sand Shiner, Emerald Shiner, Brassy Minnow, Western Silvery/Plains Minnow, Channel Catfish, Creek Chub, Flathead Chub, Goldeye, Lake Chub, Longnose Dace, Northern Pike, Shorthead Redhorse, Stonecat, Brassy Minnow, Brook Stickleback
Baker Lake	Center	Black Bullhead, Black Crappie, Fathead Minnow, Largemouth Bass, Northern Pike, Yellow Perch

Source: FWP Montana Fisheries Information System (MFISH), 2014.
[1]Quadrants of Study Area used as approximation of location because Study Area is rectangular.

Fish passage and/or barrier opportunities should be considered at affected drainages if improvements are forwarded from this study. Per FWP recommendation, culverts should be sized to span the bankfull channel width on fish-bearing streams. Culverts should also be embedded a minimum of 20% of the culvert rise. Studies have shown that culverts embedded at least 20% reduce the potential for the culvert to become a barrier to fish movements. Permitting from regulatory agencies for any future improvements may also require incorporation of additional design measures to facilitate aquatic species passage.

CRUCIAL AREAS PLANNING SYSTEM

The FWP Crucial Areas Planning System (CAPS) is a resource intended to provide non-regulatory information during early planning stages of projects, conservation opportunities, and environmental review. The finest data resolution within CAPS is at the square-mile section scale or water body. Use of these data layers at a more localized scale is not appropriate and may lead to inaccurate interpretations since the classification may or may not apply to the entire square-mile section. The CAPS system was consulted to provide a general overview of the Study Area. CAPS results are presented in Appendix C.

The online CAPS mapping tool provides FWP general recommendations and recommendations specific to transportation projects for both terrestrial and aquatic species and habitat. These recommendations can be applied generically to possible future improvements carried forward from the study.

Threatened and Endangered Species

The USFWS maintains the federal list of threatened and endangered (T&E) species. Species on this list receive protection under the Endangered Species Act (ESA). An “endangered” species is in danger of extinction throughout all or a significant portion of its range. A “threatened” species is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list. According to the USFWS, five threatened, endangered, proposed, or candidate species are listed as occurring in Fallon County (see Table 26).

Table 26: Threatened and Endangered Species in Fallon County

Species	Status
Greater Sage-Grouse	Candidate
Sprague's Pipit	Candidate
Red Knot	Threatened
Whooping Crane	Endangered
Northern Long-eared Bat	Proposed

Source: USFWS, 2015.

According to the MNHP Natural Heritage Map Viewer database (report generated August 20, 2014), which records and maps documented observations of species in a known location, only the greater sage-grouse and the Sprague's pipit have been recorded within the boundaries of the Study Area. Therefore, it is reasonable to presume that suitable habitats for these species may be present within the Study Area. If improvements are forwarded from the study, an evaluation of potential effects to T&E species will need to be completed during the project development process. As the federal status of protected species changes over time, reevaluation of the listed status and afforded protection to each species should be completed prior to issuing a determination of effect relative to potential impacts.

Species of Concern

Montana species of concern (SOC) are native plants or native animals breeding in the state that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution. Designation of a species as a Montana SOC is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). Modifiers, such as B (breeding) or N (non-breeding), may follow state ranks.

A search of the MNHP species of special concern database (report generated August 19, 2014) revealed four SOC and four potential SOC in Fallon County (Table 27). These eight species have the potential to occur in the Study Area based on presence of suitable habitat (refer to Appendix C for more information).

Table 27: Species of Concern Overlapping the Study Area

Animal Subgroup	Common Name	State[1] Rank	Habitat Description
Birds	Greater Sage-grouse	S2	Sagebrush
	Baird's Sparrow	S3B	Grasslands
	Brewer's sparrow	S3B	Sagebrush
	Chestnut-collard Longspur	S2B	Grasslands
Fish	Brook Stickleback	S4	Small prairie rivers
	Brassy Minnow	S4	Small prairie rivers
	Plains Minnow	S4	Small prairie rivers
	Creek Chub	S4	Small prairie rivers

Source: MNHP, 2014.
[1] State rank definitions are located in Appendix C.

In addition to being a state species of concern, the greater sage-grouse is currently a candidate species for inclusion on the list of threatened and endangered species by the USFWS. The USFWS has a website dedicated solely to the greater sage-grouse (sage grouse). The status of this species will be amended once USFWS biologists have made a final determination.

Montana's governor, Steve Bullock, established by Executive Order the Greater Sage-Grouse Habitat Conservation Advisory Council on February 2, 2013. The purpose of the Council was "to gather information, furnish advice, and provide to the governor recommendations on policies and actions for a state-wide strategy to preclude the need to list the greater sage-grouse under the ESA" by no later than January 31, 2014. The Council was co-chaired by FWP Director, Jeff Hagener, and the governor's Natural Resources Policy Advisor, Tim Baker. Council members included representatives from agriculture and ranching, conservation and sportsmen, energy, mining and power transmission, tribal government, local government, and the legislature. The Council has concluded its work and provided recommendations to the governor's office in the form of a "Montana Strategy to address threats to the sage-grouse in Montana" (refer to Appendix C for more information). This plan should be taken into consideration if habitat for the greater sage-grouse could be impacted.

According to the MNHP, a portion of the sage grouse Cedar Creek Core Area extends into the Study Area, as well as there being several sage grouse leks outside of core habitat that surround the Study Area. A 2014 USGS report evaluating lek buffer distances indicates an effective buffer range of 3.1 to 5 miles for both surface disturbance and linear features. Impacts to sage grouse, including core and non-core habitats, should be minimized and avoided to the extent practicable.

Other sensitive species, including golden eagles, are not listed here, but have the potential to occur within the Study Area. Available literature identifies no nests currently existing within the Study Area. A thorough field investigation for the presence and extent of these species should be conducted if improvement options are forwarded from this study. If present, special conditions to the project design or during construction should be considered to avoid or minimize impacts to these species.

4.3 Recreational, Historical, and Cultural Resources

Recreational Resources

The Baker area offers a variety of year-round activities, including fishing, boating, and swimming at Baker Lake in the summer. In the winter, snowmobiling, ice-skating, and cross-country skiing take over Baker Lake and the surrounding area. Recreation areas within the Study Area include a collection of city parks within the City of Baker, Fallon County Rifle Range & Trapshoot facility to the southwest of town, and a public golf course.

Recreational resource information was gathered through review of both United States Forest Service and FWP resource lists for Fallon County, and the Fallon County Growth Policy. Table 28 lists publically owned recreational resources identified in the Study Area.

Table 28: Recreational Resources

Resource
Mangold Sports Complex
Triangle Park
Iron Horse Park
Senior Citizens Centennial Park
Eastside Park
Fallon County Fairgrounds
County Golf Course
Steve McClain Memorial Park
Baker Lake Recreation Area

Source: Fallon Growth Policy, 2012.

These recreational areas may be protected under Section 4(f) of the U.S. Department of Transportation Act of 1966, which was enacted to protect publically owned parks, recreation areas, wildlife and waterfowl refuges, and public and private historic sites of local, state, and national significance. Federally funded transportation projects cannot impact Section 4(f)-protected properties unless there are no feasible or prudent avoidance alternatives, and all possible planning to minimize harm has occurred. Prior to approving a project that “uses” a Section 4(f) resource, FHWA must find that there is no prudent or feasible alternative that completely avoids the 4(f) resource. “Use” can occur when land is permanently incorporated into a transportation facility or when there is a temporary occupancy of the land that is adverse to a Section 4(f) resource. Constructive “use” can also occur when a project’s proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are “substantially impacted.” Potential effects on recreational use would need to be considered in accordance with Section 4(f) if improvements are forwarded from this study. Recreational resources potentially protected under Section 4(f) are shown in Figure 21.

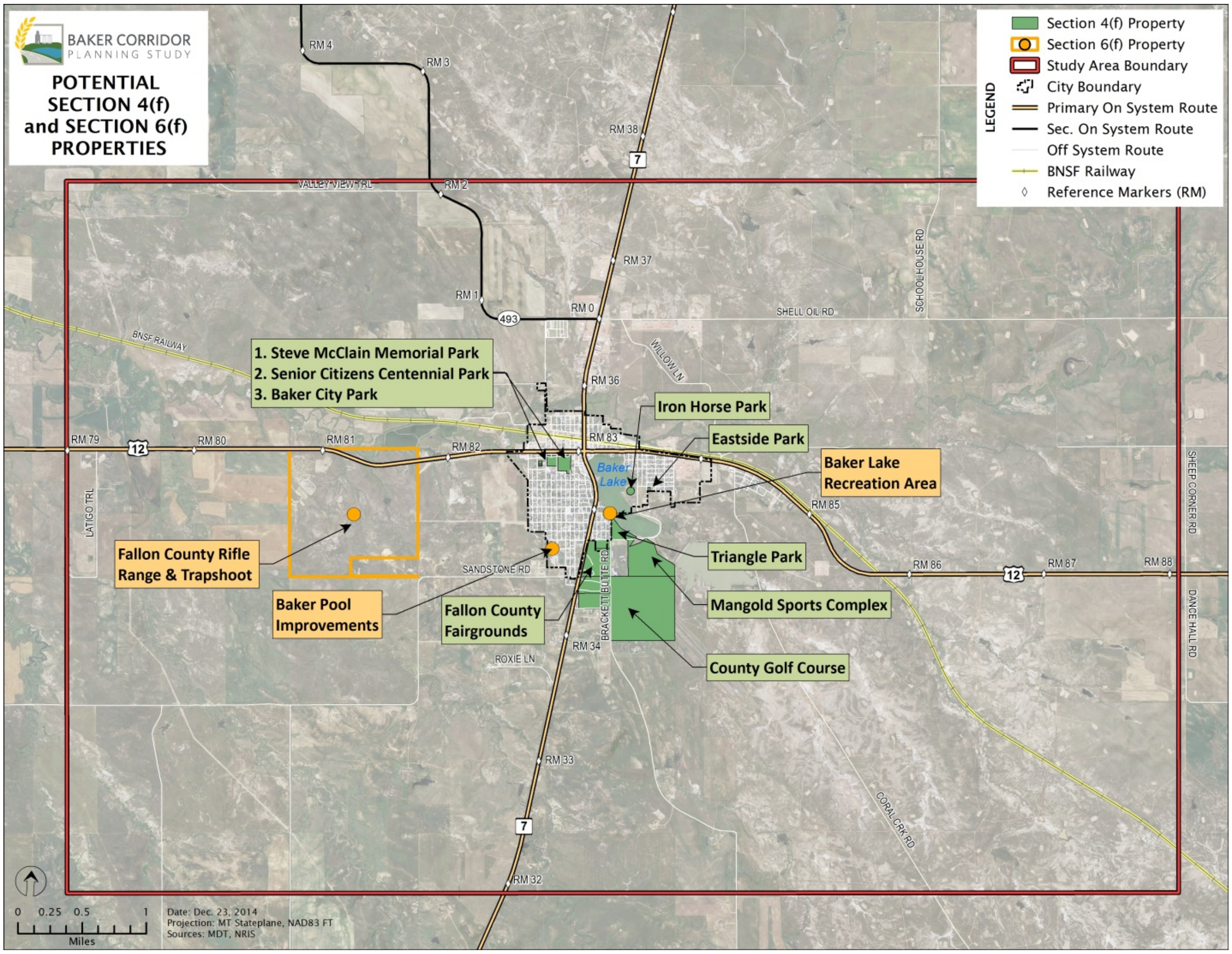

Figure 21: Potential Section 4(f) and 6(f) Properties Located within the Study Area

From a high-level evaluation, some of the resources listed in Table 28 may not being considered Section 4(f) resources, yet it is apparent from the Fallon Growth Policy and the high amount of recreational programs that the City of Baker places a high value on its recreational resources. Efforts should be made with projects advanced from the study to avoid adverse impacts to or right-of-way acquisitions from community recreational resources.

The National Land and Water Conservation Fund Act (LWCFA), or Section 6(f), was enacted to preserve, develop, and assure the quality and quantity of outdoor recreation resources. Section 6(f) protection applies to all projects that impact recreational lands purchased or improved with LWCFA funds. The Secretary of the Interior must approve any conversion of LWCFA property to a use other than public, outdoor recreation. According to FWP LWCFA Sites by County, there are three distinct Section 6(f) resources located within the Study Area: Baker Lake Recreation Area, Baker Pool Improvement, and the Fallon County Rifle Range & Trapshoot facility (see Figure 21 above). The Baker Lake Recreation Area includes the Baker Pool improvement and two other LWCFA improvements within the boundaries of Baker Lake Recreation Area. All the 6(f) and the possible 4(f) resources except the Fallon County Rifle Range & Trapshoot facility are inside the city limits of Baker, most likely not making them a concern to forwarded improvements. It could be difficult and time-consuming to convert these resources to non-recreational purpose properties, and should be avoided if practicable.

Cultural Resources
For federally funded transportation projects, a cultural resource survey must be conducted for the area of potential effect as specified in Section 106 of the National Historic Preservation Act (36 CFR 800). Section 106 requires federal agencies to "take into account the effects of their undertakings on historic properties." The purpose of the Section 106 process is to identify historic and archaeological properties that could be affected by the undertaking; assess the effects of the project; and investigate methods to avoid, minimize, or mitigate adverse effects on historic properties. These historic resources properties are also generally afforded protection under Section 4(f) of the Transportation Act.

A file search through the Montana State Historic Preservation Office revealed approximately 25 historic or archaeological properties located within the Study Area (refer to Appendix C for more information). Historic buildings, bridges, a railroad line, pre-contact buried campsites, and lithic scatters are all located in the area. These sites represent a small percentage of the archaeological sites and historic properties that can be expected within the Study Area boundaries. Because the Baker area has had minimal ground surveys to date, the current data of known archaeological and historical resources within the Study Area are likely incomplete. On-the-ground archaeological field inventories would be necessary to locate cultural resources within the Study Area or a project-specific location. Direct and indirect impacts (such as visual, noise, and access impacts) to eligible or listed properties would need to be considered if improvements options are carried forward.

The Water Resources Survey map (refer to Appendix C for more information) indicates the presence of one historical private irrigation system and ditch in the Study Area. The private irrigation system and the Munsell ditch shown on the Water Resources Survey map may be historic. At this time, not enough information is known about either the private irrigation system or the Munsell ditch, and a field investigation would be necessary to determine National Register of Historic Places (NRHP) eligibility. If eligible for the NRHP, then efforts must be made to avoid or minimize impacts to the private irrigation system and the Munsell ditch.

4.4 Noise

Evaluation of traffic noise may need to occur for any future improvements in the Study Area. Noise analysis is necessary for "Type I"-classified projects. A Type I project includes a substantial shift in the horizontal or vertical alignments, increasing the number of through lanes, providing passing lanes, or increasing traffic speed and volume.

Type I projects require a detailed noise analysis, consistent with FHWA requirements and MDT policy, which includes measuring ambient noise levels at selected receivers and modeling design year noise levels using projected traffic volumes. If noise levels approach or substantially exceed noise abatement criteria for the project, noise abatement measures may be necessary. A number of possible abatement measures available for consideration include, but are not limited to, the following:

- Alternating the horizontal or vertical alignment;
- Constructing noise barriers such as sound walls or earthen berms; and/or
- Decreasing traffic speed limits.

Noise abatement measures must be considered reasonable and feasible prior to implementation.

Construction activities in the Study Area may cause localized, short-duration noise impacts. These impacts can be minimized by using standard MDT specifications for the control of noise sources during construction.

4.5 Visual Resources

The visual resources of an area include landforms, vegetation, water features, and physical modifications caused by human activities that give the landscape its visual character and aesthetic qualities. Visual resources are typically assessed based on the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distance of seen areas) of a geographically defined view shed.

Baker is on the eastern edge of Montana, and the surrounding area is fields and rolling hills with sandstone outcroppings. There are minimal view-obstructing man-made items other than the City of Baker itself. To the north and east of Baker, oil rigs dot the horizon. As a whole, the landscape in the Study Area presents itself as a natural prairie/sagebrush environment with scattered agricultural fields and minimal urbanization. Evaluation of the potential effects on visual resources would need to be conducted if improvement options are forwarded from this study.

5. Areas of Concern

The following section provides a summary of the areas of concern identified within the Study Area. The areas of concern were identified through review of as-built drawings, MDT databases, public databases, field review, and other available resources, and are described more thoroughly in the sections above.

5.1 Transportation System Areas of Concern

Level of Service

Based on a low-growth traffic scenario and existing geometric configurations, the intersection of US 12 and MT 7 will operate at a failing level of service (LOS F) in the future. Also under the low-growth scenario, the intersection of MT 7/S-493/Shell Oil Road will be operating at a LOS D in the future. Medium- and high-growth traffic scenarios show that both intersections are predicted to fail under existing geometric configurations.

Horizontal Alignment

One curve located on S-493 does not meet the current minimum radius per MDT design standards for level terrain. Nine curves failed to meet current design standards for horizontal stopping sight distances.

Vertical Alignment

One curve located north of Baker at RM 37.10 does not meet current MDT design standards for level terrain. Three curves located between RM 37.10 and 37.83 failed to meet current design standards for vertical stopping sight distances.

Clear Zones

One area of concern was identified on US 12 at RM 86.18 on both the north and south sides of the highway. The drainage structure at this location includes concrete cutoff walls located approximately 32 feet from the edge of travel way, within the existing fill slope. The existing side slopes appear to be 4:1 or steeper. Based on current MDT standards, a clear zone distance of at least 40 feet is required for this area of US 12.

Intersections

The main intersection of US 12 and MT 7 has an insufficient geometric layout to accommodate WB-50 and larger design vehicles. Trucks with a 50’ and larger wheelbase encounter conflicts making turning movements as this intersection.

Surfacing

One section on US 12 does not meet the current MDT standard for minimum pavement width. From RM 76.954 to 82.187, the existing pavement width is listed as 24 feet, made up of two 12-foot lanes and no shoulder. Per the MDT Road Design Manual, a minimum width of 28 feet is desired for rural minor arterials.

Access Points

A high density of access points exist within Baker city limits, primarily along US 12 through the city.

Bridges

One bridge located just north of Baker on MT 7 at RM 35.86 spanning Sandstone Creek (P00027035+08231) has been categorized as Functionally Obsolete and eligible for rehabilitation.

5.2 Environmental Areas of Concern

Prime Farmland

NRCS soil surveys indicate the presence of farmland of state or local importance, or prime farmland if irrigated within the Study Area.

Geologic Resources

Soil types within the Study Area can involve revegetation challenges and additional erosion and sedimentation considerations during construction.

Surface Waters

Sandstone Creek is a major drainage that crosses the Study Area. A variety of other surface waters, including Baker Lake, as well as many unnamed streams, natural drainages, wetlands, and ponds are present in the Study Area.

Sandstone Creek is identified on DEQ's 303(d) list for impaired water bodies with agriculture as a probable cause for impairment.

Groundwater

The City of Baker has five public water supply wells and three potable water underground storage tanks located within the Study Area.

Wetlands and Wetland Mitigation Site

The Study Area contains many potential wetland areas, primarily along Sandstone Creek and areas surrounding Baker Lake. An MDT wetland mitigation site exists south of Baker along MT 7.

Floodplains and Floodways

Regulated floodplains exist on and along Sandstone Creek within the Study Area.

Hazardous Substances

Twenty-six individual USTs were identified within the Study Area. Six active and 10 inactive LUST sites were identified within the Study Area, most of which are within city limits.

One abandoned mine site was identified southwest of the intersection of US 12 and MT 7.

Oil and Gas Wells and Pipelines

Hundreds of oil and gas wells exist in the entire eastern half of the Study Area. One crude oil pipeline was identified in the northwest corner of the Study Area. Considering the amount of oil and gas well development throughout the Study Area, it is probable that other sections of unmapped pipeline exist connecting the oil and gas wells to storage tanks and other facilities.

Wildlife

Five threatened, endangered, proposed, or candidate species are listed as occurring in Fallon County.

Two threatened, endangered, proposed, or candidate species have documented occurrences within the Study Area.

Four species of concern and four potential species of concern have the potential to occur in the Study Area. Core habitat for the Greater Sage-Grouse exists within the Study Area.

Recreational, Historical, and Cultural Resources

There are multiple possible Section 4(f) and three Section 6(f) properties located within the Study Area at the time the environmental scan was completed.

Approximately 25 historic or archaeological properties are located within the Study Area, including historic buildings, bridges, a railroad, pre-contact buried campsites, and lithic scatters. The Water Resources Survey map indicates the presence of one historical private irrigation system and ditch within the Study Area.